

PROJECT MANUAL

Navajo Housing Authority 9 Arizona Scattered Sites AZ12-404

INVITATION TO BID # 613



Navajo Housing Authority Construction Document Specifications

April 2024

WHPacific
AN NV5 COMPANY

6501 Americas Parkway NE, Suite 400
Albuquerque, NM 87110
505-247-0294 FAX 505-242-4845

BID DOCUMENTS



NAVAJO HOUSING AUTHORITY

**Navajo Housing Authority (NHA)
Procurement Department**

INVITATION FOR BID

**Advertised - IFB #613 Construction Services for New Construction of Scattered Site
Homeownership Units in AZ**

The Navajo Housing Authority (NHA) (hereinafter called the “Owner”) invites all Licensed General Contractors to bid on Construction of New Homeownership Units. Detailed information may be obtained from Academy Reprographics and requesting for the Advertised - IFB #613 Construction Services for New Construction of Scattered Site Homeownership Units in AZ. The Owner will receive Sealed Bids until **2:00 PM, (MDST) on May 14, 2024**, via email at dyonnie@hooghan.org. Bids will be opened and publicly read aloud immediately after the specified closing time. Address any questions regarding this project in writing by **April 29, 2024** at **2:00 PM (MDST)** to: **Doris Yonnie, Procurement Specialist**, email dyonnie@hooghan.org. This invitation is **not restricted** to Navajo or Indian organizations and Navajo or Indian owned economic enterprises pursuant to 24 CFR 1000.48 (a) (2), 1000.50 and 1000.52 of NAHASDA.

Request for Bid Specifications may be obtained from **Academy Reprographics** by depositing \$100.00 (company check) payable to Navajo Housing Authority for each set of bid documents obtained. Upon returning sets in good condition within 10 days after the Bid Opening, deposit will be refunded. **Academy Reprographics is located at 8900 San Mateo Blvd, Suite N, Albuquerque, NM 87113 and phone number is (505) 821-6666 and fax number is (505) 857-0634, contact Savannah Arnold at savannah@acadrepro.com or Linda Chavez at linda@acadrepro.com**. General Contractors may request a maximum of two (2) complete sets of Bid Documents; subcontractors a maximum of one (1) complete set. The contractor will pay shipment of Bid Documents.



NAVAJO HOUSING AUTHORITY

Invitation for Bid Advertised – IFB #613 Construction Services for New Construction of Scattered Site Homeownership Units in AZ

BID DUE DATE:

May 14, 2024 at 2:00PM
Mountain Daylight Saving Time (MDST)

CONTACT:

Doris Yonnie, Procurement Specialist
Navajo Housing Authority
Procurement Department
Email: dyonnie@hooghan.org

Delivery Addresses

The Navajo Housing Authority Procurement Department will not be accepting in-person or post office/courier submissions from Vendors on any solicitation at this time. The NHA will receive bid responses electronically to contact person above.

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SECTION I – General Information

1. NHA Background Information: The Navajo Housing Authority (NHA) is enterprise of the Navajo Nation, which covers approximately 27,000 square miles including the states of Arizona, New Mexico and Utah. NHA manages 15 housing management offices located in major communities within the boundaries of the Navajo Indian Reservation. The central office or headquarters is located in Window Rock, Arizona.

NHA is a recognized as the Indian tribal subdivision of the Navajo Nation Government and is governed by its own Board of Commissioners appointed by the President of the Navajo Nation and approved by the Navajo Nation Council oversight Committee. NHA is also a Tribally Designated Housing Entity having full responsibility for managing the Native American Housing Assistance Self Determination Act (NAHASDA) Indian Housing Block Grant for the Navajo Nation. The NHA allocates the NAHASDA grants to various organizations for the purpose of building affordable homes for Navajo families. The NHA currently operates and maintains over 7,000 dwelling units across the Navajo Nation. NHA is also in the business of developing and constructing residential homes (both rental and homeownership housing units) including qualified public buildings such as day care centers, group homes for the elderly, college student housing complexes and such other public facilities. Most recently, NHA implemented a Mortgage Program which provides mortgage financing opportunities for Navajo families wishing to construct their homes on the Navajo Reservation.

2. Invitation For Bid (IFB): The NHA invites all Licensed General Contractors to bid on construction services for New Scattered Site Homeownership Units. This invitation is **unrestricted**: however, preference shall be given to Navajo or Indian Organizations and Navajo or Indian Owned Enterprises. Award will be in accordance with 24 CFR 1000.48, 1000.50 and 1000.52. The entities who respond to this IFB are herein referred to as the General Contractor.
3. Scope of Work in General: The Scope of Work shall contain the list of materials and/or services to be performed.
4. IFB Packet: This contains the instructions governing the bid preparation and required documents to be submitted are provided herein which must be met to be eligible for consideration.

Contractors may obtain copies of bid documents by depositing a \$100.00 check payable to Navajo Housing Authority for each set of Bid Documents or Digital Copy. The deposit is non-refundable. Copies may be obtained from Academy Reprographics, 8900 San Mateo Blvd, Suite N, Albuquerque, NM 87113, telephone number is (505) 821-6666 and fax number is (505) 857-0634, contact Savannah Arnold at savannah@acadrepro.com or Linda Chavez at linda@acadrepro.com .

5. Estimated Schedule of Activities:

Activities:

- a. Advertisement Period:
- b. Pre-Bid Conference:

Due Dates:

- April 5, 2024 – May 14 , 2024
April 24, 2024 @ 10:00am MDST

Location: NHA DCSD Conf. room #116 – Ft. Defiance, AZ

- c. Invitation For Bid Due: May 14, 2024 @ 2:00PM (MDST)**
Public Bid Opening:

Microsoft Teams

[Join the meeting now](#)

Meeting ID: 284 600 210 337

Passcode: rGqYAk

- d. Tentative NHA Approval: June 13, 2024**
e. Execution of Contract/NTP: June 19, 2024

*The NHA will issue an addendum if there is any deviation from the due date.

6. Inquiries: ANY AND ALL inquiries or questions shall be submitted in writing to Doris Yonnie, Procurement Specialist via email at dyonnie@hooghan.org by **April 29, 2024 @ 2:00PM (MDST)**. All responses will be made in writing to all General Contractors who have an interest in this IFB.
7. Addendum of Supplement to this IFB: In the event it becomes necessary to revise any part of the IFB, the Procurement Department shall issue a written addendum on the specifics of the change(s) and inform all concerned. All requested forms and attachments (Signature and Acknowledgment of Addendum) must be submitted with the Form of Bid and in the required format. The submission and signing of a bid shall indicate the intention of the bidder to adhere to the provisions described in this IFB.
8. Late Receipt of Bid: Late bids shall not be accepted. It is the responsibility of the bidder to ensure the bid arrives via email to the assigned Procurement Specialist prior to the due date and time specified NO Exceptions.
9. Rejection of Bids: The NHA reserves the right to reject any or all bids, whether within the estimated total contract price or not, and to waive informalities in the bids received whenever such rejection or waiver is in the best interest of the NHA.
10. Withdrawal of Bids: No bid shall be withdrawn for a period of sixty (60) days subsequent to the Opening of Bids without consent of NHA.
11. Proprietary Information: Any restrictions on the use of data contained within any bid must be clearly stated in the bid itself. Each and every page that contains proprietary information must be labeled or identified with "Proprietary".
12. Ownership of Bids: All materials submitted with the bid accepted shall become the property of the NHA and not returned to the General Contractor. The NHA has the right to use any or all information presented in the bid for the purpose of review and qualification. Disqualification or non-selection of the General Contractor or bid does not eliminate this right.
13. Incurring Cost: The NHA is not liable for any cost incurred by the General Contractor prior to issuance of the contract award for the General Contractor.

14. Acceptance of Bid Content: The contents of the bid of the successful General Contractor will become contractual obligations if acquisition action ensues. Failure of the successful General Contractor to accept these obligations may result in cancellation of the award and such General Contractor may be removed from future solicitation. The NHA reserves the right to pursue appropriate legal action in the set of the circumstances in Navajo Nation Tribal Courts.
15. Acceptance Time: The NHA will open and publicly read aloud all bids immediately after the specified closing time.
16. UEIN & System for Award Management (SAM) Registration:
All NHA Contractors **must** be registered in the System for Award Management (SAM) at <https://www.sam.gov> . Request for a Unique Entity Identification Number (UEIN). The NHA will not award any contracts to Contractors who do not meet this requirement.
17. Award of Bid: Upon selection, the contract document will be prepared and delivered to the General Contractor and the bid deliverable submitted by the General Contractor will become part of the contract.
18. Award Procedures and Criteria:
 - a. All bids be publically opened via zoom on the specified due date.
 - b. Review: A review team will evaluate the bids received in accordance with the general criteria used herein. General Contractor should be prepared to provide any additional information the team feels necessary to the fair evaluation.
 - c. Endorsement: Failure of the General Contractor to provide any information requested in the IFB will result in disqualification of the bid. All bids must be endorsed with the signature of a responsible official having the authority to bind the offer to execution of the bid.
 - d. Compliance with NAHASDA Navajo or Indian Preference Requirements.
 - i. Navajo Preference: This IFB is NOT restricted to Navajo organizations and Navajo owned economic enterprises pursuant to 24 CFR 1000.48 (a) (2) of NAHASDA. In the award of contract, the NHA gives preference to Navajo organizations and Navajo-owned economic enterprises pursuant to 24 CFR 1000.48 (a) (2) of NAHASDA and Navajo Business Opportunity Act (NBOA) 5.N.N.C. 201 § et. Seq. Professional Vendor(s) must provide evidence of at least 51% Navajo ownership and indicate if vendor is a partnership, corporation, joint venture, sole proprietorship, or other legally bound arrangement with appropriate ownership documents.
 - ii. The Navajo Nation Contract and Purchase Certification and Certificate of Eligibility is reviewed, monitored and issued by the Navajo Nation Business Regulatory Department under the Navajo Nation Division of Economic Development. NHA shall require the current Navajo Nation Contract and Purchase Certification and Certificate of Eligibility from Bidders seeking Navajo Preference at the time of proposal submission.

- a. Application of Navajo Preference. Businesses are certified according to the following priority classification:
 - 1. Priority #1 - 100% Navajo-owned and controlled business entity;
 - 2. Priority #2 –Certification shall be granted to:
 - a. Any fifty-one percent (51%) to ninety-nine percent (99%) Navajo; or
 - b. Fifty-one percent (51%) to one hundred percent (100%) other Indian owned and controlled business; or
 - c. One hundred percent (100%) Navajo Nation owned and controlled economic enterprise having its principal place of business on or off the Navajo Nation.
 - i. The qualified Navajo owned economic enterprise or organization Priority #1 are entitled to an award of 10 points of the available rating.
 - ii. The qualified Navajo owned economic enterprises or organizations Priority #2 are entitled to an award of 5 points of the available rating.
- b. Navajo Preference Company Ownership. If a Navajo Preference individual 51% or more, the Navajo Preference owner shall participate in more than 50% of the project and shall not offer or bid to any single sub-contractor(s) who is not Navajo Preference.

After applying Navajo Preference, if there is no Priority #1 or Priority #2 responsive and responsible bidder for a given solicitation. NHA will apply Indian Preference pursuant to Section 7(b) of the Indian Self-Determination and Education Assistance Act (ISDEAA) of 1975, preference in the award of contracts and subcontracts shall be given to Indian-owned economic enterprises and Indian organizations. The definitions of “Indian,” “economic enterprise,” and Indian Organization” shall be as defined in 24 C.F.R. 1000.48, 1000.50, and 1000.52 respectively. If there is a Priority #1 or Priority #2 responsive and responsible bidder for a given solicitation then Indian Preference shall not apply.

iii. Indian Preference:

This IFB is not restricted to Indian organizations and Indian owned economic enterprises pursuant to 24 CFR 1000.48 (a) (2), 1000.50 and 1000.52 of NAHASDA. In the award of contract, the NHA gives preference to Indian organizations and Indian-owned economic enterprises pursuant to 24 CFR 1000.48 (a) (2), 1000.50 and 1000.52 of NAHASDA. Vendor(s) must provide evidence of at least 51% Indian ownership from a recognized Indian Tribe. Indicate if vendor is a partnership, corporation, joint venture, sole proprietorship, or other legally bound arrangement with appropriate ownership documents.

- a. Application of Indian Preference. If IFB is not restricted to qualified Indian-owned economic enterprises or organizations, the NHA Procurement Department will review and certify which of the Bidders are qualified Indian-owned economic enterprises or organizations.
- b. Indian Preference Company Ownership, If Vendor or Contractor is 51% or more owned by an Indian Preference individual, the Indian Preference owner shall participate in more than 50% of the project and should not be bid out to any single sub-contractor(s) who are not Indian Preference.
- c. Award will be made to the qualified Indian enterprise or organization with the lowest responsive bid if that bid is within budgeting limits established for this project and is no more than "X" percent higher than the lowest responsive bid from any qualified Non-Indian Bidder.

	X = lesser of
When the lowest responsive bid is less than \$100,000	10% of that bid or 9,000
At least \$100,000 but less than \$200,000	9% of that bid or 16,000
At least \$200,000 but less than \$300,000	8% of that bid or \$21,000
At least \$300,000 but less than \$400,000	7% of that bid or \$24,000
At least \$400,000 but less than \$500,000	6% of that bid or \$25,000
At least \$500,000 but less than \$1,000,000	5% of that bid or \$40,000
At least \$1,000,000 but less than \$2,000,000	4% of that bid or \$60,000
At least \$2,000,000 but less than \$4,000,000	3% of that bid or \$80,000
At least \$4,000,000 but less than \$7,000,000	2% of that bid or \$105,000
\$7,000,000 or more	1 ½% of the lowest responsive bid, with no dollar limit

If no responsive bid by a qualified Indian enterprise or organization is within the stated range, award will be made to the Bidder with the lowest responsive, responsible bid.

The General Contractor shall submit a completed Form NHA Employment and Training Statement attesting to give preference and opportunity for training and employment to Navajos and Indians in implementing the contract pursuant to 24 CFR 1000.48 (a) (2), 1000.50 and 1000.52 of NAHASDA and NBOA, 5 N.N.C. § 201 et. seq. Failure to do so shall be grounds for NHA to deem the Contractor Non-Responsive.

19. Required Wage Rates: In accordance with the NAHASDA requirements, the contractor is to pay prevailing wage rates established by U.S. Department of Housing and Urban Development (Davis-Bacon Act). The current wage determination is set forth within the Contract Documents. This provision essentially provides that all labor mechanics employed by the contractor and subcontractors for this project shall be paid wages established by the U.S. Department of Housing and Urban Development.

20. Additional Information:

The NHA may request additional information from bidders after bid submission. Bidders will be required to submit by NHA's specified due date and time.

21. Organization Business Parameters

1. Team Continuity and Changes to Organizational Structure:

Following submittal of the IFB, Key Personnel or Major Participants identified in the IFB may not at any time be removed, replaced, or added without the written approval of the NHA. The NHA may revoke the responsive status of a Submitter if any Key Personnel or Major Participant identified in the IFB is removed, replaced, or added without NHA approval. To qualify for approval, the written request shall document that the proposed removal, replacement, or addition will be equal to or a more qualified Key Personnel or Major Participant provided in the IFB.

- 2. Sale of the Business Structure:** Following submittal of the IFB, if the business goes through a sale and new ownership is established, the submitter shall provide written documentation for NHA's approval of the new ownership status and provide supporting technical, administrative and financial capacity information for NHA's review and approval. The NHA may terminate contract for convenience if it is in the best interest of NHA.

- 22. Performance and Payment Bond:** A 100 percent performance and payment bond of the contract price will be required and shall be approved by the NHA prior to contract award. Verification of bonding capacity will be requested from the Contractor by the NHA for review.

- 23. Standard Contract:** A Standard Construction Agreement Between Owner and Contractor whose bid is determined to be responsive and responsible to the NHA, in consideration of qualifications, knowledge of Tribal standards, NAHASDA rules and regulations, and cost. The Navajo Housing Authority reserves the right to incorporate standard contract provisions into any contract negotiations as a result of a responsive and responsible bid in response to this IFB; such standard contract provisions include but is not limited to non-waiver of sovereign immunity by NHA. Navajo Nation laws govern the contract and Navajo Nation courts shall have sole and exclusive jurisdiction over any disputes that may arise.

- 24. Insurances(s):** The selected General Contractor agrees to procure and maintain professional liability insurance with an insurance company in good standing, name NHA as an additional insured, insuring payment of damages arising out of the performance of construction services for the NHA, in contractor's capacity if such damages are caused by error, omission or negligent act of the insured or any person for whom the insured is legally liable and responsible.

Additionally, the following minimum amounts of Liability Coverage shall be maintained by the Contractor during the life of the contract.

<u>Insurance</u>	<u>Limit or Amounts</u>
1. Workers Compensation	Statutory Limits
2. Employers Liability	One Accident \$100,000
3. Protective Liability	Bodily Injury \$1,000,000/2,000,000
4. Protective Liability	Physical Injury \$1,000,000/2,000,000
5. Public Liability	Bodily Injury \$1,000,000/2,000,000
6. Public Liability	Physical Injury \$1,000,000/2,000,000
7. Pollution (Environmental Liability)	\$1,000,000 Each Occurrence
8. Automobile Insurance	Bodily Injury \$1,000,000.00/2,000,000
9. Automobile Insurance	Physical Injury \$1,000,000.00/2,000,000
10. Errors and Omissions Liability	\$500,000/500,000

- 25.** Arbitration: At the discretion of the General Contractor, the Navajo Nation Sovereign Immunity Act provides the opportunity to parties doing business with the Navajo Housing Authority to engage in settlement of agreement of disputes through arbitration. 1 N.N.C. §554(J).

SECTION II – Instruction to Bidders and Bid Standards

The Navajo Housing Authority (NHA) is jointly developing this project with the Navajo Nation, including the financial contribution from Native American Housing & Self Determination Act (NAHASDA) program. The use of NAHASDA funds require that the contract be in compliance with the Federal Procurement standards. The following special instructions are the NHA and HUD program requirements that are part of the contract documents.

Read Instructions Carefully.
Failure to submit the following documents shall be grounds for the NHA to deem your bid as Non-Responsive.

E-mail bids will be accepted ONLY.

1. **General Standards:**

Please ensure you submit your response in the following manner:

- All Bids submitted must be one (1) electronic document.
- Submit an electronic document with subject title, clearly reads “**Do Not Open – Advertised - IFB #613 Construction Services for New Construction of Scattered Site Homeownership Units in AZ**” and if **Navajo Preference** is applicable, clearly indicate “**Priority #1**” or “**Priority #2**” and if Indian Preference is applicable clearly mark “**Indian Preference**”.
- All Bidders shall acknowledge receipt of all addenda on form of bid (if applicable).
- Please submit bids with a cover sheet** and in the order of the bid requirements and tab all sections of the bid accordingly.
- All Bids shall include the following information as outlined in Additional Requirements.
- All Bids shall include the following information as outlined in EXHIBITS A through M.

2. **Form 5369** – Instruction to Bidders for contracts Public and Indian Housing Programs

3. **Additional Requirements**

Additional information is required as such and must accompany the bids at the time of submission in order to be deemed responsive. **All forms must be submitted, signed, dated and notarized, if applicable to the form.**

- EXHIBIT “A”** Financial Information

The bidder must demonstrate it has the financial capability to perform the required services. Submit 2022 and 2021 year-end financial statements acceptable to the NHA, which clearly depicts the stability of the firm. These financial statements must either be “audited financial statements” or “signed and reviewed by a third party Certified Public Accounting (CPA)”. Financial Statements must include the **Balance Sheet, Profit & Loss Statement, and Income Statement.**

If the firm does not have “audited financial statements or signed and reviewed by a third party Certified Public Account (CPA)”, the firm shall submit the U.S. Corporation Income Tax Return Form 1120 for 2022 and 2021.

- If this is the first project as a Joint Venture (JV), please submit the requested financials for both entities.

You may be required to submit detailed financial documents and/or information by the NHA.

EXHIBIT “B-1” Navajo Preference

- All Bidders interested in claiming Navajo Preference must submit Exhibit B-1– The Navajo Nation Contract and Purchase Certification Certificate of Eligibility that documents if the bidder is Priority #1 or Priority #2, at the time of the bid submission.

Or;

EXHIBIT “B-2” Indian Preference. All Bidders interested in claiming Indian Preference must submit the following:

1. If not a qualified Indian Preference company with the NHA, but seeking Indian Preference, submit completed Appendix – 1, Form – Indian Enterprise Qualification Statement and include all required attachments as Exhibit B-2
2. If your company is already qualified as an NHA Indian Preference company, submit a copy of the NHA Indian Qualification Certified Letter as Exhibit B – 2.

If this is your first project as a JV and seeking Navajo or Indian Preference, please submit all information for both entities in the JV.

If “NOT APPLICABLE – PLEASE INDICATE NOT APPLICABLE for EXHIBIT B-1 and B-2 and submit as EXHIBIT B-1 and B-2.

EXHIBIT “C” Names of Core Crew Employees and Resumes

A core crew employee is an individual who is a bona fide employee of the contractor at the time the bid is submitted; or an individual who was not employed by the bidder at the time the bid was submitted, but who is regularly employed by the bidder in a supervisory or other key skilled position when work

is available. Bidders shall submit with their bids a list of all core crew employees and resumes.

EXHIBIT “D” List of Subcontractors

Bidders must submit a list of the subcontractors.

EXHIBIT “E” Employment and Training Statement

All Bidders are required to submit with bids a statement describing how they will provide Navajo or Indian Preference in the award of subcontracts. See Section 12(f) (1) of the Instructions to Bidders, Form 5369. The specific requirements of that statement and factors to be used by the Owner in determining the adequacy of the statement are as follows:

- (I) A statement describing the Bidder’s plan to provide Navajo or Indian Preference in subcontracting, including how eligibility for preference will be determined, the procedures that will be followed by the Bidder for qualifying subcontractors seeking to qualify for Navajo or Indian Preference, how Navajo or Indian Preference in the award of subcontracts will be made, and any other miscellaneous information.
 - (II) A statement detailing the Bidder’s employment and training opportunities and its plan to provide preference to Navajo or Indian in implementing the contract; and
 - (III) The number of percentage of Navajo or Indian anticipated to be employed and trained.
- **Must be signed and notarized** with the signature of a responsible official having the authority to bind the offer to execution of the bid.
 - **Must include required separate documents** as specified on the form to
 - If this is your first project as a JV, submit a separate form for each entity involved.

EXHIBIT “F” Non-Collusive Affidavit

- **Must be signed and notarized** with the signature of a responsible official having the authority to bind the offer to execution of the bid.
- If this is your first project as a JV, submit a separate form for each entity involved.

EXHIBIT “G” Certification Regarding Debarment, Suspension and Eligibility and Voluntary Exclusion Letter

- **Must be prepared on firm’s letterhead and signed** with the signature of a responsible official having the authority to bind the offer to execution of the bid.

- If this is your first project as a JV, submit a separate form for each entity involved.
- EXHIBIT “H”** Types of Agreements
- If any of the following apply to the applicant entity(s), the entity(s) must submit:
- Collaborative Agreements
 - JV Agreement
 - Teaming Agreement
 - Mentoring Agreement
 - Financial Support Agreement
 - Other Formalized Agreements

If “NOT APPLICABLE – PLEASE INDICATE NOT APPLICABLE for EXHIBIT H and submit as EXHIBIT H.

- EXHIBIT “I”** Contractor’s and Consultant’s Previous Participation Certification
- **Must be completed and signed** with the signature of a responsible official having the authority to bind the offer to execution of the bid.
 - If this is your first project as a JV, submit a separate form for each entity involved.

Form 5369 – Instructions to Bidders for contracts Public and Indian Housing Programs for Exhibit “J”

- EXHIBIT “J”** HUD form 5369a Representations, Certifications, and Other Statements of Bidders, Public and Indian Housing Programs, Previous Participation Certificate, Section 12: Be advised - Replacement of the second sentence; “If the Successful Bidder does not submit the certificate with his/her bid he/she must submit it within three (3) working days of the bid opening.” with **“The Bidder must submit the certificate (Replacement HUD Form 2530 Previous Participation - NHA P&CD 12/6/2010) with the bid.”** (As provided in the Contract Documents).
- EXHIBIT “K”** Form of Bid and Exhibit “K-1” Material and Labor Cost Breakdown
- **Must be completed and signed** with the signature of a responsible official having the authority to bind the offer to execution of the bid.
- EXHIBIT “L”** Bid Bond (L1) or Bid Security (L2)
- **Must be completed and signed** with the signature of a responsible official having the authority to bind the offer to execution of the bid.
- EXHIBIT “M”** If applicable, Certified Check or Cash Deposit in Lieu of Bid Bond Letter. A certified check in the amount equal to 10% of the bid, payable to the *Navajo Housing Authority* –or– an account established with a financial

institution naming *Navajo Housing Authority* as the sole account holder containing an amount equal to 10% of the bid, shall be submitted with bid.

EXHIBIT “A”- Financial Information

The bidder must demonstrate it has the financial capability to perform the required services. Submit 2022 and 2021 year-end financial statements acceptable to the NHA, which clearly depicts the stability of the firm. These financial statements must either be “audited financial statements” or “signed and reviewed by a third party Certified Public Accountant (CAP)”. Financial Statements must include the **Balance Sheet, Profit & Loss Statement, and Income Statement.**

If the bidder does not have “audited financial statements or signed and reviewed by a third party Certified Public Accountant (CPA)”, the bidder shall submit the U.S. Corporation Income Tax Return Form 1120 for 2022 and 2021.

- If this is the first project as a Joint Venture (JV), please submit the requested financials for both entities.

You may be required to submit detailed financial documents and/or information requested by the NHA.

EXHIBIT “B-1” or “B-2” NAVAJO or INDIAN PREFERENCE

- **Exhibit B-1:** All bidders interested in claiming Navajo Preference must submit current and valid “The Navajo Nation Contract and Purchase Certification Certificate of Eligibility” that documents if the bidder is Priority #1 or Priority #2, at the time of the bid submission.
- If this is your first project as a JV and seeking Navajo Preference, please submit all information for both entities in the JV.

Or;

- **Exhibit B-2:** If not a qualified Indian Preference company with the NHA, but seeking Indian Preference please complete and submit all required attachments of Appendix-1, Form – Indian Enterprises Qualifications Statement to be considered for Indian Preference and submit as Exhibit B-2.
- If your Company is already a qualified NHA Indian Preference company, please submit a copy of the NHA Indian Qualification Certified letter in place of Exhibit B-2.
- If you are seeking Indian Preference for a JV, submit all information on behalf of the JV. *If this is your first project as a JV, please submit all information for each entity involved.*

If NOT APPLICABLE – PLEASE INDICATE NOT APPLICABLE and submit as EXHIBIT B-1 or B-2, or both, B-1 and B-2.

EXHIBIT “C”- Names of Core Crew Employees and Resumes

A core crew employee is an individual who is a bona fide employee of the contractor at the time the bid is submitted; or an individual who was not employed by the General Contractor at the time the bid was submitted, but who is regularly employed by the General Contractor in a supervisory or other key skilled position when work is available. General Contractor shall submit with their bids a list of all core crew employees and resumes.

subcontractor's name, bid amount and other information required by the NHA and as stated in NHA Contract Documents.

LICENSURE:

The subcontractor's name, the type of work, the subcontractor's bid amount, and the subcontractor's license number, if such license is required under state law, shall be listed. Bidder shall certify that all subcontractors, required to be licensed, are licensed as required by State law. A subcontractor includes a trade contractor or specialty contractor and does not include suppliers who provide only materials, equipment, or supplies to a contractor or subcontractor.

'SPECIAL EXCEPTION':

A Bidder may list 'Special Exception' in place of a subcontractor when the Bidder intends to obtain a subcontractor to perform the work at a later date because the Bidder was unable to obtain a qualified or reasonable bid. The Bidder shall insert the term 'Special Exception' for that category of work, and shall provide documentation with the subcontractor list describing the Bidder's efforts to obtain a bid of a qualified subcontractor at a reasonable cost and why the Bidder was unable to obtain a qualified subcontractor bid. The NHA must find that the Bidder complied in good faith for any 'Special Exception' designation, in order for the bid to be considered. If awarded the contract, the NHA shall supervise the Bidder's efforts to obtain a qualified subcontractor bid. The amount of the awarded contract may not be adjusted to reflect the actual amount of the subcontractor's bid. Any listing of 'Special Exception' on the sub-list form shall also include amount allocated for that work.

GROUND FOR DISQUALIFICATION:

The NHA may not consider any bid submitted by a Bidder if the Bidder fails to submit a subcontractor list meeting the requirements of State law. The NHA may withhold awarding the contract to a particular Bidder if one (1) or more of the proposed subcontractors are considered by the NHA to be unqualified to do the work or for such other reason in the best interest of the NHA. Notwithstanding any other provision in these instructions, if there is a good faith error on the sub-list form, at the sole discretion of the NHA, the NHA Contracting Officer may provide notice to the contractor and the contractor shall have 24 hours to submit the correction to the NHA. If such correction is submitted timely, then the sub-list requirements shall be considered met.

CHANGES OF SUBCONTRACTORS SPECIFICALLY IDENTIFIED ON SUBLIST FORM:

Subsequent to twenty-four (24) hours after the bid opening, the Bidder may change its listed subcontractors only after receiving written permission from the NHA based on complying with all of the following criteria.

1. The Bidder has established in writing that the change is in the best interest of the NHA and that the Bidder establishes an appropriate reason for the change, which may include, but not is not limited to, the following reasons: the original subcontractor has failed to perform, or is not qualified or capable of performing, and/or the subcontractor has requested in writing to be released.

2. The circumstances related to the request for the change do not indicate any bad faith in the original listing of the subcontractors.
3. Any requirement set forth by the NHA to ensure that the process used to select a new subcontractor does not give rise to bid shopping.
4. Any increase in the cost of the subject subcontractor work is borne by the contractor.
5. Any decrease in the cost of the subject subcontractor work shall result in a deductive change order being issued for the contract for such decreased amount.
6. The NHA will give substantial weight to whether the subcontractor has consented in writing to being removed unless the Bidder establishes that the subcontractor is not qualified for the work.

Example:

TYPE OF WORK	SUBCONTRACTOR, "SELF" OR "SPECIAL EXCEPTION"	SUBCONTRACTOR LICENSE #	SUBCONTRACTOR BID AMOUNT
ELECTRICAL	ABCD Electric Inc.	123456789000	\$325,000
LANDSCAPING	"Self"	123456789000	\$275,000
CONCRETE (ALTERNATE #1)	XYZ Concrete Inc	123456789000	\$315,000

SUBCONTRACTOR BID AMOUNTS CONTAINED IN THIS SUBCONTRACTOR LIST SHALL NOT BE DISCLOSED UNTIL THE CONTRACT HAS BEEN AWARDED.

EXHIBIT "E" – Employment and Training Statement

This form, when completely filled out, shall suffice to meet the minimum acceptable standard of the Navajo Housing Authority regarding the employment and training of Navajos or Indians and providing preference to Navajos or Indians implementing the contract and in the award of subcontracts. Answers will not be evaluated to determine their acceptability but rather, all completed forms will be accepted.

1. Does your firm presently provide employment and training opportunities to Navajos or Indians?

Yes _____ [You must answer (a)].

(a.) What will your company do to provide employment and training opportunities to Navajos or Indians in implementing the contract? (You must at least check one to meet standard of acceptability.)

(i) _____ In advertising for any vacant positions my company will provide for Navajo or Indian preference.

(ii) _____ Other. Explain on a separate sheet of paper

No _____ [You must answer (a)].

(a.) Please state on a separate sheet why your company currently offers no employment and training opportunities to Navajos or Indians.

2. Check applicable box (you must check at least one box):

_____ My company will provide preference to Navajos or Indians in the award of any subcontracts.

_____ My company will not subcontract any portion of the contract.

_____ Although, I anticipate to award subcontracts, it is infeasible to provide for Navajo or Indian preference in the award of subcontracts. Please provide certified statement stating why it is infeasible to provide Navajo or Indian preference in the award of subcontracts.

3. State the anticipated number or percentage of Navajos or Indians to be employed and trained under this contract.

_____ Check here if unsure or none, and state why on a separate sheet of paper.

I hereby certify that the above statements are correct and true.

Authorized Agent

Date

State of _____)ss

County of _____)ss

Subscribed and sworn to before me this _____ day of _____, 20____.

Signature of Notary

{SEAL}

My Commission expires _____, 20____.

EXHIBIT "F" – Non-Collusive Affidavit



State of _____)ss

County of _____)ss

_____, being first duly sworn, deposes and says:

That he/she is _____;
(A partner or officer of the company)

the party making the foregoing bid or bid, that such bid is genuine and not collusive or sham; that said bidder has not colluded, conspired, connived, or agreed, directly or indirectly, with any bidder or person, to put in a sham bid or to refrain from bidding, and has not in any manner, directly or indirectly, sought by agreement collusion or communication or conference, with any person, to fix the bid price of affiant or of any other bidder, or to fix any overhead, profit or cost element of said bid price, or of that any other bidder, or to secure any advantage against the

(NHA)

or any person interested in the proposed contract; and that all statements in said bid or bid are true.

SIGNATURE OF:

Bidder, if the bidder is an individual;

Partner, if the bidder is a partnership;

Officer, if the bidder is a corporation;

(MUST BE NOTORIZED)

Subscribed and sworn to before me this _____ day of _____, 20____.

Signature of Notary

{SEAL}

My Commission expires _____, 20____.

EXHIBIT “G” – Certification Regarding Debarment, Suspension and Eligibility and Voluntary Exclusion

[Date]

Must be submitted on Entity's Letterhead

Navajo Housing Authority
Attn: Doris Yonnie
Procurement Department
P.O. Box 4980
Window Rock, AZ 86515

RE: Certification Regarding Debarment, Suspension and Eligibility
and Voluntary Exclusion

Dear Ms. Yonnie:

By submitting a bid in response to the Navajo Housing Authority (NHA) Invitation for Bid Number _____ for _____, the undersigned certifies the following: I certify that, to the best of my knowledge, [_____ **Name of Company**] and all of its principals: (a) are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by a Federal Agency or agency; (b) have not within a Ten (10) year period preceding this bid been convicted of, or had civil judgment rendered against them for commission of fraud, or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, Tribal or local) transaction or contract under a public transaction, violation of antitrust statutes or commission of embezzlement, theft, forgery, falsification or destruction of records, making false statements, or receiving stolen property; (c) are not presently indicted for or other criminally or civilly charged by a government entity (Federal, State, Tribal or local) with the commission of any of the offenses enumerated in (b) of this certification; and (d) have not within a three year period preceding this bid had one or more public transaction (Federal, State, Tribal or local) terminated for cause.

1. This certification is a material representation of fact upon which the NHA has relied upon when this transaction was entered into. If it is later determined that the undersigned knowingly rendered an erroneous certification, in addition to other remedies available, the NHA may pursue available remedies including suspension, debarment, or termination of the contract.

Sincerely,

(Signature)

[Print Name, Title]

EXHIBIT “H” - Types of Agreements

If any of the following apply to the entity(s), the entity(s) must submit copies of:

- Collaborative Agreements
- JV Agreement
- Teaming Agreement
- Mentoring Agreement
- Financial Support Agreement
- Other Formalized Agreements

***If “NOT APPLICABLE – PLEASE INDICATE NOT APPLICABLE for EXHIBIT H”
and submit as EXHIBIT H.***

**NAVAJO HOUSING AUTHORITY
 PROCUREMENT AND CONTRACTS DEPARTMENT
 CONTRACTOR'S AND CONSULTANT'S PREVIOUS PARTICIPATION CERTIFICATION**

EXHIBIT "I"

1. Firm Name/Business Address/Fax Number Telephone No./Federal Tax Identification No.	2. Year Present Firm Established	3. Date Prepared
4. Specify type of Ownership, type of business and check below. if applicable:		
1a. Submittal for: <input type="checkbox"/> Parent Company <input type="checkbox"/> Branch or Subsidiary Office		<input type="checkbox"/> A. Indian Owned Organization or Enterprise <input type="checkbox"/> B. Small Business (other Minority) <input type="checkbox"/> C. Woman Owned
5. Name of Parent Company, if any	5a. Name of Former Parent Co. or Firm/Business Name(s) if different from Parent Co. or Firm Name/Owners(s) and Years established.	
6. Name of Owner(s)/Title/Telephone Number/Owner Responsibilities 1) 2) 3) 4)		

FOR CONSTRUCTION CONTRACTING ONLY (COMPLETE IF YOU ARE A GENERAL/SUB-CONTRACTOR

7. Summary of Total Construction Contracts Awarded: Insert Index	Last 5 Years (most recent year first) 2023 2022 2021 2020 2019	INDEX Range of Construction Contracts 1. Less than \$100,000 2. \$100,000 to \$250,000 3. \$250,000 to \$500,000 4. \$500,000 to \$1,000,000 5. \$1 million to \$2 million 6. \$2 million to \$5 million 7. \$5 million to \$10 million 8. \$10 million or greater
Direct Federal Contracts	_____	
Indian Housing Authorities	_____	
All other domestic work	_____	

**NAVAJO HOUSING AUTHORITY
PROCUREMENT AND CONTRACTS DEPARTMENT
CONTRACTOR'S AND CONSULTANT PREVIOUS PARTICIPATION CERTIFICATION**

8. Has the company or its former parent company/Owner debarred by the Federal, State or Local Government? If yes, provide what agency debarred the Company, duration, and reason for debarment.

9. Work by firm which best illustrate current qualifications relevant to this project (List no more than 5 projects).

a. Project Name and Location	b. Nature of Firm's Responsibility. Indicate if Firm was Prime Contractor or Subcontractor on Project.	c. Project Owner's Name & Address Contact Person and Phone No. And Email Address	d. Completion Date (actual or estimated)	e. Total Contract Amount	f. Was Project ever in default during your participation?
1)					/ / Yes (explain) / / No
2)					/ / Yes (explain) / / No
3)					/ / Yes (explain) / / No
4)					/ / Yes (explain) / / No
5)					/ / Yes (explain) / / No

Typed or Printed Name of Principal or Title:

Signature

Certification Date

Telephone No.

**U.S. Department of Housing and
Urban Development**
Office of Public and Indian Housing

**Instructions to Bidders for Contracts
Public and Indian Housing Programs**

Instructions to Bidders for Contracts

Public and Indian Housing Programs

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1. Bid Preparation and Submission

(a) Bidders are expected to examine the specifications, drawings, all instructions, and, if applicable, the construction site (see also the contract clause entitled **Site Investigation and Conditions Affecting the Work** of the *General Conditions of the Contract for Construction*). Failure to do so will be at the bidders' risk.

(b) All bids must be submitted on the forms provided by the Public Housing Agency/Indian Housing Authority (PHA/IHA). Bidders shall furnish all the information required by the solicitation. Bids must be signed and the bidder's name typed or printed on the bid sheet and each continuation sheet which requires the entry of information by the bidder. Erasures or other changes must be initialed by the person signing the bid. Bids signed by an agent shall be accompanied by evidence of that agent's authority. (Bidders should retain a copy of their bid for their records.)

(c) Bidders must submit as part of their bid a completed form HUD-5369-A, "Representations, Certifications, and Other Statements of Bidders."

(d) All bid documents shall be sealed in an envelope which shall be clearly marked with the words "Bid Documents," the Invitation for Bids (IFB) number, any project or other identifying number, the bidder's name, and the date and time for receipt of bids.

(e) If this solicitation requires bidding on all items, failure to do so will disqualify the bid. If bidding on all items is not required, bidders should insert the words "No Bid" in the space provided for any item on which no price is submitted.

(f) Unless expressly authorized elsewhere in this solicitation, alternate bids will not be considered.

(g) Unless expressly authorized elsewhere in this solicitation, bids submitted by telegraph or facsimile (fax) machines will not be considered.

(h) If the proposed contract is for a Mutual Help project (as described in 24 CFR Part 905, Subpart E) that involves Mutual Help contributions of work, material, or equipment, supplemental information regarding the bid advertisement is provided as an attachment to this solicitation.

2. Explanations and Interpretations to Prospective Bidders

(a) Any prospective bidder desiring an explanation or interpretation of the solicitation, specifications, drawings, etc., must request it at least 7 days before the scheduled time for bid opening. Requests may be oral or written. Oral requests must be confirmed in writing. The only oral clarifications that will be provided will be those clearly related to solicitation procedures, i.e., not substantive technical information. No other oral explanation or interpretation will be provided. Any information given a prospective bidder concerning this solicitation will be furnished promptly to all other prospective bidders as a written amendment to the solicitation, if that information is necessary in submitting bids, or if the lack of it would be prejudicial to other prospective bidders.

(b) Any information obtained by, or provided to, a bidder other than by formal amendment to the solicitation shall not constitute a change to the solicitation.

3. Amendments to Invitations for Bids

(a) If this solicitation is amended, then all terms and conditions which are not modified remain unchanged.

(b) Bidders shall acknowledge receipt of any amendment to this solicitation (1) by signing and returning the amendment, (2) by identifying the amendment number and date on the bid form, or (3) by letter, telegram, or facsimile, if those methods are authorized in the solicitation. The PHA/IHA must receive acknowledgement by the time and at the place specified for receipt of bids. Bids which fail to acknowledge the bidder's receipt of any amendment will result in the rejection of the bid if the amendment(s) contained information which substantively changed the PHA's/IHA's requirements.

(c) Amendments will be on file in the offices of the PHA/IHA and the Architect at least 7 days before bid opening.

4. Responsibility of Prospective Contractor

(a) The PHA/IHA will award contracts only to responsible prospective contractors who have the ability to perform successfully under the terms and conditions of the proposed contract. In determining the responsibility of a bidder, the PHA/IHA will consider such matters as the bidder's:

- (1) Integrity;
- (2) Compliance with public policy;
- (3) Record of past performance; and
- (4) Financial and technical resources (including construction and technical equipment).

(b) Before a bid is considered for award, the bidder may be requested by the PHA/IHA to submit a statement or other documentation regarding any of the items in paragraph (a) above. Failure by the bidder to provide such additional information shall render the bidder nonresponsible and ineligible for award.

5. Late Submissions, Modifications, and Withdrawal of Bids

(a) Any bid received at the place designated in the solicitation after the exact time specified for receipt will not be considered unless it is received before award is made and it:

(1) Was sent by registered or certified mail not later than the fifth calendar day before the date specified for receipt of offers (e.g., an offer submitted in response to a solicitation requiring receipt of offers by the 20th of the month must have been mailed by the 15th);

(2) Was sent by mail, or if authorized by the solicitation, was sent by telegram or via facsimile, and it is determined by the PHA/IHA that the late receipt was due solely to mishandling by the PHA/IHA after receipt at the PHA/IHA; or

(3) Was sent by U.S. Postal Service Express Mail Next Day Service - Post Office to Addressee, not later than 5:00 p.m. at the place of mailing two working days prior to the date specified for receipt of proposals. The term "working days" excludes weekends and observed holidays.

(b) Any modification or withdrawal of a bid is subject to the same conditions as in paragraph (a) of this provision.

(c) The only acceptable evidence to establish the date of mailing of a late bid, modification, or withdrawal sent either by registered or certified mail is the U.S. or Canadian Postal Service postmark both on the envelope or wrapper and on the original receipt from the U.S. or Canadian Postal Service. Both postmarks must show a legible date or the bid, modification, or withdrawal shall be processed as if mailed late. "Postmark" means a printed, stamped, or otherwise placed impression (exclusive of a postage meter machine impression) that is readily identifiable without further action as having been supplied and affixed by employees of the U.S. or Canadian Postal Service on the date of mailing. Therefore, bidders should request the postal clerk to place a hand cancellation bull's-eye postmark on both the receipt and the envelope or wrapper.

(d) The only acceptable evidence to establish the time of receipt at the PHA/IHA is the time/date stamp of PHA/IHA on the proposal wrapper or other documentary evidence of receipt maintained by the PHA/IHA.

(e) The only acceptable evidence to establish the date of mailing of a late bid, modification, or withdrawal sent by Express Mail Next Day Service-Post Office to Addressee is the date entered by the post office receiving clerk on the "Express Mail Next Day Service-Post Office to Addressee" label and the postmark on both the envelope or wrapper and on the original receipt from the U.S. Postal Service. "Postmark" has the same meaning as defined in paragraph (c) of this provision, excluding postmarks of the Canadian Postal Service. Therefore, bidders should request the postal clerk to place a legible hand cancellation bull's eye postmark on both the receipt and Failure by a bidder to acknowledge receipt of the envelope or wrapper.

(f) Notwithstanding paragraph (a) of this provision, a late modification of an otherwise successful bid that makes its terms more favorable to the PHA/IHA will be considered at any time it is received and may be accepted.

(g) Bids may be withdrawn by written notice, or if authorized by this solicitation, by telegram (including mailgram) or facsimile machine transmission received at any time before the exact time set for opening of bids; provided that written confirmation of telegraphic or facsimile withdrawals over the signature of the bidder is mailed and postmarked prior to the specified bid opening time. A bid may be withdrawn in person by a bidder or its authorized representative if, before the exact time set for opening of bids, the identity of the person requesting withdrawal is established and the person signs a receipt for the bid.

6. Bid Opening

All bids received by the date and time of receipt specified in the solicitation will be publicly opened and read. The time and place of opening will be as specified in the solicitation. Bidders and other interested persons may be present.

7. Service of Protest

(a) Definitions. As used in this provision:

"Interested party" means an actual or prospective bidder whose direct economic interest would be affected by the award of the contract.

"Protest" means a written objection by an interested party to this solicitation or to a proposed or actual award of a contract pursuant to this solicitation.

(b) Protests shall be served on the Contracting Officer by obtaining written and dated acknowledgement from —

[Contracting Officer designate the official or location where a protest may be served on the Contracting Officer]

(c) All protests shall be resolved in accordance with the PHA's/IHA's protest policy and procedures, copies of which are maintained at the PHA/IHA.

8. Contract Award

(a) The PHA/IHA will evaluate bids in response to this solicitation without discussions and will award a contract to the responsible bidder whose bid, conforming to the solicitation, will be most advantageous to the PHA/IHA considering only price and any price-related factors specified in the solicitation.

(b) If the apparent low bid received in response to this solicitation exceeds the PHA's/IHA's available funding for the proposed contract work, the PHA/IHA may either accept separately priced items (see 8(e) below) or use the following procedure to determine contract award. The PHA/IHA shall apply in turn to each bid (proceeding in order from the apparent low bid to the high bid) each of the separately priced bid deductible items, if any, in their priority order set forth in this solicitation. If upon the application of the first deductible item to all initial bids, a new low bid is within the PHA's/IHA's available funding, then award shall be made to that bidder. If no bid is within the available funding amount, then the PHA/IHA shall apply the second deductible item. The PHA/IHA shall continue this process until an evaluated low bid, if any, is within the PHA's/IHA's available funding. If upon the application of all deductibles, no bid is within the PHA's/IHA's available funding, or if the solicitation does not request separately priced deductibles, the PHA/IHA shall follow its written policy and procedures in making any award under this solicitation.

(c) In the case of tie low bids, award shall be made in accordance with the PHA's/IHA's written policy and procedures.

(d) The PHA/IHA may reject any and all bids, accept other than the lowest bid (e.g., the apparent low bid is unreasonably low), and waive informalities or minor irregularities in bids received, in accordance with the PHA's/IHA's written policy and procedures.

(e) Unless precluded elsewhere in the solicitation, the PHA/IHA may accept any item or combination of items bid.

(f) The PHA/IHA may reject any bid as nonresponsive if it is materially unbalanced as to the prices for the various items of work to be performed. A bid is materially unbalanced when it is based on prices significantly less than cost for some work and prices which are significantly overstated for other work.

(g) A written award shall be furnished to the successful bidder within the period for acceptance specified in the bid and shall result in a binding contract without further action by either party.

9. Bid Guarantee (applicable to construction and equipment contracts exceeding \$25,000)

All bids must be accompanied by a negotiable bid guarantee which shall not be less than five percent (5%) of the amount of the bid. The bid guarantee may be a certified check, bank draft, U.S. Government Bonds at par value, or a bid bond secured by a surety company acceptable to the U.S. Government and authorized to do business in the state where the work is to be performed. In the case where the work under the contract will be performed on an Indian reservation area, the bid guarantee may also be an irrevocable Letter of Credit (see provision 10, Assurance of Completion, below). Certified checks and bank drafts must be made payable to the order of the PHA/IHA. The bid guarantee shall insure the execution of the contract and the furnishing of a method of assurance of completion by the successful bidder as required by the solicitation. Failure to submit a bid guarantee with the bid shall result in the rejection of the bid. Bid guarantees submitted by unsuccessful bidders will be returned as soon as practicable after bid opening.

10. Assurance of Completion

(a) Unless otherwise provided in State law, the successful bidder shall furnish an assurance of completion prior to the execution of any contract under this solicitation. This assurance may be [Contracting Officer check applicable items] —

[] (1) a performance and payment bond in a penal sum of 100 percent of the contract price; or, as may be required or permitted by State law;

[] (2) separate performance and payment bonds, each for 50 percent or more of the contract price;

[] (3) a 20 percent cash escrow;

[] (4) a 25 percent irrevocable letter of credit; or,

[] (5) an irrevocable letter of credit for 10 percent of the total contract price with a monitoring and disbursements agreement with the IHA (applicable only to contracts awarded by an IHA under the Indian Housing Program).

(b) Bonds must be obtained from guarantee or surety companies acceptable to the U.S. Government and authorized to do business in the state where the work is to be performed. Individual sureties will not be considered. U.S. Treasury Circular Number 570, published annually in the Federal Register, lists companies approved to act as sureties on bonds securing Government contracts, the maximum underwriting limits on each contract bonded, and the States in which the company is licensed to do business. Use of companies listed in this circular is mandatory. Copies of the circular may be downloaded on the U.S. Department of Treasury website <http://www.fms.treas.gov/c570/index.html>, or ordered for a minimum fee by contacting the Government Printing Office at (202) 512-2168.

(c) Each bond shall clearly state the rate of premium and the total amount of premium charged. The current power of attorney for the person who signs for the surety company must be attached to the bond. The effective date of the power of attorney shall not precede the date of the bond. The effective date of the bond shall be on or after the execution date of the contract.

(d) Failure by the successful bidder to obtain the required assurance of completion within the time specified, or within such extended period as the PHA/IHA may grant based upon reasons determined adequate by the PHA/IHA, shall render the bidder ineligible for award. The PHA/IHA may then either award the contract to the next lowest responsible bidder or solicit new bids. The PHA/IHA may retain the ineligible bidder's bid guarantee.

11. Preconstruction Conference (applicable to construction contracts)

After award of a contract under this solicitation and prior to the start of work, the successful bidder will be required to attend a preconstruction conference with representatives of the PHA/IHA and its architect/engineer, and other interested parties convened by the PHA/IHA. The conference will serve to acquaint the participants with the general plan of the construction operation and all other requirements of the contract (e.g., Equal Employment Opportunity, Labor Standards). The PHA/IHA will provide the successful bidder with the date, time, and place of the conference.

12. Indian Preference Requirements (applicable only if this solicitation is for a contract to be performed on a project for an Indian Housing Authority)

(a) HUD has determined that the contract awarded under this solicitation is subject to the requirements of section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450e(b)). Section 7(b) requires that any contract or subcontract entered into for the benefit of Indians shall require that, to the greatest extent feasible

(1) Preferences and opportunities for training and employment (other than core crew positions; see paragraph (h) below) in connection with the administration of such contracts or subcontracts be given to qualified "Indians." The Act defines "Indians" to mean persons who are members of an Indian tribe and defines "Indian tribe" to mean any Indian tribe, band, nation, or other organized group or community, including any Alaska Native village or regional or village corporation as defined in or established pursuant to the Alaska Native Claims Settlement Act, which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians; and,

(2) Preference in the award of contracts or subcontracts in connection with the administration of contracts be given to Indian organizations and to Indian-owned economic enterprises, as defined in section 3 of the Indian Financing Act of 1974 (25 U.S.C. 1452). That Act defines "economic enterprise" to mean any Indian-owned commercial, industrial, or business activity established or organized for the purpose of profit, except that the Indian ownership must constitute not less than 51 percent of the enterprise; "Indian organization" to mean the governing body of any Indian tribe or entity established or recognized by such governing body; "Indian" to mean any person who is a member of any tribe, band, group, pueblo, or community which is recognized by the Federal Government as eligible for services from the Bureau of Indian Affairs and any "Native" as defined in the Alaska Native Claims Settlement Act; and Indian "tribe" to mean any Indian tribe, band, group, pueblo, or community including Native villages and Native groups (including

corporations organized by Kenai, Juneau, Sitka, and Kodiak) as defined in the Alaska Native Claims Settlement Act, which is recognized by the Federal Government as eligible for services from the Bureau of Indian Affairs.

(b) (1) The successful Contractor under this solicitation shall comply with the requirements of this provision in awarding all subcontracts under the contract and in providing training and employment opportunities.

(2) A finding by the IHA that the contractor, either (i) awarded a subcontract without using the procedure required by the IHA, (ii) falsely represented that subcontracts would be awarded to Indian enterprises or organizations; or, (iii) failed to comply with the contractor's employment and training preference bid statement shall be grounds for termination of the contract or for the assessment of penalties or other remedies.

(c) If specified elsewhere in this solicitation, the IHA may restrict the solicitation to qualified Indian-owned enterprises and Indian organizations. If two or more (or a greater number as specified elsewhere in the solicitation) qualified Indian-owned enterprises or organizations submit responsive bids, award shall be made to the qualified enterprise or organization with the lowest responsive bid. If fewer than the minimum required number of qualified Indian-owned enterprises or organizations submit responsive bids, the IHA shall reject all bids and readvertise the solicitation in accordance with paragraph (d) below.

(d) If the IHA prefers not to restrict the solicitation as described in paragraph (c) above, or if after having restricted a solicitation an insufficient number of qualified Indian enterprises or organizations submit bids, the IHA may advertise for bids from non-Indian as well as Indian-owned enterprises and Indian organizations. Award shall be made to the qualified Indian enterprise or organization with the lowest responsive bid if that bid is -

(1) Within the maximum HUD-approved budget amount established for the specific project or activity for which bids are being solicited; and

(2) No more than the percentage specified in 24 CFR 905.175(c) higher than the total bid price of the lowest responsive bid from any qualified bidder. If no responsive bid by a qualified Indian-owned economic enterprise or organization is within the stated range of the total bid price of the lowest responsive bid from any qualified enterprise, award shall be made to the bidder with the lowest bid.

(e) Bidders seeking to qualify for preference in contracting or subcontracting shall submit proof of Indian ownership with their bids. Proof of Indian ownership shall include but not be limited to:

(1) Certification by a tribe or other evidence that the bidder is an Indian. The IHA shall accept the certification of a tribe that an individual is a member.

(2) Evidence such as stock ownership, structure, management, control, financing and salary or profit sharing arrangements of the enterprise.

(f) (1) All bidders must submit with their bids a statement describing how they will provide Indian preference in the award of subcontracts. The specific requirements of that statement and the factors to be used by the IHA in determining the statement's adequacy are included as an attachment to this solicitation. Any bid that fails to include the required statement shall be rejected as nonresponsive. The IHA may require that comparable statements be provided by subcontractors to the successful Contractor, and may require the Contractor to reject any bid or proposal by a subcontractor that fails to include the statement.

(2) Bidders and prospective subcontractors shall submit a certification (supported by credible evidence) to the IHA in any instance where the bidder or subcontractor believes it is infeasible to provide Indian preference in subcontracting. The acceptance or rejection by the IHA of the certification shall be final. Rejection shall disqualify the bid from further consideration.

(g) All bidders must submit with their bids a statement detailing their employment and training opportunities and their plans to provide preference to Indians in implementing the contract; and the number or percentage of Indians anticipated to be employed and trained. Comparable statements from all proposed subcontractors must be submitted. The criteria to be used by the IHA in determining the statement(s)'s adequacy are included as an attachment to this solicitation. Any bid that fails to include the required statement(s), or that includes a statement that does not meet minimum standards required by the IHA shall be rejected as nonresponsive.

(h) Core crew employees. A core crew employee is an individual who is a bona fide employee of the contractor at the time the bid is submitted; or an individual who was not employed by the bidder at the time the bid was submitted, but who is regularly employed by the bidder in a supervisory or other key skilled position when work is available. Bidders shall submit with their bids a list of all core crew employees.

(i) Preference in contracting, subcontracting, employment, and training shall apply not only on-site, on the reservation, or within the IHA's jurisdiction, but also to contracts with firms that operate outside these areas (e.g., employment in modular or manufactured housing construction facilities).

(j) Bidders should contact the IHA to determine if any additional local preference requirements are applicable to this solicitation.

(k) The IHA [] does [] does not [Contracting Officer check applicable box] maintain lists of Indian-owned economic enterprises and Indian organizations by specialty (e.g., plumbing, electrical, foundations), which are available to bidders to assist them in meeting their responsibility to provide preference in connection with the administration of contracts and subcontracts.

EXHIBIT “J” – HUD form 5369a

Representations, Certifications, and Other Statements of Bidders

Public and Indian Housing Programs

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1. Certificate of Independent Price Determination

(a) The bidder certifies that-

(1) The prices in this bid have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other bidder or competitor relating to (i) those prices, (ii) the intention to submit a bid, or (iii) the methods or factors used to calculate the prices offered;

(2) The prices in this bid have not been and will not be knowingly disclosed by the bidder, directly or indirectly, to any other bidder or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a competitive proposal solicitation) unless otherwise required by law; and

(3) No attempt has been made or will be made by the bidder to induce any other concern to submit or not to submit a bid for the purpose of restricting competition.

(b) Each signature on the bid is considered to be a certification by the signatory that the signatory-

(1) Is the person in the bidder's organization responsible for determining the prices being offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above; or

(2) (i) Has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated, and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above.

_____ [insert full name of person(s) in the bidder's organization responsible for determining the prices offered in this bid or proposal, and the title of his or her position in the bidder's organization];

(ii) As an authorized agent, does certify that the principals named in subdivision (b)(2)(i) above have not participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) above; and

(iii) As an agent, has not personally participated, and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above.

(c) If the bidder deletes or modifies subparagraph (a)2 above, the bidder must furnish with its bid a signed statement setting forth in detail the circumstances of the disclosure.

[] [Contracting Officer check if following paragraph is applicable]

(d) Non-collusive affidavit. (applicable to contracts for construction and equipment exceeding \$50,000)

(1) Each bidder shall execute, in the form provided by the PHA/IHA, an affidavit to the effect that he/she has not colluded with any other person, firm or corporation in regard to any bid submitted in response to this solicitation. If the successful bidder did not submit the affidavit with his/her bid, he/she must submit it within three (3) working days of bid opening. Failure to submit the affidavit by that date may render the bid nonresponsive. No contract award will be made without a properly executed affidavit.

(2) A fully executed "Non-collusive Affidavit" [] is, [] is not included with the bid.

2. Contingent Fee Representation and Agreement

(a) Definitions. As used in this provision:

"Bona fide employee" means a person, employed by a bidder and subject to the bidder's supervision and control as to time, place, and manner of performance, who neither exerts, nor proposes to exert improper influence to solicit or obtain contracts nor holds out as being able to obtain any contract(s) through improper influence.

"Improper influence" means any influence that induces or tends to induce a PHA/IHA employee or officer to give consideration or to act regarding a PHA/IHA contract on any basis other than the merits of the matter.

(b) The bidder represents and certifies as part of its bid that, except for full-time bona fide employees working solely for the bidder, the bidder:

(1) [] has, [] has not employed or retained any person or company to solicit or obtain this contract; and

(2) [] has, [] has not paid or agreed to pay to any person or company employed or retained to solicit or obtain this contract any commission, percentage, brokerage, or other fee contingent upon or resulting from the award of this contract.

(c) If the answer to either (a)(1) or (a)(2) above is affirmative, the bidder shall make an immediate and full written disclosure to the PHA/IHA Contracting Officer.

(d) Any misrepresentation by the bidder shall give the PHA/IHA the right to (1) terminate the contract; (2) at its discretion, deduct from contract payments the amount of any commission, percentage, brokerage, or other contingent fee; or (3) take other remedy pursuant to the contract.

3. Certification and Disclosure Regarding Payments to Influence Certain Federal Transactions (applicable to contracts exceeding \$100,000)

(a) The definitions and prohibitions contained in Section 1352 of title 31, United States Code, are hereby incorporated by reference in paragraph (b) of this certification.

(b) The bidder, by signing its bid, hereby certifies to the best of his or her knowledge and belief as of December 23, 1989 that:

(1) No Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with the awarding of a contract resulting from this solicitation;

(2) If any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with this solicitation, the bidder shall complete and submit, with its bid, OMB standard form LLL, "Disclosure of Lobbying Activities;" and

(3) He or she will include the language of this certification in all subcontracts at any tier and require that all recipients of subcontract awards in excess of \$100,000 shall certify and disclose accordingly.

(c) Submission of this certification and disclosure is a prerequisite for making or entering into this contract imposed by section 1352, title 31, United States Code. Any person who makes an expenditure prohibited under this provision or who fails to file or amend the disclosure form to be filed or amended by this provision, shall be subject to a civil penalty of not less than \$10,000, and not more than \$100,000, for each such failure.

(d) Indian tribes (except those chartered by States) and Indian organizations as defined in section 4 of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450B) are exempt from the requirements of this provision.

4. Organizational Conflicts of Interest Certification

The bidder certifies that to the best of its knowledge and belief and except as otherwise disclosed, he or she does not have any organizational conflict of interest which is defined as a situation in which the nature of work to be performed under this proposed contract and the bidder's organizational, financial, contractual, or other interests may, without some restriction on future activities:

- (a) Result in an unfair competitive advantage to the bidder; or,
- (b) Impair the bidder's objectivity in performing the contract work. [] In the absence of any actual or apparent conflict, I hereby certify that to the best of my knowledge and belief, no actual or apparent conflict of interest exists with regard to my possible performance of this procurement.

5. Bidder's Certification of Eligibility

(a) By the submission of this bid, the bidder certifies that to the best of its knowledge and belief, neither it, nor any person or firm which has an interest in the bidder's firm, nor any of the bidder's subcontractors, is ineligible to:

(1) Be awarded contracts by any agency of the United States Government, HUD, or the State in which this contract is to be performed; or,

(2) Participate in HUD programs pursuant to 24 CFR Part 24.

(b) The certification in paragraph (a) above is a material representation of fact upon which reliance was placed when making award. If it is later determined that the bidder knowingly rendered an erroneous certification, the contract may be terminated for default, and the bidder may be debarred or suspended from participation in HUD programs and other Federal contract programs.

6. Minimum Bid Acceptance Period

(a) "Acceptance period," as used in this provision, means the number of calendar days available to the PHA/IHA for awarding a contract from the date specified in this solicitation for receipt of bids.

(b) This provision supersedes any language pertaining to the acceptance period that may appear elsewhere in this solicitation.

(c) The PHA/IHA requires a minimum acceptance period of [Contracting Officer insert time period] calendar days.

(d) In the space provided immediately below, bidders may specify a longer acceptance period than the PHA's/IHA's minimum requirement. The bidder allows the following acceptance period: calendar days.

(e) A bid allowing less than the PHA's/IHA's minimum acceptance period will be rejected.

(f) The bidder agrees to execute all that it has undertaken to do, in compliance with its bid, if that bid is accepted in writing within (1) the acceptance period stated in paragraph (c) above or (2) any longer acceptance period stated in paragraph (d) above.

7. Small, Minority, Women-Owned Business Concern Representation

The bidder represents and certifies as part of its bid/ offer that it -

(a) [] is, [] is not a small business concern. "Small business concern," as used in this provision, means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding, and qualified as a small business under the criteria and size standards in 13 CFR 121.

(b) [] is, [] is not a women-owned business enterprise. "Women-owned business enterprise," as used in this provision, means a business that is at least 51 percent owned by a woman or women who are U.S. citizens and who also control and operate the business.

(c) [] is, [] is not a minority business enterprise. "Minority business enterprise," as used in this provision, means a business which is at least 51 percent owned or controlled by one or more minority group members or, in the case of a publicly owned business, at least 51 percent of its voting stock is owned by one or more minority group members, and whose management and daily operations are controlled by one or more such individuals. For the purpose of this definition, minority group members are:

(Check the block applicable to you)

- | | |
|------------------------|------------------------------|
| [] Black Americans | [] Asian Pacific Americans |
| [] Hispanic Americans | [] Asian Indian Americans |
| [] Native Americans | [] Hasidic Jewish Americans |

8. Indian-Owned Economic Enterprise and Indian Organization Representation

(applicable only if this solicitation is for a contract to be performed on a project for an Indian Housing Authority)

The bidder represents and certifies that it:

(a) [] is, [] is not an Indian-owned economic enterprise. "Economic enterprise," as used in this provision, means any commercial, industrial, or business activity established or organized for the purpose of profit, which is at least 51 percent Indian owned. "Indian," as used in this provision, means any person who is a member of any tribe, band, group, pueblo, or community which is recognized by the Federal Government as eligible for services from the Bureau of Indian Affairs and any "Native" as defined in the Alaska Native Claims Settlement Act.

(b) [] is, [] is not an Indian organization. "Indian organization," as used in this provision, means the governing body of any Indian

tribe or entity established or recognized by such governing body. Indian "tribe" means any Indian tribe, band, group, pueblo, or community including Native villages and Native groups (including corporations organized by Kenai, Juneau, Sitka, and Kodiak) as defined in the Alaska Native Claims Settlement Act, which is recognized by the Federal Government as eligible for services from the Bureau of Indian Affairs.

9. Certification of Eligibility Under the Davis-Bacon Act

(applicable to construction contracts exceeding \$2,000)

(a) By the submission of this bid, the bidder certifies that neither it nor any person or firm who has an interest in the bidder's firm is a person or firm ineligible to be awarded contracts by the United States Government by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(b) No part of the contract resulting from this solicitation shall be subcontracted to any person or firm ineligible to be awarded contracts by the United States Government by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(c) The penalty for making false statements is prescribed in the U. S. Criminal Code, 18 U.S.C. 1001.

10. Certification of Nonsegregated Facilities (applicable to contracts exceeding \$10,000)

(a) The bidder's attention is called to the clause entitled **Equal Employment Opportunity** of the General Conditions of the Contract for Construction.

(b) "Segregated facilities," as used in this provision, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees, that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origin because of habit, local custom, or otherwise.

(c) By the submission of this bid, the bidder certifies that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The bidder agrees that a breach of this certification is a violation of the Equal Employment Opportunity clause in the contract.

(d) The bidder further agrees that (except where it has obtained identical certifications from proposed subcontractors for specific time periods) prior to entering into subcontracts which exceed \$10,000 and are not exempt from the requirements of the Equal Employment Opportunity clause, it will:

- (1) Obtain identical certifications from the proposed subcontractors;
- (2) Retain the certifications in its files; and
- (3) Forward the following notice to the proposed subcontractors (except if the proposed subcontractors have submitted identical certifications for specific time periods):

Notice to Prospective Subcontractors of Requirement for Certifications of Nonsegregated Facilities

A Certification of Nonsegregated Facilities must be submitted before the award of a subcontract exceeding \$10,000 which is not exempt from the provisions of the Equal Employment Opportunity clause of the prime contract. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

Note: The penalty for making false statements in bids is prescribed in 18 U.S.C. 1001.

11. Clean Air and Water Certification (applicable to contracts exceeding \$100,000)

The bidder certifies that:

(a) Any facility to be used in the performance of this contract [] is, [] is not listed on the Environmental Protection Agency List of Violating Facilities:

(b) The bidder will immediately notify the PHA/IHA Contracting Officer, before award, of the receipt of any communication from the Administrator, or a designee, of the Environmental Protection Agency, indicating that any facility that the bidder proposes to use for the performance of the contract is under consideration to be listed on the EPA List of Violating Facilities; and,

(c) The bidder will include a certification substantially the same as this certification, including this paragraph (c), in every nonexempt subcontract.

12. Previous Participation Certificate (applicable to construction and equipment contracts exceeding \$50,000)

(a) The bidder shall complete and submit with his/her bid the Form HUD-2530, "Previous Participation Certificate." **The Bidder must submit the certificate (Replacement HUD Form 2530 Previous Participation - NHA P&CD 12/6/2010) with the bid.** Failure to submit the certificate by that date may render the bid nonresponsive. No contract award will be made without a properly executed certificate.

(b) A fully executed "Previous Participation Certificate"

[] is, [] is not included with the bid.

13. Bidder's Signature

The bidder hereby certifies that the information contained in these certifications and representations is accurate, complete, and current.

(Signature and Date)

(Typed or Printed Name)

(Title)

(Company Name)

(Company Address)

EXHIBIT "K" – Form of Bid

BID FOR: Advertised - IFB #613 General Construction for New Construction of Scattered Site Homeownership Units in AZ

To the Navajo Housing Authority
P.O. Box 4980, Navajo Nation
Window Rock, AZ 86515

Gentlemen:

The undersigned has familiarized himself with the local conditions affecting the cost of the work, and with the Specifications (including Invitation for Bid, Instructions to Bidders, this bid, the Form of Bid Bond, the Form of Non-collusive Affidavit, the Form of Contract, the requirements for Performance and Payment Security, the General Conditions, the Special Conditions, the General Scope of Work, the Technical Specifications and the Drawings) and Addenda, if any thereto, as prepared by **WHPacific, Inc (NV5 Company)** and on file in the office of the Owner and have received and examined the following addenda:

Addendum No. _____	Date: _____
Addendum No. _____	Date: _____
Addendum No. _____	Date: _____
Addendum No. _____	Date: _____

BASE BID:

The undersigned hereby proposes to furnish all labor, materials, equipment and services to complete the contract work as specified under the Base Bid for the Construction Services Demolition and Rebuild of Public Rental Housing Units under the authority of Navajo Housing Authority, all in accordance with the above, for the lump sum of:

TOTAL BID (Base Bid):

_____ Dollars (\$ _____)

In submitting this bid, it is understood that the right is reserved by the NHA to reject any and all bids. If written notice of the acceptance of this bid is mailed, telegraphed or delivered to the undersigned within sixty (60) days after the opening thereof, or at any time thereafter before this bid is withdrawn, the undersigned agrees to execute and deliver a contract in the prescribed form and furnish the required performance and payment security within ten (10) days after the contract is presented to him for signature.

Bid Security in the sum of _____ Dollars (\$ _____)

In the form of _____ is submitted herewith in accordance with the Specifications.

Attached hereto is an affidavit in proof that the undersigned has not entered into any collusion with any person with respect to this bid of any other bid or the submitting of bids for the contract for which this bid is submitted.

The bidder represents that he () has, or () has not participated in a previous contract or subcontract subject to the equal opportunity clause prescribed by Executive Orders 10925, 11114, or 11246 of the Secretary of Labor; that he () has, or () has not filed all required compliance reports, and that representations indicating submission of required compliance reports, signed by proposed subcontractors, will be obtained prior to subcontract awards. (The above representation need not be submitted in connection with contracts or subcontracts which are exempt from the clause.)

By signing this bid, the bidder certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments and that he does not permit his employees to perform their services at any location under his control where segregated facilities are maintained. The bidder agrees that a breach of this certification is a violation of the Equal Opportunity Clause in this Contract. As used in this certification the term "segregated facilities" means any waiting rooms, work areas, rest rooms or wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origin, because of habit, local custom, or otherwise. He further agrees that (except where he has obtained identical certifications from proposed subcontractors for specific time periods) he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity Clause; that he will retain such certifications in his files; and that he will forward a notice to his proposed subcontractors as provided in the Instruction to Bidders.

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001

Name of Bidder: _____ Date: _____

Official Address: _____

By: _____

Print Name

Title: _____

Phone: _____

(Sign Original Only)

NHA NM15-404 12 HOMEOWNERSHIP NEW CONSTRUCTION - IFB# 613
EXHIBIT "K-1" MATERIAL AND LABOR COST BREAKDOWN

Div. Sect #	Description	Cost (\$)
Division 3	Concrete	
031000	Concrete Forming and Accessories	_____
032000	Concrete Reinforcement	_____
033000	Cast in Place Concrete	_____
033800	Post Tensioned Structural Concrete	_____
Division 5	Metals	
055213	Pipe & Tube Railings	_____
055313	Bar Gratings	_____
Division 6	Wood and Plastics	
061000	Rough Carpentry	_____
061600	Sheathing	_____
061753	Shop-Fabricated Wood Trusses	_____
062023	Interior Finish Carpentry	_____
064510	Wood Trim	_____
064520	Wood Frames	_____
Division 7	Thermal and Moisture Protection	
072100	Thermal Insulation	_____
072500	Weather Barriers	_____
072600	Under-Slab Vapor Retarder	_____
073113	Asphalt Shingles	_____
074602	Fiber Cement Siding	_____
076200	Sheet Metal Flashing and Trim	_____
079200	Joint Sealants	_____
Division 8	Doors and Windows	
081126	Steel Doors	_____
081600	Molded Composite Doors	_____
085313	Vinyl Windows	_____
086223	Tubular Daylighting Devices	_____
087100	Door Hardware	_____
088000	Glazing	_____
088300	Mirrors	_____

Division 9

Finishes

- 092900 Gypsum Board
- 093103 Ceramic Tile
- 096519 Resilient Tile Flooring
- 099113 Exterior Painting
- 099123 Interior Painting

Division 10

Specialties

- 101419 Dimensional Letter Signage
- 102600 Wall Protection
- 102800 Toilet, Bath, and Laundry Accessories
- 104416 Fire Extinguishers

Division 11

Equipment

- 113013 Residential Appliances

Division 12

Furnishings

- 122113 Horizontal Louver Blinds
- 123530 Residential Casework

Division 22 Plumbing

- 220513 Common Work Results for Plumbing
- 220523 General- Duty Valves for Plumbing Piping
- 220529 Hangers and Supports for Plumbing Piping & Equipment
- 220719 Plumbing piping Insulation
- 221113 Facility Water Distribution Piping
- 221116 Domestic Water Piping
- 221313 Facility Sanitary Sewer
- 221316 Sanitary Waste and Vent Piping
- 223300 Electric Domestic Water Heaters
- 223400 Fuel Fired Domestic Water Heaters
- 224100 Residential Plumbing Fixtures

Division 23 Heating, Ventilating and Air Conditioning (HVAC)

- 230716 HVAC Insulation
- 231123 Facility Natural-Gas Piping
- 231126 Facility Liquefied Petroleum Gas Piping
- 233113 Metal Ducts
- 233423 HVAC Power Ventilators
- 233713.23 Registers and Grilles
- 235413 Electric Resistance Furnaces
- 235416.13 Furnaces

Division 26

Electrical

- 26000 General Electrical Work

Division 31

Earthwork

- 311000 Site Clearing
- 312000 Earth Moving
- 312311 Earthwork for Building Construction
- 313116 Termite Control

EXHIBIT "L1" – Bid Bond

KNOW ALL MEN BY THESE PRESENTS, That we the undersigned,

_____ as PRINCIPAL, and
(Name of Principal)

_____, as SURETY are held and
(Name of Surety)

firmly bound unto the NAVAJO HOUSING AUTHORITY, hereinafter called the "Owner", in the penal sum of \$ _____ Dollars, lawful money of the United States, for the payment of which sum will and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITIONS OF THIS OBLIGATION IS SUCH, that whereas the Principal has submitted the accompanying bid dated _____, 2024 for Project _____.

NOW, THEREFORE, if the Principal shall not withdraw said bid within the period specified therein after the opening of the same, or if no period be specified, within ninety (90) days after said opening, and shall within the period specified therefore, or, if no period be specified within ten (10) days after the prescribed forms are presented to for signature, enter into a written contract with the Owner in accordance with the bid as accepted, and give the required performance and payment security, for the faithful performance and proper fulfillment of such contract; or in the event of the withdrawal of said bid within the period specified, or the failure to enter into such contract and give such security within the time specified, if the Principal shall pay the Owner the difference between the amount specified in said bid and the amount for which the Owner may procure the required work or supplies or both, if the latter amount to be in excess of the former, then the above obligation shall be void and of no effect, otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounded parties have executed this instrument under their several seal this _____ day of _____, 2024, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

In presence of:

_____ (Seal)
(Individual Principal)

(Business Principal)

ATTEST:

(Corporate Principal)

(Business Address)

BY: _____ (Affix Corporate Seal)

ATTEST:

(Business Address)

(Corporate Surety)

BY: _____

(Affix Corporate Seal)

(Power of Attorney for person signing for Surety Company must be attached to Bond)

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, _____, certify that I am the
_____ (title) of the Corporation named as
Principal in the within Bond; that _____, who
signed the said Bond on behalf of the Principal was then _____, of
said Corporation; that I know his signature, and his signature thereto is genuine; and that said
Bond was duly signed, sealed, and attested to for an in behalf of said corporation by authority of
its governing body.

(Affix Corporate Seal)

EXHIBIT "L2" – Irrevocable Letter of Credit

Mrs. Heather Duncan-Etsitty, CEO/Contracting Officer

Navajo Housing Authority
Post Office Box 4980
Window Rock, AZ 86515

Must be submitted on Bank's Letterhead

Dear Mrs. Duncan-Etsitty:

We hereby authorize you to draw on us to the aggregate amount of \$_____ (10% of the amount of the bid) in the event

_____ fails to execute a contract with the NAVAJO HOUSING AUTHORITY for the _____ or fails to provide adequate performance and payment security as required by the Contract Specifications.

Such drafts must be accompanied by:

1. Written certifications by you that the proceeds of any draft drawn on this letter of Credit will be used solely for the purposes and interests described in the above paragraph.
2. Written concurrence of the United States Department of Housing and Urban Development, Region IX, Office of Indian Programs to the draft.

We warrant to you that all drafts drawn in compliance with the terms of this Letter of Credit will be unconditionally and duly honored upon delivery of the documentation specified above and presented to this office.

This letter of Credit is irrevocable and shall be in full force and effect until notification in writing is received from you that a contract for the _____ Project has been awarded and executed. Thereupon, this Letter of Credit shall automatically be cancelled.

This letter of Credit shall not be modified or amended except upon the written agreement of this Bank and the NAVAJO HOUSING AUTHORITY and then only with the written concurrence of the United States Department of Housing and Urban Development, Region IX, Office of Indian Programs.

Sincerely,

President

EXHIBIT M, if applicable

Certified Check or Cash Deposit in Lieu of Bid Bond Letter. A certified check in the amount equal to 10% of the bid, payable to the Navajo Housing Authority –or– an account established with a financial institution naming Navajo Housing Authority as the sole account holder containing an amount equal to 10% of the bid, shall be submitted with each bid.

- ***If “NOT APPLICABLE – PLEASE INDICATE NOT APPLICABLE for EXHIBIT M” and submit as EXHIBIT M.***

End of Bid

Thank you for your interest in the NHA.

To be used by those firms and vendors desiring to be qualified for Indian Preference.

INDIAN ENTERPRISES QUALIFICATION STATEMENT

NOTE: Submit complete questionnaire to the Navajo Housing Authority Procurement Department within the time frame specified. Use additional sheets to complete answer if needed.

The Undersigned certifies under oath the truth and correctness of all answers to questions made hereinafter:

1. Applicant wishes to qualify as:

___ An "Economic Enterprise" as defined in Section 3(3) of the Indian Financing Act of 1974 (P.L. 93-262); that is "any Indian-Owned... commercial, industrial or business activity established or organized for the purchase of profit: Provided, that such Indian owner-ship shall constitute not less than 51 percent of the enterprise:

___ A "Tribal Organization" as defined in Section 4(c) of the Indian Self Determination and Education Assistance Act (P.L. 93-638); that is: "the recognized governing body of any Indian Tribe; any legally established organization of Indians which is controlled, sanctioned or chartered by such governing body or which is democratically elected by the adult members of the Indian community to be served by such organization and which includes the maximum participation of Indians in all phases of its activities: Provided that in any case where a contract is let or grant made to an organization to perform services benefiting more than one Indian Tribe, the approval of each such Indian Tribe shall be a prerequisite to the letting or making of such contract or grant... "

2. Name of Enterprises or Organization: _____

Contact Person / Title: _____

Mailing Address: _____

Physical Address: _____

E-mail: Address: _____

Telephone Number: _____

Fax Number: _____

3. Check One:

___ Corporation

___ Joint Venture

___ Partnership

___ Other

____ Sole Proprietorship

4. Federal Tax ID Number: _____

If no, provide Name and copy of Social Security card.

5. Are you registered in SAM (System for Award Management)?

Yes _____ No _____

If you wish to do business with the Navajo Housing Authority, you must be registered with SAM and have a Unique Entity Identification Number (UEI). The UEI is a 12-character alphanumeric ID assigned to an entity by SAM). Website is www.SAM.gov.

On April 4, 2022, the UEI across the federal government changed from the DUNS Number to the UEI (generated by <https://www.sam.gov>)

6. Unique Entity Identification Number (UEI Number): _____

7. Answer the following **If a Corporation:**

a. Date of Incorporation: _____

b. State of Incorporation: _____

c. Give the names and addresses of the officers of this Corporation and establish whether they are Indian (I) or Non-Indian (NI).

NAME AND SOCIAL SECURITY	I OR NI	TITLE	ADDRESS	% OF STOCK OWNERSHIP

d. Complete the following information on all stockholders who are not listed in C above, owning 0% or more of the stock. Establish whether they are Indian (I) or Non-Indian (NI).

<i>NAME AND SOCIAL SECURITY</i>	<i>I OR NI</i>	<i>ADDRESS</i>	<i>% OF STOCK OWNERSHIP</i>

If a Sole Proprietorship or Partnership:

Date of Organization: _____

Give the following information on the individual or partners and establish whether they are Indian (I) or Non-Indian (NI).

<i>NAME AND SOCIAL SECURITY</i>	<i>I OR NI</i>	<i>ADDRESS</i>	<i>% OF STOCK OWNERSHIP</i>

If a Joint Venture:

- a. Date of Joint Venture Agreement: _____
- b. Attach the information of each member of the joint venture prepared in the appropriate format given above.

8. Give the name, address, and telephone number of the principal contact person of your organization: _____

9. Has any officer or partner of your organization listed in #7 been an officer or partner of another organization that failed in the last ten (10) years to complete a contract? _____

If yes, state circumstances:

10. Has this enterprise failed in the last ten (10) years, to complete any work awarded to it or to complete the work on time? _____

If so, note when, where, and why: _____

11. Will any officer or partner listed in #7 be engaged in outside employment?

_____ YES _____ NO

If yes, complete:

<i>NAME / TITLE</i>	<i>HOURS PER WEEK OUTSIDE THE ENTERPRISE</i>

12. Is the enterprise or anyone listed in #7 above, currently subject to an administrative sanction issued by any department or agency of the Federal Government?

_____ YES _____ NO

If yes, complete:

<i>NAME OF PERSON/BUSINESS</i>	<i>DATE OF ACTION</i>	<i>TYPE OF ACTION</i>	<i>DEPARTMENT OR AGENCY</i>

13. Does this enterprise have any subsidiaries or affiliates or is it a subsidiary or affiliate of another concern?

_____ YES _____ NO

If yes, complete:

<i>NAME AND ADDRESS OF SUBSIDIARY, AFFILIATE OR OTHER CONCERN</i>	<i>DESCRIPTION OF RELATIONSHIP</i>

14. Does this enterprise or any person listed in #7 above have or intend to enter into any type of agreement with any other concern or person which relates to or affects the on-going administration, management or operations of this enterprise? These include but are not limited to management, and joint venture agreements and any arrangement or contract involving the provisions of such compensated services as administrative assistance, data processing, management consulting of all types, marketing, purchasing, production, and other type of compensated assistance.

_____ YES _____ NO

If yes, attach a copy of any written agreement or an explanation of any oral or intended agreement.

15. Has this enterprise ever been subject to a judgment of any court or administrative sanction (Federal, State, or Tribal)?

_____ YES _____ NO

Has any individual listed in #7 ever been subject to judgment of any court or administrative sanction (Federal, State, or Tribal)?

_____ YES _____ NO

If the answer is yes to any question, furnish details in a separate attachment.

16. Has any tax lien or other collection procedure been instituted against this enterprise or the individuals listed in #7 as a sole proprietor or partner in their capacities with this enterprises or other enterprise?

_____ YES _____ NO

If yes, furnish details in a separate exhibit.

17. Has this enterprise or any person listed in #7 ever been involved in a bankruptcy or insolvency proceeding? _ YES _ NO

If yes, furnish details in a separate exhibit.

18. What dollar amount of Working Capital is available to your enterprise prior to the start of construction? \$

Explain the source of these funds: _____

Include a copy of the company's most recent audited financial statement.

19. How will project development bookkeeping and payroll be maintained (Check one):

a. By contract with an outside professional accounting firm: _____

Name: _____ Telephone No.: _____

Address: _____

b. Records are to be kept by enterprise personnel: If "b" has been checked, state the Qualifications of your personnel to perform this function:

c. Other: _____

20. Trade References (including addresses and telephone numbers):

21. Bank and credit references (including addresses and telephone numbers):

22. a. Indicate the core crew employees in your work force, their job titles, and whether they are Indian or Non-Indian. Core crew is defined as an individual who is a current bona-fide individual who is regularly employed by the contractor in a supervisory or other key position when work is available.

- b. Over the past three (3) years, what has been the average number of employees:

23. Attach certification by a tribe or other evidence of enrollment in a federally recognized tribe for each officer, partner, or individual designated as an Indian in #7.
24. Attached a certified copy of the charter, article of incorporation, by-laws, partnership agreement, joint venture agreement and/or other pertinent organizational documentation.
25. Explain in narrative form the stock ownership, structure, management, control, financing, and salary or profit sharing arrangements of the enterprises, if not covered in answers to specific questions heretofore. Attached copies of all shareholder agreements, including voting trust, employment contracts, agreements between owners and enterprise. Include information on salaries, fees, profit sharing, material purchases, and equipment lease or purchase arrangements.
- Evidence relating to structure, management, control, and financing should be specifically included. Also, list the specific management responsibilities of each principal, sole proprietor, partner, or party to a joint venture (as appropriate) list in response to #7.
26. Attach evidence that the enterprise (or an individual in it) is appropriately licensed for the type of work that is to be performed. Include Federal I.D. Number.
27. Attach a brief resume of the education, technical training, business, employment, and design and/or construction experience for each officer, partner, or sole proprietor listed in #7. Include references.
28. List the type of service, supplies and work your firm offers:
(Attach line card, capabilities statement, and brochure. Attach additional sheet if appropriate)

29. Complete and submit a current w-9 form.

NOTE: I. Omission of any information may be caused for this statement not receiving timely and complete consideration.

ii. Knowing that the Navajo Housing Authority must approve a contract between this enterprise, the persons signing below certify that all information in this INDIAN ENTERPRISE QUALIFICATION STATEMENT, including exhibits and attachments, is true and correct.

iii. Print and type name below all signatures.

If applicant is Sole Proprietor or LLC, Sign Below:

Name Date

If applicant is in a Partnership or Joint Venture, all Partners must sign below:

Name Date

Name Date

If applicant is a corporation, affix corporate seal

Corporate Seal Date

By: _____
President's Signature

Attested by: _____
Corporate Secretary's Signature

WARNING: U.S. Criminal Code, Section 1010, Title 18, U.S.C. provides in part: "Whoever... makes, passes, utters, or publishes any statement, knowing the same to be false... shall be fined not more than \$5000 or imprisoned not more than two years, or both."

Issued August 1989

Notary Acknowledgment Form

State of _____ }

County of _____ }

This document was signed or attested before me on _____ [date] by

_____ [name(s) of person(s)].

(Seal)

Notary's signature: _____

My Commission expires on: _____

CONTRACT DOCUMENTS

General Conditions for Construction Contracts - Public Housing Programs

U.S. Department of Housing and Urban
Development
Office of Public and Indian Housing
OMB Approval No. 2577-0157 (exp. 11/30/2023)

**Applicability. This form is applicable to any
construction/development contract greater than \$250,000.**

Public reporting burden for this collection of information is estimated to average 1.0 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Comments regarding the accuracy of this burden estimate and any suggestions for reducing this burden can be sent to the Reports Management Officer, Office of Policy Development and Research, REE, Department of Housing and Urban Development, 451 7th St SW, Room 4176, Washington, DC 20410-5000. When providing comments, please refer to OMB Approval No. 2577-0157. This form includes those clauses required by OMB's common rule on grantee procurement, implemented at HUD in 2 CFR 200, and those requirements set forth in Section 3 of the Housing and Urban Development Act of 1968 and its amendment by the Housing and Community Development Act of 1992, implemented by HUD at 24 CFR Part 75. The form is required for construction contracts awarded by Public Housing Agencies (PHAs). The form is used by Housing Authorities in solicitations to provide necessary contract clauses. If the form were not used, PHAs would be unable to enforce their contracts. Responses to the collection of information are required to obtain a benefit or to retain a benefit. The information requested does not lend itself to confidentiality. HUD may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB number.

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1. Definitions

- (a) "Architect" means the person or other entity engaged by the PHA to perform architectural, engineering, design, and other services related to the work as provided for in the contract. When a PHA uses an engineer to act in this capacity, the terms "architect" and "engineer" shall be synonymous. The Architect shall serve as a technical representative of the Contracting Officer. The Architect's authority is as set forth elsewhere in this contract.
- (b) "Contract" means the contract entered into between the PHA and the Contractor. It includes the forms of Bid, the Bid Bond, the Performance and Payment Bond or Bonds or other assurance of completion, the Certifications, Representations, and Other Statements of Bidders (form HUD-5370), these General Conditions of the Contract for Construction (form HUD-5370), the applicable wage rate determinations from the U.S. Department of Labor, any special conditions included elsewhere in the contract, the specifications, and drawings. It includes all formal changes to any of those documents by addendum, change order, or other modification.
- (c) "Contracting Officer" means the person delegated the authority by the PHA to enter into, administer, and/or terminate this contract and designated as such in writing to the Contractor. The term includes any successor Contracting Officer and any duly authorized representative of the Contracting Officer also designated in writing. The Contracting Officer shall be deemed the authorized agent of the PHA in all dealings with the Contractor.
- (d) "Contractor" means the person or other entity entering into the contract with the PHA to perform all of the work required under the contract.
- (e) "Drawings" means the drawings enumerated in the schedule of drawings contained in the Specifications and as described in the contract clause entitled Specifications and Drawings for Construction herein.
- (f) "HUD" means the United States of America acting through the Department of Housing and Urban Development including the Secretary, or any other person designated to act on its behalf. HUD has agreed, subject to the provisions of an Annual Contributions Terms and Conditions (ACC), to provide financial assistance to the PHA, which includes assistance in financing the work to be performed under this contract. As defined elsewhere in these General Conditions or the contract documents, the determination of HUD may be required to authorize changes in the work or for release of funds to the PHA for payment to the Contractor. Notwithstanding HUD's role, nothing in this contract shall be construed to create any contractual relationship between the Contractor and HUD.
- (g) "Project" means the entire project, whether construction or rehabilitation, the work for which is provided for in whole or in part under this contract.
- (h) "PHA" means the Public Housing Agency organized under applicable state laws which is a party to this contract.
- (j) "Specifications" means the written description of the technical requirements for construction and includes the criteria and tests for determining whether the requirements are met.
- (l) "Work" means materials, workmanship, and manufacture and fabrication of components.

2. Contractor's Responsibility for Work

- (a) The Contractor shall furnish all necessary labor, materials, tools, equipment, and transportation necessary for performance of the work. The Contractor shall also furnish all necessary water, heat, light, and power not made available to the Contractor by the PHA pursuant to the clause entitled Availability and Use of Utility Services herein.
- (b) The Contractor shall perform on the site, and with its own organization, work equivalent to at least [] (12 percent unless otherwise indicated) of the total amount of work to be performed under the order. This percentage may be reduced by a supplemental agreement to this order if, during performing the work, the Contractor requests a reduction and the Contracting Officer determines that the reduction would be to the advantage of the PHA.
- (c) At all times during performance of this contract and until the work is completed and accepted, the Contractor shall directly superintend the work or assign and have on the work site a competent superintendent who is satisfactory to the Contracting Officer and has authority to act for the Contractor.
- (d) The Contractor shall be responsible for all damages to persons or property that occur as a result of the Contractor's fault or negligence, and shall take proper safety and health precautions to protect the work, the workers, the public, and the property of others. The Contractor shall hold and save the PHA, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the entire work, except for any completed unit of work which may have been accepted under the contract.
- (e) The Contractor shall lay out the work from base lines and bench marks indicated on the drawings and be responsible for all lines, levels, and measurements of all work executed under the contract. The Contractor shall verify the figures before laying out the work and will be held responsible for any error resulting from its failure to do so.
- (f) The Contractor shall confine all operations (including storage of materials) on PHA premises to areas authorized or approved by the Contracting Officer.
- (g) The Contractor shall at all times keep the work area, including storage areas, free from accumulations of waste materials. After completing the work and before final inspection, the Contractor shall (1) remove from the premises all scaffolding, equipment, tools, and materials (including rejected materials) that are not the property of the PHA and all rubbish caused by its work; (2) leave the work area in a clean, neat, and orderly condition satisfactory to the Contracting Officer; (3) perform all specified tests; and, (4) deliver the installation in complete and operating condition.
- (h) The Contractor's responsibility will terminate when all work has been completed, the final inspection made, and the work accepted by the Contracting Officer. The Contractor will then be released from further obligation except as required by the warranties specified elsewhere in the contract.

3. Architect's Duties, Responsibilities, and Authority

- (a) The Architect for this contract, and any successor, shall be designated in writing by the Contracting Officer.

- (b) The Architect shall serve as the Contracting Officer's technical representative with respect to architectural, **Schedule** engineering, and design matters related to the work performed under the contract. The Architect may provide direction on contract performance. Such direction shall be within the scope of the contract and may not be of a nature which: (1) institutes additional work outside the scope of the contract; (2) constitutes a change as defined in the Changes clause herein; (3) causes an increase or decrease in the cost of the contract; (4) alters the Construction Progress Schedule; or (5) changes any of the other express terms or conditions of the contract.
- (c) The Architect's duties and responsibilities may include but shall not be limited to:
- (1) Making periodic visits to the work site, and on the basis of his/her on-site inspections, issuing written reports to the PHA which shall include all observed deficiencies. The Architect shall file a copy of the report with the Contractor's designated representative at the site;
 - (2) Making modifications in drawings and technical specifications and assisting the Contracting Officer in the preparation of change orders and other contract modifications for issuance by the Contracting Officer;
 - (3) Reviewing and making recommendations with respect to - (i) the Contractor's construction progress schedules; (ii) the Contractor's shop and detailed drawings; (iii) the machinery, mechanical and other equipment and materials or other articles proposed for use by the Contractor; and, (iv) the Contractor's price breakdown and progress payment estimates; and,
 - (4) Assisting in inspections, signing Certificates of Completion, and making recommendations with respect to acceptance of work completed under the contract.

4. Other Contracts

The PHA may undertake or award other contracts for additional work at or near the site of the work under this contract. The Contractor shall fully cooperate with the other contractors and with PHA employees and shall carefully adapt scheduling and performing the work under this contract to accommodate the additional work, heeding any direction that may be provided by the Contracting Officer. The Contractor shall not commit or permit any act that will interfere with the performance of work by any other contractor or by PHA employees

Construction Requirements

5. Pre-construction Conference and Notice to Proceed

- of the work, and that it has investigated and satisfied itself
- (a) Within ten calendar days of contract execution, and prior to the commencement of work, the Contractor shall attend a preconstruction conference with representatives of the PHA, its Architect, and other interested parties convened by the PHA. The conference will serve to acquaint the participants with the general plan of the construction operation and all other requirements of the contract. The PHA will provide the Contractor with the date, time, and place of the conference.
 - (b) The contractor shall begin work upon receipt of a written Notice to Proceed from the Contracting Officer or designee. The Contractor shall not begin work prior to receiving such notice.

6. Construction Progress

- (a) The Contractor shall, within five days after the work commences on the contract or another period of time determined by the Contracting Officer, prepare and submit to the Contracting Officer for approval three copies of a practicable schedule showing the order in which the Contractor proposes to perform the work, and the dates on which the Contractor contemplates starting and completing the several salient features of the work (including acquiring labor, materials, and equipment). The schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion by any given date during the period. If the Contractor fails to submit a schedule within the time prescribed, the Contracting Officer may withhold approval of progress payments or take other remedies under the contract until the Contractor submits the required schedule.
- (b) The Contractor shall enter the actual progress on the chart as required by the Contracting Officer, and immediately deliver three copies of the annotated schedule to the Contracting Officer. If the Contracting Officer determines, upon the basis of inspection conducted pursuant to the clause entitled Inspection and Acceptance of Construction, herein that the Contractor is not meeting the approved schedule, the Contractor shall take steps necessary to improve its progress, including those that may be required by the Contracting Officer, without additional cost to the PHA. In this circumstance, the Contracting Officer may require the Contractor to increase the number of shifts, overtime operations, days of work, and/or the amount of construction plant, and to submit for approval any supplementary schedule or schedules in chart form as the Contracting Officer deems necessary to demonstrate how the approved rate of progress will be regained.
- (c) Failure of the Contractor to comply with the requirements of the Contracting Officer under this clause shall be grounds for a determination by the Contracting Officer that the Contractor is not prosecuting the work with sufficient diligence to ensure completion within the time specified in the Contract. Upon making this determination, the Contracting Officer may terminate the Contractor's right to proceed with the work, or any separable part of it, in accordance with the Default clause of this contract.

7. Site Investigation and Conditions Affecting the Work

- (a) The Contractor acknowledges that it has taken steps reasonably necessary to ascertain the nature and location as to the general and local conditions which can affect the work or its cost, including but not limited to, (1) conditions bearing upon transportation, disposal, handling, and storage of materials; (2) the availability of labor, water, electric power, and roads; (3) uncertainties of weather, river stages, tides, or similar physical conditions at the site; (4) the conformation and conditions of the ground; and (5) the character of equipment and facilities needed preliminary to and during work performance. The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is

reasonably ascertainable from an inspection of the site, including all exploratory work done by the PHA, as well as from the drawings and specifications made a part of this contract. Any failure of the Contractor to take the actions described and acknowledged in this paragraph will not relieve the Contractor from responsibility for estimating properly the difficulty and cost of successfully performing the work, or for proceeding to successfully perform the work without additional expense to the PHA.

- (b) The PHA assumes no responsibility for any conclusions or interpretations made by the Contractor based on the information made available by the PHA. Nor does the PHA assume responsibility for any understanding reached or representation made concerning conditions which can affect the work by any of its officers or agents before the execution of this contract, unless that understanding or representation is expressly stated in this contract.

8. Differing Site Conditions

(a) The Contractor shall promptly, and before the conditions are disturbed, give a written notice to the Contracting Officer of (1) subsurface or latent physical conditions at the site which differ materially from those indicated in this contract, or (2) unknown physical conditions at the site(s), of an unusual nature, which differ materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in the contract.

(b) The Contracting Officer shall investigate the site conditions promptly after receiving the notice. Work shall not proceed at the affected site, except at the

Contractor's risk, until the Contracting Officer has provided written instructions to the Contractor. If the conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performing any part of the work under this contract, whether or not changed as a result of the conditions, the Contractor shall file a claim in writing to the PHA within ten days after receipt of such instructions and, in any event, before proceeding with the work. An equitable adjustment in the contract price, the delivery schedule, or both shall be made under this clause and the contract modified in writing accordingly.

(c) No request by the Contractor for an equitable adjustment to the contract under this clause shall be allowed, unless the Contractor has given the written notice required; provided, that the time prescribed in (a) above for giving written notice may be extended by the Contracting Officer.

(d) No request by the Contractor for an equitable adjustment to the contract for differing site conditions shall be allowed if made after final payment under this contract.

9. Specifications and Drawings for Construction

(a) The Contractor shall keep on the work site a copy of the drawings and specifications and shall at all times give the Contracting Officer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of difference between drawings and specifications, the specifications shall govern. In case of discrepancy in the figures, in the drawings, or in the specifications, the matter shall be

promptly submitted to the Contracting Officer, who shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at its own risk and expense. The Contracting Officer shall furnish from time to time such detailed drawings and other information as considered necessary, unless otherwise provided.

(b) Wherever in the specifications or upon the drawings the words "directed", "required", "ordered", "designated", "prescribed", or words of like import are used, it shall be understood that the "direction", "requirement", "order", "designation", or "prescription", of the Contracting Officer is intended and similarly the words "approved", "acceptable", "satisfactory", or words of like import shall mean "approved by", "acceptable to", or "satisfactory to" the Contracting Officer, unless otherwise expressly stated.

(c) Where "as shown" "as indicated", "as detailed", or words of similar import are used, it shall be understood that the reference is made to the drawings accompanying this contract unless stated otherwise. The word "provided" as used herein shall be understood to mean "provide complete in place" that is "furnished and installed".

(d) "Shop drawings" means drawings, submitted to the PHA by the Contractor, subcontractor, or any lower tier subcontractor, showing in detail (1) the proposed fabrication and assembly of structural elements and (2) the installation (i.e., form, fit, and attachment details) of materials of equipment. It includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials furnished by the Contractor to explain in detail specific portions of the work required by the contract. The PHA may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this contract.

(e) If this contract requires shop drawings, the Contractor shall coordinate all such drawings, and review them for accuracy, completeness, and compliance with other contract requirements and shall indicate its approval thereon as evidence of such coordination and review. Shop drawings submitted to the Contracting Officer without evidence of the Contractor's approval may be returned for resubmission. The Contracting Officer will indicate an approval or disapproval of the shop drawings and if not approved as submitted shall indicate the PHA's reasons therefore. Any work done before such approval shall be at the Contractor's risk. Approval by the Contracting Officer shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with the requirements of this contract, except with respect to variations described and approved in accordance with (f) below.

(f) If shop drawings show variations from the contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at the time of submission. If the Architect approves any such variation and the Contracting Officer concurs, the Contracting Officer shall issue an appropriate modification to the contract, except that, if the variation is minor or does not involve a change in price or in time of performance, a modification need not be issued.

(g) It shall be the responsibility of the Contractor to make timely requests of the PHA for such large scale and full size drawings, color schemes, and other additional information, not already in his possession, which shall be

required in the planning and production of the work. Such requests may be submitted as the need arises, but each such request shall be filed in ample time to permit appropriate action to be taken by all parties involved so as to avoid delay.

- (h) The Contractor shall submit to the Contracting Officer for approval four copies (unless otherwise indicated) of all shop drawings as called for under the various headings of these specifications. Three sets (unless otherwise indicated) of all shop drawings, will be retained by the PHA and one set will be returned to the Contractor. As required by the Contracting Officer, the Contractor, upon completing the work under this contract, shall furnish a complete set of all shop drawings as finally approved. These drawings shall show all changes and revisions made up to the time the work is completed and accepted.
- (i) This clause shall be included in all subcontracts at any tier. It shall be the responsibility of the Contractor to ensure that all shop drawings prepared by subcontractors are submitted to the Contracting Officer.

10. As-Built Drawings

- (a) "As-built drawings," as used in this clause, means drawings submitted by the Contractor or subcontractor at any tier to show the construction of a particular structure or work as actually completed under the contract. "As-built drawings" shall be synonymous with "Record drawings."
- (b) As required by the Contracting Officer, the Contractor shall provide the Contracting Officer accurate information to be used in the preparation of permanent as-built drawings. For this purpose, the Contractor shall record on one set of contract drawings all changes from the installations originally indicated, and record final locations of underground lines by depth from finish grade and by accurate horizontal offset distances to permanent surface improvements such as buildings, curbs, or edges of walks.
- (c) This clause shall be included in all subcontracts at any tier. It shall be the responsibility of the Contractor to ensure that all as-built drawings prepared by subcontractors are submitted to the Contracting Officer.

11. Material and Workmanship

- (a) All equipment, material, and articles furnished under this contract shall be new and of the most suitable grade for the purpose intended, unless otherwise specifically provided in this contract. References in the contract to equipment, material, articles, or patented processes by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition. The Contractor may, at its option, use any equipment, material, article, or process that, in the judgment of, and as approved by the Contracting Officer, is equal to that named in the specifications, unless otherwise specifically provided in this contract.
- (b) Approval of equipment and materials.
- (1) The Contractor shall obtain the Contracting Officer's approval of the machinery and mechanical and other equipment to be incorporated into the work. When requesting approval, the Contractor shall furnish to the Contracting Officer the name of the manufacturer, the model number, and other information concerning the performance, capacity, nature, and rating of the

machinery and mechanical and other equipment.

When required by this contract or by the Contracting Officer, the Contractor shall also obtain the

Contracting Officer's approval of the material or articles which the Contractor contemplates incorporating into the work. When requesting approval, the Contractor shall provide full information concerning the material or articles. Machinery, equipment, material, and articles that do not have the required approval shall be installed or used at the risk of subsequent rejection.

- (2) When required by the specifications or the Contracting Officer, the Contractor shall submit appropriately marked samples (and certificates related to them) for approval at the Contractor's expense, with all shipping charges prepaid. The Contractor shall label, or otherwise properly mark on the container, the material or product represented, its place of origin, the name of the producer, the Contractor's name, and the identification of the construction project for which the material or product is intended to be used.
- (3) Certificates shall be submitted in triplicate, describing each sample submitted for approval and certifying that the material, equipment or accessory complies with contract requirements. The certificates shall include the name and brand of the product, name of manufacturer, and the location where produced.
- (4) Approval of a sample shall not constitute a waiver of the PHA right to demand full compliance with contract requirements. Materials, equipment and accessories may be rejected for cause even though samples have been approved.
- (5) Wherever materials are required to comply with recognized standards or specifications, such specifications shall be accepted as establishing the technical qualities and testing methods, but shall not govern the number of tests required to be made nor modify other contract requirements. The Contracting Officer may require laboratory test reports on items submitted for approval or may approve materials on the basis of data submitted in certificates with samples. Check tests will be made on materials delivered for use only as frequently as the Contracting Officer determines necessary to insure compliance of materials with the specifications. The Contractor will assume all costs of retesting materials which fail to meet contract requirements and/or testing materials offered in substitution for those found deficient.
- (6) After approval, samples will be kept in the Project office until completion of work. They may be built into the work after a substantial quantity of the materials they represent has been built in and accepted.
- (c) Requirements concerning lead-based paint. The Contractor shall comply with the requirements concerning lead-based paint contained in the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. 4821-4846) as implemented by 24 CFR Part 35.

12. Permits and Codes

- (a) The Contractor shall give all notices and comply with all applicable laws, ordinances, codes, rules and regulations. Notwithstanding the requirement of the Contractor to comply with the drawings and specifications in the contract, all work installed shall comply with all applicable codes and regulations as amended by any

waivers. Before installing the work, the Contractor shall examine the drawings and the specifications for compliance with applicable codes and regulations bearing on the work and shall immediately report any discrepancy it may discover to the Contracting Officer.

Where the requirements of the drawings and specifications fail to comply with the applicable code or regulation, the Contracting Officer shall modify the contract by change order pursuant to the clause entitled Changes herein to conform to the code or regulation.

- (b) The Contractor shall secure and pay for all permits, fees, and licenses necessary for the proper execution and completion of the work. Where the PHA can arrange for the issuance of all or part of these permits, fees and licenses, without cost to the Contractor, the contract amount shall be reduced accordingly.

13. Health, Safety, and Accident Prevention

(a) In performing this contract, the Contractor shall:

- (1) Ensure that no laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his/her health and/or safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation;
- (2) Protect the lives, health, and safety of other persons;
- (3) Prevent damage to property, materials, supplies, and equipment; and,
- (4) Avoid work interruptions.

(b) For these purposes, the Contractor shall:

- (1) Comply with regulations and standards issued by the Secretary of Labor at 29 CFR Part 1926. Failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act (Public Law 91-54, 83 Stat. 96), 40 U.S.C. 3701 et seq.; and
 - (2) Include the terms of this clause in every subcontract so that such terms will be binding on each subcontractor.
- (c) The Contractor shall maintain an accurate record of exposure data on all accidents incident to work performed under this contract resulting in death, traumatic injury, occupational disease, or damage to property, materials, supplies, or equipment, and shall report this data in the manner prescribed by 29 CFR Part 1904.
- (d) The Contracting Officer shall notify the Contractor of any noncompliance with these requirements and of the corrective action required. This notice, when delivered to the Contractor or the Contractor's representative at the site of the work, shall be deemed sufficient notice of the noncompliance and corrective action required. After receiving the notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to take corrective action promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. The Contractor shall not base any claim or request for equitable adjustment for additional time or money on any stop order issued under these circumstances.

(e) The Contractor shall be responsible for its subcontractors' compliance with the provisions of this clause. The Contractor shall take such action with respect to any subcontract as the PHA, the Secretary of Housing and Urban Development, or the Secretary of Labor shall direct as a means of enforcing such provisions.

14. Temporary Heating

The Contractor shall provide and pay for temporary heating, covering, and enclosures necessary to properly protect all work and materials against damage by dampness and cold, to dry out the work, and to facilitate the completion of the work. Any permanent heating equipment used shall be turned over to the PHA in the condition and at the time required by the specifications.

15. Availability and Use of Utility Services

- (a) The PHA shall make all reasonably required amounts of utilities available to the Contractor from existing outlets and supplies, as specified in the contract. Unless otherwise provided in the contract, the amount of each utility service consumed shall be charged to or paid for by the Contractor at prevailing rates charged to the PHA or, where the utility is produced by the PHA, at reasonable rates determined by the Contracting Officer. The Contractor shall carefully conserve any utilities furnished without charge.
- (b) The Contractor, at its expense and in a manner satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines, and all meters required to measure the amount of each utility used for the purpose of determining charges. Before final acceptance of the work by the PHA, the Contractor shall remove all the temporary connections, distribution lines, meters, and associated paraphernalia.

16. Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements

- (a) The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed under this contract, and which do not unreasonably interfere with the work required under this contract.
- (b) The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during performance of this contract, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.
- (c) The Contractor shall protect from damage all existing improvements and utilities (1) at or near the work site and (2) on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. Prior to disturbing the ground at the construction site, the Contractor shall ensure that all underground utility lines are clearly marked.
- (d) The Contractor shall shore up, brace, underpin, secure, and protect as necessary all foundations and other parts of existing structures adjacent to, adjoining, and in the vicinity of the site, which may be affected by the excavations or other operations connected with the construction of the project.
- (e) Any equipment temporarily removed as a result of work under this contract shall be protected, cleaned, and replaced in the same condition as at the time of award of this contract.

- (f) New work which connects to existing work shall correspond in all respects with that to which it connects and/or be similar to existing work unless otherwise required by the specifications.
- (g) No structural members shall be altered or in any way weakened without the written authorization of the Contracting Officer, unless such work is clearly specified in the plans or specifications.
- (h) If the removal of the existing work exposes discolored or unfinished surfaces, or work out of alignment, such surfaces shall be refinished, or the material replaced as necessary to make the continuous work uniform and harmonious. This, however, shall not be construed to require the refinishing or reconstruction of dissimilar finishes previously exposed, or finished surfaces in good condition, but in different planes or on different levels **Construction** when brought together by the removal of intervening work, unless such refinishing or reconstruction is specified in the plans or specifications.
- (i) The Contractor shall give all required notices to any adjoining or adjacent property owner or other party before the commencement of any work.
- (j) The Contractor shall indemnify and save harmless the PHA from any damages on account of settlement or the loss of lateral support of adjoining property, any damages from changes in topography affecting drainage, and from all loss or expense and all damages for which the PHA may become liable in consequence of such injury or damage to adjoining and adjacent structures and their premises.
- (k) The Contractor shall repair any damage to vegetation, structures, equipment, utilities, or improvements, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

17. Temporary Buildings and Transportation of Materials

- (a) Temporary buildings (e.g., storage sheds, shops, offices, sanitary facilities) and utilities may be erected by the Contractor only with the approval of the Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to the PHA. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.
- (b) The Contractor shall, as directed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any federal, state, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

18. Clean Air and Water

The contractor shall comply with the Clean Air Act, as amended, 42 USC 7401 et seq., the Federal Water Pollution Control Water Act, as amended, 33 U.S.C. 1251 et seq., and standards issued pursuant thereto in the facilities in which this contract is to be performed.

19. Energy Efficiency

The Contractor shall comply with mandatory standards and policies relating to energy efficiency which are contained in the energy conservation plan issued in compliance with the Energy Policy and Conservation Act (Pub.L. 94-163) for the State in which the work under the contract is performed.

20. Inspection and Acceptance of

- (a) Definitions. As used in this clause -
 - (1) "Acceptance" means the act of an authorized representative of the PHA by which the PHA approves and assumes ownership of the work performed under this contract. Acceptance may be partial or complete.
 - (2) "Inspection" means examining and testing the work performed under the contract (including, when appropriate, raw materials, equipment, components, and intermediate assemblies) to determine whether it conforms to contract requirements.
 - (3) "Testing" means that element of inspection that determines the properties or elements, including functional operation of materials, equipment, or their components, by the application of established scientific principles and procedures.
- (b) The Contractor shall maintain an adequate inspection system and perform such inspections as will ensure that the work performed under the contract conforms to contract requirements. All work is subject to PHA inspection and test at all places and at all reasonable times before acceptance to ensure strict compliance with the terms of the contract.
- (c) PHA inspections and tests are for the sole benefit of the PHA and do not: (1) relieve the Contractor of responsibility for providing adequate quality control measures; (2) relieve the Contractor of responsibility for loss or damage of the material before acceptance; (3) constitute or imply acceptance; or, (4) affect the continuing rights of the PHA after acceptance of the completed work under paragraph (j) below.
- (d) The presence or absence of the PHA inspector does not relieve the Contractor from any contract requirement, nor is the inspector authorized to change any term or condition of the specifications without the Contracting Officer's written authorization. All instructions and approvals with respect to the work shall be given to the Contractor by the Contracting Officer.
- (e) The Contractor shall promptly furnish, without additional charge, all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by the Contracting Officer. The PHA may charge to the Contractor any additional cost of inspection or test when work is not ready at the time specified by the Contractor for inspection or test, or when prior rejection makes reinspection or retest necessary. The PHA shall perform all inspections and tests in a manner that will not unnecessarily delay the work. Special, full size, and performance tests shall be performed as described in the contract.

- (f) The PHA may conduct routine inspections of the construction site on a daily basis.
- (g) The Contractor shall, without charge, replace or correct work found by the PHA not to conform to contract requirements, unless the PHA decides that it is in its interest to accept the work with an appropriate adjustment in contract price. The Contractor shall promptly segregate and remove rejected material from the premises.
- (h) If the Contractor does not promptly replace or correct rejected work, the PHA may (1) by contract or otherwise, replace or correct the work and charge the cost to the Contractor, or (2) terminate for default the Contractor's right to proceed.
- (i) If any work requiring inspection is covered up without approval of the PHA, it must, if requested by the Contracting Officer, be uncovered at the expense of the Contractor. If at any time before final acceptance of the entire work, the **Construction** PHA considers it necessary or advisable, to examine work already completed by removing or tearing it out, the Contractor, shall on request, promptly furnish all necessary facilities, labor, and material. If such work is found to be defective or nonconforming in any material respect due to the fault of the Contractor or its subcontractors, the Contractor shall defray all the expenses of the examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the contract, the Contracting Officer shall make an equitable adjustment to cover the cost of the examination and reconstruction, including, if completion of the work was thereby delayed, an extension of time.
- (j) The Contractor shall notify the Contracting Officer, in writing, as to the date when in its opinion all or a designated portion of the work will be substantially completed and ready for inspection. If the Architect determines that the state of preparedness is as represented, the PHA will promptly arrange for the inspection. Unless otherwise specified in the contract, the PHA shall accept, as soon as practicable after completion and inspection, all work required by the contract or that portion of the work the Contracting Officer determines and designates can be accepted separately. Acceptance shall be final and conclusive except for latent defects, fraud, gross mistakes amounting to fraud, or the PHA's right under any warranty or guarantee.

21. Use and Possession Prior to Completion

- (a) The PHA shall have the right to take possession of or use any completed or partially completed part of the work. Before taking possession of or using any work, the Contracting Officer shall furnish the Contractor a list of items of work remaining to be performed or corrected on those portions of the work that the PHA intends to take possession of or use. However, failure of the Contracting Officer to list any item of work shall not relieve the Contractor of responsibility for complying with the terms of the contract. The PHA's possession or use shall not be deemed an acceptance of any work under the contract.
- (b) While the PHA has such possession or use, the Contractor shall be relieved of the responsibility for (1) the loss of or damage to the work resulting from the PHA's possession or use, notwithstanding the terms of the clause entitled Permits and Codes herein; (2) all maintenance costs on the areas occupied; and, (3) furnishing heat, light, power, and water used in the areas

occupied without proper remuneration therefore. If prior possession or use by the PHA delays the progress of the work or causes additional expense to the Contractor, an equitable adjustment shall be made in the contract price or the time of completion, and the contract shall be modified in writing accordingly.

22. Warranty of Title

The Contractor warrants good title to all materials, supplies, and equipment incorporated in the work and agrees to deliver the premises together with all improvements thereon free from any claims, liens or charges, and agrees further that neither it nor any other person, firm or corporation shall have any right to a lien upon the premises or anything appurtenant thereto.

23. Warranty of

- (a) In addition to any other warranties in this contract, the Contractor warrants, except as provided in paragraph (j) of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or workmanship performed by the Contractor or any subcontractor or supplier at any tier. This warranty shall continue for a period of _____ (one year unless otherwise indicated) from the date of final acceptance of the work. If the PHA takes possession of any part of the work before final acceptance, this warranty shall continue for a period of (one year unless otherwise indicated) from the date that the PHA takes possession.
- (b) The Contractor shall remedy, at the Contractor's expense, any failure to conform, or any defect. In addition, the Contractor shall remedy, at the Contractor's expense, any damage to PHA-owned or controlled real or personal property when the damage is the result of—
 - (1) The Contractor's failure to conform to contract requirements; or
 - (2) Any defects of equipment, material, workmanship or design furnished by the Contractor.
- (c) The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for (one year unless otherwise indicated) from the date of repair or replacement.
- (d) The Contracting Officer shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect or damage.
- (e) If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, the PHA shall have the right to replace, repair or otherwise remedy the failure, defect, or damage at the Contractor's expense.
- (f) With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall:
 - (1) Obtain all warranties that would be given in normal commercial practice;
 - (2) Require all warranties to be executed in writing, for the benefit of the PHA; and,
 - (3) Enforce all warranties for the benefit of the PHA.
- (g) In the event the Contractor's warranty under paragraph (a) of this clause has expired, the PHA may bring suit at its own expense to enforce a subcontractor's, manufacturer's or supplier's warranty.

- (h) Unless a defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defect of material or design furnished by the PHA nor for the repair of any damage that results from any defect in PHA furnished material or design.
- (i) Notwithstanding any provisions herein to the contrary, the establishment of the time periods in paragraphs (a) and (c) above relate only to the specific obligation of the Contractor to correct the work, and have no relationship to the time within which its obligation to comply with the contract may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to its obligation other than specifically to correct the work.
- (j) This warranty shall not limit the PHA's rights under the Inspection and Acceptance of Construction clause of this contract with respect to latent defects, gross mistakes or fraud.

24. Prohibition Against Liens

The Contractor is prohibited from placing a lien on the PHA's property. This prohibition shall apply to all subcontractors at any tier and all materials suppliers.

Administrative Requirements

25. Contract Period

this contract within ³⁶⁵ calendar days of the effective date of the contract, or within the time schedule established in the notice to proceed issued by the Contracting Officer.

26. Order of Provisions

accordance with the terms and conditions of the

In the event of a conflict between these General Conditions and the Specifications, the General Conditions shall prevail. In the event of a conflict between the contract and any applicable state or local law or regulation, the state or local law or regulation shall prevail; provided that such state or local law or regulation does not conflict with, or is less restrictive than applicable federal law, regulation, or Executive Order. In the event of such a conflict, applicable federal law, regulation, and Executive Order shall prevail.

27. Payments

- (a) The PHA shall pay the Contractor the price as provided in this contract.
- (b) The PHA shall make progress payments approximately every 30 days as the work proceeds, on estimates of work accomplished which meets the standards of quality established under the contract, as approved by the Contracting Officer. The PHA may, subject to written determination and approval of the Contracting Officer, make more frequent payments to contractors which are qualified small businesses.
- (c) Before the first progress payment under this contract, the Contractor shall furnish, in such detail as requested by the Contracting Officer, a breakdown of the total contract price showing the amount included therein for each principal category of the work, which shall substantiate the payment amount requested in order to provide a

basis for determining progress payments. The breakdown shall be approved by the Contracting Officer and must be acceptable to HUD. If the contract covers more than one project, the Contractor shall furnish a separate breakdown for each. The values and quantities employed in making up this breakdown are for determining the amount of progress payments and shall not be construed as a basis for additions to or deductions from the contract price. The Contractor shall prorate its overhead and profit over the construction period of the contract.

- (d) The Contractor shall submit, on forms provided by the PHA, periodic estimates showing the value of the work performed during each period based upon the approved

submitted not later than _____ days in advance of the date set for payment and are subject to correction and revision as required. The estimates must be approved by the Contracting Officer with the concurrence of the Architect prior to payment. If the contract covers more than one project, the Contractor shall furnish a separate progress payment estimate for each.

- (e) Along with each request for progress payments and the required estimates, the Contractor shall furnish the following certification, or payment shall not be made: I hereby certify, to the best of my knowledge and belief, that:

- (1) The amounts requested are only for performance in accordance with the specifications, terms, and conditions of the contract;
- (2) Payments to subcontractors and suppliers have been made from previous payments received under the contract, and timely payments will be made from the proceeds of the payment covered by this certification, in accordance with subcontract agreements; and,
- (3) This request for progress payments does not include any amounts which the prime contractor intends to withhold or retain from a subcontractor or supplier in subcontract.

Name:

Title:

Date:

- (f) Except as otherwise provided in State law, the PHA shall retain ten (10) percent of the amount of progress payments until completion and acceptance of all work under the contract; except, that if upon completion of 50 percent of the work, the Contracting Officer, after consulting with the Architect, determines that the Contractor's performance and progress are satisfactory, the PHA may make the remaining payments in full for the work subsequently completed. If the Contracting Officer subsequently determines that the Contractor's performance and progress are unsatisfactory, the PHA shall reinstate the ten (10) percent (or other percentage as provided in State law) retainage until such time as the Contracting Officer determines that performance and progress are satisfactory.
- (g) The Contracting Officer may authorize material delivered on the site and preparatory work done to be taken into consideration when computing progress payments.

Material delivered to the Contractor at locations other than the site may also be taken into consideration if the Contractor furnishes satisfactory evidence that (1) it has acquired title to such material; (2) the material is properly stored in a bonded warehouse, storage yard, or similar suitable place as may be approved by the Contracting Officer; (3) the material is insured to cover its full value; and (4) the material will be used to perform this contract. Before any progress payment which includes delivered material is made, the Contractor shall furnish such documentation as the Contracting Officer may require to assure the protection of the PHA's interest in such materials. The Contractor shall remain responsible for such stored material notwithstanding the transfer of title to the PHA.

- (h) All material and work covered by progress payments made shall, at the time of payment become the sole property of the PHA, but this shall not be construed as (1) relieving the Contractor from the sole responsibility for all material and work upon which payments have been made or the restoration of any damaged work; or, (2) waiving the right of the PHA to require the fulfillment of all of the terms of the contract. In the event the work of the Contractor has been damaged by other contractors or persons other than employees of the PHA in the course of their employment, the Contractor shall restore such damaged work without cost to the PHA and to seek redress for its damage only from those who directly caused it.
- (i) The PHA shall make the final payment due the Contractor under this contract after (1) completion and final acceptance of all work; and (2) presentation of release of all claims against the PHA arising by virtue of this contract, other than claims, in stated amounts, that the Contractor has specifically excepted from the operation of the release. Each such exception shall embrace no more than one claim, the basis and scope of which shall be clearly defined. The amounts for such excepted claims shall not be included in the request for final payment. A release may also be required of the assignee if the Contractor's claim to amounts payable under this contract has been assigned.
- (j) Prior to making any payment, the Contracting Officer may require the Contractor to furnish receipts or other evidence of payment from all persons performing work and supplying material to the Contractor, if the Contracting Officer determines such evidence is necessary to substantiate claimed costs.
- (k) The PHA shall not: (1) determine or adjust any claims for payment or disputes arising there under between the Contractor and its subcontractors or material suppliers; or, (2) withhold any moneys for the protection of the subcontractors or material suppliers. The failure or refusal of the PHA to withhold moneys from the Contractor shall in nowise impair the obligations of any surety or sureties under any bonds furnished under this contract.

28. Contract Modifications

- (a) Only the Contracting Officer has authority to modify any term or condition of this contract. Any contract modification shall be authorized in writing.
- (b) The Contracting Officer may modify the contract unilaterally (1) pursuant to a specific authorization stated in a contract clause (e.g., Changes); or (2) for administrative matters which do not change the rights or

responsibilities of the parties (e.g., change in the PHA address). All other contract modifications shall be in the form of supplemental agreements signed by the Contractor and the Contracting Officer.

- (c) When a proposed modification requires the approval of HUD prior to its issuance (e.g., a change order that exceeds the PHA's approved threshold), such modification shall not be effective until the required approval is received by the PHA.

29. Changes

- (a) The Contracting Officer may, at any time, without notice to the sureties, by written order designated or indicated to be a change order, make changes in the work within the general scope of the contract including changes:
 - (1) In the specifications (including drawings and designs);
 - (2) In the method or manner of performance of the work;
 - (3) PHA-furnished facilities, equipment, materials, services, or site; or,
 - (4) Directing the acceleration in the performance of the work.
- (b) Any other written order or oral order (which, as used in this paragraph (b), includes direction, instruction, interpretation, or determination) from the Contracting Officer that causes a change shall be treated as a change order under this clause; provided, that the Contractor gives the Contracting Officer written notice stating (1) the date, circumstances and source of the order and (2) that the Contractor regards the order as a change order.
- (c) Except as provided in this clause, no order, statement or conduct of the Contracting Officer shall be treated as a change under this clause or entitle the Contractor to an equitable adjustment.
- (d) If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for the performance of any part of the work under this contract, whether or not changed by any such order, the Contracting Officer shall make an equitable adjustment and modify the contract in writing. However, except for a adjustment based on defective specifications, no proposal for any change under paragraph (b) above shall be allowed for any costs incurred more than 20 days (5 days for oral orders) before the Contractor gives written notice as required. In the case of defective specifications for which the PHA is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with the defective specifications.
- (e) The Contractor must assert its right to an adjustment under this clause within 30 days after (1) receipt of a written change order under paragraph (a) of this clause, or (2) the furnishing of a written notice under paragraph (b) of this clause, by submitting a written statement describing the general nature and the amount of the proposal. If the facts justify it, the Contracting Officer may extend the period for submission. The proposal may be included in the notice required under paragraph (b) above. No proposal by the Contractor for an equitable adjustment shall be allowed if asserted after final payment under this contract.
- (f) The Contractor's written proposal for equitable adjustment shall be submitted in the form of a lump sum proposal supported with an itemized breakdown of all increases and decreases in the contract in at least the following details:

- (1) Direct Costs. Materials (list individual items, the quantity and unit cost of each, and the aggregate cost); Transportation and delivery costs associated with materials; Labor breakdowns by hours or unit costs (identified with specific work to be performed); Construction equipment exclusively necessary for the change; Costs of preparation and/ or revision to shop drawings resulting from the change; Worker's Compensation and Public Liability Insurance; Employment taxes under FICA and FUTA; and, Bond Costs when size of change warrants revision.
- (2) Indirect Costs. Indirect costs may include overhead, general and administrative expenses, and fringe benefits not normally treated as direct costs.
- (3) Profit. The amount of profit shall be negotiated and may vary according to the nature, extent, and complexity of the work required by the change. The allowability of the direct and indirect costs shall be determined in accordance with the Contract Cost Principles and Procedures for Commercial Firms in Part 31 of the Federal Acquisition Regulation (48 CFR 1-31), as implemented by HUD Handbook 2210.18, in effect on the date of this contract. The Contractor shall not be allowed a profit on the profit received by any subcontractor. Equitable adjustments for deleted work shall include a credit for profit and may include a credit for indirect costs. On proposals covering both increases and decreases in the amount of the contract, the application of indirect costs and profit shall be on the net-change in direct costs for the Contractor or subcontractor performing the work.
- (g) The Contractor shall include in the proposal its request for time extension (if any), and shall include sufficient information and dates to demonstrate whether and to what extent the change will delay the completion of the contract in its entirety.
- (h) The Contracting Officer shall act on proposals within 30 days after their receipt, or notify the Contractor of the date when such action will be taken.
- (i) Failure to reach an agreement on any proposal shall be a dispute under the clause entitled Disputes herein. Nothing in this clause, however, shall excuse the Contractor from proceeding with the contract as changed.
- (j) Except in an emergency endangering life or property, no change shall be made by the Contractor without a prior order from the Contracting Officer.

30. Suspension of Work

- (a) The Contracting Officer may order the Contractor in writing to suspend, delay, or interrupt all or any part of the work of this contract for the period of time that the Contracting Officer determines appropriate for the convenience of the PHA.
- (b) If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted (1) by an act of the Contracting Officer in the administration of this contract, or (2) by the Contracting Officer's failure to act within the time specified (or within a reasonable time if not specified) in this contract an adjustment shall be made for any increase in the cost of performance of the contract (excluding profit) necessarily caused by such unreasonable suspension, delay, or interruption and the contract modified in writing accordingly. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent that performance would have

- been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor or for which any equitable adjustment is provided for or excluded under any other provision of this contract.
- (c) A claim under this clause shall not be allowed (1) for any costs incurred more than 20 days before the Contractor shall have notified the Contracting Officer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order), and, (2) unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of the suspension, delay, or interruption, but not later than the date of final payment under the contract.

31. Disputes

- (a) "Claim," as used in this clause, means a written demand or written assertion by one of the contracting parties seeking, as a matter of right, the payment of money in a sum certain, the adjustment or interpretation of contract terms, or other relief arising under or relating to the contract. A claim arising under the contract, unlike a claim relating to the contract, is a claim that can be resolved under a contract clause that provides for the relief sought by the claimant. A voucher, invoice, or other routine request for payment that is not in dispute when submitted is not a claim. The submission may be converted to a claim by complying with the requirements of this clause, if it is disputed either as to liability or amount or is not acted upon in a reasonable time.
- (b) Except for disputes arising under the clauses entitled Labor Standards - Davis Bacon and Related Acts, herein, all disputes arising under or relating to this contract, including any claims for damages for the alleged breach thereof which are not disposed of by agreement, shall be resolved under this clause.
- (c) All claims by the Contractor shall be made in writing and submitted to the Contracting Officer for a written decision. A claim by the PHA against the Contractor shall be subject to a written decision by the Contracting Officer.
- (d) The Contracting Officer shall, within 60 (unless otherwise indicated) days after receipt of the request, decide the claim or notify the Contractor of the date by which the decision will be made.
- (e) The Contracting Officer's decision shall be final unless the Contractor (1) appeals in writing to a higher level in the PHA in accordance with the PHA's policy and procedures, (2) refers the appeal to an independent mediator or arbitrator, or (3) files suit in a court of competent jurisdiction. Such appeal must be made within (30 unless otherwise indicated) days after receipt of the Contracting Officer's decision.
- (f) The Contractor shall proceed diligently with performance of this contract, pending final resolution of any request for relief, claim, appeal, or action arising under or relating to the contract, and comply with any decision of the Contracting Officer.

32. Default

- (a) If the Contractor refuses or fails to prosecute the work, or any separable part thereof, with the diligence that will insure its completion within the time specified in this contract, or any extension thereof, or fails to complete said work within this time, the Contracting Officer may, by written notice to the Contractor, terminate the right to

proceed with the work (or separable part of the work) that has been delayed. In this event, the PHA may take over the work and complete it, by contract or otherwise, and may take possession of and use any materials, equipment, and plant on the work site necessary for completing the work. The Contractor and its sureties shall be liable for any damage to the PHA resulting from the

Convenience Contractor's refusal or failure to complete the work within the specified time, whether or not the Contractor's right to proceed with the work is terminated. This liability includes any increased costs incurred by the PHA in completing the work.

- (b) The Contractor's right to proceed shall not be terminated or the Contractor charged with damages under this clause if—
- (1) The delay in completing the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor. Examples of such causes include (i) acts of God, or of the public enemy, (ii) acts of the PHA or other governmental entity in either its sovereign or contractual capacity, (iii) acts of another contractor in the performance of a contract with the PHA, (iv) fires, (v) floods, (vi) epidemics, (vii) quarantine restrictions, (viii) strikes, (ix) freight embargoes, (x) unusually severe weather, or (xi) delays of subcontractors or suppliers at any tier arising from unforeseeable causes beyond the control and without the fault or negligence of both the Contractor and the subcontractors or suppliers; and
 - (2) The Contractor, within days (10 days unless otherwise indicated) from the beginning of such delay (unless extended by the Contracting Officer) notifies the Contracting Officer in writing of the causes of delay. The Contracting Officer shall ascertain the facts and the extent of the delay. If, in the judgment of the Contracting Officer, the findings of fact warrant such action, time for completing the work shall be extended by written modification to the contract. The findings of the Contracting Officer shall be reduced to a written decision which shall be subject to the provisions of the Disputes clause of this contract.
- (c) If, after termination of the Contractor's right to proceed, it is determined that the Contractor was not in default, or that the delay was excusable, the rights and obligations of the parties will be the same as if the termination had been for convenience of the PHA.

33. Liquidated Damages

- (a) If the Contractor fails to complete the work within the time specified in the contract, or any extension, as specified in the clause entitled Default of this contract, the Contractor shall pay to the PHA as liquidated damages, the sum of \$ 500 per day/unit [Contracting Officer insert amount] for each day of delay. If different completion dates are specified in the contract for separate parts or stages of the work, the amount of liquidated damages shall be assessed on those parts or stages which are delayed. To the extent that the Contractor's delay or nonperformance is excused under another clause in this contract, liquidated damages shall not be due the PHA. The Contractor remains liable for damages caused other than by delay.
- (b) If the PHA terminates the Contractor's right to proceed, the resulting damage will consist of liquidated damages until such reasonable time as may be required for final

completion of the work together with any increased costs occasioned the PHA in completing the work.

- (c) If the PHA does not terminate the Contractor's right to proceed, the resulting damage will consist of liquidated damages until the work is completed or accepted.

34. Termination for

- (a) The Contracting Officer may terminate this contract in whole, or in part, whenever the Contracting Officer determines that such termination is in the best interest of the PHA. Any such termination shall be effected by delivery to the Contractor of a Notice of Termination specifying the extent to which the performance of the work under the contract is terminated, and the date upon which such termination becomes effective.
- (b) If the performance of the work is terminated, either in whole or in part, the PHA shall be liable to the Contractor for reasonable and proper costs resulting from such termination upon the receipt by the PHA of a properly presented claim setting out in detail: (1) the total cost of the work performed to date of termination less the total amount of contract payments made to the Contractor; (2) the cost (including reasonable profit) of settling and paying claims under subcontracts and material orders for work performed and materials and supplies delivered to the site, payment for which has not been made by the PHA to the Contractor or by the Contractor to the subcontractor or supplier; (3) the cost of preserving and protecting the work already performed until the PHA or assignee takes possession thereof or assumes responsibility therefore; (4) the actual or estimated cost of legal and accounting services reasonably necessary to prepare and present the termination claim to the PHA; and (5) an amount constituting a reasonable profit on the value of the work performed by the Contractor.
- (c) The Contracting Officer will act on the Contractor's claim within days (60 days unless otherwise indicated) of receipt of the Contractor's claim.
- (d) Any disputes with regard to this clause are expressly made subject to the provisions of the Disputes clause of this contract.

35. Assignment of Contract

The Contractor shall not assign or transfer any interest in this contract; except that claims for monies due or to become due from the PHA under the contract may be assigned to a bank, trust company, or other financial institution. Such assignments of claims shall only be made with the written concurrence of the Contracting Officer. If the Contractor is a partnership, this contract shall inure to the benefit of the surviving or remaining member(s) of such partnership as approved by the Contracting Officer.

36. Insurance

- (a) Before commencing work, the Contractor and each subcontractor shall furnish the PHA with certificates of insurance showing the following insurance is in force and will insure all operations under the Contract:
 - (1) Workers' Compensation, in accordance with state or Territorial Workers' Compensation laws.
 - (2) Commercial General Liability with a combined single limit for bodily injury and property damage of not less than \$ _____ [Contracting Officer insert amount]

per occurrence to protect the Contractor and each subcontractor against claims for bodily injury or death and damage to the property of others. This shall cover the use of all equipment, hoists, and vehicles on the site(s) not covered by Automobile Liability under (3) below. If the Contractor has a "claims made" policy, then the following additional requirements apply: the policy must provide a "retroactive date" which must be on or before the execution date of the Contract; and the extended reporting period may not be less than five years following the completion date of the Contract.

- (3) Automobile Liability on owned and non-owned motor vehicles used on the site(s) or in connection therewith for a combined single limit for bodily injury and property damage of not less than \$ _____

[Contracting Officer insert amount] per occurrence.

- (b) Before commencing work, the Contractor shall furnish the PHA with a certificate of insurance evidencing that Builder's Risk (fire and extended coverage) Insurance on all work in place and/or materials stored at the building site(s), including foundations and building equipment, is in force. The Builder's Risk Insurance shall be for the benefit of the Contractor and the PHA as their interests may appear and each shall be named in the policy or policies as an insured. The Contractor in installing equipment supplied by the PHA shall carry insurance on such equipment from the time the Contractor takes possession thereof until the Contract work is accepted by the PHA. The Builder's Risk Insurance need not be carried on excavations, piers, footings, or foundations until such time as work on the superstructure is started. It need not be carried on landscape work. Policies shall furnish coverage at all times for the full cash value of all completed construction, as well as materials in place and/or stored at the site(s), whether or not partial payment has been made by the PHA. The Contractor may terminate this insurance on buildings as of the date taken over for occupancy by the PHA. The Contractor is not required to carry Builder's Risk Insurance for modernization work which does not involve structural alterations or additions and where the PHA's existing fire and extended coverage policy can be endorsed to include such work.
- (c) All insurance shall be carried with companies which are financially responsible and admitted to do business in the State in which the project is located. If any such insurance is due to expire during the construction period, the Contractor (including subcontractors, as applicable) shall not permit the coverage to lapse and shall furnish evidence of coverage to the Contracting Officer. All certificates of insurance, as evidence of coverage, shall provide that no coverage may be canceled or non-renewed by the insurance company until at least 30 days prior written notice has been given to the Contracting Officer.

37. Subcontracts

- (a) Definitions. As used in this contract -
- (1) "Subcontract" means any contract, purchase order, or other purchase agreement, including modifications and change orders to the foregoing, entered into by a subcontractor to furnish supplies, materials, equipment, and services for the performance of the prime contract or a subcontract.

(2) "Subcontractor" means any supplier, vendor, or firm that furnishes supplies, materials, equipment, or services to or for the Contractor or another subcontractor.

- (b) The Contractor shall not enter into any subcontract with any subcontractor who has been temporarily denied participation in a HUD program or who has been suspended or debarred from participating in contracting programs by any agency of the United States Government or of the state in which the work under this contract is to be performed.
- (c) The Contractor shall be as fully responsible for the acts or omissions of its subcontractors, and of persons either directly or indirectly employed by them as for the acts or omissions of persons directly employed by the Contractor.
- (d) The Contractor shall insert appropriate clauses in all subcontracts to bind subcontractors to the terms and conditions of this contract insofar as they are applicable to the work of subcontractors.
- (e) Nothing contained in this contract shall create any contractual relationship between any subcontractor and the PHA or between the subcontractor and HUD.

38. Subcontracting with Small and Minority Firms, Women's Business Enterprise, and Labor Surplus Area Firms

The Contractor shall take the following steps to ensure that, whenever possible, subcontracts are awarded to small business firms, minority firms, women's business enterprises, and labor surplus area firms:

- (a) Placing qualified small and minority businesses and women's business enterprises on solicitation lists;
- (b) Ensuring that small and minority businesses and women's business enterprises are solicited whenever they are potential sources;
- (c) Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses and women's business enterprises;
- (d) Establishing delivery schedules, where the requirements of the contract permit, which encourage participation by small and minority businesses and women's business enterprises; and
- (e) Using the services and assistance of the U.S. Small Business Administration, the Minority Business Development Agency of the U.S. Department of Commerce, and State and local governmental small business agencies.

39. Equal Employment Opportunity

During the performance of this contract, the Contractor/Seller agrees as follows:

- (a) The Contractor/Seller shall not discriminate against any employee or applicant for employment because of race color, religion, sex, sexual orientation, gender identity, disability, or national origin.
- (b) The Contractor/Seller shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, disability, or national origin. Such action shall include, but not be limited to, (1) employment, (2) upgrading demotion, (4) transfer, (5) recruitment or recruitment advertising, (6) layoff or termination, (7) rates of pay or other forms of compensation, and (8) selection for training, including apprenticeship

(c) The Contractor/Seller agrees to post in conspicuous places available to employees and applicants for employment the notices to be provided by the Contracting Officer setting forth the provisions of this nondiscrimination clause.

(d) The Contractor/Seller shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor/Seller, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

(e) The Contractor/Seller shall send, to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, the notice to be provided by the Contracting Officer advising the labor union or workers' representative of the Contractor's commitments under this clause, and post copies of the notice in conspicuous places available to employees and applicants for employment.

(f) The Contractor/Seller shall comply with Executive Order 11246, as amended, and the rules, regulations, and orders of the Secretary of Labor.

(g) The Contractor/Seller shall furnish all information and reports required by Executive Order 11246, as amended, Section 503 of the Rehabilitation Act of 1973, as amended, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto. The Contractor/Seller shall permit

access to its books, records, and accounts by the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(h) In the event of a that the Contractor/Seller is in noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be canceled, terminated or suspended in whole or in part and the contractor/seller may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(i) The contractor/seller will include the provisions of paragraphs (a) through (h) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each sub[contractor/seller] or vendor. The [contractor/seller] will take such action with respect to any subcontract or purchase order as may be directed by the Secretary of Labor as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that in the event the [contractor/seller] becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, the [contractor/seller] may request the United States to enter into such litigation to protect the interests of the United States.

(j) Compliance with the requirements of this clause shall be to the maximum extent consistent with, but not in derogation of, compliance with section 7(b) of the Indian Self-Determination and Education Assistance Act and the Indian Preference clause of this contract.

40. Employment, Training, and Contracting Opportunities for Low-Income Persons, Section 3 of the Housing and Urban Development Act of 1968.

(a) The work to be performed under this contract is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u (section 3). The purpose of section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by Section 3, shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing.

(b) The parties to this contract agree to comply with HUD's regulations in 24 CFR Part 75, which implement Section 3. As evidenced by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the Part 75 regulations.

(c) The contractor agrees to send to each labor organization or representative of workers with which the contractor has a collective bargaining agreement or other understanding, if any, a notice advising the labor organization or workers' representative of the contractor's commitments under this section 3 clause and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the Section 3 prioritization requirements and shall state the minimum percentages of labor hour requirements established in the Benchmark Notice (FR-6085-N-04).

(d) The contractor agrees to include this section 3 clause in every subcontract subject to compliance with regulations in 24 CFR Part 75, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this section 3 clause, upon a finding that the subcontractor is in violation of the regulations in 24 CFR Part 75. The contractor will not subcontract with any subcontractor where the contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR Part 75.

(e) Noncompliance with HUD's regulations in 24 CFR Part 75 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.

(f) Contracts, subcontracts, grants, or subgrants subject to Section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 5307(b)) or subject to tribal preference requirements as authorized under 101(k) of the Native American Housing Assistance and Self-Determination Act (25 U.S.C. 4111(k)) must provide preferences in employment, training, and business opportunities to Indians and Indian organizations, and are therefore not subject to the requirements of 24 CFR Part 75.

41. Interest of Members of Congress

No member of or delegate to the Congress of the United States of America shall be admitted to any share or part of this contract or to any benefit that may arise therefrom.

42. Interest of Members, Officers, or Employees and Former Members, Officers, or Employees

No member, officer, or employee of the PHA, no member of the governing body of the locality in which the project is situated, no member of the governing body of the locality in which the PHA was activated, and no other public official of such locality or localities who exercises any functions or responsibilities with respect to the project, shall, during his or her tenure, or for one year thereafter, have any interest, direct or indirect, in this contract or the proceeds thereof.

43. Limitations on Payments made to Influence Certain Federal Financial Transactions

- (a) The Contractor agrees to comply with Section 1352 of Title 31, United States Code which prohibits the use of **Acts** Federal appropriated funds to pay any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, and officer or employee of Congress, or an employee of a Member of Congress in connection with any of the following covered Federal actions: the awarding of any Federal contract; the making of any Federal grant; the making of any Federal loan; the entering into of any cooperative agreement; or the modification of any Federal contract, grant, loan, or cooperative agreement.
- (b) The Contractor further agrees to comply with the requirement of the Act to furnish a disclosure (OMB Standard Form LLL, Disclosure of Lobbying Activities) if any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a Federal contract, grant, loan, or cooperative agreement.

44. Royalties and Patents

The Contractor shall pay all royalties and license fees. It shall defend all suits or claims for infringement of any patent rights and shall save the PHA harmless from loss on account thereof; except that the PHA shall be responsible for all such loss when a particular design, process or the product of a particular manufacturer or manufacturers is specified and the Contractor has no reason to believe that the specified design, process, or product is an infringement. If, however, the Contractor has reason to believe that any design, process or product specified is an infringement of a patent, the Contractor shall promptly notify the Contracting Officer. Failure to give such notice shall make the Contractor responsible for resultant loss.

45. Examination and Retention of Contractor's Records

- (a) The PHA, HUD, or Comptroller General of the United States, or any of their duly authorized representatives shall, until 3 years after final payment under this contract, have access to and the right to examine any of the Contractor's directly pertinent books, documents, papers, or other records involving transactions related to this contract for the purpose of making audit, examination, excerpts, and transcriptions.
- (b) The Contractor agrees to include in first-tier subcontracts under this contract a clause substantially the same as paragraph (a) above. "Subcontract," as used in this clause, excludes purchase orders not exceeding \$10,000.
- (c) The periods of access and examination in paragraphs (a) and (b) above for records relating to (1) appeals under the Disputes clause of this contract, (2) litigation or settlement of claims arising from the performance of this contract, or (3) costs and expenses of this contract to which the PHA, HUD, or Comptroller General or any of their duly authorized representatives has taken exception shall continue until disposition of such appeals, litigation, claims, or exceptions.

46. Labor Standards - Davis-Bacon and Related

If the total amount of this contract exceeds \$2,000, the Federal labor standards set forth in the clause below shall apply to the development or construction work to be performed under the contract.

- (a) Minimum Wages.
- (1) All laborers and mechanics employed under this contract in the development or construction of the project(s) involved will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the regular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits in the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein; provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall

be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

- (2) (i) Any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefor only when all the following criteria have been met: (A) The work to be performed by the classification requested is not performed by a classification in the wage determination; and (B) The classification is utilized in the area by the construction industry; and (C) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.
- (ii) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employee Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary.
- (iii) In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator of the Wage and Hour Division for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary.
- (iv) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (a)(2)(ii) or (iii) of this clause shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in classification.
- (3) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.
- (4) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the

amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program; provided, that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

- (b) Withholding of funds. HUD or its designee shall, upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same prime Contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime Contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working in the construction or development of the project, all or part of the wages required by the contract, HUD or its designee may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the Contractor, disburse such amounts withheld for and on account of the Contractor or subcontractor to the respective employees to whom they are due.
- (c) Payrolls and basic records.
- (1) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working in the construction or development of the project. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made, and actual wages paid. Whenever the Secretary of Labor has found, under 29 CFR 5.5(a)(1)(iv), that the wages of any laborer or mechanic include the amount of costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(2) (i) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Contracting Officer for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under subparagraph (c)(1) of this clause. This information may be submitted in any form desired. Optional Form WH-347 (Federal Stock Number 029-005-00014-1) is available for this purpose and may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. The Contractor is responsible for the submission of copies of payrolls by all subcontractors. (Approved by the Office of Management and Budget under OMB Control Number 1214-0149.)

(ii) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

- (A) That the payroll for the payroll period contains the information required to be maintained under paragraph (c) (1) of this clause and that such information is correct and complete;
 - (B) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3; and
 - (C) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.
- (iii) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirements for submission of the "Statement of Compliance" required by subparagraph (c)(2)(ii) of this clause.
- (iv) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 3729 of Title 31 of the United States Code.

(3) The Contractor or subcontractor shall make the records required under subparagraph (c)(1) available for inspection, copying, or transcription by authorized representatives of HUD or its designee, the Contracting Officer, or the Department of Labor and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to

make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

- (d) (1) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship and Training, Employer and Labor Services (OATELS), or with a State Apprenticeship Agency recognized by OATELS, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by OATELS or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in this paragraph, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator of the Wage and Hour Division determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event OATELS, or a State Apprenticeship Agency recognized by OATELS, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.
- (2) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under

- the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed in the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate in the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate in the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate in the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.
- (3) Equal employment opportunity. The utilization of apprentices, trainees, and journeymen under this clause shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.
- (e) Compliance with Copeland Act requirements. The Contractor shall comply with the requirements of 29 CFR Part 3, which are hereby incorporated by reference in this contract.
- (f) Contract termination; debarment. A breach of this contract clause may be grounds for termination of the contract and for debarment as a Contractor and a subcontractor as provided in 29 CFR 5.12.
- (g) Compliance with Davis-Bacon and related Act requirements. All rulings and interpretations of the Davis-Bacon and related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.
- (h) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this clause shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the PHA, HUD, the U.S. Department of Labor, or the employees or their representatives.
- (i) Certification of eligibility.
- (1) By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded contracts by the United States Government by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
- (2) No part of this contract shall be subcontracted to any person or firm ineligible for award of a United States Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
- (3) The penalty for making false statements is prescribed in the U. S. Criminal Code, 18 U.S.C. 1001.
- (j) Contract Work Hours and Safety Standards Act. As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.
- (1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics, including watchmen and guards, shall require or permit any such laborer or mechanic in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.
- (2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the provisions set forth in subparagraph (j)(1) of this clause, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic (including watchmen and guards) employed in violation of the provisions set forth in subparagraph (j)(1) of this clause, in the sum of \$27 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by provisions set forth in subparagraph (j)(1) of this clause. DOL posts current fines at: <https://www.dol.gov/whd/govcontracts/cwhssa.htm#cmp>
- (3) Withholding for unpaid wages and liquidated damages. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any Federal contract with the same prime Contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime Contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the provisions set forth in subparagraph (j)(2) of this clause.
- (k) Subcontracts. The Contractor or subcontractor shall insert in any subcontracts all the provisions contained in this clause, and such other clauses as HUD or its designee may by appropriate instructions require, and also a clause requiring the subcontractors to include these provisions in any lower tier subcontracts. The prime Contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all these provisions.

47. Non-Federal Prevailing Wage Rates

- (a) Any prevailing wage rate (including basic hourly rate and any fringe benefits), determined under State or tribal law to be prevailing, with respect to any employee in any trade or position employed under the contract, is inapplicable to the contract and shall not be enforced against the Contractor or any subcontractor, with respect to employees engaged under the contract whenever such non-Federal prevailing wage rate exceeds:
- (1) The applicable wage rate determined by the Secretary of Labor pursuant to the Davis-Bacon Act (40 U.S.C. 3141 et seq.) to be prevailing in the locality with respect to such trade;
 - (b) An applicable apprentice wage rate based thereon specified in an apprenticeship program registered with the U.S. Department of Labor (DOL) or a DOL-recognized State Apprenticeship Agency; or
 - (c) An applicable trainee wage rate based thereon specified in a DOL-certified trainee program.

48. Procurement of Recovered Materials.

- (a) In accordance with Section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, the Contractor shall procure items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR Part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition. The Contractor shall procure items designated in the EPA guidelines that contain the highest percentage of recovered materials practicable unless the Contractor determines that such items: (1) are not reasonably available in a reasonable period of time; (2) fail to meet reasonable performance standards, which shall be determined on the basis of the guidelines of the National Institute of Standards and Technology, if applicable to the item; or (3) are only available at an unreasonable price.
- () Paragraph (a) of this clause shall apply to items purchased under this contract where: (1) the Contractor purchases in excess of \$10,000 of the item under this contract; or (2) during the preceding Federal fiscal year, the Contractor: (i) purchased any amount of the items for use under a contract that was funded with Federal appropriations and was with a Federal agency or a State agency or agency of a political subdivision of a State; and (ii) purchased a total of in excess of \$10,000 of the item both under and outside that contract.

INDIAN HOUSING

AMENDMENTS TO GENERAL CONDITIONS OF THE CONTRACT OF CONSTRUCTION

The following supplements modify, change, delete from or add to the “General Conditions of the Contract for Construction – Public Housing,” HUD Document 5370 (11/2023). Where any Article of the General Conditions is modified or any Paragraph, Subparagraph or Clause thereof is modified or deleted by these Supplementary Conditions, the unaltered provisions of that Article, Paragraph, Subparagraph or Clause shall remain in effect.

GENERAL

Throughout this document change all occurrences of “PHA” or “Public Housing Agency” to “IHA” or “Indian Housing Authority.”

CLAUSE 1. DEFINITIONS

Revised Paragraph 1.h. to read:

- b. The term “IHA” or “Indian Housing Authority” means the Indian Housing Authority organized under applicable tribal law.

CLAUSE 13. HEALTH, SAFETY, AND ACCIDENT PREVENTION

Add the following:

- f. The Contractor shall comply with governing standards of environmental protection in regards to use of volatile or lead-based materials in construction practices.
- g. The Contractor shall comply with governing standards of health, safety and environmental protection in regards to the potential discovery of, detection of, unearthing of, and/or disturbance of volatile, asbestos, or lead containing materials during the progress of construction.

