NAVAJO HOUSING AUTHORITY

PROJECT MANUAL

NHA CHINLE HMO BUILDING
NAVAJO HOUSING AUTHORITY
APACHE COUNTY, NM 86503

INVITATION FOR Bids (IFB) #546
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New Chinle Housing Management Office (HMO) Design Program

Draft Submittal
December 16, 2020

Prepared by:
Suina Design + Architecture

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INTRODUCTION

Navajo Housing Authority (NHA) contracted with Suina Design + Architecture, LLC (SD+A) to provide architectural and engineering services to design the New Chinle Housing Management Office (HMO) Building. This Design Program represents the first phase of work on this project and outlines the project goals, space requirements, architectural, structural, mechanical, electrical and plumbing systems. In addition, we have calculated the number of plumbing fixtures and parking spaces required by code and the current needs of the Chinle HMO.

We understand the Chinle HMO New Building will not exceed 6,000 square feet. The New Building will replace the existing Chinle HMO Building and the project site has been determined. The new project site is located northeast of the intersection of Main Street (Indian Route 102) and Indian Route 7 in Chinle, Arizona. A flood plain study and traffic impact analysis is required. In addition, our team will provide a site analysis of the of the project site including assessment of existing infrastructure, roadways, vehicle and pedestrian access, and future expansion of the site for a maintenance building and yard.

Our intent is to design a facility that meets the needs of the Chinle HMO, can be easily constructed and allows for future expansion.

PROJECT GOALS

Replacement of Existing Chinle HMO Building

The goals of this project include the replacement of the existing Chinle HMO Building. A separate existing Building Assessment was completed. The existing Building is approximately 7,400 square feet and was enlarged over the years with several additions. The types of spaces provided included Conference Room, nine (9) Offices, a Kitchen, Waiting Room, File Room, three (3) Storage Rooms, Supply Room and Maintenance Shop. There are also rooms that support the mechanical and electrical equipment in addition to Men's and Women's Restrooms.

Improve Layout of Function

The existing Chinle HMO Building was enlarged over the years to address the need for additional Offices and a Maintenance Shop. The New Building should be designed to address the current office needs and include future hires if possible. The New Building does not include space for a Maintenance Shop, and it has been determined that a future and separate building will be constructed for this purpose.

In the existing Chinle HMO Building, the offices are scattered and separated by long corridors making collaboration difficult. The Conference Room has become the new main entrance and storage location for unused office equipment. The Offices in the New Building should be located in close proximity to promote collaboration and efficient delivery of services.

The main entry of the existing Chinle HMO Building does connect to an accessible route from the parking area or provide accessibility throughout the building. The main entry is not easily identified and may be hard to locate. The main entry to the New Building should be visible from the adjacent roadway, provide a clearly marked accessible parking and an accessible route through the building including a route to the restrooms and water fountain.

Improve Work Environment

The existing Chinle HMO Building does not afford windows at all of the offices. The Kitchen is not centrally located or near the Conference Room where it is most likely needed for staff meetings and other events with food and beverages. The Restrooms do not provide for accessibility. The New Building should provide windows at all offices allowing a view of nature and access to daylight. Scientific studies have shown that greater access to daylight can improve productivity by as much as 20%, as well as enhancing employee satisfaction in the workplace. Greater exposure to daylight can also reduce stress levels too. The Conference Room should be near the main entry as it is the key location for meetings with visitors. The Kitchen should be incorporated or in close proximity to the Conference Room to allow the space to be used as a lunchroom for employees. By providing a space where employees can gather and share conversations over the lunch hour, Chinle HMO is promoting a friendly work environment allowing employees to develop relationships and camaraderie. These types of

connections can have a major effect on company loyalty, job satisfaction, and employee engagement. Relationships with coworkers have been identified as the top driver with 77% of participants listing these connections as a priority.

Culturally Appropriate

The New Chinle HMO Building should provide a workplace environment that is appropriate to the Navajo - Dine' culture. The use of local materials can show respect for the cultural landscape. The construction type or form can provide hints of the primary Navajo structure, the Hogan. Location of entries or windows can also speak to cultural traditions. For example, the rising sun is greeted in the east and providing a doorway facing east may be important. Our team will attempt to respectfully highlight the Navajo – Dine' culture in the design of this building.

SITE ANALYSIS

The New Building project site is located northeast of the intersection of Main Street (Indian Route 102) and Indian Route 7. in Chinle, Arizona. The subject parcel is approximately 2.63 acres and includes two (2) existing driveways. One driveway is off Main Street and the other off Indian Route 7. Existing sidewalk is provided on both sides of Main Street and Indian Route 7.

Utilities

Two (2) existing overhead power lines and associated poles cross the project site at the north. A sanitary sewer line was located in the south side of Indian Route 7 with an existing sewer manhole located near the southeast corner of the project site. An existing natural gas line runs along the west property line. An existing telephone line runs about ten feet (10') north of the gas line.

Existing water valves were located south of Indian Route 7. An existing fire hydrant was located at the northwest corner of Main Street and Indian Route 7.

Topography

The existing terrain slopes from east to west with approximately two feet of elevation change. The area between the project boundary and the roadway is utilized as a swale for drainage. This is evident from the 24" RCP culverts crossing Indian Route 7 at the intersection with Main street, crossing the west driveway and crossing Main Street just north of the west driveway. In addition, it appears that a small drainage swale crosses the project site near the north boundary. A topographical survey was completed for the New Building project site. It is included in the Appendix.

Climate

Chinle's climate is classified as a cold semi-arid steppe climate. Cold temperatures are experienced in Chinle during winter nights and summers are quite hot reaching into triple digits. Cold semi-arid steppe climates feature abundant sunshine, little precipitation and a large diurnal variation between daytime highs and nighttime lows. Chinle's temperature usually drops and rises by 30-degree Fahrenheit each day and night. The average number of sunny days exceeds the national average and the precipitation is only about 9 inches per year.

Sun angles are imperative to site design, location and orientation of buildings. The sun's angle in the summer is generally higher in the sky compared to the winter. The sun rises, travels across the sky and sets lower in the horizon during the winter. The wind patterns for Chinle include cold winter winds from the west and south. Cool summer breezes tend to come from the south.

Figure 1 - Summer Sun Angles

Figure 2 - Winter Sun Angles

Figure 3 – Summer Breezes

Figure 4 – Winter Winds

Views

The views from the building are important to enhancing the workplace environment. Providing a view to nature has been proven to increase productivity and overall moral. The New Chinle HMO site provides a beautiful view to the east of the nearby butte.

Figure 5 – New HMO Building Site

CODE ANALYSIS

A Preliminary Code Analysis has been completed and is provided in the Appendix. The important aspects of the Code Analysis for the New Building include the Construction Type, Occupancy Group, Allowable Area, Occupancy Load and Means of Egress.

The Construction Type will be Type V-B which allows structural elements, exterior walls and interior walls be constructed of any material allowed by code, combustible or non-combustible with no fire resistance rating required.

The primary Occupancy Group is Business Group B which is appropriate for the office function of the New Chinle HMO Building.

The base Allowable Area for Occupancy Group B and Construction Type V-B is 9,000 square feet. This base area can be increased to 22,500 square feet with the frontage increase calculation. The proposed area of the New Building is 6,000 square feet and well within the base allowable area.

The Occupancy Load per the 2006 ICC Building Codes for office use is 100 net square feet per occupant. The calculation: 6,000 gsf x 4% = 240 sf, therefore 6,000 gsf – 240 sf = 5,760 sf / 100 sf = 57.6, round up to 58 occupants. The total gross square footage was reduced by 4% to account for exterior and interior walls. Per the 2018 International Building Code, the occupancy load for office use is 150 gross square feet. The calculation: 6,000 gsf / 150 gsf = 40 occupants.

The Means of Egress components are calculated by multiplying the occupant load served by such a component (door, etc.) by a means of egress capacity factor of 0.2 inch per occupant. The 2006 ICC Building Code calculation: 58 x 0.2 = 11.6 inches. The 2018 IBC calculation: 40 x 0.2 = 8 inches. The maximum exit access travel distance for Occupancy Group B without an automatic sprinkler system is 200 feet.

Corridors

Of special note is the one-hour (1 hr.) corridor fire-resistance rating for Occupancy Group B with a corridor served by an occupant load greater than 30 occupants without an automatic sprinkler system. The corridor fire-resistance rating is zero (0) with an automatic sprinkler system. The minimum corridor with is 44 inches. Dead end corridors where more than one exit or exit access doorway is required, the exit access shall be arranged such that dead-end corridors do not exceed 20 feet in length. Where equipped with an automatic sprinkler system, dead-end corridors shall not exceed 50 feet.

Plumbing Fixtures

The minimum number of required plumbing fixtures for Occupancy Group B is as follows:

- Water Closets, Male and Female: 1 per 25 for the first 50 and 1 per 50 for the remainder exceeding 50.
- Lavatories, Male and Female: 1 per 40 for the first 80 and 1 per 80 for the remainder exceeding 80.
- Drinking Fountains: 1 per 100.
- 1 Service sink is required.

Per the 2006 IBC occupant load of 58 occupants:

- Water Closets, Male and Female: 2 required.
- Lavatories, Male and Female, 2 required.
- 1 Drinking Fountain
- 1 Service Sink

Per the 2018 IBC occupant load of 40 occupants:

- Water Closets, Male and Female: 2 required.
- Lavatories, Male and Female, 2 required.
- 1 Drinking Fountain
- 1 Service Sink

Parking

Parking requirements for a building with Occupancy Group B are one (1) parking space per 250 square feet. Parking calculation: 6,000 sf / 250 sf = 24 parking spaces required. Because of the high daily visitor count at the Chinle HMO Building for housing services (i.e. rental payments), additional parking is recommended. An additional 18 parking spaces will be provided for a total of 42 parking spaces including four (4) accessible parking spaces.

Accessibility

At least one accessible route within the site shall be provided from public transportation stops, accessible parking, accessible passenger loading zones, and public streets or sidewalks to the accessible building entrance. At least one accessible route shall connect accessible buildings, accessible facilities, accessible elements and accessible spaces that are on the same site. Accessible routes shall coincide with or be located in the same area as a general circulation path.

Where parking is provided, accessible parking shall be provided. For 26 to 50 total parking spaces provided, a minimum of two (2) accessible parking spaces are required. For every six or fraction of six accessible parking spaces, at least one (1) shall be a van-accessible parking space. Accessible parking spaces shall be located on the shortest accessible route of travel from adjacent parking to an accessible building entrance to the parking facility.

Each toilet room shall be accessible. At least one (1) of each type of fixture, element, control or dispenser in each accessible toilet room shall be accessible. Where water closet compartments are provided in a toilet room, at least 5 percent of the total number of compartments shall be wheelchair accessible. Where lavatories are provided, at least 5 percent, but not less than one, shall be accessible.

Where kitchens and kitchenettes are provided in accessible spaces or rooms, they shall be accessible.

Where drinking fountains are provided, not fewer than two drinking fountains shall be provided. One drinking fountain shall comply with the requirements for people who use a wheelchair and one drinking fountains shall comply with the requirements for standing persons.

SITE PROGRAM

The New Building project site and Indian Route 7 are aligned nearly 45 degrees from east to west or horizontal. For maximum passive solar gain, the New Building should be located with the longer building axis parallel to Indian Route 7. This will allow winter solar angles to penetrate into the interior of the building with southwest facing windows. Shorter building axis facing northwest and southeast will minimize solar heat in the morning and evenings. Windows should be minimized on these facades. This recommended New Building orientation allows for efficient use of the project site and affords a large area to the north for the future Maintenance Shop and associated yard. The area to the southwest can also be designated for on-site detention of rainfall. There is an existing drainage swale that flows across the north portion of the site and appears to outlet in an existing storm drain under Main Street or Indian Route 201.

The existing driveway on the south off Indian Route 7 is recommended for the main access route. Because it is an existing driveway, the distance to Main Street intersection should not be an issue. Driveways should allow for two-way traffic at a minimum of twenty-four feet (24') wide. Parking should be connected to the south existing driveway and provide a buffer between Indian Route 7 and the New Building. The existing driveway to the west can be designated as a separate entrance for the future Maintenance Shop. This will separate visitor and employee vehicle traffic from maintenance trucks, trailers and large deliveries.

The parking should incorporate adjacent sidewalks or accessible routes to the New Building entrance(s). Sidewalk can also be used as a concrete apron to facilitate roof runoff away from the building via downspouts and sidewalk culverts.

Landscape should be provided in key areas that accentuate the New Building but far enough away to allow for slopes from the building perimeter to fifteen feet (15') away. Native, drought tolerant plants and trees are highly recommended along with light colored gravel.

SITE PROGRAM	
New Building	6,000 sf
Parking	39 – 40 spaces
Driveways	24 feet wide
Sidewalks	Adjacent to parking
Landscape (15%)	900 sf
Onsite detention pond	5,300 sf
Future Maintenance Shop	4,500 sf

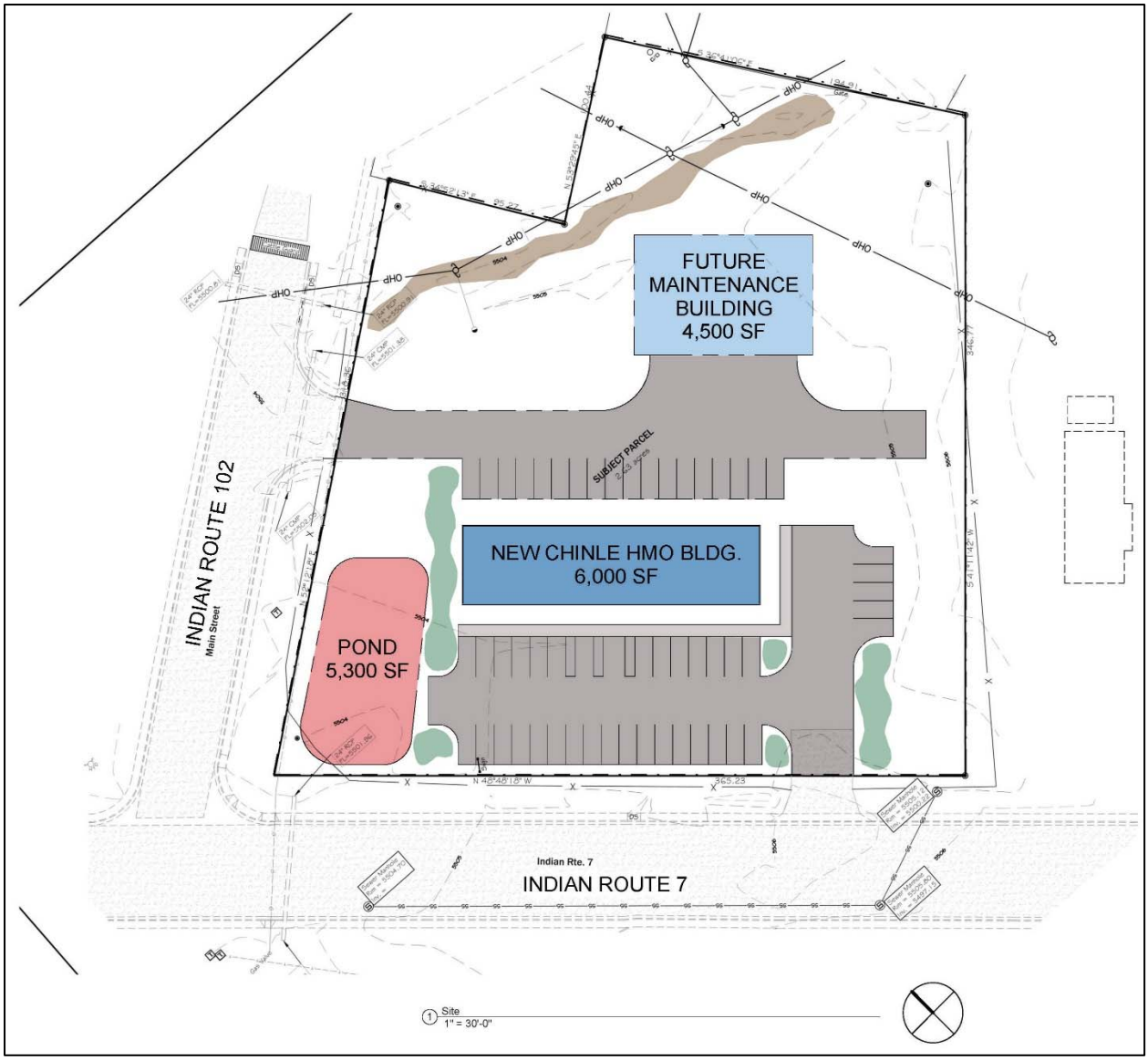


Figure 6 – Proposed Site Plan

BUILDING PROGRAM

Based on the existing Chinle HMO Building, the following spaces have been identified as essential programmatic spaces that will need to be included in the New Building.

SPACE	QTY	SIZE		TOTAL	
Vestibule	1	104	SF	104	SF
Lobby	1	244	SF	244	SF
Office (Fiscal Technician)	1	110	SF	110	SF
Storage	1	75	SF	75	SF
Storage	1	152	SF	152	SF
Conference	1	915	SF	915	SF
Reception	1	144	SF	144	SF
Office (Work Order Technician)	1	122	SF	122	SF
Storage	1	43	SF	43	SF
File Room/Copy	1	371	SF	371	SF
Offices	5	120	SF	600	SF
Collaboration	1	144	SF	144	SF
Director Office	1	222	SF	222	SF
Small Conference Room	1	322	SF	322	SF
Storage	1	28	SF	28	SF
Kitchen/Break	1	194	SF	194	SF
Pantry	1	60	SF	60	SF
Mechanical	1	131	SF	131	SF
Electrical	1	123	SF	123	SF
IT	1	131	SF	131	SF
Janitor	1	42	SF	42	SF
Men's Restroom	1	150	SF	150	SF
Women's Restroom	1	150	SF	150	SF
Chase (Plumbing)	1	30	SF	30	SF
				4,607	SF
Corridors (18%)		830	SF	830	SF
Walls (12%)		554	SF	554	SF
				5,991	**GSF**

The 2018 IBC allows a total area of 9,000 sf for Occupancy Group B and Type V-B construction. The proposed building under 6,000 sf and well within the allowable area. Due to the expanse of the project site and a centrally located building, an additional frontage increase of 1.5% is allowed. The building could be expanded up to 22,500 sf in the future.

CHARACTERISTICS OF SPACES

Offices
Flooring: Carpet
Doors: One (1) entrance door, wood.
Walls: Tape, texture and paint.
Windows: One (1) window with blinds.
Ceiling: Acoustical lay-in
Power: Provide multiple wall outlets.
Data: Provide one (1) data port per power outlet.
Lighting: LED light fixtures
Temperature: Occupancy control
Soundproofing: Provide acoustical batt in walls
Adjacencies: Offices of similar services should be co-located.

Conference Room
Flooring: Carpet
Doors: Two (2) entrance doors, wood.
Walls: Tape, texture and paint.
Windows: Multiple windows with blinds.
Ceiling: Acoustical lay-in
Power: Provide wall and floor outlets.
Data: Provide one (1) data port per power outlet.
Lighting: LED light fixtures, task lighting, dimmable
Temperature: Occupancy control
Soundproofing: Provide acoustical batt in walls
Whiteboards: Provide one (1) 8 ft x 4 ft.
Projection: Provide built-in projection screen or large monitor
Adjacencies: Near offices, waiting room/lobby and Kitchen/Break Room

Kitchen/Break Room
Flooring: VCT or similar hard surface.
Doors: Wall openings only.
Walls: Tape, texture and semi-gloss paint
Windows: One (1) window with blinds
Ceiling: Acoustical lay-in
Power: Provide GFCI power outlets.
Data: Provide two (2) data ports
Lighting: LED light fixtures
Temperature: Occupancy control
Other: Provide one (1) exhaust fan

Plumbing: Provide kitchen-type sink.
Cabinets: Provide upper, lower cabinets and countertop.
Equipment: Refrigerator, microwave oven, (range & range hood?)
Soundproofing: Provide acoustical batt in walls
Adjacencies: Near Conference Room and access to Offices.

Reception
Flooring: VCT or similar hard surface.
Doors: One (1) door, wood.
Walls: Tape, texture and paint
Windows: One (1) window with blinds, one (1) pass-through opening with security glass.
Ceiling: Acoustical lay-in
Tack boards: One (1) 4' x 4' tack board or similar.
Power: Provide multiple power outlets.
Data: Provide one (1) data port per power outlet.
Lighting: LED light fixtures
Temperature: Occupancy control
Soundproofing: Provide acoustical batt in walls
Adjacencies: Near Waiting/Lobby

Waiting/Lobby
Flooring: VCT or similar hard surface.
Doors: Double doors with door operator (ADA push button), storefront with glazing
Walls: Tape, texture and paint
Windows: none
Ceiling: Acoustical lay-in
Tack boards: One (1) 4' x 4' tack board or similar.
Power: Provide multiple power outlets.
Data: Provide one (1) data port per power outlet.
Lighting: LED light fixtures
Temperature: Occupancy control
Equipment: Seating furniture
Soundproofing: Provide acoustical batt in walls
Adjacencies: Near Vestibule and Reception

File Room/Copy
Flooring: VCT or similar hard surface.
Doors: One (1) door, wood
Walls: Tape, texture and paint
Windows: One (1) window
Ceiling: Acoustical lay-in

Tack boards: One (1) 4' x 4' tack board or similar.
Power: Provide multiple power outlets.
Data: Provide one (1) data port per power outlet.
Lighting: LED light fixtures
Temperature: Occupancy control
Equipment: Copier / large format printer
Cabinets: Storage cabinets, lower and upper cabinets with countertop.
Soundproofing: Provide acoustical batt in walls
Adjacencies: Near Offices and Reception

Vestibule
Flooring: VCT or similar hard surface
Doors: Two (2) set of double doors, aluminum storefront with automatic opener/ADA push button
Walls: Tape, texture and paint
Windows: Aluminum storefront
Ceiling: Hard surface
Power: Door opener or security
Data: Security or access
Lighting: LED light fixtures
Temperature: Connect to Waiting Room/Lobby
Adjacencies: Near Waiting Room/Lobby and Reception

Storage
Flooring: VCT or similar hard surface
Doors: Two (2) doors for wider access of large equipment or tables.
Walls: Tape, texture and paint.
Windows: For security, no windows are recommended.
Ceiling: Hard surface
Power: Receptacles per code
Lighting: Surface mounted LED light fixtures
Temperature: Connect to adjacent corridor
Adjacencies: Near restrooms and Kitchen/Break Room where storage of large bulk items is required

Mechanical
Flooring: Exposed or stained concrete
Doors: Solid core metal
Walls: Tape, texture and paint.
Windows: No windows are recommended.
Ceiling: Hard surface or exposed structure.

Power: Receptacles as required by mechanical equipment.
Lighting: Surface mounted LED light fixtures
Temperature: Occupancy or sensor control based on heat generated by mechanical equipment
Adjacencies: Near Electrical room and Restrooms

Electrical
Flooring: Exposed or stained concrete
Doors: Solid core metal
Walls: Tape, texture and paint, OSB or similar for mounting of panels
Windows: No windows are recommended.
Ceiling: Hard surface or exposed structure.
Power: Receptacles as required by electrical equipment.
Lighting: Surface mounted LED light fixtures
Temperature: Occupancy or sensor control based on heat generated by electrical equipment
Adjacencies: Near Mechanical room and IT

IT
Flooring: Exposed or stained concrete
Doors: Solid core metal
Walls: Tape, texture and paint, OSB or similar for mounting of racks
Windows: No windows are recommended.
Ceiling: Hard surface or exposed structure.
Power: Receptacles as required by computer/network equipment.
Lighting: Surface mounted LED light fixtures
Temperature: Occupancy or sensor control based on heat generated by IT equipment
Adjacencies: Near Mechanical and Electrical room

Janitor
Flooring: Exposed or stained concrete
Doors: Solid core metal
Walls: Tape, texture and paint, waterproof panels at floor sink
Windows: No windows are recommended.
Ceiling: Hard surface or exposed structure.
Power: Receptacles as required by Janitor equipment.
Lighting: Surface mounted LED light fixtures
Temperature: Occupancy control
Adjacencies: Near Mechanical and Restrooms

Men's & Women's Restroom
Flooring: Non-slip ceramic tile with floor drains
Doors: Solid core metal
Walls: Ceramic tile up to 4 feet. Tape, texture and paint above wall tile.

Windows: Opaque glazing on small windows with high sill height
Ceiling: Hard surface
Power: GFCI at counters
Lighting: Surface mounted or recessed lighting, ensure each water closet or enclosure has adequate lighting
Temperature: Occupancy control and exhaust fans
Adjacencies: Near Men's Restroom, Janitor and Mechanical Room. Access to Offices and Conference Room.

Corridors

Flooring: VCT or similar hard surface
Doors: None recommended
Walls: Tape, texture and paint
Windows: Windows can provide borrowed light from adjacent spaces. Skylights or solar tubes are recommended.
Ceiling: Acoustical lay-in ceiling
Power: Per code
Lighting: Lay-in LED light fixtures
Temperature: Occupancy control
Adjacencies: Corridors should be minimized and only used to connect adjacent spaces

DIAGRAM OF SPACES

Based on the characteristics and adjacencies of the building program, the spaces can be easily arranged in concentric circles beginning with the Offices at the outer circle. Offices are on the outer circle or edges of the building because they require windows for daylight and views of nature. Offices should be located near other Offices to promote collaboration and allow for grouping of departments or branches.

The intermediate circle includes the Office support spaces such as the Restrooms, File Room/Copy, Kitchen/Break Room and Storage. These spaces are frequently used by the Office staff and should be located within close proximity to Offices. These characteristics of these spaces lend themselves to the interior of the building with few window requirements.

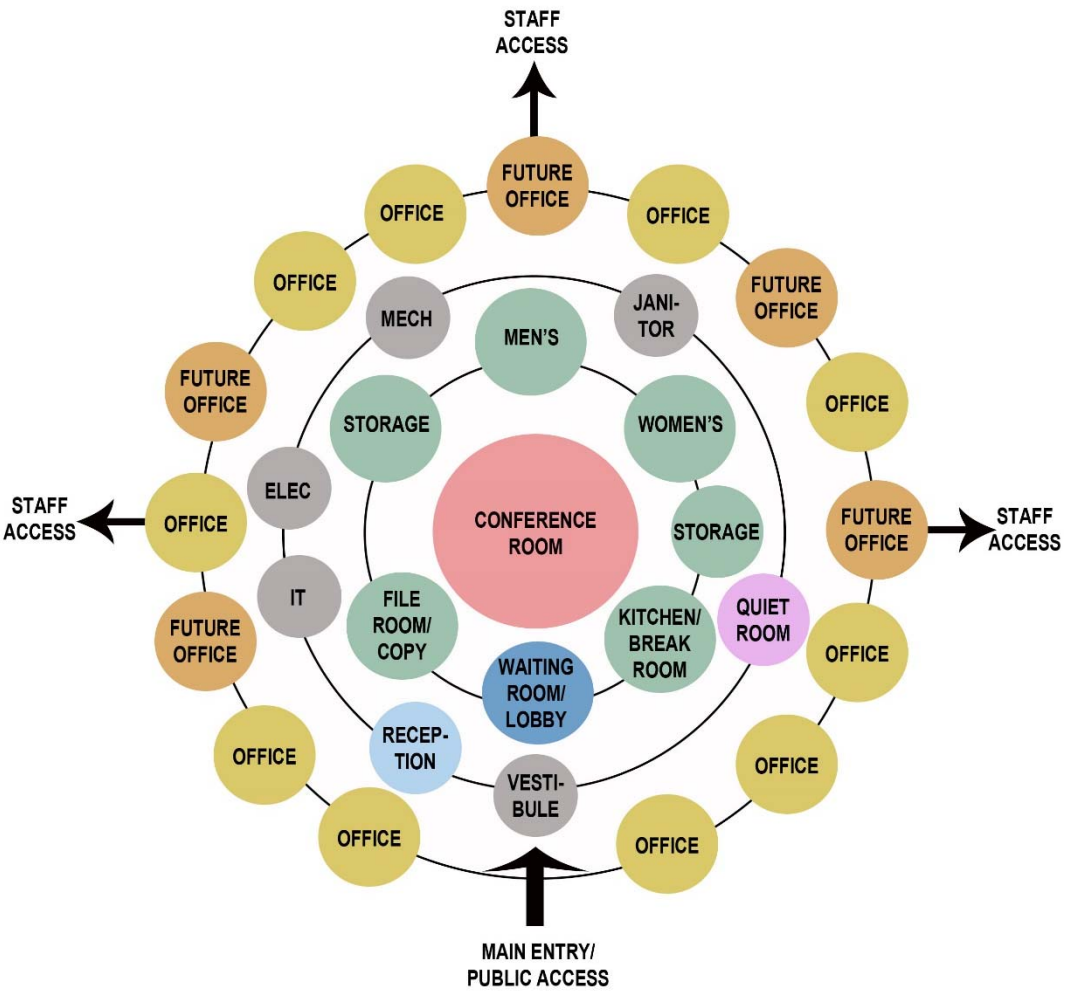
The inner circle or focus is the Conference Room. The Conference Room is a multi-use room which can serve as a place for meeting with visitors, a lunchroom for staff and staff meetings. The Conference Room should be surrounded by the support spaces and provide direct access from the Waiting Room/Lobby.

The building support spaces such as Mechanical, Electrical, IT and Janitors are part of a secondary inner circle and can be located between the Office support spaces. These are generally smaller rooms with equipment supporting the heating/cooling, network or maintenance of the building.

Other building support spaces include the Vestibule, Reception and Quiet Room (if required). The Vestibule is the transitional space between the exterior and the Waiting Room/Lobby. The Reception should be located adjacent to the Waiting Room/Lobby and provide line of sight to the Vestibule. In many cases, HMO's prefer that the Waiting Room/Lobby provide security separation from the remaining building spaces. For this reason, the Reception maybe connected to the Waiting Room/Lobby via a security window and allow controlled access to building. The Quite Room is a nice addition to any building providing an essential quiet and secure space for new mothers or for private telephone calls or one-on-one meetings.

Although the Vestibule provides the main entry or public access to the building, other entrances specifically for employee/staff access and emergency egress are required.

The concentric circle diagram of the building program clearly illustrates the hierarchy of spaces and required adjacencies. The diagram transfers easily to a square or circular building form. By locating the Offices at the perimeter of the building, however, leaves few options for future expansion or additions.



The proposed building form recommended is based on the site analysis including the site orientation, topography and climate and is linear form with the longer building axis parallel to Indian Route 7 for maximum passive solar gain.

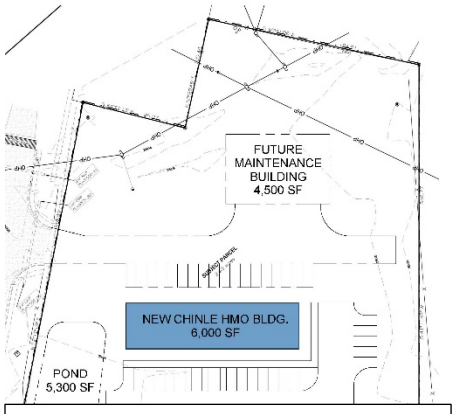


Figure 8 – Building Orientation

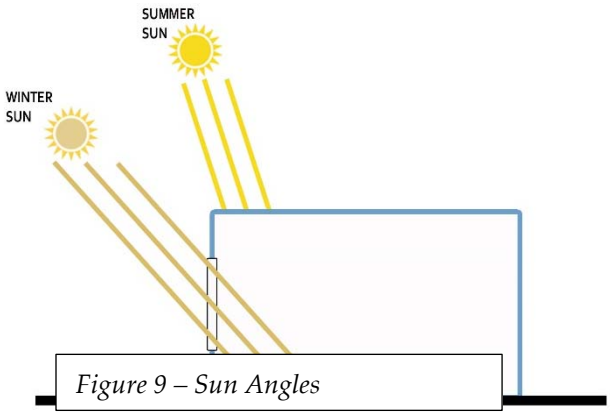


Figure 9 – Sun Angles

By changing the outer cirle into a rectangle, the building program begins to align with the recommended linear form.

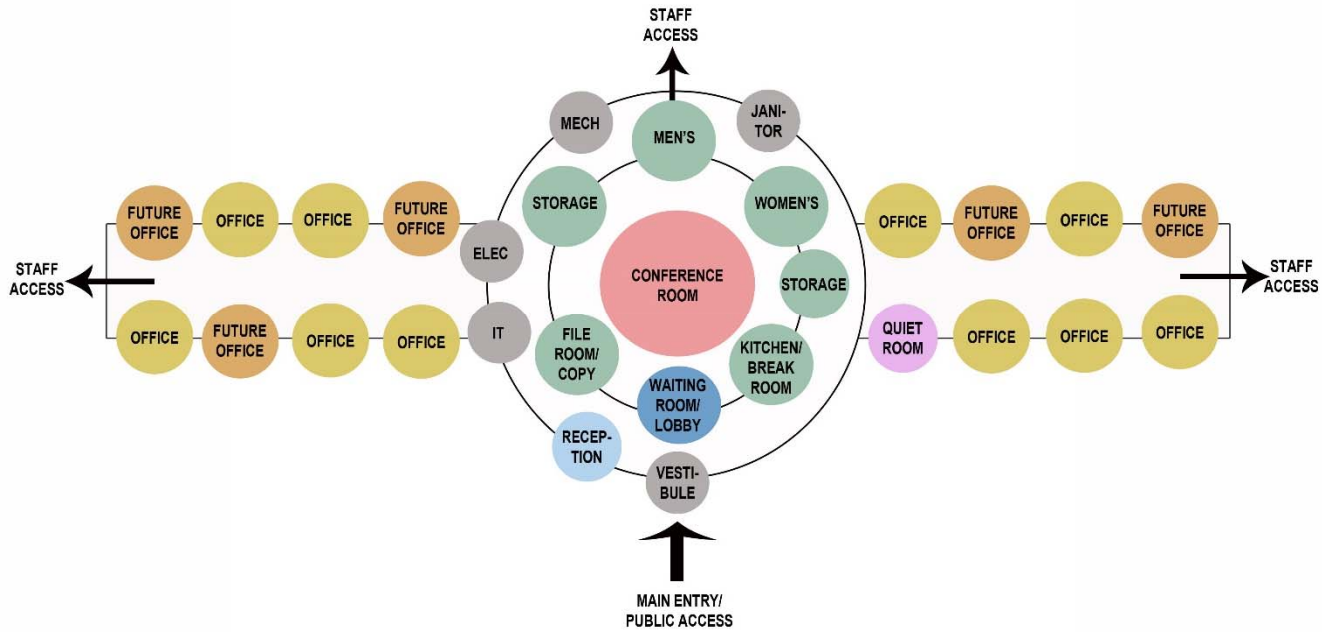


Figure 10 – Linear Diagram of Spaces

After further refinement of the diagram, the building program is totally aligned with the recommended linear form and creates a central form of support spaces drawing attention to the main entry and public access point. The larger central form allows for a higher ceiling in the Conference Room and Waiting Room/Lobby and further accentuates the entire building form.

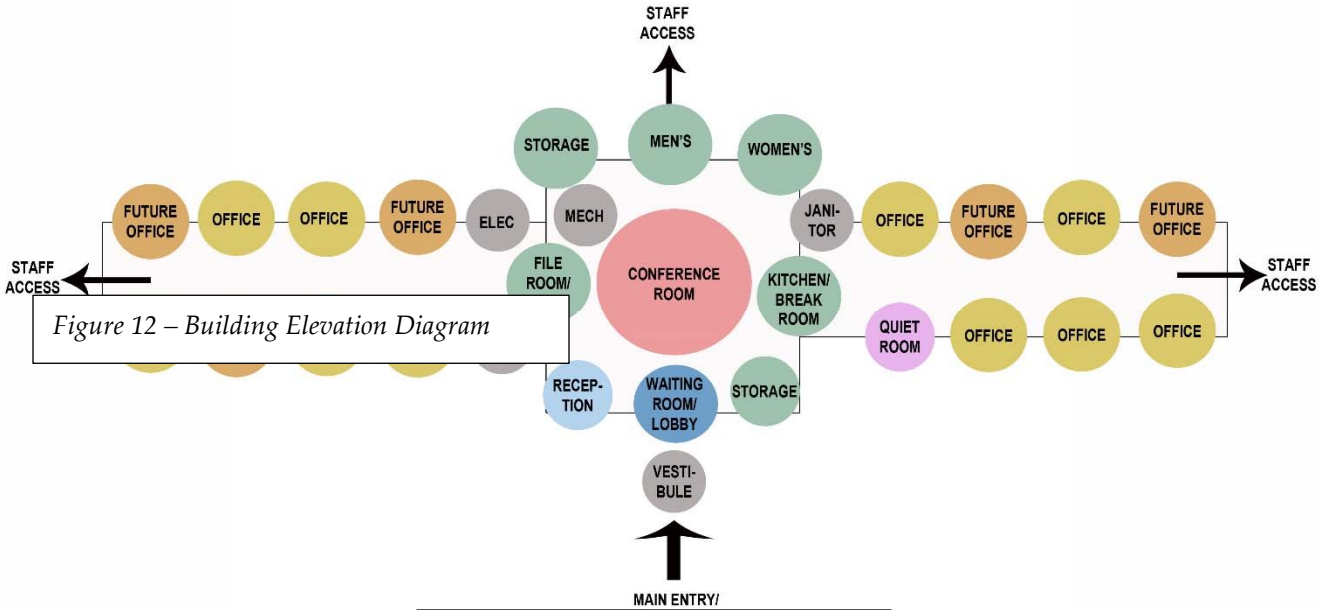
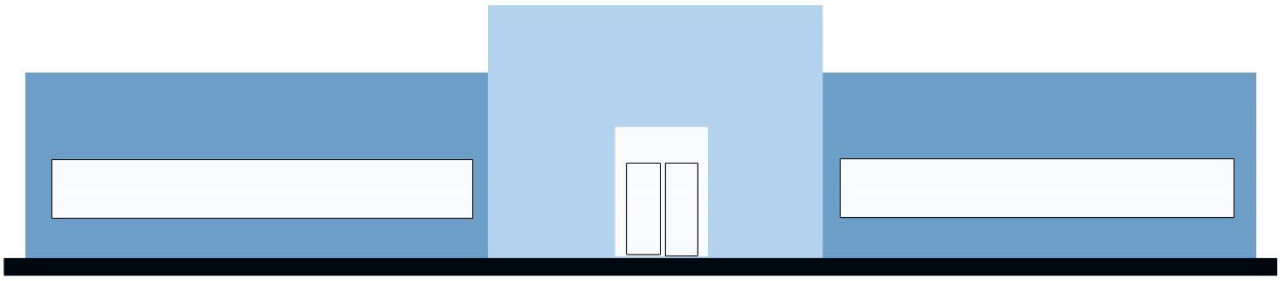


Figure 12 – Building Elevation Diagram

Figure 11 – Final Diagram of Spaces



The linear form allows for future expansion at the east and west for additional office wings or smaller conference/collaboration areas. Another future addition to the north can also be accommodated. If future expansion is evident, the building systems should be slightly oversized to support future loads.

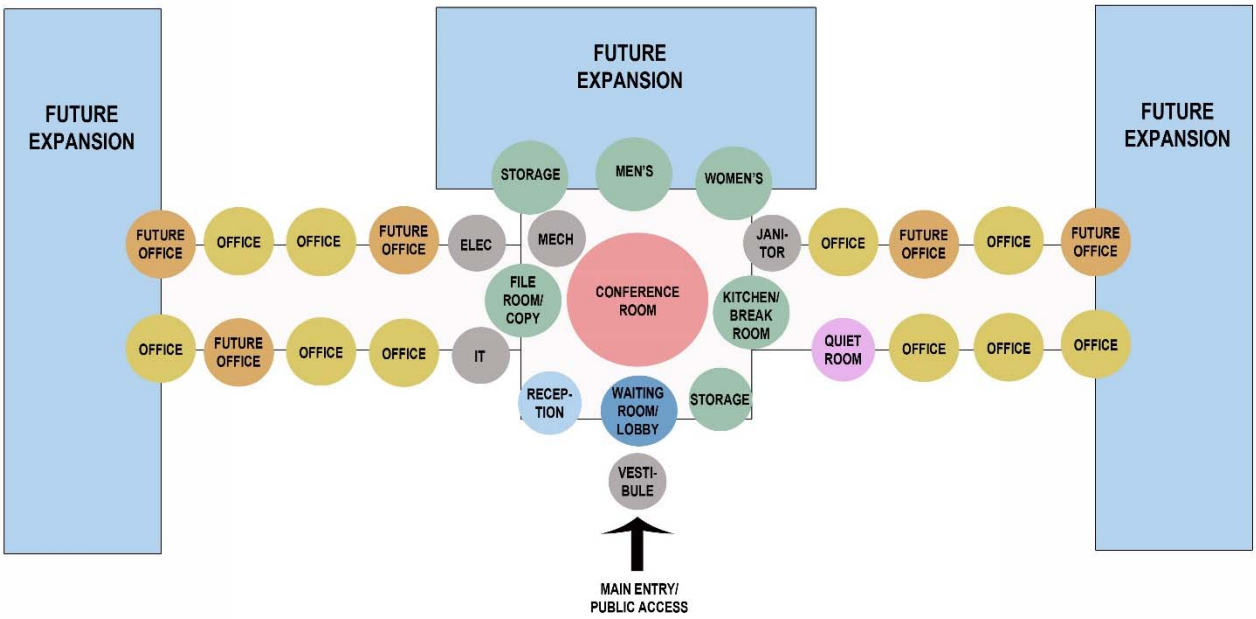


Figure 13 – Future Expansion Diagram

QUALITY OF SPACES

The feeling or mood of a space can add or detract from the quality of the space. For building staff, the quality of their work environment can elevate their work ethic, inspire their emotions and improve their performance. A high-quality space can be achieved with conscious selection of finishes, colors and textures that together create a theme, feeling or ambiance.

We have researched the Chinle area and nearby historic sites along with the Navajo or Dine' culture to understand which colors and textures might be appropriate for the New HMO building.

Canyon de Chelly

The nearby National Monument Canyon de Chelly provides picturesque views of sandstone mesas, green valleys and canyons cut by streams originating in the Chuska Mountains. The Monument preserves ruins of indigenous tribes or cliff dwellers. The Chinle (Ch'inili) name in Navajo means "flowing out" and is a reference to the location where water flows out of Canyon de Chelly. The Navajos term for Canyon de Chelly is "Tseyi" which translates as "inside the rock."

Figure 14 – Canyon de Chelly

Figure 15 – Cliff Dwellings

The sandstone walls of Canyon de Chelly provide a breathtaking passage for visitors that includes smooth walls illustrating striations creating over millions of years, large openings in the cliff walls where indigenous people too shelter and winding waterways that cool the canyon bottom. While these images cannot be literally transferred into the New HMO building, we can attempt to recreate the feeling of walking through a sandstone canyon with natural plasters. Small wall openings or "nichos" can accentuate walls and remind building staff and visitors of the nearby indigenous ruins. The exterior of the building could include a series of different shades of stucco to symbolize the canyon walls. Creative patterns in floor tiles can create a symbolic stream starting at the Vestibule or Lobby and continue throughout the building.

Traditional Navajo Dwelling – Hogan

The Hogan was the primary dwelling for Navajos and is now used only for traditional ceremonies. Key elements of the Hogan are the east facing entry to welcome the rising sun and hexagonal or octagonal form with one hole in the roof for ventilation. Navajo Hogans are constructed from stacked logs and plastered with mud for insulation. Although the Hogan has undergone significant improvements in construction techniques and modern materials, the overall shape remains the same. Some of the ceilings/roofs can be quite intricate creating an impressive geometric aspect.

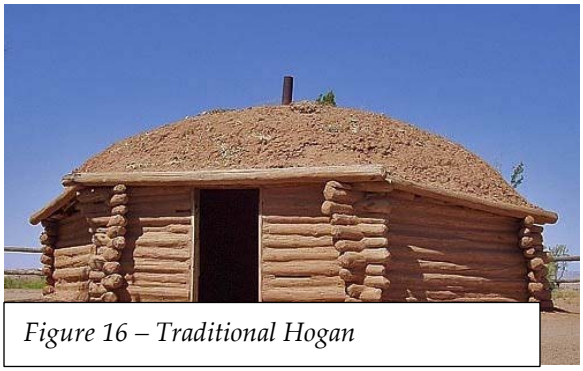


Figure 16 – Traditional Hogan

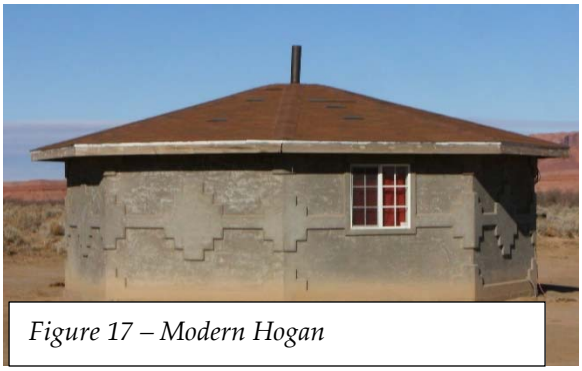


Figure 17 – Modern Hogan

Figure 18 – Hogan Ceiling

Instead of literally integrating a Hogan into the New HMO building, we recommend highlighting spaces that lend themselves to the Hogan shape with intricate ceilings or a central octagonal skylight. The Conference Room or Waiting Room/Lobby are good candidates for the Hogan form.

ARCHITECTURAL

The architectural systems include the roof, walls (interior and exterior), windows, doors and floors. Together, these systems provide the thermal envelope of skin of the building which allows the building to breathe, allow sunlight to enter the building as solar gain, and maintain interior temperatures and shelter occupants from weather.

Roof

Based on the average temperatures for Chinle which range from 88 degrees to 15 degrees, a sloped metal roof that provides a high Solar Reflectance Index (SRI) is recommended to reduce utility costs. Higher SRI numbers equate to a cooler roof surface. Cool roofs are better at rejecting heat and reflecting energy than traditional asphalt roofs which tend to absorb heat and have little reflectivity. A standing seam metal roof installation with a concealed fastening system is straightforward and warranties range from twenty-five (25) to forty (40) years. A standing seam metal roof like MBCI Lokseam, can be installed over a solid substructure and transition from roof to fascia with the use of a seamless rib cover.

Roof gutters, downspouts and splash blocks or underground piping that directs flows to at least 15 feet away from the building.

Walls

Exterior walls will include a 3-part stucco system over wood frame or light gauge studs with R-21 insulation. Interior walls of similar construction with acoustical insulation and gypsum board, taped and textures on both sides. Layers of different shades of stucco along with control joints can create a stratification that resembles the sandstone canyon walls at Canyon de Chelly.

Interior walls can be highlighted with large format images of the surrounding nature or nearby Canyon de Chelly. When high quality, large format prints are permanently bonded to interior walls, it creates a feeling of actually being in the space.

Figure 19 – Canyon walls

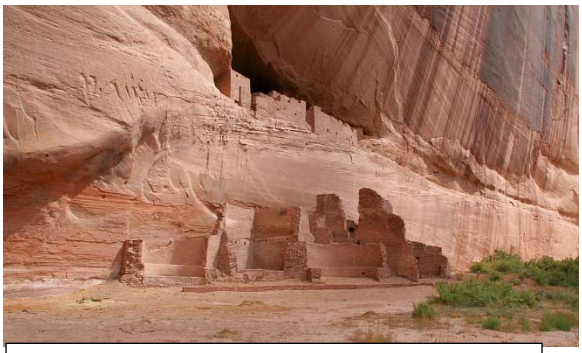


Figure 20 – Mural image

Windows

Based on the 2018 International Energy Conservation Code, Chinle, AZ, is located in climate zone 5 which requires a window U-factor of 0.35 and skylight U-factor of 0.6. We recommend a double-pane, low-e glazing with a frame that includes a thermal break.

Doors

Exterior doors should provide thermal value similar to the exterior wall in addition to security. At the main entry, storefront systems with glazing similar to windows provides an appealing yet energy efficient entry door. We recommend a solid core metal door with a minimum R-5 at secondary exits.

Floors

The perimeter foundation will include insulation of R-5 based on 2018 IECC requirements. Floor finishes include VCT or similar hard surface that is easy to install, reasonably priced and requires minimal maintenance. Carpet at offices provides acoustical and aesthetic appeal. Carpet tiles can be easily replaced and can be installed over concrete slab with water-based, low-VOC adhesives. Exposed concrete that is sealed is recommended at the mechanical, electrical and Janitor spaces for easy clean up and durability. A non-static VCT floor is recommended at the IT room.

Ceilings

Acoustical lay-in ceilings provide the best solution for the office setting. The Lobby and Reception areas can be accentuated with the use of wood ceilings with natural curves and colors.

Figure 21 – Curved Wood Ceiling

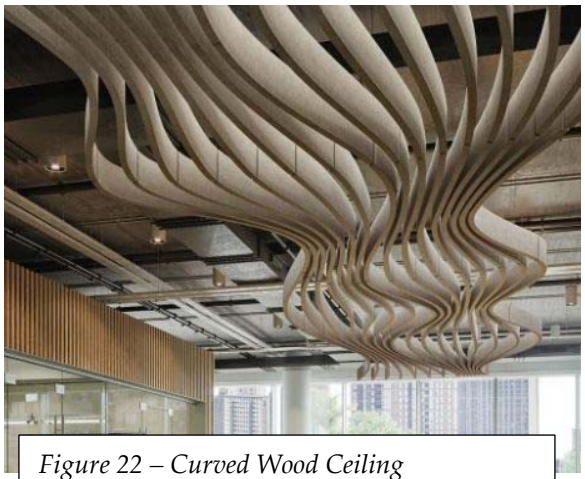


Figure 22 – Curved Wood Ceiling

STRUCTURAL

It is our expectation that the Chinle Housing Management Office will be designed utilizing the following structural systems and materials:

Foundation

The foundation will be constructed utilizing a shallow, conventional system to be comprised of a monolithically placed slab and turndown edge footing. It is anticipated that continuous turndown footings will be a minimum of 16 inches in width, extending down to frost depth. Final design loads may require larger footing widths. Architectural requirements will dictate whether insulation is required to be placed over concrete foundations.

As per the geotechnical evaluation report by Western Technologies, Inc., the bottom of footing shall be placed a minimum of 24 inches below grade and designed to an allowable soil bearing stress of 2000 pounds per square foot. The Geotechnical Evaluation Report by Western Technologies Inc. is included in the Appendix.

Site soils have been determined to be highly expansive with the possibility of inducing significant building movement. As such, the foundation must be underlain by a minimum of 48 inches of structural fill. Site drainage must be designed in such a manner to provide quick removal of moisture from around the perimeter of the building, including careful consideration of plantings and watering schedules. Further measures of moisture control may be discussed with the geotechnical engineer, including the possible placement of a concrete apron (sidewalk) around the perimeter of the building.

Interior slabs on grade must also be supported by 48 inches of structural fill. This is to include 4 inches of clean graded gravel or aggregate basecourse. The interior slab is anticipated to be 4 inches thick reinforced with #3 reinforcing steel spaced at 16 inches on-center, each way.

Framing

Based on preliminary understanding of the intended building layout, building framing may best utilize either of two systems: light gauge metal or wood framed bearing wall systems. Wood framing would consist of 2x stud exterior bearing walls, spaced at 16 inches on-center, with pre-engineered wood trusses designed to clear-span between exterior walls. Light gauge metal framing would consist of similar exterior bearing walls also supporting pre-engineered wood trusses. As an alternative, the roof may be framed with a center beam and column ridge supporting rafters that would span from the ridge to the exterior bearing walls. This system, however, comes with an increased level of complication, introducing not only beams and column, but their associated interior footings. A such, it is the opinion of this office that utilizing pre-engineered wood trusses would most economically fit the intent of the building and can easily be connected to either wood or metal support walls.

The exterior surface would be OSB (oriented strand board) sheathing and would double as the lateral force resisting system.

Design Load Requirements

The Chinle Housing Management Office will be designed in accordance with the 2015 International Building Code in combination with the requirements of the Building Safety Ordinance of Apache County. The following design values will be utilized:

Risk Category II
Roof Live Load 20 PSF
Ground/Roof Snow Load 25/20 PSF
Basic Wind Speed 115 MPH (ASCE 7-10)
Soil Site Class "D"
Seismic Design Category "B" SDs = 0.161 g; SD1 = 0.078 g

MECHANICAL

Proposed System 1

With the probable configuration and orientation of this six thousand square foot office building containing ten (10) offices, a conference room and associated support spaces, a heating, ventilating and air conditioning (HVAC) system would need to have a minimum of five (5) distinct zones and a total of twenty-five (25) tons of cooling. There are multiple ways to provide a five (5) zone heating and cooling system, but for the size and budget considerations of this facility, five (5) natural gas-fired heating / refrigerated air-cooling packaged rooftop mounted units would be the best option.

Proposed System 2

Another viable option would be to provide five (5) variable refrigerant flow (VRF), rooftop mounted, heat pump systems with a heating / cooling unit in each room. Ventilation air would be provided by two (2) energy recovery ventilators (ERV) located in an inside mechanical room. The ERV's could be mounted on the roof.

Mechanical Systems Comparison

System 1 has the advantage of utilizing natural gas for heating which costs about forty-five percent (45%) compared to a heat pump. The cooling costs would be the same for both proposed systems. Space ventilation with System 1 is accomplished via the rooftop mounted heating and cooling units. System 2 requires a separate outside air system for providing ventilation air to the spaces. System 2 does provide for individual room control and virtually eliminates most of the air distribution ductwork.

Based on the above considerations, the Proposed System 2 is recommended.

PLUMBING

Four-inch (4″) sewer piping will be routed from the building plumbing fixtures to the existing manhole in Indian Route 7. A 1-1/2″ domestic water will be routed from Indian Route 7 to the building. The domestic water lines within the building will be cross-linked polyethylene (PEX) piping run overhead and within the walls. Low water usage tank type water closet, urinals and lavatories will be utilized.

FIRE SUPPRESSION SYSTEM

Per IBC 2018, for construction Type V-B for Business Occupancy Group B, the base allowable area is 9,000 sf with no automatic sprinkler system. An automatic fire sprinkler system will not be provided.

ELECTRICAL

Electrical power will be derived from the existing overhead power lines, that are northeast of the proposed building, drop down to a grade mounted transformer and run underground to the building. A 208 volt / 3 phase / 400-amp electrical service will be provided for the building which will be adequate for a future addition to the building.

Recessed 2 x 4 LED troffers will be utilized in the offices to ensure the work surface lighting levels comply with the Illuminating Engineering Society-North America (IESNA) standards. All other areas will have LED light fixtures of varying types to provide the IESNA appropriate lighting levels.

Other electrical systems would include the infrastructure for a future photovoltaic (PV) solar electric system.

PRELIMINARY COST ESTIMATE

A preliminary cost estimate or Opinion of Probable Construction Cost (OPCC) was generated based on the 6,000 square feet proposed building to be located on the new project site. Significant considerations for over-excavation, engineered fill and building foundations are included. The OPCC is based on similar sized office building projects in similar rural locations completed by the design team. The OPCC is a starting point or baseline project budget that will be refined as the design process continues and selections of building systems, enclosure and finishes are confirmed.

The construction costs including labor, materials and subcontract are estimated at $235.00 per square foot for an overall construction cost of $1,410,000. When General Contractor costs including general requirements, overhead and profit, performance and payment bond and contingency are added, the **Total Project Costs amount to $1,931,700.** The OPCC is within the NHA TPC of $1,978,000. The complete OPCC is provided in the Appendix.

APPENDIX

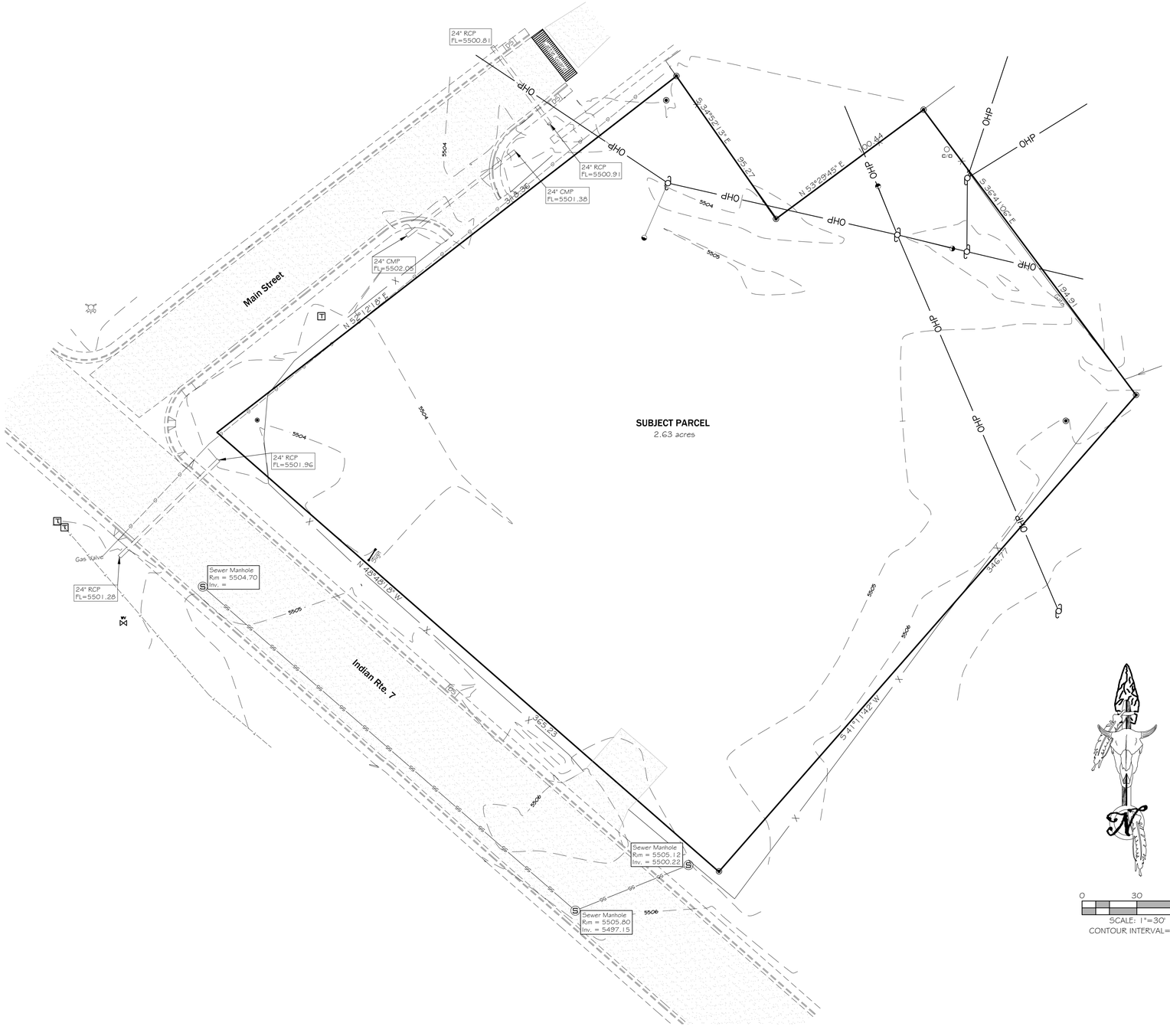
Topographic Survey by Rosenberg Associates dated September 28, 2020.

Preliminary Code Analysis by Suina Design + Architecture dated October 3, 2020.

Geotechnical Evaluation Report by Western Technologies Inc. dated September 22, 2020.

Floodplain and Drainage Study Report by Miller Engineering Consultants dated Nov. 10, 2020.

Opinion of Probable Construction Cost by Suina Design + Architecture dated December 3, 2020.



0 30 60

SCALE: 1"=30'
CONTOUR INTERVAL= 1.0'

NARRATIVE:

This survey was to provide existing utility and topographical information for the parcel shown. This parcel is that as shown on "Boundary Plat of Reassignment of B.I.A. Administrative", signed by Anson M. Carr, and dated 5-10-2018. This survey does not represent a boundary survey of this parcel. No determination was made as to the accuracy of found corner monuments. No monuments were set in the course of this survey.

SURVEYOR'S CERTIFICATE:

I, Kelly R. Schmutz, a duly qualified Registered Land Surveyor under the laws of the State of Anzona, do hereby certify that this survey and map shown hereon was prepared from an actual survey conducted by me or under my direct supervision and that the same is true and correct to the best of my knowledge, belief and information.

Registered Land Surveyor
CERTIFICATE NO.
40535
KELLY R.
SCHMUTZ
9/28/20
DATE
SIGNED
ARIZONA U.S.A.

EXPIRES: 03/31/2022

Date: 9/28/20

Kelly R. Schmutz — Certificate No. 40535

LEGEND:

- FOUND MONUMENT PER SURVEY BY ANSON M. CARR, DATED 5/10/18
- EXISTING POWER POLE
- EXISTING POWER GUY ANCHOR
- EXISTING FIRE HYDRANT
- EXISTING TELEPHONE/COMMUNICATIONS BOX
- EXISTING WATER VALVE
- DS SIDEWALK DRAINAGE STRUCTURE
- C/O SEWER CLEANOUT
- SANITARY SEWER LINE
- UNDERGROUND TELEPHONE LINE
- UNDERGROUND GAS LINE
- EXISTING CURB, GUTTER AND SIDEWALK
- OHP OVERHEAD POWER LINES
- EXISTING ASPHALT

PROPOSED OFFICE BUILDING SITE
CHINLE, ARIZONA

DATE:	9/28/20
JOB NO.:	12318-20
DRAWN BY:	K.R.S.
CHECKED BY:	
SCALE:	1"=30'
DWG:	SURVEY-BASE.DWG

REVISIONS — DATE

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SHEET
1
OF 1 SHEETS

Preliminary Code Analysis

1. Identification of Applicable Codes and Standards

2018 International Building Code (IBC)

2. Type of Construction

Type V-B, no automatic sprinkler system.

3. Reason for Submittal

New Construction

4. Location

Chinle, Arizona

5. Customer Information

Mary VanDever, Executive Director, Chinle HMO, Navajo Housing Authority

6. Date of Plan

Insert Date

7. Local Fire Department

Chinle Fire Department

8. Local Building Inspector

Fire Marshall (Name)

9. Building Location

Insert address.

Google Earth aerial image at right (Figure 1).

Figure 1 – Aerial of New Chinle HMO Building Site

10. Walls, New or Existing

New exterior walls are stucco over wood frame or light gauge construction with R-21 insulation and gypsum board at interior. New interior walls of similar construction with acoustic insulation and gypsum board on both sides.

11. Occupancies

Primary occupancy – Business Occupancy Group B

12. Construction Type

Type V-B, structural elements, exterior walls and interior walls are of any material allowed by code, combustible or non-combustible with no fire resistance rating.

13. Total Allowed Area Per Floor

OCCUPANCY GROUP	CONSTRUCTION TYPE	BASE ALLOWABLE AREA (SF)	SPRINKLER INCREASE (%/SF)	FRONTAGE INCREASE (%/SF)	TOTAL ALLOWABLE AREA (SF)
B	V-B	9,000	0	13,500	22,500
Total:					22,500

No automatic sprinkler system.

Frontage increase calculation (based on preliminary layout of 40′ x 150′ building):

$W = (L_1 \times w_1 + L_2 \times w_2 + L_3 \times w_3 + L_4 \times w_4) / F$

W = calculated width of public way or open space (feet)

L_n = Length of a portion of the exterior perimeter wall

W_n = Width (> or = 20 feet) of a public way or open space associated with that portion of the exterior perimeter wall

F – Building perimeter that fronts on a public way or opens space having a width of 20 feet or more.

W = (150′ x 85′ + 40′ x 69′ + 150′ x 84′ + 40′ x 103′) / 380

W = (12,750 + 2,760 + 12,600 + 4,120) / 380

W = 84

Where W is greater than 30 feet and the building meets the requirements of Section 507, except for compliance with the minimum with the minimum 60-foot public way or yard requirement, the value of W shall not exceed 60 feet.

Amount of increase:

$I_f = [F / P – 0.25] W / 30$

$I_f = [380 / 380 – 0.25] 60 / 30$

$I_f = [1 – 0.25] 2$

$I_f = 1.5 \times 9{,}000$ sf = 13,500 sf

14. Actual Floor Area

Total 6,000 SF (approximate)

15. Allowed Stories and Height Limitations

OCCUPANCY GROUP	CONSTRUCTION TYPE	BASE HEIGHT	SPRINKLER INCREASE	FRONTAGE INCREASE	ALLOWABLE HEIGHT
B	V-B	2 stories/40 ft	3 stories/60 ft	0	2 stories/40 ft

No automatic sprinkler system.

16. Actual Height

Insert height

17. Fire-Resistance Rating Requirements

Per 2018 IBC Table 601 for Construction Type V-B, bearing walls, exterior or interior are required to provide a fire-resistance rating of 0 hours with a fire separation distance of greater than or equal to 30 feet. Floor and roof construction are also required to provide a fire-resistance rating of 0 hours. The maximum area of exterior wall openings based on fire separation distance and degree of opening protection per 2018 IBC Table 705.8, for fire separation greater than 30 feet with unprotected, non-sprinklered, there is no limit.

18. Floors

New floors are slab on grade with finishes including VCT or similar hard surface, carpet and exposed concrete.

19. Roofs

Sloped roof with metal roof panels, substructure and R-38 insulation.

20. Exterior Openings

Existing openings and windows do not appear to be fire rated or energy efficient. Most windows are single pane with damaged frames.

21. Fire Safety Features

Fire extinguishers for light hazard occupancy include type 2-A where 1 per 3,000 sf are required and a maximum travel distance of 75 feet to each fire extinguisher.

Per 2018 IBC Section 907.2.2 for Occupancy Group B, a manual fire alarm system is required where the occupant load is more than 100 persons above or below the lowest level of exit

discharge. The occupant load is calculated at 40, therefore a manual fire alarm system is not required.

22. Smoke Detectors, Battery Emergency Lighting, Exit Lights, Emergency Power Generators

Emergency lighting are required in each room and as required in corridors or path of travel for exit discharge per code. Exit signs are required at each exit access door. Fire department connections or fire hydrants are required.

23. Occupant Load

IBC Occupant Load

RM NO	ROOM NAME	USE	LOAD FACTOR	AREA	OCC'S
101	All rooms	Office	150 GSF	6,000 GSF	40
BUILDING TOTAL					40

24. Means of Egress

The required means of egress capacity factor is 0.2 inch per occupant. Total of 40 occupants x 0.2 inch = 8 inches. All exterior doors will provide 32 inch clear opening.

The exit access travel distance for Occupancy Group B without an automatic sprinkler system is 200 feet.

The minimum corridor with is 44 inches.

Dead-end corrdidors shall not exceed 20 feet in length.

25. Accessible Building and Site Features related to the Architectural Barriers Act

- Site Accessibility
    - An accessible route from public transportation stops, accessible parking and public streets or sidewalks shall be provided to the accessible building entrance served.
    - At least one accessible route shall be provided to each portion of the building and shall coincide with the general circulation path.
    - Typical parking requirements for a building with B Occupancy are one (1) parking space per 250 s.f. Based on the area of the building, a total of thirty (30) parking spaces are required. (6,000 / 250 = 24).

  - Per IBC 2018 Table 1106.1, one (1) accessible parking spaces must be provided for every twenty-five (25) parking spaces provided. For every six or fraction of six accessible parking spaces, at least one shall be a van-accessible parking space.
  - Accessible parking spaces shall be located on the shortest accessible route of travel from adjacent parking to an accessible building entrance.
- Building Accessibility
  - The main entrance should be equipped with an accessible automatic door opener. If ramps are required along the accessible route, they should meet ANSI A117.1 requirement for 1:12 maximum ramp slope.
- Restroom Accessibility
  - Per 2018 IBC Section 1109.2, each toilet room and bathing room shall be accessible.
  - Where multiple single-use toilet rooms are clustered at a single location, at least 50 percent but not less than one room for each use at each cluster shall be accessible.
  - Accessible toilet rooms shall be located on an accessible route.
  - Where water closet compartments are provided in a toilet room, at least 5 percent of the total number of compartments shall be wheelchair accessible.
  - Where lavatories are provided, at least 5 percent but not less than one shall be accessible.
  - Where kitchens or kitchenettes are provided in accessible spaces or rooms, they shall be accessible.
  - Where drinking fountains are provided, not fewer than two drinking fountains shall be provided. One drinking fountain shall comply with the requirements for people who use a wheelchair and one drinking fountain shall comply with the requirement for standing persons.
  - Where fixed or built-in storage elements such as cabinets, coat hooks, shelves, lockers are provided in required accessible spaces, at least 5 percent but not less than one of each type shall be accessible.