CLAUSE 20. INSPECTION AND ACCEPTANCE OF CONSTRUCTION

In the first sentence of paragraph b., replace the work “Architect” with “Architect’s or Housing Authority’s Project Representative.”

Add the following paragraphs to Clause 20:

- (k) The following are the minimum required “Pre-cover-up” reviews for each dwelling unit or other designated portion of the work:
 - Before pouring concrete
 - Before backfilling utilities or foundations
 - Before installing interior building insulation
 - Before installing exterior wall finish (stucco, siding, etc.)
 - Before installing roofing over roof deck
 - Before installing drywall board
- (l) The Contractor shall notify the Architect or Housing Authority’s Project Representative a minimum of 24 hours prior to proceeding with any of the above “cover up” operations or with any tests required by the contract. The above list is not intended to be all inclusive; the

Project Representative may determine that additional "pre-cover-up" reviews are necessary and the contractor shall be so notified. The Project Representative shall maintain a record of reviews and approvals of the above phases of the work. In addition, the Contractor shall maintain an approval record card at each dwelling unit or other designated portion of the work with a space for the Project Representative's signature and date for each "pre-cover-up" approval required. The Contractor shall not proceed to cover up the work until the appropriate review and approval signatures by the Project Representative are obtained. Notwithstanding any other provisions of this contract, failure by the Contractor to notify the Project Representative fore reviews and to obtain such approvals shall not constitute justification for increase in contract time or amount.

- (2) The Contractor or his superintendent shall make a complete and thorough pre-inspection of all portions of the work which he deems to be substantially complete and prepare a punch list of all incomplete or deficient items of work. A copy of the Contractor's pre-inspection punch list shall be sent to the Housing Authority and to the Architect for record. The Contractor shall proceed immediately to correct all items on his pre-inspection punch list.
- (3) The Contractor shall back-check his pre-inspection punch list to assure that all possible incomplete and deficient items from his original list have been corrected. The Contractor shall then notify the Housing Authority or the Architect in writing that the designated portion of the work is ready for PRE-FINAL INSPECTION. The written notification shall contain a copy of the Contractor's original pre-inspection punch list checked off with dates showing when each item was corrected. A separate list of any items not corrected with a reason why each item could not be corrected shall also be included.
- (4) The Architect's or Housing Authority's Project Representative will then conduct a pre-final inspection of the designated portion of the work and prepare a pre-final punch list of items which he considers to be incomplete or deficient. A copy of the Architect's or Housing Authority's Project Representative's pre-final punch list shall be sent to the Housing Authority, to the Architect and to the Contractor. The Contractor shall proceed immediately to correct all items on the pre-final punch list.
- (5) The Contractor shall back-check the Architect's or Housing Authority's Project Representative's pre-final punch list, to assure that all possible incomplete and deficient items from this list have been corrected. The Contractor shall then notify the Housing Authority or the Architect in writing that the designated portion of the work is ready for final inspection. The written notification shall contain a copy of the Architect's or Housing Authority Project Representative's pre-final inspection punch list checked off with dates showing when each item was corrected. A separate list of any items not corrected with a reason why each item could not be corrected shall also be included.
- (6) The Architect's or Housing Authority's Project Representative win then back-check the pre-final inspection punch list to confirm that all items on the list have been corrected and notify the Architect and the Housing Authority that the designated portion of the work is completed and ready for a FINAL INSPECTION. If any uncorrected items are of such nature as to prevent the designated portion of the work from being occupied, the Architect's or the Housing Authority's representative shall have the authority to declare that the designated portion of the work is not ready for final inspection.
- (7) The Housing Authority will schedule a final inspection by representatives from the Housing Authority and the Architect, who will prepare a final inspection punch list of items which they find to be incomplete or deficient the Contractor shall have ten (10) calendar days to correct the items on the final inspection punch list.

- (8) The Contractor shall back-check the final inspection punch list to assure that all possible incomplete and deficient items from this list have been corrected. The Contractor shall then notify the Housing Authority or the Architect in writing that all items on the final inspection punch list have been corrected. The written notification shall contain a copy of the final inspection punch list checked off with dates showing when each item was corrected. A separate list of any items not corrected with a reason why each item could not be corrected shall also be included.
- (9) The Architect's or Housing Authority's Project Representative will then back-check the final inspection punch list to confirm that all items on the list have been corrected and notify the Architect, and the Housing Authority that all of the items have been corrected.
- (10) The Housing Authority will then prepare a MEMORANDUM OF ACCEPTANCE FOR OCCUPANCY for the designated portion of the work, which will be dated on the date the Architect's or Housing Authority's Project Representative verified that all of the final inspection punch list items were corrected.

CLAUSE 27. PAYMENTS

Subpart (f):

Except as otherwise provided in State law, the Navajo Housing Authority (NHA) shall retain ten (10%) percent of the amount of progress payments until completion and acceptance of all work under the contract. Retention shall be released to the contractor upon submission of Contractor's Certificate & Release; Subcontractor and Material Suppliers Lien Release(s), NHA Certification of Punch Lists Completion Certification, As-built Drawings and NHA's certification of Labor Compliance.

This section is hereby deleted: [except, that if upon completion of 50 percent of the work, the Contracting Officer, after consulting with the Architect, determines that the Contractor's performance and progress are satisfactory, the NHA may make the remaining payments in full for the work subsequently completed. If the Contracting Officer subsequently determines that the Contractor's performance and progress are unsatisfactory, the NHA shall reinstate the ten (10) percent (or other percentages provided in State law) retainage until such time as the Contracting Officer determines that performance and progress are satisfactory.]

CLAUSE 32. DEFAULT

Subpart (b)(2): Add:

The Contractor must submit proper written documentation to justify delays as stipulated. No consideration will be given for delays beyond the ten (10) day period requirement, and not at the end of construction.

CLAUSE 36. INSURANCE

Subpart (b):

“The contractor is not required to carry Builder's Risk Insurance for work which does not include structural alterations or additions and where the PHA existing fire and extended coverage policy can be endorsed to include such work.” **This paragraph shall be omitted from the contract documents and any references to this clause directly or implied. The contractor shall provide all applicable insurance for the project and shall include this cost in the bid.**

All required amount of Insurance limits shall ultimately be determined by the Contracting Officer.

SPECIAL CONDITIONS OF CONTRACT

Section 1: PROJECT IDENTIFICATION:

Site No.	Project Number/HMO	Client	Bedroom	Location/Chapter
2	AZ12-404, Dilcon	T. Chiquito	2	Dilcon, AZ
3	AZ12-404, Fort Defiance	M. Freeman	2	Oak Springs, AZ
10	AZ12-404, Chinle	B. R. Wheeler	3	Round Rock, AZ
12	AZ12-404, Navajo	L. D. & M. Jumbo	5	Sawmill, AZ
13	AZ12-404, Navajo	C. M. Rodgers	3	Lukachukai, AZ
17	AZ12-404, Navajo	M. Davis	2	Lukachukai, AZ
18	AZ12-404, Dilcon	R. Davis	3	Dilcon, AZ
19	AZ12-404, Fort Defiance	M. A. Yazzie	3	New Lands, AZ

The scope of work for 8 Scattered Sites, NHA Project No. AZ12-404, Dilcon; AZ12-404, Fort Defiance, AZ12-404, Chinle; and NM15-404, Navajo. Projects site are at various location throughout the Navajo Nation. NOTE: One Client dropped referenced as Site 8, AZ12-404 Kayenta.

Site improvements include grading, septic system, water service line connection, propane system with tank pad.

Building work includes a post tensioned slab foundation where needed, painted cementitious lap siding, 2 x 6 wood stud exterior, thermal insulation, shingled roof, metal gutter, downspouts, splash blocks, 2 x 4 interior studs, gypsum board, taped, textured, painted, exterior/interior doors, vinyl windows, electrical wiring and plumbing, interior painting, flooring, cabinets, countertops, electrical, plumbing and mechanical fixtures, sinks bathtubs, showers and exhaust fans. Units shall have a range refrigerator, range hood, heating unit, and water heater.

See specifications and drawings for the full scope of work.

The Project Architect is: WHPacific, Inc.
6501 Americas Parkway
Albuquerque, NM 87110
Contact: Paul Browne

Section 2 TIME OF COMPLETION

The Contract work shall be commenced at the time stipulated in the notice to proceed to the contractor and shall be fully completed by 365 consecutive calendar days thereafter.

Section 3 LIQUIDATED DAMAGES

The parties hereby agree that the rate of liquidated damages under clause 33 of the general conditions shall be \$500.00 per day for each uncompleted and/or unacceptable unit.

Section 4 COMMUNICATIONS

1. Any notice (including demands, instructions, approvals and claims) shall be in writing, and signed by an authorized representative of the party giving notice.

2. Any notice to the Contractor may be delivered at the office of the Contractor stated on the signature page of the contract, or at such other office as he may from time to time designate in writing to the Navajo Housing Authority, or may be sent by mail or by express courier/mail addressed to the Contractor's office.
3. All papers required to be delivered to the Navajo Housing Authority (NHA) or Architect shall, unless otherwise specified in writing to the Contractor, be delivered to NHA Construction Services Division at Ft. Defiance, Arizona, and any notice to the NHA or Architect may be delivered, or may be sent by mail to Navajo Housing Authority at P.O. Box 1579, Fort Defiance, Arizona 86504 or by express courier/mail to Navajo Housing Authority office building on Old coal Mine Road and Navajo Route 54, Fort Defiance, Arizona 86504 (928) 729-6607, or to such other representatives of the NHA or to such other address, as the NHA may from time to time designate in writing to the Contractor.
4. Any notice shall be deemed to have been given when delivered or, if mailed, when the notice shall have been received in due course of post, or, if delivered by express courier/mail, a copy of receipt of when the notice is actually received.

Section 5 FTP SITE AND QUALITY CONTROL

The contractor shall set up and maintain a web based FTP site (file transfer protocol) for exclusive use between the Contractor, A/E firm and Owner. Information for the Project shall be updated every Friday by 1:00pm to the FTP site. The FTP site must have enough storage capacity for all submittals, RFI, change orders, drawings, specifications and any other contract documents. All new information must be backed up every month and given to Owner on a monthly basis via compact disc.

Contractor must establish and maintain a site specific Quality Control Program that outlines all the necessary provisions to ensure the project meets or exceeds the contract documents. This information is due with 10 days of the notice to proceed.

Section 6 SIGNS

Subject to prior approval of the NHA or Architect as to size, design, type and location, and subject to local regulations, the Contractor and his subcontractors shall erect temporary signs for purposes of project identification and for controlling vehicular traffic. The Contractor shall furnish, erect, and maintain such signs as required by safety regulations and as necessary to safeguard life and property.

Section 7 JOB OFFICES

The Contractor shall furnish and maintain, during construction of the project, adequate office facility at the project site for the use by Contractor, Project Architect, the NHA and NHA Project Representative, as follows: The office shall be painted, heated (in winter), cooled (in summer) and shall be provided with windows that lock and operate, doors that lock, toilet facilities, telephone, tables, benches, shelves and racks for drawings. The office shall contain not less than 220 square feet, exclusive of toilet facilities. Cost of installing utilities and telephone service shall be paid for by the Contractor. Contractor shall be responsible of ensuring that the office facility is established and operational at the time when the contractor has mobilized to the project site, otherwise contractor will be penalized fifty dollars (\$50.00) per day for each day that the office is not completely operational.

Temporary structures, fencing, sheds, trailers and material storage shall be arranged in a safe manner to avoid interfering with construction, public access or Owner's Operations. All locations of temporary structures, shed, trailers and material storage shall be approved in advance by NHA.

Section 8 **NAVAJO AND INDIAN PREFERENCE**

The work to be performed under this contract is pursuant to 24 CFR 1000.48 and Section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450e (b)). The Act requires to the greatest extent feasible: (a) preference and opportunities for training and employment shall be given to Navajos, and (b) preference in the award of contracts and subcontracts shall be given to Navajo Organizations and Indian-owned Economic Enterprise.

The procedures which shall be used to implement the requirement for preference in the execution of this contract are delineated in Supplementary Instructions to Bidders of these bidding documents and construction contract package.

Section 9 **ADDITIONAL ROCK CLAUSE REQUIREMENTS**

Notwithstanding any provisions in these Special Conditions, General Conditions or any other matters specified in the Plans and Specifications the Contractor is hereby informed that Geotechnical Reports are not available for the site. The Owner makes no representation or warranty as to the existing soil and rock materials to be encountered, or the difficulty of excavation.

The contractor shall be responsible for familiarizing himself with each site, verify the data and satisfy himself as to the type, nature and quantities of all materials to be excavated. All trenching and excavating, regardless of materials encountered, equipment or methods required for excavation, will be unclassified and the cost thereof shall be considered as being included in the lump sum bid. No extra payment or change orders will be allowed for rock excavation.

Section 10 **TAXES & FEES**

The prime contractor shall be responsible to pay for all Navajo Nation Taxes and shall be included in Contractor's bid. The Navajo Housing Authority is exempt from paying any State Sales Taxes. State Sales Tax Exemption Certificates can be requested in writing from the NHA Finance Branch.

Contractor is also responsible for all others fees for this project, including utility fees, water hook-up, sewer fees, etc. The Contractor shall provide proof of payment to the Owner.

Contractor shall provide their own water supply per all applicable laws and regulations and obtain all necessary permits.

Section 11 **DWELLING EQUIPMENT FURNISHED BY GENERAL CONTRACTOR**

All dwelling equipment shall be furnished and installed as shown on the plans under this contract including the cost of the refrigerators, ranges and other residential equipment and appliances, which will be furnished by the Contractor and unloaded and installed by the Contractor at the General Contractor's expense with all appropriate adjustments for ready use.

Section 12 **ARCHAEOLOGICAL CLEARANCE**

Archaeological clearances have been obtained by the NHA, however archaeological sites may be located within the project boundaries after the construction work has started. Should an archaeological site be discovered during construction, it shall be the responsibility of the Contractor to stop construction work immediately and contact the Navajo Housing Authority for advice and instructions.

Specific details concerning archaeological requirements will be reviewed and discussed at the preconstruction conference. Any required adjustments and changes to the contract work will be accomplished by change order only.

Section 13 WARRANTY & WARRANTY RETAINAGE

Prior to the expiration of the warranty period, NHA will schedule site visit to project site to walk the Project(s), review all systems, and assure that there are no outstanding issues. The walk-thru will be made with NHA, Contractor, and select subcontractors as required. Each party shall be aware of this milestone and that they may be required to participate.

Notwithstanding any provisions in these Special Conditions, General Conditions or any other matters set out in the Plans and Specifications, the NHA shall withhold and retain two and one half percent (5%) of the construction contract price for a period coterminous with the Eighteen (18) Month period described in the General Conditions herein.

The sums withheld pursuant to this provision shall be within the exclusive domain and control of the NHA. After the expiration of the 18 month period described in the General Conditions, and no obligations of the Contractor arising for the provisions of the General Conditions continue to exist, the unexpended funds still withheld and retained shall be paid over by the NHA to the Contractor. No interest will be due the Contractor on the funds retained.

The failure of the Contractor to respond to the NHA's request or demands to comply with the provisions of the General Conditions and the Contractor having failed to adequately respond within a reasonable period of time, shall give the NHA the right to use the sums withheld to remedy any defects and damages described in the General Conditions, either by the NHA undertaking to make such remedies itself or to contract with others to do so.

The purpose of the warranty retention is to aid the NHA in the enforcement of provisions under the General Conditions of the Contract and is not to be construed as a limitation as the generality of its provisions nor the enforcement thereof.

Section 14 BORROW MATERIALS

The Contractor shall be responsible to arrange for the use of borrow sites and cost of the required borrow material for the specified construction work per the contract documents. All borrow material must be tested by a certified soil testing laboratory and approved by a registered engineer as fulfilling the requirements for structural fill as specified under the Technical Specifications.

Section 15 EXISTING UTILITIES AND STRUCTURES

It shall be the Contractor's responsibility to determine the locations of existing underground utilities including pipelines and drains, not shown on the drawings and to confirm the exact locations of those existing utilities shown on the drawings. The existence and location of utilities are not guaranteed by the NHA and shall be investigated and verified in the field by the Contractor before commencing construction activities in any particular area. Public utility companies shall be notified in advance to assist in the identification and location of their buried utilities.

Contractor shall verify the existence, location, depth, invert elevation and operational status of all existing underground utilities that will be utilized for series to the project. Contractor must work with local utility authority.

The Contractor shall be responsible for any damages to existing utilities and structures encountered during construction operations. All utilities and structures encountered shall be maintained in good operating condition and shall be protected from damage by the Contractor.

Damage by the Contractor of utilities and structures encountered shall be immediately repaired at the Contractor's expense. The repairs shall be made with the same type of materials that were damaged, and the repair work shall be done in a method acceptable to the NHA.

Contractor shall contact local utility authority concerning UFER ground clarifications and acceptable methods of installation.

Section 16 NTUA PERMISSION TO TAP (PTT'S) NTUA UTILITIES:

The Contractor shall be responsible for the installation of water and sewer utility work as indicated on the plans and in the technical specification, and the utility work shall be in accordance with NTUA specifications.

The Contractor shall be responsible for payment of all NTUA establishment, connection and inspection fees. A list of fees can be found at NTUA.com. All Materials shall be submitted to the NHA USC and NTUA for approval prior to installation.

NHA will secure and pay for all Electrical Utility infrastructure, right of ways and NTUA cost estimates. The contractor shall coordinate the construction of the electrical infrastructure with NTUA and pay for the NTUA meter establishment fees.

Section 17 "AS BUILT" DRAWINGS REQUIREMENTS

The Contractor shall be responsible for:

1. The completion, submission and maintenance of all on-site utility as-built drawings and information in strict compliance with the specified standards and requirements of the Navajo Tribal Utility Authority (NTUA) and the Indian Health Service (IHS).
2. The Coordination of review of all As-builts by the Navajo Housing Authority and the inspection of the on-site utility systems; and
3. The acceptance and transfer of all on-site utility systems to the NTUA at Fort Defiance, Arizona.

The above must be adhered to before any final inspections (MAO) are granted.

An NTUA approved set of "As-Built" site utility drawings with supporting documents (test data and results, approvals, etc.) must be submitted to the Navajo Housing Authority prior to the General Contractor's request for a final inspection of site utility work.

The contractor shall note any deviations from the contract drawings and specifications. All as-built information shall be reviewed and accepted on monthly basis with designated A/E firm, so that all closeout documents are completed in timely fashion not to delay any submitted payments. As-built drawings shall include building, site and utility information that will be tied to local mapping system on Owners Geological Information System.

Section 18 FINAL INSPECTION AND MEMORANDUM OF ACCEPTANCE FOR OCCUPANCY

Prior to the Contractor's request to the Architect for the final inspection, the Contractor shall conduct a pre-final inspection with the NHA project representative to ensure the readiness of the project. Only after the NHA's project representative verification on the readiness of the project and completion of Section 18, of these Special Conditions shall the Architect schedule a final inspection.

If after five (5) or more units have been inspected with ten (10) or more punch items per unit generated, final inspection will be cancelled and rescheduled until all punch items are reduced to ten (10) or less punch items per unit.

All punch items derived for the final inspection shall be corrected within ten (10) calendar days; otherwise the Contractor will be subjected to liquidated damages clause if the contract time frame has expired. NHA project representative shall make all required verification or corrections with the Contractor.

Contractor shall provide training to client(s) on daily operation and required maintenance for project within 14 days after project close-out. Contractor shall provide multimedia recording of required trainings.

Section 19 MONTHLY REPORTS

Contractor shall provide monthly construction report with the following information; 1) Detailed updated construction schedule with summary report 2) Construction photos 3) Progress report based on schedule 4) Daily construction activities report. Monthly construction report is due with all pay applications and no applications will be processed without report.

In addition to all pay applications and baseline schedules, the contractor shall provide a Cost Loaded Schedule (CPM) that reflects time frames and quantities as identified in the Schedule of Values and Baseline Schedule. This information is due 10 days after NTP.

Contractor shall provide no less than 50 photos per month taken throughout the course of the month. Construction photos shall have the following information: Date of photo with date stamp on photo, location, project number, house number and description of work performed in photo. Photos shall be provided in hard copy and CD copy for owners use. All photos that are unclear, too dark or blurry will be rejected.

Section 20 PROGRESS PAYMENTS

1. Request for payment: The Contractor shall submit an original and four (4) copies of completed Standard HUD Payment for Application Form and supporting documents to the Architect as of the **25th** day of each month for work completed and materials stored. Materials stored off-site in a bonded warehouse, in which materials are clearly earmarked for the Project and inspected by the Architect are subject to payment by the NHA when request is supported by prepaid invoices.
2. Contractor's Request for Payment must include the following and supporting documents:
 - a. NHA Prescribed Forms – Application for Payment.
 - b. NHS Prescribed Form or Cost Loaded Schedule.
3. Certification of Progress: The Contractor shall be responsible for coordinating and verifications of all work in place with the NHA Project Manager before request for payments is submitted to the Architect for approval.
4. Payment: Upon certification by the Architect and approval by the NHA, the NHA shall on or about the 30th day of the following month pay to the Contractor, on account of the contract, 90 percent of the value of labor and materials incorporated in the work and 90 percent of the value of materials suitably stored on the site, up to the 25th day of the preceding month. NHA will not pay for offsite storage of materials and equipment without prior approval. All offsite storage of materials must be licensed and bonded warehouse. In addition, stored material must be inspected and approved by A/E firm prior to submission of Pay Application.

Section 21 **TIME EXTENSION DUE TO WEATHER CONDITIONS**

Notwithstanding any provision in these Special Conditions, General Conditions or any other matters set out in the plan and specifications, the Contractor shall be responsible for providing records of actual site conditions, National Weather Service Reports, and any other documentation that would substantiate weather delay claims. Notice of weather delays shall be forwarded to NHA no later than ten (10) calendar days after occurrence. No claims will be entertained after 10 day period.

Section 22 **CONTRACT WORK HOURS AND SAFETY**

The Contractor and his subcontractors shall comply with Sections 203 and 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 327-330) as supplemented by Department of Labor Regulations (29 CFR Part 5).

The contractor shall conduct weekly safety meetings “tool box talks” on site with all crews and subcontractors. Contractor shall document and provide meeting minutes with submission of pay application. Contractor shall also provide site specific safety manual that includes, but not limited to the following information:

Company Safety and Health Policies:

1. Accident Reporting Procedures
2. OSHA Record Keeping
3. Control of Hazardous Energy (lock out tag out)
4. Pre-Job Planning
5. Coned Space Entry
6. Excavation and Trenching Precautions
7. Demolition Precautions
8. Health and Environment
9. Hazard Communication Program
10. Personal Protective Equipment
11. Fire Protection, Prevention and Emergency Action
12. Signs and Signals
13. Material Handling

Section 23 **OWNER ACCESS TO RECORDS**

The Contractor and his subcontractors shall provide access to the Navajo Housing Authority, the Department of Housing and Urban Development, the Comptroller General of the United States, or any of their duly authorized representatives to any books, documents, papers, and records of the audits, examinations, excerpts, and transcriptions. The Contractor and his subcontractors shall retain all required records for three years after having received final payments and all other pending matters are closed.

Section 24 **LOT CONFIGURATIONS**

Contractor shall maintain current lot configurations and ensure that established survey monuments are not disturbed during construction. In the event monuments are disturbed contractor will be responsible for re- staking.

Section 25 **ADA COMPLIANT REQUIREMENTS**

Contractor shall comply with the design for the Mechanical, Electrical, and Plumbing, including Specifications with the latest ADA requirements for the Accessible unit floor plan, if any.

Section 26 CONSTRUCTIBILITY REVIEW

The contractor shall conduct a comprehensive constructability review of the all drawings and specifications and provide a report to the NHA within 10 working days after the notice to proceed. Once the report is reviewed by the NHA and A/E firm, a meeting will be scheduled to evaluate contractor's plan review comments.

Section 27 RE-INSPECTION COSTS

Contractor shall bear all costs for all re-inspections completed by the Owner's Independent Inspection Firm and must be paid directly to the firm. NHA will provide a copy of the re-inspection report and invoice to the contractor. Contractor is to provide proof of payment to the NHA.



**CONSTRUCTION AGREEMENT
BETWEEN
OWNER AND CONTRACTOR**

NAVAJO HOUSING AUTHORITY (“Owner”): **Navajo Housing Authority**
CompanyName/Address/Phone/Fax **PO Box 4980**
Window Rock Arizona 86515
Phone: 928-871-2697, Fax: 928-871-2698

OWNER’S REPRESENTATIVE:
Contact Person – Name/Address **Aneva J. Yazzie, Interim Chief Executive Officer**
Phone/Fax/Email **PO Box 4980**
Window Rock Arizona 86515
Phone: 928-871-2602, Fax: 928-871-2604
Email: ajyazzie@hooghan.org

GENERAL CONTRACTOR:
GENERAL CONTRACTOR’S REPRESENTATIVE
Contact Person – Name/Address Phone/Email

PROJECT:
Name/Location

DESIGN PROFESSIONAL:
Company Name/Address/Phone/Email

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**TERMS AND CONDITIONS OF CONSTRUCTION AGREEMENT BETWEEN
NAVAJO HOUSING AUTHORITY AND GENERAL CONTRACTOR**

This Construction Agreement (this "**Agreement**") is made and entered this ___st day of _____ by and between **NAVAJO HOUSING AUTHORITY**, hereinafter called "**Owner**" and _____, hereinafter called "**Contractor.**"

Owner and Contractor desire to enter into this Agreement for the construction component of the project described on **Exhibit "A"**, attached hereto (the "**Project Description**"), and to set forth the terms and conditions governing the relationship between Owner and Contractor under this Agreement.

COVENANTS:

**ARTICLE 1
DEFINITIONS; THE CONTRACT DOCUMENTS**

1.1 Capitalized terms used in this Agreement and not otherwise defined herein, shall have the meanings designated for such terms in the General Conditions of the Agreement for Construction (the "**General Conditions**"), attached hereto as **Exhibit "B"**.

1.2 The contract documents that consist of this Agreement are Conditions of the Contract (General, Supplementary and other Conditions), Plans, Specifications, addenda issued prior to execution of this Agreement, other documents listed in this Agreement and Modifications issued after execution of this Agreement (collectively, the "**Contract Documents**"). Contractor shall perform the Work in strict and absolute accordance with the Contract Documents. The Contract Documents form the contract between Owner and Contractor and are as fully a part of this Agreement as if set forth herein. An enumeration of the Contract Documents, other than Modifications, appears in Article 4.

**ARTICLE 2
THE WORK (STATEMENT OF WORK); SUBCONTRACTORS; COORDINATION**

2.1 Contractor shall perform or cause to be performed all of the Work necessary to complete the construction component of the Project in strict and absolute accordance with the Contract Documents, except to the extent specifically indicated in the Contract Documents to be the responsibility of others. Contractor shall perform all undertakings reasonably inferable from the Contract Documents or in consultation with the Owner's Contracting Officer as being necessary to produce the intended results for the proper and timely completion of the Work, excluding only the following which shall not be included within the Contract Sum.

2.2 **Prior to construction**, Contractor shall furnish to Owner a written list of the names of the Subcontractors and material suppliers (including those who are to furnish materials or equipment fabricated to a special design) for whom Contractor proposes to subcontract certain parts of the Work, together with, such other documentation requested by Owner. Owner may, upon its review of the qualifications, capabilities and financial capacity of the Subcontractors and such suppliers, object to certain of the Subcontractors or such suppliers within ten (10) days of Owner's receipt of such list. Contractor shall not allow any Subcontractor or supplier to whom Owner has made a timely objection to perform any Work. If Owner has made a timely objection to any such Subcontractors or such suppliers, Contractor shall submit to Owner the names of substitute Subcontractors or suppliers to whom Owner has no objection. Contractor shall make no substitution for any Subcontractor or supplier engaged in the Work if Owner objects to such substitution. Contractor shall not be required to contract with anyone with whom Contractor has a reasonable objection.

2.3 Contractor shall coordinate the Work with the work performed by Owner or any separate contractor engaged by Owner under the Project.

**ARTICLE 3
CONTRACT SUM (STIPULATED SUM)**

3.1 Owner shall pay Contractor in current funds for Contractor's performance of completed Work a stipulated sum in the amount of _____ **Dollars and Zero Cents (\$0.00)** the "**Contract Sum**"), subject to additions and deductions evidenced by Change Orders, as provided in the Contract Documents.

3.2 Schedule of Values (Cost Breakdown): Prior to the commencement of the Work, Contractor shall complete and submit for Owner's review and approval (the "**Schedule of Values**"), in the form attached hereto as **Exhibit "C"**. The Schedule of Values shall: (a) subdivide the Work into its respective parts; (b) be based upon the Project Schedule; (c) include dollar amounts for all items comprising the Work; (d) serve as the basis for evaluating each Application for Payment; and (e) be updated and revised from time-to-time at Owner's request. Owner may reject any Schedule of Values that appears susceptible to resulting in a "front loading" of payments or for any other good cause. Contractor represents to Owner that, to the best of Contractor's knowledge, the Schedule of Values, including the draw schedule related thereto, accurately estimates the amounts that will be payable to Contractor each month; provided, however, that Owner shall be obligated to make payments of approved and certified amounts only as provided in the Contract Documents.

ARTICLE 4
ENUMERATION OF CONTRACT DOCUMENTS

4.1 The Contract Documents, except for Modifications issued after execution of this Agreement, are enumerated as follows:

4.1.1 This Agreement.

4.1.2 The General Conditions.

4.1.3 The Specifications contained in the Project Manual, dated _____, of which the table of contents listing is attached hereto as Exhibit "D". Contractor acknowledges it received from the Owner (the "**Project Manual**") for the project as part of the Bid Document Package.

<u>Section</u>	<u>Title</u>	<u>Pages</u>
	<u>See Exhibit "D"</u>	

4.1.4 The Plans dated "As listed in Exhibit E", of which the drawing listing is attached hereto as Exhibit "E". Contractor acknowledges it received from Owner (the "**Plans and Specifications**") for the Project as a part of the Bid Document Package.

<u>Number</u>	<u>Title</u>	<u>Date</u>
	<u>See Exhibit "E"</u>	

4.1.5 The Addenda dated as listed below. Contractor acknowledges it received from Owner (the "**Addenda**") for the Project as a part of the Bid Document Package.

<u>Number</u>	<u>Date</u>	<u>Pages</u>
1		

4.1.6 The Form of Bid submitted by Contractor dated _____ along with all required related documents and/or forms included in Contractor's sealed bid proposal envelope.

ARTICLE 5
PAYMENTS

5.1 Based upon an Application for Payment submitted timely by Contractor to Owner and Design Professional, and Certificates for Payment issued by Design Professional, Owner shall make monthly progress payments to Contractor on account of approved and certified amounts requested under an Application for Payment as provided below and in accordance with Article 11 of the General Conditions.

5.2 The pay period covered by each Application for Payment shall be one calendar month ending on the last day of the month or as follows.

5.3 On the first day of each month, Contractor shall submit to Owner and Design Professional, for their respective review,

certification and approval, (the "Application for Payment") in the form attached hereto as **Exhibit "F"**, or such other form as Owner may require, requesting payment for Work completed during the immediate preceding month. Each Application for Payment shall be completed in accordance with the Schedule of Values, and include all supporting documentation described in Article 11 of the General Conditions.

5.4 Owner shall make monthly progress payments to Contractor on account of the Contract Sum of amounts approved under an Application for Payment, as follows:

- (a) Not later than thirty (30) days following the timely submission of a complete and correct Application for Payment, Owner shall pay Contractor that portion of the Contract Sum properly allocable through the period covered by the Application for Payment, less the aggregate of (1) previous payment made by Owner; (2) the Retainage (as defined in Section 5.4(c) of this Agreement) from such previous payments; and (3) such other amounts properly withheld pursuant to the Contract Documents;
- (b) The Application for Payment may request payment for materials and equipment not yet incorporated into the Project, as provided in Article 11 of the General Conditions; and
- (c) Owner may retain from each progress payment an amount equal to **TEN (10%)** of amounts otherwise due and payable (the "Retainage"), plus any additional amounts Owner reasonably determines are necessary to cover any of the matters described in Article 11 of the General Conditions. The Retainage shall be maintained by Owner and shall remain on deposit until paid out to Contractor by Owner. Retainage shall be paid by the Owner to the Contractor in two payments; 7.5% within THIRTY 30 days of the completion of the project and the remaining 2.5% paid upon completion of the warranty period.

5.5 Final Payment not including the retainage, constituting the entire unpaid balance of the Contract Sum, shall be made by Owner to Contractor within **THIRTY (30)** days after Contractor has accomplished Final Completion.

5.6 Owner reserves the right to issue joint checks to Contractor and Contractor agrees to accept joint checks and, when requested by Owner, to execute joint check agreements in form acceptable to Owner. Owner shall notify Contractor prior to initiating joint check arrangements. Contractor consents to Owner communicating directly with Subcontractors to verify Contractor's payment history and account status.

ARTICLE 6

COMMENCEMENT; COMPLETION; PROGRESS SCHEDULE; LIQUIDATED DAMAGES

6.1 Contractor shall commence performance of its obligations under the Contract Documents upon the date specified in a written notice to proceed issued by Owner to Contractor. Subject to adjustments evidenced by Change Orders, Contractor shall cause the Work to be performed on an uninterrupted basis as progressively directed by the Contract Documents incorporated within this Agreement and the terms and conditions of this Agreement.

6.2 Subject to adjustments evidenced by Change Orders, Substantial Completion of the Work shall be achieved not later than (the "Substantial Completion Date"), which is equal to CALENDAR DAYS COMMENCING FROM THE "NOTICE TO PROCEED" DATE, subject only to completion of the Punch List Items included on the approved Punch List, as described in Article 11 of the General Conditions.

6.3 Subject to adjustments evidenced by Change Orders, (the "Final Completion") of the Work shall be achieved not later than **THIRTY (30) DAYS FOLLOWING SUBSTANTIAL COMPLETION DATE**.

6.4 In addition, and subject to adjustments evidenced by Change Orders, certain elements of the Work shall be completed by the milestone dates set forth in a detailed critical path schedule for performing the Work, which schedule, when approved by Owner, shall be attached hereto as **Exhibit "G"** (the "Project Schedule"). The Project Schedule shall specifically identify and incorporate the number of weather-delay days anticipated by Contractor and shall otherwise conform to the requirements set forth in Article 6 of the General Conditions.

6.5 Contractor understands that if Substantial Completion is not attained by the Substantial Completion Date, subject to adjustments evidenced by Change Orders, Owner will suffer substantial damages that will be extremely difficult and impracticable to accurately ascertain. Contractor agrees that if Contractor is delayed in attaining Substantial Completion by the Substantial Completion Date, subject to adjustments evidenced by Change Orders, Contractor shall pay Owner an amount equal

to **FIVE HUNDRED DOLLARS (\$500.00) PER UNIT/DAY** (the "**Liquidated Damages Amount**"), as liquidated damages, for each day of delay beyond the Substantial Completion Date. The Liquidated Damages Amount is a reasonable approximation of Owner's delay damages and may be assessed by Owner as and for liquidated damages, and not a penalty, in order to avoid costly litigation that would otherwise be required. Owner may deduct all liquidated damages it assesses against Contractor from any unpaid amounts then or thereafter due Contractor under this Agreement. Any liquidated damages not so deducted shall be payable by Contractor to Owner on demand. Any liquidated damages not paid within thirty (30) days of Owner's demand shall accrue interest at the prime rate of interest, as described in the *Money and Investing* section of the Wall Street Journal, plus four percent (4%) until paid in full. The liquidated damages provided herein shall not preclude Owner from exercising any other rights or remedies provided Owner in the Contract Documents or under Applicable Laws.

ARTICLE 7 **NAVAJO PREFERENCE**

This Contract is subject to termination or assessments of penalties for failure to comply with the contracting preference requirements under Navajo law, specifically including the Navajo Business Opportunity Act ("NBOA"), and in accordance with Article 17 of the General Conditions and in other provisions of this Agreement (*see* Instruction to Bidders, section 7.0) and required by 24 CFR § 1000.48-1000.54. If Contractor is eligible for and receives contracting preference under the NBOA, and other applicable laws, Contractor must maintain such Priority Certification during the course of this Agreement. The Contractor shall comply with the applicable ownership and control requirements under the NBOA, including decision-making authority requirements and shall provide evidence upon request of the Owner showing that the Contractor is utilizing the applicable decision making in day to day operations, management, administrative, selections, and financial accountability in its operations. The Owner may also verify that a Contractor receiving contracting preference under Navajo law is real and substantial in performance of all work under the Agreement. Under no circumstances shall a Contractor receiving contracting preference under Navajo law have in place any restrictions, charter requirement, or partnership agreements that prevent or limit the decision making or performance of a Navajo or Indian partner. The Owner has the right to require the Navajo or Indian partner be present or substantially participate in each subsequent decision made in furtherance of the work performed.

ARTICLE 8 **BONDS OR LETTER OF CREDIT; INSURANCE**

8.1 Before any Work is performed, Contractor shall furnish to, or for the benefit of Owner and any entity providing financing or funding for the Work (hereinafter, each such entity is a "**Funding Source**"), performance, labor, and material payment bonds covering all or any portion of the Work specified by Owner. All such bonds shall (a) contain dual obligee riders naming Owner, each Funding Source, and such other parties as Owner may designate as obligee, (b) be in the form of Exhibit "H" attached hereto, and (c) otherwise fully conform with the requirements of Article 13 of the General Conditions. The premium or other costs of any such bonds shall be included in the Contract Sum. Alternatively, Owner may agree to accept other financial accommodations from Contractor, in lieu of the bonds described in this Section 8.1, including a Letter of Credit. Contractor agrees to execute reasonable forms, instruments and agreements as necessary to effectuate any such accommodations.

8.2 Prior to performing any Work, Contractor shall provide to Owner's Representative Certificates of Insurance evidencing Contractor's and any Subcontractors' compliance with the insurance requirements provided in Article 13 of the General Conditions.

ARTICLE 9 **WAGE RATES**

Contractor must comply with the Navajo Preference and Employment Act (NPEA), including any licensing requirements; provided, however, (the "**Davis-Bacon Wage Rates**"), which are attached as Exhibit "I", are applicable to this Project in lieu of Navajo Nation wage rates for any trade classification for which the Davis-Bacon wage rate exceeds the rate of the Navajo Nation.

ARTICLE 10

GOVERNING LAW; FORUM AND VENUE; SOVEREIGN IMMUNITY

10.1 The Contract Documents shall be governed by, construed and enforced in accordance with the internal substantive Applicable Laws of the Navajo Nation. Owner and Contractor hereby irrevocably submit to the process, jurisdiction and venue of the Navajo Nation Tribal Court ("**Tribal Court**") or engage in the settlement of agreements of disputes through arbitration pursuant to 1 N.N.C. §554(j). Navajo Nation laws shall be applied to any legal disputes arising under the Contract Documents. In the absence of any Applicable Laws of the Navajo Nation, the Contract Documents shall be construed first in accordance with any federal Applicable Laws, and in the absence thereof, the Applicable Laws of the State in which the Project is located; provided that reference to and use of Applicable Laws of such State does not confer any jurisdiction to such State for purposes of any dispute arising out of or relating to the Contract Documents. Without limiting the generality of the foregoing, Owner and Contractor hereby waive and agree not to assert by way of motion, defense or otherwise in any such dispute any assertion that either party is not subject to the personal jurisdiction of the Tribal Court or Navajo Nation Arbitration Act, or that such dispute is brought in an inconvenient forum or that the venue therefore is improper.

10.2 Nothing in this agreement shall be interpreted as constituting a waiver, express or implied, of the sovereign immunity of the Navajo Nation. Furthermore, Owner hereby expressly reserves its exemption from levy or execution of judgments as set forth in 6 N.N.C § 623 and Navajo Nation laws.

ARTICLE 11 **MISCELLANEOUS**

11.1 CHANGE ORDERS

If, pursuant to the process set forth in Article 14 of the General Conditions, Owner determines a Change Order should be entered into, Owner and Contractor shall execute (a "**Change Order**") in the form attached hereto as Exhibit "J".

11.2 PROJECT REPRESENTATIVES

All decisions made by Owner's Representative and Contractor's Representative shall be binding on the respective represented party. Owner has the right, exercisable at any time, from time-to-time, to appoint a replacement Owner's Representative by providing notice thereof to Contractor. Contractor may terminate Contractor's Representative and appoint a replacement Contractor's Representative only after obtaining Owner's written approval.

11.3 PERFORMANCE

Contractor represents and warrants to Owner that: (a) Contractor will perform all of its obligations under the Contract Documents in accordance with the Standard of Care; and (b) all Work performed and materials and equipment supplied under this Agreement will be: (1) in strict and absolute accordance with the Contract Documents; (2) new and free from defects; (3) of good merchantable quality; and (4) fit for Owner's intended use. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective by Owner. If required by Owner, Contractor shall promptly furnish satisfactory Samples of materials demonstrating that the materials comply with this Section. Neither the express warranty of this Section nor any other express warranty shall void implied warranties of habitability, merchantability, or fitness for a particular purpose.

11.4 CONTRACTOR REPRESENTATIONS AND WARRANTIES

Contractor represents and warrants to Owner as follows:

- (a) Contractor's execution of this Agreement and its performance under the Contract Documents is within its duly authorized powers;
- (b) Contractor is financially solvent, able to pay its debts as they mature and progress of sufficient working capital to complete the Work and otherwise perform its obligations under the Contract Documents;
- (c) Contractor is able and has the requisite experience and competence to complete the Work and perform all of its obligations under the Contract Documents;

(d) Contractor has carefully reviewed the Contract Documents and the information furnished by Owner, has taken field measurements, as necessary, and has verified field conditions, comparing any such field measurements and conditions and other information known to Contractor with the Contract Documents, and has reported to Owner, prior to submitting Contractor's bid proposal, any error(s), conflict(s), inconsistency(ies), or omission(s) in the Contract Documents discovered during such review and verification.

(e) Contractor is authorized to do business in the jurisdiction in which the Project is located and shall at all times hold, and shall cause or ensure all persons or entities working under and through Contractor at all times hold, appropriate registrations and licenses required by Applicable Laws, including licenses from the licensing agency of the jurisdiction in which the Project is located;

(f) Contractor's employees have received or will receive all training and instruction necessary to perform the Work in conformance with the Contract Documents;

(g) the execution and delivery of the Contract Documents and performance of the Work will not result in any violation of, or default under, any term or provision of any other agreement, judgment or similar instrument to which Contractor is bound;

(h) there are no attachments, execution proceedings, assignments for the benefit of creditors, insolvency issues, bankruptcy reorganization or other similar proceedings pending or, to the best of Contractor's knowledge, threatened against Contractor, nor are any such proceedings contemplated by Contractor;

(i) there is no complaint, litigation, investigation or proceeding pending as of the date of Contractor's bid proposal or, to the knowledge of Contractor, contemplated or threatened against Contractor as of the date of this Agreement that would prevent Contractor from performing its obligations under the Contract Documents or any other instrument or document contemplated thereby or related thereto;

(j) Contractor is not a partner or joint venture with Owner in connection with the Work, and Contractor is entering into this Agreement and agreeing to comply with and perform the Work in accordance with the Contract Documents voluntarily and solely for Contractor's own profit and benefit;

(k) Contractor is not, nor will Contractor engage a Subcontractor of any tier to perform Work hereunder who is, an "Excluded Party" listed on the Excluded Parties List System maintained by the U.S. General Services Administration or otherwise prohibited from being involved in a covered transaction pursuant to 24 C.F.R. Part 24; and

(l) if, at any time during the course of the Work, Contractor, or any representative of Contractor, learns of any facts or circumstances that would render any of the foregoing representations and warranties untrue, then Contractor shall promptly notify Owner of all such facts or circumstances.

11.5 INTENDED BENEFICIARY; OWNER RIGHT TO ASSUME

Owner is an intended third-party beneficiary of any subcontracts or purchase orders between Contractor and Subcontractors or material suppliers, without liability for benefits received, and an obligee of all express and implied warranties given by any Subcontractor or material supplier under such subcontracts or purchase orders or imposed by Applicable Laws. Owner shall be entitled to enforce such subcontracts or purchase orders directly against such Subcontractors or material suppliers in the event Owner has been damaged by any breach thereof. Any such subcontracts or purchase orders are contingently assigned to and assumable by Owner, at Owner's option.

11.6 FURTHER ACTS

Each party shall execute and deliver all documents and perform all other acts reasonably necessary from time-to-time to carry out the matters contemplated herein.

11.7 ASSIGNMENT

Contractor shall not assign, convey or transfer any interest in any of this Agreement without the prior written consent of Owner, which consent may be arbitrarily withheld, conditioned or delayed. In the event Owner consents to an assignment,

Contractor's assignee shall assume in writing all obligations of Contractor hereunder, and Contractor shall continue to be liable for such obligations. Owner shall have the right, without limitation, to assign this Agreement, in whole or in part, to any party. This Section 11.7 notwithstanding, this Agreement shall inure to the benefit of and be binding upon Owner, Contractor and their respective successor(s) and assignee(s) in the event of any permitted assignment.

11.8 NOTICES AND COMMUNICATIONS

11.8.1 Any and all notices, approvals, consents or other communications required or permitted hereunder shall be given in writing and shall be delivered via: (a) facsimile (electronically confirmed by recipient); (b) personal delivery; (c) registered or certified mail, return receipt requested, postage prepaid; or (d) Federal Express, Airborne, United Parcel Service or other similar nationally recognized overnight courier; and, in each case, addressed to the applicable Project representative and, in all events, to Contractor and Owner at the addresses and/or facsimile numbers set forth on Page 1 of this Agreement. Any party may designate in writing and deliver in a like manner any changes in address at least ten (10) days before the change becomes effective.

11.8.2 Notices, approvals and other communications provided for herein shall be deemed received upon (a) electronic confirmation of receipt, if by facsimile; (b) the date of delivery to the addressee, if via personal delivery or overnight courier; or (c) three (3) days after the date of deposit in the U.S. Mail, if mailed. Notwithstanding the foregoing, any notice received after 5:00 p.m. (local time where the notice is received) shall be deemed received on the immediately following business day.

11.9 SURVIVAL

All indemnities, warranties, representations and other obligations of Contractor hereunder shall survive completion of the Work and/or termination of this Agreement.

11.10 EXHIBITS AND GENERAL CONDITIONS

The attached exhibits, including the General Conditions, are, by this reference, hereby incorporated herein and made a part hereof as though fully re-stated herein.

11.11 INDEPENDENT CONTRACTOR

Contractor's relationship to Owner is in all respects that of an independent contractor. Contractor shall be solely responsible for the supervision, performance, coordination and control of the Work to be performed by Contractor. Contractor shall not be deemed an employee, agent or member of Owner for any purpose. Neither party shall have the right or power to bind or obligate the other party for any liabilities or obligations without the prior written consent of the other party.

11.12 COMPUTATION OF PERIODS

All time periods referred to in this Agreement shall include all Saturdays, Sundays and holidays, unless the period of time specifies business days. If the date to perform any act, excluding the date on which payment is due, or give a notice with respect to this Agreement shall fall on a Saturday, Sunday or a holiday observed by the State in which the Project is located or the Navajo Nation, the act or notice may be timely performed on the next succeeding day that is not a Saturday, Sunday or a holiday observed by the State in which the Project is located or the Navajo Nation.

11.13 RELATIONSHIPS

The Contract Documents shall not be construed to create a contractual relationship of any kind between any person(s) or entity(ies) other than Owner and Contractor.

11.14 TERMS USED

Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

11.15 CAPTIONS

Any captions to or headings of the paragraphs or subparagraphs of this Agreement are solely for the convenience of the parties, are not a part of this Agreement, and shall not be used for the interpretation or determination of the validity of this Agreement or any provision hereof.

11.16 WAIVER

The waiver or failure to enforce any provision of this Agreement shall not operate as a waiver of any future breach of the provision or any other provision hereof.

11.17 COUNTERPARTS

This Agreement may be executed in counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument. The signature pages from one or more counterparts may be removed from the counterparts and attached to a single instrument so that the signatures of all parties may be physically attached to a single document.

11.18 CONSTRUCTION

Each party has reviewed the Contract Documents to its satisfaction and agrees that any rule of construction to the effect that ambiguities are to be resolved against the drafting party shall not apply in the interpretation of this Agreement or exhibits hereto.

11.19 NO OTHER AGREEMENT

This Agreement constitutes the entire agreement between Owner and Contractor with respect to the Project and shall not be modified or amended except in a written document signed by Owner and Contractor. Any prior agreements or understandings between Owner and Contractor concerning the Project are superseded and replaced by this Agreement and are hereby rendered null and void.

11.20 SEVERABILITY

The provisions of this Agreement are severable and if any provision is determined to be void or unenforceable under any dispute resolution proceeding, such provision shall not affect the validity of any of the other provisions of this Agreement.

11.21 RISK OF LOSS

Risk of loss shall be with Contractor until materials or equipment have been incorporated in the Site.

IN WITNESS WHEREOF, Owner and Contractor have executed this Agreement as of the day and year set forth above.

OWNER:

NAVAJO HOUSING AUTHORITY

By: _____

Name: Heather L. Duncan-Etsitty

Its: Chief Executive Officer

Date: _____

CONTRACTOR:

By: _____

Name: _____

Its: President

Date: _____

Exhibit "A"

SAMPLE

End of document.



Exhibit "B"

**GENERAL CONDITIONS
of the
CONSTRUCTION AGREEMENT
BETWEEN
OWNER AND CONTRACTOR**

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ARTICLE 1
DEFINITIONS

As used in these General Conditions and the other Contract Documents, the words, terms and phrases set forth below shall have the following meanings.

"**Agreement**" means the Construction Agreement between Subrecipient and General Contractor to which these General Conditions are attached.

"**Applicable Law(s)**" means the requirements of all laws, ordinances, codes, rules, regulations, executive orders, judicial opinions, and decisions of all governmental authorities having jurisdiction over the Project, the Site, the Work, or any part thereof, including, but not limited to, the Navajo Nation, federal, state, county and local authorities. Applicable Laws include, but are not limited to, as applicable, those relating to HUD, taxes, employment (including the Navajo Nation Business Activity Tax, 24 N.N.C. § 401, et seq.), social security, unemployment, workers' compensation, wages (including the Navajo Preference in Employment Act, 15 N.N.C. § 601, et seq.), occupational health and safety, discrimination, disability, waters of the United States, land use, waste disposal, air, water, endangered species, groundwater, environmental contamination, toxic wastes, hazardous substances, oil, petrochemicals, pesticides, herbicides, building and construction codes and standards, and contracting licensing statutes and regulations. All references herein and in the Agreement to any Applicable Law, including, but not limited to, the Applicable Laws set forth in Article 17 of these General Conditions, are hereby amended to mean the most recent amendment or codification of the corresponding Applicable Law described herein. If, and to the extent, the citation of any Applicable Law set forth herein has been amended or superseded as of the date of the Agreement, Contractor hereby acknowledges and agrees any such citation is hereby deemed amended to mean the current citation for any such Applicable Law effective as of the date of the Agreement.

"**Application for Payment**" means the document described in Section 11.03 of the Agreement.

The term "**approved**" with respect to any item submitted by Contractor means that such item appears satisfactory; provided, however, that no such approval expresses or implies acceptance by Owner of the submittal as being in compliance with the Contract Documents nor is Contractor thereby relieved of its obligation therefore.

The phrase "**approved as noted**" means that with respect to any item submitted by Contractor, that item is approved by Owner, subject to satisfaction of any requirements noted in such approval.

"**Approving Authority(ies)**" has the meaning provided in Section 11.07.01 below.

"**Change Order(s)**" means a written instrument issued after execution of the Agreement that is signed by Owner and Contractor and authorizes (a) a change in the Work and/or (b) an adjustment in the Contract Sum and/or the Contract Time.

"**Claim(s)**" means any third party dispute, demand, liability, damage (whether direct or consequential), expense, penalty, fine, settlement, judgment, and any other loss.

"**Confidential Information**" means any and all information (and any and all documents or other media or materials containing information) that is: (a) not publicly available and that pertains to Owner or the Project, whether or not such information is expressly labeled or described as confidential; (b) expressly labeled or described as confidential; and/or (c) generated by Contractor pursuant to the Agreement, including without limitation, all reports, maps, surveys, drawings, computations, etchings, sketches, tracings, drafts and all other original documents.

"**Construction Administrator**" has the meaning provided in Section 4.04 below.

"**Contract Documents**" has the meaning provided in Article 1 of the Agreement.

"**Contract Sum**" has the meaning provided in Article 3 of the Agreement.

"**Contract Time(s)**" means the period of time allotted in the Contract Documents for Substantial Completion of the Work, the additional period of time allotted for Final Completion of the Work, and the time within which Contractor must complete any applicable milestone tasks as specified on the Project Schedule.

"**Contractor**" means the person or entity designated as such in the Agreement, or any successor of such person or entity approved by Owner in writing.

"**Contractor's Representative**" means the person or entity designated as such in the Agreement, or any successor of such person or entity approved by Owner in writing.

"**Day**" means calendar day unless otherwise specified.

"**Design Professional**" means n/a. is the person or entity responsible for the design component of the Project, or applicable portion thereof.

"**Final Completion**" has the meaning provided in Section 11.07.03 below.

"**Funding Source**" has the meaning provided in Article 8 of the Agreement.

"**General Conditions**" means these general conditions, which are attached as Exhibit "B" to the Agreement.

"**Hazardous Materials**" has the meaning provided in Section 6.07.08 below.

The words "**include**," "**includes**," "**including**" and any other derivation of "include" means "including, but not limited to" unless specifically set forth to the contrary.

"**Indemnified Parties**" means Owner; the Funding Source; their affiliated entities, parents, subsidiaries, partnerships, joint ventures, limited liability companies, members, trusts, and assigns, of every tier; their respective directors, officers, partners, agents, employees, volunteers, members, managers, trustees, and shareholders; and any successors or assigns of any of the foregoing.

"**Liquidated Damages Amount**" has the meaning provided in Section 6.5 of the Agreement.

"**Modifications**" means any of (a) a written amendment to the Agreement signed by Owner and Contractor, (b) a Change Order, or (c) a written order for a minor change in the Work issued by Owner pursuant to Section 14.02 below.

"**Non-conforming Work**" has the meaning provided in Section 11.07.02 below.

"**OSHA**" has the meaning given in Section 6.07.07 below.

"**Overtime**" means any premium labor time within a week in excess of a work week and is subject to the provisions of Section 6.08 below.

"**Owner**" means the person or entity designated as such in the Agreement, or any successor of such person or entity.

"**Owner's Representative**" means the person or entity designated as such in the Agreement or any successor appointed by Owner in writing.

"**Plans**," "**Specifications**" and "**Plans and Specifications**" means all plans and specifications for performance of any part of the Work, including (a) the plans and specifications described in Article 3 of the Agreement; (b) Shop Drawings to be prepared by Contractor or any Subcontractor in connection with the Work and approved in writing by Owner; (c) all addenda and Modifications to any of the foregoing; and (d) any Product Data or Samples.

"**Product Data**" means the illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by Contractor to illustrate a material, product or system for some portion of the Work.

"**Project**" means the project designated as such in the Agreement's recitals.

"**Project Manager**" has the meaning provided in Section 6.04.01 below.

"**Project Schedule**" means the schedule attached as Exhibit "G" to the Agreement and defined in Section 6.4 of the Agreement.

"**Punch List**" means the list containing the Punch List Items.

"**Punch List Items**" means, and shall be limited to, incomplete and incidental items of the Work that (a) do not materially interfere with the use and occupancy of the Project for its intended purpose, and (b) as a group are capable of being completed by Contractor within thirty (30) days of issuance of any Punch List.

"**Retainage**" has the meaning provided in Section 5.4(c) of the Agreement.

"**Samples**" means physical examples that illustrate materials, equipment, or workmanship and establish standards by which the Work will be judged.

"**Schedule of Values**" has the meaning provided in Section 11.01 below.

"**Shop Drawings**" means the drawings, diagrams, schedules, and other data specially prepared for the Work by Contractor or any Subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

"**Site**" means the place where the Project is located.

"**Standard of Care**" means that degree of professional diligence and care ordinarily exercised by experienced and fully competent contractors having at least fifteen (15) years of experience constructing first-class projects that are similarly situated in scope and complexity to the construction component of the Project.

"**Stop Order**" has the meaning provided in Section 16.01 below.

"**Subcontractor(s)**" means any person or entity (other than an employee of Contractor or a Subcontractor) that contracts, directly or indirectly, with Contractor or a Subcontractor to furnish any of the Work.

"**Substantial Completion**" means the completion of all Work except Punch List Items.

"**Substantial Completion Date**" has the meaning provided in Section 6.2 of the Agreement.

"**Superintendent**" has the meaning provided in Section 6.04.02 below.

"**Week**" means a calendar week consisting of seven (7) days commencing at 12:01 A.M. each Monday and continuing up to and including midnight on the following Sunday.

"**Work**" means all labor, materials, tools, utilities, equipment, supervision, procurement, delivery, construction, installation, programming, training, start-up (including calibration, inspection and start-up operation), check-out, demonstration, testing, and other services necessary to properly construct the Project in accordance with the Contract Documents, including as set forth in, contemplated by or reasonably inferable from the Plans and Specifications, including as set forth in Article 2 of the Agreement.

"**Work week**" means 40 hours of labor time within a week.

ARTICLE 2

CORRELATION AND INTENT

2.01 The Contract Documents are intended to include all items necessary for the proper execution and completion of the Work; however, the enumeration of any portion of the Work shall not be construed to exclude other items contemplated by or reasonably inferable therefrom. The Contract Documents are complementary, and what is required by any one Contract Document shall be as binding as though required by all. In the event of inconsistencies within or between parts of the Contract Documents, or between the Contract Documents and Applicable Laws, Contractor shall (a) provide the better quality or greater quantity of Work; (b) comply with the more stringent requirement; and/or (c) provide the most stringent

degree of obligation and liability to Owner. All of the foregoing shall be in accordance with Owner's interpretation.

2.02 The omission from the Plans and Specifications of items of construction, installation, or material that are reasonably inferable therefrom, or the failure to describe items required by sound construction practice, shall not relieve Contractor from furnishing such items in place, complete, and in a manner consistent with the Standard of Care; nor shall any such omission entitle Contractor to claim an adjustment to the Contract Sum or the Contract Time.

2.03 Figured dimensions and marked data shall take precedence over scaled measurements. In the event of any inconsistency between large scale Plans and small scale Plans, the large scale Plans shall govern. The foregoing shall not relieve Contractor of Contractor's responsibility to advise Design Professional and Owner of any inconsistency in any of the foregoing that a contractor exercising the Standard of Care should reasonably be expected to discover upon an appropriate review of the Plans and Specifications as necessary to properly perform the Work.

2.04 Specifications: Format and Interpretation

- (a) Where "**as shown**," "**as indicated**," "**as detailed**" or other such words are used in any of the Contract Documents, reference is made to the Plans and Specifications unless otherwise stated. Where "**as directed**," "**as required**," "**as permitted**," "**as prescribed**," "**reviewed**," "**as authorized**," "**as approved**," "**as accepted**," "**as selected**," or words of like import are used, direction, requirement, permission, prescription, review, authorization, approval, acceptance or selection by Owner is intended unless provided otherwise.
- (b) The term "**provide**" as used in any of the Contract Documents shall mean "**provide completed in place**," that is, furnished, installed, completed, tested and ready for operation or use.
- (c) The terms "**knowledge**," "**recognize**," and "**discover**," their respective derivatives, and similar terms in the Contract Documents, as used in reference to the Contractor, shall be interpreted to mean that which the Contractor knows (or should know), recognizes (or should recognize), and discovers (or should discover) in exercising the Standard of Care required by the Contract Documents. Analogously, the expression "**reasonably inferable**" and similar terms in the Contract Documents shall be interpreted to mean reasonably inferable by a contractor exercising the Standard of Care.
- (d) Words in the singular shall include the plural whenever applicable, or if indicated by the surrounding context.
- (e) As the context so requires or indicates, gender specific terms shall be inclusive of masculine, feminine and neuter usage.

2.05 If the Specifications refer to specific products of one or more manufacturers, such references are for the purpose of designating the quality of materials and equipment to be furnished and are not intended to restrict competitive bidding unless specifically noted, "No Substitute"; provided, however, that Contractor shall not use or permit the use of a product manufactured other than one of those named without prior written approval of Owner.

2.06 If typical parts or sections of the Work are completely detailed on the Plans, and other parts or sections of the Work that are essentially of the same construction are shown in outline only, the complete details shall apply to the Work that is shown in outline.

ARTICLE 3
OWNERSHIP AND USE OF DOCUMENTS

3.01 As between the parties to the Agreement, Owner shall have title to all Plans and Specifications and other Contract Documents and unlimited rights with respect to any use thereof.

3.02 As to all persons other than Owner, the Plans and Specifications and other Contract Documents are instruments of service of the Owner. Contractor may retain one record set of such instruments of service. Neither Contractor nor any Subcontractor of any tier shall own or claim a copyright in such instruments of service, and, unless otherwise indicated,

Owner shall be deemed the author of them or the author's assignee, and will retain all common law, statutory and other reserved rights in addition to the copyright. All copies of such instruments of service, except Contractor's record set, shall be returned or suitably accounted for to Owner, upon request, upon Final Completion.

3.03 The Plans and Specifications and other Contract Documents furnished to Contractor are for use solely with respect to the Project and shall not be used by Contractor or any Subcontractor of any tier on other projects or for additions to this Project outside the scope of Work without the prior written consent of Owner. Contractor and all Subcontractors of any tier are granted a limited license to use and reproduce applicable portions of the Plans and Specifications and other Contract Documents appropriate to, and for use in, the execution of the Work. All copies made under such license shall bear the statutory copyright notice, if any, shown on the Plans and Specifications and other Contract Documents.

3.04 Contractor shall have obtained and familiarized itself with any design specifications or requirements of the Navajo Nation, federal, state and local agencies having any jurisdiction over the Work or Project before the Work commences to ensure compliance of such specifications or requirements (as applicable) with Applicable Law(s).

ARTICLE 4

DESIGN PROFESSIONAL; CONSTRUCTION ADMINISTRATOR

4.01 Owner reserves the right to delegate job administrative functions with respect to the Work to Design Professional. The Contract Documents shall not be construed to create a contractual relationship of any kind between Design Professional and Contractor.

4.02 Design Professional will provide services during the Project, including construction administration services, as provided for under that certain Design Professional Agreement dated _____, 2020 between Design Professional and Owner. A copy of such agreement shall be provided by Owner to Contractor and Contractor shall familiarize itself and comply with Design Professional's role described therein in the administration of the construction of the Project.

4.03 Design Professional may visit the Site at intervals appropriate to the stage of construction to become generally familiar with the progress and quality of the completed Work and to determine in general if the Work is being performed in a manner indicating that the Work, when completed, will be in accordance with the Contract Documents.

4.04 Owner may also, from time-to-time, engage a construction administrator ("**Construction Administrator**") to assist Owner in (a) administering Contractor's performance of duties under the Agreement, (b) overseeing the Project, and (c) coordinating certain of Contractor's duties under the Agreement, as specified by Owner. Owner has the right to change Construction Administrator, in Owner's sole discretion, effective upon written notice delivered to Contractor. Any Construction Administrator engaged by Owner will have the duties and authority as specified by Owner from time-to-time. Such duties may include, but are not limited to, requiring that Contractor submit to Construction Administrator Applications for Payment along with corresponding documentation, all as specified in the Contract Documents and by Owner. Contractor agrees to cooperate with any Construction Administrator appointed by Owner in accordance with written directives issued by Owner, which may be delivered to Contractor from time-to-time.

4.05 Contractor shall provide Owner, Owner's Representative, the Funding Source, Design Professional, Construction Administrator and Owner's invitees with proper and safe access to the Work at all reasonable times during the preparation and progress of the Work.

4.06 Contractor shall not directly communicate with Design Professional without obtaining Owner's prior written approval.

ARTICLE 5

OWNER

5.01 INFORMATION AND SERVICES REQUIRED OF OWNER

5.01.01 To the extent required by Contractor to perform the Work and as agreed to by Owner, Owner shall furnish surveys describing the physical characteristics, legal limitations and utility locations for the Site, as well as a legal description thereof, each to the extent available. All other grades, lines, levels, benchmarks, courses and distances shall be established

and maintained by Contractor. All levels given on the Plans shall be carefully checked by Contractor with existing levels.

5.01.02 Owner shall obtain all easements required for the Work. Unless otherwise provided in the Agreement, all other permits and fees (including inspection fees) relating to the Work shall be obtained, and paid for, by Contractor as part of the Contract Sum, provided Owner and Design Professional fulfilled their respective obligations and have received approval from governmental authorities having jurisdiction over the Work or the Project.

5.01.03 Owner shall furnish to Contractor all information or services under Owner's control with reasonable promptness to avoid unreasonable delay in the orderly progress of the Work.

5.01.04 Owner will issue all instructions to Contractor through Design Professional or Owner's Representative; however, Owner reserves the right to direct and/or instruct Contractor and Design Professional simultaneously to effect changes in the Work.

5.01.05 Unless otherwise provided in the Contract Documents, Contractor will be furnished with, free of charge, one set of prints and one set of reproducible mylars of all drawings comprising the Plans and Specifications and one set of the Specifications. Additional copies of any part of such sets shall be made available to Contractor at Contractor's cost and expense.

5.01.06 Requests by Contractor for supplemental information shall be directed to Owner's Representative in writing.

5.02 OWNER'S RIGHT TO PERFORM CERTAIN WORK

5.02.01 If Contractor fails to carry out the Work in accordance with the Contract Documents, Owner may demand in writing that Contractor correct such failure with diligence and promptness. If Contractor does not correct such failure within seven (7) days of receiving Owner's demand, Owner may, without prejudice to any other remedy Owner may have, remedy such failure. In such event, an appropriate Change Order shall be issued deducting from the payments then or thereafter due Contractor the cost of remedying such failure, including costs related to any additional services of Design Professional made necessary by such failure. If payments then or thereafter due Contractor are not sufficient to cover such amounts, Contractor shall pay the difference to Owner on demand.

5.02.02 The rights described in this Section 5.02 and elsewhere in the Contract Documents are cumulative and not in limitation of any rights of Owner granted in the Contract Documents or under Applicable Laws or at law or in equity.

5.03 OWNER'S REPRESENTATIVE

Owner's Representative shall have full authority to receive and transmit communications on behalf of Owner. Owner's Representative shall have authority to bind Owner only as is defined in writing by Owner to Contractor.

ARTICLE 6 **CONTRACTOR**

6.01 STANDARD OF CARE

All Work, responsibilities and obligations performed under the Agreement by Contractor and each Subcontractor, of any tier, shall be performed in accordance with the Standard of Care. The Standard of Care shall be deemed to apply to, govern, and be the basis from which such performance shall be evaluated by Owner or any party presiding over any dispute resolution proceeding.

6.02 APPLICABLE LAWS

Contractor shall perform all Work in strict compliance with Applicable Laws.

6.03 REVIEW OF CONTRACT DOCUMENTS AND INVESTIGATION OF SITE

6.03.01 Contractor acknowledges that the Contract Documents are sufficient to enable Contractor to commence and complete the Work in accordance with Applicable Laws, and otherwise perform Contractor's obligations hereunder. Contractor shall provide Owner with prompt written notice if any of the Contract Documents, at any time, is insufficient in any way to enable Contractor to complete the Work in accordance with Applicable Laws or otherwise perform Contractor's obligations hereunder. Contractor shall report to Owner any error, inconsistency or omission Contractor may discover in the Contract Documents before Contractor performs any Work affected thereby.

6.03.02 Contractor shall not perform any portion of the Work without Contract Documents or, where required, approved (or approved as noted) Shop Drawings, Product Data or Samples.

6.03.03 Although the Plans and Specifications are understood to contain the dimensions required in the construction of the Work, Contractor shall make such changes as are necessary to make the parts of the Work fit in the best possible manner, but no alterations shall be made without Owner's prior written consent.

6.03.04 The exactness of grades, elevations, dimensions, or locations given on any Plans issued by the Design Professional, or the work installed by other contractors, is not guaranteed by the Design Professional or the Owner.

6.04 CONTRACTOR'S STAFF

6.04.01 Contractor shall appoint a project manager (the "**Project Manager**") for the Work who shall be authorized to act on behalf of Contractor and shall be an individual with whom Owner may consult at all reasonable times. The Project Manager shall have full supervision over the completion of the Work, shall be designated to act as the primary point of contact with Owner regarding all matters relating to the Work, and shall have full authority to bind Contractor. Any changes in the Project Manager shall require Owner's prior written approval.

6.04.02 Contractor shall make available on the Site at all times during the course of the Work a qualified superintendent (the "**Superintendent**") who shall not be replaced without prior written notice to Owner, except under extraordinary circumstances. All communications to the Superintendent shall be as binding as if given to Contractor.

6.05 SUPERVISION AND CONSTRUCTION PROCEDURES

6.05.01 Contractor shall (a) supervise and direct the Work; (b) be solely responsible for all construction means, methods, techniques, sequences, and procedures; and (c) coordinate all portions of the Work, including coordinating its Work with the work of others on the Project.

6.05.02 Contractor accepts sole responsibility with respect to Owner for the acts and omissions of Contractor, Subcontractors and their respective agents and employees.

6.05.03 On a weekly basis, Contractor shall submit in writing to Owner a brief description of the Work, including the location thereof, an accurate manpower count broken down by trade into supervisory personnel and workers, and a listing of all major equipment on the Site.

6.05.04 Contractor shall be responsible for the conduct of all of Contractor's employees and those of the Subcontractors. Contractor shall cause all workers to eat their lunches in areas designated by Owner. Contractor shall provide, and shall ensure that all workers utilize, approved portable sanitary facilities. Contractor will not permit either its employees or those of its Subcontractors to bring or consume alcoholic beverages or narcotics on the Site. Contractor shall not permit construction workers to smoke on the Site except in areas designated therefore by Owner, if any. Contractor shall, and ensure that any Subcontractors shall, comply with any other requirements of Owner governing the Work or the Project that may be specified by Owner from time to time.

6.05.05 Contractor shall be solely responsible for the safety of the Work and all persons and property potentially impacted by the Work whether or not such safety is under the control of Contractor.

6.06 CONTRACTOR'S CONSTRUCTION SCHEDULE

6.06.01 Within five (5) days of the execution date of the Agreement, Contractor shall prepare and submit for Owner's review and approval a detailed critical path schedule for performing the Work. Such schedule, upon approval

by Owner, shall be the Project Schedule from which Contractor's performance of the Work shall be measured. The Project Schedule shall be in a level of detail acceptable to Owner and shall indicate the dates for the commencement and completion of the various stages of the Work, including the dates when Owner information, approvals and Owner-furnished deliverables are required. The Project Schedule shall also include milestones for (a) a kickoff and concept review meeting, if required by Owner; (b) Site surveys and review meetings; (c) equipment and material delivery and installation; (d) downtimes for any aspect of Owner's operations; (e) training schedules; (f) start-up, check-out and performance testing; and (g) such other milestone tasks identified by Owner.

6.06.02 Owner's approval of the Project Schedule shall not relieve Contractor of its complete and exclusive control and responsibility over the construction means, methods, techniques, sequences, and procedures for executing the Work.

6.06.03 The Project Schedule shall be updated weekly by Contractor to reflect the conditions and progress of the Work, but such revisions shall not relieve Contractor of its obligations to complete the Work required under the Agreement within the Contract Time(s), as such date(s) may be adjusted in accordance with the Contract Documents. Contractor shall provide all Project Schedule updates to Owner to keep Owner advised of progress and significant changes. If Contractor fails to submit the required Project Schedule updates, Owner may withhold approval of all or part of Contractor's Applications for Payment until such time as Contractor furnishes acceptable updates.

6.06.04 If the Work falls behind the Project Schedule for any reason, Owner shall have the right to direct Contractor to take such steps as may be necessary to improve progress, including but not limited to increasing manpower, adding additional shifts of workers, and using additional days and overtime. Contractor shall be responsible for all costs associated with this recovery effort, without adjustment to the Contract Sum or Contract Time, unless the cause of the delay is excusable under Section 10.02.01 hereof, in which case Contractor may seek relief for such costs in accordance with Article 14 hereof.

6.06.05 If Owner performs other work on the Project with separate contractors under Owner's control, Contractor agrees to include the activities of such contractors in the Project Schedule. Contractor shall reasonably cooperate with Owner's separate contractors and coordinate its activities with those of such separate contractors so that the Project can be completed in an orderly and coordinated manner without unreasonable disruption.

6.07 LABOR AND MATERIALS

6.07.01 Except to the extent otherwise provided in the Contract Documents, Contractor shall provide and pay for, as part of the Contract Sum, all labor, materials, equipment, tools, temporary structures, construction equipment and machinery, water, heat, lighting, utilities, transportation, sanitary facilities, and other facilities and services necessary for the proper execution and timely completion of the Work, whether temporary or permanent.

6.07.02 Contractor shall (a) at all times enforce strict discipline and good order among Contractor's employees and shall not employ in the performance of the Work any unfit or unskilled person; (b) store Contractor's materials, equipment, tools, supplies and the operations of its workmen and Subcontractors within areas designated by Owner from time-to-time; (c) not unnecessarily burden the Work area; and (d) correct, at Contractor's expense, damage to property resulting from the Work.

6.07.03 Contractor shall (a) protect the Work from weather, theft and vandalism and (b) properly store and protect materials, equipment, tools and supplies delivered to the Site.

6.07.04 Manufacturers' printed instructions covering details of installation shall be followed if not in conflict with the Specifications. If there is a conflict between such instructions and the Specifications, Contractor shall notify the Owner at once and obtain the Owner's approval or instructions before proceeding.

6.07.05 Completed Work shall be left plumb, level, true to line or plane, anchored securely in place, and free from damage. All Work shall be constructed according to the Standard of Care.

6.07.06 With respect to all excess materials, Contractor shall first attempt to return all such materials for credit to Owner's account to the extent such returns are available, and then, recycle such materials (with any credits or payments received therefore being for Owner's account), before disposing of such materials in accordance with

Section 6.07.09.

6.07.07 Contractor shall comply with, and cooperate with Owner and other contractors and Subcontractors in connection with their compliance with, the regulations of the Occupational Safety and Health Act of 1970, as amended ("**OSHA**"), or any similar applicable state law.

6.07.08 Contractor shall not use, in connection with the Work, any hazardous waste, toxic substance or related materials ("**Hazardous Materials**") in such manner as would (a) violate any Applicable Laws; (b) cause any damage or a risk of any damage to the environment; or (c) leave any residue that could be hazardous to persons or property or cause liability to Owner. The term "Hazardous Materials" shall include substances defined as "hazardous substances" or "toxic substances" in the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, 42 U.S.C. Sec. 9061, *et seq.*; Hazardous Materials Transportation Act, 49 U.S.C. Sec. 1802; the Resource Conservation and Recovery Act, 42 U.S.C. Sec. 6901, *et seq.*; asbestos containing material; and PCBs. The foregoing shall not be deemed to prohibit Contractor from using in the Work any item specified by name in the Plans and Specifications. Contractor shall provide Owner with prompt written notice of the existence of any Hazardous Materials located on the Site upon Contractor's becoming aware of the existence of such Hazardous Materials and, in any event, prior to disturbing such Hazardous Materials.

6.07.09 Contractor shall cause all waste produced at the Site to be properly disposed of off the Site in accordance with all Applicable Laws. Contractor shall not permit any such waste to enter or be disposed in any drainage or sewer system connecting with or constituting a portion of the Project.

6.08 OVERTIME

6.08.01 The Contract Sum is based on the Project Schedule. Except as expressly provided for in the Contract Documents, Contractor shall not be entitled to any increase in the Contract Sum for overtime required to complete the Work in accordance with the Project Schedule.

6.08.02 If Owner requests that Contractor work overtime, Contractor shall comply with the following requirements:

- (a) Contractor shall prepare and submit in triplicate to Owner on a daily basis, a statement of employees by name, trade, classification, hourly rate, and premium or overtime charges worked to substantiate premium or overtime charges, in such detail to demonstrate to Owner the accuracy of the statement, and
- (b) Owner will pay for authorized overtime work only in amounts actually paid for by Contractor for actual overtime premium wages, actual contributions paid to federal and state unemployment tax and federal insurance contributions tax. No overhead or profit shall be included in actual overtime premium wages except in those instances in which Owner requests an acceleration of the Project Schedule in writing.

6.09 TAXES

Included within the Contract Sum are all sales, transaction privilege, consumer, use, personal property and other similar taxes applicable to the Work or any portion thereof, including taxes payable under the Navajo Nation Business Activity Tax (24 N.N.C. Sec. 401 *et seq.*)

6.10 PERMITS, FEES AND NOTICES

6.10.01 Except as specifically identified in the Contract Documents as being the responsibility of Owner, Contractor shall obtain and pay for, as part of the Contract Sum, all necessary permits, approvals, licenses, government charges and inspection fees required for the prosecution of the Work by any government or quasi-government entity having jurisdiction over the Project. Contractor shall provide reasonable assistance to Owner in obtaining those permits, approvals and licenses that are Owner's responsibility under the Contract Documents.

6.10.02 Prior to the execution of any Work, Contractor shall provide evidence of current licensure of Contractor and Subcontractors, as applicable, conforming to all codes and requirements of the contractor licensing statutes and regulations of the jurisdiction in which the Project is located.

6.10.03 Contractor shall give all notices and comply with all Applicable Laws bearing on the performance of the Work, and, with the requirements and standards established by technical societies, institutions or associations that have established requirements and standards relating to portions of the Work.

6.11 DOCUMENTS AND SAMPLES AT THE SITE

6.11.01 Contractor shall maintain at the Site for Owner one record copy of all current and up-to-date Plans, Specifications, addenda, Change Orders and other Modifications, in good order and marked to reflect all changes made during construction, and approved Shop Drawings, Product Data and Samples. Contractor shall submit to Owner two (2) complete sets (one to be reproducible in a format approved by Owner) and an electronic file in Auto CADD 2005 format or such other updated version approved by Owner, including descriptions, drawings, sketches, marked prints, and similar data indicating the Work in its "as-built" condition. Contractor shall keep "as-built" record drawings up to date concurrently as the Work progresses. Contractor shall submit such drawings to Owner with its final Application for Payment, which submittal shall be a condition precedent to Owner's obligation to make final payment.

6.11.02 No review or receipt of any of the information described in Section 6.11.01 by Owner shall be deemed a waiver or approval of any deviation of any of the same from the Contract Documents, including the Shop Drawings, or in any way relieve Contractor from Contractor's responsibility to perform the Work in accordance with the Contract Documents.

6.11.03 Contractor shall furnish to Owner four (4) complete sets of manuals containing the manufacturers' instructions for maintenance and operation of each item of equipment furnished under the Contract Documents and any additional data specifically requested under the various sections of the Specifications. The manuals shall be arranged in proper order, indexed and suitably bound.

6.12 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

6.12.01 The purpose of the Shop Drawings, Product Data, Samples and similar submittals is to demonstrate Contractor's conformance to the information provided and the design concept expressed in the Contract Documents.

6.12.02 Contractor shall procure, review, and submit, with reasonable promptness and in such sequence as to cause no delay in the Work or in the work of Owner or any separate contractor, all Shop Drawings, Product Data and Samples required by the Contract Documents. Contractor shall promptly prepare and deliver to Owner a complete and detailed schedule specifying all submittals that are required or anticipated to be delivered by Contractor hereunder, which schedule shall permit Owner and Owner's other consultants ten (10) business days to review any such submittals.

6.12.03 Owner's approval of Shop Drawings, Product Data or Samples, pursuant to the Contract Documents or otherwise, shall not relieve Contractor from responsibility for (a) errors or omissions therein or (b) any deviation from the requirements of the Contract Documents unless Contractor has specifically informed Owner of such deviation in writing and Owner agrees, in writing, to such deviation.

6.12.04 Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data or Samples, to revisions other than those requested by Owner on previous submittals.

6.12.05 Contractor shall perform no portion of the Work requiring submission of a Shop Drawing, Product Data, Samples or similar submittals if the respective submittal has been rejected by Owner. Performance of such portion of the Work, to the extent the same shall not be in accordance with subsequently approved submittals, shall be at Contractor's sole risk, shall be deemed defective Work, and shall be corrected by Contractor pursuant to Section 15.02 below.

6.12.06 Contractor warrants that all Plans and Specifications prepared by or for Contractor for any part of the Work shall fully comply with all Applicable Laws; provided, however, that Contractor shall not be responsible for defects or deficiencies in any of the foregoing to the extent such are attributable to the Design Professional or any person or entity other than Contractor or a Subcontractor if such defects or deficiencies should not have been discovered by a contractor exercising the Standard of Care. If Contractor observes or becomes aware that any of the Plans and Specifications or any other part of the Contract Documents do not comply with Applicable Laws in any respect, Contractor

shall promptly notify Owner in writing, and any necessary changes shall be accomplished by appropriate Modification. If Contractor performs any Work knowing, or if Contractor reasonably should have known, it to be contrary to any Applicable Laws, Contractor shall make all changes necessary to comply therewith and shall assume full responsibility and bear all costs attributable to the correction of such Work.

6.12.07 All Shop Drawings, Product Data, Samples and similar submittals with respect to the Work shall become the property of Owner upon Final Completion.

6.13 USE OF SITE

6.13.01 Contractor shall confine the Work to the limits indicated by Applicable Laws, or as may be established by Owner from time to time.

6.13.02 Only materials and equipment that are used directly in the Work shall be brought to and stored on the Site by Contractor. Materials or equipment no longer required for the Work shall be promptly removed from the Site.

6.13.03 All construction related traffic, including truck traffic and deliveries with respect to the Work, shall enter and leave the Site only at Owner approved locations. Contractor shall stage the Work, from time to time, only at such portions of the Site as approved by Owner. Contractor shall, with no increase in the Contract Sum, move Contractor's staging area as and when requested by Owner.

6.14 CUTTING AND PATCHING OF WORK

6.14.01 Contractor shall be responsible for all cutting, fitting, patching, excavating or other alterations required to allow the Work to properly fit together. All cutting, fitting, patching, excavating or other alterations shall be done promptly and all other repairs shall be made as necessary to leave the entire Work in good condition.

6.14.02 Contractor shall not damage or endanger any portion of the Work or the work of Owner or any separate contractor by cutting, fitting, patching, excavating or otherwise altering the Work or such other work. Contractor shall not otherwise alter the work of Owner or any separate contractor except with the written consent of Owner.

6.14.03 If sleeves or hangers are not placed in time, or are improperly placed, Contractor shall be responsible for forming or drilling openings in the Work as required and for any patching or corrective work necessary, subject to the approval thereof by Owner and at no additional charge to Owner.

6.14.04 The cutting and chasing of existing construction for installation of mechanical and electrical Work and for the relocation of existing pipes, ducts, conduit and the like shall be performed by trades licensed to perform such Work.

6.14.05 Structural members shall not be cut or drilled and floors, walks, footings and partitions shall not be cut except with the prior written approval of Owner. Performance of such Work without such approval shall be at Contractor's sole risk and expense.

6.14.06 Penetration of the slab of any floor shall be core drilled in accordance with procedures to be approved by Owner before such Work is performed.

6.15 CLEANING UP

6.15.01 Contractor shall, at all times, keep the Site and, to the extent Contractor is granted access, areas adjacent to the Site and any surrounding areas in a neat and orderly condition and free from accumulation of waste materials or rubbish caused by Contractor's operations. Contractor shall clear all dirt, mud and debris from the streets surrounding the Site and, to the extent Contractor is granted access, areas adjacent to the Site and any surrounding areas so that such streets are broom clean at the end of each day. Contractor shall not, and shall not allow its Subcontractors to, burn any trash at the Site and any surrounding areas or elsewhere in the vicinity of the Site.

6.15.02 Contractor shall, and shall require its Subcontractors to, clean and maintain their respective

portions of the Work as required on a daily basis and as directed by Owner. As to unsalvageable materials disposed of off the Site, Contractor shall ensure such materials are disposed of at an approved landfill in full conformity with Applicable Laws.

6.15.03 If the Site or, to the extent Contractor is granted access, areas adjacent to the Site and any surrounding areas are not properly maintained, Owner may, upon twenty-four (24) hours notice to Contractor (or such shorter period as may be specified in any notice from a governmental authority with respect thereto), perform such maintenance and charge the cost therefore to Contractor.

6.15.04 In order to make the Work fit for occupancy and for its intended purposes upon Substantial Completion, Contractor shall remove all temporary facilities, waste materials and rubbish from and about the Site and, to the extent Contractor is granted access, the areas adjacent to the Site and any surrounding areas, as well as, all supplies, tools, construction equipment, machinery and surplus materials. In addition, at Substantial Completion, Contractor shall perform the following final cleaning:

- (a) Remove temporary protections;
- (b) Remove grease, mastic adhesives, dust, dirt, stains, fingerprints, labels and other foreign materials from sight-exposed interior and exterior surfaces;
- (c) Wash and shine glazing and mirrors;
- (d) Polish glossy surfaces to a clear shine;
- (e) Ventilating Systems: clean permanent filters and replace disposable filters if units were operated during construction; and clean ducts, blowers and coils if units were operated without filters during construction;
- (f) Broom clean exterior paved surfaces; rake clean the grounds on the Site;
- (g) Sweep up and thoroughly clean all carpeting; and
- (h) Snake all primary sanitary sewer lines that tie into the public sewer system and clean all storm drains.

6.15.05 Contractor shall use only cleaning materials that are in compliance with Applicable Laws and in a manner that will not damage any of the Work or the Site. Any glass or other Work damaged by Contractor or any Subcontractor shall be replaced and all surfaces that have been scratched or marred shall be refinished at no additional cost to Owner. All cleaning materials and methods shall comply with the recommendations of the manufacturer of the surface being cleaned.

6.16 ROYALTIES AND PATENTS

Contractor shall pay all royalties and license fees applicable to the Work and shall not unlawfully use or install any patented component of the Work. If any injunction or legal action seeking to stop the Work occurs, Owner may require Contractor to substitute such other articles of like kind as will make it possible to proceed with and complete the Work, and all costs and expenses occasioned thereby shall be borne by Contractor to the extent resulting from Contractor's failure to comply with the preceding sentence. The review by Owner of any non-specified method of construction, invention, appliance, process, article, device or material of any kind shall be for its adequacy related to the Work only, and shall not be an approval of Contractor's use thereof in violation of any patent or other rights of any third party.

6.17 INDEMNIFICATION

6.17.01 To the fullest extent permitted by Applicable Laws, Contractor agrees to defend, indemnify and hold harmless the Indemnified Parties for, from and against any and all Claims arising out of or related to performance of the Work, whether sustained or asserted before or after the date of Final Completion or termination of the Agreement, and all attorneys' fees, consultants' fees, and all other expenses, whether or not taxable, incurred by any of the Indemnified Parties in the investigation, defense, settlement and satisfaction thereof. This indemnity extends to and includes all Claims, just or unjust, whether based on a tort, strict liability, contract, lien, stop notice, Applicable Laws or other theory of relief or

liability, and whether the injury complained of arises from any death, personal injury, sickness, disease, property damage (including loss of use), trespass, economic loss, patent infringement, copyright infringement, hazardous substance release, oil discharge, waste disposal, taking of endangered species, or otherwise; provided, however, that if a Claim against any of the Indemnified Parties is based on a negligence theory of recovery, this Agreement to defend, indemnify, and hold harmless shall extend only to the extent the Claim is caused or alleged to be caused by the negligent acts, errors or omissions of Contractor or any person or entity for whom Contractor may be responsible. Contractor's indemnification obligation shall be without regard to any restriction on the compensation or benefits payable by or for Contractor or any subcontractor under any Applicable Laws governing workers' compensation.

6.17.02 Contractor expressly understands and agrees that any performance or labor and material bond or insurance protection required by any provision of the Contract Documents, or otherwise provided by Contractor, shall in no way limit the responsibility to defend, indemnify and hold harmless each of the Indemnified Parties as herein provided.

6.17.03 Contractor shall cause the provisions of this Section 6.17 to be included in each subcontract between Contractor and a Subcontractor and flow down to such other subcontracts entered into between a Subcontractor and its Subcontractors. At Owner's request, Contractor shall provide evidence satisfactory to Owner that it has fulfilled its obligation under this Section 6.17.

6.17.04 If any Claim indemnified hereunder but not accepted for coverage by Contractor's insurance policies has not been settled or discharged when the Work is completed, final payment of the Contract Sum shall not be due unless and until Contractor provides (a) a bond issued by a bonding company satisfactory to Owner, or (b) other security acceptable in an amount equal to 150% of the amount of any such Claim, including interest on such Claim as estimated by Owner. Such bond or other security shall be in form and substance satisfactory to Owner and shall be subject to such increase as Owner may from time to time require as interest accrues on such Claim.

6.17.05 All indemnities, warranties, representations and other obligations of Design Professional shall survive Final Completion and/or termination of the Agreement.

6.18 TEMPORARY OFFICE

At all times prior to Final Completion, Contractor shall provide and maintain a weather-tight, temporary office at the Site for Contractor's use at a location satisfactory to Owner. Such temporary office shall be fully functional and complete with utility hookups for power, heat, air-conditioning, and light and telephone service. The costs and expenses related to the provision and maintenance of such temporary office shall be included within the Contract Sum.

6.19 UTILITY COSTS; WORK AROUND UTILITIES

6.19.01 Except as otherwise provided for in the Agreement, Contractor shall provide and pay for all heating, cooling, lighting, utilities, and other facilities and services necessary for the proper execution and completion of the Work. Contractor shall furnish and maintain all temporary ventilating equipment as required prior to the installation of the permanent heating and cooling apparatus. As soon as the permanent heating and cooling apparatus has been fully installed, Contractor shall have the right to use the same in accordance with and subject to the provisions of Section 11.3 of the Agreement. Except as otherwise provided in the Agreement, all utility costs with respect to each portion of the Work shall be provided, and paid for, by Contractor, as part of the Contract Sum, until the date of Substantial Completion.

6.19.02 Contractor shall be responsible to cause all existing utilities to be located. Contractor shall hand excavate in proximity to located utilities. Contractor shall be responsible, without an increase in the Contract Sum, for all costs resulting from located utilities damaged during the Work.

6.20 CONFIDENTIAL RELATIONSHIP; NEWS RELEASES

In connection with the rendering of the Work, Confidential Information may be discovered by or disclosed to Contractor. Contractor agrees to treat all Confidential Information with the highest duty of trust imposed upon a fiduciary, not to disclose or allow access to any Confidential Information to any person (including employees of Contractor, except as necessary to perform the Work), to refrain from using Confidential Information for purposes other than the performance of the Work or as otherwise directed by Owner, to refrain from reproducing any Confidential Information except as necessary to perform the Work, and to return to Owner all documents and other materials containing Confidential Information

immediately upon Owner's request and in any event upon the termination of the Agreement or completion of the Work. Contractor acknowledges that Owner will not have an adequate remedy under any Applicable Laws for any breach of the foregoing provisions, and that, accordingly, Owner may obtain injunctive relief or a decree of specific performance directing Contractor to cure any such breach and to refrain from further actions that would constitute such a breach. Contractor acknowledges and agrees that its obligations hereunder and all other confidentiality provisions of the Contract Documents are as a fiduciary to Owner and that any release of Confidential Information by Contractor contrary to these confidentiality provisions shall be subject to all remedies and damages available to Owner at law or equity for breach of fiduciary duty.

6.21 NO STOPPAGE

Contractor shall not directly or indirectly stop performance of any Work in the event of a Claim or other dispute. Rather, Contractor will continue performance, under protest, pending resolution of such Claim or other dispute unless Owner specifically directs otherwise in writing. Contractor's failure to continue such performance shall be a material breach of the Agreement.

ARTICLE 7 SUBCONTRACTORS

7.01 SUBCONTRACTUAL RELATIONS

7.01.01 Each subcontract and purchase order entered between Contractor and a Subcontractor or material supplier shall:

- (a) be in writing;
- (b) specifically incorporate the Agreement by reference in its entirety;
- (c) be accompanied by such proof of insurance as Owner shall require;
- (d) provide that Owner is an intended third party beneficiary of the subcontract or purchase order (without liability for benefits received) and an obligee of all express and implied warranties given by any Subcontractor or material supplier under such subcontracts or purchase orders or as imposed by Applicable Laws, with the right to directly enforce those obligations as a principal, whether before or after Final Completion;
- (e) provide the Subcontractor or material supplier's consent to be joined in any dispute resolution procedure or proceeding involving Owner and Contractor;
- (f) provide that Owner shall be entitled to enforce such subcontract or purchase order directly against such Subcontractor or material supplier in the event Owner has been damaged by any breach thereof;
- (g) provide the Subcontractor or material supplier's consent that any such agreement or purchase order may be assigned to Owner at Owner's option if the Agreement is terminated for any reason and obligate the Subcontractor or material supplier to perform for the benefit of Owner the remainder of the Work covered by such agreement or purchase order as long as Owner continues to pay the amounts owing such Subcontractor or material supplier thereunder;
- (h) require, to the extent of the Work to be performed by the Subcontractor or materials to be supplied by the material supplier, each Subcontractor or material supplier be bound to the Contractor by the terms of the Contract Documents and to assume toward Contractor all the obligations and responsibilities that Contractor assumes toward Owner under the Agreement, including the responsibility for the safety of the Subcontractor's Work; and
- (i) require each Subcontractor or material supplier to enter into similar agreements with its Subcontractors.

7.01.02 Contractor shall coordinate the efforts of its Subcontractors and material suppliers so that no part of the Work is duplicated or omitted, and shall require its Subcontractors and material suppliers to proceed with the Work in accordance with the Project Schedule and in such order as Contractor may direct. Contractor agrees that it is as fully responsible to Owner for the acts and omissions of its Subcontractors, material suppliers and of persons either directly or indirectly employed by them as Contractor is for the acts and omissions of persons directly employed by Contractor.

7.01.03 The preceding Section 7.01.01 notwithstanding, nothing contained in the Contract Documents shall create any contractual obligation between any Subcontractor or material supplier and Owner.

7.01.04 Contractor shall require each Subcontractor and material supplier to carry insurance having limits, coverages and deductibles required by Owner, in Owner's sole and absolute discretion.

ARTICLE 8
WORK BY OWNER OR BY SEPARATE CONTRACTORS

(None)

8.01 OWNER'S RIGHT TO PERFORM WORK AND TO ENTER SEPARATE CONTRACTS

Owner reserves the right to perform certain of its own work and enter into contracts with separate contractors and subcontractors in connection with the Project. Contractor shall provide Owner and such other contractors and subcontractors reasonable opportunity to introduce and store their materials and execute their work, and shall properly connect and coordinate Contractor's Work with the work of Owner and such other contractors and subcontractors.

8.02 MUTUAL RESPONSIBILITY

8.02.01 If any part of the Work depends for proper execution or results upon the work of Owner or any separate contractor or subcontractor, Contractor shall, prior to proceeding with the Work, promptly notify Owner of any apparent discrepancies or defects in such other work that render it unsuitable for Contractor's Work. Failure of Contractor to provide such notice shall constitute an acceptance of such other work as suitable to receive Contractor's Work.

8.02.02 Should Contractor cause damage to the Work or property of Owner or any separate contractor or subcontractor, or to other work in the vicinity of the Project, including damage caused by defective work, Contractor shall promptly remedy such damage and attempt to resolve any dispute arising therefrom.

ARTICLE 9
TESTS AND COSTS

9.01 TESTS

9.01.01 If the Contract Documents or any Applicable Laws require any portion of the Work to be inspected, tested or approved, Contractor shall provide Owner timely notice (not less than 48 hours' prior notice) of its readiness therefore so Owner may observe such inspection, testing or approval. Contractor will arrange for the services of a testing laboratory(ies) or service organization designated by Owner for purposes of such inspections, tests or approvals.

9.01.02 If any inspection, testing or approval reveals a failure of the Work to comply with the requirements of the Contract Documents, Contractor shall bear the costs and expenses to correct such failure, including payment of any additional compensation to Design Professional made necessary by such failure.

9.01.03 Required certificates of inspection, testing or approval shall be secured by Contractor and promptly delivered to Owner.

9.01.04 Contractor shall coordinate the activities of all entities conducting inspections, tests or approvals by or for Owner and shall cooperate fully with such entities so as to facilitate such inspections, tests or approvals.

9.01.05 Separate testing required or performed by Owner that is consistent with normal practice in

constructing projects similar to the Project shall not entitle Contractor to any adjustment in the Contract Sum or the Contract Time.

9.02 COSTS

All cash discounts received by Contractor related to the Work shall accrue to Owner in total, and all quantity and trade discounts, rebates, refunds and all returns from sale of surplus material shall be applied as a reduction of the Contract Sum. Contractor shall notify Owner of, and qualify for available cash discounts, quantity and trade discounts, rebates, refunds and all returns from sale of surplus materials in any way related to the Work to the extent available in a manner consistent with the Contract Documents. At Owner's request, Contractor shall assist in the sale of surplus materials.

ARTICLE 10 TIME

10.01 PROGRESS AND COMPLETION

10.01.01 All time limits stated in the Contract Documents for the performance of Contractor's obligations are of the essence.

10.01.02 Contractor shall commence and carry the Work forward expeditiously with adequate forces and shall achieve Substantial Completion and Final Completion within the time periods provided therefore in Article 6 of the Agreement.

10.01.03 If Owner desires to accelerate performance of any part of the Work, Owner may request such acceleration, in which event Contractor shall advise Owner to what extent if any, in the judgment of Contractor, overtime Work will be required to accomplish such acceleration and the estimated extra actual out-of-pocket cost resulting from the use of such overtime. Upon receipt of such estimate from Contractor, if Owner still desires to accelerate performance of such part of the Work, Owner shall issue a Change Order for the Work Contractor shall perform on an accelerated basis.

10.02 DELAYS AND EXTENSIONS OF TIME

10.02.01 After all float time is used, the Contract Time may be extended by Change Order for such reasonable time as Owner may determine if Contractor is delayed in completing the Work because of: (a) any act or neglect of Owner or the Design Professional or by any employee of either, or by a separate contractor or subcontractor, but not including Subcontractors engaged by Contractor; (b) changes in the Work if the Work affected by the changes is on the critical path of the Project Schedule; (c) labor disputes, fire, unusual weather or floods; (d) any other cause beyond Contractor's reasonable control and without Contractor's negligence; (e) delay authorized by Owner; or (f) any cause that Owner determines may justify the delay.

10.02.02 A request for an extension of the Contract Time shall be made in writing to Owner, not more than seven (7) days after commencement of the occurrence giving rise to such request, otherwise such request will be waived. In the case of a continuing cause of delay, only one such request is necessary. Such request must be accompanied by complete documentation showing the current status of Work affected and the nature and exact duration of the requested extension. A request by the Contractor for an extension of the Contract Time under this Section 10.02.02 shall be a prerequisite to Contractor later claiming additional compensation as a result of Owner's acceleration or delays. Provided Owner has received a timely and proper request, within thirty (30) days after receiving such request, Owner shall determine, in Owner's reasonable discretion, whether a Change Order should be entered into on account of any of the causes described in Section 10.02.01.

10.02.03 Contractor recognizes that completing the Work on or before the original Contract Time(s) is of the utmost importance. Consequently, notwithstanding the right of Contractor to receive a time extension pursuant to Section 10.02.01, Contractor agrees that if it encounters a delay, it will, if directed by Owner under Section 6.06.04, develop and implement a schedule and plan to improve progress and overcome such delay.

10.02.04 In the event of any dispute whatsoever between Owner and Contractor, Contractor shall continue to proceed diligently with the Work as required by the Contract Documents, provided Owner continues to make undisputed payments on account of the Contract Sum as provided for in the Agreement.

ARTICLE 11

SCHEDULE OF VALUES, APPLICATION FOR PAYMENT, PAYMENTS AND COMPLETION SCHEDULE

11.01 SCHEDULE OF VALUES

Contractor shall complete and submit for Owner's review and approval the schedule of values ("**Schedule of Values**") for all of the Work in the form attached as Exhibit "C" to the Agreement. The Schedule of Values shall: (a) subdivide the Work into its respective parts; (b) be based upon the Project Schedule; (c) include dollar amounts for all items comprising the Work; (d) serve as the basis for evaluating Contractor's Applications for Payment; and (e) be updated and revised from time-to-time at Owner's request. Owner may reject any Schedule of Values that appears susceptible to resulting in a "front loading" of payments or for any other good cause. Contractor represents to Owner that, to the best of Contractor's knowledge, the Schedule of Values, including the draw schedule related thereto, accurately estimates the amounts that will be payable to Contractor each month; provided, however, that Owner shall be obligated to make payments in approved amounts only as provided in the Contract Documents.

11.02 APPLICATION FOR PAYMENTS SUBMITTED TO OWNER'S REPRESENTATIVE

All written communications from Contractor regarding payment shall be personally delivered to Owner's Representative who is designated as Owner's exclusive agent for purposes of such communications. No such communication shall be deemed received by Owner's Representative until it has been actually received by Owner's Representative.

11.03 APPLICATION FOR PAYMENT

11.03.01 The Application for Payment may request payment for equipment and materials not yet incorporated into the Project, provided that: (a) Owner has agreed in writing that the equipment and materials are suitably stored at another acceptable location; (b) the equipment and materials are protected by suitable insurance; (c) the equipment and materials are properly identified as being for Owner's Project; and (d) upon payment, title to such equipment and materials will pass to Owner free and clear of all claims, liens, encumbrances, and security interests. Payment for equipment and materials made in accordance with this Section 11.03.01 shall be subject to a retainage of ten percent (10%) or as otherwise provided in the Agreement.

11.03.02 The Application for Payment shall constitute Contractor's representation that the Work has been performed consistent with the Contract Documents, has progressed to the point indicated in the Application for Payment, and that title to all Work will pass to Owner free and clear of all claims, liens, encumbrances, and security interests upon the incorporation of the Work into the Project, or upon Contractor's receipt of payment, whichever occurs earlier. Values shall be assigned to individual items of Work in a manner that will avoid any "front loading" of payments.

11.03.03 Owner shall have the right to withhold the Retainage as provided in Section 5.4(c) of the Agreement. All requests for a reduction in Retainage shall be submitted in writing for Owner's approval and shall include consent of Contractor's surety, if any.

11.03.04 Other than the equipment and materials referenced in Section 11.03.01, no Application for Payment shall include any Work that is anticipated but not yet performed as of the date of the application. Owner may reject any Application for Payment that includes such anticipated but unperformed Work.

11.03.05 This Section 11.03 notwithstanding, payment of each Application for Payment requesting a progress payment shall be subject to all of the following conditions: (a) Contractor must submit with each Application for Payment a conditional waiver and release on progress payment in strict conformity with the statutory forms prescribed by the jurisdiction in which the Project is located from (1) Contractor, and (2) any Subcontractor, material supplier and other lower tier provider of Work ("**Lower Tier Claimant(s)**") for Work furnished or performed by Contractor and the applicable Lower Tier Claimants through the end of the month for which the Application for Payment is submitted; (b) Contractor must submit with each Application for Payment an unconditional waiver and release on progress payment in strict conformity with the statutory forms prescribed by the jurisdiction in which the Project is located from (1) Contractor, and (2) all Lower Tier Claimants in the full amount shown on all conditional waivers and releases submitted by Contractor and Lower Tier Claimants in connection with prior Applications for Payment for which Owner has made payment; (c) Contractor must submit with each progress payment Application for Payment written itemizations of the amount

requested for Contractor and each Lower Tier Claimant through the cut off date of the Application for Payment for which payment is requested, with supporting invoices, billings and other documentation, reasonably requested by Owner, to validate such amounts; (d) the Work for which payment is requested must have progressed to Owner's reasonable satisfaction; and (e) Owner is entitled to deduct any applicable withholding as provided hereunder or permitted in the jurisdiction in which the Project is located.

11.04 PROGRESS PAYMENTS

11.04.01 Upon Owner's receipt and approval of a properly submitted and accurate Application for Payment, Owner shall make payment to Contractor within the time specified in Section 5.4(a) of the Agreement, but in each case less the total of payments previously made, and less amounts properly withheld under the Contract Documents.

11.04.02 Contractor shall promptly pay each Subcontractor that amount paid to Contractor on account of such Subcontractor's Work. Contractor's agreements with all Subcontractors shall require all Subcontractors to similarly make payments to their Subcontractors.

11.04.03 Neither a progress payment nor any partial or entire use or occupancy of the Project by Owner shall constitute an acceptance of Work not in accordance with the Contract Documents.

11.05 PAYMENT WITHHELD

11.05.01 Owner may withhold payment in whole or in part of amounts requested under an Application for Payment, or nullify the whole or any part of a previously approved Application for Payment based upon subsequently discovered evidence or subsequent observations, to the extent such action is necessary in Owner's opinion to protect Owner from loss due to:

- (a) unsatisfactory job progress;
- (b) defective Work or materials not remedied;
- (c) disputed Work or materials;
- (d) failure to comply with other material provisions of the Contract Documents;
- (e) third party claims filed or reasonable evidence that a claim will be filed;
- (f) failure of the Contractor or a Subcontractor to make timely payments for labor, equipment and materials;
- (g) other damage to Owner;
- (h) reasonable evidence that Work cannot be completed for the unpaid balance of the Contract Sum;
- (i) liens filed in connection with the Work;
- (j) Change Order(s) reducing the Contract Sum;
- (k) set-off claims Owner may have against Contractor arising from work performed by Contractor under other agreements;
- (l) other items entitling Owner to a set-off against the amount requested in an Application for Payment; or
- (m) Retainage, if any, provided for in the Agreement.

11.05.02 Owner shall provide Contractor with a written statement detailing Owner's reasons for withholding payment. If Contractor disputes any determination by Owner regarding any Application for Payment, Contractor shall nevertheless expeditiously continue to prosecute the Work.

11.05.03 Payment of amounts previously withheld from an Application for Payment will be made upon submittal of a new Application for Payment by Contractor after the reasons for such withholding no longer exist.

11.06 SUBSTANTIAL COMPLETION AND PARTIAL OCCUPANCY

11.06.01 When Contractor considers that the Work, or a portion thereof that Owner agrees to accept separately, has reached the point of Substantial Completion, Contractor shall prepare and submit to Owner the Punch List. Owner shall have the right to add items to the Punch List based on Owner's inspection of the Work to determine that the Work, or portion thereof, if applicable, has reached the point of Substantial Completion. The Punch List, when approved by Owner along with Owner's determination of Substantial Completion, shall be the Punch List that must be completed by Contractor by the date for Final Completion. Failure to include any items on the Punch List does not alter the responsibility of Contractor to complete all Work in accordance with the Contract Documents.

11.06.02 At any time before Substantial Completion, following written notice to Contractor, Owner shall have the right to occupy and use the Work. The preceding sentence notwithstanding, Owner may not exercise such right if occupancy or use will unduly interfere with or unduly delay completion of the Work.

11.06.03 Contractor shall, prior to and as a condition to Substantial Completion, provide Owner with sufficient training as needed to operate the various systems incorporated into the Work, including the environmental control systems and security systems, if any. Owner shall cooperate with Contractor to enable Contractor to provide such training at appropriate times and shall make itself available to receive such training at reasonable times requested by Contractor. Contractor shall have delivered to Owner all operation and maintenance instructions for equipment and apparatus prior to and as a condition of Substantial Completion.

11.06.04 Nothing contained in this Section 11.06 shall excuse Contractor from complying with the Project Schedule or the Contract Documents.

11.07 FINAL COMPLETION AND FINAL PAYMENT

11.07.01 Upon written notice from Contractor to Owner that the Work is complete, Owner will cause all required inspections to be performed by Design Professional and any other approving authority(ies) having jurisdiction over any portion of the Site or the Project (collectively, "**Approving Authority(ies)**").

11.07.02 If such inspections disclose any Work, in whole or in part, as being incomplete, defective or not in strict and absolute conformity with the Contract Documents ("**Non-conforming Work**"), Contractor will immediately correct such Non-conforming Work upon receipt of written notice thereof. Upon completion of such correction, the procedure in this Section 11.07 will be repeated until the Design Professional provides the required certification and any Approving Authority(ies) provide confirmation to Contractor of final inspection, approval and, if applicable, acceptance (including any required official action), separately or together.

11.07.03 Contractor shall not be deemed to have accomplished final completion of the Work ("**Final Completion**") unless and until the last of all of the following shall have occurred:

- (a) Design Professional has submitted to Owner an executed certification that certifies that all Work (other than the expiration of the warranty set forth in Section 15) has been completed in strict and absolute conformance with the Contract Documents, as amended by properly executed Change Orders, and including all corrections in the Work that are required (1) to remedy any defects therein or to obtain compliance with the Contract Documents; (2) to obtain a certificate of occupancy; or (3) to fulfill any of Owner's orders or directions under the Contract Documents, including any Punch List;
- (b) Design Professional has submitted to Owner an executed certification that certifies any other matters the Funding Source may require;
- (c) Owner receives written confirmation of final inspection, approval and, if applicable, acceptance from any Approving Authority(ies) (including confirmation that any required official action has taken place as necessary to effectuate final approval and acceptance of the Work by such Approving Authority(ies));

- (d) Contractor has completed all Punch List Items to the reasonable satisfaction of Owner;
- (e) Contractor has otherwise satisfied all other conditions of the Contract Documents related to the performance of the Work; and
- (f) Owner notifies Contractor of its final acceptance of the Work.

11.07.04 Upon achieving Final Completion, Contractor shall submit its final Application for Payment to Owner, together with, all of the following documents:

- (a) a conditional waiver and release on final payment in strict conformity with the statutory forms prescribed by the jurisdiction in which the project is located from (1) Contractor, and (2) all Lower Tier Claimants for all Work furnished or performed by Contractor and Lower Tier Claimants as described under such Application for Payment;
- (b) security that is sufficient to discharge the Project Site from any lien that shall have been filed and not settled or discharged when the Work is otherwise complete, including bonds issued by a bonding company satisfactory to Owner or such other security in an amount equal to 150% of the amount of any such claim, including interest on such claim as estimated by Owner, and which bond or other security shall be in form and substance satisfactory to Owner and subject to such increase as Owner may from time to time require as interest accrues on such claim;
- (c) consent of Contractor's surety, if any, to final payment;
- (d) all final drawings with notations and corrections showing the Work "as built" and Contractor's record drawings; and operating manuals, warranties, maintenance instructions for equipment and apparatus and all permits, licenses, approvals, certificates and authorizations required by any Applicable Laws and other deliverables required by the Contract Documents.

11.07.05 Upon Owner and any Funding Source approving Contractor's properly submitted and accurate final Application for Payment, Owner shall make final payment to Contractor, including any Retainage, within the time provided for in Section 5.5 of the Agreement.

11.07.06 If Owner so requires and notwithstanding the foregoing Section 11.07.05, Owner shall not be obligated to make final payment to Contractor until (a) Owner shall have completed an audit of Contractor's books and records related to the Project (provided, however, that if Owner shall not have completed an audit of Contractor's books and records within thirty (30) days of the date when all other conditions to the final payment have been made, then Owner shall be deemed to have waived its right under this Section 11.07.06 to require a completed audit as a condition to making the final payment, which waiver shall not affect Owner's ability to subsequently complete an audit of Contractor's books and records related to the Project); and (b) Contractor delivers a certificate to Owner certifying the Work has been completed in strict and absolute accordance with the Contract Documents, including any properly authorized changes thereto, and certifying any other matter the Funding Source may require.

11.07.07 Contractor must submit at the time Contractor receives final payment, an unconditional waiver and release on the final payment from Contractor in strict conformity with the statutory forms prescribed by the jurisdiction in which the project is located. Contractor must submit within fifteen (15) days of Contractor's receipt of final payment, an unconditional waiver and release on final payment in strict conformity with the statutory forms prescribed by the jurisdiction in which the project is located from each Lower Tier Claimant showing that all lien rights and other claims against the Project site with respect to the Work are released through the Final Completion Date and that there are no disputed claims

11.07.08 The acceptance of final payment by Contractor shall constitute a waiver of all claims by Contractor against Owner.

ARTICLE 12
PROTECTION OF PERSONS AND PROPERTY

12.01 SAFETY PRECAUTIONS AND PROGRAMS

Contractor recognizes the importance of performing the Work in a safe manner so as to prevent damage, injury or loss to: (a) all individuals at the Site, whether working at or visiting the Site; (b) the Work, including equipment and materials stored on or off the Site; and (c) all other property at the Site or adjacent thereto.

12.02 SAFETY OF PERSONS AND PROPERTY

12.02.01 Contractor and Subcontractors shall comply with all Applicable Laws relating to safety, as well as any Owner-specific safety requirements set forth in the Contract Documents. Contractor will immediately report in writing any safety-related injury, loss, damage or accident arising from the Work to Owner's Representative and, to the extent mandated by Applicable Laws, to all government or quasi-government authorities having jurisdiction over safety-related matters involving the Project or the Work.

12.02.02 Contractor's responsibility for safety under this Section 12.02 is not intended in any way to relieve any Subcontractors from their own contractual and legal obligations and responsibilities for: (a) complying with all Applicable Laws, including those related to health and safety matters; and (b) taking all necessary measures to implement and monitor all safety precautions and programs to guard against injury, losses, damages or accidents resulting from their performance of the Work.

12.02.03 Contractor shall give all notices and comply with all Applicable Laws (including all applicable regulations of OSHA) and all rules, regulations and orders of Owner bearing on the safety of persons and property or their protection from damage, injury or loss.

12.02.04 Contractor shall erect and maintain, as required by existing conditions and progress of the Work, all reasonable safeguards for safety and protection, including posting of relevant signs warning against hazards in the Work or on or around the Project.

12.02.05 From time-to-time whenever all or any portion of the Project or adjacent area is open for business to the public prior to completion of the Work, Contractor shall furnish and install: (a) flashing barricades along all drives and pedestrian walkways that are adjacent to any construction areas; (b) danger signs and hard hat area signs to the extent required to safeguard the Site and people in or around the Site; and (c) wire mesh or snow fence type construction fence, or such other fence as Owner may reasonably require, to keep the public from entering the area of construction with respect to the Project. Contractor shall keep the foregoing signs and barricades in good condition and repair.

ARTICLE 13
INSURANCE AND BONDS

13.01 CONTRACTOR'S INSURANCE REQUIREMENTS

13.01.01 Contractor and the Subcontractors of every tier shall purchase and maintain for the time periods provided herein, at Contractor's and such Subcontractors' sole cost and expense, insurance in the coverage, limits, and terms set forth as follows:

- (a) Workmen's Compensation Insurance affording statutory coverage and containing not less than statutory limits for the state(s) in which the Work is being conducted, and Employer's Liability Insurance in the amount of not less than \$1,000,000 each accident for bodily injury, \$1,000,000 each employee for bodily injury by disease, and \$1,000,000 policy limit for bodily injury by disease per person;
- (b) Commercial General Liability ("CGL") Insurance with limits of liability of not less than \$1,000,000 per occurrence and \$5,000,000 annual aggregate. CGL insurance shall be written on an ISO occurrence form CG 00 01 1204 (or a substitute form providing equivalent coverage) and shall cover bodily injury and property damages arising from premises operations, independent contractor's, products-completed

operations, personal and advertising injury and liability assumed under an insured contract (including tort liability of another assumed in a contract);

- (c) Automobile Liability Insurance including coverage for owned, non-owned and hired autos in an amount not less than \$1,000,000 per occurrence, combined single limit liability covering bodily injury and property damage; and
- (d) Umbrella Insurance in the amount of \$5,000,000 per occurrence.

13.01.02 Failure to comply with Section 13.01.01 shall be a material breach of the Agreement.

13.01.03 If any part of the Work is performed pursuant to a subcontract agreement, insurance shall be provided by or on behalf of Subcontractor(s) to cover the part of the Work each has contracted to perform and shall be maintained until Final Completion. The type of insurance required is as described herein, and shall cover the amounts as specified.

13.01.04 Certificates of Insurance evidencing the required coverages shall be submitted prior to the commencement of the Work. The original and all required updates shall be sent to the Owner's Representative.

13.01.05 Contractor's insurance shall:

- (a) name the Indemnified Parties. Additional Insured under the CGL insurance using ISO additional insured endorsement CG 2037 0704 or a substitute providing equivalent coverage;
- (b) state that Owner will be provided at least thirty (30) days advance written notice of a cancellation or modification of the insurance;
- (c) apply as primary coverage without right of contribution from any other Owner insurance or self-insurance program;
- (d) be provided by an insurance company authorized to issue insurance in Arizona from a carrier having an A.M. Best Rating of at least A-.

13.01.06 The furnishing of the required Certificates of Insurance by Contractor shall in no way reduce Contractor's liabilities or obligations under the Agreement.

13.01.07 Contractor shall not violate, or permit to be violated, any conditions of any required insurance policies, and shall at all times satisfy the requirements of the insurance companies writing such policies.

13.01.08 If Contractor fails to furnish and maintain the insurance required herein or to furnish satisfactory evidence thereof, Owner shall have the right (but not the obligation) to procure and maintain the same for all parties on behalf of Contractor, at Contractor's cost and expense, and Contractor agrees to furnish all necessary information required to effect such insurance coverage.

13.02 OWNER'S INSURANCE

Owner shall pay for and maintain Owner's customary liability insurance. Owner may provide a "Builder Risk" policy. Insurance maintained by Owner is for the exclusive benefit of Owner and will not inure to the benefit of Contractor.

13.03 PERFORMANCE BONDS AND LABOR AND MATERIAL PAYMENT BONDS Pursuant to Article 8 of the Agreement, Contractor shall furnish Owner with performance and labor and material payment bonds, as applicable, covering the faithful performance and payment obligations under the Contract Documents of Contractor or any Subcontractor as required by Owner. All such bonds shall be in an amount, form and from a surety satisfactory to Owner and the Funding Source. All such bonds shall remain in full force and effect during the term of any warranty arising under the Contract Documents.

13.04 WAIVER OF SUBROGATION

Contractor waives all rights against the Indemnified Parties for recovery of damages to the extent such damages are covered by the Workmen's Compensation Insurance and Employers' Liability Insurance described herein. In connection therewith, Contractor shall obtain a Waiver of Subrogation endorsement equivalent to WC 00 03 13 for the benefit of the Indemnified Parties to effectuate such waiver. Owner and Contractor each waives, as against the other and all other named insureds, its right to recover from the other for loss or damage (notwithstanding that such loss or damage may result in whole or in part from negligence) to the extent covered by the remaining insurance coverages described herein.

ARTICLE 14 CHANGES IN THE WORK

14.01 CHANGE ORDERS

14.01.01 A "Change Order" is a written amendment to the Agreement signed by Owner and Contractor or their respective authorized Project representatives. The Contract Sum may be adjusted pursuant to a properly executed Change Order if Owner requests a change in the Work affecting the Contract Sum. The Contract Time may be adjusted as provided in Section 10.02.

14.01.02 Except in an emergency endangering life or property, in which case the Contractor shall proceed at its reasonable discretion to prevent threatened damage, injury or loss, Contractor shall provide Owner with written notice requesting a Change Order within seven (7) days after commencement of the occurrence giving rise to such request. Such notice shall (a) describe, with particularity, such occurrence and the probable effect the occurrence will have on the overall progress of the Work, and (b) include an estimate of any additional costs and expenses Contractor will incur as a result of the occurrence, as well as, such other written documentation as Owner may reasonably request to validate Contractor's Change Order request and to permit Owner to perform a cost or price analysis pursuant to 24 C.F.R. 85.36(f).

14.01.03 Provided Owner has received timely and proper notice, within thirty (30) days after receiving Contractor's Change Order request, Owner shall determine, in Owner's reasonable discretion, whether a Change Order should be executed.

14.01.04 The cost or credit to Owner resulting from a change in the Work shall be in accordance with Section 17.03.01 herein and the following:

- (a) If applicable unit prices are provided for in the Contract Documents or subsequently agreed upon, the proposal shall reflect all computations and extensions used by Contractor in arriving at the stated adjustment. Unit prices shall include all overhead, profit and all other costs applicable to the Work, and no additional mark-ups shall be added to the unit price proposals;
- (b) If applicable unit prices are not provided for in the Contract Documents or subsequently agreed upon, an itemized lump sum proposal shall be submitted. The lump sum proposal must itemize and substantiate all probable direct costs for labor, materials, tools and equipment anticipated as a result of the change and include Contractor's overhead and fee.

14.01.05 If an occurrence giving rise to a Change Order results in a modification of the original scope of the Agreement, the Change Order shall be subject to 24 C.F.R. 84.43 and 24 C.F.R. 85.36(d) in addition to the requirements of the Agreement.

14.01.06 If Owner and Contractor execute a Change Order, the Change Order may, as applicable, adjust the Contract Time by the amount of time the overall progress of the Work has been delayed, and/or equitably adjust the Contract Sum. Under no circumstance, however, shall the occurrence of the following circumstances or conditions justify a Change Order: (a) discovery of any error made by Contractor in determining the sufficiency of the time provided in the Agreement for accomplishing Substantial Completion or Final Completion; or (b) any delay caused by an alleged shortage of material, equipment or labor (for any reason). Upon execution of a Change Order, Contractor shall promptly proceed with the Work described thereunder. Owner shall receive a credit against the Contract Sum in the amount of any net

decrease in the Contract Sum resulting from all Change Orders entered into under the Agreement (i.e., the amount by which all deductive Change Orders, if any, exceed all additive Change Orders, if any).

14.01.07 No person other than Owner's Representative shall have any authority to authorize or approve a Change Order on behalf of Owner. Contractor shall not commence any Work that may be subject to a Change Order as described in this Section 14.01, unless and until a Change Order is entered into.

14.02 MINOR CHANGES IN THE WORK

Owner will have authority to order minor changes in the Work, provided such changes do not involve an adjustment in the Contract Sum or an extension of the Contract Time and are not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order executed by Owner, and shall be binding on Owner and Contractor. Contractor shall carry out such written orders promptly.

ARTICLE 15 UNCOVERING OF WORK AND CORRECTION OF WORK

15.01 UNCOVERING OF WORK

15.01.01 If a portion of the Work is covered contrary to Owner's request or to requirements specifically expressed in the Contract Documents, upon Owner's written request, Contractor shall uncover it for Owner's examination and replace it at Contractor's expense without adjustment to the Contract Sum or Contract Time.

15.01.02 If a portion of the Work that Owner has not specifically requested to examine prior to it being covered has been covered, Owner may request to see such Work and Contractor shall uncover it. If such Work is in accordance with the Contract Documents, the cost of uncovering and replacement shall, by appropriate Change Order, be at Owner's expense. If such Work is not in accordance with the Contract Documents, the cost of uncovering and replacement shall be at Contractor's expense.

15.02 CORRECTION OF WORK

15.02.01 Contractor agrees to correct any Non-conforming Work that is discovered within a period of **Eighteen (18) Months** from the date of Final Completion, or within such longer period to the extent required by the Contract Documents. Contractor shall bear all costs and expenses related to correcting such Non-conforming Work, including those related to remedying all work of Owner or separate contractors destroyed or damaged by such correction, additional testing and inspections, and compensation for the Design Professional's services and expenses made necessary thereby.

15.02.02 The **Eighteen (18) Month** period referenced in Section 15.02.01 above applies only to Contractor's obligation to correct Non-conforming Work and is not intended to constitute a period of limitations for any other rights or remedies Owner may have regarding Contractor's other obligations under the Contract Documents.

15.02.03 Contractor shall take meaningful steps to commence correction of Non-conforming Work, before or after Final Completion, including the correction, removal or replacement of the Non-conforming Work and any damage caused to other parts of the Work affected by the Non-conforming Work, within seven (7) days of receipt of Owner's written notice that the Work is not in conformance with the Contract Documents. If Contractor fails to commence the necessary steps within such seven (7) day period, Owner, in addition to any other remedies provided under the Contract Documents, may provide Contractor with written notice that Owner will commence correction of such Non-conforming Work with its own forces. If Owner does perform such corrective Work, Contractor shall be responsible for all reasonable costs incurred by Owner in performing such correction. If the Non-conforming Work creates an emergency requiring an immediate response, the seven (7) day periods identified herein shall be deemed inapplicable and any required emergency corrective Work shall be performed by Contractor within twenty-four (24) hours of Owner's notice; if such corrective Work is not performed within such time, Owner may perform such Work as provided in this Section 15.02.03.

ARTICLE 16
STOP ORDER; TERMINATION OF THE CONTRACT

16.01 OWNER'S RIGHT TO STOP WORK

The Owner may issue a stop order ("**Stop Order**") requiring Contractor to stop Work immediately on that portion of the Work defined in the Stop Order. In such event, Owner shall not be obligated to consider any claim from Contractor for additional compensation if Owner provides Contractor with written notice to resume performance of such Work within 120 days of the Stop Order. Stop Orders shall be hand delivered to the Contractor for acknowledgment and no Work shall be performed after the date of acknowledgment without Owner's written authorization to proceed. No verbal authorization will be recognized for the stoppage or restart of Work.

16.02 OWNER'S RIGHT TO TERMINATE FOR CONVENIENCE

16.02.01 Upon written notice to Contractor, Owner may, for its convenience and without cause, elect to terminate all or part of the Agreement. In the event of a termination under this Section 16.02.01, Contractor shall, unless the notice of termination directs otherwise, immediately discontinue the performance of the Work and the placing of orders for labor, equipment and materials, or other items in connection with the performance under the Contract Documents. If requested by Owner, Contractor shall make every reasonable effort to procure the cancellation or termination of all existing orders and subcontracts upon commercially reasonable terms and shall thereafter perform only such Work as may be necessary to preserve and protect any Work already in progress.

16.02.02 In the event of any termination under Section 16.02.01, Owner shall pay Contractor only for the Work executed to the date of such termination. In no event shall Contractor be entitled to any fee, overhead, expense or profit on Work not performed. Owner shall not reimburse Contractor on account of alleged continuing contractual commitment claims with respect to Subcontractors or cancellation penalties or damages related thereto.

16.03 OWNER'S RIGHT TO PERFORM AND TERMINATE FOR CAUSE

16.03.01 Owner shall have the rights set forth in Sections 16.03.02 and 16.03.03 below, in addition to any other rights and remedies provided in the Contract Documents or under Applicable Laws, if Contractor fails to: (a) provide a sufficient number of skilled workers; (b) supply the materials required by the Contract Documents; (c) comply with Applicable Laws; (d) timely pay Subcontractors without cause; (e) prosecute the Work with promptness and diligence to ensure that the Work is completed by the Contract Time(s), as such time(s) may be adjusted; or (f) perform material obligations under the Contract Documents.

16.03.02 Upon the occurrence of an event set forth in Section 16.03.01 above, Owner may provide written notice to Contractor that it intends to terminate the Agreement unless the problem cited is cured, or commenced to be cured, within seven (7) days of Contractor's receipt of such notice. If Contractor fails to cure, or reasonably commence to cure, such problem, then Owner may declare the Agreement terminated for default by providing written notice to Contractor of such declaration.

16.03.03 Upon declaring the Agreement terminated pursuant to Section 16.03.02 above, Owner may (a) enter upon the Site and take possession, for the purpose of completing the Work, of all equipment and materials, scaffolds, tools, appliances and other items thereon, that have been purchased or provided for the performance of the Work, all of which Contractor hereby transfers, assigns and sets over to Owner for such purpose; and (b) employ any person or persons to complete the Work and provide all of the required labor, services, equipment and materials, and other items. In the event of such termination, Contractor shall not be entitled to receive any further payments under the Contract Documents until the Work shall be finally completed in accordance with the Contract Documents. At such time, if the unpaid balance of the Contract Sum exceeds the cost and expense incurred by Owner in completing the Work, such excess shall be paid by Owner to Contractor. If Owner's cost and expense of completing the Work exceeds the unpaid balance of the Contract Sum, then Contractor shall be obligated to pay the difference to Owner. Such cost and expense shall include not only the cost of completing the Work, but also losses, damages, costs and expenses, including reasonable attorneys' fees and expenses, incurred by Owner in connection with the re-procurement and defense of claims arising from Contractor's default.

16.03.04 If Owner improperly terminates the Agreement for cause, the termination for cause will be converted to a termination for convenience in accordance with the provisions of Section 16.02 above.

16.04 CONTRACTOR'S RIGHT TO STOP WORK OR TERMINATE

Notwithstanding anything to the contrary in the Contract Documents, Contractor shall not have a right, and hereby waives any such right, to suspend the Work, terminate the Agreement because of Owner's default, or take any other action that would stop or slowdown its performance of the Work because of a dispute with Owner or a claim that Owner is in default and/or breach of contract, provided Owner continues to make undisputed payments on account of the Contract Sum as provided for in the Agreement. Contractor agrees that its sole remedy shall be to pursue recourse against Owner available under Article 10 of the Agreement.

16.05 BANKRUPTCY OF OWNER OR CONTRACTOR

16.05.01 If either Owner or Contractor institutes or has instituted against it a case under the United States Bankruptcy Code (such party being referred to as the "**Bankrupt Party**"), such event may impair or frustrate the Bankrupt Party's ability to perform its obligations under the Contract Documents. Accordingly, should such event occur:

- (a) The Bankrupt Party, its trustee or other successor, shall furnish, upon request of the non-Bankrupt Party, adequate assurance of the ability of the Bankrupt Party to perform all future material obligations under the Contract Documents, which assurances shall be provided within ten (10) days after receiving notice of the request; and
- (b) The Bankrupt Party shall file an appropriate action within the bankruptcy court to seek assumption or rejection of the Agreement within sixty (60) days of the institution of the bankruptcy filing and shall diligently prosecute such action.

16.05.02 If the Bankrupt Party fails to comply with its obligations in Section 16.05.01, the non-Bankrupt Party shall be entitled to request the bankruptcy court to reject the Agreement, declare the Agreement terminated and pursue any other recourse available to the non-Bankrupt Party under this Article 16.

16.05.03 The rights and remedies under Section 16.05.01 above shall not be deemed to limit the ability of the non-Bankrupt Party to seek any other rights and remedies provided by the Contract Documents or by law, including its ability to seek relief from any automatic stays under the United States Bankruptcy Code.

ARTICLE 17

FEDERAL REQUIREMENTS, NAVAJO AND INDIAN PREFERENCE AND NPEA

17.01 PROHIBITION AGAINST LIENS

Contractor hereby acknowledges that Applicable Laws prohibit Contractor and its Subcontractors from placing a lien on the Site. This prohibition shall be placed in all contracts Contractor enters into in connection with the Work performed under the Agreement.

17.02 EMPLOYMENT RIGHTS

Contractor shall meet with the Navajo Nation's Office of Navajo Labor Relations to discuss Contractor's obligations under NPEA prior to performing Work under the Agreement.

17.03 CONTRACT PROVISIONS REQUIRED BY 2 C.F.R. §200.317 - 326

By signing the Agreement, Contractor acknowledges that the Agreement is subject to the following specific Applicable Laws, to which Contractor is hereby bound.

17.03.01 CONTRACT ADJUSTMENTS; ADDITIONAL SERVICES

Notwithstanding any other term or condition of the Agreement, any settlement or equitable adjustment of amounts owing under the Agreement due to termination, suspension or delays by Owner and any Change Order modifying the Contract Sum shall be negotiated based on the cost principles stated at 48 C.F.R. Subpart 31.2 and conform to the contract pricing provisions of 2 C.F.R. §200.323. Contractor shall provide supporting cost information in sufficient detail to permit Owner to perform the required cost or price analysis.

17.03.02 REMEDIES

In accordance with 2 C.F.R. § 200.317 - 326, the Agreement contains administrative, contractual or legal remedies for instances in which Contractor violates or breaches the Agreement, and provides for such sanctions and penalties as may be appropriate.

17.03.03 EQUAL EMPLOYMENT OPPORTUNITY

Pursuant to 2 C.F.R. §200.326, Contractor and all Subcontractors of every tier shall comply with Executive Order 11246 of September 24, 1965, entitled "Equal Employment Opportunity," as amended by Executive Order 11375 of October 13, 1967, and as supplemented in Department of Labor regulations (41 C.F.R. Chapter 60).

17.03.04 COPELAND ANTI-KICKBACK ACT

Pursuant to 2 C.F.R. §200.326, Contractor and all Subcontractors of every tier shall comply with the Copeland "Anti-Kickback" Act (18 U.S.C. § 874), as supplemented in Department of Labor regulations (29 C.F.R. Part 3).

17.03.05 CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

Pursuant to 2 C.F.R. §200.326, and 24 C.F.R. 1000.16(c), Contractor and all Subcontractors of every tier shall comply with Sections 103 and 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. §§ 327-330), as supplemented by Department of Labor regulations (29 C.F.R. Part 5).

17.03.06 RECORDS RETENTION AND ACCESS

Contractor's accounting records regarding the Work performed hereunder shall be kept and maintained in accordance with generally accepted accounting principles consistently applied. Pursuant to 24 C.F.R. 85.36(i)(10) and (11), access shall be given by Contractor to Owner, HUD, the Comptroller General of the United States, or any of their duly authorized representatives, to any books, documents, papers, and records of Contractor that are directly pertinent to the contract between Owner and HUD for the purpose of making an audit, examination, excerpts, and transcriptions. All required records shall be retained for three (3) years after Owner, Contractor or other sub-grantees under the contract between Owner and HUD make final payment and all other pending matters are closed.

17.03.07 CLEAN AIR ACT AND CLEAN WATER ACT

Pursuant to 2 C.F.R. §200.326, Contractor shall comply with applicable standards, orders, or requirements issued under Section 306 of the Clean Air Act (42 U.S.C. § 1857(h)), Section 508 of the Clean Water Act (33 U.S.C. § 1368), Executive Order 11738, and Environmental Protection Agency regulations (40 C.F.R. Part 15).

17.03.08 ENERGY EFFICIENCY

Contractor shall comply with the mandatory standards and policies relating to energy efficiency which are contained in the energy conservation plan issued in compliance with the Energy Policy and Conservation Act (Pub. L. 94-163) for the State in which the work under the contract is performed.

17.04 ADDITIONAL PROVISIONS REQUIRED BY 24 C.F.R. PART 1000

By signing the Agreement, Contractor acknowledges that the Agreement is subject to the following specific Applicable Laws, to which Contractor is hereby bound.

17.04.01 DEBARRED, SUSPENDED OR INELIGIBLE CONTRACTORS

Pursuant to 24 C.F.R. 1000.44, Contractor shall comply with 24 C.F.R. Part 24, Subpart C regarding the use of debarred, suspended or ineligible subcontractors.

17.04.02 NAVAJO PREFERENCE AND INDIAN PREFERENCE

Pursuant to 24 C.F.R. § 1000.52, the Services to be performed under this Agreement are for a project subject to and in accordance with Section 101 (k) of NAHASDA, which provides a recipient shall apply the tribal employment and contract preference laws (including regulations and tribal ordinances) adopted by the Indian tribe that received a benefit from funds granted to the recipient under NAHASDA.

(a) The NHA shall apply the contracting preference laws of the Navajo Nation, which require that business entities with the Navajo Nation, including NHA, provide certified Navajo-owned businesses priority preference in the award of contracts, as well as preference to certified Indian-owned businesses. Navajo Business Opportunity Act, 5 N.N.C § 201 *et. seq.*

(b) In connection with the performance of this Agreement, the parties shall, to the greatest extent feasible, provide preference and opportunities for training and employment to Navajos and preferences in the award of contracts and subcontracts shall be given to Navajo organizations and Navajo-owned Economic Enterprises. Navajo Preference in Employment Act, 15. N.N.C. § 601 *et. seq.*

(c) The parties to this Agreement shall comply with provisions of Section 16.6, and all HUD requirements.

(d) These Navajo and Indian preference requirements shall be incorporated into every subcontract entered by General Contractor in connection with the Services.

(e) Upon a finding by Owner, the Navajo Nation, or HUD that General Contractor or and any Sub-Consultant is not in compliance with Section 16.6, General Contractor shall, at the direction of Owner, take appropriate remedial action pursuant to this Agreement.

ARTICLE 18 UNDUE INFLUENCE

Contractor shall not, directly or indirectly, provide funds or other consideration to any person or entity (including, but not limited to, Owner, Owner's Representative, and Owner's employees and agents), to improperly procure special or unusual treatment with respect to the Contract Documents or for the purpose of otherwise improperly influencing the relationship between Owner and Contractor. Additionally, Contractor shall cause all of its officers, directors, employees, members, partners, agents and Subcontractors of any tier (as the case may be) to comply with the restrictions contained in the preceding sentence. Contractor represents and warrants to Owner that Contractor, its officers, directors, employees, members, partners, agents, and Subcontractors have not at any time in the past directly or indirectly provided funds or other consideration to any person or entity to improperly procure special or unusual treatment with respect to the Contract Documents or for the purpose of otherwise improperly influencing the relationship between Owner and Contractor.

ARTICLE 19 BYRD ANTI-LOBBYING AMENDMENT

19.1 INTEREST OF MEMBERS OF CONGRESS

No member of or delegate to the Congress of the United States of America shall be admitted to any share or part of this contract or to any benefit that may arise therefrom.

19.2 INTEREST OF MEMBERS, OFFICERS, OR EMPLOYEES, AND FORMER MEMBER, OFFICERS OR EMPLOYEES

No member, officer, or employee of the Navajo Housing Authority, no member of the governing body of the locality in which the projects is situated, no member of the governing body of the locality in which the Housing Authority was activated, and no other public official of such locality or localities who exercises any functions or responsibilities with respect to the projects, shall, during his or her tenure, or for one year thereafter, have any interest, direct or indirect, in this

contract or the proceeds thereof.

19.3 LIMITATIONS ON PAYMENTS MADE TO INFLUENCE CERTAIN FEDERAL FINANCIAL TRANSACTIONS

19.3.01 The Contractor agrees to comply with Section 1352 of Title 31, United States Code which prohibits the use of Federal appropriated funds to pay any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, and officer or employee of Congress, or an employee of a Member of Congress in connection with any of the following covered Federal actions: the awarding of any Federal contract; the making of any Federal Grant; the making of any Federal loan; the entering into of any cooperative agreement; or the modification of any Federal contract, grant, loan, or cooperative agreement.

19.3.02 The Contactor further agrees to comply with the requirement of the Act to furnish a disclosure (OMB Standard Form LLL, Disclosure of Lobbying Activities) if any funds other than Federal appropriated funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, A Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a Federal contract, grant, loan, or cooperative agreement.

Exhibit "C"

SCHEDULE OF VALUES

SAMPLE

Exhibit "D"

PROJECT MANUAL

SAMPLE

Exhibit "E"
PLANS & DRAWINGS INDEX

SAMPLE

Exhibit "F"

APPLICATION FOR PAYMENT

SAMPLE

Exhibit "G"

PROJECT SCHEDULE

SAMPLE

Exhibit "H"

BONDS & INSURANCE

SAMPLE

Exhibit "I"

DAVIS BACON WAGE RATES

SAMPLE

Exhibit "J"

CHANGE ORDER

SAMPLE

PERFORMANCE AND PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: That we, _____
_____ AS PRINCIPAL and _____
_____, AS SURETY, are held firmly bound unto

NAVAJO HOUSING AUTHORITY
P.O. BOX 4980
WINDOW ROCK, ARIZONA 86515

Hereinafter called the "Owner" in the penal sum of _____
(\$ _____) Dollars, for the payment of which sum we bind ourselves, our heirs, executors, administrators,
and successors, jointly and severally.

WHEREAS, the Principal has entered into a certain Contract with the Owner, dated _____, a copy
of which is hereto attached and made a part of hereof.

NOW THEREFORE, the condition of this obligation is such that if the Principal shall in all respects fully perform the
Contract and all duly authorized modifications thereof, during its original term and any extensions thereof that may be
granted and during any guaranty period for which the Contract provides, and if the Principal shall fully satisfy all claims
arising out of the prosecution of the work under the Contract and shall fully indemnify the Owner for all expenses which it
may incur by reason of such claims, including its attorney's fees and court costs, and if the Principal shall make full
payment to all person supplying labor, services, materials, or equipment in the prosecution of the work under the Contract,
in default of which such persons shall have a direct right of action hereupon; and if the Principal shall pay or cause to be
paid all sales and use taxes payable as a result of the performance of the Contract as well as payment of gasoline and special
motor fuels taxes in the performance of the Contract and all motor vehicle fees required for Contract, then this obligation
shall be void; otherwise, it shall remain in full force and effect. No modification of the Contract or extension of neither the
term thereof, nor any forbearance on the part of the Owner shall in any way release the Principal or the Surety from liability
hereunder. Notice to the Surety of any such modification, extension, or forbearance is hereby waived.

IN WITNESS WHEREOF, the aforesaid Principal and Surety have executed this instrument and affixed their seals hereto,
this _____ day of _____.

WITNESS:

Individual Principal

Business Address

By: (Affix by Seal)

ATTEST

Corporate Principal

Business Address

By: (Affix Corporate Seal)

ATTEST:

Corporate Surety

By: _____

Title: _____

Business Address

The rate of premium on this bond is \$ _____.

The total amount of premium charges is \$ _____.

(The above is to be filled in by Surety Company. Power-of-Attorney of person signing for the Surety Company must be attached).

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, _____, certify that I am the Secretary of the corporation named as Principal in the a foregoing bond; and that _____ who signed the said bond on behalf of the Principal, was then _____ of said corporation; that I know his signature there to is genuine; and that said bond was fully signed, sealed and attested for and in behalf of said corporation by authority of its governed body.

By: _____
Affix Corporate Seal

ALTERNATIVE PERFORMANCE AND PAYMENT SECURITY

LETTER OF CREDIT

PROJECT NAME & NO: _____

COMPLETION ASSURANCE AGREEMENT

THIS AGREEMENT made this ___ day of _____, by and between the NAVAJO HOUSING AUTHORITY AND _____;
(CONTRACTOR)

WITNESSETH

WHEREAS, the General Contractor and NAVAJO HOUSING AUTHORITY have entered into a Construction Contract date _____, providing for Project: _____ described in such contract; and

WHEREAS, the General Contractor desires to meet his obligations to supply 100 percent Performance and Payment Bonds with a substitution of another form of security; and

WHEREAS, the NAVAJO HOUSING AUTHORITY has determined that a letter of credit arrangement would provide sufficient security in lieu of a performance and payment bond.

NOW THEREFORE, in consideration of the mutual promises and undertaking herein contained, and for the propose of inducing the NAVAJO HOUSING AUTHORITY to substitute a letter of credit arrangement for a performance and payment bond, the parties hereto agree that:

1. The General Contractor has provided the NAVAJO HOUSING AUTHORITY with an unconditional, irrevocable, straight Letter of Credit (FUND), issued by a banking institution in the amount of _____ and **00/100 (\$0.00)** to secure and indemnify the NAVAJO HOUSING AUTHORITY for any expenses, lost or damage suffered or sustained as a result of any default by the General Contractor in the performance of its obligations under the Construction Contract. It is expressly understood and agreed that the Fund shall at all times be under the control of the NAVAJO HOUSING AUTHORITY.
2. All disbursements from the Fund shall be authorized and made by the NAVAJO HOUSING AUTHORITY.
3. The Fund shall be maintained as a separate trust account and may be drawn in increments up to its aggregate amount of the aggregate may be drawn. Any incremented draw will not impair or diminish the right of the NAVAJO HOUSING AUTHORITY to make subsequent draws in any amount(s) up to the aggregate amount of the Fund. The proceeds of a draw may be disbursed as follows:
 - a. To the General Contractor during the course of construction to promote the completion of the project, as may be deemed necessary by the NAVAJO HOUSING AUTHORITY.
 - b. To the NAVAJO HOUSING AUTHORITY the entire Fund or balance remaining therein in the event of a default by the General Contractor under the Construction Contract to be used by the NAVAJO HOUSING AUTHORITY to indemnify for any loss, damage or

expense whatsoever which it may suffer by reason of the General Contractor's failure to perform the Construction Contract.

- c. To the General Contractor the balance of such Fund remaining after three months from the date of substantial completion, as defined in **ARTICLE 11, Section 11.06** of the Construction Contract, so long as the Project is free and clear of any liens, claims or encumbrances whatsoever, There shall be withheld from the payment of said balance an amount equal to 2 ½ percent of the total amount of the Construction Contract, which sum is to be retained in account for a period of eighteen (18) months from the date of substantial completion. Said sum shall be held as a Fund to guarantee against defects in construction due to faulty material or workmanship or damage to the premises resulting from such defects, which defects or damage become apparent within one year after the date of substantial completion. Said sum may be used for the correction of defects or damage in the event the General Contractor fails to make such corrections. The General Contractor's liability for such corrections is not limited by the amount of such sum.
4. It is agreed the General Contractor may provide a separate unconditional and irrevocable Letter of Credit to satisfy the requirement, set forth in paragraph 3(c) above, that 2 ½ percent of the total Construction Contract amount, for latent defects, be retained for eighteen (18) months beyond the date of substantial completion. If such separate unconditional and irrevocable Letter of Credit is provided, it must be delivered to and approved in writing by the NAVAJO HOUSING AUTHORITY and made subject to this completion Assurance Agreement before any balance remaining in the Fund is released to the General Contractor or the Fund Cancelled.
5. Any other provision of this Agreement, notwithstanding, it is understood and agreed that no funds may be disbursed to the General Contractor so long as there are any outstanding liens, claims or encumbrances against the Project, written notice of which have been received by the NAVAJO HOUSING AUTHORITY. If any such claims, liens, and encumbrances have not been removed or resolved, and written notice of such removal or resolution is not received by the NAVAJO HOUSING AUTHORITY, by the date of substantial completion, the NAVAJO HOUSING AUTHORITY may in its sole discretion exercise any of its right under **ARTICLE 11, Section 11.06** of the Construction Contract, General Conditions.
6. It is expressly understood by all parties hereto that in the event of a default by the General Contractor in any of its obligations under the Construction Contract, the entire Fund, any part thereof, or balance remaining therein may, at the option of the NAVAJO HOUSING AUTHORITY may be disbursed to it upon written request with an assignment of all rights granted to the NAVAJO HOUSING AUTHORITY.
7. This agreement shall not alter or limit the obligations and liabilities of General Contractor under the Construction Contract, but shall be deemed to be additional security for the performance by the General Contractor of its obligations thereunder.
8. It is understood and agreed that in the event the Fund is held by a depositary, that the depositary is not charged with any duty or responsibility to see to the performance of or compliance with any agreements between any of the parties hereto other than that of paying over the Fund as directed in writing by the NAVAJO HOUSING AUTHORITY nor to see to the application of the Fund after making disbursements as so directed. It is expressly understood and agreed that any claim, controversy, dispute or disagreement which may exist between the General Contractor and the NAVAJO HOUSING AUTHORITY shall have no effect whatsoever upon the obligation of the Depositary to pay the NAVAJO HOUSING

AUTHORITY promptly upon receipt of a notice issued pursuant to the terms of the Fund and this agreement.

9. Notwithstanding any other provisions of the Construction Contract, it is agreed the Fund will be administered pursuant to the terms of the Fund, this Agreement and any consistent provisions of the Construction Contract. Any inconsistent provisions in the Construction Contract shall be superseded and controlled by the Fund and this Agreement. It is expressly agreed that reference to this Agreement or collateral Construction Contract documents does not make the issuance of the Fund conditional.

(CONTRACTOR)

BY _____

NAVAJO HOUSING AUTHORITY

BY _____
(Contracting Officer)

WAGE RATES

"General Decision Number: AZ20240022 01/12/2024

Superseded General Decision Number: AZ20230022

State: Arizona

Construction Type: Building
BUILDING CONSTRUCTION, Includes Building Construction on
Treatment Plants and on Industrial Sites
(Chemical/Processing/Manufacturing Plants, Power Plants,
Refineries, Nuclear Plants, Etc.)

County: Apache County in Arizona.

BUILDING CONSTRUCTION PROJECTS (does not include single family
homes or apartments up to and including 4 stories).

Note: Contracts subject to the Davis-Bacon Act are generally
required to pay at least the applicable minimum wage rate
required under Executive Order 14026 or Executive Order 13658.
Please note that these Executive Orders apply to covered
contracts entered into by the federal government that are
subject to the Davis-Bacon Act itself, but do not apply to
contracts subject only to the Davis-Bacon Related Acts,
including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least \$17.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2024.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least \$12.90 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2024.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <http://www.dol.gov/whd/govcontracts>.

Modification Number	Publication Date
0	01/05/2024
1	01/12/2024

ASBE0073-002 08/01/2023

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR.....	\$ 48.81	15.64

CARP1327-001 07/01/2019

	Rates	Fringes
CARPENTER (Drywall Hanging Only).....	\$ 26.24	8.86

ELEC0518-009 08/01/2023

APACHE (Area South of Highway 66)

	Rates	Fringes
ELECTRICIAN (Including Alarm Installation and Low Voltage Wiring).....	\$ 32.50	9.50+13.25%

* ELEC0611-009 01/01/2024

APACHE COUNTY (Area North of Highway 66)

	Rates	Fringes
ELECTRICIAN (Including Alarm Installation and Low Voltage Wiring) Zone 1.....	\$ 38.30	12.98

ZONE 1: 0 to 10 miles from Gallup, NM
 ZONE 2: 10 to 30 miles from Gallup - Add 9%
 ZONE 3: 30 to 40 miles from Gallup - Add 15%
 ZONE 4: Over 40 miles from Gallup - Add 26%

ENGI0428-003 06/01/2022

	Rates	Fringes
POWER EQUIPMENT OPERATOR (CRANE) (2) under 15 tons.....	\$ 33.41	12.57
(3) 15 tons to 100 tons, Tower Crane.....	\$ 34.49	12.57
(4) 100 tons and over.....	\$ 35.52	12.57

IRON0075-002 07/31/2023

	Rates	Fringes
IRONWORKER, REINFORCING AND STRUCTURAL.....	\$ 29.00	17.44

Zone 1: 0 to 50 miles from City Hall in Phoenix or Tucson
 Zone 2: 050 to 100 miles - Add \$4.00
 Zone 3: 100 to 150 miles - Add \$5.00

Zone 4: 150 miles & over - Add \$6.50

LABO1184-009 06/01/2023

	Rates	Fringes
LABORER		
General or Common Laborer...	\$ 24.18	7.59

LABO1184-010 06/01/2023

	Rates	Fringes
LABORER (MASON TENDER-BRICK).....	\$ 24.18	7.59

PAIN0086-006 06/30/2021

	Rates	Fringes
DRYWALL FINISHER/TAPER		
ZONE A.....	\$ 23.55	7.49
ZONE B.....	\$ 27.05	7.49

ZONE PAY:

 ZONE A: Free Zone: A distance of 0 to 100 miles from the old Phoenix courthouse.

 ZONE B: A distance of 101 miles and over from the old Phoenix courthouse: \$3.50 per hour over ZONE A

* SUAZ2012-011 05/30/2012

	Rates	Fringes
CARPENTER, Excludes Drywall Hanging.....	\$ 18.42	1.46
CEMENT MASON/CONCRETE FINISHER...	\$ 17.71	2.60
FLOOR LAYER: Hardwood and Resilient Flooring.....	\$ 17.98	6.50
GLAZIER.....	\$ 15.98 **	0.79
LABORER: Landscape & Irrigation.....	\$ 9.31 **	0.00
LABORER: Mason Tender - Cement/Concrete.....	\$ 16.05 **	1.49
OPERATOR: Backhoe.....	\$ 14.00 **	1.80
PAINTER: Brush, Roller and Spray.....	\$ 16.13 **	0.00
PIPEFITTER.....	\$ 22.21	6.12
PLUMBER.....	\$ 19.04	3.07
ROOFER, Includes Installation of Metal Roofs.....	\$ 17.46	4.47
SHEET METAL WORKER.....	\$ 18.68	4.91

SPRINKLER FITTER (Fire Sprinklers).....	\$ 16.48 **	2.94
TILE SETTER.....	\$ 15.93 **	0.45

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 (\$17.20) or 13658 (\$12.90). Please see the Note at the top of the wage determination for more information. Please also note that the minimum wage requirements of Executive Order 14026 are not currently being enforced as to any contract or subcontract to which the states of Texas, Louisiana, or Mississippi, including their agencies, are a party.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at <https://www.dol.gov/agencies/whd/government-contracts>.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this

classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour

National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION"

TECHNICAL SPECIFICATIONS

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Appendix D – Geotechnical Engineering Report, Navajo Housing Authority, 25 Scattered Home
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Appendix E – Scattered Project-Proposed Individual Installation Provided by NHA (For Information
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SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Access to site.
4. Work restrictions.
5. Specification and drawing conventions.
6. Miscellaneous provisions.

1.2 PROJECT INFORMATION

A. Project Identification: 25 Scattered Sites

1. Project Location: Various Scattered Sites Throughout the Navajo Nation

B. Owner: Navajo Housing Authority

1. Owner's Representative: Ms. Kendra Dooline, Development Manager

C. Architect: WHPacific Inc., Mr. Paul Browne, AIA, PMP (505)-830-8742

D. Contractor: **TBD**.

E. Project Web Site: A project Web site administered by Contractor will be used for purposes of managing communication and documents during the construction stage.

1. See Section 013100 "Project Management and Coordination" for requirements for establishing, administering and using Project Web site.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. Construction of various 23 NHA homeowner houses consisting of: Perimeter walls are constructed with 2 x 6 wood studs with batt insulation, fiber cement siding on wood sheathing on the exterior and gypsum board taped, textured and painted on the interior. Concrete floor slab with vinyl composition plank-tile. The interior walls will consist of 2 x 4 wood studs, sound batt insulation with gypsum board taped, textured and painted. The roof consists of manufactured wood trusses & joists with batt insulation, wood sheathing and asphalt shingles. Doors will HM exterior Insulated and windows will be vinyl framed

with insulated, low-E glazing. The houses will be provided with all of the required residential appliances.