26. Plumbing Fixture Type and Count

2018 Chapter 29 Plumbing Systems, Table 2902.1
Business classification requirements for plumbing fixtures:

water closets	lavatories	drinking fountains	other
1 per 25 for the first 50 and 1 per 50 for the remainder exceeding 50 for both male and female.	1 per 40 for the first 80 and 1 per 80 for the remainder exceeding 80.	1 per 100	1 service sink
Total occupants = 40			
water closets (toilets)	lavatories (sinks)	drinking fountains	other
40 / 25 = 1.6 (2 total)	40 / 40 = 1.0 (1)	40 / 100 = 0.4 (1)	1 service sink

Actual plumbing fixtures provided:

water closets (toilets)	lavatories (sinks)	drinking fountains	other
Men's Restroom: 1 water closet 1 urinal	1 lavatory		
Women's Restroom: 2 water closets	1 lavatory		
Kitchen/Break Room:			1 service sink
		2 drinking fountains	

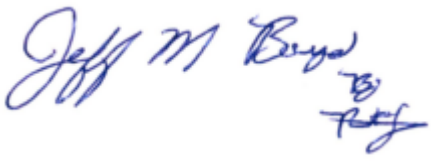
Western Technologies Inc.

GEOTECHNICAL EVALUATION REPORT

HOUSING MANAGEMENT OFFICE
Indian Route 7 and Indian Route 102
Chinle, Arizona
WT Reference No. 3120JS068

PREPARED FOR:
Suina Design
4411 McLeod Road NE, Suite A-1
Albuquerque, New Mexico 87109

September 22, 2020



Roger K. Southworth, P.E.
Managing Director

Reviewed By: Jeff M. Boyd, P.E.
Senior Geotechnical Engineer

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The Quality People
Since 1955

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September 24, 2020

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4411 McLeod Road NE, Suite A-1
Albuquerque, New Mexico 87109

Re: Geotechnical Evaluation
Housing Maintenance Office
Indian Route 7 and Indian Route 102
Chinle, Arizona

Job No. 3120JS068

Western Technologies Inc. (WT) has completed the geotechnical evaluation for the above-referenced project. This study was performed in general accordance with our proposal number 3120PS070 dated July 15, 2020. The results of our study, including the boring location diagram, boring logs, laboratory test results, and the geotechnical recommendations are attached.

We have appreciated being of service to you in the geotechnical engineering phase of this project and are prepared to assist you during the construction phases as well. Please do not hesitate to contact us if the design conditions change or if you have any questions concerning this report. We look forward to working with you on future projects.

Sincerely,
WESTERN TECHNOLOGIES INC.

Roger K. Southworth, P.E.
Managing Director

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GEOTECHNICAL EVALUATION
HOUSING MANAGEMENT OFFICE
INDIAN ROUTE 7 AND INDIAN ROUTE 102
CHINLE, ARIZONA

JOB NO. 3120JS068

1.0 PURPOSE

This report contains the results of our geotechnical evaluation for the Housing Management Office that will be constructed in Chinle, Arizona. The purpose of these services is to provide information and recommendations regarding:

- Foundation Design
- Floor Slab Support
- Seismic Design Parameters
- Pavement Design

The results of the field exploration and laboratory tests are presented in the Appendix.

2.0 PROJECT DESCRIPTION

The project will consist of constructing an office building for the Housing Management Office. The building will consist of a one- or two-story structure with a footprint of less than 6,000 square feet. It was assumed that the structure would have wall loads of less than 4 kips per linear foot and column loads of less than 200 kips. It was also assumed that grade changes of less than 3 feet would be required to develop the final site grades. We should be notified immediately if any of our assumptions are incorrect since a revision of the recommendations presented herein could then be necessary.

3.0 SCOPE OF SERVICES

3.1 Field Exploration

Four borings were drilled in the planned building area to depths of approximately 7 to 16½ feet and two borings were drilled in the planned pavement area to depths of approximately 5 feet. The borings were drilled at the approximate locations indicated on the attached Boring Location Diagram (Plate 1).

A WT engineering technician monitored the drilling operations and prepared a field log for each boring. These logs contain visual classifications of the materials encountered during drilling as well as interpolation of the subsurface conditions between samples.

The final boring logs, included in Appendix A, represent our interpretation of the field logs and may include modifications based on laboratory observations of the recovered samples. The final logs describe the materials encountered, their thicknesses, and the depths at which samples were obtained.

The Unified Soil Classification System was used to classify the soil. The soil classification symbols appear on the boring logs and are briefly described in Appendix A.

3.2 Laboratory Testing

Laboratory tests were performed on representative samples to aid in material classification and to estimate the pertinent engineering properties of the soil. Testing was performed in general accordance with applicable ASTM methodologies. The following tests were performed and the results are presented on the boring logs and in Appendix B.

- Water Content
- Percent Passing No. 200 Sieve
- Liquid and Plastic Limits
- Dry Density
- Swell Potential

The laboratory test results were used in the development of the recommendations contained in this report.

3.3 Analyses and Report

Analyses were performed and this report was prepared for the exclusive purpose of providing geotechnical engineering 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. We are available to discuss the scope of such studies with you.

This geotechnical engineering report includes a description of the project, a discussion of the field exploration and laboratory testing programs, a discussion of the subsurface conditions, and design recommendations as required to satisfy the purpose previously described.

4.0 SUBSURFACE CONDITIONS

Loose clayey sand fill was encountered in Boring B-3 to a depth of approximately 7 feet. This boring was terminated at 7 feet due to auger refusal on concrete. The native soil consisted of very stiff to hard lean to fat clay with variable sand content. The clay deposits extended to the boring to the termination depths. Groundwater not encountered in the borings during drilling.

5.0 GEOTECHNICAL PROPERTIES & ANALYSIS

Swell tests were performed to evaluate the swell potential of the clay (Plate B-1). The test results indicated swell values of 16.1 and 17.2 percent when the samples were placed under a surcharge load of about 100 pounds per square foot (psf) and inundated with water. These test results indicate that clay has a very high potential for volume change with variations in the soil water content.

6.0 RECOMMENDATIONS

6.1 General

The recommendations contained in this report are based on our understanding of the project criteria described in Section 2.0, **Project Description**, and the assumption that the subsurface conditions are those disclosed by the test borings. Others may change the plans, final elevations, number and type of structures, foundation loads, and floor levels during design or construction. Substantially different subsurface conditions from those described herein may be encountered or become known. Any changes in the project criteria or subsurface conditions shall be brought to our attention in writing.

6.2 Design Considerations

The borings indicate that the project site is underlain by highly expansive clay, which will experience volume change with variations in its water content. Structures and related improvements situated within the clay will experience large movements if the moisture content of the clay increases. These movements are expected to cause distress to structures

supported within the active zone of the clay deposits. However, if the owner is willing to accept the risk of foundation and floor slab movement, the building can be supported by spread footings with a slab-on-grade floor supported by a layer of non-expansive fill and moisture-conditioned clay. The expected movement can cause cracking of interior sheetrock, racking of doors and windows, and unlevel floors. The performance of the foundation/floor slab system will also depend upon the quality of construction and the drainage around the structure. If the risk of excessive movement and associated building distress is not acceptable, it is recommended that a drilled shafts in conjunction with a structural suspended floor be used for support. Recommendations for drilled shaft design can be provided in a supplemental report if the owner elects to use this alternative.

The performance of spread footings and a slab-on-grade floor will be highly dependent upon proper drainage during and following construction. Ponding water, waterline leaks, and other sources of water near the structure can result in an increase in the predicted movements. Conversely, the moisture content in the foundation/floor slab subgrade must be maintained during dry weather to prevent excessive drying, which can also result in a greater amount of movement than predicted. Even with a properly designed and constructed foundation/floor slab system, foundation/floor slab movements can cause distress to the structure, such as cracks in sheetrock, racking of doors and windows, and unlevel floors.

6.3 Foundations

The proposed building can be supported by spread footings. However, the site is underlain by existing fill and highly expansive clay that is not recommended for direct foundation support. The existing fill should be removed from the foundation areas and replaced with engineered fill. In addition, the foundations should be underlain by a minimum of 48 inches of non-expansive fill and 8 inches of moisture-conditioned on-site soil in order to reduce the amount of foundation movement. Foundation subgrade preparation is discussed in greater detail in the **Earthwork** section of this report.

Foundations bearing on the engineered fill can be designed for a maximum net allowable bearing capacity of up to 2,000 pounds per square foot (psf). The allowable bearing capacity applies to dead load plus design live load conditions. The foundations should be designed as rigid grade beams containing top and bottom reinforcement in order to reduce the potential for distress due to potential foundation movement.

The foundations should bear a minimum of 24 inches below the final adjacent site grade for frost considerations. Strip footings should have a minimum width of 16 inches and isolated column pad foundations should have a minimum dimension of 24 inches.

We estimate that the total post-construction movement of foundations supported as recommended herein will be on the order of 1 inch. We estimate that the differential movement between comparably sized and loaded foundations could equal the total foundation movement. Additional foundation movement can occur if water from any source infiltrates the foundation subgrade. Therefore, proper drainage should be provided in the final design and during construction.

All footings, stem walls, and masonry walls should be reinforced to reduce the potential for distress caused by differential foundation movement. The use of joints at openings and other discontinuities in masonry walls is recommended. Joints should also be closely spaced along the length of masonry site retaining walls and screen walls to accommodate minor differential foundation movement.

We recommend that the geotechnical engineer or a representative of the engineer observe the base of the footing overexcavations prior to backfilling operations. This observation is to assess whether the exposed bearing stratum is similar to that anticipated for structural fill subgrade and indirect foundation support. Any loose, soft, or disturbed material should be undercut to a suitable bearing subgrade.

6.4 Floor Support

The floor slab can be designed as a slab-on-grade provided the owner is willing to accept the risk of floor slab movement. If the risk of floor slab movement and associated distress is not acceptable, a structural floor slab suspended above the subgrade should be used.

It is assumed that the owner will elect to use a slab-on-grade floor. With this alternative all existing fill should be removed from the building area and replaced with engineered fill. In addition, the floor slab should be supported by a minimum of 48 inches of non-expansive fill and 8 inches of moisture-conditioned on-site soil in order to reduce the potential for excessive movement due to shrink/swell of the clay. The floor slab subgrade should be prepared as recommended in the **Earthwork** section of this report.

A minimum four-inch-thick layer of drainage aggregate should be provided beneath at-grade floor slabs to prevent the capillary rise of water beneath the slab and a damp slab. The drainage aggregate should consist of sand, sand-gravel, crushed stone, or a combination of these materials. The granular fill should have a maximum particle diameter of no more than one-half the granular fill thickness and should contain no more than 5 percent passing the No. 200 sieve. In addition, the granular fill should have a maximum plasticity index of 6.

The use of vapor retarders is desirable for any slab-on-grade where the floor will be covered by products using water-based adhesives, wood, vinyl-backed carpet, impermeable floor coatings (urethane, epoxy, acrylic terrazzo, etc.). When used, the design and installation should be in accordance with the recommendations presented in ACI 302.1R and 302.2R. Final determination on the use of a vapor retarder should be left to the slab designer.

All concrete placement and curing operations should follow the American Concrete Institute manual recommendations. Improper curing techniques and/or high slump (high water-cement ratio) could cause excessive shrinkage, cracking, or curling of the floor slab. Concrete slabs should be allowed to cure adequately before placing vinyl or other moisture-sensitive floor covering.

6.5 Seismic Considerations

Seismic structural design criteria is provided below.

- Design Code Reference: ASCE7-16
- Site Soil Classification: Site Class D*

S_s = 0.151 g	S_{MS} = 0.241 g	S_{DS} = 0.161 g
S_1 = 0.049 g	S_{M1} = 0.117 g	S_{D1} = 0.078 g

* The site class was based on the conditions exposed in our shallow exploratory soil borings and our knowledge of the soil conditions in the site vicinity. The soil characteristics extending beyond the depth of our borings were assumed for the purposes of providing this site classification.

6.6 Drainage

Properly functioning foundations require appropriately constructed and maintained site drainage conditions. Therefore, it is essential that positive drainage be provided during construction and maintained throughout the life of the structure. It is also important that proper planning and control of landscape and irrigation be performed.

Infiltration of water into utility or foundation excavations must be prevented during construction. 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. If utility line trenches are backfilled with the clay, care should be taken not to overcompact the backfill. However, if the trenches are backfilled

with a granular soil then a clay plug should be placed in the trench adjacent to the building to reduce the potential for water following the trench back under the structure.

The building should be provided with downspout extensions to direct water away from the structure. The downspouts should discharge into drainage swales or into the storm sewer system.

In areas where sidewalks, patios, or driveways do not immediately adjoin the structure, the ground surface adjacent to the building should slope down at a grade of about five percent for a distance of at least 10 feet from the perimeter walls. Planters or other surface features that could retain water adjacent to the building should be avoided. If planters and/or landscaping are adjacent to or near the structure, we recommend the following:

- Grades should slope away from the building.
- Planters should slope away from the building and should not pond water. Drains should be installed in enclosed planters to facilitate flow out of the planters.
- Only shallow-rooted landscaping should be used.
- Watering should be kept to a minimum. Irrigation systems should be situated on the far side of any planting and away from the building to reduce the potential for infiltration beneath foundations from possible leaks.
- A minimum of 36 inches should be maintained between the building foundations and shallow-rooted plants. In like manner, for deeper-rooted plants a minimum of 72 inches should be maintained between the building foundations and the plants. These deeper-rooted plants should still have a low moisture requirement.
- Trees should be planted no closer than a distance equal to one-half their mature height or fifteen feet, whichever is greater, from the building.

It should be understood that these recommendations will help reduce the potential for soil movement and resulting distress, but will not eliminate this potential.

6.7 Exterior Slabs

The site is underlain by zones of expansive clays that have the potential to expand and shrink with changes in their water content. Therefore, relatively lightweight exterior concrete flatwork such as sidewalks, patios, and driveways, may experience movement resulting in cracking or vertical offsets. To reduce the potential for damage, we recommend:

- Use of fill with low expansion potential and negligible frost susceptibility
- Placement of effective control joints on relatively close centers
- Moisture-density control during placement of subgrade fills
- Provision for adequate drainage in areas adjoining the slabs
- Use of designs which allow vertical movement between the exterior slabs and adjoining structural elements

It should be understood that these recommendations will help reduce the potential for soil movement and resulting distress, but will not eliminate this potential.

6.8 Pavements

It was assumed that the parking lot would be subject to both passenger vehicles and small- to medium-size trucks. On this basis, a daily traffic value of two Equivalent 18-kip Single Axle Loads (ESAL) was assumed for passenger car parking areas and drives (light duty), and a traffic value of 10 ESALs was assumed for the access drives. It was assumed that this traffic volume is an average for the life of the pavement and that it includes any anticipated traffic growth. The design period for the pavement was 20 years.

A revision of the recommended pavement sections may be necessary if the expected traffic loading conditions are different than assumed. An evaluation of the type and volume of traffic that each portion of the parking lot will experience should be conducted to determine if the pavement sections presented herein are appropriate.

The following pavement section is recommended for use on the site:

Traffic Area	Asphalt Concrete Pavement (inches)	Base Course (inches)
Light Duty	2.5	6.0
Access Drives	3.0	7.0

The "design life" of a pavement is defined as the expected life at the end of which reconstruction of the pavement will need to occur. Normal maintenance, including crack sealing, slurry sealing, and/or chip sealing, should be performed during the life of the pavement.

Due to the high static loads imposed by parking trucks in loading and unloading areas and at dumpster locations, we recommend a rigid pavement section for these areas. A minimum six-inch thick Portland cement concrete pavement is recommended.

Bituminous pavement should be constructed of dense-graded, central plant-mix, asphalt concrete. Base course, Portland cement, and asphalt concrete should conform to the Arizona Department of Transportation specifications.

Material and compaction requirements should conform to the recommendations presented in the **Earthwork** section of this report. The gradient of paved surfaces should ensure positive drainage. Water should not be allowed to pond in areas directly adjoining paved sections.

The site soils are expansive and differential heave may occur. The pavement service life may be reduced due to water infiltration into the subgrade soils heave induced cracks in the pavement. This will result in a softening and loss of strength of the subgrade soils. A regular maintenance program to seal pavement cracks will help prolong the life of the pavement.

Pavement design methods are intended to provide an adequate thickness of structural materials over a particular subgrade such that wheel loads are reduced to a level the subgrade can support. The support characteristics of the subgrade for pavement design do not account for shrink and swell movements of an expansive clayey subgrade such as the soils encountered on this project. Consequently, the pavement may be adequate from a structural standpoint, yet still experience cracking and deformation due to shrink/swell movement of the subgrade. It is therefore important to minimize moisture changes in the subgrade in order to reduce shrink/swell movements. The pavement surface, subbase surface, and adjacent areas should be well drained. Excessive watering of landscaped areas adjacent to pavements should be avoided. Proper maintenance should be performed on cracks in the pavement surface to prevent water from penetrating through to the base or subbase material. Even with these precautions, some movement and related cracking may still occur, requiring periodic maintenance.

7.0 EARTHWORK

7.1 General

The conclusions contained in this report are contingent upon compliance with recommendations presented in this section. Any excavating, trenching, or disturbance that occurs after completion of the earthwork must be backfilled, compacted, and tested in

accordance with the recommendations contained herein. It is not reasonable to rely upon our conclusions and recommendations if any future unobserved and untested trenching, earthwork activities, or backfilling occurs.

7.2 Site Clearing

Strip and remove any vegetation and other deleterious materials from the building and pavement areas. The existing fill can remain in the pavement areas provided that it does not contain any deleterious material and the subgrade is prepared as discussed in Section 7.4. The building area is defined as the area within the building footprint plus five feet beyond the perimeter of the footprint. All exposed surfaces should be free of mounds and depressions that could prevent uniform compaction.

7.3 Building Pad Preparation

The foundation areas should be overexcavated through the existing fill or to a minimum of 48 inches beneath the base of the foundations, whichever is deeper. The overexcavations should extend a lateral distance of at least one foot for every two feet of fill that will be placed beneath the foundations. In areas where a slab-on-grade floor will be used, the floor slab areas should be overexcavated through the existing fill or to a minimum of 48 inches beneath the base of the floor slab, whichever is deeper.

The base of the foundation/floor slab overexcavations should be scarified to a minimum depth of 8 inches, moisture conditioned to a water content of 0 to 4 percent above the optimum water content, and recompacted to between 93 and 97 percent of the standard Proctor maximum dry density (ASTM D 698). The overexcavations should then be backfilled to the design finish grade with non-expansive fill placed and compacted in accordance with the recommendations presented in Section 7.6. The engineered fill should consist of low expansive potential material meeting the requirements presented in Section 7.5.

The perimeter foundation excavations on the exterior side of the building area should be backfilled with on-site clay to reduce the potential for surface water ponding in the non-expansive fill. The clay backfill should be sloped away from the structure to promote drainage away from the foundations.

7.4 Pavement Subgrade Preparation

The site should then be cut as required to the design finish grade. The subgrade should then be scarified to a minimum depth of 8 inches and recompacted in accordance with the

recommendations presented in Section 7.6. The site can then be raised to the design finish grade with engineered fill.

7.5 Materials

The existing site soil is expansive and is not recommended for use as fill in building areas. The existing site soil can be used as fill in the pavement areas provided that it does not contain any deleterious material. Imported non-expansive fill soil should conform to the following:

- Gradation (ASTM C136):

	percent finer by weight
6"	100
4"	85-100
¾"	70-100
No. 4 Sieve	50-100
No. 200 Sieve	30 (max)

- Maximum expansive potential (%)* 1.5
- Maximum soluble sulfates (%) 0.10

* Measured on a sample compacted to approximately 95 percent of the ASTM D698 maximum dry density at about three percent below the optimum water content. The sample is confined under a 100 psf surcharge and submerged.

Imported fill should be approved by WT prior to placement.

7.6 Placement and Compaction

a. Place and compact fill in horizontal lifts, using equipment and procedures that will produce recommended water contents and densities throughout the lift.

b. Uncompacted fill lifts should not exceed 10 inches.

c. No fill should be placed over frozen ground nor should frozen fill or backfill be used.

d. Materials should be compacted to the following:

	Minimum Percent Material Compaction (ASTM D698)
• Recompacted on-site soil in the building area	93 to 97
• Imported non-expansive fill in the building area	95
• Fill in the pavement areas	95
• Nonstructural backfill	90

Imported non-expansive fill and fill in the pavement areas should be compacted within a water content range of –3 to +3 percent of the optimum water content. Recompacted on-site soil in the building area should be compacted within a water content range of 0 to +4 percent of the optimum water content.

7.7 Compliance

Recommendations for foundation, slab-on-grade, and pavement elements supported on compacted fill or prepared subgrade depend upon compliance with the **Earthwork** recommendations. To assess compliance, observation and testing should be performed under the direction of the project geotechnical engineer. Please contact us to provide these testing and observation services.

8.0 ADDITIONAL SERVICES

The recommendations provided in this report are based on the assumption that a sufficient schedule of tests and observations will be performed during construction to verify compliance. At a minimum, these tests and observations should be comprised of the following:

- Observations and testing during site preparation and earthwork;
- Observation of foundation excavations; and
- Consultation as may be required during construction.

Retaining the geotechnical engineer who developed your report to provide construction observation is the best way to verify compliance, and to help you manage the risks associated with unanticipated conditions.

9.0 LIMITATIONS

This report has been prepared assuming the project criteria described in Section 2.0. If changes in the project criteria occur, or if different subsurface conditions are encountered or become known, the conclusions and recommendations presented herein shall become invalid. In any such event, contact WT to assess the effect that such variations may have on our conclusions and recommendations. If WT is not retained for the construction observation and testing services to determine compliance with this report, our professional responsibility is accordingly limited.

The recommendations presented are based entirely upon data derived from a limited number of samples obtained from widely spaced borings. The attached logs are indicators of subsurface conditions only at the specific locations and times noted. This report assumes the uniformity of the geology and soil structure between borings, however variations can and often do exist. Whenever any deviation, difference or change is encountered or becomes known, WT should be contacted.

This report is for the exclusive benefit of our client alone. There are no intended third-party beneficiaries of our contract with the client or this report, and nothing contained in the contract or this report shall create any express or implied contractual or any other relationship with, or claim or cause of action for, any third party against WT.

This report is valid until the earlier of one year from the date of issuance, a change in circumstances, or discovered variations. After expiration, no person or entity shall have any right to rely on this report without the express written authorization of WT.

10.0 CLOSURE

We prepared this report as an aid to the designers of the proposed project. The comments, statements, recommendations and conclusions set forth in this report reflect the opinions of the authors. These opinions are based upon data obtained at the boring locations. Work on your project was performed in accordance with generally accepted standards and practices utilized by professionals providing similar services in this locality. No other warranty, express or implied, is made.

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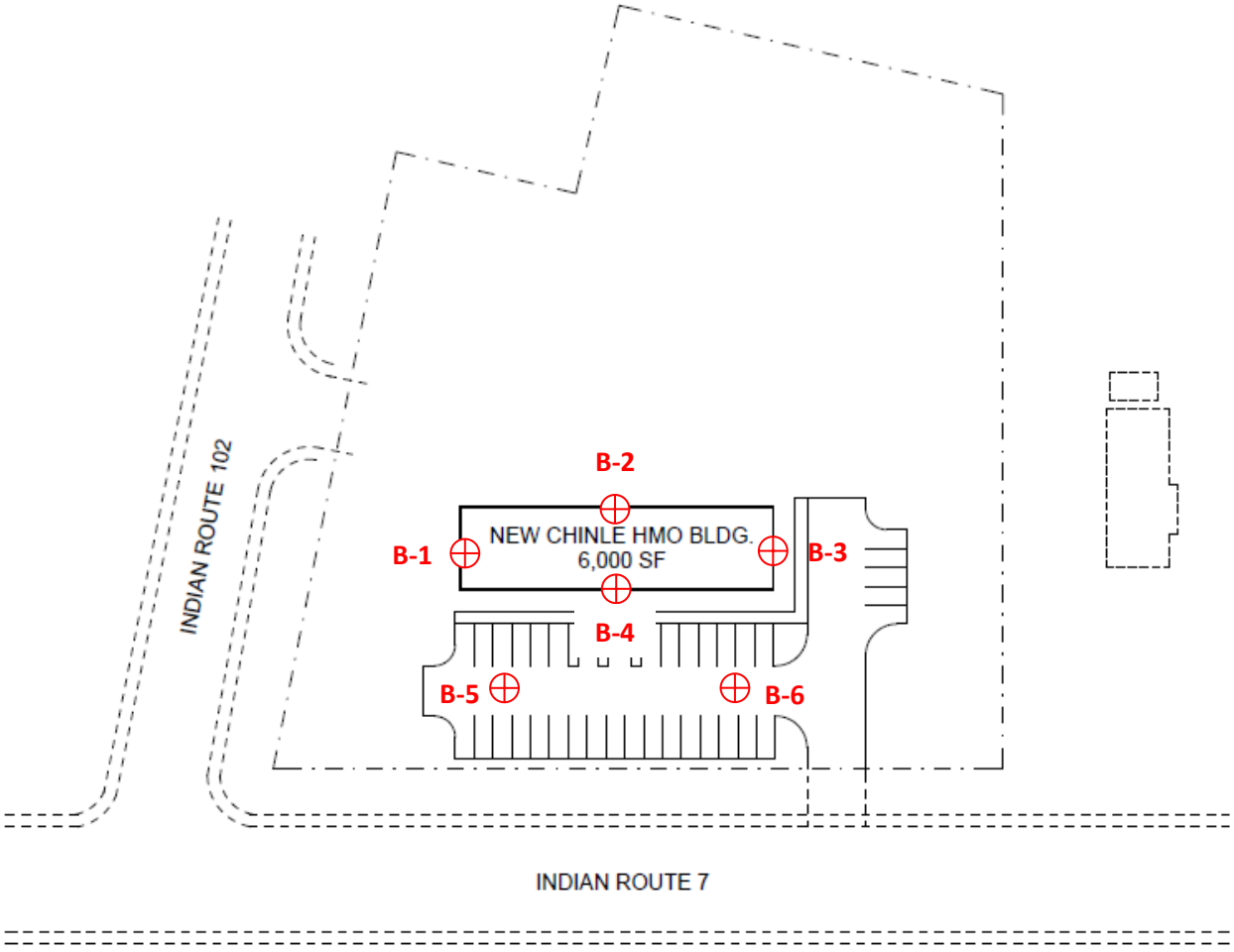

⊕ **Approximate Boring Location;**

Geotechnical
Environmental
Inspections
Materials

Western Technologies Inc.
The Quality People
Since 1955
wt-us.com

PROJECT: HOUSING MANAGEMENT OFFICE
JOB NO.: 3120JS068

PLATE: 1

BORING LOCATION DIAGRAM

BORING NUMBER B-1

Logo

Western Technologies

CLIENT Suina Design
PROJECT NAME Housing Management Office
PROJECT NUMBER 3120JS068
PROJECT LOCATION Chinle, Arizona
DATE STARTED 9/15/20 **COMPLETED** 9/15/20
GROUND ELEVATION _____ **HOLE SIZE** 7"
DRILLING CONTRACTOR Envirodrill
GROUND WATER LEVELS:
DRILLING METHOD Hollow-Stem Auger
AT TIME OF DRILLING --- Dry
LOGGED BY S. Cobb **CHECKED BY** R. Southworth
AT END OF DRILLING --- Dry
NOTES _____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(CH) LEAN to FAT CLAY; with sand, red-brown, very stiff to hard, damp to moist	GB									
			MC		50		117	12	51	21	30	87
5			MC		44			12				88
			MC		28			13				81
10			SS		6-6-9 (15)							
15			SS		2-4-4 (8)							

Bottom of borehole at 16.5 feet.

Logo

Western Technologies

BORING NUMBER B-2

CLIENT Suina Design
PROJECT NAME Housing Management Office
PROJECT NUMBER 3120JS068
PROJECT LOCATION Chinle, Arizona
DATE STARTED 9/15/20 **COMPLETED** 9/15/20
GROUND ELEVATION _____ **HOLE SIZE** 7"
DRILLING CONTRACTOR Envirodrill
GROUND WATER LEVELS:
DRILLING METHOD Hollow-Stem Auger
AT TIME OF DRILLING ---
LOGGED BY S. Cobb **CHECKED BY** R. Southworth
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(CH) LEAN to FAT CLAY; with sand, red-brown, very stiff to hard, damp to moist	GB									
			SS		9-12-12 (24)		113	12	46	19	27	86
5			SS		10-19-16 (35)							
			SS		9-12-16 (28)			14				91
10			SS		11-14-16 (30)							
15			SS		11-14-11 (25)							

Bottom of borehole at 16.5 feet.

Logo

Western Technologies

BORING NUMBER B-3

CLIENT Suina Design
PROJECT NAME Housing Management Office
PROJECT NUMBER 3120JS068
PROJECT LOCATION Chinle, Arizona
DATE STARTED 9/15/20 **COMPLETED** 9/15/20
GROUND ELEVATION _____ **HOLE SIZE** 7"
DRILLING CONTRACTOR Envirodrill
GROUND WATER LEVELS:
DRILLING METHOD Hollow-Stem Auger
AT TIME OF DRILLING ---
LOGGED BY S. Cobb **CHECKED BY** R. Southworth
AT END OF DRILLING ---
NOTES Boring terminated at 7 feet due to auger refusal in concrete
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(SC) FILL - CLAYEY SAND; loose, red-brown, damp	GB									
			MC		17			6				46
5			MC		50							

Refusal at 7.0 feet.
Bottom of borehole at 7.0 feet.

Logo

Western Technologies

BORING NUMBER B-4

CLIENT Suina Design
PROJECT NAME Housing Management Office
PROJECT NUMBER 3120JS068
PROJECT LOCATION Chinle, Arizona
DATE STARTED 9/15/20 **COMPLETED** 9/15/20
GROUND ELEVATION _____ **HOLE SIZE** 7"
DRILLING CONTRACTOR Envirodrill
GROUND WATER LEVELS:
DRILLING METHOD Hollow-Stem Auger
AT TIME OF DRILLING ---
LOGGED BY S. Cobb **CHECKED BY** R. Southworth
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(CH) LEAN to FAT CLAY; with sand, red-brown, very stiff to hard, damp to moist	GB									
			MC		14			10				78
5			MC		13			12				86
			MC		8			12				83
10			SS		9-10-9 (19)							
15			SS		10-10-12 (22)							

Bottom of borehole at 16.5 feet.

Logo

Western Technologies

BORING NUMBER B-5

CLIENT Suina Design
PROJECT NAME Housing Management Office
PROJECT NUMBER 3120JS068
PROJECT LOCATION Chinle, Arizona
DATE STARTED 9/15/20 **COMPLETED** 9/15/20
GROUND ELEVATION _____ **HOLE SIZE** 7"
DRILLING CONTRACTOR Envirodrill
GROUND WATER LEVELS:
DRILLING METHOD Hollow-Stem Auger
AT TIME OF DRILLING ---
LOGGED BY S. Cobb **CHECKED BY** R. Southworth
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(CH) LEAN to FAT CLAY; with sand, red-brown, very stiff to hard, damp to moist	GB									
			GB									
5												

Bottom of borehole at 5.0 feet.

Logo

Western Technologies

BORING NUMBER B-6

CLIENT Suina Design
PROJECT NAME Housing Management Office
PROJECT NUMBER 3120JS068
PROJECT LOCATION Chinle, Arizona
DATE STARTED 9/15/20 **COMPLETED** 9/15/20
GROUND ELEVATION _____ **HOLE SIZE** 7"
DRILLING CONTRACTOR Envirodrill
GROUND WATER LEVELS:
DRILLING METHOD Hollow-Stem Auger
AT TIME OF DRILLING ---
LOGGED BY S. Cobb **CHECKED BY** R. Southworth
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(CH) LEAN to FAT CLAY; with sand, red-brown, very stiff to hard, damp to moist	GB									
			GB									
5												

Bottom of borehole at 5.0 feet.

BORING NO.	SAMPLE DEPTH (ft)	SAMPLE CLASSIFICATION	INITIAL WATER CONTENT (%)	DRY DENSITY (pcf)	SURCHARGE LOAD (PSF)	PERCENT SWELL
B-1	2 - 3	CH-CL	11.6	117	100	17.1
B-2	2 - 3	CH-CL	11.6	113	100	16.2

FLOODPLAIN AND DRAINAGE

STUDY REPORT

FOR

HMO BUILDING SITE

CHINLE, ARIZONA

Chinle, Arizona

November 10, 2020

Prepared By:

MILLER ENGINEERING CONSULTANTS
Engineers • Planners

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TABLE OF CONTENTS

LIST OF APPENDICES

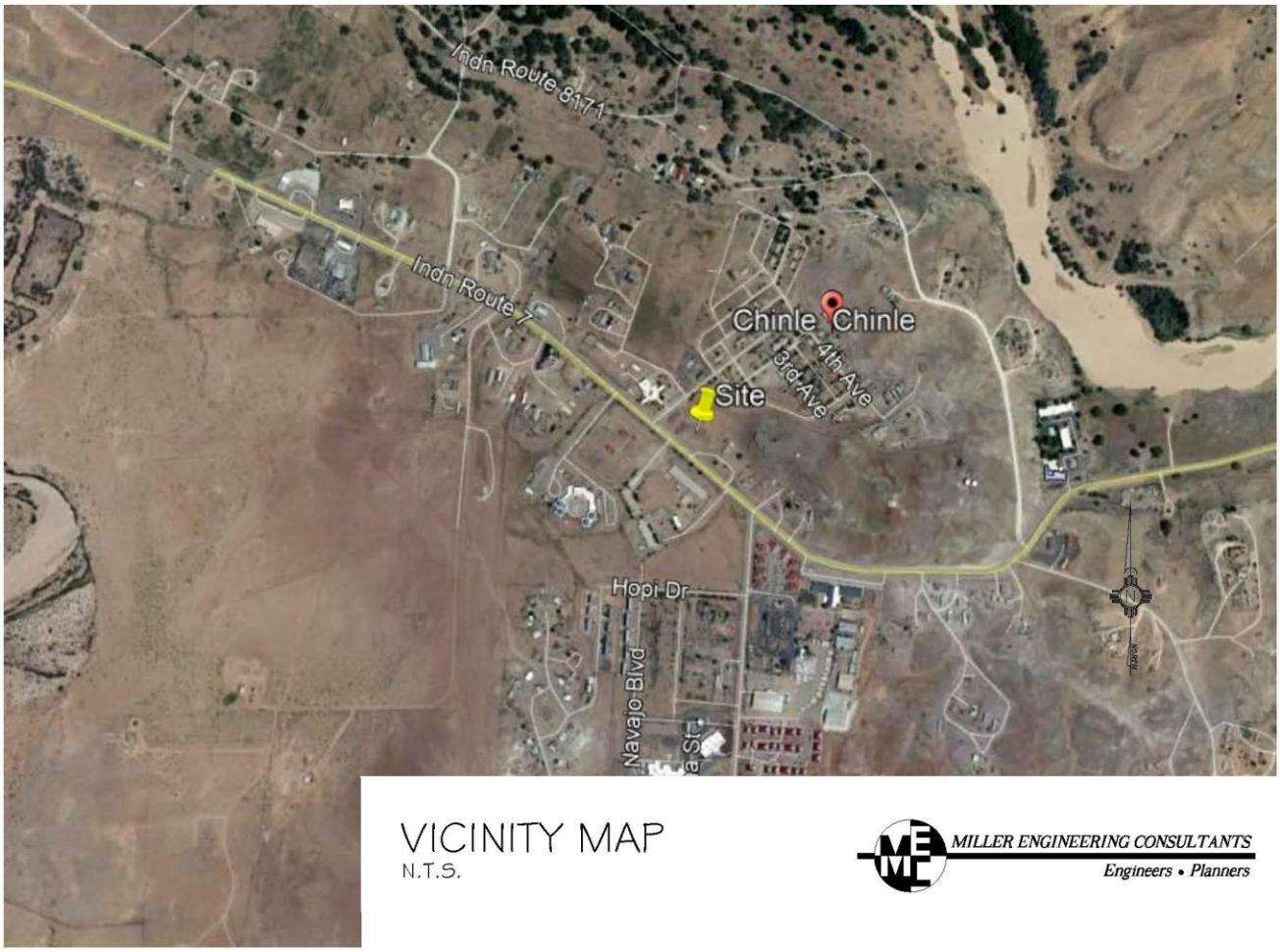
1.0 PURPOSE

The purpose of this report is to discuss the findings of a preliminary drainage and floodplain study for the new HMO site in Chinle Arizona.

2.0 EXISTING SITE CONDITIONS

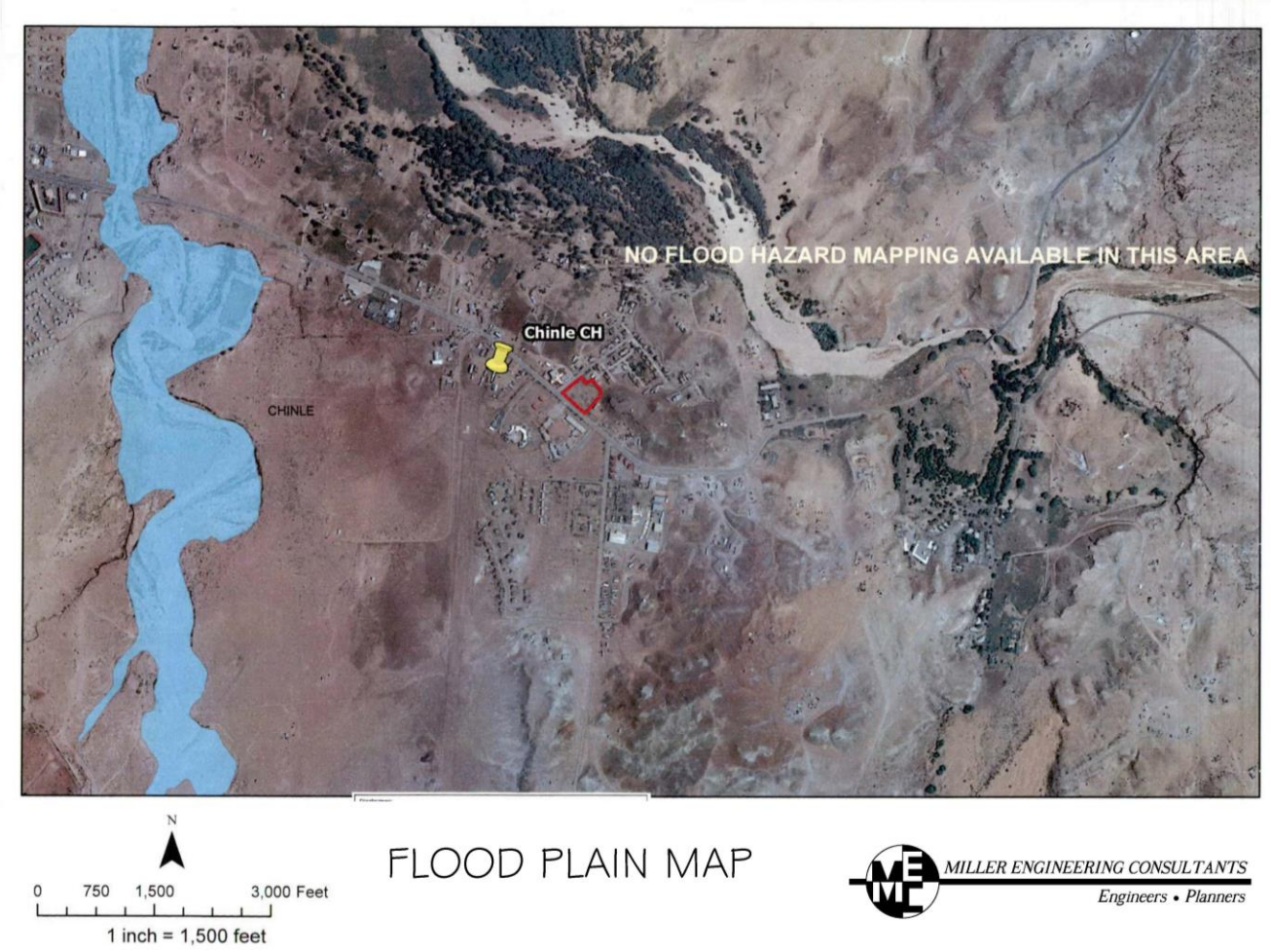
The new Chinle HMA site is located on Indian Route 7 just east of the Indian Route 102 intersection. The site is currently undeveloped with very mild slopes to the west. Based on historical photographs it appears that the site has been previously developed (See Figure 2-1).

FIGURE 2-1



Based on existing floodplain mapping it appears that thus site does not lie within a FEMA designated floodplain. Figure 2-2 shows the current floodplain map for this area.

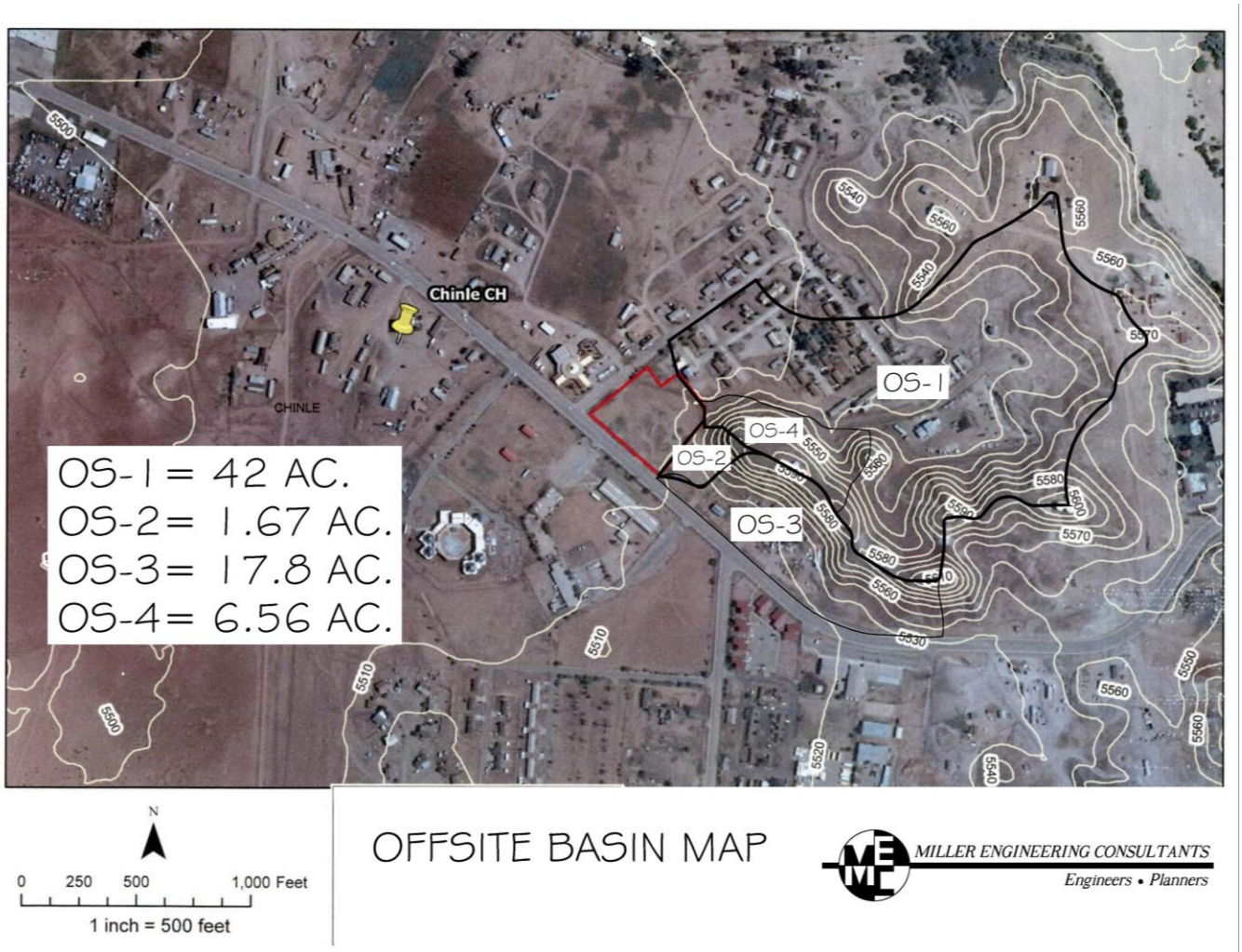
FIGURE 2-2



3.0 OFFSITE DRAINAGE

The Chinle HMO site has 4 offsite drainage basins that potentially affect this site. Figure 3-1 is an offsite basin map that shows the location and size of the four offsite drainage basins.

FIGURE 3-1



In order to develop hydrology calculations for the four offsite drainage basins the SCS simplified peak flow method will be used to estimate runoff from the drainage basins. This methodology employs the use of SCS Curve Numbers when estimating peak and volumetric runoff.

There are several parameters required in order to perform the SCS calculations. Rainfall data must first be obtained in order to begin the construction of a model. The principal design storm considered in this analysis 100-Year frequency, 24-Hour duration event. Rainfall depths are

obtained from the NOAA Atlas 14 for Arizona. Several other parameters, which are required as input for the SCS calculations include:

- **Basin Area, A (Sq. Mi.)** – The basin boundary and sub-basin boundaries were delineated using USGS Quadrangle (Quad) Mapping at a scale of 1 inch = 1500 feet.
- **Time of Concentration, Tc (Hrs.)** – The time of concentration was determined to be a minimum value to 10 minutes.
- **SCS Curve Number, CN** – Curve Number values defines the soils and ground cover within the watershed. Based on the NRCS soils survey of this area the spoils on the site are 2sdyc – Urban land Ives-Jocity complex which is classified within hydrologic soils group D. Based on the SCS these consideration a SCS curve number of 82 was selected. Basins that contain impervious areas from development has been adjusted up to as high a 85.

The supporting documentation for the SCS calculations can be found in Appendix A.
A summary of the peak discharge and volumetric runoff values for each sub-basin are summarized in Table 3-1:

TABLE 3-1
Hydrology Summary Table

Sub-basin #	100-Year Event	25-Year Event
	Q (cfs)	V (acre-feet)
OS-1	114.59	5.09
OS-2	3.93	0.17
OS-3	44.03	1.96
OS-4	15.43	0.69

4.0 FINDINGS & RECOMMENDATIONS

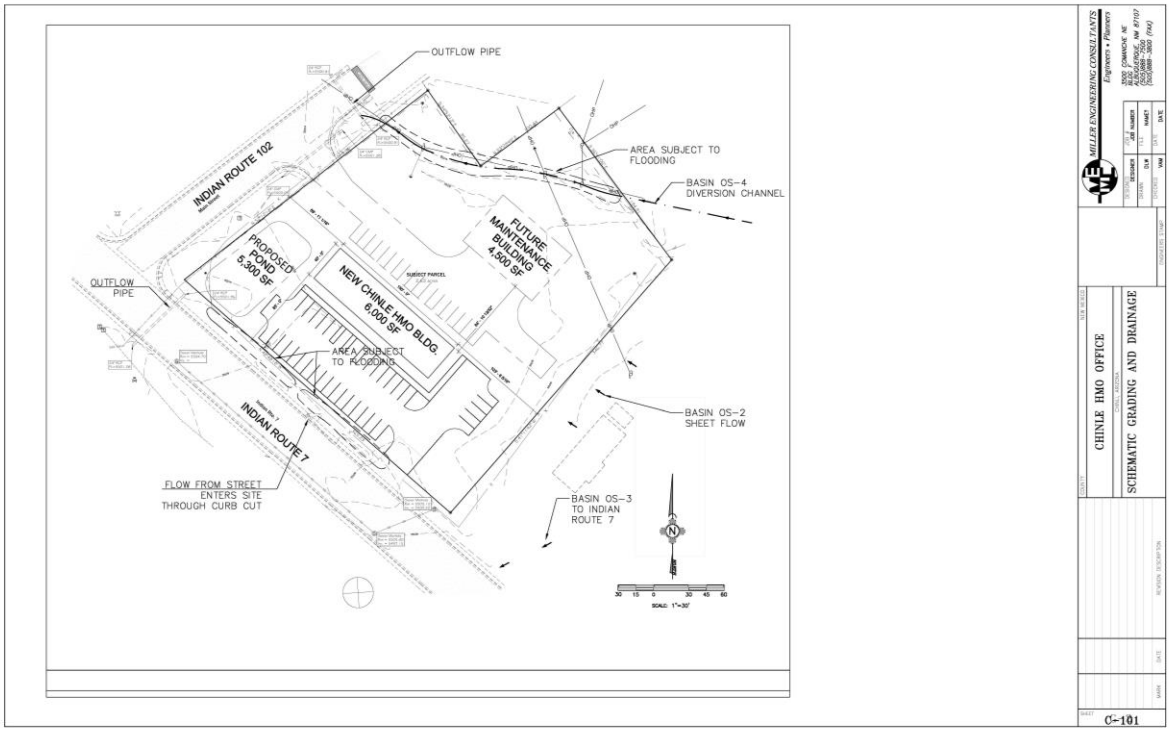
Based on the results of the hydrology analysis and the topographic survey of the site, the offsite drainage basins will impact the site as follows:

- Basin OS-1: Runoff from Basin OS-1 will discharge north of the site toward the existing residential subdivision and will have little impact to the site.
- Basin OS-2: Runoff from Basin OS-2 is minimal but will sheet flow toward the east boundary of the site.
- Basin OS-3: Runoff from Basin OS-3 will discharge into the Indian Route 7 right of way. Curb cuts along the roadway will allow some runoff from the roadway corridor onto the site along the southern boundary of the site. Figure 4-1 shows the location of potential ponding from Basin OS-3.

- Basin OS-4: Runoff from Basin OS-4 is intercepted by a small diversion channel which routes flows through the north side of the site toward a culvert located at Indian Route 102. Figure 4-1 shows the location of the diversion channel from Basin OS-4.

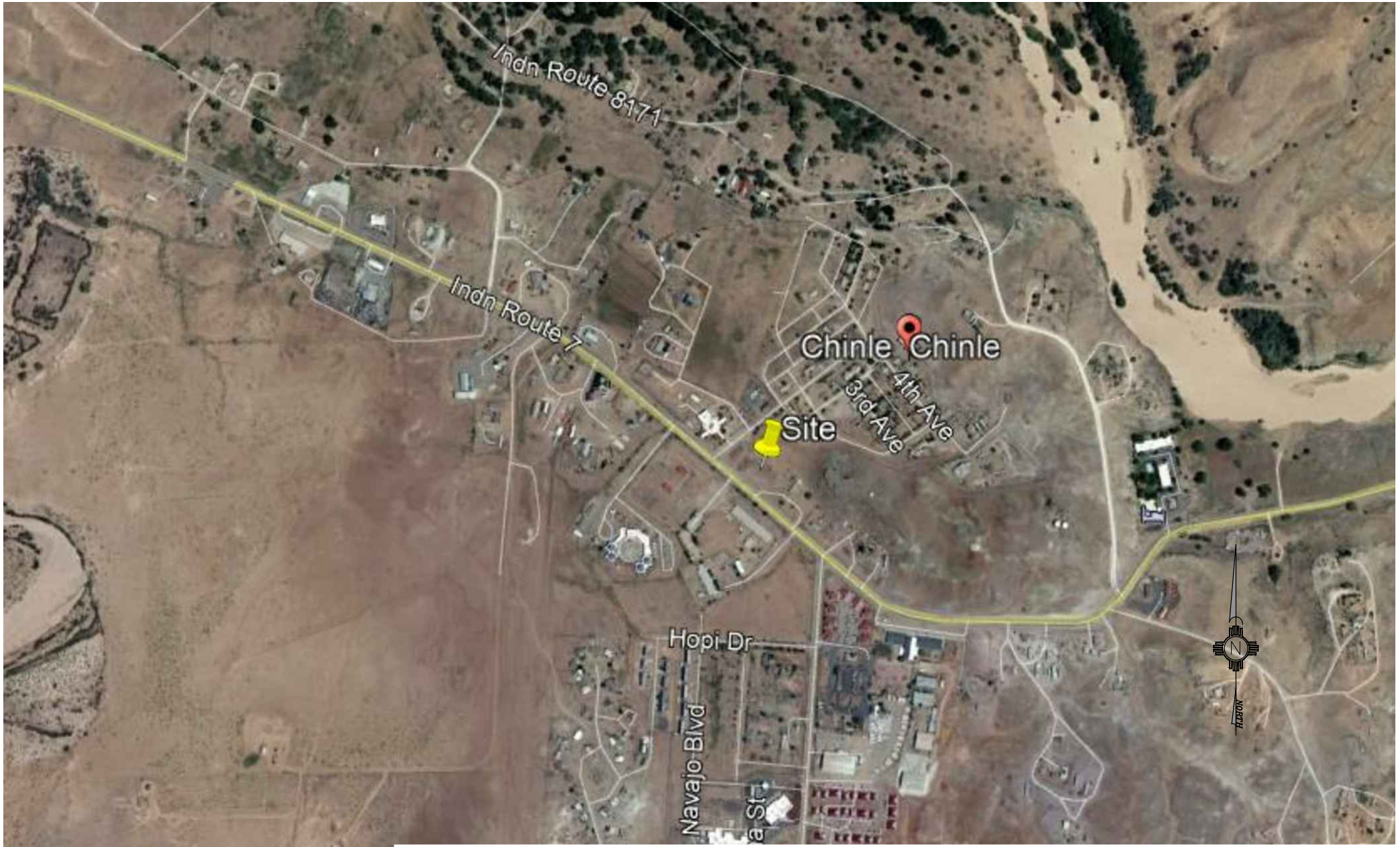
The Chinle HMO site will be developed with a new commercial building and associated parking. The site will be accessed from Indian Route 7 with a secondary access from Indian Route 102. With runoff from Basins OS-2, OS-3 and OS-4 potentially affecting the site, the finish floor of the new building should be elevated 2-3 feet above existing grade on the site. Raising the finish floor will promote positive drainage on the site while keeping offsite runoff from affecting the building. Storm water control including ponding areas will alleviate the impacts of the development on downstream drainage facilities. Figure 4-1 shows the overall schematic drainage plan for this site. Appendix A contains an 11 X 17 of this figure.

FIGURE 4-1



APPENDIX A

Figures



VICINITY MAP

N.T.S.

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N

0 750 1,500 3,000 Feet

1 inch = 1,500 feet

FLOOD PLAIN MAP

MILLER ENGINEERING CONSULTANTS

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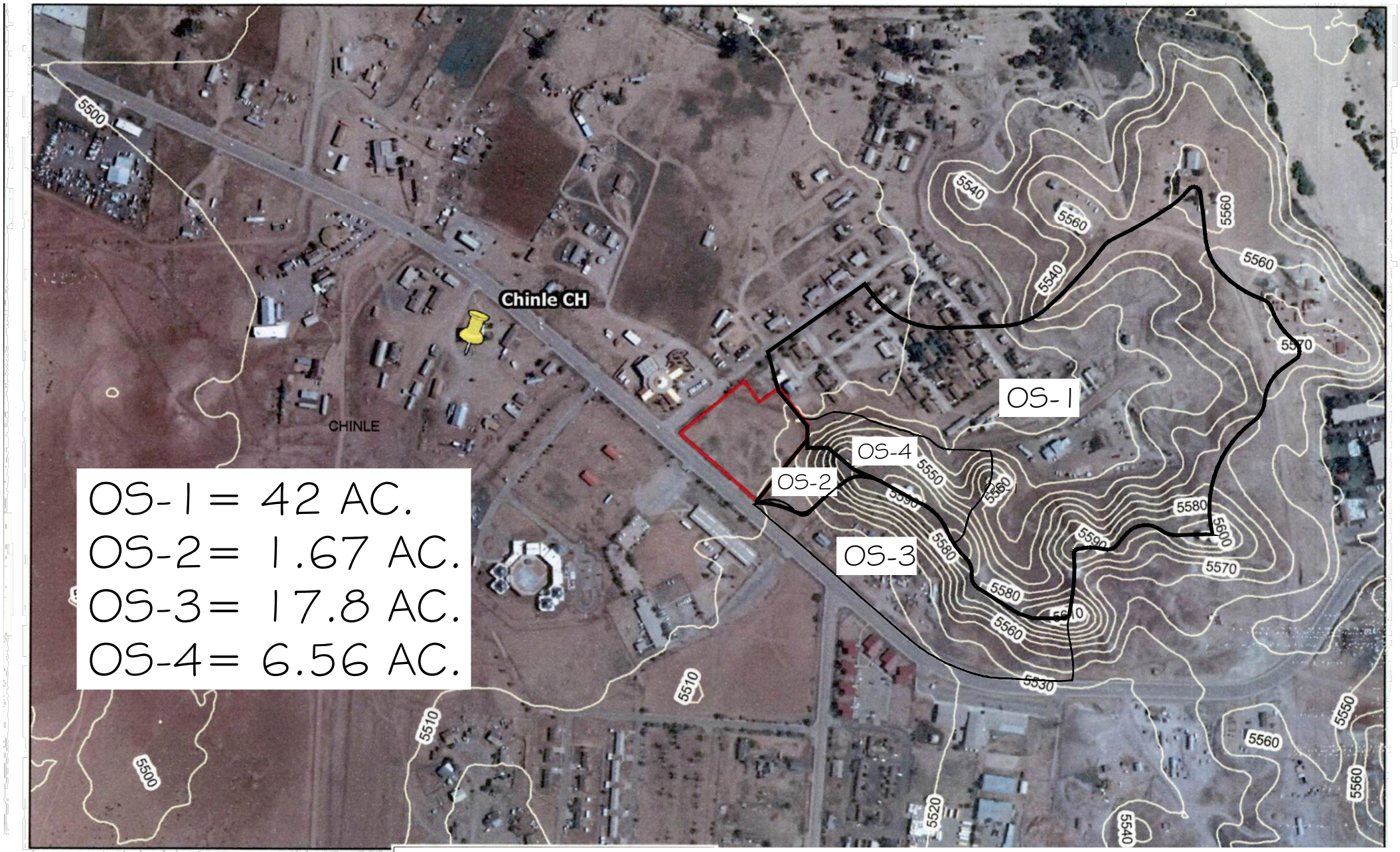

OFFSITE BASIN MAP

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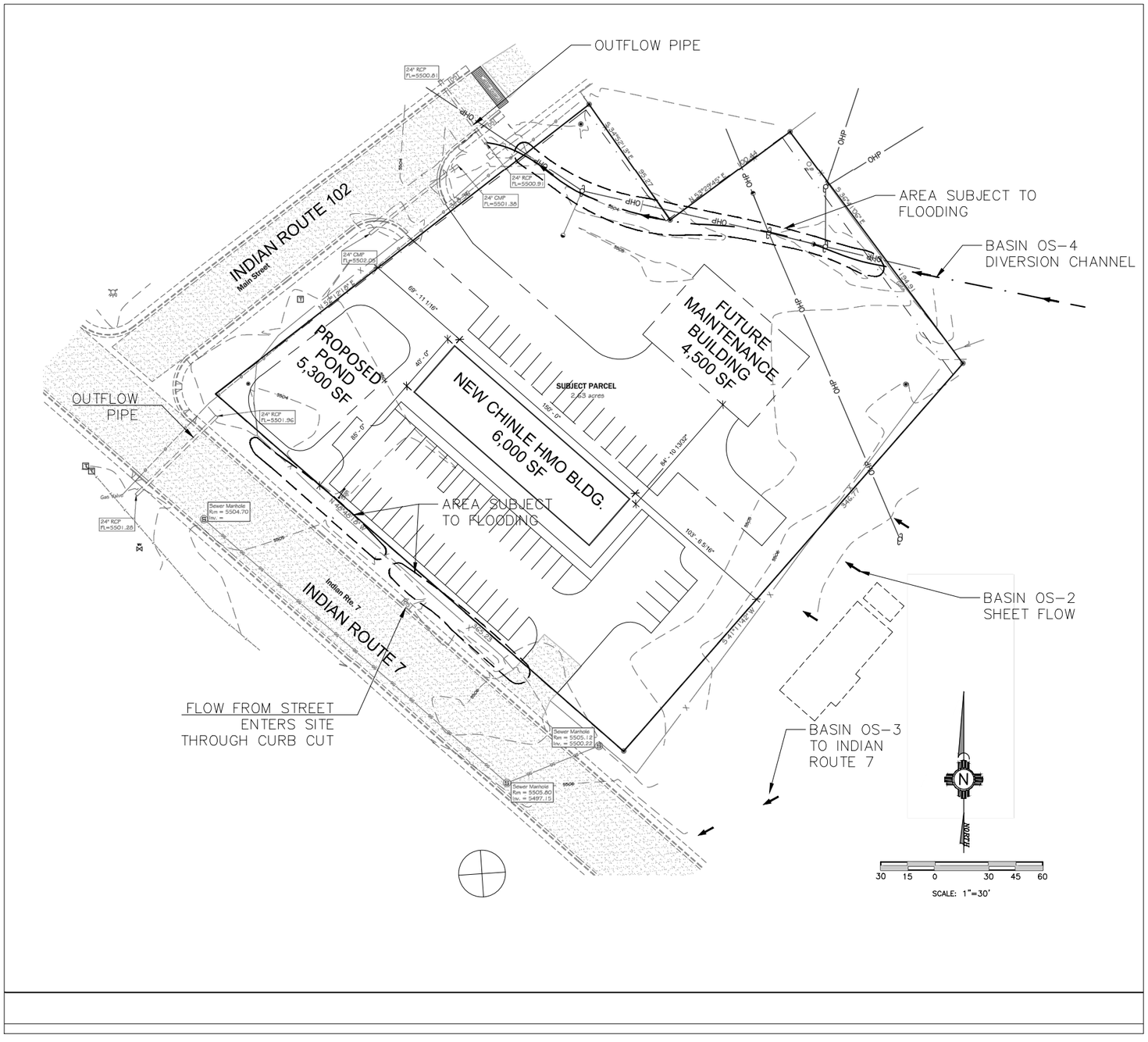

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DESIGNED	DESIGNER	JOB # JOB NUMBER
DRAWN	DLW	FILE NAME?
CHECKED	VAM	DATE DATE

ENGINEERS STAMP

NEW MEXICO

COUNTY

CHINLE HMO OFFICE

CHINLI, ARIZONA

SCHEMATIC GRADING AND DRAINAGE

REVISION DESCRIPTION

DATE

MARK

SHEET

APPENDIX B

Supplemental Information

NOAA Atlas 14, Volume 1, Version 5
Location name: Chinle, Arizona, USA*
Latitude: 36.15°, Longitude: -109.56°
Elevation: 5504.65 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.153 (0.131-0.180)	0.198 (0.170-0.232)	0.267 (0.230-0.314)	0.325 (0.278-0.383)	0.410 (0.346-0.483)	0.481 (0.401-0.565)	0.558 (0.460-0.658)	0.643 (0.522-0.762)	0.768 (0.608-0.916)	0.874 (0.679-1.05)
10-min	0.233 (0.200-0.274)	0.301 (0.259-0.353)	0.406 (0.349-0.477)	0.495 (0.423-0.582)	0.623 (0.527-0.735)	0.731 (0.611-0.860)	0.849 (0.700-1.00)	0.979 (0.795-1.16)	1.17 (0.925-1.39)	1.33 (1.03-1.60)
15-min	0.289 (0.248-0.340)	0.372 (0.321-0.437)	0.503 (0.433-0.591)	0.613 (0.524-0.721)	0.773 (0.653-0.911)	0.906 (0.757-1.07)	1.05 (0.868-1.24)	1.21 (0.986-1.44)	1.45 (1.15-1.73)	1.65 (1.28-1.98)
30-min	0.389 (0.334-0.457)	0.502 (0.432-0.589)	0.677 (0.583-0.796)	0.825 (0.706-0.971)	1.04 (0.878-1.23)	1.22 (1.02-1.44)	1.42 (1.17-1.67)	1.64 (1.33-1.94)	1.95 (1.54-2.33)	2.22 (1.72-2.66)
60-min	0.482 (0.413-0.566)	0.621 (0.535-0.729)	0.838 (0.722-0.986)	1.02 (0.874-1.20)	1.29 (1.09-1.52)	1.51 (1.26-1.78)	1.76 (1.45-2.07)	2.02 (1.64-2.40)	2.42 (1.91-2.88)	2.75 (2.13-3.30)
2-hr	0.581 (0.503-0.677)	0.742 (0.642-0.865)	0.991 (0.854-1.15)	1.20 (1.03-1.40)	1.52 (1.29-1.77)	1.79 (1.49-2.08)	2.08 (1.72-2.43)	2.41 (1.95-2.82)	2.89 (2.29-3.41)	3.31 (2.56-3.92)
3-hr	0.626 (0.550-0.723)	0.791 (0.694-0.917)	1.03 (0.906-1.19)	1.24 (1.08-1.43)	1.55 (1.33-1.78)	1.80 (1.53-2.10)	2.09 (1.75-2.45)	2.42 (1.99-2.85)	2.92 (2.33-3.44)	3.34 (2.61-3.96)
6-hr	0.744 (0.666-0.842)	0.929 (0.830-1.05)	1.18 (1.04-1.33)	1.39 (1.23-1.57)	1.70 (1.49-1.92)	1.96 (1.70-2.22)	2.24 (1.92-2.55)	2.56 (2.16-2.92)	3.03 (2.50-3.48)	3.43 (2.78-3.98)
12-hr	0.869 (0.782-0.973)	1.08 (0.973-1.21)	1.35 (1.21-1.51)	1.57 (1.40-1.75)	1.87 (1.66-2.09)	2.11 (1.86-2.35)	2.36 (2.06-2.63)	2.65 (2.29-2.97)	3.07 (2.61-3.52)	3.44 (2.89-4.02)
24-hr	0.979 (0.890-1.08)	1.23 (1.11-1.35)	1.56 (1.42-1.72)	1.83 (1.66-2.01)	2.22 (1.99-2.42)	2.52 (2.25-2.75)	2.84 (2.52-3.10)	3.17 (2.80-3.47)	3.63 (3.18-3.98)	4.00 (3.47-4.39)
2-day	1.08 (0.984-1.18)	1.35 (1.23-1.48)	1.71 (1.56-1.87)	1.99 (1.81-2.17)	2.37 (2.15-2.59)	2.67 (2.41-2.92)	2.99 (2.68-3.28)	3.32 (2.95-3.63)	3.76 (3.32-4.12)	4.11 (3.60-4.51)
3-day	1.15 (1.05-1.26)	1.44 (1.32-1.58)	1.82 (1.66-1.99)	2.11 (1.92-2.30)	2.51 (2.28-2.74)	2.82 (2.55-3.08)	3.15 (2.83-3.44)	3.48 (3.11-3.79)	3.93 (3.48-4.29)	4.27 (3.76-4.68)
4-day	1.23 (1.12-1.33)	1.54 (1.41-1.68)	1.93 (1.76-2.10)	2.23 (2.04-2.43)	2.65 (2.41-2.88)	2.97 (2.69-3.23)	3.30 (2.98-3.60)	3.64 (3.26-3.96)	4.09 (3.63-4.46)	4.44 (3.91-4.85)
7-day	1.40 (1.29-1.52)	1.75 (1.62-1.91)	2.19 (2.01-2.37)	2.53 (2.32-2.74)	2.98 (2.73-3.23)	3.32 (3.03-3.60)	3.67 (3.33-3.98)	4.02 (3.64-4.36)	4.49 (4.04-4.87)	4.84 (4.33-5.27)
10-day	1.56 (1.43-1.69)	1.95 (1.80-2.13)	2.43 (2.23-2.64)	2.80 (2.56-3.03)	3.28 (3.01-3.56)	3.64 (3.33-3.95)	4.01 (3.66-4.34)	4.38 (3.97-4.74)	4.85 (4.37-5.26)	5.20 (4.66-5.65)
20-day	1.99 (1.84-2.15)	2.49 (2.31-2.69)	3.11 (2.88-3.35)	3.58 (3.32-3.85)	4.21 (3.88-4.51)	4.67 (4.30-5.02)	5.15 (4.73-5.53)	5.62 (5.13-6.05)	6.25 (5.66-6.73)	6.72 (6.07-7.27)
30-day	2.36 (2.18-2.55)	2.96 (2.74-3.21)	3.67 (3.38-3.97)	4.21 (3.88-4.55)	4.90 (4.51-5.29)	5.42 (4.97-5.86)	5.93 (5.43-6.42)	6.42 (5.86-6.96)	7.06 (6.41-7.68)	7.53 (6.80-8.20)
45-day	2.82 (2.61-3.05)	3.54 (3.27-3.83)	4.38 (4.05-4.73)	5.01 (4.63-5.40)	5.80 (5.35-6.25)	6.38 (5.88-6.88)	6.94 (6.39-7.48)	7.49 (6.87-8.09)	8.17 (7.46-8.84)	8.66 (7.88-9.37)
60-day	3.23 (2.99-3.49)	4.05 (3.74-4.37)	4.99 (4.60-5.37)	5.69 (5.24-6.11)	6.56 (6.04-7.05)	7.19 (6.61-7.72)	7.80 (7.15-8.39)	8.37 (7.64-9.03)	9.09 (8.25-9.81)	9.60 (8.69-10.4)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Canyon de Chelly National Monument, Arizona; and Chinle Area, Parts of Apache and Navajo Counties, Arizona, and San Juan County, New Mexico

October 20, 2020

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Canyon de Chelly National Monument, Arizona
Survey Area Data: Version 7, Jun 3, 2020

Soil Survey Area: Chinle Area, Parts of Apache and Navajo Counties, Arizona, and San Juan County, New Mexico
Survey Area Data: Version 14, Jun 3, 2020

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 4, 2015—Nov 2, 2017

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
20b18	Claysprings-Badland-Farb family complex, 2 to 35 percent slopes, very stony	78.9	7.5%
21by8	Riverwash-Bebeevar complex, 0 to 3 percent slopes	3.5	0.3%
2sdxx	Claysprings-Lithic Torriorthents-Typic Torriorthents complex, badlands, 1 to 60 percent slopes	362.9	34.6%
2sdy1	Aneth-Naha-Sheppard family complex, 0 to 2 percent slopes	0.7	0.1%
2sdyb	Jocity-Tezinie-Nazlini complex, sodic, 0 to 5 percent slopes	36.9	3.5%
2sdyc	Urban land-Ives-Jocity complex, sodic, 0 to 3 percent slopes	191.9	18.3%
2sdyd	Trail-Ives-Riverwash complex, 0 to 2 percent slopes	305.0	29.1%
2sdyz	Jocity-Nazlini complex, sodic, 0 to 4 percent slopes	41.4	4.0%
2sdz2	Riverwash-Bebeevar complex, 0 to 3 percent slopes	26.9	2.6%
2sdz4	Marcou-Claysprings complex, 0 to 8 percent slopes	0.3	0.0%
Totals for Area of Interest		**1,048.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sandstone and shale

Typical profile

A1 - 0 to 8 inches: fine sandy loam
A2 - 8 to 19 inches: silt loam
Cn1 - 19 to 32 inches: silt loam
Cn2 - 32 to 49 inches: loamy very fine sand
Cn3 - 49 to 60 inches: very fine sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: NoneRare
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Gypsum, maximum content: 4 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 3.0 mmhos/cm)
Sodium adsorption ratio, maximum: 100.0
Available water capacity: Moderate (about 8.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7c
Hydrologic Soil Group: C
Ecological site: R035XB238AZ - Sandy Terrace 6-10" p.z. Sodic

Minor Components

Unnamed soils

Percent of map unit: 14 percent
Hydric soil rating: No

2sdyc—Urban land-Ives-Jocity complex, sodic, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2sdyc
Elevation: 5,200 to 5,600 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 54 to 57 degrees F
Frost-free period: 150 to 180 days

Map Unit Composition

Urban lands: 40 percent
Ives and similar soils: 30 percent
Jocity and similar soils: 20 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Lands

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8c

Description of Ives

Setting

Landform: Flood-plain steps, stream terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Flat
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Slope alluvium derived from sandstone and shale and/or eolian sands derived from sandstone and shale over residuum weathered from sandstone and shale

Typical profile

Anp1 - 0 to 6 inches: sandy clay loam
Anp2 - 6 to 21 inches: sandy clay loam
2Cny1 - 21 to 45 inches: loamy sand
2Cny2 - 45 to 52 inches: fine sandy loam
2Cny3 - 52 to 60 inches: very fine sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: NoneRare
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Gypsum, maximum content: 4 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 3.0 mmhos/cm)
Sodium adsorption ratio, maximum: 120.0
Available water capacity: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7c
Hydrologic Soil Group: D
Ecological site: R035XB237AZ - Clay Loam Terrace 6-10" p.z. Sodic

Description of Jocity

Setting

Landform: Flood-plain steps, stream terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Flat
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Slope alluvium derived from sandstone and shale and/or eolian sands derived from sandstone and shale over residuum weathered from sandstone and shale

Typical profile

Anp1 - 0 to 7 inches: clay loam
Anp2 - 7 to 24 inches: clay loam
Anp3 - 24 to 30 inches: sandy clay loam
Cny1 - 30 to 46 inches: sandy clay loam
Cny2 - 46 to 60 inches: clay

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: NoneRare
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Gypsum, maximum content: 4 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 3.0 mmhos/cm)
Sodium adsorption ratio, maximum: 30.0
Available water capacity: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7c
Hydrologic Soil Group: D
Ecological site: R035XB237AZ - Clay Loam Terrace 6-10" p.z. Sodic

Minor Components

Unnamed soils

Percent of map unit: 10 percent
Hydric soil rating: No

Project Hydrology
SCS Simplified Peak Flow Method

Client: SD+A
Project: Chinle HMO
Date: 11/6/2020

Storm = 100 Yr.
P (6 hr) = P (24 hr) = 2.84

Basin No.	Area (ac)	Tc (hrs)	CN	qu (cfs/ac-in)	Qd (in)	Qp (cfs)	V (ac-ft)
Pre-developed Conditions							
OS-1	42	0.1667	85	1.875	1.455	114.59	5.09
OS-2	1.67	0.1667	82	1.875	1.254	3.93	0.17
OS-3	17.8	0.1667	83	1.875	1.319	44.03	1.96
OS-4	6.56	0.1667	82	1.875	1.254	15.43	0.69

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Navajo Housing Authority
New Chinle HMO Building
Opinion of Probable Construction Cost

Project Size: 6,000 sf **Estimate Construction Cost for Office Building** $235.00 per sf

Item		Description	Percent of Costs	Amount
020000		*EXISTING CONDITIONS*	0.50%	$7,050.00
	05	Site Fencing		
	10	Clear and Grub		
030000		*CONCRETE*	8.00%	$112,800.00
	05	Spread Footings and foundation forms		
	10	Slab on grade and 4" deep aggregate		
	15	Spot footings and thickened slabs		
	20	Concrete accessories, anchor bolts, expansion joints		
	25	Reinforcing steel and welded wire fabric		
	30	Structural concrete, 3000 psi		
	35	Concrete finishing		
040000		*MASONRY*	0.40%	$5,640.00
	05	CMU wall at trash enclosure		
	10	Stone veneer		
050000		*METALS*	0.75%	$10,575.00
	05	Framing hardware/hold downs		
	10	Structural columns and beams		
	15	Metal gates at trash enclosure		
060000		*WOOD, PLASTICS AND COMPOSITES*	12.00%	$169,200.00
	05	Wood stud framing, 2x6 @ 16" o.c.		
	10	Wood roof trusses		
	15	Interior wood stud framing, blocking		
	20	Wall sheathing, roof sheathing		
	25	Wood casework, cabinets, countertops		
070000		*THERMAL AND MOISTURE PROTECTION*	9.00%	$126,900.00
	05	Rigid insulation, R-38 ceiling, R-21 wall		
	10	Air barriers		
	15	Standing seam metal roof		
	20	Gutters and downspouts		
080000		*OPENINGS*	2.00%	$28,200.00
	05	Metal doors and frames		
	10	Wood doors and frames		
	15	Entrances and storefronts		
	20	Aluminum windows		
	25	Door hardware		
090000		*FINISHES*	12.00%	$169,200.00
	05	Stucco		
	10	Cement backer boards		
	15	Gypsum board walls and ceilings		
	20	Ceramic tile floors and walls		
	25	Acoustical 2x4 ceilings		
	30	VCT flooring and vinyl base		
	35	Carpet		
	40	Painting of walls, ceilings, door frames		
	45	Stained concrete		

100000		*SPECIALTIES*	0.97%	$13,677.00
	05	Toilet partitions, doors, urinal screens		
	10	Grab bars, restroom accessories		
	15	Fire extinguishers		
110000		*EQUIPMENT*	0.18%	$2,538.00
	05	Refrigerator, range and range hood		
220000		*PLUMBING*	9.50%	$133,950.00
	05	Facility water distribution		
	10	Restroom and breakroom fixtures		
230000		*HEATING, VENTILATION AND AIR-CONDITIONING (HVAC)*	9.20%	$129,720.00
	05	HVAC Systems		
260000		*ELECTRICAL*	8.50%	$119,850.00
	05	Facility electrical distribution		
	10	Light fixtures, receptacles		
310000		*EARTHWORK*	7.00%	$98,700.00
	05	Excavate foundation		
	10	Engineered fill 48 inches deep		
	15	Backfill and compact foundations		
320000		*EXTERIOR IMPROVEMENTS*	20.00%	$282,000.00
	05	Site drainage 5% for 10 feet		
	10	Light duty asphalt, 2.5" and 6" base course		
	15	Access driveways, 3" and 7" base course		
	20	Utility connections (water, sewer and telecommunications) NTUA to self-perform gas and electrical utilities		
	25	Landscaping		
			100.00%	$1,410,000.00

ESTIMATE TOTALS

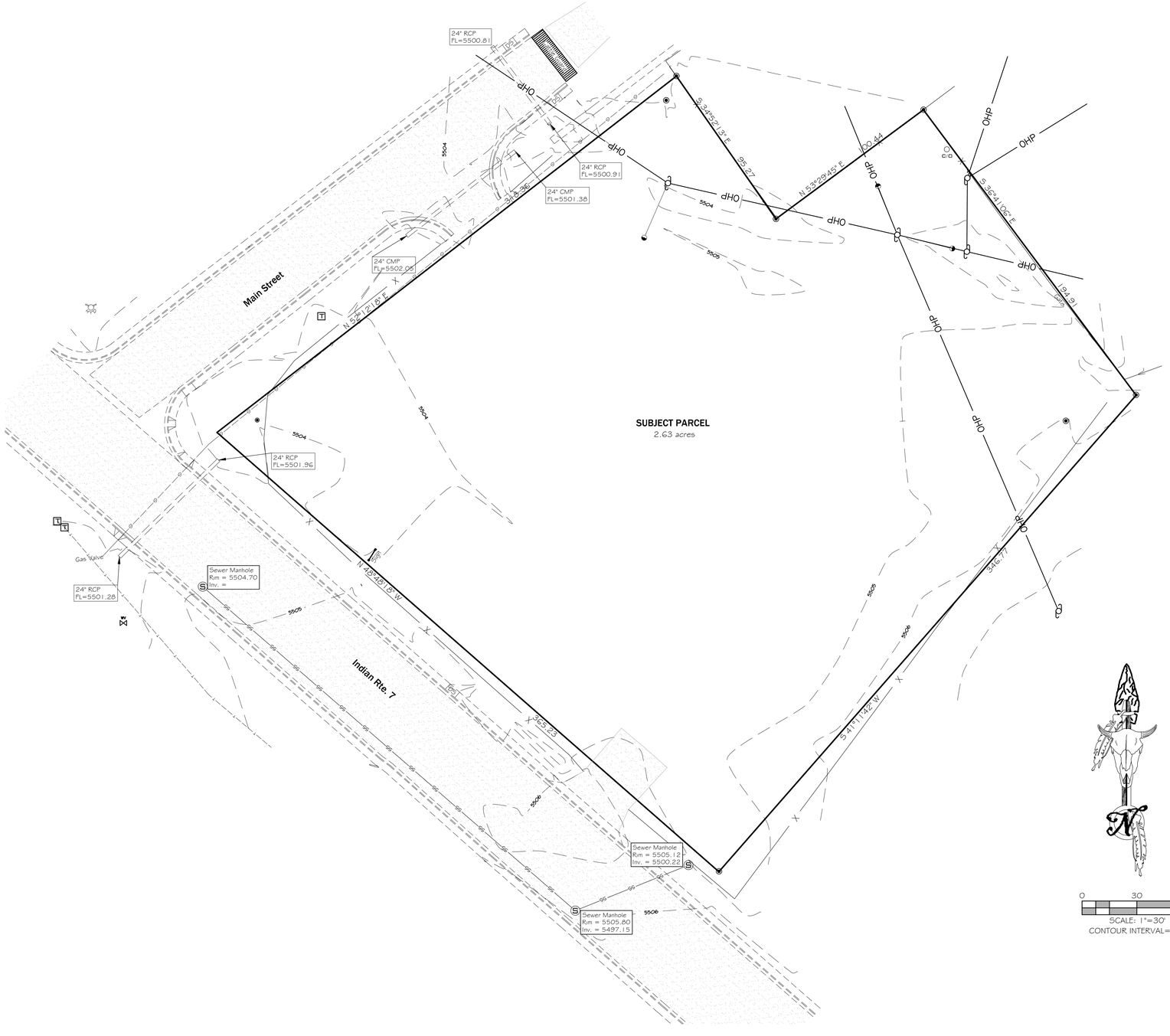
Description	Amount	Cost per Unit
Labor	$56,400.00	$9.40 /sf
Material	$183,300.00	$30.55 /sf
Subcontract	$1,170,300.00	$195.05 /sf
Equipment		
Other		
Total Construction Costs	$1,410,000.00	$235.00

General Contractor Costs	Amount	Rate
General Requirements	$169,200.00	12.00%
Overhead and Profit	$141,000.00	10.00%
Performance and Payment Bond	$70,500.00	5.00%
Contingency	$141,000.00	10.00%
	$521,700.00	

TOTAL PROJECT COSTS	**$1,931,700.00**

THANK YOU

AHÉHEE’



0 30 60

SCALE: 1"=30'
CONTOUR INTERVAL= 1.0'

NARRATIVE:

This survey was to provide existing utility and topographical information for the parcel shown. This parcel is that as shown on "Boundary Plat of Reassignment of B.I.A. Administrative", signed by Anson M. Carr, and dated 5-10-2018. This survey does not represent a boundary survey of this parcel. No determination was made as to the accuracy of found corner monuments. No monuments were set in the course of this survey.

SURVEYOR'S CERTIFICATE:

I, Kelly R. Schmutz, a duly qualified Registered Land Surveyor under the laws of the State of Anzona, do hereby certify that this survey and map shown hereon was prepared from an actual survey conducted by me or under my direct supervision and that the same is true and correct to the best of my knowledge, belief and information.

Registered Land Surveyor
CERTIFICATE NO.
40535
KELLY R.
SCHMUTZ
9/28/20
DATE
SIGNED
ARIZONA U.S.A.

EXPIRES: 03/31/2022

Date: 9/28/20

Kelly R. Schmutz — Certificate No. 40535

LEGEND:

- FOUND MONUMENT PER SURVEY BY ANSON M. CARR, DATED 5/10/18
- EXISTING POWER POLE
- EXISTING POWER GUY ANCHOR
- EXISTING FIRE HYDRANT
- EXISTING TELEPHONE/COMMUNICATIONS BOX
- EXISTING WATER VALVE
- DS SIDEWALK DRAINAGE STRUCTURE
- C/O SEWER CLEANOUT
- SANITARY SEWER LINE
- UNDERGROUND TELEPHONE LINE
- UNDERGROUND GAS LINE
- EXISTING CURB, GUTTER AND SIDEWALK
- OHP OVERHEAD POWER LINES
- EXISTING ASPHALT

PROPOSED OFFICE BUILDING SITE
CHINLE, ARIZONA

DATE:	9/28/20
JOB NO.:	12318-20
DRAWN BY:	K.R.S.
CHECKED BY:	
SCALE:	1"=30'
DWG:	SURVEY-BASE.DWG

REVISIONS — DATE

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SHEET
1
OF 1 SHEETS

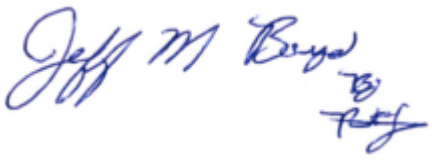
Western Technologies Inc.

GEOTECHNICAL EVALUATION REPORT

HOUSING MANAGEMENT OFFICE
Indian Route 7 and Indian Route 102
Chinle, Arizona
WT Reference No. 3120JS068

PREPARED FOR:
Suina Design
4411 McLeod Road NE, Suite A-1
Albuquerque, New Mexico 87109

September 22, 2020



Roger K. Southworth, P.E.
Managing Director

Reviewed By: Jeff M. Boyd, P.E.
Senior Geotechnical Engineer

Western Technologies Inc.
The Quality People
Since 1955

278 Sawyer Drive, No. 2
Durango, Colorado 81303-7904
(970) 375-9033 • fax 375-9034

September 24, 2020

Suina Design
4411 McLeod Road NE, Suite A-1
Albuquerque, New Mexico 87109

Re: Geotechnical Evaluation
Housing Maintenance Office
Indian Route 7 and Indian Route 102
Chinle, Arizona

Job No. 3120JS068

Western Technologies Inc. (WT) has completed the geotechnical evaluation for the above-referenced project. This study was performed in general accordance with our proposal number 3120PS070 dated July 15, 2020. The results of our study, including the boring location diagram, boring logs, laboratory test results, and the geotechnical recommendations are attached.

We have appreciated being of service to you in the geotechnical engineering phase of this project and are prepared to assist you during the construction phases as well. Please do not hesitate to contact us if the design conditions change or if you have any questions concerning this report. We look forward to working with you on future projects.

Sincerely,
WESTERN TECHNOLOGIES INC.

Roger K. Southworth, P.E.
Managing Director

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APPENDIX A

APPENDIX B

GEOTECHNICAL EVALUATION
HOUSING MANAGEMENT OFFICE
INDIAN ROUTE 7 AND INDIAN ROUTE 102
CHINLE, ARIZONA

JOB NO. 3120JS068

1.0 PURPOSE

This report contains the results of our geotechnical evaluation for the Housing Management Office that will be constructed in Chinle, Arizona. The purpose of these services is to provide information and recommendations regarding:

- Foundation Design
- Floor Slab Support
- Seismic Design Parameters
- Pavement Design

The results of the field exploration and laboratory tests are presented in the Appendix.

2.0 PROJECT DESCRIPTION

The project will consist of constructing an office building for the Housing Management Office. The building will consist of a one- or two-story structure with a footprint of less than 6,000 square feet. It was assumed that the structure would have wall loads of less than 4 kips per linear foot and column loads of less than 200 kips. It was also assumed that grade changes of less than 3 feet would be required to develop the final site grades. We should be notified immediately if any of our assumptions are incorrect since a revision of the recommendations presented herein could then be necessary.

3.0 SCOPE OF SERVICES

3.1 Field Exploration

Four borings were drilled in the planned building area to depths of approximately 7 to 16½ feet and two borings were drilled in the planned pavement area to depths of approximately 5 feet. The borings were drilled at the approximate locations indicated on the attached Boring Location Diagram (Plate 1).

A WT engineering technician monitored the drilling operations and prepared a field log for each boring. These logs contain visual classifications of the materials encountered during drilling as well as interpolation of the subsurface conditions between samples.

The final boring logs, included in Appendix A, represent our interpretation of the field logs and may include modifications based on laboratory observations of the recovered samples. The final logs describe the materials encountered, their thicknesses, and the depths at which samples were obtained.

The Unified Soil Classification System was used to classify the soil. The soil classification symbols appear on the boring logs and are briefly described in Appendix A.

3.2 Laboratory Testing

Laboratory tests were performed on representative samples to aid in material classification and to estimate the pertinent engineering properties of the soil. Testing was performed in general accordance with applicable ASTM methodologies. The following tests were performed and the results are presented on the boring logs and in Appendix B.

- Water Content
- Percent Passing No. 200 Sieve
- Liquid and Plastic Limits
- Dry Density
- Swell Potential

The laboratory test results were used in the development of the recommendations contained in this report.

3.3 Analyses and Report

Analyses were performed and this report was prepared for the exclusive purpose of providing geotechnical engineering 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. We are available to discuss the scope of such studies with you.

This geotechnical engineering report includes a description of the project, a discussion of the field exploration and laboratory testing programs, a discussion of the subsurface conditions, and design recommendations as required to satisfy the purpose previously described.

4.0 SUBSURFACE CONDITIONS

Loose clayey sand fill was encountered in Boring B-3 to a depth of approximately 7 feet. This boring was terminated at 7 feet due to auger refusal on concrete. The native soil consisted of very stiff to hard lean to fat clay with variable sand content. The clay deposits extended to the boring to the termination depths. Groundwater not encountered in the borings during drilling.

5.0 GEOTECHNICAL PROPERTIES & ANALYSIS

Swell tests were performed to evaluate the swell potential of the clay (Plate B-1). The test results indicated swell values of 16.1 and 17.2 percent when the samples were placed under a surcharge load of about 100 pounds per square foot (psf) and inundated with water. These test results indicate that clay has a very high potential for volume change with variations in the soil water content.

6.0 RECOMMENDATIONS

6.1 General

The recommendations contained in this report are based on our understanding of the project criteria described in Section 2.0, **Project Description**, and the assumption that the subsurface conditions are those disclosed by the test borings. Others may change the plans, final elevations, number and type of structures, foundation loads, and floor levels during design or construction. Substantially different subsurface conditions from those described herein may be encountered or become known. Any changes in the project criteria or subsurface conditions shall be brought to our attention in writing.

6.2 Design Considerations

The borings indicate that the project site is underlain by highly expansive clay, which will experience volume change with variations in its water content. Structures and related improvements situated within the clay will experience large movements if the moisture content of the clay increases. These movements are expected to cause distress to structures

supported within the active zone of the clay deposits. However, if the owner is willing to accept the risk of foundation and floor slab movement, the building can be supported by spread footings with a slab-on-grade floor supported by a layer of non-expansive fill and moisture-conditioned clay. The expected movement can cause cracking of interior sheetrock, racking of doors and windows, and unlevel floors. The performance of the foundation/floor slab system will also depend upon the quality of construction and the drainage around the structure. If the risk of excessive movement and associated building distress is not acceptable, it is recommended that a drilled shafts in conjunction with a structural suspended floor be used for support. Recommendations for drilled shaft design can be provided in a supplemental report if the owner elects to use this alternative.

The performance of spread footings and a slab-on-grade floor will be highly dependent upon proper drainage during and following construction. Ponding water, waterline leaks, and other sources of water near the structure can result in an increase in the predicted movements. Conversely, the moisture content in the foundation/floor slab subgrade must be maintained during dry weather to prevent excessive drying, which can also result in a greater amount of movement than predicted. Even with a properly designed and constructed foundation/floor slab system, foundation/floor slab movements can cause distress to the structure, such as cracks in sheetrock, racking of doors and windows, and unlevel floors.

6.3 Foundations

The proposed building can be supported by spread footings. However, the site is underlain by existing fill and highly expansive clay that is not recommended for direct foundation support. The existing fill should be removed from the foundation areas and replaced with engineered fill. In addition, the foundations should be underlain by a minimum of 48 inches of non-expansive fill and 8 inches of moisture-conditioned on-site soil in order to reduce the amount of foundation movement. Foundation subgrade preparation is discussed in greater detail in the **Earthwork** section of this report.

Foundations bearing on the engineered fill can be designed for a maximum net allowable bearing capacity of up to 2,000 pounds per square foot (psf). The allowable bearing capacity applies to dead load plus design live load conditions. The foundations should be designed as rigid grade beams containing top and bottom reinforcement in order to reduce the potential for distress due to potential foundation movement.

The foundations should bear a minimum of 24 inches below the final adjacent site grade for frost considerations. Strip footings should have a minimum width of 16 inches and isolated column pad foundations should have a minimum dimension of 24 inches.

We estimate that the total post-construction movement of foundations supported as recommended herein will be on the order of 1 inch. We estimate that the differential movement between comparably sized and loaded foundations could equal the total foundation movement. Additional foundation movement can occur if water from any source infiltrates the foundation subgrade. Therefore, proper drainage should be provided in the final design and during construction.

All footings, stem walls, and masonry walls should be reinforced to reduce the potential for distress caused by differential foundation movement. The use of joints at openings and other discontinuities in masonry walls is recommended. Joints should also be closely spaced along the length of masonry site retaining walls and screen walls to accommodate minor differential foundation movement.

We recommend that the geotechnical engineer or a representative of the engineer observe the base of the footing overexcavations prior to backfilling operations. This observation is to assess whether the exposed bearing stratum is similar to that anticipated for structural fill subgrade and indirect foundation support. Any loose, soft, or disturbed material should be undercut to a suitable bearing subgrade.

6.4 Floor Support

The floor slab can be designed as a slab-on-grade provided the owner is willing to accept the risk of floor slab movement. If the risk of floor slab movement and associated distress is not acceptable, a structural floor slab suspended above the subgrade should be used.

It is assumed that the owner will elect to use a slab-on-grade floor. With this alternative all existing fill should be removed from the building area and replaced with engineered fill. In addition, the floor slab should be supported by a minimum of 48 inches of non-expansive fill and 8 inches of moisture-conditioned on-site soil in order to reduce the potential for excessive movement due to shrink/swell of the clay. The floor slab subgrade should be prepared as recommended in the **Earthwork** section of this report.

A minimum four-inch-thick layer of drainage aggregate should be provided beneath at-grade floor slabs to prevent the capillary rise of water beneath the slab and a damp slab. The drainage aggregate should consist of sand, sand-gravel, crushed stone, or a combination of these materials. The granular fill should have a maximum particle diameter of no more than one-half the granular fill thickness and should contain no more than 5 percent passing the No. 200 sieve. In addition, the granular fill should have a maximum plasticity index of 6.

The use of vapor retarders is desirable for any slab-on-grade where the floor will be covered by products using water-based adhesives, wood, vinyl-backed carpet, impermeable floor coatings (urethane, epoxy, acrylic terrazzo, etc.). When used, the design and installation should be in accordance with the recommendations presented in ACI 302.1R and 302.2R. Final determination on the use of a vapor retarder should be left to the slab designer.

All concrete placement and curing operations should follow the American Concrete Institute manual recommendations. Improper curing techniques and/or high slump (high water-cement ratio) could cause excessive shrinkage, cracking, or curling of the floor slab. Concrete slabs should be allowed to cure adequately before placing vinyl or other moisture-sensitive floor covering.

6.5 Seismic Considerations

Seismic structural design criteria is provided below.

- Design Code Reference: ASCE7-16
- Site Soil Classification: Site Class D*

S_s = 0.151 g	S_{MS} = 0.241 g	S_{DS} = 0.161 g
S_1 = 0.049 g	S_{M1} = 0.117 g	S_{D1} = 0.078 g

* The site class was based on the conditions exposed in our shallow exploratory soil borings and our knowledge of the soil conditions in the site vicinity. The soil characteristics extending beyond the depth of our borings were assumed for the purposes of providing this site classification.

6.6 Drainage

Properly functioning foundations require appropriately constructed and maintained site drainage conditions. Therefore, it is essential that positive drainage be provided during construction and maintained throughout the life of the structure. It is also important that proper planning and control of landscape and irrigation be performed.

Infiltration of water into utility or foundation excavations must be prevented during construction. 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. If utility line trenches are backfilled with the clay, care should be taken not to overcompact the backfill. However, if the trenches are backfilled

with a granular soil then a clay plug should be placed in the trench adjacent to the building to reduce the potential for water following the trench back under the structure.

The building should be provided with downspout extensions to direct water away from the structure. The downspouts should discharge into drainage swales or into the storm sewer system.

In areas where sidewalks, patios, or driveways do not immediately adjoin the structure, the ground surface adjacent to the building should slope down at a grade of about five percent for a distance of at least 10 feet from the perimeter walls. Planters or other surface features that could retain water adjacent to the building should be avoided. If planters and/or landscaping are adjacent to or near the structure, we recommend the following:

- Grades should slope away from the building.
- Planters should slope away from the building and should not pond water. Drains should be installed in enclosed planters to facilitate flow out of the planters.
- Only shallow-rooted landscaping should be used.
- Watering should be kept to a minimum. Irrigation systems should be situated on the far side of any planting and away from the building to reduce the potential for infiltration beneath foundations from possible leaks.
- A minimum of 36 inches should be maintained between the building foundations and shallow-rooted plants. In like manner, for deeper-rooted plants a minimum of 72 inches should be maintained between the building foundations and the plants. These deeper-rooted plants should still have a low moisture requirement.
- Trees should be planted no closer than a distance equal to one-half their mature height or fifteen feet, whichever is greater, from the building.

It should be understood that these recommendations will help reduce the potential for soil movement and resulting distress, but will not eliminate this potential.

6.7 Exterior Slabs

The site is underlain by zones of expansive clays that have the potential to expand and shrink with changes in their water content. Therefore, relatively lightweight exterior concrete flatwork such as sidewalks, patios, and driveways, may experience movement resulting in cracking or vertical offsets. To reduce the potential for damage, we recommend:

- Use of fill with low expansion potential and negligible frost susceptibility
- Placement of effective control joints on relatively close centers
- Moisture-density control during placement of subgrade fills
- Provision for adequate drainage in areas adjoining the slabs
- Use of designs which allow vertical movement between the exterior slabs and adjoining structural elements

It should be understood that these recommendations will help reduce the potential for soil movement and resulting distress, but will not eliminate this potential.

6.8 Pavements

It was assumed that the parking lot would be subject to both passenger vehicles and small- to medium-size trucks. On this basis, a daily traffic value of two Equivalent 18-kip Single Axle Loads (ESAL) was assumed for passenger car parking areas and drives (light duty), and a traffic value of 10 ESALs was assumed for the access drives. It was assumed that this traffic volume is an average for the life of the pavement and that it includes any anticipated traffic growth. The design period for the pavement was 20 years.

A revision of the recommended pavement sections may be necessary if the expected traffic loading conditions are different than assumed. An evaluation of the type and volume of traffic that each portion of the parking lot will experience should be conducted to determine if the pavement sections presented herein are appropriate.

The following pavement section is recommended for use on the site:

Traffic Area	Asphalt Concrete Pavement (inches)	Base Course (inches)
Light Duty	2.5	6.0
Access Drives	3.0	7.0

The "design life" of a pavement is defined as the expected life at the end of which reconstruction of the pavement will need to occur. Normal maintenance, including crack sealing, slurry sealing, and/or chip sealing, should be performed during the life of the pavement.

Due to the high static loads imposed by parking trucks in loading and unloading areas and at dumpster locations, we recommend a rigid pavement section for these areas. A minimum six-inch thick Portland cement concrete pavement is recommended.

Bituminous pavement should be constructed of dense-graded, central plant-mix, asphalt concrete. Base course, Portland cement, and asphalt concrete should conform to the Arizona Department of Transportation specifications.

Material and compaction requirements should conform to the recommendations presented in the **Earthwork** section of this report. The gradient of paved surfaces should ensure positive drainage. Water should not be allowed to pond in areas directly adjoining paved sections.

The site soils are expansive and differential heave may occur. The pavement service life may be reduced due to water infiltration into the subgrade soils heave induced cracks in the pavement. This will result in a softening and loss of strength of the subgrade soils. A regular maintenance program to seal pavement cracks will help prolong the life of the pavement.

Pavement design methods are intended to provide an adequate thickness of structural materials over a particular subgrade such that wheel loads are reduced to a level the subgrade can support. The support characteristics of the subgrade for pavement design do not account for shrink and swell movements of an expansive clayey subgrade such as the soils encountered on this project. Consequently, the pavement may be adequate from a structural standpoint, yet still experience cracking and deformation due to shrink/swell movement of the subgrade. It is therefore important to minimize moisture changes in the subgrade in order to reduce shrink/swell movements. The pavement surface, subbase surface, and adjacent areas should be well drained. Excessive watering of landscaped areas adjacent to pavements should be avoided. Proper maintenance should be performed on cracks in the pavement surface to prevent water from penetrating through to the base or subbase material. Even with these precautions, some movement and related cracking may still occur, requiring periodic maintenance.

7.0 EARTHWORK

7.1 General

The conclusions contained in this report are contingent upon compliance with recommendations presented in this section. Any excavating, trenching, or disturbance that occurs after completion of the earthwork must be backfilled, compacted, and tested in

accordance with the recommendations contained herein. It is not reasonable to rely upon our conclusions and recommendations if any future unobserved and untested trenching, earthwork activities, or backfilling occurs.

7.2 Site Clearing

Strip and remove any vegetation and other deleterious materials from the building and pavement areas. The existing fill can remain in the pavement areas provided that it does not contain any deleterious material and the subgrade is prepared as discussed in Section 7.4. The building area is defined as the area within the building footprint plus five feet beyond the perimeter of the footprint. All exposed surfaces should be free of mounds and depressions that could prevent uniform compaction.

7.3 Building Pad Preparation

The foundation areas should be overexcavated through the existing fill or to a minimum of 48 inches beneath the base of the foundations, whichever is deeper. The overexcavations should extend a lateral distance of at least one foot for every two feet of fill that will be placed beneath the foundations. In areas where a slab-on-grade floor will be used, the floor slab areas should be overexcavated through the existing fill or to a minimum of 48 inches beneath the base of the floor slab, whichever is deeper.

The base of the foundation/floor slab overexcavations should be scarified to a minimum depth of 8 inches, moisture conditioned to a water content of 0 to 4 percent above the optimum water content, and recompacted to between 93 and 97 percent of the standard Proctor maximum dry density (ASTM D 698). The overexcavations should then be backfilled to the design finish grade with non-expansive fill placed and compacted in accordance with the recommendations presented in Section 7.6. The engineered fill should consist of low expansive potential material meeting the requirements presented in Section 7.5.

The perimeter foundation excavations on the exterior side of the building area should be backfilled with on-site clay to reduce the potential for surface water ponding in the non-expansive fill. The clay backfill should be sloped away from the structure to promote drainage away from the foundations.

7.4 Pavement Subgrade Preparation

The site should then be cut as required to the design finish grade. The subgrade should then be scarified to a minimum depth of 8 inches and recompacted in accordance with the

recommendations presented in Section 7.6. The site can then be raised to the design finish grade with engineered fill.

7.5 Materials

The existing site soil is expansive and is not recommended for use as fill in building areas. The existing site soil can be used as fill in the pavement areas provided that it does not contain any deleterious material. Imported non-expansive fill soil should conform to the following:

- Gradation (ASTM C136):

	percent finer by weight
6"	100
4"	85-100
¾"	70-100
No. 4 Sieve	50-100
No. 200 Sieve	30 (max)

- Maximum expansive potential (%)* 1.5
- Maximum soluble sulfates (%) 0.10

* Measured on a sample compacted to approximately 95 percent of the ASTM D698 maximum dry density at about three percent below the optimum water content. The sample is confined under a 100 psf surcharge and submerged.

Imported fill should be approved by WT prior to placement.

7.6 Placement and Compaction

a. Place and compact fill in horizontal lifts, using equipment and procedures that will produce recommended water contents and densities throughout the lift.

b. Uncompacted fill lifts should not exceed 10 inches.

c. No fill should be placed over frozen ground nor should frozen fill or backfill be used.

d. Materials should be compacted to the following:

	Minimum Percent Material Compaction (ASTM D698)
• Recompacted on-site soil in the building area	93 to 97
• Imported non-expansive fill in the building area	95
• Fill in the pavement areas	95
• Nonstructural backfill	90

Imported non-expansive fill and fill in the pavement areas should be compacted within a water content range of –3 to +3 percent of the optimum water content. Recompacted on-site soil in the building area should be compacted within a water content range of 0 to +4 percent of the optimum water content.

7.7 Compliance

Recommendations for foundation, slab-on-grade, and pavement elements supported on compacted fill or prepared subgrade depend upon compliance with the **Earthwork** recommendations. To assess compliance, observation and testing should be performed under the direction of the project geotechnical engineer. Please contact us to provide these testing and observation services.

8.0 ADDITIONAL SERVICES

The recommendations provided in this report are based on the assumption that a sufficient schedule of tests and observations will be performed during construction to verify compliance. At a minimum, these tests and observations should be comprised of the following:

- Observations and testing during site preparation and earthwork;
- Observation of foundation excavations; and
- Consultation as may be required during construction.

Retaining the geotechnical engineer who developed your report to provide construction observation is the best way to verify compliance, and to help you manage the risks associated with unanticipated conditions.

9.0 LIMITATIONS

This report has been prepared assuming the project criteria described in Section 2.0. If changes in the project criteria occur, or if different subsurface conditions are encountered or become known, the conclusions and recommendations presented herein shall become invalid. In any such event, contact WT to assess the effect that such variations may have on our conclusions and recommendations. If WT is not retained for the construction observation and testing services to determine compliance with this report, our professional responsibility is accordingly limited.

The recommendations presented are based entirely upon data derived from a limited number of samples obtained from widely spaced borings. The attached logs are indicators of subsurface conditions only at the specific locations and times noted. This report assumes the uniformity of the geology and soil structure between borings, however variations can and often do exist. Whenever any deviation, difference or change is encountered or becomes known, WT should be contacted.

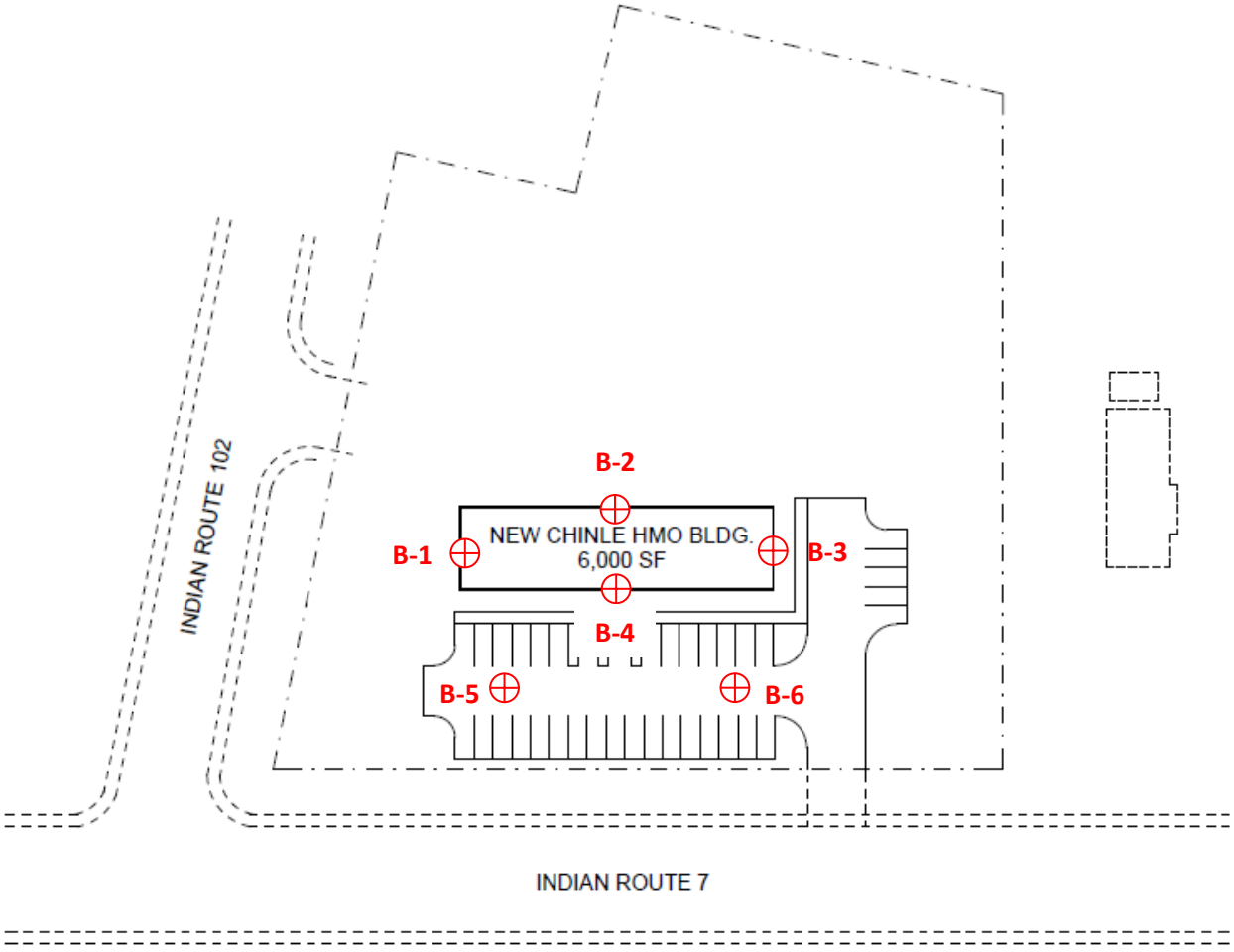
This report is for the exclusive benefit of our client alone. There are no intended third-party beneficiaries of our contract with the client or this report, and nothing contained in the contract or this report shall create any express or implied contractual or any other relationship with, or claim or cause of action for, any third party against WT.

This report is valid until the earlier of one year from the date of issuance, a change in circumstances, or discovered variations. After expiration, no person or entity shall have any right to rely on this report without the express written authorization of WT.

10.0 CLOSURE

We prepared this report as an aid to the designers of the proposed project. The comments, statements, recommendations and conclusions set forth in this report reflect the opinions of the authors. These opinions are based upon data obtained at the boring locations. Work on your project was performed in accordance with generally accepted standards and practices utilized by professionals providing similar services in this locality. No other warranty, express or implied, is made.

N



⊕ **Approximate Boring Location;**

Geotechnical
Environmental
Inspections
Materials

Western Technologies Inc.
The Quality People
Since 1955
wt-us.com

PROJECT: HOUSING MANAGEMENT OFFICE
JOB NO.: 3120JS068

PLATE: 1

BORING LOCATION DIAGRAM

BORING NUMBER B-1

Logo

Western Technologies

CLIENT Suina Design
PROJECT NAME Housing Management Office
PROJECT NUMBER 3120JS068
PROJECT LOCATION Chinle, Arizona
DATE STARTED 9/15/20 **COMPLETED** 9/15/20
GROUND ELEVATION _____ **HOLE SIZE** 7"
DRILLING CONTRACTOR Envirodrill
GROUND WATER LEVELS:
DRILLING METHOD Hollow-Stem Auger
AT TIME OF DRILLING --- Dry
LOGGED BY S. Cobb **CHECKED BY** R. Southworth
AT END OF DRILLING --- Dry
NOTES _____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(CH) LEAN to FAT CLAY; with sand, red-brown, very stiff to hard, damp to moist	GB									
			MC		50		117	12	51	21	30	87
5			MC		44			12				88
			MC		28			13				81
10			SS		6-6-9 (15)							
15			SS		2-4-4 (8)							

Bottom of borehole at 16.5 feet.

Logo

Western Technologies

BORING NUMBER B-2

CLIENT Suina Design
PROJECT NAME Housing Management Office
PROJECT NUMBER 3120JS068
PROJECT LOCATION Chinle, Arizona
DATE STARTED 9/15/20 **COMPLETED** 9/15/20
GROUND ELEVATION _____ **HOLE SIZE** 7"
DRILLING CONTRACTOR Envirodrill
GROUND WATER LEVELS:
DRILLING METHOD Hollow-Stem Auger
AT TIME OF DRILLING ---
LOGGED BY S. Cobb **CHECKED BY** R. Southworth
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(CH) LEAN to FAT CLAY; with sand, red-brown, very stiff to hard, damp to moist	GB									
			SS		9-12-12 (24)		113	12	46	19	27	86
5			SS		10-19-16 (35)							
			SS		9-12-16 (28)			14				91
10			SS		11-14-16 (30)							
15			SS		11-14-11 (25)							

Bottom of borehole at 16.5 feet.

Logo

Western Technologies

BORING NUMBER B-3

CLIENT Suina Design
PROJECT NAME Housing Management Office
PROJECT NUMBER 3120JS068
PROJECT LOCATION Chinle, Arizona
DATE STARTED 9/15/20 **COMPLETED** 9/15/20
GROUND ELEVATION _____ **HOLE SIZE** 7"
DRILLING CONTRACTOR Envirodrill
GROUND WATER LEVELS:
DRILLING METHOD Hollow-Stem Auger
AT TIME OF DRILLING ---
LOGGED BY S. Cobb **CHECKED BY** R. Southworth
AT END OF DRILLING ---
NOTES Boring terminated at 7 feet due to auger refusal in concrete
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(SC) FILL - CLAYEY SAND; loose, red-brown, damp	GB									
			MC		17			6				46
5			MC		50							

Refusal at 7.0 feet.
Bottom of borehole at 7.0 feet.

Logo

Western Technologies

BORING NUMBER B-4

CLIENT Suina Design
PROJECT NAME Housing Management Office
PROJECT NUMBER 3120JS068
PROJECT LOCATION Chinle, Arizona
DATE STARTED 9/15/20 **COMPLETED** 9/15/20
GROUND ELEVATION _____ **HOLE SIZE** 7"
DRILLING CONTRACTOR Envirodrill
GROUND WATER LEVELS:
DRILLING METHOD Hollow-Stem Auger
AT TIME OF DRILLING ---
LOGGED BY S. Cobb **CHECKED BY** R. Southworth
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(CH) LEAN to FAT CLAY; with sand, red-brown, very stiff to hard, damp to moist	GB									
			MC		14			10				78
5			MC		13			12				86
			MC		8			12				83
10			SS		9-10-9 (19)							
15			SS		10-10-12 (22)							

Bottom of borehole at 16.5 feet.

Logo

Western Technologies

BORING NUMBER B-5

CLIENT Suina Design
PROJECT NAME Housing Management Office
PROJECT NUMBER 3120JS068
PROJECT LOCATION Chinle, Arizona
DATE STARTED 9/15/20 **COMPLETED** 9/15/20
GROUND ELEVATION _____ **HOLE SIZE** 7"
DRILLING CONTRACTOR Envirodrill
GROUND WATER LEVELS:
DRILLING METHOD Hollow-Stem Auger
AT TIME OF DRILLING ---
LOGGED BY S. Cobb **CHECKED BY** R. Southworth
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(CH) LEAN to FAT CLAY; with sand, red-brown, very stiff to hard, damp to moist	GB									
			GB									
5												

Bottom of borehole at 5.0 feet.

Logo

Western Technologies

BORING NUMBER B-6

CLIENT Suina Design
PROJECT NAME Housing Management Office
PROJECT NUMBER 3120JS068
PROJECT LOCATION Chinle, Arizona
DATE STARTED 9/15/20 **COMPLETED** 9/15/20
GROUND ELEVATION _____ **HOLE SIZE** 7"
DRILLING CONTRACTOR Envirodrill
GROUND WATER LEVELS:
DRILLING METHOD Hollow-Stem Auger
AT TIME OF DRILLING ---
LOGGED BY S. Cobb **CHECKED BY** R. Southworth
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(CH) LEAN to FAT CLAY; with sand, red-brown, very stiff to hard, damp to moist	GB									
			GB									
5												

Bottom of borehole at 5.0 feet.

BORING NO.	SAMPLE DEPTH (ft)	SAMPLE CLASSIFICATION	INITIAL WATER CONTENT (%)	DRY DENSITY (pcf)	SURCHARGE LOAD (PSF)	PERCENT SWELL
B-1	2 - 3	CH-CL	11.6	117	100	17.1
B-2	2 - 3	CH-CL	11.6	113	100	16.2

SECTION 001100 - SUMMARY

PART 1 - GENERAL

1.1 PROJECT INFORMATION

A. Project Identification: NHA Chinle HMO Office Building

1. Project Location: Chinle, Apache County, Arizona, 86503

B. Owner: Navajo Housing Authority, Division of Construction Services, P.O. Box 427 Chinle Arizona, 86503 Contact: Lavon Yazzie, Development Coordinator. Nolen Nelson, Development Manager. Tel: 928-729-6610.

C. Architect: Suina Design + Architecture, LLC, 4411 McLeod Road NE, Suite A-1, Albuquerque, NM 87109. Contact: Elizabeth Suina (505) 766-6968, esuina@suinadesign.com

D. Architect's Consultants: Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. Civil Engineer: Miller Engineering Consultants Inc., 3500 Comanche NE Albuquerque, NM 87107 Contact: Verlyn Miller (505) 888-7500. Email: Vmiller@mecnm.com.

2. Structural Engineer: Luchini-Trujillo: Structural Engineers, 2019 Galisteo Street, D2, Santa Fe, NM 87505. Contact: Antonio Luchini, (505) 424-3232. Email: Tony@itseng.com.

3. Plumbing, Mechanical, Electrical: Teppics Engineering, LLC, 1725 Vista de Colinas Dr. NE., Rio Rancho, NM 87124. Contact: Brandon Toepper, (708) 426-3639. Email: brandon@teppics.com.

E. Contractor:

F. The Work consists of constructing a single-story office building for the Navajo Housing Authority. Structural consisting of concrete foundation and cast-in-place concrete, metal stud framing, pre-engineered roof trusses, post and beam timber, exterior grade wall and roof sheathing. All new plumbing, mechanical, electrical, insulation / thermal envelope, exterior and interior finishes, cabinetry, roofing and roof drainage, doors and windows.

The Site development of approximately 2.63 acres, more or less, including: wastewater, domestic water systems, site grading and drainage, building pads, roadway and driveway pavement, fencing/entrance gates, and landscaping.

G. Work by Owner’s Construction Service Division: Coordinate any Environmental work on behalf of the project. Schedule and assist Contractor in coordination of work by Owner’s own forces and separate contractors. Schedule delivery of Owner supplied products. Obtain and provide to Contractor shop drawings, product data, and installation instructions for Owner supplied products. Arrange and pay for delivery of Owner supplied products to site. Submit claims for transportation damage and replace damaged, defective, or deficient items.

H. Owner-Furnished, Owner-Installed Products: The following products will be furnished by Owner and shall be installed by Contractor as part of the Work:
   1. Owner furnished products include computer racks, cables, etc.

I. Contractor Furnished Contractor Installed: The following products will be furnished by the Contractor as part of the Work.

   1. Furnishings: Address signage.

   2. Appliances; stoves, refrigerators, ovens, range hoods, and microwaves.

1.2 WORK RESTRICTIONS

A. Contractor's Use of Premises: During construction, Contractor will have full use of site and building area as indicated by Navajo Housing Authority. Contractor's use of premises is limited only by Owner's right to perform work or employ other contractors on portions of Project and as follows:

   1. Owner may occupy premises during construction. Perform construction only during normal working hours (8 AM to 5 PM Monday thru Friday, other than holidays), unless otherwise agreed to in advance by Owner. Clean up work areas and return to usable condition at the end of each work period.
   2. Limits: Limit site disturbance, including earthwork and clearing of vegetation, to 40 feet beyond building perimeter; 10 feet beyond surface walkways, patios, surface parking, and utilities less than 12 inches in diameter; 15 feet beyond primary roadway curbs and main utility branch trenches; and 25 feet beyond constructed areas with permeable surfaces (such as pervious paving areas, stormwater detention facilities, and playing fields) that require additional staging areas to limit compaction in the constructed area.
   3. Driveways, Walkways, and Entrances: Keep driveways, parking, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles always. Do not use these areas for parking or storage of materials.

B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 8:00 a.m. to 5:00 p.m., Monday through Friday, unless otherwise indicated.

   1. Weekend Hours: As approved by the Navajo Housing Authority.
   2. Early Morning Hours: As approved by the Navajo Housing Authority.
   3. Community closures in observance of cultural and traditional events.

C. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor-air intakes.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 001100

SECTION 001300 - ADMINISTRATIVE REQUIREMENTS

GENERAL

1.01 SUMMARY

A. Sections includes: General administrative requirements and provisions.

B. Related documents and sections:

1. General Conditions, Article 8.
2. 001400 – Quality Requirements. General quality requirements
3. 001500 – Temporary Facilities and Controls: Temporary facilities such as buildings, sanitary facilities, and utilities.
4. 001600 – Product Requirements: Requirements for submitting substitution requests and using substitute products.

1.02 DESCRIPTION

A. Each division or section of the Specifications shall be deemed to have as its leading paragraph the following, which shall become part of each section or division as if written out in full: "Description: Contractor performing this work shall furnish all labor, equipment, tools, appurtenances and materials, except those specified to be furnished by others, and pay all special taxes or permits necessary to complete all work as hereinafter required or as shown or called for on the drawings and by these specifications".

1.03 SUBMITTALS

A. Provide submittals for all components of the project; proceed with related work only after such submittals have been reviewed and approved. Provide one set of reproducible originals for each shop drawing.

1.04 CONTRACTOR'S GUARANTEE

A. Contractor expressly warrants and guarantees the Work (including labor and materials) for a period of one (1) year from date of Substantial Completion. Contractor's guarantee (together with any additional guarantees or warranties necessary from Manufacturers and Subcontractors) shall be delivered to Owner in a form acceptable to Owner in conformance with the requirements of the Contract Documents as a condition precedent to final payment being due.

1.05 CERTIFICATE OF OCCUPANCY

A. Contractor shall obtain Certificate of Occupancy from the Pueblo of Jemez Housing Authority prior to Final Completion.

1.06 CONTRACTOR USE OF SITE AND OWNER OCCUPANCY

A. Access to the site shall be through Owner's property and public roads.

B. Contractor will have unrestricted use of the property in order to complete the project in a timely fashion.

C. Limit use of the site to matters essential to performing the Work.

a. Contractor shall assume full responsibility for the protection and safekeeping of all materials and equipment.

1.07 FIELD ENGINEERING

A. Provide field engineering services; verify existing grades, lines and levels, by of recognized engineering survey practices. Control datum for survey is shown on the Drawings. Locate and protect control and reference points. Provide the services of a licensed surveyor.

1.08 PROJECT MANAGEMENT

A. Provide administrative requirements for the proper coordination and completion of work including the following:

1. Competent administration and supervisory personnel. Contractor shall at all times be present at the Work in person or represented by a competent superintendent who shall supervise and direct the Work and shall be authorized by the Contractor to receive and fulfill instructions from the Architect.
2. Upon notice to proceed, a Preconstruction Conference will be scheduled on site with the Architect, Owner's Representatives, Contractor and his applicable sub-contractors.
3. Project meetings, minimum of once per month.
4. Survey lines and levels. Work from lines and levels indicated on Drawings, calculate and measure required dimensions as shown within recognized tolerance, if not otherwise indicated. Do not scale Drawings to determine dimensions. Continuously advice tradesmen performing the work of marked lines and levels provided for use in layout work.
5. Submit progress schedule, bar-chart type, updated monthly.
6. Prepare submittal schedule; coordinate with progress schedule.
7. Submit schedule of values.
8. Submit schedule of required tests including payment and responsibility.
9. Perform surveys:
10. Laying out the work and verifying locations during construction.
11. Final site survey.
12. Submit and post a list of emergency telephone numbers and address for individuals to be contacted in case of emergency.
13. Submit record drawings and specifications; to be maintained and annotated by Contractor as work progresses.
14. Submit payment request procedures.
15. Clean and protect the work.

1.09 SUBMITTAL PROCEDURES

A. Provide types of submittals listed in individual sections and number of copies required below.

1. Shop drawings, reviewed and annotated by the Contractor - transparency and two blackline prints.
2. Product data - 4 copies.
3. Samples - 2, plus extra samples as required to indicate range of color, finish, and texture to be expected.
4. Inspection and test reports - 4 copies.
5. Warranties - 4 copies.
6. Survey data - 4 copies.

7. Closeout submittals - 4 copies.
8. Home Energy Rating System (HERS): Specific product certification, stamps or documentation. Performance data for specific equipment.

B. Comply with project format for submittals.

C. Comply with submittal procedures established by Architect including Architect's submittal and shop drawing stamp. Provide required resubmittals if original submittals are not approved. Provide distribution of approved copies including modifications after submittals have been approved.

D. Samples and shop drawings shall be prepared specifically for this project. Shop drawings shall include dimensions and details, including adjacent construction and related work. Note special coordination required. Note any deviations from requirements of the Contract Documents.

E. Provide warranties as specified; warranties shall not limit length of time for remedy of damages Owner may have by legal statute. Warranties shall be signed by contractor, supplier or installer responsible for performance of warranty.

END OF SECTION 0001300

SECTION 01400 - QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Sections includes: General quality requirements and provisions.

B. Related sections:

1. 000500 – Agreement.
2. 000700 – General Conditions, Article 8.
3. 001300 – Administration Requirements: General coordination requirements.
4. 001500 – Temporary Facilities and Controls: Temporary facilities such as buildings, sanitary facilities, and utilities.
5. 001600 – Product Requirements: Requirements for submitting substitution requests and using substitute products.

1.02 CONSTRUCTION INDUSTRIES LICENSING ACT

A. Contractor shall comply with the New Mexico Construction Industries Licensing Act, the rules and regulations of the New Mexico Construction Industries Division and the rules, regulations

B. and codes of the various trade boards adopted pursuant to the Construction Industries Licensing Act.

1.03 QUALITY CONTROL

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

1.04 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate. Comply with manufacturers' tolerances.

1.05 REFERENCES

A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

1.06 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to perform the following as applicable, and to initiate instructions when necessary.

1. Observe site conditions.
2. Conditions of surfaces and installation.
3. Quality of workmanship.
4. Start-up of equipment.

5. Test, adjust and balance of equipment.

1.07 CONTRACTOR'S QUALITY CONTROL

A. Perform quality control during installation.

1.08 MOCK-UP REQUIREMENTS

A. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes. Accepted mock-ups shall be a comparison standard for the remaining Work.

B. Where mock-up has been accepted by Architect and no longer needed, remove mock-up and clear area when directed to do so.

END OF SECTION 001400

SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SUMMARY

A. Related sections:

1. 000500 – Agreement.
2. 000700 – General Conditions, Article 8.
3. 001300 – Administration Requirements: General coordination requirements.

1.02 TEMPORARY UTILITIES

A. Provide temporary services and utilities, including utility costs:

1. Water (potable and non-potable).
2. Lighting and power.
3. Metering.
4. Telephone.
5. Toilet facilities.
6. Materials storage.

1.03 CONSTRUCTION FACILITIES

A. Provide construction facilities, including utility costs:

1. Construction equipment.
2. Dewatering and pumping.
3. Enclosures.
4. Heating.
5. Lighting.
6. Access.
7. Roads.

B. Provide personnel support facilities:

1. Contractor's field office.
2. Sanitary facilities.
3. Drinking water.
4. Project identification sign.
5. Cleaning, trash removal and legal disposal of materials.

1.04 TEMPORARY CONTROLS

A. Provide security and protection requirements:

1. Fire extinguishers.
2. Site enclosure fence, barricades, warning signs, and lights.

3. Building enclosure and lock-up.
4. Environmental protection.
5. Pest control during and at the end of construction.

END OF SECTION 001500

SECTION 01600 - PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Sections includes: General product requirements and provisions.

B. Related sections:

1. 000700 – General Conditions, Article 8.
2. 001300 – Administration Requirements: General coordination requirements.
3. 001400 – Quality Requirements: General quality requirements.
4. 001500 – Temporary Facilities and Controls: Temporary facilities such as buildings, sanitary facilities, and utilities.

C. Provide products from one manufacturer for each type or kind as applicable. Provide secondary materials as acceptable to manufacturers of primary materials.

1.02 GREEN/SUSTAINABLE BUILDING

A. Product Requirements

1. Install Energy Star labeled fixtures.

1.03 PRODUCT SUBSTITUTIONS

A. Provide products selected or equal approved by Architect. Products submitted for substitution shall be submitted with complete documentation, and include construction costs of substitution including related work.

B. Request for substitution must be in writing. Conditions for substitution include:

1. Substitutions during bidding: Architect will consider written requests from qualified bidders, subcontractors, and manufacturers for substitutions.
   a. Submit separate request for each substitution with Request for Construction Changes on Project Mortgages form.
   b. Substitutions approved during bidding will be listed in Addenda.
2. Substitutions after contract award will only be considered if one or more of the below conditions exists:
   a. Unavailability of specified products through no fault of Contractor.
   b. Qualified installer is not available for specified product.
   c. Substitution is required for compliance with final interpretation of code r requirements or insurance regulations.
   d. Subsequent information discloses inability of specified products to perform properly or to fit in the designated space.
   e. Refusal of manufacturer to certify or guarantee performance of the specified product as required.
   f. An 'or equal' phrase in the specifications.
   g. Specified material cannot be coordinated with other work.

h. Substantial advantage is offered to the Owner in terms of cost, time, or other valuable consideration.

C. Substitutions shall be submitted prior to award of contract, unless otherwise acceptable. Approval of shop drawings, product data, or samples containing substitutions is not an approval of a substitution unless items are clearly presented as a substitution at the time of submittal.

END OF SECTION 001600

SECTION 001700 - EXECUTION REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Sections includes: General administrative requirements and provisions.

B. Related documents and sections:

1. 000700 – General Conditions, Article 8.
2. 001200 – Price and Payment Procedures. Requirements for submitting Applications for Payment, See attached documents.
3. 001400 – Quality Requirements. General quality requirements
4. 001500 – Temporary Facilities and Controls: Temporary facilities such as buildings, sanitary facilities, and utilities.
5. 001600 – Product Requirements: Requirements for submitting substitution requests and using substitute products.

1.02 CLOSE OUT PROCEDURES

A. The following are prerequisites to substantial completion. Provide the following:

1. Punch list prepared by Subcontractors as applicable.
2. Supporting documentation.
3. Warranties.
4. Certifications.
5. Occupancy permit.
6. Start-up and testing of building systems.
7. Changeover of locks.
8. Meter readings.

B. Provide the following prerequisites to final acceptance:

1. Final payment request with supporting affidavits.
2. Completed punch list.

C. Provide a marked-up set of drawings including changes which occurred during construction.

D. Provide the following during project closeout:

1. Submission of record documents.
2. Submission of maintenance manuals.
3. Training and turnover to Owner's personnel.
4. Final cleaning and touch-up.
5. Removal of temporary facilities.

PART 2 DOCUMENTS

A. General Pay Request

B. Subcontractor and Material Pay Request

C. Lien Release

D. Subcontractor Warranty

END OF SECTION 001700

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Items indicated to be removed and salvaged remain Owner's property. Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse. Include fasteners or brackets needed for reattachment elsewhere.

B. Predemolition Photographs: Show existing conditions of adjoining construction and site improvements. Submit before Work begins.

C. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

D. It is not expected that hazardous materials will be encountered in the Work. If hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

PART 2 - PRODUCTS

2.1 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with EPA regulations and with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 DEMOLITION

A. Maintain services/systems indicated to remain and protect them against damage during selective demolition operations. Before proceeding with demolition, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of the building.

B. Locate, identify, shut off, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

D. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

E. Protect walls, ceilings, floors, and other existing finish work that are to remain. Erect and maintain dustproof partitions. Cover and protect furniture, furnishings, and equipment that have not been removed.

F. Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

G. Provide temporary weather protection to prevent water leakage and damage to structure and interior areas.

H. Requirements for Building Reuse:

1. Maintain existing building structure (including structural floor and roof decking) and envelope (exterior skin and framing, excluding window assemblies and nonstructural roofing material) not indicated to be demolished; do not demolish such existing construction beyond indicated limits.
2. Maintain existing interior nonstructural elements (interior walls, doors, floor coverings, and ceiling systems) not indicated to be demolished; do not demolish such existing construction beyond indicated limits.

I. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction.

J. Remove demolition waste materials from Project site and legally dispose of them in an EPA-approved landfill. Do not burn demolished materials.

K. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. The Contractor shall furnish all materials for concrete in accordance with the provisions of this Section and shall form, mix, place, cure, repair, finish, and do all other work as required to produce finished concrete, in accordance with the requirements of the Contract Documents.

B. The following types of concrete shall be covered in this Section:
   1. Site work Concrete: Concrete to be used sidewalks, fence and guard post embedment, and other concrete ties unless otherwise shown.

C. The term "hydraulic structure" used in these specifications shall refer to environmental engineering concrete structures for the containment, treatment, or transmission of water, wastewater, or other fluids.

D. Related Sections:
   1. Section 03 10 00 - Concrete Forms and Accessories.
   2. Section 03 20 00 - Concrete Reinforcement.
   3. Section 03 29 00 - Joints in Concrete.
   4. Section 03 48 17 – Precast Concrete Channel.
   5. Section 03 60 00 - Grout.
   6. Section 05 50 00 - Metal fabrications
   7. Section 31 23 23 - Backfill.
   8. Section 32 12 16 - Asphalt Paving.
   9. Section 32 33 00 - Site Furnishings
   10. Section 33 11 13 - Public Water Distribution Systems.
   11. Section 33 31 00 - Sanitary Sewer Systems.
   12. Section 33 39 13 - Precast Concrete Manholes.

1.2 REFERENCES

A. American Concrete Institute:
   1. ACI 117 - Standard Tolerances for Concrete Construction and Materials.
   2. ACI 214 - Recommended Practice for Evaluation of Strength Test Results of Concrete.
   3. ACI 301 - Specifications for Structural Concrete.
   4. ACI 308.1 - Standard Specification for Curing Concrete.
   5. ACI 309 - Consolidation of Concrete.
   6. ACI 318 - Building Code Requirements for Structural Concrete.

B. ASTM International:
   1. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
   2. ASTM C33 - Standard Specification for Concrete Aggregates.

3. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
4. ASTM C40 - Test Method for Organic Impurities in Fine Aggregates for Concrete.
5. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
6. ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
7. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.
8. ASTM C150 - Standard Specification for Portland Cement.
9. ASTM C156 - Test Methods for Water Retention by Concrete Curing Materials.
10. ASTM C157 - Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete.
11. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
12. ASTM C192 - Method of Making and Curing Concrete Test Specimens in the Laboratory.
13. ASTM C227 - Test for Potential Alkali Reactivity of Cement- Aggregate Combinations.
14. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
15. ASTM C309 - Specifications for Liquid Membrane-Forming Compounds for Curing Concrete.
16. ASTM C441 - Test for Effectiveness of Mineral Admixtures in Preventing Excessive Expansion of Concrete Due to Alkali-Aggregate Reaction.
17. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
18. ASTM C1077 - Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction & Criteria for Laboratory Evaluation.
19. ASTM D2419 - Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
20. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.

1.3 SUBMITTALS

A. General**:** Submittals shall be submitted to the Owner's Representative for review in accordance with Section 01 00 00, Contractor Submittals. Submittals shall include, but not be limited to the following:

1. Mix Designs**:** Prior to beginning the Work and within 14 days of the Notice To Proceed, the Contractor shall submit to the Owner's Representative, for review, the proposed ready-mix supplier and their Laboratory-Certified concrete mix design for each class and type of concrete specified for the Work. Submitted mix designs shall have been performance-tested and certified by an independent laboratory approved by the Owner. All costs related to providing mix design shall be borne by the Contractor. Mix designs shall show the following in accordance with ACI 301:
   a. Proportions for all materials proposed.
   b. Mill tests for cement.
   c. Admixture certification, chloride ion content must be included.
   d. Aggregate gradation and certification.

2. Delivery Tickets: Where ready-mix concrete is used, the Contractor shall furnish delivery tickets at the time of delivery of each load of concrete. Each ticket shall show the state certified equipment used for measuring and the total quantities, by weight of cement, sand, each class of aggregate, admixtures, and the amounts of

water in the aggregate added at the batching plant, and the amount allowed to be added at the site for the specific design mix. In addition, each ticket shall state. The approved mix design number, total yield in cubic yards, and the time of day, to the nearest minute, corresponding to the times when the batch was dispatched, when it left the plant, when it arrived at the site, when unloading began, and when unloading was finished.

3. Materials and methods for curing:
   a. List of curing methods to be used on each type and class of concrete.
   b. Curing compound.
   c. Curing blankets and mats.
   d. Evaporation retardant.