2. **Refer to Appendix F for Design Criteria. This Design criteria is for information only and is not contractual or indicative of the actual scope of work.**

B. Type of Contract.

1. Project will be constructed under a single prime contract.

1.4 ACCESS TO SITE

- A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
- B. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- C. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 1. Limits: Confine construction operations as indicated on home site lease and lot boundaries.
 2. Limits: All grading on site will conform to the site/grading plan provided by the contractor and as approved by NHA.
 3. Driveways, Walkways and Entrances: Keep driveways parking garage, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.5 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction to where applicable.
- B. On-Site Work Hours: To where applicable, limit work in the existing building to normal business working hours of 7:00 a.m. to 6:00 p.m., Monday through Friday, unless otherwise indicated or another schedule is approved by NHA prior to being implemented.

- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than three calendar days in advance of proposed utility interruptions.
 - 2. Obtain Owner's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
 - 1. Notify Owner not less than two calendar days in advance of proposed disruptive operations.
 - 2. Obtain Owner's written permission before proceeding with disruptive operations.
- E. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet (8 m) of entrances, operable windows, or outdoor-air intakes.
- F. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

1.6 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 - 2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard
 - 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Coordination drawings.
 - 2. Requests for Information (RFIs).
 - 3. Project meetings.
- B. Related Requirements:
 - 1. Section 017300 "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.2 DEFINITIONS

- A. RFI: Request from Owner, Construction Manager, Architect, or Contractor seeking information required by or clarifications of the Contract Documents. All requests for information shall be submitted through the Owner's Representative.

1.3 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use CSI Form 1.5A or form provided by Owner. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.

1.4 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, components/ trades and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
 2. Preparation of the schedule of values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Pre-installation conferences.
 7. Project closeout activities.
 8. Startup and adjustment of systems.
 9. Safety Meeting with all trades
 10. Contractor to copy Owner with Meeting Minutes.

1.5 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

1.6 REQUESTS FOR INFORMATION (RFIs)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified. All RFIs shall be submitted through the General Contractor to the Owner's Representative.

1. The Owner's Representative will return RFIs submitted by other entities controlled by Contractor with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
 2. Project number.
 3. Date.
 4. Name of Contractor.
 5. Name of Architect and Owner's Representative.
 6. RFI number, numbered sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
- C. RFI Forms: AIA Document G716 Software-generated form with substantially the same content as indicated above, acceptable to Owner.
- D. Owner's Representative Action: The Owner's Representative, Architect and appropriate Engineers will review each RFI, determine action required, and respond. Allow Fourteen (14) calendar days for response to each RFI. RFIs received by Owner's Representative after 1:00 p.m. will be considered as received the following working day.
1. The following RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFIs or inaccurately prepared RFIs.
 2. Owner's Representative's action may include a request for additional information, in which case time for response will date from time of receipt of additional information.
 3. Owner's Representative's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to the Contract Modification Procedures contained in the Construction Contract.

- a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Owner's Representative in writing within seven (7) days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log monthly. Use CSI Log Form 13.2B or Software log with not less than the following:
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Owner.
 4. RFI number including RFIs that were dropped and not submitted.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Owner's Representative's response was received.
- F. On receipt of Owner's Representative's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Owner's Representative within seven calendar days if Contractor disagrees with response.
1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.7 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at interval acceptable to Owner's Representative. Meetings and conferences shall be conducted at a location chosen as determined by the Owner's Representative.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner's Representative and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner's Representative and Architect, within three calendar days of the meeting.
- B. Preconstruction Conference: Owner's Representative shall Schedule and conduct a preconstruction conference before start of construction, at a time convenient to Owner and Architect, but no later than **Ten (10) calendar days** after execution of the Agreement. **All reference to days shall be calendar days.**
1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: **NHA to review agenda and send to WHPacific.** Discuss items of significance that could affect progress, including the following:

- a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for RFIs.
 - g. Procedures for testing and inspecting.
 - h. Procedures for processing Applications for Payment.
 - i. Distribution of the Contract Documents.
 - j. Submittal procedures.
 - k. Preparation of record documents.
 - l. Use of the premises.
 - m. Work restrictions.
 - n. Working hours.
 - o. Owner's occupancy requirements.
 - p. Responsibility for temporary facilities and controls.
 - q. Procedures for moisture and mold control.
 - r. Procedures for disruptions and shutdowns.
 - s. Office, work, and storage areas.
 - t. Equipment deliveries and priorities.
 - u. First aid – to include Safety.
 - v. Security.
 - w. Progress cleaning.
3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Progress Meetings: Conduct progress meetings at minimum monthly and appropriate intervals as determined by the Owner's Representative.
1. Attendees as invited by NHA: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: **NHA to suggest meeting times.** Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.

- b. **NHA to send agenda to WHPacific.** Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Progress cleaning.
 - 10) Quality and work standards.
 - 11) Status of correction of deficient items.
 - 12) Field observations.
 - 13) Status of RFIs.
 - 14) Status of proposal requests.
 - 15) Pending changes.
 - 16) Status of Change Orders.
 - 17) Pending claims and disputes.
 - 18) Documentation of information for payment requests.
3. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
 - 1. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
 - 2. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Owner's Representative responsive action.
- B. Informational Submittals: Written and graphic information and physical samples that do not require Owner's Representative responsive action. Submittals may be rejected for not complying with requirements.

1.3 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Owner's Representative and additional time for handling and reviewing submittals required by those corrections.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic copies of digital data files of the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

- a. Owner's Representative reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Owner's Representative's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow twenty-one (21) calendar days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Owner's Representative will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow fifteen (15) calendar days for review of each resubmittal. **All reference to days shall be calendar days.**
- D. Paper Submittals: Six Copies to be provided from Contractor. WHPacific to send one hard copy and a PDF copy. Place a permanent label or title block on each submittal item for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Owner's Representative, Architect, or Engineer as appropriate to the submittal.
 3. Include the following information for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Name of subcontractor.
 - g. Name of supplier.
 - h. Name of manufacturer.
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Location(s) where product is to be installed, as appropriate.
 - l. Other necessary identification.
 4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Owner's Representative, Architect or Engineer, as appropriate to the submittal, observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
 - a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Owner's Representative.
 5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal

form. Owner's Representative will return without review submittals received from sources other than Contractor.

a. Transmittal Form for Paper Submittals: Provide locations on form for the following information:

- 1) Project name.
- 2) Date.
- 3) Destination (To:).
- 4) Source (From:).
- 5) Name and address of Owner's Representative.
- 6) Name and address of Architect.
- 7) Name of Contractor.
- 8) Name of firm or entity that prepared submittal.
- 9) Names of subcontractor, manufacturer, and supplier.
- 10) Category and type of submittal.
- 11) Submittal purpose and description.
- 12) Specification Section number and title.
- 13) Specification paragraph number or drawing designation and generic name for each of multiple items.
- 14) Drawing number and detail references, as appropriate.
- 15) Indication of full or partial submittal.
- 16) Transmittal number, numbered consecutively.
- 17) Submittal and transmittal distribution record.
- 18) Remarks.
- 19) Signature of transmitter.

E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Owner's Representative, Architect, or Engineer as appropriate to the submittal.
4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of Owner's Representative.
 - d. Name and address of Architect.
 - e. Name of Contractor.
 - f. Name of firm or entity that prepared submittal.
 - g. Names of subcontractor, manufacturer, and supplier.
 - h. Category and type of submittal.
 - i. Submittal purpose and description.
 - j. Specification Section number and title.

- k. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - l. Drawing number and detail references, as appropriate.
 - m. Location(s) where product is to be installed, as appropriate.
 - n. Related physical samples submitted directly.
 - o. Indication of full or partial submittal.
 - p. Transmittal number, numbered consecutively.
 - q. Submittal and transmittal distribution record.
 - r. Other necessary identification.
 - s. Remarks.
5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
- a. Project name.
 - b. Number and title of appropriate Specification Section.
 - c. Manufacturer name.
 - d. Product name.
- F. Options: Identify options requiring selection by Owner's Representative, Architect, or Engineer as appropriate to the submittal.
- G. Deviations: Identify deviations from the Contract Documents on submittals.
- H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked with approval notation from Owner's Representative, Architect, or Engineer as appropriate to the submittal.
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Owner's Representative, Architect, or Engineer as appropriate to the submittal.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements:

1. In addition to paper copies, Contractor may submit electronic submittals via email as PDF electronic files.

- a. Owner's Representative will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 2. Action Submittals: Submit six paper copies of each submittal unless otherwise indicated. Owner's Representative will return two copies.
 3. Informational Submittals: Submit three paper copies of each submittal unless otherwise indicated. Owner's Representative will not return copies.
 4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 - i. Name of local supplier and location.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before or concurrent with Samples.
 6. Submit Product Data in the following format:
 - a. PDF electronic file, and
 - b. Six paper copies of Product Data unless otherwise indicated. Owner's Representative will return two copies.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 24 inches by 36 inches.
 3. Submit Shop Drawings in the following format:
 - a. PDF electronic file, and
 - b. Five opaque copies of each submittal. Owner's Representative will retain three copies; remainder will be returned.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 3. For projects where electronic submittals are used, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit three full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from

manufacturer's product line. Owner's Representative will return one submittal with options selected.

- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 - 1. Submit product schedule in the following format:
 - a. PDF electronic file, and
 - b. Six paper copies of product schedule or list unless otherwise indicated. Owner's Representative will return two copies.
- F. Coordination Drawings Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."
- G. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."
- H. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
- I. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."
- J. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- K. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- L. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- M. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- N. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- O. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- P. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

- Q. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.
- R. Schedule of Tests and Inspections: Comply with requirements specified in Section 014000 "Quality Requirements."
- S. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- T. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- U. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- V. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file or six paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to the Owner's Representative.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 OWNER'S REPRESENTATIVE ACTION

- A. General: Owner's Representative will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Owner's Representative, Architect and Engineer, as appropriate to the submittal will review each submittal, make marks to indicate corrections or revisions required, and return it. Owner's Representative, Architect and Engineer, as appropriate to the submittal, will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- C. Informational Submittals: Owner's Representative, Architect and Engineer, as appropriate to the submittal, will review each submittal and will not return it, or will return it if it does not comply with requirements. Owner's Representative will forward each submittal to appropriate party.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

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SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 2. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, Commissioning Authority, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.
 - 3. Specific test and inspection requirements are not specified in this Section.

1.2 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Construction Manager.
- C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
 - 1. Laboratory Mockups: Full-size physical assemblies constructed at testing facility to verify performance characteristics.
- D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 INFORMATIONAL SUBMITTALS

- A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.

2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.

- B. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

1.5 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and re-inspecting.

- B. Manufacturer's Field Reports: Prepare written information documenting tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
5. Other required items indicated in individual Specification Sections.

- C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

- B. **Manufacturer Qualifications:** A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. **Fabricator Qualifications:** A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. **Installer Qualifications:** A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. **Professional Engineer Qualifications:** A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.
- F. **Specialists:** Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. **Testing Agency Qualifications:** An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. **Manufacturer's Representative Qualifications:** An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. **Preconstruction Testing:** Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.

- d. When testing is complete, remove test specimens, assemblies, and mockups, do not reuse products on Project.
2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, through Construction Manager, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect or Construction Manager.
 2. Notify Architect and Construction Manager seven calendar days in advance of dates and times when mockups will be constructed.
 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 4. Obtain Architect's and Construction Manager's approval of mockups before starting work, fabrication, or construction.
 - a. Allow seven calendar days for initial review and each re-review of each mockup.
 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 6. Demolish and remove mockups when directed unless otherwise indicated.
- K. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Specification Sections.

1.7 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
 1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

- a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 2. Notify testing agencies at least 48 hours in advance of time when Work that requires testing or inspecting will be performed.
 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
- C. **Manufacturer's Field Services:** Where indicated, engage a manufacturer's representative to observe and inspect the Work. Manufacturer's representative's services include examination of substrates and conditions, verification of materials, inspection of completed portions of the Work, and submittal of written reports.
- D. **Retesting/Re-inspecting:** Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- E. **Testing Agency Responsibilities:** Cooperate with Architect, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect, Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Does not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- F. **Associated Services:** Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.

- G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

- 1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.8 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specification Sections and as follows:

- 1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
 - 2. Notifying Architect, Construction Manager, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 - 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect, through Construction Manager, with copy to Contractor and to authorities having jurisdiction.
 - 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 - 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 - 6. Retesting and re-inspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
 - 1. Date test or inspection was conducted.
 - 2. Description of the Work tested or inspected.
 - 3. Date test or inspection results were transmitted to Architect.
 - 4. Project Site and Exact location. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's and Construction Manager's reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017000 "Execution Requirements."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to Owner's Representative, Architect or Engineer, as appropriate to submittals, on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Owner's Representative. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

AA	Aluminum Association (The)
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists
ABAA	Air Barrier Association of America
ABMA	American Bearing Manufacturers Association
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
AEIC	Association of Edison Illuminating Companies, Inc. (The)
AF&PA	American Forest & Paper Association
AGA	American Gas Association
AHAM	Association of Home Appliance Manufacturers
AHRI	Air-Conditioning, Heating, and Refrigeration Institute, The
AI	Asphalt Institute
AIA	American Institute of Architects (The)
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction

ALSC	American Lumber Standard Committee, Incorporated
AMCA	Air Movement and Control Association International, Inc.
ANSI	American National Standards Institute
AOSA	Association of Official Seed Analysts, Inc.
APA	APA - The Engineered Wood Association
APA	Architectural Precast Association
API	American Petroleum Institute
ARI	Air-Conditioning & Refrigeration Institute
ARMA	Asphalt Roofing Manufacturers Association
ASCE	American Society of Civil Engineers
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute (See ASCE)
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASME	ASME International (American Society of Mechanical Engineers International)
ASSE	American Society of Sanitary Engineering
ASTM	ASTM International (American Society for Testing and Materials International)
ATIS	Alliance for Telecommunications Industry Solutions
AWCMA	American Window Covering Manufacturers Association (Now WCMA)
AWCI	Association of the Wall and Ceiling Industry
AWI	Architectural Woodwork Institute
AWPA	American Wood Protection Association (Formerly: American Wood Preservers' Association)
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association

BICSI	BICSI, Inc.
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International)
CDA	Copper Development Association
CEA	Canadian Electricity Association
CEA	Consumer Electronics Association
CFFA	Chemical Fabrics & Film Association, Inc.
CGA	Compressed Gas Association
CIMA	Cellulose Insulation Manufacturers Association
CISCA	Ceilings & Interior Systems Construction Association
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute
CRSI	Concrete Reinforcing Steel Institute
CSA	Canadian Standards Association
CSA	CSA International (Formerly: IAS - International Approval Services)
CSI	Construction Specifications Institute (The)
DHI	Door and Hardware Institute
ECA	Electrical Components Association
EIA	Electronic Industries Alliance
EJMA	Expansion Joint Manufacturers Association, Inc.
ESD	ESD Association (Electrostatic Discharge Association)
ETL SEMCO	Intertek ETL SEMCO (Formerly: ITS - Intertek Testing Service NA)
FM Approvals	FM Approvals LLC
FM Global	FM Global (Formerly: FMG - FM Global)

FSC	Forest Stewardship Council
GA	Gypsum Association
GANA	Glass Association of North America
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)
HPVA	Hardwood Plywood & Veneer Association
HPW	H. P. White Laboratory, Inc.
ICBO	International Conference of Building Officials
ICEA	Insulated Cable Engineers Association, Inc.
ICRI	International Concrete Repair Institute, Inc.
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The)
IES	Illuminating Engineering Society of North America
IGMA	Insulating Glass Manufacturers Alliance
ISA	Instrumentation, Systems, and Automation Society, The
ISO	International Organization for Standardization
ITU	International Telecommunication Union
KCMA	Kitchen Cabinet Manufacturers Association
LMA	Laminating Materials Association (Now part of CPA)
LPI	Lightning Protection Institute
MPI	Master Painters Institute
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc.
NAAMM	National Association of Architectural Metal Manufacturers
NACE	NACE International (National Association of Corrosion Engineers International)
NAIMA	North American Insulation Manufacturers Association

NCTA	National Cable & Telecommunications Association
NECA	National Electrical Contractors Association
NeLMA	Northeastern Lumber Manufacturers' Association
NEMA	National Electrical Manufacturers Association
NETA	InterNational Electrical Testing Association
NFPA	NFPA (National Fire Protection Association)
NFRC	National Fenestration Rating Council
NGA	National Glass Association
NHLA	National Hardwood Lumber Association
NLGA	National Lumber Grades Authority
NRCA	National Roofing Contractors Association
NRMCA	National Ready Mixed Concrete Association
PDI	Plumbing & Drainage Institute
PTI	Post-Tensioning Institute
RCSC	Research Council on Structural Connections
RFCI	Resilient Floor Covering Institute
SAE	SAE International
SCTE	Society of Cable Telecommunications Engineers
SDI	Steel Door Institute
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers (See ASCE)
TCNA	Tile Council of North America, Inc.
TEMA	Tubular Exchanger Manufacturers Association
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance
TPI	Truss Plate Institute, Inc.
UL	Underwriters Laboratories Inc.

UNI	Uni-Bell PVC Pipe Association
WCLIB	West Coast Lumber Inspection Bureau
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association)
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California)
WMMPA	Wood Moulding & Millwork Producers Association
WSRCA	Western States Roofing Contractors Association
WWPA	Western Wood Products Association

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

DIN	Deutsches Institut fur Normung e.V.
IAPMO	International Association of Plumbing and Mechanical Officials
ICC	International Code Council
ICC-ES	ICC Evaluation Service, Inc.

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

COE	Army Corps of Engineers
CPSC	Consumer Product Safety Commission
EPA	Environmental Protection Agency
GSA	General Services Administration
HUD	Department of Housing and Urban Development
NIST	National Institute of Standards and Technology
OSHA	Occupational Safety & Health Administration
RUS	Rural Utilities Service (See USDA)

- D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list.

ADAAG Americans with Disabilities Act (ADA)
Architectural Barriers Act (ABA)
Accessibility Guidelines for Buildings and Facilities
Available from U.S. Access Board

CFR Code of Federal Regulations
Available from Government Printing Office

UFAS Uniform Federal Accessibility Standards
Available from Access Board

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

1.2 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.3 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Owner's Representative Action: If necessary, Owner's Representative will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Owner's Representative will notify Contractor of approval or rejection of proposed comparable product request within twenty-one (21) calendar days of receipt of request.

- a. Form of Approval: As specified in Section 013300 "Submittal Procedures."
- b. Use product specified if Owner's Representative does not issue a decision on use of a comparable product request within time allocated.

- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions. Add insurance requirements to special conditions.

- B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

- C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

1.6 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on

product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 3. Refer to other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are un-damaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Owner's Representative with assistance of the Architect will make selection.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- B. Product Selection Procedures:
1. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 2. Products:
 - a. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed

product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

3. Manufacturers:

a. Non-restricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

4. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. The Owner's Representative with assistance of the Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Owner's Representative and Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Owner's Representative may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting and patching.
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of installed construction.
 - 8. Correction of the Work.

- B. Related Requirements:
 - 1. Section 011000 "Summary" for limits on use of Project site.
 - 2. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.2 INFORMATIONAL SUBMITTALS

- A. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- B. Certified Surveys: Submit four (4) copies signed by land surveyor.
- C. Final Property Survey: Submit six (6) copies showing the Work performed and record survey data.
- D. Site design: Submit 4 (four) copies sealed by licensed Civil engineer. Design to include placement of building on site, connection of all utilities including sewer or septic system at appropriate inverts, site drainage and UFAS accessible approaches to building.
- E. Coordination submittal prepared by contractor for underground utilities must be submitted to Architect prior to foundation placement.

1.3 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in Utah and who is experienced in providing land-surveying services of the kind indicated.

- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
1. Structural Elements: When cutting and patching structural elements, notify Owner's Representative and Architect of locations and details of cutting and await directions from Owner's Representative and Architect before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility and Owner's Representative that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Owner's Representative promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 2. Establish limits on use of Project site.
 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 4. Inform installers of lines and levels to which they must comply.
 5. Check the location, level and plumb, of every major element as the Work progresses.
 6. Notify Owner's Representative when deviations from required lines and levels exceed allowable tolerances.
 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by the Owner's Representative and Architect.

3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
- C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- D. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
1. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
- F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
- G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold waste materials more than seven calendar days during normal weather or three calendar days if the temperature is expected to rise above 80 deg F.
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements"

3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.
- B. Related Requirements:
 - 1. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
 - 2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 3. General Conditions / Special Condition to the Related Requirements.

1.2 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.3 CLOSEOUT SUBMITTALS

- A. Certificate of Insurance: For continuing coverage.
- B. Field Report: For pest control inspection.
- C. As-Builts
- D. Cost of Plant
- E. NHA MOA
- F. Final Inspection Report.
- G. Utility Final Inspection Report.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.5 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of seven (7) calendar days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, final certifications, and similar documents.
 - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner's Representative. Label with manufacturer's name and model number where applicable.
 - 5. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of seven (7) calendar days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Advise Owner of pending insurance changeover requirements.
 - 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 3. Complete startup and testing of systems and equipment.
 - 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 - 5. Advise Owner of changeover in heat and other utilities.
 - 6. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 - 7. Complete final cleaning requirements, including touchup painting.
 - 8. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of ten (10) calendar days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Owners Representative will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner's Representative will

prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Owner's Representative that must be completed or corrected before certificate will be issued.

1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.6 FINAL COMPLETION PROCEDURES

A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment.
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection to determine acceptance. On receipt of request, Owner's Representative will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner's Representative will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Submit list of incomplete items in one of the following format:
 - a. MS Excel electronic file. Owner's Representative will return annotated copy.
 - b. PDF electronic file. Owner's Representative will return annotated copy.
 - c. Five paper copies unless otherwise indicated. Owner's Representative will return two copies.

1.8 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.

- b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
- c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
- d. Remove tools, construction equipment, machinery, and surplus material from Project site.
- e. Remove snow and ice to provide safe access to building.
- f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
- g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
- h. Sweep concrete floors broom clean in unoccupied spaces.
- i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
- j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
- k. Remove labels that are not permanent.
- l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
- o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
- p. Leave Project clean and ready for occupancy.

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.

- a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance manual.

1.2 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Owner's Representative will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

- B. Format: Submit operations and maintenance manuals in the following format:

1. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Owner's Representative will return one copy.

- C. Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion. Owner's Representative will return copies with comments.

1. Correct or revise each manual to comply with Owner's Representative comments. Submit copies of each corrected manual within fifteen (15) calendar days of receipt of Owner's Representative's comments.
2. Submit Four (4) sets of O & M Manual.
3. All scanned documents need to be color.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR OPERATION, AND MAINTENANCE MANUALS

- A. Directory: Prepare a single, comprehensive directory of operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information.

- B. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- C. Title Page: Include the following information:
 - 1. Name and address of Project.
 - 2. Name and address of Owner's Representative.
 - 3. Date of submittal.
 - 4. Name and contact information for Contractor.
- D. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
- E. Manual Contents: Arrange contents alphabetically by system, subsystem, and equipment. Requires all PDF to be tabbed and indexed.
- F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
 - 1. Binders: Three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name.
 - 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 - 3. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts. Requires all PDF to be tabbed and indexed.

2.2 OPERATION INFORMATION

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 - 1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 - 2. Performance and design criteria if Contractor is delegated design responsibility.
 - 3. Operating standards.

4. Operating procedures.
5. Wiring diagrams.
6. Control diagrams.
7. Piped system diagrams.
8. Precautions against improper use.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Routine and normal operating instructions.
3. Normal shutdown instructions.
4. Seasonal and weekend operating instructions.
5. Required sequences for electric or electronic systems.

D. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.3 PRODUCT MAINTENANCE INFORMATION

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.
 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.4 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
1. Standard maintenance instructions and bulletins.
 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 3. Identification and nomenclature of parts and components.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
 2. Troubleshooting guide.
 3. Precautions against improper maintenance.
 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 5. Aligning, adjusting, and checking instructions.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Operation and Maintenance Manual: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system and data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
- C. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original project record documents as part of operation and maintenance manuals.
- D. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

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SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
- B. Related Requirements:
 - 1. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.2 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - a. Final Submittal:
 - 1) Submit one paper-copy set(s) of marked-up record prints, including site utility plans.
 - 2) Submit record digital data files (PDFs) and three set(s) of record digital data file plots.
 - 3) Plot each drawing file, whether or not changes and additional information were recorded.
 - 4) See Special Conditions for Additional Requirements.
 - 5) Total cost of plant.
- B. Record Specifications: Submit one paper copy annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit one paper copy annotated PDF electronic files and directories of each submittal.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised Drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Record data as soon as possible after obtaining it.
 - c. Record and check the markup before enclosing concealed installations.
 2. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Owner's Representative. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Annotated PDF electronic file with comment function enabled.
 2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
- C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Format: Annotated PDF electronic file.
 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Note related Change Orders and record Drawings where applicable.

B. Format: Submit record Specifications as paper copy and scanned PDF electronic file(s) of marked-up paper copy of Specifications.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders and record Drawings where applicable.

B. Format: Submit record Product Data as paper copy.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Owner's Representative and Architect's reference during normal working hours.

END OF SECTION 017839

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SECTION 031000 - CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. This section includes formwork for cast-in-place concrete, including water stops, and installation of embedded items.

1.2 RELATED REQUIREMENTS

- A. Section 03 20 00 - Concrete Reinforcement
- B. Section 03 30 00 - Cast-In-Place Concrete
- C. Section 07 26 00 - Under-Slab Vapor Retarder

1.3 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM); latest version
 - 1. ASTM D226 - Specification for Asphalt - Saturated Organic Felt used in Roofing and Waterproofing
 - 2. ASTM D1751 - Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

1.4 QUALITY ASSURANCE

- A. Comply with the American Concrete Institute Standard, ACI 347-04, Recommended Practice for Concrete Formwork.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Forms for Exposed Finish Concrete: Plywood complying with Voluntary Product Standard PS 1-07 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better or metal, metal-framed plywood or other acceptable panel-type materials. Plywood shall be mill-oiled and edge-sealed, with each piece bearing legible inspection trademark. Furnish in largest practicable sizes to minimize number of joints. Provide form material with sufficient thickness to withstand pressure of newly placed concrete without bow or deflection.
- B. Forms for Unexposed Finish Concrete: Use plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.
- C. Form Coatings: Commercial formulation that will not bond with, stain, or adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.
- D. Chamfer Strips: $\frac{3}{4}$ inch by $\frac{3}{4}$ inch wood, PVC, or rubber.
- E. Expansion Joint Material: Asphalt saturated fiberboard, $\frac{1}{2}$ inch thick, meeting the requirements of ASTM D 1751.

- F. Felt: Asphalt-saturated organic felt, weighing 30 pounds per 100 square feet, meeting the requirements of ASTM D 226.
- G. Recycled Content: Minimum 5 percent post-consumer content, or minimum 20 percent pre-consumer recycled content at contractor's option.

PART 3 - EXECUTION

3.1 COORDINATION

- A. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel. Set screeds accurately. Embedded items shall be accurately aligned and adequately supported. Verify installation of mechanical, plumbing, and electrical items to be embedded in concrete. Correct any unsatisfactory condition before proceeding further.

3.2 PREPARATION

- A. Form Coating: Coat contact surfaces of forms with a form coating compound before reinforcement is placed. Thin form-coating compounds with thinning agent and apply as specified in manufacturer's instructions. Do not allow excess form-coating material to accumulate in forms or to come into contact with concrete surfaces against which fresh concrete will be placed.

3.3 INSTALLATION

- A. Formwork: Formwork shall support vertical and lateral loads that are applied until such loads can be supported by concrete structure. Formwork shall be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials. Construct forms to sizes, shapes, lines and dimensions shown. Perform surveys to obtain accurate alignment. Provide for recesses, chamfers, blocking, anchorages, inserts, and other features required in work. Select materials to obtain required finishes. Butt joints solidly and provide backup at joints to prevent leakage of cement paste.
- B. Chamfer Strips: Provide at exposed corners and edges.
- C. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris before concrete is placed. Retighten forms and bracing after concrete placement as required to eliminate mortar leaks and maintain proper alignment.

3.4 INSTALLATION OF EMBEDDED ITEMS

- A. General: Set anchorage devices and other embedded items accurately. Use setting drawings, diagrams, templates and printed instructions provided by supplier. Secure embedded items such that they are not displaced during placement of concrete.

3.5 JOINTS

- A. Construction Joints in Foundations: Provide keyways at least 1 ½ inches deep in vertical construction joints in walls and construction joints in slabs on grade and foundations.

Discontinue every other horizontal bar through slab on grade construction joints unless noted otherwise.

3.6 REMOVAL OF FORMWORK

- A. Ensure safety of the structure. Do not superimpose any load on concrete until forms are removed and concrete is cured.

3.7 RE-USE OF FORMS

- A. General: Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.
- B. When forms are intended for successive concrete placement, thoroughly clean surfaces and remove fins and latence. Align and secure joints to avoid offsets. Do not use "patched" forms for exposed concrete surfaces.

END OF SECTION 031000

SECTION 032000 - CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. This section includes fabrication and installation of deformed bar and welded wire fabric reinforcing steel.

1.2 RELATED REQUIREMENTS

- A. Section 03 10 00 - Concrete Forming and Accessories
- B. Section 03 30 00 - Cast In Place Concrete

1.3 REFERENCE STANDARDS:

- A. American Concrete Institute (ACI), latest versions:
 - 1. ACI 301 - Specifications for Structural Concrete for Buildings
 - 2. ACI 315 - Details and Detailing of Concrete Reinforcement
 - 3. ACI 318 - Building Code Requirements for Structural Concrete
- B. American Society for Testing and Materials (ASTM), latest versions:
 - 1. ASTM A82/A82M - Standard Specification for Steel Wire, plain, for Concrete Reinforcement
 - 2. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
 - 3. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
- C. Concrete Reinforcing Steel Institute (CRSI). Design Handbook, latest version

1.4 SUBMITTALS

- A. Shop Drawings: Submit shop drawings for reinforcing steel. Comply with ACI 315 requirements showing layout, bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of reinforcing steel. Shop Drawings shall not be made by reproduction of the Contract Drawings.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Reinforcing Bars: ASTM A 615, Grade 60. Stirrups and ties may be Grade 40.
- B. Supports for Reinforcing Steel: Wire bar type and precast concrete block type meeting the requirements of CRSI Manual of Standard Practice.

2.2 FABRICATION

- A. Fabricate reinforcing steel in accordance with fabricating tolerances in ACI 315.
- B. Do not fabricate reinforcing steel until shop drawings are approved.

PART 3 - EXECUTION

3.1 PLACING BAR SUPPORTS

- A. General: Provide bar supports meeting the requirements of CRSI Specification for Placing Bar Supports.
- B. Slabs-on-grade: Use supports with sand plates or precast concrete blocks or horizontal runners where base material will not support chair legs.

3.2 PLACING REINFORCING STEEL

- A. General: Comply with CRSI Code of Standard Practice for "Placing Reinforcing Bars".
- B. Clean reinforcing steel of loose rust and mill scale, earth, ice, and other materials, which reduce or destroy bond with concrete.
- C. Accurately position, support and secure reinforcing steel against displacement by formwork, construction, or concrete placement operations. Place reinforcing steel to obtain minimum coverages. Arrange, space and securely tie bars and bar supports to hold reinforcing steel in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
 - 1. Concrete Cover:

Concrete cast against and permanently exposed to earth or weather	3 inches
Bars larger than No. 5	2 inches
Bars No. 5 or smaller	1 1/2 inches
- D. Rebar Splices: Locate at points of minimum stress or as shown on contract drawings. Unless noted otherwise, provide lap splices 30 bar diameters (18 inches minimum) in length.
- E. Corner Reinforcing: Provide corner bars of same size and spacing as horizontal reinforcing steel. Lap with horizontal reinforcing 30 bar diameters or 18 inches minimum length.
- F. Reinforcing at Construction/Control Joints: Continue reinforcing steel through construction joints unless noted otherwise. Discontinue reinforcing steel 2 inches from preformed construction joints in slabs-on-grade. Cut alternate longitudinal bars at weakened plane control joints in walls.

END OF SECTION 032000

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. This section covers cast-in-place concrete including finishing, surface repair and curing.

1.2 RELATED REQUIREMENTS

- A. Section 03 10 00 - Concrete Forming and Accessories
- B. Section 03 20 00 - Concrete Reinforcement
- C. Section 07 26 00 - Under Slab Vapor Retarder

1.3 REFERENCE STANDARDS

- A. Meet the requirements of the following codes, specifications and standards.
 - 1. American Concrete Institute (ACI) Publications, latest versions:
 - a. ACI 301 - Specifications for Structural Concrete for Buildings
 - b. ACI 306.1 - Standard Specification for Cold Weather Concreting
 - c. ACI 318 - Building Code Requirements for Structural Concrete.
 - 2. ASTM International (ASTM), latest versions:
 - a. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field
 - b. ASTM C33/C33M - Standard Specification for Concrete Aggregates
 - c. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
 - d. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete
 - e. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
 - f. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete
 - g. ASTM C150/C150M - Standard Specification for Portland Cement
 - h. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete
 - i. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete
 - j. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method

- k. ASTM C231/C231M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
- l. ASTM C260/C260M - Standard Specification for Air Entraining Admixtures for Concrete
- m. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
- n. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete
- o. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's product data with application and installation instructions for proprietary materials and admixtures.
- B. Concrete Mix Design:
 - 1. Submit mix design in accordance with ACI-301, Section 4.
 - 2. Submit with mix design results of laboratory tests performed within previous 12 months indicating aggregates from the proposed source comply with the requirements of ASTM C 33 or C 330 as applicable.
 - 3. Submit the proposed area of use for each mix design submitted (footings, stemwalls, slabs, walls, columns, etc.).
- C. Granular Base Course: Submit gradation, plasticity index, and wear information.
- D. Test Reports: Submit copies of test reports for concrete compressive strength, air content, temperature and slump. Submit copies of granular base course test reports.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities.
- B. Environmental Requirements: Manufacturer and Contractor shall conform to Federal, State, and Local V.O.C. (Volatile Organic Compound) Regulations in area where Project is located. Notify A/E in writing if variations to Specifications herein are required.
 - 1. V.O.C. content shall be a maximum 250 (55) gm/liter, unless more stringent codes or laws apply.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, low alkali. Use one brand of cement throughout project.

- B. Normal Weight Aggregates: ASTM C 33. Provide aggregates from a single source for exposed concrete.
- C. Water: Potable.
- D. Air-Entraining Admixture: ASTM C 260.
- E. Water Reducing Admixture: ASTM C 494.
- F. Fly-Ash: ASTM C 618, Class F
- G. Moisture-Retaining Cover: Provide waterproof paper, polyethylene film, or polyethylene-coated burlap meeting the requirements of ASTM C 171.
- H. Liquid Membrane-Forming Curing Compound: Liquid type membrane-forming curing compound meeting the requirements of ASTM C 309; Type 1-D with fugitive dye for interior concrete and foundations; Type 2, white pigmented, for exposed exterior concrete except exposed exterior Architectural concrete, use Type 1-D.
 - 1. Curing compound shall NOT be used on interior slabs, except exposed integrally colored concrete slabs. Curing compound to be used on integrally colored concrete slabs shall be approved by the manufacturer of the color.
- I. Vapor Retarder shall comply with Section 07 26 00 of these Specifications.
- J. Granular base shall meet the following grading requirements when tested in accordance with ASTM C 136.
 - 1. Granular base shall meet the gradation and material properties requirements as listed in the General Structural Notes.
 - 1. The plasticity Index shall be no greater than 3 when tested in accordance with ASTM D 4318. The coarse aggregate shall have a percent wear of 50 or less when tested in accordance with ASTM C 131

2.2 PROPORTIONING AND DESIGN OF MIXES

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial mixture or field experience methods as specified in ACI 301, Section 4. If trial mixture method is used, employ an independent testing facility, acceptable to Architect, for preparing and reporting proposed mix designs.
- B. Submit written reports to Architect, or Engineer, of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been approved.
- C. Refer to the General Structural Notes for concrete strengths.
- D. Slabs-on-ground or on vapor retarder shall have a water/total cementitious ratio not to exceed 0.45.
- E. Admixtures
 - 1. Use water reducing admixture conforming to ASTM C 494, Type A, in all concrete unless approved otherwise by the Structural Engineer.

2. All other admixtures shall have the written approval of the Architect or Structural Engineer.
3. Calcium chloride is not permitted.
4. All admixtures, except high range water reducers, shall be added to the concrete at the batch plant.

PART 3 - EXECUTION

3.1 COORDINATION

- A. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel. Set screeds accurately. Embedded items shall be accurately aligned and adequately supported. Verify installation of mechanical, plumbing, and electrical items to be embedded in concrete. Correct any unsatisfactory condition before proceeding further.

3.2 PREPARATION

- A. Before placing concrete, clean and roughen surface of previously placed concrete. Clean reinforcing steel. Remove debris, providing clean-outs at bottom of forms when necessary. Moisten surfaces to receive concrete unless otherwise prepared. Remove excess water before placing concrete.

3.3 CONCRETE PLACEMENT

- A. General: Comply with ACI 301.
- B. Place concrete continuously in layers not deeper than 24 inches. Concrete shall not be placed against concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints. Deposit concrete as nearly as practicable to its final location to avoid segregation. Do not use vibrators to transport concrete.
- C. Maintain reinforcing in proper position during concrete placement operations.
- D. Consolidate concrete, immediately after placing, by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.
- E. Bring slab surfaces to correct level with straightedge and strikeoff. Use bull floats or darbies to smooth surface. Do not disturb slab surfaces prior to beginning finishing operations.
- F. Cold Weather Concreting: Protect concrete work from physical damage or reduced strength caused by frost, freezing or low temperatures. Comply with ACI 306.1.
- G. Hot Weather Concreting: When hot weather conditions exist that would impair quality and strength of concrete, reduce delivery time of ready mix concrete, lower the temperature of materials, or add retarder to ensure that the concrete is plastic. Retempering with water is not allowed. Comply with ACI 305R.

3.4 FINISH OF FORMED SURFACES

- A. Rough Form Finish: Provide where formed concrete surfaces are not exposed to view. Tie holes and surface imperfections shall be repaired and patched and fins and other projections exceeding ¼ inch in height rubbed down or chipped off.

3.5 FINISH OF HORIZONTAL SURFACES

- A. At tops of foundation walls and grade beams finish with a texture matching adjacent formed surfaces unless otherwise indicated.

3.6 SLAB FINISHES

- A. Float Finish: Begin floating when surface water has disappeared and when concrete has stiffened sufficiently to permit operation of power-driven or hand floats. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to a tolerance not exceeding ¼ inch in 10 feet when tested with a 10 foot straightedge.
- B. Scratch Finish: Apply scratch finish to slab surfaces that are to receive floor topping. Roughen surface before final set, using stiff brushes, or brooms.
- C. Trowel Finish: Apply trowel finish to all slab surfaces unless noted otherwise. After floating, begin first trowel finish using a power-driven or hand trowel. Finish concrete surface by a final hand-trowel operation, free of trowel marks, and uniform in texture and appearance. The final surface finish for slabs-on-grade shall have a minimum FF = 25 and a minimum FL = 20 per ACI requirements.
- D. Broom Finish: Apply on exterior slabs, ramps, steps, and sidewalks. Immediately after concrete has received a float finish, draw a broom or burlap belt across the surface to give a coarse transverse scored texture.

3.7 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Continue curing for at least 7 days.
- B. Moisture-retaining Cover curing: All interior concrete slabs, except exposed integrally colored concrete slabs, are to be cured with a moisture retaining cover for the first 7 days. After that time, the cover shall be removed and the slab should be allowed to dry. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed. Repair any holes or tears in cover during curing period.
- C. Curing compound: At contractor's option, exterior concrete slabs may be cured using curing compound. All vertical concrete (walls, beams, etc...) shall be cured using curing compound – apply compound to the vertical surface as soon as the forms are removed. Apply curing compound uniformly in accordance with the manufacturer's printed instructions. Curing compound shall NOT be used on interior slabs, except exposed integrally colored concrete slabs.
- D. Exposed integrally colored concrete slabs: Use curing compound recommended by the concrete supplier. Apply with an airless sprayer.

3.8 CONCRETE SURFACE REPAIRS

- A. Patching Surface Imperfections: Remove loose material and patch surface imperfections and holes left by tie rods with cement mortar. Surface imperfections include honeycomb, excessive air voids, sand streaking and cracks.

3.9 FOR EXPOSED-TO-VIEW SURFACES

- A. Blend white portland cement and standard portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

3.10 FIELD QUALITY CONTROL

- A. The Owner shall employ the services of a qualified testing laboratory to perform tests and submit test reports.
- B. Sampling Fresh Concrete: ASTM C 172.
- C. Slump: ASTM C 143; one test for each set of compressive strength test specimens.
- D. Air Content: ASTM C 173 or C 231 for each set of compressive strength test specimens.
- E. Concrete Temperature: Test hourly when air temperature is 40 degrees F. and below, when 80 degrees F and above; and when compression test specimens are made.
- F. Compression Test Specimen: ASTM C 31, one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field cure test specimens are required. Mold one set of standard cylinders for volume of concrete specified below or fraction thereof.
 - a. Footings and Stem Walls 50 cubic yards
 - a. All Other Locations (unless otherwise noted) 30 cubic yards
- G. Compressive Strength Tests: ASTM C 39; test 1 specimen at 7 days, 2 specimens at 28 days, and retain one specimen in reserve for later testing. Additional Tests: The testing laboratory will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure as directed by the Architect. The testing laboratory may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by the Architect or Engineer. The Owner shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.
- H. Granular Base Course: ASTM C 136 and ASTM D 4318 for every 500 square yards of building slab area.

END OF SECTION 033000

SECTION 033800 - POST TENSIONED STRUCTURAL CONCRETE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Cast -in-place, post tensioned, concrete framing members and slabs.
- B. Tensioning tendons and sheathing for unbonded system.

1.2 SUBMITTALS

- A. Shop Drawings: Indicate layout, tendon sizes, grouping, spacing, placing sequence, supports and locations, tendon supports, and accessories.
- B. Design Data: Indicate calculations for tendon elongation curves.
- C. Project Record Documents: Accurately record actual locations of tendons stressing sequence, tension loads established, and elongation of tendons.
- D. Post Tension Certification: Submit affidavit stating that contractor is certified in accordance with Post Tensioning Institute (PTI) and provide copies of certification.

1.3 QUALIFICATIONS

- A. Qualification of Engineer: Design shall be under the direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of (New Mexico, Arizona, Nevada).
- B. Qualification of Contractor: Contractor shall be certified in accordance with the Post Tensioning Institute (PTI) within the last 12 months.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Formwork, Bar Reinforcement, and Concrete: In accordance with Section 03 30 00.
- B. Tendon Strand: ASTM A 416, Grade 270 seven-wire stranded steel cable; full length without splices; 1/2 inch diameter, regular stress relieved or low relaxation type.
- C. Tendon Anchor: Type compatible with tendon of strength not less than tendon.

2.2 ACCESSORIES

- A. Sheathing: High density polypropylene, not less than .025 inch thickness.
- B. Lubricant: Grease, non-corrosive, high viscosity.

- C. Chairs, Bolsters, Bar Supports, Spacers: Size and shape for strength and support of reinforcement during tendon location, installation, and placement of concrete. Plastic coated.

2.3 MIXES

- A. Mix: In accordance with Section 03 30 00 and General Notes.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Locate and position tendons anchors, seats, plates, and other items to be cast into concrete. Protect from displacement.
- B. Grease entire length of tendon.

3.2 TENSIONING

- A. Begin tensioning operations only after concrete has reached a minimum compressive strength of 3000psi.
- B. Confirm concrete strength with test cylinders prior to tensioning.
- C. Measure prestressing force. Maintain jacking and tensioning records as work progresses. Provide 4 copies to Architect on a daily basis.
- D. Jack against tendon pressure plate, not against concrete.
- E. Cut off excess tendon inside face of concrete. Apply touch-up primer to cut end.
- F. To minimize moisture access to the tendons, anchorage pockets shall be filled with non-shrink grout as soon as practical after stressing. Grout containing chlorides shall not be used.

3.3 REMOVAL OF FORMS

- A. Removal of Forms: In accordance with Section 03 30 00 and ACI 301.
- B. Do not remove forms, shores, and bracing until concrete has been completely tensioned.

END OF SECTION 033800

SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Steel pipe and tube railings.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
 - 1. Steel: 72 percent of minimum yield strength.
- C. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails:
 - a. Concentrated load of 200 lbf applied in any direction.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- E. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of mechanically connected railings.
 - 2. Railing brackets.

3. Grout, anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including certification of compliance signed and sealed by the qualified professional engineer responsible for the design.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.7 COORDINATION AND SCHEDULING

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Steel Pipe and Tube Railings:

- a. Pisor Industries, Inc.
- b. Wagner, R & B, Inc.; a division of the Wagner Companies.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.3 STEEL

- A. Tubing: ASTM A 500 (cold formed) or ASTM A 513.
- B. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 1. Provide galvanized finish for exterior installations and where indicated.
- C. Plates, Shapes, and Bars: ASTM A 36/A 36M.
- D. Woven-Wire Mesh: Intermediate-crimp, [diamond] [square] pattern, 2-inch (50-mm) woven-wire mesh, made from 0.162-inch (4.1-mm) nominal diameter wire complying with ASTM B 211 (ASTM B 211M), Alloy 6061-T94.

2.4 FASTENERS

- A. General: Provide the following:
 1. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
- D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 1. Material: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- D. Shop Primer for Galvanized Steel: Water based galvanized metal primer complying with MPI#134.
- E. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- F. Anchoring Cement: Factory-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
 - 1. Water-Resistant Product: At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.6 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, and finish, but not less than that required to support structural loads. Provide anchorage as required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with either welded or nonwelded connections unless otherwise indicated.

- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Non-welded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
 - 1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
- J. Form changes in direction as follows:
 - 1. By bending or by inserting prefabricated elbow fittings.
- K. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- L. Close exposed ends of railing members with prefabricated end fittings.
- M. Brackets, Flanges, Fittings, and Anchors: Provide brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
- N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- O. For railing posts set in concrete, provide steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.

2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.8 STEEL FINISHES

- A. Galvanized Railings:

1. Hot-dip galvanize exterior steel railings, including hardware, after fabrication.
 2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
 3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
 4. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
 5. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.
- D. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.2 RAILING CONNECTIONS

- A. Non-welded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

- B. **Welded Connections:** Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- C. **Expansion Joints:** Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.3 ANCHORING POSTS

- A. Use metal sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with non-shrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. For posts with anchors drilled to concrete, cover anchorage joint with flange of same metal as post, attached to post with set screws.
- C. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.4 ATTACHING RAILINGS

- A. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends or connected to railing ends using non-welded connections.

3.5 ADJUSTING AND CLEANING

- A. **Touchup Painting:** Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- B. **Galvanized Surfaces:** Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.6 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 055213

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SECTION 055313 - BAR GRATINGS

1.1 PERFORMANCE REQUIREMENTS

- A. Engineering design of gratings by Contractor.
- B. Floors Loads: 125 lbf/sq. ft. (6.00 kN/sq. m) or concentrated load of 2000 lbf (8.90 kN)

1.2 GRATINGS

- A. Steel Bar Gratings: Welded
 - 1. Traffic Surface: Plain.
 - 2. Finish: Galvanized
 - 3. ½" Max Bar Spacing. Perpendicular to direction of travel for wheelchairs access
- B. Aluminum Bar Gratings: Pressure locked, rectangular bar
 - 1. Traffic Surface: Plain
 - 2. Finish: Mill
- C. GRATING FRAMES AND SUPPORTS
- D. Metal: Same metal as grating.
- E. Exterior steel frames galvanized.

END OF SECTION 055313

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SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Furnish and install all structural plywood, blocking, supports, non-structural nailers, and stripping as required for securing other work, shown on Drawings. Furnish all hardware, miscellaneous rough carpentry and related accessories as indicated on the Drawings or specified herein for a complete installation.

1.2 QUALITY ASSURANCE

- A. Codes and Standards: All lumber shall conform to all requirements of the International Building Code. All framing lumber and plywood shall be appropriately grade marked with an agency certified by the American Lumber Standards Committee Board of Review for lumber or the American Plywood Association for plywood.
- B. Coordination: Contractor shall coordinate location of blocking with other related trades. Other Contractors will furnish exact locations of grounds and blockings to this Contractor for proper installation of their Work.

1.3 SUBMITTALS

- A. Product Data: Submit copies of manufacturer's product data indicating specifications and installation requirements for rough hardware items specified, i.e., connectors, joist hangers, etc.
- B. Letters: Submit letter of compliance that all lumber is grade-marked in compliance with specified products and that lumber is of species and fiber stress specified.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Lumber:
 - 1. Standard Grade Hem-Fir: Non-structural furring, concealed blocking and stripping, and miscellaneous nailers, grade marked with WWPA stamp.

- B. Framing Lumber:
 - 1. Studs, sills, plates, ledgers, stiffeners, bridging, etc. Size and spacing as indicated and as required, shall be:

- a. Species: Spruce-Pine-Fir: Grade No. 2 or better

Fb =	875 psi
Ft =	450 psi
Fv =	135 psi
Fc =	425 psi perpendicular to grain
Fc =	1150 psi parallel to grain
Ec =	1,400,000 psi

- 2. Wood members 2" to 4" thick, 5" and wider.

- a. Species: Hem-Fir: Grade No. 2 or better

Fb =	850 psi
Ft =	525 psi
Fv =	150 psi
Fc =	405 psi perpendicular to grain
Fc =	1300 psi parallel to grain
Ec =	1,300,000 psi

3. Beam and Stringers

- a. Species: Hem-Fir: Grade No. 2 or better

Fb =	675 psi
Ft =	350 psi
Fv =	140 psi
Fc =	405 psi perpendicular to grain
Fc =	1300 psi parallel to grain
Ec =	1,100,000 psi

- C. Fasteners:

1. Nails: Meeting the requirements of ASTM F1667
 - a. Common wire nails. Use galvanized box nails where rough carpentry is exposed to moisture.
 - b. Non-corrosive finish nails of either stainless steel, aluminum or high quality hot-dipped galvanized shall be used on all exposed decorative lumber and redwood flooring.
2. Bolts: ASTM A307-94 "Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength," galvanized for exterior connections. Use washers under all heads where in contact with wood; use washers under all nuts. Bolts shall meet the requirements of ANSI/ASME Standard B18.2.1.
3. Screws: In accordance with ANSI/ASME Standard B18.6.1.
4. Connectors, Joist Hangers, Anchors, Etc.: Type and size to meet job conditions and as indicated on the Drawings, or as required, as manufactured by Simpson Co., San Leandro, California 94577 or acceptable substitution.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide and securely fasten wood nailing strips, plates, blocking, etc., at proper levels in stud partitions, to anchor all items which require use of wood blocking to fasten or support components and accessories, and as nailers used in conjunction with roofing membrane, sheet metal and flashing and roofing accessories.
- B. Workmanship and General Framing
 1. Selection of Lumber Pieces: Carefully select all members, selecting pieces so that knots and obvious defects will not interfere with placing bolts, nailing or making connections. Lumber may be rejected by Architect, whether or not is has been installed, for excessive warp, twist, bow, crook, mildew, fungus, or mold, as well as for improper cutting and fitting.
 2. Shimming: Do not shim sills, joists, short studs, trimmers, headers, lintels, or other framing components.

3. Framing: Set all horizontal or sloped members with crown up. Do not notch, bore, or cut members for pipes, ducts, conduits, or other reasons except as indicated on Drawings or approved by Architect.
4. Bearings: Make all bearings full unless indicated otherwise. Finish all bearing surfaces on which structural members are resting to give sure and even support. Where framing members slope, cut or notch ends as required for uniform bearing surface.
5. Blocking: Install all blocking required to support all items of finish and to cut off all concealed draft openings, both vertical and horizontal, between ceiling and floor areas. Fire stops shall be two (2) inches (nominal) thick, by full width of opening being blocked. Provide fire stop in accordance with the Uniform Building Code, Chapter 25.
6. Bridging: Cross bridging shall be of not less than two (2) inches by three (3) inches nominal wood or of metal cross bridging of equal strength. Space lines of bridging at eight (8) feet max.
7. Nailing:
 - a. All nailing shall be in accordance with the Contract Drawings.
 - b. For conditions not covered in the Contract Drawings, provide penetration into piece receiving the point of not less than 1/2 the length of the nail or spike.
 - c. Do all nailing without splitting wood. Pre-bore as required. Replace all split members at Contractor's expense.
8. Bolting: Drill holes 1/16 inch larger in diameter than bolts being used. Drill straight and true from one side only.
 - a. Bolt threads shall not bear on wood. Use washers under head and nut where both bear on wood. Use washers under all nuts.
9. Screws: Pre-bore holes in accordance with the National Design Specification for Wood Construction.

END OF SECTION 061000

SECTION 061600 - SHEATHING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wall sheathing.
- B. Roof sheathing.
- C. Composite nail base insulated roof sheathing.
- D. Sheathing joint and penetration treatment.

1.2 RELATED REQUIREMENTS:

- A. Section 06 10 00 - Rough Carpentry for plywood backing panels.
- B. Section 07 25 00 - Weather Barriers for water-resistive barrier applied over wall sheathing.

1.3 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.5 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For following products, from ICC-ES:
 - 1. Preservative-treated plywood.
 - 2. Foam-plastic sheathing.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 PRODUCTS

2.1 WOOD PANEL PRODUCTS

- A. Emissions: Products shall meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Certified Wood: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship":
 - 1. Plywood.
 - 2. Oriented strand board.
 - 3. Fiberboard wall sheathing.
 - 4. Particleboard underlayment.
 - 5. Hardboard underlayment.
- C. Plywood: Either DOC PS 1 or DOC PS 2 unless otherwise indicated.
- D. Oriented Strand Board: DOC PS 2.
- E. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- F. Factory mark panels to indicate compliance with applicable standard.

2.2 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.3 WALL SHEATHING

- A. Plywood Wall Sheathing: Exposure 1 sheathing.
 - 1. Span Rating: as indicated on the drawings.
 - 2. Nominal Thickness: as indicated on the drawings
- B. Oriented-Strand-Board Wall Sheathing: Exposure 1 sheathing.
 - 1. Span Rating: as indicated on the drawings
 - 2. Nominal Thickness: as indicated on the drawings

2.4 ROOF SHEATHING

- A. Plywood Roof Sheathing: Exterior rated sheathing.
 - 1. Span Rating: Not less than 32/16.
 - 2. Nominal Thickness: Not less than 5/8 inch.
- B. Oriented-Strand-Board Roof Sheathing: Exterior rated sheathing.
 - 1. Span Rating: Not less than 32/16.
 - 2. Nominal Thickness: Not less than 5/8 inch

2.5 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. For roof[and wall] sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.

2.6 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sealant for Paper-Surfaced Gypsum Sheathing: Elastomeric, medium-modulus, neutral-curing silicone joint sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturer for application indicated and complying with requirements for elastomeric sealants specified in Section 07 92 00 "Joint Sealants."
- B. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.
 - 1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches (50 mm) wide, 10 by 10 or 10 by 20 threads/inch (390 by 390 or 390 by 780 threads/m), of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.
- C. Sheathing Tape for Foam-Plastic Sheathing: Pressure-sensitive plastic tape recommended by sheathing manufacturer for sealing joints and penetrations in sheathing.

2.7 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 or ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.
 - 1. Adhesives shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
 - 3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's "International Residential Code for One- and Two-Family Dwellings."
- D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Wall and Roof Sheathing:
 - a. Nail to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.
 - b. Space panels 1/8 inch (3 mm) apart at edges and ends.

3.3 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
 - 1. Fasten gypsum sheathing to wood framing with nails.
 - 2. Install boards with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

- C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.
 - 1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of boards.
 - 2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

- D. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.
 - 1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of boards.
 - 2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

- E. Seal sheathing joints according to sheathing manufacturer's written instructions.
 - 1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
 - 2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 061600

SECTION 061753 - SHOP-FABRICATED WOOD TRUSSES

PART 1 GENERAL

1.1 SECTION INCLUDES:

- A. Wood roof trusses.
- B. Wood truss bracing.
- C. Metal truss accessories.

1.2 RELATED REQUIREMENTS:

- A. Section 06 16 00 - Sheathing for roof sheathing and subflooring.
- B. Section 31 31 16 - Termite Control for site application of borate treatment to wood trusses.
- C. Allowances: Provide wood truss bracing under the Metal-Plate-Connected Truss Bracing Allowance as specified in Section 01 21 00 "Allowances."

1.3 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.4 DEFINITIONS

- A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.

1.5 QUALITY ASSURANCE

- A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.
 - 1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
 - 2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
- B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program that complies with quality-control procedures in TPI 1 and that involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.
- C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction

that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 ACTION SUBMITTALS

- A. Product Data: For wood-preservative-treated lumber metal-plate connectors, metal truss accessories, and fasteners.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to truss fabricator.
 - 3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Shop Drawings: Show fabrication and installation details for trusses.
 - 1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
 - 2. Indicate sizes, stress grades, and species of lumber.
 - 3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
 - 4. Indicate locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
 - 5. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
 - 6. Show splice details and bearing details.
- C. Delegated-Design Submittal: For metal-plate-connected wood trusses indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer in the state of Texas responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For metal connector-plate manufacturer professional engineer and fabricator.
- B. Material Certificates: For dimension lumber specified to comply with minimum specific gravity. Indicate species and grade selected for each use and specific gravity.
- C. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss fabricating firm.
- D. Evaluation Reports: For the following, from ICC-ES:
 - 1. Wood-preservative-treated lumber.
 - 2. Fire-retardant-treated wood.
 - 3. Metal-plate connectors.
 - 4. Metal truss accessories.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Handle and store trusses to comply with recommendations in TPI BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."
 - 1. Store trusses flat, off of ground, and adequately supported to prevent lateral bending.
 - 2. Protect trusses from weather by covering with waterproof sheeting, securely anchored.
 - 3. Provide for air circulation around stacks and under coverings.
- B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design metal-plate-connected wood trusses.
- B. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1 unless more stringent requirements are specified below.
 - 1. Design Loads: As indicated.
 - 2. Maximum Deflection Under Design Loads:
 - a. Roof Trusses: Vertical deflection of 1/360 of span.
- C. Comply with applicable requirements and recommendations of the following publications:
 - 1. TPI 1, "National Design Standard for Metal Plate Connected Wood Truss Construction."
 - 2. TPI DSB, "Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses."
 - 3. TPI BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."
- D. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

2.2 DIMENSION LUMBER

- A. Certified Wood: For metal-plate-connected wood trusses and permanent bracing, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
 - 3. Provide dressed lumber, S4S.

4. Provide dry lumber with 19 percent maximum moisture content at time of dressing.

C. Minimum Chord Size for Roof Trusses: 2 by 6 inches nominal for both top and bottom chords.

D. Minimum Specific Gravity for Top Chords: 0.50.

E. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Section 06 10 00 "Rough Carpentry".

2.3 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
2. For exposed trusses indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed trusses indicated to receive a stained or natural finish, mark end or back of each piece.

2.4 METAL CONNECTOR PLATES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alpine Engineered Products, Inc.; an ITW company.
2. Cherokee Metal Products, Inc.; Masengill Machinery Company.
3. CompuTrus, Inc.
4. Eagle Metal Products.
5. Jager Building Systems, Inc.; a Tembec/SGF Rexfor company.
6. MiTek Industries, Inc.; a subsidiary of Berkshire Hathaway Inc.
7. Robbins Engineering, Inc.
8. Truswal Systems Corporation; an ITW company.

B. Source Limitations: Obtain metal connector plates from single manufacturer.

C. General: Fabricate connector plates to comply with TPI 1.

D. Hot-Dip Galvanized-Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 (Z180) coating designation; and not less than 0.036 inch (0.9 mm) thick.

1. Use for interior locations unless otherwise indicated.

- E. Hot-Dip Heavy-Galvanized-Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.
 - 1. Use for wood-preservative-treated lumber and where indicated.
- F. Stainless-Steel Sheet: ASTM A 666, Type 304 Type 316, and not less than 0.035 inch (0.88 mm) thick.
 - 1. Use for exterior locations, wood-preservative-treated lumber, and where indicated.

2.5 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.
 - 2. Where trusses are exposed to weather, in ground contact, made from pressure-preservative treated wood, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.

2.6 METAL FRAMING ANCHORS AND ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Cleveland Steel Specialty Co.
 - 2. KC Metals Products, Inc.
 - 3. Phoenix Metal Products, Inc.
 - 4. Simpson Strong-Tie Co., Inc.
 - 5. USP Structural Connectors.
- C. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- D. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.
 - 1. Use for interior locations unless otherwise indicated.
- E. Hot-Dip Heavy-Galvanized-Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.
 - 1. Use for wood-preservative-treated lumber and where indicated.
- F. Stainless-Steel Sheet: ASTM A 666, Type 304 or Type 316.

1. Use for exterior locations and where indicated.
- G. Truss Tie-Downs: Bent strap tie for fastening roof trusses to wall studs below, 1-1/2 inches (38 mm) wide by 0.050 inch (1.3 mm) thick. Tie fastens to one side of truss, top plates, and side of stud below.
- H. Truss Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening roof trusses to wall studs below, 2-1/4 inches (57 mm) wide by 0.062 inch (1.6 mm) thick. Tie fits over top of truss and fastens to both sides of truss, top plates, and one side of stud below.
- I. Roof Truss Clips: Angle clips for bracing bottom chord of roof trusses at non-load-bearing walls, 1-1/4 inches (32 mm) wide by 0.050 inch (1.3 mm) thick. Clip is fastened to truss through slotted holes to allow for truss deflection.
- J. Roof Truss Bracing/Spacers: U-shaped channels, 1-1/2 inches (38 mm) wide by 1 inch (25 mm) deep by 0.040 inch (1.0 mm) thick, made to fit between two adjacent trusses and accurately space them apart, and with tabs having metal teeth for fastening to trusses.

2.7 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20, with dry film containing a minimum of 94 percent zinc dust by weight.
- B. Protective Coatings: SSPC-Paint 22, epoxy-polyamide primer or SSPC-Paint 16, coal-tar epoxy-polyamide paint.

2.8 FABRICATION

- A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.
- B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.
- C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.
 1. Fabricate wood trusses within manufacturing tolerances in TPI 1.
- D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

2.9 SOURCE QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections.
 1. Provide special inspector with access to fabricator's documentation of detailed fabrication and quality-control procedures that provide a basis for inspection control of the workmanship and the fabricator's ability to conform to approved construction documents and referenced standards.
 2. Provide special inspector with access to places where wood trusses are being fabricated to perform inspections.

- B. Correct deficiencies in Work that special inspections indicate does not comply with the Contract Documents.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install wood trusses only after supporting construction is in place and is braced and secured.
- B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.
- C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.
- D. Install and brace trusses according to TPI recommendations and as indicated.
- E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.
- F. Space trusses as indicated; adjust and align trusses in location before permanently fastening.
- G. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in metal framing anchors according to manufacturer's fastening schedules and written instructions.
- H. Securely connect each truss ply required for forming built-up girder trusses.
 - 1. Anchor trusses to girder trusses as indicated.
- I. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.
 - 1. Install bracing to comply with Section 06 10 00 "Rough Carpentry."
 - 2. Install and fasten strongback bracing vertically against vertical web of parallel-chord floor trusses at centers indicated.
- J. Install wood trusses within installation tolerances in TPI 1.
- K. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.
- L. Replace wood trusses that are damaged or do not meet requirements.
 - 1. Damaged trusses may be repaired according to truss repair details signed and sealed by the qualified professional engineer responsible for truss design, when approved by Architect.

3.2 REPAIRS AND PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect wood trusses from weather. If, despite protection, wood trusses become wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

- C. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- D. Protective Coating: Clean and prepare exposed surfaces of metal connector plates. Brush apply primer, when part of coating system, and one coat of protective coating.
 - 1. Apply materials to provide minimum dry film thickness recommended by coating system manufacturer.

END OF SECTION 061753

SECTION 062023 - INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior trim.
2. Interior board paneling.
3. Shelving and clothes rods.
4. Interior stairs and railings.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Lumber: DOC PS 20.

1. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
 - a. For exposed lumber, mark grade stamp on end or back of each piece.

B. Softwood Plywood: DOC PS 1.

C. Hardboard: AHA A135.4.

D. MDF: Grade 130, made with binder containing no urea-formaldehyde resin.

E. Particleboard: Grade M-2, made with binder containing no urea-formaldehyde resin.

F. Melamine-Faced Particleboard: Particleboard, Grade M-2, finished on both faces with thermally fused, melamine-impregnated decorative paper.

1. Color: White.

2.2 INTERIOR TRIM

A. Softwood Lumber Trim:

1. Species and Grade: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine; C Select (Choice), Finish or 1 Common (Colonial).
2. Maximum Moisture Content: 19 percent.

B. Hardwood Lumber Trim:

1. Species and Grade: Red oak, Clear A Finish.
2. Maximum Moisture Content: 13 percent.

C. Moldings for Opaque Finish (Painted Finish):

1. Softwood Moldings:
 - a. Species: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine.
 - b. Maximum Moisture Content: 15 percent.
2. Hardwood Moldings: WMMPA HWM 2, P-grade.
 - a. Species: Aspen, basswood, cottonwood, gum, magnolia, soft maple, tupelo, or yellow poplar.
 - b. Maximum Moisture Content: 9 percent.

2.3 PANELING

A. Hardwood Veneer Plywood Paneling: Manufacturer's stock hardwood plywood panels made without urea-formaldehyde adhesive.

1. Face Veneer Species and Cut: Rotary-cut white birch .
2. Veneer Matching: Random match.
3. Thickness: 1/8 inch.
4. Face Pattern: Manufacturer's standard V grooved pattern.
5. Finish: Manufacturer's standard, transparent, UV-resistant, protective finish.

B. Hardboard Paneling: Interior factory-finished hardboard paneling...

1. Thickness: 1/8 inch.
2. Finish: Class I.
3. Surface-Burning Characteristics:
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.

C. Board Paneling: Interior wood-board paneling.

1. Species: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine.
2. Grade: Clear No. 1.
3. Maximum Moisture Content: 15 percent.

2.4 SHELVING AND CLOTHES RODS

A. Shelving: Made from particleboard with radiused and filled or solid-wood front edge, 3/4 inch thick.

B. Shelf Cleats: 3/4-by-3-1/2-inch boards with hole and notch to receive clothes rods.

C. Clothes Rods: 1-1/2-inch- diameter, clear, kiln-dried hardwood.

2.5 MISCELLANEOUS MATERIALS

- A. Low-Emitting Materials: Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.
- C. Paneling Adhesive: Comply with paneling manufacturer's written recommendations for adhesives.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

3.2 INSTALLATION, GENERAL

- A. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - 1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - 2. Countersink fasteners, fill surface flush, and sand unless otherwise indicated.
 - 3. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
 - 4. Install stairs with no more than 3/16-inch variation between adjacent treads and risers and with no more than 3/8-inch variation between largest and smallest treads and risers within each flight.

3.3 STANDING AND RUNNING TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Cope at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints.

3.4 PANELING INSTALLATION

- A. Plywood Paneling: Select and arrange panels on each wall to minimize noticeable variations in grain character and color between adjacent panels. Leave 1/4-inch gap to be covered with trim at top, bottom, and openings. Install with uniform tight joints between panels.
 - 1. Attach panels to supports with manufacturer's recommended panel adhesive and fasteners. Space fasteners and adhesive as recommended by panel manufacturer.
 - 2. Conceal fasteners to greatest practical extent.
- B. Hardboard Paneling: Install according to manufacturer's written recommendations. Leave 1/4-inch gap to be covered with trim at top, bottom, and openings. Butt adjacent panels with moderate contact. Use fasteners with prefinished heads matching paneling color.
- C. Board Paneling: Arrange in random-width pattern suggested by manufacturer unless boards or planks are of uniform width.
 - 1. Install in full lengths without end joints.
 - 2. Stagger end joints in random pattern to uniformly distribute joints on each wall.
 - 3. Select and arrange boards on each wall to minimize noticeable variations in grain character and color between adjacent boards. Install with uniform tight joints between boards.
 - 4. Fasten paneling by face nailing, setting nails, and filling over nail heads.
 - 5. Fasten paneling with trim screws, set below face and filled.
 - 6. Fasten paneling by blind nailing through tongues.

3.5 SHELVING AND CLOTHES ROD INSTALLATION

- A. Cut shelf cleats at ends of shelves about 1/2 inch (13 mm) less than width of shelves and sand exposed ends smooth.
- B. Install shelf cleats by fastening to framing or backing with finish nails or trim screws, set below face and filled. Space fasteners not more than 16 inches o.c.
- C. Install shelf brackets according to manufacturer's written instructions, spaced not more than 32 inches o.c. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.
- D. Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled. Install shelves, fully seated on cleats, brackets, and supports.

END OF SECTION 062023

SECTION 064510 - WOOD TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior standing and running trim.
2. Interior standing and running trim.
3. Closet and utility shelving.
4. Wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.
5. Shop priming of wood trim.
6. Shop finishing of wood trim.

1.2 ACTION SUBMITTALS

A. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

B. Samples:

1. Lumber for transparent finish, for each species and cut, finished on one side and one edge.
2. Lumber and panel products with shop-applied opaque finish, for each finish system and color, with exposed surface finished.

1.3 FIELD CONDITIONS

A. Weather Limitations for Exterior Work: Proceed with installation of exterior wood trim only when existing and forecasted weather conditions permit work to be performed and at least one coat of specified finish to be applied without exposure to rain, snow, or dampness.

B. Environmental Limitations for Interior Work: Do not deliver or install interior wood trim until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 EXTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

A. Grade: Premium.

- B. Wood Species: All-heart redwood.

2.2 EXTERIOR STANDING AND RUNNING TRIM FOR OPAQUE FINISH

- A. Grade: Premium.
- B. Wood Species: All-heart redwood.

2.3 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

- A. Grade: Premium.
- B. Wood Species and Cut: Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building unless otherwise indicated.
 - 1. Species: Red oak.
 - 2. Cut: Plain sliced/plain sawn.

2.4 INTERIOR STANDING AND RUNNING TRIM FOR OPAQUE FINISH

- A. Grade: Premium.
- B. Wood Species: Any closed-grain hardwood.

2.5 CLOSET AND UTILITY SHELVING

- A. Grade: Premium.
- B. Shelf Material: 3/4-inch solid lumber.
- C. Cleats: 3/4-inch solid lumber.
- D. Wood Species: Red oak.
- E. Closet Rods: 1-1/2-inch- diameter, red oak.

2.6 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of wood trim and quality grade specified unless otherwise indicated.
 - 1. Wood Moisture Content for Exterior Materials: 9 to 15 percent.
 - 2. Wood Moisture Content for Interior Materials: 5 to 10 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of wood trim and quality grade specified unless otherwise indicated.

1. Medium-Density Fiberboard: Grade 130, made with binder containing no urea formaldehyde.
 2. Particleboard: Grade M-2.
 3. Veneer-Faced Panel Products (Hardwood Plywood): , made with adhesive containing no urea formaldehyde.
 4. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper.
- C. Water-Repellent Preservative Treated Materials: (dip, spray, flood, or vacuum-pressure treatment) for exterior wood trim indicated to receive water-repellent preservative treatment.
1. Preservative Chemicals: 3-iodo-2-propynyl butyl carbamate (IPBC), combined with an insecticide containing chloropyrifos (CPF).
 2. Extent of Water-Repellent Preservative Treatment: Treat all exterior wood trim.

2.7 MISCELLANEOUS MATERIALS

- A. Exterior Blocking, Shims, and Nailers: Softwood or hardwood lumber, pressure-preservative treated, kiln dried to less than 15 percent moisture content.
1. Preservative Treatment by Pressure Process:
 - a. Kiln dry lumber after treatment to a maximum moisture content of 19 percent.
- B. Interior Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- C. Nails for Exterior Use: Aluminum, hot-dip galvanized or stainless steel.
- D. Screws for Exterior Use: Aluminum, bronze, hot-dip galvanized or stainless steel.
- E. Provide self-drilling screws for metal-framing supports.
- F. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- G. Handrail Brackets: Cast from malleable iron with wall flange drilled for exposed anchor and tapped for concealed hanger bolt and with support arm for screwing to underside of rail. Sized to provide 1-1/2-inch clearance between handrail and wall.
- H. Handrail/Bumper Rail Brackets: Pairs of extruded-aluminum channels; one for fastening to back of rail and one for fastening to face of wall. They are then assembled in overlapping fashion and fastened together top and bottom with self-tapping screws. Sized to provide 1-1/2-inch clearance between handrail and wall.
- I. Adhesives: Do not use adhesives that contain urea formaldehyde.

2.8 FABRICATION

- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- B. Fabricate wood trim to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Edges of Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.
 - 2. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.
- C. Backout or groove backs of flat trim members and kerf backs of other wide, flat members except for members with ends exposed in finished work.
- D. Assemble casings in shop except where shipping limitations require field assembly.

2.9 SHOP PRIMING

- A. Exterior Wood Trim for Opaque Finish: Shop prime with one coat of wood primer specified in Section 099113 "Exterior Painting."
- B. Interior Wood Trim for Opaque Finish: Shop prime with one coat of wood primer specified in Section 099123 "Interior Painting."
- C. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing wood trim, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of wood trim. Apply two coats to surfaces installed in contact with concrete or masonry and to end-grain surfaces.

2.10 SHOP FINISHING

- A. General: Finish wood trim at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- B. General: Drawings indicate items that are required to be shop finished. Finish such items at fabrication shop as specified in this Section. Refer to Section 099113 "Exterior Painting" Section 099123 "Interior Painting".
- C. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing wood trim, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of wood trim. Apply two coats to end-grain surfaces.
- D. Opaque Finish for Exterior Trim: Comply with Section 099113 "Exterior Painting."

E. Transparent Finish for Interior Trim:

1. Grade: Premium.
2. Finish: System - 4, water-based latex acrylic.
3. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to woodwork made from closed-grain wood before staining and finishing.
4. Staining: Match Architect's sample.
5. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
6. Filled Finish for Open-Grain Woods: After staining, apply wash-coat sealer and allow to dry. Apply paste wood filler and wipe off excess. Tint filler to match stained wood.
7. Sheen: Semigloss, 46-60 gloss units measured on 60-degree gloss.

F. Opaque Finish for Interior Trim:

1. Grade: Premium.
2. Finish: System - 4, water-based latex acrylic.
3. Color: As selected by Architect from manufacturer's full range.
4. Sheen: Semigloss, 46-60 gloss units measured on 60-degree gloss.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition wood trim to average prevailing humidity conditions in installation areas.

3.2 INSTALLATION

- A. Grade: Install wood trim to comply with same grade as item to be installed.
- B. Install wood trim level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- C. Scribe and cut wood trim to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- D. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.
- E. Preservative-Treated Wood: Where cut or drilled in field, treat cut ends and drilled holes according to AWPA M4.
- F. Anchor wood trim to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
1. For shop-finished items, use filler matching finish of items being installed.

- G. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 36 inches long except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.
1. Install wall railings on indicated metal brackets securely fastened to wall framing.
 2. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.

END OF SECTION 064510

SECTION 064520 - WOOD FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior frames and jambs.
2. Interior frames and jambs.
3. Shop priming wood frames and jambs.
4. Shop finishing wood frames and jambs.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product, including fire-retardant-treated materials and finishing materials and process.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
- C. Samples:
1. Lumber for transparent finish, for each species and cut, finished on one side and one edge.
 2. Lumber with shop-applied opaque finish, for each finish system and color, with exposed surface finished.

1.3 FIELD CONDITIONS

- A. Weather Limitations for Exterior Work: Proceed with installation of exterior wood frames only when existing and forecasted weather conditions permit work to be performed and at least one coat of specified finish to be applied without exposure to rain, snow, or dampness.
- B. Environmental Limitations for Interior Work: Do not deliver or install interior wood frames until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 EXTERIOR FRAMES AND JAMBS FOR TRANSPARENT FINISH

- A. Grade: Premium.

- B. Wood Species: All-heart redwood.

2.2 EXTERIOR FRAMES AND JAMBS FOR OPAQUE FINISH

- A. Grade: Premium.
- B. Wood Species: All-heart redwood.

2.3 INTERIOR FRAMES AND JAMBS FOR TRANSPARENT FINISH

- A. Grade: Premium.
- B. Wood Species and Cut: Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building unless otherwise indicated.
 - 1. Species: Red oak.
 - 2. Cut: Plain sliced/plain sawn.

2.4 INTERIOR FRAMES AND JAMBS FOR OPAQUE FINISH

- A. Grade: Premium.
- B. Wood Species: Any closed-grain hardwood.

2.5 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of wood frame and quality grade specified unless otherwise indicated.
 - 1. Wood Moisture Content for Exterior Materials: 9 to 15 percent.
 - 2. Wood Moisture Content for Interior Materials: 5 to 10 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of wood frame and quality grade specified unless otherwise indicated.
 - 1. Medium-Density Fiberboard: Grade 130, made with binder containing no urea formaldehyde.
 - 2. Particleboard: Grade M-2, made with binder containing no urea formaldehyde.
- C. Water-Repellent Preservative Treated Materials: (dip, spray, flood, or vacuum-pressure treatment) for exterior wood frames indicated to receive water-repellent preservative treatment.
 - 1. Preservative Chemicals: 3-iodo-2-propynyl butyl carbamate (IPBC), combined with an insecticide containing chlorpyrifos (CPF).
 - 2. Extent of Water-Repellent Preservative Treatment: Treat all exterior wood frames unless otherwise indicated.

2.6 FIRE-RETARDANT-TREATED MATERIALS

- A. Fire-Retardant-Treated Lumber: Products with a flame-spread index of 25 or less.
 - 1. Kiln dry lumber after treatment to a maximum moisture content of 19 percent.
- B. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less.
- C. Fire-Retardant Fiberboard: Medium-density fiberboard panels made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less.

2.7 MISCELLANEOUS MATERIALS

- A. Exterior Blocking, Shims, and Nailers: Softwood or hardwood lumber, pressure-preservative treated, kiln dried to less than 15 percent moisture content.
 - 1. Preservative Treatment by Pressure Process:
 - a. Kiln dry lumber after treatment to a maximum moisture content of 19 percent.
- B. Interior Blocking, Shims, and Nailers: Softwood or hardwood lumber kiln dried to less than 15 percent moisture content.
- C. Nails for Exterior Use: Aluminum, hot-dip galvanized or stainless steel.
- D. Screws for Exterior Use: Aluminum, bronze hot-dip galvanized or stainless steel.
- E. Provide self-drilling screws for metal-framing supports.
- F. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- G. Adhesives: Do not use adhesives that contain urea formaldehyde.

2.8 FABRICATION

- A. Fabricate wood frames to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Edges of Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.

2.9 SHOP PRIMING

- A. Exterior Wood Frames for Opaque Finish: Shop prime with one coat of wood primer specified in Section 099113 "Exterior Painting."

- B. Exterior Wood Frames for Transparent Finish: Shop seal with stain (if required), other required pretreatments, and first coat of finish as specified in Section 099300 "Wood Stains and Transparent Finishes."
- C. Interior Wood Frames for Opaque Finish: Shop prime with one coat of wood primer specified in Section 099123 "Interior Painting."
- D. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing wood frames, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of wood trim. Apply two coats to surfaces installed in contact with concrete or masonry and to end-grain surfaces.

2.10 SHOP FINISHING

- A. General: Finish wood frames at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- B. General: Drawings indicate items that are required to be shop finished. Finish such items at fabrication shop as specified in this Section. Refer to Section 099113 "Exterior Painting and Section 099123 "Interior Painting" for field finishing wood frames not indicated to be shop finished.
- C. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing wood frames, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of wood frames. Apply two coats to end-grain surfaces.
- D. Transparent Finish for Exterior Frames: Comply with Section 099123 "Interior Painting".
- E. Opaque Finish for Exterior Frames: Comply with Section 099113 "Exterior Painting."
- F. Transparent Finish for Interior Frames:
 - 1. Grade: Premium.
 - 2. Finish: System - 4, water-based latex acrylic.
 - 3. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to woodwork made from closed-grain wood before staining and finishing.
 - 4. Staining: Match Architect's sample.
 - 5. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
 - 6. Filled Finish for Open-Grain Woods: After staining, apply wash-coat sealer and allow to dry. Apply paste wood filler and wipe off excess. Tint filler to match stained wood.
 - 7. Sheen: Semigloss, 46-60 gloss units measured on 60-degree gloss.
- G. Opaque Finish for Interior Frames:

1. Grade: Premium.
2. Finish: System - 4, water-based latex acrylic.
3. Color: As selected by Architect from manufacturer's full range.
4. Sheen: Semigloss, 46-60 gloss units measured on 60-degree gloss meter per ASTM D 523.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition wood frames to average prevailing humidity conditions in installation areas.

3.2 INSTALLATION

- A. Grade: Install wood frames to comply with same grade as item to be installed.
- B. Install wood frames level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- C. Scribe and cut wood frames to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- D. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.
- E. Anchor wood frames to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nail or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
 1. For shop-finished items, use filler matching finish of items being installed.

END OF SECTION 064520

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SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Foam-plastic board insulation.
2. Glass-fiber blanket insulation.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. DiversiFoam Products.
 - b. Dow Chemical Company (The).
 - c. Owens Corning.
 - d. Pactiv Building Products.
2. Type VI, 40 psi.

2.2 GLASS-FIBER BLANKET INSULATION

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. CertainTeed Corporation.
 2. Guardian Building Products, Inc.
 3. Johns Manville.
 4. Knauf Insulation.
 5. Owens Corning.
- B. Unfaced, Glass-Fiber Blanket Insulation: Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

- C. Kraft-Faced, Glass-Fiber Blanket Insulation: Type II (non-reflective faced), Class C (faced surface not rated for flame propagation); Category 1 (membrane is a vapor barrier).
- D. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.
- E. At ceilings and soffits simulation to be R-38
- F. At exterior 2 x 6 frame walls insulation to be R-19.
- G. At interior 2 x 4 frame walls to be nominal 4" acoustic batt.
- H. A minimum of 1" space shall be provided between the insulation and roof sheathing by the use of insulation baffles at all vented truss bays.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.
- E. Where eave or cornice vents are installed, insulation shall not block the free flow of air. A minimum of a 1-inch space shall be provided between the insulation and the roof sheathing and at the locations of the vent. (IRC R806.3)

3.2 INSTALLATION OF BELOW-GRADE INSULATION

- A. On vertical surfaces, set insulation units loosely laid according to manufacturer's written instructions.
 - 1. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

1. If not otherwise indicated, extend insulation a minimum of 24 inches in from exterior walls.

3.3 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Glass-Fiber: Install in cavities formed by framing members according to the following requirements:
 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 4. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
 5. For wood-framed construction, install blankets as follows:
 - a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
 6. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
 - a. Exterior Walls: Set units with facing placed toward interior of construction.

END OF SECTION 072100

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SECTION 072500 - WEATHER BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Building paper.
2. Building wrap.
3. Flexible flashing.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For water-resistive barrier and flexible flashing, from ICC-ES.
- B. Product data for each type of product indicated and required for the complete system.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

- A. A weather-resistive barrier is required under all exterior wall systems in compliance with I.R.C. R703.2. Refer to manufacturers specifications for type and installation requirements.
- B. Building Paper: No. 15 asphalt-saturated organic felt, unperforated.
- C. A weather resistive barrier is required under all exterior wall systems. Refer to manufacturers specifications for type and installation requirements.
- D. This weather resistive barrier shall be applied over all open stud framing and all wood based wall sheathing.
- E. Open stud framing shall receive 1 layer of grade "D" Kraft waterproof building paper. Wood sheathed framing shall receive 2 layers of grade "D" waterproof building paper. In-lieu thereof, 1 layer of ASTM 15 asphalt-saturated organic felt may be applied or other weather-resistive barrier conforming to IRC Section R703.2 and section R703.4
- F. Provide a continuous urethane caulk sill plate sealer at all exterior sill plates to foundation.

2.2 MISCELLANEOUS MATERIALS

- A. Flexible Flashing: Self-adhesive butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. DuPont (E. I. du Pont de Nemours and Company); DuPont Flashing Tape.
 - b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Vycor Butyl Self Adhered Flashing.
 - c. Protecto Wrap Company; BT-25 XL.
 - d. Raven Industries Inc.; Fortress Flashshield.
 - e. Advanced Building Products Inc.; Wind-o-wrap.
 - f. Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
 - g. Fiberweb, Clark Hammerbeam Corp.; Aquaflash 500.
 - h. Fortifiber Building Systems Group; Fortiflash 25 or Fortiflash 40.
 - i. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Vycor Plus Self-Adhered Flashing or Vycor V40 Self-Adhered Flashing.
 - j. MFM Building Products Corp.; Window Wrap.
 - k. Polyguard Products, Inc.; Polyguard JT-20 Tape or Polyguard JT-30 Tape.
 - l. Sandell Manufacturing Co., Inc.; Presto-Seal.

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

- A. Weather-resistive barriers shall be applied over all open stud framing and all wood based wall sheathing.
- B. Open stud framing shall receive 1 layer of grade "D" Kraft water-proof-building paper. Wood sheathed framing shall receive 2 layers of grade "D" waterproof building paper. In-lieu thereof, 1 layer of ASTM TYPE 15 asphalt-saturated organic felt may be applied or other weather-resistive barrier conforming to I.R.C. section &703.2 and section R703.4.
- C. Provide a continuous urethane caulk sill plate sealer at all exterior sill plates to foundation.
- D. Cover sheathing with water-resistive barrier as follows:
 - 1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion-or control-joint locations.
 - 2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap unless otherwise indicated.
- E. Building Paper: Apply horizontally with a 2-inch overlap and a 6-inch end lap; fasten to sheathing with galvanized staples or roofing nails.

3.2 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.
 - 1. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
 - 2. Lap flashing over water-resistive barrier at bottom and sides of openings.
 - 3. Lap water-resistive barrier over flashing at heads of openings.

END OF SECTION 072500

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SECTION 072600 - UNDER-SLAB VAPOR RETARDER

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Products Supplied Under This Section
- B. Vapor Retarder, seam tape, mastic, pipe boots for installation under concrete slabs.

1.2 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-place Concrete
- B. Section 03 20 00 - Concrete Forming and Accessories
- C. Section 31 23 11 - Earthwork for Building Construction

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM), latest versions:
 - 1. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials
 - 2. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs
 - 3. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs
 - 4. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs
- B. American Concrete Institute (ACI), latest versions:
 - 1. ACI 302.2R - Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials

1.4 SUBMITTALS

- A. Quality Control / Assurance
 - 1. Comply with Section 01 33 00 – Submittal Procedures.
 - 2. Independent laboratory test results showing compliance with ASTM & ACI Standards.
 - 3. Manufacturer's samples, literature
 - 4. Manufacturer's installation instructions for placement, seaming and pipe boot installation
- B. Delivery, Storage, and Handling
 - 1. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
 - 2. Store materials in a clean dry area in accordance with manufacturer's instructions.
 - 3. Stack membrane on smooth ground or wood platform to eliminate warping.

4. Protect materials during handling and application to prevent damage or contamination.
 5. Ensure membrane is stamped with manufacturer's name, product name and membrane thickness at intervals of no more than 85" (220 cm).
- C. Environmental requirements
1. Product not intended for uses subject to abuse or permanent exposure to the elements.
 2. Do not apply on frozen ground.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Vapor Retarder (Performance-Based Specifications)
1. Vapor Retarder must have the following qualities at minimum and meet floor finish manufacturer's warranty requirements.
 - a. Water Vapor Retarder ASTM E1745: Meets or exceeds Class A
 - b. Maximum Permeance ASTM E96: 0.01 perms or as required to meet Flooring Manufacturer's Warranties.
 - c. Tensile Strength ASTM E154, Section 9: not less than 45 LBS. Force/Inch
 - d. Puncture Resistance, ASTM D1709, Method B.
 - e. Thickness of Retarder (plastic) ACI 302.1R: Not less than 15 mils
 - f. Material: Virgin Polyethylene or Polyolefin
 2. Vapor Retarder Products, may be by one of the following manufacturers or an approved equal, as long as the requirements above are met.
 - a. Epro, <http://eproserve.com>
 - b. Fortifiber, <http://www.fortifiber.com>
 - c. Stego Industries, <http://www.stegoindustries.com>
 - d. W.R. Meadows, <http://www.wrmeadows.com>
 - e. Raven Industries, <http://www.vaporblock.com>
 - f. Reef Industries, <http://www.reefindustries.com>
 - g. Insulation Solutions, <http://www.insulationsolution.com>

2.2 ACCESSORIES

- A. Seam Tape
1. Tape must have the following qualities:
 - a. Water Vapor Transmission Rate ASTM E 96 0.3 perms or lower
- B. Vapor Proofing Mastic

1. Mastic must have the following qualities:
 - a. Water Vapor Transmission Rate ASTM E 96 0.3 perms or lower
- C. Pipe Boots
 1. Construct pipe boots from vapor Retarder material, pressure sensitive tape and/or mastic per manufacturer's instructions.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive membrane. Ensure compaction requirements have been completed and geotechnical firm has confirmed compaction requirements have been met. Notify Architect if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Prepare surfaces in accordance with manufacturer's instructions.

3.3 INSTALLATION

- A. Install Vapor Retarder:
 1. Installation shall be in accordance with manufacturer's instructions and ASTM E 1643.
 - a. Unroll Vapor Retarder with the longest dimension parallel with the direction of the pour.
 - b. Lap Vapor Retarder over footings and seal to foundation walls.
 - c. Overlap joints 6 inches and seal with manufacturer's tape.
 - d. Seal all penetrations (including pipes) per manufacturer's instructions.
 - e. No penetration of the Vapor Retarder is allowed except for reinforcing steel and permanent utilities.
 - f. Repair damaged areas by cutting patches of Vapor Retarder, overlapping damaged area 6 inches and taping all four sides with tape.

END OF SECTION 072600

SECTION 073113 - ASPHALT SHINGLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Asphalt shingles.
2. Underlayment.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For each exposed product and for each color and blend specified.

1.3 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Warranties: Sample of special warranties.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 QUALITY ASSURANCE

- A. Pre-installation Conference: Conduct conference at Project site or location determined by Owner's Representative.

1.6 WARRANTY

- A. Special Warranty: Standard form in which manufacturer agrees to repair or replace asphalt shingles that fail in materials or workmanship within specified warranty period.
1. Material Warranty Period: 30 years from date of Substantial Completion, prorated, with first 12 years non-prorated.

PART 2 - PRODUCTS

2.1 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

- A. Laminated-Strip Asphalt Shingles: laminated, multi-ply overlay construction, glass-fiber reinforced, mineral-granule surfaced, and self-sealing.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Atlas Roofing Corporation.
 - b. CertainTeed Corporation.
 - c. Elk Premium Building Products, Inc.; an ElkCorp company.
 - d. Emco Building Products Corp.
 - e. GAF Materials Corporation.
 - f. IKO.
 - g. Malarkey Roofing Products.
 - h. Owens Corning.
 - i. PABCO Roofing Products.
 - j. TAMKO Roofing Products, Inc.
 - 2. Color and Blends: As selected by Owner's Representative from manufacturer's full range.
- B. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.

2.2 UNDERLAYMENT MATERIALS

- A. Felt: Type II, asphalt-saturated organic felts, non-perforated.
- B. Self-Adhering Sheet Underlayment, High Temperature (Ice and Water Shield): Minimum of 40-mil thick, slip-resisting, polyethylene-film-reinforced top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release paper backing; cold applied. Provide primer for adjoining concrete or any masonry surfaces to receive underlayment.
 - 1. Thermal Stability: Stable after testing at 240 deg F; ASTM D 1970.
 - 2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D 1970.
 - 3. Permeance (Max): 2.9ng/m Pa(.05 Perms) per ASTM E96
 - 4. Color: Gray-Black

2.3 ACCESSORIES

- A. Asphalt Roofing Cement: Type II, asbestos free.
- B. Roofing Nails: aluminum, stainless-steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch- diameter, barbed shank, sharp-pointed, with a minimum 3/8-inch-diameter flat head and of sufficient length to penetrate 3/4 inch into solid wood decking or extend at least 1/8 inch through OSB or plywood sheathing.

1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.
 2. High wind nailing pattern is required with six nails per shingle.
- C. Felt Underlayment Nails: Aluminum, stainless-steel, or hot-dip galvanized-steel wire with low-profile capped heads or disc caps, 1-inch minimum diameter.

2.4 METAL FLASHING AND TRIM

- A. General: Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
1. Sheet Metal: Zinc-tin alloy-coated steel.

PART 3 - EXECUTION

3.1 UNDERLAYMENT INSTALLATION

- A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
- B. Double-Layer Felt Underlayment: Install on roof deck parallel with and starting at the eaves. Install a 19-inch- wide starter course at eaves and completely cover with full-width second course. Install succeeding courses lapping previous courses 19 inches in shingle fashion. Lap ends a minimum of 6 inches. Stagger end laps between succeeding courses at least 72 inches. Fasten with felt underlayment nails.
1. Terminate felt underlayment extended up not less than 4 inches against sidewalls, curbs, chimneys, and other roof projections.
 2. Install fasteners at no more than 36 inch o.c.
- C. Self-Adhering Sheet Underlayment, High Temperature (Ice and Water Shield): Install, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install at locations indicated below and on drawings (specs will govern conflicts) lapped in direction to shed water. Lap sides not less than 3-1/2 inches. Lap ends not less than 6 inches staggered 24 inches between courses. Roll laps with roller. Cover underlayment within seven days.
1. Extend into the inside, warm interior wall of the roof a minimum of 36". Comply with state and local requirements.
 2. Self-adhered underlayment must be installed in all valleys, roof to wall, roof to curb or skylight and around flashings.

3.2 METAL FLASHING INSTALLATION

- A. General: Install metal flashings and other sheet metal to comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."

3.3 ASPHALT SHINGLE INSTALLATION

- A. General: Install asphalt shingles according to manufacturer's written instructions, recommendations.
- B. Install starter strip along lowest roof edge, consisting of an asphalt shingle strip at least 7 inches wide with self-sealing strip face up at roof edge.
 - 1. Extend asphalt shingles 1/2 inch over fasciae at eaves and rakes.
 - 2. Install starter strip along rake edge.
- C. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- D. Fasten asphalt shingle strips with a minimum of five roofing nails located according to manufacturer's written instructions.
 - 1. Where roof slope is less than 4:12, seal asphalt shingles with asphalt roofing cement spots.
- E. Valleys: Install full asphalt shingles at valleys to completely cover flashing providing continuously shingled valleys.
- F. Ridge and Hip Cap Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.

END OF SECTION 073113

SECTION 074602- SIDING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes fiber-cement siding.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For siding including related accessories.

1.3 INFORMATIONAL SUBMITTALS

- A. Product certificates.
- B. Product test reports.
- C. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type, color, texture, and pattern of siding, including related accessories, from single source from single manufacturer.

1.6 WARRANTY

- A. Special Warranty: Standard form in which manufacturer agrees to repair or replace siding that fail(s) in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 30 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FIBER-CEMENT SIDING

- A. Basis of design: Hardieplank Fiber Cement siding, trim & soffits or approved equal.
- B. General: Type A, Grade II, fiber-cement board, noncombustible with a flame-spread index of 25 or less.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cemplank.
 - b. CertainTeed Corp.
 - c. GAF Materials Corporation.
 - d. James Hardie.
 - e. MaxiTile, Inc; a California corporation.
 - f. Nichiha Fiber Cement.
 - 2. Horizontal Pattern: Ship-lap boards 7-1/4 to 7-1/2 inches wide in wood/ cedar mill texture style. Min. 5/16" thick.
 - a. Texture: Lap Siding: Cedarmill, Trim: 3.5-5.5" Smooth, Soffit: Smooth continuously vented
 - b. **All siding, trim & soffits shall be provided with mfgr applied primer. It is the intent for all siding to be painted in-field with a design basis paint manufacturer as shown on the drawings.**
 - c. **Provide all necessary metal trim screeds and control joints for lap siding attachments.**
 - d. **ALL CEMENTITIOUS LAP SIDING SUCH AS HARDIE PLANK SHALL BE INSTALLED IN ACCORDANCE TO THE BEST PRACTICES & INSTALLATION GUIDE OF THE MANUFACTURER.**
 - 3. Factory Priming: Manufacturer's standard primer compatible with Silicone Alkyd Enamel paint.

2.2 ACCESSORIES

- A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.
 - 1. Provide accessories made from same material as matching color and texture of adjacent siding unless otherwise indicated.

2. Provide exterior window & door trim surrounds of smooth surface. Provide color as selected by contracting officer per color board.
3. Provide smooth continuously vented cementitious soffit panels as indicated on the drawings

B. Fasteners:

1. For fastening to wood, use siding nails of sufficient length to penetrate a minimum of 1 inch into substrate.
2. For fastening fiber cement, use hot-dip galvanized fasteners.

C. Covers:

1. Butt Joint Covers.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of siding and related accessories.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with siding manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
 1. Do not install damaged components.
- B. Install fiber-cement siding and related accessories.
 1. Install fasteners no more than 24 inches o.c.
- C. Per Manufacturer's recommendation, install joint sealants as specified in Section 079200 "Joint Sealants" and to produce weathertight installation.
- D. Provide galvanized "J" metal at bottom of all exterior braced wall sheathing.

3.3 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.

- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 074602

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manufactured counter-flashing.
2. Formed roof drainage sheet metal fabrications.
3. Formed steep-slope roof sheet metal fabrications.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.

1. Include details for forming, joining, supporting, and securing sheet metal flashing and trim, including pattern of seams, termination points, fixed points, expansion joints, expansion-joint covers, edge conditions, special conditions, and connections to adjoining work.

C. Samples: For each exposed product and for each finish specified.

1.3 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 WARRANTY

A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
- B. Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process.
 - 1. Zinc-Coated (Galvanized) Steel Sheet: G90 coating designation; structural quality.
 - 2. Surface: Manufacturer's standard clear acrylic coating on both sides.
 - 3. Exposed Coil-Coated Finish:
 - a. Three-Coat Fluoropolymer: Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.
 - 4. Color: As selected by Owner's Representative from manufacturer's full range.

2.2 UNDERLAYMENT MATERIALS

- A. Felt: Type II (No. 30), asphalt-saturated organic felt, nonperforated.
- B. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.

2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 - 2. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Hot-dip galvanized steel or Series 300 stainless steel.
- C. Solder:

1. For Zinc-Coated (Galvanized) Steel: Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- E. Elastomeric Sealant: elastomeric polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- G. Bituminous Coating: Cold-applied asphalt emulsion.

2.4 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
 1. Obtain field measurements for accurate fit before shop fabrication.
 2. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
 3. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.
- B. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.
- C. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
- D. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- E. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- F. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

2.5 ROOF DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in seamless sections. Furnish flat-stock gutter

spacers and gutter brackets fabricated from same metal as gutters. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters.

- B. Downspouts: Fabricate rectangular downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.
 - 1. Fabricate from the following materials:
 - a. Galvanized Steel: Min. 0.0336 inch thick.

2.6 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Apron, Step, Cricket, and Backer Flashing: Fabricate from the following materials:
 - 1. Galvanized Steel: Min. 0.022 inch thick.
- B. Valley Flashing: Fabricate from the following materials:
 - 1. Galvanized Steel: Min. 0.217 inch thick.
- C. Drip Edges: Fabricate from the following materials:
 - 1. Galvanized Steel: Min. 0.0276 inch thick.
- D. Eave, Rake, Ridge, and Hip Flashing: Fabricate from the following materials:
 - 1. Galvanized Steel: Min. 0.0276 inch thick.

2.7 WALL SHEET METAL FABRICATIONS

- A. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch- high, end dams. Fabricate from the following materials:
 - 1. Galvanized Steel: 0.0247 inch thick.

PART 3 - EXECUTION

3.1 UNDERLAYMENT INSTALLATION

- A. Felt Underlayment: Install felt underlayment with adhesive for temporary anchorage. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

3.2 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement so that completed sheet metal

flashing and trim shall not rattle, leak, or loosen, and shall remain watertight. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 3. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
 4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
 5. Install sealant tape where indicated.
 6. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation.
1. Coat back side of sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
- D. Fastener Sizes: Use fasteners of sizes that will penetrate wood sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- E. Seal joints as shown and as required for watertight construction.
- F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.
1. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
- G. Rivets: Rivet where indicated and where necessary for strength.

3.3 ROOF DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof drainage items to produce complete roof drainage system as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.
- B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter brackets straps twisted straps spaced not more than 36 inches apart. Provide end closures and seal watertight with sealant. Slope to downspouts.
 - 1. Install gutter with expansion joints at locations not exceeding, 30 feet apart. Install expansion-joint caps.
- C. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c. in between.
- D. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints a minimum of 4 inches in direction of water flow.

3.4 ROOF FLASHING INSTALLATION

- A. General: Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.
- C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant.
- D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric or butyl sealant and clamp flashing to pipes that penetrate roof.

3.5 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

3.6 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

END OF SECTION 076200

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SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.

1.2 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples: For each kind and color of joint sealant required.

1.3 WARRANTY

- A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: 5 years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SILICONE JOINT SEALANTS

- A. Mildew-Resistant Neutral-Curing or Acid-Curing Silicone Joint Sealant, as appropriate for each installation:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Building Systems.
 - b. Dow Corning Corporation.
 - c. GE Advanced Materials - Silicones.
 - d. May National Associates, Inc.

- e. Pecora Corporation.
 - f. Polymeric Systems, Inc.
 - g. Schnee-Morehead, Inc.
 - h. Sika Corporation; Construction Products Division.
 - i. Tremco Incorporated.
2. Type: Single component (S).
 3. Grade: nonsag (NS).
 4. Class: 25.
 5. Uses Related to Exposure: Traffic (T) or Nontraffic (NT) as appropriate for each installation.

2.2 JOINT SEALANT BACKING

- A. Cylindrical Sealant Backings: Type C (closed-cell material with a surface skin) Type O (open-cell material) Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.3 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
 1. Remove laitance and form-release agents from concrete.
 2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

- B. **Joint Priming:** Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. **Masking Tape:** Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.2 INSTALLATION

- A. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- B. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- C. **Tooling of Nonsag Sealants:** Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- D. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.3 JOINT-SEALANT SCHEDULE

- A. **Joint-Sealant Application:** Exterior joints in horizontal traffic surfaces.
 - 1. **Joint Locations:**
 - a. Isolation and contraction joints in cast-in-place concrete slabs.
 - b. Joints between different materials.

- c. Other joints as may be applicable.
 2. Joint Sealant: Silicone.
 3. Joint-Sealant Color: As selected by Owner's Representative from manufacturer's full range of colors.
- B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
 1. Joint Locations:
 - a. Joints in exterior finish assemblies.
 - b. Joints between different materials.
 - c. Perimeter joints between materials listed above and frames of doors, windows and louvers.
 - d. Control and expansion joints in ceilings and other overhead surfaces.
 - e. Other joints as may be applicable.
 2. Joint Sealant: Silicone.
 3. Joint-Sealant Color: As selected by Owner's Representative from manufacturer's full range of colors.
- C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
 1. Joint Locations:
 - a. Isolation joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in tile flooring.
 2. Joint Sealant: Silicone.
 3. Joint-Sealant Color: As selected by Owner's Representative from manufacturer's full range of colors.
- D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
 1. Joint Locations:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings where indicated.
 - c. Tile control and expansion joints.
 - d. Vertical joints on exposed surfaces of walls and partitions.
 - e. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
 2. Joint Sealant: Siliconized Latex.
 3. Joint-Sealant Color: As selected by Owner's Representative from manufacturer's full range of colors.
- E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
 1. Joint Sealant Location:

- a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 - c. Other joints as may be applicable.
2. Joint Sealant: Silicone.
 3. Joint-Sealant Color: As selected by Owner's Representative from manufacturer's full range of colors.

END OF SECTION 079200

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SECTION 081126 - STEEL DOORS

1.1 SECTION INCLUDES

- A. Steel entrance doors including transoms and sidelites.
- B. Prehung hardwood door systems.
- C. Glazing.

1.2 RELATED SECTIONS

- A. Section 061000 - Rough Carpentry.
- B. Sealants: Refer to Section 079200 - Joint Sealants.
- C. Section 092900 - Gypsum Board Assemblies.

1.3 REFERENCES

- A. American Architectural Manufacturer Association (AAMA):
 - 1. AAMA 1304 - Voluntary Specification for Forced Entry Resistance of Side-Hinged Door Systems.
 - 2. AAMA 506; Voluntary Specifications for Hurricane and Impact and Cycle Testing of Fenestration Products.
- B. ASTM International (ASTM):
 - 1. ASTM E283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Doors Under Specified Pressure Differences Across the Specimen.
 - 2. ASTM E330 - Standard Test Method for Structural Performance of Exterior Doors by Uniform Static Pressure Difference.
 - 3. ASTM E331 - Standard Test Method for Water Penetration of Exterior Doors by Uniform Static Air Pressure Difference.
 - 4. ASTM E547; Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference.
 - 5. ASTM E1886 - Standard Test Method for Performance of Exterior Doors by Missile(s) and Exposed to Cyclic Pressure Differentials.
 - 6. ASTM E1996 - Standard Specification for Performance of Exterior Doors by Windborne Debris in Hurricanes.
- C. Window & Door Manufacturers Association (WDMA):
 - 1. WDMA I.S.4 - Water Repellent Preservative Non-Pressure Treatment for Millwork.
 - 2. Sponsored Hallmark Certification Program.

1.4 SUBMITTALS

- A. Submit under provisions of Section 013000.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings: Submit shop drawings indicating details of construction, flashings and relationship with adjacent construction.
- D. Verification Samples: For each factory-finished product specified, two samples, minimum size 6 in square, representing actual finishes.

- E. Quality Assurance Submittals:
 - 1. Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with indicated requirements.
 - 2. Manufacturer Instructions: Provide manufacturer's written installation instructions.
- F. Closeout Submittals: Refer to Section 017000 - Closeout Submittals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Minimum 2 years installing similar assemblies.
- B. Certifications: NAMI certification label indicating assemblies meet the design requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations and industry standards.
- B. Deliver and store assembly materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.
 - 1. Protect from damage and exposure to direct sunlight during storage.
 - 2. Store in a dry, well-ventilated area off the floor.
 - 3. During storage, do not remove paper or cardboard placed between products for shipment.
 - 4. Store in a humidity and temperature controlled facility. Recommended conditions: 30 to 50 percent relative humidity and 50 to 90 degrees F.
- C. Handling: Handle with clean hands and equipment. Lift and carry the products when moving them. Do not drag across one another.

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions; temperature, humidity, and ventilation, within limits recommended by manufacturer for optimum results. Install only in vertical walls and when conditions are dry. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.8 WARRANTY

- A. Manufacturer's Standard Warranty: Assemblies will be free from defects in materials and workmanship from the date of manufacture for the time periods indicated below:
 - 1. Door Slab: 10 Years.
 - 2. Door System: 10 Years.
 - 3. Auralast Frame: Lifetime.
 - 4. Steel Frame: See manufacturers separate warranty.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design Manufacturer: JELD-WEN Incorporated; 440 South Church Street, Suite 400, Charlotte, NC 28202; Toll Free Tel: 800-535-3936; Tel: 541-850-2606; Fax: 541-851-4333;
- B. Requests for substitutions will be considered in accordance with provisions of Section 016000.

2.2 STEEL ENTRANCE DOORS

STEEL DOORS

- A. Basis of Design: Contours Steel Doors as manufactured by JELD-WEN Incorporated.
- B. Materials:
 - 1. Wood Frames: Western Pine.
 - a. Preservative treated with AuraLast in accordance with WDMA I.S.4.
 - 2. Steel Skins: Galvanized steel. 0.0195 in plus or minus 2 percent.
 - 3. Steel Skins: Galvanized steel. 0.0175 in plus or minus 2 percent.
 - 4. Stiles and Rails:
 - a. Wood Edge Construction: 1 in Laminated Veneer Lumber (LVL).
 - b. Steel Edge Construction: Galvanized Steel; 0.028 in continuous roll-formed steel.
 - 5. Core: Custom-fitted Polystyrene.
 - 6. Thickness: 1-3/4 in.
- C. Door Design:
 - 1. Door Surface: Smooth.
 - 2. Door Shape: Squared Top.
 - 3. Sidelite Glazing Shape: Match door style.
 - 4. Finish: Two-coats, low-sheen, baked-on enamel primer.

2.3 CONSTRUCTION ACCESSORIES

- A. Sealants: Refer to Section 079200 - Joint Sealants.
- B. Sealants: Manufacturer recommended sealants to maintain watertight conditions.

2.4 FABRICATION

- A. Construction: One-piece of polystyrene is custom fitted in standard wood stile and rail frame. Back of steel skin is coated with epoxy primer before attachment to core and frame.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Inspect doors prior to installation. Verify doors are suitable for installation
- B. Inspect rough opening for compliance with door manufacturer recommendations. Verify rough opening conditions are within recommended tolerances.

3.2 INSTALLATION

- A. Install doors in accordance with manufacturer's installation guidelines and recommendations.

3.3 PROTECTION

- A. Protect installed doors from damage.

END OF SECTION

SECTION 081600 - MOLDED COMPOSITE DOORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Interior Molded Doors: Passage Doors

1.2 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. ANSI Z97.1: Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test.
- B. National Fire Protection Association (NFPA):
 - 1. NFPA 252: Standard Methods of Fire Tests of Door Assemblies.
 - 2. NFPA 80: Standard Methods for builders' hardware to be used in fire rated swing doors.
- C. Underwriters Laboratories, Inc. (UL):
 - 1. UL10B: Standard for Fire Tests of Door Assemblies (Note: Neutral pressure testing standard).
 - 2. UL 10C: Standard for Positive Pressure Fire Tests of Door Assemblies.

1.3 DESIGN REQUIREMENTS

- A. Fire-Rated Door Assemblies: Fire door assemblies shall meet or exceed fire-protection ratings indicated when tested in accordance with NFPA 252.

1.4 SUBMITTALS

- A. Submit under provisions of Section 013000 – Administrative Requirements.
- B. Product Data: Submit door manufacturer current product literature, including installation instruction.
- C. Quality Assurance Submittals
 - 1. Manufacturer Instructions: Provide manufacturer's written installation instructions.
- D. Closeout Submittals: Refer to Section 017000 Execution and Closeout Requirements Closeout Submittals.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver doors, materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Store doors as recommended by manufacturer.

1.6 WARRANTY

- A. Manufacturer's Standard Warranty: Assemblies will be free from defects in materials and workmanship from the date of manufacture for the time periods indicated below:
 - 1. Door Unit: 5 years.
 - 2. Door Frames: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design Manufacturer: JELD-WEN, Inc.; 440 South Church Street, Suite 400, Charlotte, NC 28202; Toll Free Tel: 800-535-3936; Tel: 541-850-2606; Fax: 541-851-4333; Email:
- B. Requests for substitutions will be considered in accordance with provisions of Section 016000 – Product Requirements.

2.2 PASSAGE DOORS

- A. Door Style:
 - 1. Door Type: All panel.
 - 2. Door Shape: Squared Top.
 - 3. Surface Finish: Smooth
 - a. Panels and Sticking Profile: Six panels, with Cove and Bead sticking (Colonist). Surface Finish: Smooth
- B. Core and Frame:
 - 1. Solid mineral core with all-wood frame at fire-rated doors.
 - a. Thickness: 1-3/4 inch with 45-minute fire rating.
 - 2. Hollow core with Combination wood/MDF.
 - a. Thickness: 1-3/8 inch.
- C. Finish: Preprimed.

2.3 PREHUNG DOORS

- A. Profile:
 - 1. System 01, Single Door.
 - 2. System 02, Double Door.
- B. Jamb:
 - 1. Jamb Width: As required to match wall system thickness. Jamb Type: Rabbeted.
 - 3. Jamb Species: Finger-Jointed Pine.
- C. Hinges: SAE 1010 Carbon Steel.
 - 1. Size: 3-1/2 inch by 3-1/2 inch with 5/8 inch radius corners.
 - a. Finish: Satin Nickel. Size: 3-1/2 inch by 3-1/2 inch with 5/8-inch Ball Bearing with radius corners.
 - a. Finish: Satin Nickel.
- D. Bolts/Catch: Finish: Chrome.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install doors in accordance with manufacturer's installation guidelines and recommendations.

3.2 EXAMINATION

- A. Inspect door prior to installation.
- B. Inspect rough opening for compliance with door manufacturer recommendations. Verify rough opening conditions are within recommended tolerances.

3.3 PREPARATION

- A. Prepare door for installation in accordance with manufacturer's recommendations.

- B. Trim bottom of jamb sides to achieve desired distance between door bottom and finished floor height.

3.4 DOOR INSTALLATION

- A. Place door unit into opening and level hinge side of jamb. Use shims fastened through jamb and stop to level and temporarily secure in place.
- B. Level latch side of jamb. Use shims fastened through jamb and stop to level and temporarily secure in place.
- C. Verify spacing between jamb and door is uniform on all sides. Adjust as necessary.
- D. Shim top of jamb in center of opening and fasten with nail.
- E. Re-check for square, level and even spacing around door. Nail securely in place through stop, jamb, shims and into studs every 12 inches.
- F. Set nails.
- G. Install trim on both sides using nails every 12 to 16 inches.

END OF SECTION

SECTION 085313 - VINYL WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes vinyl-framed windows.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.

1.3 WARRANTY

- A. Windows: 10 years from date of Substantial Completion.
- B. Glazing Units: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 WINDOW PERFORMANCE REQUIREMENTS

- A. Product Standard: AAMA/WDMA/CSA 101/I.S.2/A440.
 - 1. Minimum Performance Class: R
 - 2. Minimum Performance Grade: 15
- B. Thermal Transmittance: 0.35 Btu/sq. ft. x h x deg F.
- C. Solar Heat-Gain Coefficient: 0.40 maximum.
- D. Sound Transmission Class: 30 minimum.
- E. Outside-Inside Transmission Class: 30 minimum.
- F. Windborne-Debris Resistance: Passing ASTM E 1886 and requirements of authorities having jurisdiction.

2.2 VINYL WINDOWS

- A. Finish: Integral color, white
- B. Glass: Clear, insulating, argon filled, with low-E coating.
- C. Insect Screens: At each operable exterior sash, with aluminum frames and without wickets.
- D. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
- E. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
 - 1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.
- F. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted

2.3 MANUFACTURERS

- A. Basis of design: Jeld-Wen builder's vinyl windows or approved equal.

PART 3 - EXECUTION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.
- B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.
- C. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- D. Clean exposed surfaces immediately after installing windows. Remove excess sealants, glazing materials, dirt, and other substances.
- E. Remove and replace sashes if glass has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION 085313

SECTION 086223-TUBULAR DAYLIGHTING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Tubular daylighting devices and accessories.

1.2 REFERENCES

- A. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- B. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. ASTM A 463/A 463M - Standard Specification for Steel Sheet, Aluminum Coated, by the Hot Dip Process.
- D. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc Coated (Galvanized), by the Hot Dip Process.
- E. ASTM A 792/A 792M – Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- F. ASTM E 108 - Standard Test Methods for Fire Tests of Roof Coverings.
- G. ASTM E 283 - Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- H. ASTM E 308 - Standard Practice for Computing the Colors of Objects by Using the CIE System.
- I. ASTM E 330 - Structural Performance of Exterior Windows, Curtain Walls and Doors.
- J. ASTM E 547 - Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain walls by Cyclic Air Pressure Difference.
- K. ASTM E 1886 - Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.

- L. ASTM E 1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricane.
- M. ASTM D 635 - Test Method for Rate of Burning and/or Extent of Time of Burning of Self-Supporting Plastics in a Horizontal Position.
- N. ASTM D 1929 - Test Method for Ignition Properties of Plastics.
- O. ASTM D 2843 – Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics.
- P. ASTM F 1642 – Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loading.
- Q. AAMA/WDMA/CSA 101/I.S.2/A440 - Standard/Specification for Windows, Doors, and Unit Skylights; 2011
- R. FM Standard 4431 - The Approval Standard for Skylights
- S. GSA-TS01-2003: Standard Test Method for Glazing and Window Systems Subject to Dynamic Overpressure Loadings
- T. ICC-ES AC-16 - Acceptance Criteria for Plastic Skylights; 2008.
- U. IBC Section 1710 - Load Test Procedure for Wind Load Testing on Rooftop Daylight Collecting System - Structural Performance Testing - Devised by ATI PE); 2012
- V. IBC Section 2606.7.2 – Installation – Diffuser Fall Out Test (Devised by PE); 2012

1.3 PERFORMANCE REQUIREMENTS

- A. Daylight Reflective Tubes: Spectralight Infinity with Cool Tube Technology combines ultra-high Visible Light reflectance with Ultra-low Infrared (IR) reflectance. Patented spectrally-selective optical surface yields an average total- and specular-reflectance greater than 99.5% percent for the Visible Light spectrum (400 nm to 700 nm) providing maximized visible light transmission and less than 25% reflectance for Infrared (IR) heat wavelengths (750 nm to 2500 nm) for minimized heat transmission, resulting in a spectrally-selective Total Solar Spectrum (250 nm to 2500 nm) reflectance less than 37 percent, as measured using a Perkin Elmer Lambda 1050 spectrophotometer with a Universal Reflectance Accessory. Color: a* and b* (defined by CIE L*a*b* color model) shall not exceed plus 2 or be less than minus 2 as determined in accordance to ASTM E 308.
- B. BRIGHTEN UP 160 DS (Suspended or Open Ceilings)

1. AAMA/WDMA/CSA 101/IS2/A440, Class CW-PG70 size tested 14 inch (356 mm), Type TDDCC.
 - a. Air Infiltration Test: Air infiltration will not exceed 0.30 cfm/sf aperture with a pressure delta of 1.57 psf across the tube when tested in accordance with ASTM E 283.
 - b. Water Resistance Test:
 - 1) Passes water resistance; no uncontrolled water leakage with a pressure differential of 10.7 psf (512 Pa) or 15 percent of the design load (whichever is greater) and a water spray rate of 5 gallons/hour/sf for 24 minutes when tested in accordance with ICC-ES AC-16, ASTM E 547 and ASTM E 331.
 - c. Uniform Load Test: All units tested with a safety factor of (3) for positive pressure and (2) for negative pressure, acting normal to plane of roof in accordance with ASTM E 330.
 - 1) No breakage, permanent damage to fasteners, hardware parts, or damage to make system inoperable or cause excessive permanent deflection of any section when tested at a Positive Load of 150 psf (7.18 kPa) or Negative Load of 60 psf (2.87 kPa) in accordance with ICC AC-16 Section A, or Negative Load of 70 psf (3.35 kPa) if tested per ICC AC-16 Section B.
 - d. Fire Testing:
 - 1) When used with the Dome Edge Protection Band, all domes meet fire rating requirements as described in the International Building Code.
 - 2) Self-Ignition Temperature - Greater than 650 degrees F per ASTM D-1929.
 - 3) Smoke Density: Rating no greater than 450 per ASTM Standard E 84 in way intended for use. Classification C.
 - 4) Rate of Burn and/or Extent: Maximum Burning Rate: 2.5 inches/min (62 mm/min) Classification CC-2 per ASTM D 635.
 - 5) Rate of Burn and/or Extent: Maximum Burn Extent: 1 inch (25 mm) Classification CC-1 per ASTM D 635.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 1. Preparation instructions and recommendations.
 2. Storage and handling requirements and recommendations.
 3. Data sheets showing roof dome assembly, flashing base, reflective tubes, diffuser assembly, and accessories.
 4. Installation requirements.
- C. Shop Drawings. Submit shop drawings showing layout, profiles and product components, including rough opening and framing dimensions, anchorage, roof flashings and accessories.

- D. Electrical wiring diagrams and recommendations for power and control wiring.
- E. Verification Samples: As requested by Architect.
- F. Test Reports: Independent testing agency or evaluation service reports verifying compliance with specified performance requirements.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Engaged in manufacture of tubular daylighting devices for minimum 20 years.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in manufacturer's original containers, dry, undamaged, seals and labels intact.
- B. Store products in manufacturer's unopened packaging until ready for installation.

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 WARRANTY

- A. Daylighting Device: Manufacturer's standard warranty for 10 years.
- B. Electrical Parts: Manufacturer's standard warranty for 5 years, unless otherwise indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Solatube International, Inc.; 2210 Oak Ridge Way, Vista, CA 92081. Tel. Toll Free: 888-765-2882. Tel: (760) 477-1120. Fax: (760) 597-4488. Email: commsales@solatube.com. Web: www.solatube.com.
- B. Substitutions: Products equal to those listed above.**
- C. Solatube is provided as a design basis only. Requests for substitutions will be reviewed via the construction submittal process.**

2.2 TUBULAR DAYLIGHTING DEVICES

- A. Tubular Daylighting Devices General: Transparent roof-mounted skylight dome and self-flashing curb, reflective tube, and ceiling level diffuser assembly, transferring sunlight to interior spaces; complying with ICC AC-16.
- B. Brighten Up Series: Solatube Model 160 DS, 10 Inch Daylighting System.
1. Model:
 - a. Solatube Model 160 DS used for daylighting systems with hard ceilings. AAMA Type TDDCC.
 2. Capture Zone:
 - a. Domes:
 - 1) Roof Dome Assembly: Transparent, UV and impact resistant dome with flashing base supporting dome and top of tube.
 - (a) Outer Dome Glazing: Type DA, 0.125 inch minimum thickness injection molded acrylic classified as CC2 material; UV inhibiting (100 percent UV C, 100 percent UV B and 98.5 percent UV A), impact modified acrylic blend.
 - (1) Raybender 3000: Variable prism optic molded into outer dome to capture low angle sunlight and limit high angle sunlight.
 - (b) Optional Shock Inner Dome Glazing: Type DAI, 0.115 inch (2.9 mm) minimum thickness classified as CC1 material. High impact injection molded acrylic required for high velocity wind zones.
 - (c) Tube Ring: Attached to top of base section; 0.090 inch nominal thickness injection molded high impact acrylic; to prevent thermal bridging between base flashing and tubing and channel condensed moisture out of tubing.
 - 2) Dome Seal: Polyethylene foam seal, black, 0.13 inch thick by 10.73 diameter, 2 PCF polyethylene foam.
 - 3) LightTracker Reflector, made of aluminum sheet, thickness 0.015 inch with Spectralight Infinity. Positioned in the dome to capture lo
 - b. Dome Options:
 - 1) Dome Edge Protection Band: Type PB, for fire rated Class A, B or C roof applications. Aluminized steel nominal thickness of 0.028 inches.
 - c. Flashings:
 - 1) Roof Flashing Base:
 - (a) One Piece: One piece, seamless, leak-proof flashing functioning as base support for dome and top of tube. Sheet steel, corrosion resistant conforming to ASTM A 653/A 653M or ASTM A 463/A 463M or ASTM A792/A 792M, 0.028 inch (0.7 mm) plus or minus .006 inch thick.

- (1) Base Pitched: Pitched Type FP, 22.5 degrees slope from horizontal, 4 inches high.
3. Transfer Zone:
 - a. Extension Tubes: Aluminum sheet, thickness 0.015 inch.
 - 1) Reflective Tubes:
 - (a) Reflective angle adapter tube (standard Top and Bottom Tubes), providing up to a 30-degree angle adjustment.
 - (b) Reflective extension tube, Type EXX and Type EL with total length of run as indicated on the Drawings.
 - (c) Interior Finish: Spectralight Infinity with Cool Tube Technology combining ultra-high Visible Light reflectance with Ultra-low Infrared (IR) reflectance.
 - 2) Extension Tube Options
 - (a) Extension Tube Angle Adapter: Provide manufacturer's standard adapters for applications requiring:
 - (1) Type A1 one 0 to 90 degree extension tube angle adapter.
 - (2) Type A2 two 0 to 90 degree extension tube angle adapters.
 - (b) Severe Climate Glazing: Type SCG PET GAG plastic glazing to minimize potential for condensation and heat loss. Nominal thickness 0.039 inches.
 - (c) Wire Suspension Kit: Type E, Use the wire suspension kit when additional bracing to the structure is required.
 - (d) Thermal Insulation Panel: Type TIP, high-performance dual-glazed, tube insulation system.
4. Delivery Zone:
 - a. Ceiling Ring: Injection molded impact resistant acrylic. Nominal thickness is 0.110 inches.
 - b. Ceiling Ring Seal: Polyethylene foam seal, white, 0.25 inch wide by 0.19 inch high, 2 PCF polyethylene foam with low-tack pressure sensitive adhesive.
 - c. Upper glazing: PET GAG plastic with EPDM low density sponge seal to minimize condensation and bug, dirt, and air infiltration per ASTM E283. The nominal thickness is 0.039 inches.
 - 1) Natural Effect Lens: Type LN.
 - 2) Softening Effect Lens: Type LS.
 - 3) Warm Effect Lens: Type LW.
 - 4) Warm Softening Effect Lens: Type LWS.
 - d. Round Diffusers/Decorative Fixtures: Dual Glazed Diffuser Assembly.
 - 1) Lower glazing with integral injection molded acrylic Dress Ring classified as CC2 material. Nominal thickness is 0.110 inches
 - (a) Classic Vusion Diffuser: Type L4, molded acrylic plastic classified as CC2 material (nominal thickness 0.090 inches with injection molded acrylic Diffuser Trim Ring.
 - (b) Classic OptiView (Fresnel Lens) Diffuser: Type L1, molded polycarbonate plastic classified as CC1 material,

- nominal thickness 0.022 inches with injection molded acrylic Diffuser Trim Ring.
- or
- (c) TierDrop Decorative Fixture: Type L10, three layers of frosted acrylic plastic lens classified as CC2 material (nominal thickness is 0.16 inches). Bottom layer is continuous with two stepped full-tempered glass rings on top and decorative metal fasteners.
 - (d) OptiView Decorative Fixture: Type L11, molded polycarbonate plastic Fresnel Lens classified as CC1 material (nominal thickness is 0.022 inches) with full-tempered frosted glass bezel (nominal thickness is 0.16 inches), and decorative metal fasteners.
- e. Square Diffuser Assemblies for Tubes Penetrating Ceilings: Ceiling mounted box transitioning from round tube to square ceiling assembly, supporting light transmitting surface at bottom termination of tube 10 inches by 10 inches square diffuser opening.
- 1) Square JustFrost Decorative Fixture: Type L9, frosted acrylic plastic lens classified as CC2 material (nominal thickness is 0.16 inches), and decorative metal fasteners.
 - 2) Square OptiView Decorative Fixture: Type L11, molded polycarbonate plastic Fresnel Lens classified as CC1 material (nominal thickness is 0.022 inches) with white metal bezel (nominal thickness is 0.16 inches), and decorative metal fasteners.
5. Delivery Zone Options
- a. Local Dimmer Control utilizing a butterfly baffle design of Spectralight Infinity reflective material to minimize shadowing when in use: Provided with dimmer switch and cable.
 - 1) Daylight Dimmer: Type D Electro-mechanically actuated daylight valve; for universal input voltages ranging between 90 and 277 V at 50 or 60 Hz; maximum current draw of 50 ma per unit; controlled by low voltage, series Type T02. Provided with dimmer switch and cable.
 - b. Lighting Fixture: Bracket mounted inside system just above diffuser; UL and CSA Listed.
 - 1) Universal: Type INC, for two 23 W maximum CFL, maximum total length 4-3/4 inch, ceramic screw-in lamp holder, medium base, two lamps.
 - 2) Compact Fluorescent: Type CFL, dedicated compact fluorescent fixture, for one 26 W, 4-pin lamp.
 - 3) Electrical Requirements: 110 V, 15 amp GFCI circuit for damp and wet conditions.
 - 4) Exhaust Fan: Type VEN, permanently lubricated in-line fan motor, 110 cfm capacity.
 - (a) Exhaust Duct: Flexible, Class 1, in accordance with UL 181. Provide as specified in Section 15810.

- (b) Air Intake trim: Injection molded impact resistance acrylic with trim to fit installation conditions.
- (c) Exhaust Vent Cap: Type RV, low-profile roof cap.
- (d) Electrical Requirements: 115 V; install fan on same switch as internal light fixture.
- (e) Electrical Requirements: 115 V; wall switch.

2.3 ACCESSORIES

- A. Fasteners: Same material as metals being fastened, non-magnetic steel, non-corrosive metal of type recommended by manufacturer, or injection molded nylon.
- B. Suspension Wire: Steel, annealed, galvanized finish, size and type for application and ceiling system requirement.
- C. Sealant: Polyurethane or copolymer based elastomeric sealant as provided or recommended by manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Examine openings, substrates, structural support, anchorage, and conditions for compliance with requirements for installation tolerances and other conditions.
- C. If substrate and rough opening preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Coordinate requirements for power supply, conduit and wiring.
- C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's printed instructions.
- B. Coordinate installation with substrates, air and vapor retarders, roof insulation, roofing membrane, and flashing to ensure that each element of the Work performs properly and that finished installation is weather tight.

1. Install flashing to produce weatherproof seal with curb and overlap with roofing system termination at top of curb.
 2. Provide thermal isolation when components penetrate or disrupt building insulation. Pack fibrous insulation in rough opening to maintain continuity of thermal barriers.
 3. Coordinate attachment and seal of perimeter air and vapor barrier material.
- C. Where metal surfaces of tubular unit skylights will contact incompatible metal or corrosive substrates, including preservative-treated wood, provide permanent separation as recommended by manufacturer
- D. Align device free of warp or twist, maintain dimensional tolerances.
- E. After installation of first unit, field test to determine adequacy of installation. Conduct water test in presence of Owner, Architect, or Contractor, or their designated representative. Correct if needed before proceeding with installation of subsequent units.
- F. Inspect installation to verify secure and proper mounting. Test each fixture to verify operation, control functions, and performance. Correct deficiencies.

3.4 CLEANING

- A. Clean exposed surfaces according to manufacturer's written instructions. Touch up damaged metal coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 087100 – DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Division 08 Section “Door Hardware Schedule”.
 - 2. Division 08 Section “Hollow Metal Doors and Frames”.
 - 3. Division 08 Section “Molded Composite Doors”.
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards:
 - 1. ANSI/BHMA Certified Product Standards - A156 Series
 - 2. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 - 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - h. Warranty information for each product.
 - 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- D. Informational Submittals:
 - 1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals.

1.4 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- D. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
 - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
- E. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.
- F. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
 - 1. Function of building, purpose of each area and degree of security required.
 - 2. Plans for existing and future key system expansion.
 - 3. Requirements for key control storage and software.
 - 4. Installation of permanent keys, cylinder cores and software.
 - 5. Address and requirements for delivery of keys.
- G. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 3. Review sequence of operation narratives for each unique access controlled opening.
 4. Review and finalize construction schedule and verify availability of materials.
 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- H. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods:
 - 1. Twenty five years for manual surface door closer bodies.

1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
 - 1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

- A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles as specified in the Door Hardware Sets.
1. Quantity: Provide the following hinge quantity, unless otherwise indicated:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
 4. Hinge Options: Comply with the following:
 - a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
 5. Acceptable Manufacturers:
 - a. Hager Companies (HA).
 - b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).
 - c. Stanley Hardware (ST).

2.3 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.
1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
 2. Furnish dust proof strikes for bottom bolts.
 3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
 4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

5. Acceptable Manufacturers:

- a. Door Controls International (DC).
- b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
- c. Trimco (TC).

B. Coordinators: ANSI/BHMA A156.3 certified door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.

1. Acceptable Manufacturers:

- a. Door Controls International (DC).
- b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

2.4 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.

C. Cylinders: Original manufacturer cylinders complying with the following:

1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
5. Keyway: Manufacturer's Standard.

D. Keying System: Each type of lock and cylinders to be factory keyed.

1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. New System: Key locks to a new key system as directed by the Owner.

E. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

2.5 MECHANICAL LOCKS AND LATCHING DEVICES

- A. Interconnected Locksets: ANSI/BHMA A156.12, Series 5000. Grade 2.
1. Interconnected locksets designed with an interlocking tubular chassis and latchbolt and allow simultaneous retraction of latchbolt and deadbolt with a single motion turning of the lever/knob.
 2. Locksets to be UL listed for use on a fire door.
 3. Locksets to be field adjustable for center to center dimension.
 4. Locksets to be non-handed, and have a 2 3/8" standard backset.
 5. Acceptable Manufacturers:
 - a. Schlage (SC) – H Series.
 - b. Yale Residential (YR) - YH Series.

2.6 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
 4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:
1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 2. Strikes for Bored Locks and Latches: BHMA A156.2.
 3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
 4. Dustproof Strikes: BHMA A156.16.

2.7 ARCHITECTURAL TRIM

- A. Door Protective Trim
1. General: Door protective trim units to be of type and design as specified below.
 2. Size: Fabricate protection kick plates not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1"

less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates.

3. Protection Plates: ANSI/BHMA A156.6 certified protection plate, fabricated from the following:
 - a. Stainless Steel: 300 grade, 050-inch thick.
4. Options and fasteners: Provide manufacturer's designated fastener type. Provide countersunk screw holes.
5. Acceptable Manufacturers:
 - a. Burns Manufacturing (BU).
 - b. Rockwood Manufacturing (RO).

2.8 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
 1. Acceptable Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
 - c. Trimco (TC).

2.9 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
 - 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Acceptable Manufacturers:
 - 1. National Guard Products (NG).
 - 2. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
 - 3. Reese Enterprises, Inc. (RE).

2.10 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.11 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

- B. Manufacturer's Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. RO - Rockwood

- 4. YR - Yale Residential
- 5. NO - Norton

Hardware Sets

Set: 1.0

Doors: 2-101, 3-101, 4-101, 5-101

3 Hinge	MP79	US26D MK
1 Entrance Lock		626 YR
1 Deadbolt	85	626 YR
1 Door Stop	528	NP RO
1 Threshold	94518AW x Door Width	PE
1 Threshold	EXT2A	PE
1 Gasketing	S442D 17'	PE
1 Door Bottom	217AV	PE
2 Viewer	626	DCRM RO

Set: 1.1

Doors: 2-101A, 2-103A, 3-101A, 3-103A, 4-101A, 4-103A, 5-101A, 5-103A

1 Deadbolt	85	626 YR
1 Passage Latch	11 MC	626 YR

Notes: Hinges and wind storm spring chain by storm door supplier. Offset levers so they do not hit back to back when both doors are closed.

Set: 2.0

Doors: 2-103, 3-103, 4-103,5-103

3 Hinge	MP79	US26D MK
1 Entrance Lock		626 YR
1 Deadbolt	85	626 YR
1 Door Stop	525	NP RO
1 Threshold	94518AW x Door Width	PE
1 Threshold	EXT2A	PE
1 Gasketing	S442D 17'	PE
1 Door Bottom	216AV	PE

Set: 3.0

Doors: 2-108, 3-108, 4-108, 5-108

3 Hinge	MP79	US26D	MK
1 Passage Latch	11 MC	626	YR
1 Deadbolt	82	626	YR
1 Threshold	271A		PE
1 Gasketing	303AS		PE
1 Sweep	315CN		PE

Set: 4.0

Doors: 2-105, 3-110, 4-110, 5-110

6 Hinge	MP79	US26D	MK
2 Single Dummy	81 MC	626	YR
2 Roller Latch	592	US26D	RO
2 Door Stop	528	NP	RO

Set: 5.0

Doors: 2-104, 2-111, 2-112, 2-114, 3-104, 3-105, 3-111, 3-116, 4-104, 4-105, 4-113, 4-118, 5-104, 5-105, 5-113, 5-120

6 Hinge	MPS679	US26D	MK
2 Flush Bolt	2962	US26D	RO
1 Passage Latch	11 MC	626	YR
1 Coordinator	1700	US28	RO
2 Door Stop	528	NP	RO
1 Gasketing	S88D		PE

Set: 6.0

Doors: 2-106, 2-110, 2-113, 3-106, 3-109, 3-112, 3-114, 3-115, 4-106, 4-109, 4-112, 4-114, 4-116, 4-117, 5-106, 5-109, 5-112, 5-114, 5-116, 5-118, 5-119

3 Hinge	MP79	US26D	MK
1 Privacy Lock	21 MC	626	YR
1 Door Stop	525	NP	RO

Set: 7.0

Doors: 2-109

3 Hinge	MP79	US26D	MK
1 Privacy Lock	21 MC	626	YR
1 Door Stop	525	NP	RO

Set: 8.0

Doors: 2-102, 2-107, 3-102, 3-107, 3-113, 4-102, 4-107, 4-111, 4-115, 5-102, 5-107, 5-111, 5-115, 5-117

3 Hinge	MP79	US26D	MK
1 Passage Latch	11 MC	626	YR
1 Door Stop	528	NP	RO

END OF SECTION 087100

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SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Windows.
 - 2. Door sidelights.

1.2 ACTION SUBMITTALS

- A. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.

1.3 QUALITY ASSURANCE

- A. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

1.4 WARRANTY

- A. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
- B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass.

- C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
2. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace qualified complying with other requirements specified.

1. Sealing System: Dual seal.
2. Spacer: Manufacturer's standard spacer material and construction.

2.3 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:

1. Neoprene

2.4 GLAZING SEALANTS

- A. General:

1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Sealants used inside the weatherproofing system, shall have a VOC content of not more than 250 g/L.
4. Colors of Exposed Glazing Sealants: As selected by Contracting officer from manufacturer's full range.

- B. Glazing Sealant: Neutral-curing silicone glazing sealant Type S, Grade NS, Class 100/50, Use NT.

2.5 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod.

2.6 MISCELLANEOUS GLAZING MATERIALS

- A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- E. Cylindrical Glazing Sealant Backing: Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.7 INSULATING-GLASS TYPES

- A. Glass Type: Low-e-coated, tinted insulating glass.
 - 1. Overall Unit Thickness: 5/8 inch (16 mm).
 - 2. Thickness of Each Glass Lite: 6.0 mm.
 - 3. Outdoor Lite: Tinted float glass.
 - 4. Interspace Content: Argon.
 - 5. Indoor Lite: Clear float glass.
 - 6. Low-E Coating: Pyrolytic on second surface.
 - 7. Provide safety glazing labeling.

2.8 HAZARDOUS LOCATIONS PER IRC SECTION R308.4

- A. Glazing in side hinged doors except Jalousies
- B. Glazing in fixed and sliding panels of sliding door assemblies and panels in sliding and bifold closet door assemblies.
- C. Glazing in storm doors.
- D. Glazing in doors and enclosures for hot tubs, whirlpools, saunas, steam rooms, bathtubs and showers. Glazing in any part of a building wall enclosing these compartments where the bottom exposed edge of the glazing is less than 60 inches measured vertically above any standing or walking surface.

- E. Glazing in an individual fixed or operable panel adjacent to a door where the nearest vertical edge is within a 24 inch arc of the door in a closed position and whose bottom edge is less than 60 inches above the floor or walking surface.
- F. Glazing in an individual fixed or operable panel, other than those locations described above that meets all of the following conditions.
 - 1. Exposed area of an individual pane greater than 9 square feet.
 - 2. Bottom edge less than 18" above the floor.
 - 3. Top edge greater than 36" above the floor.
 - 4. One or more walking surfaces with 36" horizontally of the glazing.
- G. All glazing in railings regardless of an area or height above a walking surface including structural baluster panels and non-structural in-fill panels.
- H. Glazing in walls and fences enclosing indoor and outdoor swimming pools, hot tubs, and spas where the bottom edge of the pool or spa side is less than 60 inches above a walking surface and within 60 inches horizontally of the water's edge. This shall apply to single glazing and all panes in multiple glazing.
- I. Glazing in walls enclosing stairway landings or within 60 inches of the top and bottom of stairways where the bottom edge of the glass is less than 60 inches above the walking surface.
- J. Exemption: See IRC (R308.4) Items 4 through 7.

PART 3 - EXECUTION

3.1 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

- G. Provide spacers for glass lites where length plus width is larger than 50 inches.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

3.2 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Apply heel bead of elastomeric sealant.
- F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- G. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.3 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

- E. Install gaskets so they protrude past face of glazing stops.

END OF SECTION 088000

SECTION 088300 - MIRRORS

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

- A. Safety Glass: Category II materials per 16 CFR 1201.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachment details

1.3 WARRANTY

- A. Warranty: Five years.

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. Glass Mirrors: ASTM C 1503; manufactured using copper-free, low-lead mirror coating process.
- B. Film backing for safety mirrors.
- C. Mirror Hardware: Bottom, top, and sides aluminum J-channels.
- D. Mirror Edges: Beveled polished.
- E. Provide one ADA Fixed Tilt Mirror - 18 in. x 30 in. for each fully compliant unit.
- F. Provide one 5'-0" x 3'-0" fixed mirror in master bath.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.

- B. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

- A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

- A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.
- B. Install mirrors with mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
- C. Clean exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Clean mirrors as recommended in writing by mirror manufacturer.

END OF SECTION 088300

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Exterior gypsum board for ceilings and soffits.
3. Tile backing panels.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated.

2.2 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. American Gypsum.
 2. CertainTeed Corp.
 3. Georgia-Pacific Gypsum LLC.
 4. Lafarge North America Inc.
 5. National Gypsum Company.
 6. PABCO Gypsum.
 7. Temple-Inland.
 8. USG Corporation.
- B. Use ½” drywall throughout (U.N.O.). Use ½” sag resistant gyp board at ceiling, ½” gyp board at bearing walls, walls common to house, and at enclosed usable storage areas under stairs (where applicable).
- C. Gypsum wallboard installed as a backing in showers shall be type M.R. identified and referred to as “green board” ICBO ER-1874.

- D. Shower walls shall be finished with moisture-resistant gypsum board and ceramic tile (or equal) to a minimum height of 72" above drain, (IRC R307.2).
- E. Gypsum Board, Type X:
 - 1. Thickness: 5/8" inch.
 - 2. Long Edges: Tapered.
 - 3. Apply at garage wall adjacent to resident.
- F. Gypsum Board
 - 1. Thickness: 1/2" inch.
 - 2. Long Edges: Tapered.
 - 3. Apply at all spaces U.N.O.
- G. Gypsum Ceiling Board:
 - 1. Thickness: 1/2" inch.
 - 2. Long Edges: Tapered.
 - 3. Sag resistant.
- H. Moisture- and Mold-Resistant Gypsum Board: With moisture- and mold-resistant core and paper surfaces.
 - 1. Core: 1/2" inch, Type X.
 - 2. Long Edges: Tapered.

2.3 TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Board: with manufacturer's standard edges.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. CertainTeed Corp.; GlasRoc Tile Backer.
 - b. Georgia-Pacific Gypsum LLC; DensShield Tile Backer.
 - 2. Core: 1/2 inch, Type X.
 - 3. Mold Resistance: Score of 10.

2.4 TRIM ACCESSORIES

- A. Interior Trim:
 - 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
- B. Aluminum Trim: Alloy 6063-T5.

2.5 JOINT TREATMENT MATERIALS

- A. General:
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
 - 2. Exterior Gypsum Soffit Board: Paper.
 - 3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 - 4. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

2.6 AUXILIARY MATERIALS

- A. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 - 1. Laminating adhesive shall have a VOC content of 50 g/L or less.

PART 3 - EXECUTION

3.1 APPLYING AND FINISHING PANELS

- A. When applying a water based texture material, the minimum gypsum board thickness shall be increased from 3/8" to 1/2" for 16" o.c. framing, and from 1/2" to 5/8" for 24" o.c. framing or 1/2" sag resistant gypsum ceiling board shall be used.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- D. Install trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- E. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- F. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- G. Gypsum Board Finish Levels:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 2: Panels that are substrate for tile.

3. Level 4: At panel surfaces that will be exposed to view.
 - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

- H. Protect adjacent surfaces from drywall compound and texture finishes and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

- I. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION 092900

SECTION 093103 - CERAMIC TILE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ceramic tile.
2. Tile backing panels.
3. Metal edge strips.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples:

1. Each type and composition of tile and for each color and finish required.
2. Assembled samples, with grouted joints, for each type and composition of tile and for each color and finish required.
3. Stone thresholds in 6-inch lengths.

1.3 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.1 TILE PRODUCTS

A. ANSI Ceramic Tile Standard: Provide Standard grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated. Ceramic tiles to be provided at fire place areas and restrooms. Use 12" x 12" size ceramic/Porcelain tile with 6 x 12 cove base at restrooms. Edges of fireplace to be 12 x 12 with bull nosed 4 x 12 surround.

B. Tile Type: Glazed. No wall tile shall be used.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- 1) American Marazzi Tile, Inc.
 - 2) American Olean; Division of Dal-Tile International Inc.
 - 3) Crossville Ceramics Co
 - 4) Daltile; Division of Dal-Tile International Inc.
 - 5) Deutsche Steinzeug America, Inc.
 - 6) Florida Tile Industries, Inc.
 - 7) Florim USA.
 - 8) Laufen.
 - 9) Grupo Porcelanite.
 - 10) Portobello America, Inc.
 - 11) Seneca Tiles, Inc.
 - 12) United States Ceramic Tile Company.
2. Module Size: 12 inches by 12 inches
 3. Thickness: 5/16 inch.
 4. Face: Plain with modified square edges or cushion edges.
 5. Finish: Bright, clear glaze.
 6. Tile Color and Pattern: **as indicated on design basis schedule or similar**
 7. Grout Color: **as indicated on design basis schedule or similar**
 8. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - 1) External Corners for Thin-Set Mortar Installations: Surface bullnose, same size as adjoining flat tile.
 - 2) Internal Corners: Field-buttet square corners. For coved base and cap use angle pieces designed to fit with stretcher shapes.

2.2 TILE BACKING PANELS

A. Cementitious Backer Units:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) C-Cure; C-Cure Board 990.
 - 2) Custom Building Products; Wonderboard.
 - 3) FinPan, Inc.; Util-A-Crete Concrete Backer Board.
 - 4) USG Corporation; DUROCK Cement Board.
2. Thickness: 1/2 inch.

2.3 SETTING MATERIALS

A. Dry-Set Portland Cement Mortar (Thin Set):

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Boiardi Products; a QEP company.
 - 2) Bonsal American; an Oldcastle company.
 - 3) Bostik, Inc.

- 4) C-Cure.
 - 5) Custom Building Products.
 - 6) Jamo Inc.
 - 7) Laticrete International, Inc.
 - 8) MAPEI Corporation.
 - 9) Southern Grouts & Mortars, Inc.
 - 10) Summitville Tiles, Inc.
 - 11) TEC; a subsidiary of H. B. Fuller Company.
2. For wall applications, provide nonsagging mortar.

2.4 GROUT MATERIALS

A. Standard Cement Grout:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Boiardi Products; a QEP company.
 - 2) Bonsal American; an Oldcastle company.
 - 3) Bostik, Inc.
 - 4) C-Cure.
 - 5) Custom Building Products.
 - 6) Jamo Inc.
 - 7) Laticrete International, Inc.
 - 8) MAPEI Corporation.
 - 9) Southern Grouts & Mortars, Inc.
 - 10) Summitville Tiles, Inc.
 - 11) TEC; a subsidiary of H. B. Fuller Company.

2.5 MISCELLANEOUS MATERIALS

- A. Trowelable Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips: Angle or L-shape, half-hard brass exposed-edge material.
- C. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Bonsal American, an Oldcastle company; Grout Sealer.
 - 2) Bostik, Inc.; CeramaSeal.
 - 3) C-Cure; Penetrating Sealer 978.
 - 4) Custom Building Products; Grout Sealer.
 - 5) Jamo Inc.; Matte Finish Sealer.
 - 6) MAPEI Corporation; KER 003, Silicone Spray Sealer for Cementitious Tile Grout.
 - 7) Southern Grouts & Mortars, Inc.; Silicone Grout Sealer.
 - 8) Summitville Tiles, Inc.; SL-15, Invisible Seal Penetrating Grout and Tile Sealer.

- 9) TEC, a subsidiary of H. B. Fuller Company; TA-257 Silicone Grout Sealer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
- C. Blending: For tile exhibiting color variations, use factory blended tile or blend tiles at Project site before installing.
- D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 INSTALLATION

- A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 1. For the following installations, provide 95 percent mortar coverage:
 - 1) Exterior tile floors.
 - 2) Tile floors in wet areas.
 - 3) Tile floors composed of tiles 8 by 8 inches or larger.
 - 4) Tile floors composed of rib-backed tiles.

- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
- F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Paver Tile: 1/4 inch.
- G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
 - 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- I. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
 - 1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thin set).
- J. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.
- K. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.
- L. Install cementitious backer units and treat joints according to manufacturer's written instructions for type of application indicated. Use latex-portland cement mortar for bonding material unless otherwise directed in manufacturer's written instructions.

END OF SECTION 093013

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and pattern specified.

1.2 CLOSEOUT SUBMITTALS

- A. Maintenance data.

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. Solid Vinyl Floor Tile/ Plank: Monolithic vinyl tile
- B. Design Basis: Earth Works LVT Parkhill Plank & Sherbrook
 - 1. Classification: ASTM F 1700-04 Class III, Type A or B Solid Vinyl Floor Tile
 - 2. Size: 7" x 48"
 - 3. Thickness: .25"/ 6mm with 20 mil wear layer
 - 4. Edge: Beveled
 - 5. Install Method: 2G fold Down Click
 - 6. Warranty: Lifetime Residential/ 30-year commercial

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.

- C. Do not install floor tiles until materials are the same temperature as space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.2 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- C. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

END OF SECTION 096519

SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on exterior substrates.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples: For each type of paint system and each color and gloss of topcoat.
- C. Product List: For each product indicated. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.4 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Contracting officer will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
 - b. Other Items: Contracting officer will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by contracting officer at no added cost to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in other Part 2 articles for the paint category indicated.

2.2 PAINT, GENERAL

- A. **Refer to Product & Manufactures Design Basis Schedule on drawings. Substitutions may be applied for and will be managed through the construction submittal process.**
- B. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- C. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- D. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.
- E. Colors: As selected by Contracting officer from manufacturer's full range.

2.3 BLOCK FILLERS

- A. Block Filler, Latex, Interior/Exterior.

2.4 PRIMERS/SEALERS

- A. Primer, Alkali Resistant, Water Based.
- B. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.

2.5 METAL PRIMERS

- A. Primer, Alkyd, Quick Dry, for Metal.

2.6 WOOD PRIMERS

- A. Primer, Latex for Exterior Wood.

2.7 CEMENTITIOUS PRIMERS

- A. Primer, Latex for Exterior Cementitious Siding, Soffit and Trim.

2.8 WATER-BASED PAINTS

- A. Latex, Exterior Semi-Gloss (Gloss Level 5).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Masonry (Clay and CMU): 12 percent.
 - 3. Wood: 15 percent.
 - 4. Cementitious materials: 12 percent.
 - 5. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.
- B. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

- A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Contracting officer, and leave in an undamaged condition.
- B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINTING SCHEDULE

- 1. Per plans & finish schedule.
 - A. Concrete Substrates, Traffic Surfaces:
 - 1. Latex Floor Paint System:
 - a. Prime Coat: Floor paint, latex, low gloss (maximum Gloss Level 3).
 - b. Intermediate Coat: Floor paint, latex, low gloss (maximum Gloss Level 3).
 - c. Topcoat: Floor paint, latex, low gloss (maximum Gloss Level 3).
 - B. Steel Substrates:
 - 1. Quick-Drying Enamel System:
 - a. Prime Coat: Primer, alkyd, quick dry, for metal.
 - b. Intermediate Coat: Alkyd, quick dry, matching topcoat.
 - c. Topcoat: Alkyd, quick dry, semi-gloss (Gloss Level 5).
 - C. Galvanized-Metal Substrates:
 - 1. Latex System:
 - a. Prime Coat: Primer, galvanized, water based.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior flat (Gloss Level 1).
 - D. Wood Substrates: Including wood trim, interior woodwork, doors, windows, wood siding, wood fences, wood-based panel products, glued-laminated construction, exposed joist and exposed beams.
 - 1. Latex System:
 - a. Prime Coat: Primer, latex for exterior wood.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.

c. Topcoat: Latex, exterior, low sheen (Gloss Level 3-4).

E. Exterior Cementitious Board Substrates:

1. Latex System:

a. Prime Coat: Latex, exterior, matching topcoat.

b. Intermediate Coat: Latex, exterior, matching topcoat.

c. Topcoat: Latex, exterior, low sheen (Gloss Level 3-4).

END OF SECTION 099113

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SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on interior substrates.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples: For each type of paint system and in each color and gloss of topcoat.
- C. Product List: For each product indicated. Include printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra material, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.4 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Contracting officer will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
 - b. Other Items: Contracting officer will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Contracting officer at no added cost to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in other Part 2 articles for the paint category indicated.
- B. Refer to Product & Manufactures Design Basis Schedule on drawings. Substitutions may be applied for and will be managed through the construction submittal process.**

2.2 PAINT, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 1. Nonflat Paints and Coatings: 150 g/L.
 - 2. Dry-Fog Coatings: 400 g/L.
 - 3. Primers, Sealers, and Undercoaters: 200 g/L.
 - 4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
 - 5. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
 - 6. Pretreatment Wash Primers: 420 g/L.
 - 7. Floor Coatings: 100 g/L.
 - 8. Shellacs, Clear: 730 g/L.
 - 9. Shellacs, Pigmented: 550 g/L.
- C. Colors: As selected by Contracting officer from manufacturer's full range.
- D. Ceilings at kitchen and baths shall be taped, textured and painted semi-gloss. All others shall be taped, textured and painted flat unless noted otherwise by NHA.
- E. All interior doors and trim shall be painted semi-gloss.

2.3 BLOCK FILLERS

- A. Block Filler, Latex, Interior/Exterior.

2.4 PRIMERS/SEALERS

- A. Primer Sealer, Latex, Interior:
- B. Primer, Bonding, Water Based.
- C. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.

2.5 METAL PRIMERS

- A. Primer, Rust-Inhibitive, Water Based.

2.6 WATER-BASED PAINTS

- A. Latex, Interior, Flat, (Gloss Level 1)
- B. Latex, Interior, (Gloss Level 2)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Masonry (Clay and CMU): 12 percent.
 - 3. Wood: 15 percent.
 - 4. Gypsum Board: 12 percent.
 - 5. Plaster: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

- A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Contracting officer, and leave in an undamaged condition.
- B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 TOUCH UP

- A. All touching up of painted surfaces must be accomplished to exactly match adjacent color, texture and sheen. If original paint was applied by sprayer, touch up will also be spray applied to ensure touch up is unnoticeable.

3.6 INTERIOR PAINTING SCHEDULE

- A. CMU Substrates:
 - 1. Latex System:
 - a. Block Filler: Block filler, latex, interior/exterior.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, (Gloss Level 2).
- B. Steel Substrates:

1. Latex over Alkyd Primer System:
 - a. Prime Coat: Primer, alkyd, anti-corrosive, for metal or primer, alkyd, quick dry, for metal.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, flat, (Gloss Level 1).
 2. Quick-Drying Enamel System:
 - a. Prime Coat: Primer, alkyd, quick dry, for metal.
 - b. Intermediate Coat: Alkyd, quick dry, matching topcoat.
 - c. Topcoat: Alkyd, quick dry, semi-gloss (Gloss Level 5).
- C. Galvanized-Metal Substrates:
1. Latex over Waterborne Primer System:
 - a. Prime Coat: Primer, galvanized, water based.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, (Gloss Level 2).
- D. Wood Substrates: Including wood trim, doors, and wood-based panel products.
1. Latex System:
 - a. Prime Coat: Primer, latex, for interior wood.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, (Gloss Level 2).
- E. Gypsum Board Substrates:
1. Latex System:
 - a. Prime Coat: Primer sealer, latex, interior.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, flat, (Gloss Level 1).
- F. Solid Wood Posts: At exterior patios.
1. Stain System:
 - a. Base coat: oil based, exterior.
 - b. Topcoat: Oil based, exterior.

END OF SECTION 099123

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SECTION 101419 - DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast dimensional characters.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.

C. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

A. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DIMENSIONAL CHARACTERS

- A. Cast Characters: Characters with uniform faces, sharp corners, and precisely formed lines and profiles, and as follows:
1. Character Material: Cast aluminum.
 2. Character Height: As indicated on Drawings.
 3. Finishes:
 - a. Integral Metal Finish: Mill.
 - b. Integral Aluminum Finish: Anodized color as selected by Architect from full range of industry colors and color densities. Or;
 - c. Powder-Coat Finish: Manufacturer's standard, in color as selected by Architect from manufacturer's full range.

2.2 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
1. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
 2. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 3. Internally brace dimensional characters for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
 4. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
 5. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.
- B. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted signs to suit sign construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.
1. Aluminum Brackets: Factory finish brackets with baked-enamel or powder-coat finish **to match sign-background color** unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
2. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.
3. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
4. Back Bar and Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position, so that signage is correctly located and aligned.
5. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.

C. Remove temporary protective coverings and strippable films as signs are installed.

END OF SECTION 101419

SECTION 102600 - WALL PROTECTION

1.1 SUMMARY

A. Section Includes:

1. Corner guards.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of wall and door protection showing locations and extent.

1. Include plans, elevations, sections, and attachment details.

C. Samples: For each exposed product and for each color and texture specified, 12 inches long.

1.3 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Material certificates.

C. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of wall- and door-protection units that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1.

2.2 CORNER GUARDS

- A. Basis of design: Wallguard Defender 2335, 1 1/8" wings, screw attachment.
- B. Surface-Mounted Corner Guards: Manufacturer's standard, PVC-free assembly consisting of resilient polycarbonate corner guard; including mounting hardware; fabricated with 90 degree turn to match wall condition.
1. Cover: Extruded rigid plastic, minimum 0.075-inch wall thickness; in dimensions and profiles indicated on Drawings.
 - a. Color and Texture: Clear, smooth.

2.3 MATERIALS

- A. Plastic Materials: Chemical- and stain-resistant, high-impact-resistant plastic with integral color throughout; extruded and sheet material as required, thickness as indicated.
- B. Polycarbonate Plastic Sheet: ASTM D 6098, S-PC01, Class 1 or Class 2, abrasion resistant; with a minimum impact-resistance rating of 15 ft.-lbf/in. (800 J/m) of notch when tested according to ASTM D 256, Test Method A.
- C. Fasteners: Stainless-steel screws.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Corner guards will be installed at all outside gypsum board corners within fully accessible (ADA/UFAS compliant) homes only.
- B. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
- C. Accessories: Provide mounting hardware, anchors, trim and other accessories required for a complete installation.
1. Provide anchoring devices at suitable locations to withstand imposed loads.

END OF SECTION 102600

SECTION 102800 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Private-use bathroom accessories.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify products using designations indicated.

1.3 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PRIVATE-USE BATHROOM ACCESSORIES

- A. Basis of Design Product: Subject to compliance with requirements, provide product indicated on drawings or comparable product by one of the following:
1. Bobrick Washroom Equipment Inc.
 2. Bradley Corporation
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Basco, Inc.
 2. Bobrick Washroom Equipment, Inc.
 3. Franklin Brass by Liberty Hardware Manufacturing Corporation; a Masco company.
 4. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
 5. Ginger; a Masco company.
 6. Seachrome Corporation.
 7. Tubular Specialties Manufacturing, Inc.
- C. Toilet Tissue Dispenser:
1. Toilet tissue (roll) dispenser will be a single roll dispenser, surface mounted, non control delivery with standard spindle, design for 4-1/2" or 5" and made of stainless steel, number 4 finish (satin) finished smooth, no. 4 finish (satin) on ends and slip resistant texture in grip area.
- D. Shower Curtain Rod:
1. Outside Diameter: 1-1/4 inches.
 2. Mounting: Flanges with exposed fasteners.
 3. Rod Material and Finish: Polished chrome-plated brass.
 4. Flange Material and Finish: Polished chrome-plated brass.
 5. Accessories: Integral chrome-plated brass glide hooks.
- E. Grab Bars:
1. Grab bars will be stainless steel, 0.05 inch thick, straight, 18, 36 & 42 inches long, 1-1/4" inches outside diameter mounted with flanges with exposed fasteners. Coordinate that bars will be mounted at ADA/UFAS correct locations and that blocking has been installed.
- F. Soap Dish:
1. Mounting: Surface mounted.
 2. Material and Finish: Polished chrome-plated brass.
- G. Medicine Cabinet:

1. Medicine cabinet; recessed for nominal 4-inch wall depth, 18 x 24 inches with a framed mirror door concealing storage cabinet equipped with continuous hinge and spring-buffered. The cabinet should have 3 adjustable glass shelves with ground edges. The medicine cabinet should be baked enamel paint finish, no. 4 finish (satin). The mirror frame should be baked enamel paint finish, no. 4 finish (satin). The cabinet door should be baked enamel paint finish, no. 4 finish (satin) frame with mirror with baked enamel paint finish, no. 4 finish (satin) hinges.
- H. Robe Hook:
1. Robe hook should be polished chrome plated zinc alloy (ZAMAC) double prong unit.
- I. Towel Bar and Towel Ring:
1. Towel bar should be $\frac{3}{4}$ inch square tube, 30 inches long with rectangular end brackets with flanges with concealed fasteners made of stainless steel, no. 4 finish (satin)
 2. Towel ring should be a standard ring with concealed fastener mounting bracket made of stainless steel, no. 4 finish (satin).
- J. Mirror:
1. Mirror unit will have stainless steel angle frame, 0.05 inch thick with manufacturer's standard corners. The mirror should match the cabinet width x 36" high. Hangers should be rigid, tamper and theft resistant installation, using one-piece galvanized steel wall hanger device with spring action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
- K. Bathtub & ADA Compliant Roll-In-Shower option & transfer shower option:
1. Refer to drawings for make and model.
 2. Coordinate that grab bars will be mounted at ADA/UFAS correct locations and that blocking has been installed in fully compliant units.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

END OF SECTION 102800

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SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type ABC, five (5) pound capacity for each location indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Larsens Manufacturing Company or approved equal.
 - 2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.

2.3 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Larsens Manufacturing Company or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
 - 1. Mounting Brackets: 54 inches (1372 mm) above finished floor to top of fire extinguisher.
- C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416

SECTION 113013 - RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cooking appliances.
 - 2. Kitchen exhaust ventilation.
 - 3. Refrigeration appliances.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For each exposed product and for each color and texture.

1.3 INFORMATIONAL SUBMITTALS

- A. Product certificates.
- B. Field quality-control reports.
- C. Warranties: Sample of special warranties.

1.4 CLOSEOUT SUBMITTALS

- A. Provide operation and maintenance data.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer for installation and maintenance of units required for this Project.
- B. High-Altitude and Propane Conversion: Provide gas-operated appliances with manufacturer's conversion kit installed by a qualified service agency according to manufacturer's written instructions for Project location and type of fuel.

1.6 WARRANTY

- A. Special Warranties: Manufacturer's standard form in which manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Amana; a division of Whirlpool Corporation.
 2. Electrolux Home Products (Frigidaire).
 3. General Electric Company (GE).
 4. General Electric Company (Hotpoint).
 5. Jade Home Products Company.
 6. KitchenAid; a division of Whirlpool Corporation.
 7. LG Appliances.
 8. Maytag; a division of Whirlpool Corporation.
 9. Samsung.
 10. Sears Brands LLC (Kenmore).
 11. Sharp Electronics Corp.
 12. Whirlpool Corporation.

2.2 RANGES

- A. Gas Range: Freestanding one oven and complying with AHAM ER-1.
 1. Gas Burners: Four burners.
 2. Anti-Tip Device: Manufacturer's standard.
 3. Material: Porcelain-enameled steel with manufacturer's standard basic for gas range.
 4. Vented hood to outside with metal Panel backsplash 34" high.
 5. Basis of design: GE JGBS10DEK
- B. Electric Range: Freestanding one oven and complying with AHAM ER-1.
 1. Electric Heating Elements: Four elements.
 2. Anti-Tip Device: Manufacturer's standard.
 3. Material: Porcelain-enameled steel with manufacturer's standard basic for electric range.
 4. Vented hood to outside with metal Panel backsplash 34" high.
 5. Basis of design: GE JBS45DFWW

2.3 KITCHEN EXHAUST VENTILATION

- A. Overhead Exhaust Hood:
 1. Type: Under cabinet mounted exhaust-hood system.
 2. Exhaust Fan: Built into hood capacity.
 3. Basis of design: Broan BKDEG130WW
 - a. Venting: Vented to outside through roof.

4. Finish: Baked enamel.
5. Grease Shield.

2.4 REFRIGERATOR/FREEZER

- A. Refrigerator/Freezer: Two-door, side-by-side refrigerator/freezer and complying with AHAM HRF-1.
 1. Type: Freestanding.
 2. Storage Capacity, 2 & 3 bedroom basis of design: GE GSS23HGH
 - a. Refrigeration Compartment Volume: 16.2 cu. ft.
 - b. Freezer Volume: 6.9 cu. ft.
 3. Storage Capacity, 4 & 5 bedroom basis of design: GE GSS25GGH
 - a. Refrigeration Compartment Volume: 15.7 cu. ft.
 - b. Freezer Volume: 9.6 cu. ft.
 4. General Features:
 - a. Interior light in refrigeration compartment.
 - b. Automatic defrost.
 - c. Interior light in freezer compartment.
 5. Energy Performance, ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.
 6. Front Panel(s): Manufacturer's standard.
 7. Ice makers as a separate purchase will not be provided by NHA.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.
- B. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- C. Range Anti-Tip Device: Install at each range according to manufacturer's written instructions.
- D. Utilities: Comply with plumbing and electrical requirements.

3.2 FIELD QUALITY CONTROL

- A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections:
1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
 2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
 3. Operational Test: After installation, start units to confirm proper operation.
 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.
- C. Prepare test and inspection reports.

END OF SECTION 113013

SECTION 122113 - HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Horizontal louver blinds with aluminum slats.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For horizontal louver blinds, include fabrication and installation details.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 - PRODUCTS

2.1 HORIZONTAL LOUVER BLINDS, ALUMINUM SLATS

A. Hunter Douglas Contract or approved equal.

B. Slats: Aluminum; alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and radius corners.

1. Width: 1 inch (25 mm).
2. Thickness: Manufacturer's standard.
3. Features:
 - a. Lift-Cord Rout Holes: Minimum size required for lift cord and located near back (outside) edge of slat to maximize slat overlap and minimize light gaps between slats.
 - b. Perforated Slats: Openness factor of 6 to 7 percent.

C. Headrail: Formed steel or extruded aluminum; long edges returned or rolled. Headrails fully enclose operating mechanisms on three sides.

1. Manual Lift Mechanism:
 - a. Lift-Cord Lock: Variable; stops lift cord at user-selected position within blind full operating range.
 - b. Operator: Extension of lift cord(s) through lift-cord lock mechanism to form cord pull.
 2. Manual Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.
 - a. Tilt: Full.
 - b. Tilt: Two-direction, positive stop or lockout limited at an angle of 60 degrees from horizontal, both directions.
 - c. Operator: Clear-plastic wand.
 3. Manual Lift-Operator and Tilt-Operator Lengths: Manufacturer's standard.
- D. Bottom Rail: Formed-steel or extruded-aluminum tube that secures and protects ends of ladders and lift cords and has plastic- or metal-capped ends.
1. Type: Manufacturer's standard.
- E. Ladders: Manufacturer's standard.
- F. Valance: Manufacturer's standard.
- G. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
- H. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard.
- I. Side Channels and Perimeter Light Gap Seals: Manufacturer's standard.
- J. Colors, Textures, Patterns, and Gloss:
1. Slats: As selected by Architect from manufacturer's full range.
 2. Components: Provide rails, cords, ladders, and materials exposed to view matching or coordinating with slat color unless otherwise indicated.
- 2.2 HORIZONTAL LOUVER BLIND FABRICATION
- A. Product Safety Standard: Fabricate horizontal louver blinds to comply with WCMA A 100.1 including requirements for corded, flexible, looped devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):
1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which blind is installed less 1/4 inch (6 mm) per side or 1/2 inch (13 mm) total, plus or

- minus 1/8 inch (3.1 mm). Length equal to head-to-sill dimension of opening in which blind is installed less 1/4 inch (6 mm), plus or minus 1/8 inch (3.1 mm).
2. Outside of Jamb Installation: Width and length as indicated, with terminations between blinds of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install horizontal louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units according to manufacturer's written instructions.
 1. Locate so exterior slat edges are not closer than 1 inch (25 mm) from interior faces of glass and not closer than 1/2 inch (13 mm) from interior faces of glazing frames through full operating ranges of blinds.
 2. Install mounting and intermediate brackets to prevent deflection of headrails.
 3. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.
- B. Adjust horizontal louver blinds to operate free of binding or malfunction through full operating ranges.
- C. Clean horizontal louver blind surfaces after installation according to manufacturer's written instructions.

END OF SECTION 122113

SECTION 123530 - RESIDENTIAL CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Kitchen cabinets.
 - 2. Vanity cabinets.
 - 3. Plastic-laminate countertops and backsplashes.

1.2 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Cabinets.
 - 2. Plastic-laminate countertops.
 - 3. Cabinet hardware.
- B. Shop Drawings: For cabinets and countertops. Include plans, elevations, details, and attachments to other work. Show materials, finishes, filler panels, hardware, edge and backsplash profiles, methods of joining countertops, and cutouts for plumbing fixtures.
- C. Samples: For each type of material exposed to view.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified manufacturer.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Obtain cabinets from a manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- B. KCMA certified.

PART 2 - PRODUCTS

2.1 CABINETS

- A. Face Style: Flush overlay.
- B. Cabinet Style: Face frame.

- C. Door and Drawer Fronts: Solid-wood stiles and rails, 5/8 inch thick, with 3/4-inch- thick, solid-wood center panels.
- D. Face Frames: 3/4-by-1-5/8-inch solid wood.
- E. Exposed Cabinet End Finish: Plastic laminate.

2.2 CABINET MATERIALS

A. General:

- 1. Certified Wood Materials: Fabricate cabinets with wood and wood-based products produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- 2. Adhesives and Composite Wood and Agrifiber Products: Do not use products that contain urea formaldehyde.
- 3. Adhesives: Use adhesives that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- 4. Composite Wood and Agrifiber Products: Products shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- 5. Hardwood Lumber: Kiln dried to 7 percent moisture content.
- 6. Softwood Lumber: Kiln dried to 10 percent moisture content.
- 7. Hardwood Plywood: HPVA HP-1, made with adhesive containing no urea formaldehyde.
- 8. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
- 9. Hardboard: ANSI A135.4, Class 1 Tempered.

B. Exposed Materials:

- 1. Exposed Wood Species: Red Oak or plain sawn Birch dependent on owner selection.
 - a. Select materials for compatible color and grain. Do not use two adjacent exposed surfaces that are noticeably dissimilar in color, grain, figure, or natural character markings.
 - b. Staining and Finish: As indicated by manufacturer's designations.
- 2. Solid Wood: Clear hardwood lumber of species indicated, free of defects.
- 3. Plywood: Hardwood plywood with face veneer of species indicated, with Grade A faces and Grade C backs of same species as faces.
- 4. Plastic Laminate: Particleboard faced with high-pressure decorative laminate complying with NEMA LD 3, Grade VGS.
 - a. Colors, Textures, and Patterns: As selected by Contracting officer from cabinet manufacturer's full range.

- C. Semiexposed Materials: Unless otherwise indicated, provide the following:
 - 1. Solid Wood: Sound hardwood lumber, selected to eliminate appearance defects. Same species as exposed surfaces **or** stained to be compatible with exposed surfaces.
 - 2. Plastic Laminate: Particleboard faced with high-pressure decorative laminate complying with NEMA LD 3, Grade VGS.
 - a. Colors, Textures, and Patterns: As indicated by manufacturer's designations.
- D. Concealed Materials: Solid wood or plywood, of any hardwood or softwood species, with no defects affecting strength or utility; particleboard; medium-density fiberboard; or hardboard.

2.3 CABINET HARDWARE

- A. General: Manufacturer's standard units complying with BHMA A156.9, of type, size, style, material, and finish as indicated by manufacturer's designations.
- B. Pulls: Surface-mounted decorative pulls, ADA compliant, minimum 5 inches in width.
- C. Hinges: Concealed European-style self-closing hinges.
- D. Drawer Guides: Epoxy-coated-metal, self-closing drawer guides; designed to prevent rebound when drawers are closed; with nylon-tired, ball-bearing rollers; and complying with BHMA A156.9, Type B05011 or B05091.

2.4 PLASTIC-LAMINATE COUNTERTOPS

- A. Quality Standard: KCMA A161.2.
- B. Configuration: Provide countertops with the following front, cove (intersection of top with backsplash), backsplash, and endsplash style:
 - 1. Front: Rolled.
 - 2. Cove: Cove molding (one-piece postformed laminate supported at junction of top and backsplash by wood cove molding).
 - 3. Backsplash: Curved or waterfall shape.
 - 4. Endsplash: Square edge.

2.5 COUNTERTOP MATERIALS

- A. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3.
 - 1. Grade: HGS.
 - 2. Provide through-color plastic laminate.
 - 3. Grade for Backer Sheet: BKL.
 - 4. Colors, Textures, and Patterns: As indicated per design basis schedule.

- B. Certified Wood Materials: Fabricate countertops with wood and wood-based products produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- C. Composite Wood and Agrifiber Products: Products shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.
- E. Adhesives: Do not use adhesives that contain urea formaldehyde.
- F. Adhesives: Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install cabinets with no variations in flushness of adjoining surfaces; use concealed shims. Where cabinets abut other finished work, scribe and cut for accurate fit. Provide filler strips, scribe strips, and moldings in finish to match cabinet face.
- B. Install cabinets without distortion so doors and drawers fit openings, are aligned, and are uniformly spaced. Complete installation of hardware and accessories as indicated.
- C. Install cabinets and countertop level and plumb to a tolerance of 1/8 inch in 8 feet.
- D. Contractor to coordinate block with cabinet installation.
- E. Contractor to use hardwood for drawers. No particle board shall be used.
- F. Fasten cabinets to adjacent units and to backing.
 - 1. Fasten wall cabinets through back, near top and bottom, at ends and not less than 24 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips.
 - 2. Fasten wall cabinets through back, near top and bottom, at ends and not less than 24 inches o.c., with toggle bolts through metal backing behind gypsum board.
- G. Fasten plastic-laminate countertops by screwing through corner blocks of base units into underside of countertop. Form seams using splines to align adjacent surfaces, and secure with glue and concealed clamping devices designed for this purpose.

- H. Adjust cabinets and hardware so doors and drawers are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

END OF SECTION 123530

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SECTION 220513 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Escutcheons.
7. Grout.
8. Equipment installation requirements common to equipment sections.
9. Painting and finishing.
10. Supports and anchorages.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
 1. ABS: Acrylonitrile-butadiene-styrene plastic.
 2. CPVC: Chlorinated polyvinyl chloride plastic.

3. PE: Polyethylene plastic.
4. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Escutcheons.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

D. All installation work to be done by qualified licensed journeyman and journeyman apprentices. Journeyman shall have a minimum of 5 years related experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

- A. Refer to individual Division 22 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- H. Solvent Cements for Joining Plastic Piping:
 - 1. CPVC Piping: ASTM F 493.
 - 2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
- I. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.4 TRANSITION FITTINGS

- A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
 - 1. Available Manufacturers:
 - a. Cascade Waterworks Mfg. Co.
 - b. Dresser Industries, Inc.; DMD Div.
 - c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
 - d. JCM Industries.
 - e. Smith-Blair, Inc.
 - f. Viking Johnson.
 - 2. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling.
 - 3. Underground Piping NPS 2 and Larger: AWWA C219, metal sleeve-type coupling.
 - 4. Aboveground Pressure Piping: Pipe fitting.
- B. Plastic-to-Metal Transition Fittings: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
 - 1. Available Manufacturers:
 - a. Eslon Thermoplastics.
- C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

1. Available Manufacturers:

- a. Thompson Plastics, Inc.

D. Plastic-to-Metal Transition Unions: MSS SP-107, CPVC and PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.

1. Available Manufacturers:

- a. NIBCO INC.
- b. NIBCO, Inc.; Chemtrol Div.

E. Flexible Transition Couplings for Underground Nonpressure Drainage Piping: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

1. Available Manufacturers:

- a. Cascade Waterworks Mfg. Co.
- b. Fernco, Inc.
- c. Mission Rubber Company.
- d. Plastic Oddities, Inc.

2.5 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

1. Available Manufacturers:

- a. Capitol Manufacturing Co.
- b. Central Plastics Company.
- c. Eclipse, Inc.
- d. Epcos Sales, Inc.
- e. Hart Industries, International, Inc.
- f. Watts Industries, Inc.; Water Products Div.
- g. Zurn Industries, Inc.; Wilkins Div.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

1. Available Manufacturers:

- a. Capitol Manufacturing Co.
- b. Central Plastics Company.

- c. Epco Sales, Inc.
 - d. Watts Industries, Inc.; Water Products Div.

- E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
 - 1. Available Manufacturers:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Central Plastics Company.
 - d. Pipeline Seal and Insulator, Inc.

 - 2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

- F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
 - 1. Available Manufacturers:
 - a. Calpico, Inc.
 - b. Lochinvar Corp.

- G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.
 - 1. Available Manufacturers:
 - a. Perfection Corp.
 - b. Precision Plumbing Products, Inc.
 - c. Sioux Chief Manufacturing Co., Inc.
 - d. Victaulic Co. of America.

2.6 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
 - 1. Available Manufacturers:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc.

 - 2. Sealing Elements: EPDM NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

 - 3. Pressure Plates: Plastic and Carbon steel. Include two for each sealing element.

4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.7 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 1. Underdeck Clamp: Clamping ring with set screws.
- E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
- F. PVC Pipe: ASTM D 1785, Schedule 40.
- G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.8 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
 1. Finish: Polished chrome-plated.
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
 1. Finish: Polished chrome-plated.
- E. One-Piece, Stamped-Steel Type: With spring clips and chrome-plated finish.
- F. Split-Plate, Stamped-Steel Type: With concealed hinge, spring clips, and chrome-plated finish.
- G. One-Piece, Floor-Plate Type: Cast-iron floor plate.
- H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.9 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 15 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
 - 1. New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.

- c. Insulated Piping: One-piece, stamped-steel type with spring clips.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
 - f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.
 - h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type with concealed hinge and spring clips.
 - j. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
 - k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type with set screw spring clips.
 - l. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.
2. Existing Piping: Use the following:
- a. Chrome-Plated Piping: Split-casting, cast-brass type with chrome-plated finish.
 - b. Insulated Piping: Split-plate, stamped-steel type with concealed hinge and spring clips.
 - c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge and spring clips.
 - e. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
 - f. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge and set screw.
 - g. Bare Piping in Unfinished Service Spaces: Split-casting, cast-brass type with polished chrome-plated finish.
 - h. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with concealed hinge and set screw or spring clips.
 - i. Bare Piping in Equipment Rooms: Split-casting, cast-brass type.
 - j. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with set screw or spring clips.
 - k. Bare Piping at Floor Penetrations in Equipment Rooms: Split-casting, floor-plate type.
- M. Sleeves are not required for core-drilled holes.
- N. Permanent sleeves are not required for holes formed by removable PE sleeves.
- O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
- P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
 3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - a. PVC Steel Pipe Sleeves: For pipes smaller than NPS 6.
 - b. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 7 Section "Sheet Metal Flashing and Trim" for flashing.
 - 1) Seal space outside of sleeve fittings with grout.
 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.
- Q. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- R. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 7 Section "Through-Penetration Firestop Systems" for materials.
- S. Verify final equipment locations for roughing-in.
- T. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 15 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
 - 3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
 - 4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
 - 5. PVC Nonpressure Piping: Join according to ASTM D 2855.
 - 6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.
- J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
- K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.
- L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
 - 1. Plain-End Pipe and Fittings: Use butt fusion.
 - 2. Plain-End Pipe and Socket Fittings: Use socket fusion.
- M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.3 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 - 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
 - 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.5 PAINTING

- A. Painting of plumbing systems, equipment, and components is specified in Division 9 Sections "Interior Painting" and "Exterior Painting."
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.6 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
 - 1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
 - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
 - 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.

4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

3.7 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 5 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

3.8 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor plumbing materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

3.9 GROUTING

- A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

END OF SECTION 220513

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SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Bronze angle valves.
 - 2. Brass ball valves.
 - 3. Bronze ball valves.
 - 4. Bronze lift check valves.
 - 5. Bronze swing check valves.
 - 6. Bronze gate valves.
 - 7. Bronze globe valves.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Nonrising stem.
- E. OS&Y: Outside screw and yoke.
- F. RS: Rising stem.
- G. SWP: Steam working pressure.

1.4 SUBMITTALS

- A. Product Data: For each type of valve indicated.

1.5 QUALITY ASSURANCE

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

- B. ASME Compliance:
 - 1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 2. ASME B31.1 for power piping valves.
 - 3. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Set angle, gate, and globe valves closed to prevent rattling.
 - 4. Set ball and plug valves open to minimize exposure of functional surfaces.
 - 5. Set butterfly valves closed or slightly open.
 - 6. Block check valves in either closed or open position.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Refer to valve schedule articles for applications of valves.
- B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- C. Valve Sizes: Same as upstream piping unless otherwise indicated.
- D. Valve Actuator Types:
 - 1. Handlever: For quarter-turn valves NPS 6 and smaller except plug valves.
 - 2. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 5 plug valves, for each size square plug-valve head.
- E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
 - 1. Gate Valves: With rising stem.
 - 2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
 - 3. Butterfly Valves: With extended neck.

- F. Valve-End Connections:
 - 1. Threaded: With threads according to ASME B1.20.1.

- G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE ANGLE VALVES

- A. Class 125, Bronze Angle Valves with Bronze Disc:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hammond Valve.
 - b. Milwaukee Valve Company.
- 2. Description:
 - a. Standard: MSS SP-80, Type 1.
 - b. CWP Rating: 200 psig.
 - c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
 - d. Ends: Threaded.
 - e. Stem and Disc: Bronze.
 - f. Packing: Asbestos free.
 - g. Handwheel: Malleable iron.

- B. Class 125, Bronze Angle Valves with Nonmetallic Disc:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Valve, Inc.
 - b. NIBCO INC.
- 2. Description:
 - a. Standard: MSS SP-80, Type 2.
 - b. CWP Rating: 200 psig.
 - c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
 - d. Ends: Threaded.
 - e. Stem: Bronze.
 - f. Disc: PTFE or TFE.
 - g. Packing: Asbestos free.
 - h. Handwheel: Malleable iron.

2.3 BRASS BALL VALVES

- A. One-Piece, Reduced-Port, Brass Ball Valves with Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Kitz Corporation.
2. Description:
 - a. Standard: MSS SP-110.
 - b. CWP Rating: 400 psig.
 - c. Body Design: One piece.
 - d. Body Material: Forged brass.
 - e. Ends: Threaded.
 - f. Seats: PTFE or TFE.
 - g. Stem: Brass.
 - h. Ball: Chrome-plated brass.
 - i. Port: Reduced.

B. Full-Port, Brass Ball Valves with Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. DynaQuip Controls.
 - d. Flow-Tek, Inc.; a subsidiary of Bray International, Inc.
 - e. Hammond Valve.
 - f. Jamesbury; a subsidiary of Metso Automation.
 - g. Jomar International, LTD.
 - h. Kitz Corporation.
 - i. Legend Valve.
 - j. Marwin Valve; a division of Richards Industries.
 - k. Milwaukee Valve Company.
 - l. NIBCO INC.
 - m. Red-White Valve Corporation.
 - n. RuB Inc.
2. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig.
 - c. CWP Rating: 600 psig.
 - d. Body Design: Two piece.
 - e. Body Material: Forged brass.
 - f. Ends: Threaded.
 - g. Seats: PTFE or TFE.
 - h. Stem: Brass.
 - i. Ball: Chrome-plated brass.
 - j. Port: Full.

2.4 BRONZE GATE VALVES

A. Class 125, NRS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Valve, Inc.
 - b. Crane Co.; Crane Valve Group; Crane Valves.
 - c. Crane Co.; Crane Valve Group; Jenkins Valves.
 - d. Crane Co.; Crane Valve Group; Stockham Division.
 - e. Hammond Valve.
 - f. Kitz Corporation.
 - g. Milwaukee Valve Company.
 - h. NIBCO INC.
 - i. Powell Valves.
 - j. Red-White Valve Corporation.
 - k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - l. Zy-Tech Global Industries, Inc.
2. Description:
 - a. Standard: MSS SP-80, Type 1.
 - b. CWP Rating: 200 psig.
 - c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
 - d. Ends: Threaded.
 - e. Stem: Bronze.
 - f. Disc: Solid wedge; bronze.
 - g. Packing: Asbestos free.
 - h. Handwheel: Malleable iron.

B. Class 125, RS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Valve, Inc.
 - b. Crane Co.; Crane Valve Group; Crane Valves.
 - c. Crane Co.; Crane Valve Group; Jenkins Valves.
 - d. Crane Co.; Crane Valve Group; Stockham Division.
 - e. Hammond Valve.
 - f. Kitz Corporation.
 - g. Milwaukee Valve Company.
 - h. NIBCO INC.
 - i. Powell Valves.
 - j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - k. Zy-Tech Global Industries, Inc.
2. Description:
 - a. Standard: MSS SP-80, Type 2.

- b. CWP Rating: 200 psig.
- c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
- d. Ends: Threaded.
- e. Stem: Bronze.
- f. Disc: Solid wedge; bronze.
- g. Packing: Asbestos free.
- h. Handwheel: Malleable iron.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
 - 1. Shutoff Service: Ball, or gate valves.
 - 2. Throttling Service: Ball valves.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.
- C. Select valves, except wafer types, with the following end connections:
 - 1. For Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.

3.2 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller:
 - 1. Bronze and Brass Valves: Threaded ends.
 - 2. Bronze Angle Valves: Class 125, bronze disc.
 - 3. Ball Valves: One piece, full port, brass with brass or bronze stainless-steel trim.
 - 4. Bronze Swing Check Valves: Class 125, bronze disc.
 - 5. Bronze Gate Valves: Class 125, bronze, NRS.

END OF SECTION 220523

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Steel pipe hangers and supports..
 - 2. Thermal-hanger shield inserts.
 - 3. Fastener systems.
 - 4. Equipment supports.

1.2 DEFINITIONS

- A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel pipe hangers and supports.
 - 2. Thermal-hanger shield inserts.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze pipe hangers. Include Product Data for components.
 - 2. Metal framing systems. Include Product Data for components.
- C. Welding certificates.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.
- B. Available Manufacturers:
 1. AAA Technology & Specialties Co., Inc.
 2. Bergen-Power Pipe Supports.
 3. B-Line Systems, Inc.; a division of Cooper Industries.
 4. Carpenter & Paterson, Inc.
 5. Empire Industries, Inc.
 6. ERICO/Michigan Hanger Co.
 7. Globe Pipe Hanger Products, Inc.
 8. Grinnell Corp.
 9. GS Metals Corp.
 10. National Pipe Hanger Corporation.
 11. PHD Manufacturing, Inc.
 12. PHS Industries, Inc.
 13. Piping Technology & Products, Inc.
 14. Tolco Inc.
- C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.
- D. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 THERMAL-HANGER SHIELD INSERTS

- A. Description: 100-psig- (690-kPa-) minimum, compressive-strength insulation insert encased in sheet metal shield.
- B. Available Manufacturers:
 1. Carpenter & Paterson, Inc.
 2. ERICO/Michigan Hanger Co.
 3. PHS Industries, Inc.
 4. Pipe Shields, Inc.
 5. Rilco Manufacturing Company, Inc.
 6. Value Engineered Products, Inc.
- C. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with vapor barrier.
- D. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass.

- E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- G. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use padded hangers for piping that is subject to scratching.
- F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
 - 2. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
- G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500).
 - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500), if longer ends are required for riser clamps.
- H. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 - 2. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

3.2 HANGER AND SUPPORT INSTALLATION

- A. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- B. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- C. Insulated Piping: Comply with the following:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits according to ASME B31.9 for building services piping.
 - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
 - 5. Insert Material: Length at least as long as protective shield.
 - 6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.4 PAINTING

- A. Touch Up: Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

END OF SECTION 220529

SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: Flame-spread index of 25, and smoke-developed index of 50 for insulation installed indoors; according to ASTM E 84.

1.2 FIELD QUALITY CONTROL

- A. Field Inspections: By Owner-engaged agency.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Special-Shaped Insulation: ASTM C 552, Type III.
 - 2. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
 - 3. Preformed Pipe Insulation with Factory-Applied **ASJ**: Comply with ASTM C 552, Type II, Class 2.
 - 4. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

PART 3 - EXECUTION

3.1 PIPING INSULATION SCHEDULE, GENERAL

- A. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 - 1. Drainage piping located in crawl spaces.
 - 2. Below-grade piping.
 - 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.2 INDOOR PIPING INSULATION SCHEDULE (Per IRC unless noted otherwise)

- A. Domestic Cold Water: Cellular glass.
- B. Domestic Hot and Recirculated Hot Water: Cellular glass.
- C. Floor Drains, Traps, and Sanitary Drain Piping within 10 Feet of Drain Receiving Condensate and Equipment Drain Water: Cellular glass.
- D. Hot Service Drains: Cellular glass.
- E. Hot Service Vents: Cellular glass.

END OF SECTION 220719

SECTION 221113 - FACILITY WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes water-distribution piping and related components outside the building for the water services, and water meters outside of the building. All installation, tapping of water mains, materials, testing and disinfection shall comply with the attached Navajo Tribal Utility Authority Technical Specifications for Materials and Workmanship for Water and Wastewater Facilities.

END OF SECTION 221113

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SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Copper tube and fittings.
 - 2. PEX tube and fittings.
 - 3. Piping joining materials.
 - 4. Encasement for piping.
 - 5. Transition fittings.

1.3 ACTION SUBMITTALS

- A. Product Data: For transition fittings and dielectric fittings.

1.4 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.
- B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."
- C. Comply with NSF 372 for low lead.

2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
- B. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.
- C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- D. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- E. Copper Unions:
 - 1. MSS SP-123.
 - 2. Cast-copper-alloy, hexagonal-stock body.
 - 3. Ball-and-socket, metal-to-metal seating surfaces.
 - 4. Solder-joint or threaded ends.
- F. Copper Pressure-Seal-Joint Fittings:
 - 1. Fittings for NPS 2 (DN 50) and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
 - 2. Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
- G. Copper Push-on-Joint Fittings:
 - 1. Description:
 - a. Cast-copper fitting complying with ASME B16.18 or wrought-copper fitting complying with ASME B 16.22.
 - b. Stainless-steel teeth and EPDM-rubber, O-ring seal in each end instead of solder-joint ends.
- H. Copper-Tube, Extruded-Tee Connections:
 - 1. Description: Tee formed in copper tube according to ASTM F 2014.
- I. Appurtenances for Grooved-End Copper Tubing:
 - 1. Bronze Fittings for Grooved-End, Copper Tubing: ASTM B 75/B 75M copper tube or ASTM B 584 bronze castings.
 - 2. Mechanical Couplings for Grooved-End Copper Tubing:
 - a. Copper-tube dimensions and design similar to AWWA C606.
 - b. Ferrous housing sections.
 - c. EPDM-rubber gaskets suitable for hot and cold water.
 - d. Bolts and nuts.
 - e. Minimum Pressure Rating: 300 psig (2070 kPa).

2.3 PEX TUBE AND FITTINGS

- A. Tube Material: PEX plastic according to ASTM F 876 and ASTM F 877.
- B. Fittings: ASTM F 1960, cold expansion fittings and reinforcing rings.

- C. Manifold: Multiple-outlet, plastic or corrosion-resistant-metal assembly complying with ASTM F 876; with plastic or corrosion-resistant-metal valve for each outlet.

2.4 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

E. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

F. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.5 ENCASEMENT FOR PIPING

- A. Above grade: Polyethylene, 25 mil, Oatey Pipe Guard Tape, blue.

2.6 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Sleeve-Type Transition Coupling: AWWA C219.

D. Plastic-to-Metal Transition Fittings:

1. Description:
 - a. PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions.
 - b. One end with threaded brass insert and one solvent-cement-socket or threaded end.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Under building slab shall be in accordance with the attached Navajo Tribal Utility Authority Technical Specifications.
- C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."
- D. Install shutoff valve immediately upstream of each dielectric fitting.
- E. Install domestic water piping level and plumb.
- F. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- G. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- H. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- I. Install piping to permit valve servicing.
- J. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- K. Install piping free of sags and bends.
- L. Install fittings for changes in direction and branch connections.
- M. Install PEX tubing with loop at each change of direction of more than 90 degrees.
- N. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- O. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping."
- P. Install thermostats in hot-water circulation piping.

- Q. Install thermometers on outlet piping from each water heater.
- R. Install sleeves for piping penetrations of walls, ceilings and floors.
- S. Install flexible piping spool piece for all piping penetrations in floor slab. Install within sleeve.
- T. Install sleeve seals for piping penetrations of concrete walls and slabs.
- U. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.2 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Braze Joints" chapter.
- E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.
- G. Push-on Joints for Copper Tubing: Clean end of tube. Measure insertion depth with manufacturer's depth gage. Join copper tube and push-on-joint fittings by inserting tube to measured depth.
- H. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.
- I. Joint Construction for Grooved-End Copper Tubing: Make joints according to AWWA C606. Roll groove ends of tubes. Lubricate and install gasket over ends of tubes or tube and fitting. Install coupling housing sections over gasket with keys seated in tubing grooves. Install and tighten housing bolts.
- J. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

- K. Joints for PEX Tubing: Join according to ASTM F 1807 for metal insert and copper crimp ring fittings and ASTM F 1960 for cold expansion fittings and reinforcing rings.
- L. Joints for PEX Tubing: Join according to ASSE 1061 for push-fit fittings.
- M. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.3 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Aboveground Domestic Water Piping NPS 2 (DN 50) and Smaller: Plastic-to-metal transition fittings or unions.

3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
 - 1. Vertical Piping: MSS Type 8 or 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs:
 - a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet (30 m) if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Support vertical piping and tubing at base and at each floor.
- C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch (10 mm).
- D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 3/4 (DN 20) and Smaller: 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
 - 2. NPS 1 and NPS 1-1/4 (DN 25 and DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
- E. Install supports for vertical copper tubing every 10 feet (3 m).
- F. Install vinyl-coated hangers for PEX tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1 (DN 25) and Smaller: 32 inches (815 mm) with 3/8-inch (10-mm) rod.

- G. Install hangers for vertical PEX tubing every 48 inches (1200 mm).
- H. Support piping and tubing not listed in this article according to MSS SP-58 and manufacturer's written instructions.

3.5 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
 - 1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 - 2. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.

3.6 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Piping Inspections:
 - a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
 - b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
 - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
 - c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
 - d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
 - 2. Piping Tests:
 - a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.

- b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
- c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
- d. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
- e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
- f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.7 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
 - b. Adjust calibrated balancing valves to flows indicated.
5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.8 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

- a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Repeat procedures if biological examination shows contamination.
 - e. Submit water samples in sterile bottles to authorities having jurisdiction.
- B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.9 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
- D. Under-building-slab, domestic water piping, NPS 2 and smaller, shall be the following:
 1. In accordance with the attached Navajo Tribal Utility Authority Technical Specifications.
- E. Aboveground domestic water piping, NPS 2 and smaller shall be one of the following:
 1. Hard copper tube, ASTM B 88, Type L cast- or wrought-copper, solder-joint fittings; and soldered joints.
 2. PEX tube, NPS 1 (DN 25) and smaller.
 - a. Fittings for PEX tube:
 - 1) ASTM F 1807, metal insert and copper crimp rings.
 - 2) ASTM F 1960, cold expansion fittings and reinforcing rings.
 - 3) ASSE 1061, push-fit fittings.

3.10 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball or gate valves for piping NPS 2 (DN 50) and smaller. Use butterfly, ball, or gate valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.
 2. Hot-Water Circulation Piping, Balancing Duty: Calibrated balancing valves.
 3. Drain Duty: Hose-end drain valves.
- B. Use check valves to maintain correct direction of domestic water flow to and from equipment.
- C. Iron grooved-end valves may be used with grooved-end piping.

END OF SECTION 221116

SECTION 221313 - FACILITY SANITARY SEWERS

PART 1 - GENERAL

1.1 REFERENCE SPECIFICATION

- A. This Section includes gravity-flow, non-pressure sanitary sewerage outside the building, and cleanouts. All installation, materials, and testing for sanitary sewer services lines and cleanouts shall comply with requirements of the attached Navajo Tribal Utility Authority Technical Specifications for Materials and Workmanship for Water and Wastewater Facilities.

END OF SECTION 221313

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SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following for soil, waste, and vent piping inside the building:
 - 1. Pipe, tube, and fittings.
 - 2. Special pipe fittings.
 - 3. Encasement for underground metal piping.

1.3 DEFINITIONS

- A. PVC: Polyvinyl chloride plastic.

1.4 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water.
 - 2. Sanitary Sewer, Force-Main Piping: 50 psig.

1.5 SUBMITTALS

- A. Field quality-control inspection and test reports.

1.6 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 PVC PIPE AND FITTINGS

- A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
 - 1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.
- B. Solvent Cement and Adhesive Primer:
 - 1. Use PVC solvent cement that has a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

- A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.
- B. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:
 - 1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
- C. Aboveground, soil and waste piping NPS 5 and larger shall be any of the following:

1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
- D. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:
 1. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
- E. Aboveground sanitary-sewage force mains NPS 1-1/2 and NPS 2:
 1. Hard copper tube, Type L (Type B); copper pressure fittings; and soldered joints.

3.3 PIPING INSTALLATION

- A. BInstall cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.
- B. Install cleanout fitting with closure plug inside the building in sanitary force-main piping.
- C. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight.
- D. Install wall-penetration fitting at each service pipe penetration through foundation wall. Make installation watertight.
- E. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- F. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- G. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
 1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
 2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- H. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.
- I. Install underground PVC soil and waste drainage piping according to ASTM D 2321.

- J. Install flexible piping spool piece for all piping penetrations in floor slab. Install within sleeve.
- K. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.4 JOINT CONSTRUCTION

- A. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.
- B. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports." Install the following:
 - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 2. Install individual, straight, horizontal piping runs according to the following:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install supports according to Division 22 Section "Hangers and Supports."
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.
- E. Install supports for copper tubing every 10 feet.
- F. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
 - 2. NPS 3: 48 inches with 1/2-inch rod.
 - 3. NPS 4 and 5: 48 inches with 5/8-inch rod.
 - 4. NPS 6: 48 inches with 3/4-inch rod.
- G. Install supports for vertical PVC piping every 48 inches.
- H. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
 - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
 - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
 - 4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.
- D. Connect force-main piping to the following:
 - 1. Pumps: To pump discharge.

3.7 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes

before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.

4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 6. Prepare reports for tests and required corrective action.
- E. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 4. Prepare reports for tests and required corrective action.

3.8 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.9 PROTECTION

- A. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION 221316

SECTION 223300 - ELECTRIC WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following electric water heaters:
1. Compression tanks.
 2. Water heater accessories.

1.2 SUBMITTALS

- A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Product Certificates: For each type of electric water heater, signed by product manufacturer.
- D. Manufacturer Seismic Qualification Certification: Submit certification that commercial water heaters, accessories, and components will withstand seismic forces at location.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
 - b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- E. Source quality-control test reports.
- F. Field quality-control test reports.
- G. Operation and Maintenance Data: For electric water heaters to include in emergency, operation, and maintenance manuals.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain same type of electric water heaters through one source from a single manufacturer.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of electric water heaters and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004.
- E. ASME Compliance: Where indicated, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- F. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for all components that will be in contact with potable water.

1.4 COORDINATION

- A. Coordinate size and location of concrete bases with Architectural and Structural Drawings.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric water heaters that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including storage tank and supports.
 - b. Faulty operation of controls.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
 - 2. Warranty Period(s): From date of Substantial Completion:
 - a. Household Electric Water Heaters, EWH1 and EWH2:
 - 1) Storage Tank: Five years.
 - 2) Controls and Other Components: Two years.
 - b. Light-Commercial Electric Water Heaters:
 - 1) Storage Tank: Five years.
 - 2) Controls and Other Components: Two years.

- c. Commercial Electric Water Heaters:
 - 1) Storage Tank: Five years.
 - 2) Controls and Other Components: Three> years.
- d. Compression Tanks: One year(s).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 HOUSEHOLD ELECTRIC WATER HEATERS

- A. Household, Standard, Storage Electric Water Heaters: Comply with UL 174.
 - 1. Available Manufacturers:
 - a. American Water Heater Company.
 - b. Bradford White Corporation.
 - c. Lochinvar Corporation.
 - d. Rheem Water Heater Div.; Rheem Manufacturing Company.
 - e. Ruud Water Heater Div.; Rheem Manufacturing Company.
 - f. Smith, A. O. Water Products Company.
 - g. State Industries, Inc.
 - 2. Storage-Tank Construction: Steel.
 - a. Tappings: ASME B1.20.1 pipe thread.
 - b. Pressure Rating: 150 psig (1035 kPa).
 - c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.
 - 3. Factory-Installed Storage-Tank Appurtenances:
 - a. Anode Rod: Replaceable magnesium.
 - b. Dip Tube: Provide unless cold-water inlet is near bottom of tank.
 - c. Drain Valve: ASSE 1005.
 - d. Insulation: Comply with ASHRAE/IESNA 90.1-2004 or ASHRAE 90.2-2004.
 - e. Jacket: Steel with enameled finish.

1) Standard: Cylindrical shape.

- f. Heat Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.
- g. Heating Elements: Two; electric, screw-in immersion type with 12 kW or less total, and wired for nonsimultaneous operation, unless otherwise indicated.
- h. Temperature Control: Adjustable thermostat for each element.
- i. Safety Control: High-temperature-limit cutoff device or system.
- j. Relief Valve: ASME rated and stamped and complying with ASME PTC 25.3 for combination temperature and pressure relief valves. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.

2.3 WATER HEATER ACCESSORIES

- A. Combination Temperature and Pressure Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.
- B. Water Heater Stands: Water heater manufacturer's factory-fabricated steel stand for floor mounting and capable of supporting water heater and water. Include dimension that will support bottom of water heater a minimum of 18 inches (457 mm) above the floor.
- C. Piping Manifold Kits: Water heater manufacturer's factory-fabricated inlet and outlet piping arrangement for multiple-unit installation. Include piping and valves for field assembly that are capable of isolating each water heater and of providing balanced flow through each water heater.
- D. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1-2004 or ASHRAE 90.2-2004.
- E. Water Regulators: ASSE 1003, water-pressure reducing valve. Set at 25-psig- (172.5-kPa-) maximum outlet pressure, unless otherwise indicated.
- F. Shock Absorbers: ASSE 1010 or PDI WH 201, Size A water hammer arrester.

2.4 SOURCE QUALITY CONTROL

- A. Test and inspect water heater storage tanks, specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.
- B. Hydrostatically test commercial water heater storage tanks before shipment to minimum of one and one-half times pressure rating.
- C. Prepare test reports.

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

- A. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
- B. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains.
- C. Fill water heaters with water.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.

3.3 FIELD QUALITY CONTROL

- A. **Manufacturer's Field Service:** Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
 - 1. **Leak Test:** After installation, test for leaks. Repair leaks and retest until no leaks exist.
 - 2. **Operational Test:** After electrical circuitry has been energized, confirm proper operation.
 - 3. **Test and adjust controls and safeties.** Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial and instantaneous electric water heaters. Refer to Division 1 Section "Closeout Procedures."

END OF SECTION 223300

SECTION 223400 - FUEL-FIRED WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following fuel-fired water heaters:
 - 1. Household, atmospheric, storage, gas water heaters.
 - 2. Compression tanks.
 - 3. Water heater accessories.

1.3 DEFINITIONS

- A. LP Gas: Liquefied-petroleum fuel gas.
- B. NG Gas: Natural Gas Fuel

1.4 SUBMITTALS

- A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Diagram power, signal, and control wiring, venting.
- C. Product Certificates: For each type of commercial and instantaneous water heater, signed by product manufacturer.
- D. Source quality-control test reports.
- E. Field quality-control test reports.
- F. Operation and Maintenance Data: For water heaters to include in emergency, operation, and maintenance manuals.
- G. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain same type of water heaters through one source from a single manufacturer.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of water heaters and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004.
- E. ASME Compliance:
 - 1. Where ASME-code construction is indicated, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
 - 2. Where ASME-code construction is indicated, fabricate and label commercial, finned-tube water heaters to comply with ASME Boiler and Pressure Vessel Code: Section IV.
- F. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9" for all components that will be in contact with potable water.

1.6 COORDINATION

- A. Coordinate size and location of concrete bases with Architectural and Structural Drawings.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-fired water heaters that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including storage tank and supports.
 - b. Faulty operation of controls.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
 - 2. Warranty Period(s): From date of Substantial Completion:
 - a. Household, Gas Water Heaters:
 - 1) Storage Tank: 10 years.

- 2) Controls and Other Components: 6 years.
- b. Compression Tanks: One year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 HOUSEHOLD, GAS WATER HEATERS

- A. Household, Atmospheric, Storage, Gas Water Heaters: Comply with ANSI Z21.10.1/CSA 4.1.
 1. Available Manufacturers:
 - a. American Water Heater Company.
 - b. Bradford White Corporation.
 - c. Lochinvar Corporation.
 - d. Rheem Water Heater Div.; Rheem Manufacturing Company.
 - e. Ruud Water Heater Div.; Rheem Manufacturing Company.
 - f. Smith, A. O. Water Products Company.
 - g. State Industries, Inc.
 2. Storage-Tank Construction: Steel.
 - a. Tappings: ASME B1.20.1 pipe thread.
 - b. Pressure Rating: 150 psig (1035 kPa).
 - c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.
 3. Factory-Installed, Storage-Tank Appurtenances:
 - a. Anode Rod: Replaceable magnesium.
 - b. Dip Tube: Provide unless cold-water inlet is near bottom of tank.
 - c. Drain Valve: ASSE 1005.
 - d. Insulation: Comply with ASHRAE/IESNA 90.1-2004 or ASHRAE 90.2-2004.
 - e. Jacket: Steel with enameled finish.
 - f. Burner: For use with atmospheric water heaters and for natural-gas or LP-gas fuel.
 - g. Automatic Ignition: ANSI Z21.20, electric, automatic, gas-ignition system.
 - h. Temperature Control: Adjustable thermostat.

- i. Heat Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.
 - j. Combination Temperature and Pressure Relief Valve: ANSI Z21.22/CSA 4.4. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.
4. Draft Hood: Low-profile-type, draft diverter; complying with ANSI Z21.12.
 5. Capacity and Characteristics: See Plans.

2.3 WATER HEATER ACCESSORIES

- A. Gas Shutoff Valves: ANSI Z21.15/CGA 9.1, manually operated. Furnish for installation in piping.
- B. Gas Pressure Regulators: ANSI Z21.18, appliance type. Include pressure rating, capacity, and pressure differential required between gas supply and water heater.
- C. Combination Temperature and Pressure Relief Valves: Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select each relief valve with sensing element that extends into storage tank.
 1. Gas Water Heaters: ANSI Z21.22/CSA 4.4.
- D. Water Heater Stands: Water heater manufacturer's factory-fabricated steel stand for floor mounting and capable of supporting water heater and water. Provide dimension that will support bottom of water heater a minimum of 18 inches (457 mm) above the floor.

2.4 SOURCE QUALITY CONTROL

- A. Test and inspect water heater storage tanks, specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.
- B. Hydrostatically test water heater storage tanks before shipment to minimum of one and one-half times pressure rating.
- C. Prepare test reports.

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

- A. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
- B. Install gas water heaters according to NFPA 54.

- C. Install gas shutoff valves on gas supplies to gas water heaters without shutoff valves.
- D. Install gas pressure regulators on gas supplies to gas water heaters without gas pressure regulators if gas pressure regulators are required to reduce gas pressure at burner.
- E. Fill water heaters with water.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.
- C. Ground equipment according to Division 26 Section.
- D. Connect wiring according to Division 26 Section.

3.3 FIELD QUALITY CONTROL

- A. **Manufacturer's Field Service:** Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
 - 1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain water heaters. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION 223400

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SECTION 224100 - RESIDENTIAL PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Bathtubs.
2. Faucets.
3. Lavatories.
4. Showers.
5. Kitchen sinks.
6. Laundry trays.
7. Dishwasher air-gap fittings.
8. Water closets.
9. Toilet seats.
10. Supply fittings.
11. Waste fittings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted plumbing fixtures.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURES

- A. See Plumbing Fixture Schedule on plans for specific plumbing fixture information.
- B. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

2.2 SUPPLY FITTINGS

- A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.
- B. Standard: ASME A112.18.1/CSA B125.1.
- C. Supply Fittings:
 - 1. Supply Piping: Chrome-plated-brass pipe or chrome-plated-copper tube matching water-supply piping size. Include chrome-plated wall flange.
 - 2. Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression stop with inlet connection matching water-supply piping type and size.
 - a. Operation: Wheel handle.
 - 3. Risers:
 - a. Size: NPS 3/8 for lavatories.
 - b. Size: NPS 1/2 for kitchen sinks and laundry trays.
 - c. Material: ASME A112.18.6, braided- or corrugated-stainless-steel flexible hose riser.

2.3 WASTE FITTINGS

- A. Standard: ASME A112.18.2/CSA B125.2.
- B. Drain: Grid type with NPS 1-1/4 (DN 32) offset tailpiece for accessible lavatories.
- C. Drain: Pop-up type with NPS 1-1/4 (DN 32) straight tailpiece as part of faucet for standard lavatories.
- D. Drain: Grid type with NPS 1-1/2 (DN 40) offset tailpiece for accessible kitchen sinks.
- E. Drain: Grid type with NPS 1-1/2 (DN 40) straight tailpiece for standard kitchen sinks and laundry trays.
- F. Trap:
 - 1. Size: NPS 1-1/2 by NPS 1-1/4 for lavatories.
 - 2. Size: NPS 1-1/2 for kitchen sinks and laundry trays.
 - 3. Material: ASTM F 409 ABS or PVC two-piece trap and waste to wall and wall flange.

2.4 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.

- C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install plumbing fixtures level and plumb according to roughing-in drawings.
- B. Install floor-mounted water closets on closet flange attachments to drainage piping.
- C. Install counter-mounting fixtures in and attached to casework.
- D. Install pedestal lavatories on pedestals and secured to wood blocking in wall.
- E. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
 - 1. Exception: Use ball or gate valves if supply stops are not specified with fixture. "
- F. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.
- G. Install toilet seats on water closets.
- H. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- I. Install shower flow-control fittings with specified maximum flow rates in shower arms.
- J. Install traps on fixture outlets.
 - 1. Exception: Omit trap on fixtures with integral traps.
 - 2. Exception: Omit trap on indirect wastes unless otherwise indicated.
- K. Install disposer in outlet of each sink indicated to have disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.
- L. Install dishwasher air-gap fitting at each sink indicated to have air-gap fitting. Install in sink deck. Connect inlet hose to dishwasher and outlet hose to disposer.
- M. Set bathtubs and shower receptors in leveling bed of cement grout.
- N. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories and sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

- O. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- P. Seal joints between plumbing fixtures, counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.2 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."
- D. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories and sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.3 ADJUSTING

- A. Operate and adjust plumbing fixtures and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.

3.4 CLEANING AND PROTECTION

- A. After completing installation of plumbing fixtures, inspect and repair damaged finishes.
- B. Clean plumbing fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed plumbing fixtures and fittings.
- D. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224100

SECTION 230716 - HVAC INSULATION

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: Flame-spread index of 25, and smoke-developed index of 50 for insulation installed indoors; according to ASTM E 84.

1.2 FIELD QUALITY CONTROL

- A. Field Inspections: By Owner-engaged agency.

1.3 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
 - 1. Indoor, concealed supply and outdoor air.
 - 2. Indoor, exposed supply and outdoor air.
 - 3. Indoor, concealed return located in unconditioned space.
 - 4. Indoor, exposed return located in unconditioned space.
- B. Items Not Insulated:
 - 1. Fibrous-glass ducts.
 - 2. Factory-insulated flexible ducts.
 - 3. Factory-insulated plenums and casings.
 - 4. Flexible connectors.
 - 5. Factory-insulated access panels and doors.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Fiber Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Block Insulation: ASTM C 552, Type I.
 - 2. Special-Shaped Insulation: ASTM C 552, Type III.
 - 3. Board Insulation: ASTM C 552, Type IV.

4. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
- B. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- C. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. Provide insulation with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
 4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.

PART 3 - EXECUTION

3.1 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Concealed, Round and Flat-Oval, Supply-Air Duct Insulation: Fiberglass or mineral-fiber blanket or mineral-fiber board.
- B. Concealed, Round and Flat-Oval, Return-Air Duct Insulation: Fiberglass or mineral-fiber blanket or mineral-fiber board.
- C. Concealed, Rectangular, Supply-Air Duct Insulation: Fiberglass or mineral-fiber blanket or mineral-fiber board.
- D. Concealed, Rectangular, Return-Air Duct Insulation: Fiberglass or mineral-fiber blanket or mineral-fiber board.
- E. Concealed, Supply-Air Plenum Insulation: Fiberglass or mineral-fiber blanket or mineral-fiber board.
- F. Concealed, Return-Air Plenum Insulation: Fiberglass or mineral-fiber blanket or mineral-fiber board.
- G. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

- J. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- K. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

END OF SECTION 230716

SECTION 231123 - FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Valves.
5. Pressure regulators.

1.2 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.
2. Service Regulators: 100 psig minimum unless otherwise indicated.

B. Natural-Gas System Pressure within Buildings: 0.5 psig.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For facility natural-gas piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

C. Field quality-control reports.

D. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
 2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
 3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
 4. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.
 - a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.
- B. Corrugated, Stainless-Steel Tubing: Comply with ANSI/IAS LC 1 (**Appliance Connections only**).
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. OmegaFlex, Inc.
 - b. Parker Hannifin Corporation; Parflex Division.
 - c. Titeflex.
 - d. Tru-Flex Metal Hose Corp.
 2. Tubing: ASTM A 240/A 240M, corrugated, Series 300 stainless steel.
 3. Coating: PE with flame retardant.
 - a. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1) Flame-Spread Index: 25 or less.
 - 2) Smoke-Developed Index: 50 or less.
 4. Fittings: Copper-alloy mechanical fittings with ends made to fit and listed for use with corrugated stainless-steel tubing and capable of metal-to-metal seal without gaskets. Include brazing socket or threaded ends complying with ASME B1.20.1.
 5. Striker Plates: Steel, designed to protect tubing from penetrations.
 6. Manifolds: Malleable iron or steel with factory-applied protective coating. Threaded connections shall comply with ASME B1.20.1 for pipe inlet and corrugated tubing outlets.

7. Operating-Pressure Rating: 5 psig (34.5 kPa).

C. PE Pipe: ASTM D 2513, SDR 11.

1. PE Fittings: ASTM D 2683, socket-fusion type or ASTM D 3261, butt-fusion type with dimensions matching PE pipe.
2. PE Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D 2513, SDR 11; and steel pipe complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
3. Anodeless Service-Line Risers: Factory fabricated and leak tested.
 - a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet.
 - b. Casing: Steel pipe complying with ASTM A 53/A 53M, Schedule 40, black steel, Type E or S, Grade B, with corrosion-protective coating covering. Vent casing aboveground.
 - c. Aboveground Portion: PE transition fitting.
 - d. Outlet shall be threaded or suitable for welded connection.
 - e. Tracer wire connection.
 - f. Ultraviolet shield.
 - g. Stake supports with factory finish to match steel pipe casing or carrier pipe.
4. Transition Service-Line Risers: Factory fabricated and leak tested.
 - a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet connected to steel pipe complying with ASTM A 53/A 53M, Schedule 40, Type E or S, Grade B, with corrosion-protective coating for aboveground outlet.
 - b. Outlet shall be threaded or suitable for welded connection.
 - c. Bridging sleeve over mechanical coupling.
 - d. Factory-connected anode.
 - e. Tracer wire connection.
 - f. Ultraviolet shield.
 - g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

2.2 PIPING SPECIALTIES

A. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
4. Corrugated stainless-steel tubing with polymer coating.
5. Operating-Pressure Rating: 0.5 psig (3.45 kPa).
6. End Fittings: Zinc-coated steel.
7. Threaded Ends: Comply with ASME B1.20.1.
8. Maximum Length: 72 inches (1830 mm).

B. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.

2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller.
 3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
 4. CWP Rating: 125 psig (862 kPa).
- C. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

- A. Joint Compound and Tape: Suitable for natural gas.
- B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 MANUAL GAS SHUTOFF VALVES

- A. General Requirements for Metallic Valves, NPS 2 (DN 50) and Smaller: Comply with ASME B16.33.
 1. CWP Rating: 125 psig.
 2. Threaded Ends: Comply with ASME B1.20.1.
 3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
 4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch (25 mm) and smaller.
 6. Service Mark: Valves 1-1/4 inches (32 mm) to NPS 2 (DN 50) shall have initials "WOG" permanently marked on valve body.
- B. One-Piece, Bronze Ball Valve with Bronze Trim: MSS SP-110.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BrassCraft Manufacturing Company; a Masco company.
 - b. Conbraco Industries, Inc.; Apollo Div.
 - c. Lyall, R. W. & Company, Inc.
 - d. McDonald, A. Y. Mfg. Co.
 - e. Perfection Corporation; a subsidiary of American Meter Company.
 2. Body: Bronze, complying with ASTM B 584.
 3. Ball: Chrome-plated brass.
 4. Stem: Bronze; blowout proof.
 5. Seats: Reinforced TFE; blowout proof.

6. Packing: Separate packnut with adjustable-stem packing threaded ends.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig (4140 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

C. Bronze Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Lee Brass Company.
 - b. McDonald, A. Y. Mfg. Co.
2. Body: Bronze, complying with ASTM B 584.
3. Plug: Bronze.
4. Ends: Threaded, socket, as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig (862 kPa).
7. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

D. Valve Boxes:

1. Cast-iron, two-section box.
2. Top section with cover with "GAS" lettering.
3. Bottom section with base to fit over valve and barrel a minimum of 5 inches (125 mm) in diameter.
4. Adjustable cast-iron extensions of length required for depth of bury.
5. Include tee-handle, steel operating wrench with socket end fitting valve nut or flat head, and with stem of length required to operate valve.

2.5 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas (or propane where equipped)..
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 (DN 50) and smaller.

B. Line Pressure Regulators: Comply with ANSI Z21.80.

1. Manufacturers: Subject to compliance with requirements available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Actaris.
 - b. American Meter Company.
 - c. Eclipse Combustion, Inc.
 - d. Fisher Control Valves and Regulators; Division of Emerson Process Management.
 - e. Invensys.
 - f. Maxitrol Company.
 - g. Richards Industries; Jordan Valve Div.
 2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
 3. Springs: Zinc-plated steel; interchangeable.
 4. Diaphragm Plate: Zinc-plated steel.
 5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
 6. Orifice: Aluminum; interchangeable.
 7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
 8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
 9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
 10. Overpressure Protection Device: Factory mounted on pressure regulator.
 11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
 12. Maximum Inlet Pressure: 10 psig (69 kPa).
- C. Appliance Pressure Regulators: Comply with ANSI Z21.18.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Canadian Meter Company Inc.
 - b. Eaton Corporation; Controls Div.
 - c. Harper Wyman Co.
 - d. Maxitrol Company.
 - e. SCP, Inc.
 2. Body and Diaphragm Case: Die-cast aluminum.
 3. Springs: Zinc-plated steel; interchangeable.
 4. Diaphragm Plate: Zinc-plated steel.
 5. Seat Disc: Nitrile rubber.
 6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
 7. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
 8. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
 9. Maximum Inlet Pressure: 2 psig (13.8 kPa).

2.6 DIELECTRIC UNIONS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Capitol Manufacturing Company.
 - 2. Central Plastics Company.
 - 3. Hart Industries International, Inc.
 - 4. McDonald, A. Y. Mfg. Co.
 - 5. Watts Regulator Co.; Division of Watts Water Technologies, Inc.
 - 6. Wilkins; Zurn Plumbing Products Group.
- B. Minimum Operating-Pressure Rating: 150 psig (1034 kPa).
- C. Combination fitting of copper alloy and ferrous materials.
- D. Insulating materials suitable for natural gas.
- E. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain, or welded end connections that match piping system materials.

2.7 SLEEVES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

2.8 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico Inc.
 - c. Metraflex Company (The).
 - d. Pipeline Seal and Insulator, Inc.
 - 2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe and sleeve.
 - 3. Pressure Plates: Stainless steel.
 - 4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one nut and bolt for each sealing element.

2.9 LABELING AND IDENTIFYING

- A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored yellow.

PART 3 - EXECUTION

3.1 OUTDOOR PIPING INSTALLATION

- A. Comply with the International Fuel Gas Code for installation and purging of natural-gas piping.
- B. Install underground, natural-gas piping buried at least 36 inches below finished grade. Comply with requirements in Division 2 Section "Earthwork" for excavating, trenching, and backfilling.
 - 1. If natural-gas piping is installed less than 36 inches below finished grade, install it in containment conduit.
- C. Underground piping shall comply with the attached Navajo Tribal Utility Authority Technical Specifications.
- D. Steel Piping with Protective Coating:
 - 1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
 - 2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
 - 3. Replace pipe having damaged PE coating with new pipe.
- E. Install fittings for changes in direction and branch connections.
- F. Exterior-Wall Pipe Penetrations: Seal penetrations using steel or cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- G. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.2 INDOOR PIPING INSTALLATION

- A. Comply with the International Fuel Gas Code for installation and purging of natural-gas piping.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss,

expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

- C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.
- D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- G. Locate valves for easy access.
- H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.
- I. Install piping free of sags and bends.
- J. Install fittings for changes in direction and branch connections.
- K. Verify final equipment locations for roughing-in.
- L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.
- M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.
 - 1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.
- N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.
- O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.
- P. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- Q. Connect branch piping from top or side of horizontal piping.
- R. Install unions in pipes NPS 2 (DN 50) and smaller, adjacent to each valve, at final connection to each piece of equipment.

- S. Do not use natural-gas piping as grounding electrode.
- T. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

3.3 VALVE INSTALLATION

- A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing.
- B. Install underground valves with valve boxes.
- C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.
- D. Install anode for metallic valves in underground PE piping.

3.4 PIPING JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints:
 - 1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
 - 2. Cut threads full and clean using sharp dies.
 - 3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
 - 4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
 - 5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- D. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
 - 1. Plain-End Pipe and Fittings: Use butt fusion.
 - 2. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hangers and supports specified in Division 15 Section "Hangers and Supports."
- B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 (DN 25) and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
2. NPS 1-1/4 (DN 32): Maximum span, 108 inches; minimum rod size, 3/8 inch.
3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): Maximum span, 108 inches; minimum rod size, 3/8 inch.

3.6 CONNECTIONS

- A. Connect to utility's gas main according to utility's procedures and requirements.
- B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.
- C. Install piping adjacent to appliances to allow service and maintenance of appliances.
- D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.
- E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.7 LABELING AND IDENTIFYING

- A. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.8 FIELD QUALITY CONTROL

- A. Test, inspect, and purge natural gas according to the International Fuel Gas Code and authorities having jurisdiction.
- B. Natural-gas piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.9 OUTDOOR PIPING SCHEDULE

- A. Underground natural-gas piping shall be the following:
 1. Underground piping shall comply with the attached Navajo Tribal Utility Authority Technical Specifications.
- B. Aboveground natural-gas piping shall be the following:
 1. Steel pipe with malleable-iron fittings and threaded joints.
- C. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

3.10 INDOOR PIPING SCHEDULE

- A. Aboveground, branch piping NPS 1 (DN 25) and smaller shall be the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints.
- B. Aboveground, distribution piping shall be the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints.
- C. Underground, below building, piping shall be the following:
 - 1. Steel pipe with wrought-steel fittings and welded joints.
- D. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.
- E. Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

3.11 UNDERGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

- A. Connections to Existing Gas Piping: Use valve and fitting assemblies made for tapping utility's gas mains and listed by an NRTL.
- B. Underground PR valves.

3.12 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

- A. Valves for pipe sizes NPS 2 (DN 50) and smaller at service meter shall be the following:
 - 1. One-piece, bronze ball valve with bronze trim.
- B. Distribution piping valves for pipe sizes NPS 2 (DN 50) and smaller shall be the following:
 - 1. One-piece, bronze ball valve with bronze trim.
- C. Valves in branch piping for single appliance shall be the following:
 - 1. Bronze plug valve.

END OF SECTION 231123

SECTION 231126 - FACILITY LIQUEFIED-PETROLEUM GAS PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Valves.
5. Pressure regulators.
6. Storage containers.

1.2 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. For Piping Containing Only Vapor:
 - a. Piping and Valves: 125 psig unless otherwise indicated.
2. For Piping Containing Liquid:
 - a. Piping between Shutoff Valves: 350 psig unless otherwise indicated.
 - b. Piping Other Than Above: 250 psig unless otherwise indicated.
 - c. Valves and Fittings: 250 psig unless otherwise indicated.

B. LPG System Pressure within Buildings: One pressure range. 0.5 psig or less.

C. Delegated Design: Design restraints and anchors for LPG piping and equipment, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

D. Seismic Performance: Vaporizers and storage container supports shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For facility LPG piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes,

alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

1.4 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Data: Submit certification that vaporizer, storage container supports, accessories, and components will withstand seismic forces.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- B. Welding certificates.
- C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

- A. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedules 40 and 80, Type E or S, Grade B.
 - 1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
 - 2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
 - 3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
 - 4. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.
 - a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

B. PE Pipe: ASTM D 2513, SDR 11.

1. PE Fittings: ASTM D 2683, socket-fusion type or ASTM D 3261, butt-fusion type with dimensions matching PE pipe.
2. PE Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D 2513, SDR 11; and steel pipe complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
3. Transition Service-Line Risers: Factory fabricated and leak tested.
 - a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet connected to steel pipe complying with ASTM A 53/A 53M, Schedule 40, Type E or S, Grade B, with corrosion-protective coating for aboveground outlet.
 - b. Outlet shall be threaded suitable for welded connection.
 - c. Bridging sleeve over mechanical coupling.
 - d. Factory-connected anode.
 - e. Tracer wire connection.
 - f. Ultraviolet shield.
 - g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

2.2 PIPING SPECIALTIES

A. Flexible Piping Joints:

1. Approved for LPG service.
2. Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
3. Minimum working pressure of 250 psig and 250 deg F operating temperature.
4. Threaded-end connections to match equipment connected and shall be capable of minimum 3/4-inch misalignment.
5. Maximum 36-inch length for liquid LPG lines.

B. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
4. Corrugated stainless-steel tubing with polymer coating.
5. Operating-Pressure Rating: 0.5 psig.
6. End Fittings: Zinc-coated steel.
7. Threaded Ends: Comply with ASME B1.20.1.
8. Maximum Length: 72 inches

C. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller.
3. Strainer Screen: 40 mesh startup strainer and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig

- D. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

- A. Joint Compound and Tape: Suitable for LPG.
- B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F complying with AWS A5.8/A5.8M.

2.4 MANUAL GAS SHUTOFF VALVES

- A. See "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.
- B. Metallic Valves, NPS 2 and Smaller for Liquid Service: Comply with ASME B16.33 and UL 842.
 - 1. CWP Rating: 250 psig.
 - 2. Threaded Ends: Comply with ASME B1.20.1.
 - 3. Socket ends for brazed joints.
 - 4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 - 5. Listing by CSA or agency acceptable to authorities having jurisdiction for valves 1 inch and smaller.
 - 6. Valves 1-1/4 inch and larger shall be suitable for LPG service, with "WOG" indicated on valve body.
- C. General Requirements for Metallic Valves, NPS 2 and Smaller for Vapor Service: Comply with ASME B16.33.
 - 1. CWP Rating: 125 psig.
 - 2. Threaded Ends: Comply with ASME B1.20.1.
 - 3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
 - 4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 - 5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
 - 6. Service Mark: Valves 1-1/4 inch to NPS 2 shall have initials "WOG" permanently marked on valve body.
- D. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.
 - 1. Body: Bronze, complying with ASTM B 584.

2. Ball: Chrome-plated bronze.
3. Stem: Bronze; blowout proof.
4. Seats: Reinforced TFE; blowout proof.
5. Packing: Threaded-body packnut design with adjustable-stem packing.
6. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. CWP Rating: 600 psig (4143 kPa).
8. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
9. Service: Suitable for LPG service with "WOG" indicated on valve body.

E. Bronze Plug Valves: MSS SP-78.

1. Body: Bronze, complying with ASTM B 584.
2. Plug: Bronze.
3. Ends: Threaded or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
4. Operator: Square head or lug type with tamperproof feature where indicated.
5. Pressure Class: 125 psig (862 kPa).
6. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
7. Service: Suitable for LPG service with "WOG" indicated on valve body.

F. Valve Boxes:

1. Cast-iron, two-section box.
2. Top section with cover with "GAS" lettering.
3. Bottom section with base to fit over valve and barrel a minimum of 5 inches (125 mm) in diameter.
4. Adjustable cast-iron extensions of length required for depth of bury.
5. Include tee-handle, steel operating wrench with socket end fitting valve nut or flat head and with stem of length required to operate valve.

2.5 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for LPG.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 and smaller.

B. Line Pressure Regulators: Comply with ANSI Z21.80.

1. Body and Diaphragm Case: Cast iron or die-cast aluminum.
2. Springs: Zinc-plated steel; interchangeable.
3. Diaphragm Plate: Zinc-plated steel.
4. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
5. Orifice: Aluminum; interchangeable.
6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.

7. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet and no pressure sensing piping external to the regulator.
8. Pressure regulator shall maintain discharge pressure setting downstream and not exceed 150 percent of design discharge pressure at shutoff.
9. Overpressure Protection Device: Factory mounted on pressure regulator.
10. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
11. Maximum Inlet Pressure: 2 psig.

C. Appliance Pressure Regulators: Comply with ANSI Z21.18.

1. Body and Diaphragm Case: Die-cast aluminum.
2. Springs: Zinc-plated steel; interchangeable.
3. Diaphragm Plate: Zinc-plated steel.
4. Seat Disc: Nitrile rubber.
5. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
6. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
7. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
8. Maximum Inlet Pressure: 1 psig.

2.6 DIELECTRIC UNIONS

A. Dielectric Unions:

1. Standard: ASSE 1079.
2. Pressure Rating: 125 psig minimum at 180 deg F
3. End Connections: Solder-joint copper alloy and threaded ferrous.

2.7 STORAGE CONTAINERS

A. Description: Factory fabricated, complying with requirements in NFPA 58 and ASME Boiler and Pressure Vessel Code and bearing the ASME label. Tanks shall be rated for 250-psig minimum working pressure.

1. Liquid outlet and vapor inlet and outlet connections shall have shutoff valves with excess-flow safety shutoff valves and bypass and back-pressure check valves with smaller than 0.039-inch drill-size hole to equalize pressure. Liquid-fill connection shall have backflow check valve.
 - a. Connections: Color-code and tag valves to indicate type.
 - 1) Liquid fill and outlet, red.
 - 2) Vapor inlet and outlet, yellow.
2. Level gage shall indicate current level of liquid in the container. Gages shall also indicate storage container contents; e.g., "Butane," "50-50 LPG Mix," or "Propane."
3. Pressure relief valves, type and number as required by NFPA 58, connected to vapor space and having discharge piping same size as relief-valve outlet and long enough to extend at least 84 inches directly overhead. Identify relief valves as follows:

- a. Discharge pressure in psig (kPa).
 - b. Rate of discharge for standard air in cfm (L/s).
 - c. Manufacturer's name.
 - d. Catalog or model number.
4. Container pressure gage.
 5. For outdoor installation, exposed metal surfaces mechanically cleaned, primed, and painted for resistance to corrosion.
 6. Ladders for access to valves more than 72 inches aboveground.
 7. Stainless-Steel Nameplate: Attach to aboveground storage container or to adjacent structure for underground storage container.
 - a. Name and address of supplier or trade name of container.
 - b. Water capacity in gallons and liters.
 - c. Design pressure in psig (kPa).
 - d. Statement, "This container shall not contain a product having a vapor pressure in excess of <pressure by container manufacturer>.
 - e. Outside surface area in sq. ft. (sq. m).
 - f. Year of manufacture.
 - g. Shell thickness in inches (mm).
 - h. Overall length in feet (m).
 - i. OD in feet (m).
 - j. Manufacturer's serial number.
 - k. ASME Code label.
 8. Felt support pads and two concrete or painted-steel saddles per storage container. Corrosion protection required at container-to-felt contact.
 9. Tie straps for each saddle.
 10. Straps and anchors for tie-down slab.
 11. Asphalt-based coating for corrosion protection.
 12. Container connections and valves protected in manway at top of storage container.
 13. Manway equipped with ventilation louvers.

2.8 LABELING AND IDENTIFYING

- A. Detectable Warning Tape: Acid- and alkali-resistant PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored yellow.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 OUTDOOR PIPING INSTALLATION

- A. Comply with NFPA 58 and the International Fuel Gas Code requirements for installation and purging of LPG piping.
- B. Install underground, LPG piping buried at least 36 inches below finished grade. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.
 - 1. If LPG piping is installed less than 36 inches below finished grade, install it in containment conduit.
- C. Steel Piping with Protective Coating:
 - 1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
 - 2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
- D. Install fittings for changes in direction and branch connections.

3.3 INDOOR PIPING INSTALLATION

- A. Comply with the International Fuel Gas Code for installation and purging of LPG piping.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.
- D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- G. Locate valves for easy access.
- H. Install LPG piping at uniform grade of 2 percent down toward drip and sediment traps.
- I. Install piping free of sags and bends.
- J. Install fittings for changes in direction and branch connections.
- K. Verify final equipment locations for roughing-in.

- L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.
- M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where readily accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.
 - 1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.
- N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.
- O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.
- P. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- Q. Connect branch piping from top or side of horizontal piping.
- R. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment.
- S. Do not use LPG piping as grounding electrode.
- T. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.
- U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- V. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- W. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.4 VALVE INSTALLATION

- A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, or copper connector.
- B. Install underground valves with valve boxes.
- C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

- D. Install earthquake valves aboveground outside buildings according to listing.
- E. Install anode for metallic valves in underground PE piping.

3.5 PIPING JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints:
 - 1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
 - 2. Cut threads full and clean using sharp dies.
 - 3. Ream threaded pipe ends to remove burrs and restore full ID of pipe.
 - 4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
 - 5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- D. Welded Joints:
 - 1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
 - 2. Bevel plain ends of steel pipe.
 - 3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Ch. 22, "Pipe and Tube."
- F. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not overtighten.
- G. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
 - 1. Plain-End Pipe and Fittings: Use butt fusion.
 - 2. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.6 HANGER AND SUPPORT INSTALLATION

- A. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices.
- B. Comply with requirements for pipe hangers and supports specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

- C. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
 - 2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
 - 3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.

3.7 CONNECTIONS

- A. Connect to utility's gas main according to utility's procedures and requirements.
- B. Install LPG piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.
- C. Install piping adjacent to appliances to allow service and maintenance of appliances.
- D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliances and equipment. Install union between valve and appliances or equipment.
- E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.8 LABELING AND IDENTIFYING

- A. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for piping and valve identification.
- B. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.9 FIELD QUALITY CONTROL

- A. Test, inspect, and purge LPG according to NFPA 58 and the International Fuel Gas Code and requirements of authorities having jurisdiction.
- B. LPG piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.10 OUTDOOR PIPING SCHEDULE

- A. Underground LPG liquid piping shall be the following:
 - 1. Schedule 40 steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.
- B. Aboveground LPG liquid piping shall be the following:

1. NPS 2 and Smaller: Schedule 40 steel pipe, malleable-iron threaded fittings and threaded and seal welded joints. Coat pipe and fittings with protective coating for steel piping.
 - C. Underground LPG vapor piping shall be the following:
 1. Schedule 40, steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.
 - D. Aboveground LPG vapor piping shall be the following:
 1. Schedule 40, steel pipe with malleable-iron fittings and threaded joints.
 - E. Branch Piping in Cast-in-Place Concrete to Single Appliance: Annealed-temper copper, with wrought-copper fittings and brazed joints. Install piping embedded in concrete with no joints in concrete.
 - F. Containment Conduit: Schedule 40, steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.
- 3.11 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5
- A. Aboveground piping shall be one of the following:
 1. Schedule 40, steel pipe with malleable-iron fittings and threaded joints.
 - B. Underground, below building, piping shall be the following:
 1. Schedule 40, steel pipe with malleable-iron fittings and threaded joints.
 - C. Containment Conduit: Schedule 40, steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.
 - D. Containment Conduit Vent Piping: Schedule 40, steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.
- 3.12 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE
- A. Aboveground Liquid Piping:
 1. Two-piece, full port, bronze ball valves with bronze trim.
 - B. Valves for pipe NPS 2 and smaller at service meter shall be the following:
 1. Two-piece, full-port, bronze ball valves with bronze trim.
 2. Bronze plug valve.
 - C. Distribution piping valves for pipe NPS 2 and smaller shall be the following:
 1. Two-piece, full-port, bronze ball valves with bronze trim.
 2. Bronze plug valve.
 - D. Valves in branch piping for single appliance shall be the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.

END OF SECTION 231126

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round and flat-oval ducts and fittings.
3. Sheet metal materials.
4. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.

- B. Related Sections:

1. Division 22 Section "Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.
2. Division 22 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing requirements for metal ducts.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Provide duct layout and construction, including airflows, sheet metal thicknesses, dampers, registers, grilles, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.4 SUBMITTALS

- A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.

B. Shop Drawings:

1. Factory-fabricated ducts and fittings submittals.
2. Duct layout indicating sizes, configuration, material, registers, grilles and vents.
3. Penetrations through fire-rated and other partitions.
4. Equipment installation based on equipment being used on Project.
5. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.

1.5 QUALITY ASSURANCE

- A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."
- B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6.4.4 - "HVAC System Construction and Insulation."
- C. All installation work to be done by qualified licensed journeyman and journeyman apprentices. Journeyman shall have a minimum of 5 years related experience.

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on 1" static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Lindab Inc.
 - b. McGill AirFlow LLC.
 - c. SEMCO Incorporated.
 - d. Sheet Metal Connectors, Inc.
 - e. Spiral Manufacturing Co., Inc.
- B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).
- C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- E. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G60.
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.

- C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- D. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.4 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Water-Based Joint and Seam Sealant:
 - 1. Application Method: Brush on.
 - 2. Solids Content: Minimum 65 percent.
 - 3. Shore A Hardness: Minimum 20.
 - 4. Water resistant.
 - 5. Mold and mildew resistant.
 - 6. VOC: Maximum 75 g/L (less water).
 - 7. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
 - 8. Service: Indoor or outdoor.
 - 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

2.5 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."
- D. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- E. Trapeze and Riser Supports:
 - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round and flat-oval ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches (38 mm).
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 22 Section "Duct Accessories" for fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 2. Outdoor, Supply-Air Ducts: Seal Class A.
 - 3. Outdoor, Exhaust Ducts: Seal Class C.
 - 4. Outdoor, Return-Air Ducts: Seal Class C.
 - 5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 1-Inch wg (500 Pa) and Lower: Seal Class B.
 - 6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 1-Inch wg (500 Pa): Seal Class A.
 - 7. Unconditioned Space, Exhaust Ducts: Seal Class C.
 - 8. Unconditioned Space, Return-Air Ducts: Seal Class B.
 - 9. Conditioned Space, Supply-Air Ducts in Pressure Classes 1-Inch wg (500 Pa) and Lower: Seal Class C.
 - 10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 1-Inch wg (500 Pa): Seal Class B.
 - 11. Conditioned Space, Exhaust Ducts: Seal Class B.
 - 12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.

4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.
 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet (5 m).
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Division 22 Section "Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Duct System Cleanliness Tests:
 1. Visually inspect duct system to ensure that no visible contaminants are present.
- C. Duct system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.7 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated.
- B. Supply Ducts:
 1. Ducts Connected to Furnaces:
 - a. Pressure Class: Positive 1-inch wg (250 Pa).
 - b. Minimum SMACNA Seal Class: A.

- c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 12.
 - C. Return Ducts:
 - 1. Ducts Connected to Furnaces:
 - a. Pressure Class: Positive or negative 1-inch wg (250 Pa).
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 12.
 - D. Exhaust Ducts:
 - 1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
 - a. Pressure Class: Negative 1-inch wg (250 Pa).
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 6.
 - E. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:
 - 1. Ducts Connected to Furnaces.
 - a. Pressure Class: Positive or negative 1-inch wg (250 Pa).
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 12.

END OF SECTION 233113

SECTION 233423 - HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Ceiling mounted ventilator fans.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Wiring Diagrams: For power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 2 - PRODUCTS

2.1 CEILING-MOUNTED VENTILATORS

- A. Housing: Steel, lined with acoustical insulation.
- B. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.
- C. Grille: Plastic or painted aluminum, louvered grille with flange on intake and thumbscrew attachment to fan housing.
- D. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

E. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Time-Delay Switch: Assembly with single-pole rocker switch, timer, and cover plate.
3. Motion Sensor: Motion detector with adjustable shutoff timer.
4. Filter: Washable aluminum to fit between fan and grille.
5. Isolation: Rubber-in-shear vibration isolators.
6. Manufacturer's standard roof jack or wall cap, and transition fittings.

F. Capacities and Characteristics:

1. See mechanical equipment schedule on plans.

2.2 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified.

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

B. Enclosure Type: Totally enclosed, fan cooled.

2.3 SOURCE QUALITY CONTROL

A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

B. Support suspended units from structure using threaded steel rods and elastomeric hangers having a static deflection of 1 inch. Vibration-control devices are specified in

C. Install units with clearances for service and maintenance.

3.2 CONNECTIONS

- A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors.
- B. Install ducts adjacent to power ventilators to allow service and maintenance.
- C. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections:
 - 1. Verify that shipping, blocking, and bracing are removed.
 - 2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
 - 3. Verify that cleaning and adjusting are complete.
 - 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
 - 5. Adjust belt tension.
 - 6. Adjust damper linkages for proper damper operation.
 - 7. Verify lubrication for bearings and other moving parts.
 - 8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
 - 9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
 - 10. Shut unit down and reconnect automatic temperature-control operators.
 - 11. Remove and replace malfunctioning units and retest as specified above.
- C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Adjust belt tension.

- C. Replace fan and motor pulleys as required to achieve design airflow.
- D. Lubricate bearings.

END OF SECTION 233423

SECTION 233713.23 - REGISTERS AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Adjustable blade face registers.
2. Fixed face grilles.

1.2 ACTION SUBMITTALS

- ##### A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 REGISTERS

A. Adjustable Blade Face Register:

1. Material: Aluminum
2. Finish: Baked enamel, white.
3. Face Blade Arrangement: Horizontal spaced 1/2 inch apart.
4. Rear-Blade Arrangement: Vertical spaced 1/2 inch apart.
5. Frame: 1-1/4 inches wide.
6. Mounting: Countersunk screw.
7. Damper Type: Multishutter.

2.2 GRILLES

A. Fixed Face Grille

1. Material: Steel.
2. Finish: Baked enamel, white.
3. Face Blade Arrangement: Horizontal 1/2 inch apart.
4. Face Arrangement: Louvered core.
5. Frame: 1-1/4 inches wide.
6. Mounting Frame: Filter.
7. Mounting: Countersunk screw.
8. Accessory: Filter.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install registers and grilles level and plumb.
- B. Outlets and Inlets Locations: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install registers and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

- A. After installation, adjust registers and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713.23

SECTION 235413 - ELECTRIC-RESISTANCE FURNACES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Electric furnaces and accessories complete with controls.
2. Air filters.
3. Humidifiers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Include diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace the following components of furnaces that fail in materials or workmanship within specified warranty period:

1. Warranty Period, Commencing on Date of Substantial Completion:
 - a. Furnace Heat Exchanger: 10 years.
 - b. Integrated Ignition and Blower Control Circuit Board: Five years.
 - c. Draft-Inducer Motor: Five years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Carrier or approved equal that can be purchased locally.

2.2 ASSEMBLY DESCRIPTION

- A. Factory assembled, piped, wired, and tested.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a qualified testing agency, and marked for intended location and application.

2.3 FURNACES

- A. Cabinet: Steel, with duct liner.
 - 1. Duct Liner: Fiberglass, minimum 1/2 inch thick, complying with ASTM C 1071 and having a coated surface exposed to airstream complying with NFPA 90A or NFPA 90B and with NAIMA's "Fibrous Glass Duct Liner Standard."
 - 2. Factory paint external cabinets in manufacturer's standard color.
- B. Fan: Centrifugal, factory balanced, resilient mounted, direct drive.
 - 1. Fan Motors: Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - 2. Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.
- C. Electric-Resistant Heating Elements: Helix-wound, nickel-chromium wire-heating elements in ceramic insulators mounted on steel supports.
- D. Heating-Element Control: Sequencer relay with relay for each element; switches elements on and off, with delay between each increment; initiates, stops, or changes fan speed.
- E. Summer Fan Switch: Connected to permit independent on-off switch of unit fan.
- F. Capacities and Characteristics:
 - a. See Mechanical Equipment Schedule on plans.

2.4 THERMOSTATS

- A. Heating-Only Thermostat: Wall-mounted unit with fan on-automatic selector.
- B. Control Wiring: Balanced twisted-pair cabling.
 - 1. Description: No. 24 AWG, 100 ohm, four pair.
 - 2. Cable Jacket Color: Blue.

2.5 AIR FILTERS

- A. Disposable Filters: 1-inch thick fiberglass media in sheet metal frame.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Suspended Units: Suspend from structure using threaded rods, spring hangers, and building attachments. Secure rods to unit hanger attachments. Adjust hangers so unit is level and plumb.
- B. Base-Mounted Units: Secure units to substrate. Provide optional bottom closure base if required by installation conditions.
- C. Controls: Install thermostats and humidistats at mounting height of 60 inches above floor, unless indicated otherwise on plans..
- D. Wiring Method: Install control wiring in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal control wiring except in unfinished spaces.

3.2 CONNECTIONS

- A. Install piping adjacent to equipment to allow service and maintenance.
- B. Connect ducts to furnace with flexible connector.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Perform electrical test and visual and mechanical inspection.
 - 2. Leak Test: After installation, charge systems with refrigerant and oil and test for leaks. Repair leaks, replace lost refrigerant and oil, and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.
 - 4. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.
 - 5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

END OF SECTION 235413

SECTION 235416.13 – FURNACES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Gas-fired, noncondensing with annual fuel utilization efficiency rating of 80 percent designed to vent dry flue gas and accessories complete with controls.
 - 2. Air filters.

1.3 SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each of the following:
 - 1. Furnace.
 - 2. Thermostat.
 - 3. Air filter.
- B. Shop Drawings: Provide equipment submittal and ductwork drawings with detailed equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Wiring Diagrams: Power, signal, and control wiring.
- C. Operation and Maintenance Data: For each furnace to include in emergency, operation, and maintenance manuals for each of the following:
 - 1. Furnace and accessories complete with controls.
 - 2. Air filter.
- D. Warranty: Special warranty specified in this Section.
- E. Calculations: Provide heating load and airflow calculations per AHRAE Fundamentals or approved load calculation software with equipment and duct sizing.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- C. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- D. Comply with NFPA 70.
- E. All installation work to be done by qualified licensed journeyman and journeyman apprentices. Journeyman shall have a minimum of 5 years related experience.

1.5 COORDINATION

- A. Coordinate size and location of bases.
- B. Coordinate installation, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace the following components of furnaces that fail in materials or workmanship within specified warranty period:
 - 1. Warranty Period, Commencing on Date of Substantial Completion:
 - a. Furnace Heat Exchanger: 10 years.
 - b. Integrated Ignition and Blower Control Circuit Board: Five years.
 - c. Draft-Inducer Motor: Five years.

PART 2 - PRODUCTS

2.1 GAS-FIRED FURNACES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that are available locally may be incorporated into the Work include, but are not limited to, the following:
 - 1. Adams Manufacturing Company.
 - 2. Amana Heating & Air Conditioning; Goodman Manufacturing Company, L.P.
 - 3. American Standard Companies, Inc.
 - 4. Arcoaire Air Conditioning & Heating; a division of International Comfort Products, LLC.

5. Armstrong Air Conditioning Inc.
 6. Bryant Heating & Cooling Systems; Div. of United Technologies Corp.
 7. Carrier Corporation; Div. of United Technologies Corp.
 8. Clare Brothers.
 9. Comfort-Aire; a division of Heat Controller, Inc.
 10. Comfortmaker Air Conditioning & Heating; a division of International Comfort Products, LLC.
 11. Dornback Furnace.
 12. Goodman Manufacturing Company, L.P.
 13. Heil Heating & Cooling Products; a division of International Comfort Products, LLC.
 14. Lennox Industries Inc.
 15. Luxaire Corporation; a division of Unitary Products Group.
 16. Rheem Manufacturing Company; Air Conditioning Division.
 17. Ruud Air Conditioning Division.
 18. Tempstar Heating & Cooling Products; a division of International Comfort Products, LLC.
 19. Thermo Products, Inc.; a division of Burnham Holdings Inc.
 20. Trane.
 21. York International Corp.; a division of Unitary Products Group.
- B. General Requirements for Gas-Fired Furnaces: Factory assembled, piped, wired, and tested; complying with ANSI Z21.47/CSA 2.3, "Gas-Fired Central Furnaces," and with NFPA 54.
- C. Cabinet: Steel.
1. Cabinet interior around heat exchanger shall be factory-installed insulation.
 2. Lift-out panels shall expose burners and all other items requiring access for maintenance.
 3. Factory paint external cabinets in manufacturer's standard color.
 4. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.
- D. Fan: Centrifugal, factory balanced, resilient mounted, direct drive.
1. Special Motor Features: Single speed, Premium (TM) efficiency and with internal thermal protection and permanent lubrication.
 2. Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.
- E. Type of Gas: Natural Gas or LP-Gas. Provide LP kit as required.
- F. Heat Exchanger:
1. Primary: Aluminized steel.
- G. Burner: Atmospheric type.
1. Gas Valve: 24V, 100 percent safety gas shutoff, pressure regulator, safety pilot, manuals set (on-off), pilot filtration, and automatic electric valve.
 2. Ignition: Electric pilot ignition, with hot-surface igniter.
- H. Gas-Burner Safety Controls:

1. Electronic Flame Sensor: Prevents gas valve from opening until pilot flame is proven; stops gas flow on ignition failure.
 2. Flame Rollout Switch: Installed on burner box; prevents burner operation.
 3. Limit Control: Fixed stop at maximum permissible setting; de-energizes burner on excessive bonnet temperature; automatic reset.
- I. Furnace Controls: Solid-state board integrates ignition, heat, cooling, and fan speeds; adjustable fan-on and fan-off timing; terminals for connection to accessories.
- J. Capacities and Characteristics:
- a. See Mechanical Equipment Schedule on plans.

2.2 THERMOSTATS

- A. Two stage, heating-Only Thermostat: Wall-mounting unit with fan on-automatic selector.
- B. Control Wiring: Unshielded twisted-pair cabling.

2.3 AIR FILTERS

- A. Disposable Filters: 1-inch- (25-mm-) thick fiberglass media.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine factory-installed insulation before furnace installation. Reject units that are wet, moisture damaged, or mold damaged.
- C. Examine roughing-in for gas piping systems to verify actual locations of piping connections before equipment installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install gas-fired furnaces and associated fuel and vent features and systems according to NFPA 54.
- B. Base-Mounted Units: Secure units to substrate. Provide optional bottom closure base if required by installation conditions.
 1. Anchor furnace to substrate to resist code-required seismic acceleration.

- C. Controls: Install thermostats and humidistats at mounting height of 60 inches (1500 mm) above floor.
- D. Wiring Method: Install control wiring in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal control wiring except in unfinished spaces.

3.3 CONNECTIONS

- A. Gas piping installation requirements are specified in Division 23 Sections for Gas Piping Drawings indicate general arrangement of piping, fittings, and specialties. Connect gas piping with union or flange and appliance connector valve.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Vent Connection, Noncondensing, Gas-Fired Furnaces: Connect Type B vents to noncondensing furnace vent connection and extend outdoors. Type B vents and their installation requirements are per NFPA 54 and per manufacture's requirements.
- D. Connect ducts to furnace with flexible connector.

3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. Perform electrical test and visual and mechanical inspection.
 - 2. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

3.5 STARTUP SERVICE

- A. Complete installation and startup checks according to manufacturer's written instructions and perform the following:
 - 1. Inspect for physical damage to unit casings.
 - 2. Verify that access doors move freely and are weathertight.
 - 3. Clean units and inspect for construction debris.
 - 4. Verify that all bolts and screws are tight.
 - 5. Adjust vibration isolation and flexible connections.
 - 6. Verify that controls are connected and operational.
- B. Start unit according to manufacturer's written instructions and complete manufacturer's operational checklist.

- C. Measure and record airflows.
- D. Verify proper operation of capacity control device.
- E. After startup and performance test, lubricate bearings.

3.6 ADJUSTING

- A. Adjust initial temperature set points.
- B. Set controls, burner, and other adjustments for optimum heating performance and efficiency. Adjust heat-distribution features, including shutters, dampers, and relays, to provide optimum heating performance and system efficiency.

3.7 CLEANING

- A. After completing installation, clean furnaces internally according to manufacturer's written instructions.
- B. Install new filters in each furnace within 14 days after Substantial Completion.

END OF SECTION 235416.13

SECTION 260000 - ELECTRICAL WORK

PART 1 - GENERAL

1.1 Section Includes

- A. Utility Coordination
- B. Conduit
- C. Wire and Cable
- D. Boxes
- E. Wiring Devices
- F. Lights and Ceiling Fans.
- G. Disconnect Switches
- H. Panelboards
- I. Miscellaneous Electrical Items

1.2 REFERENCES

A. General

1. ANSI/NFPA 70 - National Electrical Code.
2. NFPA 101 – Life Safety Code
3. Underwriters Laboratories, Inc. (UL)

B. Conduit

1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated (RGS).
2. ANSI C80.6 – Intermediate Metal Conduit, Zinc Coated (IMC).
3. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated (EMT).
4. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies. Compatible and specifically designed for the raceway type with which used.
5. FS WW-C-566 – Specification for flexible metal conduit.
6. UL 360 – Liquid-Tight Flexible Steel Conduit.
7. NECA 1 - "Standard Practice for Good Workmanship in Electrical Construction".
8. NEMA RN 1 - Polyvinyl Chloride (PVC) externally-coated galvanized rigid steel conduit.
9. NEMA TC 2 - Electrical Non-metallic Tubing (ENT) and Conduit (EPC-40 and EPC-80).
10. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

C. Wire and Cable

1. NEMA WC 70/ICEA S-95-658 – Type THHN/THWN-2, copper.
2. NEMA WC 70 – Non-Shielded Power Cable and nonmetallic-sheathed cable, Type NM, 600V or less.
3. ICEA S-80-576 – Category 1 & 2 Individually Unshielded Twisted Pair Indoor Cables for Use in Communications Wiring Systems.
4. TIA/EIA-568 – Telecommunications Industry Association/Electronic Industries Alliance Standards.

D. Boxes

1. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
2. ANSI/NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
3. NEMA OS 2 and UL 514C – Nonmetallic Outlet and Device Boxes.

E. Wiring Devices

1. FS W-C-596 - Electrical Power Connector, Plug, Receptacle, and Cable Outlet.
2. NEMA WD 1 - General-purpose Wiring Devices.
3. NEMA WD 6 - Wiring Device Configurations.

F. Disconnect Switches

1. ANSI/UL 198E - Class R Fuses.
2. FS W-F-870 – Fuse holders
3. FS W-S-865 - Switch, Box, Surface-Mounted.
4. NEMA KS 1 - Enclosed Switches.

G. Panelboards

1. NEMA PB 1 – Panelboards
2. NEMA 250 – Enclosures for Electrical Equipment
3. NEMA AB1 – Molded Case Circuit Breakers and Molded Case Switches.

1.3 SUBMITTALS

- A. Provide technical data for the following new items used on the Project. Data shall substantiate compliance with the requirements of the Specifications and Drawings and shall include, but not be limited to, ratings, material type, construction, operation and maintenance data, listings and/or certifications, and color. Catalog data or "cut-sheets" which contain information on several products/items should be marked to clearly indicate the specific product or material proposed for this project.

1. Control devices, starters, enclosures.
2. Disconnect Switches.
3. Lights and Ceiling Fans
4. Panelboards.
5. Wiring method proposed, related materials.
6. Device box type(s) proposed, related materials.

7. Utility coordination information: Companies involved, contact names and contact phone or email.

B. Warranty

1. Manufacturer's standard warranty.

1.4 REGULATORY REQUIREMENTS

A. Conform to applicable Building Codes for the State(s) involved, and to the requirements of the Navajo Housing Authority and the utility companies involved.

B. Conform to ANSI/NFPA 70 (National Electrical Code, NEC).

C. Obtain permits and request inspections from authority having jurisdiction.

D. Conform to applicable UL requirements for each product indicated. Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for the purposes specified.

E. Conform to applicable requirements of all authorities having jurisdiction.

1.5 COORDINATION

A. Coordinate with serving utilities including power and telephone. Arrange for connection of services and provide any work required by the utilities including trenching and backfill, conduit, boxes and devices, and cable.

B. Coordinate location of service transformer, utility meter, and service disconnect (panelboard). Coordinate with both serving utility and with NHA.

C. Coordinate location of telephone network interface device or POP, or other entrance device. Coordinate with both serving utility and with NHA.

D. If Cable TV is available at the site, coordinate with the providing utility and provide equipment and raceway required. Coordinate entrance location for service and other equipment. Coordinate with both serving utility and with NHA.

E. Coordinate existing utilities during progress of construction to facilitate the electrical installations that follow. Do not interrupt power or communications to existing facilities without receiving approval to do so in writing from the Owner.

F. Coordinate with the supplier/installer of roof and mechanical equipment.

G. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work.

H. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

1.6 PROJECT CONDITIONS

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions:
1. Notify Engineer and Owner no fewer than seven days in advance of proposed interruption of electrical service (14 days for transformer replacement).
 2. Indicate method of providing temporary utilities if appropriate.
 3. Do not proceed with interruption of electrical service without Owner's written permission.

PART 2 - PRODUCTS

2.1 CONDUIT

- A. Electrical Metallic Tubing (EMT) and Fittings
1. Type: ANSI C80.3, galvanized steel tubing.
 2. Fittings and Conduit Bodies: ANSI/NEMA FB 1, compression or set-screw type, steel or malleable steel.
 3. Grounding Bushings: ANSI/NEMA FB 1, insulated lay-in grounding type, steel or malleable iron.
 4. Listing: UL listed.

2.2 NONMETALLIC CONDUITS AND FITTINGS

- A. Nonmetallic Conduit:
- B. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
1. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
 2. LFNC: Comply with UL 1660.
- C. Nonmetallic Fittings:
1. Fittings, General: Listed and labeled for type of conduit, location, and use.
 2. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
 3. Fittings for LFNC: Comply with UL 514B.
 4. Solvents and Adhesives: As recommended by conduit manufacturer.
- D. Metal Conduit and Fittings
1. Types: ANSI C80.1, rigid galvanized steel conduit (RGS), and ANSI C80.6 intermediate metallic conduit (IMC).
 2. Fittings and Conduit Bodies: ANSI/NEMA FB 1, threaded type, steel or malleable steel.

3. Grounding Bushings: ANSI/NEMA FB 1, insulated lay-in grounding type, steel or malleable iron.
4. Listing: UL listed.

E. Liquid-tight Flexible Conduit and Fittings

1. Conduit: FS WW-C-566, Zinc-coated flexible steel with sunlight-resistant and mineral-oil-resistant PVC jacket.
2. Fittings and Conduit Bodies: ANSI/NEMA FB 1, steel or malleable iron.
3. Listing: UL listed.

F. Conduit Clamps, Straps, and Supports: Indoor locations, steel or malleable iron; Outdoor locations, stainless steel.

G. Corrosion Protection Tape: 3M Scotch "Scotchrap 51" in conjunction with "Scotchrap Pipe Primer".

2.3 WIRE AND CABLE

A. Building Wire and Cable, Single Conductor in Conduit:

1. Description: Single conductor insulated wire; solid for #10 and smaller, stranded for larger sizes.
2. Conductor: Copper.
3. Insulation:
 - a. Voltage Rating: 600 volt.
 - b. Type: NEMA WC 5, Type THHN/THWN, rated at 75 deg C minimum.
 - c. Color:
 - 1) #10 AWG and Smaller: Solid color compound throughout conductor length.
 - 2) #8 AWG and Larger: 3M Scotch "35 Vinyl Plastic" electrical color coding tape, 1" wide, extended a minimum of 2 inches along conductor insulation.
 - d. Size: as indicated on the Drawings, #12 AWG minimum for power conductors.
 - e. Wire Connectors and Splices: Units of size, ampacity rating, temperature rating, material, type, and class suitable for service indicated.
 - f. Listing: UL listed.

B. Building Wire and Cable, Nonmetallic-Sheathed Cable (NM):

1. Description: Multi-conductor cable, up to four conductors with two neutrals and a bare ground. Solid conductor for #12 and #10, stranded for #8 and #6.
2. Conductor: Copper.
3. Insulation:
 - a. Voltage Rating: 600 volt.
 - b. Type: ASTM B-3 and B8, rated at 90 degree C maximum with ampacity based on 60 degree C conductors.
 - c. Color:
 - 1) Wire: black, white, red, blue for four conductor with one neutral; black, white, red, white with red stripe for four conductor with two neutrals.
 - 2) Jacket: yellow.

- d. Size: as indicated on the Drawings, #12 AWG minimum for power conductors.
- e. Wire Connectors and Splices: Units of size, ampacity rating, temperature rating, material, type, and class suitable for service indicated.
- f. Listing: UL listed, Type NM-B.

2.4 BOXES

- A. Sheet Metal Boxes: ANSI/NEMA OS 1, galvanized steel; rated for weight of equipment supported; grounding terminal; include 1/2" inch male fixture studs where required.
- B. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

2.5 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 3R unless otherwise indicated, and sized according to NFPA 70.
 - 1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.6 WIRING DEVICES

- A. Wall Switches
 - 1. Type: NEMA WD 1, FS W-S-896E, specification grade toggle switch; white.
 - 2. Rating: 20 Amperes at 120-277 Volts AC.
 - 3. Single- and Double-Pole Switches: Comply with DSCC W-C-896F and UL 20.
 - 4. Snap Switches: Heavy-Duty grade, quiet type.
 - 5. Motor-rated for exhaust fan control.
- B. Receptacles
 - 1. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498; white.
 - 2. Duplex GFI Receptacles: Straight blade, feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped; white.
- C. Device Cover Plates
 - 1. Interior Locations: Nylon, white.
 - 2. Exterior Locations: Weatherproof, gasketed nonmetallic device cover, listed and labeled "in-use in wet locations."

3. Single and combination types to match corresponding wiring devices.
4. Plate-Securing Screws: Metal with head color to match plate finish.

2.7 SUPPORTING DEVICES

- A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.
- B. Metal Items for Use Outdoors or in Damp Locations: Galvanized steel or stainless steel.
- C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch- diameter slotted holes at a maximum of 2 inches o.c., in webs.
- D. Slotted-Steel Channel Supports:
 1. Channel Thickness: Selected to suit structural loading.
 2. Fittings and Accessories: Products of the same manufacturer as channel supports.

2.8 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- B. Mains: Circuit breaker.
- C. Branch Overcurrent Protective Devices: Plug-in or Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- D. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.9 DISCONNECT SWITCHES

- A. Manufacturer: Square-D or equal.
- B. Switch Assemblies: NEMA KS1, FS W-S-865, general duty, quick make, quick break, load interrupter enclosed knife switch, not fused, with externally operable handle, interlocked to prevent opening front cover with switch in ON position. Handle lockable in the OFF position.
- C. Enclosures: NEMA KS 1, Type 1 or 12 for dry interior locations; Type 3R/12 or 4 for exterior or wet interior locations. Provide with factory or field installed equipment grounding kit.
- D. Listing: UL listed.

2.10 Lighting and Ceiling Fans

- A. Manufacturer: As specified or approved equal.

- B. Availability: Light fixtures have been selected to be available either in-store or on-line for in-store pickup at Home Depot and Lowes. All fixtures have home owner replaceable lamps with lamps available in stores listed above. Do not use fixtures with integral (not easily replaceable) LEDs.
- C. Ceiling Fans: same criteria for availability as for lighting fixtures, with integral light fixture switched separately from fan. Fans to be two or three speed with appropriate speed control device listed as compatible with fan. Lights to be dimmable with appropriate dimmer switch listed as compatible with light.
- D. Listing: UL listed.

PART 3 - EXECUTION

3.1 GENERAL

- A. Perform Work in accordance with ANSI/NFPA 70.
- B. Coordinate device locations with equipment served, such as range and heating equipment.
- C. Install circuits and devices for all equipment even where gas powered equipment will be used.
- D. Install equipment and products in accordance with manufacturers' instructions.

3.2 CONDUIT

- A. Schedule
 1. Size: 1/2 inch minimum or as noted.
 2. Type, Underground: Use Polyvinyl Chloride (PVC) externally-coated galvanized rigid steel conduit and elbows underground. Use Electrical Plastic Conduit (EPC-40) underground from the utility service pole to the metering equipment. Use a sealing fitting at each end.
 3. Type, above ground: RGS, IMC, and EMT except for connection to vibrating equipment and where noted: Liquid-tight flexible metal conduit.
- B. Installation
 1. Install conduit and/or NM cable in accordance with NECA "Standard of Installation."
 2. Install no more than the equivalent of four 90 degree bends between conduit terminations for 2 inch through 1 inch conduit size, three bends for 1-1/4 inch through 2 inch conduit, and two bends for conduit 2-1/2 inch and larger. Provide pull boxes, if necessary to meet these requirements.
 3. Maintain minimum 6 inch clearance between conduit/cable and piping.
 4. Maintain minimum 12 inch clearance between conduit/cable and surfaces with temperature exceeding 104 degrees F (40 degrees C).
 5. Install and support conduit in accordance with the applicable NEC Article. Support NM cable in accordance with NEC Article 334.
 6. Use grounding bushings on metallic conduit terminations.

7. Use sealing fittings to comply with NEC Article 500.
8. Install fittings to accommodate expansion where conduit crosses building control and expansion joints.
9. Avoid moisture traps where possible. Provide junction box with drain fitting at conduit low point, if necessary.
10. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.
11. Provide pull string in each empty conduit.

C. Above Grade Conduit

1. Install conduit concealed in walls, above ceilings, or under new roof, except for final connection to equipment.
2. Route conduit parallel and perpendicular to structures.
3. Route conduit to maintain headroom and present neat appearance.

3.3 WIRE AND CABLE

- A. Run building wiring in raceways, unless otherwise indicated on Drawings.
- B. Pull all conductors into raceway at same time.
- C. Use suitable wiring pulling lubricant for building wire #4 AWG and larger.
- D. Install pull string in empty conduits.

3.4 BRANCH CIRCUIT WIRING

- A. Provide number of phase, neutral and switch conductors required to implement circuiting shown on Drawings, unless otherwise noted.
- B. Size neutral conductor same size as phase conductors, unless otherwise noted.
- C. Provide a separate equipment ground conductor in each raceway. Size equipment ground conductor same size as phase conductors, unless otherwise noted.
- D. Place an equal number of conductors for each phase of a circuit in same raceway.
- E. Two or three branch circuits of different phases may share a common neutral, except as otherwise indicated.
- F. Install splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.
- G. Install wiring at switches and outlets with at least 12 inches of slack conductor.
- H. Connect outlet and component connections to wiring systems and to ground. Tighten electrical connectors and terminals, according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

3.5 CONTROLS COORDINATION

- A. Coordinate requirements for control of equipment, install conduit and boxes for control circuits and devices. Install conductors required by systems or as specified by manufacturer and Division 23.

3.6 BOXES

- A. Quality Control: Install boxes so mounting surface of device is flush with finished wall surface. Install square and plumb. Make cut-outs in wall surface so that standard device cover plate fits flush and square and completely covers opening. Do not use jumbo plates.
- B. Schedule:
 - 1. Exterior Locations: Cast Metal Boxes.
 - 2. Interior Locations: Sheet steel or plastic, as appropriate for wiring method.
- C. Enclosures:
 - 1. Exterior Locations: NEMA 3R/12 or 4/12 or as noted.

3.7 WIRING DEVICES

- A. Install wall switches 4'-0" above finished floor or grade to top of box, "OFF" position down, unless otherwise noted.
- B. Install all devices in compliance with UFAS requirements.

3.8 GROUNDING AND BONDING

- A. Provide grounding system shown on Drawings.
- B. Provide separate insulated ground conductor in each raceway. Provide NM cable with an integral ground. Bond each end of conductor.
- C. Use grounding bushings on metallic conduit terminations.

3.9 DISCONNECT SWITCHES

- A. Install 4'-0" above finished floor or grade to top of disconnect handle in the ON position, unless otherwise noted.

3.10 ELECTRICAL SUPPORTING DEVICE APPLICATION

- A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.

- B. Dry Locations: Steel materials.
- C. Selection of Supports: Comply with manufacturer's written instructions.
- D. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb (90-kg) design load.

3.11 SUPPORT INSTALLATION

- A. Install support devices to securely and permanently fasten and support electrical components.
- B. Install 1/4-inch-diameter or larger threaded steel hanger rods, unless otherwise indicated.
- C. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.
- D. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.
- E. Simultaneously install vertical conductor supports with conductors.
- F. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.
- G. Install metal channel racks for mounting cabinets, disconnect switches, control enclosures, pull and junction boxes, and other devices unless components are mounted directly to structural elements of adequate strength.
- H. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
- I. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:
 - 1. Wood: Fasten with wood screws or screw-type nails.
 - 2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
 - 3. New Concrete: Concrete inserts with machine screws and bolts.
 - 4. Existing Concrete: Expansion bolts.
 - 5. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
 - 6. Steel: Welded threaded studs or spring-tension clamps on steel.
 - a. Field Welding: Comply with AWS D1.1.

7. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
8. Light Steel: Sheet-metal screws.
9. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.12 IDENTIFICATION MATERIALS AND DEVICES

- A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.
- C. Self-Adhesive Identification Products: Clean surfaces before applying.
- D. Color-code the 120/240V branch-circuit conductors throughout the secondary electrical system with a continuous unique color per phase. Use green (or bare) for grounding conductors and white for grounded (neutral) conductors.

3.13 REFINISHING AND TOUCHUP PAINTING

- A. Refinish and touch up paint.
 1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
 2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
 3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.14 CLEANING AND PROTECTION

- A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.
- B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

3.15 FIELD QUALITY CONTROL

- A. Inspect installed components for damage and faulty work, including the following:
 1. Raceways.
 2. Disconnect switches.

□ Arizona Scattered Sites

3. Building wire and connectors.
 4. Supporting devices for electrical components.
 5. Electrical identification.
 6. Cutting and patching for electrical construction.
 7. Touchup painting.
- B. Perform the following field tests and inspections of the communication system cabling and prepare test reports:
1. Operational Test: After installation of cables and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.
- C. Remove malfunctioning materials and equipment, replace with new units, and retest as specified above.

END OF SECTION 260000

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping, or sealing site utilities.
7. Temporary erosion and sedimentation control.

1.2 PREINSTALLATION MEETINGS

- ##### A. Preinstallation Conference: Conduct conference at Project site.

1.3 MATERIAL OWNERSHIP

- ##### A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.4 FIELD CONDITIONS

- ##### A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- ##### B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated. Dispose of material per Navajo Nation regulations.
- ##### C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
- ##### D. Do not commence site clearing operations until temporary erosion- and sedimentation-control measures are in place.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."
 - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.
 - 2. Imported Fill Material shall be obtain from a permitted site within the Navajo Nation or Off Navajo Nation, Contractor shall keep record of the imported material source.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

3.3 EXISTING UTILITIES

- A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
 - 1. Arrange with utility companies to shut off indicated utilities.

- B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.
- C. Removal of underground utilities is included in earthwork sections; in applicable fire suppression, plumbing, HVAC, electrical, communications, electronic safety and security, and utilities sections; and in Section 024116 "Structure Demolition" and Section 024119 "Selective Demolition."

3.4 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
 - 1. Grind down stumps and remove roots larger than 3 inches in diameter, obstructions, and debris to a depth of 18 inches below exposed subgrade.
 - 2. Use only hand methods or air spade for grubbing within protection zones.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

3.5 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

3.6 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for slabs-on-grade, walks, pavements.
3. Subbase course for concrete walks and pavements.
4. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. RELATED DOCUMENTS

1. A Geotechnical Study was performed by GEOMAT, Inc and a report "Geotechnical Engineering Report, Navajo Housing Authority, 25 Scattered Home Ownership Units, Navajo Nation, GEOMAT Project 212-3668" issued for this project. GEOMAT, Inc. can be reached at phone number (505) 327-7928.

1.2 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

C. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

D. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

- F. Fill: Soil materials used to raise existing grades.
- G. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- H. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- I. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct preexcavation conference at Project site.

1.4 INFORMATIONAL SUBMITTALS

- A. Material test reports.

1.5 FIELD CONDITIONS

- A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 4 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; Type II Base Course per NMDOT Section 303.
- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

2.2 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored to comply with local practice or requirements of authorities having jurisdiction.
- B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored to comply with local practice or requirements of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth-moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.3 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.4 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit unless otherwise indicated.
 - 1. Clearance: As indicated.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
 - 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.5 SUBGRADE INSPECTION

- A. Proof-roll subgrade below the pavements with a pneumatic-tired dump truck to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.6 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi (17.2 MPa), may be used when approved by Architect.
 - 1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.7 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.8 UTILITY TRENCH BACKFILL

- A. Utility trenching and backfilling shall be in accordance with 2016 IHS-OEHE Section 01-Trench Excavation and Backfill for Pipelines and Appurtenant Structures.

3.9 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
 - 1. Under grass and planted areas, use satisfactory soil material.
 - 2. Under walks and pavements, use satisfactory soil material.
 - 3. Under steps and ramps, use engineered fill.

3.10 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.11 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 10 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
 - 1. Under pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
 - 2. Under walkways, scarify and recompact top 12 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.
 - 3. Under turf or unpaved areas, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 90 percent.

3.12 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
 - 1. Turf or Unpaved Areas: Plus or minus 1 inch.
 - 2. Walks: Plus or minus 1 inch.
 - 3. Pavements: Plus or minus 1/2 inch.

3.13 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place base course under pavements and walks as follows:
 - 1. Shape base course to required crown elevations and cross-slope grades.
 - 2. Place base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 - 3. Compact base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.14 FIELD QUALITY CONTROL

- A. Special Inspections: Contractor will engage a qualified special inspector to perform inspections:
- B. Testing Agency: Contractor will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.
- E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2937, and ASTM D 6938, as applicable. Tests will be performed at the following locations and frequencies:
 - 1. Paved Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft or less of paved area or building slab but in no case fewer than three tests.

- F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.15 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.16 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property. Dispose all material to a permitted site if on the Navajo Nation.

END OF SECTION 312000

SECTION 312311 - EARTHWORK FOR BUILDING CONSTRUCTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. The work covered by this Section consists of furnishing all plant, labor, equipment, appurtenances and material in performing all operations, hauling, placing, spreading, watering, processing, compacting and shaping earth sections, within the building limits, complete in place in accordance with the Project Manual and Drawings.

1.2 RELATED REQUIREMENTS

- A. Section 31 10 00 - Clearing
- B. Section 07 26 00 - Under-Slab Vapor Retarder
- C. General Foundation Notes on Drawings.
- D. Project Soils Report – shall be completely reviewed and understood by the contractor. In case of conflict or omission, the Project Soils Report shall govern.

1.3 SUBSURFACE SOIL DATA

- A. Subsurface soil investigations shall be made with the results available for examination by the Contractor. This is not a warranty of conditions, the Contractor is expected to examine the site and determine for himself the character of materials to be encountered.
- B. No additional allowance will be made for rock removal, site clearing and grading, filling, compaction, disposal, or removal of any unclassified materials.

1.4 REFERENCE STANDARDS

- A. ASTM International, latest versions:
 - 1. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method
 - 2. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard effort (12,400 ft-lbf/ft³(600Kn-M/M³ ASTM D4318 Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
 - 3. ASTM D4318 - Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
 - 4. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

1.5 SUBMITTALS

- A. Submit copies of materials certificates and test results for materials in accordance with type of tests, frequencies and remarks as outlined in the sampling and testing schedule.

1.6 TESTING AND INSPECTION

- A. General: The Owner shall employ the services of a registered, licensed Geotechnical Engineer to observe all controlled earthwork soil testing. The testing laboratory shall provide continuous on-site observation by experienced personnel during construction of fill material. The Contractor shall notify the testing laboratory at least two working days in advance of any field operations of controlled earthwork, or of any resumption of operations after stoppages.
- B. Report of Field Density Tests
 - 1. The Geotechnical Engineer shall submit, daily, the results of field density tests required by these specifications.
- C. Costs of Tests and Inspection
 - 1. The cost of testing, inspecting and engineering, as specified in this section of the specifications, shall be borne by the Owner.
- D. Lines and Grades: Alignment and grade of all elements shall be made on true tangents and curves. Grades shall conform to the elevations indicated on Drawings, with minor adjustments, to provide a smooth approach at building lines, at connections to existing paving and to provide proper drainage. Correct irregularities at no cost to the Owner.

1.7 WEATHER LIMITATIONS

- A. Controlled fill shall not be constructed when the atmospheric temperature is below 35 degrees F. When the temperature falls below 35 degrees, it shall be the responsibility of the Contractor to protect all areas of completed work against any detrimental effects of ground freezing by methods approved by the testing laboratory. Any areas that are damaged by freezing shall be reconditioned, reshaped, and compacted by the Contractor in conformance with the requirements of this specification without additional cost to the Owner.

PART 2 - PRODUCTS

2.1 STRUCTURAL FILL MATERIAL

- A. Material shall consist of soils that conform to the following physical characteristics:

Sieve Size	Percent Passing
Sq. Openings	By Weight
3 inch	100
No. 4	50-100
No. 200	50 Max

- B. Aggregate base should conform to Type I Base Course as specified in Section 303 of the 2014 New Mexico Department of Transportation (NMDOT) "Standard Specifications for Road and Bridge Construction" or Class I Aggregate Base as specified in Section 303 of the 2008 Arizona Department of Transportation (ADOT) "Standard Specifications for Road and Bridge Construction." Aggregate base course conforming to either specification would be appropriate.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clearing and Grubbing: Prior to placing structural fill all borrow areas and areas to receive structural fill shall be stripped of vegetation and deleterious materials. Strippings shall be hauled offsite or stockpiled for subsequent use in landscaped areas or non-structural fill areas as designated by the Owner or his representative and approved by the Geotechnical Engineer.

3.2 CONSTRUCTION AREA TREATMENT

- A. Site Preparation - Fill Areas: Prior to placing structural fill the areas to be filled shall be scarified to a depth of eight inches and moisture conditioned as described below. The area to be filled shall then be compacted to a minimum of 95 percent of maximum density as determined in accordance with ASTM D 698. Any soft or "spongy" areas shall be removed as directed by the Geotechnical Engineer and replaced with structural fill as described herein.
- B. Site Preparation - Cut Areas: Following excavation to rough grade all building and pavement areas shall be scarified to a depth of eight inches and moisture conditioned as described below. All building and paved areas shall be compacted to a minimum of 95 percent of maximum density as determined by ASTM D 698.

3.3 EQUIPMENT AND METHODS

- A. In areas not accessible to heavy equipment, distribute by and compact with hand operated vibratory compactors.

3.4 BORROW

- A. The Contractor shall provide sufficient material for fill to the lines, elevations and cross sections as shown on the contract drawings from borrow areas.
- B. The Contractor shall obtain from the Owners of said borrow areas the right to excavate material, shall pay all royalties and other charges involved, and shall pay all expenses in developing the source including the cost of right-of-way required for hauling the material.

3.5 COMPACTION

- A. Fill shall be spread in layers not exceeding 10 inches, watered as necessary, and compacted. Moisture content at time of compaction shall plus/minus 3 percent of optimum moisture. A density of not less than 95 percent of maximum dry density shall be obtained within the building pads.
- B. Optimum moisture content and maximum dry density for each soil type used shall be determined in accordance with ASTM D 698.
- C. Compaction of the fill shall be by mechanical means only. Where vibratory compaction equipment is used, it shall be the Contractor's responsibility to ensure that the vibrations do not damage nearby buildings or other adjacent property. Where vibratory compaction is not possible, pneumatic rolling equipment shall be used.

MATERIAL	MINIMUM PERCENT COMPACTION
Structural & granular fill in construction area	95
Subgrade below structural fill	95

Structural fill under exterior walls	95
Miscellaneous backfill	90

3.6 MOISTURE CONTROL

- A. The material, while being compacted, shall be within the moisture range of 3 percent below to 3 percent above optimum, well distributed throughout the layer. Over excavation of wet zones and replacement with granular materials may be necessary in soils with high water content. Moisture control underlying the structure is critical, refer to surface drainage section of the project soils report.

3.7 DENSITY REQUIREMENTS

- A. Density of undisturbed soils, in-place fill and backfill shall be determined in accordance with the procedures of ASTM D 1556 or ASTM D 6938. If tests indicate that the density of in-place soil is less than required, the material shall be scarified, moistened or dried as necessary to obtain proper moisture content and recompact as necessary to achieve the proper densities. Sufficient density tests shall be made and reports submitted by the Testing Laboratory indicating all cut and fill areas were compacted and graded in accordance with the requirements.

3.8 SLOPE PROTECTION & DRAINAGE

- A. Berming and grading shall be done as may be necessary to prevent surface water from flowing into and out of the construction area. Any water accumulating therein shall be removed by pumping or by other methods. For foundation adjacent to descending slopes, refer to project soils report for grading and setback requirements.

3.9 SOIL EROSION PROTECTION

- A. The Contractor shall ensure that no soil erodes or blows from the site into public right-of-way or onto private property.
- B. The Contractor shall promptly clean up any material which erodes or blows into the public right-of-way or onto private property.

3.10 PRESERVATION OF PROPERTY

- A. Provide temporary fences, barricades, coverings, or other protections to preserve existing items indicated to remain and to prevent injury or damage to persons or property. Apply protections to adjacent properties as required.
- B. Restore damaged work to condition existing prior to start of work, unless otherwise directed.

3.11 EXISTING UTILITIES

- A. The Contractor shall verify the location of any utility lines, pipelines, or underground utility lines in or near the area of the work in advance of and during Earthwork. The Contractor is fully responsible for any and all damage caused by failure to locate, identify and preserve

any and all existing utilities, pipelines and underground utility lines. Repair damaged utilities to the satisfaction of the utility owner at no expense to the Owner.

- B. Should uncharted or incorrectly charted piping or other utilities be encountered during grading, consult the Architect immediately for directions as to procedures.
- C. Cooperate with the Owner and public or private utility companies in keeping service and facilities in operation.

3.12 WASTE

- A. Dispose of all waste off Owner's property.
- B. Burning of waste will not be permitted.

3.13 AIR POLLUTION

- A. Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt air pollution. Comply with governing regulations pertaining to environmental protection.

SAMPLING AND TESTING SCHEDULE FOR EARTHWORK			
FIELD QUALITY CONTROL			
MATERIAL	TEST FOR	FREQUENCY	REMARKS
NATURAL GROUND	Compaction in accordance with ASTM D 1556 or ASTM D 6938	1 per 2500 square feet of surface	Conduct a minimum of 2 tests on each section
EMBANKMENT AND/OR SUBGRADE	Soil Conditions Moisture-Density in accordance with ASTM D 698	Test 1 per soil classification	
	Compaction control in accordance with ASTM D 1556 or ASTM D 6938	1 per each lift every 2500 square feet of surface	Immediately after placing, Conduct a minimum of 2 tests per section
		1 per each lift every 2500 square feet of fill	

END OF SECTION 312311

SECTION 313116 - TERMITES CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Soil treatment with termiticide.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include the EPA-Registered Label for termiticide products.

B. Product certificates.

C. Soil Treatment Application Report: Include the following:

1. Date and time of application.
2. Moisture content of soil before application.
3. Termiticide brand name and manufacturer.
4. Quantity of undiluted termiticide used.
5. Dilutions, methods, volumes used, and rates of application.
6. Areas of application.
7. Water source for application.

D. Warranties: Sample of special warranties.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located and who employs workers trained and approved by manufacturer to install manufacturer's products.

B. Regulatory Requirements: Formulate and apply termiticides and termiticide devices according to the EPA-Registered Label.

C. Preinstallation Conference: Conduct conference at Project site or location designated by the Owner's Representative.

1.4 PROJECT CONDITIONS

- A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.
- B. Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.5 WARRANTY

- A. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOIL TREATMENT

- A. Termiticide: Provide an EPA-Registered termiticide, complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Corporation, Agricultural Products; Termidor.
 - b. Bayer Environmental Science; Premise 75.
 - c. FMC Corporation, Agricultural Products Group; Dragnet FT, Talstar, or Prevail.
 - d. Syngenta; Demon TC, Prelude, or Probuild TC.
 - 2. Service Life of Treatment: Soil treatment termiticide that is effective for not less than five years against infestation of subterranean termites.

PART 3 - EXECUTION

3.1 APPLICATION, GENERAL

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.2 APPLYING SOIL TREATMENT

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil per termiticide label requirements, interfaces with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.
- B. Proceed with application only after unsatisfactory conditions have been corrected.
- C. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.
 - 1. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.
- D. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute treatment evenly.
 - 1. Slabs-on-Grade: Underground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
 - 2. Foundations: Adjacent soil, including soil along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit penetrating the slab; around interior column footers, piers, and chimney bases; and along the entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
 - 3. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.
- E. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.
- F. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.
- G. Post warning signs in areas of application.
- H. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION 313116

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SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Drive Pad
 - 2. Walks.
 - 3. Concrete Equipment Pad

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Other Action Submittals:
 - 1. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.3 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- B. ACI Publications: Comply with ACI 301 unless otherwise indicated.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

- A. Cementitious Material: Use approved equal cementitious materials, of the same type, brand, and source throughout the Project:
 - 1. Portland Cement: ASTM C 150, Type I/II
 - a. Fly Ash: ASTM C 618, Class C.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
 - 2. Blended Hydraulic Cement: ASTM C 595, Type IS, portland blast-furnace slag IP, portland-pozzolan, I (PM), pozzolan-modified portland I (SM), slag-modified portland cement.

- B. Normal-Weight Aggregates: ASTM C 33, Class 4S coarse aggregate, uniformly graded. Provide aggregates from a single source.
- C. Water: ASTM C 94/C 94M.
- D. Air-Entraining Admixture: ASTM C 260.
- E. Chemical Admixtures: ASTM C 494/C 494M, of type suitable for application, certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

2.2 FIBER REINFORCEMENT

- A. Synthetic Fiber: fibrillated polypropylene fibers engineered and designed for use in concrete paving, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches long.

2.3 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry or cotton mats.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
- F. White, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B, dissipating.

2.4 RELATED MATERIALS

- A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber in preformed strips.
- B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

2.5 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, with the following properties:
 - 1. Compressive Strength (28 Days): 3500 psi
 - 2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.50.
 - 3. Slump Limit: 4 inches, plus or minus 1 inch.
 - 4. Air Content: 5-1/2 percent plus or minus 1.5 percent.
- B. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd.
- C. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions.

2.6 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.
- B. Remove loose material from compacted subbase surface immediately before placing concrete.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.3 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness[, to match jointing of existing adjacent concrete paving]:
- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.4 CONCRETE PLACEMENT

- A. Moisten subbase to provide a uniform dampened condition at time concrete is placed.
- B. Comply with ACI 301 requirements for measuring, mixing, transporting, placing, and consolidating concrete.
- C. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- D. Screed paving surface with a straightedge and strike off.
- E. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

3.5 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
 - 1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
 - 2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
 - 3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

- C. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on paving surface according to manufacturer's written instructions.
 - 1. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
 - 2. After curing, lightly work surface with a steel wire brush or abrasive stone and water to expose nonslip aggregate.

3.6 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound or a combination of these.

3.7 PAVING TOLERANCES

- A. Comply with tolerances in ACI 117 and as follows:
 - 1. Elevation: 1/2 inch.
 - 2. Thickness: Plus 3/8 inch, minus 1/4 inch.
 - 3. Surface: Gap below 10-foot long, unlevelled straightedge not to exceed 1/2 inch.
 - 4. Joint Spacing: 3 inches.
 - 5. Contraction Joint Depth: Plus 1/4 inch, no minus.
 - 6. Joint Width: Plus 1/8 inch, no minus.

3.8 REPAIRS AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.
- B. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

- C. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor to engage a qualified testing agency to perform tests and inspections.
- B. Testing Services: Testing and inspecting of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain at least one composite sample for each 50 cu. yd. or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 - 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 - 3. Air Content: ASTM C 231/C 231M, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
 - 5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
 - 6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.
 - a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi
- D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
- G. Concrete paving will be considered defective if it does not pass tests and inspections.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- I. Prepare test and inspection reports.

END OF SECTION 321313

SECTION 321373 - PAVEMENT JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes cold and hot-applied pavement joint sealants in the following locations.
 - 1. Portland Cement concrete pavement expansion and contraction joints.
 - 2. Joints between Portland Cement concrete and asphalt pavement.

1.2 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Samples: For each type and color of joint sealant indicated.
- C. Product test reports.
- D. Sealant compatibility and adhesion test reports.

1.3 QUALITY ASSURANCE

- A. Sealant Compatibility and Adhesion Testing: Use sealant manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.
 - 2. Products: Subject to compliance with requirements, provide one of the products specified.

2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

1. Primers: Product recommended in writing by joint sealant manufacturer for adhesion of sealant to joint substrates indicated, as determined from sealant compatibility and adhesion tests and prior experience.
- B. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint sealant manufacturer based on field experience and laboratory testing.
 1. Round Backer Rod for Cold- and Hot-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depths and prevent bottom-side adhesion of sealant.
 2. Backer Strips for Cold- and Hot-Applied Sealants: ASTM D 5249; Type 2; of thickness and width required to control sealant depths, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.
 3. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depths and prevent bottom-side adhesion of sealant.

2.3 COLD-APPLIED JOINT SEALANTS

- A. Multicomponent Jet-Fuel-Resistant Sealant for Concrete: ASTM C 920, pourable, chemically curing elastomeric formulation.
 1. Urethane Formulation: Type M; Grade P; Class 12-1/2; Uses T, M, and, as applicable to joint substrates indicated, O.
 - a. Products:
 - 1) Pecora Corporation; Urexpam NR-300.
 - 2) Engineer Approved.
 2. Coal-Tar-Modified Polymer Formulation: Type M; Grade P; Class 25; Uses T and, as applicable to joint substrates indicated, O.
 - a. Products:
 - 1) Meadows, W. R., Inc.; SEALTIGHT GARDOX.
 - 2) Engineer Approved.
 3. Bitumen-Modified Urethane Formulation: Type M; Grade P; Class 25; Uses T, M, and, as applicable to joint substrates indicated, O.
 - a. Products:
 - 1) Mameco International; Vulkem 202.
 - 2) Sonneborn Building Products Div., ChemRex, Inc.; Sonomeric 2.
 - 3) Engineer Approved.
 - B. Nonsag Silicone Sealant for Concrete: ASTM D 5893, Type NS, single-component, low-modulus, neutral-curing, nonsag silicone sealant.
 1. Products:
 - a. Crafcoc Inc.; Roadsaver Silicone-SL.
 - b. Dow Corning; 888.
 - c. Engineer Approved.
 - C. Self-Leveling Silicone Sealant for Concrete and Asphalt: ASTM D 5893, Type SL, single-component, low-modulus, neutral-curing, self-leveling silicone sealant.

1. Products:
 - a. Dow Corning; 890-SL.
 - b. Engineer Approved.

D. Multicomponent Low-Modulus Sealant for Concrete and Asphalt: Proprietary, pourable, self-leveling formulation of reactive petropolymer and activator.

1. Products:
 - a. Meadows, W. R., Inc.; SOF-SEAL.
 - b. Engineer Approved.

2.4 HOT-APPLIED JOINT SEALANTS

A. Elastomeric Sealant for Concrete: ASTM D 3406.

1. Products:
 - a. CrafcO, Inc.; Superseal 444/777.
 - b. Meadows, W. R., Inc.; POLY-JET 3406.
 - c. Engineer Approved.

B. Sealant for Concrete and Asphalt: ASTM D 3405.

1. Products:
 - a. CrafcO Inc.; ROADSAVER 221.
 - b. Koch Materials Company; Product #9005.
 - c. Meadows, W. R., Inc.; SEALTIGHT HI-SPEC.
 - d. Engineer Approved.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Clean out joints immediately before installing joint sealants.
- B. Joint Priming: Prime joint substrates where indicated or recommended in writing by joint sealant manufacturer, based on sealant compatibility and adhesion tests and prior experience. Confine primers to areas of joint-sealant bond; do not spill primers or allow them to migrate onto adjoining surfaces.
- C. Sealant Installation: Comply with applicable recommendations in ASTM C 1193.
- D. Install backer materials to support sealants during application and at position required to produce optimum sealant movement capability.
 1. Do not leave gaps between ends of backer materials.
 2. Do not stretch, twist, puncture, or tear backer materials.
 3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.

- E. Install sealants at same time backer materials are installed.
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses provided for each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths optimize sealant movement capability.

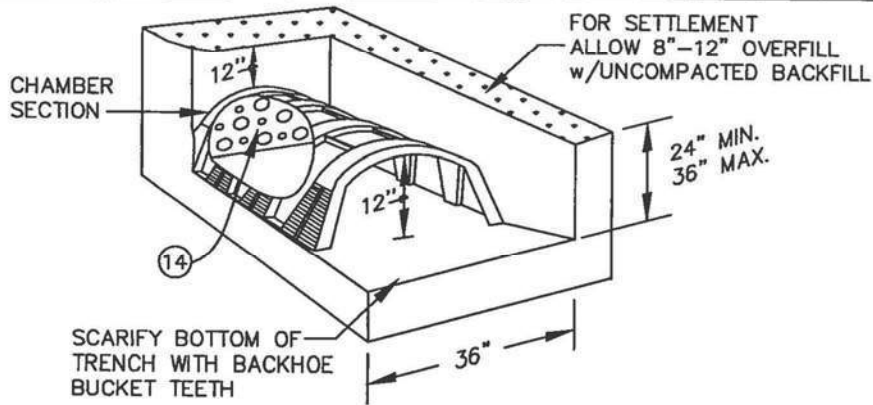
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealants from surfaces adjacent to joint.
 - 2. Use tooling agents that are approved in writing by joint sealant manufacturer and that do not discolor sealants or adjacent surfaces.

- G. Clean excess sealants or sealant smears adjacent to joints as installation progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

END OF SECTION 321373

APPENDIX A

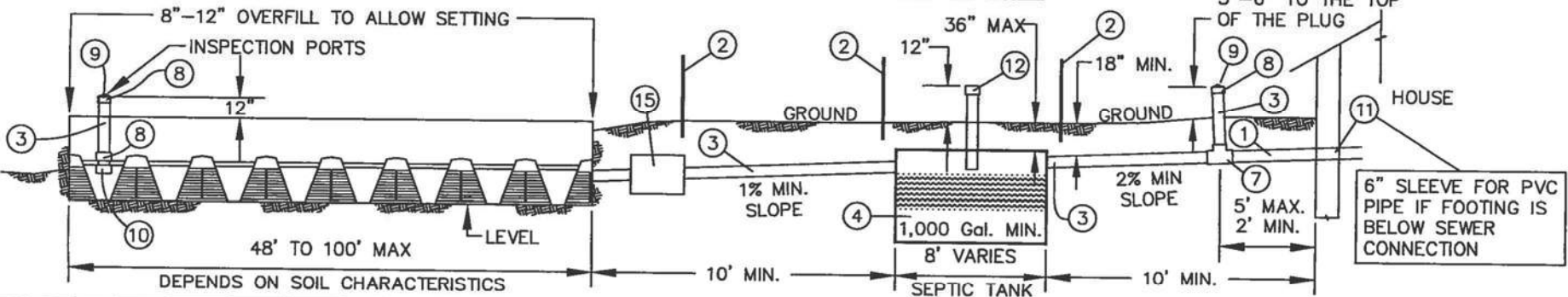
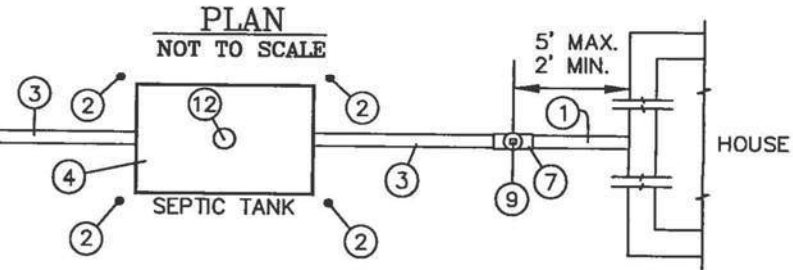
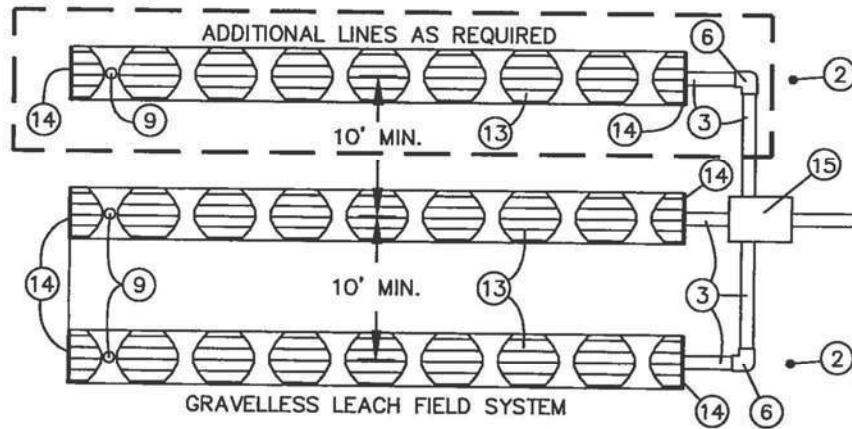
IHS STANDARD DETAIL
NO. S-19 SEPTIC TANK & GRAVELLESS DRAINFIELD
SYSTEM



ISOMETRIC VIEW - CHAMBER DRAINFIELD

ITEM	QUAN.	DESCRIPTION
1	AS NEEDED	3" SOLID SEWER PIPE, PVC-DWV, SCH. 40
2	AS NEEDED	MARKER T POST, RED
3	AS NEEDED	4" PVC PIPE, SEWER & DRAIN (S&D)
4	1	SEPTIC TANK, 1000 Gal. MINIMUM, PRE-CAST CONCRETE OR P.E.
5	AS NEEDED	TEE, 4" PVC, S&D
6	2	90° ELBOW, 4" PVC, S&D
7	AS NEEDED	2 WAY CLEANOUT ASSEMBLY 4" STD COMPONENT SC103340
8	AS NEEDED	4" ADAPTER, HUBxFIPT, PVC-DWV SCH. 40
9	AS NEEDED	4" CLEANOUT PLUG MIPT, PVC-DWV, SCH. 40
10	AS NEEDED	4" COUPLING, HUB x MIPT, PVC-DWV, SCH. 40
11	AS NEEDED	6" SLEEVE STEEL PIPE
12	1	PUMPER ACCESS/INSPECTION PORT w/CAP OR PLUG
13	AS NEEDED	QUIK 4 CHAMBER: 34" W x 48" L x 12" H
14	AS NEEDED	QUIK 4 COMBO-END PLATE, SIZE: 34" W x 12" H
15	1	DISTRIBUTION BOX: 1 INLET & 6 OULETS

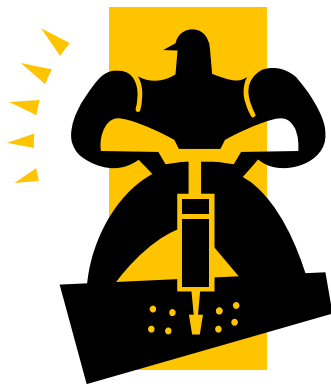
- NOTES: 1. PROVIDE ADDITIONAL CLEANOUTS PER NAIHS/NECA TECHNICAL PROVISIONS SECTION 4 REQUIREMENTS.
2. PROVIDE 10 FEET MINIMUM DISTANCE BETWEEN THE DOMESTIC STOP AND SEWER CLEANOUT.



04	03MAY16	JPM	CORRECT COVER DEPTH	DRAWN BY: L.S.	CHECKED BY: P.S.	DEPARTMENT OF HEALTH & HUMAN SERVICES PUBLIC HEALTH SERVICE INDIAN HEALTH SERVICE NAVAJO AREA INDIAN HEALTH SERVICE	LOCATION: NAVAJO AREA OFFICE NAVAJO NATION	TITLE: STANDARD DRAWING NO. S-19 SEPTIC TANK & GRAVELLESS DRAINFIELD SYSTEM	DISTRICT WINDOW ROCK	SHEET NO: 1 OF 1 SHEETS	TOTAL
03	22SEP11	JPM	1% MIN SLOPE; MAX DF LENGTH 100'	DATE: 10/93	DATE: 10/93						
02	12NOV06	JPM	ADD DISTRIBUTION BOX	INDIAN HEALTH SERVICE NAVAJO AREA OFFICE							
01	26JAN10	JPM	MATCH BEND PER TP-4	OFFICE OF ENVIRONMENTAL HEALTH							
NO.	DATE	APPR.	DESCRIPTION						PROJECT NO.	DWG. #	
										S-19	

APPENDIX B

AAIHS/OEHE SANITATION FACILITIES
CONSTRUCTION TECHNICAL PROVISIONS



AAIHS/OEHE
SANITATION FACILITIES
CONSTRUCTION
TECHNICAL PROVISIONS



February 2016

TECHNICAL PROVISIONS

SECTION 01	TRENCH EXCAVATION & BACKFILL FOR PIPELINES AND APPURTENANT STRUCTURES
SECTION 02	CONCRETE
SECTION 03	REINFORCING STEEL
SECTION 04	WATER TRANSMISSION AND DISTRIBUTION MAINS
SECTION 05	WATER SERVICE LINES
SECTION 06	GRAVITY SANITARY SEWERS
SECTION 07	SEWER SERVICE LINE
SECTION 11	ROADWAY, RAILROAD, AND SPECIAL UTILITY CROSSINGS
SECTION 12	NON-AGGREGATE SEWAGE DISPOSAL SYSTEMS
SECTION 13	INDIVIDUAL PRESSURIZED DOSED SEWAGE DISPOSAL SYSTEM
SECTION 16	SINGLE RESIDENCE LIFT STATION
SECTION 28	HIGH DENSITY POLYETHYLENE (HDPE) PIPE & FITTINGS
SECTION 30	BOLTED STEEL WATER STORAGE TANK AND FOUNDATION
SECTION 31	WELDED STEEL WATER STORAGE TANK AND FOUNDATION
SECTION 34	COATINGS FOR WELDED STEEL WATER STORAGE TANKS
SECTION 35	IMPRESSED CURRENT CATHODIC PROTECTION SYSTEM FOR WATER STORAGE TANKS

TECHNICAL PROVISIONS

SECTION 01 - TRENCH EXCAVATION & BACKFILL FOR PIPELINES AND APPURTENANT STRUCTURES

TP-101 SCOPE:

Excavation, as used in these specifications refers to all construction activities necessary to install subsurface utilities in accordance with the plans and specifications. Such activities include, but are not limited to:

All necessary clearing, grubbing and site preparation; removal of all materials that may interfere with construction activities (except existing pipe work, conduits, utility structures or other items to be left in place) to the lines and grades indicated on the plans and otherwise described herein. The Contractor shall remove all construction trash from the site and transport to a legal disposal site.

Removal and/or storage of subsurface materials from trench and construction excavation areas to allow installation of designated utilities or structures. All suitable material removed from excavations shall be used, insofar as practicable, in the formation of embankments, fills and backfilling.

Preparation of sub-grades and backfilling of trench and construction areas upon completion of utility or structure construction.

All necessary bracing, shoring and protection (but not including tight sheeting in trenches and structure excavation ordered left in place by the Owner or Owner's Representative).

Final grading, dressing and cleanup of the construction site.

TP-102 SAFETY:

All trench excavation shall be coordinated in strict accordance with current OSHA requirements found in the Occupational Safety and Health Standards - Construction Standards for Excavations (29 CFR 1926, Subpart P).

Trenches shall be properly sheeted, shored, or sloped in accordance with the current OSHA standards. Trench excavation shall not proceed more than 500 feet in advance of pipeline work without the Owner or Owner's Representative's approval. All trenches shall be completely backfilled at the end of each working day, unless otherwise approved by the Owner or Owner's Representative. No excavation shall be left open without proper barricades and warning lights. Such devices shall conform to the Manual of Uniform Traffic Control Devices (ANSI D6.1) or such permits as are appended to these specifications.

The contractor shall be responsible for safety on the job site and shall designate a trained "competent person" knowledgeable in trench safety to supervise the work.

TP-103 SHORING AND SHEETING SYSTEMS:

Protection of employees in excavations shall conform to applicable OSHA Standards. Any trench protection and modification to trenching safety plans shall be submitted to the Owner or Owner's Representative in writing to be maintained as part of the record.

The Contractor shall install all shoring and sheeting systems required to prevent cave-ins and protect his employees and adjacent property and structures in accordance with current OSHA standards. No extra payment will be made for these items, the cost thereof being merged with and considered a part of the cost for the related excavation.

Before sheeting is withdrawn, or trench boxes moved forward, they shall be raised, in place, just above the pipe crown to safely allow the Contractor to completely fill any voids left in the pipe zone.

TP-104 ROAD, RAILROAD AND SPECIAL UTILITY CROSSINGS (IF REQUIRED):

The Contractor shall be responsible for compliance with all requirements of special crossing permits applicable to this project. Copies of such permits shall be included in the Appendix of these specifications. If no special crossing permits are appended, and such crossings are indicated on the plans, crossings will comply with all applicable provisions of Section 11 of the Technical Provisions in addition to those indicated under other provisions of this Section. At least two days notice shall be given to the Owner or Owner's Representative before work is done on any crossing.

TP-105 WORK WITHIN RIGHT-OF-WAYS & TRAFFIC CONTROL

When performing any work within the right-of-way of roads or railroads, the Contractor shall comply with the right-of-way permit for the installation including all of the requirements for traffic control and compaction. All work within the right-of-way of roads shall be performed in accordance with the "Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects FP-03 U.S. Customary Units – Section 614." All work within the right-of-way of roads shall be performed in accordance with the latest edition of the Manual on Uniformed Traffic Control Devices (MUTCD)." In addition, the Contractor shall submit a traffic control plan to the project engineer for review and approval prior to any work within the right-of-way of any roads or railroads.

TP-106 DRAINAGE:

The Contractor shall control the grading in the vicinity of the excavation so that the ground surface is properly sloped to prevent water from running into the excavated areas. Water that has accumulated in the excavation from rainfall and/or surface runoff, or from any other cause which might have been prevented by proper care and foresight, shall be removed and the subgrade restored to its proper bearing capacity, all at the Contractor's expense.