1.4 QUALITY ASSURANCE

A. When required by any applicable permits, such as CID permits, Contractor shall have reinforcement inspected by the agency with jurisdiction prior to placement of concrete.

B. General:
   1. Tests on concrete will be field performed in accordance with all requirements of applicable ASTM standards for such tests, including but not limited to obtaining samples, temperature, slump, air entrainment, making and curing specimens, breaking concrete cylinders, and other as may be applicable.
   2. The cost of all laboratory tests on cement, aggregates, and concrete, for the development of the mix design, will be borne by the Contractor. The laboratory must meet or exceed the requirements of ASTM C1077.
   3. Concrete for testing shall be supplied by the Contractor as part of the project cost, and the Contractor shall provide assistance in obtaining samples, and disposal and cleanup of excess material.
   4. Test cylinders will be prepared at the frequency determined by the Owner and Owner's Representative.

C. Compression Tests:
   1. Compression test specimens will be taken during construction from the first placement of each class of concrete specified herein and at intervals thereafter as selected by the Owner's Representative to ensure continued compliance with these specifications. Each set of test specimens will be a minimum of 5 cylinders.
   2. Compression test specimens for concrete shall be made in accordance with ASTM C31. Specimens shall be 6-inch diameter by 12-inch high cylinders.
   3. Compression tests shall be performed in accordance with ASTM C39. One test cylinder will be tested at 7 days and 2 at 28 days. The remaining cylinders will be held to verify test results, if needed.
   4. Compression testing will be paid for by the Owner.

D. Evaluation and Acceptance of Concrete:
   1. Evaluation and acceptance of the compressive strength of concrete shall be according to the requirements of ACI 318, and as specified herein.
   2. All concrete that fails to meet the ACI requirements and these specifications, is subject to removal and replacement at the cost of the Contractor.
   3. Concrete delivered to the site that does not meet the requirements as herein specified may be rejected.

1.5 CONSTRUCTION TOLERANCES

A. The Contractor shall set and maintain concrete forms and perform finishing operations so as to ensure that the completed work is within the tolerances specified herein. Surface defects and irregularities are defined as finishes and are to be distinguished from tolerances. Tolerance is the specified permissible variation from lines, grades, or dimensions shown. Where tolerances are not stated in the specifications, permissible deviations will be in accordance with ACI 117.

B. The following construction tolerances are hereby established and apply to finished walls and slabs unless otherwise shown:

Item	Tolerance
Variation of the constructed linear outline from the established position in plan.	In 10 feet: 1/4-inch In 20 feet or more: 1/2-inch
Variation from the level or from the grades shown.	In 10 feet: 1/4-inch In 20 feet or more: 1/2-inch
Variation from the plumb.	In 10 feet: 1/4-inch In 20 feet or more: 1/2-inch
Variation in the thickness of slabs and walls.	Minus 1/4-inch; Plus 1/2-inch
Variation in the locations and sizes of slabs and wall openings.	Plus or minus 1/4-inch

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Except as otherwise specified, all cement shall be standard brand Portland Cement conforming to ASTM C150 for Type II, low alkali. Portland Cement shall contain not more than 0.60 percent total alkalies. The term "alkalies" is defined as the sum sodium oxide (Na_2O), potassium oxide (K2O), calculated as sodium oxide (.658 K2O). Only one (1) brand of cement shall be used for exposed concrete in any individual structure. The cement shall be suitably protected from exposure to moisture until used. Certified mill test reports for each shipment of cement to be used shall be submitted to the Owner’s Representative. Mill test reports shall include the alkali content.

B. Water shall be potable, clean and free from objectionable quantities of silty organic matter, alkali, salts and other impurities. The water shall be considered potable, for the purpose of this Section only, if it meets the requirements of the local governmental agencies. Agricultural water with high total dissolved solids (over 1000 mg/l TDS) shall not be used.

C. All concrete aggregates shall be obtained from pits acceptable to the Owner’s Representative, shall be non-reactive, sound, uniformly graded and free of deleterious material in excess of allowable limits specified. Combined aggregates shall be well graded from coarse to fine sizes and be uniformly graded between screen sizes to produce a concrete that has optimum workability and consolidation characteristics. Lightweight sand

for fine aggregate will not be permitted. Aggregates shall conform to ASTM C33.

1. Coarse Aggregate: Coarse aggregate shall consist of gravel, crushed gravel or crushed stone made up of clean, hard, durable particles free from calcareous coatings, organic matter or other foreign substances. Thin or elongated pieces having a length greater than four (4) times the average thickness shall not exceed fifteen percent (15%) by weight. Deleterious substances shall not be present in excess of the following percentages by weight, and in no case shall the total of all deleterious substances exceed one and one-half percent (1.5%):

Soft Fragments	1.5%
Shale	1.5%
Coal and Lignite	0.25%
Clay Lumps	0.25%
Materials Finer than No. 200 Sieve	0.50%*

*Except that when material finer than No. 200 sieve consists of crusher dust, the maximum amount maybe 1%.

Except as otherwise specified or approved in writing by the Engineer, coarse aggregate shall be graded as specified in ASTM C33, size No. 57.

2. Fine Aggregate: Fine aggregate for concrete or mortar shall consist of clean, natural sand or a combination of natural and manufactured sands that are hard and durable. Deleterious substances shall not be present in excess of the following percentages by weight of contaminating substances. In no case shall the total exceed three percent (3%):

Removed by Decantation (Dirt, Silt, Etc.)	3%
Shale	1%
Clay Lumps	1%

Fine aggregate shall not contain strong alkali nor organic matter which gives a color darker than a standard color when tested in accordance with ASTM C40. Fine aggregate shall have a fineness modulus not less than 2.50 nor greater than 3.00. Except as otherwise specified, fine aggregate shall be graded from coarse to fine in accordance with the requirements of ASTM C33.

D. If non-reactive aggregates are unavailable, and either the coarse or fine aggregates are found to be alkali-silica reactive, the Contractor shall submit a proposed design mix that effectively mitigates the alkali-silica reactivity, per ASTM C441. The admixture will be considered effective if the mean mortar bar expansion at 14 days is less than or equal to 0.10%.

E. Admixtures of any type, except as otherwise specified, shall not be used unless written authorization has been obtained from the Engineer. The use of calcium chloride will not be permitted.

1. All concrete shall contain five percent (5%), plus or minus one percent (1%) entrained air of evenly dispersed air bubbles at the time of placement. The air-entraining agent shall contain no chloride and conform to ASTM C260, or U.S. Army Corps of Engineers Specifications CRD-C13. The air-entraining agent shall

be added to the batch in a portion of the mixing water. The solution shall be batched by means of a mechanical batcher capable of accurate measurement. The Engineer, or Owner and his duly authorized representatives reserve the right, at any time, to sample and test the air-entraining agent or the air content of concrete received on the job by the Contractor. Air entrainment in the concrete shall be tested by ASTM C138, ASTM C231 or ASTM C173. If any sample tested does not have the specified air content, a second test shall be performed. If the second test does not meet the specified air content, the concrete represented by the test shall be removed from the job.

2. A "super plasticizer" water reducing agent may be used at the Contractors option, subject to approval by the Engineer, for concrete in hydraulic structures. The amount of cement in the mix shall not be reduced. The slump may be increased to a maximum of 8-inches. Quantities of admixtures and procedures shall be in accordance with the manufacturers published recommendations. The super plasticizer shall conform to ASTM C494, Type F or G. The admixture shall be a second-generation type, free of chlorides and alkalies, composed of a synthesized sulfonated complex polymer that shall be added to the concrete mixer at the batch plant.

3. Fly ash/pozzolan shall conform to ASTM C618, including the requirements of Table 1A, therein, and the following supplementary requirements:

a. Class C Fly Ash

Loss on ignition, maximum	1%
SO3 content, maximum	4%
Moisture content, maximum	1%
$R = (CaO - 5\%)/(Fe_2O_3)$, maximum	4.5

b. Class F Fly Ash

Loss on ignition, maximum	1%
SO3 content, maximum	3%
Moisture content, maximum	1%
$R = (CaO - 5\%)/(Fe_2O_3)$, maximum	1.5

2.2 CONCRETE CURING MATERIALS

A. Materials for curing concrete shall conform to the following requirements:

1. Concrete curing compound shall be Protex LR-151 as manufactured by Protex Industries, Denver, CO; Hunt Process Clear ARB as manufactured by Hunt Process Co., Santa Fe Springs, CA; Select Cure CRB as manufactured by Select Products Co., Upland, CA; or equal. The curing compound shall contain a fugitive dye so that areas of application will be readily distinguishable.
2. Polyethylene sheet for use as concrete curing blanket shall be white and shall have a normal thickness of 10 mils.
3. Burlap, cotton mats or other covering material for use as concrete curing blanket must be overlapped adequately to ensure 100% coverage at all times, and must not be allowed to become dry at any point during the curing period.
4. The loss of moisture, when determined in accordance with the requirements of ASTM C156, shall not exceed 0.055 grams per square centimeter of surface.

2.3 CONCRETE DESIGN REQUIREMENTS

A. General: The concrete mixes shall be designed to produce a concrete of such consistency and composition so as to obtain maximum density and minimum shrinkage. Mix designs with more than forty-one percent (41%) of sand of the total weight of fine and coarse

aggregate shall not be used.

B. Water-Cement Ratio and Compressive Strength: The minimum compressive strength and cement content of concrete shall not be less than that specified in the following Table:

Type of Work	Min. 28-Day Compressive Strength (psi)	Max. Size Aggregate (in.)	Min. Cement W/C per CY (94# sacks)	Maximum Ratio (by wt.)
Slabs on grade, curb and gutter, retaining walls/structural items, steps/platforms, ramps and all concrete items not specified below.	4,000	1	6.0	0.50
Sidewalks, fence posts, collars.	3,500	1	6.0	0.50

C. Adjustments to Mix Design: The mixes used shall be changed whenever such change is necessary or desirable to secure the required strength, density, workability and surface finish and the Contractor shall be entitled to no additional compensation because of such changes.

D. At the Contractors option, fly ash/pozzolan may be used as a partial cement replacement in concrete as follows:

1. Fly ash shall replace not more than twenty five percent (25%) by weight of the Portland Cement in the design mix. The design mix shall contain a minimum of six (6) sacks of cement per cubic yard before the replacement is made.
2. Fly ash for hydraulic/liquid containing structures shall be Class C fly ash. Fly ash concrete for all other structures shall be Class C or F fly ash.
3. If the coarse or fine aggregates are proven to be potentially alkali-silica reactive per ASTM C227, the mineral admixture Class F fly ash shall be proportioned by weight of cement to provide a fly ash to Portland cement ratio not less than 1:4, not less than 20 per cent of the total cementitious material. The Contractor shall provide the Owner's Representative and Engineer with chemical and physical analysis of the fly ash, and detailed design mix to meet the requirements of ASTM C441.

2.4 CONSISTENCY

A. The consistency of the concrete in successive batches shall be determined by slump tests in accordance with ASTM C 143. The slumps shall be as follows:

Part of Work	Slump (inches)
Footings and Slabs	3-inches + 1/2-inches, - 1 inch.
Other Work	3-inches ± 1-inch.

With High Range Water Reducer Added 8-inches maximum.

2.5 TRIAL BATCH AND LABORATORY TESTS

A. Before placing any concrete, the Contractor shall submit the certified trial batch results of each class of concrete having a 28-day strength of 3,500 psi or higher, based on the

preliminary concrete mixes submitted by the Contractor. All concrete shall conform to the requirements of this Section, whether the aggregate proportions are from the Contractors preliminary mix design, or whether the proportions have been adjusted during the trial batch process. The trial batch shall be prepared using the aggregates, cement and admixture proposed for the project. The trial batch materials shall be of a quantity such that the testing laboratory can obtain three (3) drying shrinkage, and six (6) compression test specimens from each batch. The costs for the trial batch tests shall be borne by the Contractor.

B. The determination of compressive strength will be made by testing 6-inch diameter by 12-inch high cylinders; made, cured and tested in accordance with ASTM C192 and ASTM C39. Three (3) compression test cylinders will be tested at 7-days and three (3) at 28- days. The average compressive strength for the three (3) cylinders tested at 28-days for any given trial batch shall not be less than one hundred twenty-five percent (125%) of the specified compressive strength.

C. A standard sieve analysis of the combined aggregate for each trial batch shall be performed according to the requirements for ASTM C136. Values shall be given for percent passing each sieve.

2.6 SHRINKAGE LIMITATION

A. Drying shrinkage specimens shall be 4-inch by 4-inch by 11-inch prisms with an effective gage length of 10-inches, fabricated, cured, dried and measured in accordance with ASTM C157 modified as follows: Specimens shall be removed from molds at an age of 23+ hours after trial batching, shall be placed immediately in water at 70 degrees F. +3 degrees F. for at least thirty (30) minutes, and shall be measured within thirty (30) minutes thereafter to determine original length and then submerged in saturated lime water at 73 degrees F. +3 degrees F. Measurement to determine expansion expressed as a percentage of original length shall be made at age 7-days. This length at age 7- days shall be the base length for drying shrinkage calculations ("0" days drying age). Specimens then shall be stored immediately in a humidity control room maintained at 73 degrees F. +3 degrees F. and fifty percent (50%) +4 percent relative humidity for the remainder of the test. Measurements to determine shrinkage expressed as percentage of base length shall be made and reported separately for 7, 14, 21 and 28-days of drying after 7-days of moist curing.

B. The drying shrinkage deformation of each specimen shall be computed as the difference between the base length (at "0" days drying age) and the length after drying at each test age. The average drying shrinkage deformation of the specimens shall be computed to the nearest 0.0001-inch at each test age. If the drying shrinkage of any specimen departs from the average of that test age by more than 0.0004-inch, the results obtained from that specimen shall be disregarded. Results of the shrinkage test shall be reported to the nearest 0.001 percent of shrinkage. Compression test specimens shall be taken in each case from the same concrete used for preparing during shrinkage specimens. These tests shall be considered a part of the normal compression tests for the project. Allowable shrinkage limitations shall be specified herein.

C. The maximum concrete shrinkage for specimens cast in the laboratory from the trial batch, as measured at 21-day drying age or at 28-day drying age, shall be 0.036 percent or 0.042 percent, respectively. The Contractor shall only use a mix design for construction that has first met the trial batch shrinkage requirements.

D. The maximum concrete shrinkage for specimens cast in the field shall not exceed the trial batch maximum shrinkage requirement by more than twenty-five percent (25%).

E. If the required shrinkage limitation is not met during construction, the Contractor shall take all necessary action, at not additional cost to the Owner, for securing the specified shrinkage requirements. These actions may include changing the source of aggregates, cement and/or admixtures; reducing water content ratio; washing or aggregate to reduce fines; increasing the number of construction joints; modifying the curing requirements; or other actions designed to minimize shrinkage or the effects of shrinkage.

2.7 CEMENT GROUT

A. Portland Cement: ASTM C150, Type I and II.

B. Water:
1. Potable: containing no impurities, suspended particles, algae or dissolved natural salts in quantities capable of causing:
   a. Corrosion of steel.
   b. Volume changes increasing shrinkage cracking.
   c. Efflorescence.
   d. Excess air entraining.

C. Fine Aggregate:
1. Washed natural sand.
2. Gradation in accordance with ASTM C33 and represented by smooth granulometric curve within required limits.
3. Free from injurious amounts of organic impurities as determined by ASTM C40.

D. Mix:
1. Portland cement, sand and water. Do not use ferrous aggregate or staining ingredients in grout mixes.
2. Water content shall be such that the grout can be readily spread, yet not wet enough to cause trouble with surface water or laitance, or failure to stay in place after screeding. All grout mixes and mixing procedures shall be submitted in accordance with Section 01 00 00 - Contractor Submittals shall be subject to review and approval by the Engineer prior to commencing the grouting operations.

E. The minimum compressive strength at 28 days shall be 4000 psi.

F. Procedures for Grout placement shall be approved by the equipment supplier, to ensure that no equipment is overstressed, as well as proper placement tolerances. Equipment Supplier shall have final say on grouting procedures and final tolerances.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 00 00 - Administrative Requirements: Coordination and project conditions.

B. Verify requirements for concrete cover over reinforcement.

C. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

3.2 MIXING CONCRETE

A. Mixing equipment shall be subject to the Owner's Representatives approval. Mixers shall be of the stationary plant or truck mixer type. Adequate equipment and facilities shall be provided for accurate measurement and control of all materials and for readily changing the proportions of the material. The mixing equipment shall be maintained in good working order and shall be capable of combining the aggregates, cement and water within the specified time into a thoroughly mixed and uniform mass and of discharging the mixture without segregation. Cement and aggregate shall be proportioned by weight.

B. The batch plant shall be capable of controlling and delivering of all material to within one percent (1%) by weight of the individual material. If bulk cement is used, it shall be weighed on a separate visible scale that will accurately register the scale load at any stage of the weighing operation from zero to full capacity.

1. Cement shall not come in contact with aggregate or with water until the materials are in the mixer ready for complete mixing with all mixing water. The procedure of mixing cement with sand or with sand and coarse aggregate for delivery to the jobsite for final mixing and an addition of mixing water will not be permitted. Retempering of concrete (addition of water to previously prepared concrete mix) will not be permitted. The entire batch shall be discharged before recharging. The volume of the mixed material per batch shall not exceed the manufacturers rated capacity of the mixer.
2. Each mixer shall be equipped with a device for accurately measuring and indicating the quantity of water entering the concrete, and the operating mechanism shall be such that leakage will not occur when the valves are closed. Each mixer shall be equipped with a device for automatically measuring, indicating and controlling the time required for mixing. This device shall be interlocked to prevent the discharge of concrete from the mixer before the expiration of the mixing period.
3. Transit-mixed concrete shall be mixed and delivered in accordance with ASTM C94. After the drum is once started, it shall be revolved continuously until it has completely discharged its batch. Water shall not be admitted to the mix until the drum has started revolving. The right is reserved to increase the required minimum number of revolutions allowed, if necessary, to obtain satisfactory mixing, and the Contractor will not be entitled to additional compensation because of such an increase or decrease.

C. Mixed concrete shall be delivered to the site of the work and discharge shall be completed within one (1) hour after the addition of the cement to the aggregates. In hot weather or under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 85 degrees F. or above, the time between the introduction of the cement to the aggregates and discharge shall not exceed forty-five (45) minutes. The use of non-agitating equipment for transporting concrete will not be permitted.

D. Truck mixers shall be equipped with counters so that the number of revolutions of the drum may be readily verified. The counter must be capable of being reset and shall be actuated at the time of starting mixers at mixing speeds. Concrete shall be mixed in a truck mixer for not less than seventy (70) revolutions of the drum or blades at the rate of rotation

designated by the manufacturer of equipment. Additional mixing, if any, shall be at the speed designated by the manufacturer of the equipment as agitating speed. All materials including mixing water shall be in the mixer drum before actuating the revolution counter for determining the number of revolution of mixing.

3.3 PREPARATION OF SURFACES FOR CONCRETING

A. Earth surfaces shall be thoroughly and uniformly wetted by sprinkling prior to the placing of any concrete. These surfaces shall be kept moist by frequent sprinkling up to the time concrete is placed thereon. The surface shall be free from standing water, mud and debris at the time of placing concrete.

B. The surfaces of all horizontal construction joints shall be cleaned of all latence, loose or defective concrete and foreign material. Such cleaning shall be accomplished by sandblasting followed by thorough washing. All pools of water shall be removed from he surface of construction joints before the new concrete is placed.

C. No concrete shall be placed until all formwork, installation of parts to be embedded, reinforcement steel and preparation off surfaces involved in the placing have been completed and accepted by the Owner's Representative at least four (4) hours before placement of concrete. All reinforcement, anchor bolts, sleeves, inserts and similar items shall be set and secured in the forms where shown or by shop drawings and shall be acceptable to the Owner's Representative before any concrete is placed. Accuracy of placement is the responsibility of the Contractor. All surfaces of embedded items that have become encrusted with dried grout from concrete previously placed shall be cleaned of all such grout before the surrounding or adjacent concrete is placed.

D. All form surfaces in contact with the concrete shall be thoroughly cleaned of all previous concrete, dirt and other surface contaminants prior to use. Damaged form surfaces shall not be used.
   1. Wood form surfaces in contact with the concrete shall be coated with an approved release agent prior to form installation. The release agent shall be non-staining and non-toxic after thirty (30) days. Mill scale and other ferrous deposits shall be sandblasted or otherwise removed from the contact surface of steel forms.
   2. All steel forms shall have the contact surfaces coated with an approved release agent. The release agent shall be effective in preventing discoloration of the concrete from rust and shall be non-toxic after thirty (30) days.

E. Where concrete is to be cast against old existing concrete, the old concrete shall be thoroughly roughened to exposed, hard aggregate by sandblasting or chipping. Any additional surface preparation shall be as called for in the drawings.

F. No concrete shall be placed in any structure until all water entering the space to be filled with concrete has been properly cut off or diverted out of the forms and clear of the work. No concrete shall be deposited under water or allowed to rise on any concrete until the concrete has attained its initial set. Pumping or other necessary dewatering operations for removing ground water, if required, shall be the responsibility of the Contractor and will be subject to review by the Owner's Representative.

G. Pipe, conduit, dowels, sleeves and other ferrous items required to be embedded in concrete construction shall be adequately positioned and supported prior to placement of concrete.

There shall be a minimum of 2-inches clearance between embedded items and any of the concrete reinforcement. Securing embedments in position by wiring or welding them to the reinforcement will not be permitted.

3.4 PLACING CONCRETE

A. No concrete shall be placed without prior inspection of the forms, reinforcing and embedded items and approval from an authorized representative of the Owner. The Contractor shall notify he Owner's Representative at least twenty-four (24) hours in advance of any scheduled concrete placement and shall call for final inspections no later than four (4) hours in advance of the scheduled placement. The Contractor shall notify the Owner's Representative at least two (2) hours in advance of setting the opposite side of wall forms so that the construction joint preparation, water stop installation and reinforcing steel inspections can be conducted. It is the Contractors responsibility to see that the forms are properly cleaned and oiled before being set, the construction joints properly prepared, reinforcing steel is securely and properly supported in the correct position and that all embedment items including electrical conduit is correctly installed before calling for inspections. The Owner's Representative may at his option require the use of placement cords if deemed necessary.

B. Placement of concrete shall conform to the requirements and recommendations of ACI 301, 304 and 318, except as modified herein.

C. Concrete, which upon or before placing is found not to conform to the requirements specified herein, shall be rejected and immediately removed from the Work. Concrete which is not placed in accordance with these specifications, or which is of inferior quality, shall be removed and replaced at the expense of the Contractor.

D. No concrete shall be placed during rain or snow storms, unless completely covered to prevent storm water from coming in contact with it. Sufficient protective covering material shall be kept on hand at all times should rain or snow storms arise during concrete placement operations.

E. Concrete shall be deposited at or near its final position to avoid segregation caused by rehandling or flowing. Concrete shall not be deposited in large quantities in one place and worked along the forms with vibrator or other means. Concrete shall be uniformly distributed during the placing process and in no case after depositing shall any portion be displaced in the forms more than 2-feet in horizontal direction. Concrete shall be deposited in forms in horizontal layers not to exceed 24-inches in depth and shall be brought up evenly in all parts of the form. The rate of placement of concrete in forms shall not exceed 5-feet of vertical rise per hour. As the concrete is placed it shall be consolidated thoroughly and uniformly by mechanical vibration to secure a dense mass, close bond with reinforcement and other embedded items and smooth surface. The mechanical vibrator shall penetrate not only the freshly placed concrete, but also the previously placed lift to ensure the lifts become monolith. New concrete shall be placed against previously placed concrete, not away from it. When concrete is placed on a slope, placement shall begin at the lower end of the slope and progress to the upper end for the full width of the placement. Consolidation by mechanical vibration shall follow directly behind placement and the rate of placement shall never get ahead of the consolidation crew. Concrete placement shall continue without avoidable interruption, in a continuous operation until the end of the placement is reached.

F. The drop of concrete into slab or wall forms shall be vertical. Concrete shall not be dropped through reinforced steel, but deposited in forms using a hopper with a drop chute to avoid segregation and to keep mortar from coating the reinforcement steel and forms above the in-place concrete. In no case shall the free fall of concrete exceed 4- feet below the end of the hopper or chute.

G. If it takes more than 20-minutes to get back to place concrete over concrete previously placed, the depth of the layers being placed at one time shall be reduced, and/or placing equipment increased, until it is possible to return with the placing operation to previously placed concrete within 20-minutes. If concrete is to be placed over previously poured concrete and more than 20-minutes have elapsed, then a layer of grout not less than 1/2-inch thick shall be spread over the surface before placing the additional concrete.

H. The placement of concrete for slabs, beams or walkways cast monolithically with walls or columns shall not commence until the concrete in the walls or columns has been allowed to set and shrink. The time allowed for shrinkage shall be not less than one (1) hour.

I. Concrete shall be placed with the aid of approved mechanical vibrators. Vibration shall be supplemented by manual forking or spading adjacent to the forms on exposed faced in order to secure smooth dense surfaces. The concrete shall be thoroughly consolidated around reinforcement, pipes or other shapes built into the work. The vibration shall be sufficiently intense to cause the concrete to flow and settle readily into place and to visibly affect the concrete over a radius of at least 18-inches.

1. Sufficient vibrators shall be on hand at all times to vibrate the concrete as placed. In addition to the vibrators in actual use while concrete is being placed, the Contractor shall have on hand one (1) spare vibrator in serviceable condition. No concrete shall be placed until it has been ascertained that all vibrating equipment, including spares, is in serviceable condition.

J. Special care shall be taken to place the concrete solidly against the forms so as to leave no voids. Every precaution shall be taken to make all concrete solid, compact and smooth, and if for any reason the surfaces or interiors have voids or are in any way defective, such concrete shall be repaired as directed by the Owner's Representative. No defective work shall be patched or repaired without the prior inspection and approval of the Owner's Representative.

K. The temperature of concrete when it is being placed shall be not more than 90 degrees F. nor less than 40 degrees F. in moderate weather, and not less than 50 degrees F. in weather during which the mean daily temperature drops below 40 degrees F. Concrete ingredients shall not be heated to a temperature higher than that necessary to keep the temperature of the mixed concrete, as placed, from falling below the specified minimum temperature. If concrete is placed when the weather is such that the temperature of the concrete would exceed 90 degrees F., the Contractor shall employ effective means, such as precooling of aggregates and mixing water using ice or placing at night, as necessary to maintain the temperature of the concrete, as it is placed, below 90 degrees F. The Contractor shall be entitled to no additional compensation on account of the foregoing requirements.

L. Concrete shall not be placed on a frozen subgrade or subgrade that contains frozen materials. All ice and snow shall be removed from inside forms and from reinforcing steel and embedded items. The temperature of all surfaces that the concrete will contact shall be raised above the freezing point for at least 12-hours prior to placing new concrete.

1. The minimum temperature of fresh concrete as mixed shall be 60 degrees F. for ambient temperature above 30 degrees F.; 65 degrees F. for ambient temperature 0 degrees F. to 30 degrees F.; and 70 degrees F. for ambient temperature below 0 degrees F. The minimum temperature of fresh concrete after placing shall be 55 degrees F. for the first 72-hours.
2. The use of calcium chloride shall not be permitted.
3. In general, the Contractor shall adhere to the recommendations as outlined in ACI Standard 306 for cold weather concreting, except as required herein.

3.5 PUMPING OF CONCRETE

A. Pumping of concrete will be permitted only with the Owner's Representative's approval. The pumping equipment must have two (2) cylinders and be designed to operate with one (1) cylinder only in case the other one is not functioning. In lieu of this requirement, the Contractor shall have a standby pump or crane and concrete bucket on site during pumping to provide assurance the concrete will be placed without cold joints in the event of pumping equipment breakdown. The minimum diameter of the hose (conduits) shall be 4-inches. Pumping equipment and hoses (conduits) that are not functioning properly, shall be replaced. Aluminum conduits for conveying the concrete will not be permitted.

B. Concrete samples for slump and test cylinders will be taken at the discharge end of the pumping conduit.

3.6 ORDER OF PLACING CONCRETE

A. The order of placing concrete in all parts of the work shall be acceptable to the Owner's Representative. In order to minimize the effects of shrinkage, the concrete shall be placed in units as bounded by construction joints shown. The placing of units shall be done by placing alternate units in a manner such that each unit placed shall have cured at least 7-days before the contiguous unit or units are placed, except that the corner sections of vertical walls shall not be placed until the two (2) adjacent wall panels have cured at least 14-days.

B. The surface of the concrete shall be level whenever a run of concrete is stopped. To ensure a level, straight joint on the exposed surface of walls, a wood strip at least 3/4- inch thick shall be tacked to the forms on these surfaces. The concrete shall be carried about 1/2-inch above the underside of the strip. About one (1) hour after the concrete is placed, the strip shall be removed and any irregularities in the edge formed by the strip shall be leveled with a trowel.

3.7 TAMPING AND VIBRATING

A. As concrete is placed in the forms or in excavations, it shall be thoroughly settled and compacted, throughout the entire depth of the layer which is being consolidated, into a dense, homogeneous mass, filling all corners and angles, thoroughly embedding the reinforcement, eliminating rock pockets and bringing only a slight excess of water to be exposed surface of concrete during placement. Vibrators shall be high speed power vibrators (8,000 to 10,000 rpm) of an immersion type in sufficient number and with (at least one) standby units as required.

B. Care shall be used in placing concrete around waterstops. The concrete shall be carefully worked by rodding and vibrating to make sure that all air and rock pockets have been eliminated. Where flat-strip type waterstops are horizontal, the concrete shall be worked under the waterstops by hand, making sure that all air and rock pockets have been eliminated. Concrete surrounding the waterstops shall be given additional vibration, over and above that used for adjacent concrete placement to assure complete embedment of the waterstops in the concrete.

C. Concrete in walls shall be internally vibrated and at the same time rammed, stirred or worked with suitable appliances, tamping bars, shovels or forked tools until it completely fills the forms or excavations and closes snugly against all surfaces. Subsequent layers of concrete shall not be placed until the layers previously placed have been worked thoroughly as specified. Vibrators shall be provided in sufficient numbers, with standby units as required, to accomplish the results herein specified with fifteen (15) minutes after concrete of the prescribed consistency is placed in the forms. The vibrating head shall be kept from contact with the surfaces of the forms. Care shall be taken not to vibrate concrete excessively or to work it in any manner than causes segregation of its constituents.

3.8 FINISHING CONCRETE SURFACES

A. General: Surfaces shall be free from fins, bulges, ridges, offsets, honeycombing or roughness of any kind, and shall present a finished, smooth, continuous hard surface. Allowable deviations from plumb or level and from the alignment, profiles and dimensions shown are defined as tolerances and are specified in Paragraph 1.5, herein. These tolerances are to be distinguished from irregularities in finish as described herein. Aluminum finishing tools shall not be used.

B. Unformed Surfaces: After placing and consolidating concrete, all unformed top surfaces of slabs, walls, curbs, gutter and steps, shall be brought to a uniform finished surface. The classes of finish specified for unformed concrete surfaces are defined as follows:

1. Finish U1: Sufficient leveling and screeding to produce an even, uniform surface with surface irregularities not to exceed 3/8-inch. No further special finish is required.
2. Finish U2: After sufficient stiffening of the screeded concrete, surfaces shall be float finished with wood or metal floats or with a finishing machine using float blades. Excessive floating of surfaces while the concrete is plastic and dusting of dry cement and sand on the concrete surface to absorb excess moisture will not be permitted. Floating shall be the minimum necessary to produce a surface that is free from screed marks and is uniform texture. Surface irregularities shall not exceed 1/4-inch. Joints and edges shall be tooled where shown or as determined by the Owner's Representative.
3. Finish U3: After the floated surface (as specified for Finish U2) has hardened sufficiently to prevent excess of fine material from being drawn to the surface, steel troweling shall be performed with firm pressure such as will flatten the sandy texture of the floated surface and produce a dense, uniform surface free from blemishes, ripples and trowel marks. The finish shall be smooth and free of all irregularities.
4. Finish U4: Steel trowel finish (as specified for Finish U3) without local depressions or high points. In addition, the surface shall be given a light hairbroom finish with brooming perpendicular to drainage unless otherwise shown. The resulting surface shall be rough enough to provide a non-skid finish.

C. The schedule for finished unformed surfaces shall be as follows:

Unformed Concrete Surface Schedule

Area	Finish
Grade slabs and foundations to be covered with concrete or fill material.	U1
Floor slabs to be covered with grouted tile or topping grout and slabs to be covered with built-up roofing.	U2
All building and machine room floors, basin floors not receiving a grout topping, channel floors, top of interior walls, top of interior curbs, steps and walkways. Grout Surfaces in Bottom of Clarifier and DAF.	U3
Exterior walkways, curb, gutter, sidewalk and steps, top of valve or meter vaults, electrical pull boxes and catch basins. Grout surface in Clarifier and DAF Launders.	U4

D. Floor Sealer Hardener (Surface Applied):
1. Floor hardener shall be applied where shown or noted on the drawings.
2. Floors to receive hardener shall be cured, cleaned and dry with all work above them completed. Apply zinc and/or magnesium fluosilicate evenly, using three (3) coats, allowing 24-hours between coats.
3. The first coat shall be 1/3 strength, second coat 1/2 strength and third coat shall be 2/3 strength. Each coat shall be applied so as to remain set on the concrete surface for fifteen (15) minutes. If sodium silicate is used, it shall be applied evenly, using three (3) coats, allowing twenty-four (24) hours between coats, and the material shall be applied full strength a the rate of one (1) gallon per 300 square feet. Approved proprietary hardeners shall be applied in conformance with the manufacturers instruction. After the final coat is completed and dry, surplus hardener shall be removed from the surface by scrubbing and mopping with water.

E. Formed Surfaces: Immediately following the removal of forms, the concrete shall be inspected for defects such as rock pockets, grout loss, damage from stripping forms, surface defects such as fins, offsets, bulges, excessive bug-holes and stains. All defective concrete work shall be removed and replaced or repaired to the satisfaction of the Owner's Representative. Any work which has not been constructed in accordance with the plans and specifications will be considered defective.

Correction of defective work shall be as directed by the Owner's Representative and specified herein. No defective work shall be patched, repaired or covered without prior inspection and approval of the Owner's Representative.

Holes left by tie-rod cones or taper ties shall be reamed with suitable toothed reamers so as to leave the surfaces of the holes clean and rough. These holes then shall be repaired in an approved manner with non-metallic grout.

The classes of formed concrete surfaces are defined as follows:

1. Finish F1: No special treatment is required after form removal except for curing, repair of defective concrete treatment of surface defects, removal of fins and projections, filling of tie holes and filling of depressions and bug-holes 3/8-inch or larger in width or depth with mortar.
2. Finish F2: All defective concrete shall be repaired, all fins, offsets, bulges and projections ground smooth, filling of tie holes and filling of depressions and bug-holes 1/4-inch or larger in width or depth with mortar.
3. Finish F3: All defective concrete shall be repaired, all fins, offsets, bulges and projections ground smooth and tie holes filled with grout. The entire surface shall then receive a light stoning or grinding using a No. 50 or No. 60 grit carborundum stone or grinding wheel to remove any latence and curing film and to open up bug-holes hidden beneath the thin surface grout film. The surface shall then be given a stoned-sand type architectural finish as follows:
   a. The concrete surface shall be pre-wet for several hours or overnight before treatment.
   b. While the surface is still damp, spread a sand mix, consisting of one (1) part of Type II Cement and one to one and a half (1 to 1-1/2) parts of fine sand passing the No. 70 screen mixed with enough water and an emulsified bonding agent to have the consistency of thick cream. The sand mix should be spread thinly over the damp surface with a rubber float and rubbed in over the entire area leaving only a minimum amount of material on the surface necessary to produce a sand texture, approximately 1/32-inch in thickness.
   c. The surface shall be kept continually damp for seventy-two (72) hours following this finish treatment.

F. The schedule for formed surface finish shall be as follows:

Formed Concrete Surface Schedule

Area	Finish
Formed concrete surfaces to be covered by backfill or coated with below grade waterproofing systems.	F1
Formed concrete surfaces in water channels, below water surface of basins, inside meter and valve vaults, inside cells of hydraulic splitter boxes and weirs.	F2
Formed concrete surfaces inside buildings and machine rooms and all exposed exterior surfaces of foundations, basins, vaults, hydraulic structures and curbs.	F3

3.9 CURING AND DAMPPROOFING

A. General: All concrete shall be cured for not less than ten (10) days in warm to hot weather and fourteen (14) days in cold weather after placing, unless otherwise indicated by the Owner's Representative, in accordance with the methods specified herein for the different

parts of the Work, and described in detail as follows:

1. Water Curing: Keep the concrete structures thoroughly and continuously wet and covered for at least 7 days. Place and anchor covers, mats, and sheeting to ensure continuous contact with the concrete surfaces. Use one of the water curing methods as detailed in ACI 308R-01.
2. Curing Compound: The surface shall be sprayed with a liquid membrane- forming curing compound applied in accordance with the manufacturers printed instructions.
   a. Care shall be exercised to avoid damage to the seal during the curing period. Should the seal be damaged or broken before the expiration of the curing period, the break shall be repaired immediately by the application of additional curing compound over the damaged portion.

   b. Curing compound specified shall be applied as soon as the concrete has hardened enough to prevent marring on unformed surfaces, and within one (1) hour after removal of forms from contact with formed surfaces. Repairs to formed surfaces shall be made within the said one (1) hour period. If repairs cannot be made with the one (1) hour period they shall be delayed until after the curing compound has been applied. When repairs are to be made to an area on which curing compound has been applied, the area involved shall first be sandblasted to remove the curing compound, following which repairs shall be made as specified herein.
3. Cold weather is defined as when the temperature reaches or goes below 35 degrees F for one (1) hour during any 24-hour period during the curing period.

B. Method 2 shall be used for wall sections with forms removed, encasement concrete and all concrete surfaces where Method 1 is not feasible.

3.10 PROTECTION

A. The Contractor shall protect all concrete against injury or damage from excessive heat, lack of moisture, overstress or any other cause until final acceptance by the Owner. Particular care shall be taken to prevent the drying of concrete and to avoid roughening or otherwise damage to finish surfaces.

B. Finished floor slabs in buildings and machine rooms shall be suitably protected from wear or damage from construction operations. The Contractor shall not use newly finished floors or buildings for machine assembly, fabrication, pipefitting, curing or welding operations without covering the working area with plastic sheets and/or plywood. Any concrete found to be damaged or which may have been originally defective or which becomes defective at any time prior to the final acceptance of the completed work, or which departs from the established line or grade, or which, for any other reason, does not conform to the requirements of the Contract Documents, shall be satisfactorily repaired or removed and replaced with acceptable concrete at the Contractor's expense.

C. Immediately following the first frost in the fall, the Contractor shall be prepared to protect all concrete against freezing.

3.11 CURING IN COLD WEATHER

A. After the first frost, and until the mean daily temperature in the vicinity of the worksite falls below 40 degrees F for more than one (1) day, the concrete shall be protected against

freezing temperatures for not less than forty-eight (48) hours after it is placed. After the mean daily temperature in the vicinity of the worksite falls below 40 degrees F. for more than one (1) day, the concrete shall be maintained at a temperature not lower than 50 degrees F. for at least seventy-two (72) hours after it is placed.

B. Discontinuance of protection against freezing temperatures shall be such that the drop in temperature of any portion of the concrete will be gradual and will not exceed 40 degrees F. over a (3) three day duration.

C. Where artificial heat is employed, special care shall be taken to prevent the concrete from drying. Use of unvented heaters will be permitted only when unformed surfaces of concrete adjacent to the heaters are protected from drying and excessive carbon dioxide atmosphere by application of curing Method 2 or Method 3, as specified under Article 3.9, Paragraph A herein.

3.12 REPAIR OF DEFECTIVE CONCRETE

A. No concrete repairs shall be made until after inspection and approval of the method of repair by the Owner's Representative. In no case will extensive patching of honeycombed concrete be permitted. Concrete containing extensive voids, holes, honeycombing or similar depression defects shall be completely removed and replaced. Concrete containing minor voids, holes, honeycombing or similar depression defects shall be repaired as specified herein. All concrete repairs and replacements shall be promptly executed by the Contractor at its own expense.

B. Prior to filling any structure with water, all cracks that may have developed shall be "vee'd" as shown on the Drawings and filled with construction joint sealant conforming to the requirements under Section 03 29 00 - Joints In Concrete. This repair method shall be done on the water bearing face of members. Prior to backfilling, faces of members in contact with fill, which are not covered with a waterproofing membrane shall also have cracks repaired as specified herein.

C. The repair of holes left by rock pockets, penetrations, tie rods or other reasons will require the use of non-shrink, non-metallic grout material.

END OF SECTION 033000

SECTION 034816 – PRE-CAST CONCRETE SPLASH BLOCKS

PART I - GENERAL

1.1 SECTION INCLUDES

A. Precast Concrete Splash Blocks.

1.2 SUBMITTALS

A. Shop Drawings: Submit plan, section, and elevation drawings as necessary to determine the required dimensions and placement location for each product specified as well as clarify the manufacturer's recommended installation techniques.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer.

1.4 DELIVERY, STORAGE AND HANDLING

A. Transport, store and handle precast concrete splash blocks in accordance with manufacturers written instructions. Transport and store precast splash blocks so that edges and corners are not damaged.

PART 2 - PRODUCTS

2.1 Pre-Cast Splash Blocks

1. Manufacturer

    a. Riccobene

        6141 Edith Blvd. NE

        Albuquerque, NM 87107

        505-345-2601

2. Dimensions: 24 in X 11.5 in X 2.5 in

3. Weight: 38lbs

4. Color/Finish: Smoke.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set units accurately in location in accordance with drawings.

END OF SECTION 034816

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Section 092433 “Cement Plater” for parging for unit masonry

B. Submittals:

1. Samples for **decorative concrete masonry units and colored mortar**.
2. Material Certificates: For each type of product indicated. Include statements of material properties indicating compliance with requirements.

PART 2 - PRODUCTS

2.1 UNIT MASONRY

A. Comply with TMS 602/ACI 530.1/ASCE 6.

2.2 MASONRY UNITS

A. Concrete Masonry Units: ASTM C 90; Density Classification, Normal Weight.

1. Integral water repellent.
2. Special shapes for lintels, corners, jambs, sash, control joints, and other special conditions.
3. Square-edge units for outside corners unless otherwise indicated.

2.3 MORTAR AND GROUT

A. Mortar: ASTM C 270, proportion specification.

1. Use portland cement-lime or masonry cement mortar.
2. Do not use calcium chloride in mortar.
3. For masonry below grade or in contact with earth, use Type M.
4. For reinforced masonry, use Type M.
5. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions, and for other applications where another type is not indicated, use Type N.
6. Colored Mortar: For decorative concrete masonry units, use colored cement or cement-lime mix of color selected.
7. Water-Repellent Additive: For mortar used with concrete masonry units made with integral water repellent, use product recommended by manufacturer of units.

B. Grout: ASTM C 476 with a slump of 8 to 11 inches (200 to 280 mm).

C. Refractory Mortar: Ground fireclay mortar or other refractory mortar that passes ASTM C 199 test and is acceptable to authorities having jurisdiction.

2.4 REINFORCEMENT, TIES, AND ANCHORS

A. Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).

B. Joint Reinforcement: ASTM A 951/A 951M.

1. Coating: Hot-dip galvanized at exterior walls.
2. For single-wythe masonry, provide either ladder design or truss design.

2.5 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded strips complying with ASTM D 1056, Grade 2A1.

B. Preformed Control-Joint Gaskets: Designed to fit standard sash block and to maintain lateral stability in masonry wall; made from styrene-butadiene rubber or PVC.

C. Weep Holes: Cotton or polyester rope, 1/4 to 3/8 inch (6 to 10 mm) in diameter, width of masonry.

2.6 INSTALLATION, GENERAL

A. Cut masonry units with saw. Install with cut surfaces and, where possible, cut edges concealed.

B. Mix units for exposed unit masonry from several pallets or cubes as they are placed to produce uniform blend of colors and textures.

C. Fill cores in hollow concrete masonry units with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

D. Tool exposed joints slightly concave when thumbprint hard unless otherwise indicated.

E. Keep cavities clean of mortar droppings and other materials during construction.

2.7 FLASHING AND WEEP HOLES

A. Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to the downward flow of water in the wall, and where indicated.

B. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing before covering with mortar.

1. Extend flashing 4 inches (100 mm) into masonry at each end and turn up 2 inches (50 mm) to form a pan.

C. Trim wicking material used in weep holes flush with outside face of wall after mortar has set.

2.8 PARGING

A. Parge masonry walls, where indicated, in two uniform coats with a steel-trowel finish. Form a wash at top of parging and a cove at bottom. Damp cure parging for at least 24 hours.

2.9 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections required by authorities having jurisdiction.

1. Inspections: Level B in TMS 402/ACI 530/ASCE 5.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.

2.10 CLEANING

A. Clean masonry as work progresses. Remove mortar fins and smears before tooling joints.

B. Final Cleaning: After mortar is thoroughly cured, clean exposed masonry.

1. Wet wall surfaces with water before applying acidic cleaner, then remove cleaner promptly by rinsing thoroughly with clear water.
2. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

END OF SECTION 042000

SECTION 055000 - METAL FABRICATIONS

PART 1 GENERAL

1.01 SUMMARY

A. Provide the following metal fabrications:

1. Miscellaneous framing supports.
2. Pipe bollards.
3. Fencing and gates.
4. Miscellaneous metals to include:
   a. Bollards
   b. Steel Fence Enclosure at Portal
   c. Perforated Steel Sheets
   d. Handrails at ramps and concrete stairs
   e. Tube Steel at Dumpster Enclosure

B. Related Sections

1. 03 30 00 - Cast-In-Place Concrete

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations.

B. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years.

C. Use experienced installers.

D. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 MATERIALS

A. Ferrous Materials:

1. Galvanized Steel Sheet: ASTM A 653, G90.
2. Steel Pipe, Yellow Paint Finish: ASTM A 53.
3. Prefabricated Railing Coated with PVC:
4. Reinforcing Bars: ASTM A 615, Grade 60.
5. Brackets, Flanges, and Anchors: Cast or formed metal.
6. Concrete Inserts: Threaded or wedge type.

7. Zinc-Coating: Hot-dip galvanized coating for materials in exterior assemblies or exterior walls.

B. Aluminum Materials:

1. Extruded Bars and Shapes: ASTM B 221 aluminum alloy.
2. Rolled Tread Plate: ASTM B 632 aluminum alloy.
3. Rivets: ASTM B 316, aluminum alloy.
4. Fasteners: ASTM A 153.
5. Finish: Mill finish.
6. Finish: Clear anodized.

C. Fasteners:

1. Bolts and Nuts: Hexagon head type, ASTM A 307, Grade A.
2. Lag Bolts: Square head, FS FF-B-561.
3. Machine Screws: Cadmium plated steel, FS FF-S-92.
4. Wood Screws: Flat head carbon steel, FS FF-S-111.
5. Plain Washers: Round carbon steel, FS FF-W-92.
6. Drilled-In Expansion Anchors: FS FF-S-325.
7. Toggle Bolts: Tumble-wing type, FS FF-B-588.
8. Lock Washers: Spring type carbon steel, FS FF-W-84.
9. Zinc-Coating: Fasteners in exterior assemblies or exterior walls.

D. Auxiliary Materials:

1. Exterior/Interior Anchoring Cement: Erosion-resistant hydraulic expansion cement.
2. Shop Primer: Alkyd primer, FS TT-P-645, compatible with topcoats.
3. Galvanizing Repair Paint: SSPC - Paint 20.
4. Bituminous Paint: Asphalt mastic, SSPC - Paint 12.

PART 3 EXECUTION

3.01 INSTALLATION

A. Touch-up damaged coatings with shop primer and galvanized repair paint.

B. Paint items scheduled in accordance with painting section.

END OF SECTION 055000

SECTION 055000.1 – METAL SIDEWALK CULVERT PLATE

PART 1 GENRAL

1.1 SECTION INCLUDES

A. Slip-resistant metal fabrications.

1.2 RELATED SECTIONS

A. Section 05 05 13 - Shop-Applied Coatings for Metal: Finishes for slip resistant metal fabrications.
B. Section 05 05 23 - Metal Fastenings: Fastening slip resistant metal fabrications.
C. Section 0512 00 - Structural Steel Framing: Structural support for slip resistant metal fabrications.
D. Section 05 51 00 - Metal Stairs and 05 51 33 Metal Ladders.
E. Section 05 53 00 - Metal Gratings.
F. Section 05 54 00 - Metal Floor Plates.
G. Section 05 55 00 - Metal Stair Treads and Nosings.
H. Section 11 13 00 - Loading Dock Equipment: Dock levelers and dock lifts.
I. Section 05 52 20 - Metal Railings.
J. Section 33 46 00 - Surface Drains.

1.3 REFERENCES

A. ASTM C 633 - Adhesion or Cohesive Strength of Flame-Sprayed Coatings.

B. ASTM E 140 - Hardness Conversion Tables for Metals.

C. ASTM E 384 - Microhardness of Materials.

1.4 SUBMITTALS

A. Comply with Section 01330 - Submittal Procedures.

B. Product Data: Submit manufacturer's product data.

C. Shop Drawings: Submit manufacturer's shop drawings, showing slip resistant metal fabrications, sizes, dimensions, manufacturer's factory-applied finishes, fastening, and installation details.

1.5 DELIVERY, ST O RAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage: Store materials in a clean, dry area in accordance with manufacturer's instructions. Allow adequate ventilation of products to prevent condensation forming in *Slip*NOT® surfaces. Do not store for extended time in original banding or distortion may occur in products.

C. Handling: Protect materials, surfaces, and finishes during handling and installation to prevent damage. Avoid all metal-on-metal contact with aluminum *Slip*NOT® surface.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. *Slip*NOT® Metal Safety Flooring, Division of Traction Technologies Holdings, LLC, 2545 Beaufait Street, Detroit,
Michigan 48207.
Toll Free (800) 754-7668.
Phone (313) 923-0400.
Fax (313) 923-4555.
Web Site: www.slipnot.com. Email info@slipnot.com.

2.2 SLIP-RESISTANT METAL FABRICATIONS

A. Floor Plate: *SlipNOT*® Grip Plate®.
1 . Size: As indicated on the drawings.

2.3 MATERIALS

A. Steel Surface on Steel Substrate:

1. Type: Anti-slip, non-gritted, steel surface on steel substrate.
2. Surface Texture: Grade 2, Medium.
3. Surface: All metal plasma stream deposition process bonds surface to substate. Anti-slip primarily martensitic steal surface consisting of a random hatch matrix. Add to all surface coverage 100%.
4. Surface Hardness, Rockwell C Scale, ASTM E 140 and E 389: Minimum of 55.
5. Bond Strength, Surface to Substrate, ASTM C 633: Minimum of 4,000 psi.
6. Coefficient of friction, Anti-Slip Surface: Minimum of 0.6.
7. UL Listed: UL 410 Slip resistant.

2.4 FACTORY-APPLIED FINISHES

A. Mill: Unfinished.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas to receive slip-resistant metal fabrications. Notify engineer if areas are not acceptable. Do not begin installation until unacceptable conditions have been corrected.

3.2 INSTALLATION

A. Install slip-resistant metal fabrications at locations indicated on the drawings and in accordance with manufacturer’s instructions.

B. Install slip-resistant metal fabrications level, square, rigid, with flush installation.

C. Fasten slip-resistant metal fabrications to support steel as indicated on the drawings.

D. Repair damaged factory-applied finishes as directed by engineer.

E. Replace defective or damaged slip-resistant metal fabrications as directed by engineer.

END OF SECTION 055000.1

SECTION 055123 – METAL LADDER

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aluminum access ladders.

B. Aluminum ship's ladders.

C. Aluminum cage ladders.

1.2 RELATED SECTIONS

A. Section 05500 – Metal Fabrications: Fasteners and installation requirements used to attach ladders to structure.

B. Section 14200 – Elevators: For pit ladders.

C. Section 15050 – Basic Electrical Materials and Methods: For electrical grounding of ladders.

1.3 REFERENCES

A. AA – Aluminum Association.

B. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

C. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

D. OSHA 1910.27 – Fixed Ladders.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product.

C. Shop Drawings:

1. Detail fabrication and erection of each ladder indicated. Include plans, elevations, sections, and details of metal fabrications and their connections.

2. Provide templates for anchors and bolts specified for installation under other Sections.

3. Provide reaction loads for each hanger and bracket.

D. Qualification Data:

1. Refer to Quality Assurance provisions for submittal requirements evidencing experience, certifications and resources.

E. Selection Samples: For each finish specified, two complete sets of color chips representing manufacturer's full range of available colors.

F. Verification Samples: For each finish specified, two samples, minimum size 6 inches (150 mm) square, represent actual product color.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in producing aluminum metal ladders similar to those indicated for this Project.

1. Record of successful in-service performance.

2. Sufficient production capacity to produce required units.

3. Professional engineering competent in design and structural analysis to fabricate ladders in compliance with industry standards and local codes.

B. Installer Qualifications: Competent and experienced firm capable of selecting fasteners and installing ladders to attain designed operational and structural performance.

C. Product Qualification: Product design shall comply with OSHA 1910.27 minimum standards for ladders.

D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Install ladder in area designated by Architect.

2. Do not proceed with remaining work until workmanship and installation are approved by Architect.

3. Rework mock-up as required to produce acceptable work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurement before fabrication.

1. Established Dimensions: Where field measurements cannot be made without delaying

the Work, indicate established dimensions on shop drawing submittal and proceed with fabrication.

1.8 WARRANTY

A. A. Manufacturer has responsibility for an extended Corrective Period for work of this Section for a period of 5 years commencing on the shipment date of the product against all the conditions indicated below, and when notified in writing from Owner, manufacturer shall promptly and without inconvenience and cost to Owner correct said deficiencies.

1. Defects in materials and workmanship.

2. Deterioration of material and surface performance below minimum OSHA standards as certified by independent third-party testing laboratory. Ordinary wear and tear, unusual abuse or neglect excepted.

3. Within the warranty period, the manufacturer shall, at its option, repair, replace, or refund the purchase price of defective ladder.

B. Manufacturer shall be notified immediately of defective products and be given a reasonable opportunity to inspect the goods prior to return. Manufacturer will not assume responsibility, or compensation, for unauthorized repairs or labor. Manufacturer makes no other warranty, expressed or implied, to the merchantability, fitness for a particular purpose, design, sale, installation, or use, of the ladder; and shall not be liable for incidental or consequential damages, losses of or expenses, resulting from the use of ladder products.

1.9 EXTRA MATERIALS

A. Furnish touchup kit for each type and color of paint finish provided.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: O’Keeffe’s, Inc.; 100 N Hill Drive, Suite 12, Brisbane, CA 94005. Toll Free Tel: (888) 653-3333. Tel: (415) 824-4900. Fax: (415) 824-5900. Email: info@okeeffes.com. Web: http://www.okeeffes.com.

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 APPLICATIONS/SCOPE

A. Fixed and Cage Ladder Design:

1. Safety cages are required on ladders over 24 feet (7315 mm)
2. Safety cages are required on all ladders in high or hazardous areas.
3. Landing platforms are required at 50 feet (15,240 mm) above the bottom of the ladder.
4. Rail and harness fall arrest system as alternate to safety cage and landing platforms shall be a permissible manufacturer's option.
    a. Fixed Ladder Bottom Bracket:
    b. Bottom floor supported bracket.
    c. Bottom wall supported bracket.
    d. Bracket as drawn.

2.3 FINISHES

A. Mill finish. As extruded.

2.4 MATERIALS

A. Aluminum Sheet: Alloy 5005-H34 to comply with ASTM B209.

B. Aluminum Extrusions: Alloy 6063-T6 to comply with ASTM B221.

2.5 FABRICATION

A. Rungs: Not less than 1-1/4 inches (32 mm) in section and 18–3/8 inches (467mm) long, formed from tubular aluminum extrusions. Squared and deeply serrated on all sides.
    1. Rungs shall withstand a 1,500-pound (454 kg) load without deformation or failure.

B. Channel Side Rails: Not less than 1/8-inch (3 mm) wall thickness by 3 inches (76 mm) wide.

C. Heavy Duty Tubular Side Rails: Assembled from two interlocking aluminum extrusions no less than 1/8-inch (3 mm) wall thickness by 3 inches (76 mm) wide. Construction shall be self-locking stainless-steel fasteners, full penetration TIG welds and clean, smooth and burr-free surfaces.

D. Walk-Through Rail and Roof Rail Extension: Not less than 3 feet 6 inches (1067 mm) above the landing and shall be fitted with deeply serrated, square, tubular grab rails.

E. Landing Platform: 1-1/2 inches (38 mm) or greater diameter, tubular aluminum guardrails and decks of serrated aluminum treads.

F. Security Doors: Formed 1/8 inch (3 mm) thick aluminum sheet. Security panels shall extend

on both sides, perpendicular to the door face, to within 2 inches (51 mm) of the wall. Security door shall be furnished with continuous aluminum piano hinge and heavy-duty forged steel locking hasps.

G. Ladder Safety Post: Retractable hand hold and tie off.

H. Rail and Harness Fall Arrest System: Supplied where specified as alternate to safety cage and landing platforms, in accordance with OSHA regulation 1910.27; permanently mounted to ladder rungs and complete with necessary components.

I. Safety Cages:

1. Fabricate ladder safety cages to comply with authority having jurisdiction. Assemble by welding. Spacing of primary hoops, secondary hoops and vertical bars shall not exceed that required by code.

2. Safety cage hoops and vertical bars: 3/16-inch (5 mm) by 2 inches (51 mm) aluminum bar.

PART 3 EXECUTION

3.1 EXAMINATION

A. Coordinate anchorages. Furnish setting drawings, templates, and anchorage structural loads for fastener resistance.

B. Do not begin installation until supporting structure is complete and ladder installation will not interfere with supporting structure work.

C. If supporting structure is the responsibility of another installer, notify Architect of unsatisfactory supporting work before proceeding.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions and in proper relationship with adjacent construction.

3.3 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 055123

SECTION 072100 - BUILDING INSULATION

PART 1 GENERAL

1.01 SUMMARY

A. Provide building insulation and vapor retarders.

B. Insulation

1. Insulation that meets or exceeds the R-value requirements listed in 2018 International Energy Conservation Code (IECC). Insulation to include:

a. Acoustic batts at party walls.

b. Acoustic batts at mid floor of residences.

c. R-21 batt insulation at exterior walls and fur-outs.

d. R-38 batt insulation at the ceiling.

e. R-10 slab insulation.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

B. HERS Certification: Provide relevant product stamps, certification labels, literature and insulation certification. Provide a signed Accountability Form.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations.

B. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years.

C. Use experienced installers.

D. Deliver, handle, and store materials in accordance with manufacturer's instructions.

E. HERS: Allow a certified energy rater access to project site to complete thermal bypass inspection and testing.

PART 2 PRODUCTS

2.01 MATERIALS

A. Board Insulation:

1. Application: Thermal insulation at exterior walls.

2. Manufacturer: Owens Corning

3. Products must comply with California’s Practice for Testing of VOC’s from Building Materials Using Small Chambers.

4. R-10 rigid insulation is required at new foundation stem wall.

5. R-5 rigid insulation is required at the exterior walls.

B. Blanket/Batt Insulation:

1. Application: Thermal & Acoustic insulation in studs at interior walls.

2. Manufacturer: Owens Corning
3. Type: Glass fiber, ASTM C 665, Type III (foil-scrim-kraft vapor-retarder membrane).
4. LEED for Homes: Products must comply with California's Practice for Testing of VOC's from Building Materials Using Small Chambers.
5. HERS: R-13 batt insulation is required at exterior walls and fur-outs.
6. R-38 batt insulation is required at roof attics.
7. Grade I installation per 2006 Mortgage Industry National Home Energy Rating Systems Standards, Appendix A: On-Site Inspection Procedures for Minimum Rated Features, December 28, 2005 compliance.
    a. All cavities are filled completely.
    b. The fiberglass batts are cut to exactly the size of the cavity they fill.
    c. The fiberglass batts are not compressed.
    d. The fiberglass batts surround electrical wires instead of being squeezed behind or in front of wires.
    e. Only occasional very small gaps are acceptable.
    f. Less than 2% of the area is uninsulated.

C. Accessories:
1. Adhesives and mechanical anchors and clips.
2. Protection board.
3. Crack sealers and tapes.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction. Coordinate with work of other sections. Provide full thickness in one layer over entire area, tightly fitting around penetrations.

B. Protect installed insulation and vapor retarder.

C. HERS: Install insulation to meet Grade I or II specifications set by the National Home Energy Rating Standards.

END OF SECTION 072100

SECTION 072500 - WEATHER BARRIERS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: ICC-ES evaluation reports for water-resistive barrier.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIERS

A. Building Paper: ASTM D 226, Type 1 (No. 15 asphalt-saturated organic felt), unperforated.

B. Building Paper: Kraft building paper with not less than 50 lbf/in. tensile strength, 1-hour water resistance, and 75 g/sq. m x 24 h water-vapor transmission.

C. Building Wrap: ASTM E 1677, Type I air barrier; with water-vapor permeance not less than 5 perms per ASTM E 96/E 96M, Desiccant Method (Procedure A); flame-spread and smoke-developed indexes not greater than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.

D. Vapor Retarder: ACI 302.1R-15 and 302.2R-15, at slab-on-grade where the floor will be covered by products using water-based adhesives, wood, vinyl backed carpet, impermeable floor coatings (urethane, epoxy, acrylic terrazzo, etc.) or where the floor will be in contact with moisture sensitive equipment or product. When required for radon, 10 mil products is recommended.

2.2 ACCESSORIES

A. Flexible Flashing: Adhesive butyl rubber or rubberized-asphalt compound, bonded to plastic film or spunbonded polyolefin, with an overall thickness of 0.030 inch.

1. Butyl Rubber:

2. Rubberized Asphalt:

B. Building Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Building Paper Installation:

1. Apply building paper immediately after sheathing is installed.
2. Apply horizontally with a 2-inch overlap and a 6-inch end lap.
3. Seal seams, edges, fasteners, and penetrations with tape.
4. Extend into jambs of openings and seal corners with flexible flashing.

B. Building Wrap Installation:

1. Apply building wrap immediately after sheathing is installed.
2. Seal seams, edges, fasteners, and penetrations with building wrap tape.
3. Extend into jambs of openings and seal corners with building wrap tape.

C. Flexible Flashing Installation:

1. Prime substrates as recommended by flashing manufacturer.
2. Lap seams and junctures with other materials at least 3 inches (75 mm), except that at flashing flanges of other construction, laps need not exceed flange width.
3. Lap flashing over water-resistive barrier at bottom and sides of openings.
4. Lap water-resistive barrier over flashing at heads of openings.
5. After flashing has been applied, roll surfaces with a hard rubber or metal roller.

END OF SECTION 072500

SECTION 074113 - METAL ROOF PANELS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Summary: Factory-formed metal roof panels, fasciae, and trim.

B. Submittals: Product Data**,** Shop Drawings, and color Samples.

C. Warranties: Manufacturer's standard written warranty, signed by manufacturer agreeing to promptly repair or replace products that fail to remain weather tight for the period of 20 years.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Energy Performance of Roof Panels: Three-year, aged, solar reflectance not less than 0.55 and emissivity not less than 0.75, or aged, Solar Reflectance Index of not less than 64.

B. Solar Reflectance: Equal to or greater than 0.25 for slopes greater than 2:12.

C. Wind-Uplift Resistance of Roof Assemblies: UL 580, Class 90.

2.2 METAL ROOF PANELS

A. Roof Panel Type: Structural standing-seam metal roof panels.
   1. Basis of Design: MBCI, LokSeam, www.mbci.com/lokseam.html.
   2. Color: Fern Green

B. Metallic-Coated Steel Roof Panels: Fabricated from aluminum-zinc alloy-coated steel sheet, ASTM A 792/A 792M, Class AZ50.
   1. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, structural quality, Grade 50, Coating Class AZ50 (Grade 340, Coating Class AZM150), prepainted by the coil-coating process per ASTM A 755/A 755M.
   2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, structural quality, Grade 50, Coating Class AZ55 (Grade 340, Coating Class AZM165) unpainted Galvalume Plus coating.
   3. Nominal Coated Thickness: 24 gauge
   4. Panel Surface: Smooth with striations in pan
   5. Exterior Finish: Fluoropolymer two-coat system
   6. Color: Fern Green
   7. Panel Width: [16 inches (406 mm)
   8. Panel Seam Height: 1.75 inch (44.4 mm).
   9. Joint Type: Snap joint seamed.

2.3 ACCESSORIES

A. Provide components required for a complete roof panel assembly, including trim, fasciae, clips, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

B. Flashing and Trim: Formed from 0.025-inch nominal thickness, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet. Provide flashing and trim as required to seal against weather and to provide finished appearance. Finish flashing and trim with same finish system as adjacent metal roof panels.

C. Self-Adhering Sheet Underlayment, High Temperature: Butyl or SBS-modified asphalt; slip-resisting-polyethylene surfaced; with release-paper backing; cold applied. Stable after testing at 240 deg F and passes after testing at minus 20 deg F ASTM D 1970.

1. Owens Corning: One Owens Corning Parkway, Toledo OH, 43659. (800) 438-7465.

2. Grace Construction Products: 62 Whittemore Avenue, Cambridge, MA 02140-1623. (800) 354-5414.

3. Kirsch Building Products, LLC: 1464 Madera Road #N, Suite 387, Simi Valley, CA 93065. (877) 742-7507.

4. Carlisle Construction Material: PO Box 7000, Carlisle, PA 17013, (888) 717-1440.

D. Felt Underlayment: ASTM D 226, Type II (No. 30), asphalt-saturated organic felts.

E. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

F. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat.

G. Walk pad: Provide non-slip surface from ladder to each rooftop unit.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Apply self-adhering sheet underlayment at eaves and rakes from edges of roof to at least 36 inches inside exterior wall line.

B. Apply self-adhering sheet underlayment at valleys extending 18 inches on each side.

C. Install felt underlayment on roof deck not covered by self-adhering sheet underlayment.

D. Apply slip sheet over underlayment before installing metal roof panels.

E. Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Flashing and Sheet Metal”.

F. Rigidly fasten metal roof panels to structure at one and only one location for each panel. Allow remainder of panel to move freely for thermal expansion and contraction. Predrill panels for fasteners.

1. Steel Roof Panels: Use stainless-steel fasteners for surfaces exposed to the exterior and galvanized-steel fasteners for surfaces exposed to the interior.
2. Provide metal closures at rake edges, rake walls, and each side of ridge and hip caps.
3. Flash and seal metal roof panels with weather closures at eaves, rakes, and perimeter of all openings.
4. Install ridge and hip caps as metal roof panel work proceeds.

G. Install gaskets, joint fillers, and sealants where required for weatherproof performance of metal roof panel assemblies. Provide types of gaskets, fillers, and sealants recommended by metal roof panel manufacturer.

H. Separate dissimilar metals with a bituminous coating or self-adhering sheet underlayment.

I. Coat back side of aluminum panels with bituminous coating where they will contact wood, ferrous metal, or cementitious construction.

END OF SECTION 074113

SECTION 074646 – FIBER-CEMENT SIDING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fiber cement soffit panels, trim, fascia, moulding and accessories; James Hardie HZ10 Engineered for Climate Siding.

B. Factory-finished fiber cement soffit panels, trim, fascia, moulding and accessories; James Hardie HZ10 Engineered for Climate Siding.

1.2 RELATED SECTIONS

A. Section 06100 - Rough Carpentry: Wood framing and bracing.

B. Section 06100 - Rough Carpentry: Sheathing.

C. Section 07210 - Insulation: Exterior wall insulation.

1.3 REFERENCES

A. AS D3359 - Standard Test Method for Measuring Adhesion by Tape Test, Tool and Tape.

B. AS E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

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: Provide detailed drawings of atypical non-standard applications which are outside the scope of the standard details and specifications provided by the manufacturer.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Minimum of 2 years experience with installation of similar products.
1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
3. Remodel mock-up area as required to produce acceptable work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store siding on edge or lay flat on a smooth level surface. Protect edges and corners

from chipping. Store sheets under cover and keep dry prior to installing.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

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. Product Warranty: Limited, non-pro-rated product warranty.
1. HardieSoffit HZ10 panels for 30 years.
2. HardieTrim HZ10 boards for 15 years.