TP-107 EXCAVATION:

A. General: All excavation, other than by drilling and blasting, undertaken with the excavation equipment commonly used in the industry for this type of excavated material shall be classified as common excavation.

All excavation shall be made by open cut method except as approved or specified. During excavation, materials suitable for backfill shall be neatly piled no closer than 24-inches from the edge of the excavation. All materials not required or not suitable for backfill shall be removed and wasted at locations designated by the Owner or Owner's Representative.

1. Width: The sides of all trenches for the installation of utility piping systems shall be as nearly vertical as soil conditions will permit from ground level to the pipe. Except for the trenching of 1-inch water service lines, the width of the trench shall not be less than 16-inches nor more than 24-inches wider than the outside diameter of the pipe barrel. Trench excavation shall be centered on pipe alignment such that a minimum clear space of 8-inches is provided on each side of the pipe. Trench width above the level of the top of the pipe may be as wide as necessary for shoring or sheathing and for proper installation of the work.

2. Depth: The trench shall be excavated to the depth that permits pipe to be laid at the elevations shown on the engineering drawings or with the required depth of cover specified by the Owner or Owner's Representative. Depth of cover shall be measured from the finished grade or the surface of the permanent improvement to the top of the pipe barrel.

3. Preparation: The bottom of the trenches shall be accurately shaped to line and grade and shall provide uniform bearing and support for each section of the pipe on specifically placed bedding material at every point along its entire length. Bell holes and depressions for joints shall be dug after the trench bottom has been graded and shall be only of such length, depth and width as required for properly making the particular type joint. Care shall be taken not to excavate below the depths indicated. Unauthorized over depths shall be backfilled with suitable bedding material at the Contractor's expense.

4. Previous Excavation: If the trench passes over a sewer or other previous excavation, the trench bottom shall (1) be compacted to provide support equal to that of the undisturbed native soil or (2) conform to the specific regulatory requirements that preclude damage to the existing installed facility.

5. Unstable Subgrade: Where soft, spongy or otherwise unsuitable material is encountered, which will not provide a firm foundation for pipe, the Owner will direct the extent to which removal and replacement shall be made with suitable material. Special pipe foundation material is NOT anticipated. However, if required, a price shall be negotiated between the Owner and Contractor for special pipe foundation material.

6. Underground Obstructions: The Contractor shall preserve intact any underground pipes, culverts or other utilities encountered during construction (except as hereinafter permitted) provided their location is such that they do not interfere with new pipelines or structures being installed. The Contractor shall notify all appropriate utility authorities of his construction schedule so they may be at the site to locate and protect their property. If any utilities or structures are accidentally broken or disturbed, they shall be replaced immediately to a condition at least equal to that in which they were found, all at the Contractor's expense. Couplings used to repair water service lines shall be brass compression couplings and couplings used to repair sewer service lines shall be solid sleeve couplings that provide a rigid connection between pipes. The repair work shall be done in a manner acceptable to the Owner or Owner's Representative and the utility company. Any existing water or sewer services that will intersect or interfere with the new pipelines or structures shall be rerouted by the Contractor in the manner indicated by the Owner or Owner's Representative. Existing water or sewer services from the mains to private property that interfere with trenching operations may be cut and replaced at the Contractor's option and expense, provided that users of such services are notified at least 2 hours in advance and that the use of such service shall in no case be interrupted for more than 4 hours, unless specifically permitted in writing by the user. Materials and construction for these items shall be as provided in other sections of these specifications. All new and existing water and sewer mains and water and sewer services shall be protected from freezing at all times during construction.

B. Rock: The inclusion of a bid item and estimated quantity for rock excavation in the bid schedule indicates that rock excavation is probable. However, the exclusion of this item from the bid schedule does not preclude the possibility that rock will be encountered; it merely indicates that it is not anticipated. If unanticipated rock is encountered, the Owner or Owner's Representative will negotiate a price for rock excavation with the contractor. The following paragraphs define solid rock and loose rock excavation.

Solid rock shall be defined as large masses of igneous, metamorphic, or sedimentary rock that, in the opinion of the Owner or Owner's Representative, cannot be

excavated without drilling, blasting, or the use of rippers or other specialized equipment. Any material excavated without the use of blasting or specialized ripping equipment shall not be considered rock.

Solid rock excavation shall be measured in cubic yards from the top of the rock to a point 4-inches below the invert of the installed pipe and an assumed 24-inches trench width, regardless of the actual trench width and depth excavated. For structures, the rock shall be profiled 12-inches outside the perimeter of the structure and computed based on a product of the profile of the rock and an assumed 24-inches outside the structure's perimeter and 6-inches below the structure's footing. The rock volume will be computed as the product of the profiled rock area, as measured by the Owner or Owner's Representative. The measurements shall be within the nearest 0.1-feet from the surface and no less than every 10-feet by one of the following methods:

1. Excavating and exposing the rock profile for measurement. This shall be the responsibility of the contractor and no additional payment shall be made for this excavation.
2. Rock profile determined by drilling without excavating and measurements taken prior to any blasting.
3. Rock profile measured after blasting and excavation. A 20% deduction shall be made in rock determination when this method is used to allow for expansion in ledge due to blasting.

Loose rock shall be defined as boulders and other detached stones each having a volume of 1 cubic yard or more. Loose rock shall be removed from the excavation in such a way that a clear distance of at least 4-inches exists between the rock and the bottom of the pipe and 6-inches exist between the rock and the bottom structure. Loose rock shall not be used for backfill. Loose rock excavation shall be measured in cubic yards, including the total volume of only those rocks or boulders that are individually over 1 cubic yard in volume.

Trench in which rock is encountered shall be excavated at least 4-inches deeper than the pipe invert and refilled to the required elevation with sand, gravel, or crushed rock passing a 3/4-inch mesh screen. Bedding material shall extend upward at least 12-inches above the pipe. Payment for this fill material shall be considered incidental to the rock excavation and no additional payment shall be made.

Should rock excavation be encountered, it shall be the responsibility of the Contractor to have an experienced powderman handle all blasting and be able to furnish proof of his/her credentials. The Contractor shall also inform all residents in the vicinity of proposed blasting activities and shall be responsible for any damage to persons or property as covered in the General Provisions.

C. Removal of Water: The contractor shall remove and dispose of all water entering the trenches and shall keep the trenches water free until the facilities are in

place and sealed against the entrance of water. Use of a trash pump for removal of nuisance water shall be at no extra cost and shall not be considered dewatering. In no case shall water, earth, or any foreign materials be allowed to enter the water main or sewer lines.

The removal of nuisance water is determined by pumping the water out of the trench with a heavy-duty 4" construction trash pump with a strainer for a minimum of 1 hour. The strainer shall be placed in a bed of pea gravel or a slotted PVC pipe in order to screen the debris.

All water removed from trenches shall be conveyed to natural drainage channels, storm sewers, or proper reservoirs as approved by Owner or Owner's Representative. Such removal of water shall be in a manner that prevents property damage, erosion, or sedimentation.

The inclusion of a bid item and estimated quantity for dewatering in the bid schedule indicates that dewatering is probable. However, the exclusion of this item from the bid schedule does not preclude the possibility that water will not be encountered, it merely indicates that it is not anticipated.

If continuous pumping with well points is required to maintain a satisfactory trench, and the contractor is so directed by the Owner or Owner's Representative, this work shall be considered as dewatering. Well points shall be set separately for each trench being dewatered. Dewatering shall be based on the actual number of lineal feet of trench dewatered and paid for at the negotiated price between the contractor and Owner or Owner's Representative.

D. Structural Excavation: Excavation for structures shall extend a sufficient distance from walls and footings to provide for forming, except where concrete for walls or footings is authorized to be deposited directly against excavated surfaces. Care shall be taken to avoid excavating below the depths indicated in the plans. Over-excavation shall be restored to proper elevation by filling with suitable granular bedding material at the Contractor's expense.

TP-108 BACKFILLING:

A. General: Trenches shall not be backfilled until the Owner or Owner's Representative has inspected and approved the pipe installation and jointing as being in compliance with the requirements of plans and specifications.

Bedding and backfill materials to a depth of 12-inches above the pipe shall be carefully deposited in layers not more than 6-inches thick, loose measurements, wetted to optimum moisture content and hand or mechanically compacted to at least 95% of the reference density for this material as described in the specification titled "Compaction Requirements, Methods and Testing. From 12 inches above the pipe to

ground surface, the excavation material shall be placed in layers not to exceed 12-inches, mounded and left in a uniform, neat condition.

Wherever trenches have not been properly filled, or if settlement occurs, they shall be reopened to the depth required for proper compaction and refilled and re-compacted as specified above and approved by the Owner or Owner's Representative.

Compaction methods and equipment may utilize hand and mechanical tampers and rollers. The equipment and procedures proposed by the Contractor shall be subject to the approval of the Owner or Owner's Representative.

B. Materials: All backfill material shall be approved in advance of installation by the Owner or Owner's Representative. Materials shall be obtained from areas approved by the Owner or Owner's Representative.

Backfill material will not be paid for separately, but shall be considered as subsidiary to and a part of the cost for the applicable contract bid item.

1. Embedment: Embedment is that material from the bottom of the trench to twelve inches above the pipe, and includes the pipe bedding material (upon which pipe is laid), haunching material (extending from pipe bottom to pipe centerline), and initial backfill material (extending from pipe centerline to 12 inches above pipe). Native soil used for embedment must be free from clods of earth or stones larger than 1 inch in any dimension, organic refuse, debris, frozen soil, and other objectionable material. If the native soil does not meet these criteria, the Contractor shall screen it (as applicable) or import special bedding material.

2. Imported Special Bedding Material: If required, special bedding material shall consist of sand, sandy gravel, or other suitable granular material having a maximum plasticity index of 6, with 100% of the bedding material smaller than 3/4-inches, and no more than 5% passing a No. 200 sieve.

3. Stabilization: Granular stabilization material shall be used to replace soft, spongy, or other unsuitable material, including rock encountered in excavation, to the depths necessary to support the pipe or structure. Stabilization materials shall be underlay bedding material (as applicable) and shall consist of suitable hard, durable granular material having a maximum size of 6-inches, graded so that a maximum of 20% passes a No. 4 sieve. Granular stabilization is not anticipated. If required, a price for granular stabilization shall be negotiated between the Contractor and the Owner.

4. Final Backfill: In general, final backfill will be that material originally excavated from the trench and will extend from 12 inches above the pipe to surface grade. Final backfill material shall be the same as that around the pipe except that the inclusion of a limited amount of stones up to 6-inches in diameter will be permitted.

C. Placement:

1. Embedment: Embedment shall be placed in 6-inch loose lifts and compacted as described herein. If over-excavation is required, bedding material is to be compacted to 95% of the maximum dry density as determined by the Standard Proctor density test (ASTM D-698). Haunching material shall be placed by hand and worked under the pipe haunch to provide adequate side support for the pipe. Haunching and initial backfill material shall be compacted to 95% of the maximum dry density as determined by the Standard Proctor density test (ASTM D-698).
2. Final Backfill: Final backfill shall not be placed until the embedment material is placed and compacted, and the Owner or Owners Representative have inspected and approved the installation. Final backfill shall be placed in lifts not to exceed 12-inches unless otherwise approved by the Owner or Owners Representative. Compaction shall be as defined in the Compaction Requirements, Methods, and Testing section.
3. Backfill for Road Subgrade: Under existing and proposed roadways, to a distance of 10-feet on either side of the road, bedding and backfill materials shall be carefully deposited in layers not more than 6-inches thick, loose measurements, wetted to optimum moisture content and mechanically compacted as described in the Compaction Requirements, Methods, and Testing section.
4. In areas where pavement is to be replaced, or in roads that are to be paved, no rocks or stones that will interfere with subgrade preparation shall be included in the backfill within 12-inches of the finished subgrade elevation. The upper 12-inch layer, forming the subgrade for pavements, shall be compacted to a density of at least 95% (ASTM D-698 - Modified Proctor Test). See Section 11 of the Technical Provisions where this is required.
5. Cement slurry can be substituted for compacted native backfill and subgrade if approved by Owner or Owner's Representative. The cement slurry shall consist of one sack of cement to one cubic yard of concrete sand and shall be placed from the concrete truck at a slump of 6 to 8 inches. Steel plates 5/8" thick are to be placed over the trench with at least 6 inches overlap on each side and edged with asphalt to prevent traffic movement. The backfill shall be allowed to set for a minimum of 12 hours before completing the asphalt patch. Slurry can typically be installed from the trench bottom to ground surface and no intermediary subgrade material is required for placement of asphalt patch.
6. Where trenches cross roads, streets, or driveways, backfilling shall be completed immediately following excavation and inspection. No trenches across roads shall remain open overnight. All crossings shall be backfilled, compacted and open to traffic at the end of each day's work. Major road crossings shall be excavated and backfilled in half widths of the traveled way so that at least one-half of the roadway is open to controlled traffic at all times during the work.

7. **Backfill Around Structures:** Backfill around structures shall conform to the same requirements as those for backfill around piping in unpaved areas, unless more stringent requirements are indicated in other sections of these specifications.

TP-109 COMPACTION REQUIREMENTS, METHODS, AND TESTING:

A. **Minimum Density:** Unless otherwise specified by applicable permits initial and final backfill and gravel resurfacing shall be compacted to the following minimum requirements. The minimum acceptable percent of compaction is the in place dry density divided by the reference density times 100. Compacted soil shall also be at plus or minus 2% of optimum moisture content.

TYPE	LOCATION	REQUIRED COMPACTION
I	Under any existing or proposed pavement, curb Gutter, sidewalk, roadway, shoulder, alley, slab, Footing, canal embankment, or when within 2 feet of above.	95%
II	Within any gas, electric, or telephone utility easement, Or within any street or road right-of-way outside the limits defined above as Type I.	90%
III	All other locations not defined above as Type I or Type II.	80% (or 100% of adjacent natural ground)

B. **Reference Densities/Baseline Testing:** The Contractor, at his expense, shall provide the reference densities for the various bedding and backfill materials used. All tests shall be performed by a certified soils testing laboratory approved by the Owner or Owner’s Representative. If reference to natural ground is used, a nuclear gauge may be used to measure the density of the natural ground. The reference densities for compaction tests shall be established in accordance with ASTM D-698, Modified Proctor Test. The Contractor shall submit for approval a testing plan identifying proposed testing locations prior to the start of any excavation work.

Contractor shall provide copies of the Modified Proctor Tests with 5 point minimum moisture vs. density curves.

The contractor shall coordinate the collection of soil samples for proctor testing with the IHS construction inspector such that both parties are on-site during the collection of soil samples. This will ensure that enough samples are collected to provide for accurate density testing during construction by providing reference density for differing soil conditions within the project area.

C. Methods: Mechanical compaction is permitted. Water jetting methods are not permitted. The backfill shall be uniformly moistened to plus or minus 2% of optimum moisture content, placed in sufficiently thin layers to obtain the specified results, and compacted with hand and/or pneumatic tamp, roller, hydrohammer, or other device which will obtain the specified density without injury to the pipe or related structures.

D. Density Tests: Backfill density tests shall be performed in accordance with the latest versions of ASTM D-1556 (Sand Cone Method), ASTM D-2167 (Rubber Balloon Method), ASTM D-2216 (Moisture Content), ASTM D-2922 (Nuclear Density), and ASTM D-3017 (Nuclear Moisture Content). The Contractor will perform initial field density tests for each location listed in the next paragraph at the expense of the Contractor. Any additional tests due to failure of initial tests shall be at the expense of the Contractor.

The Contractor will perform at least one (1) compaction test every other lift at each two hundred and fifty (250) linear feet of Type I location. One compaction test will be performed every other lift on each five hundred (500) linear feet of trench at Type II or III locations. A minimum of one (1) compaction test shall be performed under each lift station base and a minimum of four (4) compaction tests shall be performed on each lift of material under proposed foundations or tanks. The exact test locations shall be specified by the Owner or Owner's Representative. The Owner may perform additional tests. If the results of any of the compaction tests indicate insufficient compaction, the area in question shall be reopened to a depth required for proper compacting, then refilled, compacted and retested, at the expense of the Contractor, until the compaction tests indicate that the necessary compaction requirements have been met. Two copies of the test results of any retesting performed by the Contractor shall be provided to the Owner, for approval, prior to any permanent surfacing. Any improperly placed backfill, or locations where settlement occurs, shall be reopened to the depth required for proper compaction, then refilled and compacted at the expense of the Contractor. The surface shall be restored and resurfaced, if necessary to the required grade.

TP-110 DISPOSAL OF EXCESS MATERIAL:

Excess material, including rock, broken concrete, bituminous materials, debris or other materials not suitable for backfill, shall be removed from the site and wasted in the disposal areas selected by the Contractor and approved by the Owner or Owner's Representative.

The disposal of such excess materials will not be paid for separately, but shall be considered as incidental to and a part of the cost for the applicable contract bid item.

TP-111 CLEANUP:

Upon completion of the work, the entire site shall be cleared of all debris, and ground surfaces shall be finished to smooth, uniform slopes and shall present neat and workmanlike appearance. All slopes shall be trimmed and dressed, and all surfaces graded such that effective drainage is assured.

Unpaved streets shall be graded smooth to the satisfaction of the Owner or Owner's Representative.

TP-112 TRENCH MAINTENANCE:

The Contractor shall, for a period of one year after completion and final acceptance of the work, maintain and repair any trench settlement that may occur and shall make suitable repairs to any pipe, pavement, or other structures that may become damaged as a result of backfill settlement.

TP-113 STORM WATER POLLUTION PREVENTION PLAN (SWPPP):

The Contractor shall prepare a Storm Water Pollution Prevention Plan (SWPPP) in accordance with the latest requirements of the Environmental Protection Agency's (EPA) National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges from Large and Small Construction Activities. The SWPPP must be prepared in accordance with good engineering practices and must 1) Identify all potential sources of pollution which may reasonably be expected to affect the quality of storm water discharges from the construction site; 2) Describe practices to be used to reduce pollutants in storm water discharges from construction site; 3) Assure compliance with the terms and conditions of the NPDES General Permit.

If the Contractor is not experienced in the preparation of SWPPP, the contractor shall retain the services of an environmental firm regularly engaged in the preparation of

SWPPP to perform said service. The completed SWPPP must be approved by the Owner or Owner's Representative at least 14 calendar days before the start of construction so that a Notice of Intent can be sent to EPA.

The Contractor shall fully implement the SWPPP from the commencement of construction until final stabilization, as defined in the NPDES General Permit is achieved.

The Contractor shall maintain and update the SWPPP, as required in the NPDES General Permit, for the life of the project. Updates shall include amendments required as a result of the ineffective controls discovered through the course of inspections or investigations conducted by the Owner or Owner's Representative, site staff, or by local, state, tribal or federal officials. The Contractor shall submit a Notice of Intent to EPA to obtain permit coverage, modify the coverage as necessary, and terminate permit coverage once final stabilization is achieved.

TP-114 LINES AND GRADES:

The Engineer will give all lines, grades and building locations on the plans and will supply the contractor with the AutoCAD drawing to stake out the facilities to be installed. The CONTRACTOR shall be responsible for staking out pipeline centerlines with a lath every 200 feet or line-of-sight whichever is less. Bends, intersections, manholes, lift station centers and fence corners shall be staked by the CONTRACTOR and provided with two offsets for alignment. Elevation references will be provided as shown on the plans, at lift station and for sewer manholes. The Contractor shall be responsible for the preservation of the location and line and grade stakes when set, and if disturbed, shall have such stakes replaced.

TP-115 CLEARING & GRUBBING:

It is the contractor's responsibility to clear and grub the site prior to or during construction. The contractor shall remove all trees along the water and sewer main alignments. Trees may either be chipped with a woodchipper and placed over the trench for erosion control or disposed of at the Contractor's expense. Clearing and grubbing shall be done at the contractor's expense.

TP-116 SEEDING:

All disturbed areas shall be returned to their pre-construction vegetative state. The contractor shall submit a seed mix that is equivalent to the native vegetation in the

area of construction. The contractor shall protect the seed after it is placed with hay mulch, straw mulch, wood cellulose mulch, or as approved by the project engineer. A minimum of 20 pounds of seed per acre shall be placed. Seed shall be placed by either drill seeding at a depth of approximately 1 inch or broadcast seeding. If broadcast seeding is utilized, the contractor shall apply twice the minimum seeding rate (40 pounds of seed per acre). The contractor shall perform maintenance as needed to ensure that adequate vegetative growth and stabilization has taken place to minimize erosion after construction is completed.

TP-117 FROST PROTECTION:

- A. Materials: The insulation shall be rigid extruded polystyrene insulation board, having a minimum compressive strength of 25 psi. The width shall be 2 feet for mains, service lines and effluent discharge lines less than 6-inches (nominal diameter). The thickness shall be 2-inches.
- B. Placement: When indicated on the drawings and in the bid schedule, insulation shall be placed in areas where water lines, sewer lines, or effluent discharge lines are susceptible to freezing. The insulation shall be centered over the main with no more than 6 inches of compacted fill between the pipe and insulation. The Contractor shall grade fill so insulation lays flat and maintain a straight alignment of insulation. The Contractor shall lap insulation by 6 inches or stagger by 6 inches if composed of two layers. The thickness for the first lift of backfill over the insulation shall be a minimum of 8 inches. The Contractor shall not operate construction equipment directly on insulation and not compact the first lift with the backhoe-mounted compactor, or any other large compaction equipment. The remaining backfill shall be compacted using normal construction practices.

TP-118 REPAIRS TO DAMAGED UTILITIES

The contractor is responsible for repairing any utilities that they damage during construction at no cost to the Owner. Repairs shall be made in accordance with the requirements of each utility. Below are the requirements for making repairs to damaged water and sewer utilities.

Water Mains: If the damage is small a small crack or hole in the water main, the contractor shall install a stainless steel repair coupling equal to a Romac SS1, SS2, or SS3. If the damage is too large to repair with a repair coupling, the Contractor shall install new water main to replace the damaged water main. The repair must result in a watertight water main that does not leak. The new water main shall be DR-18, Class 235, C900 PVC water main per TP-4. The new water main shall be connected to the existing water main using restrained joint solid sleeve couplings equal to

Romac Alpha series restrained couplings.

Water Service Lines: If the damage is small a small crack or hole in the water service line, the contractor shall install a stainless steel repair coupling equal to a Ford Small Repair Clamp with Full Wrap Gasket FSC. If the damage is too large to repair with a repair coupling, the Contractor shall install new water service line to replace the damaged water service line. The repair must result in a watertight water service line that does not leak. The new water service line shall be 200 psi rated polyethylene water service line meeting TP-5 requirements. The new water service line shall be connected to the existing water service line using stab joint, compression joint, or pack joint brass fittings as specified in TP-5.

Sewer Mains & Service Lines: If the damage is small a small crack or hole in the sewer main or service line, the contractor shall install a stainless steel repair coupling equal to a Romac LSS1, LSS2, or LSS3. If the damage is too large to repair with a repair coupling, the Contractor shall install new sewer main or service line to replace the damaged sewer main. The repair must result in a watertight sewer main or service line that does not leak. The new sewer main shall be SDR-35 PVC sewer main meeting TP-6 requirements and the new sewer service line shall be SDR-35 PVC sewer service line meet TP-7 requirements. The new sewer main or service line shall be connected to the existing sewer main using solid sleeve couplings equal to Romac 501 sewer couplings.

TP-119 AS-BUILT DRAWINGS:

- A. General: The as-constructed drawings shall be a record of the construction as installed and completed by the Contractor. They shall include all the information shown on the Contractor's set of drawings and a record of all deviations, modifications or changes from those drawings, however minor, which were incorporated in the work, all additional work not appearing on the contract drawings and all changes which are made after final inspection of the contract work.
- B. As-Built Drawings: The Contractor shall mark up one set of paper prints to show the As-Built Drawing information. These Asbuilt Drawing prints shall be kept current and available on the job site at all times. All changes from the contract plans which are made in the work or additional information which might be uncovered in the course of construction shall be accurately and neatly recorded as they occur by means of details and notes. No construction work shall be concealed until the necessary record data has been recorded. The Asbuilt Drawing marked prints will be jointly inspected for accuracy and completeness by the Owner and a responsible representative of the construction Contractor prior to submission of each partial payment, as evidenced by the issuance of a receipt by the Owner indicating the adequacy of the information. Failure to keep the as-constructed marked prints on a

current basis shall be sufficient justification to withhold approval of request for payment or suspend pay estimates. The drawings shall show the following information, but not limited thereto.

1. The location and description of any utility lines or other installations of any kind or description known to exist within the construction area. The location includes dimensions to permanent features.
 2. The location and dimensions of any changes from the contract drawings.
 3. Changes in details of design or additional information obtained from working drawings specified to be prepared and/or furnished by the Contractor including but not limited to fabrication, erection, installation plans, and placing details, pipe sized, insulation materials, dimensions of equipment foundations, etc.
 4. All changes or modifications which result from the final inspection.
 5. All information as required in the technical provisions.
- C. Electronic/Surveyed As-built Drawings: The contractor shall obtain the services of a surveyor licensed in the State of New Mexico to survey in the locations of all sanitation facilities installed by the project being constructed. The number and location of surveyed points must be sufficient to provide enough detail to accurately identify the location of the installed sanitation facilities. Points to be surveyed shall include, but not be limited to:

Water Mains & Services: gate valves, fire hydrants, flush hydrants, water meters, air/vacuum release valves, water/sewer crossings, water main bends, water service line connection, water main intersections, casing pipe, water main reducers, and other water main components installed under this project.

Other Water Facilities: wells, booster pumps, valve vaults, building corners, fence corners, water tanks (including base and overflow elevations), and other water main components installed under this project.

Sewer Mains & Services: manholes (including rim elevation, invert in elevation, and invert out elevation), terminal sewer main cleanout rim and invert, sewer service cleanout, new sewer service line connection, and other sewer components installed under this project.

Other Sewer Facilities: lift stations (including base elevation, rim elevation, invert in elevation, lead/lag pump on elevation, all pump off elevation, and high/low alarm elevation), valve vaults, gate or plug valves, air/vacuum valves, building corners, fence corners, treatment tanks (including rim elevations, invert in elevations, and

invert out elevations), treatment units, lagoons (including floor elevation, top of berm elevation, and invert elevations of all piping in transfer structures), and other sewer components installed under this project.

The contractor shall furnish the Owner with electronic asbuilts of the facilities installed on this project in ACAD format (dwg file). The project engineer will furnish the contractor with an electronic copy of the contract drawings in ACAD format and will provide control points for use by the contractor to draft the electronic asbuilt drawings. The labeling, linework, and format of the electronic asbuilts shall be similar to that of the contract drawings.

- D. Review and Approval: One set of the preliminary As-built Drawings marked prints shall be delivered to the Owner before final inspection for his review and approval. The review by the Owner will be expedited; however, the Owner cannot guarantee to review more than one complex mechanical or electrical Record drawing sheet per working day. Upon disapproval of the As-built Drawings one set of marked prints will be returned to the Contractor for further work and resubmitted to the Owner.
- E. Other: All costs incurred by the Contractor in the preparation and furnishing As-built Drawings shall be included in the contract price and no separate payment will be made for this work.

TP-119 MEASUREMENT AND PAYMENT:

- A. General: Except for the following items, the cost of all work done by the Contractor as required under Section 01 of the Technical Provisions shall be merged with the pay items defined within the Measurement and Payment portions of other Sections of this contract.
- B. Rock Excavation: Payment for rock excavation shall be at the unit price listed in the Bid Schedule based on the computed number of cubic yards removed. No differentiation payment will be made between solid or loose rock excavations.
- C. Dewatering: Dewatering shall be based on the actual number of lineal feet completed. Payment for dewatering shall be at the contract unit price shown in the Bid Schedule. This price shall be full compensation for furnishing all labor, equipment, materials, and incidentals required for a complete dewatering installation.
- D. Mobilization/Demobilization: Payment for mobilization/demobilization shall be at the unit price listed in the bid schedule. 60% of this line item may be requested upon complete mobilization to the job site and the remainder may be requested upon demobilization from the job site.

E. Storm Water Pollution Prevention Plan: Payment for the preparation and implementation of the SWPPP shall be paid on a lump sum basis as shown on the Bid Schedule. Payment shall be full compensation for plan preparation including required revisions for Owner's acceptance, updates to the SWPPP for the life of the project, permit application, inspections, installation and maintenance of controls, modification of controls as determined by inspections, removal of pollutants due to failed controls, and permit termination.

F. Seeding: Seeding shall be paid for on a lump sum basis to seed the site in accordance with these specifications. Payment for seeding shall be at the contract unit price shown in the Bid Schedule. This price shall be full compensation for furnishing all labor, equipment, materials, and incidentals required for complete installation.

G. Exploratory Time: Exploratory time shall be measured on an hourly basis for an actual period spent on locating the existing utility line exceeding two hours. Contractor shall follow these steps:

1. Call the representative from the operating Utility and make every effort to locate the existing utility line prior to excavation.
2. Locate the existing utility line for two hours at the Contractor's expense.
3. If the Contractor is unable to locate the existing utility line within two hours, the Contractor shall notify the Owner or Owner's Representative and both agree upon a start time. The start time shall be recorded. When the Contractor locates the existing utility line, the end time shall be recorded.

If the Contractor fails to notify the Owner or Owner's Representative when the Contractor will start locating the existing utility line, the Contractor will not be compensated. Payment for exploratory time shall be at the contract unit price shown in the Bid Schedule. This price shall be full compensation for furnishing all labor, equipment, materials, and incidentals required for locating the existing utility line.

H. Frost Protection: Payment for frost protection shall be based on the actual number of lineal feet completed. Payment for frost protection shall be at the contract unit price shown in the Bid Schedule. This price shall be full compensation for furnishing all labor, equipment, materials, and incidentals required for a complete installation.

TP-120 APPROVALS:

- A. Stabilization material, if required
- B. Bedding material, if required

- C. Rock excavation method, if required
- D. Dewatering procedures, if required
- E. Baseline Proctor density test results (5 point moisture density curves)
- F. Baseline testing location plan
- G. Soil Testing Lab Certification
- H. Stormwater Pollution Prevention Plan, if required
- I. Blasting contractor and credentials, if required
- J. Seed Mix
- K. Insulation, if required
- L. Traffic control plan, if required

TECHNICAL SPECIFICATIONS

SECTION 07 - SEWER SERVICE LINES

TP-700 GENERAL:

The Contractor shall provide all labor, equipment and materials required to install the residence sewer service line indicated on the site layout plans. Installation shall include necessary fittings for connection to the building sewer stubout, tapping of the sewer, installation of the wye or tee as required. All permits, permissions or other authorizations required by the tribal or municipal utility authority for tapping and connection are the responsibility and cost of the Contractor.

TP-701 MATERIALS:

All pipe and fittings required for completion of the sewer service line installation shall meet the requirements of the latest revision of ASTM D 3034. All service line piping shall be 4 inches PVC unless otherwise directed. Pipe shall be nominal size, SDR-35, 0.125-inch minimum wall thickness.

TP-702 INSTALLATION:

Trenching and excavation for sewer service lines shall be in accordance with the provision of Section 01 . The grade from building to sewer main connection shall be uniform and not less than 2 percent. Any changes or deviations in line shall be made with bends not exceeding an angle of 45 degrees.

TP-703 CLEANOUTS:

Sewer service line cleanouts will be installed at the locations indicated in the plans. The cleanout shall be constructed of SDR-35 PVC with a cast iron ferrule equal to a Tyler 2-11. The cleanouts shall be installed with a brass hex socket plug equal to Tyler A Low Square Head cleanout plug. A clear silicon lubricant shall be applied to the cleanout plug to allow for easier removal. The cleanouts shall be constructed in the manner indicated in the detail drawings.

TP-704 SEWER MAIN CONNECTION:

Sewer service line connections to main lines shall be made in accordance with the details as shown on the drawings, or as indicated by the Owner or Owner's Representative. The Contractor shall connect the service line to the main with the appropriate sized sewer saddle or sewer wye as shown on the detail drawings. Sewer saddles shall be stainless steel wye type saddles as manufactured by Cascade Waterworks or equal. The time and method of connection to existing mains shall be approved by the Owner or Owner's Representative prior to such connection. In no case shall a tapping method be approved that does not provide for a water tight connection to the sewer main.

TP-705 WATER AND SEWER CROSSINGS:

Where water service lines must cross sewer service lines or mains, and the water line is not a minimum of 18 inches above the sewer service line or main, special protection is required. In these instances, the sewer service line or main shall be reconstructed of ductile iron pipe of the same size as the original sewer service line or main for a distance of 10 feet on either side of the water/sewer crossing point. All existing sewer grades shall be maintained.

Water and Sewer Service Line Separation Within 5 ft. of House: This section shall apply to that portion of water and sewer service lines located within five feet of the house. All lines within five feet of the house will be considered as part of the house plumbing. For new construction all service lines shall have 10 foot minimum horizontal separation.

This can best be accomplished by having the water and sewer service lines exit the house 10 feet apart or from different sides. If the 10 foot separation cannot be maintained, and prior written approval is obtained from the Owner or Owner's Representative, and the top of the water service line is at least 12 inches below the bottom of the sewer service line, and the water and sewer service lines are continuous with no joints until the 10 foot separation requirement is met, service lines can be laid closer together than 10 feet.

TP-706 SEPTIC TANK ABANDONMENT

Where shown on the drawings and on the bid schedule, the contractor shall abandon existing septic tank(s) by pumping the tank, knocking a hole in the bottom of the tank to prevent accumulation of water, crush the top of the tank, and backfill with native fill material. The septic tank shall be pumped by a licensed septic tank pumping company and the septage shall be hauled to an approved septage disposal site.

TP-707 AS-BUILT DRAWINGS:

As-built drawings to be furnished by the Contractor for sewer service lines shall include two swing ties from permanent structures or facilities to each of the following:

- A. Tapping point at sewer main
- B. Intersection point with other utilities
- C. Location of cleanouts
- D. Point of connection to the house stubout.

TP-708 MEASUREMENT AND PAYMENT - SEWER SERVICE LINES:

- A. Sewer Service Line: PVC sewer service pipe shall be measured in linear feet along the

centerline of the pipe, including fittings. Payment for sewer service lines shall be at the contract unit price shown in the Bid Schedule, this price being full compensation for furnishing all labor, equipment, materials, and incidentals required for a complete installation; including, excavation, bedding, stabilization material, pipe, sewer saddle or sewer wye, connections to the sewer service cleanout, fittings, trench backfilling, as-builts, and final clean-up.

- B. Cleanouts: Payment for sewer service cleanouts shall be at the contract unit price shown on the Bid Schedule, and shall be full compensation for furnishing all labor, equipment, materials, and incidentals required for complete installation; including, excavation, connections to the tight line and house plumbing, as-builts, and final clean-up.

- C. Septic Tank Abandonment: Payment for abandonment of the existing septic tank shall be at the contract unit price per job and shall be full compensation for pumping and crushing the existing concrete tank, backfilling the void left by the tank, and compacting the soil to prevent subsidence and to bring it to the same level as the surrounding grade. If the existing septic tank is any material other than concrete, the Contractor shall be paid at the contract unit price per job to pump and remove the existing septic tank. The Contractor shall be responsible for all costs associated with the removal, including, but not limited to transporting and disposing of the septic tank at a State licensed and approved waste disposal site located off the particular reservation where the work is to be performed. The payment shall also be full compensation for backfilling the void with soil from the designated area, and compaction to prevent subsidence and to bring it to the same level as the surrounding grade.

TP-709 SUBMITTALS:

All materials listed below will require that a submittal be provided to the Owner for approval prior to the start of any construction requiring those materials.

- A. PVC Sewer Pipe for Service Lines
- B. Service Line Cleanout
- C. Sewer Main Saddle or Wye and Fittings
- D. Permits - if required

TECHNICAL PROVISIONS

SECTION 12- NON-AGGREGATE SEWAGE DISPOSAL SYSTEMS

TP-1201 SCOPE:

The work covered by these specifications includes the furnishing of all labor, tools, equipment, material and performing all operations necessary to construct non-aggregate type individual sewage disposal facilities at indicated individual homesites and shown in the site plans.

TP-1202 GENERAL:

The individual sewage disposal systems and related facilities shall be constructed at the locations and of the sizes shown on the site plans. Field changes in location and orientation may be directed by the Owner or Owners Representative at the time of construction but shall not alter the total area of drainfield required. Excavation, trenching, and backfilling shall be in accordance with Section 01 of the Technical Provisions unless specifically altered under other requirements of this specification section.

TP-1203 MATERIALS:

- A. Pipe and Fittings: Solid pipe and fittings utilized for septic tank and drainfield construction including sewer service line, cleanouts, distribution piping, observation ports and appurtenances shall be 4 inches diameter PVC pipe, conforming to ASTM 3034, SDR 35, unless otherwise noted on the drawings or bid schedule. All 4-inch perforated PVC pipe shall be solvent-weld joints, conforming to ASTM 3034, SDR 35. Perforations shall be 1/2 to 5/8 inch diameter holes on 5-inch centers in two rows spaces 90 to 120 degrees apart.
- B. Cleanouts: Sewer service line cleanouts will be installed at the locations indicated in the plans. The cleanout shall be constructed of SDR-35 PVC with a cast iron ferrule equal to a Tyler 2-11. The cleanouts shall be installed with a brass hex socket plug equal to Tyler A Low Square Head cleanout plug. A clear silicon lubricant shall be applied to the cleanout plug to allow for easier removal. The cleanouts shall be constructed in the manner indicated in the detail drawings.
- C. Septic Tank: Septic tanks shall be dual compartment with a minimum of 1000 gallon liquid capacity as measured below the invert of the outlet. The actual size of the septic tank shall be as shown on the drawings and in the bid schedule. The tanks, as shown in the detail drawings, shall be constructed of precast, reinforced concrete of sufficient strength to withstand hauling and handling stresses and shall meet all regulations of the State Health Department for the state which it is installed. Septic tanks shall be water-tight and shall have a 28 day compressive strength of at least 3,000 psi. All concrete used for septic tanks shall be batched with a chemical resistant admixture for protection against hydrogen sulfide gas. The admixture shall be equal to Moxie 1800 Super-Admix as manufactured by Moxie International.

If noted in the Statement of Work or site plans, some sites may require installation of a special low profile septic tank. These tanks shall comply with all provisions for a

standard tank but shall require a bury depth of no greater than 48 inches.

- D. Effluent Filter: Effluent filters shall have a minimum diameter of 4 inch and a maximum filtration size of 1/16 inch. The filters shall be designed for a maximum daily flow of 800 gallons per day. The effluent filters shall be equal to a Zabel Filter Model A1800.
- E. Septic Tank Manhole Risers: Manhole risers, a minimum of 24 inches in diameter, must be provided to provide access to the effluent filter and the inlet of the septic tank for pumping purposes. Risers shall be corrugated HDPE with a Polylok 24" HDPE heavy cover, part # 3008-HD, with stainless steel locking screws or equal.
- F. Distribution Boxes: Distribution boxes and covers shall be constructed in general conformance with the configuration indicated in the detail drawings with discharge hole locations as required to maintain design elevations. Boxes shall be fabricated from pre-cast concrete or injection molded HDPE with a separate outlet for each drainfield lateral. Each outlet shall be fitted with a speed leveler, as manufactured by Tuf-Tite or equal to facilitate equal distribution of effluent to each drainfield lateral. Concrete boxes shall be manufactured by a fabricator routinely involved in construction of distribution boxes and shall contain sufficient interior steel reinforcing sufficient to facilitate handling. Chipped and honey combed boxes shall not be approved. All concrete used for concrete distribution boxes shall be batched with a chemical resistant admixture for protection against hydrogen sulfide gas. The admixture shall be equal to Moxie 1800 Super-Admix as manufactured by Moxie International.
- G. Distribution Box Risers: Distribution box risers shall be installed to provide access to the distribution box from the surface. Risers shall be at least the same dimensions as the distribution box and shall be attached to the distribution box to provide a watertight attachment. The distribution box cover shall have an effective locking device which meets the Owner or Owner's Representative's approval. Risers shall be corrugated HDPE with a Polylok 24" HDPE heavy cover, part # 3008-HD, with stainless steel locking screws or equal.
- H. Manufactured Chambers: Drainfield chamber sections shall be constructed of high strength polyethylene plastic. Chambers shall be high capacity chambers equal to INFILTRATOR Quick4 Plus High Capacity Chambers (34" wide x 53" long x 14" high), ADS Arc 36 HC Chambers (34.5" wide x 63" long x 16" high), or approved equal. A minimum loading rating of AASHTO H-10 shall be required for wheel load protection.
- I. In-Drain Modules: In-Drain modules shall be constructed of recycled plastic fins inner woven with bio-Matt and securely banded together into rigid modules, Eljen Type B or approved equal. Each module shall have the approximate dimensions of 36 inches wide by 48 inches long by 7 inches tall/deep.
- J. Pea Gravel: Pea gravel shall be clean washed pea gravel between 1/8" to 1/4" inches in diameter.

- K. Filter Fabric: Should filter fabric soil protection be recommended by the chamber manufacturer as an integral part of the drainfield installation, the fabric material shall be a synthetic geotextile specifically intended for drainfield use as manufactured by Hancor, Inc. or approved equal. Fabric shall be approved by the Owner or Owner's Representative.
- L. Sand: The sand layer under the In-Drain modules shall be washed concrete sand. The sand shall be medium to coarse with an effective size of .25 to 2.0 mm and no more than 5% passing a #200 sieve and no more than 10% passing a #100 sieve.
- M. Gravel: Gravel for splash pads shall be clean, hard, durable and free of fines, coal, clay or other soft fragments and shall meet the approval of the Owner or Owner's Representative. Gravel shall vary in size from 3/4-inch to 1-1/2-inch.
- N. Geosynthetic Aggregate: Drainfield sections shall be constructed of EZ flow manufactured 12 inch diameter bundles as manufactured by INFILTRATOR, or approved equal. The internal perforated pipe and coupling shall meet ASTM F405 and shall be 4 inches in diameter. The internal perforated pipe shall be surrounded with Styrofoam packing material that is encased within durable high strength netting material.
- O. Observation Pipe: Observation pipes shall be constructed of solid 4 inch Schedule 40 PVC pipe and installed at the locations indicated on the drawings.

TP-1204 INSTALLATION:

- A. Sewer Service Lines: All lines leading from the building stubout to the septic tank and from the septic tank to the distribution box shall be 4 inch solid, PVC pipe, laid at a minimum grade of 2%. The sewer service line shall be sealed with a rubber gasket or masonry grouted at connection points to the inlet and discharge openings of the septic tank. Grout shall conform to Section 02 of the Technical Provisions.

Plastic pipes with scratches, gouges, or grooves deeper than 10 percent of the wall thickness shall be rejected. Pipe joints and fitting installation shall be in accordance with manufacturer's recommendations. All pipes shall be approved by the Owner or Owner's Representative prior to backfilling.

- B. Septic Tank: The septic tank shall be installed at the location shown in the plans and detail drawings. Excavation shall be the minimum required to provide placement of the tank. Prior to setting the tank, all rocks and other foreign material which might damage the tank upon placement shall be removed from the hole. The contractor shall set the tank on a 6-inch thick minimum bed of sand or gravel to facilitate leveling the tank. Prior to backfilling, the tank elevation shall be checked at all corners to assure that placement is level. Final backfill material shall be mounded 6 inches above the natural ground surface to allow for settlement. An effluent filter shall be installed on the septic tank outlet to prevent grease and solids carryover into the drainfield.

The Contractor shall install an approved covered riser which will provide access to the tank not more than 6 inches above nor less than 1 inch above finished grade. The riser system the Contractor proposes to use shall be submitted with the septic tank drawing and specifications for approval by the Owner or Owner's Representative. At a minimum, access risers shall be provided for the inlet and outlet of the septic tank. All septic tank risers shall be connected to the top of the tank with a Ram-Nek flexible gasket as manufactured by K.T. Snyder Company or equal and grouted to the top of the tank. A 3/8 inch minimum diameter rope shall be attached to the septic tank access cover and shall extend to within 6 inches of grade. The rope shall be secured to the inside septic tank riser to facilitate the removal of the access cover inside the riser. During and after construction the Contractor shall avoid driving over the tank.

- C. Distribution Boxes: Distribution boxes shall be placed at the location indicated in the plans and detail drawings. The boxes shall be set on a 6 inch minimum bed of sand or gravel to facilitate leveling. Distribution boxes shall be installed level to assure that equal distribution is provided to each drainfield lateral. Equal distribution shall be checked by the Contractor in the presence of the Construction Inspector by filling the box with water to indicate equal overflow to the drainfield. The speed levelers shall be adjusted as needed to obtain equal flow to each drainfield lateral.

Any unused outlet openings shall be left sealed or shall be grouted as directed by the project engineer. The distribution box shall be installed such that the top of the distribution box is between 1 and 3 inches above finished grade. Distribution box extension collars shall be installed if necessary to bring the access cover up to grade.

The distribution box riser shall be connected to the top of the tank with a Ram-Nek flexible gasket as manufactured by K.T. Snyder Company or equal and grouted to the top of the tank. During and after construction the Contractor shall avoid driving over the tank.

- D. Chamber Drainfield: Chamber drainfields shall be constructed in accordance with the detail drawings. Trenches for installation of the chamber sections shall be excavated to the elevation indicated by the Owner or Owner's Representative and shall be maintained at a level grade throughout the entire length. Chamber sections shall be checked with a construction level upon placement to preclude high or low sections. All smeared or compacted surfaces of the bottom or side walls shall be raked to a depth of 3 inches and loose material removed before the infiltration chambers are placed in the trench.

Distribution piping to and between chamber trenches shall be connected in accordance with the chamber manufacturer's recommendations. End caps shall be installed at the end of each drainfield lateral as recommended by the chamber manufacturer. Each row of leaching chambers shall contain a splash plate on the native soil within the leaching chamber where the effluent pipe enters the chamber to prevent erosion. This splash plate may be a splash plate made by the manufacturer of the leaching chamber, a concrete block, or a patio block, as approved by the project engineer. Backfill material shall be hand selected to be free of organic and other potentially clogging material and hand placed to a point 3 inches above the

highest chamber perforation. The remaining backfill material may be mechanically placed. Trench backfill material shall be mounded 6 inches above the natural ground surface to allow for settlement.

- E. In-Drain Modules: In-Drain modules shall be constructed in accordance with the detail drawings for each site. Trenches for installation of the modules shall be excavated to the elevation indicated by the Owner or Owner's Representative and shall be maintained at a level grade throughout the entire length. In-Drain modules shall be checked with a construction level upon placement to preclude high or low sections. All smeared or compacted surfaces of the trenches or bed shall be raked to expose the natural texture of the soil. All loose material shall be removed from the trench before the sand is placed.

The bottom of the trench shall be covered with a 6-inch minimum depth lift of sand. The lift shall be leveled (but not compacted) by hand to within 1-inch throughout the entire length of the trench. The In-Drains shall then be placed end to end on the sand. The 4-inch perforated pipe shall be centered over the In-Drains with the perforations facing downwards in the 5 and 7 o'clock positions and shall be secured to the In-Drain Module with one clamp (supplied by manufacturer) per In-Drain unit.

The cover fabric shall then be placed over the rows of In-Drains. Drape the fabric straight down over the pipe. The fabric shall be secured with hand shoveled sand. Place sand a minimum of 6-inches at the sides of the trench up to the top of the In-Drain units.

The trench shall then be backfilled with clean, porous material devoid of any rocks larger than 3 inches and not compacted. The top shall then be mounded with an 8 to 12-inch crown and shall not be compacted. No mechanical or vehicular traffic shall be used to compact the trench. Backhoes shall not be allowed on trenches during or after the backfilling operation.

For installations greater than 18 inches deep, the contractor shall install a layer of pea gravel over the top of the geotextile that covers the perforated pipe on top of the In-Drain Modules. The pea gravel layer shall be installed to the depth needed such that the clean backfill material layer doesn't exceed 18 inches. In no circumstances shall the In-Drain Modules be buried deeper than 4 feet. When pea gravel is installed, the contractor shall also install air vents at the end of each row of In-Drain Modules. The air vents shall consist of 4" solid PVC pipe with a gooseneck screened vent a minimum of 18 inches above grade.

- F. Filter Fabric: Filter fabric shall be installed in accordance with chamber/In-Drain module manufacturer's recommendations.
- G. Cleanouts: A double service line cleanout shall be provided on the sewer service line between house and septic tank and at every change of sewer service line direction or as directed in the plans and detail drawings. All required fittings shall be in conformance with the provisions of TP-1203.
- G. Observation Pipe: Observation pipes shall be installed at the locations indicated on the drawings. The pipe shall be installed through the knockout ports as shown on the

detail drawings. The observation pipe shall extend between 12 inches and 24 inches above ground surface. A PVC cap shall be placed on the top of the observation pipe without glue. Exposed PVC pipe shall be coated with 2 coats of paint. Paint shall be equal to Krylon Fusion brand spray paint for plastic. Paint color shall be white. The observation pipes shall be constructed in the manner indicated in the detail drawings. The observation pipes must be stabilized as shown on the details drawings so that they don't pull out when removing the cap.

- I. Geosynthetic Aggregate: Geosynthetic Aggregate shall be constructed in accordance with the detail drawings for each site. Trenches for installation shall be excavated to the elevation indicated by the Owner or Owner's Representative and shall be maintained at a level grade throughout the entire length. Installation shall be checked with a construction level upon placement to preclude high or low sections. All smeared or compacted surfaces of the trenches or bed shall be raked to expose the natural texture of the soil.

Prior to placement, the contractor shall remove the plastic shipping wrap from the geosynthetic aggregate. The contractor shall place the geosynthetic aggregate with the geotextile fabric portion facing upwards to prevent the movement of soil into the geosynthetic aggregate. When multiple geosynthetic aggregate cylinders are stacked vertically, the upper geosynthetic aggregate cylinder shall be installed with the geotextile fabric portion facing upwards and each lower geosynthetic aggregate cylinder shall be installed with the geotextile fabric portion facing the side of the trench receiving the backfill.

The geosynthetic aggregate shall be connected to each other using the 4 inch diameter perforated pipe internal couplings provided by the manufacturer. The installation shall be in accordance with manufacturer's recommendations.

- J. Inspection: The Contractor shall provide the Owner or Owner's Representative with a minimum of 24 hours notice on the need for inspection prior to final backfill of the septic tank and drainfield installation. The sewer service lines, septic tank and drainfield shall remain uncovered until inspected and approved by the Owner or his/her representative. Backfill prior to such approval will be cause for rejection of the construction for payment until disputed sections are uncovered for inspection purposes. All such re-excavation shall be at the sole expense of the Contractor.

TP-1205 SEPTIC TANK ABANDONMENT

Where shown on the drawings and on the bid schedule, the contractor shall abandon existing septic tank(s) by pumping the tank, knocking a hole in the bottom of the tank to prevent accumulation of water, crush the top of the tank, and backfill with native fill material. The septic tank shall be pumped by a licensed septic tank pumping company and the septage shall be hauled to an approved septage disposal site.

TP-1206 AS-BUILT DRAWINGS:

As-built drawings shall be furnished for individual sewage disposal systems and shall include two

swing ties from permanent structures or facilities to each of the following:

- A. Inspection holes on the septic tank
- B. All cleanouts, bends and elbows
- C. Location of the drainfield header
- D. Intersections with other utilities

TP-1207 WATER AND SEWER CROSSINGS:

Where sewer service lines must cross water service lines or mains, and the sewer line is not a minimum of 18 inches below the water service line or main, special protection is required. In these instances, the sewer service line or main shall be reconstructed of ductile iron pipe of the same size as the original sewer service line or main for a distance of 10 feet on either side of the water/sewer crossing point. All existing sewer grades shall be maintained.

TP-1208 MEASUREMENT AND PAYMENT:

- A. Sewer Service Lines: PVC sewer service line pipe shall be measured in linear feet along the centerline of the pipe, including fittings. Payment for sewer service lines shall be at the contract unit price shown in the Bid Schedule. This price being full compensation for furnishing all labor, equipment, materials, and incidentals required for a complete installation; including, excavation, bedding, stabilization material, connections to the septic tank, cleanouts and drainfield, fittings trench backfilling, as-builts, and final clean-up.
- B. Cleanouts: Payment for sewer service cleanouts shall be at the contract unit price shown on the Bid Schedule, and shall be full compensation for furnishing all labor, equipment, materials, and incidentals required for complete installation; including, excavation, connections to the sewer service line, house plumbing, as-builts, and final clean-up.
- C. Septic Tanks: Payment for septic tanks shall be at the contract unit price shown on the Bid Schedule, and shall be full compensation for furnishing all labor, equipment, materials, and incidentals required for complete installation; including excavation, effluent filter, as-builts, and final clean-up.
- D. Septic Tank Manhole Risers: Payment for septic tank manhole risers shall be at the unit price shown on the Bid Schedule, and based on actual feet installed including one septic tank riser cover. Payment shall be full compensation for all materials, labor, and equipment required for a complete installation. **No separate payment for the cover shall be made.**
- E. Distribution Boxes: Payment for distribution boxes shall be at the contract unit price shown on the Bid Schedule, and shall be full compensation for furnishing all labor, equipment, materials, and incidentals required for complete installation; including, excavation, connections to the sewer service line and drainfield piping, as-builts, and final clean-up.
- F. Chamber Drainfields: Payment for chamber drainfields shall be made on a linear

foot basis measured to the nearest foot and includes costs for the installation of manufactured chambers, splash pads, end pieces, filter fabric (if required), observation pipes and all required piping and fittings. Compensation shall include all labor, equipment, materials, and incidentals required for complete installation; including excavation, backfilling, as-builts, and final clean-up.

- H. In-Drain Module Drainfields: Payment for In-Drain module drainfields shall be made on a linear foot basis measured to nearest foot and includes costs for the installation of the manufactured In-Drain Modules, sand, filter fabric, perforated pipe, clamps to secure perforated pipe to In-Drain units, observation pipes, and all required piping and fittings. Payment shall be full compensation for all plant, labor and material required for a complete installation; including excavation, backfilling, as-builts, and final clean-up.
- I. Geosynthetic Aggregate: Payment for geosynthetic aggregate drainfields shall be made on a linear foot basis measured to nearest foot and includes costs for the installation of the cylinders, observation pipes, and all required piping and fittings. Payment shall be full compensation for all plant, labor and material required for a complete installation; including excavation, backfilling, as-builts, and final clean-up.
- J. Water and Sewer Crossings - Sewer service lines: All costs associated with completion of water and sewer crossings shall be merged with other bid items and will not be considered a separate item for payment. No additional payment will be made for installation of ductile iron sewer pipe associated with water and sewer crossings.
- K. Pump and Fill Cess Pool: Payment for pumping and filling the existing cess pool shall be at the contract unit price per job and shall include costs for getting to and from the job site, the cost of the pump truck, labor, and filling the pit with approved fill.
- L. Septic Tank Abandonment: Payment for abandonment of the existing septic tank shall be at the contract unit price per job and shall be full compensation for pumping and crushing the existing concrete tank, backfilling the void left by the tank, and compacting the soil to prevent subsidence and to bring it to the same level as the surrounding grade. If the existing septic tank is any material other than concrete, the Contractor shall be paid at the contract unit price per job to pump and remove the existing septic tank. The Contractor shall be responsible for all costs associated with the removal, including, but not limited to transporting and disposing of the septic tank at a State licensed and approved waste disposal site located off the particular reservation where the work is to be performed. The payment shall also be full compensation for backfilling the void with soil from the designated area, and compaction to prevent subsidence and to bring it to the same level as the surrounding grade.
- M. Distribution Box Risers: Payment for the distribution box risers shall be at the contract unit price shown on the Bid Schedule, measured in vertical feet based on the actual quantity of risers installed, and shall be full compensation for furnishing all labor, equipment, materials, and incidentals required for complete installation;

including the risers, cover, connection to the distribution box, excavation, as-builts, and final clean-up. Payment shall be compensation for all materials and labor required to furnish and install the risers. **No separate payment for the cover shall be made.**

TP-1209 SUBMITTALS: All materials listed below will require that a submittal be provided to the owner for approval prior to the start of any construction requiring those materials.

- A. Sewer Service Line Pipe and Fittings
- B. Perforated Pipe
- C. Septic Tanks
- D. Effluent Filter
- E. Septic Tank Manhole Riser
- F. Distribution Box and Risers
- G. Drainfield Chambers/In-Drain modules/Perforated Pipe Encased in Netted Styrofoam Aggregate
- H. Filter Fabric (If required)
- I. Sieve Analysis of Sand for In-Drain modules

APPENDIX C

NAVAJO TRIBAL UTILITY AUTHORITY (NTUA)
TECHNICAL SPECIFICATIONS AND STANDARD
DETAILS FOR WATER & SEWER

NAVAJO TRIBAL UTILITY AUTHORITY CONSTRUCTION REQUIREMENTS

**Reviewed by:
NAVAJO NATION and HIS STANDARDS COMMITTEE**



TECHNICAL SPECIFICATIONS FOR MATERIALS AND WORKMANSHIP FOR WATER AND WASTEWATER FACILITIES

**Civil Engineering Department
Ft. Defiance, AZ**

REVISED SEPTEMBER 2008

**TECHNICAL SPECIFICATIONS FOR MATERIAL AND WORKMANSHIP
OF WATER AND WASTEWATER FACILITIES**

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DRAWING STANDARDS AND LEGEND

DEFINITION OF TERMS:

- Owner:** The organization or its representative authorizing and administering the construction project.
- Contractor:** The organization or its representative performing the construction.
- Operating Utility:** The organization or its representative operating the water and wastewater utility affected by the construction.
- Roadway Authority:** The authority or agency with jurisdiction over the roadway.
- Or Approved Equal (OAE):** A substitute in material that is considered by the **Operating Utility** to be equal to or better than the item listed in the specifications or standards.
- NTUA:** The utility owner, **Navajo Tribal Utility Authority**

TECHNICAL PROVISIONS 1.0

TP 1.0 EXCAVATION, TRENCHING, AND BACKFILLING FOR WATER AND WASTEWATER UTILITIES

1.01 Scope of Work

The work covered by this section includes the furnishing of all plant, labor, tools, equipment, and material, and performing all operations in connection with excavating, trenching, and backfilling, for installations of all water/wastewater utility pipelines, related structures, and accessories. This includes the necessary clearing and grubbing, pavement cutting, compaction, pavement restoration, grading, and cleanup, all in accordance with these Technical Provisions and applicable drawings. The final installation also shall meet the requirements of Section 2.0, Water, and Wastewater Line Separation Requirements.

If there is a conflict between these Technical Provisions and any other section of the specifications and/or drawings, then the most stringent, as determined by the Owner and/or NTUA shall apply.

1.02 Layout and Staking

All layout and staking for site work shall be performed by a licensed engineer or land surveyor, approved by the Owner and/or NTUA, who is to be paid by the Contractor, unless other arrangements are negotiated. Copies of survey notes shall be submitted to the Owner and the NTUA, with one or more copies remaining on the job site at all times.

1.03 Protection of Excavations

The Contractor shall provide suitable sheathing, shoring, and bracing to protect all excavations as required, to provide safe working conditions as directed by the NTUA. and in conformance with applicable OSHA and all other safety regulations. The Contractor at his expense shall repair damages resulting from settlements, slides, cave-ins, flooding, pipeline breaks, and other causes. Suitable signs shall be so placed as to show in advance where construction, barricades, or detours exists.

The Contractor shall at all times perform his work to insure the least possible obstruction to traffic, inconveniences to the general public and residents in the vicinity of the work, and to insure the protection of persons and property in a manner satisfactory to the Owner and the NTUA.. No road or street shall be closed to the public except with the permission of the proper authority. Fire hydrants on or adjacent to the work site shall be kept accessible to fire-fighting equipment at all times. Temporary provisions shall be made by the Contractor to insure the use of sidewalks, and the proper functioning of all gutters, sewer inlets,

drainage ditches, and irrigation ditches.

1.04 Protection of Existing Utilities

It shall be the Contractor's responsibility to determine the locations of all known existing underground utilities not shown on the drawings and to confirm the exact locations of those existing utilities shown on the drawings. All existing utilities shall be protected from damage, during excavation and backfilling of trenches and if damaged, shall be repaired at the expense of the Contractor.

1.05 Excavation

1.05.01 General

It is expected that all excavation required for the performance of the work shall be made by open cut methods unless otherwise specified and shown on the drawings or as required by applicable permits.

1.05.02 Grading and Stacking

All grading in the vicinity of the construction shall be controlled to prevent surface water from flowing into the excavation. Any water accumulated in the excavation shall be removed by pumping or other approved method. During excavation, material suitable for embedment and backfilling shall be piled in an orderly manner, a sufficient distance back from the edges of the bank to avoid overloading and to prevent slides or cave-ins. Material unsuitable for backfilling shall be hauled from the job site and disposed of by the Contractor at approved disposal sites.

1.05.03 Pavement Cutting

Where it is necessary to remove sections of asphalt pavement, the asphalt shall be clean-cut with approved equipment in a neat line 6 inches back from the outside edge of the excavation, in order to provide a key when restored.

Where it is necessary to remove sections of concrete pavement, the concrete shall be saw-cut to a depth of not less than 1-1/2-inches with neat vertical lines in such a manner that the adjoining surfaces will not be damaged.

1.05.04 Rock Excavation

If given special consideration, rock is considered to exist when excavation cannot be accomplished using a 790E John Deere Class

track hoe with a rock bucket, without stressing the machine. The NTUA shall be the sole party in determining the existence of rock and the appropriate means of removal. The quantity of rock shall be determined in cubic yards of material removed. All other trenching and excavations, regardless of materials encountered, equipments used, or methods required for excavation, will be unclassified.

1.05.05 Dewatering

The Contractor shall remove and dispose of all water entering the trenches and shall keep the trenches water free until the water or wastewater lines and other appurtenances are in place. In no case shall water, earth, or any foreign materials be allowed to enter the water or wastewater pipelines.

1.05.06 Excavation for Structures

Excavation for appurtenances such as manholes, valves, foundations, catch basins, culverts, subterranean formwork, and other structures shall be to the necessary depth and sufficient width to leave at least 12-inches of space between the structure's outer surface and the embankment or shoring used to stabilize the banks.

1.05.07 Over-Excavation

Whenever solid or loose rock, rocky soil with rocks larger than 3/4-inches in their largest dimension, or otherwise unsuitable soils which are incapable of properly supporting the pipe or structure are encountered in the trench bottom, all unsuitable material, as determined by the Owner and NTUA, shall be over-excavated to a minimum depth of 6-inches below the pipe or structure and removed.

Except at locations where over-excavation is required, care shall be exercised not to excavate below the depths indicated. In the event of accidental over-excavation, the trench bottom grade will be restored in the same manner as areas specified to be over-excavated.

1.05.08 Trench Excavation

The sides of all trenches for the installation of utility piping system shall be as nearly vertical as soil conditions will allow from ground level to the pipe. Except for the trenching of 1-inch water service lines, the width of the trench shall be a minimum of 16-inches and a maximum of 30-inches wider than the outside diameter of the pipe. Trench excavation shall be centered on pipe alignment such that a minimum clearance of 8-inches is provided on each side of the pipe. Trench width

above the level of the top of the pipe may be as wide as necessary for shoring or sheathing and for proper installation of the work.

The depth of all trenches shall be as indicated on the drawings. If not otherwise specified, the depth of all trenches shall be in accordance with the specifications for the installation of waterlines and wastewater lines.

Unless otherwise required by applicable permits, the maximum length of trench that may be left open at any one time shall not exceed 500 feet.

1.06 Placement and Compaction of Pipe Embedment and Backfill Material

1.06.01 Pipe Embedment

Pipe embedment: Pipe embedment is defined as that material required to bring the trench bottom up to surface grade and that material placed alongside and above the pipe to a level of at least 6-inches over the top of the pipe. Pipe embedment shall be selected earth or sand, which contain no stones, dry or frozen lumps greater than 3/4-inch in diameter, or other unsuitable material as defined by the NTUA. Embedment and the first 6-inches of backfill, above the top of the pipe in rock excavation shall be done in the presence of the NTUA. Any backfilling, done in violation of this provision shall be cause for removal and replacement of the embedment, at the expense of the Contractor even though the work is found to be in accordance with these specifications.

Bedding: Bedding is that portion of pipe embedment zone beneath the pipe. If the native soil is suitable for bedding, the bottom of the trench shall be accurately shaped to provide uniform bearing and support for the entire length of the pipe. Bell holes shall be excavated to provide minimum clearances of 2-inches below the couplings or bells. Imported bedding material shall likewise be placed to provide uniform and adequate longitudinal support under the pipe. Bedding material shall be placed and compacted in lifts not to exceed 6-inches in loose measure.

Haunching: Haunching is that portion of the pipe embedment zone from the bottom of the pipe to the spring line of the pipe. Haunching material shall be placed and hand tamped to provide adequate side support to the pipe while avoiding both vertical and lateral displacement of the pipe from proper alignment.

Initial Backfill: Initial backfill is that portion of the pipe embedment zone from the spring line of the pipe to a minimum of 6-inches above the top of the pipe. Initial backfill material shall be placed and compacted in lifts not to exceed 6-inches in loose measure. Compaction shall be performed in such a manner so as to avoid damage and

disturbance of the embedded pipe.

Final Backfill: Final backfill is defined as that material used in the area between the initial backfill and the existing ground surface. Material shall be placed and compacted in lifts not to exceed 6-inches in loose measure except as otherwise specified.

1.06.02 Compaction Requirements

Unless otherwise specified by permit issued by the roadway authority or by special arrangement between the NTUA, bedding, haunching, initial backfill, final backfill, and gravel resurfacing shall be compacted to the following percentages of the maximum density as determined by ASTM D1557. (If using Standard Proctor ASTM D-698, add 5% to all compaction requirements listed in the table below). In-place densities of materials shall be determined by the sand-cone method, ASTM D1556 or by the nuclear method, ASTM D2922.

Percent of Maximum Density - D1557

Backfill Location	Bedding Backfill	Haunching Backfill	Initial Backfill	Final Backfill
Roadway Rights-of-Way Within Roadway Prism	95% *	95%	95%	95%
Roadway Rights-of-Way Outside of Roadway Prism	90% *	90%	90%	95%
All Other Conditions	90%	90%	90%	90%

* or the existing condition within the undisturbed bottom of the trench.

1.06.03 Water Jetting

The introduction of water to the pipe embedment or final backfill material shall not be permitted as a means of compaction.

1.07 Imported Backfill

1.07.01 Imported Pipe Embedment

If the native soil is unsuitable, the Contractor shall import suitable pipe embedment material. Pipe embedment shall be select earth or sand which contains no stones, dry lumps, or frozen lumps greater than 3/4-inches in diameter and shall be defined as 100% passing 3/4-inches, 40-99% passing # 4 sieve and 30% or less passing # 200 sieve. Unsuitable material is defined as solid or loose rock, soils with rocks larger than 3/4-inches in their largest dimension, or other unsuitable

soils which are, as determined by the NTUA, incapable of properly supporting the pipe.

1.07.02 Imported Final Backfill

If the native soil is unsuitable for use as final backfill, the Contractor shall import suitable final backfill. Imported final backfill may be any material, which is locally available and is capable of being compacted to the required density. This material shall be free of boulders and rocks larger than 6-inches in their smallest dimension, frozen clumps of dirt, organic material, or rubble, which could damage the pipe.

1.08 Bedding and Backfill for Structures

1.08.01 Bedding

Bedding material for structures is defined as that material beneath the structure. This material shall be as specified in the standard detail for each structure.

1.08.02 Backfill

Backfill for structures is defined as that material from the bottom of the structure to the existing ground surface. This material and the required compaction of such shall be the same as that specified for in the final backfill on pipelines, or as specified in the drawings.

1.09 Settlement of Adjacent Structures

Throughout the 1-year warranty period, the Contractor shall be required to fill and compact any areas where settlement has taken place and shall also be responsible for the settlement of any adjacent structure or object caused by any excavation performed under his contract.

1.10 Surface Restoration and Resurfacing

1.10.01 Surface Restoration

The following requirements shall be followed unless alternative specifications are set forth by the roadway or other rights-of-way crossing permits, or as arranged between the NTUA and the NMDOT.

After the piping and structures have been installed and all backfilling completed, areas, which were disturbed, shall be brought to true grades. All slopes shall be trimmed and dressed, and all surface graded to maintain existing drainages. All streets, alleys, driveways, sidewalks,

curbs, or other surfaces, which have been disturbed or damaged, shall be resurfaced or replaced. The Contractor shall properly dispose of all excess excavated materials.

As required by the operating utility, the contractor shall install the utility brand Carsonite markers at all road crossings, water valves, fittings, junctions, connections, points of intersection, or at a minimum, every 1500 feet. Naturally, this would apply only within the rural areas, along stretches of roadways, or as requested by the operating utility. This is also a requirement for marking sewer manholes, cleanouts, and service connections.

1.10.02 Roadway Patching

Whenever existing roadways are disturbed during the course of construction, the Contractor shall restore the roadways to their original condition.

For ease of compaction, the Contractor may use well-graded gravel, crushed stone, or flowable fill as backfill, from a Ready Mix plant as approved by the appropriate roadway agency. The material shall be clean, varying in size from 3/8-inches to 1-1/4-inches, with not more than 10 percent of the material less than 3/8-inches in size and shall be compacted in 6-inch layers or as directed by the NMDOT. Flowable fill is defined as one bag concrete, with gradations of 100% passing the 3/8 sieve, and less than 25% passing the #200 sieve. The slump should be between 5-inches and 8-inches, and the 28-day strength should be between 50 and 150-PSI.

Surfacing shall be replaced where the roadway has gravel, crushed stone, asphaltic, or concrete surfacing. Gravel or crushed stone shall be replaced in quantities and locations as directed by or as required by the roadway permitting authority. Asphalt mix or concrete surfacing shall be replaced, in the case of asphalt, appropriately compacted in roadways to a depth equal to existing roadway surface but not less than 2-inches in asphalt or 6-inches in concrete. A compacted stabilized gravel or crushed stone base 6-inches in depth shall be placed in the roadway at all locations where surfacing is required prior to placement of the bituminous or concrete wear course, unless other requirements are stipulated by the roadway authority.

The Contractor shall obtain any and all necessary written permissions, easements, and permits from federal, state, and county agencies prior to beginning any roadway excavation.

TECHNICAL PROVISIONS 2.0

TP 2.0 WATER AND WASTEWATER LINE SEPARATION REQUIREMENTS

2.01 General

Water lines located near wastewater facilities present conditions for serious potential cross contamination. Protection from cross contamination can be provided by separation of the facilities and use of special piping materials. For measuring separation between pipes, all measurements shall be the clearances between pipes. (Pipe O.D. to pipe O.D.).

2.02 Horizontal Separation of Water and Wastewater Lines

When water and wastewater lines are laid parallel to each other, the horizontal distance between the water and wastewater lines shall not be less than 10 feet. Each line shall be laid in separate trenches. The requirements for this separation shall apply to all other buried utilities, except the distance may be reduced to 5 feet for secondary electric and gas distribution lines less than 60-PSIG; however, all stipulations of the electric, gas, or other sub-surface utilities shall be met.

When physical conditions such as an existing obstruction, will not allow the required 10-foot horizontal separation, the water and wastewater mains may be laid closer than 10 feet if the bottom of the water main is a minimum of 12 inches above the top of the wastewater main and prior written approval is granted by the NTUA.

2.03 Vertical Separation of Water and Wastewater Lines

2.03.01 Water Above Wastewater

When waterlines cross wastewater lines, the waterline shall cross above the wastewater line with a minimum vertical separation of 12 inches. If necessary, the depth of bury for the waterline may be reduced to 36 inches (normally 42 inches) at the crossing to maintain the 12-inch vertical separation. No joints in new waterlines shall be permitted within 10 feet of crossing a wastewater line.

2.03.02 Wastewater Above Water

When a waterline must cross below a wastewater line, the minimum vertical separation between the lines is 12 inches. Backfill of the trenches shall be compacted to provide adequate support to prevent settling of the wastewater line and damaging the water line.

For new water construction, the waterline shall be normal PVC water pipes with 20-foot pipe sections centered on the wastewater crossing.

No joints of new waterline construction shall be permitted within 10 feet of crossing a wastewater line. While it is desirable to have all crossings perpendicular or normal, new waterlines (centered on the crossing) may cross under a wastewater line at a maximum of 25° from perpendicular.

For new wastewater construction, the wastewater line shall be ductile iron pipe with gasketed joints, or approved equal (OAE), with an 18-foot section centered on the crossing. No joints in new wastewater line construction shall be permitted within 9 feet of crossing a water line.

For water and wastewater lines crossing electric, gas, or other buried facilities; the standards established by that other specific utility must be met.

2.04 Water Main Separation from Wastewater Manholes

No waterline pipe shall pass through, under, or come into contact with any part of a wastewater manhole.

2.05 Water and Wastewater Service Line Separation Within 5 feet of the House

This section shall apply to that portion of water and wastewater service lines located within 5 feet of the house. All lines within 5 feet of the house will be considered as part of the house plumbing. For new construction, all service lines shall have a 10-foot minimum horizontal separation. This can be accomplished by having the water and wastewater service lines exit the house 10 feet apart or from different sides. If the 10-foot separation cannot be maintained and prior written approval is obtained from the NTUA, the service lines can be laid closer than 10 feet, if the bottom of the water service line is at least 12-inches above the top of the wastewater service line; and the water service line is continuous with no joints until the separation requirement is met.

2.06 Separations Between Waterlines and Components of the Wastewater Disposal System

Waterlines shall not be installed within 10 feet of a septic tank, within 25 feet of a drain field, or 50 feet from an outhouse. Also, waterlines shall not be installed within 100 feet of the perimeter fence of an **individual** lagoon, or within 500 feet of the perimeter fence of a **community** lagoon.

2.07 Separation Between Residences and Wastewater Lagoons

No permanent residence shall be within 1000 feet from the perimeter fence line of a **community** sewer lagoon, or within 300 feet from the perimeter fence line of an **individual** sewer lagoon without written consideration of the Operating Utility.

TECHNICAL PROVISIONS 3.0

TP 3.0 WATER MAINS, WATER SERVICE LINES, AND APPURTENANCES

3.01 Scope of Work

The work covered by this section includes the furnishing of all labor, equipment and tools, and material; performing all operations in connection with the construction of water mains, including the placing of all necessary valves, hydrants, fittings, and appurtenances, and the construction of water service lines and appurtenances, in accordance with these technical provisions and applicable drawings.

3.02 Water Mains

3.02.01 Polyvinyl Chloride (PVC) Pipe and Fittings

Fittings for PVC pipe 4-inch and larger shall be Class 350 SSB mechanical joint, ductile iron conforming to AWWA C153 and shall be cement mortar-lined conforming to AWWA C104 or if shown on the plans, may be Class 200 PVC Bell and Gasket, conforming to ASTM D3139 and D1784, Type 1, Grade 1, and ASTM D2241.

PVC pipe shall conform to ASTM D2241 and the pipe shall be PVC 1120, SDR 21 and 200-PSI pressure rating or SDR 26 and 160-PSI, as specified on the plans. All PVC pipe joints shall be rubber compression ring type gaskets conforming to ASTM D3139 - Rieber type or equal. Special piping provisions are required when higher pressures are encountered.

Plastic pipe with scratches, gouges, or grooves deeper than one-tenth (0.10) of the wall thickness shall be rejected. Damaged sections of pipe shall be completely destroyed or immediately removed from the job site.

Ductile Iron pipe of specific class and type as shown on the plans may be required under certain circumstances. The pipe may require polyethylene encasement. In cases where the soil environment is corrosive -the soil resistivity is less than 1000 ohm-cm, the PH is less than 4 or greater than 8.5, or sulfides or high moisture content exist in the soil, etc. -the Contractor shall be required to wrap all mechanical joint fittings and all Ductile Iron pipe with 9 mill polyethylene film per AWWA C105/A21.5.

3.02.02 Water Main Installation

Pipe and fittings shall be installed generally in accordance with the manufacturer's printed instructions and specifications, to the standards of the AWWA for installing the type of pipe used, and in accordance with the NTUA Technical Provisions. Minimum bury depth shall be 42-inches, unless otherwise specified, with a maximum depth of 72-inches, unless specifically exempted by the NTUA Engineer.

Pipe and fittings shall be carefully handled to avoid damage. Dirt or other foreign material shall be prevented from entering the pipe or pipe joint during handling or laying operations and any pipe or fitting that has been installed with dirt or foreign material shall be removed, cleaned, and re-laid. When pipe installation is not in progress, the open ends of the pipe shall be closed with a watertight plug.

Long radius curves, either horizontal or vertical, may be installed with standard pipe by deflecting at the joints. The amount of deflection at each pipe joint shall not exceed the manufacturer's printed recommended deflections. When rubber gasket pipe is laid on a curve, the pipe shall be jointed in a straight alignment and then deflected to the curved alignment. Trenches shall be excavated wider on curves for this purpose.

3.02.03 Connections to Existing Mains

A permission to tap permit shall be obtained from the local NTUA office by the Contractor and all work shall be in conformance with said tapping permit.

Connections to existing mains shall be dry connections, made in a neat and workmanlike manner, unless otherwise permitted by the NTUA. Each connection to an existing waterline shall be made at a time and under conditions which will least interfere with water services to customers affected thereby, or as authorized by the NTUA and as evidenced by an approved tapping permit. Such connections shall be made to the satisfaction of the NTUA. Proper tools and fittings to suit actual conditions encountered in the field in each case shall be utilized. The cutting of pipe for inserting fittings or closure pieces shall be done in strict accordance with the recommendations of the pipe manufacturer, without damage to the pipe, or coating, and so as to leave a smooth end at right angle to the axis of the pipe.

Great care shall be taken to prevent pipeline contamination when cutting into and making connections with existing pipelines used for the conveyance or distribution of water for domestic or public use. The

Contractor shall coordinate and cooperate with the NTUA, in locating services and shall conduct his operations in such a manner that trench water, mud, or other contaminations are not allowed to enter the connected line or lines, at any time during the progress of the work. The interior of all pipe, fittings, and valves installed in such connections shall be thoroughly cleaned and then swabbed with or dipped in strong chlorine solution having a chlorine content of 200 parts per million (PPM).

3.03 Valves For Water Mains

3.03.01 Gate Valves

All gate valves shall conform to AWWA Specification C509, iron body, epoxy coated, bronze mounted, resilient wedge, counter clockwise opening, inside screw, non-rising stem with O-ring seals, and a 2-inch square wrench nut. Valve working pressure rating shall be 200-PSI minimum. The valves shall be Mueller, Kennedy, Waterous, Dresser M & H, Clow, or an approved equal (OAE) with mechanical joints as specified on the plans with appropriate transition gaskets. For operating pressures greater than 200-PSI, special considerations shall be followed.

3.03.02 Valve Boxes

Valve boxes shall be installed on all buried valves and shall be 5-1/4-inch nominal diameter shaft, two-piece adjustable screw type equal to Tyler No. 6850 Series. The length of the box shall be sufficient to permit access to the valve at the specified depth of bury. Tyler Series extensions will be utilized to extend the valve box where required. The word "Water" shall be cast onto the lid.

3.03.03 Valve Installation

Before installing the valve, care shall be taken to see that all foreign material and objects are removed from the interior of the valve. The valve shall be opened and closed to see that all moving parts are in working order, prior to installation.

All valves shall be set and jointed to the pipe in the manner as set forth in the AWWA Standards for the type of connecting ends furnished. All valves shall be set in and tied to poured in-place concrete support blocks as per the NTUA standard detail. Valves and valve boxes shall be set plumb. The cast iron valve boxes shall be placed over valves in such a manner that the valve boxes do not transmit shock or stress to the valve. The valve box cover shall be set flush with, or slightly above the

finished grade, as shown per the NTUA standard detail. A 2-foot square by 4-inch deep reinforced concrete pad shall be poured around each valve box. Before the concrete hardens, the Contractor shall neatly scribe in the concrete pad, the valve and pipe size and type, and a line indicating the direction of flow of water through the valve.

3.04 Fire Hydrant Assembly

3.04.01 Fire Hydrant

Fire hydrants shall be of standard manufacture with the name of the manufacturer and direction of opening cast on the hydrant top. Fire hydrants shall conform to AWWA C502. The end connections shall be mechanical joint. The hydrants shall be equipped with a breakaway safety flange and safety stem coupling at or near the bury line such that a heavy impact would minimize breakage of hydrant parts. The hydrants shall open counter clockwise, have a 5 1/4-inch or larger main valve opening, 6-inch inlet, 1 1/2-inch tapered pentagonal operating nut, 2 hose nozzles 2 1/2-inches in diameter, and a 4 1/2-inch pumper nozzle, all with National Standard hose threads. The hydrant shall be Mueller A423, Kennedy K81A, or an approved equal OAE.

3.04.02 Hydrant Connections and Auxiliary Gate Valves

An auxiliary gate valve and valve box shall be installed adjacent to each fire hydrant per the standard detail or as specified on the plans. The pipe between the fire hydrant and the auxiliary gate valve and between the auxiliary gate valve and the main shall be 6-inch minimum.

3.04.03 Fire Hydrant and Guard Installation

Before installing any hydrant, care shall be taken to see that all foreign materials and objects are removed from the interior of the barrel. The hydrant shall be opened and closed to see that all moving parts are in working order.

Hydrants shall be installed plumb with the pumper nozzle toward the street. The hydrant shall be set per the standard detail for the hydrant and guard.

3.05 Thrust Blocking

Thrust blocking as detailed in the standard drawings shall be placed at all bends, caps, tees, crosses, and fire hydrants. Blocking shall be concrete mix poured in place. Concrete blocking shall bear against solid undisturbed earth at the sides and bottom of the trench excavation and shall be shaped so as not to block weep

holes or obstruct access to the joints of the pipes or fittings. The concrete shall not cover nuts and bolts of joints or fittings. Ductile Iron Joint Restraints used in conjunction with Mechanical Joint fittings may be used as a substitute for concrete blocking.

3.06 Water Main Crossings

3.06.01 Wash Crossings

Water mains shall be installed as shown on the plans. The Contractor shall divert surface flows, conduct dewatering, and perform all steps necessary to maintain proper bedding conditions and alignment. A minimum 6-foot depth of bury is required at the centerline of all wash crossings.

3.06.02 Road Crossings

In lieu of boring, roads may be open cut for water line and casing installation. The original surface pavement on all open cut roadways shall be either cut square or sawed straight. As with open cut, if boring is required the steel conduit shall be extended from right-of-way to right-of-way. The Contractor shall obtain written permission from the appropriate agency prior to beginning any roadway excavation. Backfill within the limits of a roadway prism may require special compaction in accordance with the requirements of the roadway crossing permits.

Surfacing shall be replaced where the roadway has gravel, concrete, or asphaltic paving in the same thickness as were removed, or as specified by the roadway agency, and completed as soon as possible following backfilling.

Ductile iron pipes resting on the bells within the steel casing shall be used as the carrier pipes. PVC waterline road crossings may also be installed within the steel casing on approved casing chocks or redwood skids secured to the pipe with stainless steel straps. The casing ends shall be sealed with an approved rubber boot or 9-mil plastic sheeting with stainless steel clamps. Casing pipe shall be straight welded Schedule 10 steel pipe, .25-inch wall thickness, unless otherwise specified. An alternate method for roadway crossing is to install ductile iron pipe, Class 52, bell and spigot, direct bury by open cut excavation from right of way to right of way. This would be considered when crossing minor roads or trails, or for congested area within an urban setting.

For pressure testing purposes, gate valves will be required on the up

stream and downstream side of roadway crossings.

3.07 Water Service Connections Material

3.07.01 Polyethylene (PE) Pipe

Polyethylene (PE) pipe shall be 1-inch IPS, 200 psi, SIDR 7 in conformance with ASTM D2239. The pipe shall be produced from a high density ultra-high molecular weight PE pipe compound, PE 3406 or PE 3408 which conforms to the latest revision of ASTM D1248. The pipe shall be equal to Driscopipe 5100 Ultral-line or Yardley Ultra-high Molecular Weight PE. The designation PE 3406 or PE 3408 shall be stamped on the pipe.

3.07.02 Service Line Fittings and Connections

Fittings and connections for PE pipe shall be made with non-flare compression connections and shall be Mueller Insta-Tite H-15426, or approved equal. All threaded connections from the water main to and including the inlet of the domestic stop shall be standard iron pipe (I.P.) threads.

3.07.03 Saddles

Saddles shall be specific for the type, size, and pressure rating of the mainline as recommended by the saddle manufacturer. Saddles shall be double strapped, double banded, or of the contoured band type. Saddles and saddle components shall be brass, bronze, or stainless steel. Tap threads shall be FIP. Acceptable saddles include Ford S71 and Mueller H-13478 for IPS PVC O.D. pipe, or Ford 202B or approved equal for DI and AC O.D. pipe.

3.07.04 Corporation Stops

Corporation stops shall be bronze alloy with MIP threads inlet by FIP threads outlet. They shall be equal to Mueller H-10046 corporation stops or Ford Type FB1700.

3.07.05 Curb Stops

Curb stops shall be 1-inch bronze alloy, quarter turn check, FIPT x FIPT end connections, with tee head and 30-inch (approx.) stationary operating rod. Curb stops shall be Minneapolis pattern top threads with resilient O-rings seals and equal to the Mueller B-20287, or Ford B11-444M or AY McDonald 6105.

3.07.06 Curb Stop Boxes

Curb stop boxes shall be the extension type, cast iron with 1 1/2-inch upper section. Curb box lid shall be cast iron and have a countersunk brass pentagon head plug. The curb stop boxes shall be Minneapolis pattern 2-inch base bushed to 1 1/2-inch and equal to Mueller H-10302 or Ford Type PXL. The finished elevation of the plug shall be such that it extends just slightly above the ground surface. The stationary rod shall be sized so that the top extends 2 to 4 inches below the top of the curb box. An 18-inch by 18-inch by 4-inch depth reinforced concrete collar shall be poured around each curb box.

3.07.07 Water Meters

Water meters shall be of cast bronze construction with magnetic drive and a hermetically sealed register which reads in gallons. The meter shall accurately record flows from 1/4 to 20 gpm and shall be a 5/8-inch by 3/4-inch Sensus SR model with frost plate. The Sensus SR II model is not acceptable.

3.07.08 Meter Yokes/Coppersettters

Yokes or coppersettters for water meters shall have 3/4-inch ID x 12-inch riser, with a ball valve with padlock wing angle on the inlet, with a meter nut on the outlet side, and in the base, a 1-inch double purpose union swivel inlet and outlet connection. Yokes shall have an eye for the insertion of a cross brace and equal to Ford VB 72-12W-11-44 or AY McDonald 20-212WX-DD-44. The cross brace shall be a 1/2-inch OD PVC pipe or # 4 rebar 18-inches in length. The tandem coppersetter shall have an "S" tube with two bronze adapters, iron thread by meter nut, for the pressure regulators. The PRV shall be Watts Series 25AUB or approved equal.

3.07.09 Meter Boxes

Meter boxes shall be 20-inches diameter, 30-inches high nonmetallic by DFW or approved equal and shall be extended a minimum of 1-inch below the service line. The meter box lid shall be a cast iron, double lid cover with 11-1/2-inches lid opening, plastic or aluminum inner lid, and locking outer lid with pentagon head worm type lock. The meter box cover shall be equal to Castings model M 70.

3.07.10 Domestic Stops (Not part of the NTUA's facilities)

Domestic stops shall be a 1-inch bronze alloy, quarter turn check, FIPT x FIPT end connections, with tee head and 39-inch stationary operating

rod. They shall have resilient O-rings seals and equal to the Ford B11-444 or AY McDonald 610.

3.07.11 Domestic Stop Valve Boxes (Not part of the NTUA's facilities)

The domestic stop valve box shall consist of 3-inch diameter PVC-DWV pipe with a 3-inch hub by FIP threaded adapter with a 3-inch MIP threaded plug for the lid. The finished elevation of the plug shall be such that the stationary rod is located immediately below or within the plug so that the rod can be operated with an adjustable wrench from ground surface with the plug removed. The 3-inch diameter PVC-DWV pipe shall be cut so that the top of the adapter extends 3 to 6-inches above ground surface.

3.08 Water Service Line Installation

Water service lines and appurtenances shall be installed in accordance with TP 1.0, Excavation, Trenching, and Backfilling for Water and Sewer Utilities, and TP 2.0, Water and Sewer Line Separation Requirements. A minimum of 3 feet of cover is required for water service lines.

Service lines shall be cut using tools specifically designed to leave a smooth, even, and square end on the pipe. The cut ends shall be reamed to the full inside diameter of the pipe. Pipe ends are to be connected using fittings which seal to the outside surface of the pipe which shall be cleaned to a sound smooth finish before installation. Splices shall be kept to a minimum and no splices shall be made within 10 feet of any sewer line.

All 1-inch service connections to water mains 4-inches or larger shall be made using saddles (tap tees are permitted for new construction). Service connections to 2-inch pipe shall be made using tees. Particular care shall be exercised to assure that the main is not damaged by the installation of the saddle. The saddle shall be aligned on the water main so that it is at a 45 degree angle above the springline of the pipe. The hole drilled into the pipe through the saddle shall be no smaller than 1/8-inch less than the size of the saddle.

Where required, the Contractor shall reconnect existing water service connections to the new water mains using materials specified herein. Individual pressure reducing valves, where required, shall be installed on a tandem meter yoke as shown on the standard detail. Prior to installation of the meter and connection to the building or house, the entire water service line and appurtenances shall be flushed.

3.09 Pressure Tests

Where any section of a waterline is provided with concrete thrust blocking for fittings or hydrants, the pressure tests shall not be conducted until at least 48 hours after installation of the concrete thrust blocking, unless otherwise specified.

3.09.01 Pressure Test

All labor, test equipment, water for testing; appurtenances and material, and performance of all operations in accordance with the specifications, are the responsibility of the Contractor.

All pipelines shall be tested for water tightness up to the individual service meter or domestic stop. The test equipment will not be provided, but is subject to inspection by the NTUA. Arrangements for water used in pipeline testing and payment for the water shall be coordinated with the local NTUA office. Pressure gauges used for pressure testing, shall be graduated at a maximum of 5-PSI increments. Two gauges will be used simultaneously for verification of the gauges functionality. Prior to the actual test, the pipeline shall be pressured to 10-PSI above the test pressure. The pressure will then be decreased to the test pressure, after the required time, so that gauge responsiveness can be observed.

The minimum test pressure shall be at least 160-PSI, measured at the lowest point of elevation in the test section. No section shall be tested that is greater than one mile in length or that has greater than 25-PSI pressure change, due to elevation. The test shall be conducted in such a manner that existing mains, services lines, and service user's plumbing are not damaged. Damage caused by testing shall be corrected at the expense of the Contractor. All connections, valves, blow-offs, hydrants, and house services up to the meter yoke shall be tested with the main, as far as are practicable. When testing piping systems designed to operate above 160-PSI, it will be tested as if it were rated at 160-PSI.

No air testing shall be allowed.

The test section shall be filled slowly with potable water and all air shall be vented from the line. The test shall not begin until the pipe has been filled with water for at least 24 hours to allow for absorption. The test shall have a minimum duration of two hours with the two-hour period beginning when the test pressure is attained and the pump ceases operation.

No pipe installed shall be accepted if the leakage is greater than that determined by the following formula:

$$Q = \frac{N \cdot D \cdot (P)^{1/2}}{7400}$$

in which,

Q = Allowable leakage in gallons per hour

N = Number of joints in the pipeline being tested, this "N" being the standard length of pipe furnished divided into the length being tested with no allowance for double gasket joint caused by use of couplings instead of integral bell pipe or for joints at branches, blow-offs, fittings, etc.

D = Nominal diameter of pipe in inches

P = The test pressure in PSI gauge as discussed in the third paragraph of this procedure.

During the test, the test pressure should not lose more than 5-PSIG without being pumped back up to the test pressure. The total of the gallons of water required to hold the test pressure during the two hours plus the amount of water required to return the line to the test pressure at the end of the two-hour test period is the total leakage. If the total leakage is less than the allowable leakage, the line can be accepted. All visible leaks will be repaired, regardless of the amount of leakage. Should the test on any section of the pipeline show leakage greater than the allowable leakage, the Contractor shall locate and repair the defective pipe, fitting, or joint until the leakage is within the allowable leakage for the two-hour test duration.

3.09.02 Observation of Tests

The NTUA shall witness the pressure testing of waterlines. Prior to the actual test, the Contractor shall have all equipment set up completely, ready for operation and shall have previously successfully performed the test to verify that the test section will pass. The Contractor shall notify both the NTUA and the NMDOT a minimum of three working days in advance of the date that the Contractor plans to perform the pressure tests.

The NTUA shall observe the testing to verify that the testing was performed according to the specifications and that the test data were properly and accurately recorded. The Contractor shall complete the required certification forms and submit them to the NTUA for approval. A letter of approval or disapproval of the test results will be sent from the Operating Utility to the Contractor.

3.10 Disinfection

A liquid chlorine solution shall be introduced continuously into one end of the system and allowed to flow along and through all lines and appurtenances to be disinfected until a minimum of 50-PPM of chlorine is detected at representative points throughout the line. A contact period of 24 hours shall be maintained before the system is flushed out with clean water until a maximum of 0.4-PPM chlorine residual is attained. All valves shall be operated several times during the 24-hour contact period.

After disinfection, the Contractor shall collect bacteriological samples for testing at his expense. A laboratory certified by the State Health Department or the U.S. Environmental Protection Agency shall perform the analysis. If an unsatisfactory bacteriological test result (positive result) is obtained, the system shall be disinfected and re-tested by the Contractor. This shall be repeated until a satisfactory bacteriological test (negative result) is obtained. Disinfection by introducing granular or tablet chlorine compounds in each pipe length is not an acceptable method of disinfection and will not be allowed.

**EXHIBIT A OF TP-3
WATER LINE PRESSURE TEST CERTIFICATION**

LOCATION OF LINE TESTED: _____
Include Project Name & Number

DATE(S) TEST WAS CONDUCTED: _____

GAUGES MANUFACTURER AND MODEL: 1) _____

2) _____

STANDARD LENGTH OF PIPE IN TEST SECTION: _____ FEET.

TEST SECTION: _____
(Sta.-Sta., Line No., etc.)

Length (Sta.-Sta.) Time-Start/End	Line Size/Type (Inch)	Pipe Pressure Rating (PSI)	Test Pressures (PSIG)	Observed Pressure Range (PSIG)	Total Leakage (Gal./2hrs.)	Allowable Leakage (Gal./2hrs.)

THE TEST AND ATTACHED INFORMATION IS CERTIFIED BY:

Signature/Printed Name: _____

Organization/Address: _____

Address: _____

Telephone Number: _____

TEST RESULTS CHECKED AND APPROVED ON: _____
Date

BY: _____ PASSED _____ FAILED _____
NTUA Representative

COPY OF APPROVAL OF TEST SENT TO: _____

ON _____ BY _____
Date Project Agency Involved
NTUA

EXHIBIT C OF TP-3

WATER LINE PRESSURE TEST WORKSHEET 2

Test Section: _____
(Sta-Sta, Line No., Etc.)

Length (Sta.-Sta.) Time: Start & End	Line Size & Type (Inch)	Pipe Pressure Rating (PSI)	Test Pressure (PSIG)	Observed Pressure Range (PSIG)	Total Leakage (Gal./2hrs.)	Allowable Leakage (Gal./2hrs.)

TECHNICAL PROVISIONS 4.0

TP 4.0 WASTEWATER MAINS AND APPURTENANCES

4.01 Scope of Work

The work covered by this section includes the furnishing of all labor, equipment, and material; performing all operations in connection with the construction of gravity wastewater mains and service lines, including manholes and other appurtenances, in accordance with these technical provisions and applicable drawings.

4.02 General

The wastewater line shall be constructed in the location and to the grade and size shown on the drawings or as directed in writing by the NTUA. Excavation, trenching, and backfilling shall be in accordance with TP 1.0 of these specifications. Inspection of wastewater lines and manhole connections shall be accomplished before backfilling, but work covered by this section will not be accepted until backfilling has been completed satisfactorily. Any section of wastewater that is found defective in material, alignment, and/or grade shall be corrected to the satisfaction of the NTUA and the NMDOT.

4.03 Materials

4.03.01 Polyvinyl Chloride (PVC) Wastewater Pipe

Except for extensions to dead ends of 400 feet or less where 6-inch is permitted, minimum wastewater main pipe size and slope, shall be 8-inch nominal diameter at 0.4% slope; and minimum wastewater service pipe size shall be 4-inch nominal diameter at 2.0% slope. All PVC wastewater pipe shall be made of materials conforming to the requirements of ASTM-D1784, Type I, Grade I for Rigid Polyvinyl Chloride compounds. The PVC wastewater pipe shall be SDR 35, Type PSM, with elastomeric gasket joints and shall meet the requirements of ASTM-D3034. The pipe shall have an integral bell with a solid cross section rubber ring, which has been factory assembled and securely locked in place to prevent displacement. Standard lengths shall be 20 feet.

4.03.02 Polyvinyl Chloride (PVC) Wastewater Pipe Fittings

All PVC wastewater pipe fittings shall be SDR 35, Type PSM, with elastomeric gasket joints and shall meet the requirements of ASTM D-3034. Service connections to new wastewater mains shall be wye fittings. Connections to existing wastewater mains may be wye saddles.

4.03.03 Ductile Iron Wastewater Pipe

Ductile Iron Pipe shall meet the requirements of AWWA C151, with either mechanical or push-on joints, with an interior lining of 40-mil polyurethane or ceramic epoxy and an exterior of standard bituminous coating. Thickness shall be Class 52 in all sizes.

4.03.04 Ductile Iron Wastewater Pipe Fittings

Service connections to ductile iron pipe shall be via saddle-type fittings equal to the " or AOE. Connections between wastewater PVC pipe and ductile iron pipe shall be via the appropriate size Calder coupling; however, the ductile iron pipe should be extended from manhole to manhole to minimize the use of adapters.

4.03.05 Pre-cast Concrete Manhole Sections

Manhole sections shall conform to ASTM C 478. A polyisoprene rubber connector meeting the material and performance requirements of ASTM C-923 and equal to the "A-Lok" Connector as manufactured by A-Lok Products Inc., Trenton, N.J., shall be used to seal between the pre-cast manhole and the sewer pipe. "Ram-Nek" flexible gasket or the "Butyl-Lok" preformed sealant tape by A-Lok Products, Inc., or an approved equal shall be used to seal between manhole sections, grade rings, and cover ring. Bottom manhole sections shall have integral pre-cast base or reinforced concrete floor slabs.

4.03.06 Manhole Covers and Frames

The frames and covers shall be cast iron, equivalent to a Deeter 1257, 330 pounds, with a Type C surface pick slot. The cover minimum opening shall be 24-inches in diameter with a 6-inch high ring. The lid shall not have any holes including pick holes, which penetrate the entire thickness of the lid. A 3/4"-inch by 2-inch by 2-inch recessed slot with a 1/2-inch diameter pin, crossing the small dimension and centered along the long dimension, shall be provided in the lid, in lieu of a pick hole.

4.03.07 Manhole Steps

Manhole steps shall be made of 1/2-inch steel rod encapsulated with copolymer polypropylene or approved equal and shall conform to ASTM C478. The ALCO 12653A aluminum step is also acceptable. Steps shall have minimum projections of 4-inches, spaced no more than 16-inches apart, minimum overall widths of 14-inches, and thoroughly anchored into the walls.

4.03.08 Concrete

All concrete in addition to the concrete used in precast sections shall have a compressive strength of not less than 3,000 pounds per square inch at 28 days of age. The aggregates, Portland cement, and concrete shall comply with the provisions of ASTM C144 and C33, ASTM C150, Type II. The concrete mix shall be approved by the Owner and shall include no less than 5-1/2 bags of Portland cement per cubic yard. When directed by the Owner, the Contractor shall have compressive strength tests made of the concrete in accordance with ASTM Standard Specifications.

4.03.09 Wastewater Cleanout and Frame

Where required on the plans, a Neenah R1791A or approved equal cast iron cleanout cover and frame shall be used on all 8-inch wastewater cleanouts.

4.04 Installation of Wastewater Pipe

4.04.01 Pipe Laying

All trenching, excavation, and backfilling shall be performed in accordance with TP 1.0 of these specifications. The bottom of the trench shall be shaped to give substantial uniform bearing and support for each section for the entire length of the pipe. Bell holes shall be excavated to provide a minimum clearance of 2 inches below the coupling or bell. Pipe laying shall proceed upgrade, with the spigot end pointing in the direction of the flow. Each pipe shall be laid true to line and grade and in such manner as to form a close concentric joint with the adjoining pipe. As the work progresses, the interior of the sewer shall be cleared of all dirt and superfluous materials of every description. If the maximum width of the trench at the top of the pipe specified in TP 1.0 of these specifications is exceeded for any reason other than by direction, the Contractor shall install such concrete cradling, encasement, gravel base or other bedding as may be required to satisfactorily support the added load of the backfill.

Trenches shall be kept free from water and the pipe shall not be laid when conditions of the trench or the weather are unsuitable for such work. At all times when work is not in progress, all open ends of pipe and fittings shall be securely closed so that no trench water, earth, or other substances will enter the pipe.

4.04.02 Depth of Bury

All sewage collection lines shall be ductile iron if less than 3 feet of cover is provided within streets and less than 2 feet of cover is provided in all other areas.

4.04.03 Installation of Service Connections

Wye fittings shall be provided and installed for sewer service connections to new sewer mains. Service saddles are not appropriate for service connections to newly constructed sewer mains but may be used for connections to existing sewer mains. The wye shall be installed such that it is at about a 45-degree angle with the vertical.

4.05 Manhole Installation

4.05.01 General

Manholes shall be installed in the locations shown on the plans and shall be constructed in accordance with the standard details. Manholes shall be spaced no more than 400 feet apart, and shall be installed at every change in grade, pipe size, or direction.

The invert channel shall be smooth and U-shaped. The lower portion shall conform to the inside of the adjacent sewer section and the upper portion shall be greater in height than the diameter of the largest pipe. A minimum invert elevation drop of 1/10 of a foot from the entrance to the outlet shall be provided in all manholes where there is a change in direction or grade. Changes in size and grade of the channel shall be made gradually and evenly. The invert channel may be formed directly in the concrete, or where there is no change in grade or direction between incoming and outgoing sewers, may be constructed by laying a full section of sewer pipe through the manhole and cutting out the top half after the surrounding concrete has hardened.

The floor of the manhole outside the channel shall be smooth and shall slope toward the channel not less than one inch per foot and not more than 2-inches per foot. Drop inside the manhole shall not exceed 2 feet, measured from the invert of the inlet pipe to the invert of its corresponding channel. If the drop exceeds 2 feet, then a drop manhole shall be installed. A channel must be formed in the concrete of an ogee shape so there is no free drop. Joints between manhole sections, adjustment rings, and cover rings shall be sealed with Ram-Nek flexible gasket or approved equal; and a concrete collar shall be installed in accordance with the standard details.

All sewers extending from manholes shall be supported with compacted gravel from where the sewer pipe leaves the manhole to where the pipe is supported by undisturbed soil.

4.05.02 Connection to Existing Manhole

The Contractor shall obtain a tapping permit from the NTUA prior to making connections to existing manholes. The connection to the existing manhole shall be made in accordance with the approved plans. Care should be exercised when connecting to the existing manhole so that limited fracture and cracking will occur on the existing manhole. Also, placement of the new wastewater main should be correctly aligned to the invert elevation so as to allow for proper flow of sewage through the manhole. Excessive damage to the existing manhole or improper installation of the new wastewater main, as determined by the NTUA, shall be cause for replacement of the existing facilities within the construction area by the Contractor. This replacement shall be done to the satisfaction of the NTUA and NMDOT.

4.06 Wastewater Main Crossings

4.06.01 Wash Crossings

Wastewater mains shall be installed as shown on the approved plans. The Contractor shall divert surface flows, conduct dewatering, and perform all steps necessary to maintain proper bedding conditions and alignment.

4.06.02 Road Crossings

In lieu of boring, the roadway may be open cut for sewer line within casing installation. The original surface pavement on all open cut roadways shall be either cut square or sawed straight. As with open cut, if boring is required, the steel casing shall be extended from right of way to right of way. The Contractor shall obtain written permission from the appropriate agency prior to beginning any roadway excavation. Backfill within the limits of a roadway prism may require special compaction in accordance with the roadway crossing permits.

Surfacing shall be replaced where the roadway has gravel, concrete, or asphaltic paving in the same thicknesses as were removed, or as specified by the Owner, and completed as soon as possible following backfilling.

PVC wastewater line road crossings shall be installed within steel casing on acceptable casing chocks or redwood skids secured to the pipe

with stainless steel straps. Ductile Iron pipe resting on the bells also may be used as the carrier pipes. The casing ends shall be sealed with an approved rubber boot or 9 mil plastic sheeting with stainless steel clamps. Casing pipe shall be straight welded SCH 10 steel pipe 1/4" wall unless otherwise specified. An alternative method for roadway crossing is to install ductile iron pipe, Class 52, bell and spigot, direct bury by open cut excavation from right of way to right of way. This would be considered when crossing minor roads or trails, or for congested area within an urban setting.

A manhole shall be installed on each side of the roadway right of way, unless specified otherwise. The minimum grade of all road crossings should be 1.0% unless exempted by the NTUA and the NMDOT.

4.07 Sewer Service Line Installations (Not part of the Utility company's facilities)

4.07.01 General

All trenching, excavating, and backfilling should be performed in accordance with TP 1.0 and TP 2.0 of these specifications. All new construction shall provide a minimum slope of 1/4-inch per foot (2%) and maintain at least 2 feet of cover over the line. Clean outs should be placed at the house, at any in-line bend greater than 45 degree, and at 100-foot intervals. Bends greater than 45 degrees are discouraged. Services should not enter a manhole but should enter the main line at least 10 feet either side of the manhole.

4.07.02 Connection to Wyes or Main

Sewer service lines should be connected to the sewer wyes provided with the new sewer main. If connecting to an existing main without existing wyes, the connections shall be made with wye saddles. The Contractor shall obtain from the Operating Utility tapping permits before making sewer service connections to existing sewer mains. The saddle shall be aligned on the sewer main such that it is at about a 45 degree angle with vertical and in no case shall deviate, by more than 15 degrees from either side of 45 degrees without prior approval. During the installation of the sewer saddle, the Contractor shall not allow the pipe cutout or other foreign objects to enter the sewage collection system.

4.08 Wastewater Line Testing

4.08.01 Alignment Test

The Contractor shall notify the NTUA two working days in advance of

the date that the Contractor is ready for inspection of sewer alignment. The wastewater main shall be checked by the Contractor and verified by the NTUA, to determine whether any displacement of the pipe has occurred, after the trench has been backfilled to 2 feet above the pipe and tamped as specified. The test shall be made as follows: A light shall be flashed between ends of line by means of a flash light or reflected light. Any deviation from true line or grade, causing less than a full lamped circle, may be cause for rejection. Any ponding of water in the wastewater line may be cause for rejection. A full lamp circle is when a full circle of light is seen from any position around the pipe perimeter.

4.08.02 Deflection Test

The maximum allowable deflection (reduction in vertical inside diameter) for PVC pipe shall be five percent. Deflection testing may not be required in all cases; however, the NTUA reserves the right to require the Contractor to perform random deflection tests. If three successive tests are determined to be unsatisfactory, the Contractor shall perform deflection tests on the entire project. All locations with excessive deflection shall be excavated and repaired by re-bedding or replacement of pipe. Acceptable methods of deflection testing include use of properly sized go-no-go mandrels or other proposals suitable to the operating utility.

4.08.03 Ex-filtration Test

The Contractor shall conduct an ex-filtration test on each section of wastewater mains between manholes. The Contractor shall provide at his own expense all necessary equipment and materials required for the tests. One of the following testing methods shall be used.

Air Testing: Testing equipment shall be equal to the “Air-Loc” low pressure air testing system manufactured by Cherne Industrial, Inc. of Edina Minnesota. The gauge used for the air test shall have a minimum division of 0.10-PSI.

Testing shall be conducted in accordance with ASTM C924 (Testing Sewer Lines by the Low-Pressure Air Test Method), except as modified herein. Air testing shall be done between consecutive manholes throughout the entire length of the installed line. Air shall be added to the plugged test section until the internal air pressure reaches 4.0 psig. At least two minutes shall be allowed for the air pressure to stabilize. The air supply shall then be disconnected and the time required for the pressure to drop from 3.5 to 3.0 psig shall be measured with a stopwatch. No one shall enter a manhole when a line into it is

pressurized. If the groundwater level is above any portion of the test section, the test pressure shall be increased, by an amount equal to the average hydrostatic pressure of the groundwater.

The test section will be accepted if the time required for the pressure to decrease from 3.5 to 3.0 PSIG is equal to or greater than the time in the following table. The pipe diameter shall be based on the nominal size of the sewer main. If the time measured is less than the time specified in the table, the Contractor shall locate and repair any leaks and retest the sewer until it is acceptable.

Minimum Duration for Pressure Drop (400 feet Max.)	
Pipe Diameter (Inches)	Time (Minutes)
4	2.5
6	4.0
8	5.0
10	6.5
12	7.5

The following formula should be utilized to determine the minimum duration for pressure drop for test sections greater than 400 feet or pipe sizes greater than 12 inches.

$$T = 0.000371 \cdot D^2 \cdot L \div 2$$

Where: T = Time in Minutes
 D = Nominal Diameter in Inches
 L = Pipe Length in Feet

Water Testing: One gallon of water may be lost in 2 hours, per each section between manholes, when testing any size main up to 12-inches. The line shall not be tested with the manhole. At least 4 feet of head shall be used for the test. Service lines need not be tested, but they must be plugged to conduct the test of the main. If any leakage in excess of the allowable occurs in any section of the sewerline, that section(s) shall be repaired and re-tested after the leaks are located.

4.08.04 Groundwater Infiltration

Infiltration of groundwater in excess of 200 gallons per day per inch diameter per mile of wastewater line indicates that the line is not

watertight. Infiltration less than this amount does not relieve the Contractor of the requirement to perform ex-filtration testing. If excess infiltration is noted after ex-filtration tests have been completed, it shall be considered as evidence that the original test was in error or that subsequent failure of the pipeline has occurred.

4.09 Manhole Testing

Manholes shall be tested for water tightness. Each manhole shall be tested by itself. All lift holes shall be plugged with an approved non-shrink grout. All mains into and out of the manhole shall be plugged with a suitable device. If the manhole fails the initial test, necessary repairs shall be made and the manhole shall be retested. One of the following methods shall be used.

Vacuum Testing: Vacuum testing should be conducted, in accordance with ASTM C1244 (Vacuum Test for Concrete Manholes), except as modified below. The vacuum test head shall be placed inside the top section and the seal inflated in accordance with the manufacturers' recommendations. A vacuum of 10-inches of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to 9-inches. The manhole shall pass if the time is greater than 60 seconds for 48-inches diameter, 75 seconds for 60-inches, and 90 seconds for 72-inches diameter manholes.

Hydrostatic Testing: Hydrostatic testing shall be conducted in accordance with ASTM C969, except as modified below. The manhole shall be filled with water to the ring. The maximum loss shall be 5 gallons in a 2-hour test regardless of the manhole depth. The amount of loss shall be determined by measuring the volume of water required to maintain the water level in the manhole within 2-inches of the top of the cone or flat top throughout the entire duration of the 2-hour test.

4.10 Observation of Pressure Tests

The NTUA is to witness the pressure testing of wastewater lines and manholes. Prior to the test, the Contractor shall have all equipment set up, completely ready for operation and shall have previously successfully performed the test to verify that the test section or manhole will pass. The Contractor shall notify both the NTUA and the NMDOT, a minimum of two working days in advance of the date that the Contractor plans to perform the pressure tests. The Contractor will complete the required certification forms and submit them to the NTUA for approval. A copy of the approval or disapproval of the test results will be sent from the NTUA to the Contractor (see "Exhibit A & C of TP-4).

EXHIBIT A OF TP 4.0

WASTEWATER MAINLINE/MANHOLE WATER TEST 1 CERTIFICATION

LOCATION OF LINE TESTED: _____
Include Project's Name & Number

DATE(S) TEST WAS CONDUCTED: _____

STANDARD LENGTH OF PIPE IN TEST SECTION: _____ FEET.

THE TEST AND INFORMATION IS CERTIFIED BY:

Signature/Printed Name: _____

Organization/Address: _____

Address: _____

Telephone Number: _____

WASTEWATER TEST 1 RESULTS CHECKED AND APPROVED ON: _____
Date

BY: _____
NTUA Representative

PASSED _____ FAILED _____

COPY OF APPROVAL OF THE TEST SENT TO: _____
Project Agency Involved

ON _____ BY _____
Date NTUA

EXHIBIT B OF TP 4.0

WASTEWATER MAINLINE/MANHOLE WATER TEST 1-WORKSHEET

LOCATION OF LINE TESTED: _____
 Include Project Name & Number

DATE(S) TEST WAS CONDUCTED: _____

(Allowable Leakage: 1 gal/section/2 hrs. for 8" PVC to 12" PVC, regardless of length, using 4-feet of head test pressure.)

SEWER MAIN

Sewer Main (MH# to MH#)	Size (in)	Length (ft.)	Actual Leakage (gal.)	Pass/Fail (P or F)	Remarks

Verified By: _____
 NTUA Representative/Date

 Print Name/Title

(Allowable Ex-filtration: 5 gal./MH/2 hrs. regardless of height. Lamp testing shall be conducted at completion of final grading.)

SEWER MANHOLE

Manhole No.	Station	Actual Leakage (gal.)	Pass/Fail (P or F)	Remarks

Verified By: _____
 NTUA Representative/Date

 Print Name/Title

EXHIBIT C OF TP 4.0

WASTEWATER MAINLINE/MANHOLE AIR/VACUUM TEST 2 CERTIFICATION

LOCATION OF LINE TESTED: _____
Include Project Name & Number

DATE(S) TEST WAS CONDUCTED: _____

THE GAUGE USED FOR TESTING SHALL HAVE MIN. DIVISION OF 0.10 PSI.

STANDARD LENGTH OF PIPE USED ON THIS PROJECT IS _____ FEET.

THE TEST AND ATTACHED INFORMATION IS CERTIFIED BY:

Signature/Printed Name: _____

Organization/Address: _____

Address: _____

Telephone Number: _____

WASTEWATER TEST 2 RESULTS CHECKED AND APPROVED ON: _____
Date

BY: _____
NTUA Representative

PASSED _____ FAILED _____

COPY OF APPROVAL OF THE TEST SENT TO: _____
Project Agency Involved

ON _____ BY _____
Date NTUA

EXHIBIT D OF TP 4.0

WASTEWATER MAINLINE/MANHOLE AIR/VACUUM TEST 2 WORKSHEET

LOCATION OF LINE TESTED: _____
 Include Project's Name & Number

DATE(S) TEST WAS CONDUCTED: _____

Air testing shall be conducted between consecutive manholes. The test section shall be acceptable if the time required for the pressure to drop from 3.5 to 3.0 PSIG is greater than or equal to the time in the "Minimum Duration for Pressure Drop" table of TP-4.08.03.

SEWER MAIN AIR TEST

Sewer Main MH# to MH#	Size (in.)	Length (ft.)	Start Test Pressure (Psig)	Stop Test Pressure (Psig)	Elapsed Time (Min/Sec.)	Pass/Fail (P or F)	Remarks

Verified By: _____ Date: _____

Title/Company: _____

Manhole shall pass if time is greater than 60 seconds for 48" Dia. MH, 75 seconds for 60" Dia. MH, and 90 seconds for 72" Dia. MH.

MANHOLE VACUUM TEST

Manhole No.	Station	Start Vacuum of 10" of Mercury (Inch)	Stop Vacuum (Inch)	Elapsed Time (Min/Sec.)	Pass/Fail (P or F)	Remarks

Verified By: _____ Date: _____

Title/Company: _____

* Lamp test shall be conducted after completion of street construction and final grading.

TP 4.11 Individual Subsurface Disposal Systems (Not part of the Utility Company's Facilities)

4.11.01 General

The Contractor shall install individual subsurface disposal systems at the locations shown on the plans. The work shall consist of furnishing and installing a double compartment 1,000-gallon or larger septic tank, 4-inch sewer pipe, and leachfield system in accordance with these technical provisions and applicable drawings. All construction will be done in a workmanlike manner. All sites will be left with a neat appearance.

4.11.02 Septic Tanks

4.11.02.01 General

All septic tanks shall have a minimum liquid capacity of 1,000 gallons and double compartment. Liquid capacity shall be split with two-thirds in the first compartment and one-third in the second compartment. The liquid depth of the septic tanks shall be at least 4 feet but not more than 5 feet.

The inlet and outlet on all tanks shall be provided with vertical tee fittings of cast iron or PVC plastic. In concrete tanks, oval box shaped or slab type baffles of pre-cast reinforced concrete with a minimum thickness of 2-inches may be used. The inlet baffle or tee must penetrate at least 5-inches below the liquid level but in no case shall it be greater than the penetration of the outlet baffle or tee. Both inlet and outlet baffles or tees shall extend 6-inches or more above the liquid level and end 1-inch from the underside of the tank top to allow gases to escape. The outlet baffle or tee shall extend below liquid level 40 percent of the liquid depth for rectangular tanks and 35 percent for circular tanks. The common wall passage shall also be located at the 40 percent liquid level depth. The inlet invert should be at least 2-inches above the liquid level in the septic tank. Four copies of drawings indicating pertinent dimensions, type, and location of steel reinforcing in concrete tanks, and important details shall be submitted by the Contractor for approval by the Owner prior to the installation of any septic tank.

4.11.02.02 Concrete Tanks

Concrete septic tanks shall be of pre-cast, mechanically vibrated, 4,000 psi minimum strength, watertight concrete containing adequate steel reinforcement to facilitate handling. Minimum wall thickness shall be 3-inches. The top and bottom shall have a minimum

thickness of 4-inches. Minimum steel reinforcement will be No. 3 reinforcing bars spaced 2 feet on centers in both directions in the top, bottom, and sides. The equivalent shall be used around manhole inspection ports and construction joints. Minimum steel reinforcement of the access cover or lid shall be No. 4 rebar spaced 6-inches on center in both direction or equivalent. The manhole and inspection opening covers shall be provided with steel lifting handles of No. 3 or No. 4 rebar.

Tanks shall be free of cracks from casting or handling (including placement). No wire mesh or rebar shall be exposed at any point on the tank interior or exterior.

Adequate access shall be provided into the septic tank either through a removable section or manhole with a minimum of 20-inches in the least dimension. The access manhole may be placed partially over the inlet to serve as an inspection hole; otherwise, inspection openings with a minimum of 7-inches in the least dimension shall be provided above the inlet, outlet, and the inter-compartment piping. The access manhole shall be provided with a 6-inch PVC coupling that extends through the center. A 6-inch diameter inspection pipe shall be installed so that it is connected to the access manhole coupling and extends to a point 12-inches above the ground surface. The pipe shall be 160 psi, SDR 26, PVC, shall terminate above ground surface with a 6-inch slip joint PVC cap, and shall be painted red on those portions above the ground surface.

4.11.03 Septic Tank Installation

Excavation shall be approximately 1 foot wider and longer than the tank. All tanks shall be set on a smooth level surface. The septic tank shall be placed plumb and true so that the inlet and outlet are at the highest possible elevations and so that the outlet pipe is not less than 2-inches nor more than 5-inches below the inlet pipe. The minimum bury for the septic tank inlet pipe shall be 18-inches. The maximum dirt cover for the septic tank shall be 36-inches. Where over excavation occurs, the bottom shall be raised to final elevation in 6-inch compacted lifts. Any water in the excavation must be removed and elevations checked before setting the tank. After setting the tank, it shall be filled with water to prevent floating. Both the septic tank inlet and outlet lines shall be grouted to the septic tank. Backfill around the tank shall be compacted and shall be sufficient to allow for no settlement.

4.11.04 Sewer Pipe and Fittings

All 4-inch pipe and fittings, except clean out tees, risers, hub adapters, and plugs, shall be PVC, SDR 35, solvent-weld joints and shall comply with ASTM

Specifications D-3033 and D-3034. All PVC shall be Type 1, Grade 1, PVC 1140 conforming to ASTM Specification D-1784.

Cleanout tees, risers, hub adapters, and plugs shall be PVC/DWV and comply with ASTM Specification D-2665.

4.11.05 Sewer Pipe Installation

All trenching, excavating, and backfilling shall be performed in accordance with TP 1.0 of these specifications. All construction shall provide a slope of 1/4" per foot (2%) and maintain at least 18-inches of cover over the line between the house and the septic tank. A minimum cover of 12-inches is required between the septic tank and drainfield system. Cleanout tees shall be two-way, 4" x 4" x 4", all solvent-weld hubs, PVC/DWV fittings. Cleanout risers for DWV cleanout shall be 4-inch PVC/DWV and shall terminate 3 to 6-inches above the ground surface with a PVC/DWV 4-inch hub adapter (solvent-weld hub by FIPT) and MIPT plug. Cleanout shall be placed at the house and at any in-line bends greater than 45 degree (bends greater than 45 degrees are discouraged) and at 100 feet intervals.

4.11.06 Drainfield Materials

4.11.06.01 Gravel

Drainfield gravel shall comply with the requirements for coarse aggregate under Federal Specification SS-A-281b, "Aggregate; (for Portland-Cement-Concrete)", and shall be Size 3 (2" to 1" nominal size). The amount of deleterious substances in the coarse aggregate shall not exceed the limits given in Section 3.2.3 of Federal Specification SS-A-281b.

4.11.06.02 Pipe and Fittings

All PVC shall be Type 1, Grade 1, PVC 1140 conforming to ASTM Specification D-1784. All 4-inch solid PVC pipe and fittings shall be PVC, SDR 35, solvent-weld joints and shall comply with ASTM Specifications D-3033 and D-3034. All 4-inch perforated PVC pipe shall be solvent-weld joints and shall comply with ASTM Specification D-2729 or D-3033 and D-3034. Perforations shall be 1/2 to 5/8 inch diameter holes on 5-inch centers in two rows spaced 90 to 120 degrees apart.

4.11.06.03 Drainage Fabric

The drainfield fabric shall be non-woven and composed of polypropylene filaments and shall be inert to biological degradation

and naturally encountered chemicals, alkalies, and acids. The fabric shall have a minimum average grab tensile strength of 120 pounds, a minimum average burst strength of 285 psi, a minimum average coefficient of permeability of 0.3 cm/sec, and a minimum thickness of 60 mils. The drainage fabric shall be equal to the Mirafi 140N non-woven fabric as manufactured by Mirafi, Inc., P.O. Box 240967, Charlotte, North Carolina.

4.11.07 Drainfield Installation

The trench width in the drainfield shall normally be 24-inches and shall not exceed 36-inches nor be less than 12-inches without the consent of the Owner. Trench bottoms shall be smooth and level from beginning of trench to end. All smeared or compacted surfaces of the trenches or bed shall be raked to expose the natural texture of the soil. All loose material shall be removed from the trench before the gravel is placed. The drainfield trench shall be kept as shallow as possible but with a minimum depth of 24-inches and a maximum depth of 60-inches. Drainfields shall be built so that all lines are looped. Where rock, clay, or ground water are encountered, the Contractor shall immediately notify the Owner and shall cease work on the drainfield installation. The bottom of the trench shall be covered with a 6-inch minimum depth lift of gravel. The lift shall be leveled (but not compacted) by hand to within \pm 1-inch throughout the entire length of the trench. The 4-inch perforated plastic pipe shall then be laid level \pm 1-inch by hand and centered in the trench. After the pipe has been laid, a second 6-inch lift of gravel shall be placed by hand and not compacted. The gravel shall be placed so that it extends 2-inches above the pipe. A layer of synthetic drainage fabric then shall be placed over the gravel and folded up the sides of the trench to prevent backfill soil from coming in contact with the gravel.

The trench shall then be backfilled and not compacted. The top shall then be mounded with a 8 to 12-inch crown and shall not be compacted. No mechanical or vehicular traffic shall be used to compact the trench. Backhoes shall not be allowed on trenches during or after the backfilling operation.

Four, red T-type, steel posts shall be placed at the outside corners of the drainfield. The post shall be driven a minimum of 14-inches into the ground and shall extend a minimum of 36-inches above the ground. The Contractor shall leave the premises in a neat and orderly condition. Excess dirt shall be spread evenly over the ground in the immediate area or disposed of in a manner approved by the Owner.

4.11.08 Gravel-less Drainfield Materials

The gravel-less drainfield shall consist of interlocking leaching chamber units, opened end plates, and closed end plates constructed from molded high density polyethylene. Gravel-less drainfield components shall be equal to the Infiltrator

as manufactured by Infiltrator Systems Inc., P.O. Box 768, Old Saybrook, CT 06475, or an approved equal.

4.11.09 Gravel-less Drainfield Installation

In place of perforated pipe and gravel for distribution and storage of waste water, leaching chambers or gravel-less drainfield systems can be employed.

The trench width for a gravel-less drainfield shall normally be 36-inches or as specified by the supplier of system. Trench bottoms shall be smooth and level from beginning of trench to end. All smeared or compacted surfaces of the trenches or bed shall be raked to expose the natural texture of the soil. All loose material shall be removed from the trench before the chamber units are installed. The trench shall be kept as shallow as possible but with a minimum depth of 24-inches and a maximum depth of 36-inches.

The installation of the gravel-less system shall be per the manufacturer's recommendations. Where rock, clay, or ground water are encountered, the Contractor shall immediately notify the Owner and shall cease work on the drainfield installation. The area between the leach chamber and trench wall shall be backfilled and compacted. The minimum cover for the gravel-less drainfield is 12-inches. The top shall then be mounded with an 8 to 12-inch crown and shall not be compacted. No mechanical or vehicular traffic shall be used to compact the trench. Backhoes shall not be allowed on trenches during or after the backfilling operation.

A 4-inch solid sewer PVC-DWV inspection port with adapter hub and plug shall be installed at the end of each line. The Contractor shall leave the premises in a neat and orderly condition. Excess dirt shall be spread evenly over the ground in the immediate area or disposed of in a manner approved by the Owner.

TECHNICAL PROVISIONS 5.0

TP 5.0 FINAL SITE UTILITY INSPECTION REQUIREMENTS

5.01 Final Inspection Package

The Contractor shall submit a complete site utility inspection package, which shall include the following items; all copies of which shall be legible.

5.01.01 As-Built Drawings

Four (4) sets of Size D "as-built" drawings which contain:

- A. Cover Sheet
- B. Rights of Way Plat Sheets
- C. Utility Plan View Sheets
- D. Water/Wastewater Plan and Profile Construction Sheets
- E. Details Sheets - Standard and Specific Drawings

5.01.02 As-Built Notebook

Four (4) three ring, loose-leaf binders, containing the following information:

- A. Water Pressure Test Certification and Test Results Approved by the NTUA. See "Exhibit A" of TP-3.
- B. Wastewater Main and Manhole Test Certifications and Test Results Approved by the NTUA. See "Exhibit A" or "Exhibit C" of TP-4
- C. Executed Transfer Agreement with Cost of Plant attached. See Exhibit "A" and "B" of TP-5.
- D. Water Meter Serial Number Listing and Current Meter Readings.
- E. Approved Tapping Permits.
- F. Approved Water/Wastewater Material Submittals.
- G. A set of plans on CD in the AutoCAD version specified.

5.02 Scheduling Final Inspection

The scheduling for the final inspection shall be coordinated with the NTUA by the Contractor. A complete as-built package is to be provided to the NTUA for review, a minimum of 21 calendar days prior to the scheduled inspection.

5.03 As-Built Drawing Requirements

Each project site that contains utilities to be transferred to the NTUA must be submitted with the following requirements and sheets.

5.03.01 General Requirements for All Sheets

5.03.01.01 Each sheet must be stamped by an A/E* and prominently labeled, signed, and dated by the Contractor (excepting cover and rights of way sheets):

AS BUILT _____
(Name) (Date)

“I certify that I have constructed this project following the standards set forth in TPs 1 - 4, and I have complied with all vertical and horizontal pipeline separation requirements.”

5.03.01.02 All facilities shall be shown as constructed and references to "proposed" or "future" deleted.

5.03.01.03 Where appropriate, each sheet must have a north arrow. Whenever possible, the arrow shall be up or to the right of the sheet.

5.03.01.04 Where appropriate, each sheet must have a standard legend and bar scale. All existing mains must be solid lines and sewer manholes must be solid circles.

5.03.01.05 All sheets must be numbered sequentially beginning with “Sheet 1 of (Total) Sheets.”

5.03.02 Cover Sheet

5.03.02.01 Since drawings occasionally cover several project sites, the location for each as-built site must be prominently identified by project number and project site location.

5.03.02.02 A map of the Navajo Nation that shows the project location, a vicinity map with a scale of 1" = 2 miles, and a north arrow is to be provided. These maps may be on a separate sheet or on the topographic boundary sheet.

5.03.02.03 The project site location, with the project number(s), should be shown on both the Navajo Nation and vicinity maps.

5.03.03 Plat Sheet

5.03.03.01 Show site boundaries with bearings and distances, complete with ties to permanent state plane markers (Section Corners, established monuments, etc.) and bearing references. All bearings shall be in the appropriate State Plane System in NAD 83 if possible; all distances shall be ground distances. Indicate basis of bearing.

5.03.03.02 Show and describe location of elevation and vertical datum references. A broken line may be utilized if the benchmark is not within the drawing scope or scale.

5.03.03.03 Show each lot and street boundary defined with bearings and distances, if appropriate. Show street centerline bearing, distance, and curve data.

5.03.03.04 Provide statements "Street Rights of Way are Dedicated to the Common Use of Utilities" if appropriate, and "the operating utility is not responsible for the repair or replacements of improvements in utility easements disturbed during operation and maintenance activities."

5.03.03.05 Show minimum 20-foot wide easements for each utility (electric, natural gas, water, sewers, telephones, cable) not located within the street right of way. Add an additional 10-foot width for each additional parallel utility. The NTUA will provide to the Contractor as-built drawings of utilities not constructed by the Contractor.

5.03.03.06 Utility or street rights of way may require expansion in localized areas to include all utility appurtenances (e.g., fire hydrant guards), which are not within the normal easement.

5.03.03.07 Provide a narrative legal description of the site boundary.

5.03.04 Utility Plan View Sheet(s)

5.03.04.01 On a sheet with a scale between 1"=20' and 1"=50', provide a plan view of the site that shows all utilities (e.g., propane, water, sewers, electric, natural gas, telephones, cable).

5.03.04.02 Show all lot, street, and easement boundary lines without bearing and distances.

5.03.04.03 Label all houses with final house numbers. Numbers must be

consistent with a swing tie table.

5.03.04.04 Provide a legend, north arrow, and bar scale.

5.03.04.05 Show as-built routing of all water and sewer mains and service lines. Emphasize water and sewer mains by using bolder lines. Use a smaller but bold line for service lines. Reference the standard NTUA legend.

5.03.04.06 Label water mains with size, type of material, pressure rating, and length of pipe from P.I. to P.I. Example: 6" PVC, SDR 21, 232.00'.

5.03.04.07 Label wastewater mains with size, type of material, and distances between manholes. Example: 8" PVC, SDR 35, 389.00'.

5.03.04.08 Label water and wastewater main tap points, to previous projects with previous project number and as-built sheet number. Contractor shall contact the Operating Utility to determine this information.

Examples: White Cone Composite	Red Water Housing
IHS NA 88-114	NHA AZ 12-106
Sheet 15 of 43	Sheet C-8

5.03.04.09 Show and label depth of bury at all locations where water main varies from the standard depth of bury of 42 inches.

5.03.04.10 For fire hydrants, gate valves, tees, bends, water meters, curb stops, and saddles state the manufacturer model number and type of joint for the actual item used. As an option this information can be shown on the standard detail sheet next to the appropriate detail, or include submittals.

5.03.04.11 Show and label all water main fittings actually used. G.V., 6" DI TEE, 6" DI 45° BEND. Examples: 6" G.V., 6" DI TEE, 6" DI 45° BEND.

5.03.04.12 Provide swing ties in table format for all gate valves, water meters, domestic stops, curb stops, water main taps, manholes, main line clean out, yard clean outs, and sewer wyes. Swing ties shall be measured from building corners or other permanent structures.

SWING TIES (Examples)

House No.	Domestic Stop		Water Meter		Curb Stop		Water Main Tap		Yard Clean out		Sewer Wye	
	A	B	A	B	A	B	A	C	A	B	A	C
1	31.6	3.8	34.8	32.9	36.7	35.8	42.0	65.0	22.4	11.6	57.0	73.0

Item	House No.	Distance	
		A	B
MH 11A-3	3	56.2	68.4
GV-1	5	43.4	63.6
GV-2	5	43.6	61.6
MH 11A-1-2	15	93.4	73.0
CO-2	14	64.8	61.5

5.03.04.13 Label corners of each building or structure, as necessary, to provide references for swing tie tables.



5.03.04.14.1 Provide pipe information for each size and type of pipe in a table with the following format:

Use	Size (in)	Type of Material	Joint Type	SDR	Pressure Rating PSI	Dimensions (in)			ASTM No.
						O.D.	I.D.	Wall Thick	
Water	6	PVC	Slip	21	200	6.625	5.993	0.316	D2241
Water	1	PE	Stab	7	200	1.349	1.049	0.150	D2239

Sewer	8	PVC	Slip	35	N/A	8.400	7.920	0.240	D3034
Sewer	4	PVC	Slip	35	N/A	4.215	3.975	0.120	D3034

PIPE DIMENSIONAL DATA 5.03.05

5.03.05 Water/Wastewater Plan and Profile Sheet(s)

5.03.05.01 Plan View

Provide all items from the utility plan view sheet requirements on the Utility Plan View Sheets portion; TP 5.03.04.

5.03.05.02 Profile View

5.03.05.02.01 Label all manholes and wastewater main clean-outs with manholes and clean-out numbers. Provide rim elevations with inlet and outlet invert elevations. The manhole numbers must conform to the existing manhole numbering system. Station all manholes and connections.

5.03.05.02.02 Label all wastewater mains with size, type of material, slope, and distance. Distance shall be the actual distance of the pipeline. (O.D. of manholes to O.D. of manholes).

5.03.05.02.03 Show all water mains that cross the sewer main and dimension Pipe O.D. to Pipe O.D. the vertical separation. Station all water mains and appurtenances.

EXHIBIT A OF TP 5.0

Note: (This is an example only. The actual Cost of Plant shall be developed by the Contractor and attached to the Transfer Agreement.)

COST OF PLANT
 NHA Project AZ 12-51
 Kayenta, Arizona

ITEM	QUANTITY	UNIT	LABOR	MATERIAL	TRANS.	TOTAL
8" PVC Sewer Main	1745	LF	\$7,187.22	\$5,750.00	\$1,437.44	\$14,374.66
Precast Manhole	7	EA.	\$2,101.10	\$1,681.68	\$ 420.00	\$ 4,209.78
8" Sewer Clean out	1	EA.	\$ 123.50	\$ 68.75	\$ 24.75	\$ 216.50
Sewer Service Connection	30	EA.	\$2,415.00	\$1,932.00	\$ 483.00	\$ 4,830.00
					Subtotal:	<u>\$23,630.94</u>
6" PVC Water Main	1707	LF	\$16,438.41	\$13,150.73	\$3,287.68	\$32,876.82
Fire Hydrant	3	EA.	\$ 750.00	\$ 600.00	\$ 150.00	\$ 1,500.00
6" Gate Valves	9	EA.	\$ 948.47	\$ 758.00	\$ 189.00	\$ 1,895.47
1" Water Service Line w/Meters	30	EA.	\$ 6,420.00	\$ 5,136.00	\$1,284.00	\$12,840.00
					Subtotal:	<u>\$49,112.29</u>
TOTAL COST OF UTILITY PLANT:						<u>\$72,743.23</u>
Less: Sewer Service Connection not transferred to Operating Utility:						<u>-\$ 4,830.00</u>
TOTAL OF PLANT TRANSFERRED:						<u>\$67,913.23</u>

EXHIBIT B OF TP 5.0
UTILITY TRANSFER AGREEMENT
FOR
WATER AND WASTEWATER FACILITIES

This agreement is made between _____, hereinafter called the Grantor, and the **NAVAJO TRIBAL UTILITY AUTHORITY**, hereinafter, call the Grantee.

WHEREAS, the Grantor has constructed or caused to have constructed water and wastewater facilities located at or near _____ as shown on the plans titled _____, designed by _____, and dated _____ and said facilities and related final as-built plans already have been inspected, accepted and approved by the Grantee, and;

WHEREAS, the Grantor wishes to convey to the Grantee all his interest in these facilities and appurtenances constructed at the above-mentioned location on or about the above-mentioned time, along with all rights, rights of way, and privileges so that the Grantee may own, operate, and maintain all such facilities and appurtenances.

NOW THEREFORE IT IS AGREED:

For consideration of \$1.00, the receipt of which already has been acknowledged, the Grantor transfers, assigns, grants, and conveys to the Grantee all rights, titles, interests, easements, and rights of way in the aforementioned facilities, and;

The Grantee agrees to accept such aforementioned facilities, and further agrees to own, operate, and maintain such facilities in a reasonable and prudent manner until such facilities are determined to be no longer of any value. Further, the Grantor hereby warranties all such facilities against defects in workmanship and materials, and for design deficiencies, errors, and omissions for the period of one year beginning on _____ and ending on _____.

A listing of the total inventory and Cost of Plant determined by the Grantor, to be transferred to the Grantee, is attached as EXHIBIT _____ and made a part of this Utility Transfer Agreement. The total Cost of Plant as appears on this document is \$ _____.

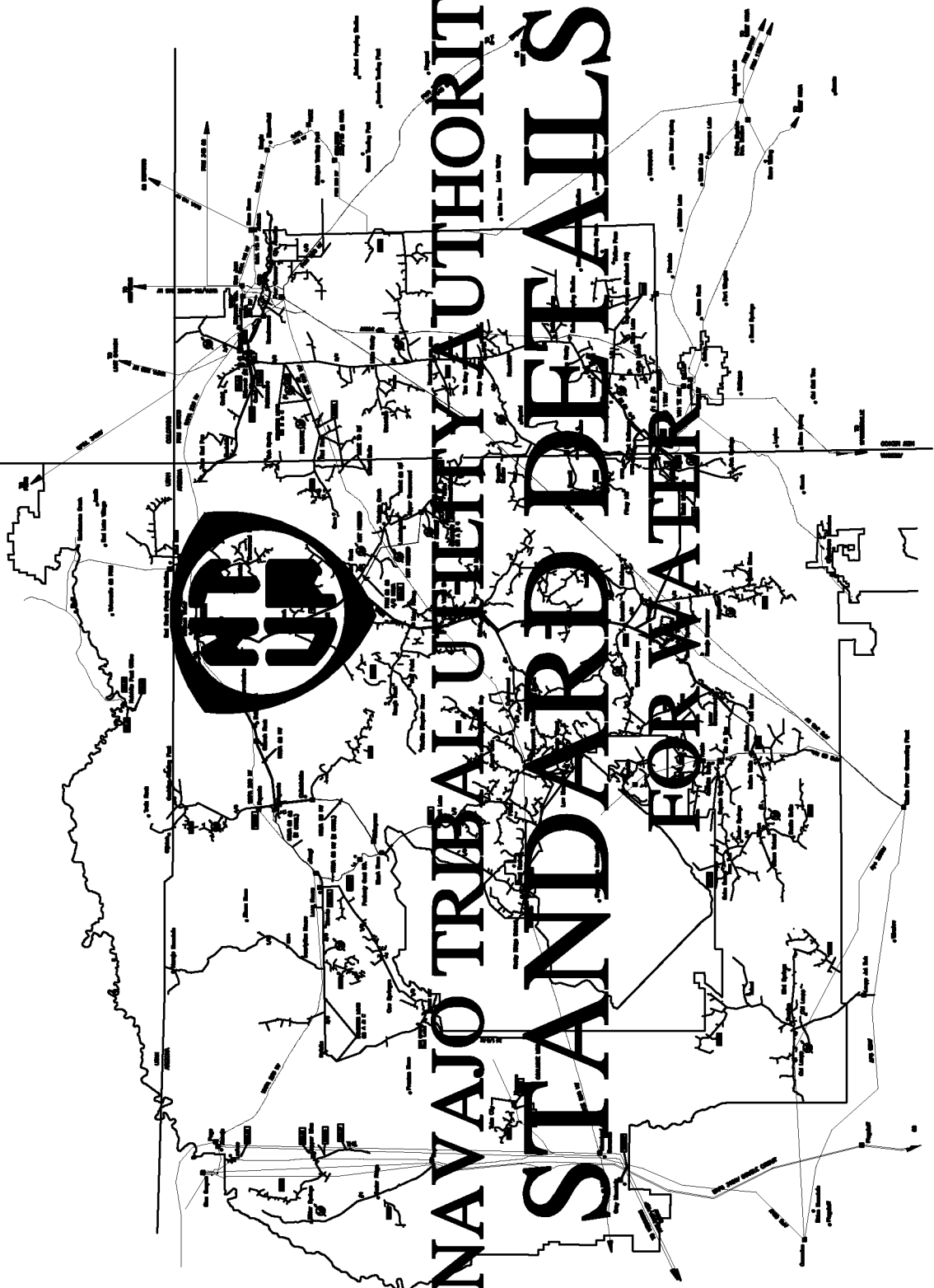
IN WITNESS THEREOF, both parties have signed and dated this agreement.

Grantor: by _____ Date: _____
Signature

Printed Name

Navajo Tribal Utility Authority: by _____ Date: _____
Signature

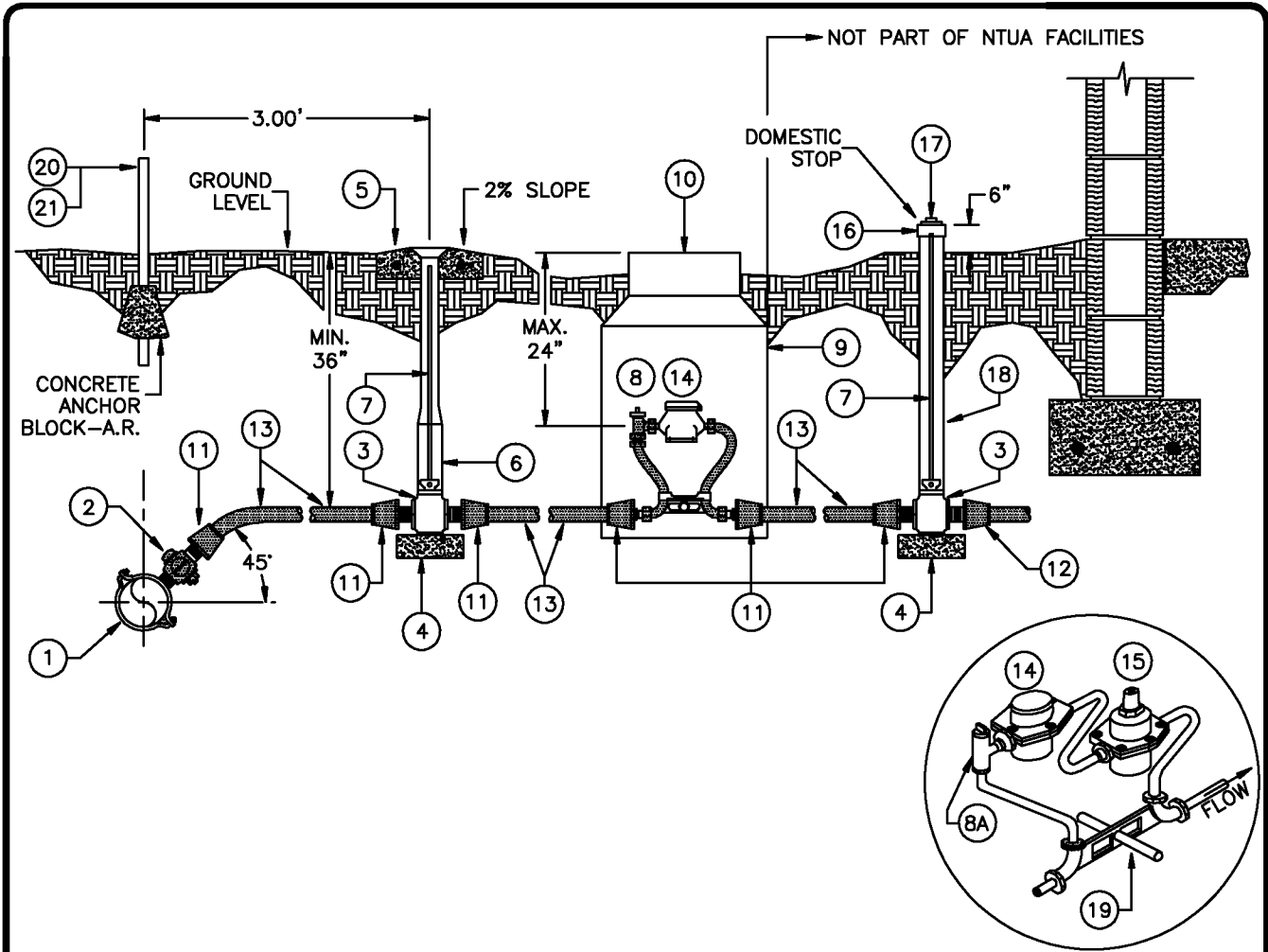
Printed Name



NAVAJO TRIBE UTILITY AUTHORITY STANDARD DETAILS FOR WATER

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NOTES:

1. SELECT EITHER PAGE 2a OR 2b BASED ON METER SIZE.
2. TEST DURATION SHALL BE FOR 2 HOURS.

DATE PERFORMED: _____. LAB SAMPLE NO.: _____. INITIALED (NTUA): _____.

INDEX	SHEET
1" WATER SERVICE	1 of 5
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AS-BUILT LOCATION OF TAP	
SYSTEM NAME	
PROJECT NO.	
SHEET NO.	
LINE NO.	
STATION NO.	

SHEET 1 OF 7

DESIGNED BY:	NTUA
SURVEYED BY:	
DRAWN BY:	NTUA
APPROVED BY:	NTUA
DATE:	04/08
PROJECT NO.	
SCALE:	NTS
ACAD FILENAME:	Water Standard
DWG. NO.	WS-1.DWG

NAVAJO TRIBAL UTILITY AUTHORITY
By Order of the Board of Directors
1" WATER SERVICE FOR
A 5/8" x 3/4"
OR 1" METER

800-899-0888 FT. DEFENCE, AZ

REVISIONS			
No.	Date	Brief	By
01	04/08	Revised	L.H.
02			
03			
04			
05			
06			



DESIGNED BY:	NTUA
SUBMITTED BY:	NTUA
DRAWN BY:	NTUA
APPROVED BY:	NTUA
DATE:	04/08
PROJECT NO.:	
SCALE:	N.T.S.
ASD FILENAME:	Water-Standard
DWG. NO.:	US-10.DWG

NAVAJO TRIBAL UTILITY AUTHORITY
AN EQUAL OPPORTUNITY ORGANIZATION

**MATERIAL LIST: 1" SERVICE
 WITH 5/8" x 3/4" METER**

PLANNING, AS

REVISIONS			
No.	Date	By	Checked
01	04/08		
02			
03			
04			
05			
06			



MATERIAL LIST		
ITEM	QUAN	DESCRIPTION
1	1	SADDLE, BRASS, 1" FIPT x APPROPRIATE PIPE TYPE, O.D., AND LINE PRESSURE
2	1	CORPORATION STOP, 1" MIPT x 1" FIPT, MUELLER H-10046, OAE
3	1	CURB STOP, 1" FIPT x 1" FIPT, MINNEAPOLIS PATTERN W/ O-RING, MUELLER H-10287, OAE
4	A.R.	CONCRETE BLOCK OR BRICK
5	A.R.	CONCRETE COLLAR, 18" SQUARE x 4" THICK, W/ #4 REBARS, E.W.O.C.
6	1	CURB VALVE BOX, EXTENSION TYPE, MUELLER H-10302, W/ 2" x 1 1/2" BUSHING, OAE
7	2	STATIONARY ROD 36" LONG, MUELLER PART #84338, SECURED TO THE CURB STOP W/ COTTER PIN
8	1	COPPERSETTER W/ VALVED 12" RISER FOR 5/8" x 3/4" WATER METER, FORD NO. VB72-12W-FF-44, OAE, W/ 1" IP UNION NUT/SWIVEL ASSEMBLY CONNECTION ON INLET, OUTLET, AND BRACING EYE
8a	1	TANDEM COPPERSETTER WITH VALVED 12" RISER, 5/8" x 3/4" WATER METER, FORD NO. TVB-72-12W-FF-44, OAE, W/ TWO REGULATOR ADAPTERS FOR THE PRV
9	1	METER CAN, 20" O.D. x 30" HT., DFW PLASTIC, DFW 2030 B SERIES "T" TOP
10	1	METER BOX COVER W/ FROST PLATE, FOR 20" METER CAN, 11 1/2" MINIMUM LID OPENING, CASTING M-70
11	6	INSTA-TITE FITTING, 1" MIPT x 1" STAB FOR SIDR 7 P.E. PIPE, MUELLER H15426
12	1	CONNECTOR/ADAPTER, 1" MIPT x APPROPRIATE PIPE TYPE AND O.D.
13	A.R.	PIPE, 1" P.E., ASTM D-2239, SIDR 7, 200 PSI, 200' MAX.
14	1	METER, POSITIVE DISPLACEMENT, NEPTUNE, SR, 5/8" x 3/4", GALLONS, W/ FROST PLATE
15	1	PRV, WILKENS 600 OR WATTS 25 AUB, 3/4" FIPT
16	1	ADAPTER, 3", HUB x FIPT PVC-DWV
17	1	CLEANOUT PLUG, 3" MIPT, PVC-DWV
18	1	RISER, 3" x 36" LONG, PVC-DWV
19	1	STABILIZER, 1/2" O.D. x 12" LONG PIPE, PVC, SCH. 40
20	A.R.	BLUE CARSONITE MARKER POST
21	A.R.	"WATERLINE WARNING" DECAL (FOR ITEM 20)

NOTES:

1. A.R. = AS REQUIRED
2. DECAL TO BE AFFIXED TO ITEM NO. 20.
3. NORMAL FLOW RATE = 1-20 GPM.
4. NTUA WILL NOT PROVIDE WATER METERS FOR SUBDIVISIONS AND DEVELOPERS.
5. WATER METER SERIAL NUMBER: _____
6. SADDLE SIZE: _____

DESIGNED BY:	NTUA
SUBMITTED BY:	NTUA
DRAWN BY:	NTUA
APPROVED BY:	NTUA
DATE:	04/08
PROJECT NO.:	
SCALE:	NTS
ADD FILENAME:	Water Standard
DWG. NO.:	US-1b.DWG

NAVAJO TRIBAL UTILITY AUTHORITY
BY ORDER OF THE BOARD OF DIRECTORS
**MATERIAL LIST: 1" SERVICE
 WITH 1" METER**
PLUMBING, AS

REVISIONS			
No.	Date	By	Initial
01	04/08	LJA	
02			
03			
04			
05			
06			



SHEET 3 OF 7

MATERIAL LIST		
ITEM	QUAN	DESCRIPTION
1	1	SADDLE, BRASS, 1" FIPT x APPROPRIATE PIPE TYPE, O.D., AND LINE PRESSURE
2	1	CORPORATION STOP, 1" MIPT x 1" FIPT, MUELLER H-10046, OAE
3	1	CURB STOP, 1" FIPT x 1" FIPT, MINNEAPOLIS PATTERN W/ O-RING, MUELLER H-10287, OAE
4	A.R.	CONCRETE BLOCK OR BRICK
5	A.R.	CONCRETE COLLAR, 18" SQUARE x 4" THICK, W/ #4 REBARS, E.W.O.C.
6	1	CURB VALVE BOX, EXTENSION TYPE, MUELLER H-10302, W/ 2" x 1 1/2" BUSHING, OAE
7	2	STATIONARY ROD, 36" LONG, MUELLER PART #84338, SECURED TO THE CURB STOP W/ COTTER PIN
8	1	COPPERSETTER W/ VALVED 12" RISER, 1" WATER METER, FORD NO. VB74-12W-FF-44, OAE, W/ 1" IP UNION NUT/SWIVEL ASSEMBLY CONNECTION ON INLET, OUTLET, AND BRACING EYE
8a	1	TANDEM COPPERSETTER WITH VALVED 12" RISER, 1" WATER METER, FORD NO. TVB-74-12W-FF-44, OAE, W/ TWO REGULATOR ADAPTERS FOR THE PRV
9	1	METER CAN, 20" O.D. x 30" HT., DFW PLASTIC, DFW 2030 B SERIES "T" TOP
10	1	METER BOX COVER W/ FROST PLATE, FOR 20" METER CAN, 11 1/2" MINIMUM LID OPENING, CASTING M-70
11	6	INSTA-TITE FITTING, 1" MIPT x 1" STAB FOR SIDR 7 P.E. PIPE, MUELLER H15426
12	1	CONNECTOR/ADAPTER, 1" MIPT x APPROPRIATE PIPE TYPE AND O.D.
13	A.R.	PIPE, 1" P.E., ASTM D-2239, SIDR 7, 200 PSI, 200' MAX.
14	1	METER, POSITIVE DISPLACEMENT, SENSUS, SR, 1", GALLONS, W/ FROST PLATE
15	1	PRV, WILKENS 600 OR WATTS 25 AUB, 1" FIPT
16	1	ADAPTER, 3", HUB x FIPT PVC-DWV
17	1	CLEANOUT PLUG, 3" MIPT, PVC-DWV
18	1	RISER, 3" x 36" LONG, PVC-DWV
19	1	STABILIZER, 1/2" O.D. x 12" LONG PIPE, PVC, SCH. 40
20	A.R.	BLUE CARSONITE MARKER POST
21	A.R.	"WATERLINE WARNING" DECAL (FOR ITEM 20)

NOTES:

1. A.R. = AS REQUIRED
2. DECAL TO BE AFFIXED TO ITEM NO. 20.
3. NORMAL FLOW RATE = 3-50 GPM.
4. WATER METER SERIAL NUMBER: _____
5. SADDLE SIZE: _____

1. PROVIDE 10' MINIMUM HORIZONTAL SEPARATION IN SEPARATE TRENCHES BETWEEN WATER AND SEWER SERVICES, PAST THE BUILDING PLUMBING. PROVIDE 5' MINIMUM HORIZONTAL SEPARATION BETWEEN WATER SERVICE AND OTHER UTILITIES. FOR WATER AND SEWER CROSSING. PROVIDE A MINIMUM OF 12" VERTICAL CLEARANCE, PIPE O.D. TO PIPE O.D. IF WATER SERVICE CROSSES OTHER UTILITIES, ALL STIPULATIONS FOR THE OTHER UTILITY MUST BE MET.
2. BUILDING PLUMBING, WATER AND SEWER SERVICES TO BE INSTALLED IN ACCORDANCE WITH THE NATIONAL PLUMBING CODE ADOPTED BY THE NAVAJO NATION.
3. WATER SERVICES SHALL HAVE A MINIMUM COVER OF 36" AND SHALL BE INSTALLED IN CONFORMANCE WITH NTUA STANDARDS.
4. SADDLES SHALL BE SINGLE STRAP/BAND TYPE, FOR STEEL PIPE O.D. PVC. SADDLES SHALL BE DOUBLE STRAP/BAND TYPE, FOR D.I., A.C., OR C-900 PIPE. ON EXISTING 2" PIPING, A 2" x 1" PVC TEE SHALL BE USED. CONTACT NTUA HEADQUARTERS ENGINEERING ON PIPING SMALLER THAN 2".
5. PROVIDE THE AS-BUILT SWING TIE INFORMATION FOR THE TAP POINT AND OTHER APPURTENANCES INSTALLED, ON SHEET 5 of 5.
6. THE WATER METER SHALL BE CENTERED AND SET A MAX. OF 24" BELOW THE TOP OF THE METER BOX COVER.
7. THE METER CAN SHALL BE LOCATED JUST BEYOND THE SIDEWALK AT THE PROPERTY LINE OR WITH OWNER'S PERMISSION A MINIMUM OF 10' FROM THE BUILDING.
8. WATER SERVICE LINES ARE LIMITED TO A MAXIMUM OF 200'. IF THE PRESSURE AT THE HOME SITE IS ABOVE 70 PSI, INSTALL THE APPROPRIATE TANDEM COPPERSETTER WITH AN INDIVIDUAL PRV (ITEM 8A).
9. USE FIELD MARKERS WHERE APPROPRIATE.
10. SUBMIT CONSTRUCTION COST OF NEW INSTALLATION UP TO AND INCLUDING THE METER. INDICATE AS FOLLOWS: A. MATERIAL COST, B. LABOR COST, C. EQUIPMENT COST, D. TOTAL CONSTRUCTION COST. THE COST SHALL BE SHOWN ON SHEET 5 of 5 AND THE TRANSFER AGREEMENT.
11. SHEETS 4 OF 5 AND 5 OF 5 ARE FOR RESIDENTIAL INSTALLATIONS ONLY. ALL OTHER PROJECTS, SUBMIT 4 SETS OF COMPLETE DRAWINGS.