B. Finish Warranty: Limited product warranty against manufacturing finish defects.
1. When used for its intended purpose, properly installed and maintained according to Hardie's published installation instructions, James Hardie's ColorPlus finish with ColorPlus Technology, for a period of 15 years from the date of purchase: will not peel; will not crack; and will not chip. Finish warranty includes the coverage for labor and material.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: James Hardie Building Products, Inc., which is located at: 26300 La Alameda Suite 400 ; Mission Viejo, CA 92691; Toll Free Tel: 866-274-3464; Tel: 949-367-4980; Fax: 949-367-4981; Email: request info (info@jameshardie.com); Web: www.jameshardiepros.com.

B. Requests for approval of equal substitutions will be considered in accordance with provisions of Section 01600.

2.2 TRIM

A. Soffit Panels: HardieSoffit HZ10 soffit panel, factory sealed on 5 sides as manufactured by James Hardie Building Products, Inc.
1. Type: Textured Cedarmill vented, provides 5 square inches (32.3 sq.cm) of net free ventilation per linear foot, 16 inches (406 mm) by 12 feet (3658 mm).

B. Trim:
1. HardieTrim HZ10 boards as manufactured by James Hardie Building Products, Inc.
   a. Texture: Wood Grained.
   b. Length: 12 feet (3658 mm).
   c. Thickness: 3/4 inch (19 mm).
   d. Thickness: 1 inch (24 mm).
2. HardieTrim HZ10 Fascia boards as manufactured by James Hardie Building Products, Inc.
3. Fiber-cement trim - complies with ASTM C 1186 Type A Grade II.

4. Fiber-cement trim - complies with ASTM E 136 as a noncombustible material.
5. Fiber-cement trim - complies with ASTM E 84 Flame Spread Index = 0, Smoke Developed Index = 5.
6. Intertek Product Listing.

2.3 FASTENERS

A. Wood Framing Fasteners:
1. Wood Framing: 6d common corrosion resistant nails.
2. Wood Framing: 0.089 inch (2.2 mm) shank by 0.221 inch (5.6 mm) head by 2 inches (51 mm) corrosion resistant siding nails.
3. Wood Framing: 0.091 inch (2.3 mm) shank by 0.221 inch (5.6 mm) head by 1-1/2 inches (38 mm) corrosion resistant siding nails.

2.4 FlNlSHES

A. Factory Primer: Provide factory applied universal primer.
1. Primer: Factory primed by James Hardie.
2. Topcoat: Refer to Section 09900 and Exterior Finish Schedule

B. Factory Finish Color for Soffit and Fascia Colors:

1. Architect to select finish colors from manufacturer color set.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If framing preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Nominal 2 inch by 4 inch (51 m by 102 mm) wood framing selected for minimal shrinkage and complying with local building codes, including the use of water-resistive barriers or vapor barriers where required. Minimum 1-1/2 inches (38 mm) face and straight, true, of uniform dimensions and properly aligned.
1. Install water-resistive barriers and claddings to dry surfaces.
2. Repair any punctures or tears in the water-resistive barrier prior to the installation of the siding.
3. Protect siding from other trades.

D. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

E. Install a water-resistive barrier as required in accordance with local building code requirements.

3.2 INSTALLATION - HARDIETRIM HZ10 BOARDS

A. Install materials in strict accordance with manufacturer's installation instructions. Install flashing around all wall openings.

B. Fasten through trim into structural framing or code complying sheathing. Fasteners must penetrate minimum 3/4 inch (19 mm) or full thickness of sheathing. Additional fasteners may be required to ensure adequate security.

C. Place fasteners no closer than 3/4 inch (19 mm) and no further than 2 inches (51 mm) from side edge of trim board and no closer than 1 inch (25 mm) from end. Fasten maximum 16 inches (406 mm) on center.

D. Maintain clearance between trim and adjacent finished grade.

3.3 FINISHING

A. Finish unprimed siding with a minimum one coat high quality, alkali resistant primer and one coat of either, 100 percent acrylic or latex or oil based, exterior grade topcoats or two coats high quality alkali resistant 100 percent acrylic or latex, exterior grade topcoat within 90 days of installation. Follow paint manufacturer's written product recommendation and written application instructions.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 074646

SECTION 075423 – THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
1. Thermoplastic Polyolefin Single-Ply Roofing Membrane
2. Thermoplastic Polyolefin Flashings
3. Thermoplastic Polyolefin Accessories
4. Roof Insulation

B. Related Sections
1. Section 06100: Rough Carpentry
2. Section 07620: Sheet Metal Flashing and Trim
3. Section 15430: Plumbing Specialties

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM) - *Annual Book of ASTM Standards*
1. ASTM D-751 – Standard Test Methods for Coated Fabrics
2. ASTM D-2137 - Standard Test Methods for Rubber Property—Brittleness Point of Flexible Polymers and Coated Fabrics
3. ASTM E-96 - Standard Test Methods for Water Vapor Transmission of Materials
4. ASTM D1204 - Standard Test Method for Linear Dimensional Changes of Non Rigid Thermoplastic Sheeting or Film at Elevated Temperature
5. ASTM D-471 - Standard Test Method for Rubber Property—Effect of Liquids
6. ASTM D-1149 - Standard Test Methods for Rubber Deterioration—Cracking in an Ozone Controlled Environment
7. ASTM C-1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer
8. ASTM C-1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers
9. ASTM E 903 – Standard Test Method for Solar Absorptance, Reflectance, and Transmission of Materials Using Integrating Spheres

B. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - *Architectural Sheet Metal Manual*

C. National Roofing Contractors Association (NRCA)

D. American Society of Civil Engineers (ASCE)

E. U.S. Green Building Council (USGBC)
1. Leadership in Energy and Environmental Design (LEED)

F. Factory Mutual (FM Global) - *Approval Guide*

G. Underwriters Laboratories (UL) - *Roofing Systems and Materials Guide* (TGFU R1306)

H. California Title 24 Energy Efficient Standards

I. ENERGY STAR

J. Cool Roof Rating Council (CRRC)

K. Miami Dade County

1.03 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D1079 and the glossary of the National Roofing Contractors Association (NRCA) *Roofing and Waterproofing Manual* for definitions of roofing terms related to this section.

1.04 SUBMITTALS

A. Product Data: Provide product data sheets for each type of product indicated in this section.

B. Shop Drawings: Provide manufacturers standard details and approved shop drawings for the roof system specified.

C. Samples: Provide samples of insulations, fasteners, membrane materials and accessories for verification of quality.

D. Certificates: Installer shall provide written documentation from the manufacturer of their authorization to install the roof system, and eligibility to obtain the warranty specified in this section.

E. L.E.E.D. submittal: Coordinate with Section 01115 - Green Building Requirements, for LEED certification submittal forms and certification templates.

1.05 QUALITY ASSURANCE

A. Manufacturer's Qualifications: GAF® shall provide a roofing system that meets or exceeds all criteria listed in this section.

B. Installer's Qualifications:
   1. Installer shall be classified as a *Master or Master Select ™* contractor as defined and certified by GAF®.
   2. Installer shall be classified as a *Master Select ™* contractor as defined and certified by GAF®.
   3. Installer shall be classified as a *Master* contractor as defined and certified by GAF®.
   4. Installer shall be classified as a *Certified Maintenance Professional* as defined and certified by GAF®.

C. Source Limitations: All components listed in this section shall be provided by a single manufacturer or approved by the primary roofing manufacturer.

D. Final Inspection Manufacturer's representative shall provide a comprehensive final inspection after completion of the roof system. All application errors must be addressed, and final punch list completed.

1.06 QUALITY ASSURANCE

A. Cold storage, more than most construction, requires correct design, quality materials, good workmanship, and close supervision. Design should ensure that proper installation can be accomplished under various adverse job site conditions. Materials must be compatible with each other. Installation must be made by careful workers directed by an experienced, well-trained superintendent. Close cooperation between the general, roofing, insulation, and other contractors increases the likelihood of a successful installation.

B. The cold storage/freezer envelope system must be installed by a Master or Master Select™ in compliance with shop drawings as approved by GAF. There must be no deviations made without PRIOR WRITTEN APPROVAL of GAF.

C. For a start-up and/or an interim inspection contact a Field Service Representative of GAF.

D. Upon completion of the installation, an inspection will be conducted by a Field Service Representative of GAF to ascertain the roofing system has been installed according to GAF's specifications and details.

E. In the United States, the U.S. Public Health Service Food and Drug Administration developed the Food Code (FDA 1997), which consists of model requirements for safeguarding public health and ensuring that food is unadulterated. The code is a guide for establishing standards for all phases of handling refrigerated foods. These standards must be recognized in the design and operation of refrigerated storage facilities.

F. Regulations of the Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), the U.S. Department of Agriculture (USDA), and other standards must also be followed.

G. Incorrect design and poor installation can cause moist air leakage into the facility, resulting in frost and ice formation, energy loss and, eventually, expensive repairs.

H. A continuous and uninterrupted vapor/air seal must encapsulate the building structure to prevent warm, humid air from infiltrating the roof assembly around the perimeter and penetrations. In freezer applications the vapor barrier under the floor slab must provide a sealed transition to prevent air leakage at the insulated wall panel/floor junction.

I. Cold storage facilities can change in dimension due to settling, temperature change, and other factors; therefore, cold storage facilities should be inspected regularly to spot problems early, so that preventive maintenance can be performed in time to avert serious damage.

1.07 PRE-INSTALLATION CONFERENCE

A. Prior to scheduled commencement of the roofing installation and associated work, conduct a meeting at the project site with the installer, architect, owner, GAF® representative and any other persons directly involved with the performance of the work. The installer shall record conference discussions to include decisions and agreements reached (or disagreements), and furnish copies of recorded discussions to each attending party. The main purpose of this meeting is to review foreseeable methods and procedures related to roofing work.

1.08 PERFORMANCE REQUIREMENTS

A. Provide an installed roofing membrane and base flashing system that does not permit the passage of water and will withstand the design pressures calculated in accordance with the most current revision of ASCE 7.
B. Provide an installed roofing membrane and base flashing system that does not permit the passage of water and will withstand the design pressures determined in FM Global Loss Prevention Data Sheet 1-28, to meet a 1-60 or greater wind uplift rating as required by location.

C. GAF® shall provide all primary roofing materials that are physically and chemically compatible when installed in accordance with manufacturers current application requirements.

1.09 REGULATORY REQUIREMENTS

A. All work shall be performed in a safe, professional manner, conforming to all federal, state and local codes.

B. Exterior Fire Test Exposure: Provide a roofing system achieving a UL Class A B Crating for roof slopes indicated.

C. Windstorm Classification: Provide a roofing system which will achieve a Factory Mutual 1-60 1-75 1-90 1-120 wind uplift rating, as listed in the current FM Approval Guide.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver all roofing materials to the site in original containers, with factory seals intact. All products are to carry a GAF® label.

B. Store all pail goods in their original undamaged containers in a clean, dry location within their specified temperature range. Reference data sheets for product storage requirements.

C. Do not expose materials to moisture in any form before, during or after delivery to the site. Reject delivery of materials that show evidence of contact with moisture.

D. Use “breathable” type covers such as canvas tarpaulins to allow venting and protection from weather and moisture. Cover and protect materials at the end of each work day. Do not remove any protective tarpaulins until immediately before the material will be installed.

1.11 PROJECT CONDITIONS

A. Weather

1. Proceed with roofing only when existing and forecasted weather conditions permit.
2. Ambient temperatures must be above 45°F (7.2°C) when applying hot asphalt or water based adhesives.

1.12 JOB CONDITIONS

A. All steel beams, columns, and large pipes that project through the insulation should be vapor-sealed and insulated with a 4-foot high wrap of insulation. The height of insulation at conduits, small pipes, and rods should be four times the regular wall insulation thickness. In both cases, the thickness of insulation on the projection should be half that on the regular wall or ceiling.

B. Temperature Pulldown

1. Because of the low temperatures in freezer facilities, contraction of structural members in these spaces will be substantially greater than in any surrounding ambient or cooler facilities. Therefore, contraction joints must be properly designed to prevent structural damage during facility pulldown.

2. The first stage of temperature reduction should be from ambient down to 35° F at whatever rate of reduction the refrigeration system can achieve.

3. The room should then be held at that temperature until it is dry. Finishes are especially subject to damage when temperatures are lowered too rapidly. Portland cement plaster should be fully cured before the room is refrigerated.

4. If there is a possibility that the room is airtight (most likely for small rooms, 20 feet by 20 feet maximum), swinging doors should be partially open during pulldown to relieve the internal vacuum caused by the cooling of the air, or vents should be provided. Permanent air relief vents are needed for continual operation of defrosts in small rooms with only swinging doors. Both conditions of possible air heating during defrost and cooling should be considered in design of air vents and reliefs.

5. The concrete slab will contract during pulldown, causing slab/wall joints, contraction joints, and other construction joints to open. At the end of the holding period (i.e., at 35° F), any necessary caulking should be done.

6. An average time for achieving dryness is 72 hours. However, there are indicators that may be used, such as watching the rate of frost formation on the coils or measuring the rate of moisture removal by capturing the condensation during defrost.

7. After the refrigerated room is dry, the temperature can then be reduced again at whatever rate the refrigeration equipment can achieve until the operating temperature is reached. Rates of 10° F per day have been used in the past, but if care has been taken to remove all the construction moisture in the previous steps, faster rates are possible without damage.

1.13 WARRANTY/GUARANTEE Provide manufacturers standard WeatherStopper® Diamond Pledge™ Guarantee

1. Single source coverage and no monetary limitation where the manufacturer agrees to repair or replace components in the roofing system, which cause a leak due to a failure in materials or workmanship.
   a) Duration: Five (5), Ten (10), Fifteen (15), Twenty (20) years from the date of completion.
   b) *WELL ROOF™ Extension*. GAF® also guarantees to the original or first subsequent owner coverage extension by 25% of the original guarantee length, provided that the roof in inspected and maintained in accordance with the MAINTAINENCE section of this specification.

B. Provide manufacturers standard WeatherStopper® System Pledge™ Guarantee

1. Single source coverage and a monetary limitation of one (1) dollar per square foot where the manufacturer agrees to repair or replace components in the roof system, which cause a leak due to failure in materials or workmanship.
   a) Duration: Five (5), Ten (10), Fifteen (15), Twenty (20) years from the date of completion.

*Materials and workmanship of listed products within this section when installed in accordance with current GAF® application and specification requirements. Contact GAF® Contractor Services for the full terms and conditions of the guarantee.

C. Provide manufacturers standard WeatherStopper® Integrated Roofing System Guarantee
   1. The manufacturer agrees to repair or replace the portion of the roofing materials, which have resulted in a leak due to a manufacturing defect or defects caused by ordinary wear and tear.
      a) Duration: Five (5), Ten (10), Fifteen (15), Twenty (20) years from the date of completion.

D. Provide manufacturers Vapor Seal Addendum to the Diamond Pledge NDL Roof Guarantee
   1. The manufacturer agrees to repair or replace roof to wall junctures of the roofing system that has been compromised due to a manufacturing defect or misapplication of the GAF Vapor Barrier Product.
      a) Duration: Five (5) years from the date of warranty issuance

   **This Guarantee does NOT cover conditions other than leaks, except to the extent of condensation or moisture intrusion issues due to a manufacturing defect or misapplication of the GAF Vapor Barrier Products installed on the roof. Contact GAF® Technical Support Services for the full terms and conditions*.

E. Provide manufacturers standard prorated material warranty
   1. The manufacturer agrees to repair or replace the portion of the roofing materials that have resulted in a leak due to a manufacturing defect or defects caused by ordinary wear and tear.
      a) Duration:

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

A. GAF® - 1 Campus Drive, Parsippany, NJ 07054

2.02 AIR AND VAPOR RETARDER SYSTEM

A. Proprietary formulated elastomeric styrene-butadiene-styrene (SBS) polymer modified bitumen in combination with a high tack self-adhesive, GAF SA Vapor Retarder by GAF.

2.03 INSULATION

A. Rigid polyisocyanurate board, with a strong white or black fibrous glass facer
   1. EnergyGuard™ Polyiso Insulation by GAF®,
      a) Board Thickness:
      b) Thermal Resistance (LTTR value) of:
      c) Compressive Strength: 20 PSI, meets ASTM C1289, Type II, Class 1, Grade 2*.
      d) Compressive Strength: 25 PSI, meets ASTM C1289, Type II, Class 1, Grade 3*.

   2. EnergyGuard™ Tapered Polyiso Insulation by GAF®,
      a) Board Thickness: tapered
      b) Thermal Resistance (LTTR value) of:
      c) Compressive Strength: 20 PSI, meets ASTM C1289, Type II, Class 1, Grade 2*.
      d) Compressive Strength: 25 PSI, meets ASTM C1289, Type II, Class 1, Grade 3*.

B. Non-halogenated rigid polyisocyanurate board, with glass-reinforced cellulosic felt containing no hazardous halogenated flame-retardant chemicals and conforming to or exceeding the requirements of ASTM C 1289,
   1. EnergyGuard™ NH Polyiso Insulation by GAF®,
      a) Board Thickness:
      b) Thermal Resistance (LTTR value) of:
      c) Compressive Strength: 20 PSI, meets ASTM C1289, Type II, Class 1, Grade 2*.
      d) Compressive Strength: 25 PSI, meets ASTM C1289, Type II, Class 1, Grade 3*.

   2. EnergyGuard™ NH Tapered Polyiso Insulation by GAF®,
      a) Board Thickness: tapered
      b) Thermal Resistance (LTTR value) of:
      c) Compressive Strength: 20 PSI, meets ASTM C1289, Type II, Class 1, Grade 2*.
      d) Compressive Strength: 25 PSI, meets ASTM C1289, Type II, Class 1, Grade 3*.

C. Red List Free certified, holding both an Environmental Product Declaration (EPD) and a Health Product Declaration (HPD) coated glass-fiber bonded to a core of isocyanurate foam meeting the requirements of ASTM D3273 for resistance to mold growth, EnergyGuard™ Barrier Polyiso Roof Insulation by GAF®.
   1. Board Thickness:
   2. Thermal Resistance (LTTR value) of: >20
   3. Compressive Strength: 20 PSI, meets ASTM C1289, Type II, Class 1, Grade 2*.
   4. Compressive Strength: 25 PSI, meets ASTM C1289, Type II, Class 1, Grade 3*.

D. Non-halogenated Red List Free certified, holding both an Environmental Product Declaration (EPD) and a Health Product Declaration (HPD) coated glass-fiber bonded to a core of isocyanurate foam containing no hazardous halogenated flame-retardant chemicals meeting the requirements of ASTM D3273 for resistance to mold growth, EnergyGuard™ NH Barrier Polyiso Roof Insulation by GAF®.
   1. Board Thickness:
   2. Thermal Resistance (LTTR value) of: >20
   3. Compressive Strength: 20 PSI, meets ASTM C1289, Type II, Class 1, Grade 2*.
   4. Compressive Strength: 25 PSI, meets ASTM C1289, Type II, Class 1, Grade 3*.

E. Rigid polyisocyanurate foam insulation with 1/2" perlite roof insulation laminated to one side and a strong fibrous glass facer on the other; conforms to or exceeds the requirements of ASTM C 1289 / FS HH-I-1972. EnergyGuard™ Composite Insulation, by GAF®.
   1. Board Thickness:
   2. Thermal Resistance (LTTR value) of:
   3. Lamination:
      a) 1/2" perlite roof insulation
      b) 1/2" gypsum board
      c) 1/2" cellulose fiber board

F. UltraShield™ coated glass-fiber mat facer laminated to a closed-cell polyisocyanurate foam core, ,
   1. EnergyGuard™ Ultra Polyiso Insulation by GAF®.
      a) Board Thickness:
      b) Thermal Resistance (LTTR value) of:
      c) Compressive Strength: 20 PSI, meets ASTM C1289, Type II, Class 1, Grade 2*.

d) Compressive Strength: 25 PSI, meets ASTM C1289, Type II, Class 1, Grade 3*.

2. EnergyGuard™ Ultra Tapered Polyiso Insulation by GAF®.
   a) Board Thickness:
   b) Thermal Resistance (LTTR value) of:
   c) Compressive Strength: 20 PSI, meets ASTM C1289, Type II, Class 1, Grade 2*.
   d) Compressive Strength: 25 PSI, meets ASTM C1289, Type II, Class 1, Grade 3*.

** Stated Dimensional Stability Tolerance: Board thickness shall not diminish by more than 2% max*

G. Non-halogenated UltraShield™ coated glass-fiber mat facer laminated to a closed-cell polyisocyanurate foam core, containing no hazardous halogenated flame-retardant chemicals and meets ASTM C1289, Type II, Class 2, Grade 2*,
   1. EnergyGuard™ NH Ultra Polyiso Insulation by GAF®.
      a) Board Thickness:
      b) Thermal Resistance (LTTR value) of:
      c) Compressive Strength: 20 PSI, meets ASTM C1289, Type II, Class 1, Grade 2*.
      d) Compressive Strength: 25 PSI, meets ASTM C1289, Type II, Class 1, Grade 3*.

   2. EnergyGuard™ NH Ultra Tapered Polyiso Insulation by GAF®.
      a) Board Thickness:
      b) Thermal Resistance (LTTR value) of:
      c) Compressive Strength: 20 PSI, meets ASTM C1289, Type II, Class 1, Grade 2*.
      d) Compressive Strength: 25 PSI, meets ASTM C1289, Type II, Class 1, Grade 3*.

   ** Stated Dimensional Stability Tolerance: Board thickness shall not diminish by more than 2% max*

H. Expanded perlite mineral aggregate board conforming to or exceeding the requirements of FS HH-I-529b, ANSI/ASTM C 728.
   1. EnergyGuard™ Perlite, with the following characteristics:
   2. EnergyGuard™ Tapered Perlite, with the following characteristics:
      a) Board Density: 9-lb. per cu. ft. min.
      b) Board Thickness:
      c) Thermal Resistance (R value) of:

I. Expanded Polystyrene Board
   **A separation mat or cover board must be installed over this insulation prior to installing an EverGuard® TPO roof membrane.*
   1. ASTM C-578 Type II, recover board (EPS), with the following characteristics:
      a) Compressive Strength: 15 psi minimum
      b) Board Density: 1.35 lbs. per cubic foot. minimum

   2. ASTM C-578 Type IX, High density (EPS), with the following characteristics:
      a) Compressive Strength: 25 psi nominal
      b) Board Density: 1.8 lbs. per cubic foot. minimum

   3. ASTM C-578 Type X, (XPS), with the following characteristics:
      a) Compressive Strength: 15 psi minimum
      b) Board Density: 1.3 lbs. per cubic foot. Minimum

4. Board Thickness:
5. Thermal Resistance (R value) of:

J. Fan Fold Polystyrene Board
**A separation mat or cover board must be installed over this insulation prior to installing an EverGuard® TPO roof membrane.*
1. ASTM C-578 Type X, 3/8" fan-fold board (XPS), with the following characteristics:
   a) Compressive Strength: 15 psi minimum
   b) Board Density: 1.3 lbs. per cubic foot. minimum
   c) Board Thickness: 3/8" (5mm)
   d) Thermal Resistance (R value) of: 1.5

K. Overlayment board made of cellulose fiber conforming to or exceeding the requirements of FS LLL-I-535, Class C, ANSI/ASTM C 208, with the following characteristics:
1. Board Thickness: 1/2"
2. Thermal Resistance (R value) of: 1.32

2.04 ROOF BOARD

A. Underlayment or overlayment board with a water-resistant and silicone treated gypsum core with glass fiber facers embedded on both sides, and pre-primed on one side. GP Dens-Deck® Prime Roof Board, distributed by GAF®.
1. Board Thickness:
2. Thermal Resistance (R value) of:

B. Underlayment or overlayment board with a water-resistant and silicone treated gypsum core with glass fiber facers embedded on both sides. GP Dens-Deck® Roof Board, distributed by GAF®
1. Board Thickness:
2. Thermal Resistance (R value) of:

C. Underlayment or overlayment board with a water-resistant and silicone treated gypsum core with glass fiber facers embedded on both sides and a factory-applied low perm, integrated, durable coating that enhances bond strength of the membrane system. GP Dens-Deck® DuraGuard™ Roof Board, distributed by GAF®
1. Board Thickness:
2. Thermal Resistance (R value) of:

2.05 ROOF COVER BOARD/RECOVER BOARD

A. High-density polyisocyanurate cover board, with a coated glass facers on both major surfaces of the core foam meets ASTM C1289, Type II, Class 4, Grade 2.
1. EnergyGuard™ HD Polyiso Insulation by GAF®,
   a) Board Thickness: ½" or 12.7mm
   b) Minimum Compressive Strength: 80psi (551kPa)
   c) Thermal Resistance (LTTR value) of: >2.5
   d) Recycle Content: Max 8%

2. EnergyGuard™ HD PLUS Polyiso Insulation, by GAF®
   a) Board Thickness: ½" or 12.7mm
   b) Minimum Compressive Strength: 110psi (758 kPa)
   c) Thermal Resistance (LTTR value) of: >2.5
   d) Recycle Content: Max 8%

** Stated Dimensional Stability Tolerance: Board thickness shall not diminish by more than 2% max*

B. Non-halogenated high-density polyisocyanurate cover board, with a coated glass facers on both major surfaces of the core foam containing no hazardous halogenated flame-retardant chemicals and meets ASTM C1289, Type II, Class 4, Grade 2.
   1. EnergyGuard™ NH HD Polyiso Insulation by GAF®,
      a) Board Thickness: ½" or 12.7mm
      b) Minimum Compressive Strength: 80psi (551kPa)
      c) Thermal Resistance (LTTR value) of: >2.5
      d) Recycle Content: Max 8%

   2. EnergyGuard™ NH HD PLUS Polyiso Insulation, by GAF®
      a) Board Thickness: ½" or 12.7mm
      b) Minimum Compressive Strength: 110psi (758 kPa)
      c) Thermal Resistance (LTTR value) of: >2.5
      d) Recycle Content: Max 8%

   ** Stated Dimensional Stability Tolerance: Board thickness shall not diminish by more than 2% max*

C. Expanded perlite mineral aggregate board conforming to or exceeding the requirements of FS HH-I-529b, ANSI/ASTM C 728.
   1. EnergyGuard™ Perlite, with the following characteristics:
   2. EnergyGuard™ Tapered Perlite, with the following characteristics:
      a) Board Density: 9-lb per cu. ft. min.
      b) Board Thickness:
      c) Thermal Resistance (R value) of:

D. Fiber-reinforced gypsum panel with an integral water-resistant core. Securock® Roof Board by US Gypsum.
   1. Board Thickness: ¼"
   2. Thermal Resistance (R value) of: .20

E. High-density fiberboard roof insulation with unique, patent-pending, non-asphaltic primed red coating that allows for a solid membrane bond and meets ASTM C208, Type II, Grade 1 and Grade 2, STRUCTODEK® HD Fiberboard by Blue Ridge FiberBoard®
   a) Compressive Strength: 15 lbf/in² (103 kPa) minimum
   b) Board Thickness: 1/2" 1"
   c) Thermal Resistance (R value) of: 1.3 (for 1/2") 2.5 (for 1")

2.06 SEPARATION SHEET

A. Fire Resistant non-woven fiberglass slip sheet used as a separation sheet over polystyrene foam insulation or beneath insulation over wood substrates providing a UL class A fire rating. Each roll contains ten (10) squares (1,000 sq. ft.) of material, 6' x 166.7' (1.83m x 50.8m), 110 lbs nominal weight, VersaShield™ Solo® Fire Resistant Slip Sheet by GAF®.

B. Fire resistant glass fiber mat used as a separation sheet over polystyrene foam insulation or beneath insulation over wood substrates. Each roll contains ten (10) squares (1,000 sq. ft.) of material, 4' x 250' (1.2m x 76.9m), 80 lbs. (36.4 kg), Fiberglass Fire Sheet 10 by GAF®.

C. Fire resistant glass fiber mat used as a separation sheet over polystyrene foam insulation or beneath insulation over wood substrates. Each roll contains four (4) squares (420 sq. ft.) of material, 4' x 105' (1.2m x 32.3m), 79 lbs. (35.9 kg), Fiberglass Fire Sheet 50 by GAF®.

D. Non-woven polyester UV-stabilized mat, 3 oz. per sq. yd. used as a separation sheet beneath membranes as a protection layer and used over membranes in ballast applied assemblies. Each roll contains thirty (30) squares (3,000 sq. ft.) of material, 10' x 300' (3.07m x 92.3m), 75 lbs. (34.1 kg), EverGuard® Poly Separation Layer 3 oz. by GAF®.

E. Non-woven polyester UV-stabilized mat, 6 oz. per sq. yd. used as a separation sheet beneath membranes as a protection layer and used over membranes in ballast or paver applied assemblies. Each roll contains thirty (30) squares (3,000 sq. ft.) of material, 10' x 300' (3.07m x 92.3m), 125 lbs. (56.8 kg), EverGuard® Poly Cushioning Layer 6 oz. by GAF®.

2.07 MEMBRANE MATERIALS

A. A smooth type, polyester scrim reinforced thermoplastic polyolefin membrane, for use as a single ply roofing membrane. Meets or exceeds the minimum requirements of ASTM D-6878. UL Listed, FM Approved, Dade County Product Approval, Florida Building Code Approved.
   1. EverGuard® TPO by GAF®.
      a) Thickness: 45mil 60mil 80mil
      b) Full Sheet size:
         i) 12' x 100, 1200 sq.ft
         ii) 10' X 100', 1000 sq.ft.
         iii) 8 x 100, 800 sq. ft.
      c) Half sheet size:
         i) 6' x 100, 600 sq.ft.
         ii) 5' x 100', 500 sq.ft.
      d) Color:
         i) White - Energy Star Listed, CRRC Listed and Title 24 Compliant.
         ii) Gray - Energy Star Listed, and CRRC Listed.
         iii) Tan - Energy Star Listed, and CRRC Listed.
         iv) Energy Gray - Energy Star Listed, CRRC Listed and Title 24 Compliant.
         v) Energy Tan - Energy Star Listed, CRRC Listed and Title 24 Compliant.
         i) Available Pre-Formulated Colors: Colonial Red, Dark Brown, Dark Bronze, Desert Tan, Electric Blue, Goldenrod, Ivy Green, Moss Green, Patina Green, Slate Gray, Teal, Terra Cotta, Tropical Green, Smoke Gray, Regal Red Regal Blue Hartford Green
         ii) Custom colors available

2.08 FLASHING MATERIALS

A. A smooth type, polyester scrim reinforced thermoplastic polyolefin membrane, for use as a single ply roofing membrane. Meets or exceeds the minimum requirements of ASTM D-6878. UL Listed, FM Approved, Dade County Product Approval, Florida Building Code Approved.
   1. EverGuard® TPO by GAF®.
      a) Thickness: 45mil 60mil 80mil
      b) Full Sheet size:
         i) 12' x 100, 1200 sq.ft
         ii) 10' X 100', 1000 sq.ft.
         iii) 8 x 100, 800 sq. ft.
      c) Half sheet size:
         i) 6' x 100, 600 sq.ft.

ii) 5’ x 100’, 500 sq.ft.

d) Color:
   i) White - Energy Star Listed, CRRC Listed and Title 24 Compliant.
   ii) Gray - Energy Star Listed, and CRRC Listed.
   iii) Tan - Energy Star Listed, and CRRC Listed.
   iv) Energy Gray - Energy Star Listed, CRRC Listed and Title 24 Compliant.
   v) Energy Tan - Energy Star Listed, CRRC Listed and Title 24 Compliant.
   iii) Available Pre-Formulated Colors: Colonial Red, Dark Brown, Dark Bronze, Desert Tan, Electric Blue, Goldenrod, Ivy Green, Moss Green, Patina Green, Slate Gray, Teal, Terra Cotta, Tropical Green, Smoke Gray, Regal Red Regal Blue Hartford Green
   iv) Custom colors available

2.09 ADHESIVES, SEALANTS and PRIMERS

A. Sprayable solvent-based adhesive for smooth TPO: EverGuard® TPO Quick Spray Adhesive, by GAF®.

B. Low VOC Sprayable solvent-based adhesive for smooth TPO: EverGuard® TPO Quick Spray Adhesive LV50, by GAF®.

C. Water-based Bonding Adhesive: Water based rubberized adhesive for use with EverGuard® TPO membranes, EverGuard® WB181 Bonding Adhesive, by GAF®.

D. Solvent-based bonding adhesive for use with smooth TPO membranes, EverGuard® 1121 Bonding Adhesive, by GAF®.

E. Low VOC solvent-based bonding adhesive for use with smooth TPO membranes, EverGuard® Low VOC Bonding Adhesive, by GAF®.

F. Low VOC solvent-based bonding adhesive covering 3 squares per pail for use with smooth TPO membranes, EverGuard® TPO 3 square Low VOC Bonding Adhesive, by GAF®.

G. Two-part low rise polyurethane foam adhesive for use with insulation and fleece-back membranes, Oly-Bond 500™ Roofing Adhesive - Equipment-Free Canister by GAF®.

H. Solvent based primer for preparing surfaces to receive butyl based adhesive tapes, EverGuard® TPO Primer, by GAF®.

I. Low VOC solvent based primer for preparing surfaces to receive butyl based adhesive tapes, EverGuard® TPO Low VOC Primer, by GAF®.

J. Solvent based seam cleaner used to clean exposed or contaminated seam prior to heat welding, EverGuard® TPO Seam Cleaner, by GAF®.

K. Low VOC solvent based cleaner used to clean exposed or contaminated seam prior to heat-welding or priming, EverGuard® CleanWeld™ Conditioner, by GAF®.

L. Solvent based, trowel grade synthetic elastomeric sealant. Durable and UV resistant suitable for use where caulk is typically used. Available in 10 oz. tubes, FlexSeal™ Caulk Grade Sealant by GAF®.

M. Commercial grade roofing sealant suitable for sealing the upper lip of exposed termination bars and penetrations and around clamping rings and comes with a 20 yr. ltd warranty against leaks caused by manufacturing defects. Meets the performance criteria of ASTM D412, ASTM D2196, ASTM D1475 and ASTM D1644, FlexSeal™ Roof Sealant, by GAF®.

N. One-part moisture cure, self-leveling sealant designed for use in pitch pans EverGuard® One-Part Pourable Sealer by GAF®.

O. One part butyl based high viscosity sealant suitable for sealing between flashing membrane and substrate surface behind exposed termination bars and for sealing between roofing membrane and drain flange. EverGuard® Water Block, by GAF®.

P. Solvent based liquid, required to protect field cut edges of EverGuard® TPO membranes. Applied directly from a squeeze bottle, EverGuard® TPO Cut Edge Sealant, by GAF®.

Q. Insulation Adhesive: Oly-Bond 500™ distributed by GAF®.

R. Insulation Adhesive: Oly-Bond 500™ Spot Shot distributed by GAF®.

2.10 PLATES & FASTENERS

A. Drill•Tec™ Standard Screws: Standard duty alloy steel insulation fastener with CR-10 coating with a .215” diameter thread. Factory Mutual Standard 4470 Approved, #3 Phillips head for use on steel and wood decks.
B. Drill•Tec™ ASAP® 3P Fastener: Assembled screw and 3” locking plastic plate. Alloy steel fastener with CR-10 coating with a .215” diameter thread. Factory Mutual Standard 4470 Approved, #3 Phillips truss head.
C. Drill•Tec™ ASAP® 3S Fastener: Assembled screw and 3” steel plate. Alloy steel fastener with CR-10 coating with a .215” diameter thread. Factory Mutual Standard 4470 Approved, #3 Phillips truss head.
D. Drill•Tec™ Polymer GypTec™ Fastener: Glass-filled nylon auger with 1" (25.4 mm) with major thread diameter of .675. To be used with 3" steel plate for insulation and 2" steel plate for single-ply membranes. Miami Dade and Factory Mutual Standard 4470 approved (for insulation attachment)
E. Drill•Tec™ HD Screws: Heavy gauge alloy steel fastener with CR-10 coating with a .245” diameter thread. Miami Dade and Factory Mutual Standard 4470 Approved, #3 Phillips truss head for use on wood, concrete and steel decks.
F. Drill•Tec™ XHD Screws: Heavy gauge alloy steel fastener with CR-10 coating with a .275” diameter thread. Factory Mutual Standard 4470 Approved, #3 Phillips truss head for use on heavy steel decks, O.S.B or aluminum roof decks.
G. Drill•Tec™ SXHD Screws: Heavy gauge alloy steel fastener with CR-10 coating with a .320” diameter thread. Factory Mutual Standard 4470 Approved, #3 Phillips truss head for use on specific FM assemblies on heavy steel decks.
H. Drill•Tec™ Lite-Deck Fastener: A large diameter reinforced nylon screw with a #3 square drive flat head. Thread diameter of .375” and shank diameter of .312”. Uses a 3" (76 mm) Metal Round Plate fastening system.
I. Drill•Tec™ CR Base Sheet Fastener: G-90 galvanized, CR-10 Corrosion resistant coating with 1.125” x1” (25.4 mm) head and 1 3/4” (44 mm) leg length. Preassembled with 2 3/4” (70 mm) diameter Galvalume steel roof disc.
J. Drill•Tec™ CR 1.2 Base Sheet Fastener: G-90 galvanized, CR-10 Corrosion resistant coating with 1.125” x1” (25.4 mm) head and 1.2”leg length. Preassembled with 2 3/4” (70 mm) Diameter Galvalume steel roof disc.

K. Drill•Tec™ Purlin Fastener: Alloy steel fastener with CR-10 coating with a .210" diameter thread. Factory Mutual Standard 4470 Approved, ¼" hex head. For use when mechanically fastening single-ply membranes in metal-retrofit applications.
L. Nail-Tite Type-R Fasteners: Self-locking one-piece fastener for securing base ply when roofing over existing poured gypsum roof decks. Shank: 1" (25.4 mm) tapered cone precision formed from corrosion resistant galvanized (G-90) steel. Cap: 1-1/4" round cap formed from corrosion resistant Galvalume (AZ-55) steel, reinforced to resist cupping during driving. The shank is securely wedged to cap forming rigid one-piece fastener, by E. S. Products.
M. Drill•Tec™ AccuTrac Insulation Plates: Galvalume coated steel 3" square plates recessed or flat bottom. Miami Dade and Factory Mutual Standard 4470 Approved and suitable for use with Drill•Tec™ standard fasteners, Drill•Tec™ heavy duty fasteners, Drill•Tec™ extra heavy duty fasteners. Made for east use with Drill•Tec™ AccuTrac stand up tool
N. Drill•Tec™ Accuseam Plates: Galvalume coated steel 3" diameter plates. Miami Dade and Factory Mutual Standard 4470 Approved and suitable for use with Drill•Tec™ Philips head fasteners and Drill•Tec™ extra heavy duty fasteners. Made for east use with Drill•Tec™ AccuTrac stand up tool
O. Drill•Tec™ Insulation Plates: Galvalume, 3" (76 mm) diameter, suitable for use with Drill•Tec™ Standard and HD screws, and Drill•Tec™ Spikes. Special design available for use with Drill•Tec™ Polymer Screws.
P. Drill•Tec™ XHD Plates: Galvalume, 2 3/8" (60 mm) diameter, with a barbed underside. Suitable for use with Drill•Tec™ Standard, HD, and XHD Screws, and Drill•Tec™ Spikes.
Q. Drill•Tec™ SXHD Plates: Galvalume, 2 3/4" (70 mm) diameter, with a double barbed underside. Required for use with Drill•Tec™ SXHD Screws, HD Screws and Drill•Tec™ Spikes for specific FM assemblies.
R. Drill•Tec™ SHD Plates: Galvalume, 2" (52 mm) diameter, with a double barbed underside. Suitable for use with Drill•Tec™ Standard, HD, XHD, and SXHD Screws, and Drill•Tec™ Spikes.
S. Drill•Tec™ Lite-Deck Plate: Galvalume, plate with extra wide diameter designed specifically for Lite-Deck Fastener.
T. Drill•Tec™ Locking Impact Nail: Factory Assembled, G-90 Galvalume Coated fastener designed to install base sheets or insulation to gypsum or cementitious wood fiber. 1.8" to 4.8" lengths available with a 2.7" diameter plate.

2.11 NAILS & SPIKES

A. DRILL-TEC™ CD-10: Hammer-in, non-threaded fastener designed to secure insulation and membrane to structural concrete. Miami Dade and Factory Mutual Standard 4470 approved
B. DRILL-TEC™ Spikes: Hammer-in, non-threaded fastener designed to secure insulation and membrane to structural concrete. Alloy steel fastener with a CR-10 coating and a .250 shank diameter.
C. DRILL-TEC™ Masonry Anchor: Zinc alloy anchor with stainless steel or zinc plated steel pin available in either 1/4" or 3/16" diameter. Designed to attach termination bars to concrete or masonry walls.
D. Threaded Cap Nail: Annular-threaded electro-galvanized with yellow di-chromate coating, with 1" (25.4 mm) round or square cap, as manufactured by the Simplex Nail Corporation.
E. Two-Piece Tube Nail: 1" diameter cap; when the nail is driven down through the tube of first part that was installed, the nail hooks up to provide back out resistance, as manufactured by The Simplex Corporation

2.12 PAVERS

A. Extruded polystyrene insulation panels with an integral latex-molded mortar top face. Nominal 2" thick insulated pavers to be provided with tongue and groove interlocking edges.

2.13 ACCESSORIES

A. GENERAL FLASHING ACCESSORIES

1. A smooth type, unreinforced thermoplastic polyolefin based membrane for use as an alternative flashing/reinforcing material for penetrations and corners. Required whenever preformed vent boots cannot be used, available in White, Tan, Gray, Regal Red, Regal Blue, and Hartford Green, 0.055 inches (55 mils) nominal thickness and sheet size: 24in x 50ft. EverGuard® TPO Detailing Membrane, by GAF®.

2. An 8 inch (203 mm) wide smooth type, polyester scrim reinforced thermoplastic polyolefin membrane strip for use as a cover strip over coated metal and stripping-in coated metal flanges and general repairs: 0.045 inches (45 mils) nominal thickness with 100 foot length, available in White, Tan, Gray, Regal Red, Regal Blue, and Hartford Green EverGuard® TPO Flashing Membrane, by GAF®.

3. Extruded aluminum termination bar with angled lip caulk receiver and lower leg bulb stiffener. Pre-punched slotted holes at 6" on center or 8" on center. ¾" x 10' with 0.090" cross section, DRILL-TEC™ Termination Bar, by GAF®.

4. 25 mil TPO membrane laminated to galvanized sheet metal for fabrication into metal gravel stop and drip edge profiles, metal base and curb flashings, sealant pans, and scupper sleeves. EverGuard® TPO Coated Metal, by GAF®.
   a) Metal type: 24 gauge, 20 gauge Aluminum Stainless steel
   b) Sheet per pallet: 5 10 30
   c) Sheet Size: 4' x 10' Custom size
   d) Sheet Color:
      i) Stock Colors: White Gray Tan Energy Gray, Energy Tan
      ii) Pre-Formulated Colors: Colonial Red, Dark Brown, Dark Bronze, Desert Tan, Electric Blue, Goldenrod, Ivy Green, Moss Green, Patina Green, Slate Gray, Teal, Terra Cotta, Tropical Green, Smoke Gray, Regal Red Regal Blue Hartford Green
      iii) Custom colors available

B. ROOF EDGE ACCESSORIES

1. A 6 inch (152 mm) wide, 0.045 mil reinforced TPO membrane with a 3-inch self-adhered area and a 3-inch heat-weld area. Designed for use as a cover strip over coated and non-coated metal edges and flanges. Each full roll contains approximately 100 Lineal Ft. of material, 6" X 100'. EverGuard® TPO Cover Tape Heat-Weld, by GAF®

2. A 6 inch (152 mm) wide, smooth type, polyester scrim reinforced thermoplastic polyolefin membrane strip with a factory laminated butyl tape. Designed for use as a cover strip over non-coated metal edges and flanges. Each full roll contains approximately 100 Lineal Ft. of material, 6" X 100'. EverGuard® TPO Cover Tape, by GAF®.

3. Two-part assembly with a continuous cleat and a formed high-quality KYNAR 500® finish cover tested per ANSI/SPRI/FM4435/ES-1. The system shall have all concealed fasteners

with no penetration on horizontal roof surface available in 10' lengths, EverGuard® Standard Drip Edge by GAF®.

4. Two part decorative fascia edge metal tested per ANSI/SPRI/FM4435/ES-1. The system shall have all concealed fasteners with no penetration on horizontal roof surface available in 10' lengths,
   a) 20 gauge galvanized retainer, EverGuard® EZ Fascia by GAF®.
   b) 0.50 aluminum retainer, EverGuard® EZ Fascia AR by GAF®.
   c) 24 gauge galvanized retainer, EverGuard® EZ Fascia LT by GAF®.
   d) Extruded aluminum retainer, EverGuard® EZ Fascia EX by GAF®.

5. Decorative metal fascia with continuous galvanized steel spring cant to terminate single-ply roofing at perimeter. The system shall be watertight with concealed splice plates and no exposed fasteners available in 10' lengths, EverGuard® Snap-on Fascia by GAF®

6. 20 gauge galvanized steel box with pre-punched holes and supplied with corrosion-resistant fasteners, EverGuard Edge Box RI by GAF®.

C. WALL & CURB ACCESSORIES

1. 045” reinforced TPO membrane with pressure sensitive adhesive, to be installed on horizontal surfaces using plates and fasteners as a base attachment in fully adhered systems. Size 6” x 100’, EverGuard® RTA (Roof Transition Anchor) Strip™, by GAF®

2. 55 mil TPO membrane and 24 gauge coated metal prefabricated into standard and custom size thru wall scuppers. Available in two sizes: 4" x 6" x 12" (l x w x d) with a 5.75" x 3.75" opening and 8" x 10" x 12" (l x w x d) with a 9.75" x 7.75" opening, EverGuard® TPO Scupper, by GAF®

3. .045” or .060” thick reinforced TPO membrane fabricated corners. Available in four standard sizes to flash curbs that are 24”, 36”, 48”, and 60” in size. Four corners are required to flash the curb, EverGuard® Corner Curb Wraps, by GAF®.

4. 0.060” thick molded TPO membrane outside corners of base and curb flashing. Hot-air welds directly to EverGuard® TPO membrane. Size 4” x 4” with 6” flange, EverGuard® TPO Universal Corners by GAF®.

5. 0.055” molded TPO membrane inside corners of base and curb flashing. Hot-air welds directly to EverGuard® TPO membrane. Size 6” x 6” x 5.5” high EverGuard® TPO Preformed Corners by GAF®.

6. 8” diameter, nominal .050” vacuum formed unreinforced TPO membrane for use in flashing outside corners of base and curb flashings, EverGuard® TPO Fluted Corner, by GAF®.

D. PENETRATION ACCESSORIES

1. 0.075” thick molded TPO membrane sized to accommodate most common pipe and conduits, (1” (25.4 mm) to 6” diameter pipes), including square tube. Hot-air welded directly to EverGuard® TPO membrane, supplied with stainless steel clamping rings, EverGuard® TPO Preformed Vent Boots by GAF®.

2. 0.045” or 0.60” thick molded TPO membrane preformed boots are split to accommodate most common pipes and conduits and available in three standard sizes, EverGuard® TPO Split Pipe Boots, by GAF®.

3. 0.045” or 0.60” thick molded TPO membrane preformed square boots are split to accommodate most common square penetrations and conduits and available in three standard sizes, EverGuard® TPO Square Tube Wraps, by GAF®.

4. .070 thick molded penetration pocket to provide structure and foundation for the application of a pourable sealant for a variety of roof penetrations, weldable and 9" x 6" x 4" (l x w x h). EverGuard® TPO Pourable Sealer Pocket

5. .055” thick smooth type, unreinforced thermoplastic polyolefin membrane designed for use as a conforming membrane seal over T-joints in 60 and 80 mil membrane applications. EverGuard® TPO Drain by GAF®

E. FIELD OF ROOF ACCESSORIES

1. Pre-manufactured expansion joint covers used to bridge expansion joint openings in a roof structure. Fabricated to accommodate all roof to wall and roof to roof applications, made of .060” reinforced TPO membrane, available in 5 standard sizes for expansion joint openings up to 8” wide. EverGuard® TPO Expansion Joint Covers, by GAF®

2. .055” thick smooth type, unreinforced thermoplastic polyolefin membrane designed for use as a conforming membrane seal over T-joints in 60 and 80 mil membrane applications. EverGuard® T-Joint Patches, by GAF®.

3. 1/8” thick extruded and embossed TPO roll 30” x 50’, heat welds directly to roofing membrane. Unique herringbone traction surface. Gray in color, EverGuard® TPO Walkway Rolls, GAF®.

F. GENERAL FLASHING ACCESSORIES

1. A smooth type, unreinforced thermoplastic polyolefin based membrane for use as an alternative flashing/reinforcing material for penetrations and corners. Required whenever preformed vent boots cannot be used, available in White, 0.055 inches (55 mils) nominal thickness and sheet size: 24in x 50ft. EverGuard Extreme® TPO Detailing Membrane, by GAF®.

2. An 8 inch (203 mm) wide smooth type, polyester scrim reinforced thermoplastic polyolefin membrane strip for use as a cover strip over coated metal and stripping-in coated metal flanges and general repairs: 0.045 inches (45 mils) nominal thickness with 100 foot length, available in White, EverGuard Extreme® TPO Flashing Membrane, by GAF®.

3. 25 mil TPO membrane laminated to galvanized sheet metal for fabrication into metal gravel stop and drip edge profiles, metal base and curb flashings, sealant pans, and scupper sleeves. EverGuard Extreme ® TPO Coated Metal, by GAF®.
   a) Metal type: 24 gauge, 20 gauge Aluminum Stainless steel
   b) Sheet per pallet: 5 10 30
   c) Sheet Size: 4’ x 10’ Custom size

d) Sheet Color: White
   i) Custom colors available

G. WALL & CURB ACCESSORIES

1. 045” reinforced TPO membrane with pressure sensitive adhesive, to be installed on horizontal surfaces using plates and fasteners as a base attachment in fully adhered systems. Size 6” x 100’, EverGuard Extreme ® RTA (Roof Transition Anchor) Strip™, by GAF®

2. 55 mil TPO membrane and 24 gauge coated metal prefabricated into standard and custom size thru wall scuppers. Available in two sizes: 4" x 6" x 12" (l x w x d) with a 5.75" x 3.75" opening and 8" x 10" x 12" (l x w x d) with a 9.75" x 7.75" opening, EverGuard Extreme ® TPO Scupper, by GAF®

3. .045” or .060” thick reinforced TPO membrane fabricated corners. Available in four standard sizes to flash curbs that are 24”, 36”, 48”, and 60” in size. Four corners are required to flash the curb, EverGuard Extreme ® Corner Curb Wraps, by GAF®.

4. 0.060” thick molded TPO membrane outside corners of base and curb flashing. Hot-air welds directly to EverGuard® TPO membrane. Size 4” x 4” with 6” flange, EverGuard Extreme ® TPO Universal Corners by GAF®.

5. 0.055” molded TPO membrane inside corners of base and curb flashing. Hot-air welds directly to EverGuard® TPO membrane. Size 6” x 6” x 5.5” high EverGuard Extreme ® TPO Preformed Corners by GAF®.

6. 8” diameter, nominal .050” vacuum formed unreinforced TPO membrane for use in flashing outside corners of base and curb flashings, EverGuard Extreme® TPO Fluted Corner, by GAF®.

H. PENETRATION ACCESSORIES

1. 0.075” thick molded TPO membrane sized to accommodate most common pipe and conduits, (1” (25.4 mm) to 6” diameter pipes), including square tube. Hot-air welded directly to EverGuard® TPO membrane, supplied with stainless steel clamping rings, EverGuard Extreme® TPO Preformed Vent Boots by GAF®.

2. 0.045” or 0.60” thick molded TPO membrane preformed boots are split to accommodate most common pipes and conduits and available in three standard sizes, EverGuard Extreme® TPO Split Pipe Boots, by GAF®.

3. 0.045” or 0.60” thick molded TPO membrane preformed square boots are split to accommodate most common square penetrations and conduits and available in three standard sizes, EverGuard Extreme® TPO Square Tube Wraps, by GAF®.

4. .070 thick molded penetration pocket to provide structure and foundation for the application of a pourable sealant for a variety of roof penetrations, weldable and 9" x 6" x 4" (l x w x h). EverGuard Extreme® TPO Pourable Sealer Pocket

I. FIELD OF ROOF ACCESSORIES

1. Pre-manufactured expansion joint covers used to bridge expansion joint openings in a roof structure. Fabricated to accommodate all roof to wall and roof to roof applications, made of .060" reinforced TPO membrane, available in 5 standard sizes for expansion joint openings up to 8" wide. EverGuard Extreme® TPO Expansion Joint Covers, by GAF®

2. .055" thick smooth type, unreinforced thermoplastic polyolefin membrane designed for use as a conforming membrane seal over T-joints in 60, 70 and 80 mil membrane applications. EverGuard Extreme® T-Joint Patches, by GAF®.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that the surfaces and site conditions are ready to receive work.

B. Verify that the deck is supported and secured.

C. Verify that the deck is clean and smooth, free of depressions, waves, or projections, and properly sloped to drains, valleys, eaves, scuppers or gutters.

D. Verify that the deck surfaces are dry and free of ice or snow.

E. Verify that all roof openings or penetrations through the roof are solidly set, and that all flashings are tapered.

3.02 SUBSTRATE PREPARATION

A. Recover
   1. Suitable roofs for recover shall be free of dust, dirt, debris, and any contaminants that may adversely affect the performance of the new roof. Areas of substantial deck deflection or membrane imperfections shall be corrected prior to installing any new roofing.
   2. For recover installations over single-ply, fluid applied, coal tar and metal roofs, contact Technical Support Services for prior approval and technical requirements.
   3. Taking test cuts to verify the existing roof construction and condition. Three test cuts should be made for roofs under 100 squares and one test cut per 100 squares above the minimum amount. It is highly recommended and in certain circumstances, required, that a moisture survey be made to determine the extent of wet insulation and moisture entrapment. Contact Technical Support Services for more information on moisture surveys.
   4. Existing substrates and insulation (if applicable) must be dry over the majority of the roof area. Wet or deteriorated areas of insulation and substrate must be removed and replaced with new materials. When adhering insulation or new roofing directly to the existing roof surface, the existing roof system components must be well attached to each other and their substrate.
   5. All applicable code requirements must be met for recover over an existing roofing system.
   6. GAF does not recommend partial recover or re-roofing of a single roof area due to the potential for defects in the portion of the roof system not replaced or negatively affecting the performance of the new membrane. When required by project conditions or budget considerations, GAF requires full separation of the old and new roof areas by means of a full curb mounted expansion joint or area divider installed to provide a complete watertight seal or break between areas. Tie-in constructions, in which the old and new membranes are

adhered directly to each other and stripped in are not acceptable for coverage under certain guarantees

B. Tear-off
   1. Remove all existing roofing materials to the roof decking, including flashings, metal edgings, drain leads, pipe boots, and pitch pockets, and clean substrate surfaces of all asphalt and adhesive contaminants.
   2. Confirm the quality and condition of the roof decking by visual inspection. Fastener pull-out testing must be conducted by the roof fastener manufacturer.
   3. Secure all loose decking. Remove and replace all deteriorated decking.
   4. Remove abandoned equipment and equipment supports.
   5. Confirm that the height of equipment supports will allow the installation of full-height flashings.

C. Steel Deck
   1. Metal decks must be a minimum uncoated thickness of 22 gauge (0.8 mm) and shall have a G-90 galvanized finish on all panels. FM requirements may supersede those set forth in this section. Consult the current FM Guide for more information.
   2. Decks must comply with the gauge and span requirements in the current Factory Mutual FM Approval Guide and be installed in accordance with Loss Prevention Data Sheet 1-28 or specific FM approval.
   3. When re-roofing over steel decks, surface corrosion shall be removed, and repairs to severely corroded areas made. Loose or inadequately secured decking shall be fastened, and irreparable or otherwise defective decking shall be replaced.
   4. In all retrofit roof applications, it is required that deck be inspected for defects. Any defects are to be corrected per the deck manufacturer's recommendations prior to the new roof application.
   5. Existing metal roof panels' flutes are to be filled with flute filler insulation: EPS, XPS, or polyiso insulation. Flute insulation should fit snuggly between seams of the existing metal panels. Flute filler insulation thickness should be equivalent to the height of the metal panel seams

A. Structural Concrete Deck
   1. Minimum Min. 2,500 psi compressive resistance (98,066 kilogram-force/square centimeter)
   2. The deck must be smooth, level and cannot be wet or frozen. If deck is determined to be wet, it must be allowed to dry.
   3. Only poured in place concrete decks that provide bottom side drying are acceptable. Decks that are installed over non-vented metal decks or pans that remain in place may trap moisture in the deck beneath the roof system and are not acceptable.
   4. The roof deck shall be properly cured prior to application of the roofing system; twenty-eight (28) days is normally required for proper curing. Curing agents must be checked for compatibility with roofing materials. Prior to the installation of the roof assemblies, GAF® recommends the evaluation of the surface moisture and deck's dryness through the use of ASTM D-4263 or hot bitumen test.
   5. Treat cracks greater than 1/8" (3 mm) in width in accordance with the deck manufacturer's recommendations.
   6. Sumps for the roof drains shall be provided in the casting of the deck.
   7. In all retrofit roof applications, it is required that deck be inspected for defects. Any defects are to be corrected per the deck manufacturer's recommendations prior to the new roof application.

8. For Pre-Cast Concrete Decks
    a) Minimum 2” (51 mm) deck thickness
    b) Joints must be filled with a masonry grout to correct imperfections between slabs and feathered to provide a slope not greater than 1/8:12 adhered insulated assemblies.
    c) If the joints cannot be grouted and finished smooth, then a leveling course of lightweight insulating concrete (minimum 2" [51 mm] thickness) must be applied. Do not seal joints between the slabs; leave open to permit venting and drying of the roof fill from below.
9. For Pre-Stressed Concrete Decks
    a) GAF recommends a minimum 2" (51 mm) cellular lightweight concrete fill be installed over all pre-stressed concrete decks prior to installation of the roof system and/or insulation because variations in camber and thickness of pre-stressed concrete members may make securement of the roof system difficult.
    b) Provisions must be made for the curing or drying of the fill installed over the top of the pre-stressed deck members. Do not seal joints between the slabs; leave open to permit venting and drying of the roof fill from below.
10. For Poured Structural Concrete Decks
    a) Minimum 4” (102 mm) deck thickness
    b) Must be poured over removable forms or must provide for bottom side drying. Poured-in-place structural concrete decks that are poured over non-vented metal decks or pans that remain in place not acceptable.

B. Wood Deck (Plank / Heavy Timber)
1. Wood boards must be minimum 2” (51 mm) nominal thickness and have a nominal width of 4’-6”. Tongue and groove or shiplap lumber is preferred to square edge material since subsequent shrinkage or warping of square edge planks may cause ridging of the roof system above adjacent boards.
2. All boards must have a bearing on rafters at each end and be securely fastened.
3. Lumber shall be kiln dried.
4. Preservatives or fire retardants used to treat decking must be compatible with roofing materials.
5. Decking shall be kept dry and roofed promptly after installation.
6. Knotholes or large cracks in excess of ¼” (6 mm) shall be covered with securely nailed sheet metal.
7. Tape and staple fastening systems may be used on wood decks when they comply with local building codes and agencies
8. In all retrofit roof applications, it is required that deck be inspected for defects. Any defects are to be corrected per the deck manufacturer’s recommendations and standards of the APA/Engineered Wood Association prior to new roof application

C. Plywood Deck
1. Plywood sheathing must be exterior grade, minimum 4 ply, and not less than 3/4” (19 mm) 19/32” (Miami Dade County) thick.
2. Preservatives or fire retardants used to treat the decking must be compatible with roofing materials.
3. The deck must be installed over joists that are spaced 24” (610 mm) o.c. or less.
4. The deck must be installed so that all four sides of each panel bear on and are secured to joist and cross blocking. The panels must be secured in accordance with APA–The Engineered Wood Association recommendations “H” clips are not acceptable.
5. Panels must be installed with a 1/8” to 1/4” (3mm – 6mm) gap between panels and must match vertically at joints to within 1/8” (3mm).

6. Decking should be kept dry and roofed promptly after installation.
7. Deck shall be attached with approved fasteners at required spacing. Consult local building codes for specific requirements

D. Oriented Strand Board (OSB) Deck
   1. Oriented Strand Board must carry a Structural 1 rating if it is to be used as a decking material.
   2. Preservatives or fire retardants used to treat decking must be compatible with roofing materials.
   3. The deck must be installed over joists that are spaced 24" (610 mm) o.c. or less.
   4. The deck must be installed so that all four sides of each panel bear on and are secured to joist and cross blocking; the APA/Engineered Wood Association (APA) recommendations. "H" clips are not acceptable.
   5. Panels must be installed with a 1/8" to 1/4" (3mm – 6mm) gap between panels and must match vertically at joints to within (1/8" (3mm).
   6. Decking should be kept dry and roofed promptly after installation.

E. Lightweight Insulating Concrete Deck
   1. Insulating concrete decks are required to have a minimum thickness of 2" (52 mm), a minimum compressive strength of 125 psi (9 kg/cm) and a minimum density of 22 pcf (208 g/m^2). Individual deck manufacturer's standards apply when their specifications exceed the minimum thickness, compressive strength, or density requirements.
   2. The insulating deck/fill must be installed by an applicator approved by the deck manufacturer.
   3. The roof system shall be installed immediately following deck curing to prevent damage from exposure to precipitation. The deck manufacturer determines the minimum curing time and maximum exposure limitations.
   4. LWIC should not be poured during rainy periods. Deck areas that have frozen before they have cured must be removed and replaced. Decks which receive precipitation prior to installation of the roof membrane must be checked for moisture content and dryness.
   5. Where the mean January temperature (Reference current ASHRAE Fundamentals Handbook) is below 40^{o}F (4.4^{o}C), lightweight insulating concrete decks must be poured and roofed between April 1st and October 31st. This type of deck is unacceptable in Alaska.
   6. Cellular lightweight insulating concrete decks can be installed over non-slotted, galvanized metal decking designed for cellular lightweight insulating concrete or structural concrete.

F. Cementitious Wood Fiber
   1. Minimum 2" (51 mm) thickness
   2. Tongue & groove panel edges required
   3. Decks must be protected from the weather during storage and application; any wet or deformed decking should be removed and replaced.
   4. Cementitious wood fiber decks should not be installed over high humidity occupancies.
   5. Cementitious wood fiber decks must have a minimum design load as recommended by the manufacturer.
   6. All cementitious wood fiber deck panels must be anchored against uplift and lateral movement.
   7. The deck must be installed level. Any deflection, irregularities, or otherwise damaged panels must be corrected or replaced.
   8. All structural wood fiber deck panels must be anchored against uplift and lateral movement.

G. Gypsum

1. Gypsum decks must be smooth and free from deflections or ridges.
2. When installing base sheet fasteners, an average fastener withdrawal resistance as recommended by the fastener manufacturer must be obtained; however, at no time shall it be less than 40 lbs. (178 N) per fastener.
3. Wet or frozen poured gypsum decks are not suitable to receive a roof.
4. Poured-in-place gypsum roof decks contain a large percentage of moisture. All necessary precautions must be taken to avoid the entrapment of moisture under the roofing system. In addition to ventilation of the underside to allow for proper curing, topside and perimeter venting shall be implemented.

H. Loadmaster Decks
1. Roof deck must be installed by a Loadmaster-approved contractor according to Loadmaster specifications.
2. Min. 25 gauge steel decking, 15/16" (22 mm) deep with 1/2" thick (13 mm) mineral board top panel.
3. Polystyrene or polyisocyanurate insulation is optional.
4. Consult a GAF Field Services Manager for reroofing and re-covering requirements

3.02 NAILER INSTALLATION

A. Acceptable Material
1. Solid Blocking: Non-pressure treated wood as required, #2 Grade or better, nominal 1 1 /4" (30 mm) x 4" (102 mm) with a minimum thickness of 3 1 /2" (88 mm).
2. Shim Material: Plywood, 1 /2" (13 mm) x width to match solid blocking.
3. Verify the condition of existing roof nailers and anchor to resist 250 lb. per ft. (550 kg) load applied in any direction. New nailers should meet same load requirements.
4. DRILL-TEC™ HD screws 18" (457 mm) o.c. attachment to structural wood, steel decks with a 1" (25 mm) thread embedment.
5. DRILL-TEC™ spikes or HD screws 18" (457 mm) o.c. attachment to concrete decks. Min. 1" (25 mm) shank or thread penetration.
6. Wood nailers attached to gypsum, concrete, cellular concrete and cementitious wood fiber must be fastened 12" (305 mm) o.c., through the nailer into the substrate with substrate approved DRILL-TEC™ fasteners.
7. Three anchors per length of wood nailer minimum.

B. Metal Blocking
1. 20 Ga. galvanized steel box with pre-punched holes and supplied with corrosion-resistant fasteners.
2. Closure and finish strip required for metal decking.
3. Secure in place using provided #14 x 1½-in. universal fasteners through pre-punched holes to roof edge.
4. Install end cap and top of box section with #14 x 1½-in. universal fasteners.

3.03 INSTALLATION - GENERAL

A. Install GAF®'s EverGuard® TPO roofing system according to all current application requirements in addition to those listed in this section.

B. GAF® EverGuard® TPO Specification #:

C. Start the application of membrane plies at the low point of the roof or at the drains, so that the flow of water is over or parallel to, but never against the laps.

3.03 AIR/VAPOR BARRIER

A. GENERAL
   1. Air/vapor retarder components must typically be installed when required by design professional to address internal building air pressure or humidity conditions on the structural deck or directly over a minimal layer of EnergyGuard™ insulation or fire barrier.
   2. EnergyGuard™ insulation must be installed over the vapor retarder to raise the location of the dew point temperature above the level of the vapor retarder.
   3. Designers should consider requiring air retarders:
      a) On all air porous decks, with openings in the walls or area directly below the roof deck that exceeds 10% of the total wall area.
      b) When the internal pressurization of the building is in excess of 5 lbs. per sq. ft. (239 Pa).
      c) When the building height exceeds 50 ft. (30.5 m).
      d) When buildings have large openings or overhangs.
      e) In conditions where positive internal pressure is applied suddenly, as may be the case at aircraft hangers or distribution centers—otherwise, the roofing system may fail due to pressure impact.
   4. Refer to FM Global Loss Prevention Data Sheets 1-28 and 1-29 for specific installation procedures for all roofs with large openings.
   5. For roofs to be guaranteed by GAF:
      a) Air retarders are required for all extended-length guarantees on buildings where large wall openings greater than 10% of the total wall area can be open during a windstorm, including opening due to storm damage.

B. APPLICATION – LOOSE-APPLIED
   1. Install air/vapor barrier sheet loose-applied to the deck or fire board so that wrinkles and buckles are not formed.
   2. Overlap air/vapor barrier sheets a minimum of 6" for side and end laps. Tape laps together with duct tape or double sided tape.
   3. Seal perimeter and penetration areas with foam sealant.
   4. Seal all perimeter nailers with adhered roof membrane placed over the nailer and covering the exterior face of the nailer by 1" (25 mm).
   5. Install insulation boards over the air/vapor retarder and mechanically attach the boards to the deck.

C. APPLICATION – ADHERED
   1. Apply compatible adhesive to the structural deck or fire barrier board per air vapor retarder manufacturers' recommendations.
   2. Install the air/vapor retarder components loose applied to the deck or fire barrier board so that wrinkles and buckles are not formed. Broom air/vapor barrier components to ensure embedment into the adhesive.
   3. Overlap air/vapor retarder components a minimum of 6" (152 mm) for side and end laps. Adhere laps together with compatible adhesive.
   4. Seal perimeter and penetration areas with foam sealant.
   5. Install insulation boards over the air/vapor barrier and mechanically attach the boards to the deck or adhere the boards to the air/vapor retarder with compatible adhesive to achieve the desired roof system uplift resistance.