SHEET 4 OF 7

DESIGNED BY:	NTUA
SURVEYED BY:	
DRAWN BY:	NTUA
APPROVED BY:	NTUA
DATE:	04/08
PROJECT NO.	
SCALE:	NTS
ACAD FILENAME:	Water Standard
DWG. NO.	WS-1c.DWG













NAVAJO TRIBAL UTILITY AUTHORITY
By One Department Authority
GENERAL NOTES FOR
WATER SERVICE
EQ-ENGINEERING PT.DEPANCE, AS

REVISIONS			
No.	Date	Brief	By
01	04/08	Revised	L.H.
02			
03			
04			
05			
06			



(PLAN VIEW - NORTH ARROW REQUIRED)

* SEE GENERAL NOTES NO. 11 ON SHEET 3 of 5

ITEM DESCRIPTION	MATERIALS			ITEM DESCRIPTION	MATERIALS		
	LEGEND	SIZE	TYPE		LEGEND	SIZE	TYPE
WATERLINE TAP 				WATERLINE, PROPOSED	-- W --		
VALVE, GATE				WATERLINE, EXISTING	—W—		
VALVE, CURB STOP				SEWERLINE, PROPOSED	-- S --		
WATER METER				SEWERLINE, EXISTING	—S—		
WATER METER W/ IND PRV				PROPOSED TIE INFORMATION			
VALVE, DOMESTIC STOP							
YARD HYDRANT				LOCATION:			
CLEAN-OUT(S)				SYSTEM:			
SEPTIC TANK				PROJECT NO:	SHT.	OF	SHTS.
INFILTRATORS				DRAWN BY:	DATE:		
DWELLING/OTHER BLDGS				PROPOSED START DATE:			

SHEET 5 OF 7

DESIGNED BY:	NTUA
SURVEYED BY:	
DRAWN BY:	NTUA
APPROVED BY:	
DATE:	04/08
PROJECT NO.	
SCALE:	NTS
ACAD FILENAME:	Water Standard
DWG. NO.	WS-1d.DWG

NAVAJO TRIBAL UTILITY AUTHORITY
By One Department Agreement
**PROPOSED INDIVIDUAL
 INSTALLATION**






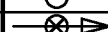


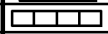

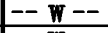
800-890-0000 FT. DEFENCE, AZ

REVISIONS			
No.	Date	Brief	By
01	04/08	Revised	L.H.
02			
03			
04			
05			
06			



(PLAN VIEW - NORTH ARROW REQUIRED)

* SEE GENERAL NOTES NO. 11 ON SHEET 3 of 5

ITEM DESCRIPTION	MATERIALS			SWING TIES (IN FEET)				CONSTRUCTION COST:
	LEGEND	SIZE	TYPE	NW(A)	NE(B)	SW(C)	SE(D)	
WATERLINE TAP								MATERIAL:
VALVE, GATE								LABOR:
VALVE, CURB STOP								EQUIPMENT:
WATER METER								TOTAL:
WATER METER W/ IND PRV								
VALVE, DOMESTIC STOP								
YARD HYDRANT								
CLEAN-OUT(S)								
SEPTIC TANK								
INFILTRATORS								
DWELLING/OTHER BLDGS								AS-BUILT TIE INFORMATION
WATERLINE, PROPOSED	-- W --							LOCATION:
WATERLINE, EXISTING	— W —							SYSTEM:
SEWERLINE, PROPOSED	-- S --							PROJECT NO:
SEWERLINE, EXISTING	— S —							DRAWN BY: DATE:
								COMPLETION DATE:

SHEET 6 OF 7

DESIGNED BY:	NTUA
SURVEYED BY:	
DRAWN BY:	NTUA
APPROVED BY:	NTUA
DATE:	04/08
PROJECT NO.	
SCALE:	NTS
ACAD FILENAME:	Water Standard
DWG. NO.	WS-1e.DWG

NAVAJO TRIBAL UTILITY AUTHORITY
By Order of the Board of Directors
INDIVIDUAL AS-BUILT
BY: [Signature] DATE: [Date]

REVISIONS			
No.	Date	Brief	By
01	04/08	Revised	L.H.
02			
03			
04			
05			
06			



PLAN VIEW - (NORTH ARROW REQUIRED) - Draw location of new service/home with references to adjacent permanent structures, i.e. existing utilities, roads, washes, businesses, neighbor's home, etc.

SHEET 7 OF 7

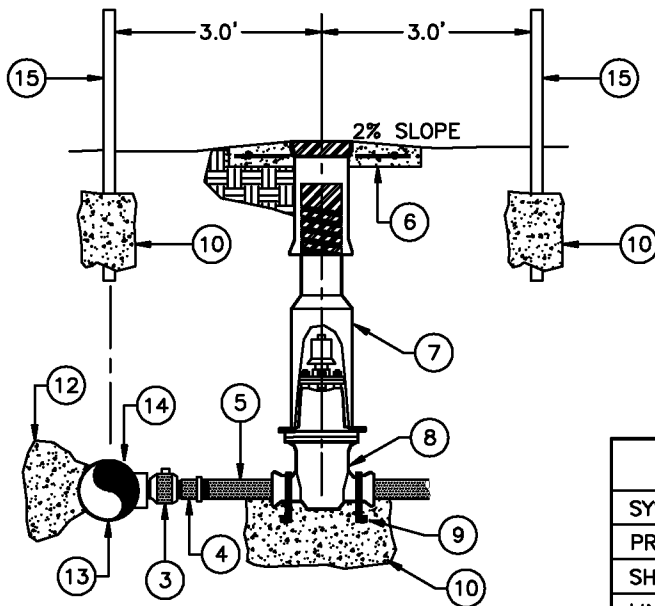
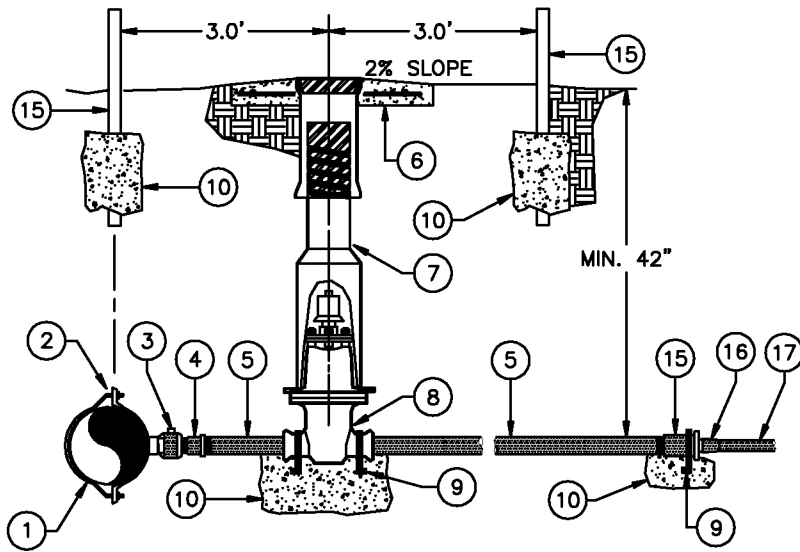
DESIGNED BY:	NTUA
SURVEYED BY:	
DRAWN BY:	NTUA
APPROVED BY:	NTUA
DATE:	04/08
PROJECT NO.	
SCALE:	NTS
ACAD FILENAME:	Water Standard
DWG. NO.	WS-1F.DWG

NAVAJO TRIBAL UTILITY AUTHORITY
By Order of the Board of Directors
**VICINITY LOCATION
 OF NEW SERVICE**

80-8990000000 PT.DISTANCE, AZ

REVISIONS			
No.	Date	Brief	By
01	04/08	Revised	L.H.
02			
03			
04			
05			
06			





AS-BUILT LOCATION OF TAP	
SYSTEM NAME	
PROJECT NO.	
SHEET NO.	
LINE NO.	
STATION NO.	

NOTES:

1. TEST DURATION SHALL BE FOR 2 HOURS.

DATE PERFORMED: _____. LAB SAMPLE NO.: _____. INITIALED (NTUA): _____.

DESIGNED BY:	NTUA
SURVEYED BY:	
DRAWN BY:	NTUA
APPROVED BY:	NTUA
DATE:	04/08
PROJECT NO.	
SCALE:	NTS
ACAD FILENAME:	Water Standard
DWG. NO.	WS-3.DWG

NAVAJO TRIBAL UTILITY AUTHORITY
AN EQUAL OPPORTUNITY ORGANIZATION

**2" MAINLINE TAP FOR
 SERVICE IN EXCESS
 OF 200'**

EQ-ENGINEERING FT. DEFENCE, AZ

REVISIONS			
No.	Date	Brief	By
01	04/08	Revised	L.H.
02			
03			
04			
05			
06			



DESIGNED BY:	NTUA
DRAWN BY:	NTUA
APPROVED BY:	NTUA
DATE:	04/08
PROJECT NO.:	
SCALE:	N.T.S.
ACAD. PLANTING:	Victor Standard
DRG. NO.:	VS-36(J)VG

NAVALO TRIBAL UTILITY AUTHORITY
MATERIAL LIST: 2" TAP
FOR SERVICES IN
EXCESS OF 200'
 PROJECT NO. 04

No.	Date	Revised	By
01	04/08		LJA
02			
03			
04			
05			
06			

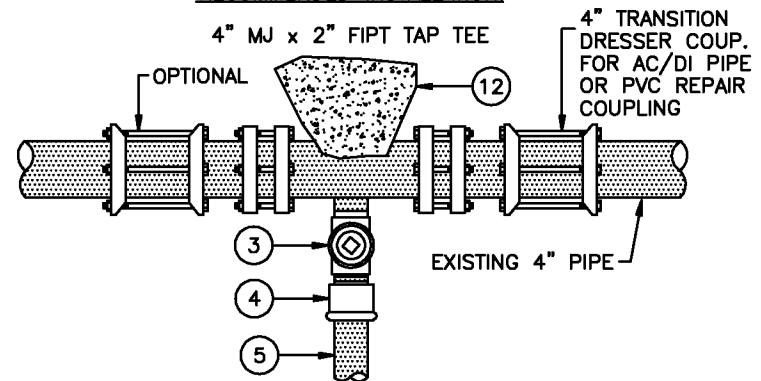


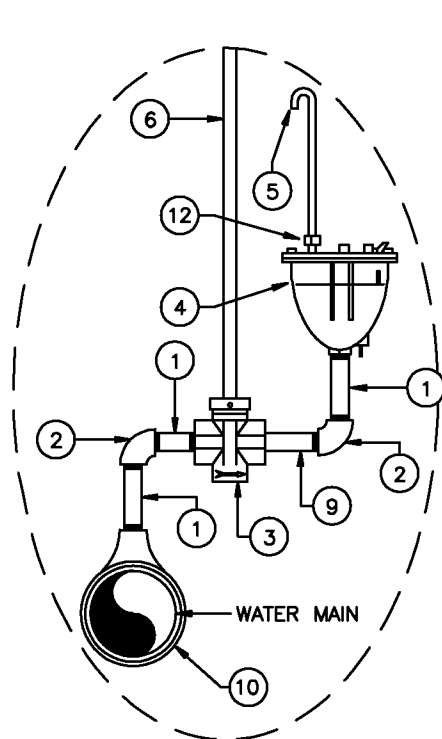
MATERIAL LIST		
ITEM	QUAN	DESCRIPTION
1	-	PIPE, 6" OR LARGER, EXISTING
2	1	SADDLE, BRASS, PIPE SIZE & TYPE x 2" FIPT TAP, 6" AND LARGER
3	1	CORPORATION STOP, 2" MIPT x 2" FIPT, MUELLER B-20046
4	1	ADAPTER, PVC, CL 200, SDR-21, 2" GASKET x 2" MIPT
5	A.R.	PIPE, 2" PVC, SDR-21, BELL & SPIGOT
6	A.R.	CONCRETE COLLAR, 24" SQUARE x 4" THICK, W/ #4 REBARS, E.W.O.C., INSCRIBED W/ LINE SIZE AND FLOW DIRECTION
7	1	VALVE BOX, C.I., 2-PIECE, 5.25" SHAFT, SCREW TYPE, TYLER 6850 SERIES W/ LID
8	1	GATE VALVE, 2", RESILIENT SEAT WEDGE, S x S, NRS, RHT, 2" OPERATING NUT-MUELLER A2360-37
9	A.R.	REBAR, #4, CUT & SHAPE AS NEEDED
10	A.R.	CONCRETE ANCHOR BLOCK, 1.5 C.F. MIN. (DO NOT COVER JOINTS OR BOLTS)
11	1	ADAPTER, PVC, CL 200, SDR 21, 2" GASKET x 2" FIPT
12	A.R.	CONCRETE THRUST BLOCK, 1.5 C.F. MIN. (DO NOT COVER JOINTS OR BOLTS)
13	-	PIPE, 4" OR LESS, EXISTING
14	1	TEE, 4" MJ x 2" FIPT TAP W/ 2" BRASS CORP. STOP (FIG. 2-1) OR 2" TEE, PVC, CL 200
15	A.R.	BLUE CARSONITE MARKER POST W/ "WATERLINE WARNING" DECAL
16	1	INSTA-TITE FITTING, 1" MIPT x 1" STAB FOR SIDR 7 P.E. PIPE, MUELLER H15426
17	1	PIPE, 1" P.E., ASTM D-2239, SIDR 7, 200 PSI, 200' MAX.

NOTES:

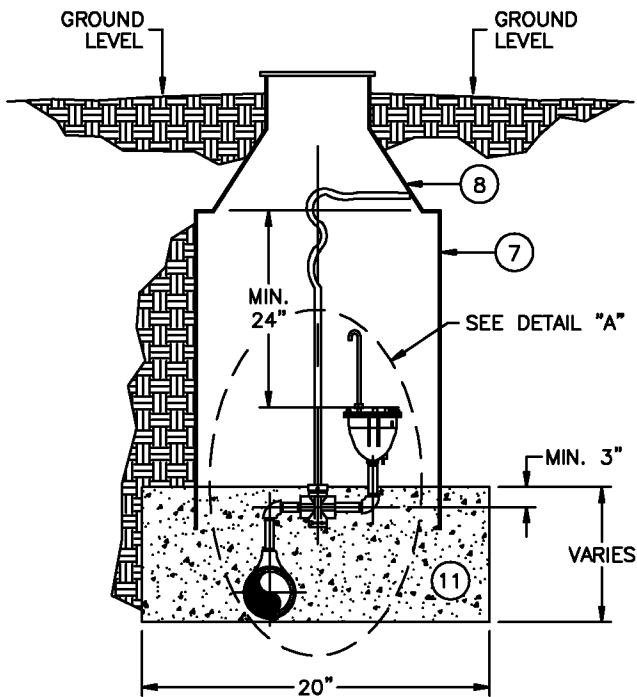
1. A.R. = AS REQUIRED
2. DECAL TO BE AFFIXED TO ITEM NO. 15
3. ASSEMBLE AND INSTALL AS ONE UNIT
4. WATER METER SERIAL NUMBER: _____

**FIGURE 2-1
RECOMMENDED INSTALLATION:**





DETAIL "A"



MATERIAL LIST

ITEM	QUAN	DESCRIPTION
1	3	3/4" x 3" NIPPLE, BRASS
2	2	3/4" x 90° ELBOW, BRASS
3	1	3/4" CURB STOP VALVE, FIPT, MUELLER H-10287, OAE
4	1	3/4" IN x 3/8" OUT AIR RELEASE VALVE
5	1	3/8" O.D. PIPE, COPPER, 12" MIN.
6	1	STATIONARY ROD, 42"
7	1	METER CAN, 20" O.D. x 30" DEPTH, SONOLOC
8	1	METER CAN COVER W/ DOUBLE LID (FROST PLATE) FOR 20" O.D. CAN, CASTING M-70
9	1	3/4" x 6" NIPPLE, BRASS
10	1	SADDLE, BRASS, 3/4" TAP x APPROPRIATE PIPE O.D. SIZE
11	3 CF*	1" TO 2" FILTER ROCK
12	1	ADAPTER, 3/8" MIPT x 1/2" COMPRESSION

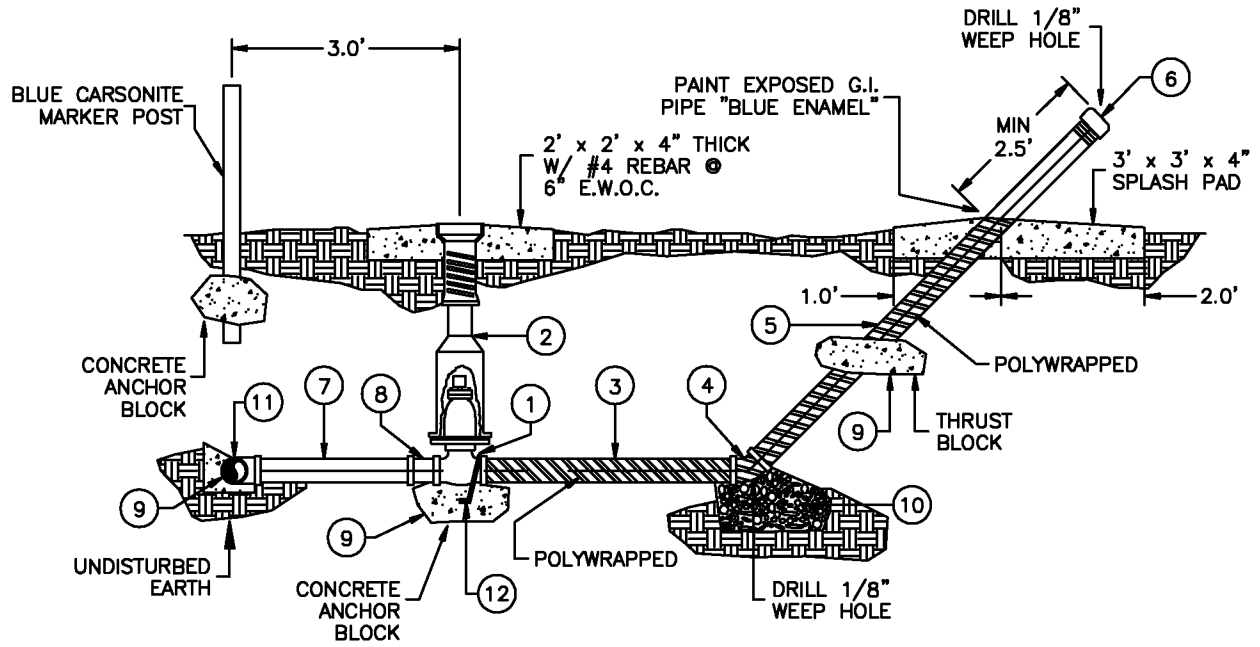
*CF = CUBIC FEET

DESIGNED BY:	NTUA
SURVEYED BY:	
DRAWN BY:	NTUA
APPROVED BY:	NTUA
DATE:	04/08
PROJECT NO.	
SCALE:	NTS
ACAD FILENAME:	Water Standard
DWG. NO.	WS-10.DWG

NAVAJO TRIBAL UTILITY AUTHORITY
By One Department Authority
AIR RELEASE VALVE DETAIL
BY: JPH/CH/ER/MS

REVISIONS			
No.	Date	Brief	By
01	04/08	Revised	L.H.
02			
03			
04			
05			
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MATERIAL LIST

ITEM	QUAN	DESCRIPTION
1	1	2' GATE VALVE, C.I., FIPT, RW, NRS, RHT, W/ 2' OPERATING NUT, MUELLER A-2360-37
2	1	VALVE BOX, SCREW-TYPE, C.I., 2 PIECE, 5 1/4" SHAFT, TYLER 6850
3	1	2" x 3' PIPE (MIN.), G.I., COATED OR POLYWRAPPED
4	1	2" x 45° ELBOW, G.I., W/ 1/8" WEEP HOLE
5	1	2" PIPE, G.I. x CUT TO LENGTH AS NEEDED
6	1	2" CAP, G.I. W/ 1/8" VENT HOLE
7	1	2" PIPE, PVC CUT TO LENGTH AS NEEDED
8	1	2" ADAPTER, PVC, SLIP-GASKET x MIPT, SDR-21
9	A.R.	CONCRETE THRUST BLOCK, (DO NOT COVER JOINTS OR BOLTS), MIN. 1.5 CUBIC FEET
10	1.5 CF	CLEAN GRAVEL
11	1	MAIN LINE SADDLE OR TEE
12	A.R.	#4 REBAR

DESIGNED BY:	NTUA
SURVEYED BY:	
DRAWN BY:	NTUA
APPROVED BY:	NTUA
DATE:	04/08
PROJECT NO.	
SCALE:	NTS
ACAD FILENAME:	Water Standard
DWG. NO.	WS-11.DWG

NAVAJO TRIBAL UTILITY AUTHORITY
By One Department Agreement
2" FLUSH VALVE DETAIL
EQ-REVISIONS

REVISIONS			
No.	Date	Brief	By
01	04/08	Revised	L.H.
02			
03			
04			
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06			



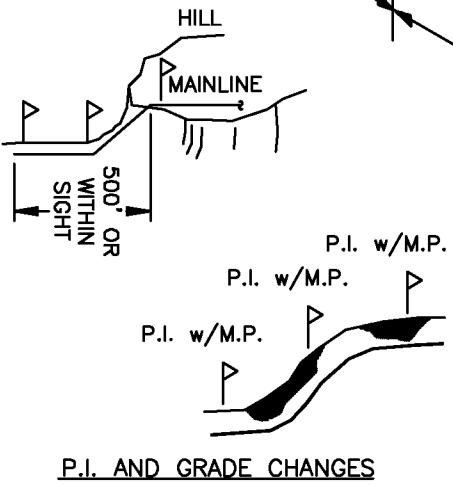
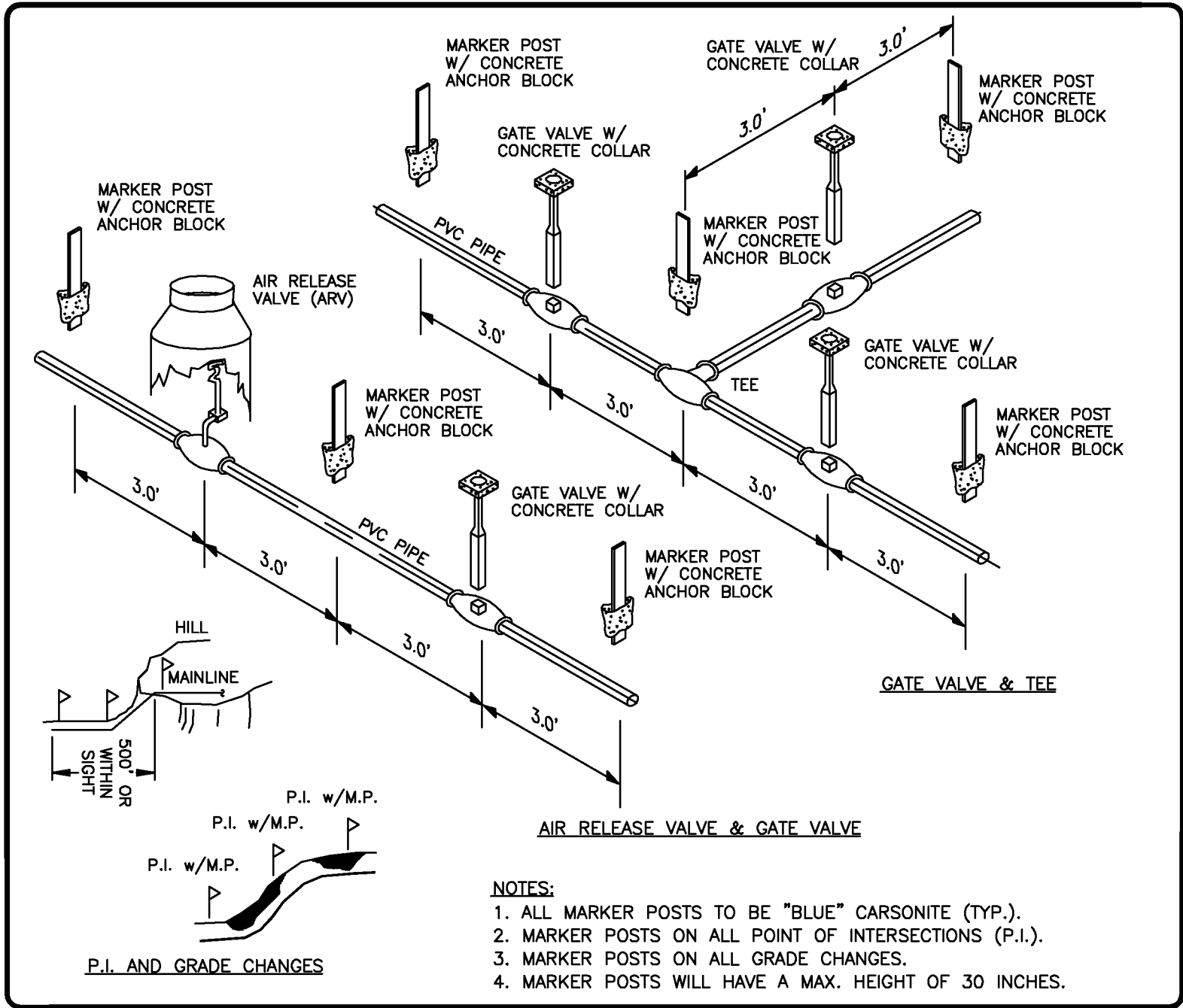
DESIGNED BY:	NTUA
SUPERSEDED BY:	
DRAWN BY:	NTUA
APPROVED BY:	NTUA
DATE:	04/08
PROJECT NO.:	
SCALE:	N.T.S.
ADD FILENAME:	Water-Standard
DWG. NO.:	WS-13DWG

NAVAJO TRIBAL UTILITY AUTHORITY
In Cooperation with Navajo Nation

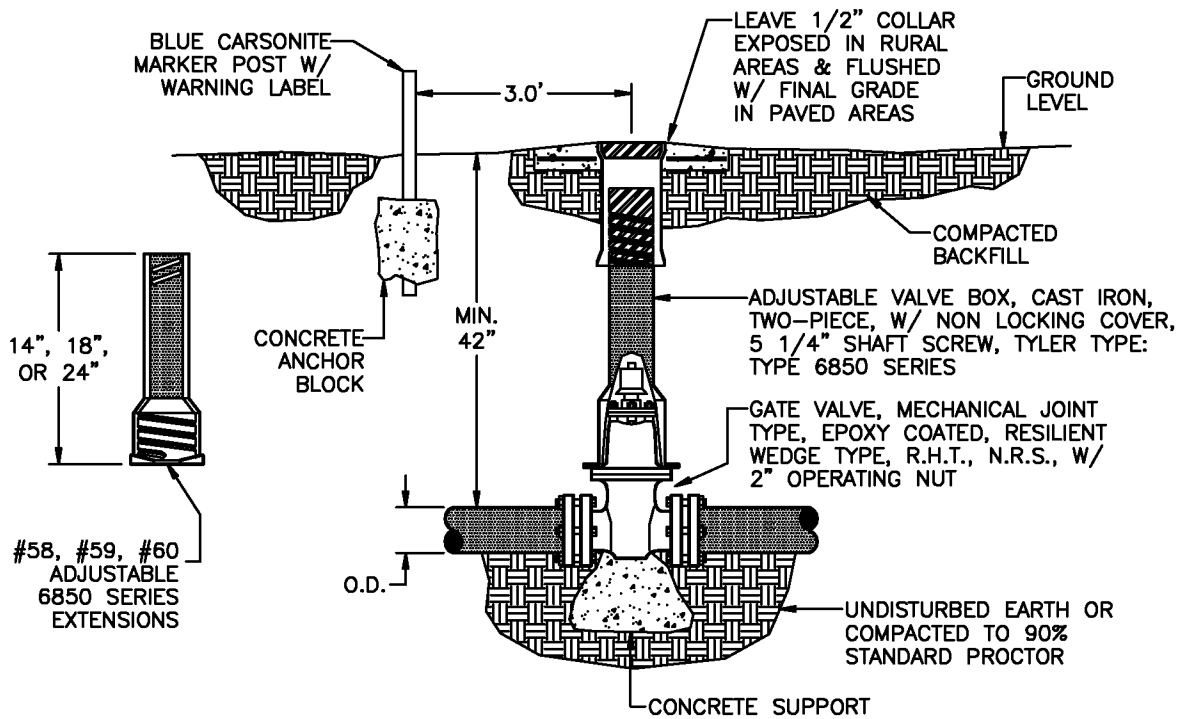
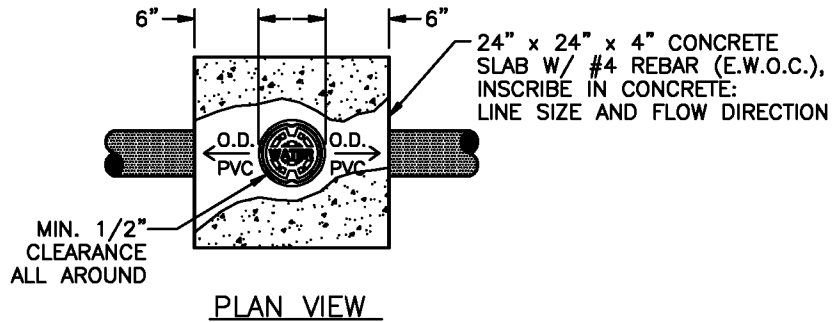
MARKER POST DETAILS

PTLAWAYAN, AS

REVISIONS		
No.	Date	By



- NOTES:**
1. ALL MARKER POSTS TO BE "BLUE" CARSONITE (TYP.).
 2. MARKER POSTS ON ALL POINT OF INTERSECTIONS (P.I.).
 3. MARKER POSTS ON ALL GRADE CHANGES.
 4. MARKER POSTS WILL HAVE A MAX. HEIGHT OF 30 INCHES.



NOTES:

1. IF APPROPRIATE, USE SERIES 2000 PV MEGALUG GLANDS FOR SDR-21, PVC TO SECURE GATE VALVE(S) TO OTHER FITTINGS/PIPE, USE OTHER MEGALUGS FOR DIFFERENT OUTSIDE DIAMETER PIPE/TYPE.
2. DO NOT COVER JOINTS AND BOLTS WITH CONCRETE.
3. SEE WS-13 FOR APPROPRIATE LOCATION OF MARKER POST.

DESIGNED BY:	NTUA
SURVEYED BY:	
DRAWN BY:	NTUA
APPROVED BY:	NTUA
DATE:	04/08
PROJECT NO.	
SCALE:	NTS
ACAD FILENAME:	Water Standard
DWG. NO.	WS-14.DWG

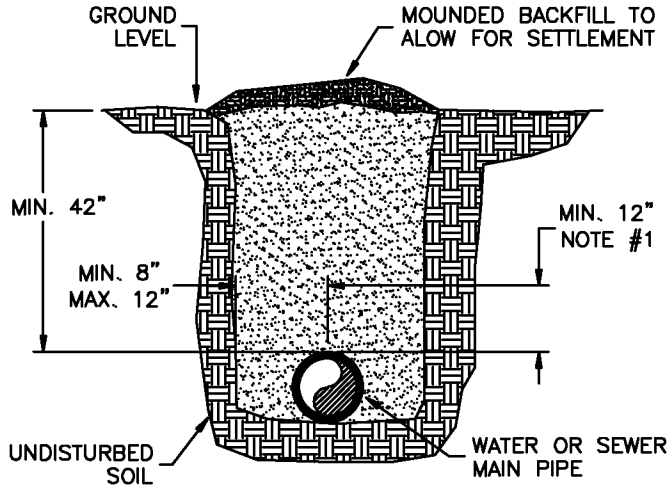
NAVAJO TRIBAL UTILITY AUTHORITY
By Order of the Navajo Tribal Council

**WATER MAIN VALVE
INSTALLATION**

BQ-REVISIONS FT.DISTANCE, AZ

REVISIONS			
No.	Date	Brief	By
01	04/08	Revised	L.H.
02			
03			
04			
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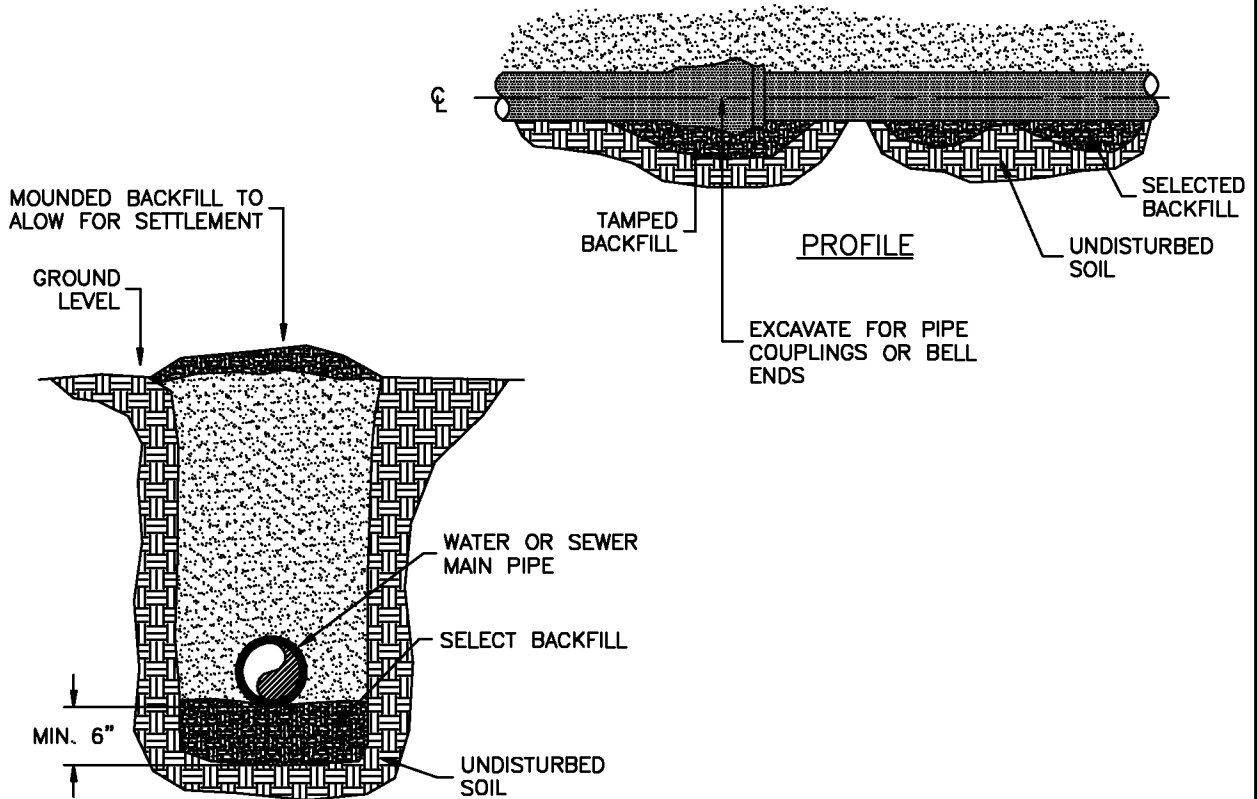




TYPICAL TRENCH DETAIL

NOTES:

1. HAND COMPACTED IN 6" LIFTS FROM BOTTOM OF TRENCH TO 12" ABOVE PIPE CROWN.
2. OPEN CUT OR PAVED OR GRAVEL ROADS (IF REQUIRED), BACK FILL MINIMUM COMPACTION 95% OPTIMUM DENSITY IN LIFTS.
3. REPAVING AND REGRAVELING WILL BE DONE TO ROAD OWNER'S REQUIREMENTS.
4. KEEP LOWER 5' OF TRENCH WALL VERTICAL IF POSSIBLE. UPPER PART OF THE TRENCH WILL VARY IN WIDTH TO COMPENSATE FOR UNSTABLE SOIL. APPLICABLE O.S.H.A. REQUIREMENTS SHALL BE MET.



ALTERNATE TRENCH DETAIL

DESIGNED BY:	NTUA
SURVEYED BY:	
DRAWN BY:	NTUA
APPROVED BY:	NTUA
DATE:	04/08
PROJECT NO.	
SCALE:	NTS
ACAD FILENAME:	Water Standard
DWG. NO.	WS-15.DWG

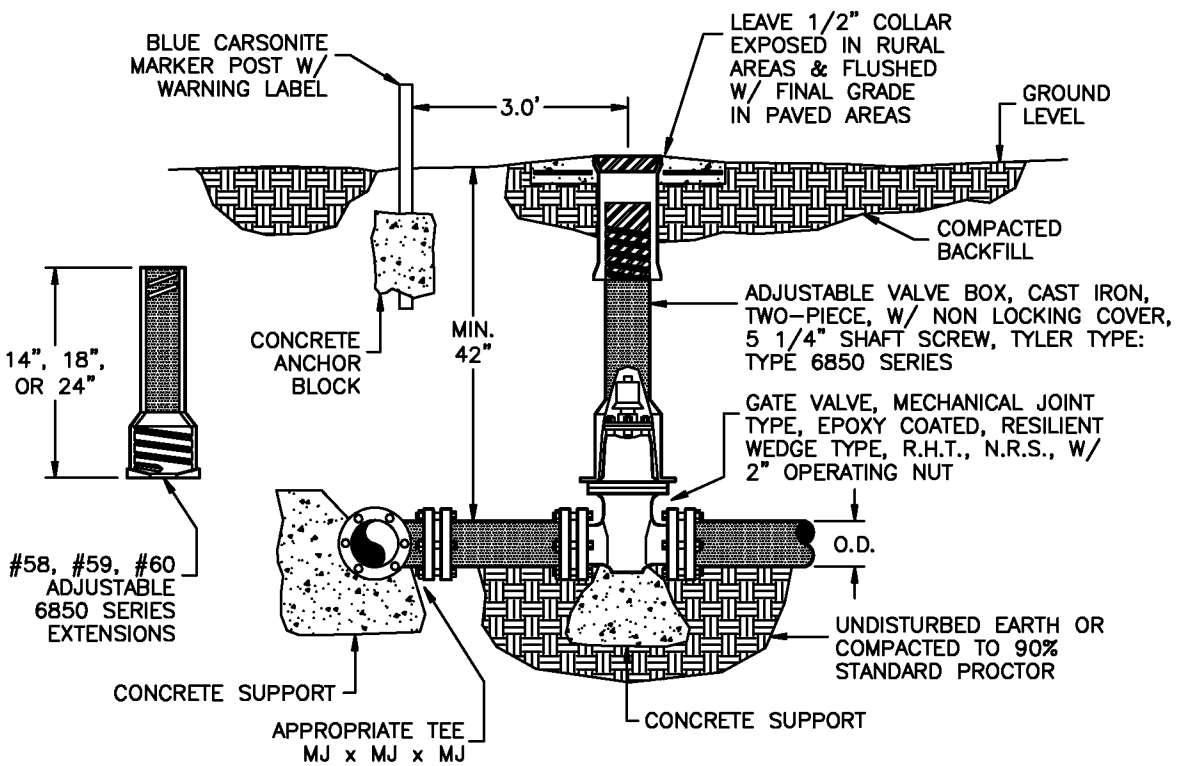
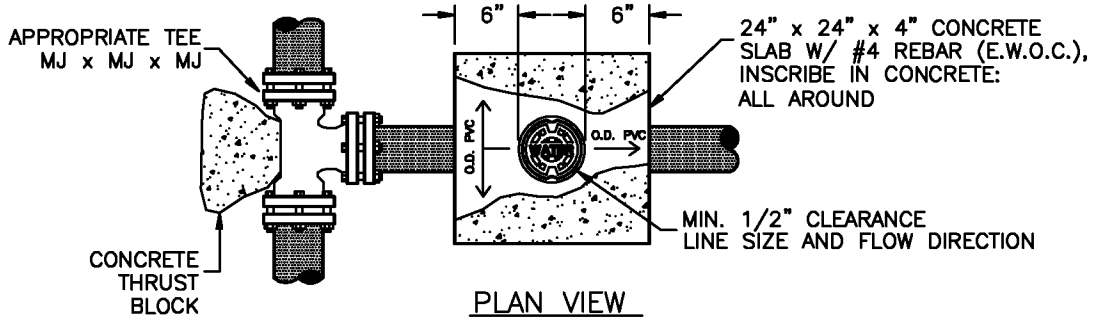
NAVAJO TRIBAL UTILITY AUTHORITY
By One Department

TRENCH DETAIL

EQ-ENGINEERING FT.DENANCE, AZ

REVISIONS			
No.	Date	Brief	By
01	04/08	Revised	L.H.
02			
03			
04			
05			
06			





NOTES:

1. IF APPROPRIATE, USE SERIES 2000 PV MEGALUG GLANDS FOR SDR-21, PVC TO SECURE GATE VALVE(S) TO OTHER FITTINGS/PIPE, USE OTHER MEGALUGS FOR DIFFERENT OUTSIDE DIAMETER PIPE/TYPE.
2. DO NOT COVER JOINTS AND BOLTS WITH CONCRETE.
3. SEE WS-13 FOR APPROPRIATE LOCATION OF MARKER POST.

DESIGNED BY:	NTUA
SURVEYED BY:	
DRAWN BY:	NTUA
APPROVED BY:	NTUA
DATE:	04/08
PROJECT NO.:	
SCALE:	NTS
ACAD FILENAME:	Water Standard
DWG. NO.:	WS-16.DWG

NAVAJO TRIBAL UTILITY AUTHORITY
By Order of the Navajo Tribal Council

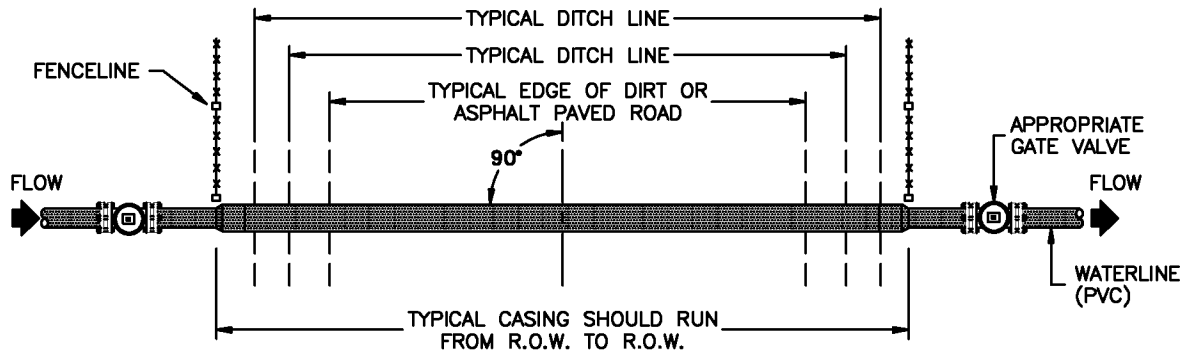
**WATER MAIN TAP
W/GATE VALVE**

EQ-REVISIONS

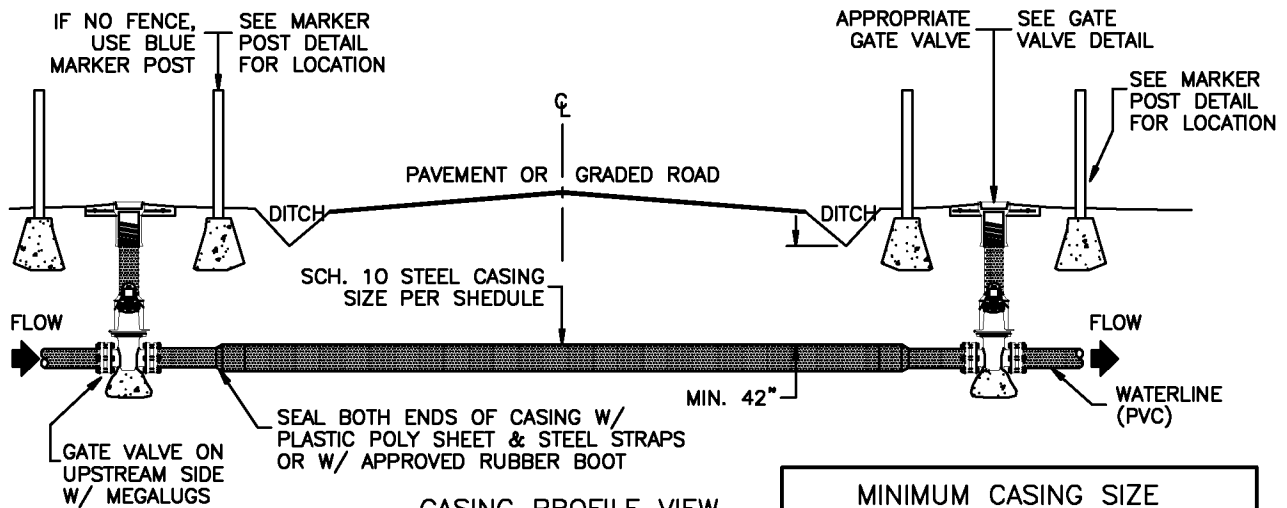
PT.DISTANCE, AZ

REVISIONS			
No.	Date	Brief	By
01	04/08	Revised	L.H.
02			
03			
04			
05			
06			





CASING PLAN VIEW



CASING PROFILE VIEW

MINIMUM CASING SIZE	
PIPE SIZE (O.D.)	CASING SIZE (I.D.)
4"	12"
6"	14"
8"	16"
10"	18"
12"	20"
14"	22"

NOTES:

1. ALL CASINGS WILL TYPICALLY RUN FROM ROW TO ROW UNLESS OTHERWISE SPECIFIED.
2. BACKFILL SHALL BE 95% OF STANDARD PROCTOR DENSITY – TESTED IN 6" LIFTS.
3. ALL WOOD SKIDS ARE TO BE REDWOOD GRADE OR APPROVED EQUAL (OAE)
4. ALL SKIDS WILL BE SECURELY FASTENED TO PIPE WITH STAINLESS STEEL STRAPS.
5. ROAD SHALL BE BORED UNDER EXISTING PAVEMENT AND OPEN TRENCH ON REMAINDER, UNLESS OTHERWISE SPECIFIED.
6. IF SYSTEM IS LOOPED FOR A ROAD BORING APPLICATION, INSTALL GATE VALVE ON UPSTREAM AND DOWNSTREAM SIDES OF ROADWAY.
7. DUCTILE IRON SHALL BE CLASS 50.
8. DUCTILE IRON ROAD CROSSING IN B.I.A. RURAL AREAS SHALL BE FROM 10' BEYOND DITCH LINE UNLESS OTHERWISE SPECIFIED.

DESIGNED BY:	NTUA
SURVEYED BY:	
DRAWN BY:	NTUA
APPROVED BY:	NTUA
DATE:	04/08
PROJECT NO.	
SCALE:	NTS
ACAD FILENAME:	Water Standard
DWG. NO.	WS-17a.DWG

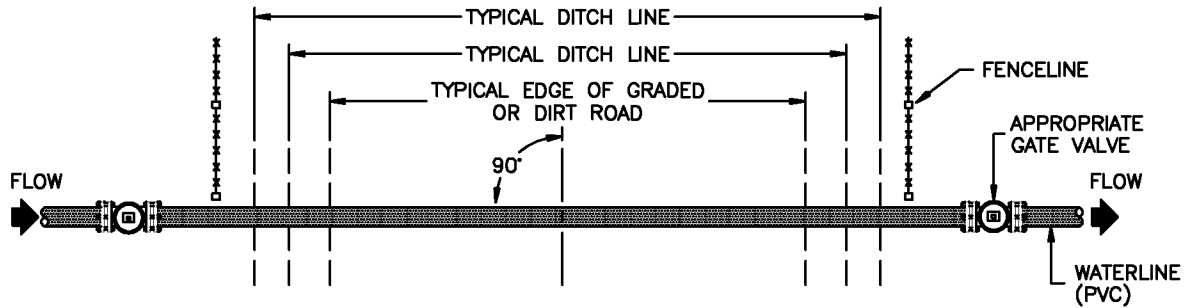
NAVAJO TRIBAL UTILITY AUTHORITY
By One Department Structure

**TYPICAL ROAD CROSSING
FOR NTUA WATERLINES**

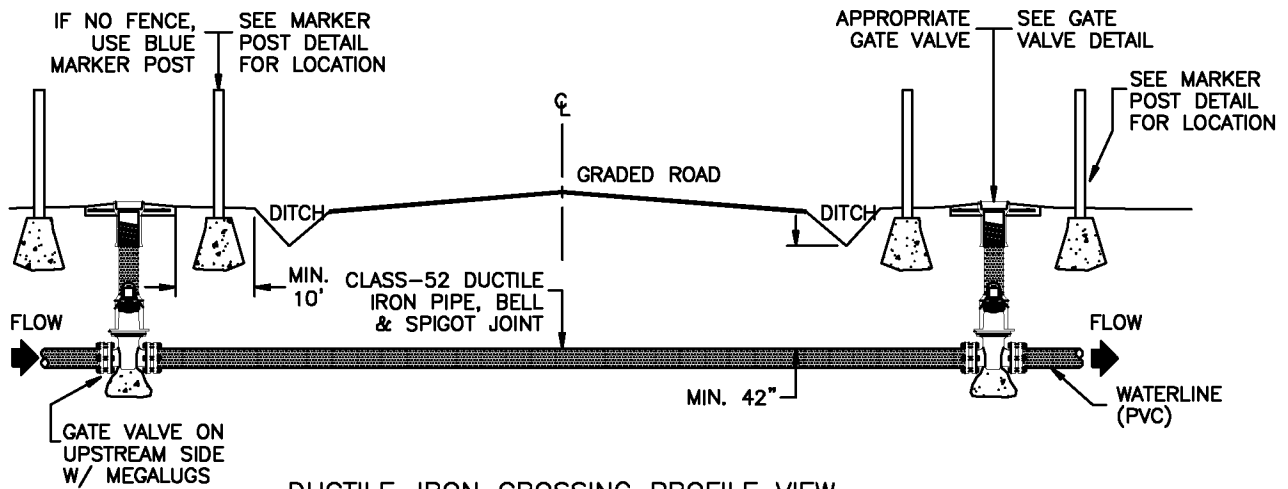
REQ-REVISIONS PT.DEPANANCE, AS

REVISIONS			
No.	Date	Brief	By
01	04/08	Revised	L.H.
02			
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DUCTILE-IRON CROSSING PLAN VIEW



DUCTILE-IRON CROSSING PROFILE VIEW

NOTES:

1. ALL CASINGS WILL TYPICALLY RUN FROM ROW TO ROW, UNLESS OTHERWISE SPECIFIED.
2. BACKFILL SHALL BE 95% OF STANDARD PROCTOR DENSITY - TESTED IN 6" LIFTS.
3. ALL WOOD SKIDS ARE TO BE REDWOOD GRADE OR APPROVED EQUAL (OAE)
4. ALL SKIDS WILL BE SECURELY FASTENED TO PIPE WITH STAINLESS STEEL STRAPS.
5. ROAD SHALL BE BORED UNDER EXISTING PAVEMENT AND OPEN TRENCH ON REMAINDER, UNLESS OTHERWISE SPECIFIED.
6. IF SYSTEM IS LOOPED FOR A ROAD BORING APPLICATION, INSTALL GATE VALVE ON UPSTREAM AND DOWNSTREAM SIDES OF THE ROADWAY.
7. DUCTILE IRON SHALL BE CLASS 52.
8. DUCTILE IRON ROAD CROSSING IN B.I.A. RURAL AREAS SHALL BE FROM 10' BEYOND DITCH LINE UNLESS OTHERWISE SPECIFIED.

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SCALE:	NTS
ACAD FILENAME:	Water Standard
DWG. NO.:	WS-17b.DWG

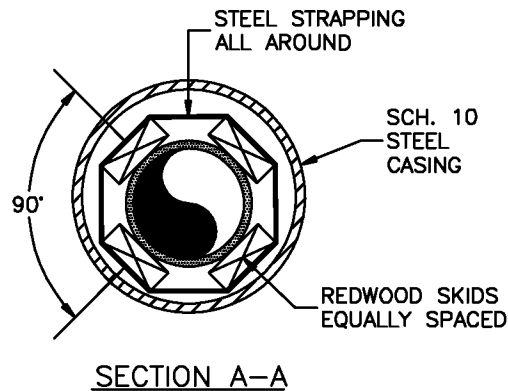
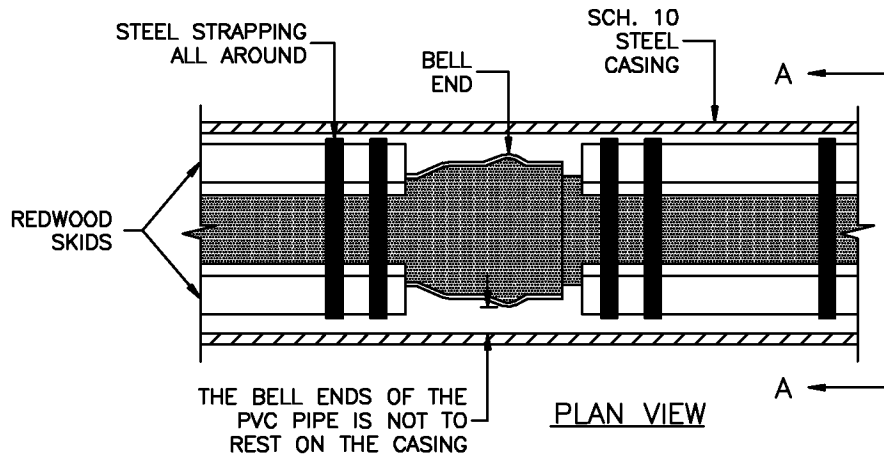
NAVAJO TRIBAL UTILITY AUTHORITY
By Order of the Board of Directors

**TYPICAL ROAD CROSSING
FOR NTUA WATERLINES**

800-899-0000 FT. DEFENCE, AZ

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NOTES:

1. ALL SKIDS SHALL RUN THE LENGTH OF THE PVC PIPE, BELL TO BELL.
2. ALL SKIDS TO BE REDWOOD LUMBER, OR APPROVED EQUAL.
3. BELL AND SPIGOT DUCTILE IRON PIPE MAY BE INSTALLED DIRECTLY WITHIN THE CASING.
4. TYPICAL ROAD BORES BY NAVAJO ENGINEERING AND CONSTRUCTION AUTHORITY ARE 8" AND 14" CASING SIZES.
5. ALL STRAPPING MUST BE STAINLESS STEEL AND BE SECURELY FASTENED TO THE PVC CARRIER PIPE FOR PROPER SUPPORT OF PIPE DURING INSTALLATION.
6. SEAL ENDS OF CASING W/ PLASTIC POLY SHEET AND STAINLESS STEEL STRAPS OR AN APPROVED RUBBER BOOT.

MINIMUM CASING SIZE	
PIPE SIZE (O.D.)	CASING SIZE (I.D.)
4"	12"
6"	14"
8"	16"
10"	18"
12"	20"
14"	22"

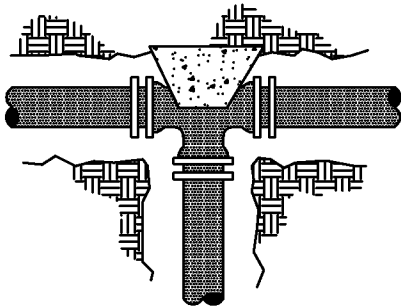
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SCALE:	NTS
ACAD FILENAME:	Water Standard
DWG. NO.	WS-18.DWG

NAVAJO TRIBAL UTILITY AUTHORITY
By One Department Authority
**INSTALLATION OF SKIDS
 INSIDE CASING**

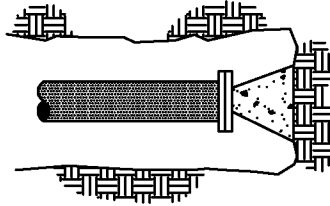
EQ-ENGINEERING
PT.DISTANCE, AZ

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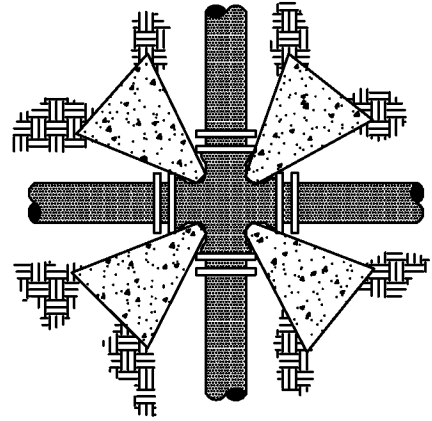




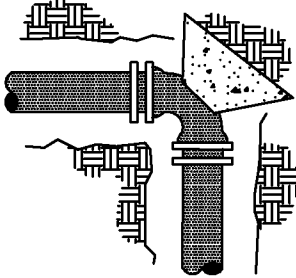
TEE
(PLAN VIEW)



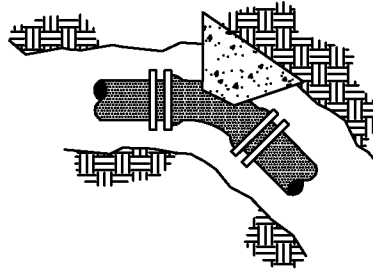
DEAD END CAPPED OR PLUG
(PLAN VIEW)



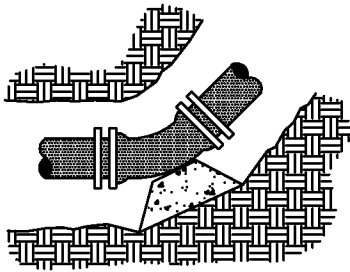
CROSS
(PLAN VIEW)



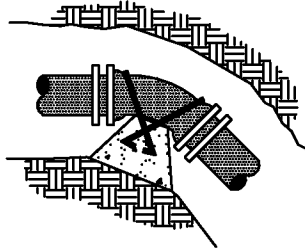
90° ELBOW
(PLAN VIEW)



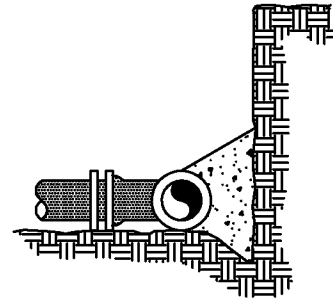
45° ELBOW
(PLAN VIEW)



VERTICAL BENDS
(SECTION VIEW)



VERTICAL GRAVITY THRUST BLOCK
(SECTION VIEW)



BEARING AREA
(SECTION VIEW)

NOTES:

1. DO NOT COVER GASKETED JOINTS AND NUTS/BOLTS.

MINIMUM BEARING AREAS IN SQUARE FEET

PIPE SIZE	TEE & PLUG	90° ELBOW	45° OR 22 1/2° ELBOW	CROSS
2"	0.5	0.5	0.5	0.5
4"	1.5	2.0	1.5	1.0
6"	3.0	4.5	2.5	2.0
8"	5.0	7.5	4.0	4.0
10"	8.0	11.0	6.5	5.5
12"	11.0	15.5	9.0	8.0
14"	15.0	21.0	12.0	10.5
16"	19.0	27.0	15.5	13.5
18"	24.0	34.0	19.0	17.0

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DWG. NO.	WS-19.DWG

NAVAJO TRIBAL UTILITY AUTHORITY
By One Department Agreement
GRAVITY/THRUST
BLOCK DETAILS
EQ-REVISIONS

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No.	Date	Brief	By
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GRAVITY THRUST BLOCK
 (ALSO TO BE USED IN UNSTABLE TRENCH CONDITIONS)
 RESULTANT THRUST IN POUNDS OF FITTINGS AT 100 PSI WATER PRESSURE

TOTAL POUNDS					
PIPE SIZE	DEAD END	90° ELBOW	45° ELBOW	22 1/2° ELBOW	11 1/4° ELBOW
3"	1,232	1,742	943	481	241
4"	1,810	2,559	1,385	706	355
6"	3,739	5,288	2,862	1,459	733
8"	6,433	9,097	4,923	2,510	1,261
10"	9,677	13,685	7,406	3,776	1,897
12"	13,685	19,353	10,474	5,340	2,683
14"	18,385	26,001	14,072	7,174	3,604
16"	23,799	33,628	18,199	9,278	4,661
18"	29,865	42,235	22,858	11,653	5,855
20"	36,644	51,822	28,046	14,298	7,183
24"	52,279	73,934	40,013	20,398	10,249
30"	80,425	113,738	61,554	31,380	15,766
36"	115,209	162,931	88,177	44,952	22,585
42"	155,528	219,950	119,036	60,684	30,489
48"	202,683	286,637	155,127	79,083	39,733
54"	260,214	367,999	199,160	101,531	51,011
60"	298,121	421,606	228,172	116,321	58,442
64"	338,707	479,004	259,235	132,157	66,398

NOTES:

1. THE THRUST (IN TOTAL POUNDS) IN THE CHART IS BASED ON DUCTILE IRON OUTSIDE DIAMETER PIPE DIMENSION. SURGES SHOULD BE CONSIDERED AT TWICE THE NORMAL OPERATING PRESSURE. THE VOLUME OF THE GRAVITY THRUST BLOCK IS BASED ON CONCRETE AT 150 LBS./FT³.
2. TO OBTAIN VOLUME OF CONCRETE REQUIRED, USE:
 VOLUME OF CONCRETE(FT³)= THRUST(LBS.) x SYSTEM PRESSURE(Psi)/100 PSI // 150 LBS./FT³.

E.G.: CALCULATE THE VOLUME OF THE GRAVITY THRUST BLOCK FOR AN 8" x 45° BEND AT AN OPERATING PRESSURE OF 80 PSI.

ANSWER: 4923 LBS. x 160 PSI/100 PSI DIVIDED BY 150 LBS./CUBIC FT. = 52.5 CUBIC FEET OR 2 CUBIC YARDS.

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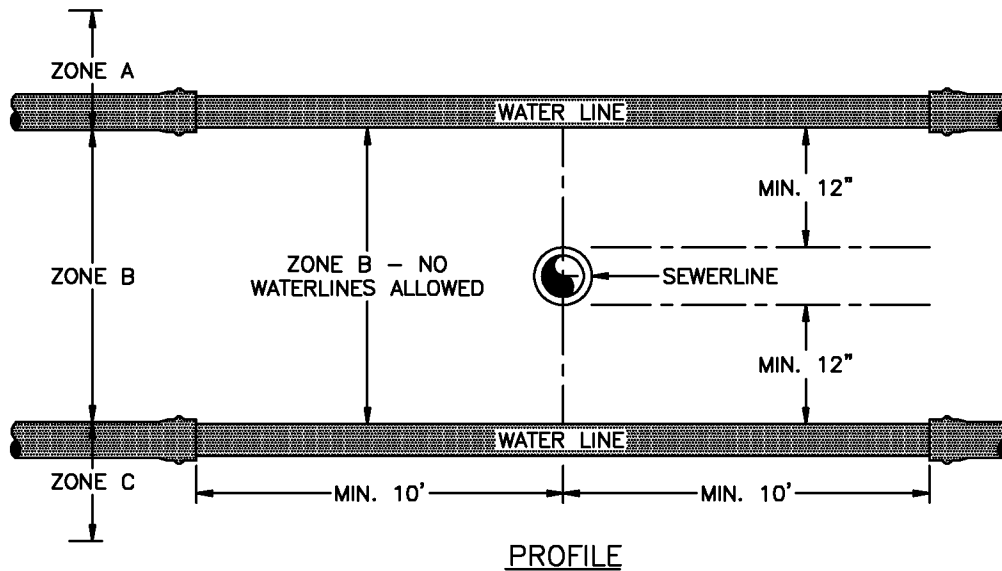
NAVAJO TRIBAL UTILITY AUTHORITY
By One Department Agreement

**GRAVITY/THRUST
BLOCK CHART**

80-REVISIONS FT.DISTANCE, AS

REVISIONS			
No.	Date	Brief	By
01	04/08	Revised	L.H.
02			
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- ZONE A - THE BOTTOM OF THE WATER LINE SHALL BE 12" OR MORE ABOVE THE TOP OF THE SEWER LINE - NO SPECIAL PRECAUTIONS REQUIRED.
- ZONE B - 12' ABOVE AND 12' BELOW SEWER LINE - NO WATER LINES ALLOWED.
- ZONE C - THE TOP OF THE WATER LINE SHALL BE 12" OR MORE BELOW THE BOTTOM OF THE SEWER LINE. IF THE SEWER LINE IS A NEWLY CONSTRUCTED SEWER LINE, AN 18" LENGTH OF DUCTILE IRON SEWER PIPE W/ GASKETED JOINTS SHALL BE CENTERED OVER THE WATER LINE WITH NO JOINTS CLOSER THAN 9' TO THE WATER LINE IN EACH DIRECTION. IF THE WATER LINE IS IN ZONE C AND THE WATER MAIN IS A NEWLY CONSTRUCTED WATER LINE, A 20' LENGTH OF PVC WATER PIPE SHALL BE CENTERED UNDER THE SEWER LINE.

NOTES:

1. WHEN POSSIBLE, WATER LINES SHALL BE INSTALLED ABOVE SEWER LINES AND CROSSINGS SHALL BE AT 90° ANGLE(S).
2. WHEN WATER AND SEWER LINES ARE INSTALLED PARALLEL TO EACH OTHER, THE MINIMUM HORIZONTAL SEPARATION SHALL BE 10'.

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DWG. NO.:	WS-20.DWG

NAVAJO TRIBAL UTILITY AUTHORITY
By One Department
WATER AND SEWER CROSSING SEPERATION
BY-ENGINEERING FT.DENANCE, AZ

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LEGEND

	EXISTING WATER MAIN W/ LINE SIZE, TYPE, & PSI RATING INDICATED
	PROPOSED WATERLINE W/ SIZE TYPE, & PSI RATING INDICATED
	EXISTING SEWER MAIN W/ SIZE, TYPE, & LENGTH INDICATED
	PROPOSED SEWER MAIN W/ SIZE, TYPE, & LENGTH INDICATED
	HOUSE W/ CUSTOMER NAME AND/OR HOUSE NUMBER
	SEPTIC TANK
	FENCELINE
	PAVED OR GRADED ROAD
	UNIMPROVED ROAD
	ARCHAEOLOGICAL SITE
	WASH OR ARROYO
	PRESSURE REDUCING VALVE (VAULT)
	AIR RELEASE VALVE
	DOMESTIC STOP
	FIRE HYDRANT W/ GATE VALVE
	CLEANOUT
	GATE VALVE
	CURB STOP
	METER
	PROPOSED SEWERLINE & MANHOLE W/ FLOW DIRECTION
	EXISTING SEWER LINE & MANHOLE W/ FLOW DIRECTION
	REDUCER
	OVERHEAD ELECTRIC LABEL WITH JNC-TEP FOR TELEPHONE JNC-CATV FOR CABLE TV (JNC IS JOINT NAVAJO COMMUNICATION)
	UNDERGROUND ELECTRIC
	LINE CROSSING
	METER W/ INDIVIDUAL PRV
	FLUSH VALVE
	GAS LINE
	MARKER POST
	YARD HYDRANT
	INFILTRATORS

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SCALE:	NTS
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DWG. NO.:	WS-21.DWG

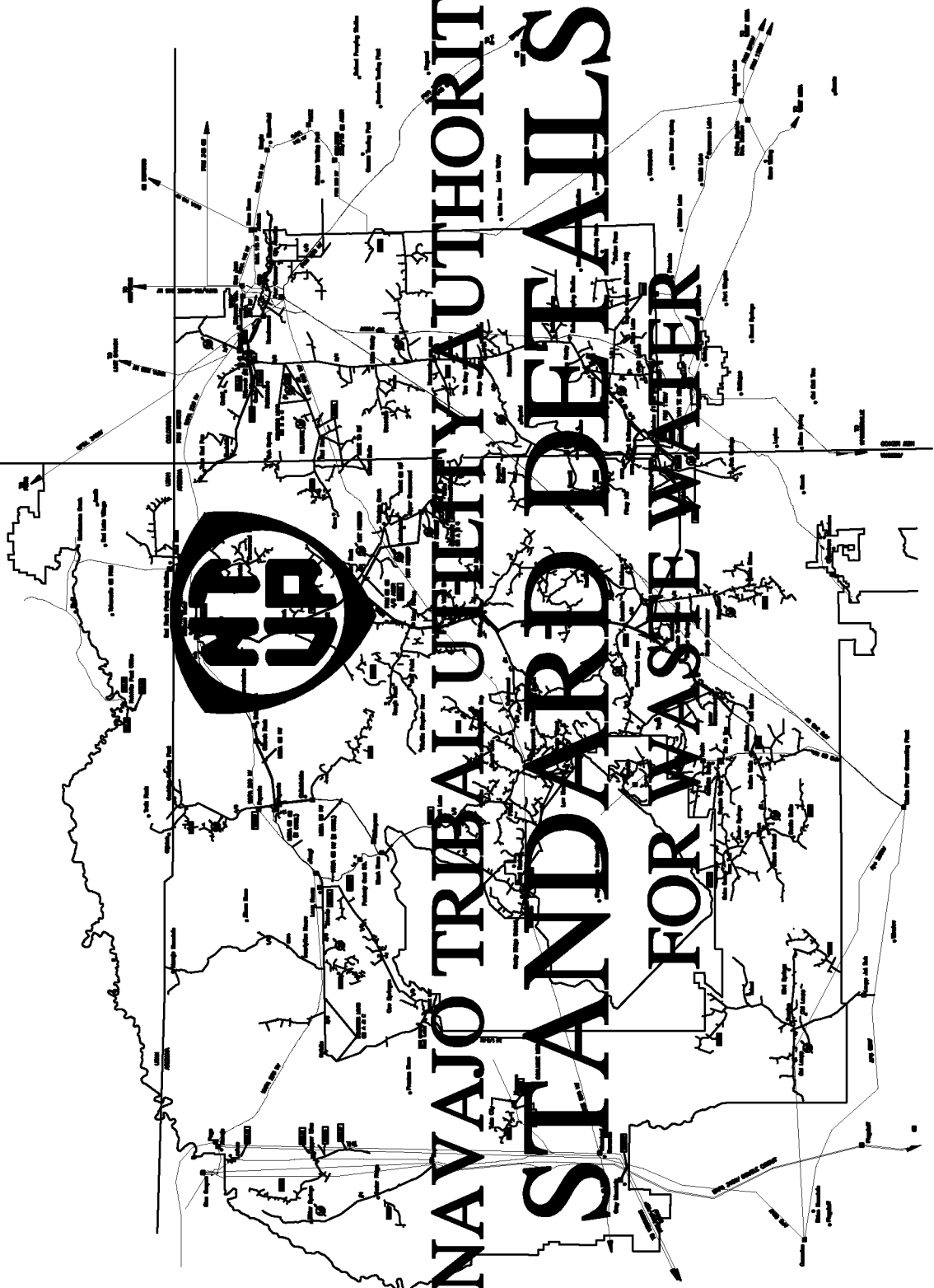
NAVAJO TRIBAL UTILITY AUTHORITY
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STANDARD LEGEND

EQ-REVISIONS FT.DISTANCE, AS

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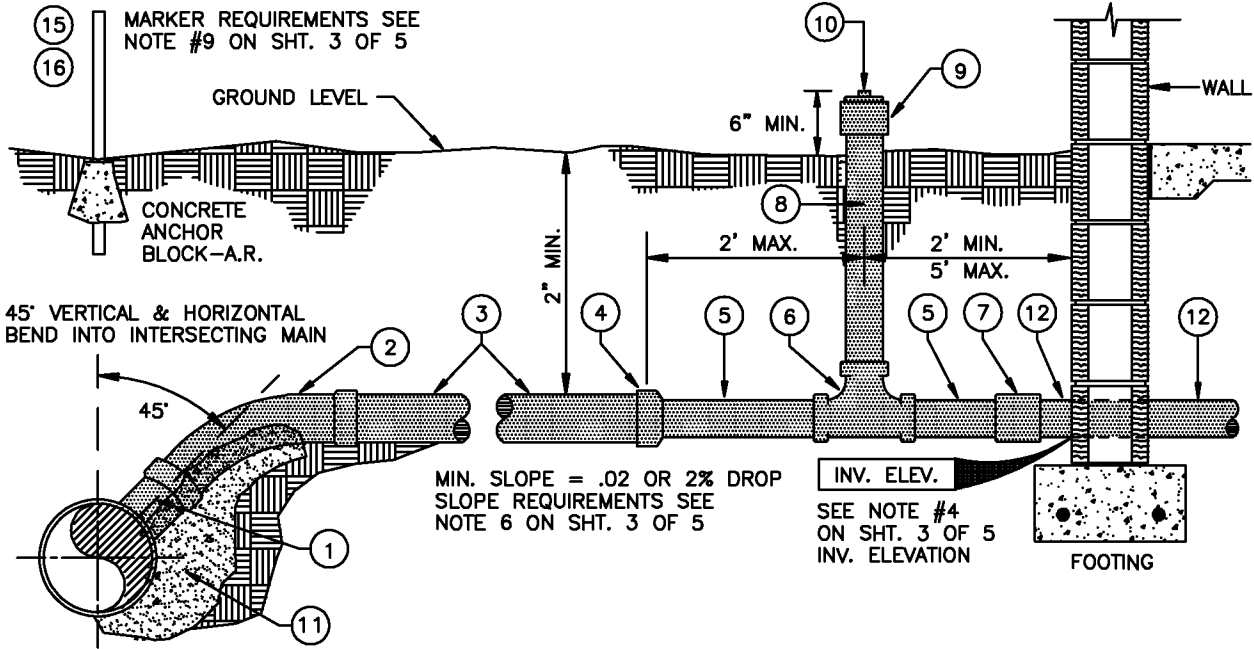




NAVAJO TRIBAL UTILITY AUTHORITY STANDARD DETAILS FOR WASTE WATER

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NOTE: NTUA DOES NOT MAINTAIN SEWER SERVICE LINES.
THEY ARE THE CUSTOMERS RESPONSIBILITY.

AS-BUILT LOCATION OF TAP	
PROJECT NAME	
PROJECT NO.	
SHEET NO.	
LINE NO.	
STATION NO.	
INV. ELEVATION	
RELATED W.O. NO'S.	

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PROPOSED INDIVIDUAL INSTALLATION	4 of 6
INDIVIDUAL AS-BUILT	5 of 6
VICINITY LOCATION OF SERVICE	6 of 6

TESTED IN ACCORDANCE WITH THE NTUA TECHNICAL SPECIFICATIONS
TP-4.08 THRU 4.10; DATED MARCH 2003.

BY: _____
NAME/TITLE: _____
DATE: _____

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APPROVED BY:	NTUA
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PROJECT NO.	
SCALE:	NTS
ACAD FILENAME:	Waterwaste Standard
DWG. NO.	WWS-1

NAVAJO TRIBAL UTILITY AUTHORITY
AN EQUAL OPPORTUNITY ORGANIZATION

4" STANDARD SEWER SERVICE LINE

EEQ-ENGINEERING FT. DEFENCE, AZ

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MATERIAL LIST		
ITEM	QUAN	DESCRIPTION
1	1	45° WYE or SADDLE, 4" SDR-35, PVC x APPROPRIATE PIPE TYPE and O.D.
2	1	4" x 45° ELBOW, SDR-35, PVC, GASKET x GASKET
3	A.R.	4" PIPE, SDR-35, PVC, INTEGRAL BELL with ELASTOMERIC GASKET. (FT.)
4	1	ADAPTER, REDUCING, 4" SDR-35, PVC, ASTM D-3034 x 3" PVC-DWV, ASTM D-2665
5	A.R.	3" PIPE, PVC-DWV, ASTM D-2665. (FT.)
6	1	3" TEE, PVC-DWV, HUB x HUB, ASTM D-2665 with a SINGLE RISER.
7	1	3" COUPLING, PVC-DWV, ASTM D-2665.
8	A.R.	3" RISER, PVC-DWV, ASTM D-2665. (FT.)
9	1	3" ADAPTER, HUB x FIPT, PVC-DWV, ASTM D-2665
10	1	3" PLUG, CLEAN OUT, MIPT, PVC-DWV, ASTM D-2665
11	1	CONCRETE, PRE-MIX, (FIELD DETERMINE AS REQUIRED FOR PIPE SUPPORT)
12	1	HOUSE STUB-OUT, APPROPRIATE PIPE TYPE and O.D.
13	1	CEMENT, SOLVENT, PVC. (QUART CAN)
14	1	CLEANER, PVC PIPE. (QUART CAN)
15	A.R.	GREEN CARSONITE MARKER POST
16	A.R.	"NTUA SEWERLINE WARNING" DECAL (for Item 15) * *

NOTES:

1. A.R. = AS REQUIRED
2. ITEM 12 IS USUALLY DONE BY THE HOME OWNER.
3. ITEM 7 MAY BE MODIFIED AS REQUIRED.
4. DECAL TO BE AFFIXED TO ITEM 15**.

SHEET 2 OF 6

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DWG. NO.	WWS-1a

NAVAJO TRIBAL UTILITY AUTHORITY
AN EQUAL OPPORTUNITY ORGANIZATION
MATERIAL LIST 4"
STANDARD SEWER SERVICE

EEG-ENGINEERING
PT.DIFFIANCE, AZ

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GENERAL NOTES:

1. PROVIDE 10 FT. MINIMUM HORIZONTAL SEPARATION IN SEPARATE TRENCHES BETWEEN THE WATER AND SEWER SERVICES. PROVIDE 5 FT. MIN. HORIZONTAL SEPARATION BETWEEN THE SEWER SERVICE AND OTHER UTILITIES. IF SEWER SERVICE CROSSES OTHER SERVICES, SEE N.T.U.A CROSSING POLICY OR CONTACT N.T.U.A. HEADQUARTERS ENGINEERING.
2. SEWER CLEANOUTS ARE REQUIRED ON ALL BENDS IN EXCESS OF 45° AS PER PLUMBING CODE ADOPTED BY THE NAVAJO NATION. MODIFY MATERIAL LIST ACCORDINGLY AFTER CONSULTING WITH N.T.U.A. HEADQUARTERS ENGINEERING.
3. ADDITIONAL SEWER CLEANOUTS ARE REQUIRED ON SEWER SERVICES LONGER THAN 50 FT. AS PER UNIFORM PLUMBING CODE ADOPTED BY THE NAVAJO NATION. MODIFY MATERIAL LIST ACCORDINGLY AFTER CONSULTING WITH N.T.U.A. HEADQUARTERS ENGINEERING. EACH ADDITIONAL CLEANOUT IS AT THE CUSTOMERS EXPENSE INSTALL AT LEAST ONE CLEANOUT AS REQUIRED BY NOTE 2. IF CUSTOMER REQUEST FEWER AND REALIZES THIS VIOLATES NAVAJO TRIBAL CODE, THEN INSTALL PER THE CUSTOMER'S REQUEST AND SO NOTE ON THE INDIVIDUAL AS-BUILT, N.T.U.A. RECOMMENDS THAT CLEANOUTS BE SPACED NO MORE THAN 100'.
4. PROVIDE PROPOSED ELEVATION AT WALL. PROVIDE 6 IN. DIAMETER SLEEVE IF PIPING PENETRATES WALL OR 4 IN. DEPTH OF SAND BETWEEN FOOTING AND TOP OF PIPING IS BELOW THE FOOTING. ORDER ASTM D-1785 SCH. 40 PIPE WITH LENGTH AS NEEDED FOR THE SLEEVE. CONTACT N.T.U.A. HEADQUARTERS ENGINEERING ON PIPING SMALLER THAN 2 IN. IN SIZE.
5. STATE THE EXISTING PIPE TYPE AND O.D. (e.g. ASTM D-3034, SDR 35, PVC, 8. 40"). SADDLE IS TO HAVE A GASKET SEAL OR O-RING AND NON-CORRODIBLE STRAP SECURING SYSTEM.
6. MINIMUM SLOPE OF 1/4 INCH PER FOOT (2%) OR CONTACT N.T.U.A. HEADQUARTERS ENGINEERING.
7. BACKFILL IS TO BE HAND TAMPED (NO-MECHANICAL) AND COMPACTED IN 6 INCH LAYERS FOR AT LEAST 12 IN. ABOVE PVC PIPE. INSTALL PER ASTM D-2321 AND UNIFORM PLUMBING CODE ADOPTED BY THE NAVAJO NATION.
8. PROVIDE THE AS-BUILT AND SWING TIES FOR THE TAP POINT.
9. THE MATERIAL LIST SHALL BE MODIFIED IF A FIELD MARKER OF THE TAP POINT IS TO BE INSTALLED. UNDER THE AS-BUILT TIE INFORMATION. PROVIDE THE SURFACE DESCRIPTION OF THE TAP POINT (e.g. OPEN FIELD, PAVED ROAD, etc)
10. ITEM 12 IS USUALLY DONE BY THE HOME OWNER. ITEM 7 MUST BE COMPATIBLE WITH ITEM 12. ITEM 7 AS LISTED IS FOR A CONNECTION BETWEEN TWO LENGTHS OF 3 IN. PVC-DWV ASTM D-2665. IN THE MATERIALS LIST, ITEM 12 NEEDS TO BE COMPLETED AND ITEM 7 MODIFIED AS REQUIRED.
11. ORDER CONCRETE AS NEEDED. THE CONCRETE MAY BE ELIMINATED IF N.T.U.A. DISTRICT WATER FOREMAN AND ENGINEER DETERMINE FIELD CONDITIONS DO NOT REQUIRE THIS FOR ADEQUATE COMPACTION AND 4 IN. PIPE STRUCTURAL SUPPORT. MARK THE AS-BUILT DRAWING TO SHOW WHEN THE CONCRETE IS NOT USED.
12. FOR MULTIPLE BENDS, A CLEANOUT IS REQUIRED UPSTREAM FROM THE FIRST BEND THAT CAUSED THE CUMULATIVE ANGLE TO EXCEED 45'.

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DWG. NO.	WWS-1b

NAVAJO TRIBAL UTILITY AUTHORITY
of the Navajo Nation
GENERAL NOTES
SEWER SERVICE























EQ-ENGINEERING PT.DENANCE, AZ

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No.	Date	Brief	By
01	3/08	Revised	L.H.
02			
03			
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(PLAN VIEW - NORTH ARROW REQUIRED)

* SEE GENERAL NOTES NO. 11 ON SHEET 3 of 5

ITEM DESCRIPTION	MATERIALS			ITEM DESCRIPTION	MATERIALS		
	LEGEND	SIZE	TYPE		LEGEND	SIZE	TYPE
WATERLINE TAP 				WATERLINE, PROPOSED	-- W --		
VALVE, GATE 				WATERLINE, EXISTING	—W—		
VALVE, CURB STOP 				SEWERLINE, PROPOSED	-- S --		
WATER METER 				SEWERLINE, EXISTING	—S—		
WATER METER W/ IND PRV 		*		PROPOSED TIE INFORMATION			
VALVE, DOMESTIC STOP 				LOCATION:			
YARD HYDRANT 				SYSTEM:			
CLEAN-OUT(S) 				PROJECT NO:	SHT.	OF	SHTS.
SEPTIC TANK 				DRAWN BY:	DATE:		
INFILTRATORS 				PROPOSED START DATE:			
DWELLING/OTHER BLDGS 							

SHEET 4 OF 6

DESIGNED BY:	NTUA
SURVEYED BY:	
DRAWN BY:	NTUA
APPROVED BY:	NTUA
DATE:	3/08
PROJECT NO.	
SCALE:	NTS
ACAD FILENAME:	Waterwaste Standard
DWG. NO.	WWS-1c

NAVAJO TRIBAL UTILITY AUTHORITY
IN THE DISTRICT OF COLUMBIA
PROPOSED INDIVIDUAL
INSTALLATION

EEG-ENGINEERING
PT.DIFFIANCE, AZ

REVISIONS			
No.	Date	Brief	By
01	3/08	Revised	L.H.
02			
03			
04			
05			
06			



(PLAN VIEW - NORTH ARROW REQUIRED)

* SEE GENERAL NOTES NO. 11 ON SHEET 3 of 5

ITEM DESCRIPTION	MATERIALS			SWING TIES (IN FEET)				CONSTRUCTION COST:
	LEGEND	SIZE	TYPE	NW(A)	NE(B)	SW(C)	SE(D)	
WATERLINE TAP								MATERIAL:
VALVE, GATE								LABOR:
VALVE, CURB STOP								EQUIPMENT:
WATER METER								TOTAL:
WATER METER W/ IND PRV								
VALVE, DOMESTIC STOP								
YARD HYDRANT								
CLEAN-OUT(S)								
SEPTIC TANK								
INFILTRATORS				AS-BUILT TIE INFORMATION				
DWELLING/OTHER BLDGS				LOCATION:				
WATERLINE, PROPOSED	-- W --			SYSTEM:				
WATERLINE, EXISTING	-W-			PROJECT NO:				
SEWERLINE, PROPOSED	-- S --			DRAWN BY:		DATE:		
SEWERLINE, EXISTING	-S-			COMPLETION DATE:				

SHEET 5 OF 6

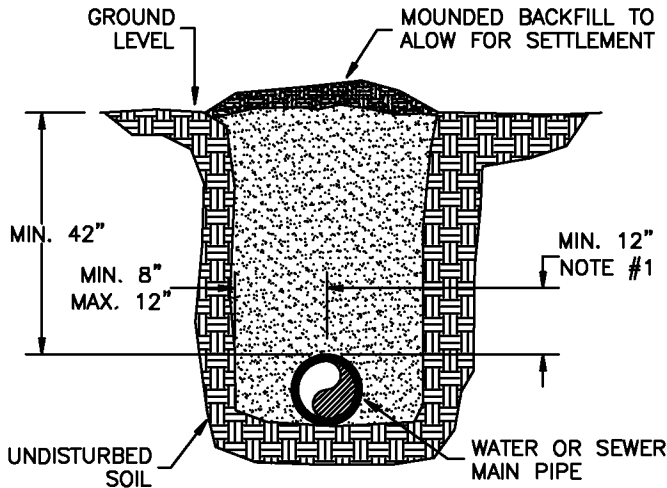
DESIGNED BY:	NTUA
SURVEYED BY:	
DRAWN BY:	NTUA
APPROVED BY:	NTUA
DATE:	3/08
PROJECT NO.	
SCALE:	NTS
ACAD FILENAME:	Waterwaste Standard
DWG. NO.	WWS-1d

NAVAJO TRIBAL UTILITY AUTHORITY
AN EQUAL OPPORTUNITY ORGANIZATION
INDIVIDUAL
AS-BUILTS

EEG-ENGINEERING
PT.DENANCE, AZ

REVISIONS			
No.	Date	Brief	By
01	3/08	Revised	L.H.
02			
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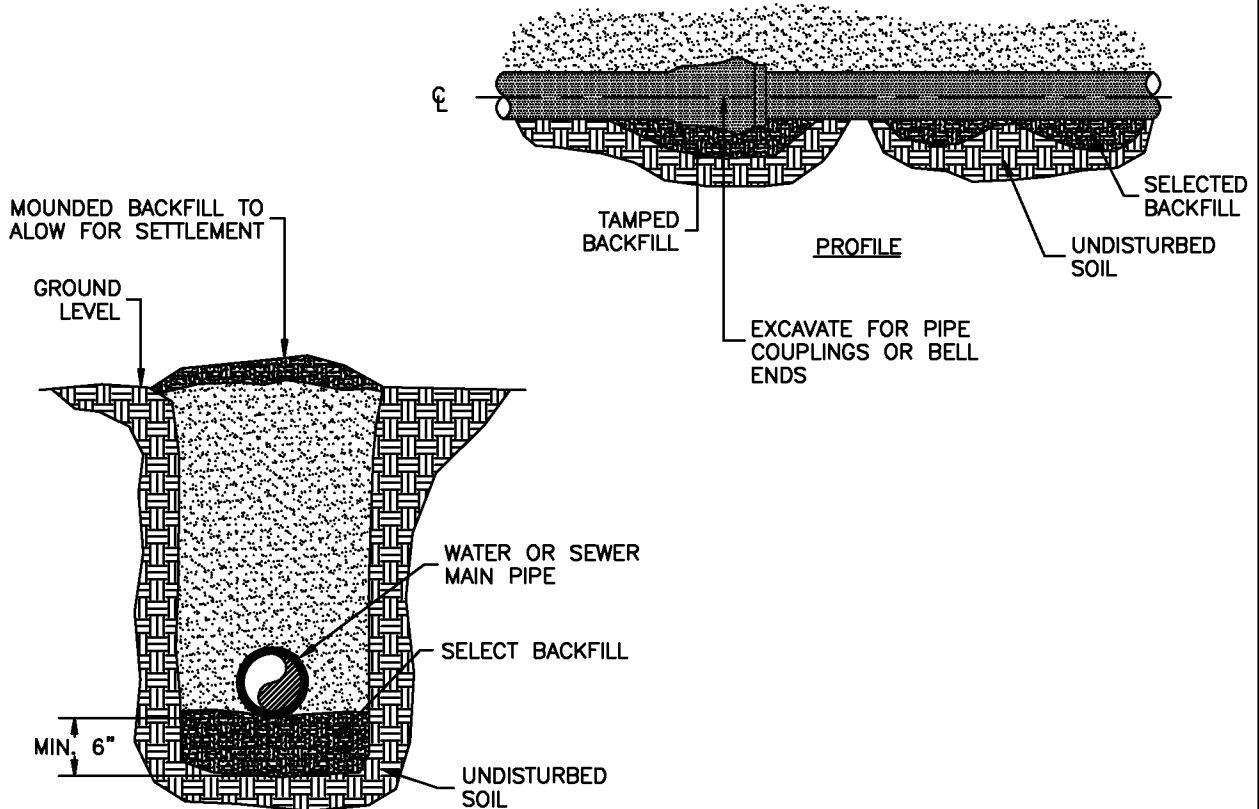




TYPICAL TRENCH DETAIL

NOTES:

1. HAND COMPACTED IN 6 IN. LIFTS FROM BOTTOM OF TRENCH TO 12 IN. ABOVE PIPE CROWN.
2. OPEN CUT OR PAVED OR GRAVEL ROADS (IF REQUIRED), BACK FILL MINIMUM COMPACTION 95% OPTIMUM DENSITY IN LIFTS.
3. REPAVING AND REGRAVELING WILL BE DONE TO ROAD OWNER'S REQUIREMENTS.
4. KEEP LOWER 5 FT. OF TRENCH WALL VERTICAL IF POSSIBLE. UPPER PART OF THE TRENCH WILL VARY IN WIDTH TO COMPENSATE FOR UNSTABLE SOIL. APPLICABLE O.S.H.A. REQUIREMENTS SHALL BE MET.



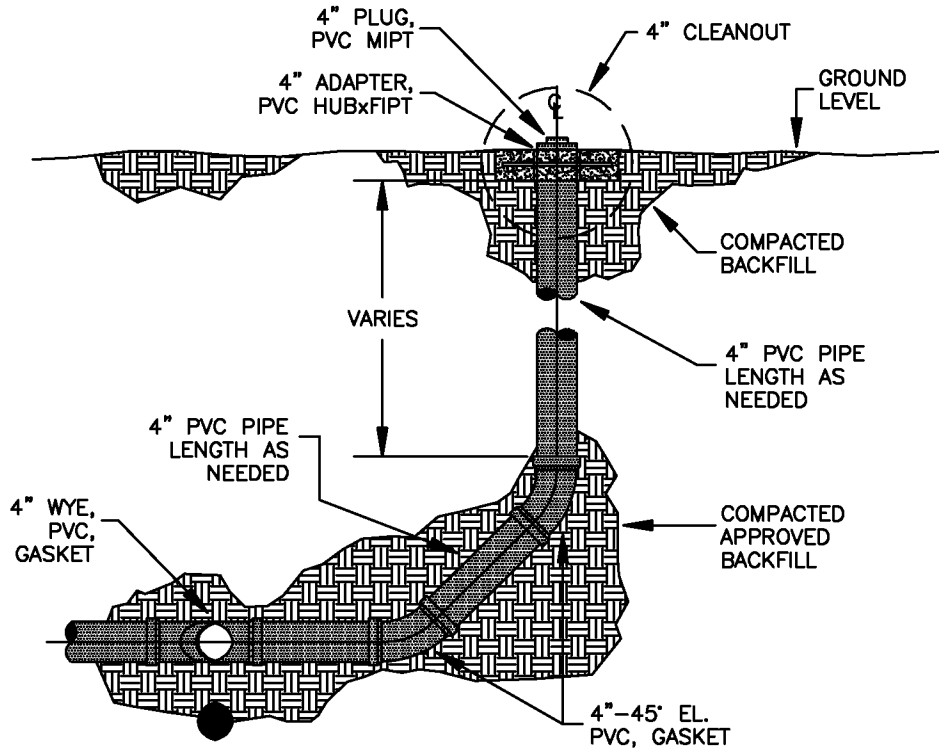
ALTERNATE TRENCH DETAIL

DESIGNED BY:	NTUA
SURVEYED BY:	
DRAWN BY:	NTUA
APPROVED BY:	NTUA
DATE:	3/08
PROJECT NO.	
SCALE:	NTS
ACAD FILENAME:	Waterwaste Standard
DWG. NO.	WWS-10

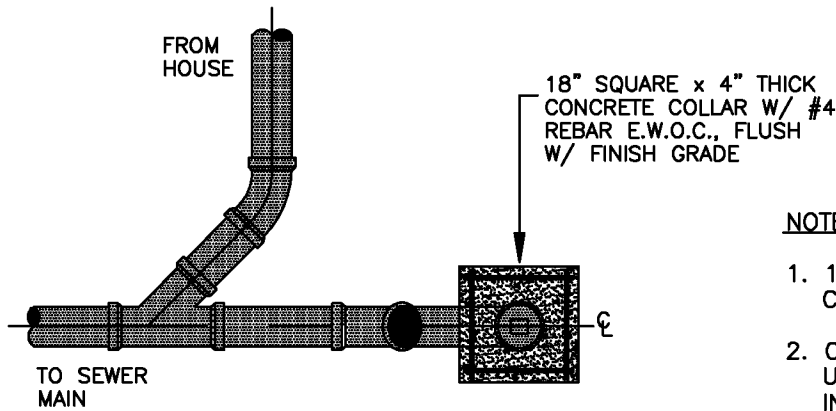
NAVAJO TRIBAL UTILITY AUTHORITY
AN EQUAL OPPORTUNITY ORGANIZATION
STANDARD TRENCH
DETAIL
EQ-ENGINEERING PT.DIFFANCE, AZ

REVISIONS			
No.	Date	Brief	By
01	3/08	Revised	L.H.
02			
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04			
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PROFILE VIEW



PLAN VIEW

NOTES:

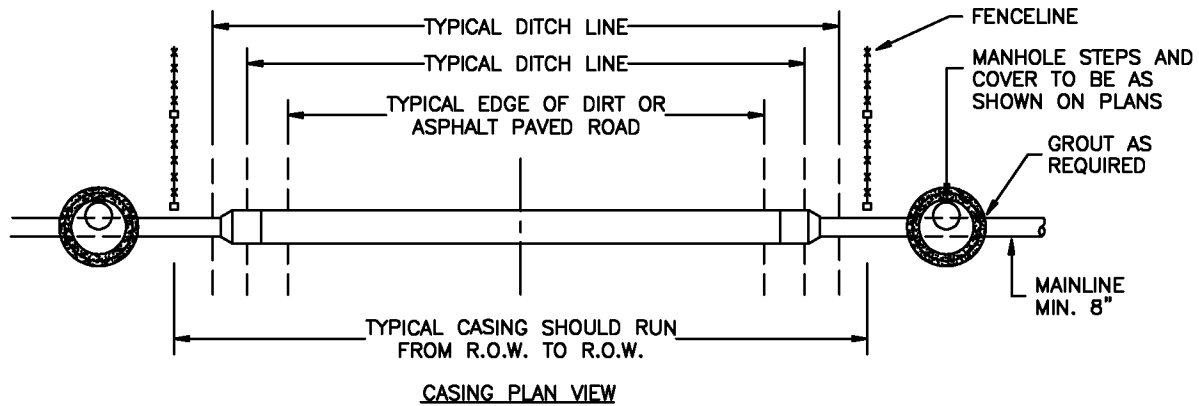
1. 100 FT. MAX. BETWEEN CLEANOUTS.
2. CLEANOUT REQUIRED AT UPSTREAM OF ANY BEND IN EXCESS OF 45'.

DESIGNED BY:	NTUA
SURVEYED BY:	
DRAWN BY:	NTUA
APPROVED BY:	NTUA
DATE:	3/08
PROJECT NO.:	
SCALE:	NTS
ACAD FILENAME:	Waterwaste Standard
DWG. NO.:	WWS-12

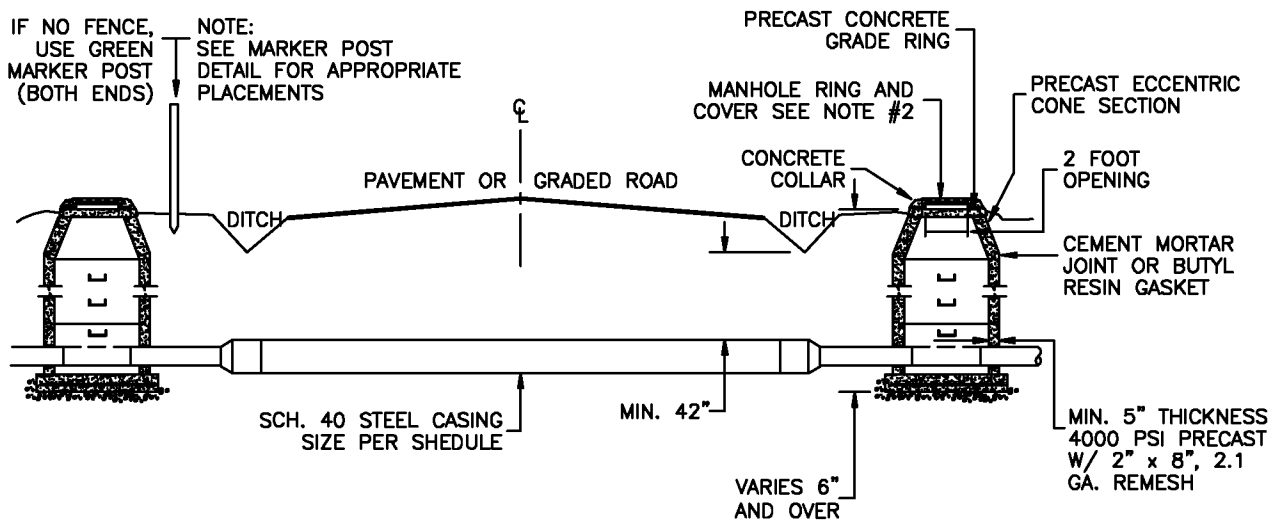
NAVAJO TRIBAL UTILITY AUTHORITY
AN EQUAL OPPORTUNITY ORGANIZATION
4" SEWER CLEANOUT DETAIL
EQ-ENGINEERING FT. DEFENCE, AZ

REVISIONS			
No.	Date	Brief	By
01	3/08	Revised	L.H.
02			
03			
04			
05			
06			





CASING PLAN VIEW



CASING PROFILE VIEW

NOTES:

1. SEE STANDARD DRAWING FOR MANHOLE STEPS, WWS-8.
2. SEE STANDARD DRAWING FOR MANHOLE RING AND COVER, WWS-7.
3. CONCRETE CHANNELS SHALL BE A MIN. OF 3000 PSI RICH-MIX.
4. GROUT ALL LIFTING HOLES.
5. INVERT ELEV., OUTLET ELEV., RIM ELEV., & DROP ELEV. SHALL BE SHOWN ON PLANS.
6. ALL STRUCTURAL CONCRETE SHALL BE 4000 PSI.
7. ROAD SHALL BE BORED UNDER EXISTING PAVEMENT AND OPEN TRENCH ON REMAINDER, UNLESS OTHERWISE SPECIFIED.

DESIGNED BY:	NTUA
SURVEYED BY:	
DRAWN BY:	NTUA
APPROVED BY:	NTUA
DATE:	3/08
PROJECT NO.	
SCALE:	NTS
ACAD FILENAME:	Waterwaste Standard
DWG. NO.	WWS-14

NAVAJO TRIBAL UTILITY AUTHORITY
IN THE STATE OF ARIZONA

**TYPICAL ROAD CROSSING
FOR NTUA SEWERLINES**

EEG-ENGINEERING FT. DEFENCE, AZ

REVISIONS			
No.	Date	Brief	By
01	3/08	Revised	L.H.
02			
03			
04			
05			
06			



LEGEND

	EXISTING WATER MAIN W/ LINE SIZE, TYPE, & PSI RATING INDICATED
	PROPOSED WATERLINE W/ SIZE TYPE, & PSI RATING INDICATED
	EXISTING SEWER MAIN W/ SIZE, TYPE, & LENGTH INDICATED
	PROPOSED SEWER MAIN W/ SIZE, TYPE, & LENGTH INDICATED
	HOUSE W/ CUSTOMER NAME AND/OR HOUSE NUMBER
	SEPTIC TANK
	FENCELINE
	PAVED OR GRADED ROAD
	UNIMPROVED ROAD
	ARCHAEOLOGICAL SITE
	WASH OR ARROYO
	PRESSURE REDUCING VALVE (VAULT)
	AIR RELEASE VALVE
	DOMESTIC STOP
	FIRE HYDRANT W/ GATE VALVE
	CLEANOUT
	GATE VALVE
	CURB STOP
	METER
	PROPOSED SEWERLINE & MANHOLE W/ FLOW DIRECTION
	EXISTING SEWER LINE & MANHOLE W/ FLOW DIRECTION
	REDUCER
	OVERHEAD ELECTRIC LABEL WITH JNC-TEP FOR TELEPHONE JNC-CATV FOR CABLE TV (JNC IS JOINT NAVAJO COMMUNICATION)
	UNDERGROUND ELECTRIC
	LINE CROSSING
	METER W/ INDIVIDUAL PRV
	FLUSH VALVE
	GAS LINE
	MARKER POST
	YARD HYDRANT
	INFILTRATORS

DESIGNED BY:	NTUA
SURVEYED BY:	
DRAWN BY:	NTUA
APPROVED BY:	NTUA
DATE:	3/08
PROJECT NO.:	
SCALE:	NTS
ACAD FILENAME:	Waterwaste Standard
DWG. NO.:	WWS-15

NAVAJO TRIBAL UTILITY AUTHORITY
AN EQUAL OPPORTUNITY ORGANIZATION
**STANDARD
LEGEND**

EEG-ENGINEERING
PT.DENAFANCE, AZ

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No.	Date	Brief	By
01	3/08	Revised	L.H.
02			
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04			
05			
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APPENDIX D

GEOTECHNICAL ENGINEERING REPORT

(NEW MEXICO SITES ARE NOT INCLUDED IN THE AZ12-404 PROJECT)



**GEOTECHNICAL ENGINEERING REPORT
NAVAJO HOUSING AUTHORITY
25 SCATTERED HOME OWNERSHIP UNITS
NAVAJO NATION, USA**

Submitted To:

Paul Browne, AIA, MBA, PMP
WHPacific
6501 Americas Parkway NE, Suite 400
Albuquerque, New Mexico 87110

Submitted By:

GEOMAT Inc.
915 Malta Avenue
Farmington, New Mexico 87401

March 2, 2021
GEOMAT Project 212-3668



915 Malta Avenue ♦ Farmington, NM 87401 ♦ Tel (505) 327-7928 ♦ Fax (505) 326-5721

March 2, 2021

Paul Browne, AIA, MBA, PMP

WHPacific

6501 Americas Parkway NE, Suite 400

Albuquerque, New Mexico 87110

RE: Geotechnical Engineering Report
Navajo Housing Authority 25 Scattered Home Ownership Units
Navajo Nation, USA
GEOMAT Project No. 212-3668

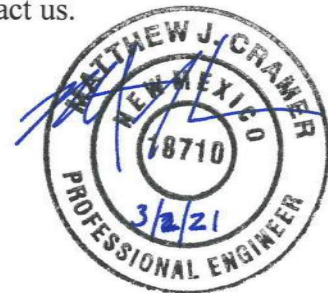
GEOMAT Inc. (GEOMAT) has completed the geotechnical engineering exploration for the Navajo Housing Authority's 25 home ownership units scattered sites located in different locations around the Navajo Nation, USA. This study was performed in general accordance with our Proposal No. 202-07-31, dated September 8, 2020.

The results of our engineering study, including the geotechnical recommendations, site plan, boring records, and laboratory test results are attached. Based on the geotechnical engineering analyses, subsurface exploration and laboratory test results, the proposed residences could be supported on conventional spread footings or post-tensioned slab-on-grade foundations per options presented in the Scattered Sites Prototype Drawings dated May 3, 2018 and the updated Scattered Sites drawings dated February 28, 2020 as presented in the report. Other design and construction details, based upon geotechnical conditions, are presented in the report.

We have appreciated being of service to you in the geotechnical engineering phase of this project. If you have any questions concerning this report, please contact us.

Sincerely yours,
GEOMAT Inc.

Seth D. Yokel
Staff Geologist



Matthew J. Cramer, P.E.
President, Principal

Copies to: Addressee (1)

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APPENDIX A

Site Plans
Logs of Borings
Unified Soil Classification
Drilling and Exploration Procedures

APPENDIX B

Laboratory Test Results
Laboratory Test Procedures

APPENDIX C

Important Information About This Geotechnical Engineering Report (Taken From GBA)

**GEOTECHNICAL ENGINEERING REPORT
NAVAJO HOUSING AUTHORITY
25 HOME OWNERSHIP UNITS - SCATTERED SITES
NAVAJO NATION, USA
GEOMAT PROJECT NO. 212-3668**

INTRODUCTION

This report contains the results of our geotechnical engineering exploration for the Navajo Housing Authority's 25 scattered home ownership units sites located in different locations around the Navajo Nation, USA, as shown on the Vicinity and Site Plans in Appendix A of this report.

The purpose of these services is to provide information and geotechnical engineering recommendations about:

- subsurface soil conditions
- groundwater conditions
- lateral soil pressures
- earthwork
- foundation design and construction
- slab design and construction
- percolation test results
- drainage

We understand the homes will be single-family, single-story, wood-framed structures supported on concrete post-tensioned slab/foundations or conventional spread footings utilizing the available NHA prototypical designs. We have assumed that no basements or other below grade structures are planned and no significant earthwork cuts or fill will be required to achieve final site grades. The geotechnical engineering recommendations are to categorize each site and provide recommendations on which foundation system can be used for each site based upon the criteria given in the prototype drawings.

The opinions and recommendations contained in this report are based upon the results of field and laboratory testing, engineering analyses, and experience with similar soil conditions, structures, and our understanding of the proposed project as stated below.

PROPOSED CONSTRUCTION

We understand the homes will be single-family, single-story, wood-framed structures supported on concrete post-tensioned slab/foundations or conventional spread footings utilizing the available NHA prototypical designs by WHPacific. We have assumed that no basements or other below grade structures are planned and no significant earthwork cuts or fill will be required to achieve final site grades.

The units will be supported on either typical spread footings or post-tensioned slabs-on-ground in accordance with the methods presented in the “Design and Construction of Post-Tensioned Slabs-on-Ground” manual published by the Post-Tensioning Institute (PTI). The prototype drawings provided give three options for the spread footings or post-tensioned slab designs as follows:

Option 1: Spread Footings; Provided for Non-Active Ground Sites (this option replaces previous post-tensioned slab Option 1 for these sites)

Design Criteria:

- Allowable Soil Bearing Pressure – 2,500 psf
- Maximum Differential Soil Movement – 0.5 inches

Option 2: Post-tensioned slabs; Provided for Compressible Ground Sites

Design Criteria:

- Allowable Soil Bearing Pressure – 1,000 psf
- Maximum Differential Soil Movement
 - Center – 0.5 inches
 - Across Slab – 1.0 inches

Option 3: Post-tensioned slabs; Provided for Expansive Ground Sites

Design Criteria:

- Allowable Soil Bearing Pressure – 750 psf
- Edge Moisture Variation Distance
 - Center – 9 feet
 - Edge – 5 feet
- Maximum Differential Soil Movement
 - Center – -1 inches
 - Edge – 2.5 inches
- Slab-Subgrade Friction Coefficient – 0.75

SITE EXPLORATION

Our scope of services performed for this project included a site reconnaissance by a staff geologist, a subsurface exploration program, laboratory testing and engineering analyses.

Field Exploration:

Subsurface conditions at the sites were explored on February 5 and 8 through 12, 2021 by drilling two exploratory borings at each site at the approximate locations shown on the Site Plans in Appendix A. At each site, one boring was drilled to a depth of approximately 10 feet below the existing ground surface (bgs) within the footprint of the proposed homes to be built; a second hole was drilled to a depth of approximately 3 feet bgs in an area designated for the homes leach field in order to perform a field percolation test at a later time.

The borings were advanced using a CME-45 truck-mounted drill rig with continuous-flight, 7.25-inch O.D. hollow-stem auger. The borings were continuously monitored by a geologist from our office who examined and classified the subsurface materials encountered, obtained representative samples, observed groundwater conditions, and maintained a continuous log of each boring.

Soil samples were obtained from the borings using a combination of standard 2-inch O.D. split spoon and 3-inch O.D. ring-lined split-barrel samplers. The samplers were driven using a 140-pound hammer falling 30 inches. The standard penetration resistance was determined by recording the number of hammer blows required to advance the sampler in six-inch increments. Representative bulk samples of subsurface materials were also obtained.

Groundwater evaluations were made in each boring at the time of site exploration. Soils were classified in accordance with the Unified Soil Classification System described in Appendix A. Boring logs were prepared and are presented in Appendix A.

Laboratory Testing:

Samples retrieved during the field exploration were transported to our laboratory for further evaluation. At that time, the field descriptions were confirmed or modified as necessary, and laboratory tests were performed to evaluate the engineering properties of the subsurface materials.

SITE CONDITIONS

The conditions at all of the sites varied. Some of the sites appeared to have been recently graded, others were located on undeveloped land within close proximity of other residential units, while

others were on entirely undeveloped land. Vegetation ranged from none on some sites to moderate on others.

SUBSURFACE CONDITIONS

Soil Conditions:

A generalized summary of the subsurface conditions encountered in the borings is presented in the following table. More detailed descriptions of subsurface conditions are presented on the Boring Logs in Appendix A.

Table No. 1 – Site Locations and Subsurface Materials				
SITE #	BORING #	NAME	LOCATION	SUBSURFACE MATERIAL
1	B-8	Evelyn Henry	White Rock, NM	Clayey SAND with gravel, SHALE & SANDSTONE
2	B-18	Tanya Chiquito	Dilkon, AZ	Silty, Clayey SAND & Silty SAND
3	B-15	Maggie A. Freeman	Pine Springs, AZ	Silty, Clayey SAND & SANDSTONE
4	B-10	Lita Pat	Pinehill, NM	Clayey SAND & SANDSTONE
5	B-7	Jeraline S. Yazzie	Crownpoint, NM	Clayey SAND & SHALE w/ SILTSTONE
6	B-6	Jessica Lynn Peshlakai	Standing Rock, NM	Clayey SAND & Carbonaceous SHALE
7	B-11	Jerry Haswood	Rock Springs, NM	Clayey SAND & SHALE
8	B-22	Ray Tom & Lena Tomasyo	Navajo Mtn., AZ	Silty SAND & SANDSTONE
9	B-1	Sarah Benally	Shiprock, NM	Sandy Lean CLAY & Silty SAND

Table No. 1 – continued				
10	B-19	Bertha Rae Wheeler	Round Rock, AZ	Silty SAND & SANDSTONE w/ SHALE
11	B-23	Samantha Norton	Aneth, UT	Silty SAND
12	B-14	Lionel Don & Melissa Joy Jumbo	Sawmill, AZ	Silty SAND & SANDSTONE
13	B-21	Crystal Mercedes Rodgers	Lukachukai, AZ	Silty SAND
14	B-25	Charles Jim	Burnham, NM	Poorly graded SAND & SANDSTONE
15	B-24	Nora Mae Harvey	Aneth, UT	Silty SAND & Poorly graded GRAVEL and COBBLE and sand
16	B-12	Elivera Sue Bahe	Crystal, NM	Sandy, Silty CLAY & Silty SAND
17	B-20	Mercedes Davis	Lukachukai, AZ	Silty, Clayey SAND & SANDSTONE
18	B-17	Ray Davis	Dilkon, AZ	Clayey SAND
19	B-16	Melissa Ann Yazzie	New Lands, AZ	Clayey SAND & Silty SAND
20	B-4	Darlene Thomposon & Dennis Dugi	Nenahnezad, NM	Silty SAND & SANDSTONE
22	B-3	Arlo Art & Lanette Fay Lansing	Shiprock, NM	Poorly graded GRAVEL and COBBLE with sand
23	B-9	Beth B. Miller	Thoreau, NM	Silty SAND & Clayey SAND
24	B-2	Shirley Tsosie	Shiprock, NM	Poorly graded SAND & Poorly graded GRAVEL/COBBLE with sand
25	B-5	Joshua J. Mike	Nenahnezad, NM	Poorly graded SAND with silt
26 SITE #21	B-13	Joan Jones	Crystal, NM (AZ)	Clayey SAND & SHALE

Groundwater was not encountered to the depths explored in any of the borings. However, groundwater elevations can fluctuate over time depending upon precipitation, irrigation, runoff and infiltration of surface water. We do not have any information regarding the historical fluctuation of the groundwater level in this vicinity.

Laboratory Test Results:

Results of all laboratory tests are presented in Appendix B.

OPINIONS AND RECOMMENDATIONS

Geotechnical Considerations:

The sites are considered suitable for the proposed residential units based on the geotechnical conditions encountered and tested for this report. To reduce the allowable movements to those specified in the prototype design drawings for each option, the spread footings or post-tensioned foundations should bear on compacted native soils, engineered fill, or rock as recommended herein.

Soils and/or rock at some of the sites exhibited compressible and expansive properties in response to applied loads and increased moisture conditions, respectively. If the underlying soil and/or rock were to become wetted, the residences could experience movement beyond the specified limits resulting in distress to the structures.

The recommendations in this report are intended to reduce, but not completely eliminate, the potential for movements to occur. Additional movement beyond what is stated in this report could occur if water is allowed to infiltrate the on-site soils and bedrock. This wetting could be due to broken/leaking water lines, infiltration of surface water, irrigation, or other sources. Strict moisture control throughout the life of the structure is critical to reducing the potential for moisture-induced movements. It is of paramount importance to provide good positive drainage to ensure that surface water is quickly transmitted away from the structures. Consideration should be given to paving or otherwise surfacing the area surrounding the buildings to prevent water infiltration adjacent to or beneath the structures. Raising the site grade may also help improve drainage and reduce the potential for the supporting soil/rock to become wet.

Highly expansive clay/rock was encountered at the Jeraline S. Yazzie (#5), Evelyn Henry (#1), and Jerry Haswood (#7) sites. Utilizing post-tensioned slabs as shown in the Prototype drawings bearing on engineered fill as recommended herein will serve to reduce the distress related to subsurface movements at these sites. However, movements beyond the maximums given in Option 3 could be expected if the underlying soils/rock are to become significantly elevated in moisture. In our opinion, utilizing deep foundations such as drilled piers with suspended floor

slabs would substantial reduce the risk of subsurface related movements at these sites. Alternative recommendations for deep foundations for these site are provided herein.

If there are any significant deviations from the assumed floor elevations, structure locations and/or loads noted at the beginning of this report, the opinions and recommendations of this report should be reviewed and confirmed/modified as necessary to reflect the final planned design conditions.

Foundations:

Based on our understanding of the type of structures to be built and the results of our field subsurface exploration and laboratory testing, the buildings should be supported on a structural, reinforced (mat or post-tensioned) slab foundation in accordance with the “Design and Construction of Post-Tensioned Slabs-on-Ground” manual published by the Post-Tensioning Institute (PTI) and as shown in the afore mentioned Prototype drawings.

Collapsible and/or expansive conditions were encountered at the sites with recommendations for Options 2 and 3 (post-tensioned slabs). Structural (mat or post-tensioned) slab foundations are intended to be sufficiently rigid to function as a single structural unit to reduce building distress if the underlying soils were to become wet and differentially move. It is of paramount importance to provide good positive drainage away from the buildings to ensure that surface water is transmitted away from the structures. Also, utility trenches entering and exiting the buildings should be properly backfilled to reduce the potential for moisture infiltration through the backfill. Consideration should also be given to routing the water lines overhead in the buildings to reduce the potential for leaks below the slab.

The following table summarizes our recommendations for the support of each unit at the various sites:

Table No. 2 – Foundation Option Recommendations			
Site Name	Site Number	Foundation Option¹	Bearing Material^{2,3,4}
Evelyn Henry	1	Option 3	2 feet of Engineered Fill
Tanya Chiquito	2	Option 2	2 foot of Engineered Fill
Maggie A. Freeman	3	Option 1	Competent Sandstone OR 1 foot of Engineered Fill
Lita Pat	4	Option 1	Competent Sandstone OR 1 foot of Engineered Fill
Jeraline S. Yazzie	5	Option 3	2 feet of Engineered Fill

Table No. 2 – continued			
Jessica Lynn Peshlakai	6	Option 1	2 foot of Engineered Fill
Jerry Haswood	7	Option 3	2 feet of Engineered Fill
Ray Tom & Lena Tomasyo	8	Option 1	Competent Sandstone OR 1 foot of Engineered Fill
Sarah Benally	9	Option 1	2 feet of Engineered Fill
Bertha Rae Wheeler	10	Option 2	2 foot of Engineered Fill
Samantha Norton	11	Option 1	2 foot of Engineered Fill
Lionel Don & Melissa Joy Jumbo	12	Option 1	Competent Sandstone OR 1 foot of Engineered Fill
Crystal Mercedes Rodgers	13	Option 1	2 foot of Engineered Fill
Charles Jim	14	Option 2	2 feet of Engineered Fill
Nora Mae Harvey	15	Option 1	1 foot of Engineered Fill
Elivera Sue Bahe	16	Option 1	1 foot of Engineered Fill
Mercedes Davis	17	Option 1	1 feet of Engineered Fill
Ray Davis	18	Option 1	1 foot of Engineered Fill
Melissa Ann Yazzie	19	Option 1	1 foot of Engineered Fill
Darlene Thomposon & Dennis Dugi	20	Option 1	2 foot of Engineered Fill
Arlo Art & Lanette Fay Lansing	22	Option 1	1 foot of Engineered Fill OR Compacted Gravel/Cobble
Beth B. Miller	23	Option 1	2 foot of Engineered Fill
Shirley Tsosie	24	Option 1	1 foot of Engineered Fill
Joshua J. Mike	25	Option 1	2 foot of Engineered Fill
Joan Jones	(#21)26	Option 1	2 feet of Engineered Fill

¹Foundation options as described in the structural Prototype Drawings dated May 3, 2018, and additionally Spread Footings option dated February 28, 2020.

²Materials and compaction criteria for engineered fill should be as recommended in the **Earthwork** section of this report. Footings with options for bearing materials shall be supported entirely on one option or the other but not a combination of the two materials.

³If used, the thickness of aggregate base course may be subtracted from the overall recommended engineered fill thickness.

⁴All exposed subgrade soils areas which will receive fill, once properly cleared and benched where necessary, should be scarified to a minimum depth of eight inches, conditioned to near optimum moisture content, and compacted to at least 95% of standard proctor (ASTM D698). Subgrade compaction may be omitted if rock exists at subgrade elevations. All loose rock shall be removed from the bottom of the excavation when present.

The estimated differential soil movement outlined in the prototypes is based on normal climate conditions. Additional movements are possible if the foundation soils are infiltrated by moisture due to concentrated surface storm water, inadequate site drainage, water line or utility pipe leaks, landscape irrigation line leaks, excessive irrigation, etc.

Materials and compaction criteria for the engineered fill should be as recommended in the **Earthwork** section of this report. Adequate drainage should be provided to prevent the supporting soils from undergoing significant moisture changes.

For foundations adjacent to descending slopes, a minimum horizontal setback of five (5) feet should be maintained between the foundation base and slope face. In addition, the setback should be such that an imaginary line extending downward at 45 degrees from the nearest foundation edge does not intersect the slope.

Footings and foundations should be reinforced as necessary to reduce the potential for distress caused by differential foundation movement.

Foundation excavations should be observed by GEOMAT. If the soil conditions encountered differ significantly from those presented in this report, supplemental recommendations will be required.

Drilled Shaft Foundations:

In order to reduce the potential risk of subsurface movement due the expansive conditions at the Jeraline S. Yazzie (#5), Evelyn Henry (#1), and Jerry Haswood (#7) sites drilled shafts could be used. A suspended floor should be used in conjunction with grade beams over minimum 6 inch void form.

Drilled Shaft Design:

Drilled shafts should bear a minimum of 7 feet below finished grade or two (2.0) feet into rock, whichever is deeper and to the depth necessary to resist uplift forces on the shafts.

The top of the drilled shafts below the bottom of the grade beam should not be allowed to “mushroom”. Grade beams should extend between drilled shafts to support the walls and suspended floor. A six (6.0) inch void space should be provided between the bottom of the grade beams and the underlying soil/rock.

Drilled shafts should be designed on an equivalent end-bearing basis using an allowable bearing pressure of 10,000 psf for vertical downward loads. Uplift load capacities could be calculated using the weight of the drilled shaft plus an adhesion value of 300 pounds per square foot of the

contact area between the concrete in the drilled shaft and the adjacent soil and 500 pounds per square foot of contact area for the areas in contact with the rock. The upper two (2.0) feet should be neglected in the calculation of the allowable uplift capacity due to potential disturbance during drilling of the pier.

Lateral capacities of the shafts should be calculated using an allowable equivalent fluid passive pressure of 450 pounds per square foot of depth for soil and 750 pounds per square foot per foot of depth for rock. If the lateral capacity of the shafts is to be calculated using an LPILE analysis, we should be contacted to provide the appropriate design values.

Drilled Shaft Construction:

Drilled shafts should be a minimum of one and a half (1.5) feet in diameter. Shafts should not be drilled within 10 feet of another shaft while the concrete in the shaft has not been in place for at least 12 hours. Pier concrete with a slump of 6 to 8 inches is recommended. Concrete should be placed in accordance with the American Concrete Institute (ACI) Specification for the Construction of Drilled Piers (ACI 336.1-01). Concrete may be placed by free-falling, provided that concrete is guided so as not to hit the reinforcement, hole sides, or anchor bolt assemblies (ACI 336.1-01, Section 3.5.6).

It is recommended that the following items concerning the installation of drilled shafts be addressed in the job specifications.

1. A GEOMAT representative should be present at the site during drilling to observe and document the conditions encountered and to provide alternate recommendations, if applicable. All drilled shaft installation procedures and techniques and concrete placement shall be observed and documented by qualified geotechnical personnel.
2. Holes shall be drilled or bored in such a manner as to provide the full-sized shaft diameter and length as specified on the drawings or in the specifications.
3. Before and after placement of reinforcement cages and before placing concrete, the diameter, depth, and bearing stratum of each borehole must be verified by a representative of the owner (Geotechnical Engineer).
4. Under no circumstances should concrete be allowed to free fall against shaft sides or reinforcing. Free-falling concrete should be guided so that it does not hit the reinforcement, hole sides, or anchor bolt assemblies.
5. If the Geotechnical Engineer deems the bearing stratum as not capable of providing

sufficient bearing support, the shaft length shall be extended as directed, or the diameter of the shaft should be enlarged.

6. All loose material and slough shall be removed from drilled shafts before reinforcing and concrete placement. Excavate shaft bottoms to a level plane, as approved by the Geotechnical Engineer. If caving occurs or “slough” from the surface falls into the borehole after placement of the reinforcement cage, the reinforcement cage shall be removed, the bottom cleaned out, and reinforcement cage reinserted.
7. It is not anticipated that groundwater will be encountered; however, should unforeseen groundwater be encountered or should drilling mud/slurry be necessary, tremie concrete placement methods, as described below, may be used.
 - a. Drilled shafts shall be cleaned with a clean out bucket, immediately before concrete placement.
 - b. The tremie or pump pipe shall have watertight joints.
 - c. During the initial concrete placement, the concrete tremie or pump pipe shall be extended to the bottom of the drilled shaft before concrete placement.
 - d. During placement of concrete, the bottom of the pipe shall be maintained below the top of the concrete at all times. If the seal is lost, the pipe shall be re-inserted and the operation restarted.
 - e. Sufficient embedment of the tremie or pump pipe in concrete shall be maintained throughout concrete placement to prevent re-entry of water. The minimum embedment depth shall be 5 feet
 - f. The first-placed portion of concrete flow that comes to the top of the shaft shall be wasted, as determined by the Geotechnical Engineer.
 - g. Under no circumstances shall concrete be allowed to free fall through water or drilling fluid.
8. The placement of concrete for each drilled shaft shall be completed in one placement before commencing the placement of concrete in another.
9. Quantities of concrete placed for each drilled shaft shall be provided to the representative of the Owner.

10. Concrete shall have an ultimate compressive strength of not less than that provided for in the specifications and shall be workable and plastic so that it may be placed without segregation. A slump of 6 to 8 inches is recommended.
11. Concrete shall be cast-in-place against undisturbed earth in the holes in such a manner to provide for the exclusion of foreign matter in the concrete. Concrete shall not be dropped vertically into the dry excavation more than 60 feet unless an approved tremie (elephant trunk) or other similar approved method is used to prevent the concrete from striking the sides of the excavation.
12. The Geotechnical Engineer should review drilled shaft spacing at the time of construction. In order to prevent blowout between drilled shafts, it may be necessary to place concrete and allow it to harden for at least 8 hours before drilling adjacent shafts.

The test drilling was performed using a truck-mounted, CME-45 drill rig with 7.25-inch-diameter augers. It is not possible to accurately correlate the auger drilling results with the ease or difficulty of excavation at the site with other types of drilling equipment. We present the following general comments regarding excavatability for the designers' information with the understanding that they are opinions based on the test boring data. More accurate information regarding excavatability of drilled shafts should be evaluated by contractors or other interested parties from test excavations using the equipment that will be used during construction. Based on the conditions encountered in our test borings, we anticipate that drilling to design depths may be possible with appropriate rotary or single-flight power augers.

Final concrete quantities should be expected to exceed ideal geometric quantities, due to raveling and sloughing of the drilled shafts.

Total and differential settlements/movements resulting from the assumed structural loads are estimated to be on the order of 1/2 inch. Proper drainage should be provided in the final design and during construction and areas adjacent to the structure should be designed to prevent water from ponding or accumulating next to the structure.

Foundation excavations should be observed by GEOMAT. If the soil conditions encountered differ significantly from those presented in this report, supplemental recommendations will be required.

Site Classification:

The prototype drawings have assumed a Site Class D for the sites. Based on the subsurface conditions encountered in the borings, we that a Site Class D is appropriate or conservative for the sites according to Table 20.3-1 of the ASCE 7-10 Standard in accordance with the 2015 International Building Code. This parameter was estimated based on extrapolation of data beyond the deepest depth explored, using methods allowed by the code. Actual shear wave velocity testing/analysis and/or exploration to a depth of 100 feet were not performed as part of our scope of services for this project. Appropriate site classes for each individual site based upon our boring data can be provided upon request.

Lateral Earth Pressures:

For soils above any free water surface, recommended equivalent fluid pressures for unrestrained foundation elements are presented in the following table:

- **Active:**
 - Granular soil backfill 35 psf/ft
 - Undisturbed subsoil30 psf/ft

- **Passive:**
 - Shallow foundation walls250 psf/ft
 - Shallow column footings.....350 psf/ft

- **Coefficient of base friction:**0.40
The coefficient of base friction should be reduced to 0.30 when used in conjunction with passive pressure.

Where the design includes restrained elements, the following equivalent fluid pressures are recommended:

- **At rest:**
 - Granular soil backfill50 psf/ft
 - Undisturbed subsoil.....60 psf/ft

Fill against grade beams and retaining walls should be compacted to densities specified in **Earthwork**. Medium to high plasticity clay soils should not be used as backfill against retaining walls. Compaction of each lift adjacent to walls should be accomplished with hand-operated tampers or other lightweight compactors. Over compaction may cause excessive lateral earth pressures that could result in wall movement.

Percolation Test Results:

Soil percolation testing was conducted in the area of the proposed leach field for each individual site except for those in Shiprock, New Mexico as those sites will be connected to sewer. The percolation test was performed to provide information for design of the leach field. In accordance with New Mexico Environmental Improvement Division Percolation Test for Individual Lots, tests were conducted at locations designated by the client where the leach field will be. The percolation test was performed using the falling head method in a borehole that was approximately eight inches in diameter and approximately 3 feet below existing ground surface. The sides and bottom of the borehole were scarified and any remaining loose soil was removed from the borehole. All sites were presoaked for a minimum of 24 hours prior to testing.

After the presoaking, test trials were performed to establish a stabilized percolation rate. Each test trial was performed by measuring and recording the vertical drop in the water level at 10 or 30 minute intervals (depending on soil type). This process was repeated until a stabilized percolation rate was indicated. The test result for each site is presented in the table below:

Table No. 3 - Stabilized Percolation Test Results							
Site Name	Site Number	Test Number	Test Depth¹ (Feet)	Pre-Soak Date	Test Date	Subsurface Material²	Percolation Rate (Minutes Per Inch)
Evelyn Henry	1	P-8	3½	2/8/2021	2/22/2021	Clayey SAND & SHALE	15.0**
Tanya Chiquito	2	P-18	3½	2/11/2021	2/24/2021	Silty, Clayey SAND	1.3
Maggie A. Freeman	3	P-15	2	2/10/2021	2/23/2021	Silty, Clayey SAND & SANDSTONE	1.0**
Lita Pat	4	P-10	3½	2/9/2021	2/23/2021	Clayey SAND & SANDSTONE	2.0**
Jeraline S. Yazzie	5	P-7	3½	2/8/2021	2/22/2021	Clayey SAND & SHALE w/ SILTSTONE	NA**
Jessica Lynn Peshlakai	6	P-6	3	2/8/2021	2/22/2021	Clayey SAND	10.0
Jerry Haswood	7	P-11	3	2/9/2021	2/24/2021	Clayey SAND & SHALE	NA**
Ray Tom & Lena Tomasyo	8	P-22	3	2/12/2021	2/22/2021	Silty SAND	1.1

Table No. 3 - continued							
Bertha Rae Wheeler	10	P-19	3	2/11/2021	2/23/2021	Silty SAND	1.0
Samantha Norton	11	P-23	3	2/12/2021	2/22/2021	Silty SAND	1.7
Lionel Don & Melissa Jo Jumbo	12	P-14	2	2/10/2021	2/24/2021	Silty SAND & SANDSTONE	6.7**
Crystal Mercedes Rodgers	13	P-21	3½	2/11/2021	2/23/2021	Silty SAND	1.8
Charles Jim	14	P-25	2½	2/19/2021	2/19/2021	Silty SAND	1.1
Nora Mae Harvey	15	P-24	3	2/12/2021	2/22/2021	Silty SAND	2.5
Elivera Sue Bahe	16	P-12	2½	2/10/2021	2/24/2021	Sandy, Silty CLAY	8.0
Mercedes Davis	17	P-20	3½	2/11/2021	2/23/2021	Silty, Clayey SAND	3.3
Ray Davis	18	P-17	3	2/11/2021	2/24/2021	Clayey SAND	2.0
Melissa Ann Yazzie	19	P-16	3	2/10/2021	2/23/2021	Clayey SAND	10.0
Darlene Thompson & Dennis Dugi	20	P-4	2½	2/5/2021	2/19/2021	Silty SAND	1.8
Beth B. Miller	23	P-9	2	2/9/2021	2/22/2021	Clayey SAND	6.0
Joshua J. Mike	25	P-5	3	2/5/2021	2/19/2021	Poorly graded SAND with silt	3.5
Joan Jones	26 SITE #21	P-13	2	2/10/2021	2/24/2021	Clayey SAND	13.0

¹Approximate depth measured to bottom of test hole from adjacent existing grade

²Based upon visual classification of subsurface material encountered at percolation test location.

**Shallow rock was encountered on the site. Test holes in shallow bedrock can cause unreliable or variable results in percolation testing and the final design of the leach fields should take into account that the percolation rates will vary from those shown if the located in rock. Some locations are reported as "NA" since the shallow rock would not permit reasonable testing to the depths required.

Slopes:

Assuming fill specifications, compaction requirements, and recommended setbacks provided in this report are followed, cut and fill slopes as steep as to 2.5:1 (horizontal:vertical) should be stable. Depending upon specific project conditions, adequate factors of safety against slope failure may be available for steeper configurations. However, such a determination would require additional analysis.

Earthwork:

General Considerations:

The opinions contained in this report for the proposed construction are contingent upon compliance with recommendations presented in this section. Although underground facilities such as foundations, septic tanks, cesspools, basements and irrigation systems were not encountered during site reconnaissance, such features could exist and might be encountered during construction.

Site Clearing:

1. Strip and remove all existing pavement, fill, debris and other deleterious materials from the proposed building areas. Any existing structures should be completely removed from below any building, including foundation elements and any associated development such as underground utilities, septic tanks, etc. All exposed surfaces below footings and slabs should be free of mounds and depressions which could prevent uniform compaction.
2. If unexpected fills or underground facilities are encountered during site clearing, we should be contacted for further recommendations. All excavations should be observed by GEOMAT prior to backfill placement.
3. Stripped materials consisting of vegetation and organic materials should be removed from the site, or used to re-vegetate exposed slopes after completion of grading operations. If it is necessary to dispose of organic materials on-site, they should be placed in non-structural areas, and in fill sections not exceeding 5 feet in height.
4. Sloping areas steeper than 5:1 (horizontal:vertical) should be benched to reduce the potential for slippage between existing slopes and fills. Benches should be level and wide enough to accommodate compaction and earth moving equipment.
5. All exposed areas which will receive fill, once properly cleared and benched where necessary, should be scarified to a minimum depth of eight inches, conditioned to near

optimum moisture content, and compacted to at least 95% of standard proctor (ASTM D698).

Excavation:

1. We present the following general comments regarding our opinion of the excavation conditions for the designers' information with the understanding that they are opinions based on our boring data. More accurate information regarding the excavation conditions should be evaluated by contractors or other interested parties from test excavations using the equipment that will be used during construction. Based on our subsurface evaluation it appears that excavations in soils at the sites will be possible using standard excavation equipment. Excavations that encounter rock, including excavations for site utilities, are expected to be difficult and may necessitate the use of heavy-duty equipment and/or specialized techniques. Our notation of the degree of weathering of formational rock is a geological description of the material and is not intended to imply the degree of ease or difficulty of rock excavation.
2. On-site soils may pump or become unstable or unworkable at high water contents, especially for excavations near the water table. Dewatering may be necessary to achieve a stable excavation. Workability may be improved by scarifying and drying. Over-excavation of wet zones and replacement with granular materials may be necessary. Lightweight excavation equipment may be required to reduce subgrade pumping.

Slab Subgrade Preparation:

1. After site clearing is complete, the existing soil below the building area should be prepared as recommended in the **Foundations** and **Site Clearing** sections of this report.
2. A minimum 4-inch layer of aggregate base course should be placed beneath floor slabs on grade.

Foundation Preparation:

Footings should bear on materials as recommended in the **Foundations** section of this report. All loose and/or disturbed soils should either be compacted or removed from the bottoms of footing excavations prior to placement of reinforcing steel and/or concrete.

Fill Materials:

1. Native or imported soils with low expansive potentials could be used as fill material for the following:
 - general site grading
 - foundation areas
 - interior floor slab areas
 - foundation backfill
2. Select granular materials should be used as backfill behind walls that retain earth.
3. On site or imported soils to be used in structural fills should conform to the following:

<u>Gradation</u>	<u>Percent finer by weight (ASTM C136)</u>
3"	100
No. 4 Sieve	50-100
No. 200 Sieve	50 Max
Maximum expansive potential (%)*	1.5

* Measured on a sample compacted to approximately 95 percent of the ASTM D698 maximum dry density at about 3 percent below optimum water content. The sample is confined under a 144-psf surcharge and submerged.

4. Aggregate base should conform to Type I Base Course as specified in Section 303 of the 2014 New Mexico Department of Transportation (NMDOT) “*Standard Specifications for Road and Bridge Construction*” or Class I Aggregate Base as specified in Section 303 of the 2008 Arizona Department of Transportation (ADOT) “*Standard Specifications for Road and Bridge Construction.*” Aggregate base course conforming to either specification would be appropriate.

Placement and Compaction:

1. Place and compact fill in horizontal lifts, using equipment and procedures that will produce recommended moisture contents and densities throughout the lift.
2. Un-compacted fill lifts should not exceed 10 inches loose thickness.
3. Materials should be compacted to the following:

<u>Material</u>	<u>Minimum Percent (ASTM D698)</u>
Subgrade soils beneath fill areas	95
On site or imported soil fills:	

Beneath footings, slabs on grade and pavements.....	95
Aggregate base beneath slabs and pavements.....	95
Miscellaneous backfill.....	90

4. On-site and imported soils should be compacted at moisture contents near optimum.

Compliance:

Recommendations for slabs-on-grade and foundation elements supported on compacted fills depend upon compliance with **Earthwork** recommendations. To assess compliance, observation and testing should be performed by GEOMAT.

Drainage:

Surface Drainage:

1. Positive drainage should be provided during construction and maintained throughout the life of the proposed project. Infiltration of water into utility or foundation excavations must be prevented during construction. Planters and other surface features that could retain water in areas adjacent to the building or pavements should be sealed or eliminated.
2. In areas where sidewalks or paving do not immediately adjoin the structure, we recommend that protective slopes be provided with a minimum grade of approximately 5 percent for at least 10 feet from perimeter walls. Backfill against footings, exterior walls, and in utility and sprinkler line trenches should be well compacted and free of all construction debris to reduce the possibility of moisture infiltration.
3. Downspouts, roof drains or scuppers should discharge into splash blocks or extensions when the ground surface beneath such features is not protected by exterior slabs or paving.
4. Sprinkler systems should not be within 5 feet of foundation walls. Irrigated landscaping adjacent to the foundation system should be minimized or eliminated.

Subsurface Drainage:

Free-draining, granular soils containing less than five percent fines (by weight) passing a No. 200 sieve should be placed adjacent to walls which retain earth. A drainage system consisting of either weep holes or perforated drain lines (placed near the base of the wall) should be used to intercept and discharge water which would tend to saturate the backfill. Where used, drain lines

should be embedded in a uniformly graded filter material and provided with adequate clean-outs for periodic maintenance. An impervious soil should be used in the upper layer of backfill to reduce the potential for water infiltration.

GENERAL COMMENTS

It is recommended that GEOMAT be retained to provide a general review of final design plans and specifications in order to confirm that grading and foundation recommendations in this report have been interpreted and implemented. In the event that any changes of the proposed project are planned, the opinions and recommendations contained in this report should be reviewed and the report modified or supplemented as necessary.

GEOMAT should also be retained to provide services during excavation, grading, foundation, and construction phases of the work. Observation of footing excavations should be performed prior to placement of reinforcing and concrete to confirm that satisfactory bearing materials are present and is considered a necessary part of continuing geotechnical engineering services for the project. Construction testing, including field and laboratory evaluation of fill, backfill, pavement materials, concrete and steel should be performed to determine whether applicable project requirements have been met.

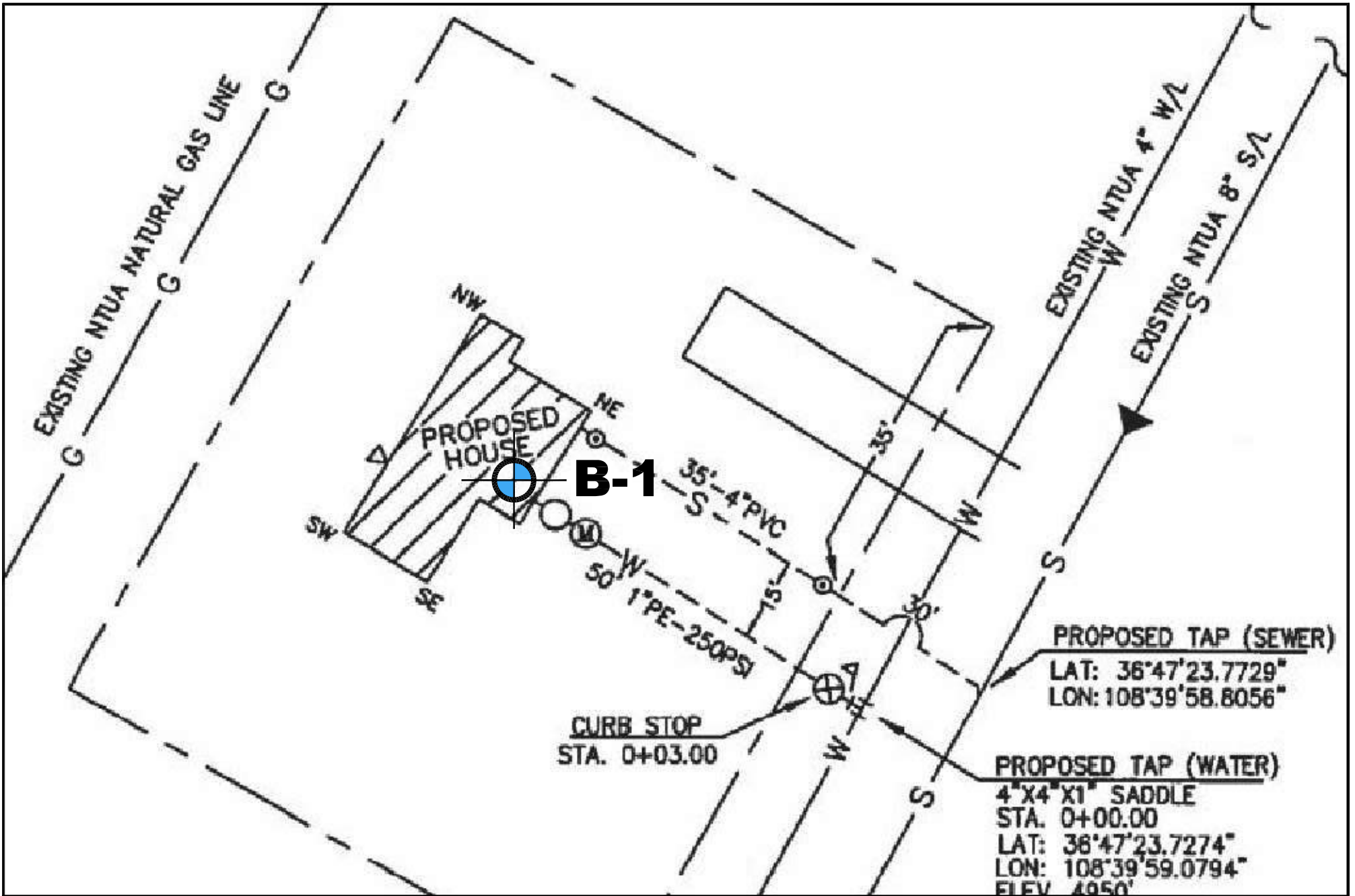
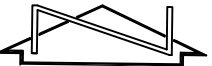
The analyses and recommendations in this report are based in part upon data obtained from the field exploration. The nature and extent of variations beyond the location of test borings may not become evident until construction. If variations then appear evident, it may be necessary to re-evaluate the recommendations of this report.

Our professional services were performed using that degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical engineers practicing in this or similar localities at the same time. No warranty, express or implied, is intended or made. We prepared the report as an aid in design of the proposed project. This report is not a bidding document. Any contractor reviewing this report must draw his own conclusions regarding site conditions and specific construction equipment and techniques to be used on this project.

This report is for the exclusive purpose of providing geotechnical engineering and/or testing information and recommendations. The scope of services for this project does not include, either specifically or by implication, any environmental assessment of the site or identification of contaminated or hazardous materials or conditions. If the owner is concerned about the potential for such contamination, other studies should be undertaken. This report has also not addressed any geologic hazards that may exist on or near the site.

This report may be used only by the Client and only for the purposes stated, within a reasonable time from its issuance. Land use, site conditions (both on and off site), or other factors may change over time and additional work may be required with the passage of time. Any party, other than the Client, who wishes to use this report, shall notify GEOMAT in writing of such intended use. Based on the intended use of the report, GEOMAT may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements, by the Client or anyone else, will release GEOMAT from any liability resulting from the use of this report by an unauthorized party.