3.04 FIRE BARRIER/PROTECTION LAYER

A. GENERAL

1. Slip sheet protection layer must typically be installed when required by design professional or code authority to address code or approval requirements.
2. Fire resistant fiberglass sheet protection layer shall typically be installed when required by design professionals or code authority to address code or approval requirements or as a separator layer.
3. Install fiberglass sheet or polymat protection layer loose-applied over substrate surface so that wrinkles and buckles are not formed.
4. Overlap sheets a minimum of 6" (152 mm) for side and end laps.
5. Install VersaShield Solo loose-applied over substrate surface so that wrinkles and buckles are not formed.
6. GAF VersaShield® Solo™ protection layer should be installed perpendicular to the direction of the TPO membrane
7. Overlap membrane a minimum 2" (52 mm) at the side laps and minimum 4" (102 mm) at the end laps.
8. Use corrosive resistant nails with 1” (25.4 mm) diameter metal head or plastic caps to fasten in place. Only use enough fasteners to hold in place until primary roof covering is in place.
9. Do not install more VersaShield Solo than can be covered in one day.
10. The substrate must be clean, dry, and free of foreign matter.
11. Install GAF FireOut™ Fire Barrier coating at an application rate of one gallon per 100 sq. ft. (9.2 sq. m) via spray, brush, or roller.

3.04 INSULATION

A. GENERAL

1. Do not apply roof insulation or roofing until all other work trades have completed jobs that require them to traverse the deck on foot or with equipment. A vapor retarder coated lightly with asphalt may be applied to protect the inside of the structure prior to the insulation and final roofing installation. Before the application of the insulation, any damage or deterioration to the vapor retarder must be repaired.
2. Do not install wet, damaged or warped insulation boards.
3. Install insulation boards with staggered board joints in one direction (unless taping joint).
4. Install insulation boards snug. Gaps between board joints must not exceed ¼” (6 mm). All gaps in excess of ¼” (6 mm) must be filled with like insulation material.
5. Wood nailers must be 3-1/2” (89 mm) minimum width or 1” (25.4 mm) wider than metal flange. They shall be of equal thickness as the insulation, and be treated for rot resistance. All nailers must be securely fastened to the deck.
6. Do not kick insulation boards into place.
7. Miter and fill the edges of the insulation boards at ridges, valleys and other changes in plane to prevent open joints or irregular surfaces. Avoid breaking or crushing of the insulation at the corners.
8. Insulation should not be installed over new lightweight insulating concrete.
9. Roof tape, if required over insulation joints, must be laid evenly, smoothly and embedded in a uniform coating of hot steep asphalt with 4” (102 mm) end laps. Care must be taken to assure smooth application of tape, and full embedment of the tape in the asphalt.
10. Do not install any more insulation than will be completely waterproofed each day.

1. Overlay/re-cover boards may be installed using all full-size overlay boards in a staggered pattern. Overlay/re-cover boards include gypsum, DensDeck® and SECUROCK® roof board. If plywood or OSB is specified, it must be a minimum thickness of ¾" (19 mm). Overlay/re-cover boards are required when using EPS or XPS as the insulation system.
2. When installing the DRILL-TEC™ RhinoBond® Attachment System over tapered insulation, RhinoBond® plates are to be flat or flush against the insulation surface to ensure proper welding of the plate to the membrane. For this reason, it is preferable to install the tapered insulation first and cover the tapered system with an overlay/re-cover board.
3. Do NOT install insulation boards that are wet, warped, or buckled; they must be discarded. Insulation boards that are broken, cracked, or crushed shall not be installed unless the damaged area is first removed and discarded.
4. Remove and replace insulation boards that become wet or damaged after installation.
5. Install no more insulation than can be properly covered by the end of each day with roofing membrane.

B. INSULATION APPLICATION
1. The insulation must be securely attached to the roof deck. A minimum FMRC 1-60 attachment is recommended. Refer to FMRC Approval Guide for FM fastening patterns. Factory Mutual requires fastener density increased in corner areas for FM 1-60 as well as perimeter and corner area fastener density increases for FM 1-90 or greater. Refer to FM Loss Prevention Data Sheets 1-7, 1-28, and 1-49.
2. Use only fasteners with a minimum 3 inch (76 mm) stress plate when mechanically attaching insulation. Do not attach insulation with nails.
3. Apply LRF O Adhesive directly to the substrate using a ribbon pattern. Space beads as required by job specification, typically 6” or 12” (152 mm or 305 mm) o.c.
4. LRF O Adhesive should be approximately 70°F (22°C) when being dispensed. As adhesive is applied, allow the adhesive to begin rising, then place board.
5. The substrate must be free of and debris, dust, dirt, oil, grease, and standing water before applying the adhesive.
6. OlyBond 500 must be applied using the specially designed PaceCart dispenser. OlyBond 500 SpotShot shall be applied using one of the specially designed dual cartridge dispensers. OlyBond 500 Equipment Free Canister System dispenses with 25’ hose and gun assembly included with product.
7. Install insulation layers applied with bands of OlyBond 500 spaced 12” o.c. Approximate coverage rate is ½ to 1 gallon per 100 square feet, depending on the substrate. Allow the foam to rise ¾” to 1” (25.4 mm). Walk each board firmly into place. Stagger the joints of additional layers in relation to the insulation joints in the layer(s) below by a minimum of 6” (152 mm) to eliminate continuous vertical gaps.
8. The substrate must be free of debris, dust, dirt, oil, grease, and standing water before applying the adhesive.
9. Install insulation layers applied with 3/4” beads of Insta-Stik spaced 12” o.c. Press each board firmly into place. Stagger the joints of additional layers in relation to the insulation joints in the layer(s) below by a minimum of 6” (152 mm) to eliminate continuous vertical gaps.
10. Loose apply the base layer of insulation for subsequent layers to be simultaneously attached or for ballast applications. Minimal fastening should be performed to avoid movement of the boards.
11. Fill all flutes with a loose applied base layer of insulation. Insulation must be of equal height as metal ribs, seams or flutes to allow for subsequent layers to be applied without interference. Minimal fastening should be performed to avoid movement of the boards.

12. If subsequent layers of insulation are to be attached with insulation adhesive, the base layer must be mechanically attached with a minimum fastener density of 1 fastener every 2 square feet.

3.01 MEMBRANE APPLICATION

A. GENERAL

1. Substrates must be inspected and accepted by the contractor as suitable to receive and hold roof membrane materials.
2. Place roof membrane so that wrinkles and buckles are not formed. Any wrinkles or buckles must be removed from the sheet prior to permanent securement.
3. Membrane that has been exposed for more than 12 hours or has become contaminated will require additional cleaning methods.
   a) Light Contamination - Membrane that has been exposed overnight up to a few days to debris, foot traffic, or dew or light precipitation can usually be cleaned with a white cloth moistened with EverGuard® TPO Cleaner (or EverGuard® CleanWeld™ Conditioner, a low-VOC cleaner) for TPO membranes. For PVC, acetone or MEK (Methyl Ethyl Ketone) may be used. Be sure to wait for solvent to flash off prior to welding.
   b) Dirt-Based Contamination - Membrane that is dirt encrusted will require the use of a low-residue cleaner, such as Formula 409® and a mildly abrasive scrubbing pad to remove the dirt. This must be followed by cleaning with a white cloth moistened with EverGuard® TPO Cleaner (or EverGuard® CleanWeld™ Conditioner) for TPO membranes. For PVC, acetone or MEK may be used. Be sure to wait for solvent to flash off prior to welding.
   c) Exposure-Based Contamination - Membrane that is weathered or oxidized will require the use of EverGuard® TPO Cleaner, EverGuard® CleanWeld™ Conditioner, or acetone for PVC and a mildly abrasive scrubbing pad to remove the weathered/oxidized top surface layer. This must be followed by cleaning with a white cloth moistened with EverGuard® TPO Cleaner (or EverGuard® CleanWeld™ Conditioner) for TPO membranes. For PVC, acetone or MEK may be used. Unexposed membrane left in inventory for a year or more may need to be cleaned as instructed above. Be sure to wait for solvent to flash off prior to welding.
   d) Chemical-Based Contamination - Membrane that is contaminated with bonding adhesive, asphalt, flashing cement, grease and oil, and most other contaminants usually cannot be cleaned sufficiently to allow an adequate heat weld to the membrane surface. These membranes should be removed and replaced.

A. MECHANICALLY ATTACHED

1. Full-width rolls must be installed in the field of the roof. Half-width rolls must be installed in the perimeter region of the roof. Width of the roof perimeter region must be determined in accordance with the Perimeter half sheet calculation.

Building Width	Building Height	Number of EverGuard® TPO 60" (1.5 m) Half Sheets	Number of EverGuard® PVC 60" (1.5 m) Half Sheets	Number of EverGuard® TPO 72" (1.83 m) Half Sheets
<200' (61 m)	0-34' (0-10 m)	1	1	1
	35-100' (10-30 m)	2	2	2
	>100' (30 m)	**Formula Calulations:** Install half sheet throughout the perimeter and corner region. The width of this region is defined as the least of the following two measurements: 0.1 x building width or 0.4 x building height. **Note:** The minimum perimeter width is 4' (1.2 m). The width is defined as the narrowest dimension.		
≥200' (61 m)	any height			

2. Overlap roof membrane a minimum of 3" (76 mm) for end laps.
3. The membrane shall be mechanically fastened in the side lap area to the roof deck with appropriate DRILL-TEC™ fasteners and plates as required by roof system specification and/or Factory Mutual classification requirements.
4. Best practice is to install membrane so that the side laps run across the roof slope lapped toward drainage points.
5. All exposed sheet corners must be rounded a minimum of 1" (25 mm).
6. Use full-width rolls throughout the field and perimeter of the roof. Half sheets are not necessary.
7. Membrane laps shall be heat-welded together. All welds shall be continuous, without voids or partial welds. Welds shall be free of burns and scorch marks.
8. Weld shall be a minimum of 1” (25.4 mm) in width for automatic machine welding and a minimum 2” in width for hand welding,
9. Roof membrane must be mechanically attached along the base of walls with screws and plates 12” (305 mm) on center
10. Alternatively, membrane may be extended vertically 3" (75 mm) up walls and curbs and secured to the wall/ curb substrate within 2" (51 mm) of the plane of the roof. Use DRILL-TEC™ Fasteners and inverted termination bar of type and spacing in accordance with in-lap attachment requirements, with a 6" (152 mm) o.c. maximum spacing. Vertical attachment with seam plates and fasteners may also be used. This alternative detail is required to be used for pressurized buildings.
11. The metal plates must be placed within ¼” to ½” of the membrane edge. Plates shall not be placed less than ¼” from the membrane edge.
12. In the corner regions, additional fasteners shall be installed through the perimeter membrane to form a grid pattern, with an 8” (305 mm) wide EverGuard® TPO reinforced membrane flashing-strip welded over the additional fasteners. Corners include both outside and inside corners that measure 75 - 105 angle degrees.
13. Membrane attachment to the roof deck is required at locations of deck angle changes in excess of 1:12.
14. In the corner areas, additional fasteners will also be installed through the perimeter half-width membrane rolls to form a grid pattern, with an 8" (203 mm) wide reinforced membrane flashing strip heat-welded over the additional fasteners. "Corners" include both outside and inside corners that measure 75°-105°. Perimeter cap sheets may overlap one another in the corner areas. Alternatively, the half sheet may be laid out in a “picture frame” manner, burying the fasteners under the half sheets.

15. Roof membrane must be mechanically secured at the perimeter, at the base of internal walls and curbs, and at all penetrations with DRILL-TEC™ Membrane Fasteners and Plates at a 12" (305 mm) o.c. maximum spacing.
16. Membrane may be heat welded to coated metal flanges

B. MECHANICALLY ATTACHED METAL RETROFIT SYSTEM
1. Roof Slope no greater than 2:12 and maximum building height of 40 ft.
2. Overlap roof membrane a minimum of 6" (152 mm) for side laps of mechanically attached systems, and a minimum of 3" (76 mm) for end laps.
3. All exposed sheet corners must be rounded a minimum of 1" (25 mm).
4. The membrane shall be mechanically fastened in the side lap area to the roof deck with appropriate DRILL-TEC™ fasteners and plates as required by roof system specification and/or Factory Mutual classification requirements.
5. Use full-width rolls throughout the field and perimeter of the roof. Half sheets are not necessary.
6. Best practice is to install membrane so that the side laps run across the roof slope lapped toward drainage points. Depending on sheet orientation and placement of the fasteners into the purlins, fasteners may be located in the seams of the membrane or in the field of the sheet. Fasteners not located in the seams should be covered by an 8” (203 mm) wide flashing strip hot air welded to the membrane.
7. Membrane laps shall be heat-welded together. All welds shall be continuous, without voids or partial welds. Welds shall be free of burns and scorch marks
8. Place membrane so that wrinkles and buckles are not formed. Any wrinkles or buckles must be removed from the sheet prior to permanent attachment. Roof membrane shall be mechanically fastened immediately after it is rolled out, followed by welding to adjacent sheets.
9. Weld shall be a minimum of 1” (25.4 mm) in width for automatic machine welding and a minimum 2” (51 mm) in width for hand welding,
10. Roof membrane must be mechanically attached along the base of walls with screws and plates 12” (305 mm) on center
11. Alternatively, membrane may be extended vertically 3" (75 mm) up walls and curbs and secured to the wall/ curb substrate within 2" (51 mm) of the plane of the roof. Use DRILL-TEC™ Fasteners and inverted termination bar of type and spacing in accordance with in-lap attachment requirements, with a 6" (152 mm) o.c. maximum spacing. Vertical attachment with seam plates and fasteners may also be used. This alternative detail is required to be used for pressurized buildings.
12. The metal plates must be placed within ¼” to ½” of the membrane edge. Plates shall not be placed less than ¼” from the membrane edge.
13. In the corner regions, additional fasteners shall be installed through the perimeter membrane to form a grid pattern, with an 8” (305 mm) wide EverGuard® TPO reinforced membrane flashing-strip welded over the additional fasteners. Corners include both outside and inside corners that measure 75 - 105 angle degrees.
14. Membrane attachment to the roof deck is required at locations of deck angle changes in excess of 1:12
15. In the corner areas, additional fasteners will also be installed through the perimeter half-width membrane rolls to form a grid pattern, with an 8" (203 mm) wide reinforced membrane flashing strip heat-welded over the additional fasteners. "Corners" include both outside and inside corners that measure 75°-105°. Perimeter cap sheets may overlap one another in the corner areas. Alternatively, the half sheet may be laid out in a “picture frame” manner, burying the fasteners under the half sheets.

16. Roof membrane must be mechanically secured at the perimeter, at the base of internal walls and curbs, and at all penetrations with DRILL-TEC™ Membrane Fasteners and Plates at a 12" (305 mm) o.c. maximum spacing.
17. Membrane may be heat welded to coated metal flanges.

3.02 FLASHINGS

A. GENERAL

1. All penetrations must be at least 24” (610 mm) from curbs, walls, and edges to provide adequate space for proper flashing.
2. Flash all perimeter, curb, and penetration conditions with coated metal, membrane flashing, and flashing accessories as appropriate to the site condition.
3. All coated metal and membrane flashing corners shall be reinforced with preformed corners or non-reinforced membrane.
4. Heat-weld all flashing membranes, accessories, and coated metal. A minimum 2” (52 mm) wide hand weld or minimum 1” (25 mm) to 1-1/2" (39 mm) automatic machine weld is required.
5. Consult the EverGuard® *Application and Specifications Manual* or GAF® Technical Support Services for more information on specific construction details, or those not addressed in this section.
6. EverGuard Extreme® flashings and accessories are required for use with EverGuard Extreme® membranes.

B. COATED METAL FLASHINGS

1. Coated metal flashings shall be formed in accordance with current EverGuard® construction details and SMACNA guidelines.
2. Coated metal sections used for roof edging, base flashing and coping shall be butted together with a ¼” (7 mm) gap to allow for expansion and contraction. Heat-weld a 6” (152 mm) wide reinforced membrane flashing strip to both sides of the joint, with approximately 1” (25.4 mm) on either side of the joint left un-welded to allow for expansion and contraction. 2” (52 mm) wide aluminum tape can be installed over the joint as a bond-breaker, to prevent welding in this area.
3. Coated metal used for sealant pans, scupper inserts, corners of roof edging, base flashing and coping shall be overlapped or provided with separate metal pieces to create a continuous flange condition, and pop-riveted securely. Heat-weld a 6” (152 mm) wide reinforced membrane flashing strip over all seams that will not be sealed during subsequent flashing installation.
4. Provide a ½” (13 mm) hem for all exposed metal edges to provide corrosion protection and edge reinforcement for improved durability.
5. Provide a ½” (13 mm) hem for all metal flange edges whenever possible to prevent wearing of the roofing and flashing membranes at the flange edge.
6. Coated metal flashings shall be nailed to treated wood nailers or otherwise mechanically attached to the roof deck, wall or curb substrates, in accordance with construction detail requirements.

C. REINFORCED MEMBRANE FLASHINGS

1. The thickness of the flashing membrane shall be the same as the thickness of the roofing membrane.

2. Membrane flashing may either be installed loose or fully adhered to the substrate surface in accordance with “Construction Detail Requirements”.
3. Apply the adhesive only when outside temperature is above 40°F. Recommended minimum application temperature is 50°F to allow for easier adhesive application. Water-based adhesives are approved for use with smooth TPO membranes for flashings only
4. The membrane flashing shall be carefully positioned prior to application to avoid wrinkles and buckles.
5. Please note that solvent-based adhesives must be allowed to dry until tacky to the touch before mating flashing membrane. Water-based adhesive must be allowed to flash off completely.
6. Heat-weld all laps in EverGuard® smooth-reinforced flashing membrane in accordance with heat-welding guidelines. All seams in fleece-back membrane and smooth field sheet must be stripped in with 8" (203 mm) flashing strip.
7. For extended length guarantees, separate counter flashing is required; exposed termination bars are not acceptable

D. UN-REINFORCED MEMBRANE FLASHINGS
1. Un-reinforced membrane is used to field-fabricate penetration or reinforcement flashings in locations where preformed corners and pipe boots cannot be properly installed.
2. Penetration flashings constructed of un-reinforced membrane are typically installed in two sections, a horizontal piece that extends onto the roofing membrane and a vertical piece that extends up the penetration. The two pieces are overlapped and hot-air welded together.
3. Apply the adhesive only when outside temperature is above 40°F. Recommended minimum application temperature is 50°F to allow for easier adhesive application. Water-based adhesives are approved for use with smooth TPO membranes for flashings only
4. The membrane flashing shall be carefully positioned prior to application to avoid wrinkles and buckles.
5. Please note that solvent-based adhesives must be allowed to dry until tacky to the touch before mating flashing membrane. Water-based adhesive must be allowed to flash off completely.

E. ROOF EDGES
1. Roof edge flashings are applicable for gravel stop and drip edge conditions as well as for exterior edges of parapet walls.
2. Flash roof edges with coated metal flanged edging with a minimum 3" (76 mm) wide flange nailed 4" (102 mm) on center to wood nailers, and heat weld 8” (203 mm) membrane strip to metal flanges.
3. When the fascia width exceeds 4” (102 mm), coated metal roof edging must be attached with a continuous cleat to secure the lower fascia edge. The cleat must be secured to the building no less than 12” (305 mm) o.c.
4. Flash roof edge scuppers with a coated metal insert that is mechanically attached to the roof edge and integrated as a part of the metal edging.
5. Alternatively, roof edges may be flashed with a 2-piece snap on fascia system, adhering the roof membrane to a metal cant and face nailing the membrane 8” (152 mm) on center prior to installing a snap-on fascia.
    a) Submit design drawings for review and approval to Architect or Specifier before fabrication.
    b) Installing contractor shall check as-built conditions and verify the manufacturer’s roof edging details for accuracy to fit the wall assembly prior to fabrication. The installer shall comply with the roof edging manufacturer’s installation guide when setting edging.

F. PARAPET AND BUILDING WALLS
1. Flash walls with EverGuard® TPO membrane adhered to the substrate with bonding adhesive, loose applied or with coated metal flashing nailed 4” (102 mm) on center to pressure-treated wood nailers.
2. Maximum flashing height without intermediate fastening is 24" (610 mm) for loose-applied flashing and 54" (1.4 m) for adhered flashing
3. Secure membrane flashing at the top edge with a termination bar. EverGuard® Water Block shall be applied between the wall surface and membrane flashing underneath all exposed termination bars. Exposed termination bars shall be mechanically fastened 6” (152 mm) on center for guarantees less than 20 years and 12” (305 mm) on center for guarantees greater than 20 years or that are counter-flashed.
4. Exposed termination bars must be sealed with Flexseal™ Caulk Grade Sealant.
5. Roof membrane must be mechanically attached along the base of walls with screws and plates 12” (305 mm) on center [6” (152 mm) on center for Ballasted Systems]
6. Metal cap flashings must have continuous cleats or be face fastened 12" (305 mm) o.c. on both the inside and outside of the walls.
7. Flash wall scuppers with a coated metal insert that is mechanically attached to the wall and integrated as part of the wall flashing.

G. CURBS AND DUCTS
1. Flash curbs and ducts with EverGuard® TPO membrane adhered to the curb substrate with bonding adhesive, loose applied or with coated metal flashing nailed 4” on center to pressure-treated wood nailers.
2. Maximum flashing height without intermediate fastening is 24" (610 mm) for loose-applied flashing and 54" (1.4 m) for adhered flashing
3. Secure membrane flashing at the top edge with a termination bar. EverGuard® Water Block shall be applied between the wall surface and membrane flashing underneath all exposed termination bars. Exposed termination bars shall be mechanically fastened 6” (152 mm) on center for guarantees less than 20 years and 12” (305 mm) on center for guarantees greater than 20 years or that are counter-flashed.
4. Exposed termination bars must be sealed with Flexseal™ Caulk Grade Sealant.
5. Roof membrane must be mechanically attached along the base of walls with screws and plates 12” (305 mm) on center [6” (152 mm) on center for Ballasted Systems]
6. Metal counterflashing may be optional with fully adhered flashings depending on guarantee requirements. Exposed termination bars must be sealed with Flexseal™ Roofing Cement.
7. All coated metal curb flashings and loose applied membrane flashings must be provided with separate metal counterflashings, or metal copings

H. ROOF DRAINS
1. Roof drains must be fitted with compression type clamping rings and strainer baskets. Original-type cast iron and aluminum drains, as well as retrofit-type cast iron, aluminum or molded plastic drains are acceptable.
2. Roof drains must be provided with a minimum 36” x 36” (914 mm x 914 mm) sump if applicable. Slope of tapered insulation within the sump shall not exceed 4” in 12”.
3. Extend the roofing membrane over the drain opening. Locate the drain and cut a hole in the roofing membrane directly over the drain opening. Provide a ½” (13 mm) of membrane flap extending past the drain flange into the drain opening. Punch holes through the roofing membrane at drain bolt locations.

4. For cast iron and aluminum drains, the roofing membrane must be set in a full bed of FlexSeal™ Caulk Grade Sealant on the drain flange prior to securement with the compression clamping ring. Typical application is one 10.5 ounce cartridge of FlexSeal™ Caulk Grade Sealant per drain.
5. Lap seams shall not be located within the sump area. Where lap seams will be located within the sump area, a separate smooth membrane drain flashing a minimum of 12” (305 mm) larger than the sump area must be installed. The membrane flashing must be heat-welded to the roof membrane. Alternately, if the seam does not run under the clamping ring, it can be covered with a 6" (152 mm) wide reinforced-membrane strip heat-welded to the membrane.
6. Tighten the drain compression ring in place.

I. EXPANSION JOINTS
1. Any prefabricated expansion joint metal nailing strips must be fastened to wood nailers, curbs or secured to walls with appropriate nails or EverGuard® DRILL-TEC™ Fasteners.
2. Roof membrane must be mechanically attached along the base of raised curb-expansion joints with screws and plates a minimum of 12" (305 mm) o.c. The expansion joint cover bellows shall be at least 2 times the expansion joint opening.
3. Metal nailing strip must be set in FlexSeal™ Caulk Grade Sealant and secured with fasteners and neoprene washers fastened 6" (152 mm) o.c
4. Expansion joints may be field fabricated. Reference appropriate Construction Detail.

J. SCUPPERS
1. Coated-metal roof-edge scuppers must be provided with a min. 4" (102 mm) wide flange nailed to wood nailers, with hemmed edges and secured with continuous clips in accordance with the gravel stop assembly.
2. Coated-metal wall scuppers must be provided with 4" (102 mm) wide flanges, with additional corner pieces pop-riveted to the flanges to create a continuous flange. All flange corners must be rounded.
3. Install wall scuppers over the roof and flashing membrane and secure to the roof deck/wall with DRILL-TEC™ Fasteners 6" (152 mm) o.c., a minimum of 2 fasteners per side.
4. All corners must be reinforced with EverGuard® PVC or EverGuard® TPO Universal Corners or field-fabricated from EverGuard® non-reinforced materials.
5. Strip-in scupper with flashing membrane target sheet.
6. Alternately, a wall scupper box may be field-flashed using non-reinforced flashing membrane heat-welded to membrane on the wall face and roof deck. Fully adhere to the scupper box and terminate on the outside wall face with a termination bar and FlexSeal™ Caulk Grade sealant.
7. EverGuard® TPO has prefabricated scuppers in standard and custom sizes available.

K. WOOD SUPPORT BLOCKING
1. Wood support blocking, typically 4" x 4" (102 mm x 102 mm), is usually installed under light-duty or temporary roof-mounted equipment, such as electrical conduit, gas lines, condensation and drain lines.
2. Install wood support blocking over a protective layer of EverGuard® TPO walkway rolls or PVC walkway pads. Place wood blocking on oversized slip sheet, fold two sides vertically, and fasten with roofing nails into the blocking.

3.03 TRAFFIC PROTECTION

A. Install walkway pads at all roof access locations and other designated locations including roof-mounted equipment work locations and areas of repeated rooftop traffic.

B. Walkway rolls or pads must be spaced 6" (152 mm) apart to allow for drainage between the pads.

C. Heat-weld walkway rolls or pads to the roof membrane surface continuously around the perimeter of the pad/roll.

3.04 ROOF PROTECTION

A. Protect all partially and fully completed roofing work from other trades until completion.

B. Whenever possible, stage materials in such a manner that foot traffic is minimized over completed roof areas.

C. When it is not possible to stage materials away from locations where partial or complete installation has taken place, temporary walkways and platforms shall be installed in order to protect all completed roof areas from traffic and point loading during the application process.

D. Temporary tie-ins shall be installed at the end of each workday and removed prior to commencement of work the following day.

3.05 CLEAN-UP

A. All work areas are to be kept clean, clear and free of debris at all times.

B. Do not allow trash, waste, or debris to collect on the roof. These items shall be removed from the roof on a daily basis.

C. All tools and unused materials must be collected at the end of each workday and stored properly off of the finished roof surface and protected from exposure to the elements.

D. Dispose of or recycle all trash and excess material in a manner conforming to current EPA regulations and local laws.

E. Properly clean the finished roof surface after completion, and make sure the drains and gutters are not clogged.

F. Clean and restore all damaged surfaces to their original condition.

3.06 MAINTENANCE

A. Inspections to the roof shall be performed annually by a GAF® Master Select™ contractor.

B. An annual roofing system maintenance program shall be performed by a Master Select™ contractor in accordance with GAF®'s 10 Point Maintenance Program provided with your Diamond Pledge™ guarantee.

C. Submit copies of the roof inspection form, accompanying photographs (a minimum of 6 photos showing the condition of the roof and critical details), and a record of all roofing system maintenance to the GAF® Technical Support Services Department within sixty (60) days of the anniversary date of the completion of the roofing system. Annual roof inspections must be started within the first two (2) years of the guarantee term.

END OF SECTION 075423

SECTION 076200 - FLASHING AND SHEET METAL

PART 1 GENERAL

1.01 SUMMARY

A. Provide flashing and sheet metal.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 MATERIALS

A. Applications:

1. Metal counter-flashing and base flashing.
2. Exterior wall flashing and expansion joints.
3. Built-in metal valleys, gutters, and scuppers.
4. Exposed metal trim and fascia units.
5. Sheet metal accessories.
6. Ridge and soffit vents.

B. Sheet Metal Flashing and Trim:

1. Zinc-Coated Steel: ASTM A 653, G90 hot-dip galvanized, 20 gauge (.0359 inch).

C. Fabricated Units: Compliance with SMACNA Sheet Metal Manual.

D. Sheet Metal:

1. Painted 12” metal barrier at foundation rigid insulation to below grade.
2. Base sheet at utility closets.

E. Ridge and Soffit Vents:

1. Continuous aluminum strip soffit vents.

PART 3 EXECUTION

3.01 INSTALLATION

A. Follow recommendations of SMACNA Sheet Metal Manual. Allow for expansion. Isolate dissimilar materials.

B. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.

C. Restore damaged components and finishes. Clean and protect work from damage.

END OF SECTION 076200

SECTION 077100 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data, Shop Drawings, and color Samples.

B. Warranties: Provide manufacturer's standard written warranty, without monetary limitation, signed by manufacturer agreeing to promptly repair or replace roof specialties that show evidence of deterioration of factory-applied finishes for the period of 20 years.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. SPRI Wind Design Standard: Manufacture and install copings tested according to IBC or SPRI ES-1 and capable of resisting design pressures indicated on Drawings.

2.2 ROOF SPECIALTIES

A. Gutters and Downspouts:

1. 5” Gutters: Manufactured in uniform section lengths, with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch above front edge. Furnish expansion joints and expansion-joint covers.

    a. Gutter Style: Rectangular
    b. Aluminum: 0.050 inch
    c. Prepainted, Zinc-Coated Steel: 0.028 inch
    d. Gutter Supports: Gutter brackets, Straps, Manufacturer's standard supports

2. Downspouts: Plain rectangular, Corrugated rectangular with mitered elbows. Furnish wall brackets of same material and finish as downspouts, with anchors.

    a. Formed Aluminum: 0.050 inch
    b. Extruded Aluminum: 0.125 inch
    c. Prepainted, Zinc-Coated Steel: 0.028 inch

B. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces. Provide reglets with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.

1. Formed Aluminum: 0.024 inch
2. Stainless Steel: 0.019 inch
3. Zinc-Coated Steel: Nominal 0.022-inch

C. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches (100 mm) designed to snap into reglets or through-wall-flashing receiver and compress against base flashings with joints lapped.
   1. Stainless Steel: 0.019 inch
   2. Zinc-Coated Steel: Nominal 0.022-inch

2.3 MATERIALS

A. Finishes:
   1. Application: Factory-applied
   2. Finish: Fluoropolymer, Kynar 500

B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer for finish required.

C. Aluminum Extrusions: ASTM B 221, alloy and temper as recommended by manufacturer for use and finish indicated.

D. Aluminum Finish: Class I, clear anodic finish; complying with AAMA 611

E. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304,

F. Prepainted, Zinc-Coated Steel Sheet: ASTM A 653/A 653M, G90 coating designation. Prepare, pretreat, and apply coating to comply with ASTM A 755/A 755M.

   1. Finish: Manufacturer's standard two-coat fluoropolymer system with color coat containing not less than 70 percent PVDF resin by weight; complying with AAMA 621 SMACNA recommends No. 30 felt or self-adhering sheet underlayment.

G. Felt Underlayment: ASTM D 226/D 226M, Type II (No. 30) asphalt-saturated organic felts.

H. Self-Adhering Sheet Underlayment, High Temperature: Butyl or SBS-modified asphalt; slip-resisting-polyethylene surfaced; with release paper backing; cold applied. Stable after testing at 240 deg F and passes after testing at minus 20 deg F ASTM D 1970.

I. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements.

   1. Exposed Penetrating Fasteners: Gasketed screws with heads matching color of metal.
   2. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
   3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
   4. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel.

J. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant.

K. Butyl Sealant: ASTM C 1311, solvent-release butyl rubber sealant.

L. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement.

B. Isolate dissimilar metals to prevent galvanic corrosion.

C. Coat back side of stainless-steel roof specialties with bituminous coating where they will contact wood, ferrous metal, or cementitious construction.

D. Separate dissimilar metals with a bituminous coating or polymer-modified, bituminous sheet underlayment.

E. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

F. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless indicated.

G. Fastener Sizes: Use fasteners of sizes that will penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

H. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches except where pretinned surface would show in finished Work.

I. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 24 inches. Attach ends with rivets and solder to make watertight. Slope to downspouts.

J. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1500 mm) o.c.

K. Test and operate units; clean, lubricate and adjust moving parts.

L. Reglets: Install reglets to receive flashings where flashing without embedded reglets is indicated on Drawings. Install at height so that inserted counterflashings overlap 4 inches (100 mm) over top edge of base flashings.

END OF SECTION 077100

SECTION 079200 - JOINT SEALANTS

PART 1 GENERAL

1.01 SUMMARY

A. Provide joint sealers in the following interior and exterior vertical and horizontal non-traffic surfaces.

1. Construction joints in cast-in-place concrete.
2. Control and expansion joints in unit masonry.
3. Control and expansion joints in stucco systems.
4. Joints between metal panels.
5. Joints between different materials listed above.
6. Perimeter joints between materials listed above and frames of doors, windows and louvers.
7. Control and expansion joints in ceilings and other overhead surfaces.
8. Other joints as indicated.

B. Provide joint sealers in the following exterior horizontal traffic joints.

1. Control and expansion joints in brick pavers.
2. Isolation and contraction joints in cast-in-place concrete slabs.
3. Joints between plant-precast architectural concrete paving units.
4. Joints in stone paving units, including steps.
5. Tile control and expansion joints.
6. Joints between different materials listed above.
7. Other joints as indicated.

C. All wall and roof penetrations and joints are sealed and caulked.

D. Caulk all sill plates.

E. Panelized wall systems to be caulked and sealed.

F. All penetrations in sill plates, top plates are sealed.

G. Air seal around all fenestrations, gaps and cracks with caulk or foam.

H. Seal all gaps and cracks in exterior.

I. Sill plate to be sealed with sill seal and caulk.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

B. Include manufacturer’s full range of color and finish options if additional selection is required.

C. Enterprise Green Communities: Provide relevant product stamps, certification labels or literature. Provide a signed Accountability Form.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations.

B. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years.

C. Use experienced installers.

D. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 MATERIALS

A. Urethane Elastomeric Joint Sealants:

1. Manufacturers: Vulcem, Pecora Corp., Sika Corp., Tremco or approved equal.
2. Type and Application: One-part nonsag urethane sealant, ASTM C 920:
   a. Application: For joints in vertical and horizontal surfaces.
   b. Exterior use.

B. Silicone Elastomeric Joint Sealants:

1. Manufacturers: Dow Corning, GE Silicones, Tremco, or approved equal.
2. Type and Application: One-part nonacid-curing silicone sealant, ASTM C 920, modulus as required for application:
   a. Application: For joints in vertical and horizontal surfaces.
   b. Exterior and interior use.

C. Latex Joint Sealants:

1. Manufacturers: DAP, Pecora Corporation, Polymeric Systems, Inc., Sonneborn Building Products, Tremco, or approved equal.
2. Type: Acrylic-emulsion, ASTM C 834.
3. Type: Silicone emulsion, ASTM C 834, and ASTM C 920.
4. Application: Interior joints in vertical and overhead surfaces with limited movement.

D. Auxiliary Materials:

1. Plastic foam joint fillers.
2. Elastomeric tubing backer rods.
3. Bond breaker tape.

PART 3 EXECUTION

3.01 INSTALLATION

A. Examine substrate; report unsatisfactory conditions in writing. Beginning work means acceptance of substrates.

B. Provide sealants in colors as selected from manufacturer's standards.

C. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with

uniform appearance. Coordinate with work of other sections. Clean and prime joints, and install bond breakers, backer rods and sealant as recommended by manufacturers.

D. Depth shall equal width up to 1/2" wide; depth shall equal 1/2 width for joints over 1/2" wide.

E. Cure and protect sealants as directed by manufacturers. Replace or restore damaged sealants. Clean adjacent surfaces to remove spillage.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

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. Standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Louvers installed in hollow metal doors.
4. Light frames and glazing installed in hollow metal doors.

B. Related Sections:

1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
2. Division 08 Section “Flush Wood Doors”.
3. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
4. Division 08 Section "Door Hardware".
5. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.

11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.

B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of anchorages, joints, field splices, and connections.
6. Details of accessories.
7. Details of moldings, removable stops, and glazing.
8. Details of conduit and preparations for power, signal, and control systems.

D. Samples for Verification:

1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40” above sill) or UL 10C.

1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
3. Smoke Control Door Assemblies: Comply with NFPA 105.

    a. Smoke "S" Label: Doors to bear “S” label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.

E. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:

1. CECO Door Products (C).
2. Curries Company (CU).

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.

B. Exterior Doors: Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard vertical steel-stiffener core. Minimum 22 gauge steel-stiffeners at 6 inches on-center construction attached by spot welds spaced not more than 5" on centers. Spaces between stiffeners filled with fiberglass insulation (minimum density 0.8#/cubic ft.).
3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053-inch - 1.3-mm) thick steel, Model 2.
4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Manufacturers Basis of Design:

1. Curries Company (CU) - Steel-Stiffened - 747 Series.

2.4 LOUVERS

A. Metal Louvers: Unless otherwise indicated provide louvers to meet the following requirements.

1. Blade Type: Vision proof inverted V or inverted Y.
2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

B. Louvers for Fire Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire protection rating of 1-1/2 hours and less.

1. Manufacturers: Subject to compliance with requirements, provide louvers to meet rating indicated.
2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

2.5 LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator’s shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.

C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.

D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.6 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.7 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical,

fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:

1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.

D. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.8 STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

    a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
    b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
    c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
    d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

END OF SECTION 081113

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. SUBMITTALS: Samples for factory-finished doors and warrantee.

B. HERS Certification:
   1. All main floor interior passage doors in each residential unit will have 32” of clear passage space.
   2. At the bath on the main floor of the unit, a minimum area of 32” by 48” area beyond the swing of the door shall be provided.

C. QUALITY ASSURANCE:
   1. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
   2. Quality Standards: NWWDA I.S. 1A, and AWI Architectural Quality Standards.

PART 2 - PRODUCTS

2.1 FLUSH WOOD DOORS

2.2 DOOR CONSTRUCTION, GENERAL

A. Quality Standard: WDMA I.S.1-A.

B. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.

C. WDMA I.S.1-A Performance Grade:

   1. Extra Heavy Duty: Public toilets, Janitor's closets, Storage, Offices
   2. Standard Duty: Residential

D. Fire-Rated Wood Doors: Labeled by a testing and inspecting agency acceptable to authorities having jurisdiction based on testing at positive pressure according to NFPA 252 or UL 10C.

   1. Where indicated (Maintenance, Storage and under stair Storage), provide doors that have a temperature rise rating of 450 deg F.
   2. Provide core specified or mineral core as needed to provide fire-protection rating indicated.

E. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.

F. Particleboard-Core Doors: Provide blocking in particleboard cores or provide structural composite lumber cores instead of particleboard cores for doors with exit devices or protection plates.

2.3 FLUSH WOOD DOORS

A. Veneer-Faced Doors for Transparent Finish:

1. Interior Solid-Core Doors: particleboard cores.

a. Faces: Grade A rotary-cut select white birch.
b. Veneer Matching: Slip and running match.

B. Hollow Core Doors:

1. Interior Hollow-Core Doors: Economy grade, hollow cores with lock blocks on both sides.
a. Faces: 6 panel, wood grain texture
b. Finish: Pre-primed and painted on site.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install doors to comply with manufacturer's written instructions and WDMA I.S.1-A, and as indicated.

1. Install fire-rated doors to comply with NFPA 80.
2. Install smoke- and draft-control doors according to NFPA 105.

B. Align and fit doors in frames with uniform clearances and bevels. Machine doors for hardware. Seal cut surfaces after fitting and machining.

C. Clearances: As follows unless otherwise indicated:

1. 1/8 inch at heads, jambs, and between pairs of doors.
2. 1/8 inch from bottom of door to top of decorative floor finish or covering.
3. 1/4 inch from bottom of door to top of threshold.
4. Comply with NFPA 80 for fire-rated doors.

END OF SECTION 081416

SECTION 083213 - SLIDING ALUMINUM-FRAMED GLASS DOORS

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 Kawneer sliding aluminum-framed glass doors, including factory glazing, operating hardware and accessories designed for exterior applications.
   1. Types of sliding aluminum-framed glass doors include:
      a. Kawneer Series 990 Sliding Door
      b. SD-C-60

A. Related Sections:
   1. 072700 “Air Barriers”
   2. 079200 “Joint Sealants”
   3. 084113 “Aluminum-Framed Entrances and Storefronts”
   4. 084313 "Aluminum-Framed Storefronts"
   5. 084329 “Sliding Storefronts”
   6. 084413 “Glazed Aluminum Curtain Walls”
   7. 084433 “Sloped Glazing Assemblies”
   8. 085113 “Aluminum Windows”
   9. 086300 “Metal-Framed Skylights”
   10. 087000 "Hardware"
   11. 088000 “Glazing”
   12. 280000 “Electronic Safety and Security”

1.3 Definitions

A. Definitions: For fenestration industry standard terminology and definitions refer to American Architectural Manufacturers Association (AAMA) – AAMA Glossary (AAMA AG).

1.4 Performance Requirements

A. General Performance: Sliding aluminum-framed glass door system shall withstand the effects of the following performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Sliding Aluminum-Framed Glass Door Performance Requirements:

   1. Performance Requirements: Provide sliding aluminum-framed glass doors of performance indicated that comply with AAMA/WDMA/CSA 101/I.S.2/A440 (NAFS).
      a. Performance Class and Grade: SD-C-60

   2. Wind loads: Provide sliding door system; include anchorage, capable of withstanding wind load design pressures of (____) lbs./sq. ft. inward and (____) lbs./sq. ft. outward. The design pressures are based on the (____) Building Code; (____) Edition.

   3. Air Infiltration: The test specimen shall be tested in accordance with ASTM E 283. The air infiltration rate shall not exceed 0.30 cfm/ft^2 (1.5 L/s•m^2) at a static air pressure differential of 1.57 psf (75 Pa).

4. Water Resistance: The test specimen shall be tested in accordance with ASTM E 547 and ASTM E 331. There shall be no leakage as defined in the test method at a static air pressure differential of 10 psf (480 Pa).
5. Forced Entry Resistance: Comply with Performance Grade 10 requirements when tested according to ASTM F 842.
6. Operating Force: Tested according to and complying with ASTM E2068.

C. Environmental Product Declaration (EPD): Shall have a Type III Product-Specific EPD created from a Product Category Rule.

1.5 Submittals

A. Product Data: Include construction details, material descriptions, and fabrication methods, dimensions of individual components and profiles, hardware, finishes, and installation instructions for each type of sliding aluminum-framed glass doors indicated.
   1. Recycled Content:
      a. Provide documentation that aluminum has a minimum of 50% mixed pre- and post-consumer recycled content with a sample document illustrating project specific information that will be provided after product shipment.
      b. Once product has shipped, provide project specific recycled content information, including:
         1) Indicate recycled content; indicate percentage of pre- and post-consumer recycled content per unit of product.
         2) Indicate relative dollar value of recycled content product to total dollar value of product included in project.
         3) Indicate location recovery of recycled content.
         4) Indicate location of manufacturing facility.
   2. Environmental Product Declaration (EPD).
      a. Include a Type III Product-Specific EPD created from a Product Category Rule.

B. Shop Drawings: Include plans, elevations, sections, details, hardware, and attachments to other work, operational clearances and installation details.

C. Samples for Initial Selection: For units with factory-applied color finishes including samples of hardware and accessories involving color selection.

D. Samples for Verification: For sliding aluminum-framed glass door and components required.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for each type, class, grade, and size of sliding aluminum-framed glass doors. Test results based on use of downsized test units will not be accepted.

F. Other Action Submittals:
   1. Sliding Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of sliding door hardware, as well as procedures and diagrams. Coordinate final sliding door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of sliding door hardware.

1.6 Quality Assurance

A. Installer Qualifications: An installer which has had successful experience with installation of the same or similar units required for the project and other projects of similar size and scope.

B. Manufacturer Qualifications: A manufacturer capable of fabricating sliding aluminum-framed glass doors and storefronts that meet or exceed performance requirements indicated and of documenting this performance by inclusion of test reports, and calculations.

C. Source Limitations: Obtain sliding aluminum-framed glass door through one source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of sliding aluminum-framed glass doors and are based on the specific system indicated. Refer to Division 01 Section “Product Requirements”. Do not modify size and dimensional requirements.
   1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockup for type(s) of sliding aluminum-framed glass door(s) indicated, in location(s) shown on Drawings.

F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section “Project Management and Coordination”.

1.7 Project Conditions

A. Field Measurements: Verify actual dimensions of sliding aluminum-framed glass door openings by field measurements before fabrication and indicate field measurements on Shop Drawings.

1.8 Warranty

A. Manufacturer’s Warranty: Submit, for Owner’s acceptance, manufacturer’s standard warranty.
   1. Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by manufacturer.

PART 2 - PRODUCTS

2.1 Manufacturers

A. Basis-of-Design Product:
   1. Kawneer Company Inc.
   2. Series 990 Sliding Doors
   3. SD-C-60
   4. Product Literature and Drawings: Submit product literature and drawings modified to suit specific project requirements and job conditions.
   5. Certificates: Submit certificate(s) certifying substitute manufacturer (1) attesting to adherence to specification requirements for sliding aluminum-framed glass door system performance criteria, and (2) has been engaged in the design, manufacturer and fabrication of sliding aluminum-framed glass doors for a period of not less than ten (10) years. (Company Name)
   6. Test Reports: Submit test reports verifying compliance with each test requirement required by the project.
   7. Samples: Provide samples of typical product sections and finish samples in manufacturer's standard sizes.

B. Substitution Acceptance: Acceptance will be in written form, either as an addendum or modification, and documented by a formal change order signed by the Owner and Contractor.

2.2 Materials

A. Aluminum Extrusions: Alloy and temper recommended by sliding aluminum-framed glass door manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.070" (1.8 mm) wall thickness at any location for the main frame and sash members.
   1. Recycled Content: Shall have a minimum of 50% mixed pre- and post-consumer recycled content.
      a. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
      b. Indicate relative dollar value of recycled content product to total dollar value of product included in project.
      c. Indicate location recovery of recycled content.
      d. Indicate location of manufacturing facility.

B. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with sliding aluminum-framed glass door members, trim hardware, anchors, and other components.

C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

E. Sliding-Type Weather Stripping: Provide woven-pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric. Comply with AAMA 701/702.
   1. Weather Seals: Provide weather stripping with integral barrier fin or fins of semi-rigid, polypropylene sheet or polypropylene-coated material. Comply with AAMA 701/702.

F. Sealant: For sealants required within fabricated sliding door, provide sliding door manufacturer's standard, permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.

2.3 Sliding Door

A. Sliding Aluminum-Framed Glass Doors:
   1. 990 Sliding Doors.
   2. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
   3. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Where exposed shall be stainless steel.
   4. Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.
   5. Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
   6. Storage and Protection: Store sliding door materials protected from exposure to harmful weather conditions. Handle material and components to avoid damage. Protect material against

damage from elements, construction activities, and other hazards before, during and after sliding door installation.

2.4 Glazing

A. Glazing System: Refer to Division 08 Section “Glazing” for glass units and glazing requirements applicable to glazed sliding aluminum-framed glass doors units.

B. Glazing System: Glazing method shall be a channel type PVC gasket (marine glazed) which is compatible with aluminum and shall be resistant to deterioration by all forms of weathering and suitably retained to maintain a watertight seal between the glass and the surrounding frame.

2.5 Hardware

A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock sliding aluminum-framed glass doors.

B. Standard Hardware:
1. One pair of stainless steel tandem rollers per sliding panel.
2. Stainless steel roller track.
3. Adams Rite 1847 Stainless Steel Deadlock.
4. Blank extruded pull handle exterior.
5. Extruded pull with slide operator interior.

C. Optional Hardware:
1. Adams Rite MS 1850A-505 Hookbolt Lock.
2. Mortise cylinder, interior or exterior.
3. Thumb turn, interior.
4. Flush pull blank or with cylinder exterior.
5. Flush pull blank or with slide operator interior.

2.6 Insect Screens

A. Optional Insect Screens: Extruded aluminum frames, joined at corners: 18 x 16 mesh fiberglass screen cloth; frames finished to match aluminum sliding doors; splines shall be extruded vinyl, removable to permit rescreening.

B. Hardware: Manufacturer's standard flush pull, adjustable stainless steel or steel rollers and continuous EPDM closure strip at jamb.

2.7 Fabrication

A. Fabricate sliding aluminum-framed glass doors in sizes indicated. Include a complete system for assembling components and anchoring doors.

B. Fabricate sliding aluminum-framed glass doors that are reglazable without dismantling perimeter framing.
1. Master Frame: Joined together with butt type joints, neatly sealed and assembled by a minimum of 2 stainless steel fasteners per joint anchored into continuous integral screw raceways.
2. Sliding Panels: Shall have coped butt type joinery secured with stainless steel fasteners. Sliding panels shall not be removable when in a locked position.
3. Fixed Panels: Shall have coped butt type joinery secured with stainless steel fasteners.

C. Weather Stripping: Provide weather stripping locked into extruded grooves in door panels or frames as indicated on manufactures drawings and details.

D. Weep Holes: Provide weep holes and internal drainage passages to conduct infiltrating water to exterior as detailed.

E. Factory-Glazed Fabrication: Glaze sliding aluminum-framed glass doors in the factory where practical and possible for applications indicated. Comply with requirements in Division 08 Section "Glazing" and with AAMA/WDMA/CSA 101/I.S.2/A440.

2.8 Finishes, General

A. Comply with AAMA-AFPA “Anodic Finishes/Painted Aluminum” for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.9 Aluminum Finishes

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Factory Finishing:
1. Kawneer Permanodic™ AA-M10C21A44 / AA-M45C22A44, AAMA 611, Architectural Class I Color Anodic Coating (Color _____).
2. Kawneer Permanodic™ AA-M10C21A41 / AA-M45C22A41, AAMA 611, Architectural Class I Clear Anodic Coating (Color #14 Clear) (Optional).
3. Kawneer Permanodic™ AA-M10C21A31, AAMA 611, Architectural Class II Clear Anodic Coating (Color #17 Clear) (Standard).
4. Kawneer Permafluor™ (70% PVDF), AAMA 2605, Fluoropolymer Coating (Color _____).
5. Kawneer Permadize™ (50% PVDF), AAMA 2604, Fluoropolymer Coating (Color _____).
6. Kawneer Permacoat™ AAMA 2604, Powder Coating (Color _____)

PART 3 - EXECUTION

3.1 Examination

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weather tight sliding door installation.
1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches (76.2 mm) of opening.
3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Installation

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing sliding doors, hardware, accessories, and other components.

B. Install sliding doors level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, as indicated, for weather tight construction.

D. Install sliding doors and components to drain condensation, water penetrating joints, and moisture migrating within sliding door to the exterior.

E. Separate aluminum from dissimilar materials to prevent corrosion or electrolytic action at points of contact.

3.3 Field Quality Control

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.
   1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

B. Testing Services: Testing and inspecting of installed sliding doors shall take place as follows:
   1. Testing Methodology: Testing Standard shall be per AAMA 502 including reference to ASTM E 783 for Air Infiltration Test and ASTM E 1105 for Water Penetration Test.
      a. Air Infiltration Test: Conduct in accordance with ASTM E 783. Tests shall be conducted at a minimum uniform static test pressure of 1.57 psf (75 Pa). The maximum allowable rates of air leakage for field testing shall not exceed 1.5 times the project specifications.
      b. Water Infiltration Test: Water penetration resistance tests shall be conducted at a static test pressure equal to 2/3 of the tested laboratory performance test pressure.
   2. Testing Extent: Architect shall select sliding door units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured and prior to the installation of interior finishes and trim. Conduct tests for air infiltration and water penetration with manufacturer’s representative present.
   3. Test Reports: Shall be prepared according to AAMA 502.

3.4 Adjusting, Cleaning, And Protection

A. Adjust operating door panels, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weather tight closure. Lubricate hardware and moving parts.

B. Clean aluminum surfaces immediately after installing sliding doors. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

C. Clean factory-glazed glass immediately after installing sliding doors. Comply with glass manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.

D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

E. Protect sliding door surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor sliding door surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, mortar, alkaline

deposits, stains, or other contaminants. If contaminating substances do contact sliding door surfaces, remove contaminants immediately according to manufacturer's written recommendations.

END OF SECTION 083213

SECTION 084313 - ALUMINUM-FRAMED STOREFRONTS

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. Exterior storefront systems.
   2. Interior storefront systems.
   3. Aluminum shade canopies as detailed on the drawings.

B. Related sections include the following:

   1. Division 7 Section "Sealants" for joint sealants installed as part of aluminum entrance and storefront systems (Refer to pre-construction testing requirements).
   2. Division 8 Section "Glazing".
   3. Division 8 Section "Finish Hardware".

1.3 HERS CERTIFICATION: R-4

1.4 SYSTEM DESCRIPTION

A. General: Provide aluminum entrance and storefront systems capable of withstanding loads and thermal and structural movement requirements indicated without failure, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project. Failure includes the following:

   1. Air infiltration and water penetration exceeding specified limits.
   2. Framing members transferring stresses, including those caused by thermal and structural movement, to glazing units.

B. Glazing: Physically and thermally isolate glazing from framing members.

C. Thermally Broken Construction: Provide systems that isolate aluminum exposed to exterior from aluminum exposed to interior with a material of low thermal conductance. No slotted mullion system allowed.

D. Wind Loads: Provide entrance and storefront systems, including anchorage, capable of withstanding wind-load design pressures calculated according to requirements of authorities having jurisdiction or the American Society of Civil Engineers' ASCE 7, "Minimum Design

Loads for Buildings and Other Structures," 6.4.2, "Analytical Procedure," whichever are more stringent.

1. Deflection of framing members in a direction normal to wall plane is limited to 1/175 of clear span or 3/4 inch (19 mm), whichever is smaller, unless otherwise indicated.
2. Static-Pressure Test Performance: Provide entrance and storefront systems that do not evidence material failures, structural distress, failure of operating components to function normally, or permanent deformation of main framing members exceeding 0.2 percent of clear span when tested according to ASTM E 330.

    a. Test Pressure: 150 percent of inward and outward wind-load design pressures.
    b. Duration: As required by design wind velocity; fastest 1 mile (1.609 km) of wind for relevant exposure category.

E. Seismic Loads: Provide entrance and storefront systems, including anchorage, capable of withstanding the effects of earthquake motions calculated according to requirements of authorities having jurisdiction or ASCE 7, "Minimum Design Loads for Buildings and Other Structures," Section 9, "Earthquake Loads," whichever are more stringent.

F. Dead Loads: Provide entrance- and storefront-system members that do not deflect an amount which will reduce glazing bite below 75 percent of design dimension when carrying full dead load.

1. Provide a minimum 1/8-inch (3.18-mm) clearance between members and top of glazing or other fixed part immediately below.

G. Live Loads: Provide entrance and storefront systems, including anchorage, that accommodate the supporting structures' deflection from uniformly distributed and concentrated live loads indicated without failure of materials or permanent deformation.

H. Air Infiltration: Provide entrance and storefront systems with permanent resistance to air leakage through fixed glazing and frame areas of not more than 0.06 cfm/sq. ft. (0.3 L/s/sq. m) of fixed wall area when tested according to ASTM E 283 at a static-air-pressure difference of 1.57 lbf/sq. ft. (75.2 Pa).

I. Water Penetration: Provide entrance and storefront systems that do not evidence water leakage through fixed glazing and frame areas when tested according to ASTM E 331 at minimum differential pressure of 20 percent of inward-acting wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 8.0 lbf/sq. ft. (299 Pa). Water leakage is defined as follows:

1. Uncontrolled water infiltrating systems or appearing on systems' normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage.

J. Thermal Movements: Provide entrance and storefront systems, including anchorage, that accommodate thermal movements of systems and supporting elements resulting from the following maximum change (range) in ambient and surface temperatures without buckling, damaging stresses on glazing, failure of joint sealants, damaging loads on fasteners, failure of doors or other operating units to function properly, and other detrimental effects.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

K. Structural-Support Movement: Provide entrance and storefront systems that accommodate structural movements including, but not limited to, sway and deflection.

L. Average Thermal Conductance: Provide storefront systems with average U-values of not more than 0.63 Btu/sq. ft. x h x deg F (3.57 W/sq. m x K) when tested according to AAMA 1503.1.

M. Dimensional Tolerances: Provide entrance and storefront systems that accommodate dimensional tolerances of building frame and other adjacent construction.

1.5 SUBMITTALS

A. Product Data: For each product specified. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.

B. Shop Drawings: For entrance and storefront systems. Show details of fabrication and installation, including plans, elevations, sections, details of components, provisions for expansion and contraction, and attachments to other work.

1. For entrance systems, include hardware schedule and indicate operating hardware types, quantities, and locations.

C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for units with factory-applied color finishes.

D. Samples for Verification: Of each type of exposed finish required in manufacturer's standard sizes. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing entrance and storefront systems similar to those required for this Project and who is acceptable to manufacturer.

1. Engineering Responsibility: Prepare data for entrance and storefront systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Source Limitations: Obtain each type of entrance and storefront system through one source from a single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of entrance and storefront systems and are based on the specific systems indicated. Other manufacturers' systems with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

1. Do not modify intended aesthetic effect, as judged solely by Architect, except with Architect's approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Welding Standards: Comply with applicable provisions of AWS D1.2, "Structural Welding Code--Aluminum."

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.8 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Warranty Period: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis of Design: Kawneer 451T Series.

C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. International Aluminum Corporation; U.S. Aluminum.
2. Kawneer Company, Inc.
3. Tubelite Architectural Systems.
4. Vistawall Architectural Products

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below.

1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221 (ASTM B 221M).

3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Bars, Rods, and Wire: ASTM B 211 (ASTM B 211M).
5. Welding Rods and Bare Electrodes: AWS A5.10.

B. Steel Reinforcement: Complying with ASTM A 36 (ASTM A 36M) for structural shapes, plates, and bars; ASTM A 611 for cold-rolled sheet and strip; or ASTM A 570 (ASTM A 570M) for hot-rolled sheet and strip.

C. Glazing as specified in Division 8 Section "Glazing."

D. Glazing Gaskets: Manufacturer's standard pressure-glazing system of black, resilient glazing gaskets, setting blocks, and shims or spacers, fabricated from an elastomer of type and in hardness recommended by system and gasket manufacturer to comply with system performance requirements. Provide gasket assemblies that have corners sealed with sealant recommended by gasket manufacturer.

E. Framing system gaskets, sealants, and joint fillers as recommended by manufacturer for joint type.

F. Sealants and joint fillers for joints at perimeter of entrance and storefront systems as specified in Division 7 Section "Joint Sealants."

G. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

2.3 COMPONENTS

A. Exterior Doors: Provide manufacturer's 2” deep - glazed doors with minimum 0.188-inch- (4.8-mm-) thick, extruded tubular rail and stile members. Dual moment welded corner construction that are deep penetration and fillet welded or that incorporate concealed tie-rods.

1. Glazing Stops and Gaskets: Provide manufacturer's standard snap-on extruded-aluminum glazing stops and preformed gaskets.
2. Stile Design: Top Rail: 7-inch. Vertical Rail: 5-inch. Bottom Rail: 10-inch.

B. Interior Doors: Provide manufacturer's 1 3/4” deep - glazed doors with minimum 0.125-inch-thick, extruded tubular rail and stile members. Dual moment welded corner construction that are deep penetration and fillet welded or that incorporate concealed tie-rods.

1. Glazing Stops and Gaskets: Provide manufacturer's standard snap-on extruded-aluminum glazing stops and preformed gaskets.
2. Stile Design: Top Rail: 7-inch. Vertical Rail: 5-inch. Bottom Rail: 10-inch.

C. Brackets and Reinforcements: Provide manufacturer's standard brackets and reinforcements that are compatible with adjacent materials. Provide nonstaining, nonferrous shims for aligning system components.

D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Reinforce members as required to retain fastener threads.

E. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.

F. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing, compatible with adjacent materials, and of type recommended by manufacturer.

G. Weather Stripping: Manufacturer's standard replaceable weather stripping as follows:

1. Compression Weather Stripping: Molded neoprene complying with ASTM D 2000 requirements or molded PVC complying with ASTM D 2287 requirements.
2. Sliding Weather Stripping: Wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing complying with AAMA 701 requirements.

2.4 HARDWARE

A. As specified in section 087100 – Finish Hardware

2.5 FABRICATION

A. General: Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

1. Fabricate components for shear-block frame construction.

B. Forming: Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.

C. Prepare components to receive concealed fasteners and anchor and connection devices.

D. Fabricate components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.

E. Welding: Weld components to comply with referenced AWS standard. Weld before finishing components to greatest extent possible. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

F. Glazing Channels: Provide minimum clearances for thickness and type of glass indicated according to FGMA's "Glazing Manual."

G. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

H. Storefront: Fabricate framing in profiles indicated for flush glazing (without projecting stops). Provide subframes and reinforcing of types indicated or, if not indicated, as required for a

complete system. Factory assemble components to greatest extent possible. Disassemble components only as necessary for shipment and installation.

I. Entrances: Fabricate door framing in profiles indicated. Reinforce as required to support imposed loads. Factory assemble door and frame units and factory install hardware to greatest extent possible. Reinforce door and frame units as required for installing hardware indicated. Cut, drill, and tap for factory-installed hardware before finishing components.

1. Exterior Doors: Provide compression weather stripping at fixed stops. At other locations, provide sliding weather stripping retained in adjustable strip mortised into door edge.
2. Interior Doors: Provide ANSI/BHMA A156.16 silencers at stops to prevent metal to metal contact. Provide 3 silencers on strike jamb of single-door frames and 2 silencers on head of double-door frames.

2.6 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

B. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

C. Class 2, Clear Anodic Finish: AA-M12C22A31 Anodic Coating: Architectural Class 2, clear coating 0.04 mm or thicker complying with AAMA 611.

2.7 STEEL PRIMING

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying primer.

B. Surface Preparation: Perform manufacturer's standard cleaning operations to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel.

C. Priming: Apply manufacturer's standard corrosion-resistant primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of entrance and storefront systems. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written instructions for protecting, handling, and installing entrance and storefront systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.

B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.

D. Set continuous sill members, with Manufacturer’s end dams and flashing in a full sealant bed to provide weathertight construction, unless otherwise indicated. Comply with requirements of Division 7 Section "Joint Sealants."

E. Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.

F. Install entrances plumb and true in alignment with established lines and grades without warp or rack. Lubricate operating hardware and other moving parts according to hardware manufacturers' written instructions.

1. Install surface-mounted hardware according to manufacturer's written instructions using concealed fasteners to greatest extent possible.

G. Install perimeter sealant to comply with requirements of Division 7 Section "Joint Sealants," unless otherwise indicated.

H. Erection Tolerances: Install entrance and storefront systems to comply with the following maximum tolerances:

1. Variation from Plane: Limit variation from plane or location shown to 1/8 inch in 12 feet; 1/4 inch (6 mm) over total length.
2. Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16 inch. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
3. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch .

3.3 ADJUSTING AND CLEANING

A. Adjust doors and hardware to provide tight fit at contact points and weather stripping, smooth operation, and weathertight closure.

B. Remove excess sealant and glazing compounds, and dirt from surfaces.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure entrance and storefront systems are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 084113

SECTION 085113 - ALUMINUM WINDOWS

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. This Section includes fixed and operable aluminum-framed windows for exterior locations.

B. Related Sections include the following:

1. Division 08 Section "Aluminum-Framed Entrances and Storefronts" for coordinating finish among aluminum fenestration units.
2. Division 7 Section "Joint Sealants" for joint sealants installed as part of aluminum entrance and storefront systems (Refer to pre-construction testing requirements)

1.3 HERS CERTIFICATION: U-FACTOR 0.35, SHGC: 0.30.

1.4 DEFINITIONS

A. Performance class designations according to AAMA/WDMA 101/I.S.2/NAFS:

1. AW: Architectural.
2. HC: Heavy Commercial.
3. C: Commercial.

B. Performance grade number according to AAMA/WDMA 101/I.S.2/NAFS:

1. Design pressure number in pounds force per square foot (pascals) used to determine the structural test pressure and water test pressure.

C. Structural Test Pressure: For uniform load structural test, is equivalent to 150 percent of the design pressure.

D. Minimum Test Size: Smallest size permitted for performance class (gateway test size). Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class.

1.5 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified, and that are of minimum test size indicated below:

1. Size indicated on Drawings.

B. Structural Performance: Provide aluminum windows capable of withstanding the effects of the following loads, based on testing units representative of those indicated for Project that pass AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Structural Test:

1. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour (meters per second) at 33 feet (10 m) above grade, according to ASCE 7, Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.

2. Deflection: Design glass framing system to limit lateral deflections of glass edges to less than 1/175 of glass-edge length or 3/4 inch (19 mm), whichever is less, at design pressure based on testing performed according to AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Deflection Test or structural computations.

C. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C) material surfaces.

1.6 SUBMITTALS

A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of aluminum window indicated.

B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, installation details, and the following:

1. Mullion details, including reinforcement and stiffeners.
2. Joinery details.
3. Expansion provisions.
4. Flashing and drainage details.
5. Weather-stripping details.
6. Thermal-break details.
7. Glazing details.
8. Window cleaning provisions.

9. Window System Operators: Show locations, mounting, and details for installing operator components and controls.
10. For installed products indicated to comply with design loads, include structural analysis data prepared by or under the supervision of a qualified professional engineer detailing fabrication and assembly of aluminum windows and used to determine the following:

    a. Structural test pressures and design pressures from wind loads indicated.
    b. Deflection limitations of glass framing systems.

C. Samples for Initial Selection: For units with factory-applied color finishes.

1. Include similar Samples of hardware and accessories involving color selection.

D. Samples for Verification: For aluminum windows and components required, prepared on Samples of size indicated below.

1. Main Framing Member: 12-inch- (300-mm-) long, full-size sections of extrusions with factory-applied color finish.
2. Window Corner Fabrication: 12-by-12-inch- (300-by-300-mm-) long, full-size window corner including full-size sections of extrusions with factory-applied color finish, weather stripping, and glazing.
3. Operable Window: Full-size unit with factory-applied finish.
4. Hardware: Full-size units with factory-applied finishes.
5. Weather Stripping: 12-inch- (300-mm-) long sections.

E. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

F. Qualification Data: For Installer manufacturer and professional engineer.

G. Product Test Reports: Based on evaluation of comprehensive tests performed within the last four years by a qualified testing agency for each type, class, grade, and size of aluminum window. Test results based on use of downsized test units will not be accepted.

H. Maintenance Data: For operable window sash operating hardware weather stripping and finishes to include in maintenance manuals.

I. Warranty: Special warranty specified in this Section.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

B. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.

C. Source Limitations: Obtain aluminum windows through one source from a single manufacturer.

D. Product Options: Information on Drawings and in Specifications establishes requirements for aluminum windows' aesthetic effects and performance characteristics. Aesthetic effects are

indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

E. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum windows and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements." Do not modify size and dimensional requirements.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

F. Fenestration Standard: Comply with AAMA/WDMA 101/I.S.2/NAFS, "North American Fenestration Standard Voluntary Performance Specification for Windows, Skylights and Glass Doors," for definitions and minimum standards of performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.

1. Provide AAMA-certified aluminum windows with an attached label.

G. Glazing Publications: Comply with published recommendations of glass manufacturers and with GANA's "Glazing Manual" unless more stringent requirements are indicated.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify aluminum window openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating aluminum windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to meet performance requirements.
b. Structural failures including excessive deflection, water leakage, air infiltration, or condensation.
c. Faulty operation of movable sash and hardware.
d. Deterioration of metals, other materials, and metal finishes beyond normal weathering.
e. Failure of insulating glass.

2. Warranty Period:

a. Window: Two years from date of Substantial Completion.
b. Glazing: 10 years from date of Substantial Completion.
c. Metal Finish: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. All Seasons Windows & Doors; All Seasons Commercial Division, Inc.
2. Kawneer; an Alcoa Company.
3. Vista Wall.

2.2 MATERIALS

A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi (150-MPa) ultimate tensile strength, not less than 16,000-psi (110-MPa) minimum yield strength, and not less than 0.125-inch (1.6-mm) thickness at any location for the main frame and sash members.

B. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum window members, trim, hardware, anchors, and other components.

1. Reinforcement: Where fasteners screw anchor into aluminum, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, noncorrosive, pressed-in, splined grommet nuts.
2. Exposed Fasteners: Unless unavoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.

C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

D. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action and for complete concealment when aluminum window is closed.

1. Weather-Stripping Material: Manufacturer's standard system and materials complying with AAMA/WDMA 101/I.S.2/NAFS.

E. Replaceable Weather Seals: Comply with AAMA 701/702.

F. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, nonshrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement.

2.3 WINDOW. Operable Windows

A. Window Type: Casement Outswing and Horizontal Sliding.

B. AAMA/WDMA Performance Requirements: Provide aluminum windows of performance indicated that comply with AAMA/WDMA 101/I.S.2/NAFS.

1. Performance Class and Grade: HC 50.

C. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 52.

D. Thermal Transmittance: Provide aluminum windows with a whole-window, U-factor maximum indicated at 15-mph (24-km/h) exterior wind velocity and winter condition temperatures when tested according to AAMA 1503 ASTM E 1423 NFRC 100.

1. U-Factor: 0.30 Btu/sq. ft. x h x deg F (3.4 W/sq. m x K) or less.

E. Air Infiltration: Maximum rate not more than indicated when tested according to AAMA/WDMA 101/I.S.2/NAFS, Air Infiltration Test.

1. Maximum Rate: 0.3 cfm/sq. ft. (5 cu. m/h x sq. m) of area at an inward test pressure of 6.24 lbf/sq. ft. (300 Pa).

F. Water Resistance: No water leakage as defined in AAMA/WDMA referenced test methods at a water test pressure equaling that indicated, when tested according to AAMA/WDMA 101/I.S.2/NAFS, Water Resistance Test.

1. Test Pressure: 15 percent of positive design pressure, but not less than 2.86 lbf/sq. ft. (140 Pa) or more than 15 lbf/sq. ft. (720 Pa).

G. Forced-Entry Resistance: Comply with Performance Grade 20 requirements when tested according to ASTM F 588.

H. Life-Cycle Testing: Test according to AAMA 910 and comply with AAMA/WDMA 101/I.S.2/NAFS.

2.4 GLAZING

A. Glass and Glazing Materials: Refer to Division 08 Section "Glazing" for glass units and glazing requirements applicable to glazed aluminum window units.

2.5 HARDWARE

A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows, and sized to accommodate sash or ventilator weight and dimensions. Do not use aluminum in frictional contact with other metals. Where exposed, provide nonmagnetic stainless steel.

B. Casement Windows: Provide the following operating hardware:

1. Hinge: Heavy-duty, five knuckle butt hinge with nylon bushings.
2. Lock: Lift-type throw, cam-action lock with keeper; two per ventilator.
3. Limit Device: Concealed support arms with adjustable, limited, hold-open limit device.

C. Manual Operable Accessories:

1. Provide two 6-foot sash poles and sash pole hangars at greenhouse.
2. Provide cam handle with pole ring at operable ventilators in the greenhouse.
3. Provide pole ring on locking hardware for pole operation at greenhouse operable ventilators.

2.6 INSECT SCREENS

A. General: Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Fabricate insect screens to fully integrate with window frame. Locate screens on inside of window and provide for each operable exterior sash or ventilator.

1. Aluminum Tubular Frame Screens: Comply with SMA 1004, "Specifications for Aluminum Tubular Frame Screens for Windows," Architectural C-24 class.
2. Comply with SMA 1004, "Specifications for Aluminum Tubular Frame Screens for Windows," for minimum standards of appearance, fabrication, attachment of screen fabric, hardware, and accessories unless more stringent requirements are indicated.

B. Aluminum Insect Screen Frames: Manufacturer's standard aluminum alloy complying with SMA 1004. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.

1. Aluminum Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet with minimum wall thickness as required for class indicated.
2. Finish: Match aluminum window members.

C. Aluminum Wire Fabric: 18-by-16 mesh of 0.011-inch diameter, coated aluminum wire.

1. Wire-Fabric Finish: Charcoal gray.

2.7 FABRICATION

A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

B. Fabricate aluminum windows that are reglazable without dismantling sash or ventilator framing.

C. Thermally Improved Construction: Fabricate aluminum windows with an integral, concealed, low-conductance thermal barrier; located between exterior materials and window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact.

1. Provide thermal-break construction that has been in use for not less than three years and has been tested to demonstrate resistance to thermal conductance and condensation and to show adequate strength and security of glass retention.
2. Provide thermal barriers tested according to AAMA 505; determine the allowable design shear flow per the appendix in AAMA 505.

D. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator.

E. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

F. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 08 Section "Glazing" and with AAMA/WDMA 101/I.S.2/NAFS.

2.8 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. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.9 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate, and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight window installation.

1. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing windows, hardware, accessories, and other components.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.

D. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.

1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

B. Testing Services: Testing and inspecting of installed windows shall take place as follows:

1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AAMA 502, Test Method A B, by applying same test pressures required to determine compliance with AAMA/WDMA 101/I.S.2/NAFS in Part 1 "Performance Requirements" Article.
2. Testing Extent: Three windows as selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested immediately after installation.
3. Test Reports: Shall be prepared according to AAMA 502.

C. Remove and replace noncomplying aluminum window and retest as specified above.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

B. Clean aluminum surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

C. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.

D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

E. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

END OF SECTION 085113

SECTION 08 56 19 – PASS WINDOW

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Exterior and interior window units.
2. Bullet resistant exterior and interior security pass, service and teller window units.
3. Glazing.
4. Air curtains.
5. Intercom and talk through.

B. Related Sections:
1. Section 092900 - Gypsum Board Assemblies: Partition construction

1.2 REFERENCES

A. American Architectural Manufacturers Association:
1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
2. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.

B. American Society Mechanical Engineers Standards:
1. ASME SA-240/SA-240M - Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

C. ASTM International:
1. ASTM A27/A27M - Standard Specification for Steel Castings, Carbon, for General Application.
2. ASTM A 36/A 36M. - Standard Specification for Carbon Structural Steel.
3. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings.
4. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
5. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
6. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
7. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
9. ASTM B221/B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
10. ASTM C1036 - Standard Specification for Flat Glass.
11. ASTM C1048 - Standard Specification for Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.

12. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
13. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics.
14. ASTM E488 - Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements.
15. ASTM E699 - Standard Practice for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating of Building Components.
16. ASTM E2188 - Standard Test Method for Insulating Glass Unit Performance.
17. ASTM E2189 - Standard Test Method for Testing Resistance to Fogging in Insulating Glass Units.
18. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.
19. ASTM F588 - Standard Test Methods for Resistance of Window Assemblies to Forced Entry Excluding Glazing.
20. ASTM F2329 - Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.

D. California Model Building Security Ordinance:
   1. CMBSO - Section 15.52.100, Tests CAWM 301-90, Forced Entry Resistance Tests for Windows.

E. Consumer Products Safety Commission:
   1. CPSC 16 CFR 1201 - Safety Standard for Architectural Glazing.

F. CSA International - Canadian Standards Association:
   1. CAN/CSA C22.2 No. 68-92 - Motor-Operated Appliances (Household and Commercial).
   2. CAN/CSA C22.2 No. 247- Operators and Systems of Doors, Gates, Draperies and Louvers.

G. DuPont Powder Coating Test Method:
   1. DPC TM 10.219 - PCI Powder Smoothness.

H. Florida Building Code:
   1. Static Air Pressure Test.

I. H.P. White Laboratory, Inc.:
   1. HPW-TP0500.01:
      a. Level V.
      b. Level C Ballistics (.44 magnum).
   2. HPW-TP-0500.02 - Level B Ballistics (9mm).

J. National Association of Architectural Metal Manufacturers.
   1. NAAMM No. 3 Finish: Ground unidirectional uniform finish obtained with 80 - 100 grit abrasive.

K. SAE International:
   1. AMS5511 - Steel, Corrosion-Resistant, Sheet, Strip, and Plate, 19Cr - 9.5Ni (304L), Solution Heat Treated.

2. AMS5513 - Steel, Corrosion-Resistant, Sheet, Strip, and Plate 19cr 9.2Ni (SAE 30304) Solution Heat Treated.

L. Steel Structures Painting Council:
1. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

M. Underwriters Laboratory:
1. UL 73 - Motor-Operated Appliances.
2. UL 325 - Door, Drapery, Gate, Louver, and Window Operators and Systems.
3. UL 752 - Ballistic Standards:
   a. Level I MPSA 9mm.
   b. Level III SPSA .44 Magnum.
4. UL 1995 - Heating and Cooling Equipment.

1.3 PERFORMANCE REQUIREMENTS

A. System Design:
1. Design and size components to withstand dead loads and live loads caused by pressure and negative wind loads acting normal to plane of window as calculated in accordance with applicable code.

B. System Internal Drainage: Drain water entering joints, condensation occurring in glazing channels, and migrating moisture occurring within system, to exterior by weep drainage network.

C. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with [inside] pane of glass and heel bead of glazing compound. [Position thermal insulation on exterior surface of air barrier and vapor retarder.]

D. Provide glass and glazing materials for continuity of building enclosure vapor retarder and air barrier:
1. To utilize the inner pane of multiple pane sealed units for the continuity of the air barrier and vapor retarder seal.

E. Structural Design: Design glass and glazing in accordance with IBC 2018 code for most critical combination of wind, snow, seismic, and dead loads.

F. Electrical Requirements:
1. Motor operated to comply with CAN/CSA C22.2 No. 68-92 and UL 73.
2. Operators and systems for doors, gates, and window operators to comply with CAN/CSA C22.2 No. 247 and UL 325.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures {01330 - Submittal Procedures}: Requirements for submittals.

B. Shop Drawings:

1. Indicate configuration, sizes, rough-in, mounting, construction and glazing details as well as installation clearances and finishes.

C. Product Data:
1. Submit manufacturer's product data for specified Products indicating materials, operation characteristics, and finishes.

D. Samples:
1. Submit two samples, 4 x 4 inches (100 x 100 mm) in size illustrating metal finishes for each finish specified.

E. Test Reports:
1. [Indicate compliance with specified bullet resistance performance.]

F. Manufacturer's Installation Instructions:
1. Submit installation instructions with requirements to accommodate specific site conditions.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum 10 years documented experience.
1. Participates in a Quality Assurance validation Program.
a. Facility Audit.

B. Installer: Company specializing in installation of window systems specified with minimum three years documented experience.

1.6 DELIVERY, STORAGE, AND PROTECTION

A. Section 01 60 00 - Product Requirements {01600 - Product Requirements}: Requirements for transporting, handling, storing, and protecting products.

B. Ordering: To avoid construction delays comply with ordering instructions and lead time requirements as set by window system manufacturer.

C. Pack window units in manufacturer's standard shipping containers and protective packaging. Deliver units in manufacturer's original packaging and unopened containers with identification labels intact.

D. Store window units and accessories on raised blocks to prevent moisture damage protected from exposure to weather and vandalism.

1.7 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.8 COORDINATION

A. Section 01 30 00 - Administrative Requirements {01300 - Administrative Requirements}: Requirements for coordination.

B. Coordinate work with adjacent materials specified in other Sections and as indicated on Drawings and approved shop drawings.

C. Coordinate installation of anchorages for security windows. 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.

1.9 WARRANTY

A. Furnish manufacturer's standard warranty document, executed by an authorized Quikserv Corp. officer in which manufacturer agrees to repair or replace windows, drawers and air curtains that fail in materials or workmanship within specified warranty period. This warranty is in addition to, and not a limitation of other rights Owner has under the contract.
   1. Warranty Period:
      a. One year parts and labor from date of installation.
   2. Failures include, but are not limited to, the following:
      a. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
      b. Structural failures including deflections exceeding 1/4 inch.
      c. Failure of welds.
      d. Excessive air leakage.
      e. Faulty operation of sliding window hardware.
      f. Faulty operation of transaction drawers.
      g. Faulty operation of air curtains.

PART 2 PRODUCTS

2.1 MATERIALS

A. Aluminum Extrusions: ASTM B221/B221M. Provide alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi (150-MPa) ultimate tensile strength and not less than 0.125 inch (3.2 mm) thick at any location for main frame and sash members.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Metallic-Coated Steel Sheet:
   1. ASTM A653/A653M, CS (Commercial Steel), Type B; with G90 (Z275)zinc (galvanized) coating designation.
   2. AMS5511, steel, corrosion-resistant, sheet, strip, and plate, 19Cr - 9.5Ni (304L), solution heat treated.
   3. AMS5513, steel, corrosion-resistant, sheet, strip, and plate 19cr 9.2Ni (SAE 30304) solution heat treated.

D. Stainless-Steel Sheet, Strip, Plate, and Flat Bars:
   1. ASTM A666, austenitic stainless steel, Type 304, stretcher-leveled standard of flatness.
   2. ASME SA-240/SA-240M, chromium and chromium-nickel stainless steel plate, sheet, and strip for general applications..

E. Concealed Bolts: ASTM A307, Grade A unless otherwise indicated.

F. Embedded Plate Anchors: Fabricated from steel shapes and plates, minimum 3/16 inch (4.8 mm) thick; with minimum 1/2-inch- (12.7-mm-) diameter, headed studs welded to back of plate..

G. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

H. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil (0.76-mm) thickness per coat.

I. Sealants: For sealants required within fabricated security windows, provide type recommended by manufacturer for joint size and movement. Sealant shall remain permanently elastic, nonshrinking, and nonmigrating.

J. Gaskets: For gaskets required within fabricated security windows, provide type recommended by manufacturer for joint size and movement. Gaskets shall remain permanently elastic, nonshrinking, and nonmigrating.

2.2 WINDOW COMPONENTS

A. Comply with requirements of UL listing for ballistics-resistance levels as specified.

B. Glass:
   1. Tempered Glass: 1/4 inch thick.
   2. Insulated Glass: 5/8 inch thick total thickness.

C. Track/Slides: Stainless steel ball bearing slides all windows and drawers.

D. Miscellaneous Glazing Materials: Provide material, size, and shape complying with requirements of glass manufacturers, and with a proven record of compatibility with surfaces contacted in installation:
   1. Cleaners, Primers, and Sealers: Type recommended by sealant or gasket manufacturer.
   2. Setting Blocks: Elastomeric material with a Type A Shore durometer hardness of 85, plus or minus 5.
   3. Spacers: Elastomeric blocks or continuous extrusions with a Type A Shore durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
   4. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

E. Flashing.

F. Welding Materials.

G. Anchors, Clips, and Window Accessories: Stainless steel; hot-dip, zinc-coated steel or iron, of sufficient strength to withstand design pressure indicated.

2.3 BULLET RESISTANT EXTERIOR AND INTERIOR SECURITY PASS, SERVICE AND TELLER WINDOW UNITS

A. Manufacturers:
1. Quikserv Corp.

a. Model T1 - 3636S:
1) Rough Opening: 36-3/8 inches (w) x 36-3/8 inches (h). [Custom size as indicated on Drawings plus 3/8 inch on all sides.]
2) Glazing:
a) Level 1 Bullet Resistant.
3) Finish: Clear

2.4 GLAZING

A. Clear Glass: Annealed and Tempered float glass as specified; Class 1 clear.
1. Clear annealed glass (FG-CA).
2. Clear tempered glass (FG-CT).
3. Minimum Thickness: 1/4 inch.

2.5 AIR CURTAINS

A. Manufacturers:
1. Quikserv Corp.

2.6 DEAL TRAYS AND SHELVES

A. Refer Section 11 17 00 {11030} Teller and Service Equipment.

2.7 INTERCOM AND TALK THROUGH

A. Manufacturers - Talk Through:
1. Quikserv Corp.

a. Model: 6 inch Round Heavy Stainless Steel Level 3 Speak-Thru.

2.8 FABRICATION

A. Fabricate window to dimensions indicated on Drawings.

B. Fabricate windows, and accessories to provide a complete system for assembly of components and anchorage of window, drawers and accessories.
   1. Provide units that are reglazable from the secure side without dismantling the nonsecure side of framing.
   2. Prepare security windows for glazing unless preglazing at the factory is indicated.

C. Provide weep holes and internal water passages for exterior security windows to conduct infiltrating water to the exterior.

D. Rigidly fit and secure joints and corners with internal reinforcement. Make joints and connections flush, hairline, and weatherproof. Fully weld corners.
   1. Fabricate framing with manufacturer's standard, internal opaque armoring in thicknesses required for security windows to comply with ballistics-resistance performance indicated.

E. Prepare components with reinforcement required for hardware.

F. Welding: To greatest extent possible, weld before finishing and in concealed locations to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

G. Metal Protection: Separate dissimilar metals to protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.

H. Factory-cut openings in glazing for speaking apertures.

I. Preglazed Fabrication: Preglaze window units at factory, where required for applications indicated.

J. Weather Stripping: Factory applied.

K. Bottom Sills: Stainless steel construction, no bottom tracks and no pop rivets.

L. Handles: Stainless steel, manufacturer's standard profile and finish.

2.9 SHOP FINISHING

A. Aluminum Finishes:
   1. Mill Finished Aluminum Surfaces: manufacturer's standard finish.
   2. Clear Anodized Aluminum Surfaces: AA-M10C22A31 non-specular as fabricated mechanical finish, medium matte chemical finish, and Architectural Class II 0.7 mils (0.018 mm) clear anodized coating.
      a. Conform to AAMA 611
   3. Color Anodized Aluminum Surfaces: AA-M10C22A34 non-specular as fabricated mechanical finish, medium matte chemical finish, and Architectural Class II 0.7 mils (018 mm) bronze or black coating.
      a. Conform to AAMA 611.
   4. Painted Finish:

a. AA-M12C12R1x non-specular as fabricated mechanical finish, chemically cleaned, and prepared for applied coating; with organic coating.
   1) Organic Coating: Manufacturer's standard powder coat finish.
      a) Conform to AAMA 2603.
b. DPC TM 10.219 - PCI Powder Smoothness.
   1) DuPont Powder Coating Test Method.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements {01300 - Administrative Requirements}: Verification of existing conditions before starting work

B. Verify construction is ready to receive Products specified in this section.

C. Verify rough openings are correct size and in correct location.

D. Examine roughing-in for embedded and built-in anchors to verify actual locations of security window connections before security window installation.

E. Inspect built-in and cast-in anchor installations, before installing security windows, to verify that anchor installations comply with requirements. Prepare inspection reports.
   1. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
   2. Perform additional inspections to determine compliance of replaced or additional work. Prepare anchor inspection reports.

F. For glazing materials whose orientation is critical for performance, verify installation orientation.

G. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Furnish frames and anchors to other sections as required for installation in surrounding partition and casework construction.

3.3 INSTALLATION

A. Install Products in accordance with manufacturer's instructions.

B. Align Products plumb, level and square.

C. Rigidly secure Products to adjacent supporting construction.

D. Glaze windows in accordance with manufacturer's instructions.

E. Seal perimeter joints.

F. Connect electrical components to power source.

G. Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended in writing by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

3.4 ADJUSTING

A. Section 01 70 00 - Execution and Closeout Requirements {01700 - Execution Requirements}: Requirements for adjusting.

B. Adjust horizontal-sliding, transaction security windows to provide a tight fit at contact points for smooth operation and a secure enclosure.

C. Adjust transaction drawers to provide a tight fit at contact points for smooth operation and [weathertight and] secure enclosure.

D. Remove and replace defective work, including security windows that are warped, bowed, or otherwise unacceptable.

3.5 CLEANING AND PROTECTION

A. Section 01 70 00 - Execution and Closeout Requirements {01700 - Execution Requirements}: Requirements for cleaning.

B. Remove protective material from factory finished surfaces.

C. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.

D. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.

E. Clean metal and glass surfaces to polished condition.
1. Lubricate sliding security window hardware.
2. Lubricate transaction drawer hardware.

F. Provide temporary protection to ensure that security windows are without damage at time of 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. Sliding doors.
3. 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 “Hollow Metal Doors and Frames”.
2. Division 08 Section “Flush Wood Doors”.
3. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.

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 as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.

5. ANSI/UL 437- Key Locks.

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 Procedures.

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. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. 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.

D. 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.

E. 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.

F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

G. 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.

H. 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

I. 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. Seven years for heavy duty cylindrical (bored) locks and latches.
2. Twenty five years for manual overhead 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 and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

   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. Manufacturers:

   a. Bommer Industries (BO).
   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. Manufacturers:

    a. Burns Manufacturing (BU).
    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. Manufacturers:

    a. Burns Manufacturing (BU).
    b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
    c. Trimco (TC).

C. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

5. Manufacturers:

    a. Burns Manufacturing (BU).
    b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
    c. Trimco (TC).

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. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. 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.
6. Keyway: Match Facility Standard.

D. Interchangeable Cores: Provide small format interchangeable cores as specified, core insert, removable by use of a special key; usable with other manufacturers' cylinders.

E. Removable Cores: Provide removable cores as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.

F. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "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. Existing System: Field verify and key cylinders to match Owner's existing system.

G. 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).

H. Construction Keying: Provide construction master keyed cylinders.

I. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.5 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

a. Lund Equipment (LU).
b. MMF Industries (MM).
c. Telkee (TK).

2.6 MECHANICAL LOCKS AND LATCHING DEVICES

A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed.

1. Furnish with solid cast levers, standard 2 3/4” backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt.

2. Locks are to be non-handed and fully field reversible.

3. Extended cycle test: Locks to have been cycle tested in ordinance with ANSI/BHMA 156.2 requirements to 2 million cycles.

4. Manufacturers:

a. Corbin Russwin Hardware (RU) - CL3300 Series.
b. dormakaba Best (BE) - 9K Series.

2.7 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.

2.8 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.

2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.

4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Unitrol): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted closers with door stop mechanism to absorb dead stop shock on arm and top hinge. Hold-open arms to have a spring loaded mechanism in addition to shock absorber assembly. Arms to be provided with rigid steel main arm and secondary arm lengths proportional to the door width.

1. Manufacturers:

   a. Corbin Russwin Hardware (RU) - Unitrol Series.
   b. Norton Door Controls (NO) - Unitrol Series.
   c. Yale Commercial(YA) - Unitrol Series.

C. Door Closers, Surface Mounted (Commercial Duty): ANSI/BHMA 156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, institutional grade door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck, closing sweep, and latch speed control valves. Provide non-handed units standard.

1. Manufacturers:

   a. Corbin Russwin Hardware (RU) - DC6000 Series.
   b. Norton Door Controls (NO) - 8500 Series.
   c. Yale Commercial(YA) - 3500 Series.

2.9 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.

2. Size: Fabricate protection plates (kick, armor, or mop) 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. Height to be as specified in the Hardware Sets.

3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.

4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:

   a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.

6. Manufacturers:

   a. Burns Manufacturing (BU).
   b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
   c. Trimco (TC).

2.10 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. Manufacturers:

   a. Burns Manufacturing (BU).
   b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
   c. Trimco (TC).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:

a. Rixson Door Controls (RF).
b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

2.11 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. Manufacturers:

1. National Guard Products (NG).
2. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
3. Reese Enterprises, Inc. (RE).

2.12 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.

2.13 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 (Punch Report): Reference Division 01 Sections “Closeout Procedures” and “Cash Allowances”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.
2. Submit documentation of incomplete items in the following formats:

   a. PDF electronic file.
   b. Electronic formatted file integrated with the Openings Studio™ door opening management software platform.

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.

1. Quantities listed are for each pair of doors, or for each single door.

2. The supplier is responsible for handing and sizing all products.

3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

B. Manufacturer’s Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. RO - Rockwood
4. BE - dormakaba Best
5. RU - Corbin Russwin
6. RF - Rixson

7. NO - Norton

Hardware Sets

Set: 1.0

Doors: 1

1	SFIC Permanent Keyed Core	1C71 (verify keyway)	626	BE
1	Mortise Cylinder	1E-74 CMK	626	BE
1	Hardware	Provided by Door Manufacturer		

Set: 2.0

Doors: 12, 19, 26, 8

3	Hinge (Heavy Weight)	T4A3786 x NRP	US26D	MK
1	Access Control Cyl Lock	9KQ37DV 15PKP CMK	626	BE
1	SFIC Permanent Keyed Core	1C71 (verify keyway)	626	BE
1	Surface Closer/Stop	UNI8501 SN	689	NO
1	Kick Plate	K1050 10" high x 2" LDW B4E CSK	US32D	RO
1	Threshold	271A		PE
1	Rain Guard	346C		PE
1	Gasketing	305CR		PE
1	Sweep	315CN		PE
1	Latch Protector	325	US26D	RO

Set: 3.0

3	Hinge (Heavy Weight)	T4A3786 x NRP	US26D	MK
1	Office Lock	CL3351 NZD M08 CMK	626	RU
1	SFIC Permanent Keyed Core	1C71 (verify keyway)	626	BE
1	Surface Closer/Stop	UNI8501 SN	689	NO
1	Kick Plate	K1050 10" high x 2" LDW B4E CSK	US32D	RO
1	Threshold	271A		PE
1	Rain Guard	346C		PE
1	Gasketing	305CR		PE
1	Sweep	315CN		PE
1	Latch Protector	325	US26D	RO

Set: 4.0

Doors: 14, 16, 3, 34

3	Hinge (Heavy Weight)	T4A3786	US26D	MK
1	Access Control Cyl Lock	9KQ37DV 15PKP CMK	626	BE
1	SFIC Permanent Keyed Core	1C71 (verify keyway)	626	BE
1	Surface Closer	8501 SN	689	NO
1	Kick Plate	K1050 10" high x 2" LDW B4E CSK	US32D	RO
1	Stop	406/409/441H (as required)	US32D	RO
1	Gasketing	S88BL		PE

Set: 5.0

Doors: 11, 15

3	Hinge, Full Mortise	TA2714	US26D	MK
1	Storeroom Lock	CL3357 NZD M08 CMK	626	RU
1	SFIC Permanent Keyed Core	1C71 (verify keyway)	626	BE
1	Surface Closer	8501 SN	689	NO
1	Kick Plate	K1050 10" high x 2" LDW B4E CSK	US32D	RO
1	Stop	406/409/441H (as required)	US32D	RO
1	Gasketing	S88BL		PE

Set: 6.0

Doors: 31

6	Hinge, Full Mortise	TA2714	US26D	MK
1	Flush Bolt	2845/2945 (as required)	US32D	RO
1	Dust Proof Strike	570	US26D	RO
1	Office Lock	CL3351 NZD M16 M08 CMK	626	RU
1	SFIC Permanent Keyed Core	1C71 (verify keyway)	626	BE
1	Coordinator	2600 (brackets as required)	US28	RO
2	Surface Closer	8501 SN	689	NO
2	Kick Plate	K1050 10" high x 1" LDW 4BE CSK	US32D	RO
2	Stop	406/409/441H (as required)	US32D	RO
1	Gasketing	S88BL		PE
1	Astragal	355CS		PE

Set: 7.0

Doors: 13, 20, 23, 24, 25, 27, 28, 29, 30, 32, 4, 6

3	Hinge, Full Mortise	TA2714	US26D	MK

1	Office Lock	CL3351 NZD M08 CMK	626	RU
1	SFIC Permanent Keyed Core	1C71 (verify keyway)	626	BE
1	Surface Closer	8501 SN	689	NO
1	Kick Plate	K1050 10" high x 2" LDW B4E CSK	US32D	RO
1	Stop	406/409/441H (as required)	US32D	RO
1	Gasketing	S88BL		PE

Set: 8.0

Doors: 10, 17, 9

3	Hinge (Heavy Weight)	T4A3786	US26D	MK
1	Passage Latch	CL3310 NZD	626	RU
1	Surface Closer	8501 SN	689	NO
1	Mop Plate	K1050 4" high x 1" LDW 4BE CSK	US32D	RO
1	Kick Plate	K1050 10" high x 2" LDW B4E CSK	US32D	RO
1	Stop	406/409/441H (as required)	US32D	RO
1	Gasketing	S88BL		PE

Set: 9.0

Doors: 22

3	Hinge, Full Mortise	TA2714	US26D	MK
1	Office Lock	CL3351 NZD M16 M08 CMK	626	RU
1	SFIC Permanent Keyed Core	1C71 (verify keyway)	626	BE
1	Stop	406/409/441H (as required)	US32D	RO
3	Silencer	608		RO

Set: 10.0

Doors: 33, 5

3	Hinge, Full Mortise	TA2714	US26D	MK
1	Classroom Lock	CL3355 NZD M08 CMK	626	RU
1	SFIC Permanent Keyed Core	1C71 (verify keyway)	626	BE
1	Stop	406/409/441H (as required)	US32D	RO
3	Silencer	608		RO

Set: 11.0

Doors: 18, 21, 7

3	Hinge, Full Mortise	TA2714 x NRP	US26D	MK

1	Classroom Lock	CL3355 NZD M08 CMK	626	RU
1	SFIC Permanent Keyed Core	1C71 (verify keyway)	626	BE
1	Surf Overhead Stop	9-X36	630	RF
3	Silencer	608		RO

Set: 12.0

Doors: 2

1	Hardware	Provided by Door Manufacturer

END OF SECTION 087100

SECTION 087113 – AUTOMATIC DOOR OPERATORS

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. Power door operators for swinging doors.

B. Related Sections:
1. Section 081113 “Hollow Metal Doors and Frames” for metal doors and frames.
2. Section 081416 “Flush Wood Doors” for wood doors.
3. Section 084113 “Aluminum-Framed Entrances and Storefronts” for entrances and storefronts.
4. Section 084229 “Automatic Entrances” for Automatic Entrances.
5. Section 084243 "Intensive Care Unit/Critical Care Unit (ICU/CCU) Entrances" for manual ICU/CCU entrance packages.

1.3 DEFINITIONS

A. Double Egress Doors: A pair of doors that simultaneously swing with the two doors moving in opposite directions with no mullion between them.

B. Double Swing Doors: A pair of doors that swing with the two doors moving in opposite directions with a mullion between them; each door functioning as a single swing door.

C. Activation Device: Device that, when actuated, sends an electrical signal to the door operator to open the door.

1.4 REFERENCES

A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.

B. Underwriters Laboratories (UL):

1. UL 325 – Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.

C. American National Standards Institute (ANSI)/Builders' Hardware Manufacturers Association (BHMA):

1. ANSI/BHMA A156.10: Standard for Power Operated Pedestrian Doors.
2. ANSI/BHMA A156.19: Standard for Power Assist and Low Energy Power Operated Doors.

D. American Society for Testing and Materials (ASTM):

1. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
2. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

E. Builders' Hardware Manufacturers Association (BHMA):

1. BHMA A156.10 - Standard for Power Operated Pedestrian Doors.

F. American Association of Automatic Door Manufacturers (AAADM):

G. National Fire Protection Association (NFPA):

1. NFPA 101 – Life Safety Code.
2. NFPA 70 – National Electric Code.

H. International Conference of Building Officials (ICBO):

1. UBC 1997: Uniform Building Code

I. California Department of Forestry and Fire Protection, Office of the State Fire Marshall.

J. International Standards Organization (ISO):

1. ISO 9001 - Standard for Manufacturing Quality Management Systems

K. National Association of Architectural Metal Manufacturers (NAAMM):

L. Metal Finishes Manual for Architectural and Metal Products.

M. American Architectural Manufacturers Association (AAMA):

1. AAMA 607.1 - Clear Anodic Finishes for Architectural Aluminum.
2. AAMA 611 Voluntary Specification for Anodized Architectural Aluminum.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for automatic door operators, including activation and safety devices. Include operating characteristics, electrical characteristics, and furnished accessories.

B. Shop Drawings: For automatic door operators. Include plans, elevations, sections, details, hardware mounting heights, and attachments to other work. Including wiring for electrical supply.

1. Indicate required clearances, method of field assembly, components, and location and size of each field connection.
2. Include locations and elevations of entrances showing activation and safety devices.
3. Wiring Diagrams: For power, signal, and activation- and safety-device wiring.
4. Include plans, elevations, sections, details, and attachments to other work for guide rails.

C. Samples: For each exposed product and for each color and texture specified, manufacturer's standard in size.

D. Qualification Data: For qualified Installer.

E. Product Certificates: For each operator for fire-rated door assemblies, signed by product manufacturer. Certify that operator is listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for use on types and sizes of labeled fire doors required.

F. Field quality-control reports.

G. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For automatic door operators, including activation and safety devices, to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Certifications: Automatic door operators shall be certified by the manufacturer to be performance design criteria in accordance with the following standards:

1. ANSI A156.10.
2. NFPA 101.
3. UL 325 Listed at fire door locations.
4. ICBO (UBC Standard 10-1)
5. California Department of Forestry and Fire Protection, Listed.

B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation and maintenance of units required for this Project.

1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

C. Certified Inspector Qualifications: Certified by the AAADM.

D. Manufacturers Qualifications: A qualified manufacturer with a manufacturing facility certified under ISO 9001 and with company certificate issued by AAADM.

E. Source Limitations: Obtain automatic door operators, including activation and safety devices, from single source from single manufacturer.

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency, and marked for intended location and application.

G. Exit-Door Requirements: Comply with requirements of authorities having jurisdiction for doors with automatic door operators serving as a component of a required means of egress.

H. Preinstallation Conference: Conduct conference at Project site.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of door frames by field measurements before fabrication of exposed covers for automatic door operators.

1.9 COORDINATION

A. Coordinate size and locations of recesses in concrete floors for recessed control mats that control automatic door operators. Concrete, reinforcement, and formwork requirements are specified together with Concrete.

B. Templates: Obtain and distribute, to the parties involved, templates for doors, frames, operators, and other work specified to be factory prepared and reinforced for installing automatic door operators. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing automatic door operators to comply with indicated requirements.

C. Electrical System Roughing-in: Coordinate layout and installation of automatic door operators, including activation and safety devices, with connections to power supplies and to access-control system.

D. System Integration: Integrate automatic door operators with other systems as required for a complete working installation.

1. Provide electrical interface control capability for card reader or keypad operation of automatic door operators on doors with electric locking.

2. Where required for proper operation, provide a time delay relay to signal automatic door operator to activate only after electric lock system is released.

B. Field Measurements: General Contractor shall verify openings to receive automatic door operators by field measurements before fabrication and indicate measurements on Shop Drawings.

C. Mounting Surface: General Contractor advise shall verify all surfaces to be plumb, straight and secure; substrates to be of proper dimension and material.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of automatic door operators that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Faulty or sporadic operation of automatic door operator, including activation and safety devices.
   b. Deterioration of metals, metal finishes, and other materials beyond normal weathering or use.

2. Warranty Period: Two years from date of Substantial Completion.
   a. During the warranty period a factory-trained technician shall be engaged to perform service and affect repairs. A safety inspection shall be performed after each adjustment or repair and a completed inspection form shall be submitted to the owner.
   b. During the warranty period all warranty work, including by no limited to emergency service shall be performed during normal working hours.

1.11 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of automatic door operator Installer. Include quarterly planned and preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

1. Engage a certified inspector to perform safety inspection after each adjustment or repair, and at end of maintenance period. Furnish completed inspection reports to Owner.
2. Perform maintenance, including emergency callback service, during normal working hours.
3. Include 24-hour-per-day, seven-day-per-week emergency callback service.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Stanley Access Technologies; Division of The Stanley Works.
   a. Magic-Fource Series automatic door operator facility standard.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with standards indicated below:

1. Headers: 6063-T6
2. Sheet and Plate: ASTM B 209 (ASTM B 209M).
3. Extrusions, Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).

B. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, stretcher-leveled standard of flatness, in manufacturer's standard thickness.

C. Expanded Aluminum Mesh: Manufacturer's standard expanded and flattened aluminum sheet in accordance with the geometry of ASTM F 1267.

D. Polycarbonate: Manufacturer's standard monolithic polycarbonate sheet manufactured by extrusion process, with an average impact strength of 12 to 16 ft-lbf/in. (640 to 854 J/m) of width when tested according to ASTM D 256, Method A.

E. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

F. Sealants and Joint Fillers: Refer to Division 07 “Joint Sealants”.

2.3 AUTOMATIC DOOR OPERATORS, GENERAL

A. General: Provide operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated; and complying with UL 325. Coordinate operator mechanisms with door operation, hinges, and activation and safety devices.

1. Emergency Breakaway: Where indicated for center-pivoted doors, provide emergency breakaway feature for reverse swing of doors. Equip system to discontinue power to automatic door operator when door is in emergency breakaway position, and to return to closed position after breakaway and automatically reset. Door shall breakaway with no more than 50 lbf (222 N) applied at 1” (25 mm) from the latch edge of the door.

2. Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.
3. Wind Load: Provide door operators on exterior doors that will open and close doors and maintain them in fully closed position when subjected to wind load of ***<Insert wind load>***.

B. Electromechanical Operating System: Self-contained unit powered by permanent-magnet dc motor; with closing speed controlled mechanically by gear train and dynamically by braking action of electric motor, connections for power and activation- and safety-device wiring, and manual operation including spring closing when power is off.

C. Hinges: See Section 087100 "Door Hardware" for type of hinge for each door that door operator shall accommodate.

D. Housing for Overhead Concealed Operators: Fabricated from minimum 0.125-inch- (3.2-mm-) thick, extruded or formed aluminum and extending full width of door opening including door jambs to conceal door operators and controls. Provide full length hinged or removable cover for service and adjustment of door operators and controls. Secure cover to prevent unauthorized access. Housing case shall not exceed 6” (152 mm) square in section. The operator shall be sealed against dust, dirt, and corrosion within the header case.

E. Cover for Surface-Mounted Operators: Fabricated from 0.125-inch- (3.2-mm-) thick extruded or formed aluminum; continuous over full width of operator-controlled door opening; with enclosed end caps, provision for maintenance access, and fasteners concealed when door is in closed position.

F. Brackets and Reinforcements: Manufacturer's standard, fabricated from aluminum with nonstaining, nonferrous shims for aligning system components.

G. Fire-Door Package: Consisting of UL-listed latch mechanism, power-reset box, and caution signage for fire-rated doors. Latch mechanism shall allow door to swing free during automatic operation; when fire is detected, latch actuator shall cause exit hardware to latch when door closes. Provide latch actuators with fail-secure design.

H. Door Arms: A combination of door arms and linkage shall provide positive control of door through entire swing; units shall permit use of butt hung, center pivot and offset pivot-hung doors.

2.4 POWER DOOR OPERATORS

A. Standard: BHMA A156.10.

B. Performance Requirements:

1. Opening Force:
   a. Power-Operated Doors: Not more than 50 lbf (222 N) required to manually set door in motion if power fails; not more than 15 lbf (67 N) required to open door to minimum required width.

b. Power-Operated Swinging Doors: Not more than 30 lbf (133 N) required to manually open door if power fails.
c. Breakaway Device for Power-Operated Doors: Not more than 50 lbf (222 N) required for a door to open.

2. Entrapment Protection: Not more than 40 lbf (178 N) required to prevent stopped door in the last 10 degrees of opening from moving in the direction of opening; not more than 30 lbf (133 N) required to prevent stopped door from moving in direction of closing.
3. Operating Range: Minus 30 deg F (29 deg C) to 130 deg F (54 deg C).
4. Closing Time:
   a. Doors shall be field adjusted to close from 90 degrees to 10 degrees in 3 seconds or longer.

5. Doors shall be field adjusted to close from 10 degrees to fully closed in not less than 1.5 seconds.
6. Door Energy: The kinetic energy of a door in motion shall not exceed 1.25 lbd-ft (1.69 Nm).

C. Configuration: Operator to control single swinging door or pair of swinging doors.

1. Traffic Pattern: One way, Two way, Double swing, or Double egress.
2. Operator Mounting: Surface.

D. Operation: Power opening and spring closing. Provide time delay for door to remain open before initiating closing cycle as required by BHMA A156.10.

E. Operating System: Electromechanical; low energy; readily convertible to full energy; no tools required to change type. Self-contained unit powered by a minimum 3/16 horsepower, permanent-magnet DC motor; through a high torque reduction gear system.

F. Microprocessor Control Unit: Solid-state controls.

G. Handing: Non-Handed; no tools required to change handing.

H. Capacity: Rated for door panels weighing up to 350 pounds.

I. Features:

1. Adjustable opening and closing speed.
2. Adjustable opening closing force.
3. Adjustable backcheck.
4. Adjustable hold-open time from zero to 30 seconds.
5. Adjustable time delay.
6. Adjustable acceleration.
7. Adjustable limit switch.
8. Obstruction recycle.
9. On-off/hold-open switch to control electric power to operator.
10. Reverse upon obstruction.
11. Visible rate open/closed speed control.
12. Close loop speed control with active braking and acceleration.

13. Visible obstruction recycle time delay.
14. When operators are provided in pairs, adjustable features are independently adjustable for each operator.

J. Exposed Finish: Finish exposed components Class II, Clear Anodic Finish: AA-M10C22A31 Mechanical Finish: as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.40 mils minimum complying with AAMA 611-98, and the following:

1. AAMA 607.1
2. Applicator must be fully compliant with all applicable environmental regulations and permits, including wastewater and heavy metal discharge.
3. Color: As selected by Architect from full range of industry colors and color densities.

K. Field Adjustable Spring Closing Operation: The operator shall close the door by spring energy employing the motor, as a dynamic brake to provide closing speed control. The closing spring shall be a helical compression spring, adjustable for positive closing action. The spring shall be adjustable, without removing the operator from the header, to accommodate a wide range of field conditions.

L. Independent Adjustable Closing and Latching Speed Control: The operator shall employ a rheostat module to allow for independent field adjustment of closing and latching speeds using the motor as a dynamic brake.

M. Field Adjustable Open Stop: The operator shall provide a field adjustable open stop to accommodate opening angles from 80 to 135 degrees without the need for additional components.

N. Consistent Cycle: The operator shall deliver an even, consistent open force across the entire transition from door fully closed to door fully open. Additionally, the range of the force shall be field adjustable to accommodate a wide range of on-site conditions.

O. Quiet Performance: The operator shall be designed to output audible noise ratios less than or equal to 50dba.

P. Manual Use: The operator shall function as a manual door closer in the direction of swing with or without electrical power. The operator shall deliver an even, consistent open force across the entire transition from door fully closed to door fully open.

Q. Electrical service to door operators shall be provided under Division 16 Electrical. Minimum service to be 120 VAC, 10 amps for doors with operators in pairs, 5 amps for single doors.

2.5 ELECTRICAL CONTROLS

A. Electrical Control System: Electrical control system shall include a microprocessor controller and position encoder. The encoder shall monitor revolutions of the operator shaft and send signals to microprocessor controller to define door position. Systems utilizing external magnets and magnetic switches are not acceptable.

B. Life Cycle Data Counter: The microprocessor control shall incorporate a non-re-settable counter to track door operation cycles.

C. Controller Protection: The microprocessor controller shall incorporate the following features to ensure trouble free operation:

1. Automatic Reset Upon Power Up.
2. Main Fuse Protection.
3. Electronic Surge Protection.
4. Internal Power Supply Protection.
5. Resetable sensor supply fuse protection.
6. Software “Watchdog” protection in the case of software malfunction.

D. Push Button Interface with LED: The controller shall have push button switches with LED readout to allow for selection or change of the following parameters: carpet or timer logic, single or dual door, activation options, normal back check or large back check, push-to-open assist on/off.

E. Soft Start/Stop: A “soft-start” “soft-stop” motor driving circuit shall be provided for smooth normal opening and recycling.

F. Safety Search Circuitry: Provide system to recycle the swinging panels when an obstruction is encountered during the closing cycle. If an obstruction is detected, the system shall search for that object on the next closing cycle by reducing door closing speed prior to the previously encountered obstruction location, and will continue to close in check speed until doors are fully closed, at which time the doors will reset to normal speed. If obstruction is encountered again, the door will come to a full stop. The doors shall remain stopped until obstruction is removed and operate signal is given, resetting the door to normal operation.

G. Programmable Controller: Microprocessor controller shall be programmable and shall be designed for connection to a local configuration tool. Local configuration tool shall be software driven and shall be utilized via Palm® handheld interface. The following parameters may be adjusted via the configuration tool.

1. Operating speeds and forces as required to meet ANSI/BHMA A156.10.
2. Adjustable and variable features as specified in 2.04, B., 6.
3. Firmware update.
4. Trouble Shooting
    a. I/O Status.
    b. Electrical component monitoring including parameter summary.
5. Entrance profile copy/paste.

Software for local configuration tool shall be available as a free download from the automatic door operators manufacturer’s internet site.

H. Emergency Breakout Switch: A cam actuated emergency breakout switch shall be provided to disconnect power to the motor when an in-swinging door is manually pushed in the emergency out direction. The operator will then automatically reset and power will be resumed.

I. Control Switch: Automatic door operators shall be equipped with a three position function switch to control the operation of the door. Control switch shall provide three modes of operation, Automatic, Off, and Hold-Open.

J. Power Switch: Automatic door operators shall be equipped with a two position On/Off switch to control power to the door.

2.6 ACTIVATION AND SAFETY DEVICES

A. General: Provide activation and safety devices in accordance with BHMA standards, for condition of exposure and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated. Coordinate activation and safety devices with door operation and door operator mechanisms.

B. Motion Sensors: Self-contained, K-band-frequency, microwave-scanner units; adjustable to provide detection field sizes and functions required by BHMA A156.10.

1. Provide capability for switching between bidirectional and unidirectional detection.
2. For one-way traffic, sensor on egress side shall not be active when doors are fully closed.

C. Presence Sensors: Self-contained, infrared-scanner units; adjustable to provide detection field sizes and functions required by BHMA A156.10. Sensors shall remain active at all times.

D. Combination Motion/Presence Sensors: Self-contained units consisting of both motion and presence sensors in a single housing; adjustable to provide detection field sizes and functions required by BHMA A156.10.

1. Motion Sensor: K-band-frequency, microwave-scanner units.
   a. Provide capability for switching between bidirectional and unidirectional detection.
   b. For one-way traffic, sensor on egress side shall not be active when doors are fully closed.

2. Presence Sensor: Infrared-scanner units that remain active at all times.

E. Photoelectric Beams: Pulsed infrared, sender-receiver assembly for recessed mounting. Beams shall not be active when doors are fully closed.

F. Push-Plate Switch: Momentary-contact door control switch with flat push-plate actuator with contrasting-colored, engraved message.

1. Configuration: Square push plate with 4-by-4-inch (100-by-100-mm) junction box.
   a. Mounting: As indicated on Drawings.

2. Push-Plate Material: Stainless steel as selected by Architect from manufacturer's full range.
3. Message: International symbol of accessibility and "Push to Open."

G. Electrical Interlocks: Unless units are equipped with self-protecting devices or circuits, provide electrical interlocks to prevent activation of operator when door is locked, latched, or bolted.

2.7 FABRICATION

A. Factory fabricate automatic door operators to comply with indicated standards.

B. Fabricate exterior components to drain water passing joints and condensation and moisture occurring or migrating within operator enclosure to the exterior.

C. Form aluminum shapes before finishing.

D. Use concealed fasteners to greatest extent possible. Where exposed fasteners are required, use countersunk Phillips flat-head machine screws, finished to match operator.

E. Provide metal cladding, completely cladding visible surfaces before shipment to Project site. Fabricate cladding with concealed fasteners and connection devices, with accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion, and with allowance for thermal expansion at exterior doors.

2.8 ACCESSORIES

A. Signage: As required by cited BHMA standard for the type of operator.

1. Application Process: Door manufacturer's standard process.
2. Provide sign materials with instructions for field application when operators are installed.

B. Guide Rails: Anodized aluminum, fabricated from bars or tubing, minimum 30 inches (762 mm) high, and finished to match doors unless otherwise indicated; positioned and projecting from face of door jamb for distance as indicated, but not less than that required by BHMA A156.10 for type of door and direction of travel; with filler panel.

1. Filler Panel: Polycarbonate plastic.
   a. Color: As selected by Architect from manufacturer's full range.

2. Provide intermediate guide rail suitable for supporting photoelectric beams.
3. Mounting: Jamb and floor.

2.9 GENERAL FINISH REQUIREMENTS

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. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.

D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, door and frame preparation and reinforcements, and other conditions affecting performance of automatic door operators.

B. Examine roughing-in for electrical systems to verify actual locations of power connections before automatic door operator installation.

C. Examine roughing-in for compressed-air piping systems to verify actual locations of piping connections before automatic door operator installation.

D. Verify that full-height finger guards are installed at each door with pivot hinges where door has a clearance at hinge side greater than 1/4 inch (6 mm) and less than 3/4 inch (19 mm) with door in any position.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install complete automatic door operators according to manufacturer's written instructions, including activation and safety devices, control wiring, and remote power units if any; connection to the building's power supply; and signage.

1. Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion.
2. Install operators true in alignment with established lines and door geometry without warp or rack. Anchor securely in place.
3. Power Door Operator Installation Standard: BHMA A156.10.
4. Low-Energy Door Operator Installation Standard: BHMA A156.19.

B. Activation and Safety Devices: Install devices and wiring according to manufacturer's written instructions and cited BHMA standard for type of operator and direction of pedestrian travel. Connect activation- and safety-device wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Access-Control System: Connect operators to access-control system as specified in Section 281300 "Access Control."

D. Signage: Apply on both sides of each door as required by cited BHMA standard for type of door operator and direction of pedestrian travel.

E. Guide Rails: Install according to BHMA A156.10 including Appendix A and manufacturer's written instructions unless otherwise indicated.

F. Mounting: Install automatic door operator/headers plumb and true in alignment with established lines and grades. Anchor securely in place.

1. Install surface-mounted hardware using concealed fasteners to greatest extent possible.
2. Set headers, arms and linkages level and true to location with anchorage for permanent support.

3.3 FIELD QUALITY CONTROL

A. Inspection: Engage Installer's certified inspector to test and inspect automatic door operators and prepare test and inspection reports.

1. Certified inspector shall test and inspect each automatic door operator to determine compliance of installed systems with applicable BHMA standards.
2. Inspection Report: Certified inspector shall submit report in writing to Architect and Contractor within 24 hours after inspection.

B. Work will be considered defective if it does not pass tests and inspections.

3.4 ADJUSTING

A. Adjust automatic door operators to function smoothly, and lubricate as recommended by manufacturer; comply with requirements of applicable BHMA standards.

1. Adjust operators on exterior doors for weathertight closure.
2. Adjustments are to be performed by AAADM Certified Technicians.

B. After completing installation of exposed, factory-finished automatic door operators, inspect exposed finishes on doors and operators. Repair damaged finish to match original finish.

C. Readjust automatic door operators after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles).

D. Occupancy Adjustment: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to five visits to Project during other-than-normal occupancy hours for this purpose.

3.5 CLEANING AND PROTECTION

A. Clean all surfaces promptly after installation.

B. Remove excess sealant compounds, dirt, and other substances.

C. Repair all damaged sustained during delivery, installation and testing to repaired finish to match original factory condition.

3.6 DEMONSTRATION

A. Engage a certified inspector to train Owner's maintenance personnel to adjust, operate, and maintain automatic door operators.

END OF SECTION 087113

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Related Documents:
   1. Drawings and general provisions of the Subcontract apply to this Section.
   2. Review these documents for coordination with additional requirements and information that apply to work under this Section.

B. Section Includes:
   1. Glass and glazing required throughout Project and not specified as a part of other Sections.

C. Related Sections:
   1. Division 08 Section "Vinyl Windows”.

D. Glass and glazing is specified with the following components. Unless otherwise noted, glass and glazing specified elsewhere shall conform to materials and glazing requirements and procedures specified in this Section.
   1. Division 10 Section "Toilet, Bath, and Laundry Accessories": Mirrors.

1.2 REFERENCES

A. General:
   1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
   2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
   3. Refer to Division 01 Section "General Requirements" for the list of applicable regulatory requirements.

B. "Glazing Manual" published by Flat Glass Marketing Assn.

C. "Safety Standard for Architectural Glazing Materials (16 CFR 1201) CI and CII issued by the Consumer Product Safety Commission.

D. California Building Code, Chapter 16 as modified by Division 01 Section "Lateral Force Procedures", and Chapter 24.

E. ANSI Z 97.1, "Safety Glass Test Requirements".

F. ASTM International.
   1. ASTM C864 Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers
   2. ASTM C1036 Standard Specification for Flat Glass

3. ASTM C1048 Standard Specification for Heat-Treated Flat Glass—Kind HS, Kind FT Coated and Uncoated Glass
4. ASTM E774 Standard Specification for the Classification of the Durability of Sealed Insulating Glass Units. (This standard is withdrawn and no replacement has been issued).

G. DD-G-1403.

H. Sealed Insulating Glass Manufacturers Association (SIGMA) Recommendations.

I. BAAQMD Regulation 8-51 - Adhesive and Sealant Products.

1.3 SYSTEM DESCRIPTION

A. Install each piece of glass watertight and airtight. Each installation shall withstand local, normal temperature changes, wind loading, impact loading (for operating sash and doors) without failure of any kind, including loss or breakage of glass, failure of sealants or gaskets to remain watertight, deterioration of glazing materials, and other defects of work.

B. Where no thickness of glass is given in the glass schedule, it shall be determined by glass manufacturer for the wind loads specified in the California Building Code Chapter 16 as modified by Division 01 Section "Lateral Force Procedures".

1.4 SUBMITTALS

A. Submit under provisions of Division 01 Section "General Requirements."

B. Product Data: Manufacturer's product data, material safety data sheets, and specifications for installations indicated, listing specific materials proposed. Indicate completely, recommendations for use of primers, joint preparation and sealant dimensions, and shall state shelf life (from date of shipment by manufacturer to expiration date for use on a project) for the material. Provide necessary information required to translate batch number code into date of manufacture and to thereby determine the latest date of usage from manufacturer's shelf life requirements.

C. Samples:
1. Each glass type required, minimum size 6 by 6 inches (300 by 300 mm).
2. Identify each type of glazing material, where its specified, available colors, and accessories.

D. Certifications:
1. Certification that all insulating units furnished comply with Class CBA of ASTM E774 and the performance specified.
2. Certification that all sealants are fully compatible with the surfaces and finishes with which they are in contact.

E. Closeout Submittals: Material Safety Data: Sealant and adhesive quantity use for in accordance with requirements of BAAQMD Regulation 8-51.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Glazing materials and installation shall comply with the requirements of Bay Area Air Quality Management District Regulation 8-51.

1.6 DELIVERY, STORAGE AND HANDLING

A. Package and deliver glass in manufacturer's sealed unopened containers, fully identified, and each pane clearly labeled with manufacturer's name and product designation.

B. Protect glass from damage and store in accordance with manufacturer's recommendations. Keep handling to a minimum. Protect edges of laminated and insulated glass from damage.

C. Glazing Sealants:
1. Deliver sealants and related accessories to the job site in factory sealed, unopened containers bearing manufacturer's name, product designation and batch number.
2. Store in unopened containers. Follow manufacturer's recommendations for storage temperatures and shelf life (see "Submittals" above).
3. Follow manufacturer's recommendations for handling products containing toxic materials. Keep flammable material away from heat, sparks and open flame. Use recommended solvents and cleaning agents for cleaning tools, equipment and skin.

1.7 ENVIRONMENTAL CONDITIONS

A. Perform no glazing operations when ambient temperature is at or below 40 deg F (4.4 deg C).

1.8 WARRANTIES

A. Insulating Glass Units: Warrant for 10 years from date of acceptance of Project to be free from delamination and failure of seals and not to develop material obstruction of vision as a result of dust, moisture or film formation on internal glass surfaces.

B. Low-E Glass: Warrant for 10 years from date of acceptance of Project to be free of peeling or other deterioration of the Low-E coating.

C. Laminated Glass: Warrant for 10 years from date of acceptance of Project to be free from delamination and discoloration.

D. Glazing Sealants: Warrant for 10 years per sealant manufacturer's standard warranty of merchantable quality. Warranty shall certify that cured sealants:
1. Will perform as a watertight weatherseal.
2. Will not become brittle or crack due to weathering or normal expansion and contraction of adjacent surfaces.
3. Will not harden beyond a Shore A durometer of 50, nor soften below a durometer of 10.
4. Will not change color when used with compatible back-up materials.
5. Will not bleed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Glass Manufacturers: PPG, LOF, Guardian Industries, Ford Glass, Hordis Brothers Inc., or equal. Provide all tinted and Low-E glass from the same manufacturer for the entire project.

2.2 MATERIALS

A. Glass types, thicknesses and fabricated assemblies are scheduled in the Glass Schedule included in PART 3. EXECUTION of this Section. Where no thickness is given, it shall be determined by glass manufacturer as specified in Article 1.04 System Description of this Section. Adjacent tinted and Low-E glass shall have the same light transmittance.
   1. Clear Annealed Float Glass: Clear float glass conforming to ASTM C 1036, Type I, Class 1, quality q3.
   2. Tempered Low-E Float Glass: As specified for clear annealed float glass except fully tempered to conform to ASTM C 1048, Kind FT.
   3. Tempered Low-E Clear Float Glass: PPG "Sungate 500(2)", or equal, clear float glass with transparent reflective coating on inboard (No. 2) surface, tempered to conform to ASTM C 1048, Kind FT.
   4. Insulating Glass:
      a. Manufacturer And Unit Fabrication: By a member of the Sealed Insulating Glass Manufacturers Assn. (SIGMA) and fabricated in accordance with SIGMA recommendations, except where more stringent requirements are indicated.
      b. Class: "CBA" and certified as such by the Insulating Glass Certification Council (IGCC).
      c. Construction: ASTM E 774 organic elastomeric sealed edge (no metal edges permitted) consisting of a polyisobutylene primary seal and a silicone secondary seal, with the interior air space hermetically sealed and provided with a concealed desiccant agent. Secondary seals other than silicone shall not be used.
      d. Where visible through the glass, the exposed surface of the metal spacer tube shall be painted with thermosetting, siliconized acrylic paint, or equal, color to match the color of aluminum frame at the interior of the building.
      e. Configuration: As per Glass Schedule.
   5. Glazing Materials and Accessories: Glazing materials and accessories shall be fully compatible with the materials and finishes with which they are in contact. Neoprene and EPDM materials shall not come in contact with silicone sealant materials. Silicone rubber spacers, setting and edge blocks and gaskets shall be either Type I (designed to prevent adhesion) or Type II (designed for adhesion) as per glazing system manufacturer's recommendations for each condition of use.
      a. Glazing Tapes: Preformed, preshimmed polyisobutylene-butyl tape, 1/2 inch (13 mm) wide x thickness to suit proper face clearance of glass, black color.
      b. Glazing Sealants: One component, silicone based sealant, black color.
      c. Glazing Sealants (Butt Glazing And Steel Windows): One component, silicone based sealant, black color except clear color at butt glazing.
      d. Primers (If Required For Sealants): Non-staining and non-etching type as recommended by sealant manufacturer.
      e. Setting Blocks: Neoprene, EPDM or silicone rubber conforming to ASTM C 864, 80-90 Shore A durometer hardness, and which will permit permanent mounting. Blocks shall be 0.1 inch (2.5 mm) long for each square foot of glass area (but no less than 4 inches (100 mm)) x 1/16 inches (1.6 mm) less than full channel width and of thickness to provide proper bite and minimum edge clearance for glass.

Where length of block may become excessive, lead blocks having a length of 0.05" for each square foot of glass (4 inches (100 mm) minimum) may be used. Do not use lead blocks for insulating, laminated or wire glass.

f. Edge Blocks: Neoprene, EPDM or silicone rubber conforming to ASTM C 864, 60-70 Shore A durometer hardness, and which will permit permanent mounting. Blocks shall be 3 inches (75 mm) minimum length x full channel width and of thickness or configuration to provide 1/8 inch (3 m) (nom.) clearance between block and glass edge.

g. Glazing Spacers: Neoprene, EPDM or silicone rubber conforming to ASTM C 864, 60-70 Shore A durometer hardness, size as required by glazing conditions, continuous (do not use intermittent spacers).

h. Insulation (Glass Spandrels): Owens-Corning Fiberglas "CW 225-FSK", or approved equal, fiberglass, semi-rigid, friction fit board with integral aluminum foil vapor barrier, "R" value as indicated on Drawings. Include galvanized steel mounting channels as required by job conditions.

2.3 FABRICATION

A. Cut glass to full fit and play, consistent with glass and glazing material manufacturers' recommendations and the requirements of the Drawings and References, Codes and Standards Article.

B. Follow code requirements and glass manufacturer's recommendations for minimum bite and edge and face clearances.

C. Cut lights to smooth straight edges, clean, free of nicks and flares; nipping not permitted. Follow glass manufacturer's directions exactly for tinted and Low-E glass.

D. Where glass edges (including cut openings) are required to be exposed, grind smooth and polish.

E. Tempered and heat strengthened glass shall be horizontally treated only. Fabrication and treatment shall, where at all possible, be such that roller distortion lines (where they may occur) will run horizontally (parallel to sill and head) after installation.

F. Glass Identification:
1. Tempered and heat strengthened glass shall bear the manufacturer's identification as to type and thickness.
2. Glazing in fire rated doors and fire rated windows shall bear UL classification marking in accordance with UL 9.
3. Manufacturer's and UL identifications for glazing shall be permanently etched so as to be visible after glass has been set in place and glazed.
4. Glass other than tempered, heat strengthened and UL-marked glass shall not have labels.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspect surfaces to receive glazing materials and report defects which might adversely affect the glazing work. Commencing work implies acceptance of surfaces as satisfactory.

B. Weep systems shall be open.

C. Surfaces shall be free of condensation and moisture.

D. Steel surfaces shall be primed and dry.

3.2 PREPARATION

A. Clean rebates and glazing reveals free of foreign matter, special coatings, dust, grease, projections and irregularities prior to setting glass. Solvents used for cleaning shall not etch or damage glass or metal surfaces.

B. Wipe glass free of dust and oil.

3.3 INSTALLATION

A. Conform to recommendations of glass manufacturer where such covers points not shown on Drawings or specified herein.

B. Remove "loose" stops furnished with the units and reinstall as a part of the glazing operation.

C. Handle lites so as to prevent nicks and flares on glass edges.

D. Install glass exceeding 1/8" thickness on identical setting blocks permanently mounted and centered at 1/4 points. If necessary to reduce deflection of horizontal supporting member, blocks may be placed at 1/8 points or with the nearest end 6" (whichever is greater) from edge of glass unit. Ensure that blocks are equidistant from centerline of glass. Do not obstruct weep holes.

E. Provide permanently mounted edge blocks at head and jambs of dry-glazed lights to prevent damage to glass edges during installation and lateral shifting of glass due to thermal and seismic loads and vibrations. Follow recommendations of Flat Glass Marketing Assn. Glazing Manual.

F. Set glass to maintain bite, edge and face clearance stipulated by code and the glass manufacturer.

G. Take special precautions to protect laminated glass edges from deterioration of vinyl interlayer by moisture.

H. Glaze dry-glazed aluminum doors and frames as per manufacturer's directions using glazing gaskets and seals furnished with the units.

I. Miter gaskets at corners, and install so as to prevent pulling away at corners. Gaskets with gaps or other visible irregularities on door and window units shall be corrected by manufacturer or fabricator at no additional cost to University.

J. Set interior non-wired glass in fixed stops with glazing tape one face.

3.4 FIELD QUALITY CONTROL

A. Conduct field check (test) of glazing in exterior for water leakage in accordance with AAMA 501.2.

B. After substantial cure of exterior glazing sealants which are exposed to the weather, test for water leaks. Flood the joint exposure with water directed from a 3/4 inch (38 mm) garden hose held perpendicular to the wall face, 24 inches (600 mm) from the joint, connected to a water system with 43 psf minimum static water pressure. Move stream of water along joint at an approximate rate of 20 feet (6 m) per minute.

C. Test approximately 5 percent of total glazing system in locations which are typical of every joint condition and which can be inspected easily for leakage on opposite face. Conduct tests in presence of the Project Manager, who will determine actual percentage of joints to be tested and the actual period of exposure to water from hose, based upon extent of observed leakage or lack thereof.

D. Repair glazing installation at leaks or, where leakage is excessive, replace glazing sealants.

E. Where nature of observed leakage indicates possibility of inadequate glazing joint bond strength, the Project Manager may direct that additional testing be performed at a time when joints have been fully cured, followed by natural exposure through both extreme temperatures, and returned to range of temperature in which it is feasible to conduct testing. Repair or replace work as required for permanent elimination of leakage.

3.5 WASTE MANAGEMENT

A. Separate float glass and place in designated containers for recycling.

B. Separate tempered glass and place in designated containers for recycling.

C. Separate corrugated cardboard in accordance with the approved Waste Management Plan in Division 01 Section "Construction Waste Management", and place in designated containers for recycling.

D. Place used sealant containers in designated containers for legal disposal.

3.6 CLEANING

A. Initial cleaning of glass surfaces is a part of this Section. Follow glass manufacturer's directions exactly for cleaning tinted and Low-E glass. Do not use abrasive cleaners or sharp instruments. Final cleaning and periodic cleaning of glass for protection from etching due to alkaline runoff from cementitious surfaces or due to construction soil is a part of the General Subcontract and is specified as a part of Division 01.

3.7 PROTECTION

A. Protect installed glass from damage due to subsequent construction operations.

B. Identification or caution markers shall not be applied to glass surfaces nor shall they be applied to metal surfaces in any way which would damage or stain the metal.

C. Replace glass broken or damaged prior to acceptance of Project. Costs occasioned by replacement shall be borne by those causing the damage.

3.8 GLASS SCHEDULE

A. Glass types shall be indicated in the shop drawings and submittals.

Glass Type	Material or Assembly
lA	Annealed clear float glass, 1/4 inch (6 mm) thick.
3A	Tempered clear float glass, 1/4 inch (6 mm) thick.
11C	Insulating glass fabricated with 1/4 inch (6 mm) thick tempered tinted float glass outboard light, 1/2 inch (13 mm) air space and 1/4 inch (6 mm) thick clear tempered float glass inboard light.

END OF SECTION 088000

SECTION 09 24 00 - PORTLAND CEMENT PLASTER

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Supply and Installation of Portland Cement Plaster with Cement Finish Stucco Assemblies

1.2 RELATED SECTIONS

A. Section 03 30 00 - Cast-in-Place Concrete

B. Section 06 16 00 - Sheathing

C. Section 07 25 00 - Weather Barriers

D. Section 07 62 00 - Sheet Metal Flashing and Trim

E. Section 07 90 00 - Joint Protection

F. Section 08 53 13 - Vinyl Windows

G. Section 09 21 16 - Gypsum Board Assemblies

1.3 REFERENCES

A. ASTM C578 - Specification for Preformed, Cellular Polystyrene Thermal Insulation

B. ASTM C897 - Standard Specification for Aggregate for Job-Mixed Portland Cement-Based Plaster

C. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster

D. ASTM C1032 - Standard Specification for Woven Wire Plaster Base

E. ASTM C1063 - Standard Specification for Installation of Lathing and Furring for Portland Cement Based Plaster

F. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials

G. ASTM E119 - Method for Fire Tests of Building Construction and Materials

H. ASTM E330 - Test Method for Structural Performance of Windows, Curtain Walls, and Doors by Uniform Static air Pressure Difference

I. ICC Acceptance Criteria 219 - Acceptance Criteria for Exterior Insulation And Finish Systems

J. ICC Acceptance Criteria 11 - Acceptance Criteria for Cementitious Exterior Wall Coatings

1.1 ASSEMBLY DESCRIPTION

K. Stucco Assembly: A code complying water resistive barrier, wire fabric or metal lath, manufacturer’s stucco base concentrate or sanded base and with a cement finish coat.

1.2 SUBMITTALS

A. General: Submit Samples, Evaluation Reports and manufacturer’s product datasheets in accordance with Division 1 General Requirements Submittal Section.

B. Samples: Submit samples for approval. Samples shall be of materials specified and of suitable size as required to accurately represent each color and texture used on project. Prepare each sample using same tools and techniques for actual project application. Maintain and make available, at job site, approved samples.

C. Manufacturer's Warranty: Submit sample copies of Manufacturer's Warranty indicating Single Source Responsibility for Water Stucco Base coat, finish coat and optional Primer, level coat and reinforcing mesh as specified.

1.3 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Shall have marketed stucco assemblies in United States for at least five years and shall have completed projects of same general scope and complexity.
2. Applicator: Shall be experienced and competent in installation of stucco materials and shall provide evidence of a minimum of 5 years experience in work similar to that required by this section.