Appendix A

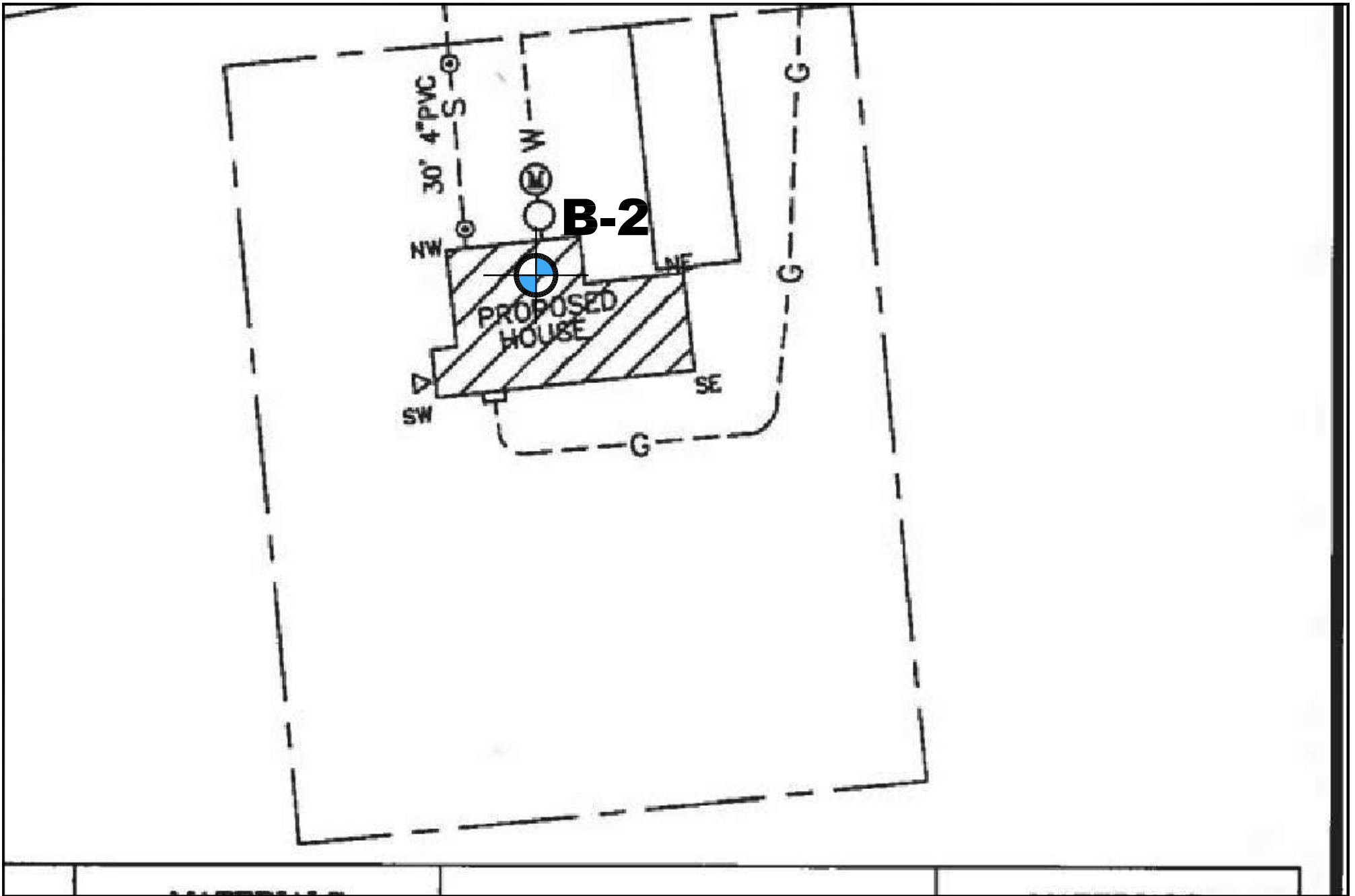



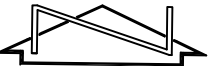
Approximate
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SITE PLAN	
Boring Locations (approximate)	
GEOMAT Project No. 212-3668	
Date of Exploration: February 5, 2021	

PROJECT	
NHA 25 HOU - Scattered Sites	
Sarah Benally	
Shiprock, New Mexico	



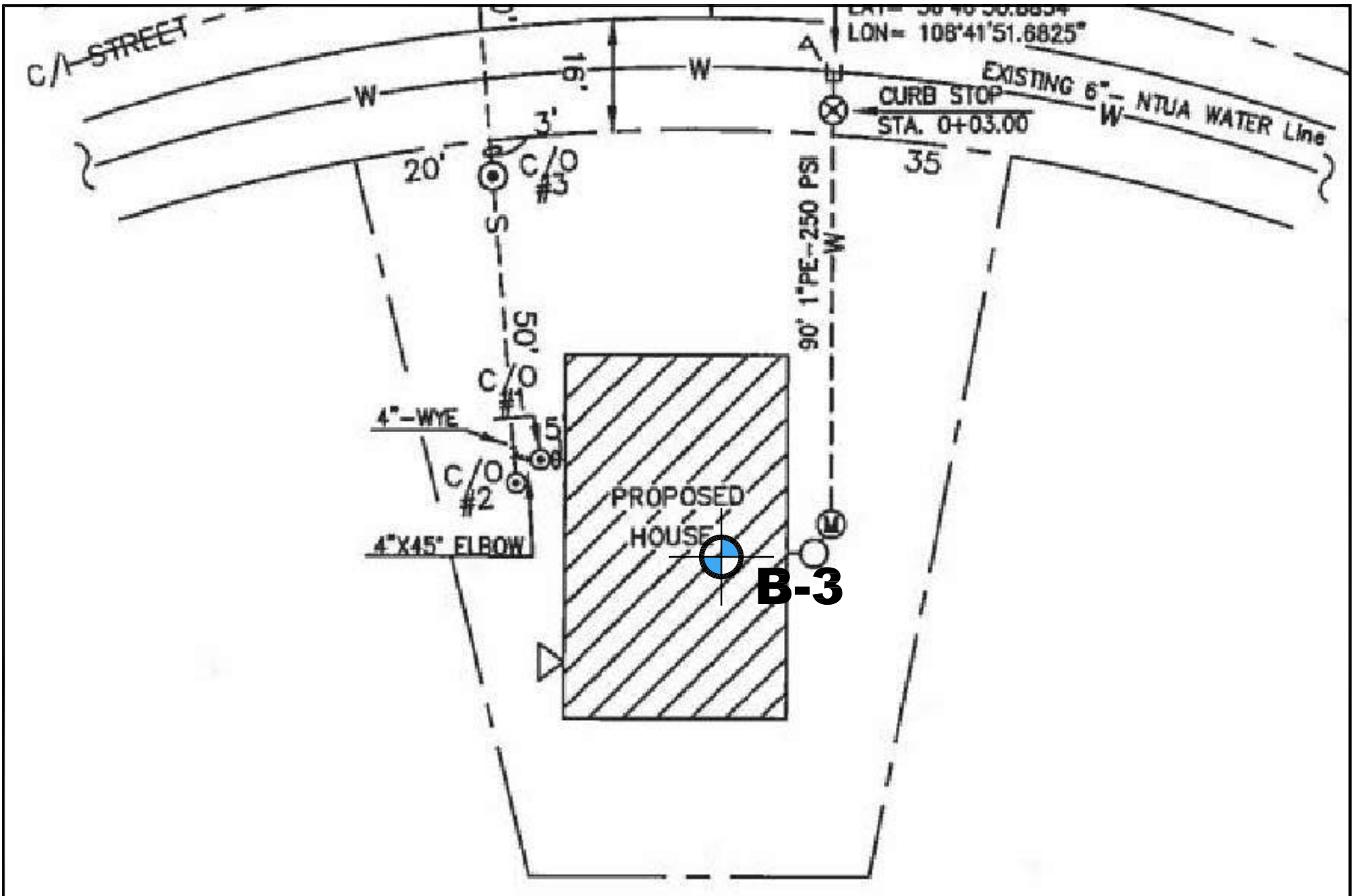


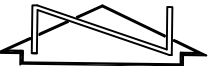


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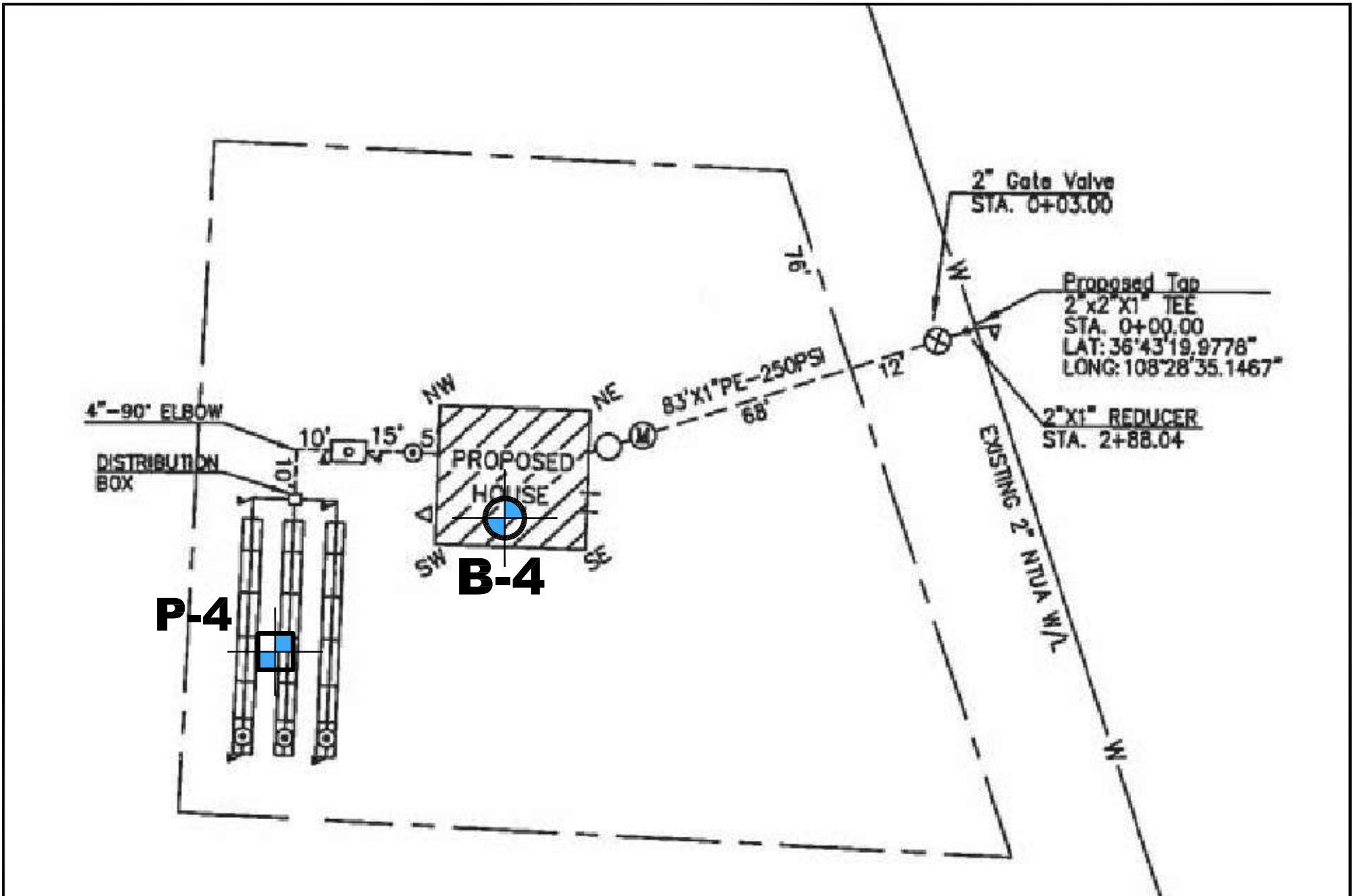
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 Boring Locations (approximate)
 GEOMAT Project No. 212-3668
 Date of Exploration: February 5, 2021

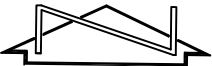

PROJECT
 NHA 25 HOU - Scattered Sites
 Shirley Tsosie
 Shiprock, New Mexico



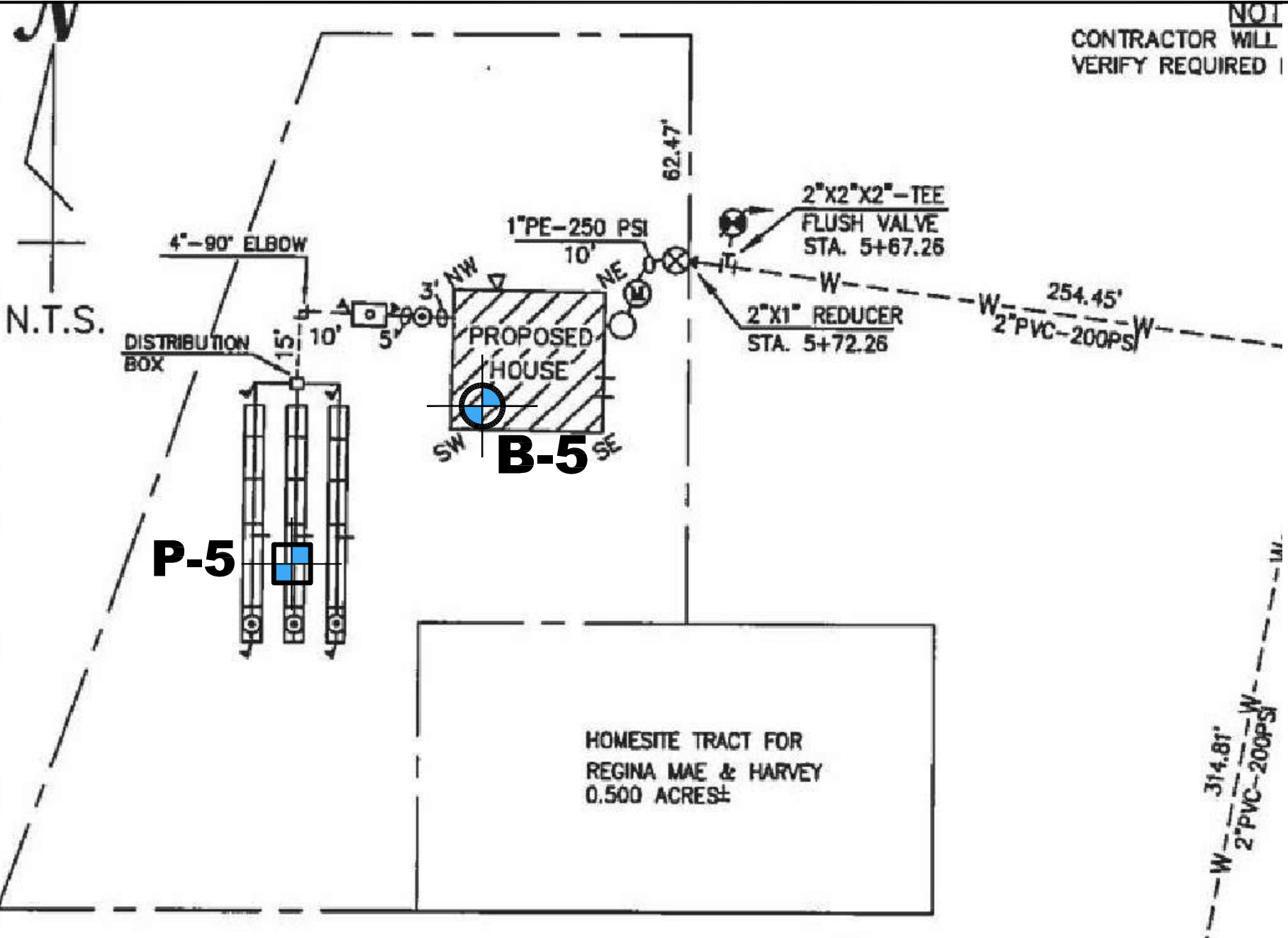


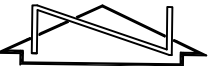
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	Boring Locations (approximate)	NHA 25 HOU - Scattered Sites	
	GEOMAT Project No. 212-3668 Date of Exploration: February 5, 2021	Arlo Art & Lanette Fay Lansing Shiprock, New Mexico	



 Approximate Not to Scale	SITE PLAN Boring and Percolation Test Locations (approximate)		PROJECT NHA 25 HOU - Scattered Sites Dennis Dugi & Darlene Thompson Nenahnezad, New Mexico		
	GEOMAT Project No. 212-3668 Date of Exploration: February 5, 2021				

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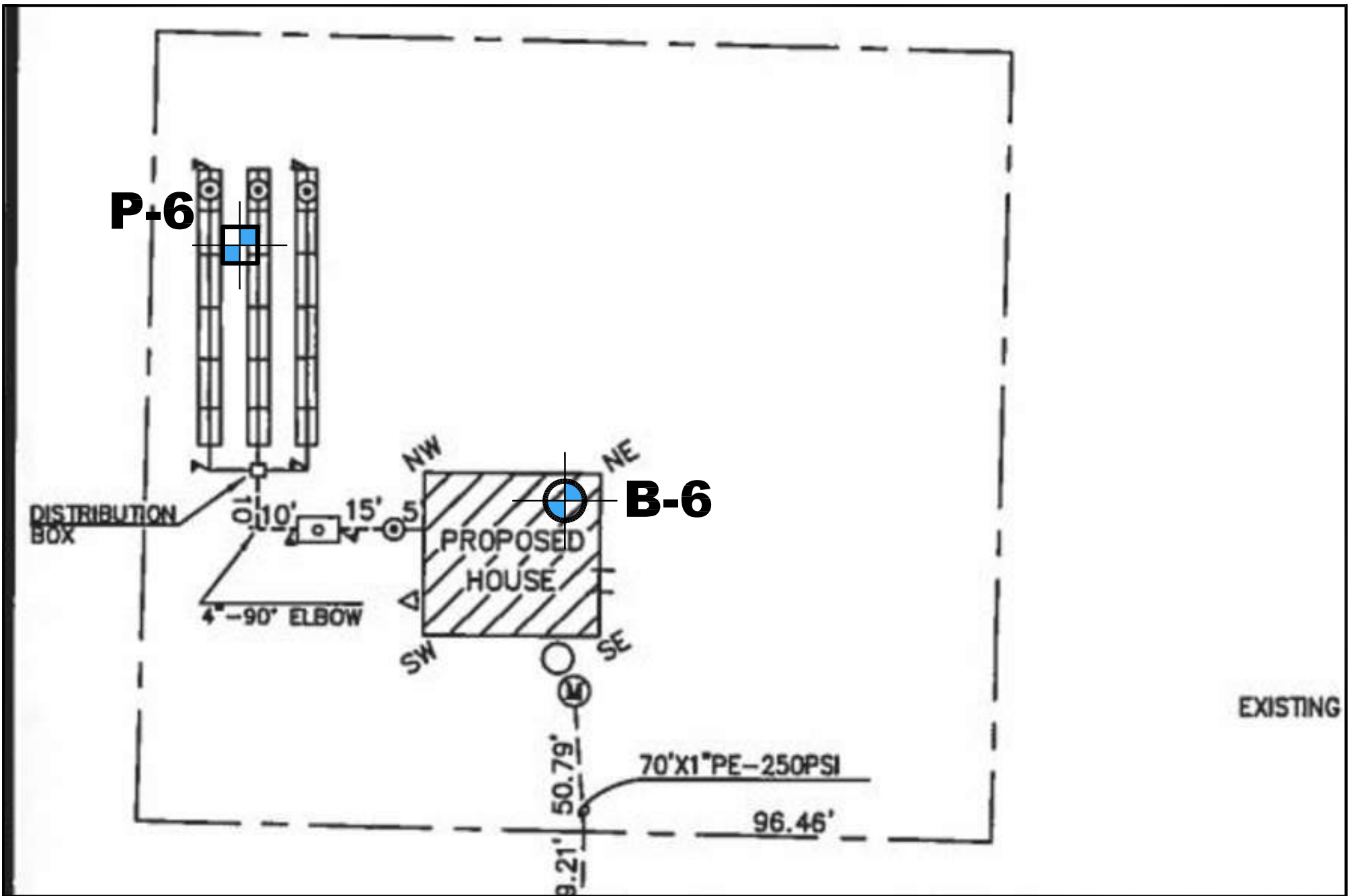
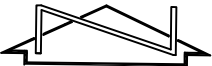



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SITE PLAN
 Boring and Percolation Test Locations (approximate)
 GEOMAT Project No. 212-3668
 Date of Exploration: February 5, 2021

PROJECT
 NHA 25 HOU - Scattered Sites
 Joshua James Mike
 Nenahnezad, New Mexico



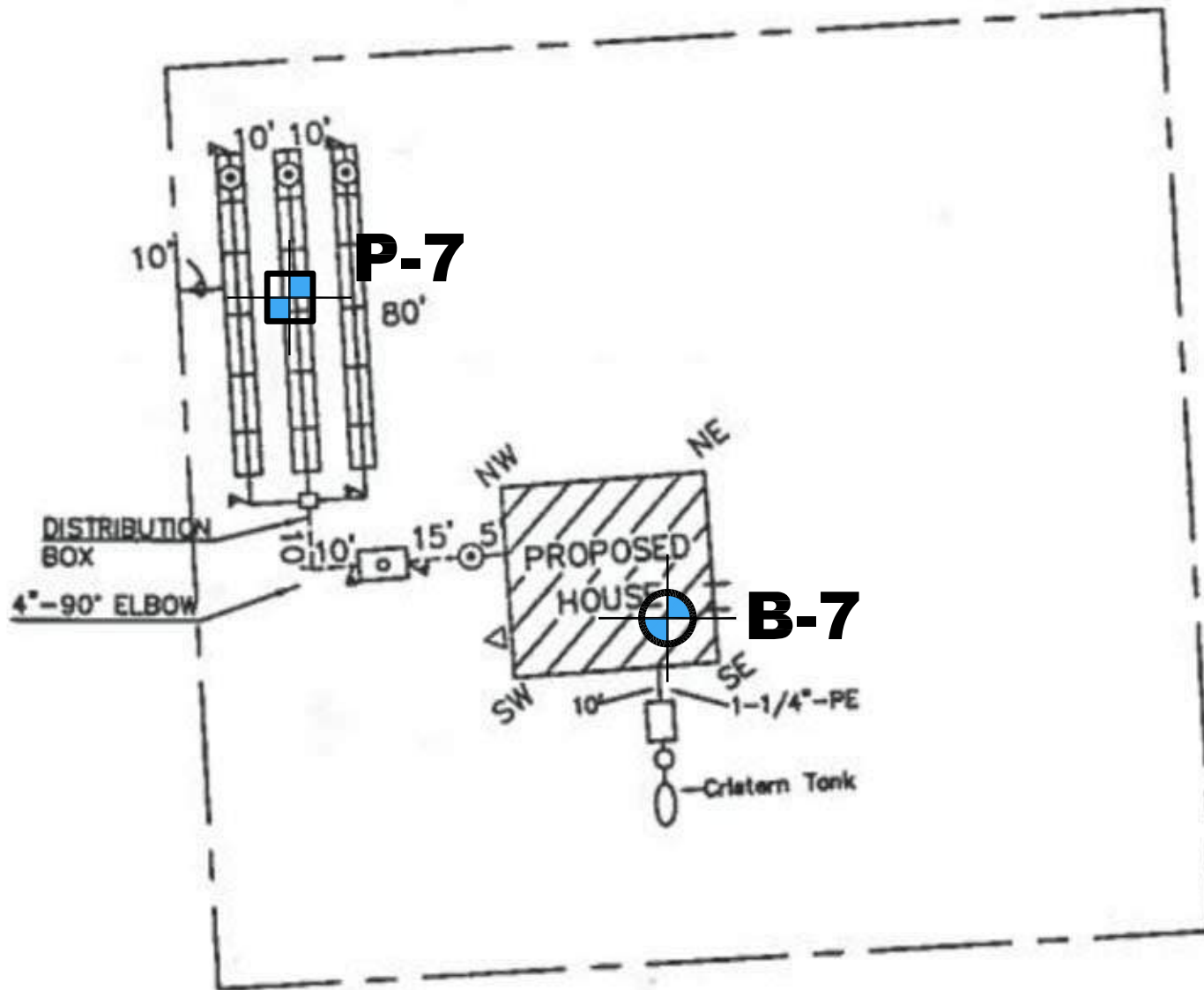



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SITE PLAN	
Boring and Percolation Test Locations (approximate)	
GEOMAT Project No. 212-3668	
Date of Exploration: February 8, 2021	

PROJECT
NHA 25 HOU - Scattered Sites Jessica Lynn Peshlakai Standing Rock, New Mexico





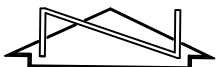
SITE PLAN

Boring and Percolation Test Locations (approximate)

GEOMAT Project No. 212-3668
Date of Exploration: February 8, 2021

PROJECT

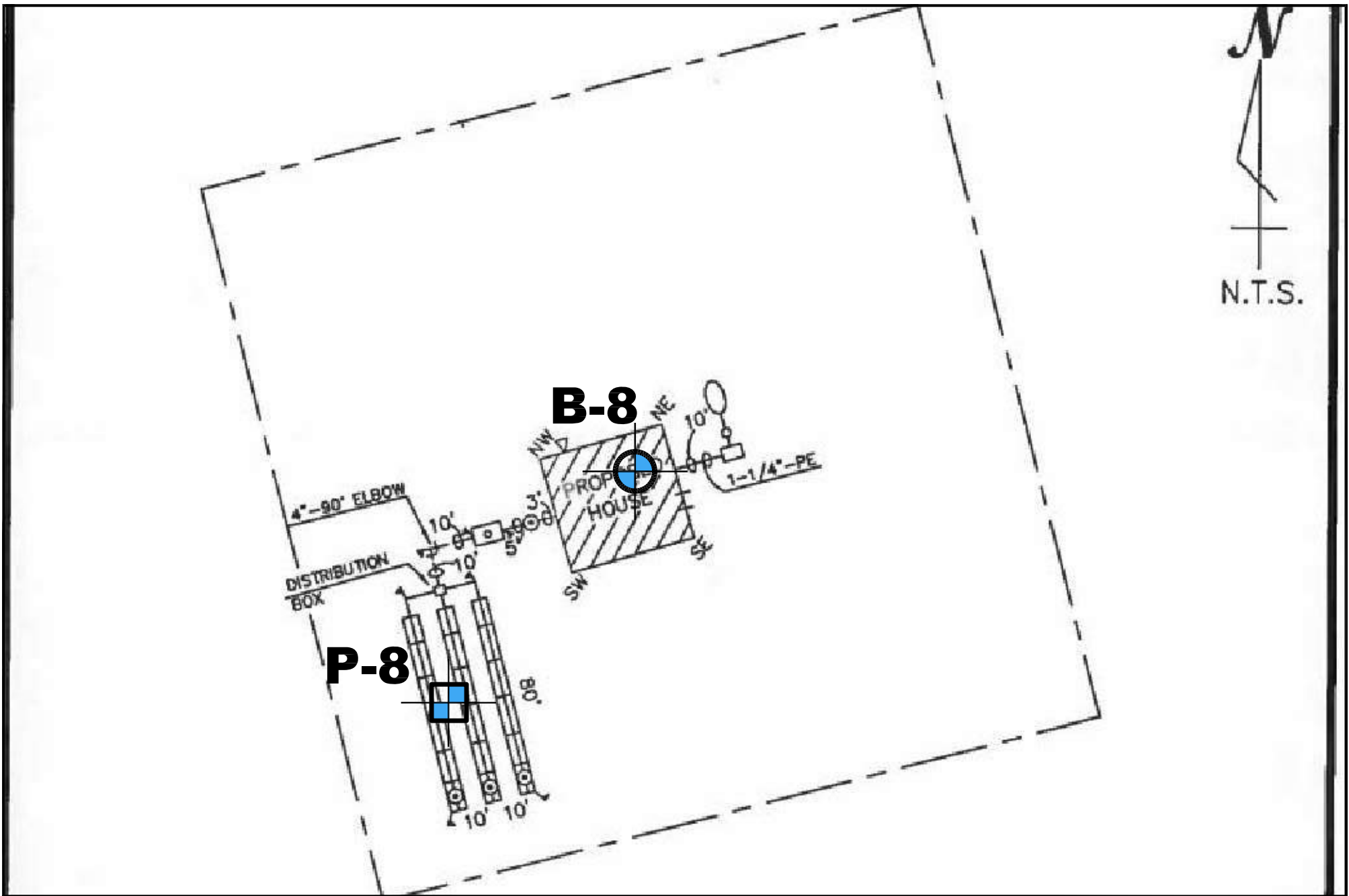
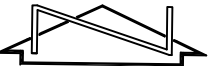
NHA 25 HOU - Scattered Sites
Jeraline S. Yazzie & Aldren J. Chicharelllo
Standing Rock, New Mexico



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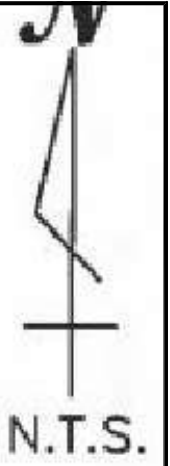
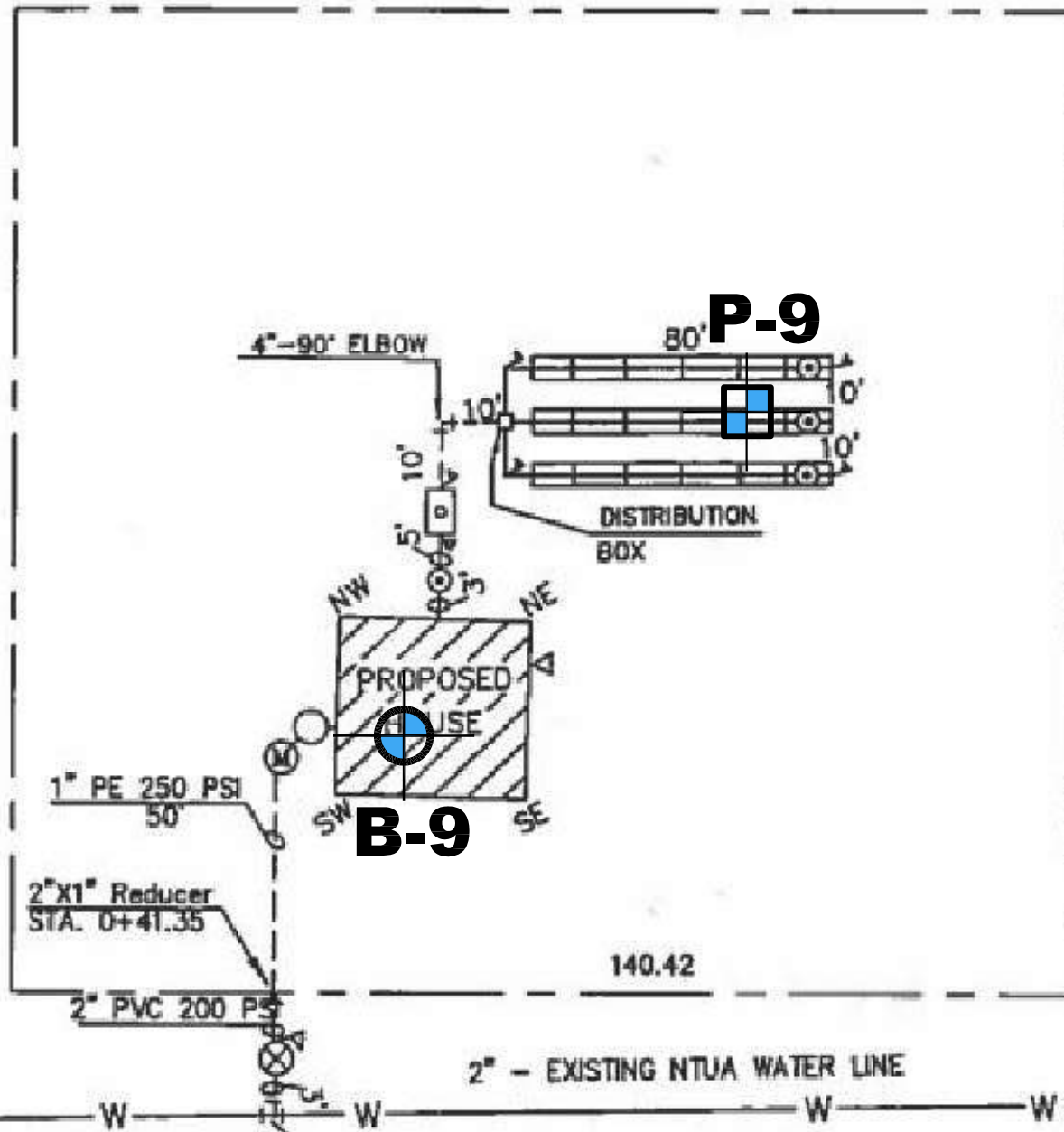
SITE PLAN
Boring and Percolation Test Locations (approximate)

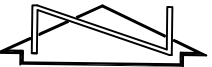

GEOMAT Project No. 212-3668
Date of Exploration: February 8, 2021

PROJECT

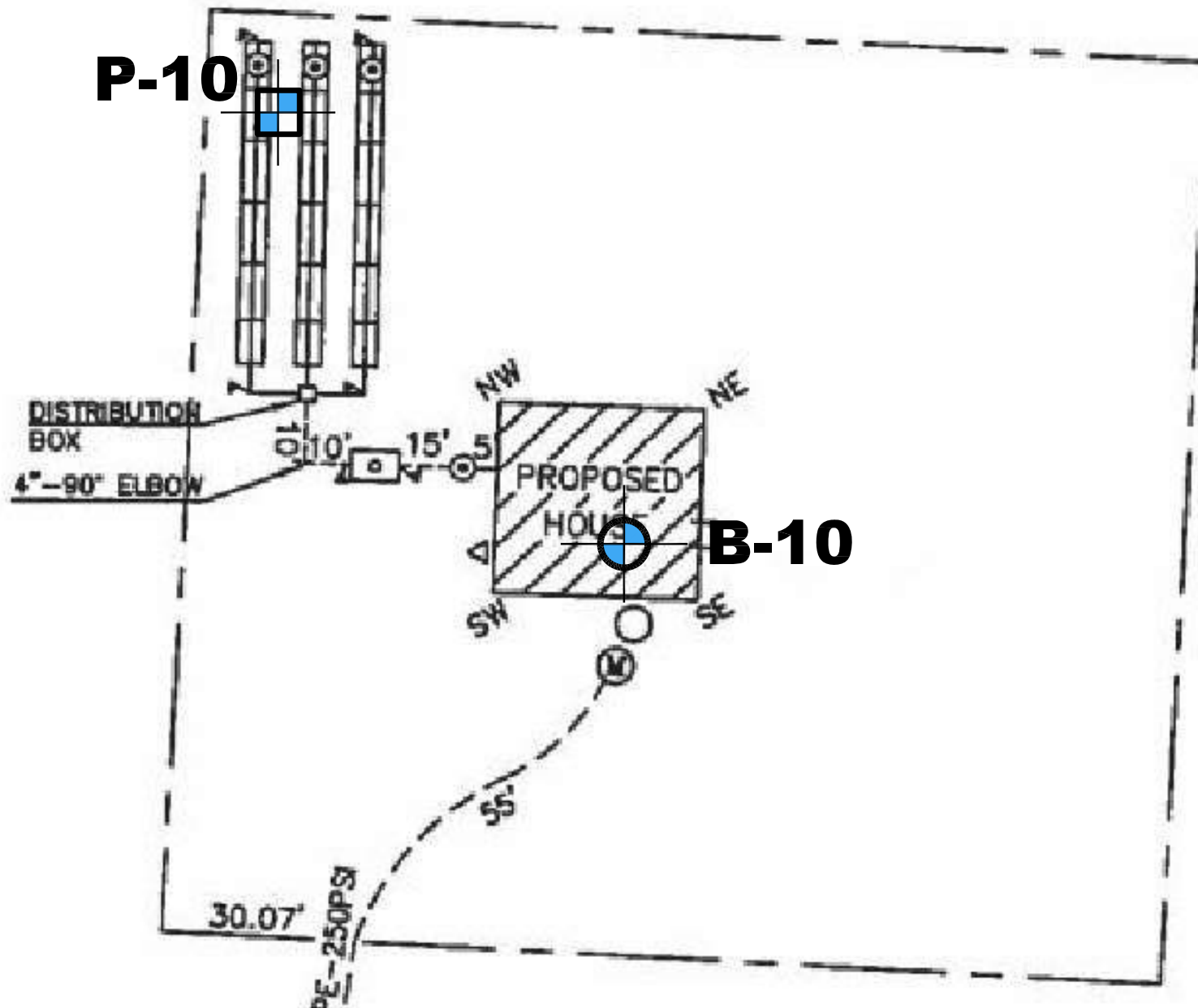
NHA 25 HOU - Scattered Sites
Evelyn Delores Henry
Whiterock, New Mexico





 Approximate Not to Scale	SITE PLAN Boring and Percolation Test Locations (approximate)	PROJECT NHA 25 HOU - Scattered Sites Beth B. Miller Thoreau, New Mexico	
	GEOMAT Project No. 212-3668 Date of Exploration: February 9, 2021		

P-10



B-10

SITE PLAN

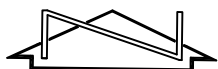
Boring and Percolation Test Locations (approximate)

GEOMAT Project No. 212-3668

Date of Exploration: February 9, 2021

PROJECT

NHA 25 HOU - Scattered Sites
Lita Pat
Pinehill, New Mexico



Approximate

Not to Scale

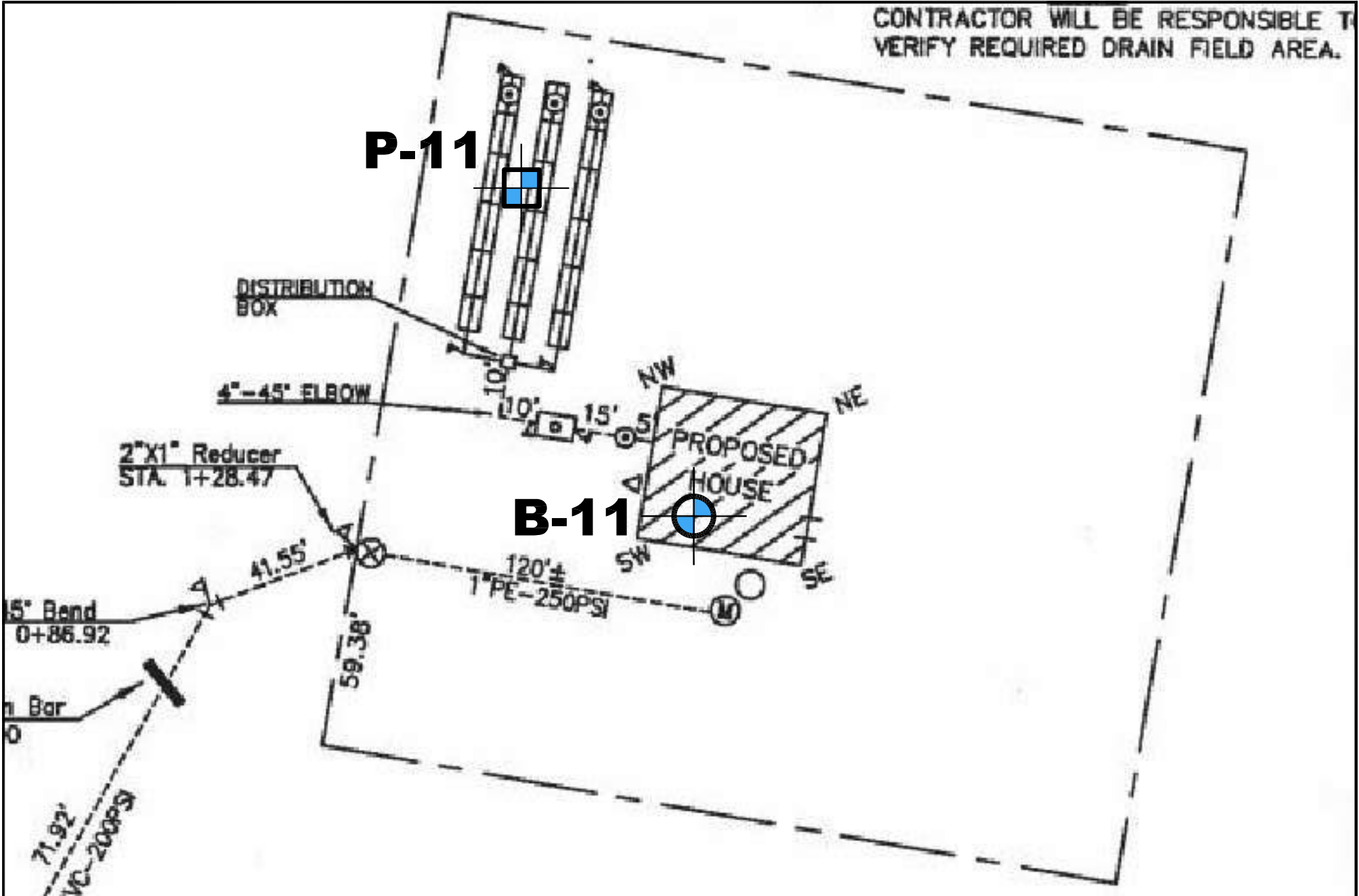
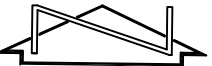


CONTRACTOR WILL BE RESPONSIBLE TO VERIFY REQUIRED DRAIN FIELD AREA.

P-11



B-11

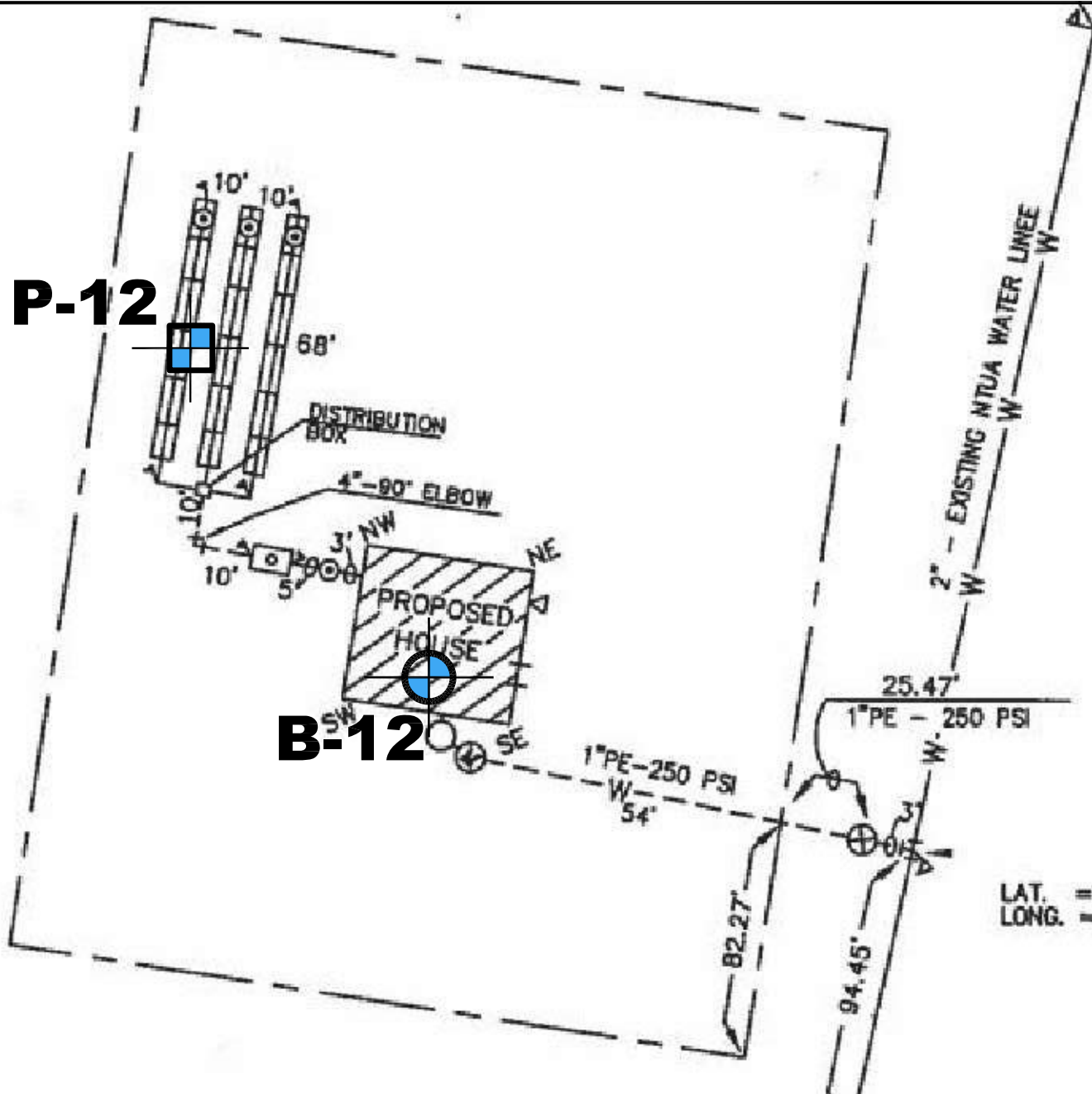
Approximate
Not to Scale

SITE PLAN	
Boring and Percolation Test Locations (approximate)	
GEOMAT Project No. 212-3668	
Date of Exploration: February 9, 2021	

PROJECT	
NHA 25 HOU - Scattered Sites	
Jerry Haswood	
Rocksprings, New Mexico	



P-12



B-12

LAT. = 36° 03' 20.05799"
LONG. = 108° 58' 04.4582"

SITE PLAN

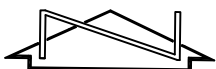
Boring and Percolation Test Locations (approximate)

GEOMAT Project No. 212-3668

Date of Exploration: February 10, 2021

PROJECT

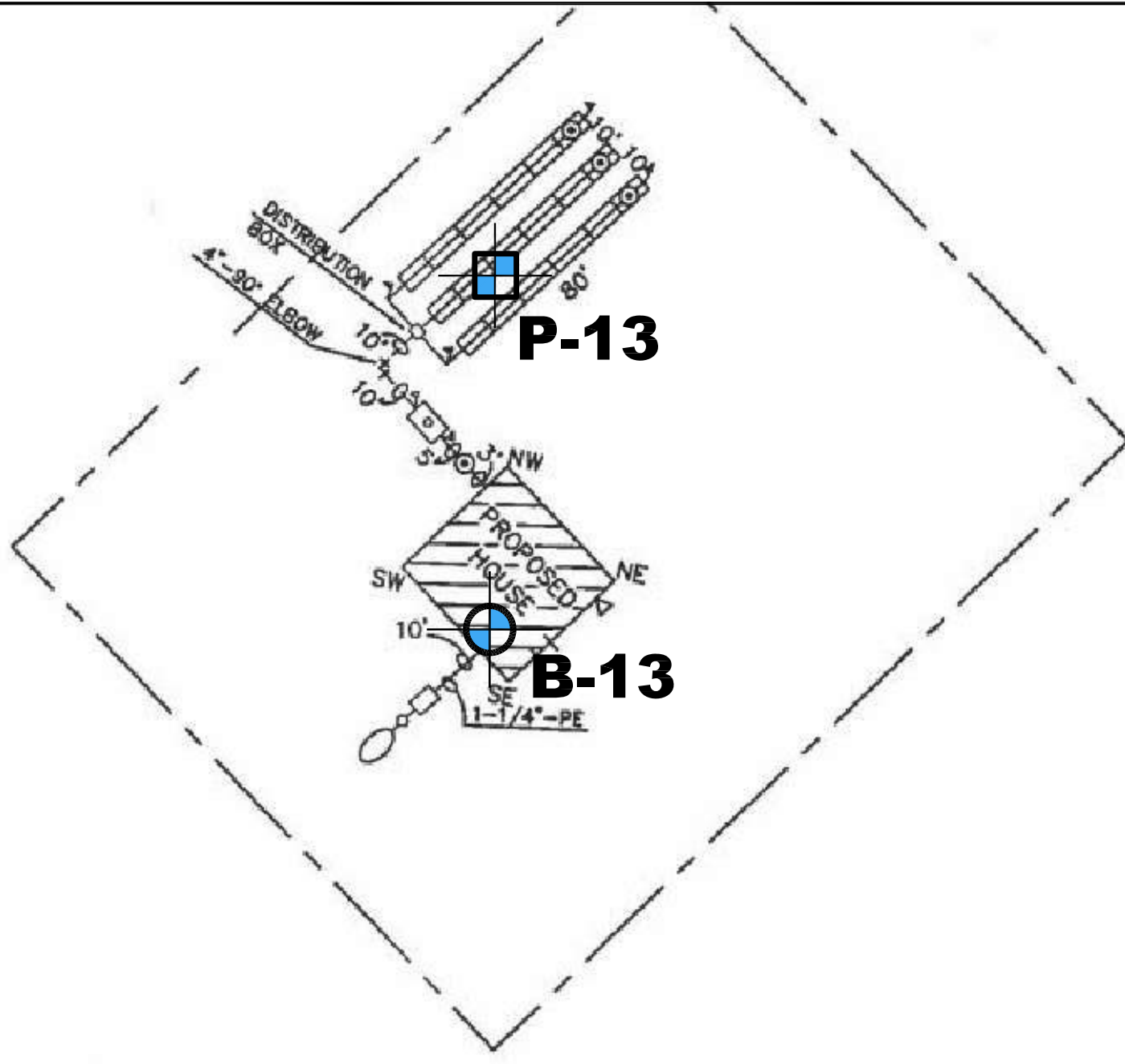
NHA 25 HOU - Scattered Sites
Elivera Sue Bahe
Crystal, New Mexico

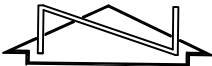



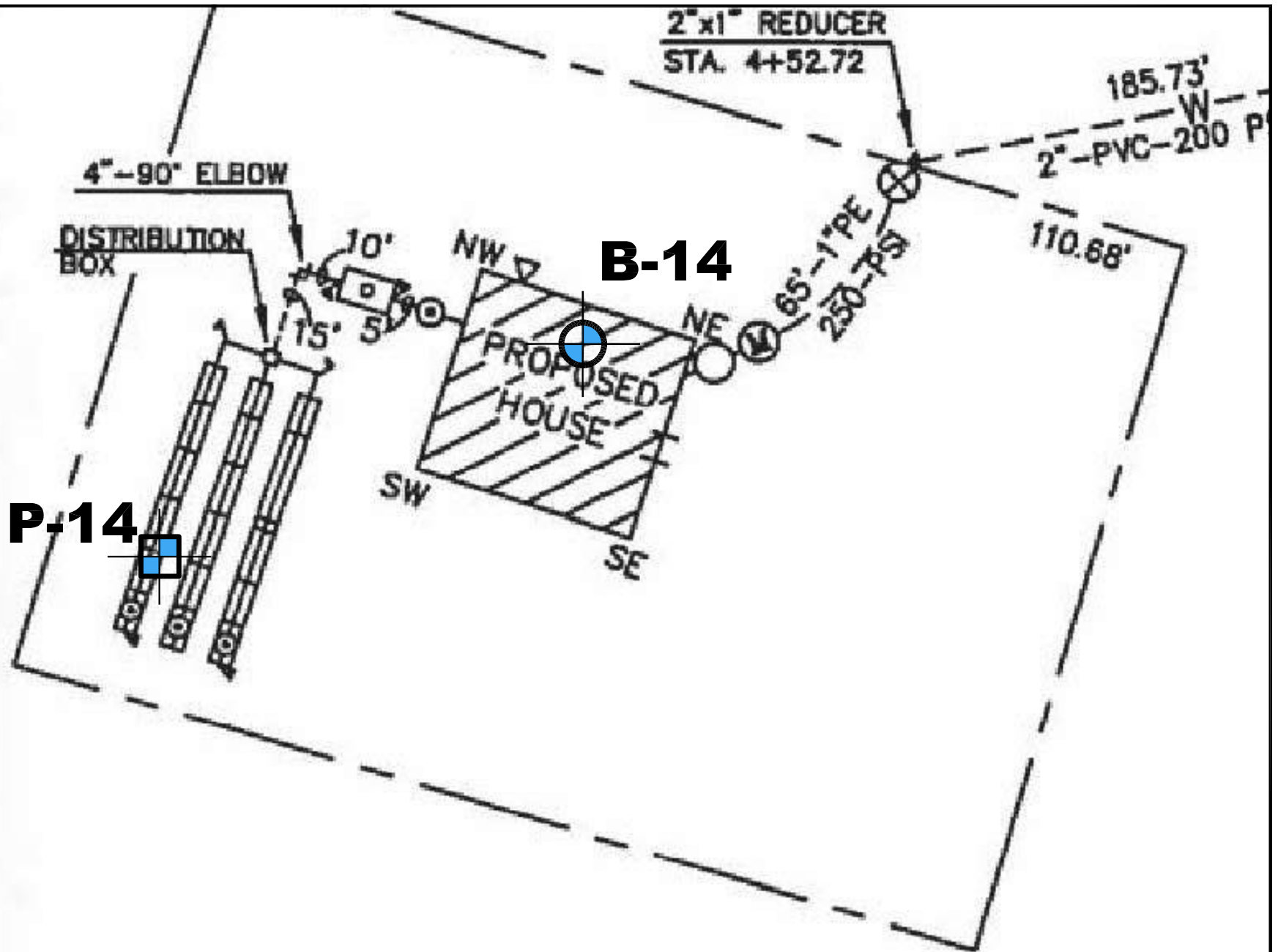
Approximate

Not to Scale





 Approximate Not to Scale	SITE PLAN	PROJECT	
	Boring and Percolation Test Locations (approximate)	NHA 25 HOU - Scattered Sites Joan Jones	
	GEOMAT Project No. 212-3668 Date of Exploration: February 10, 2021	Crystal, New Mexico (AZ)	



SITE PLAN

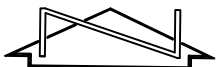
Boring and Percolation Test Locations (approximate)

GEOMAT Project No. 212-3668

Date of Exploration: February 10, 2021

PROJECT

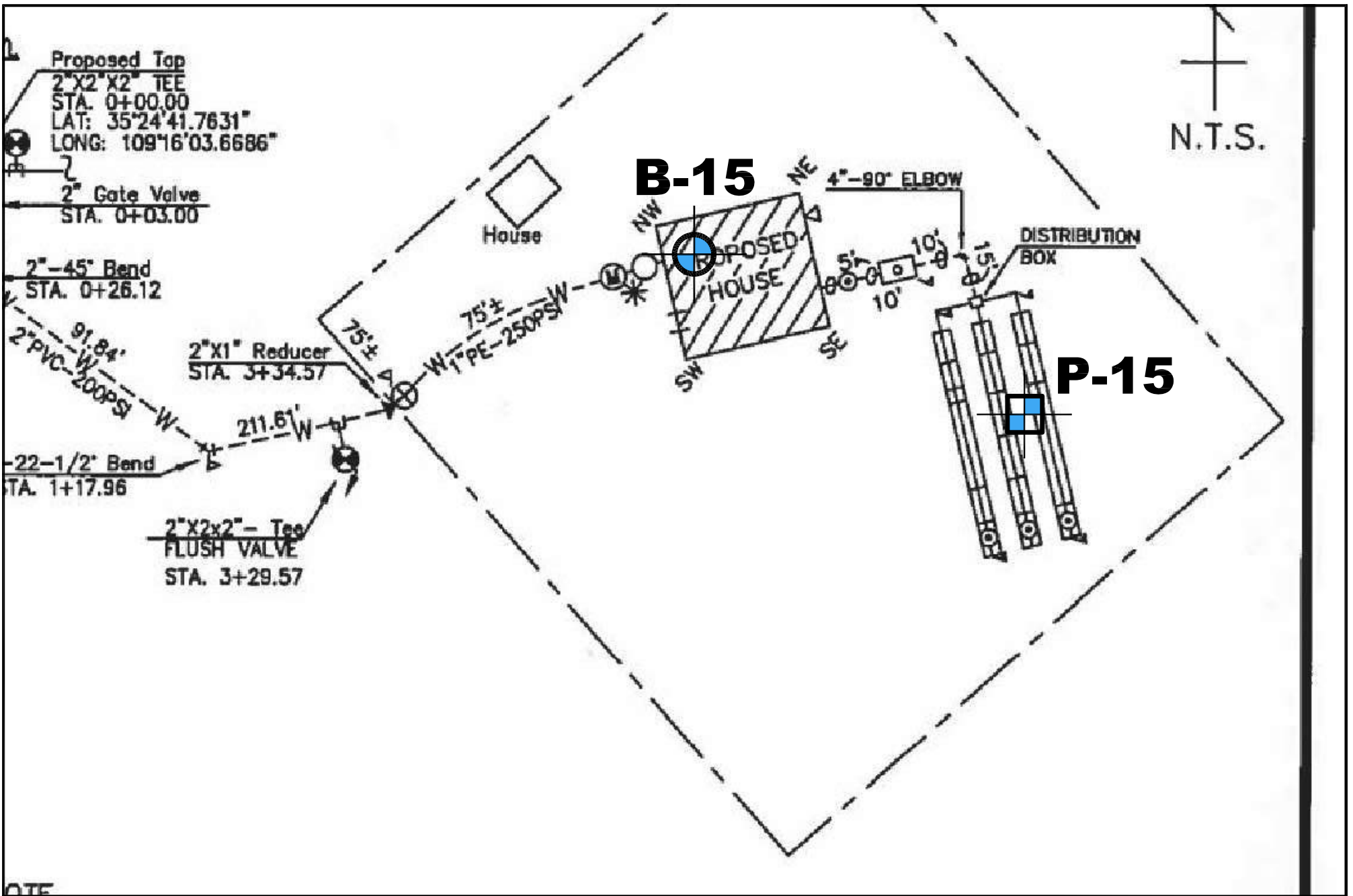
NHA 25 HOU - Scattered Sites
 Lionel D. & Melissa J. Jumbo
 Sawmill, Arizona



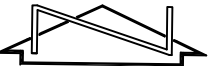

Approximate

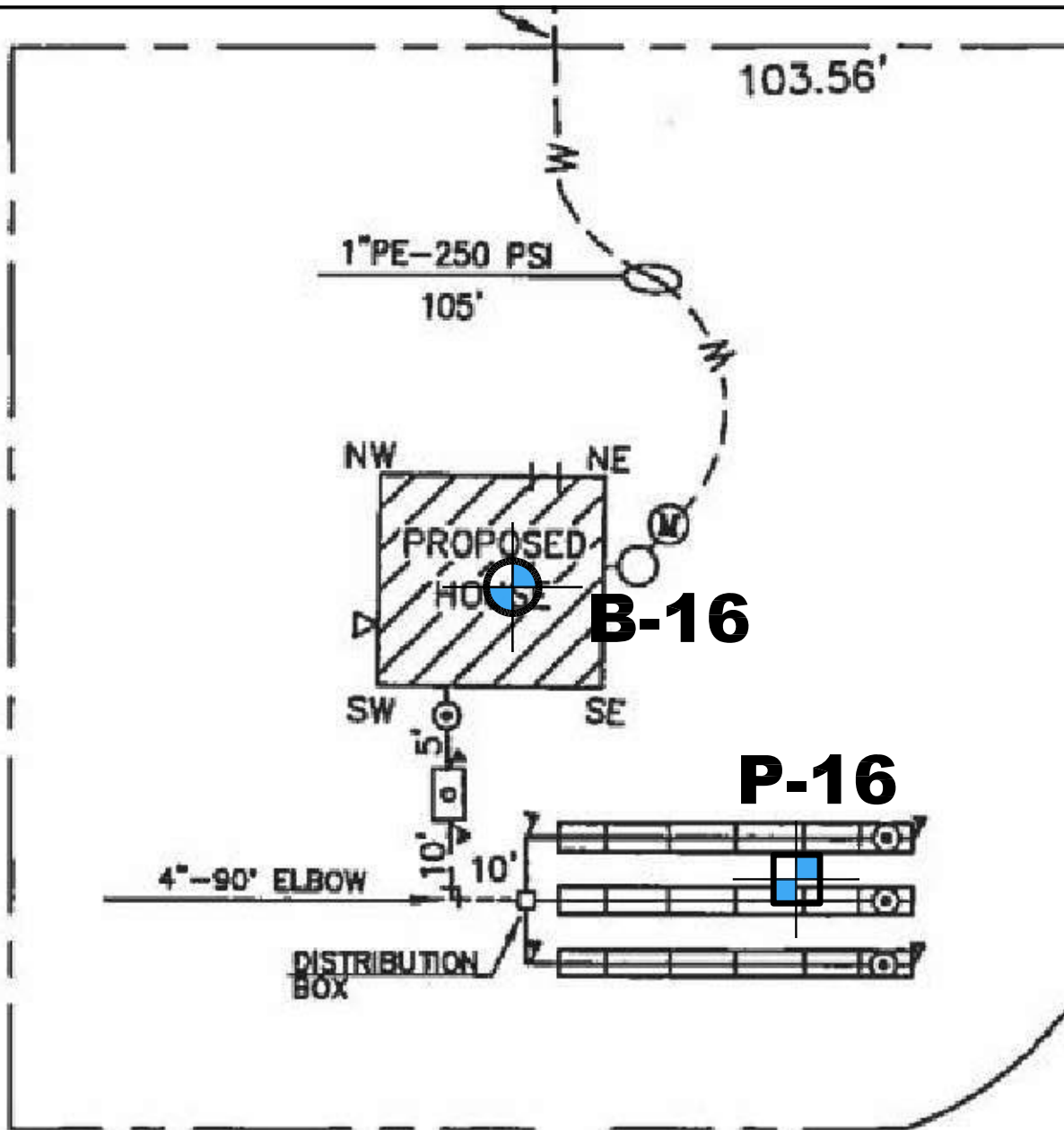
Not to Scale

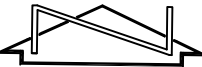




NOTE

 Approximate Not to Scale	SITE PLAN	PROJECT	
	Boring and Percolation Test Locations (approximate)		
	GEOMAT Project No. 212-3668 Date of Exploration: February 10, 2021	NHA 25 HOU - Scattered Sites Maggie A. Freeman Pine Springs, Arizona	

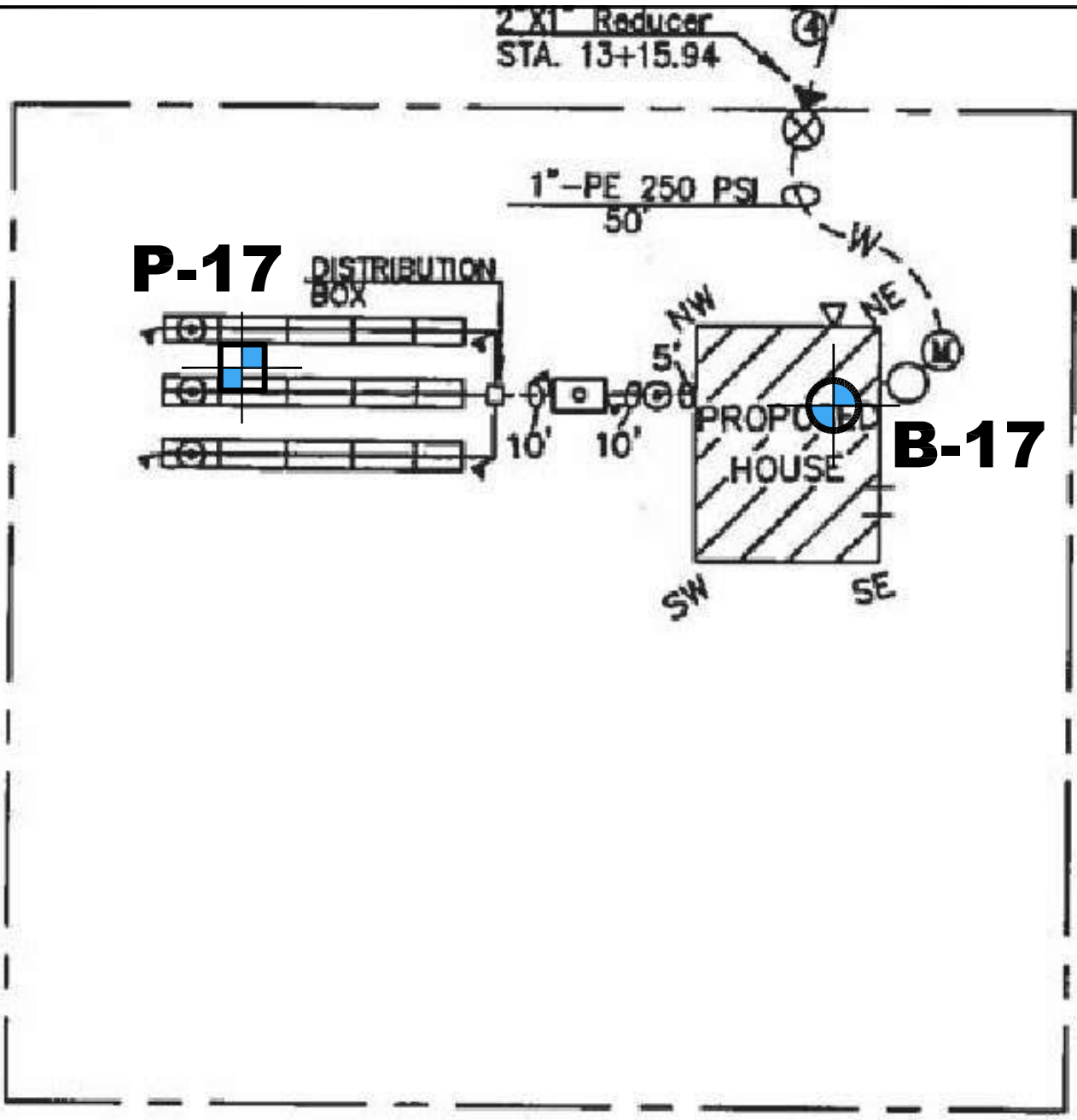



 Approximate
 Not to Scale

SITE PLAN
 Boring and Percolation Test Locations (approximate)
 GEOMAT Project No. 212-3668
 Date of Exploration: February 10, 2021

PROJECT
 NHA 25 HOU - Scattered Sites
 Melissa Ann Yazzie
 New Land, Arizona





SITE PLAN

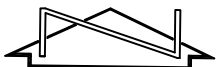
Boring and Percolation Test Locations (approximate)

GEOMAT Project No. 212-3668

Date of Exploration: February 11, 2021

PROJECT

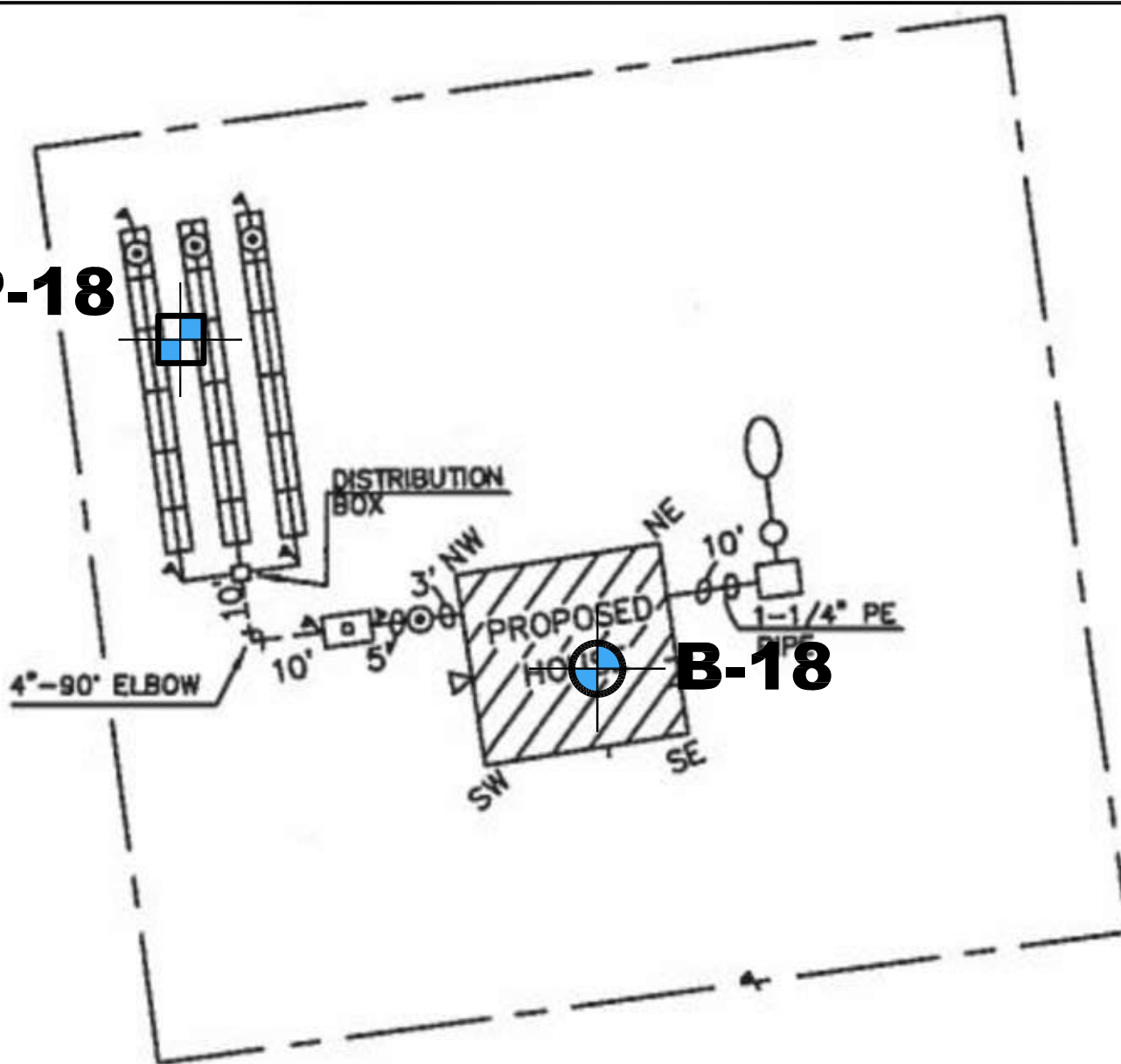
NHA 25 HOU - Scattered Sites
 Ray Davis
 Dilkon, Arizona



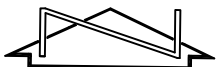
Approximate

Not to Scale

P-18



B-18



Approximate

Not to Scale

SITE PLAN

Boring and Percolation Test Locations (approximate)

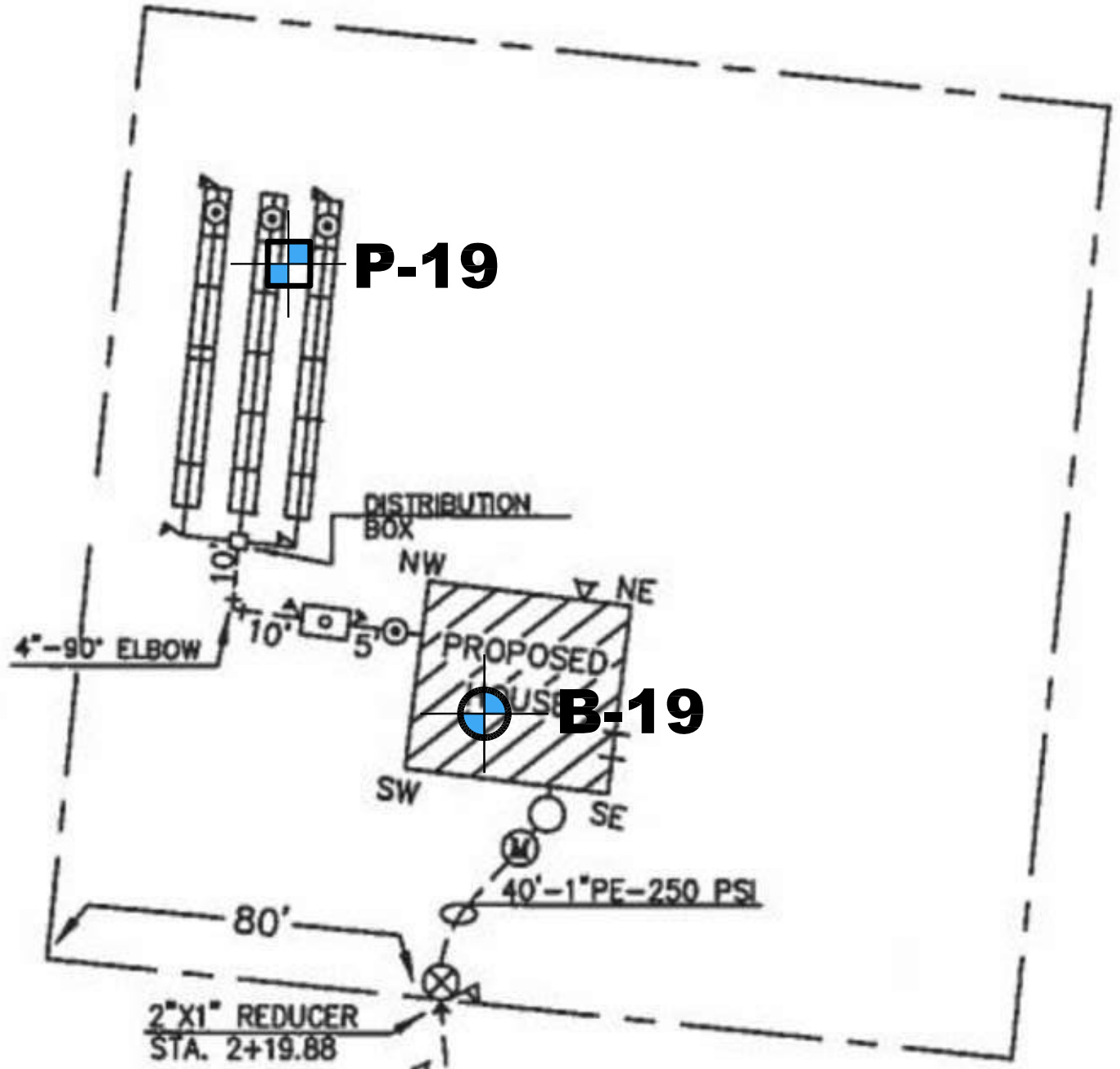
GEOMAT Project No. 212-3668

Date of Exploration: February 11, 2021

PROJECT

NHA 25 HOU - Scattered Sites
Tanya Chiquito
Dilkon, Arizona





SITE PLAN

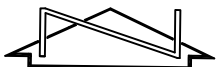
Boring and Percolation Test Locations (approximate)

GEOMAT Project No. 212-3668

Date of Exploration: February 11, 2021

PROJECT

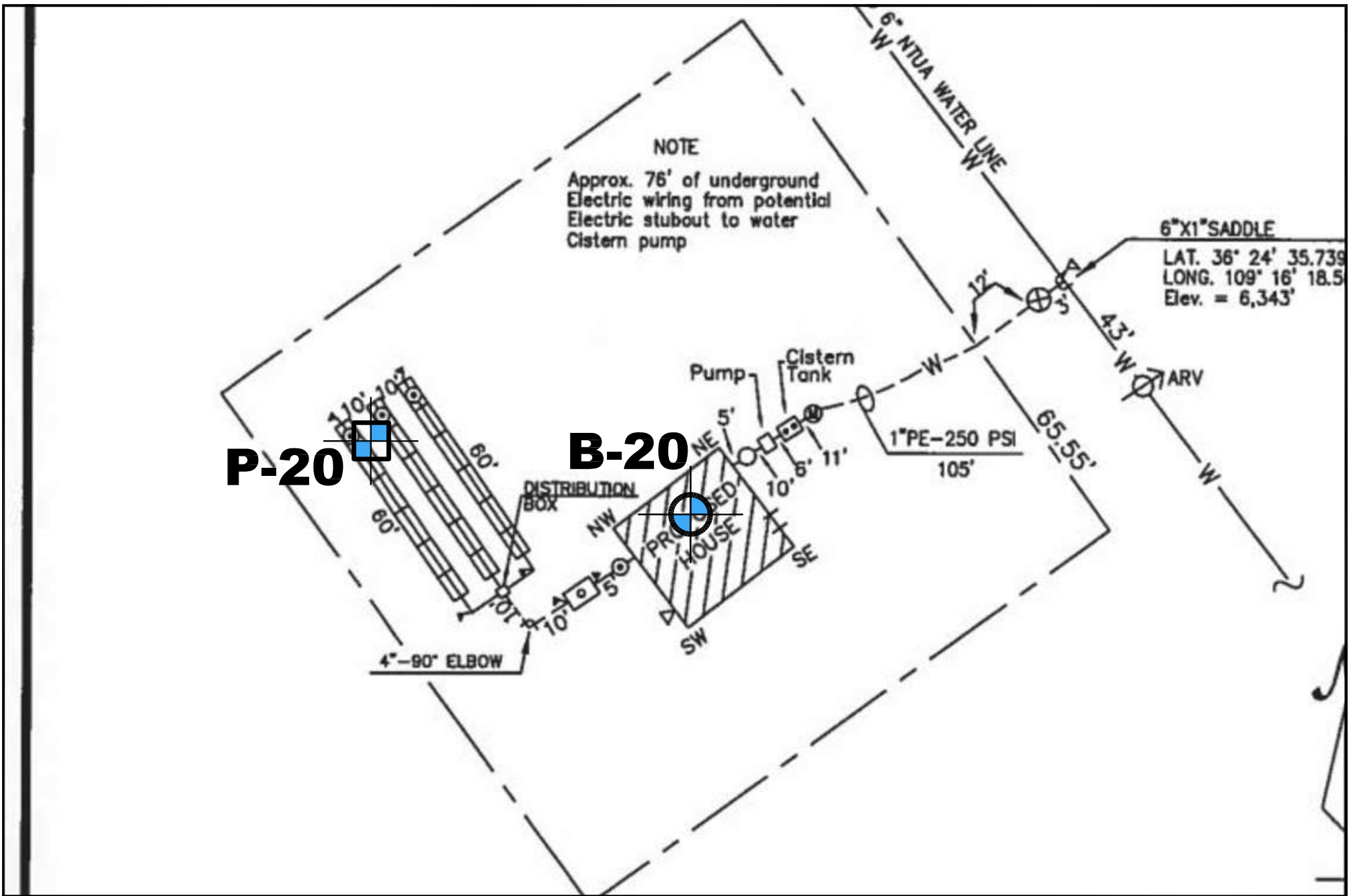
NHA 25 HOU - Scattered Sites
 Bertha Rae Wheeler
 Round Rock, Arizona

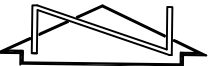



Approximate

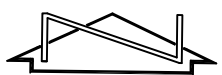
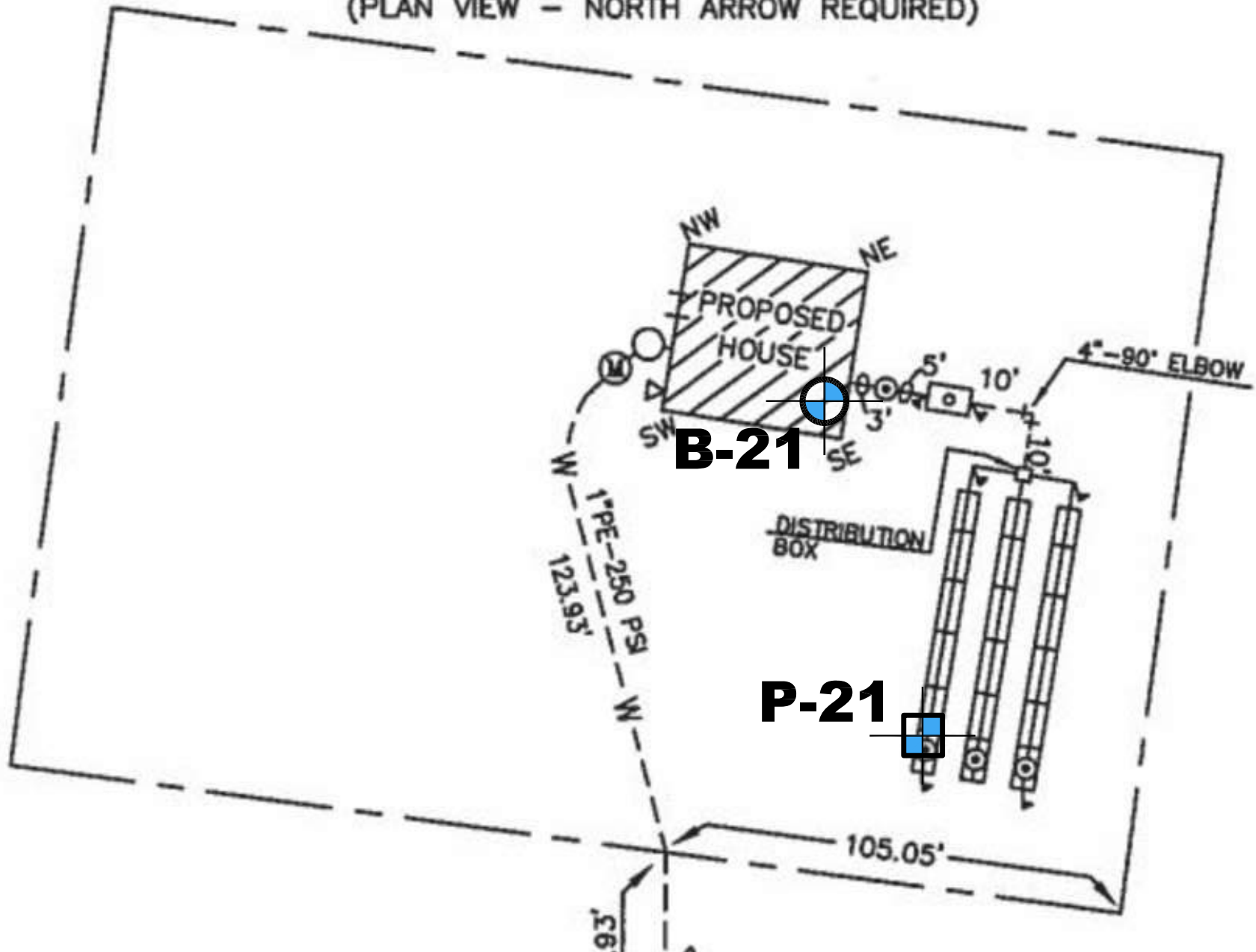
Not to Scale





 Approximate Not to Scale	SITE PLAN Boring and Percolation Test Locations (approximate)	PROJECT NHA 25 HOU - Scattered Sites Mercedes Davis Lukachukai, Arizona	
	GEOMAT Project No. 212-3668 Date of Exploration: February 11, 2021		

(PLAN VIEW - NORTH ARROW REQUIRED)



Approximate

Not to Scale

SITE PLAN

Boring and Percolation Test Locations (approximate)

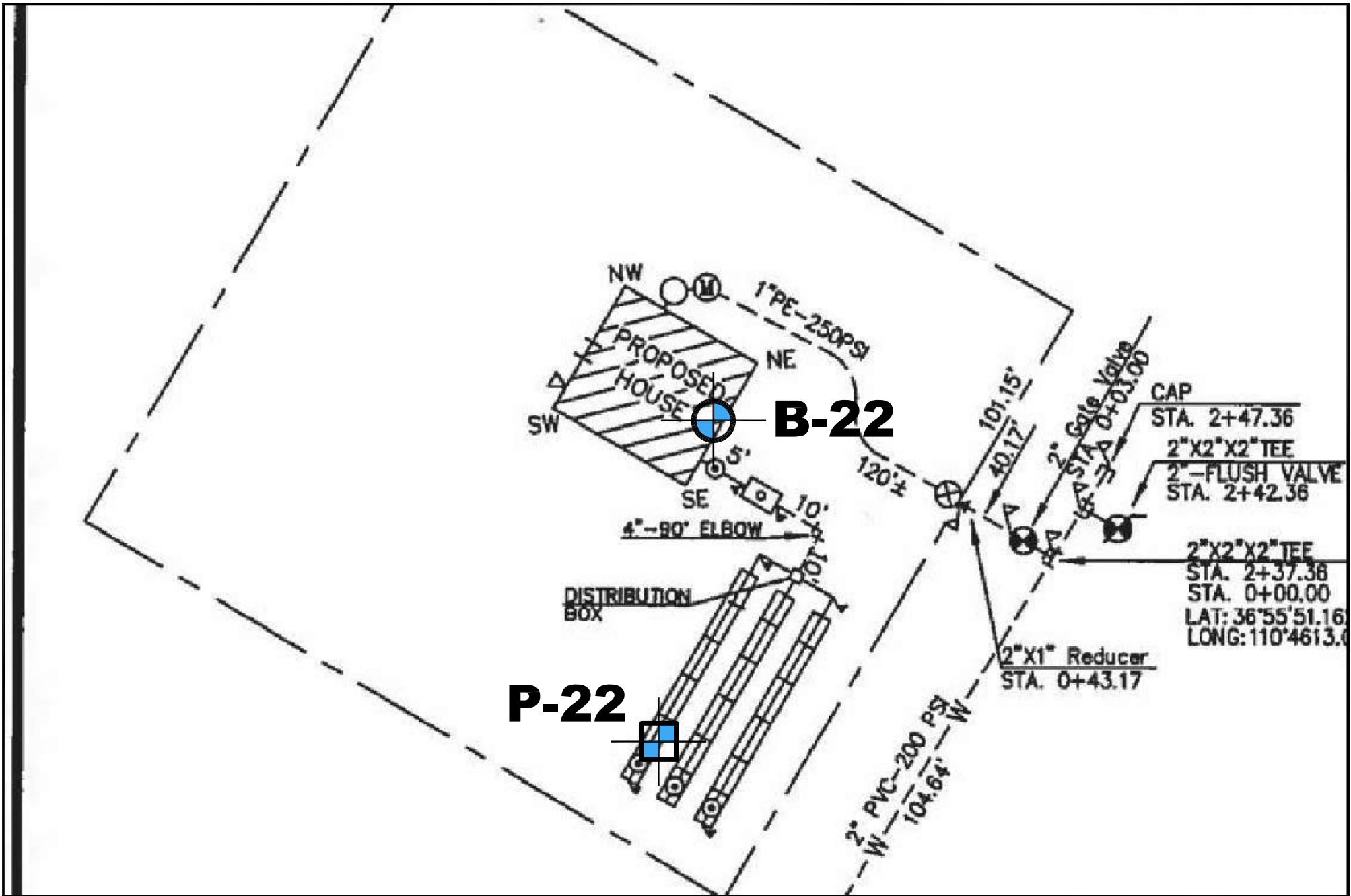
GEOMAT Project No. 212-3668

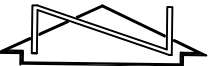

Date of Exploration: February 11, 2021

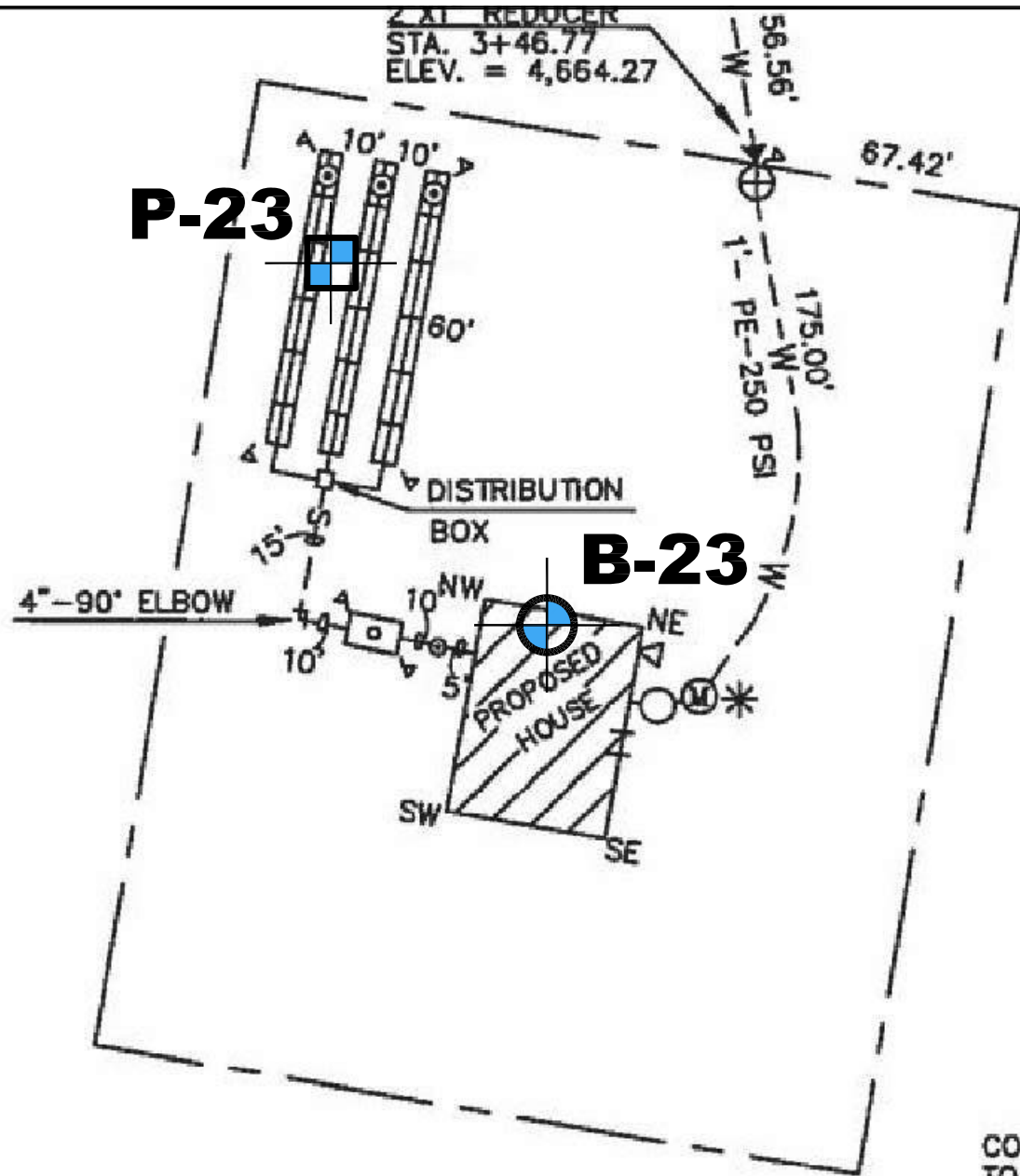
PROJECT

NHA 25 HOU - Scattered Sites
Crystal Mercedes Rodgers
Lukachukai, Arizona





 Approximate Not to Scale	SITE PLAN Boring and Percolation Test Locations (approximate)	PROJECT NHA 25 HOU - Scattered Sites Ray Tom & Lena Tomasyo Navajo Mountain, Arizona	
	GEOMAT Project No. 212-3668 Date of Exploration: February 12, 2021		



NOTE
CONTRACTOR WILL BE RESPONSIBLE TO VERIFY REQUIRED DRAIN FIELD

SITE PLAN

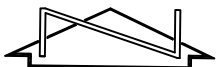
Boring and Percolation Test Locations (approximate)

GEOMAT Project No. 212-3668

Date of Exploration: February 12, 2021

PROJECT

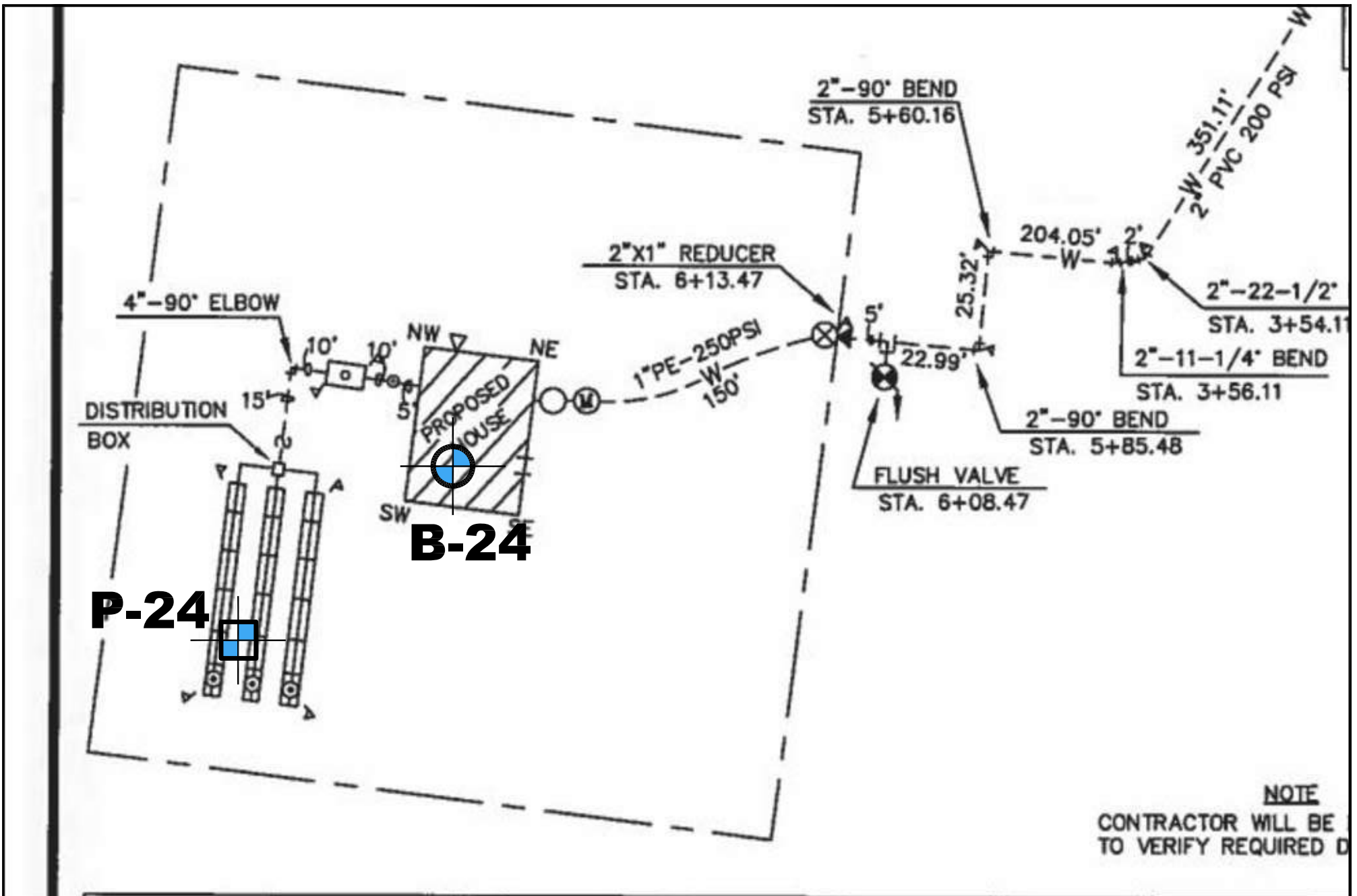
NHA 25 HOU - Scattered Sites
Samantha Norton
Aneth, Utah



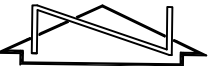

Approximate

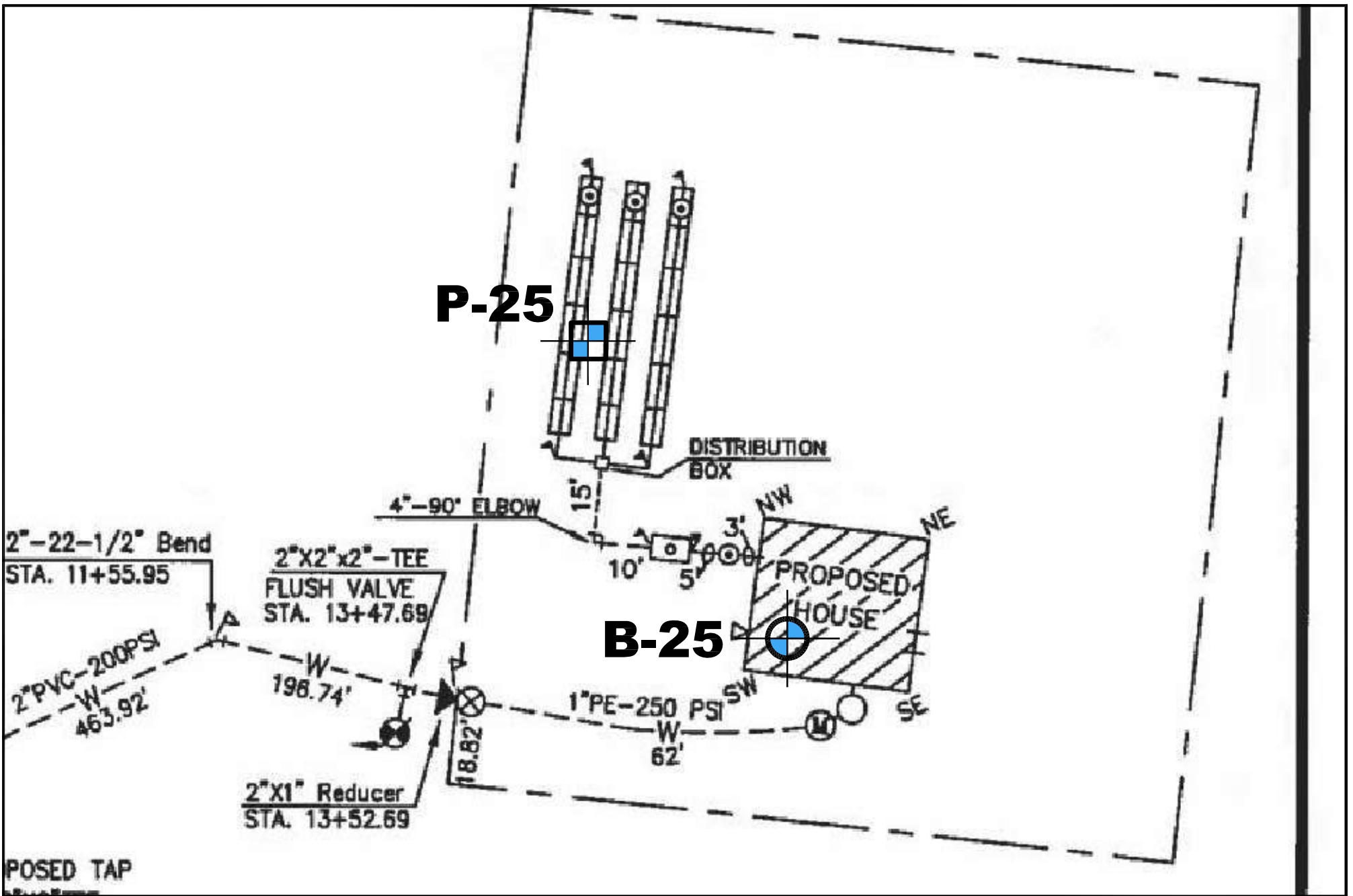
Not to Scale



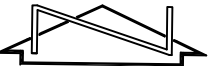



NOTE
CONTRACTOR WILL BE TO VERIFY REQUIRED D

 Approximate Not to Scale	SITE PLAN Boring and Percolation Test Locations (approximate)	PROJECT NHA 25 HOU - Scattered Sites Nora Mae Harvey Aneth, Utah	
	GEOMAT Project No. 212-3668 Date of Exploration: February 12, 2021		



PROPOSED TAP

 Approximate Not to Scale	SITE PLAN Boring and Percolation Test Locations (approximate)	PROJECT NHA 25 HOU - Scattered Sites Charles Jim Burnham, NM	
	GEOMAT Project No. 212-3668 Date of Exploration: February 19, 2021		



915 Malta Ave
Farmington, NM 87401
Tel (505) 327-7928
Fax (505) 326-5721

Boring B-1

Project Name: <u>NHA 25 HOU - Scattered Sites</u>	Date Drilled: <u>2/3/2021</u>
Project Number: <u>212-3668</u>	Northing: <u>Not Determined</u>
Client: <u>WHPacific, Inc.</u>	Easting: <u>Not Determined</u>
Site Location: <u>Navajo Nation, USA</u>	Elevation: <u>Not Determined</u>
Rig Type: <u>CME-45</u>	Boring Location: <u>See Site Plan</u>
Drilling Method: <u>7.25" O.D. Hollow Stem Auger</u>	Groundwater Depth: <u>None Encountered</u>
Sampling Method: <u>Bulk, Ring and Split spoon samples</u>	Logged By: <u>SY</u>
Hammer Weight: <u>140 lbs</u>	Remarks: <u>#9 S. Benally; Shiprock, NM</u>
Hammer Fall: <u>30 inches</u>	

Laboratory Results				Blows per 6"	Shear Strength (tsf)	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)								
94.1	71	12	8.9	4-7	A					1	Sandy Lean CLAY with trace gravel at the surface, dark brown, medium stiff, slightly damp
					R 12			CL		2	
										3	weak carbonate cementation
					R 12					4	
100.8			7.6	5-7						5	
										6	
										7	Silty SAND, brown, fine- to medium-grained, medium dense, slightly damp
								SM		8	
										9	
				5-12-12	SS 18					10	
										11	slightly higher clay content gravel at base of sample
										12	Total Depth 11.5 feet
										13	

MC = Modified California (Ring Sample) D = Disturbed Bulk Sample from Sonic Core Barrel G = Grab Sample



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Boring B-2

Project Name: <u>NHA 25 HOU - Scattered Sites</u>	Date Drilled: <u>2/3/2021</u>
Project Number: <u>212-3668</u>	Northing: <u>Not Determined</u>
Client: <u>WHPacific, Inc.</u>	Easting: <u>Not Determined</u>
Site Location: <u>Navajo Nation, USA</u>	Elevation: <u>Not Determined</u>
Rig Type: <u>CME-45</u>	Boring Location: <u>See Site Plan</u>
Drilling Method: <u>7.25" O.D. Hollow Stem Auger</u>	Groundwater Depth: <u>None Encountered</u>
Sampling Method: <u>Bulk, Ring and Split spoon samples</u>	Logged By: <u>SY</u>
Hammer Weight: <u>140 lbs</u>	Remarks: <u>#24 S. Tsosie; Shiprock, NM</u>
Hammer Fall: <u>30 inches</u>	

Laboratory Results				Blows per 6"	Shear Strength (tsf)	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)								
97.1	4.4	NP	1.3	4-8		A R 12		SM		1-3	Poorly graded SAND with trace gravel, tan/gray, fine- to coarse-grained, loose, slightly damp to dry
103.9			1.6	6-17		R 12				4-6	grades to gravel/cobble
				35-33-14		SS 6		GP		7-8	Poorly graded GRAVEL and COBBLE with sand, gray/tan, fine- to coarse-grained, dense, slightly damp sample taken (poor recovery)
										8-13	Auger Refusal on gravel and cobble Total Depth 8 feet

MC = Modified California (Ring Sample) D = Disturbed Bulk Sample from Sonic Core Barrel G = Grab Sample



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Boring B-3

Project Name: <u>NHA 25 HOU - Scattered Sites</u>	Date Drilled: <u>2/3/2021</u>
Project Number: <u>212-3668</u>	Northing: <u>Not Determined</u>
Client: <u>WHPacific, Inc.</u>	Easting: <u>Not Determined</u>
Site Location: <u>Navajo Nation, USA</u>	Elevation: <u>Not Determined</u>
Rig Type: <u>CME-45</u>	Boring Location: <u>See Site Plan</u>
Drilling Method: <u>7.25" O.D. Hollow Stem Auger</u>	Groundwater Depth: <u>None Encountered</u>
Sampling Method: <u>Bulk sample from auger cuttings</u>	Logged By: <u>SY</u>
Hammer Weight: <u>N/A</u>	Remarks: <u>#22 A. Art & L. Lansing; Shiprock, NM</u>
Hammer Fall: <u>N/A</u>	

Laboratory Results					Blows per 6"	Shear Strength (tsf)	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)									
						A			GP		1	Poorly graded GRAVEL and COBBLE with sand, gray/brown, fine- to coarse-grained, slightly damp
											2	Auger Refusal on gravel and cobble Total Depth 1 feet
											3	
											4	
											5	
											6	
											7	
											8	
											9	
											10	
											11	
											12	
											13	

MC = Modified California (Ring Sample) D = Disturbed Bulk Sample from Sonic Core Barrel G = Grab Sample



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Boring B-4

Project Name: <u>NHA 25 HOU - Scattered Sites</u>	Date Drilled: <u>2/3/2021</u>
Project Number: <u>212-3668</u>	Northing: <u>Not Determined</u>
Client: <u>WHPacific, Inc.</u>	Easting: <u>Not Determined</u>
Site Location: <u>Navajo Nation, USA</u>	Elevation: <u>Not Determined</u>
Rig Type: <u>CME-45</u>	Boring Location: <u>See Site Plan</u>
Drilling Method: <u>7.25" O.D. Hollow Stem Auger</u>	Groundwater Depth: <u>None Encountered</u>
Sampling Method: <u>Bulk, Ring and Split spoon samples</u>	Logged By: <u>SY</u>
Hammer Weight: <u>140 lbs</u>	Remarks: <u>#20 Thompson & Dugi; Nenahnezad, NM</u>
Hammer Fall: <u>30 inches</u>	

Laboratory Results				Blows per 6"	Shear Strength (tsf)	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)								
94.6	30	NP	4.4	10-13		A R 12		SC-SM		1	Silty SAND with trace gravel, tan/orange to tan, fine- to coarse-grained, loose to medium dense, slightly damp to dry, weak carbonate cementation
94.2			4.8	11-36		R 12				2	
										3	
										4	
										5	
										6	moderate carbonate cementation
										7	
										8	
								RK		9	SANDSTONE, tan/brown, fine- to medium-grained, slightly damp, moderate to well cementation
				50/2"		SS 2				10	Total Depth 10 feet
										11	
										12	
										13	

MC = Modified California (Ring Sample) D = Disturbed Bulk Sample from Sonic Core Barrel G = Grab Sample



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Boring B-5

Project Name: <u>NHA 25 HOU - Scattered Sites</u>	Date Drilled: <u>2/3/2021</u>
Project Number: <u>212-3668</u>	Northing: <u>Not Determined</u>
Client: <u>WHPacific, Inc.</u>	Easting: <u>Not Determined</u>
Site Location: <u>Navajo Nation, USA</u>	Elevation: <u>Not Determined</u>
Rig Type: <u>CME-45</u>	Boring Location: <u>See Site Plan</u>
Drilling Method: <u>7.25" O.D. Hollow Stem Auger</u>	Groundwater Depth: <u>None Encountered</u>
Sampling Method: <u>Bulk, Ring and Split spoon samples</u>	Logged By: <u>SY</u>
Hammer Weight: <u>140 lbs</u>	Remarks: <u>#25 J. Mike; Nenahnezad, NM</u>
Hammer Fall: <u>30 inches</u>	

Laboratory Results				Blows per 6"	Shear Strength (tsf)	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)								
102.7	8.1	NP	1.7	6-6		A R 12				1	Poorly graded SAND with silt and trace gravel, tan/brown to gray/tan, fine- to coarse-grained, very loose to loose, slightly damp to dry
										2	gravel/cobble lens
						R 12		SP-SM		3	
98.4			1.5	4-6						4	
										5	
										6	
										7	gravel/cobble lens
										8	
										9	
				4-3-2		SS 18				10	
										11	
										12	Total Depth 11.5 feet
										13	

GEO W/ N VALS 212-3668.GPJ GEOMAT.GDT 3/1/21

MC = Modified California (Ring Sample) D = Disturbed Bulk Sample from Sonic Core Barrel G = Grab Sample



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Boring B-6

Project Name: <u>NHA 25 HOU - Scattered Sites</u>	Date Drilled: <u>2/8/2021</u>
Project Number: <u>212-3668</u>	Northing: <u>Not Determined</u>
Client: <u>WHPacific, Inc.</u>	Easting: <u>Not Determined</u>
Site Location: <u>Navajo Nation, USA</u>	Elevation: <u>Not Determined</u>
Rig Type: <u>CME-45</u>	Boring Location: <u>See Site Plan</u>
Drilling Method: <u>7.25" O.D. Hollow Stem Auger</u>	Groundwater Depth: <u>None Encountered</u>
Sampling Method: <u>Bulk, Ring and Split spoon samples</u>	Logged By: <u>SY</u>
Hammer Weight: <u>140 lbs</u>	Remarks: <u>#6 J. Peshlakai; Standing Rock, NM</u>
Hammer Fall: <u>30 inches</u>	

Laboratory Results				Blows per 6"	Shear Strength (tsf)	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)								
94.7	48	24	9.1	17-28		GRAB				1	Clayey SAND, dark gray/brown, fine- to coarse-grained, medium dense, slightly damp
					R 12		SC			2	
										3	
										4	
85.9			19.7	18-43		R 12				5	grades to shale
										6	Carbonaceous SHALE, brown to black, slightly damp, moderately fissile/friable
										7	
										8	
										9	
				8-10-12		SS 18				10	
										11	gray with orange mottlin, moderately weathered
										12	Total Depth 11.5 feet
										13	

MC = Modified California (Ring Sample) D = Disturbed Bulk Sample from Sonic Core Barrel G = Grab Sample



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Boring B-7

Project Name: <u>NHA 25 HOU - Scattered Sites</u>	Date Drilled: <u>2/8/2021</u>
Project Number: <u>212-3668</u>	Northing: <u>Not Determined</u>
Client: <u>WHPacific, Inc.</u>	Easting: <u>Not Determined</u>
Site Location: <u>Navajo Nation, USA</u>	Elevation: <u>Not Determined</u>
Rig Type: <u>CME-45</u>	Boring Location: <u>See Site Plan</u>
Drilling Method: <u>7.25" O.D. Hollow Stem Auger</u>	Groundwater Depth: <u>None Encountered</u>
Sampling Method: <u>Bulk, Ring and Split spoon samples</u>	Logged By: <u>SY</u>
Hammer Weight: <u>140 lbs</u>	Remarks: <u>#5 J. Yazzie; Crownpoint, NM</u>
Hammer Fall: <u>30 inches</u>	

Laboratory Results				Blows per 6"	Shear Strength (tsf)	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)								
110.8		8.3		17-27		GRAB		SC		1	Clayey SAND with trace gravel (regolith), tan/brown, fine-to coarse-grained, slightly damp
										2	SHALE with interlayered SILTSTONE, tan to brown/gray, slightly damp, slightly fissile/friable, slightly weathered, contains salt precipitates
						R 12				3	
										4	
111.8		6.7		27-38		R 12				5	
								RK		6	
										7	
										8	
										9	
				15-16-17		SS 18				10	
										11	
										12	Total Depth 11.5 feet
										13	

GEO W/ N VALS 212-3668.GPJ GEOMAT.GDT 3/1/21

MC = Modified California (Ring Sample) D = Disturbed Bulk Sample from Sonic Core Barrel G = Grab Sample



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Boring B-8

Project Name: <u>NHA 25 HOU - Scattered Sites</u>	Date Drilled: <u>2/8/2021</u>
Project Number: <u>212-3668</u>	Northing: <u>Not Determined</u>
Client: <u>WHPacific, Inc.</u>	Easting: <u>Not Determined</u>
Site Location: <u>Navajo Nation, USA</u>	Elevation: <u>Not Determined</u>
Rig Type: <u>CME-45</u>	Boring Location: <u>See Site Plan</u>
Drilling Method: <u>7.25" O.D. Hollow Stem Auger</u>	Groundwater Depth: <u>None Encountered</u>
Sampling Method: <u>Bulk, Ring and Split spoon samples</u>	Logged By: <u>SY</u>
Hammer Weight: <u>140 lbs</u>	Remarks: <u>#1 E. Henry; White Rock, NM</u>
Hammer Fall: <u>30 inches</u>	

Laboratory Results				Blows per 6"	Shear Strength (tsf)	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)								
105.3			11.1	32-50/5"		GRAB		SC		1	Clayey SAND with gravel, tan/brown/gray, fine- to coarse-grained, slightly damp
						R 11		RK		2-4	SHALE, gray/tan with orange mottling, slightly damp, slightly fissile/friable
				50/3"		R 3				5-7	SANDSTONE, tan, fine- to medium-grained, slightly damp, moderately cemented
				50/2"		SS 0				10	no sample recovery Total Depth 10 feet
										8	
										9	
										10	
										11	
										12	
										13	

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Boring B-9

Project Name: <u>NHA 25 HOU - Scattered Sites</u>	Date Drilled: <u>2/9/2021</u>
Project Number: <u>212-3668</u>	Northing: <u>Not Determined</u>
Client: <u>WHPacific, Inc.</u>	Easting: <u>Not Determined</u>
Site Location: <u>Navajo Nation, USA</u>	Elevation: <u>Not Determined</u>
Rig Type: <u>CME-45</u>	Boring Location: <u>See Site Plan</u>
Drilling Method: <u>7.25" O.D. Hollow Stem Auger</u>	Groundwater Depth: <u>None Encountered</u>
Sampling Method: <u>Bulk, Ring and Split spoon samples</u>	Logged By: <u>SY</u>
Hammer Weight: <u>140 lbs</u>	Remarks: <u>#23 B. Miller; Thoreau, NM</u>
Hammer Fall: <u>30 inches</u>	

Laboratory Results				Blows per 6"	Shear Strength (tsf)	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)								
95.4	24	8	6.1	5-7		GRAB		SM		1	Silty SAND with trace gravel, red/brown, fine- to coarse-grained, loose, slightly damp to dry
						R 12				2	Clayey SAND, pink/red, fine- to coarse-grained, medium dense, slightly damp, weak carbonate cementation
						R 12		SC		3	
108.0			5.0	17-26		R 12				4	
										5	
										6	
										7	gravel lens
										8	grades to silty sand
										9	Silty SAND with trace gravel, light red, fine- to coarse-grained, dense, slightly damp
				14-16-20		SS 18		SM		10	
										11	
										12	Total Depth 11.5 feet
										13	

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Boring B-10

Project Name: <u>NHA 25 HOU - Scattered Sites</u>	Date Drilled: <u>2/9/2021</u>
Project Number: <u>212-3668</u>	Northing: <u>Not Determined</u>
Client: <u>WHPacific, Inc.</u>	Easting: <u>Not Determined</u>
Site Location: <u>Navajo Nation, USA</u>	Elevation: <u>Not Determined</u>
Rig Type: <u>CME-45</u>	Boring Location: <u>See Site Plan</u>
Drilling Method: <u>7.25" O.D. Hollow Stem Auger</u>	Groundwater Depth: <u>None Encountered</u>
Sampling Method: <u>Bulk, Ring and Split spoon samples</u>	Logged By: <u>SY</u>
Hammer Weight: <u>140 lbs</u>	Remarks: <u>#4 L. Pat; Pinehill, NM</u>
Hammer Fall: <u>30 inches</u>	

Laboratory Results				Blows per 6"	Shear Strength (tsf)	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)								
	36	14				GRAB		SC		1	Clayey SAND, tan/brown, fine- to coarse-grained, damp
				50/4"		R 4				2	SANDSTONE, tan/orange, fine- to medium-grained, slightly damp, moderately cemented, slightly weathered
										3	poor sample recovery
				50/6"		SS 6		RK		4	
										5	
										6	
										7	
										8	
										9	
				50/3"		SS 3				10	Total Depth 10 feet
										11	
										12	
										13	

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Boring B-11

Project Name: <u>NHA 25 HOU - Scattered Sites</u>	Date Drilled: <u>2/9/2021</u>
Project Number: <u>212-3668</u>	Northing: <u>Not Determined</u>
Client: <u>WHPacific, Inc.</u>	Easting: <u>Not Determined</u>
Site Location: <u>Navajo Nation, USA</u>	Elevation: <u>Not Determined</u>
Rig Type: <u>CME-45</u>	Boring Location: <u>See Site Plan</u>
Drilling Method: <u>7.25" O.D. Hollow Stem Auger</u>	Groundwater Depth: <u>None Encountered</u>
Sampling Method: <u>Bulk, Ring and Split spoon samples</u>	Logged By: <u>SY</u>
Hammer Weight: <u>140 lbs</u>	Remarks: <u>#7 J. Haswood; Rock Springs, NM</u>
Hammer Fall: <u>30 inches</u>	

Laboratory Results				Blows per 6"	Shear Strength (tsf)	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)								
100.3		13.9		18-36		GRAB		SC		1	Clayey SAND, brown to tan, fine- to medium-grained, damp to slightly damp
						R 12				2	
										3	SHALE, dark gray, slightly damp, slightly fissile/friable, moderately weathered, contains salt precipitates
						R 12				4	
106.7		13.4		31-40		R 12				5	
								RK		6	
										7	
										8	
										9	
										10	
				15-18-22		SS 18				11	
										12	Total Depth 11.5 feet
										13	

MC = Modified California (Ring Sample) D = Disturbed Bulk Sample from Sonic Core Barrel G = Grab Sample



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Boring B-12

Project Name: <u>NHA 25 HOU - Scattered Sites</u>	Date Drilled: <u>2/10/2021</u>
Project Number: <u>212-3668</u>	Northing: <u>Not Determined</u>
Client: <u>WHPacific, Inc.</u>	Easting: <u>Not Determined</u>
Site Location: <u>Navajo Nation, USA</u>	Elevation: <u>Not Determined</u>
Rig Type: <u>CME-45</u>	Boring Location: <u>See Site Plan</u>
Drilling Method: <u>7.25" O.D. Hollow Stem Auger</u>	Groundwater Depth: <u>None Encountered</u>
Sampling Method: <u>Bulk, Ring and Split spoon samples</u>	Logged By: <u>SY</u>
Hammer Weight: <u>140 lbs</u>	Remarks: <u>#16 E. Bahe; Crystal, NM</u>
Hammer Fall: <u>30 inches</u>	

Laboratory Results				Blows per 6"	Shear Strength (tsf)	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)								
	70	6				GRAB				1	Sandy, Silty CLAY, red/brown, stiff, slightly damp
98.5			5.1	14-11	R 12			CL-ML		2	
										3	
										4	
95.7			4.2	8-14	R 12					5	
										6	
										7	
										8	
										9	Silty SAND, red, fine- to coarse-grained, medium dense, slightly damp
										10	
				8-12-15	SS 18			SM		11	
										12	Total Depth 11.5 feet
										13	

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Boring B-13

Project Name: <u>NHA 25 HOU - Scattered Sites</u>	Date Drilled: <u>2/10/2021</u>
Project Number: <u>212-3668</u>	Northing: <u>Not Determined</u>
Client: <u>WHPacific, Inc.</u>	Easting: <u>Not Determined</u>
Site Location: <u>Navajo Nation, USA</u>	Elevation: <u>Not Determined</u>
Rig Type: <u>CME-45</u>	Boring Location: <u>See Site Plan</u>
Drilling Method: <u>7.25" O.D. Hollow Stem Auger</u>	Groundwater Depth: <u>None Encountered</u>
Sampling Method: <u>Bulk and Ring samples</u>	Logged By: <u>SY</u>
Hammer Weight: <u>140 lbs</u>	Remarks: <u>#26 J. Jones; Crystal, NM (AZ)</u>
Hammer Fall: <u>30 inches</u>	

Laboratory Results				Blows per 6"	Shear Strength (tsf)	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)								
103.5	31	16	10.0	5-6		GRAB				1	Clayey SAND, tan/brown to red/brown, fine- to coarse-grained, loose, slightly damp contains clay lens
					R 12		SC			2	
										3	
										4	
				7-9		R 12				5	
										6	
										7	SHALE, gray to purple, damp, moderately to highly fissile/friable
										8	
										9	
										10	
106.9			16.6	8-22		R 12		RK		11	Total Depth 11 feet
										12	
										13	

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Boring B-14

Project Name: <u>NHA 25 HOU - Scattered Sites</u>	Date Drilled: <u>2/10/2021</u>
Project Number: <u>212-3668</u>	Northing: <u>Not Determined</u>
Client: <u>WHPacific, Inc.</u>	Easting: <u>Not Determined</u>
Site Location: <u>Navajo Nation, USA</u>	Elevation: <u>Not Determined</u>
Rig Type: <u>CME-45</u>	Boring Location: <u>See Site Plan</u>
Drilling Method: <u>7.25" O.D. Hollow Stem Auger</u>	Groundwater Depth: <u>None Encountered</u>
Sampling Method: <u>Bulk and Split spoon samples</u>	Logged By: <u>SY</u>
Hammer Weight: <u>140 lbs</u>	Remarks: <u>#12 L. & M. Jumbo; Sawmill, AZ</u>
Hammer Fall: <u>30 inches</u>	

Laboratory Results					Blows per 6"	Shear Strength (tsf)	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)									
48	3			50/1"		GRAB		SM		0 - 1	Silty SAND, red/brown, fine- to coarse-grained, damp to moist	
						SS 1		RK		1 - 2	SANDSTONE, red, fine- to medium-grained, slightly damp, well cemented	
											2 - 3	
											3 - 4	Auger Refusal on sandstone Total Depth 3.5 feet
											4 - 5	
											5 - 6	
											6 - 7	
											7 - 8	
											8 - 9	
											9 - 10	
											10 - 11	
											11 - 12	
											12 - 13	

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Boring B-15

Project Name: <u>NHA 25 HOU - Scattered Sites</u>	Date Drilled: <u>2/10/2021</u>
Project Number: <u>212-3668</u>	Northing: <u>Not Determined</u>
Client: <u>WHPacific, Inc.</u>	Easting: <u>Not Determined</u>
Site Location: <u>Navajo Nation, USA</u>	Elevation: <u>Not Determined</u>
Rig Type: <u>CME-45</u>	Boring Location: <u>See Site Plan</u>
Drilling Method: <u>7.25" O.D. Hollow Stem Auger</u>	Groundwater Depth: <u>None Encountered</u>
Sampling Method: <u>Bulk and Split spoon samples</u>	Logged By: <u>SY</u>
Hammer Weight: <u>140 lbs</u>	Remarks: <u>#3 M. Freeman: Pine Springs, AZ</u>
Hammer Fall: <u>30 inches</u>	

Laboratory Results				Blows per 6"	Shear Strength (tsf)	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)								
26	4			50/5"	GRAB		SC-SM		1	Silty, Clayey SAND, brown, fine- to coarse-grained, damp	
					SS 5		RK		2	SANDSTONE, tan, fine- to medium-grained, slightly damp, moderately to well cemented	
									3		
									4	Auger Refusal on sandstone Total Depth 3.5 feet	
									5		
									6		
									7		
									8		
									9		
									10		
									11		
									12		
									13		

MC = Modified California (Ring Sample) D = Disturbed Bulk Sample from Sonic Core Barrel G = Grab Sample



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Boring B-16

Project Name: <u>NHA 25 HOU - Scattered Sites</u>	Date Drilled: <u>2/10/2021</u>
Project Number: <u>212-3668</u>	Northing: <u>Not Determined</u>
Client: <u>WHPacific, Inc.</u>	Easting: <u>Not Determined</u>
Site Location: <u>Navajo Nation, USA</u>	Elevation: <u>Not Determined</u>
Rig Type: <u>CME-45</u>	Boring Location: <u>See Site Plan</u>
Drilling Method: <u>7.25" O.D. Hollow Stem Auger</u>	Groundwater Depth: <u>None Encountered</u>
Sampling Method: <u>Bulk, Ring and Split spoon samples</u>	Logged By: <u>SY</u>
Hammer Weight: <u>140 lbs</u>	Remarks: <u>#19 M. Yazzie; New Lands, AZ</u>
Hammer Fall: <u>30 inches</u>	

Laboratory Results				Blows per 6"	Shear Strength (tsf)	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)								
	27	8				GRAB				1	Clayey SAND, light red/brown, fine- to coarse-grained, damp to slightly damp
111.6			4.4	29-40	R 12			SC		2	
										3	Silty SAND, light red/brown, fine- to coarse-grained, medium dense to dense, slightly damp, weak carbonate cementation
110.1			1.6	20-38	R 12					4	
										5	
										6	
										7	
										8	
										9	
										10	
				12-20-24		SS 18				11	
										12	
										13	Total Depth 11.5 feet

MC = Modified California (Ring Sample) D = Disturbed Bulk Sample from Sonic Core Barrel G = Grab Sample



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Boring B-17

Project Name: <u>NHA 25 HOU - Scattered Sites</u>	Date Drilled: <u>2/11/2021</u>
Project Number: <u>212-3668</u>	Northing: <u>Not Determined</u>
Client: <u>WHPacific, Inc.</u>	Easting: <u>Not Determined</u>
Site Location: <u>Navajo Nation, USA</u>	Elevation: <u>Not Determined</u>
Rig Type: <u>CME-45</u>	Boring Location: <u>See Site Plan</u>
Drilling Method: <u>7.25" O.D. Hollow Stem Auger</u>	Groundwater Depth: <u>None Encountered</u>
Sampling Method: <u>Bulk, Ring and Split spoon samples</u>	Logged By: <u>SY</u>
Hammer Weight: <u>140 lbs</u>	Remarks: <u>#18 R. Davis; Dilkon, AZ</u>
Hammer Fall: <u>30 inches</u>	

Laboratory Results				Blows per 6"	Shear Strength (tsf)	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)								
	33	12				GRAB				1	Clayey SAND, light red/brown, fine- to medium-grained, medium dense to dense, slightly damp, weak carbonate cementation
111.2			4.4	24-35	R 12					2	
										3	
										4	
108.1			4.5	21-39	R 12			SC		5	
										6	
										7	
										8	
										9	
				11-17-18		SS 18				10	fine- to coarse-grained
										11	
										12	Total Depth 11.5 feet
										13	

MC = Modified California (Ring Sample) D = Disturbed Bulk Sample from Sonic Core Barrel G = Grab Sample



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Boring B-18

Project Name: <u>NHA 25 HOU - Scattered Sites</u>	Date Drilled: <u>2/11/2021</u>
Project Number: <u>212-3668</u>	Northing: <u>Not Determined</u>
Client: <u>WHPacific, Inc.</u>	Easting: <u>Not Determined</u>
Site Location: <u>Navajo Nation, USA</u>	Elevation: <u>Not Determined</u>
Rig Type: <u>CME-45</u>	Boring Location: <u>See Site Plan</u>
Drilling Method: <u>7.25" O.D. Hollow Stem Auger</u>	Groundwater Depth: <u>None Encountered</u>
Sampling Method: <u>Bulk, Ring and Split spoon samples</u>	Logged By: <u>SY</u>
Hammer Weight: <u>140 lbs</u>	Remarks: <u>#2 T. Chiquito; Dilkon, AZ</u>
Hammer Fall: <u>30 inches</u>	

Laboratory Results				Blows per 6"	Shear Strength (tsf)	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)								
88.3	30	4	4.3	8-10		GRAB				1	Silty, Clayey SAND, light brown, fine- to coarse-grained, loose, slightly damp, weak carbonate cementation
					R 12					2	
										3	
										4	
97.0			4.0	4-12		R 12		SC-SM		5	
										6	
										7	
										8	
										9	grades to silty sand
										10	Silty SAND with trace gravel, light brown, fine- to coarse-grained, medium dense, slightly damp
										11	gravel lens
				18-11-15		SS 18		SM		12	
										13	Total Depth 11.5 feet

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Boring B-19

Project Name: <u>NHA 25 HOU - Scattered Sites</u>	Date Drilled: <u>2/11/2021</u>
Project Number: <u>212-3668</u>	Northing: <u>Not Determined</u>
Client: <u>WHPacific, Inc.</u>	Easting: <u>Not Determined</u>
Site Location: <u>Navajo Nation, USA</u>	Elevation: <u>Not Determined</u>
Rig Type: <u>CME-45</u>	Boring Location: <u>See Site Plan</u>
Drilling Method: <u>7.25" O.D. Hollow Stem Auger</u>	Groundwater Depth: <u>None Encountered</u>
Sampling Method: <u>Bulk, Ring and Split spoon samples</u>	Logged By: <u>SY</u>
Hammer Weight: <u>140 lbs</u>	Remarks: <u>#10 B. Wheeler; Round Rock, AZ</u>
Hammer Fall: <u>30 inches</u>	

Laboratory Results				Blows per 6"	Shear Strength (tsf)	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)								
	15	NP				GRAB				1	Silty SAND, light red/brown, fine- to coarse-grained, medium dense, damp to slightly damp
108.4			3.4	14-24		R 12				2	
										3	Silty SAND, light red/brown, fine- to coarse-grained, medium dense, damp to slightly damp
			2.6	14-24		R 12		SM		4	
105.1										5	Silty SAND, light red/brown, fine- to coarse-grained, medium dense, damp to slightly damp
										6	
										7	Silty SAND, light red/brown, fine- to coarse-grained, medium dense, damp to slightly damp
										8	
										9	SANDSTONE with thin SHALE lenses, gray/white to dark gray, fine- to coarse-grained, slightly damp, weakly cemented
				12-20-21		SS 18		RK		10	
										11	SANDSTONE with thin SHALE lenses, gray/white to dark gray, fine- to coarse-grained, slightly damp, weakly cemented
										12	
										13	Total Depth 11.5 feet

MC = Modified California (Ring Sample) D = Disturbed Bulk Sample from Sonic Core Barrel G = Grab Sample



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Boring B-20

Project Name: <u>NHA 25 HOU - Scattered Sites</u>	Date Drilled: <u>2/11/2021</u>
Project Number: <u>212-3668</u>	Northing: <u>Not Determined</u>
Client: <u>WHPacific, Inc.</u>	Easting: <u>Not Determined</u>
Site Location: <u>Navajo Nation, USA</u>	Elevation: <u>Not Determined</u>
Rig Type: <u>CME-45</u>	Boring Location: <u>See Site Plan</u>
Drilling Method: <u>7.25" O.D. Hollow Stem Auger</u>	Groundwater Depth: <u>None Encountered</u>
Sampling Method: <u>Bulk, Ring and Split spoon samples</u>	Logged By: <u>SY</u>
Hammer Weight: <u>140 lbs</u>	Remarks: <u>#17 M. Davis; Lukachukai, AZ</u>
Hammer Fall: <u>30 inches</u>	

Laboratory Results				Blows per 6"	Shear Strength (tsf)	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)								
	39	6				GRAB				1	Silty, Clayey SAND, light red/brown, fine- to medium-grained, medium dense to dense, damp to slightly damp, weak carbonate cementation
103.4			5.6	15-15	R 12			SC-SM		2-3	
			4.6	21-50/6"	R 12					4-5	
102.8										6-7	
										8	SANDSTONE, gray, fine-grained, slightly damp, weakly to moderately cemented
										9-10	
				29-43-50/4"	SS 16			RK		11	
										12	
										13	

Total Depth 11 feet

MC = Modified California (Ring Sample) D = Disturbed Bulk Sample from Sonic Core Barrel G = Grab Sample



915 Malta Ave
Farmington, NM 87401
Tel (505) 327-7928
Fax (505) 326-5721

Boring B-21

Project Name: <u>NHA 25 HOU - Scattered Sites</u>	Date Drilled: <u>2/11/2021</u>
Project Number: <u>212-3668</u>	Northing: <u>Not Determined</u>
Client: <u>WHPacific, Inc.</u>	Easting: <u>Not Determined</u>
Site Location: <u>Navajo Nation, USA</u>	Elevation: <u>Not Determined</u>
Rig Type: <u>CME-45</u>	Boring Location: <u>See Site Plan</u>
Drilling Method: <u>7.25" O.D. Hollow Stem Auger</u>	Groundwater Depth: <u>None Encountered</u>
Sampling Method: <u>Bulk, Ring and Split spoon samples</u>	Logged By: <u>SY</u>
Hammer Weight: <u>140 lbs</u>	Remarks: <u>#13 C. Rodgers; Lukachukai, AZ</u>
Hammer Fall: <u>30 inches</u>	

Laboratory Results				Blows per 6"	Shear Strength (tsf)	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description	
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)									
	35	NP				GRAB				1	Silty SAND, red/brown to light red, fine- to coarse-grained, very loose to medium dense, damp to slightly damp	
97.0			3.4	5-5	R 12					2		
										3		
										4		
96.6			2.5	4-7	R 12			SM		5		
										6		
										7		
										8		gravel lens
										9		
				5-6-8	SS 18					10		trace gravel
										11		
										12		Total Depth 11.5 feet
										13		

MC = Modified California (Ring Sample) D = Disturbed Bulk Sample from Sonic Core Barrel G = Grab Sample



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Boring B-22

Project Name: <u>NHA 25 HOU - Scattered Sites</u>	Date Drilled: <u>2/12/2021</u>
Project Number: <u>212-3668</u>	Northing: <u>Not Determined</u>
Client: <u>WHPacific, Inc.</u>	Easting: <u>Not Determined</u>
Site Location: <u>Navajo Nation, USA</u>	Elevation: <u>Not Determined</u>
Rig Type: <u>CME-45</u>	Boring Location: <u>See Site Plan</u>
Drilling Method: <u>7.25" O.D. Hollow Stem Auger</u>	Groundwater Depth: <u>None Encountered</u>
Sampling Method: <u>Bulk and Split spoon samples</u>	Logged By: <u>SY</u>
Hammer Weight: <u>140 lbs</u>	Remarks: <u>#8 R. & L. Tomasyo; Navajo Mtn., AZ</u>
Hammer Fall: <u>30 inches</u>	

Laboratory Results				Blows per 6"	Shear Strength (tsf)	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)								
	13	NP		24-25-43	GRAB			SM		1	Silty SAND, red, fine- to coarse-grained, slightly damp grades to sandstone
					SS 18					2	
				38-5/3"	SS 9			RK		3	SANDSTONE, red to tan/red, fine- to coarse-grained, slightly damp, moderately cemented
										4	
										5	
										6	
										7	Auger Refusal on sandstone Total Depth 6.5 feet
										8	
										9	
										10	
										11	
										12	
										13	

MC = Modified California (Ring Sample) D = Disturbed Bulk Sample from Sonic Core Barrel G = Grab Sample



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Boring B-23

Project Name: <u>NHA 25 HOU - Scattered Sites</u>	Date Drilled: <u>2/12/2021</u>
Project Number: <u>212-3668</u>	Northing: <u>Not Determined</u>
Client: <u>WHPacific, Inc.</u>	Easting: <u>Not Determined</u>
Site Location: <u>Navajo Nation, USA</u>	Elevation: <u>Not Determined</u>
Rig Type: <u>CME-45</u>	Boring Location: <u>See Site Plan</u>
Drilling Method: <u>7.25" O.D. Hollow Stem Auger</u>	Groundwater Depth: <u>None Encountered</u>
Sampling Method: <u>Bulk, Ring and Split spoon samples</u>	Logged By: <u>SY</u>
Hammer Weight: <u>140 lbs</u>	Remarks: <u>#11 S. Norton: Aneth, UT</u>
Hammer Fall: <u>30 inches</u>	

Laboratory Results				Blows per 6"	Shear Strength (tsf)	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)								
	23	NP				GRAB				1	Silty SAND, light brown to dark brown, fine- to coarse-grained, loose to dense, damp to slightly damp
105.1			4.0	9-14	R 12					2	
										3	fine- to medium-grained
										4	
104.3			2.4	19-22	R 12		SM			5	
										6	
										7	Total Depth 11.5 feet
										8	
				10-15-16	SS 18					9	
										10	
										11	
										12	
										13	

MC = Modified California (Ring Sample) D = Disturbed Bulk Sample from Sonic Core Barrel G = Grab Sample



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Boring B-24

Project Name: <u>NHA 25 HOU - Scattered Sites</u>	Date Drilled: <u>2/12/2021</u>
Project Number: <u>212-3668</u>	Northing: <u>Not Determined</u>
Client: <u>WHPacific, Inc.</u>	Easting: <u>Not Determined</u>
Site Location: <u>Navajo Nation, USA</u>	Elevation: <u>Not Determined</u>
Rig Type: <u>CME-45</u>	Boring Location: <u>See Site Plan</u>
Drilling Method: <u>7.25" O.D. Hollow Stem Auger</u>	Groundwater Depth: <u>None Encountered</u>
Sampling Method: <u>Bulk, Ring and Split spoon samples</u>	Logged By: <u>SY</u>
Hammer Weight: <u>140 lbs</u>	Remarks: <u>#15 N. Harvey; Aneth, UT</u>
Hammer Fall: <u>30 inches</u>	

Laboratory Results				Blows per 6"	Shear Strength (tsf)	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)								
100.3	40	NP	6.4	16-23		GRAB		SM		1	Silty SAND, light brown, fine- to coarse-grained, medium dense, damp to slightly damp
					R 12					2	
										3	trace gravel at base of sample
				26-50/6"		SS 12		GP		4	Poorly graded GRAVEL and COBBLE with sand, gray to brown, fine- to coarse-grained, dense, slightly damp, weak carbonate cementation
										5	
										6	Auger Refusal on gravel and cobble Total Depth 6 feet
										7	
										8	
										9	
										10	
										11	
										12	
										13	

MC = Modified California (Ring Sample) D = Disturbed Bulk Sample from Sonic Core Barrel G = Grab Sample



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Boring B-25

Project Name: <u>NHA 25 HOU - Scattered Sites</u>	Date Drilled: <u>2/19/2021</u>
Project Number: <u>212-3668</u>	Northing: <u>Not Determined</u>
Client: <u>WHPacific, Inc.</u>	Easting: <u>Not Determined</u>
Site Location: <u>Navajo Nation, USA</u>	Elevation: <u>Not Determined</u>
Rig Type: <u>CME-45</u>	Boring Location: <u>See Site Plan</u>
Drilling Method: <u>7.25" O.D. Hollow Stem Auger</u>	Groundwater Depth: <u>None Encountered</u>
Sampling Method: <u>Bulk, Ring and Split spoon samples</u>	Logged By: <u>SY</u>
Hammer Weight: <u>140 lbs</u>	Remarks: <u>#14 C. Jim; Burnham, NM</u>
Hammer Fall: <u>30 inches</u>	

Laboratory Results				Blows per 6"	Shear Strength (tsf)	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)								
	4.4	NP				GRAB				1	Poorly graded SAND with trace gravel, tan/brown, fine- to coarse-grained, loose to medium dense, slightly damp
96.4			3.3	8-13		R 12				2	gravel lens
										3	slight carbonate cementation
109.8			3.2	19-31		R 12		SP		4	
										5	
										6	
										7	
										8	gravel lens
										9	SANDSTONE, brown/gray, fine- to coarse-grained, slightly damp, slightly weathered, moderately cemented
				50/3"		SS 3				10	Total Depth 10 feet
										11	
										12	
										13	

MC = Modified California (Ring Sample) D = Disturbed Bulk Sample from Sonic Core Barrel G = Grab Sample

UNIFIED SOIL CLASSIFICATION SYSTEM						CONSISTENCY OR RELATIVE DENSITY CRITERIA					
Major Divisions				Group Symbols	Typical Names						
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels 50% or more of coarse fraction retained on No. 4 sieve	Clean Gravels	GW	Well-graded gravels and gravel-sand mixtures, little or no fines		Penetration Resistance, N (blows/ft.)	Standard Penetration Test Density of Granular Soils				
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines			Relative Density				
		Gravels with Fines	GM	Silty gravels, gravel-sand-silt mixtures			0-4	Very Loose			
			GC	Clayey gravels, gravel-sand-clay mixtures			5-10	Loose			
	Sands More than 50% of coarse fraction passes No. 4 sieve	Clean Sands	SW	Well-graded sands and gravelly sands, little or no fines			11-30	Medium Dense			
			SP	Poorly graded sands and gravelly sands, little or no fines			31-50	Dense			
			Sands with Fines	SM	Silty sands, sand-silt mixtures		>50	Very Dense			
		SC		Clayey sands, sand-clay mixtures			Standard Penetration Test Density of Granular Soils				
		Fine-Grained Soils 50% or more passes No. 200 sieve	Silts and Clays Liquid Limit 50 or less		ML		Inorganic silts, very fine sands, rock flour, silty or clayey fine sands		Penetration Resistance, N (blows/ft.)	Consistency	Unconfined Compressive Strength (Tons/ft2)
CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays				<2	Very Soft	<0.25				
OL	Organic silts and organic silty clays of low plasticity				2-4	Soft	0.25-0.50				
Silts and Clays Liquid Limit greater than 50			MH	Inorganic silts, micaceous or diatomaceous free sands or silts, elastic silts		4-8	Firm	0.50-1.00			
			CH	Inorganic clays of high plasticity, fat clays		8-15	Stiff	1.00-2.00			
			OH	Organic clays of medium to high plasticity		15-30	Very Stiff	2.00-4.00			
			Highly Organic Soils		PT	Peat, mucic & other highly organic soils		>30			
U.S. Standard Sieve Sizes											
>12"		12"	3"	3/4"	#4	#10	#40	#200			
Boulders	Cobbles		Gravel		Sand			Silt or Clay			
		coarse	fine	coarse	medium	fine					

MOISTURE CONDITIONS

Dry	Absence of moist, dusty, dry to the touch
Slightly Damp	Below optimum moisture content for compaction
Moist	Near optimum moisture content, will moisten the hand
Very Moist	Above optimum moisture content
Wet	Visible free water, below water table

MATERIAL QUANTITY

trace	0-5%
few	5-10%
little	10-25%
some	25-45%
mostly	50-100%

OTHER SYMBOLS

R	Ring Sample
S	SPT Sample
B	Bulk Sample
▼	Ground Water

BASIC LOG FORMAT:

Group name, Group symbol, (grain size), color, moisture, consistency or relative density. Additional comments: odor, presence of roots, mica, gypsum, coarse particles, etc.

EXAMPLE:

SILTY SAND w/trace silt (SM-SP), Brown, loose to med. Dense, fine to medium grained, damp

UNIFIED SOIL CLASSIFICATION SYSTEM

TEST DRILLING EQUIPMENT & PROCEDURES

Description of Subsurface Exploration Methods

Drilling Equipment – Truck-mounted drill rigs powered with gasoline or diesel engines are used in advancing test borings. Drilling through soil or softer rock is performed with hollow-stem auger or continuous flight auger. Carbide insert teeth are normally used on bits to penetrate soft rock or very strongly cemented soils which require blasting or very heavy equipment for excavation. Where refusal is experienced in auger drilling, the holes are sometimes advanced with tricone gear bits and NX rods using water or air as a drilling fluid.

Coring Equipment – Portable electric core drills are used when recovery of asphalt or concrete cores is necessary. The core drill is equipped with either a 4” or 6” diameter diamond core barrel. Water is generally used as a drilling fluid to facilitate cooling and removal of cuttings from the annulus.


Sampling Procedures - Dynamically driven tube samples are usually obtained at selected intervals in the borings by the ASTM D1586 test procedure. In most cases, 2” outside diameter, 1 3/8” inside diameter, samplers are used to obtain the standard penetration resistance. “Undisturbed” samples of firmer soils are often obtained with 3” outside diameter samplers lined with 2.42” inside diameter brass rings. The driving energy is generally recorded as the number of blows of a 140-pound, 30-inch free fall drop hammer required to advance the samplers in 6-inch increments. These values are expressed in blows per foot on the boring logs. However, in stratified soils, driving resistance is sometimes recorded in 2- or 3-inch increments so that soil changes and the presence of scattered gravel or cemented layers can be readily detected and the realistic penetration values obtained for consideration in design. “Undisturbed” sampling of softer soils is sometimes performed with thin-walled Shelby tubes (ASTM D1587). Tube samples are labeled and placed in watertight containers to maintain field moisture contents for testing. When necessary for testing, larger bulk samples are taken from auger cuttings. Where samples of rock are required, they are obtained by NX diamond core drilling (ASTM D2113).


Boring Records - Drilling operations are directed by our field engineer or geologist who examines soil recovery and prepares boring logs. Soils are visually classified in accordance with the Unified Soil Classification System (ASTM D2487), with appropriate group symbols being shown on the logs.

Appendix B

LAB NO.	BORING NO.	DEPTH FT.	ASTM D698		MOISTURE CONT. (%)	DENSITY		ATTERBERG LIMITS			SWELL (%)	CONSOL TEST	% PASS #200 SIEVE	CLASSIFICATION
			Density	Moisture		WET (pcf)	DRY (pcf)	LL	PL	PI				
2055	B-1	2½	-	-	8.9	102.5	94.1	27	15	12	-	-	71	Sandy Lean CLAY (CL)
2056	B-1	5	-	-	7.6	108.5	100.8	-	-	-	-	-	-	Sandy Lean CLAY (CL)
2057	B-2	2½	-	-	1.3	98.4	97.1	NLL	NPL	NP	-	-	4.4	Poorly graded SAND (SP)
2058	B-2	5	-	-	1.6	105.6	103.9	-	-	-	-	-	-	Poorly graded SAND (SP)
2059	B-4	2½	-	-	4.4	98.8	94.6	NLL	NPL	NP	-	-	30	Silty SAND (SM)
2060	B-4	5	-	-	4.8	98.7	94.2	-	-	-	-	-	-	Silty SAND (SM)
2061	B-5	2½	-	-	1.7	104.4	102.7	NLL	NPL	NP	-	-	8.1	Poorly graded SAND with silt (SP-SM)
2062	B-5	5	-	-	1.5	99.9	98.4	-	-	-	-	-	-	Poorly graded SAND with silt (SP-SM)
2163	B-6	2½	-	-	9.1	103.3	94.7	41	17	24	-	Attached	48	Clayey SAND (SC)
2164	B-6	5	-	-	19.7	102.9	85.9	-	-	-	-	-	-	Carbonaceous SHALE (RK)
2165	B-7	2½	-	-	8.3	119.5	110.8	-	-	-	-	Attached	-	SHALE with interlayered SILTSTONE (RK)
2166	B-7	5	-	-	6.7	119.3	111.8	-	-	-	-	-	-	SHALE with interlayered SILTSTONE (RK)
2167	B-8	2½	-	-	11.1	117.0	105.3	-	-	-	-	Attached	-	SHALE (RK)
2168	B-9	2½	-	-	6.1	101.2	95.4	24	16	8	-	-	24	Clayey SAND (SC)
2169	B-9	5	-	-	5.0	113.4	108.0	-	-	-	-	-	-	Clayey SAND (SC)
2170	B-10	0 - 1	-	-	-	-	-	32	18	14	-	-	36	Clayey SAND (SC)
2171	B-11	2½	-	-	13.9	114.2	100.3	-	-	-	-	Attached	-	SHALE (RK)
2172	B-11	5	-	-	13.4	121.0	106.7	-	-	-	-	-	-	SHALE (RK)
2173	B-12	0 - 2½	-	-	-	-	-	25	19	6	-	-	70	Sandy, Silty CLAY (CL-ML)
2174	B-12	2½	-	-	5.1	103.5	98.5	-	-	-	-	Attached	-	Sandy, Silty CLAY (CL-ML)
2175	B-12	5	-	-	4.2	99.7	95.7	-	-	-	-	-	-	Sandy, Silty CLAY (CL-ML)
2176	B-13	2½	-	-	10.0	113.9	103.5	28	12	16	-	Attached	31	Clayey SAND (SC)
2177	B-13	10	-	-	16.6	124.6	106.9	-	-	-	-	Attached	-	SHALE (RK)
2178	B-14	0 - ½	-	-	-	-	-	24	21	3	-	-	48	Silty SAND (SM)

NLL = No Liquid Limit
NPL = No Plastic Limit
NP = Non Plastic

	SUMMARY OF SOIL TESTS of 2) (1		Project	NHA 25 HOU - Scattered Sites
			Job No.	212-3668
			Location	Navajo Nation, USA
			Date Drilled	2/5, 2/8-12 & 2/19/2021

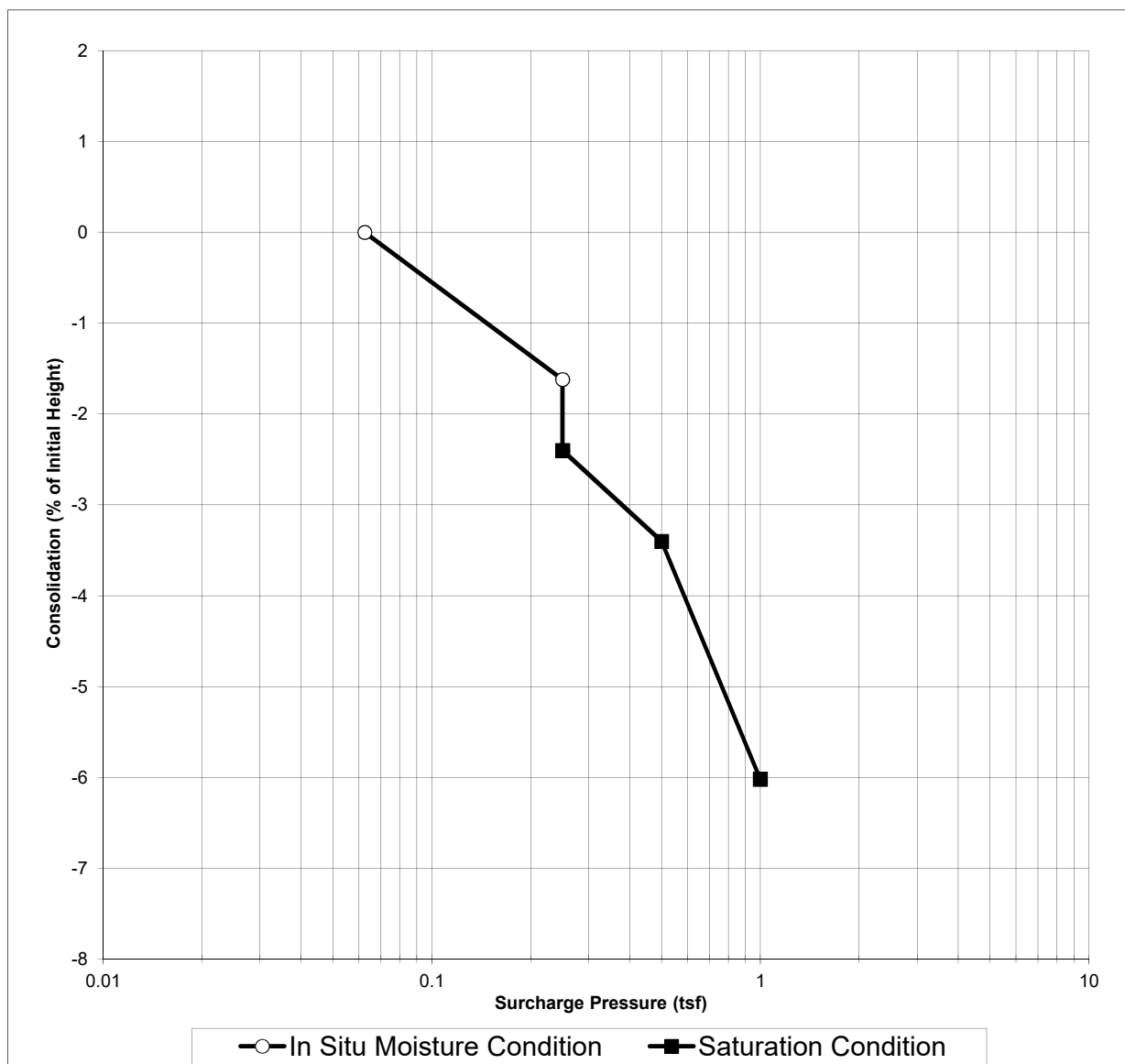
LAB NO.	BORING NO.	DEPTH FT.	ASTM D698		MOISTURE CONT. (%)	DENSITY		ATTERBERG LIMITS			SWELL (%)	CONSOL TEST	% PASS #200 SIEVE	CLASSIFICATION	
			Density	Moisture		WET (pcf)	DRY (pcf)	LL	PL	PI					
2179	B-15	0 - 1	-	-	-	-	-	18	14	4	-	-	26	Silty, Clayey SAND (SC-SM)	
2180	B-16	0 - 2½	-	-	-	-	-	27	19	8	-	-	27	Clayey SAND (SC)	
2181	B-16	2½	-	-	4.4	116.5	111.6	-	-	-	-	Attached	-	Clayey SAND (SC)	
2182	B-16	5	-	-	1.6	111.9	110.1	-	-	-	-	-	-	Silty SAND (SM)	
2183	B-17	0 - 2½	-	-	-	-	-	27	15	12	-	-	33	Clayey SAND (SC)	
2184	B-17	2½	-	-	4.4	116.2	111.2	-	-	-	-	Attached	-	Clayey SAND (SC)	
2185	B-17	5	-	-	4.5	113.0	108.1	-	-	-	-	-	-	Clayey SAND (SC)	
2186	B-18	2½	-	-	4.3	92.1	88.3	21	17	4	-	-	30	Silty, Clayey SAND (SC-SM)	
2187	B-18	5	-	-	4.0	100.9	97.0	-	-	-	-	-	-	Silty, Clayey SAND (SC-SM)	
2188	B-19	0 - 2½	-	-	-	-	-	NLL	NPL	NP	-	-	15	Silty SAND (SM)	
2189	B-19	2½	-	-	3.4	112.1	108.4	-	-	-	-	Attached	-	Silty SAND (SM)	
2190	B-19	5	-	-	2.6	107.8	105.1	-	-	-	-	-	-	Silty SAND (SM)	
2191	B-20	0 - 2½	-	-	-	-	-	24	18	6	-	-	39	Silty, Clayey SAND (SC-SM)	
2192	B-20	2½	-	-	5.6	109.2	103.4	-	-	-	-	Attached	-	Silty, Clayey SAND (SC-SM)	
2193	B-20	5	-	-	4.6	107.5	102.8	-	-	-	-	-	-	Silty, Clayey SAND (SC-SM)	
2194	B-21	0 - 2½	-	-	-	-	-	NLL	NPL	NP	-	-	35	Silty SAND (SM)	
2195	B-21	2½	-	-	3.4	100.3	97.0	-	-	-	-	Attached	-	Silty SAND (SM)	
2196	B-21	5	-	-	2.5	99.0	96.6	-	-	-	-	-	-	Silty SAND (SM)	
2197	B-22	0 - 2½	-	-	-	-	-	NLL	NPL	NP	-	-	13	Silty SAND (SM)	
2198	B-23	0 - 2½	-	-	-	-	-	NLL	NPL	NP	-	-	23	Silty SAND (SM)	
2199	B-23	2½	-	-	4.0	109.3	105.1	-	-	-	-	Attached	-	Silty SAND (SM)	
2200	B-23	5	-	-	2.4	106.9	104.3	-	-	-	-	-	-	Silty SAND (SM)	
2201	B-24	2½	-	-	6.4	106.8	100.3	NLL	NPL	NP	-	Attached	40	Silty SAND (SM)	
2272	B-25	0 - 2½	-	-	-	-	-	NLL	NPL	NP	-	-	4.4	Poorly graded SAND (SM)	
2273	B-25	2½	-	-	3.3	99.6	96.4	-	-	-	-	Attached	-	Poorly graded SAND (SM)	
2274	B-25	5	-	-	3.2	113.2	109.8	-	-	-	-	-	-	Poorly graded SAND (SM)	
NLL = No Liquid Limit NPL = No Plastic Limit NP = Non Plastic															
						SUMMARY OF SOIL TESTS (2 of 2)						Project		NHA 25 HOU - Scattered Sites	
												Job No.		212-3668	
												Location		Navajo Nation, USA	
												Date Drilled		2/5, 2/8-12 & 2/19/2021	

PROJECT: NHA 25 HOU - Scattered Sites
CLIENT: WHPacific, Inc.
MATERIAL: Sandy Lean CLAY (CL)
SAMPLE SOURCE: B-1 @ 2.5'
SAMPLE PREP.: In Situ

JOB NO: 212-3668
WORK ORDER NO: NA
LAB NO: 2055
DATE SAMPLED: 2/5/2021
SAMPLED BY: SY

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D2435)

INITIAL VOLUME (cu.in)	4.60	FINAL VOLUME (cu.in)	4.33
INITIAL MOISTURE CONTENT	8.9%	FINAL MOISTURE CONTENT	23.4%
INITIAL DRY DENSITY(pcf)	94.1	FINAL DRY DENSITY(pcf)	99.6
INITIAL DEGREE OF SATURATION	25%	FINAL DEGREE OF SATURATION	71%
INITIAL VOID RATIO	0.77	FINAL VOID RATIO	0.66
ESTIMATED SPECIFIC GRAVITY	2.651	SATURATED AT	0.25 tsf

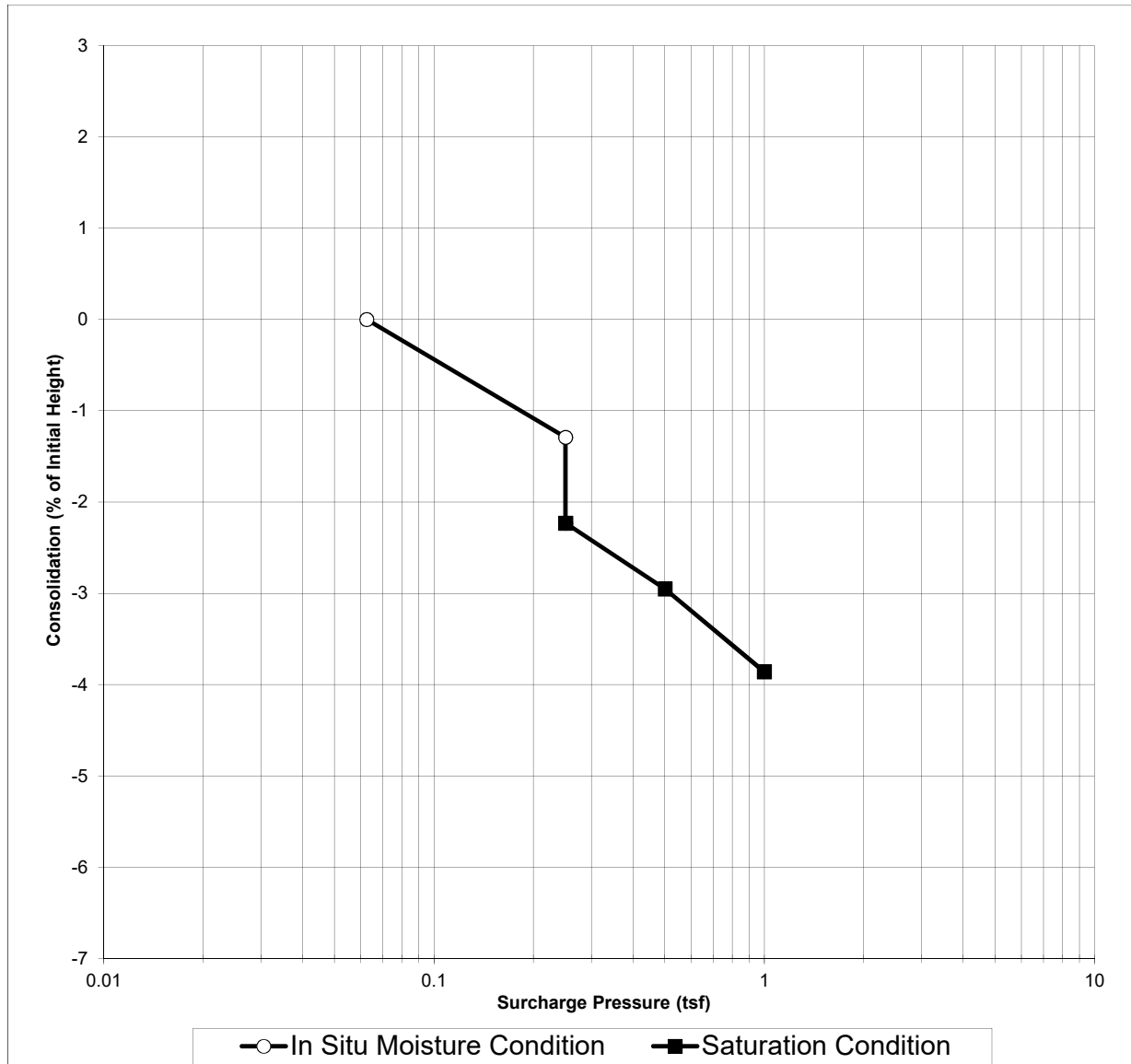


PROJECT: NHA 25 HOU - Scattered Sites
CLIENT: WHPacific, Inc.
MATERIAL: Poorly graded SAND (SP)
SAMPLE SOURCE: B-2 @ 2.5'
SAMPLE PREP.: In Situ

JOB NO: 212-3668
WORK ORDER NO: NA
LAB NO: 2057
DATE SAMPLED: 2/5/2021
SAMPLED BY: SY

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D2435)

INITIAL VOLUME (cu.in)	4.60	FINAL VOLUME (cu.in)	4.43
INITIAL MOISTURE CONTENT	1.3%	FINAL MOISTURE CONTENT	21.7%
INITIAL DRY DENSITY(pcf)	97.1	FINAL DRY DENSITY(pcf)	100.5
INITIAL DEGREE OF SATURATION	4%	FINAL DEGREE OF SATURATION	67%
INITIAL VOID RATIO	0.71	FINAL VOID RATIO	0.65
ESTIMATED SPECIFIC GRAVITY	2.651	SATURATED AT	0.25 tsf

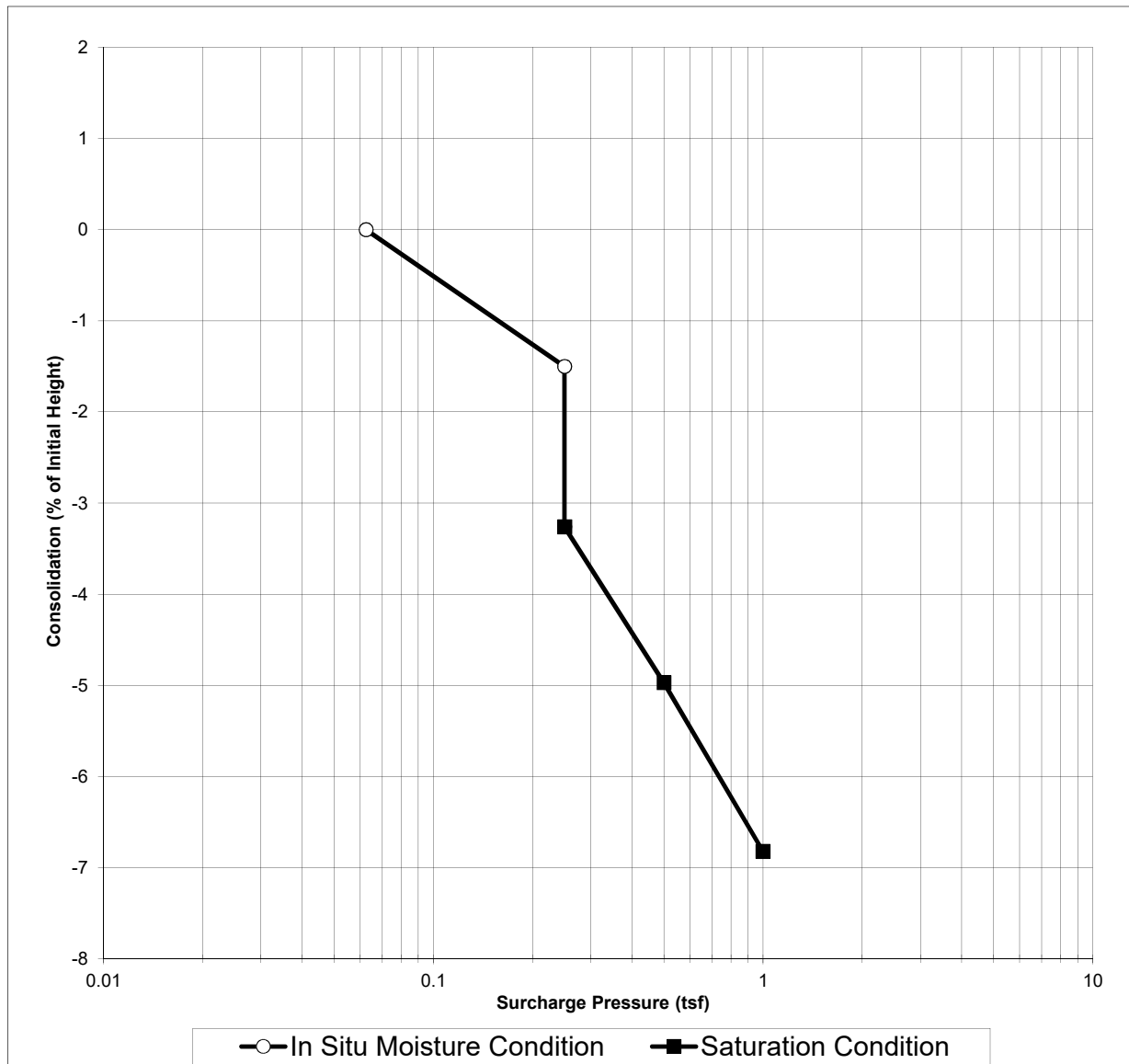


PROJECT: NHA 25 HOU - Scattered Sites
CLIENT: WHPacific, Inc.
MATERIAL: Silty SAND (SM)
SAMPLE SOURCE: B-4 @ 2.5'
SAMPLE PREP.: In Situ

JOB NO: 212-3668
WORK ORDER NO: NA
LAB NO: 2059
DATE SAMPLED: 2/5/2021
SAMPLED BY: SY

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D2435)

INITIAL VOLUME (cu.in)	4.60	FINAL VOLUME (cu.in)	4.29
INITIAL MOISTURE CONTENT	4.4%	FINAL MOISTURE CONTENT	22.7%
INITIAL DRY DENSITY(pcf)	94.6	FINAL DRY DENSITY(pcf)	101.0
INITIAL DEGREE OF SATURATION	12%	FINAL DEGREE OF SATURATION	71%
INITIAL VOID RATIO	0.76	FINAL VOID RATIO	0.64
ESTIMATED SPECIFIC GRAVITY	2.651	SATURATED AT	0.25 tsf

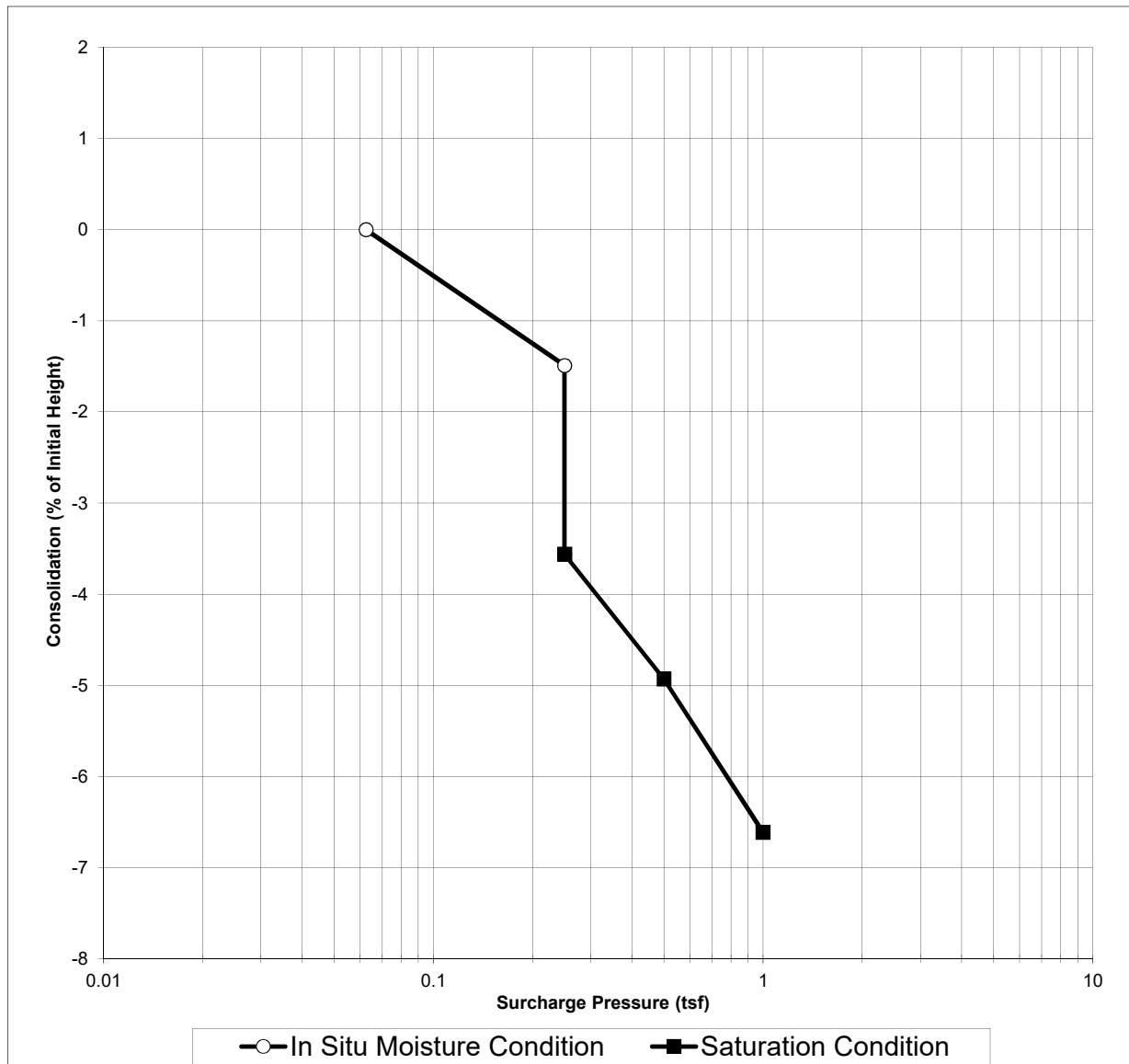


PROJECT: NHA 25 HOU - Scattered Sites
CLIENT: WHPacific, Inc.
MATERIAL: Poorly graded SAND with silt (SP-SM)
SAMPLE SOURCE: B-5 @ 2.5'
SAMPLE PREP.: In Situ

JOB NO: 212-3668
WORK ORDER NO: NA
LAB NO: 2061
DATE SAMPLED: 2/5/2021
SAMPLED BY: SY

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D2435)

INITIAL VOLUME (cu.in)	4.60	FINAL VOLUME (cu.in)	4.30
INITIAL MOISTURE CONTENT	1.7%	FINAL MOISTURE CONTENT	20.1%
INITIAL DRY DENSITY(pcf)	102.7	FINAL DRY DENSITY(pcf)	109.5
INITIAL DEGREE OF SATURATION	5%	FINAL DEGREE OF SATURATION	74%
INITIAL VOID RATIO	0.62	FINAL VOID RATIO	0.51
ESTIMATED SPECIFIC GRAVITY	2.651	SATURATED AT	0.25 tsf

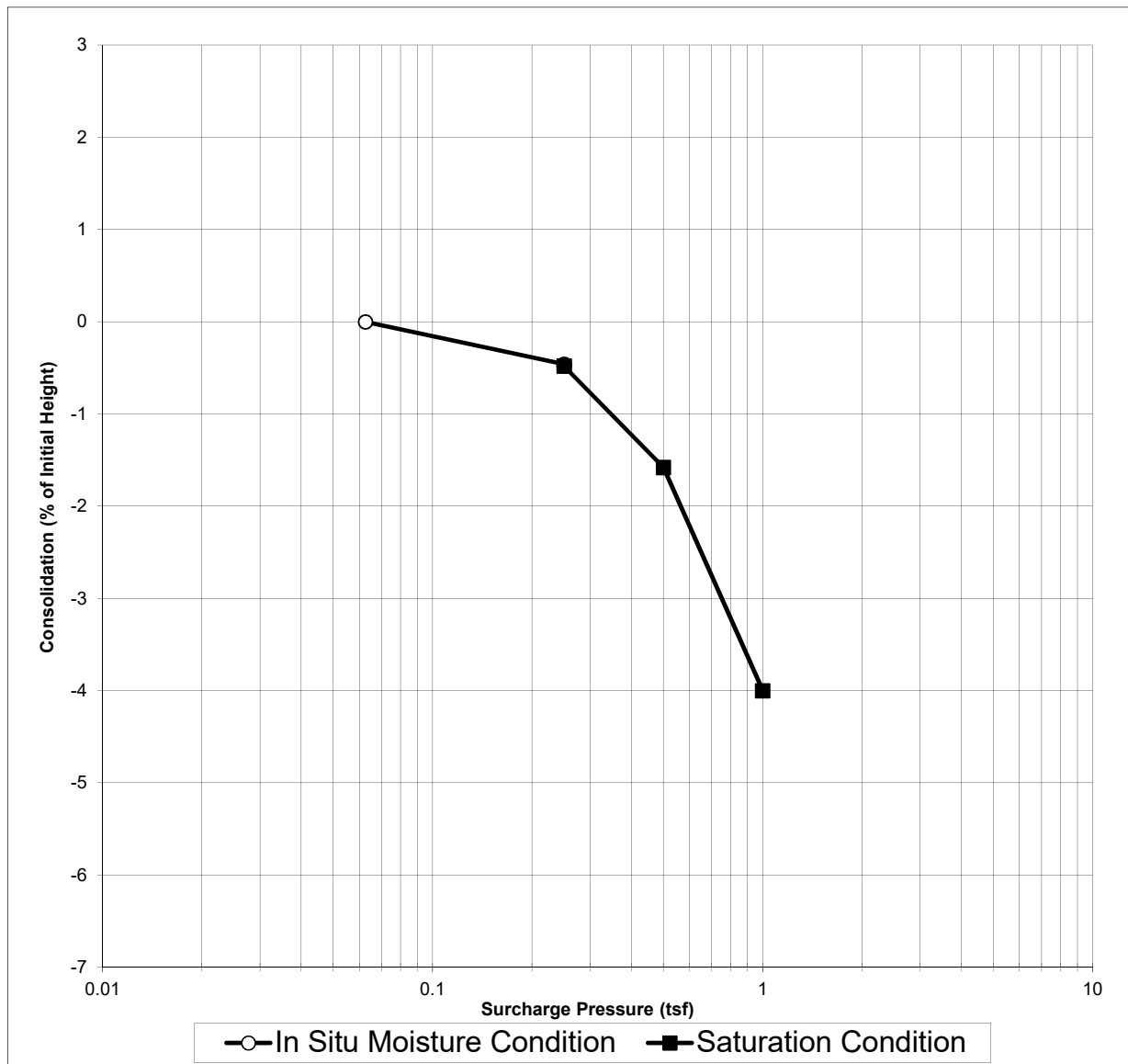


PROJECT: NHA 25 HOU - Scattered Sites
CLIENT: WHPacific, Inc.
MATERIAL: Clayey SAND (SC)
SAMPLE SOURCE: B-6 @ 2.5'
SAMPLE PREP.: In Situ

JOB NO: 212-3668
WORK ORDER NO: NA
LAB NO: 2163
DATE SAMPLED: 2/8/2021
SAMPLED BY: SY

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D2435)

INITIAL VOLUME (cu.in)	4.60	FINAL VOLUME (cu.in)	4.42
INITIAL MOISTURE CONTENT	9.1%	FINAL MOISTURE CONTENT	20.3%
INITIAL DRY DENSITY(pcf)	94.7	FINAL DRY DENSITY(pcf)	98.2
INITIAL DEGREE OF SATURATION	25%	FINAL DEGREE OF SATURATION	60%
INITIAL VOID RATIO	0.76	FINAL VOID RATIO	0.68
ESTIMATED SPECIFIC GRAVITY	2.651	SATURATED AT	0.25 tsf

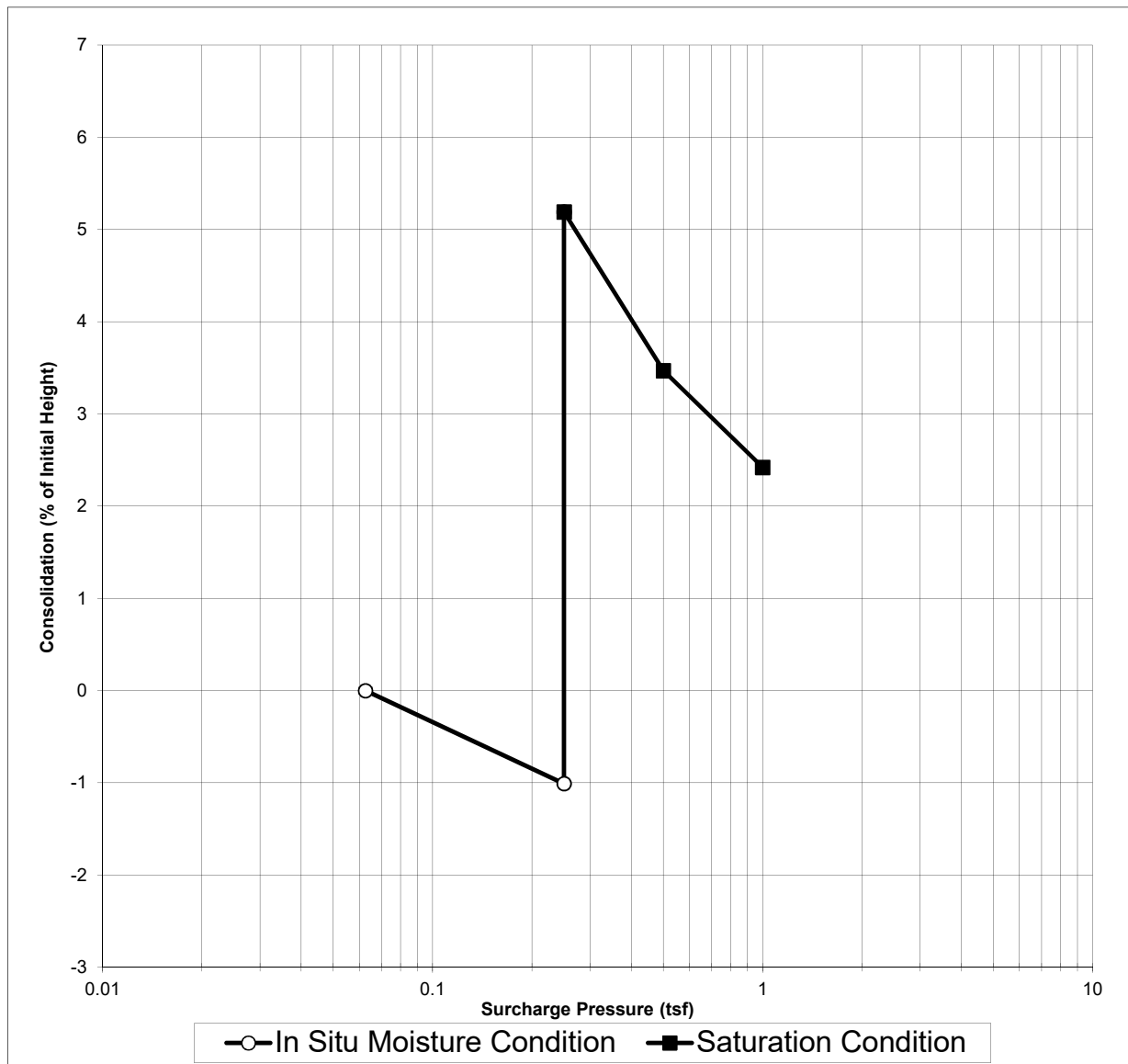


PROJECT: NHA 25 HOU - Scattered Sites
CLIENT: WHPacific, Inc.
MATERIAL: SHALE with interlayered SILTSTONE (RK)
SAMPLE SOURCE: B-7 @ 2.5'
SAMPLE PREP.: In Situ

JOB NO: 212-3668
WORK ORDER NO: NA
LAB NO: 2165
DATE SAMPLED: 2/8/2021
SAMPLED BY: SY

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D2435)

INITIAL VOLUME (cu.in)	4.60	FINAL VOLUME (cu.in)	4.72
INITIAL MOISTURE CONTENT	8.3%	FINAL MOISTURE CONTENT	18.0%
INITIAL DRY DENSITY(pcf)	110.8	FINAL DRY DENSITY(pcf)	107.7
INITIAL DEGREE OF SATURATION	31%	FINAL DEGREE OF SATURATION	64%
INITIAL VOID RATIO	0.50	FINAL VOID RATIO	0.54
ESTIMATED SPECIFIC GRAVITY	2.651	SATURATED AT	0.25 tsf

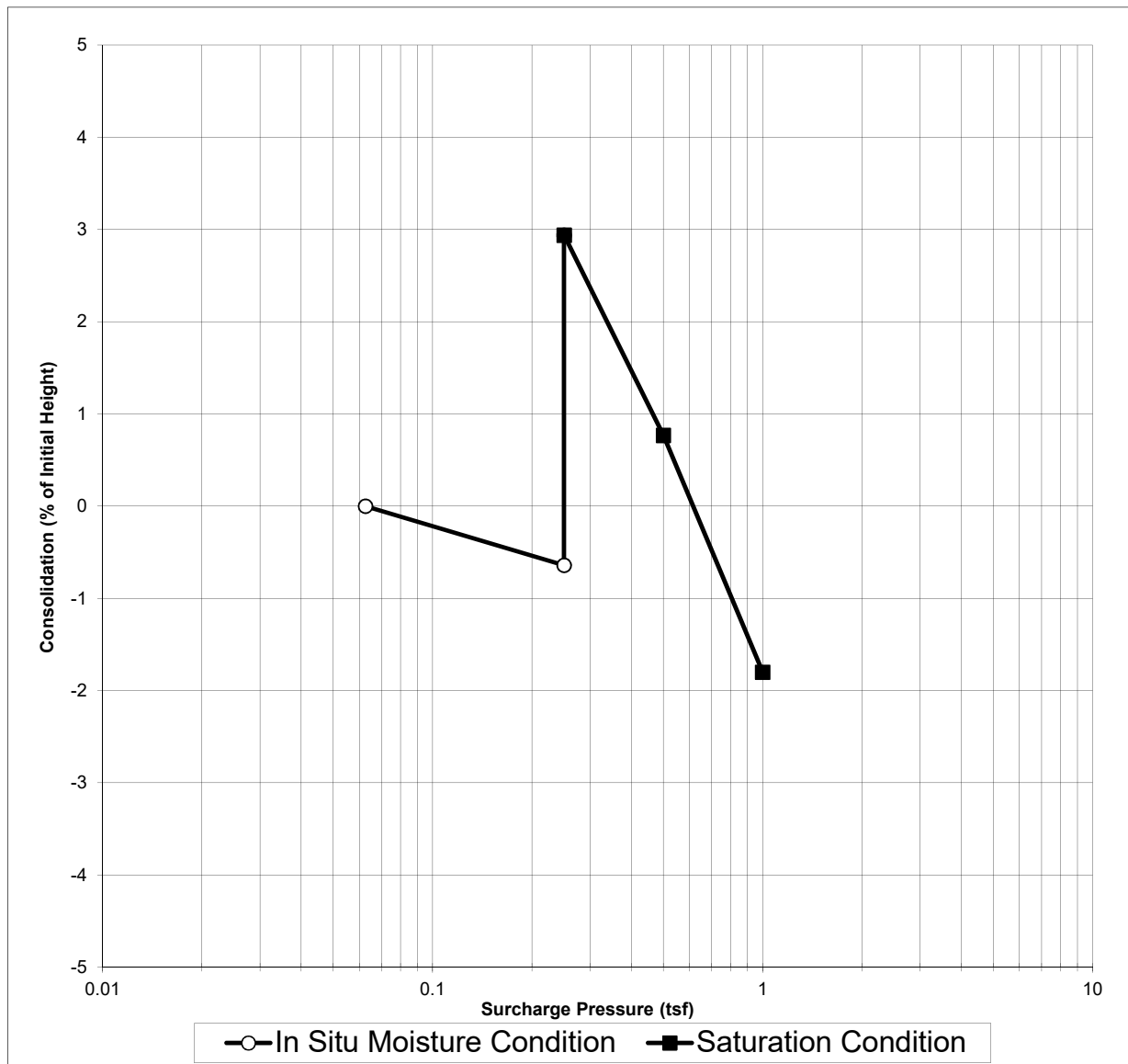


PROJECT: NHA 25 HOU - Scattered Sites
CLIENT: WHPacific, Inc.
MATERIAL: SHALE (RK)
SAMPLE SOURCE: B-8 @ 2.5'
SAMPLE PREP.: In Situ

JOB NO: 212-3668
WORK ORDER NO: NA
LAB NO: 2167
DATE SAMPLED: 2/8/2021
SAMPLED BY: SY

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D2435)

INITIAL VOLUME (cu.in)	4.60	FINAL VOLUME (cu.in)	4.52
INITIAL MOISTURE CONTENT	11.1%	FINAL MOISTURE CONTENT	24.0%
INITIAL DRY DENSITY(pcf)	105.3	FINAL DRY DENSITY(pcf)	106.7
INITIAL DEGREE OF SATURATION	38%	FINAL DEGREE OF SATURATION	84%
INITIAL VOID RATIO	0.58	FINAL VOID RATIO	0.55
ESTIMATED SPECIFIC GRAVITY	2.651	SATURATED AT	0.25 tsf

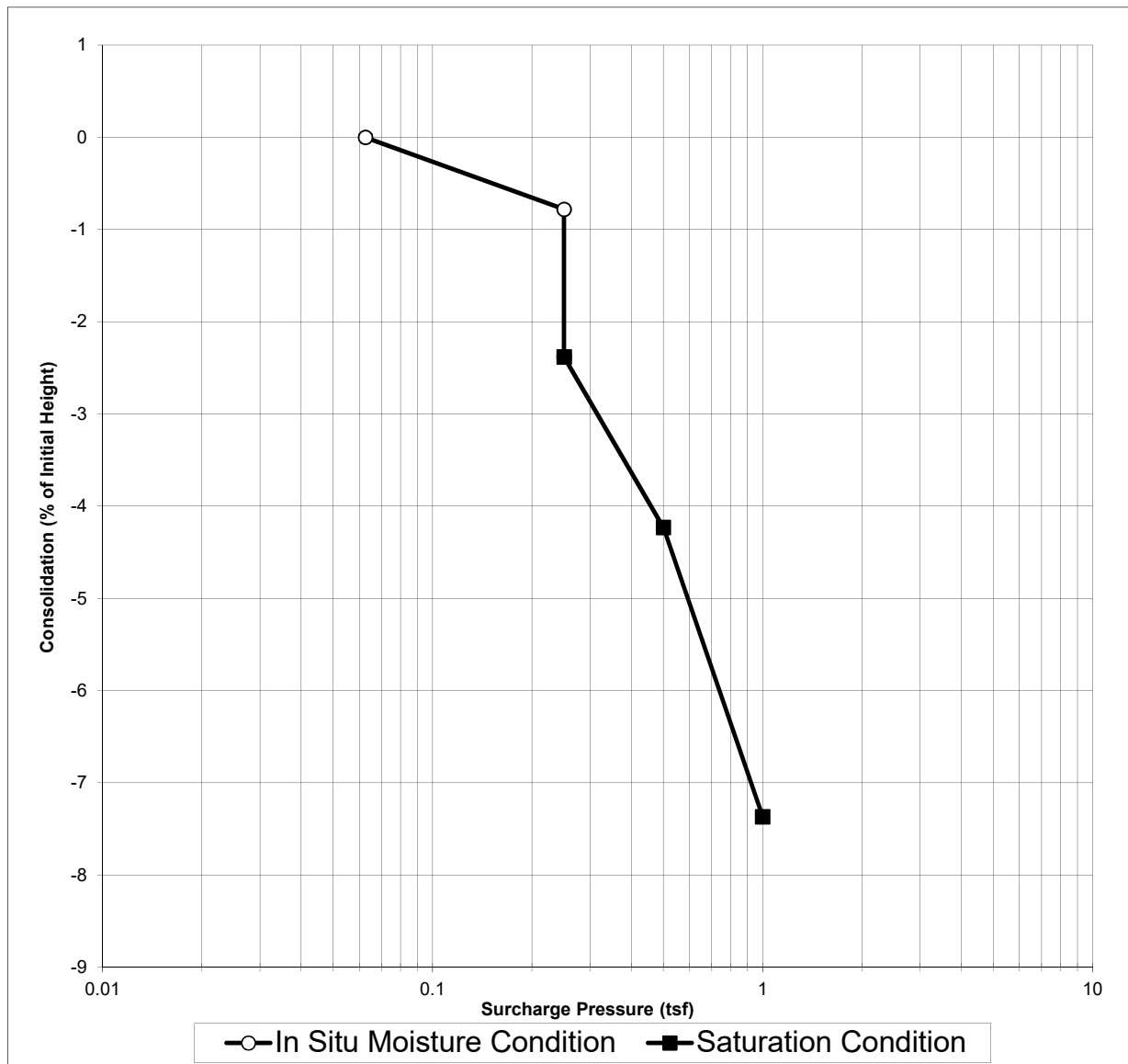


PROJECT: NHA 25 HOU - Scattered Sites
CLIENT: WHPacific, Inc.
MATERIAL: Clayey SAND (SC)
SAMPLE SOURCE: B-9 @ 2.5'
SAMPLE PREP.: In Situ

JOB NO: 212-3668
WORK ORDER NO: NA
LAB NO: 2168
DATE SAMPLED: 2/9/2021
SAMPLED BY: SY

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D2435)

INITIAL VOLUME (cu.in)	4.60	FINAL VOLUME (cu.in)	4.27
INITIAL MOISTURE CONTENT	6.1%	FINAL MOISTURE CONTENT	19.9%
INITIAL DRY DENSITY(pcf)	95.4	FINAL DRY DENSITY(pcf)	102.5
INITIAL DEGREE OF SATURATION	17%	FINAL DEGREE OF SATURATION	64%
INITIAL VOID RATIO	0.74	FINAL VOID RATIO	0.61
ESTIMATED SPECIFIC GRAVITY	2.651	SATURATED AT	0.25 tsf

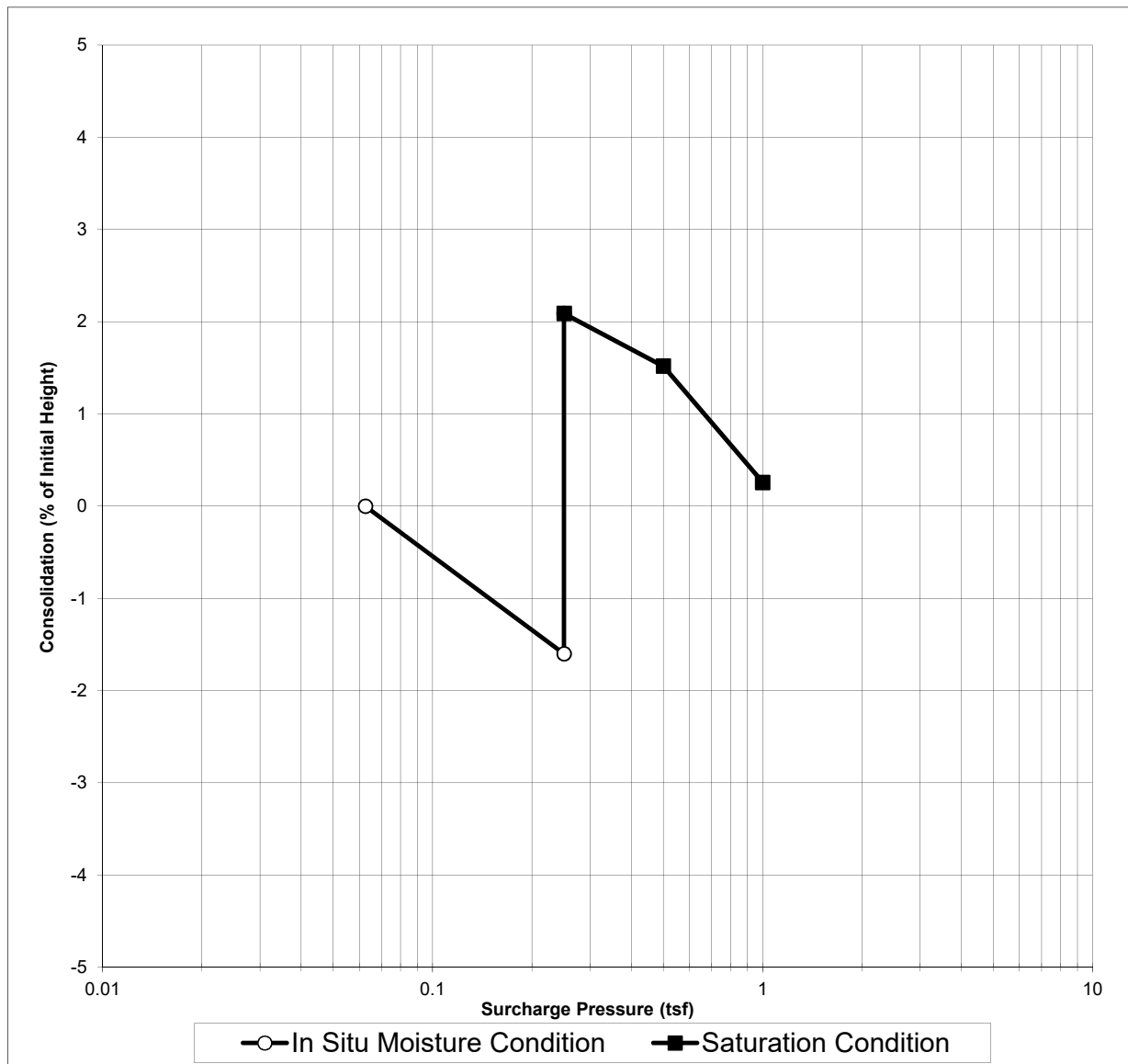


PROJECT: NHA 25 HOU - Scattered Sites
CLIENT: WHPacific, Inc.
MATERIAL: SHALE (RK)
SAMPLE SOURCE: B-11 @ 2.5'
SAMPLE PREP.: In Situ

JOB NO: 212-3668
WORK ORDER NO: NA
LAB NO: 2170
DATE SAMPLED: 2/9/2021
SAMPLED BY: SY

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D2435)

INITIAL VOLUME (cu.in)	4.60	FINAL VOLUME (cu.in)	4.62
INITIAL MOISTURE CONTENT	13.9%	FINAL MOISTURE CONTENT	25.7%
INITIAL DRY DENSITY(pcf)	100.3	FINAL DRY DENSITY(pcf)	99.6
INITIAL DEGREE OF SATURATION	43%	FINAL DEGREE OF SATURATION	79%
INITIAL VOID RATIO	0.66	FINAL VOID RATIO	0.66
ESTIMATED SPECIFIC GRAVITY	2.651	SATURATED AT	0.25 tsf

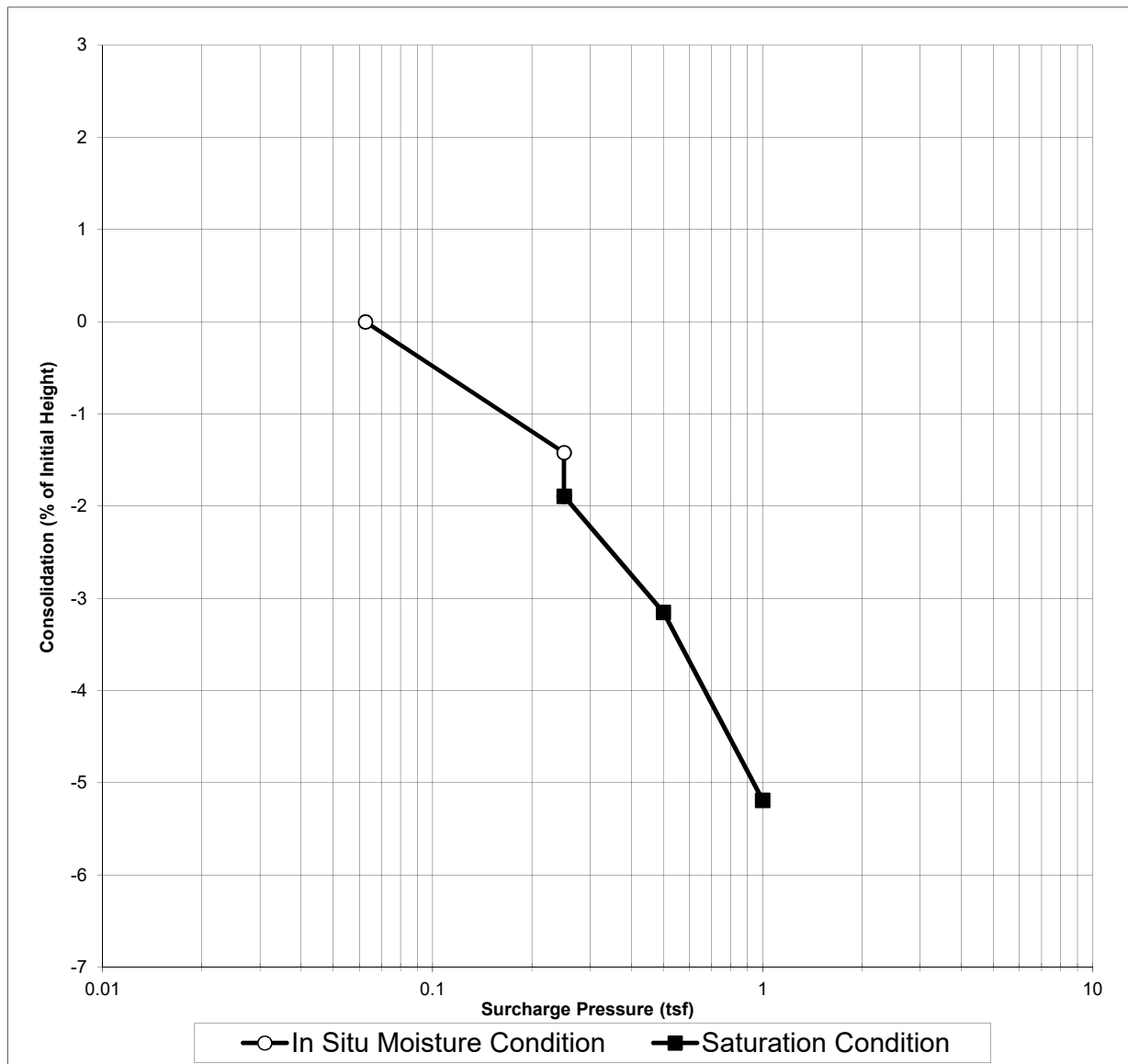


PROJECT: NHA 25 HOU - Scattered Sites
CLIENT: WHPacific, Inc.
MATERIAL: Sandy, Silty CLAY (CL-ML)
SAMPLE SOURCE: B-12 @ 2.5'
SAMPLE PREP.: In Situ

JOB NO: 212-3668
WORK ORDER NO: NA
LAB NO: 2174
DATE SAMPLED: 2/10/2021
SAMPLED BY: SY

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D2435)

INITIAL VOLUME (cu.in)	4.60	FINAL VOLUME (cu.in)	4.37
INITIAL MOISTURE CONTENT	5.1%	FINAL MOISTURE CONTENT	20.9%
INITIAL DRY DENSITY(pcf)	98.5	FINAL DRY DENSITY(pcf)	103.4
INITIAL DEGREE OF SATURATION	15%	FINAL DEGREE OF SATURATION	69%
INITIAL VOID RATIO	0.69	FINAL VOID RATIO	0.60
ESTIMATED SPECIFIC GRAVITY	2.651	SATURATED AT	0.25 tsf

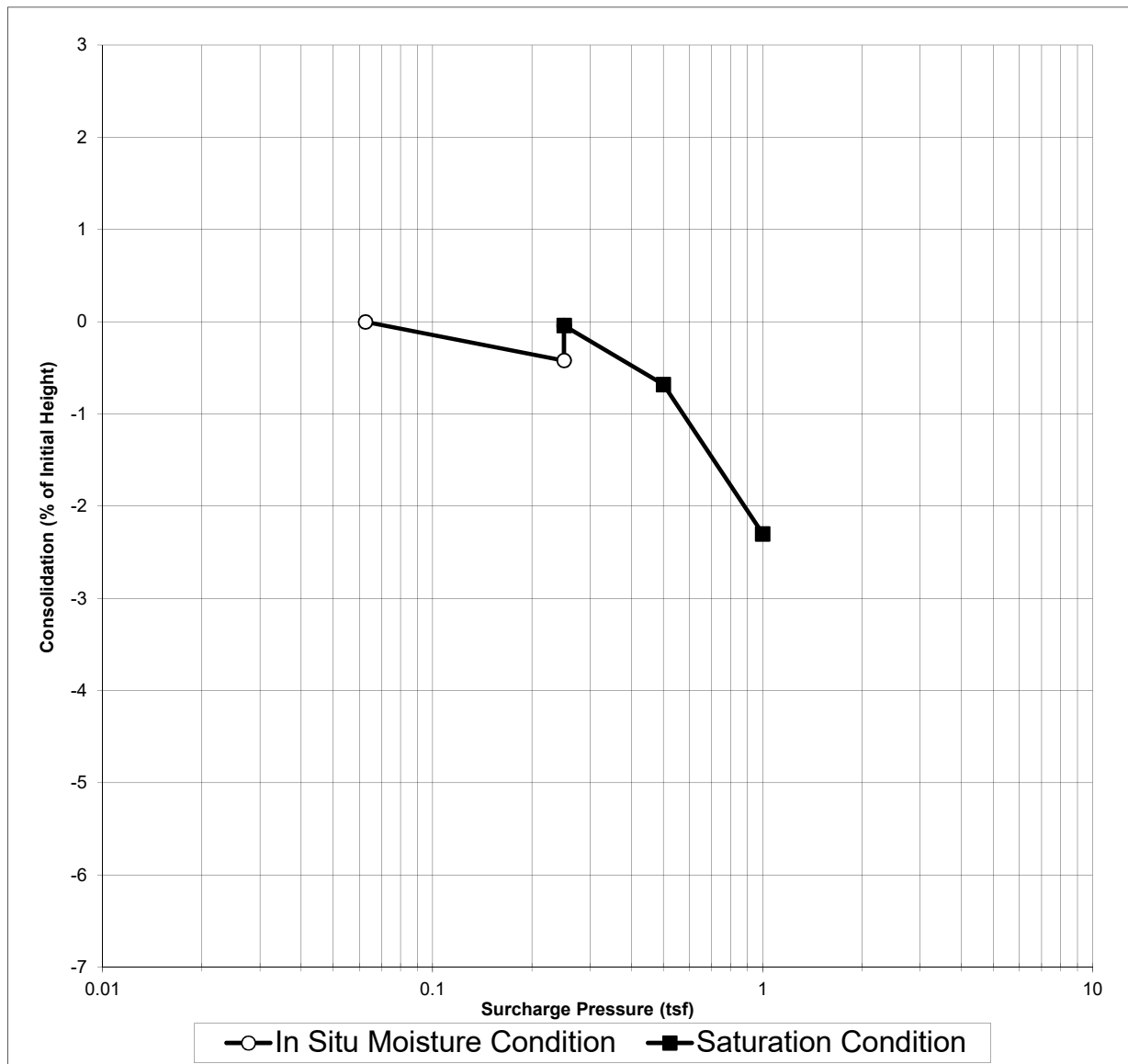


PROJECT: NHA 25 HOU - Scattered Sites
CLIENT: WHPacific, Inc.
MATERIAL: Clayey SAND (SC)
SAMPLE SOURCE: B-13 @ 2.5'
SAMPLE PREP.: In Situ

JOB NO: 212-3668
WORK ORDER NO: NA
LAB NO: 2176
DATE SAMPLED: 2/10/2021
SAMPLED BY: SY

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D2435)

INITIAL VOLUME (cu.in)	4.60	FINAL VOLUME (cu.in)	4.50
INITIAL MOISTURE CONTENT	10.0%	FINAL MOISTURE CONTENT	19.8%
INITIAL DRY DENSITY(pcf)	103.5	FINAL DRY DENSITY(pcf)	105.4
INITIAL DEGREE OF SATURATION	33%	FINAL DEGREE OF SATURATION	67%
INITIAL VOID RATIO	0.61	FINAL VOID RATIO	0.57
ESTIMATED SPECIFIC GRAVITY	2.651	SATURATED AT	0.25 tsf

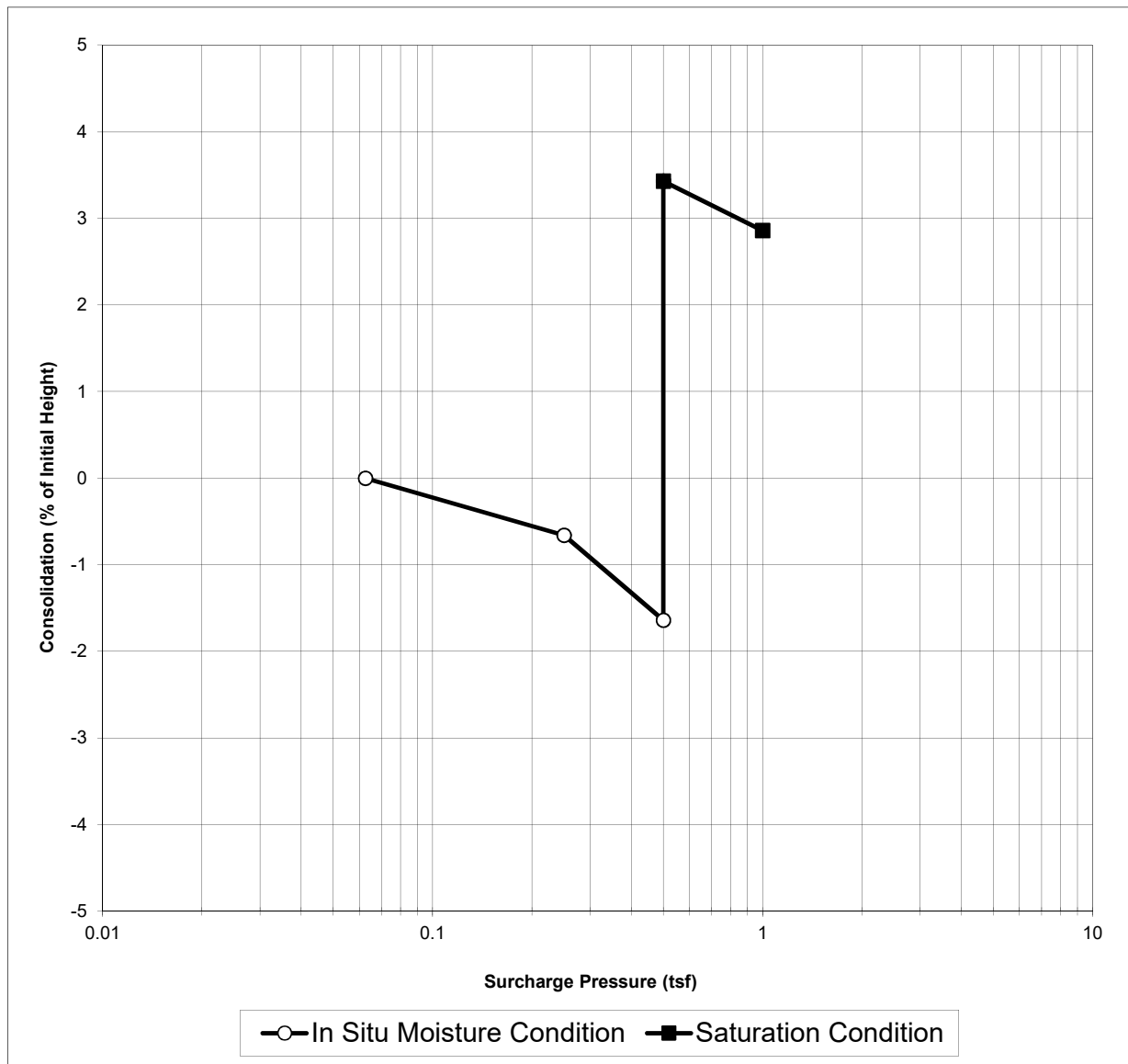


PROJECT: NHA 25 HOU - Scattered Sites
CLIENT: WHPacific, Inc.
MATERIAL: SHALE (RK)
SAMPLE SOURCE: B-13 @ 10'
SAMPLE PREP.: In Situ

JOB NO: 212-3668
WORK ORDER NO: NA
LAB NO: 2177
DATE SAMPLED: 2/10/2021
SAMPLED BY: SY

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D2435)

INITIAL VOLUME (cu.in)	4.60	FINAL VOLUME (cu.in)	4.74
INITIAL MOISTURE CONTENT	16.6%	FINAL MOISTURE CONTENT	20.1%
INITIAL DRY DENSITY(pcf)	106.9	FINAL DRY DENSITY(pcf)	103.4
INITIAL DEGREE OF SATURATION	58%	FINAL DEGREE OF SATURATION	66%
INITIAL VOID RATIO	0.56	FINAL VOID RATIO	0.60
ESTIMATED SPECIFIC GRAVITY	2.651	SATURATED AT	0.5 tsf

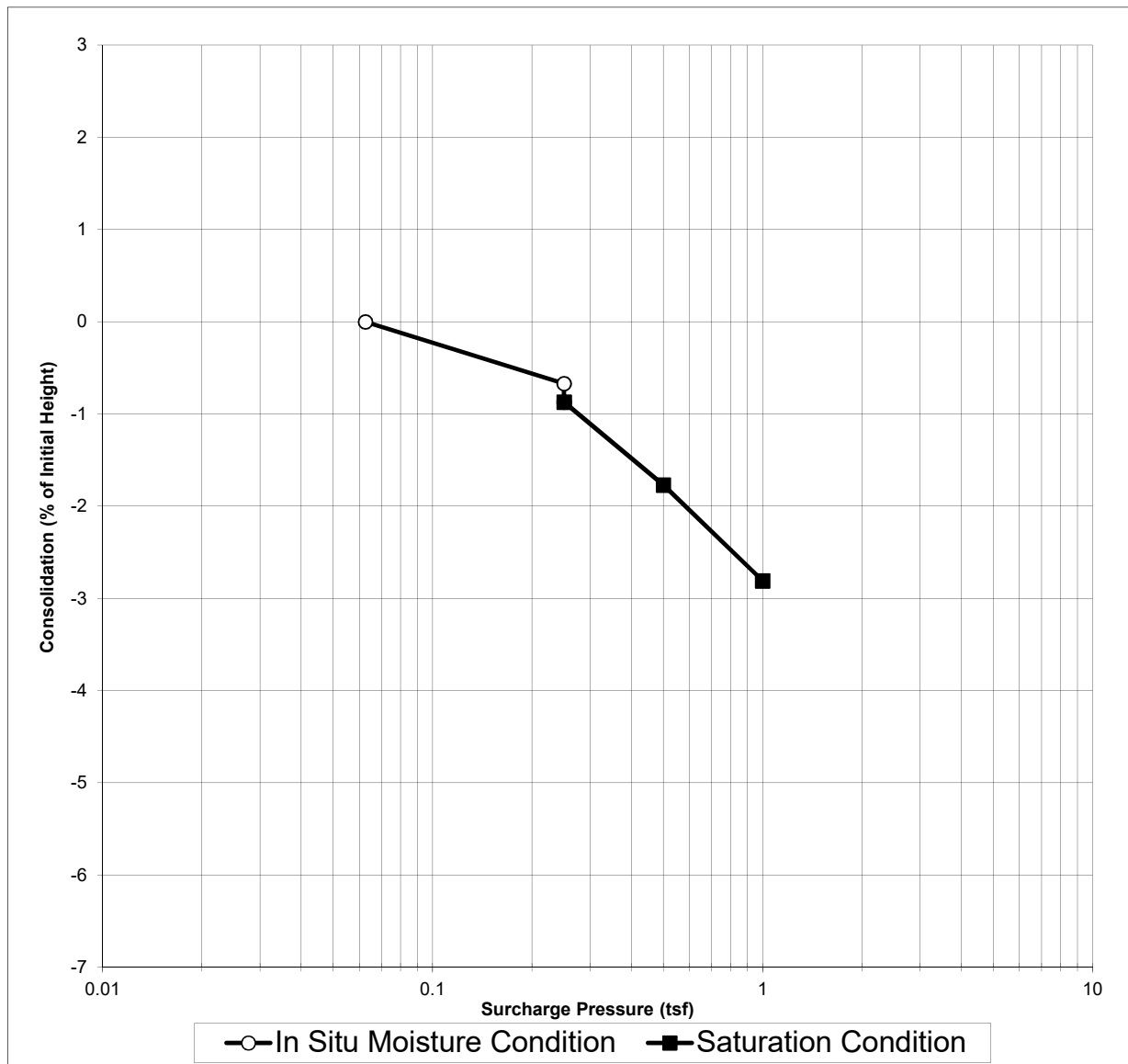


PROJECT: NHA 25 HOU - Scattered Sites
CLIENT: WHPacific, Inc.
MATERIAL: Clayey SAND (SC)
SAMPLE SOURCE: B-16 @ 2.5'
SAMPLE PREP.: In Situ

JOB NO: 212-3668
WORK ORDER NO: NA
LAB NO: 2181
DATE SAMPLED: 2/10/2021
SAMPLED BY: SY

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D2435)

INITIAL VOLUME (cu.in)	4.60	FINAL VOLUME (cu.in)	4.48
INITIAL MOISTURE CONTENT	4.4%	FINAL MOISTURE CONTENT	14.8%
INITIAL DRY DENSITY(pcf)	111.6	FINAL DRY DENSITY(pcf)	114.3
INITIAL DEGREE OF SATURATION	17%	FINAL DEGREE OF SATURATION	60%
INITIAL VOID RATIO	0.49	FINAL VOID RATIO	0.45
ESTIMATED SPECIFIC GRAVITY	2.651	SATURATED AT	0.25 tsf

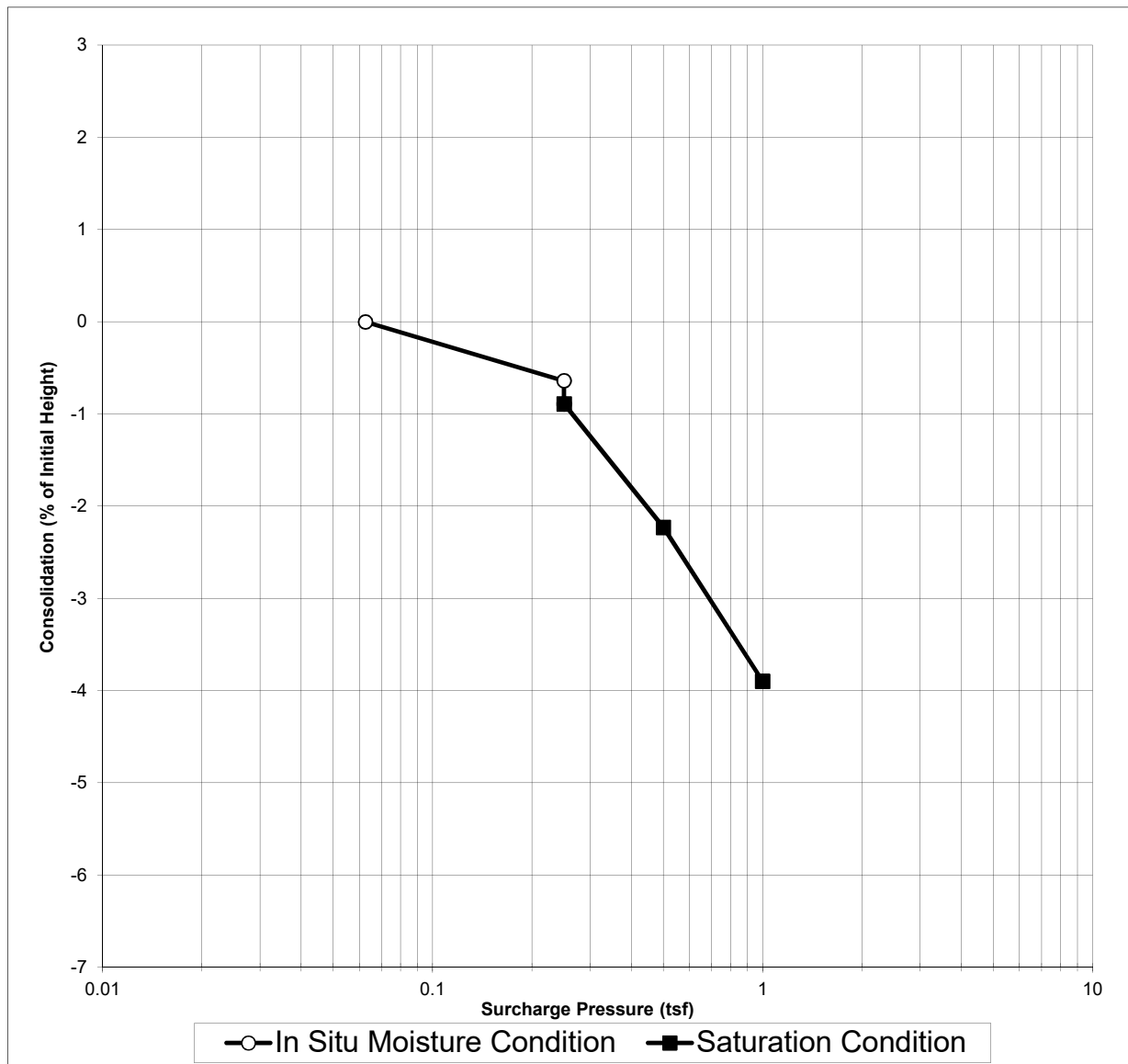


PROJECT: NHA 25 HOU - Scattered Sites
CLIENT: WHPacific, Inc.
MATERIAL: Clayey SAND (SC)
SAMPLE SOURCE: B-17 @ 2.5'
SAMPLE PREP.: In Situ

JOB NO: 212-3668
WORK ORDER NO: NA
LAB NO: 2184
DATE SAMPLED: 2/11/2021
SAMPLED BY: SY

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D2435)

INITIAL VOLUME (cu.in)	4.60	FINAL VOLUME (cu.in)	4.42
INITIAL MOISTURE CONTENT	4.4%	FINAL MOISTURE CONTENT	15.5%
INITIAL DRY DENSITY(pcf)	111.2	FINAL DRY DENSITY(pcf)	115.2
INITIAL DEGREE OF SATURATION	17%	FINAL DEGREE OF SATURATION	64%
INITIAL VOID RATIO	0.49	FINAL VOID RATIO	0.44
ESTIMATED SPECIFIC GRAVITY	2.651	SATURATED AT	0.25 tsf

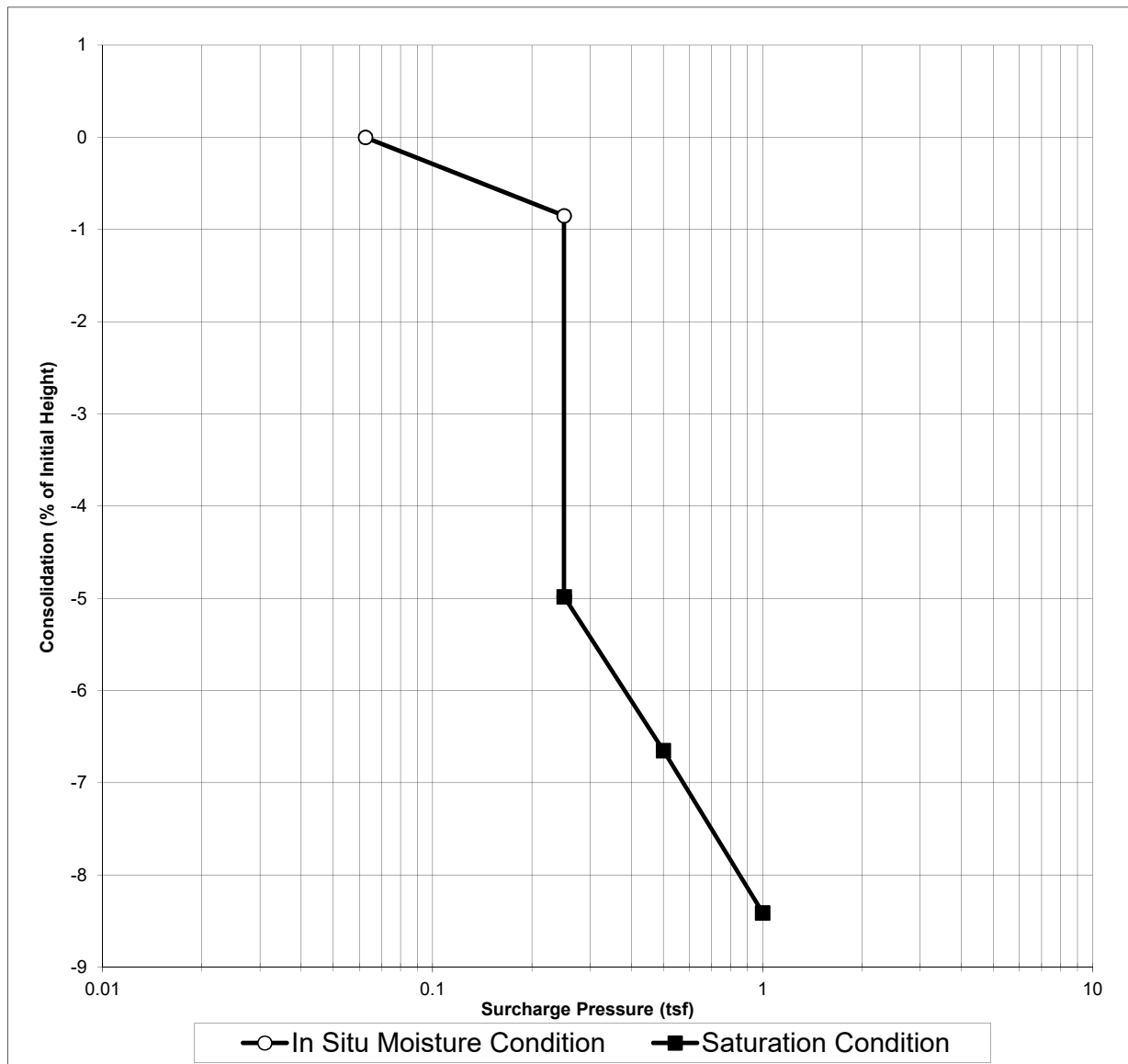


PROJECT: NHA 25 HOU - Scattered Sites
CLIENT: WHPacific, Inc.
MATERIAL: Silty, Clayey SAND (SC-SM)
SAMPLE SOURCE: B-18 @ 2.5'
SAMPLE PREP.: In Situ

JOB NO: 212-3668
WORK ORDER NO: NA
LAB NO: 2186
DATE SAMPLED: 2/11/2021
SAMPLED BY: SY

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D2435)

INITIAL VOLUME (cu.in)	4.60	FINAL VOLUME (cu.in)	4.22
INITIAL MOISTURE CONTENT	4.3%	FINAL MOISTURE CONTENT	21.2%
INITIAL DRY DENSITY(pcf)	88.3	FINAL DRY DENSITY(pcf)	96.0
INITIAL DEGREE OF SATURATION	11%	FINAL DEGREE OF SATURATION	60%
INITIAL VOID RATIO	0.88	FINAL VOID RATIO	0.72
ESTIMATED SPECIFIC GRAVITY	2.651	SATURATED AT	0.25 tsf

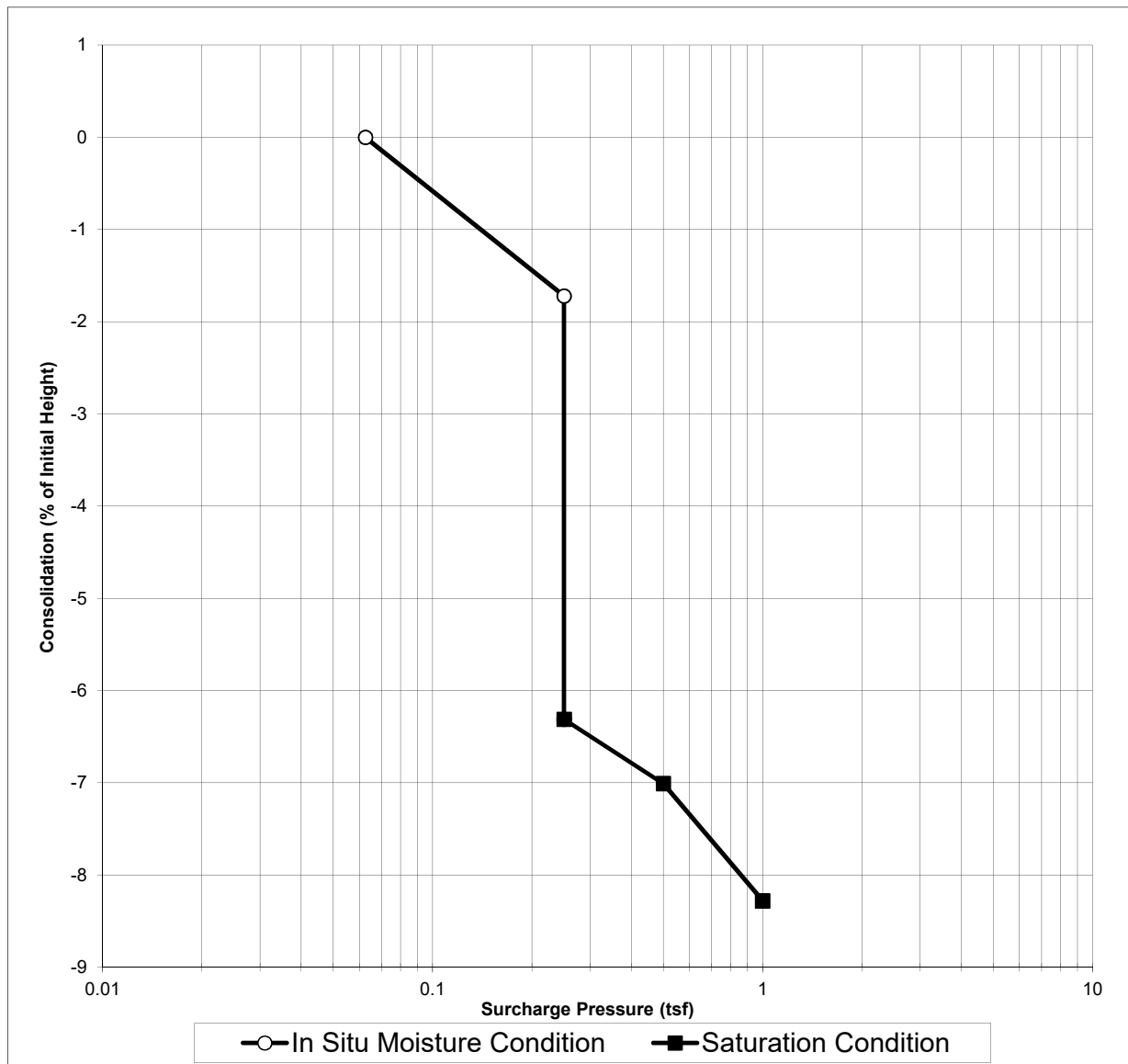


PROJECT: NHA 25 HOU - Scattered Sites
CLIENT: WHPacific, Inc.
MATERIAL: Silty SAND (SM)
SAMPLE SOURCE: B-19 @ 2.5'
SAMPLE PREP.: In Situ

JOB NO: 212-3668
WORK ORDER NO: NA
LAB NO: 2189
DATE SAMPLED: 2/11/2021
SAMPLED BY: SY

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D2435)

INITIAL VOLUME (cu.in)	4.60	FINAL VOLUME (cu.in)	4.22
INITIAL MOISTURE CONTENT	3.4%	FINAL MOISTURE CONTENT	17.3%
INITIAL DRY DENSITY(pcf)	108.4	FINAL DRY DENSITY(pcf)	117.6
INITIAL DEGREE OF SATURATION	12%	FINAL DEGREE OF SATURATION	75%
INITIAL VOID RATIO	0.53	FINAL VOID RATIO	0.41
ESTIMATED SPECIFIC GRAVITY	2.651	SATURATED AT	0.25 tsf

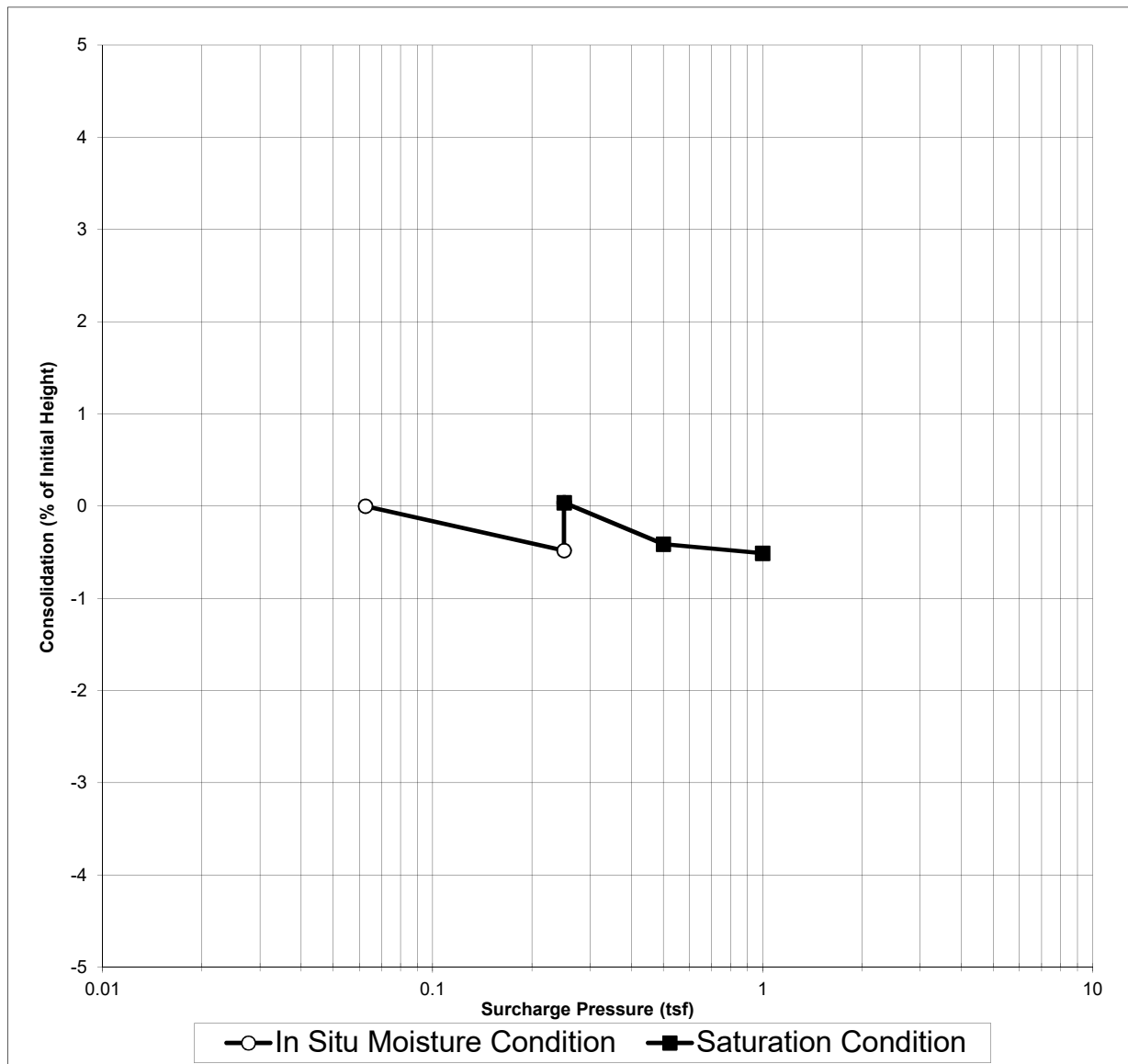


PROJECT: NHA 25 HOU - Scattered Sites
CLIENT: WHPacific, Inc.
MATERIAL: Silty, Clayey SAND (SC-SM)
SAMPLE SOURCE: B-20 @ 2.5'
SAMPLE PREP.: In Situ

JOB NO: 212-3668
WORK ORDER NO: NA
LAB NO: 2192
DATE SAMPLED: 2/10/2021
SAMPLED BY: SY

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D2435)

INITIAL VOLUME (cu.in)	4.60	FINAL VOLUME (cu.in)	4.58
INITIAL MOISTURE CONTENT	5.6%	FINAL MOISTURE CONTENT	19.4%
INITIAL DRY DENSITY(pcf)	103.4	FINAL DRY DENSITY(pcf)	103.4
INITIAL DEGREE OF SATURATION	18%	FINAL DEGREE OF SATURATION	64%
INITIAL VOID RATIO	0.61	FINAL VOID RATIO	0.60
ESTIMATED SPECIFIC GRAVITY	2.651	SATURATED AT	0.25 tsf

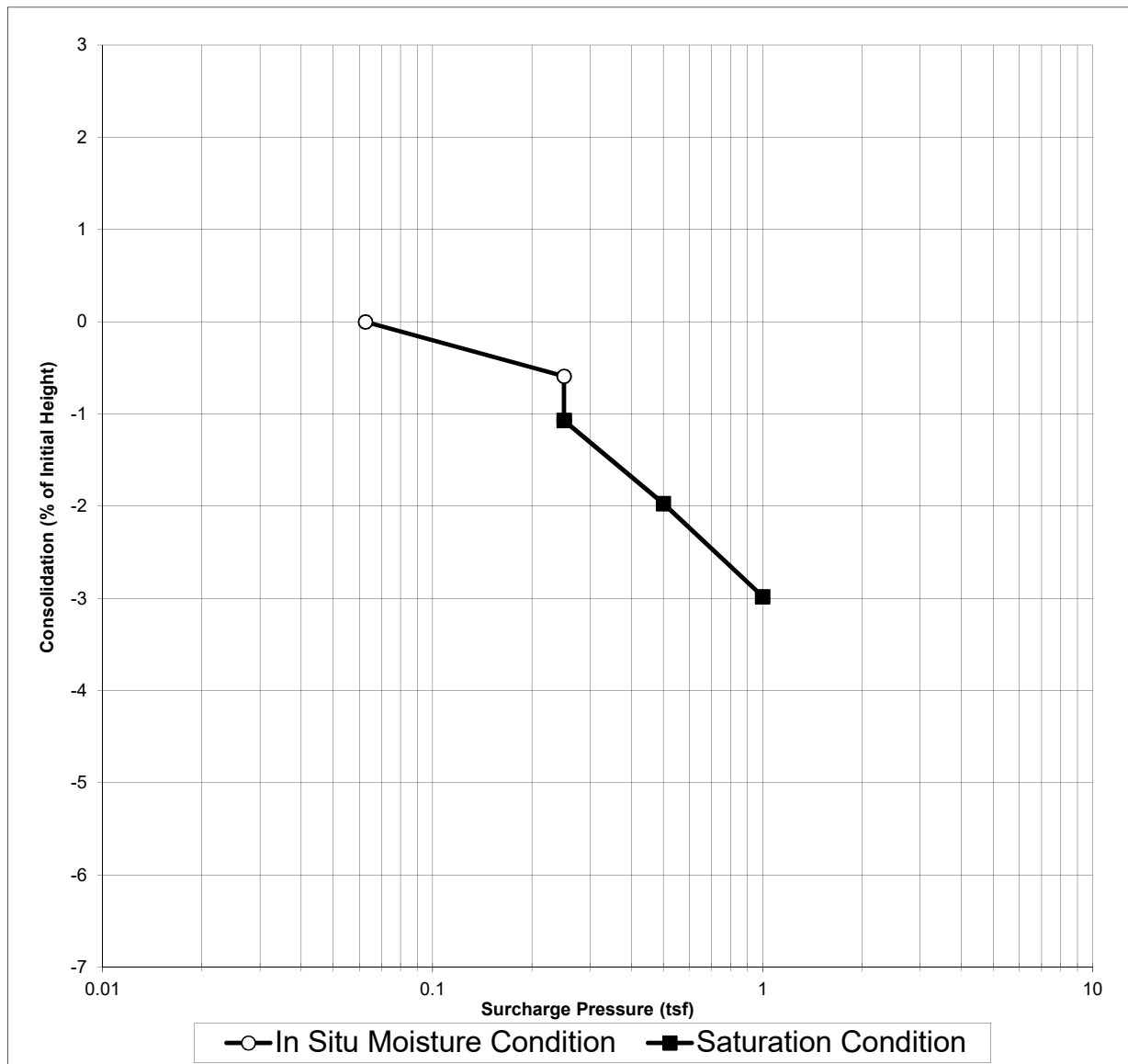


PROJECT: NHA 25 HOU - Scattered Sites
CLIENT: WHPacific, Inc.
MATERIAL: Silty SAND (SM)
SAMPLE SOURCE: B-21 @ 2.5'
SAMPLE PREP.: In Situ

JOB NO: 212-3668
WORK ORDER NO: NA
LAB NO: 2195
DATE SAMPLED: 2/11/2021
SAMPLED BY: SY

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D2435)

INITIAL VOLUME (cu.in)	4.60	FINAL VOLUME (cu.in)	4.47
INITIAL MOISTURE CONTENT	3.4%	FINAL MOISTURE CONTENT	22.6%
INITIAL DRY DENSITY(pcf)	97.0	FINAL DRY DENSITY(pcf)	99.5
INITIAL DEGREE OF SATURATION	10%	FINAL DEGREE OF SATURATION	69%
INITIAL VOID RATIO	0.71	FINAL VOID RATIO	0.66
ESTIMATED SPECIFIC GRAVITY	2.651	SATURATED AT	0.25 tsf

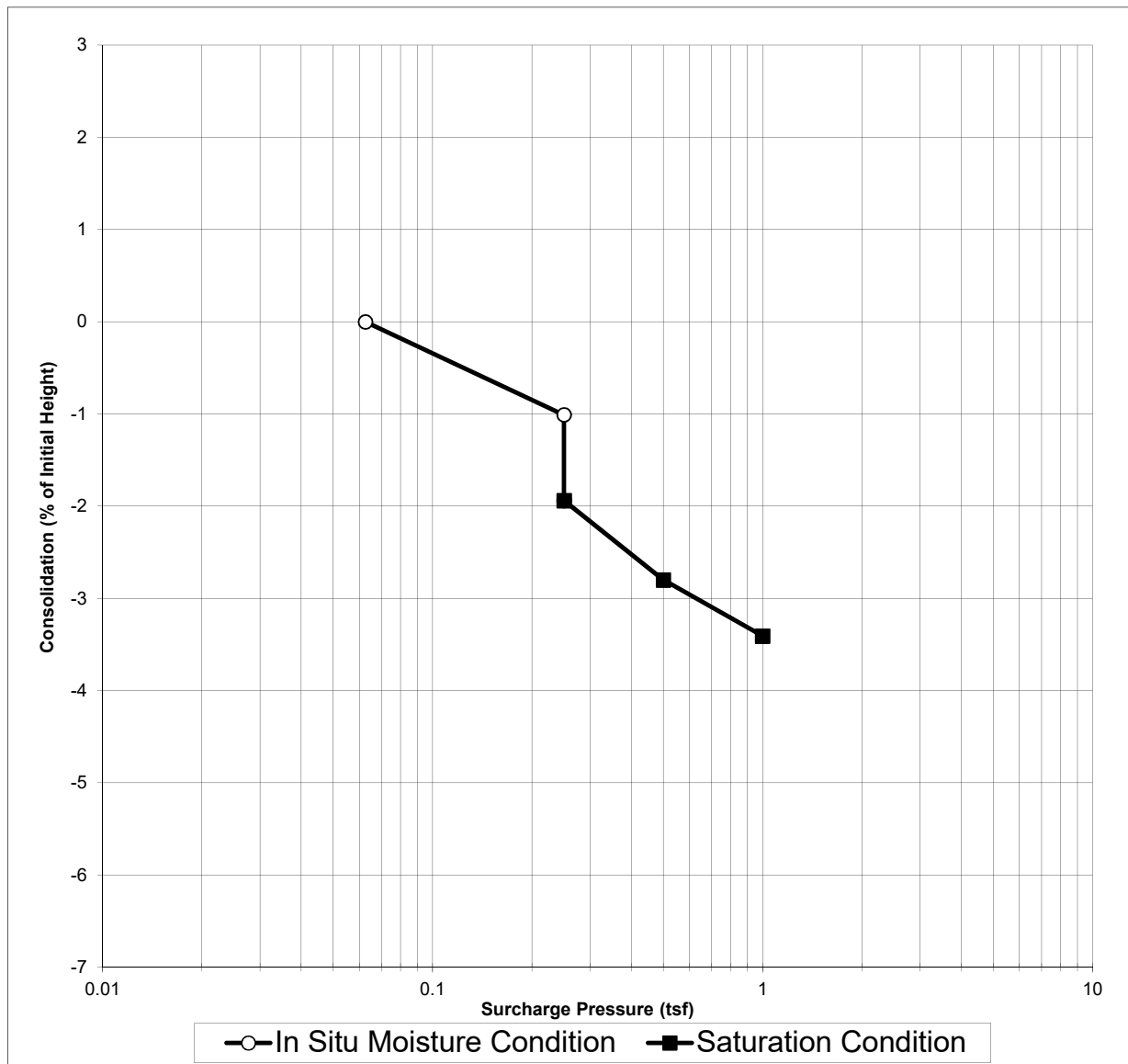


PROJECT: NHA 25 HOU - Scattered Sites
CLIENT: WHPacific, Inc.
MATERIAL: Silty, Clayey SAND (SC-SM)
SAMPLE SOURCE: B-23 @ 2.5'
SAMPLE PREP.: In Situ

JOB NO: 212-3668
WORK ORDER NO: NA
LAB NO: 2199
DATE SAMPLED: 2/12/2021
SAMPLED BY: SY

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D2435)

INITIAL VOLUME (cu.in)	4.60	FINAL VOLUME (cu.in)	4.45
INITIAL MOISTURE CONTENT	4.0%	FINAL MOISTURE CONTENT	18.4%
INITIAL DRY DENSITY(pcf)	105.1	FINAL DRY DENSITY(pcf)	108.3
INITIAL DEGREE OF SATURATION	13%	FINAL DEGREE OF SATURATION	66%
INITIAL VOID RATIO	0.58	FINAL VOID RATIO	0.53
ESTIMATED SPECIFIC GRAVITY	2.651	SATURATED AT	0.25 tsf

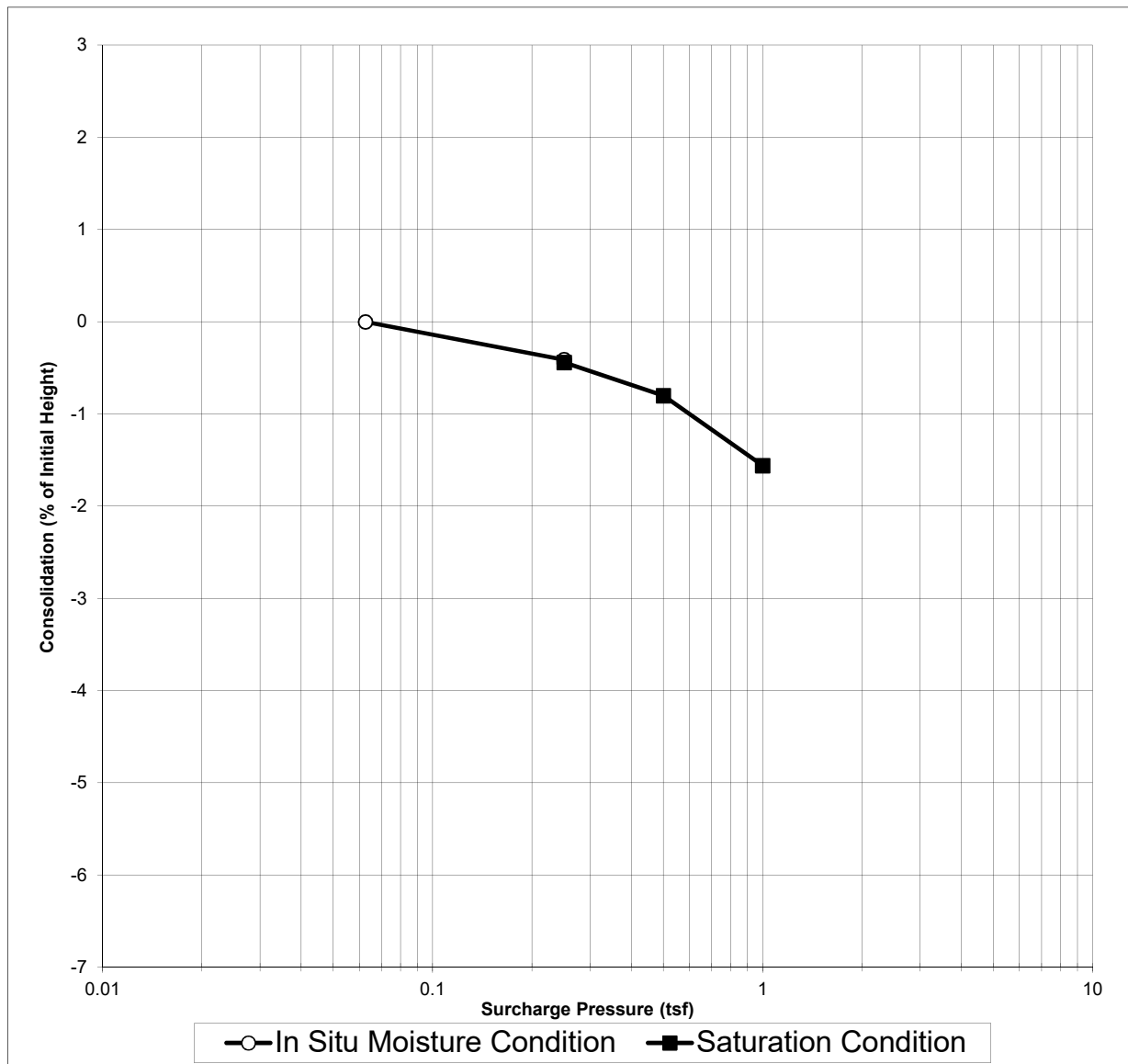


PROJECT: NHA 25 HOU - Scattered Sites
CLIENT: WHPacific, Inc.
MATERIAL: Silty SAND (SM)
SAMPLE SOURCE: B-24 @ 2.5'
SAMPLE PREP.: In Situ

JOB NO: 212-3668
WORK ORDER NO: NA
LAB NO: 2201
DATE SAMPLED: 2/12/2021
SAMPLED BY: SY

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D2435)

INITIAL VOLUME (cu.in)	4.60	FINAL VOLUME (cu.in)	4.53
INITIAL MOISTURE CONTENT	6.4%	FINAL MOISTURE CONTENT	21.0%
INITIAL DRY DENSITY(pcf)	100.3	FINAL DRY DENSITY(pcf)	101.4
INITIAL DEGREE OF SATURATION	20%	FINAL DEGREE OF SATURATION	66%
INITIAL VOID RATIO	0.66	FINAL VOID RATIO	0.63
ESTIMATED SPECIFIC GRAVITY	2.651	SATURATED AT	0.25 tsf

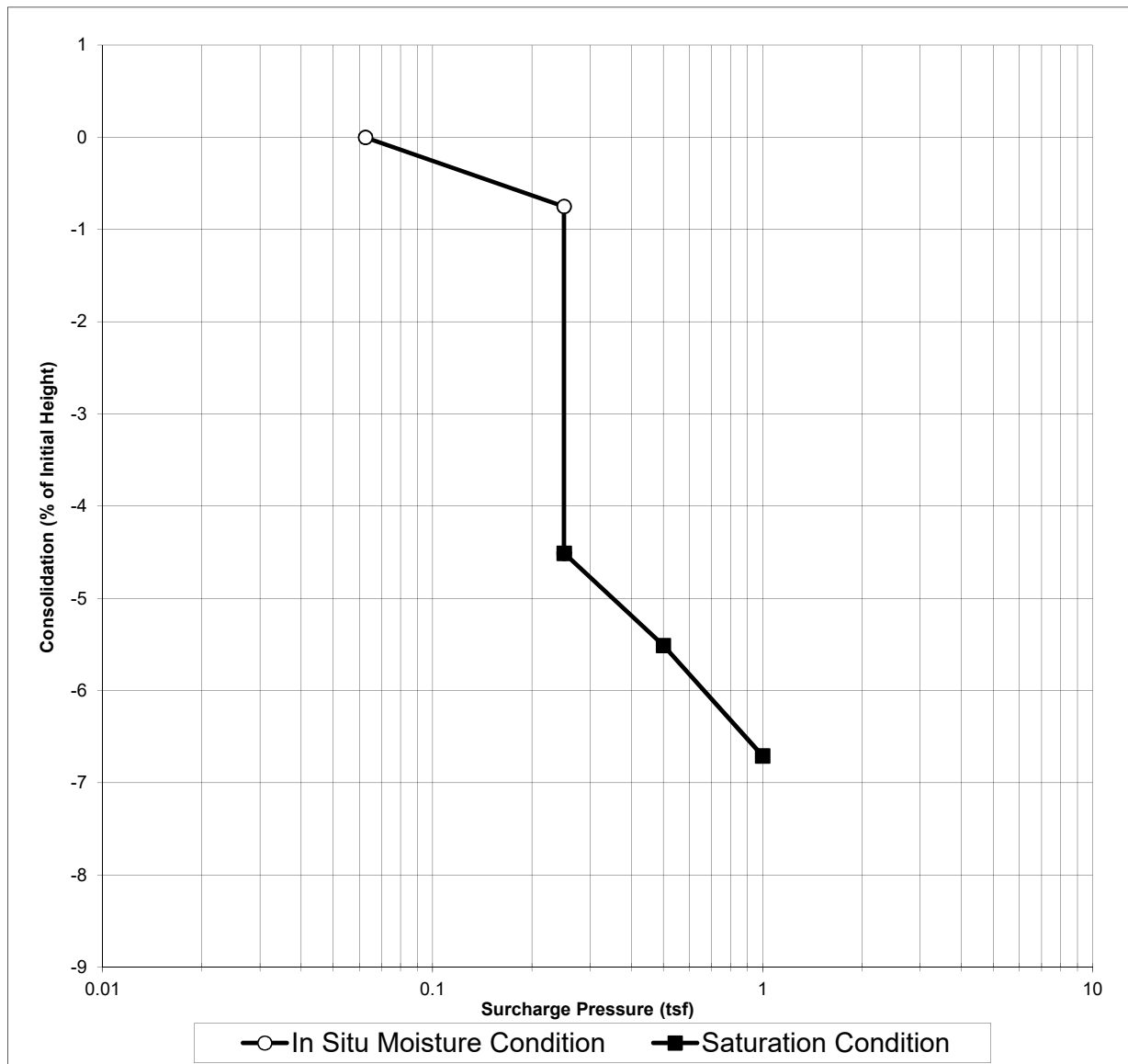


PROJECT: NHA 25 HOU - Scattered Sites
CLIENT: WHPacific, Inc.
MATERIAL: Poorly graded SAND (SP)
SAMPLE SOURCE: B-25 @ 2.5'
SAMPLE PREP.: In Situ

JOB NO: 212-3668
WORK ORDER NO: NA
LAB NO: 2273
DATE SAMPLED: 2/19/2021
SAMPLED BY: SY

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D2435)

INITIAL VOLUME (cu.in)	4.60	FINAL VOLUME (cu.in)	4.30
INITIAL MOISTURE CONTENT	3.3%	FINAL MOISTURE CONTENT	19.2%
INITIAL DRY DENSITY(pcf)	96.4	FINAL DRY DENSITY(pcf)	102.9
INITIAL DEGREE OF SATURATION	10%	FINAL DEGREE OF SATURATION	62%
INITIAL VOID RATIO	0.72	FINAL VOID RATIO	0.61
ESTIMATED SPECIFIC GRAVITY	2.651	SATURATED AT	0.25 tsf



LABORATORY TESTING PROCEDURES

Laboratory testing is performed by trained personnel in our accredited laboratory or may be subcontracted by GEOMAT through a qualified outside laboratory if necessary. Actual types and quantities of tests performed for any project will be dependent upon subsurface conditions encountered and specific design requirements.

The following is an abbreviated table of laboratory testing that may be performed by GEOMAT with the applicable standards listed. Testing for a specific project may include all or a selected subset of the laboratory work listed. Laboratory testing beyond those listed may be available and could be incorporated into the project scope at the discretion of GEOMAT.

PROCEDURE	ASTM	AASHTO
Moisture Content	ASTM D2216	AASHTO T 265
Sieve Analysis	ASTM C136	AASHTO T 27
Fines Content	ASTM D1140	T 11
Hydrometer	ASTM D422	T 88
Atterberg Limits	ASTM D4318	AASHTO T 89/T 90
Soil Compression/Expansion	ASTM D2435	T 216
Soil Classification	ASTM D2487	M 145
Direct Shear	ASTM D3080	T 236
Unconfined Compressive Strength of Soils	ASTM D2166	T 208
Unconfined Compressive Strength of Rock Cores	ASTM D4543	-

Appendix C

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer

will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the “Findings” Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site’s subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual site-wide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report’s Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals’ misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals’ plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note*

conspicuously that you’ve included the material for information purposes only. To avoid misunderstanding, you may also want to note that “informational purposes” means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled “limitations,” many of these provisions indicate where geotechnical engineers’ responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a “phase-one” or “phase-two” environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer’s services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer’s recommendations will not of itself be sufficient to prevent moisture infiltration.* **Confront the risk of moisture infiltration** by including building-envelope or mold specialists on the design team. **Geotechnical engineers are not building-envelope or mold specialists.**



Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

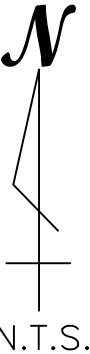
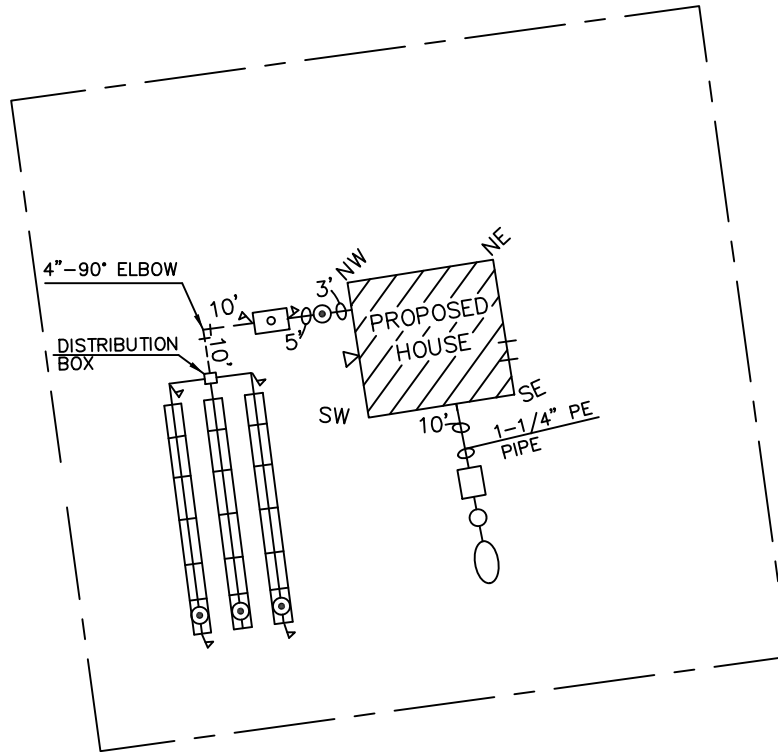
APPENDIX E

PROPOSED INDIVIUAL INSTALLATION PROVIDED
BY NHA
(FOR INFORMATON ONLY)

(PLAN VIEW – NORTH ARROW REQUIRED)

NOTE

CONTRACTOR IS TO REFER TO THE PROJECT CONSTRUCTION DESIGN PLANS FOR THE DRAIN FIELD SYSTEM.



ITEM DESCRIPTION	MATERIALS			ITEM DESCRIPTION	MATERIALS		
	LEGEND	SIZE	TYPE		LEGEND	SIZE	TYPE
WATERLINE TAP				WATERLINE, PROPOSED	-- W --		
VALVE, GATE				WATERLINE, EXISTING	— W —		
VALVE, CURB STOP				SEWERLINE, PROPOSED	-- S --	4"	PVC
WATER METER				SEWERLINE, EXISTING	— S —		
WATER METER W/ IND PRV				PROPOSED TIE INFORMATION			
VALVE, DOMESTIC STOP				LOCATION: Dilkon, AZ.			
CISTERN TANK		1000GAL	PE	SYSTEM: Dilkon, AZ.			
CLEAN-OUT(S)		4"	PVC	PROJECT NO:	SHT. 01 OF 01 SHTS.		
SEPTIC TANK		1000GAL	PE	DRAWN BY: M.T.	DATE: April 11, 2019		
INFILTRATORS		3'X4'	HDPE	PROPOSED START DATE: 3-Days Advance Notice			
DWELLING/OTHER BLDGS							

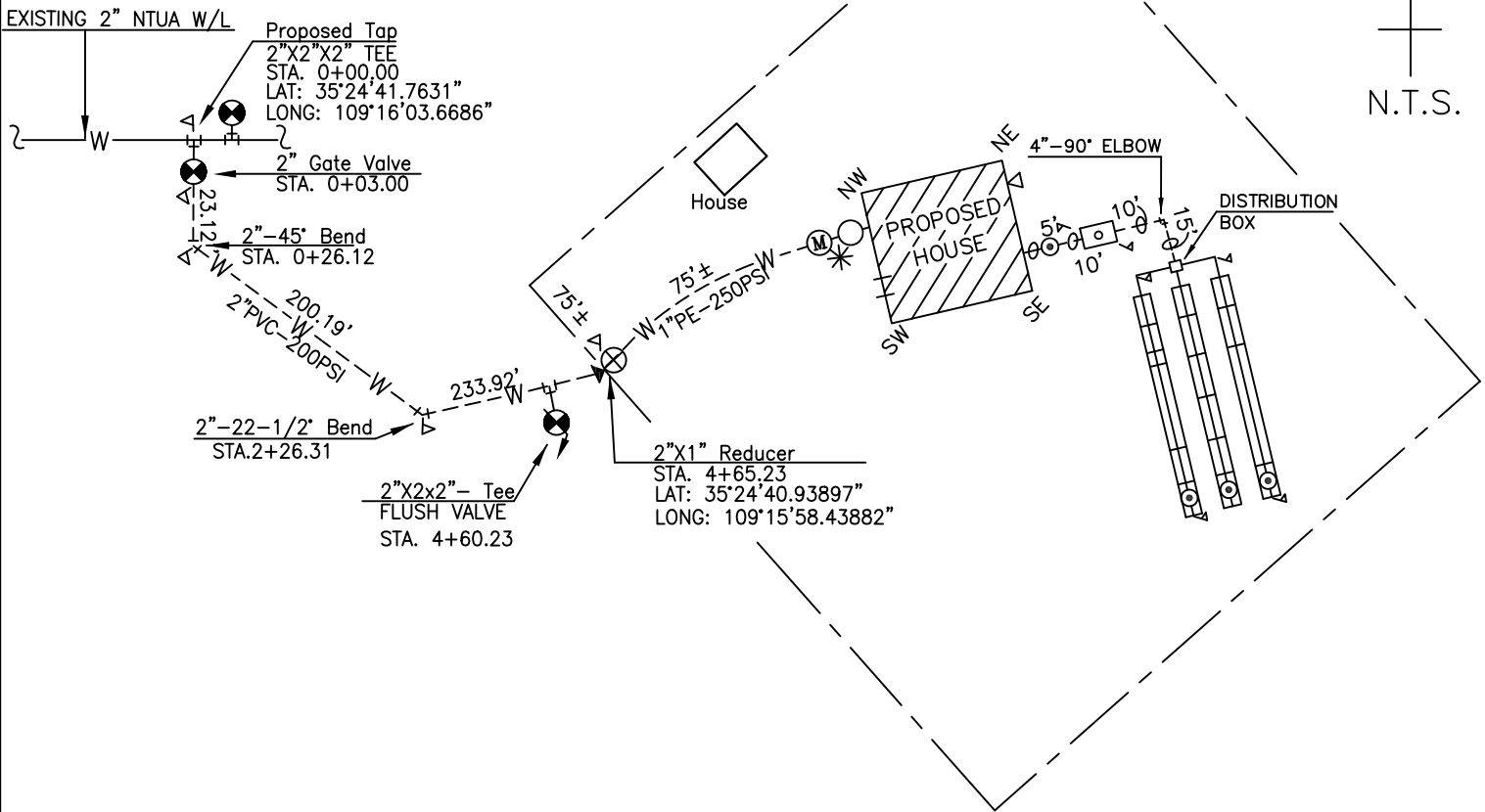
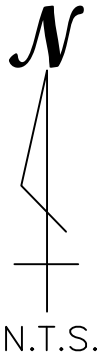
TITLE: SCATTERED PROJECT – PROPOSED INDIVIDUAL INSTALLATION SHEET 4 OF 6

Customer' Name & Location:
Tanya Chiquito, Dilkon, AZ.

SAP Project No.
AZ 12-404/NM 15-404 – SITE NO. 2

Designed by:	Drawn By:	Appr. Engr:	Exhibit no.		Scale: N.T.S.
Date:	Date:	Rev. Date: 5/06	NTUA STANDARD NO. WS-1d		ACAD File Name: WS-1_PTT-06.DWG

(PLAN VIEW - NORTH ARROW REQUIRED)



NOTE
 CONTRACTOR WILL BE RESPONSIBLE TO
 VERIFY REQUIRED DRAIN FIELD AREA.

ITEM DESCRIPTION	MATERIALS			ITEM DESCRIPTION	MATERIALS		
	LEGEND	SIZE	TYPE		LEGEND	SIZE	TYPE
WATERLINE TAP		2"X2"	TEE	WATERLINE, PROPOSED	-- W --	2"	PVC
VALVE, GATE		2"		WATERLINE, EXISTING	— W —	2"	PVC
VALVE, CURB STOP		1"	BRASS	SEWERLINE, PROPOSED	-- S --	4"	PVC
WATER METER				SEWERLINE, EXISTING	— S —		
WATER METER W/ IND PRV		COPPER SETTER	5/8"X3/4"	PROPOSED TIE INFORMATION			
VALVE, DOMESTIC STOP		1"	BRASS				
YARD HYDRANT				LOCATION: Pine Springs, AZ.			
CLEAN-OUT(S)		4"	PVC	SYSTEM: Pine Springs, AZ			
SEPTIC TANK		1000GAL	PE	PROJECT NO:	SHT. 01 OF 01 SHTS.		
INFILTRATORS		3'X4'	HDPE	DRAWN BY: M.T.	DATE: Revised 7-9-21		
DWELLING/OTHER BLDGS				PROPOSED START DATE: 3-Days Advance Notice			

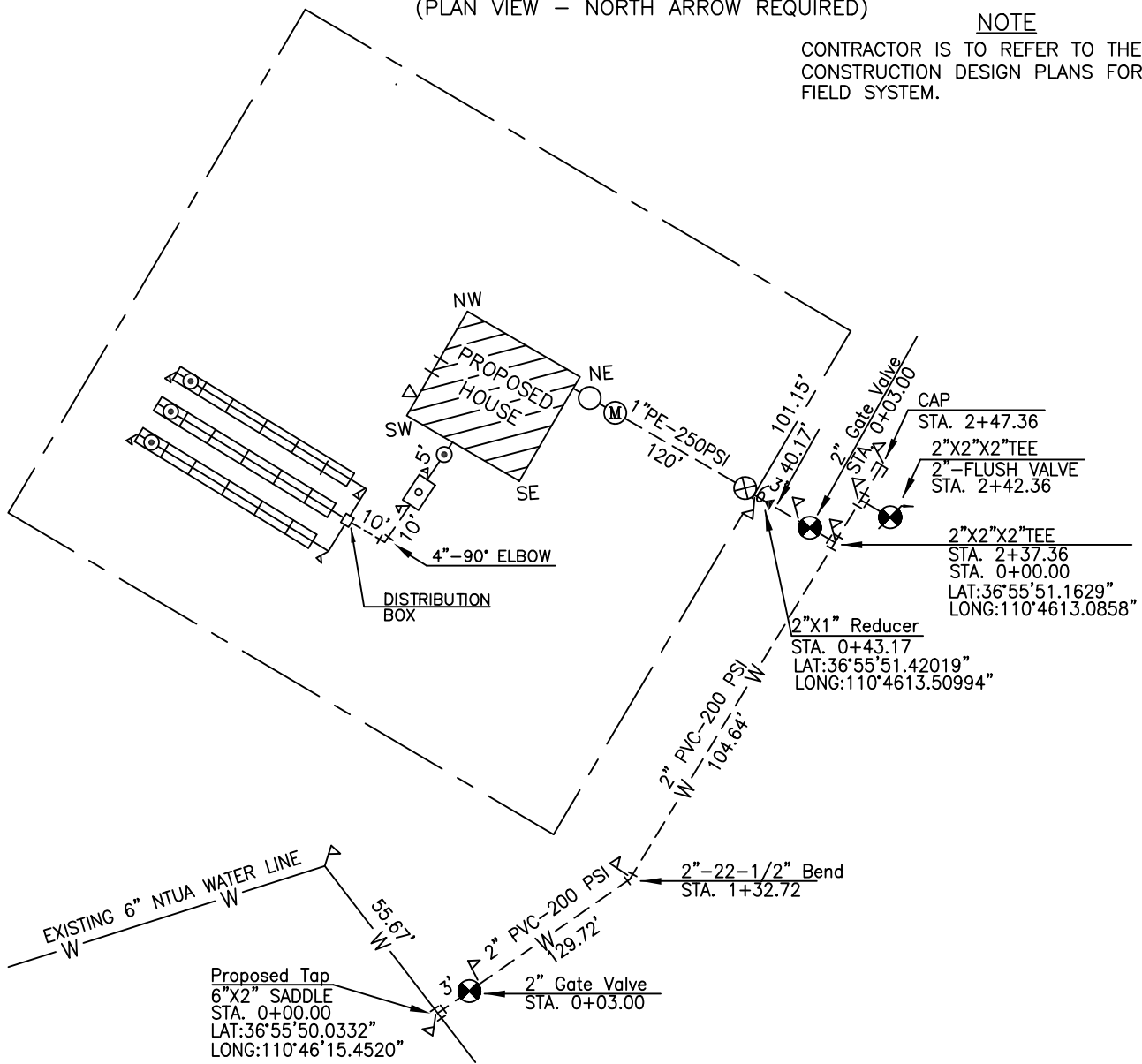
TITLE: SCATTERED PROJECT - PROPOSED INDIVIDUAL INSTALLATION SHEET 4 OF 6

Customer' Name & Location: Maggie A. Freeman - Pine Springs, AZ			SAP Project No. AZ 12-404/NM 15-404 - SITE NO. 3		
Designed by:	Drawn By:	Appr. Engr:	Exhibit no.		
Date:	Date:	Rev. Date: 5/06	NTUA STANDARD NO. WS-1d		
			Scale: N.T.S.		ACAD File Name: WS-1_PTT-06.DWG

(PLAN VIEW - NORTH ARROW REQUIRED)

NOTE

CONTRACTOR IS TO REFER TO THE PROJECT CONSTRUCTION DESIGN PLANS FOR THE DRAIN FIELD SYSTEM.

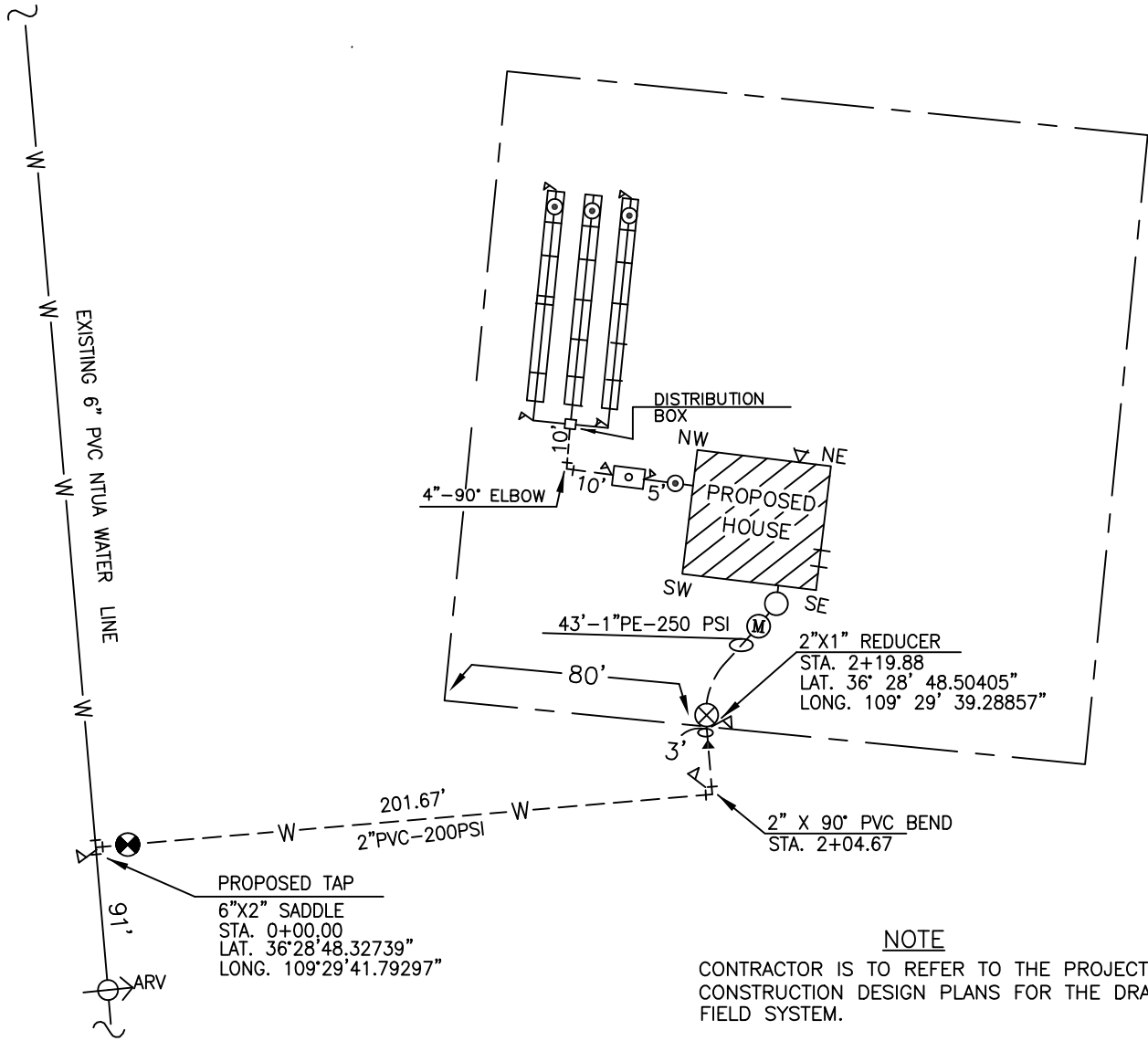


ITEM DESCRIPTION	MATERIALS			ITEM DESCRIPTION	MATERIALS		
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WATERLINE TAP		6"X2"	SADDLE	WATERLINE, PROPOSED	-- W --	2"	PVC
VALVE, GATE		2"		WATERLINE, EXISTING	— W —	6"	PVC
VALVE, CURB STOP		1"	BRASS	SEWERLINE, PROPOSED	-- S --	4"	PVC
WATER METER		5/8"X3/4"	COPPER SETTER	SEWERLINE, EXISTING	— S —		
WATER METER W/ IND PRV				PROPOSED TIE INFORMATION			
VALVE, DOMESTIC STOP		1"	BRASS				
YARD HYDRANT				LOCATION: Navajo Mountain, AZ.			
CLEAN-OUT(S)		4"	PVC	SYSTEM: Navajo Mountain, AZ.			
SEPTIC TANK		1000GAL	PE	PROJECT NO:	SHT. 01 OF 01 SHTS.		
INFILTRATORS		3'X4'	HDPE	DRAWN BY: M.T.	DATE: Revised 7-9-21		
DWELLING/OTHER BLDGS				PROPOSED START DATE: 3-Days Advance Notice			

TITLE: SCATTERED PROJECT - PROPOSED INDIVIDUAL INSTALLATION SHEET 4 OF 6

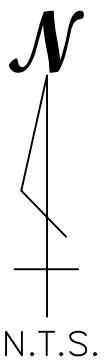
Customer' Name & Location: Ray Tom & Lena Tomasyo-Navajo Mountain, AZ.			SAP Project No. AZ 12-404/NM 15-404 - SITE NO. 8		
Designed by:	Drawn By:	Appr. Engr:	Exhibit no.		
Date:	Date:	Rev. Date: 5/06	NTUA STANDARD NO. WS-1d		
			Scale: N.T.S.		ACAD File Name: WS-1_PTT-06.DWG

(PLAN VIEW - NORTH ARROW REQUIRED)



NOTE

CONTRACTOR IS TO REFER TO THE PROJECT CONSTRUCTION DESIGN PLANS FOR THE DRAIN FIELD SYSTEM.



ITEM DESCRIPTION	MATERIALS			ITEM DESCRIPTION	MATERIALS		
	LEGEND	SIZE	TYPE		LEGEND	SIZE	TYPE
WATERLINE TAP		6"x2"	SADDLE	WATERLINE, PROPOSED	-- W --	1" & 2"	PE & PVC
VALVE, GATE				WATERLINE, EXISTING	— W —	6"	PVC
VALVE, CURB STOP		1"	BRASS	SEWERLINE, PROPOSED	-- S --	4"	PVC
WATER METER		5/8"x3/4"	COPPER SETTER	SEWERLINE, EXISTING	— S —		
WATER METER W/ IND PRV				PROPOSED TIE INFORMATION			
VALVE, DOMESTIC STOP		1"	BRASS				
YARD HYDRANT				LOCATION: Round Rock, AZ.			
CLEAN-OUT(S)		4"	PVC	SYSTEM: Round Rock, AZ.			
SEPTIC TANK		1000GAL	PE	PROJECT NO:	SHT. 01 OF 01 SHTS.		
INFILTRATORS		3'x4'	HDPE	DRAWN BY: M.T.	DATE: Revised: 7-9-21		
DWELLING/OTHER BLDGS				PROPOSED START DATE: 3-Days Advance Notice			

TITLE: SCATTERED PROJECT - PROPOSED INDIVIDUAL INSTALLATION SHEET 4 OF 6

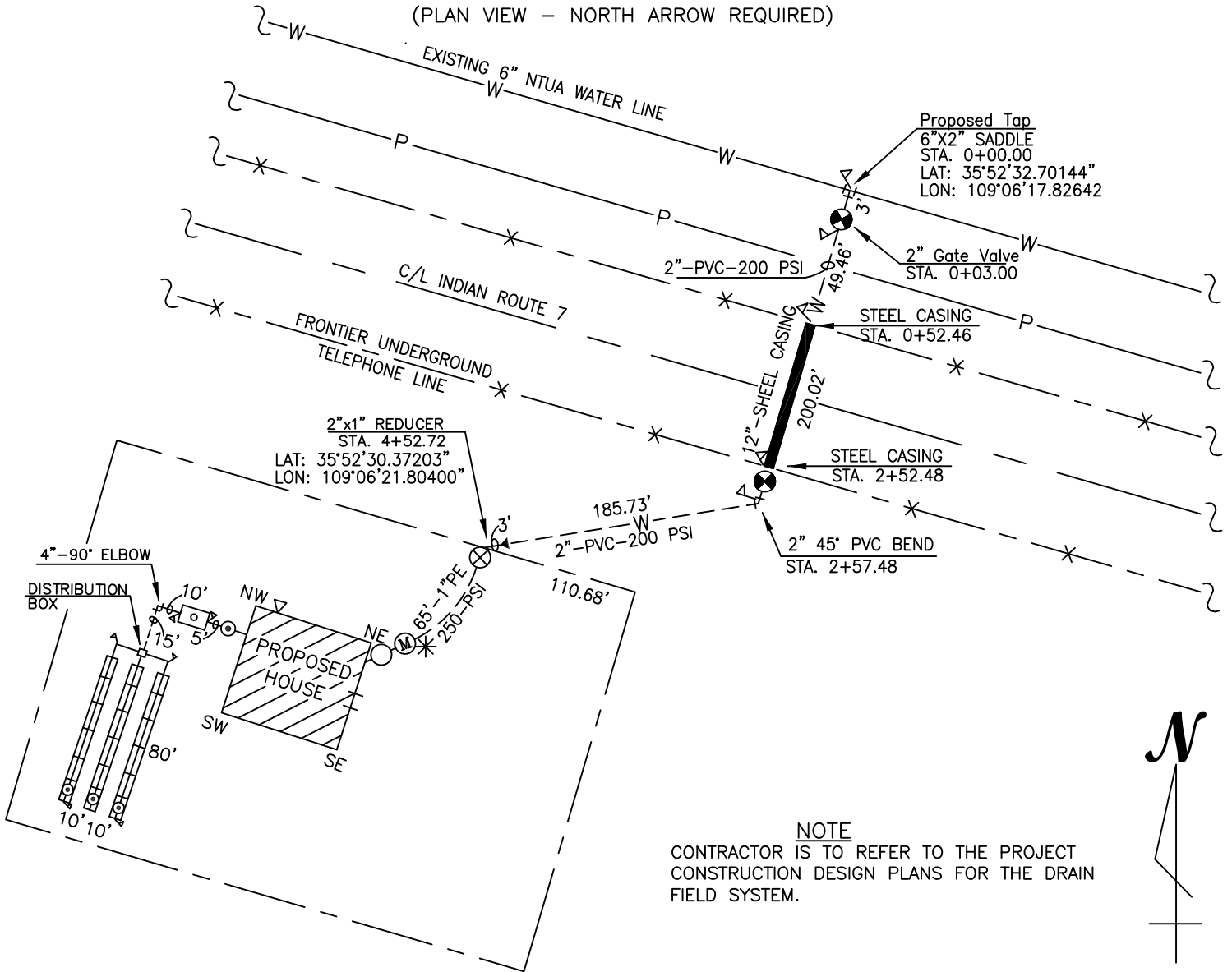
Customer' Name & Location: Bertha Rae Wheeler, Round Rock, AZ. SAP Project No. AZ 12-404/NM 15-404 - SITE NO. 10.

Designed by: _____ Drawn By: _____ Appr. Engr: _____ Exhibit no. _____
 Date: _____ Date: _____ Rev. Date: 5/06 NTUA STANDARD NO. WS-1d

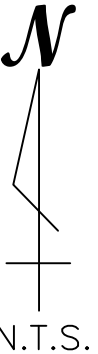


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(PLAN VIEW - NORTH ARROW REQUIRED)



NOTE
 CONTRACTOR IS TO REFER TO THE PROJECT
 CONSTRUCTION DESIGN PLANS FOR THE DRAIN
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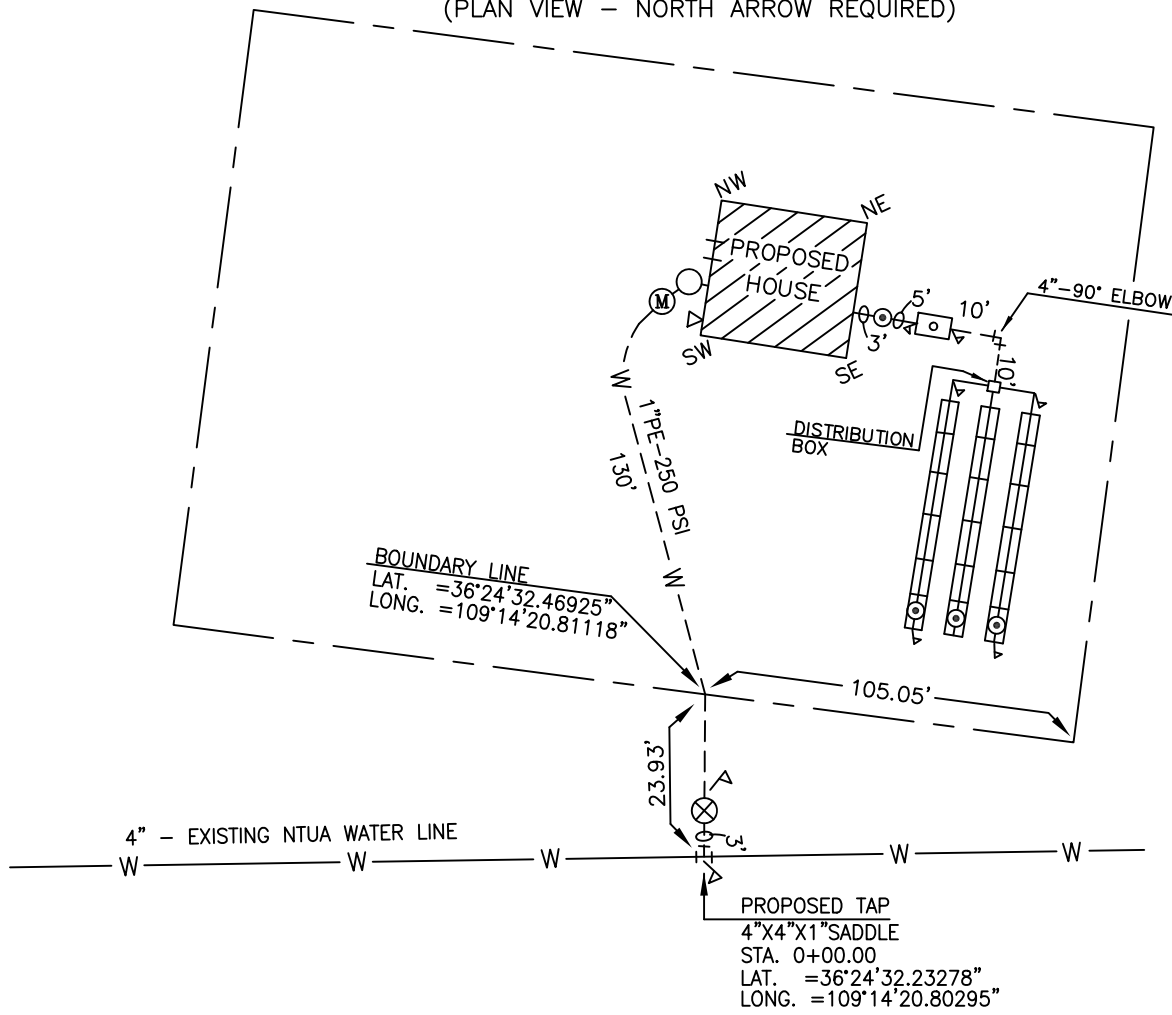


ITEM DESCRIPTION	MATERIALS			ITEM DESCRIPTION	MATERIALS		
	LEGEND	SIZE	TYPE		LEGEND	SIZE	TYPE
WATERLINE TAP		6"x6"x2"	SADDLE	WATERLINE, PROPOSED	-- W --	1"x2"	PE&PVC
VALVE, GATE		2"		WATERLINE, EXISTING	— W —	6"	PVC
VALVE, CURB STOP		1"	BRASS	SEWERLINE, PROPOSED	-- S --	4"	PVC
WATER METER		5/8"x3/4"	COPPER SETTER	SEWERLINE, EXISTING	— S —		
WATER METER W/ IND PRV				PROPOSED TIE INFORMATION			
VALVE, DOMESTIC STOP		1"	BRASS				
YARD HYDRANT				LOCATION: Sawmill, AZ.			
CLEAN-OUT(S)		4"	PVC	SYSTEM: Sawmill, AZ.			
SEPTIC TANK		1000GAL	PE	PROJECT NO:	SHT. 01 OF 01 SHTS.		
INFILTRATORS		3'x4'	HDPE	DRAWN BY: M.T.	DATE: Revised 7-9-21		
DWELLING/OTHER BLDGS				PROPOSED START DATE: 3-Days Advance Notice			

TITLE: SCATTERED PROJECT - PROPOSED INDIVIDUAL INSTALLATION SHEET 4 OF 6

Customer' Name & Location: Lionel D. & Melissa J. Jumbo, Sawmill, AZ.			SAP Project No. AZ 12-404/NM 15-404 - SITE NO. 12		
Designed by:	Drawn By:	Appr. Engr:	Exhibit no.		
Date:	Date:	Rev. Date: 5/06	NTUA STANDARD NO. WS-1d		
			Scale: N.T.S.		ACAD File Name: WS-1_PTT-06.DWG

(PLAN VIEW - NORTH ARROW REQUIRED)



NOTE

CONTRACTOR IS TO REFER TO THE PROJECT CONSTRUCTION DESIGN PLANS FOR THE DRAIN FIELD SYSTEM.

ITEM DESCRIPTION	MATERIALS			ITEM DESCRIPTION	MATERIALS		
	LEGEND	SIZE	TYPE		LEGEND	SIZE	TYPE
WATERLINE TAP		4"X4X2"	SADDLE	WATERLINE, PROPOSED	-- W --	1"	PE
VALVE, GATE				WATERLINE, EXISTING	— W —	4"	PVC
VALVE, CURB STOP		1"	BRASS	SEWERLINE, PROPOSED	-- S --	4"	PVC
WATER METER		5/8"X3/4"	COPPER SETTER	SEWERLINE, EXISTING	— S —		
WATER METER W/ IND PRV				PROPOSED TIE INFORMATION			
VALVE, DOMESTIC STOP		1"	BRASS				
YARD HYDRANT				LOCATION: Lukachukai, AZ.			
CLEAN-OUT(S)		4"	PVC	SYSTEM: Lukachukai, AZ.			
SEPTIC TANK		1000GAL	PE	PROJECT NO:	SHT. 01 OF 01 SHTS.		
INFILTRATORS		3'X4'	HDPE	DRAWN BY: M.T.	DATE: Revised: 7-9-21		
DWELLING/OTHER BLDGS				PROPOSED START DATE: 3-Days Advance Notice			

TITLE: SCATTERED PROJECT - PROPOSED INDIVIDUAL INSTALLATION SHEET 4 OF 6

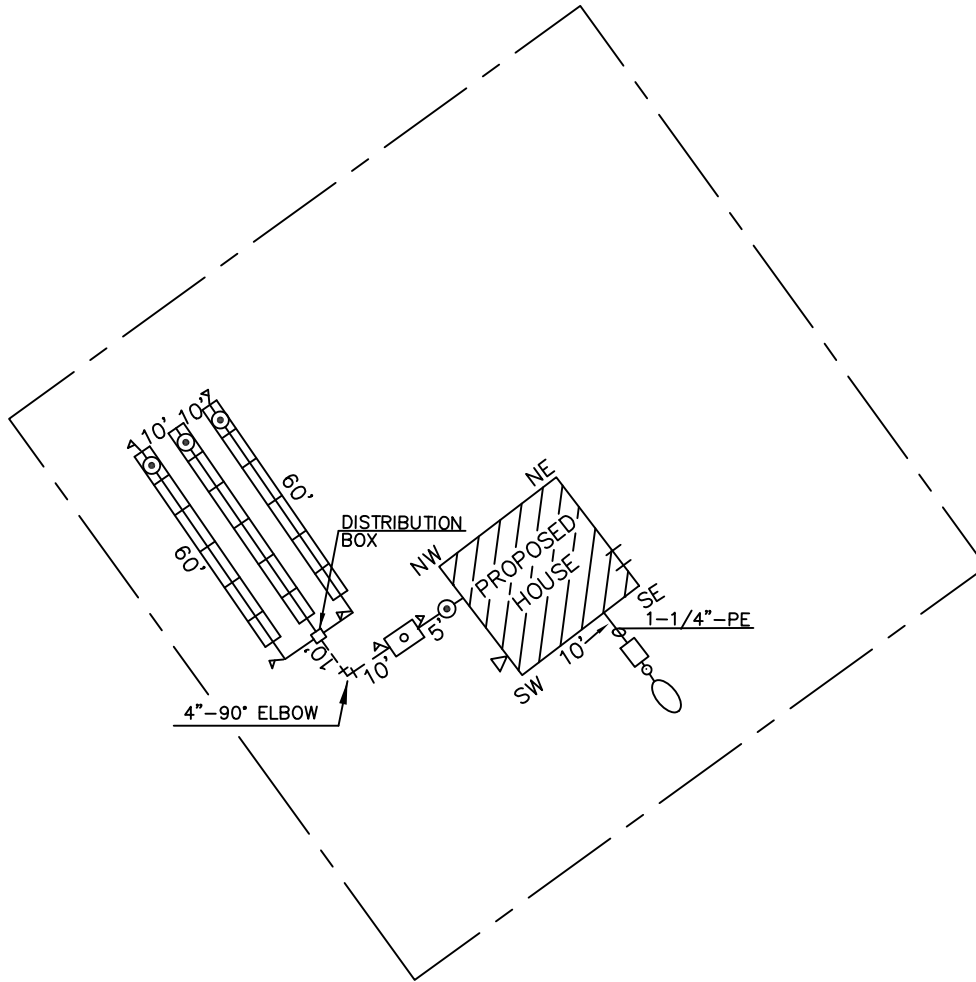
Customer' Name & Location: Crystal Mercedes Rogers - Lukachukai, AZ. SAP Project No. AZ 12-404/NM 15-404 - SITE NO. 13

Designed by:	Drawn By:	Appr. Engr:	Exhibit no.		Scale: N.T.S.
Date:	Date:	Rev. Date: 5/06	NTUA STANDARD NO. WS-1d		ACAD File Name: WS-1_PTT-06.DWG

(PLAN VIEW - NORTH ARROW REQUIRED)

NOTE

CONTRACTOR IS TO REFER TO THE PROJECT CONSTRUCTION DESIGN PLANS FOR THE DRAIN FIELD SYSTEM.



ITEM DESCRIPTION	MATERIALS			ITEM DESCRIPTION	MATERIALS		
	LEGEND	SIZE	TYPE		LEGEND	SIZE	TYPE
WATERLINE TAP				WATERLINE, PROPOSED	-- W --	1-1/4"	PE
VALVE, GATE				WATERLINE, EXISTING	— W —		
VALVE, CURB STOP				SEWERLINE, PROPOSED	-- S --	4"	PVC
WATER METER				SEWERLINE, EXISTING	— S —		
WATER METER W/ IND PRV				PROPOSED TIE INFORMATION			
VALVE, DOMESTIC STOP				LOCATION: Lukachukai, AZ.			
CISTERN TANK		1000GAL		SYSTEM: Lukachukai, AZ. Revised Aug. 14, 2020			
CLEAN-OUT(S)		4"	PVC	PROJECT NO: SHT. 01 OF 01 SHTS.			
SEPTIC TANK		1000GAL	PE	DRAWN BY: M.T. DATE: March 19, 2019			
INFILTRATORS		3'X4'	HDPE	PROPOSED START DATE: 3-Days Advance Notice			
DWELLING/OTHER BLDGS							

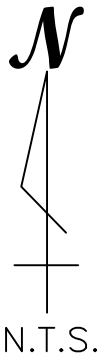
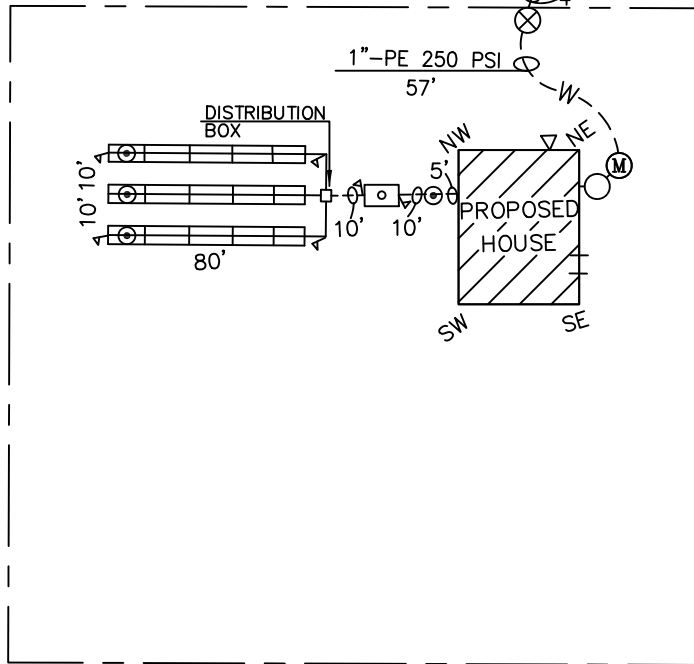
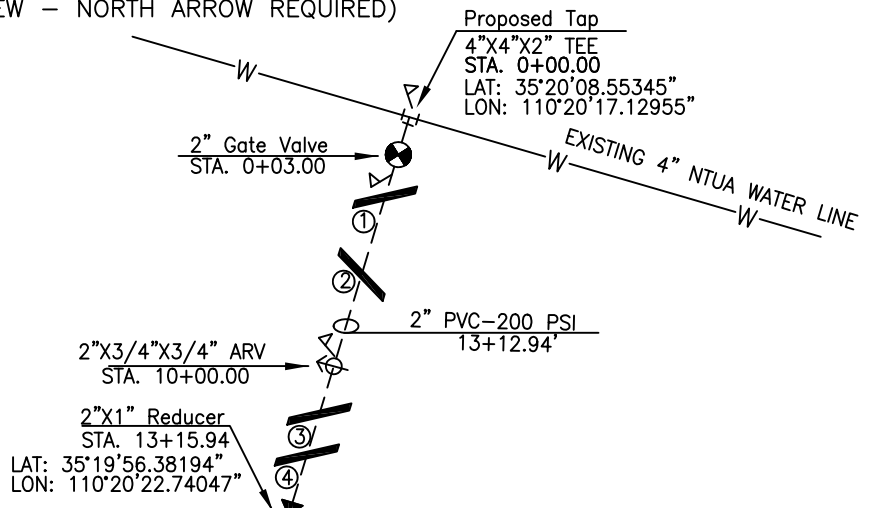
TITLE: SCATTERED PROJECT - PROPOSED INDIVIDUAL INSTALLATION SHEET 4 OF 6

Customer' Name & Location: Mercedes Davis, Lukachukai, AZ.			SAP Project No. AZ 12-404/NM 15-404 - SITE NO. 17		
Designed by:	Drawn By:	Appr. Engr:	Exhibit no.		
Date:	Date:	Rev. Date: 5/06	NTUA STANDARD NO. WS-1d		
			Scale: N.T.S.		ACAD File Name: WS-1_PTT-06.DWG

(PLAN VIEW - NORTH ARROW REQUIRED)

NOTE
 CONTRACTOR IS TO REFER TO THE PROJECT
 CONSTRUCTION DESIGN PLATS FOR THE DRAIN
 FIELD SYSTEM.

WATER EROSION BARS
 STA. #1 0+50.00
 STA. #2 8+50.00
 STA. #3 11+30.00
 STA. #4 12+50.00



ITEM DESCRIPTION	MATERIALS			ITEM DESCRIPTION	MATERIALS		
	LEGEND	SIZE	TYPE		LEGEND	SIZE	TYPE
WATERLINE TAP		4"x2"	TEE	WATERLINE, PROPOSED	-- W --	1" & 2"	PE & PVC
VALVE, GATE		2"	GV	WATERLINE, EXISTING	— W —	4"	PVC'
VALVE, CURB STOP		1"	BRASS	SEWERLINE, PROPOSED	-- S --	4"	PVC
WATER METER		5/8"x3/4"	COPPER SETTER	SEWERLINE, EXISTING	— S —		
WATER METER W/ IND PRV				PROPOSED TIE INFORMATION			
VALVE, DOMESTIC STOP		3"x4"	BRASS				
YARD HYDRANT		1000GAL	PE	LOCATION: Dilkon, AZ.			
CLEAN-OUT(S)		4"	PVC	SYSTEM: Dilkon, AZ.			
SEPTIC TANK		1000GAL	PE	PROJECT NO:	SHT. 01 OF 01 SHTS.		
INFILTRATORS		3'x4'	HDPE	DRAWN BY: M.T.	DATE: Revised: 7-9-21		
DWELLING/OTHER BLDGS				PROPOSED START DATE: 3-Days Advance Notice			

TITLE: SCATTERED PROJECT - PROPOSED INDIVIDUAL INSTALLATION SHEET 4 OF 6

Customer' Name & Location:
 Ray Davis, Dilkon, AZ.

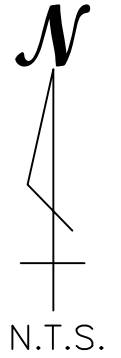
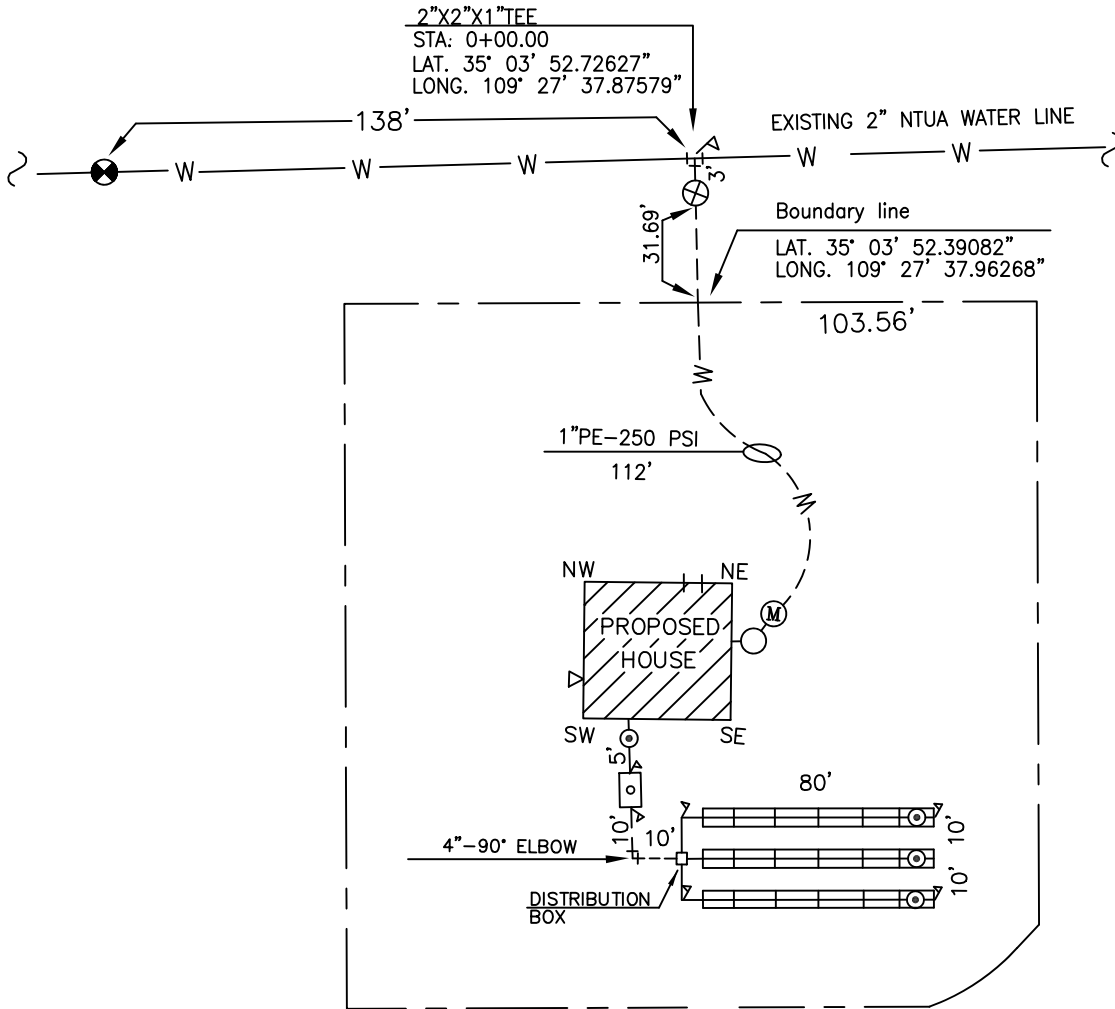
SAP Project No.
 AZ 12-404/NM 15-404 - SITE NO. 18

Designed by:	Drawn By:	Appr. Engr:	Exhibit no.
Date:	Date:	Rev. Date:	NTUA STANDARD NO.
		5/06	WS-1d



Scale:
 N.T.S.
 ACAD File Name:
 WS-1_PTT-06.DWG

(PLAN VIEW - NORTH ARROW REQUIRED)



NOTE

CONTRACTOR IS TO REFER TO THE PROJECT CONSTRUCTION DESIGN PLANS FOR THE DRAIN FIELD SYSTEM.

ITEM DESCRIPTION	MATERIALS			ITEM DESCRIPTION	MATERIALS		
	LEGEND	SIZE	TYPE		LEGEND	SIZE	TYPE
WATERLINE TAP				WATERLINE, PROPOSED	-- W --	1" & 2"	PE&PVC
VALVE, GATE				WATERLINE, EXISTING	— W —	2"	PVC
VALVE, CURB STOP		1"	BRASS	SEWERLINE, PROPOSED	-- S --	4"	PVC
WATER METER		5/8" X 3/4"	COPPER SETTER	SEWERLINE, EXISTING	— S —		
WATER METER W/ IND PRV				PROPOSED TIE INFORMATION			
VALVE, DOMESTIC STOP		1"	BRASS				
YARD HYDRANT				LOCATION: New Land, AZ.			
CLEAN-OUT(S)		4"	PVC	SYSTEM: New Land, AZ.			
SEPTIC TANK		1000GAL	PE	PROJECT NO:	SHT. 01 OF 01 SHTS.		
INFILTRATORS		3'X4'	HDPE	DRAWN BY: M.T.	DATE: Revised 7-9-21		
DWELLING/OTHER BLDGS				PROPOSED START DATE: 3-Days Advance Notice			

TITLE: SCATTERED PROJECT - PROPOSED INDIVIDUAL INSTALLATION SHEET 4 OF 6

Customer' Name & Location:
Melissa Ann Yazzie, New Land, AZ.

SAP Project No.
AZ 12-404/NM 15-404 - SITE NO. 19

Designed by:	Drawn By:	Appr. Engr:	Exhibit no.
Date:	Date:	Rev. Date:	NTUA STANDARD NO.
		5/06	WS-1d



Scale:
N.T.S.
ACAD File Name:
WS-1_PTT-06.DWG

Appendix F

SCATTERED SITE PROTOTYPE DESIGN CRITERIA

Design Criteria: WHPacific, Inc. will design the scattered site residential prototypes to meet the following criteria established on 06-22-2017 at NHA Headquarters. WHPacific will also design to meet the most current IBC, IRC, and NEC Codes. Fire protection requirements will be waived by NHA and not included in the design. Design will comply with local utility requirements. These house designs are intended to be utilized for 25 scattered site locations where utility connection points may vary, therefore, standard detail options for multiple connection locations for utilities will be provided within these plans.

The intent of design is to be ADA-adaptable (ADA 2010). Design should provide the ability for any or all parts of the dwelling unit to be converted to ADA accessible without structural modifications.

HOUSE PLAN DESIGN AND SPECIFICATIONS:

1. House Plans

- a. The WHPacific shall provide a floor plan for single story 2, 3, 4 and 5 bedroom units. The units will maintain the same layout for the kitchen, dining, and living room areas but will differentiate in square footage as a result of the number of bedrooms. Mirroring of the floor plans will be an option.
- b. The plans will be designed to be accessible adaptable and will include exterior concrete work immediately adjacent to dwelling unit. All other required exterior ADA paths and driveways to be addressed by civil/site designer as a part of a separate site adapt task order.
- c. WHPacific will provide three (3) color schemes for the homes on a display board. Boards will encompass exterior colors as well as interior colors choices.
- d. Designs shall be simple and energy efficient. But with some architectural amenities to enhance the appearance.
 - i. Covered Entry Doors and concrete porch at the same elevation of finished floor. Door threshold will comply with ADA specs.
 - ii. Porch or stoops: front and back of unit.
- e. The WHPacific shall design these homes, including foundations, to meet a minimum life span of 25 years.
- f. Design will consider ease of maintenance and serviceability.

2. Foundations

- a. Foundations shall be post-tensioned slab-on-grade with concrete turn-downs.
 - i. WHPacific will provide three designs, based on three bearing capacities, to allow selection of a foundation to accommodate bearing capacity based on a geotech investigation and report for that site.
- b. Sub-grade preparation will be specified per site specific geo-technical evaluation.

3. Exterior Walls

- a. 2 x 6 SPF studs, 16" OC exterior wall partitions with a single bottom plate, double top plate for all load bearing walls, with R-19 fiberglass batt insulation or better Per ASHRAE 90.1
- b. Headers installed over all door and window locations.
- c. Pressure-treated green board at locations in contact with concrete.

- d. Foam-type sill seal at all exterior locations in contact with concrete.
- e. 5/8" Anchor bolts installed per current IBC and structural design.
- f. 7/16" OSB exterior wall sheathing or per structural design.
- g. Vapor barrier at perimeter walls with window and door flashing.
- h. Switches and outlets on exterior walls shall include foam insulators.

4. Interior Walls

- a. 2 x 4 SPF studs, 16" OC interior wall partitions with a single bottom plate and double top plate.
- b. ½" dry wall interior finished with two coats of primer paint and a final coat of paint. Use green board drywall in all wet areas.
- c. Corner bead drywall finish at corners.
- d. Wall finish shall be orange-peel spray texture or similar.
- e. Typical 8 feet ceiling height. Ceiling height may vary at Kitchen, Dining & Living Room Area.

5. Roof and Ceiling

- a. 3:12 pitch engineered wood-truss roof at 24" OC
- b. 5/8" OSB roof sheathing or per structural with 30# roofing paper.
- c. Architectural Shingle (Dimensional Composition Shingles) roofing with 30-year warranty
- d. Ice and water barrier three (3) feet from edge of fascia
- e. R-38 fiberglass ceiling batt insulation or better in attic per ASHRAE 90.1 5B Climate Zone. Recommend Radiant Barrier Foil to reduce summer heat gain due to climate zone.
- f. ½" drywall ceiling
- g. 10" -12" eave and gable overhangs with fascia board and aluminum drip edge
- h. Gable vent with screen or soffit vent system. Ridge venting and O'Hagan venting to be provided as necessary based on roof vent calculations.
- i. Gutters and down spouts with concrete splash blocks
- j. Optional hip roof on front elevation "pop-out" in lieu of gable to be provide in plan and partial elevation as option.

6. Exterior Design

- a. Hardie-board plan siding or equal with associated trim.
- b. Fiberglass insulated metal door with metal jambs and metal hurricane doors at all entrances.
- c. Windows – Double-pane aluminum, Low-E windows with screen
- d. Exterior porch lights.
- e. Front door bell.
- f. 5' perimeter sidewalk, sloped to meet 2010 ADA.

7. Interior Design

- a. All interior and exterior doors shall be a minimum width of 36 inches.
- b. All hallways shall be a minimum width of 36" finish to finish.
- c. All interior and exterior door hardware shall be lever-type.
- d. Accessible Adaptable Floor Design

- i. Floor plan layout shall meet all minimum turning radius'
 - ii. Minimum clear floor space
 - iii. Blocking for handrails, grab bars, and closet rods
 - e. 7-12 mm min LVT tile or tile plank for durability. f) 3 feet wide six-panel white solid-core doors, pre-hung on wood jambs and pre-finished white
 - f. 2 ¼" pine casing and 3 ¼" pine based board pre-finished white.
 - g. Privacy locksets on doors to bathrooms and master bedroom.
 - h. Door stops at all locations.
 - i. Vented pantry with shelves.
 - j. Closet shelves with clothes bar.
 - k. Commercial grade horizontal window mini-blinds
 - l. Windows shall have 1" wood sills.

8. Bathrooms

- a. Wood backing for bathroom grab bars
 - i. Shower
 - ii. Toilet
- b. One-piece enamel tub/shower stall.
- c. Fiberglass shower stall in master bedroom.
- d. Anti-scald valves in bathtubs and showers.
- e. Elongated 1.6 gallon low-flow water closet.
- f. Vanity cabinets to match kitchen cabinets
- g. Integral oval bowl sink and single lever faucet.
- h. Recessed medicine cabinet with light.
- i. Combination fan/light ventilation unit.
- j. Towel Bar and toilet paper holder.
- k. 5' Minimum turning radius in bathroom areas.
- l. For all bedroom units, the bathrooms shall be designed for easy conversion to accessible type shower or bathtub.

9. Kitchen

- a. Laminate self-edge countertop with backsplash. As option can provide ½" Bull Nose Solid Surfacing with 4" solid surface back splash (Hi-macs or Equal).
- b. 30" vented range hood with light. Must be vented to outside of unit.
- c. Double bowl 8" deep stainless steel sink with single-lever faucet assembly and sprayer.
- d. Crown molding over wall cabinets
- e. 5' Minimum turning radius in kitchen area.
- f. Standard height of cabinets shall be 34" to top of counter throughout in keeping with accessibility. Otherwise keep all cabinets 36" to top of counter and provide one 30" wide space at 34" top of counter with removable base cabinet at this location.
- g. Appliance openings shall conform to cabinet shop drawings.
- h. Appliances: painted rather than stainless steel.

- i. 4-5 Bedroom units shall receive a larger refrigerator.

10. Square Footage: The following square footages shall be applied:

- a. Two Bedroom Units: 1,740 sf Max, Less 1 Half Restroom
- b. Three Bedroom Units: 1,860 sf Max, Less 1 Half Restroom
- c. Four Bedroom Units: 1,980 sf. Max
- d. Five Bedroom Units: 2,100 sf. Max

11. Bedroom and Bathroom Sizes:

- a. Two bedroom units shall have one bathroom in master & 1 shared.
- b. Three bedroom units shall have one bathroom in master & 1 shared
- c. Four bedroom units shall have 1 ½ restroom off of kitchen area, 1 restroom in master bedroom with shower & 1 shared restroom with tub
- d. Five bedroom units shall have 1 ½ restroom off of kitchen area, 1 restroom in master bedroom with shower & 1 shared restroom with tub

12. Plumbing

- a. Washer-less faucets.
- b. Insulated PEX fresh water supply lines stubbed through floor.
- c. Shut-off valves on each fixture.
- d. Tub/shower valves with integral stops.
- e. PVC schedule 40 drain, waste and vent system.
- f. Gas or electric water heater depending on available utilities.
- g. Exterior freeze-less hose bibs shall be installed on the exterior wall facing south to prevent freezing.
- h. Water – off site water system design and construction will require the local provider’s approval of design and materials specifications. Domestic stop valves will be required for all homes.
 - i. Provide options for the location of water stub out (connection point) shall be provided for two (2) opposite sides of the dwelling unit.
 - ii. Water meter location shall be addressed by civil/site designer as a part of a separate site adapt task order.
 - iii. For all utility stub out and connection points, NTUA requires a minimum of 10 feet horizontal separation.
- i. Waste water – Septic Systems – Invert of sewer service to be a maximum of two feet below finish floor elevation at the footing and a PVC Schedule 40 sleeve through the slab turndown or stem wall shall be required. Connections will be coordinated by civil/site designer as a part of a separate site adapt task order.
 - i. Design options for the location of waste water connection point shall be provided for two opposite sides of the dwelling unit.
 - ii. Cleanouts and connections will be designed by a civil/site designer as a part of a separate site adapt task order.
- j. For Scattered Site locations where domestic water service is not available, cistern design will be by civil/site designer as a part of a separate site adapt task order.
- k. No provision for a dishwasher.

13. Electrical

- a. Design per latest National Electric Code standards (at time of contract execution).
- b. Separate meter and separate control panel box to provide access to main shutoff switch. This will allow the unit to be converted to ADA at a later date.
- c. 200 AMP, 40 space main service panel box with main breaker, individual circuit breakers per room.
- d. Two exterior weatherproof receptacles with GFI protection (front and rear).
- e. GFI protection on receptacles at kitchen countertop, lavatories and all wet areas.
- f. Toggle switches and receptacles throughout.
- g. AC/DC smoke detectors per latest fire code.
- h. Ceiling lights in kitchen, dining room, hall, foyer, and above kitchen sink.
- i. Fan/light combination and medicine cabinet light in all baths.
- j. Wiring location for thermostat will be on the living room adjoining wall.
- k. One Carbon Monoxide detector per home
- l. Door Bells at front and rear entrances.
- m. Arc fault protection in bedroom locations.
- n. Insulated receptacle covers
- o. Design options for the location of panel and electrical service entrance shall be provided for two (2) opposite sides of the dwelling unit.
- p. Grounding shall be completed through use of 5/8" x 8' copper rod per NEC standards. UFER grounding method shall not be used.

14. Gas

- a. Some locations will be serviced by natural gas. Some may require LPG Service. Design shall be provided for both gas options, including design for an LP tank with a pad.
- b. Specifications will include the requirement that the contractor provide an LP tank 80% full upon Memorandum of Acceptance of Occupancy of the home.
- c. If Natural Gas is available, design options for the location of gas meter for two (2) opposite sides of the dwelling unit.
- d. Natural Gas stub out locations shall be per NTUA standards.
- e. For all utility stub out and connection points, NTUA requires a minimum of 10 feet horizontal separation.

15. Telecommunications and Data

- a. Telephone. Phone jacks in living room, kitchen and master bedroom
- b. Satellite. Provide in living room and all bedrooms
- c. Internet/Data. Provide in living room and master bedroom.

16. Mechanical

- a. Central heating system will be overhead with rigid duct system. Flex duct shall not be allowed.
- b. Adjustable metal vent covers.

- c. Inside furnace rooms, all condensation drain lines will need to be installed in the rough-in phase to domestic drain system.
- d. Install chimney kits for wood/coal stove provided by owner. Heat protection on the floor and the adjacent walls at the wood/coal stove location. Electrical receptacle to be installed behind wood/coal stove locations.
- e. Provide options for LPG, natural gas, and all electric heating.
- f. Provide options for LPG, natural gas, and electric domestic hot water.
- g. Provide options for LPG, natural gas, and electric clothes dryers.
- h. Dryer vents to be short and direct to outside to provide easier cleaning.
- i. Mechanical systems to be simpler/easier to maintain, rather than complex, even if less efficient.
- j. Provide ductwork for future installation of an evaporative coolers with water supply lines to be located on the exterior of the units.

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