B. Stucco Functional Criteria:

1. General: Stucco application shall be to vertical substrates or to substrates sloped for positive drainage. Substrates sloped for drainage shall have additional protection from weather exposure that might be harmful to coating performance.
2. Testing to meet International Code Council Acceptance Criteria AC11
3. Performance Requirements

Stucco Base Test	Method	ICC AC 11 Criteria	Results
Accelerated Weathering	ASTM G153	2000 Hours	No deleterious effects
Freeze-Thaw Resistance	ICC AC 11	10 cycles	Pass
Transverse Wind Load Resistance	ASTM E330	Meet Design Loads	Refer to ICC-ES ESR-2564
Fire Resistance	ASTM E119	One hour fire	Refer to ICC-ES ESR-2564
Drainage	ICC AC 11	90%	Refer to ICC-ES ESR-2564

C. Substrate Conditions:

1. Substrate materials and construction shall conform to the building code having jurisdiction.
2. Substrates shall be sound, dry and free of dust, dirt, laitance, efflorescence and other harmful contaminants.
3. Substrate Dimensional Tolerances: Flat with ¼ in (6.4 mm) within any 4 ft (1.22 m) radius.
4. Maximum deflection of substrate system under positive or negative design loads shall not exceed L/360 of span.

D. Expansion and Control Joints: Continuous expansion and control joints shall be installed at locations in accordance with ASTM C1063 and ASTM C926.

1. Substrate movement, and expansion and contraction of stucco and adjacent materials shall be taken into account in design of expansion joints, with proper consideration given to sealant properties, installation conditions, temperature range, and coefficients of expansion of materials, joint width to depth ratios, and other material factors. Minimum width of expansion joints shall be as specified by the designer or shown on the project drawings.
2. In accordance with ASTM C1063, expansion or control joints shall be installed in walls not more than 144 ft² (13.4 m²) in area, and not more than 100 ft² (9.3 m²) in area for all non-vertical applications. The distance between joints shall not exceed 18 ft (5.5 m) in either direction or a length-to-width ratio of 2-½ to 1.

3. For direct application to concrete or masonry, stucco joints are required only at control/expansion joints in the underlying concrete or masonry

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver stucco assembly products in original packaging with manufacturer's identification.

B. Storage: Store stucco assembly products in a dry location, out of direct sunlight, off the ground, and protected from moisture.

1.5 SITE / ENVIRONMENTAL CONDITIONS

A. Substrate Temperature: Do not apply stucco products to substrates whose temperature are below 40°F (4.4°C) or contain frost or ice.

B. Inclement Weather: Do not apply stucco products during inclement weather, unless appropriate protection is employed.

C. Sunlight Exposure: Avoid, when possible, installation of stucco products in direct sunlight. Application of finishes in direct sunlight in hot weather may adversely affect aesthetics.

D. Do not apply stucco base coats or finishes if ambient temperature falls below 40ºF (4ºC) within 24 hours of application. Protect stucco from uneven and excessive evaporation during dry weather and strong blasts of dry air.

E. Prior to installation, the wall shall be inspected for surface contamination, or other conditions that may adversely affect the performance of the stucco assembly, and shall be free of residual moisture.

1.6 COORDINATION AND SCHEDULING:

A. Coordination: Coordinate stucco assembly installation with other construction operations.

1.7 WARRANTY

A. Warranty: Upon request, at completion of installation, provide Standard Stucco Assembly Warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Parex USA, Inc., 4125 E. La Palma Ave., Suite 250, Anaheim, CA 92807

B. Components: Obtain components manufactured by Parex USA of El Rey FastWall 100 Stucco Assembly from authorized distributors.

2.2 MATERIALS

A. Stucco assembly materials:

1. Stucco base (⅜ in – ½ in)

a. Stucco base concentrate: Proprietary mixture of portland cement, and proprietary ingredients mixed with clean, cool, potable water, and ASTM C897 or ASTM C144 sand added in the field.

B. 100% acrylic admix emulsion additive for portland cement based products, to enhance curing, adhesion, freeze-thaw resistance and workability and/or as an acrylic polymer bonding agent for between a cementitious base and stucco finish coat.

C. Leveling and Reinforcing Coat : *NOT FOR USE ON EPS FOAM SHAPES

1. Stucco leveling coat: Copolymer based, manufacturer’s factory blend of cement and proprietary ingredients requiring addition of water.

2. Reinforcing Meshes:
   a. 355 Standard Mesh: Weight 4.5 oz/yd^2 (153 g/m^2) reinforcing mesh.

2.2 RELATED MATERIALS AND ACCESSORIES

A. General: El Rey FastWall 100 Stucco Assembly and its related materials shall conform to the requirements of ICC-ES Evaluation Report No. 2564 and shall conform to this specification.

B. Substrate Materials:
   1. Plywood: Minimum $^5/_{16}$ in (8 mm) thick exterior grade or Exposure I plywood for studs spaced 16 in (406 mm) o.c.
   2. Oriented Strand Board (OSB): $^7/_{16}$ in Wall-16, Structural 1, APA approved.

C. Water-Resistive Barriers:
   1. For wood based sheathing shall be either:
      a. 2 layers of Grade D asphalt saturated Kraft building paper, or 1 layer of the Kraft building paper plus paper backed lath
      b. Grade D paper with a water resistance equal to or greater than 60 minutes, with an intervening nonwater-absorbing layer or drainage space.
      c. Other recognized equivalent

D. Lath and Accessories: Conform to ASTM C847, ASTM C933, ASTM C1032, ASTM C1063 and Appendix
   1. Accessories: Manufacturer's standard steel products with minimum G60 galvanizing unless otherwise indicated as rigid polyvinyl chloride (PVC plastic) or zinc alloy
   2. Metal Plaster Bases: Minimum 17 gauge self-furred stucco netting, minimum 2.5 lb/yd^2 (1.4 kg/m^2) expanded metal diamond lath, or welded wire lath in accordance with applicable codes and standards.
   3. Weep Screeds: Foundation weep screed with minimum 3-½ inch vertical attachment flange.

E. Seals, Sealants and Bond Breakers: Sealants shall conform to ASTM C920, Grade NS, Class 25, Use NT. Backer rod shall be closed-cell polyethylene foam.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify project site conditions under provisions of Section 01 00 00.

B. Compliance: Comply with manufacturer's instructions for installation of stucco assembly products.

C. Substrate Examination: Examine prior to stucco base installation as follows:
   1. Substrate shall be of a type approved by system manufacturer. Plywood and OSB substrates shall be gapped ⅛ in (3.2 mm) at all edges.
   2. Substrate shall be examined for soundness, and other harmful conditions.
   3. Substrate shall be free of dust, dirt, laitance, efflorescence, and other harmful

contaminants.

4. Substrate construction in accordance with substrate material manufacturer's specifications and applicable building codes.

D. Advise Contractor of discrepancies preventing installation of stucco system assembly. Do not proceed with work until unsatisfactory conditions are corrected.

E. Ensure that flashing has been installed per Specification Section 07 60 00 - Flashing and Sheet Metal.

3.2 PREPARATION

A. Water Resistive Barrier:

1. The Water Resistive Barrier is placed over all substrates except concrete or unpainted masonry. As occurs, painted (coated) CMU is to use a bond breaker such as asphalt paper and lath if the paint or coating cannot be removed.

2. Installed according to manufacturer’s instructions.

B. Wire Fabric Lath and Metal Lath: Install according to ICC Evaluation Report ESR 2564, ASTM C1063 and Appendix and the Building Code.

C. Concrete (Cast-in-Place): As occurs; Provide a surface that is slightly scarified, water absorbent, straight and true to line and plane. Remove form ties and trim projecting concrete so it is even with the plane of the wall. Remove form release agents.

D. Ensure that metal flashing has been installed per Specification Section 07 60 00 - Flashing and Sheet Metal.

3.3 MIXING

A. Mix proprietary products in accordance with manufacturer's instructions, including the applicable product data sheets.

B. Admix and Bonding Agent

Mix up to 1 gal (3.8 L) per 1 bag of stucco concentrate. Mix up to 1 qt (1 L) per bag of Manufacturer Sanded. Add after dry components and the majority of the water has been mixed. Mix no longer than required to provide a uniform mixture. DO NOT OVER-MIX. Overmixing entrains excessive amounts of air which weaken the material. Do not re-temper mixes over 20 minutes old.

3.4 APPLICATION

A. General: Stucco system assembly and its related materials shall conform to the requirements of ICC-ES Evaluation Report No. 2564 and shall conform to this specification.

B. Bonding Agent & Admix:

1. Apply at the approximate rate of 250 ft^2 per gallon using a low-pressure sprayer, brush or roller. (application in direct sunlight may cause the product to dry too quickly)

2. Cement products should be applied after Admix and Bonding Agent becomes tacky and up to 72 hours after application, but not while wet.

C. Stucco Base:

1. Either, stucco mixtures shall be applied in one or two coats to a minimum thickness of ⅜ in (9.5 mm) by hand troweling or machine spraying the mixture to the wire lath in accordance with manufacturer’s product data sheets. The maximum thickness applied in one pass is ½ in (12.7 mm).

2. Rod surface to true plane and float to densify.
3. Trowel to smooth and uniform surface

D. Manufacturer's Leveling and Reinforcing Coat:
1. After Moist Curing, allow stucco base to air dry a minimum of 24 hours before applying the leveling and reinforcing coat.
2. Using a stainless steel trowel, apply stucco leveling coat over stucco base coat at a thickness of $^{1}/_{16}$ – $^{3}/_{32}$ in. (1.6 – 2.4 mm)
3. Fully embed the standard mesh into the wet stucco level coat including diagonal strips at corners of openings and trowel smooth. If Standard Mesh is used, seams are overlapped 2½ in (63 mm).

E. Admix and Bonding Agent:
1. Recommended as a surface bonding agent when cement finishes are to be applied over Stucco Level Coat.
2. Apply according to product datasheets and application instructions using a low-pressure sprayer brush or roller (application in direct sunlight may cause the product to dry too quickly).
3. Stucco finishes may be applied after Admix and Bonding Agent becomes tacky up to 72 hours after application, but not while wet.

F. Cement Finish Coat:
1. Apply Stucco Finish according to product datasheet and application instructions.
2. Protect finish coats from inclement weather until completely dry and cured.

G. Curing:
1. Stucco base: Keep stucco moist for at least 48 hours (longer in dry weather) by lightly fogging walls. Start light fogging after initial set of 1–2 hours.

3.5 CLEAN-UP

A. Removal: Remove and legally dispose of component debris material from job site.

3.6 PROTECTION

A. Provide protection of installed materials from water infiltration into or behind them.

B. Provide protection of installed stucco from dust, dirt, precipitation, and freezing during installation.

C. Provide protection of installed finish from dust, dirt, precipitation, freezing, and continuous high humidity until fully dry.

D. Clean exposed surfaces using materials and methods recommended by the manufacturer of the material or product being cleaned. Remove and replace work that cannot be cleaned to the satisfaction of the Designer/Owner.

END OF SECTION 092400

SECTION 092900 - GYPSUM BOARD

1.1 SUMMARY

A. Provide gypsum board assemblies:
   1. Interior walls, partitions, and ceilings with tape and joint compound finish.
   2. Non-paper faced gypsum board assemblies behind shower enclosures.
   3. Exterior ceilings.
   4. Wood framing systems to receive gypsum board.
   5. Insulation and vapor barrier systems in gypsum board assemblies.
   6. Installation of access panels in gypsum board assemblies.
   7. Cover board for insulated roof systems.

1.2 HERS Certification

A. Gypsum Board
   1. Gypsum drywall walls and ceilings taped and orange peel textured as required per code throughout.
   2. Non-paper faced backer board required behind tubs and shower surrounds.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

1.4 QUALITY ASSURANCE

A. Comply with governing codes and regulations.

B. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years.

C. Use experienced installers.

D. Deliver, handle, and store materials in accordance with manufacturer's instructions.

E. Tolerances: Not more than 1/16 inch difference in true plane at joints between adjacent boards before finishing. After finishing, joints shall be not be visible. Not more than 1/8 inch in 10 feet deviation from true plane, plumb, level and proper relation to adjacent surfaces in finished work.

F. Fire Resistance for Fire-Rated Assemblies: ASTM E 119.

G. Performance: Fire, structural, and seismic performance meeting requirements of building code and local authorities.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: Provide materials and construction identical to those tested in assemblies per ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

B. STC-Rated Assemblies: Provide materials and construction identical to those tested in assemblies per ASTM E 90 and classified per ASTM E 413 by a qualified independent testing and inspecting agency.

2.2 PANEL PRODUCTS

A. Provide in maximum lengths available to minimize end-to-end butt joints.

B. Interior Gypsum Board: ASTM C 1396/C 1396M, in thickness indicated, with manufacturer's standard edges. Regular type unless otherwise indicated, Type X where indicated.

C. Water-Resistant Gypsum Backing Board: ASTM C 1396/C 1396M, in thickness indicated by wall type. Regular type unless otherwise indicated, Type X where required for fire-resistance-rated assemblies and where indicated.

D. Glass-Mat, Water-Resistant Gypsum Backing Board: ASTM C 1178/C 1178M, of thickness indicated. Regular type unless otherwise indicated.

E. Cementitious Backer Units: ANSI A118.9, ASTM C 1288, or ASTM C 1325.

2.3 ACCESSORIES

A. Trim Accessories: ASTM C 1047, formed from galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet. For exterior trim, use accessories formed from hot-dip galvanized-steel sheet, plastic, or rolled zinc.

1. Provide bullnosed and 90 degree cornerbead at outside corners unless otherwise indicated.
2. Provide bullnosed and 90 degree LC-bead (J-bead) at exposed panel edges.
3. Provide control joints where indicated.

B. Aluminum Accessories: Extruded-aluminum accessories indicated with manufacturer's standard corrosion-resistant primer.

C. Joint-Treatment Materials: ASTM C 475/C 475M.

1. Joint Tape: Paper unless otherwise recommended by panel manufacturer.
2. Joint Compounds: Setting-type compounds
3. Skim Coat: For final coat of Level 5 finish, use setting-type, sand-able topping compound
4. Cementitious Backer Unit Joint-Treatment Materials: Products recommended by cementitious backer unit manufacturer.

D. Sound-Attenuation Blankets: ASTM C 665, Type I (unfaced).

E. Textured Finish: Ceiling finish – orange peel texture.

F. Textured Finish: Wall finish – orange peel texture.

G. Textured Finish: Wall finish – hard trowel clay plaster.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install gypsum board to comply with ASTM C 840.

1. Isolate gypsum board assemblies from abutting structural and masonry work. Provide edge trim and acoustical sealant.
2. Single-Layer Fastening Methods: Fasten gypsum panels to supports with screws.
3. Multilayer Fastening Methods: Fasten base layers and face layer separately to supports with screws.

B. Install cementitious backer units to comply with ANSI A108.11.

C. Fire-Resistance-Rated Assemblies: Comply with requirements of listed assemblies.

D. Finishing Gypsum Board: ASTM C 840.

1. At concealed areas, unless a higher level of finish is required for fire-resistance-rated assemblies, provide Level 1 finish: Embed tape at joints.
2. At substrates for tile, provide Level 2 finish: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges.
3. Unless otherwise indicated, provide Level 4 finish: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges.
4. Where indicated, provide Level 5 finish: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges. Apply skim coat to entire surface.

E. Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.

F. Cementitious Backer Units: Finish according to manufacturer's written instructions.

G. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture free of starved spots or other evidence of thin application or of application patterns.

END OF SECTION 092900

SECTION 093013 - CERAMIC TILING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data and Samples.

B. Obtain tile of each type and color or finish from same production run for each contiguous area.

C. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling ceramic tile packages.

PART 2 - PRODUCTS

2.1 CERAMIC TILE

A. Ceramic tile that complies with ANSI A137.1.

B. Tile Type Ceramic Tile: Glazed, square-edged quarry tile.

1. Datile Koncrete Glazed Ceramic Tile

2. Face Size: 12 by 12 inches (76 by 76 mm).
3. Wearing Surface: Nonabrasive, smooth
4. Finish: Matte, clear glaze.
5. Color and Pattern: White and Grey
6. Grout Color: White and Grey
7. Trim Units: Coordinated with sizes and coursing of adjoining flat tile Floor Bullnose – Item Number: P-43C9, Dimensions: 3” x 12”

    a. Base: Coved with surface bullnose top edge.
    b. Wainscot Cap: Surface bullnose.

2.2 INSTALLATION MATERIALS

A. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325, 1/2 inch (12.7 mm) thick.

B. Fiber-Cement Underlayment: ASTM C 1288, 1/2 inch (12.7 mm) thick.

C. Low-Emitting Materials: Adhesives and fluid-applied waterproofing membranes shall have a VOC content of 65 g/L or less.

D. Low-Emitting Materials: Adhesives and fluid-applied waterproofing membranes shall comply with Green Seal's GS-36 and with the testing and product requirements of the California

Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

E. Waterproofing Membranes for Thinset Installations: ANSI A118.10, [fabric-faced chlorinated polyethylene, PVC, or polyethylene sheet product] [fabric-reinforced modified bituminous product] [fabric-reinforced liquid-latex or elastomeric polymer product] [unreinforced liquid-latex or elastomeric polymer product] [urethane waterproofing and adhesive].

F. Setting and Grouting Materials: Comply with material standards in ANSI's "Specifications for the Installation of Ceramic Tile" that apply to materials and methods indicated.

1. Thinset Mortar Type: Dry-set Portland cement; white, unless otherwise indicated.

2. Water-Cleanable, Tile-Setting Epoxy:

3. Organic Adhesive: ANSI A136.1, Type I.

4. Grout Type: Standard cement grout, ANSI A118.6.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, are specified in tile installation schedules, and apply to types of setting and grouting materials used.

B. 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.

C. Lay tile in grid pattern unless otherwise indicated. Align joints where adjoining tiles on floor, base, walls, and trim are the same size.

D. Install cementitious backer units and fiber-cement underlayment, and treat joints according to ANSI A108.11.

E. Install waterproofing to comply with ANSI A108.13.

F. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

G. Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thinset).

H. Interior Floor Tile Installation Method(s):

1. Over Concrete Subfloors [TCNA F113; thinset mortar]

Interior Wall Tile Installation Method(s):

2. Over Wood or Metal Studs or Furring: TCNA W245 or TCNA W248; thinset mortar on water-resistant backer board (Blue Board Drywall)
3. 4’ wainscotting in bathroom walls

END OF SECTION 093013

SECTION 095113 — ACOUSTICAL PANEL CEILINGS

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 acoustical panels and exposed suspension systems for ceilings.

1.3 SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, 6 inches (150 mm) in size.

C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Panel: Set of 6-inch- (150-mm-) square Samples of each type, color, pattern, and texture.
2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch- (150-mm-) long Samples of each type, finish, and color.

D. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Structural members to which suspension systems will be attached.
3. Size and location of initial access modules for acoustical panels.
4. Method of attaching hangers to building structure.
5. Perimeter moldings.
6. Items penetrating finished ceiling including the following:

    a. Lighting fixtures.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.

E. Qualification Data: For testing agency.

F. Product Test Reports: For each acoustical panel ceiling, for tests performed by a qualified testing agency.

G. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

H. Field quality-control reports.

I. Maintenance Data: For finishes to include in maintenance manuals.

J. Warranty: Sample of special warranty.

K. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Panels: Full-size panels equal to 3 percent of quantity installed, but not less than one box.
2. Suspension-System Components: Quantity of each exposed component equal to 3 percent of quantity installed.
3. Hold-Down Clips: Equal to 3 percent of quantity installed.
4. Impact Clips: Equal to 3 percent of quantity installed.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.

B. Seismic Standard: Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions according to the following:

1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.
2. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's "Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings--Seismic Zones 0-2."
3. CISCA's Guidelines for Systems Requiring Seismic Restraint: Comply with CISCA's "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies--Seismic Zones 3 & 4."
4. UBC Standard 25-2, "Metal Suspension Systems for Acoustical Tile and for Lay-in Panel Ceilings."
5. ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

C. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

1.7 WARRANTY

A. Manufacturer’s thirty (30) year warranty of ceiling panels and suspension system covering the following:

1. Free from defects in materials or factory workmanship.
2. Free from sagging and warping.
3. Free from growth of mold, mildew, and bacteria.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and in accordance with authorities having jurisdiction.

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
2. Smoke-Developed Index: 50 or less.

C. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 ACOUSTICAL PANELS, GENERAL

A. Source Limitations:

1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
2. Suspension System: Obtain each type from single source from single manufacturer.

B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.

C. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.

D. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface according to ASTM E 795.

E. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

F. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.3 ACOUSTICAL PANELS

A. Manufactures: Subject to compliance with requirements, provide Armstrong World Industries, Inc.; provide product by the following:

1. Armstrong World Industries, Inc – Facility Standard.

2. Ultima High NRC, Item No. 1943

B. Color: White unless noted otherwise on Drawings.

C. LR: Not less than 0.80.

D. NRC: Not less than 0.50.

E. CAC: Not less than 35.

F. Edge/Joint Detail: Square unless noted otherwise on Drawings.

G. Thickness: As indicated on Drawings.

H. Modular Size: As indicated on Drawings.

I. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.

B. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
3. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
4. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire but provide not less than 0.135-inch- (3.5-mm-) diameter wire.

C. Angle Hangers: Angles with legs not less than 7/8-inch (22 mm) wide; formed with 0.04-inch- (1-mm-) thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch- (8-mm-) diameter bolts.

D. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

E. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

F. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in place.

G. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches (610 mm) o.c. on all cross tees.

H. Impact Clips: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.

I. Clean-Room Gasket System: Where indicated, provide manufacturer's standard system, including manufacturer's standard unless noted otherwise gasket and related adhesives, tapes, seals, and retention clips, designed to seal out foreign material from and maintain positive pressure in clean room.

2.5 METAL SUSPENSION SYSTEM

A. Manufacturers: Subject to compliance with requirements, provide Armstong World Industries; grid or comparable product by the following:

1. Armstrong World Industries, Inc.

2.6 METAL EDGE MOLDINGS AND TRIM

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Armstrong World Industries, Inc.

B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

C. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements and the following:

1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 (ASTM B 221M) for Alloy and Temper 6063-T5.
2. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
3. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils (0.04 mm). Comply with ASTM C 635/C 635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.7 ACOUSTICAL SEALANT

A. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.
2. Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant.
3. Acoustical sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.

2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
10. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m). Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. Arrange directionally patterned acoustical panels as follows:

    a. As indicated on reflected ceiling plans.

2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
3. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
5. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
6. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions unless otherwise indicated.
7. Install clean-room gasket system in areas indicated, sealing each panel and fixture as recommended by panel manufacturer's written instructions.
8. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:

    1. Compliance of seismic design.

B. Perform the following tests and inspections of completed installations of acoustical panel ceiling hangers and anchors and fasteners in successive stages. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations show compliance with requirements.

    1. Extent of Each Test Area: When installation of ceiling suspension systems on each floor has reached 20 percent completion but no panels have been installed.

        a. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf (890 N) of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf (1957 N) of tension.
        b. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.

C. Acoustical panel ceiling hangers and anchors and fasteners will be considered defective if they do not pass tests and inspections. If tests and inspections are note passed hangers, anchors and fasteners shall be removed and replaced.

D. Prepare test and inspection reports.

3.5 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 09 61 19 – CONCRETE FLOOR STAINING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior concrete flooring stain.

B. Interior concrete polyurethane coating.

C. Sacrificial floor protection.

1.2 RELATED SECTIONS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 03 35 00 - Concrete Finishing.

1.3 REFERENCES

A. ASTM International (ASTM):
   1. ASTM 2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.

B. American Concrete Institute (ACI):
   1. ACI 301 - Specifications for Structural Concrete.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data:
   1. Manufacturer's data sheets on each product to be used.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Typical installation methods.

C. Verification Samples: Two representative units of each type, size, pattern and color.

D. Shop Drawings: Include details of materials, construction and finish. Include relationship with adjacent construction.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum ten years documented experience.

B. Installer Qualifications: Company specializing in performing Work of this section with minimum three years documented experience with projects of similar scope and complexity.

C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

D. Mock-Up: Construct a mock-up with actual materials in sufficient time for Architect's review and to not delay construction progress. Locate mock-up as acceptable to Architect

and provide temporary foundations and support.

1. Intent of mock-up is to demonstrate quality of workmanship and visual appearance.
2. If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.
3. Retain mock-up during construction as a standard for comparison with completed work.
4. Do not alter or remove mock-up until work is completed or removal is authorized.

E. System shall be in compliance with requirements of ACI 301.

1.6 PRE-INSTALLATION CONFERENCE

A. Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.

1.7 DELIVERY, STORAGE, AND HANDLING

A. All components of the system shall be delivered to the site in the Manufacturer's packaging, clearly identified with the product type and batch number.

B. Store and handle in strict compliance with manufacturer's written instructions and recommendations.

C. The Applicator shall be provided with a storage area for all components. The area shall be between 60 and 90 degrees F (15.6 and 32 degrees C), dry, out of direct sunlight and in accordance with the Manufacturer's recommendations and relevant health and safety regulations.

D. Protect from damage due to weather, excessive temperature, and construction operations.

E. Copies of Safety Data Sheets (SDS) for all components shall be kept on site for review by the Engineer or other personnel.

F. Waste Disposal: The Applicator shall be provided with adequate disposal facilities for non-hazardous waste generated during installation of the system.

1.8 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 recommended limits.

1.9 WARRANTY

A. Manufacturer's standard warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: SureCrete, 15246 Citrus County Drive, Dade City, FL 33523; Tel: 352-567-7973; Fax: 352-521-0973; Email: specs@fenixspc.com; Web: www.surecrete.com

B. Substitutions: Permitted upon approval by Architect.

2.2 INTERIOR CONCRETE FLOORING STAIN

A. Water Based Concrete Stain:
1. Basis of Design: SureCrete ECO STAIN as manufactured by SureCrete.
a. UV resistant.
b. VOC: 0 oz per gal (0 grams per L).
c. Coverage Rate: 200 sq ft per gal (15.58 sq m) uncut.
d. Color: As determined by the Architect from manufacturer's selection.

B. Water Based Clear Polyurethane Coating:
1. Basis of Design: SureCrete DK 400WB as manufactured by SureCrete.
a. Sheen: Gloss.
b. Sheen: Satin.
c. Sheen: As determined by the Architect from manufacturer's selection.
d. UV resistant.
e. VOC: 72000 ppm (72 grams per L).
f. Solids Content: 57 percent.
g. Application Temperature: 50 to 90 degrees F (10 to 32 degrees C).
h. Cure Rates at 77 degrees F (25 degrees C).
1) Dry to Touch: After 6 to 8 hours.
2) Light Traffic: After 24 hours.
3) Heavy Traffic: After 3 days.
4) Full Cure: After 5 to 7 days.
i. Cure Rates at 50 degrees F (10 degrees C)
1) Dry to Touch: After 18 hours.
2) Light Traffic: After 48 hours.
3) Heavy Traffic: After 5 days.
4) Full Cure: After 14 days.

C. Sacrificial Floor Protection:
1. Basis of Design: SureCrete SUREFINISH as manufactured by SureCrete.
a. Standards Compliance: ASTM D2047.
b. Sheen: Gloss.
c. Sheen: Satin.
d. Sheen: As determined by the Architect from manufacturer's selection.
e. VOC: 72000 ppm (72 grams per L).
f. Content Type: Water Based

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly constructed and prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Protection:
   1. Protect walls and surrounding surfaces not to receive concrete floor stain.
   2. Do not allow stain to come in contact with wood or metal surfaces.
   3. Prepare concrete surface in accordance with manufacturer's instructions.
   4. Concrete shall be as specified in Section 03 30 00 - Cast-in-Place Concrete. Ensure concrete is a minimum of 28 days old.

C. Ensure surface is clean, dry, structurally sound, and free from dirt, dust, oil, grease, solvents, paint, wax, asphalt, concrete curing compounds, sealing compounds, surface hardeners, bond breakers, adhesive residue, and other surface contaminants

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions approved submittals and in proper relationship with adjacent construction.
   1. Apply stain in accordance with manufacturer's instructions at locations indicated on the drawings.
   2. Control depth of color by adjusting volume of stain applied.
   3. Apply 2 coats of stain. Do not scrub clean between coats.
   4. When multiple colors are required, product can be applied wet on wet or wet on dry. Use same technique as approved sample.
   5. Allow to completely dry.

B. Sealing Application:
   1. Conduct a moisture vapor emission test prior to applying any coating. Refer to the specific sealer's Technical Data Bulletin for acceptable moisture vapor emission rate (MVER).
   2. Apply coating according the coating manufacturer's printed instructions at a rate of 300 to 400 square feet per gallon (7.4 to 9.8 sq m per L) per coat. Maintain a wet edge at all times.
   3. Allow sealer to completely dry, while staying within the recoat window, before applying additional coats.
   4. Apply second application of the coating, at 90 degrees to the direction of the first coat, using the same application method and rates.

3.4 CLEANING AND PROTECTION

A. Clean products in accordance with the manufacturer's recommendations.

B. The General Contractor is responsible for using Temporary Floor Protection throughout the project to safeguard the surface quality of concrete slabs before and after application of decorative finishes or installations of other materials.

C. All concrete floors that will be not be covered by other materials will be protected throughout the project. The concrete slab must be treated as a finished floor at all times during construction.

D. Temporary Floor Protection will be removed, only while finish work to the concrete is being performed, and will be replaced after the final finish has cured sufficiently.

E. Protect surfaces from foot traffic for a minimum of 24 hours.

F. Use of an Industrial Sacrificial Floor finish is advised.

G. Sacrificial Floor Finish: Applied in accordance with published installation procedures. No substitutions will be allowed

H. Do not wash surfaces for a minimum of 48 hours.

I. Maintain stained and sealed concrete floors by sweeping. Clean spills when they occur and rinse dirt off with water. Wet-clean heavily soiled areas by mopping or by scrubbing with a rotary floor machine equipped with a scrubbing brush and a suitable, high quality commercial detergent. Maintain interior floors that require polishing by using a compatible, premium-grade, emulsion-type, commercial floor polish, according to manufacturer's printed instructions and safety requirements.

END OF SECTION 096119

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

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. Resilient Wall Base.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:

   1. Product Data for Credit EQ 4.1: For adhesives, include printed statement of VOC content and chemical components.

C. Samples for Initial Selection: For each type of product indicated.

D. Samples for Verification: For each type of product indicated, in manufacturer's standard-size samples of each resilient product color, texture, and pattern required.

E. Product Schedule: For resilient products. Use same designations indicated on Drawings**.**

1.4 QUALITY ASSURANCE

A. Installation Qualification: Contractors for floor covering installation should be experienced in managing commercial flooring projects and provide professional installers, qualified to install the various flooring materials specified. An installer is “qualified” if trained by Tarkett or a certified INSTALL (International Standards & Training Alliance) resilient floor covering installer.

B. Mockups: Provide resilient products with mockups specified in other Sections.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by Tarkett, but not less than 55 deg F (13 deg C) or more than 85 deg F (29 deg C).

PART 2 - PROJECT CONDITIONS

A. Install resilient products after other finishing operations, including painting, have been completed.

B. Maintain ambient temperatures within range recommended by Tarkett, but not less than 65 deg F (18 deg C) or more than 85 deg F (29 deg C) in spaces to receive resilient products during the following time periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

C. Maintain the ambient relative humidity between 40% and 60% during installation.

D. Until Substantial Completion, maintain ambient temperatures within range recommended by Tarkett, but not less than 55 deg F (13 deg C) or more than 85 deg F (29 deg C).

PART 3 - PRODUCTS

3.1 RESILIENT **TRADITIONAL VINYL** WALL BASE

A. Basis-of-Design Product: Subject to compliance with requirements, provide Tarkett Traditional Thermoplastic Vinyl Wall Base.

B. Performance requirements meets ASTM F1861 Standard Specification for Resilient Vinyl Wall Base, Type TV, Group 1.

C. For thickness, specify: 0.080" (2 mm)

D. For type, specify: Coved

E. For height, specify: 4" (10.16 cm)

F. For corners, specify: Inside Corners

G. Colors and Patterns: As selected by Architect from full range of industry colors

H. Test Data:
   1. Flexibility, ASTM F137: Passes 1/4 inch mandrel
   2. Resistance to light, ASTM F1515: Passes
   3. Resistance to chemicals, ASTM F925: Passes
   4. ASTM E 648, Standard Test Method for Critical Radiant Flux of 0.45 watts/cm^2 or greater, Class 1.

3.2 INSTALLATION MATERIALS

A. Adhesives: as recommended by Tarkett to meet site conditions
   1. Tarkett 960 Cove Base Adhesive (Porous applications)
   2. Tarkett 946 Premium Contact Bond Adhesive (Non-porous applications)

PART 4 - EXECUTION

4.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

4.2 PREPARATION

A. Prepare substrates according to Tarkett's written instructions to ensure adhesion of resilient wall base.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

C. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

D. Vacuum clean substrates to be covered by resilient products immediately before installation.

4.3 RESILIENT BASE INSTALLATION

A. Comply with Tarkett's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

4.4 CLEANING AND PROTECTION

A. Comply with Tarkett's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:
   1. Remove adhesive and other blemishes from exposed surfaces.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data and Samples.

B. Extra Materials: Deliver to Owner one box of each type and color of resilient floor tile installed.

PART 2 - PRODUCTS

2.1 VINYL COMPOSITION FLOOR TILE

A. Armstrong Flooring: Sandrift White 51858, Blue Dreams 57508

B. Tile Standard: ASTM F 1066, Class 2, through-pattern tile ISO 10595 Type II

C. Wearing Surface: Smooth

D. Thickness: 0.125 inch (3.2 mm)

E. Size: 12 by 12 inches (305 by 305 mm).

2.2 INSTALLATION ACCESSORIES

A. Trowel able Leveling and Patching Compounds: Latex-modified, Portland-cement- or blended-hydraulic-cement-based formulation provided or approved by flooring manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit floor covering and substrate conditions indicated.

1. Low-Emitting Materials: Adhesives shall have a VOC content of 50 g/L or less.
2. Low-Emitting Materials: Adhesives shall comply with Green Seal's GS-36 and with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Floor Polish: Protective liquid floor polish products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Prepare concrete substrates according to ASTM F 710. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

B. Lay out tiles so tile widths at opposite edges of room are equal and are at least one-half of a tile.

C. Match tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged. Lay tiles in basket-weave pattern with grain direction alternating in adjacent tiles in patterns indicated on floor finish schedule sheet.

D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor covering before applying liquid floor polish.

1. Apply a minimum of two cost of high-quality commercial polish such as Armstrong S-480 Commercial Floor Polish

3.2 MAINTENACE RECOMMENDATIONS

A. Initial Maintenance, Immediately After Installation

1. Sweep, dust mop or vacuum the floor thoroughly to remove all loose dust, dirt, grit and debris.

2. Remove any dried adhesive residue with a clean, white cloth dampened with mineral spirits, carefully following warnings on the container.

3. Damp mop the floor with a properly diluted neutral (pH 6 to 8) detergent solutions such as Armstrong S-485 Commercial Floor Cleaner.

4. Apply a minimum of two coats of a high-quality commercial floor polish (such as Armstrong S-480 Commercial Floor Polish) to temporarily protect the floor until regular maintenance procedures can begin. The use of a high-quality stain-resistant sealer (such as Armstrong S-495 Commercial Floor Sealer) beneath the polish should be considered in areas of high traffic, high soil load and areas where staining potential is high.

B. Initial Maintenance and Preparation for Commercial Traffic

1. Machine scrub the floor with a properly diluted neutral detergent solution (such as Armstrong S-485 Commercial Floor Cleaner) and a scrubbing pad (3M blue or equal), or equivalent brushes. If the floor is badly soiled and/or scratched, strip it using the same procedure but substituting a properly diluted stripping solution. NOTE: The use of aggressive strippers such as mop-on/mop-off, no-scrub and norinse strippers is not recommended on tile floors less than two years old because they may affect the adhesive bond.

2. Thoroughly rinse the entire floor with fresh, clean water. Remove rinse water and allow the floor to dry completely.

3. Apply 3 to 5 coats of high-quality commercial floor polish, such as Armstrong® S-480 Commercial Floor Polish. In areas where the flooring will be exposed to heavy traffic and/or staining agents, the application of 1 or 2 coats of a stain resistant sealer (such as Armstrong® S-495 Commercial Floor Sealer) prior to the application of polish, is recommended.

END OF SECTION 096519

SECTION 096816 - TILE CARPETING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data and Samples.

B. Extra Materials: Deliver to Owner carpet tiles equal to 5 percent of each type and color installed, packaged with protective covering for storage.

1.2 WARRANTY

A. Manufacturer Provided Lifetime Limited Carpet Tile Warranty, Lifetime Limited Duracolor Stain Warranty, Lifetime Static, Lifetime Duracolor Stain Warranty

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Mohawk Group, Awareness Tile, Tantastic

B. Fiber Content: Colorstrand SD Nylon

C. Pile Characteristic: Textured Patterned Loop

D. Face Weight: 22 oz/yd2 (746 g/m2) excluding weight of backings.

E. Primary Backing: EcoFlex NXT - Product is non-woven, needle punch, post-consumer PET. There is no cell structure as in Urethane.

F. Secondary Backing: Pre-Coat Polymer, Polyolefin Thermoplastics Polymer, FiberGlass Scrim, PET Cushion

G. Tile Size: 12" x 36" (.3048 m x .9144 m)

H. Appearance Retention Rating: Severe traffic, 3.5

I. Retain or revise "Critical Radiant Flux Classification" Paragraph below after verifying requirements of authorities having jurisdiction.

J. Critical Radiant Flux Classification: ASTM E 648 Class 1 (Glue Down)

K. Tuft Bind: 5 lbf (22 N) per ASTM D 1335.

L. Delamination: The Mohawk Group warrants for the life of the carpet that the carpet modules will not delaminate. Chair pads are not required for this warranty but are recommended for maximum appearance retention.

M. Emissions: CRI Green Label Plus GLP1171

N. Built in Cushion: EcoFlex NXT AIR - Product is non-woven, needle punch, post-consumer PET. There is no cell structure as in Urethane.

1. Weight: 16 oz/SY
2. Thickness: 0.158” plus 5 percent maximum.
3. Density 7.8 lbs./ft3

O. Emissions: CRI Green Label Plus Certified demonstrating low VOC emissions

2.2 INSTALLATION ACCESSORIES

A. Carpet Adhesives: Product that complies with flammability requirements for installed carpet and is recommended by Mohawk Group for conditions indicated. EnPress (M004)
B. Moisture & pH: 5 lbs, 80% RH, 5-9 pH
C. Spread Rate: 25-30 SY/Gal

1. Low-Emitting Materials: Adhesives shall have a VOC content of 50 g/L or less.
2. Low-Emitting Materials: Adhesives shall comply with Green Seal's GS-36 and with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Tackless Carpet Stripping: Water-resistant plywood, in strips as required to match cushion thickness and that comply with CRI 104, Section 12.2.

E. Seam Adhesive: Hot-melt adhesive tape or similar product recommended by carpet manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with CRI 104.

B. Carpet Installation Method: Adhesive Application Method - 1/16"x1/32"x1/32" U-Notch Trowel Direct glue down. Install in Brick Ashlar Formation.

1. Maintain uniformity of carpet direction and lay of pile. At doorways, center seams under door in closed position. Bind or seal cut edges as recommended by carpet manufacturer.
2. Install pattern parallel to walls and borders.

END OF SECTION 096816

SECTION 099100 - PAINTING

PART 1 GENERAL

1.01 SUMMARY

A. Provide the following:

1. Painting and surface preparation for interior unfinished surfaces as scheduled.
2. Painting and surface preparation for exterior unfinished surfaces as scheduled.

1.02 Green Design

A. Interior Paints

1. Provide paints with VOC requirements of not more than 100 g/L for flats and 150 g/L for non-flats

1.03 SUBMITTALS

1. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
2. Samples: Submit samples of materials specified indicating visual characteristics and finish.
   a. Include manufacturer’s full range of color and finish options if additional selection is required.

1.04 QUALITY ASSURANCE

A. Comply with governing codes and regulations.

B. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years.

C. Use experienced installers.

D. Deliver, handle, and store materials in accordance with manufacturer's instructions.

E. Regulations: Compliance with VOC and environmental regulations.

PART 2 PRODUCTS

2.01 MATERIALS

A. Manufacturers: Dunn Edwards (Wellborn), Benjamin Moore, Sherwin Williams or approved equal. First-line commercial-quality products for all coating systems.

PART 3 EXECUTION

3.01 INSTALLATION

A. Inspect surfaces, report unsatisfactory conditions in writing; beginning work means acceptance of substrate.

B. Comply with manufacturer's instructions and recommendations for preparation, priming and coating work. Coordinate with work of other sections.

C. Clean up, touch up and protect work.

3.02 PAINT SCHEDULE

A. Gypsum Drywall Walls and Ceilings
   1. Semi-Gloss
   2. 1 coat latex primer
   3. 2 coats finish

B. Wood for Painted Finish
   1. Semi-gloss
   2. 1 coat alkyd Undercoat
   3. 2 coats alkyd enamel finish

C. Wood for Clear Finish
   1. Satin
   2. 2 coats oil base varnish

D. Interior Wood Ceiling & Beams for Finish
   1. Solid Stain
   2. 2 coats oil base

E. Exterior Wood for Stain Finish
   1. Solid Stain
   2. 2 coats oil base

F. Exterior Metal Doors and Ferrous Metals
   1. Semi-gloss
   2. 1 coat rust inhibiting primer
   3. 2 coats alkyd enamel finish

G. Galvanized Metal
   1. Semi-gloss
   2. 1 coat galvanized primer
   3. 2 coats alkyd enamel finish

H. Exterior Concrete Walkways
   1. 2 coats non-slip, waterborne, acrylic, textured coating
   2. 1 coat masonry sealer

END OF SECTION

SECTION 099300 - CONCRETE STAINING

PART 1 GENERAL

1.1 SUMMARY

A. This Section specifies an applied stain and sealer for horizontal cast-in-place concrete surfaces.

B. Related Sections: Refer to the following specification sections for coordination:
1. Section 033000 - Cast-In-Place Concrete.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions.

B Mock-Up: Prepare a test area minimum 2 by 2 feet in size to verify suitability of the stain, sealer and final appearance.

1.3 QUALITY ASSURANCE

A. Manufacturer: Minimum 10 years experience producing concrete coatings.

B. Installer: Licensed installers, experienced and trained in the use of these products.

C. Suitability of Substrate: Do not apply to concrete surfaces which may have insufficient chemical reaction, including older or weather concrete, concrete subject to runoff or weathered concrete, or heavily sandblasted concrete.

C. Regulatory Requirements: Comply with requirements of authorities having jurisdiction and applicable codes at the location of the project.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in unopened factory labeled packages. Protect from damage.

B. Store in a safe place, out of direct sunlight. Keep containers tightly sealed. Do not allow product to freeze. Use within manufacturer’s recommended shelf life, approximately 12 months.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete Stain: Vivid Acid Stain by Concrete Coatings Inc., 1105 North 1600 West, Layton, UT 84041, 800-443-2871, www.concretecoatingsinc.com. The concrete stain shall have the following properties:
1. Type: Penetrating chemical stain which chemically reacts with concrete.
2. Stain Colors: Jade, Turquoise, Coffee, Amber, Mahogany, Ebony, Mission Brown, Caramel, Olive, Walnut and Weathered Terracotta. Note that Turquoise and Jade colors are not suitable for slab concrete or areas subject to water from the sub-grade or standing water.
3. Coverage: 200-300 square feet of concrete surface per gallon.

B. Concrete Sealer: Sealer by Concrete Coatings Inc., 1105 North 1600 West, Layton, UT 84041, 800-443-2871, www.concretecoatingsinc.com.
   1. Type: CCI SuperSeal 2000, 650 voc.
   2. Type: CCI GemKote High Gloss Sealer, meets 100, 350 and 400 voc requirements.
   3. Coverage: As recommended by manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Inspection: Prior to start of application, inspect existing conditions to ensure surfaces are suitable for installation including the following:
   1. Concrete has cured for a minimum of 28 days prior to application of stain.
   2. Surface is completely free of sealers, oils, dirt, paint, alkali, penetrating sealers and foreign materials that would prevent the stain from penetrating the concrete surface.
   3. Concrete has been swept clean.
   4. Test area has been approved.

3.2 APPLICATION

A. Concrete Stain: Strictly comply with manufacturer's installation recommendations including the following:
   1. Use experienced installers wearing protective clothing and breathing apparatus.
   2. Test surface for suitable reactivity.
   3. Protect adjacent areas from over-spray, runoff, spills and tracking prior to application.
   4. For areas requiring material from more than one container, mix together prior to application to avoid color variation.
   5. Apply at rate recommended by manufacturer.
   6. Clean, rinse and neutralize surface.

B. Concrete Sealer: Strictly comply with manufacturer's installation recommendations. Apply after stain has dried at rate recommended by manufacturer. Clean surface as recommended by manufacturer.

3.3 CLEANING AND PROTECTION

A. Protection: Do not cover, but protect floor area from paint and other contaminates that could inhibit the stain.

END OF SECTION

SECTION 101400 - SIGNAGE

PART 1 GENERAL

1.01 SUMMARY

A. Provide exterior signage.

1. Provide exterior signage at buildings and individual dwelling units with visible, contrasting identifying devices.
2. The building identifying devices must be illuminated from dusk until dawn.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.

C. Samples: Submit representative samples of material specified indicating visual characteristics and finish.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations.

B. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years.

C. Use experienced installers.

D. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 MATERIALS

A. Manufacturers: Best Sign Systems or approved equivalent.

B. Parking Signs

1. Handicap Parking Signs
   a. 18 gauge bonderized steel sign with rounded corners and baked enamel background with screen printed graphics. Comply with ANSI 117.1 – 1998 standards.
   b. Posts: Galvanized U channel with 3/8 inch diameter mounting holes.
2. Warning sign “Children Play at Their Own Risk”
   a. 18 gauge bonderized steel sign with rounded corners and baked enamel background with screen printed graphics. Comply with ANSI 117.1 – 2009 standards.
   b. Posts: Galvanized U channel with 3/8 inch diameter mounting holes.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.

B. Restore damaged finishes. Clean and protect work from damage.

END OF SECTION 101400

SECTION 101419 – DIMENSIONAL LETTER SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cut Aluminum Letters.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.

C. Samples: Submit representative samples of material specified indicating visual characteristics and finish.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations.

B. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years.

C. Use experienced installers.

D. All letters to be manufactured by one manufacturer.

E. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 MAUFACTURERS:

A. Impact Architectural Signs, 26 E Burlington Ave, LaGrange, IL 60525

2.02 Materials (Metal Alloys)

A. Aluminum – 5052 Alloy

2.03 Finishes

A. Aluminum

1. Aluminum Satin, Brushed

2.04 Thickness

A. Aluminum – ¾”

2.05 Font Styles

A. Architect to select font from manufacturers standard font list.

2.06 Mounting Hardware

A. Cut metal letters are tapped for threaded stud insertion.

B. All aluminum letters under 18” use aluminum studs

C. All other letters use stainless steel studs.

D. Spacers can be used to “float” letters from wall. From .25”

E. Paper Installation template with marked stud locations should be provided.

F. Double Rail Mounting, Bottom Rail Mounting may be used where individual letter installation is not possible.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.

B. Restore damaged finishes. Clean and protect work from damage.

3.02 Warranty

A. Letters should be guaranteed for the life of the business against defects.

END OF SECTION 101419

SECTION 101423.16 – ROOM-IDENTIFICATION PANEL SIGNAGE

PART 1 GENERAL

1.01 SUMMARY

A. Interior non illuminated, Informational surface mounted signage.

1.02 SECTION INCLUDES:

A. 120 ADA Room Identification Signs.

1.03 REFERENCES

A. Americans with Disabilities Act (ADA).

B. American National Standards Institute (ANSI).

1.04 SYSTEM DESCRIPTION

A. Performance Requirements: Provide signage systems that conform to the following requirements of regulatory agencies and the quality control of Inpro SignScape.

1. Signage shall comply with all applicable provisions of the 2010 ADA Standard for Accessible Design.

1.05 SUBMITTALS

A. Product Data: Manufacturer’s printed product data for each signage system indicated in this section.

B. Signage Report: SignPro signage report indicating signage sizes, lettering, construction, schedule and quantity.

C. Samples: Verification samples of signage systems minimum of 6” (152mm) square of each type and color indicated.

D. Manufacturer’s Installation Instructions: Printed Installation Instructions for each signage system.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in unopened factory packaging to the jobsite.

B. Inspect materials at delivery to assure that specified product have been received.

C. Store in original packaging in a climate controlled environment away from direct sunlight.

1.07 WARRANTY

A. Standard Inpro SignScape limited two year warranty against material and manufacturing defects.

PART 2 PRODUCTS

2.01 MANUFACURERS

A. Manufacturer: Inpro SignScape, Inpro Corporation PO Box 406, Muskego, WI 53150 USA Telephone 800.222.5556,Fax: 888.715.8407 E-mail: service@Inprocorp.com

B. Provide all signage systems from a single manufacturer.

2.02 PRODUCTION STYLE

A. Production – Interior Unframed Signage

1. Tactile – Raised Characters:
   a. Grade 2 Braille: Provide Grade 2 Braille produced with the Raster™ Method, patented process for placing Braille on signage. Raster™ Braille is computer engineered using a carbide-engraving bit, press-fit tool with vacuum pump and UV stable acrylic rasters

   b. Solid Colors: Provide sign panel consisting of .060” (2mm) sheet bonded with .040” (1mm) sheet that is cut and assembled to create signage.

   c. Woodland/Element: Provide sign panel consisting of .060” (1.5mm) sheet bonded with .040” (1mm) sheet that is cut and assembled to create signage.

2.03 PRODUCTION STYLE

A. Reference Inprocorp.com for all collection info

1. Unframed Sign Designs options:
a. Architect to select from manufacturer options.

2.04 MOUNTING

A. VHB Double-sided Foam Tape (interior): Provide double-sided 3M VHB adhesive with conformable foam core to adhere unframed signage to clean, dry, well-sealed surfaces.

B. Screw Mount: Provide screw mount unframed signage with exposed mounting fasteners. Fasteners to be located at each corner, 3/16” (5mm) Diameter.

C. Sign Standoffs shall mount through the sign panel at each corner.
a. Finish: Clear Anodized

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions in which the signage system will be installed.

1. Complete all finishing operations, including painting, before beginning installation of signage systems. Reference Paint manufactures specs for proper drying and cure time.

2. Wall surface shall be dry and free from dirt, grease and loose paint.

3.02 PREPERATION

A. General: Prior to installation, clean substrate to remove dust, debris and loose particles.

3.03 INSTALLATION

A. General: Locate the signage system as indicated on the approved detail drawing for the appropriate substrate and in compliance with the Inpro SignScape installation instructions. Install signage systems level and plumb at the height indicated on the drawings.

3.04 CLEANING

A. At completion of the installation, clean surfaces in accordance with the Inpro SignScape clean up and maintenance instructions.

END OF SECTION 101423.16

SECTION 102113.13 - METAL TOILET COMPARTMENTS

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data, Shop Drawings, and Samples.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. 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 for toilet compartments designated as accessible.

2.2 PAINTED STEEL TOILET COMPARTMENTS

A. Bobrick Washroom Equipment, Inc. or approved equivalent.

B. Toilet-Enclosure Style: **Floor and ceiling anchored**.

C. Entrance-Screen Style: **Floor and ceiling anchored**.

D. Urinal-Screen Style: **Wall hung, flat panel**

E. Door, Panel, and Pilaster Construction: Seamless, **hot-dip galvanized-steel** sheets pressure laminated to core material; with continuous, interlocking molding strip or lapped-and-formed edge closures.

1. Core Material: Sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness of 1 inch (25 mm) for doors and panels and 1-1/4 inches (32 mm) for pilasters.
2. Internally reinforce panels for hardware, accessories, and grab bars.

F. Pilaster **Shoes and Sleeves (Caps)**: Manufacturer's standard design; stainless steel.

G. Brackets:

1. Stirrup Type: **Clear-anodized aluminum**
2. Full-Height (Continuous) Type: **Extruded aluminum**

H. Doors: Unless otherwise indicated, 24-inch- (610-mm-) wide in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide out-swinging doors with a minimum 32-inch- (813-mm-) wide clear opening for compartments indicated to be accessible to people with disabilities.

I. Door Hardware: **Clear-anodized aluminum**

1. Hinges: Self-closing type.
2. Latches and Keepers: **Recessed** unit designed for emergency access and with combination rubber-faced door strike and keeper.
3. Coat Hook: Combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
4. Door Bumper: Rubber-tipped bumpers at out-swinging doors or entrance screen doors.
5. Door Pull: Provide at out-swinging doors. Provide units on both sides of doors at compartments indicated to be accessible to people with disabilities.

J. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use rust-resistant materials compatible with related materials.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units rigid, straight, level, and plumb, with not more than 1/2 inch (13 mm) between pilasters and panels and not more than 1 inch (25 mm) between panels and walls.

1. Stirrup Brackets: Align brackets at pilasters with brackets at walls**.** Locate wall brackets so holes for wall anchors occur in tile joints.
2. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and swing doors in entrance screens to return to fully closed position.

END OF SECTION 102113.13

SECTION 102313 – WALL AND DOOR PROTECTION

PART I - GENERAL

1.1 SECTION INCLUDES

A. Corner Guards.

1.2 RELATED SECTIONS

A. Reference Structural Sheets S-001 and S-002: For wood blocking backup in gypsum wallboard partitions.

B. Section 09250 - Gypsum Board: For light gauge metal framing and backup.

1.3 REFERANCES

A. Aluminum Association (AA).

B. American Society for Testing and Materials (ASTM).

1. ASTM B 221-93 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.

1.4 SUBMITTALS

A. Submit the following in accordance with Section 01300:

1. Product Data: Manufacturer’s product specifications, installation and maintenance instructions.
2. Shop Drawings: Show locations, extent, and installation details of each system including method of attachment and adjacent construction.
3. Maintenance Instructions: Manufacturer’s instructions for maintenance of installed work.

1.5 QUALITY ASSURANCE

A. Single Source Responsibility: Furnish all wall protection system components from a single source.

B. Manufacturer: A firm regularly engaged in the manufacture of wall protection system components similar to those specified.

C. Installer: A firm with at least 3 years of successful experience in the installation of wall protection systems similar to those specified.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturers packages properly labeled for identification and for location in the Project. Comply with manufacturers instructions for storage and handling. Damaged and otherwise unsuitable material, when so determined, shall be immediately removed from the Project site.

1.7 PROTECTION CONDITIONS

A. Environmental Conditions: Do NOT install wall surface protection systems until the installation area is enclosed and weatherproof, and until the ambient temperature within the building is maintained at not less than 70 degrees F (21 degrees C) for not less than 72 hours prior to installation.

1.8 EXTRA MATERIALS

A. Furnish Owner at least 2 percent of each type, color and pattern of wall surface protection components used on the Project over and above the amount installed.

B. Deliver to Owner at time of final inspection of work under this Section and store where directed in the building.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Badcock Davis
9300 73rd Ave N
Brooklyn Park, MN 55428
PH: 888.412.3726
www.BabcockDavis.com

B. STAINLESS STEEL CORNER GUARDS
1. Model: BCGS/BCGT/BCGA
2. Material: Type 304, 316 or 430 Stainless Steel or 14-gauge Aluminum
3. Mounting: Surface Mounted or Recessed
4. Size 2 inches
5. Length: Reference drawings

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the substrates and conditions under which the work is to be performed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the installation until unsatisfactory conditions have been corrected.

B. Ensure that surfaces to receive materials specified are properly prepared.

3.2 INSTALLATION

A. Set units accurately in location in accordance with drawings.

END OF SECTION 102600

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

PART 2 - PRODUCTS

2.1 TOILET AND BATH ACCESSORIES

A. Manufacturers: Bradley for the following products.

B. Toilet Tissue Dispenser:

1. Basis-of-Design Product: Bradley Model 5084 – Satin Stainless Steel Bradex
2. Type: Single-roll dispenser
3. Mounting: Surface mounted with concealed anchorage
4. Material:
   a. POSTS: 22-gauge stainless steel with exposed surfaces in architectural satin finish (Model 5084).
   b. ESCUTCHEONS: heavy stainless steel with exposed surfaces in architectural satin finish (Model 5084).
   c. SPINDLE: chrome-plated plastic.
   d. MOUNTING BRACKET: 18-gauge stainless steel. Controlled-delivery units cannot be used at accessible toilets.
5. Operation: Concealed spring permits spindle to telescope for servicing. Spindle turns freely for non-controlled delivery.
6. Capacity: Designed for 5 1/2-inch diameter-core tissue rolls.

C. Paper Towel Dispenser/Waste Receptacle:

1. Basis-of-Design Product: Bradley Model 234-10
2. Mounting: Semi-Recessed (recesses 1-31/32"; projects 6-13/16")
3. Minimum Capacity:
   a. Towel Dispenser: 800 multifold towels or 600 C-fold paper towels
   b. Waste Receptacle: 12 gal. (1.6 cu. ft.)
4. Material:
   a. CABINET: 24-gauge steel. Welded construction with seamless corners and burr-free edges.
   b. FLANGE: 22-gauge stainless steel with exposed surfaces in architectural satin finish. One-piece seamless construction, 1" wide radiused edges with ¼" return.
   c. DOOR: 18-gauge stainless steel. Warp resistant, with full length piano hinge and tumbler lock keyed.
   d. TOWEL DISPENSER: 22-gauge stainless steel. Rolled edge on dispenser opening.

e. WASTE RECEPTACLE: 22-gauge stainless steel. All welded construction. Secured to cabinet with tumbler lock keyed.
f. LINER: (optional) heavy duty stitched vinyl coated nylon: 12-gallon part # P11-004; 18-gallon part no. P11-001.
g. OPTIONAL HINGED COVER: 22-gauge stainless steel with exposed surfaces in architectural satin finish. Heavy-duty stainless-steel piano hinge
h. OPTIONAL PUSH FLAP DOOR: 22-gauge stainless steel with exposed surfaces in architectural satin finish. Heavy-duty stainless-steel piano hinge. Self-closing door is embossed PUSH.

5. Lockset: Tumbler type.
6. Refill Indicators: None.

D. Liquid-Soap Dispenser:

1. Basis-of-Design Product: Model 6a01-11 Surface Mounted Foam
2. Mounting: Surface.
3. Capacity: 27 oz (800ml) of bulk foam soap and foam sanitizer.
4. Materials:
   a. BODY: Heavy gauge stainless steel with exposed surfaces in architectural satin finish. Front has matching curvature to other Bradley Diplomat washroom accessories.
   b. WALL PLATE: ABS plastic.
   c. RESERVOIR: reusable, cap-sealed plastic tank, holds 27 oz.
   d. BATTERY BOX: Plastic, holds (4), "AA" Alkaline batteries, not included. INDICATOR LIGHTS: Green light = In "use" and dispensing. Red flashing light = Low battery.
5. Stainless-Steel Soap Valve: Designed for dispensing soap in liquid form.
6. Lockset: Tumbler type.
7. Refill Indicator: Window type.

E. Grab Bar:

1. Basis-of-Design Product: Bradley Grab Bar Series 812 (001-18”) (001-36”) (001-42”)
2. Material: Stainless steel
   a. FLANGES: 31⁄8" dia. 13-gauge stainless steel.
   b. ESCUTCHEONS: 22-gauge stainless steel. One-piece drawn construction with exposed surfaces in architectural satin finish. Snap over flanges to conceal mounting screws.
   c. TUBING: 1¼" O.D. 18-gauge stainless steel, seamless construction with exposed surfaces in architectural satin finish. Bent ends of tubing pass thru the flanges and are welded for maximum strength. Intermediate supports are contour cut and joined by welding to form an integral part of the grab bar. All welds ground and polished to blend. Mandrel bending process maintains uniform bar diameter. Return provides 1½" standard safety clearance between wall and bar.
3. Mounting: Concealed
4. Gripping Surfaces: Smooth, satin finish
5. Outside Diameter: 1-1/4 inches (32 mm) for medium duty applications.

F. Sanitary Napkin Disposal Unit:

1. Basis-of-Design Product: Bradley Model 4781-11

2. Mounting: Surface-mounted
3. Material:
   a. COVER: 22-gauge stainless steel with exposed surfaces in architectural satin finish. Heavy-duty stainless steel piano hinge.
   b. CONTAINER: 22-gauge stainless steel with exposed surfaces in architectural satin finish. All welded construction with rounded front corners.
4. Door or Cover: Self-closing.
5. Receptacle: Non-Removable.

G. Seat-Cover Dispenser:

1. Basis-of-Design Product: Bradley Model 584
2. Mounting: Recessed
3. Capacity: 500 standard single-fold or half-fold toilet seat covers.
4. Material: 22-gauge stainless steel
   a. FLANGE: 22-gauge stainless steel with exposed surfaces in architectural satin finish. One-piece seamless construction, 1" wide with burr-free beveled edges.
   b. CABINET: 22-gauge stainless steel with exposed surfaces in architectural satin finish. Welded construction with burr-free edges.
   c. DOOR: 22-gauge stainless steel with full-length piano hinge and tumbler lock keyed.
5. Lockset: Tumbler type.

H. Mirror Unit:

1. Basis-of-Design Product: Framed Mirror, Standard Bradley Model 781-2436 (24”x36”)
2. Materials:
   a. FRAME: one-piece, roll-formed stainless steel with bright annealed finish. Channel is ¾" x ¾" x 7⁄16" with 90° mitered corners. Double strength continuous integral stiffener on all sides for added strength.
   b. BACK: galvanized steel. MIRROR: first quality ¼" float glass, thermosetting infrared cured paint backing with Poly-Glaze protective finish. Manufactured in accordance with ASTM C 1036 and ASTM C 1503. All edges protected by shock-absorbing, neoprene tubing. The back of the mirror is protected by a sheet of ¼" extruded polystyrene, which is placed between the mirror and the galvanized steel.
   c. MOUNTING BRACKETS: 18 gauge cold rolled steel.

I. Baby Changing Station:
1. Basis-of-Design Product: Bradley Model 9631 Light Gray
2. Mounting: Surface-Mount
3. Materials: Bacterial resistant high-density polyethylene with steel-to-steel support hinges. Pneumatic gas shock mechanism opens and closes unit smoothly. Liner dispenser and purse. Diaper bag hooks molded in. ADA compliant nylon buckle is adjustable with one hand.
   a. STRENGTH NOTE: Unit complies with ASTM F2285 Standard that requires commercial diaper changing stations be able to support a static load of up to 250 lbs.

2.2 MATERIALS.

A. Stainless Steel: ASTM A 666, Type 304, No. 4 finish (satin), 0.031-inch minimum nominal thickness unless otherwise indicated.

B. Brass: ASTM B 19, ASTM B 16/B 16M, or ASTM B 30.

C. Sheet Steel: ASTM A 1008/A 1008M, 0.036-inch minimum nominal thickness.

D. Galvanized-Steel Sheet: ASTM A 653/A 653M, G60.

E. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

F. Baked-Enamel Finish: Factory-applied, gloss-white, baked-acrylic-enamel coating.

G. Mirrors: ASTM C 1503, mirror glazing quality, clear-glass mirrors, nominal 6.0 mm thick.

H. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

I. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

J. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

1. Install grab bars to withstand a downward load of at least 250 lbf when tested according to method in ASTM F 446.

B. Adjust accessories for unencumbered, smooth operation, and verify that mechanisms function properly. Replace damaged or defective items. Remove temporary labels and protective coatings.

END OF SECTION 102800

SECTION 104416 - PORTABLE FIRE EXTINGUISHERS

PART 1 GENERAL

1.01 SUMMARY

A. Provide fire extinguishers and mounting brackets in kitchens.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations.

B. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years.

C. Use experienced installers.

D. Deliver, handle, and store materials in accordance with manufacturer's instructions.

E. Standards: UL and FM listed products, NFPA 10.

F. Regulations: ADAAG.

PART 2 PRODUCTS

2.01 MATERIALS

A. Manufactures:

1. J. L. Industries, Larsen’s Manufacturing, Potter-Roemer, or approved equal.
2. Kiddie a UTC Fire and Security Company.

B. Fire Extinguishers:

1. Type:
   a. Multipurpose dry chemical type.
   b. Kitchen 2A 10:B-C rated.
2. Service Area Mounting: Manufacturer’s metal mounting brackets.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.

B. Install fire extinguishers in mechanical and service areas with wall-hung brackets at locations and heights indicated and acceptable to authorities having jurisdiction.

C. Install fire extinguishers in cabinets in public areas plumb and level at heights acceptable to authorities having jurisdiction.

END OF SECTION 104416

SECTION 105723 - CLOSET AND UTILITY SHELVING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

B. Verify dimensions by field measurements before ordering.

PART 2 - PRODUCTS

2.1 WIRE CLOSET SHELVING

A. Structural Performance: Wire closet shelving system shall be capable of supporting the following weight per unit length:

1. With shelf supported by walls at both ends:
   a. Shelves 49 to 60 Inches in Length: 55 lb/ft.

2. With shelf supported by a wall at one end only:
   a. Shelves 48 Inches in Length or less: 45 lb/ft.

B. Wire closet shelving, made from steel wire spaced not more than 1 inch o.c. and welded to longitudinal steel wire rods. Provide longitudinal wire rods at shelf edges and corners of lips, with not less than four longitudinal wire rods per shelf. Provide shelves of widths indicated. Provides units complete with brackets, fasteners, end caps, and accessories per manufacturer.

1. Provide units mounted on adjustable tracks that allow shelf configurations to be modified. Provide units in quantities and sizes indicated.
2. Provide fixed (nonadjustable) units of configurations and in quantities and sizes indicated.
3. Provide units with rod for clothes hangers.
4. Provide units with longitudinal wire rods on tops of shelves to allow objects to slide easily along length of shelf.

2.2 MATERIALS

A. Steel Wire: ASTM A 853.

2.3 FINISHES

A. Wire Shelving Finish: White coating applied over cleaned and conversion-coated metal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units in configurations indicated, complete with accessories indicated, and ready for use.

B. Install units level, plumb, and true to line, without warp or rack, and anchor securely in place.

C. Repair, refinish, or replace wire closet shelving damaged during installation, as directed by Architect.

END OF SECTION 105723

SECTION 107516 - GROUND-SET FLAGPOLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes ground-set flagpoles made from aluminum.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain flagpoles as complete units, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

2.2 ALUMINUM FLAGPOLES

A. Aluminum Flagpoles: Cone-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B 241/B 241M, Alloy 6063, with a minimum wall thickness of 3/16 inch.
1. National Capital Flag Co. (Alexandria, VA)
2. Kay Park (Janesville, IA)
3. Morgan-Francis Flagpoles and Accessories (Muncie, IN)
4. Other manufacturer not listed, but approved by Architect.

B. Exposed Height: 25 feet.

C. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, 0.060-inch wall thickness with 3/16-inch steel bottom plate and support plate; 3/4-inch diameter, steel ground spike; and steel centering wedges welded together. Galvanize foundation tube after assembly. Furnish loose hardwood wedges at top of foundation tube for plumbing pole.

D. Sleeve for Aluminum Flagpole: PVC pipe foundation sleeve, made to fit flagpole, for casting into concrete foundation.

2.3 FITTINGS

A. Finial Ball: Flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.

1. 0.063-inch spun aluminum, finished to match flagpole.

B. Internal Halyard, Winch System: Manually operated winch with control stop device and removable handle, stainless-steel cable halyard, and concealed revolving truck assembly with plastic-coated counterweight and sling. Furnish flush access door secured with cylinder lock. Finish truck assembly to match flagpole.

1. Halyard Flag Snaps: Stainless-steel swivel snap hooks with neoprene or vinyl covers. Furnish two per halyard.

2.4 MISCELLANEOUS MATERIALS

A. Drainage Material: Crushed stone or crushed or uncrushed gravel; coarse aggregate.

B. Sand: ASTM C 33/C 33M, fine aggregate.

C. Elastomeric Joint Sealant: Multicomponent nonsag urethane joint sealant complying with requirements in Section 079200 "Joint Sealants."

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

2.5 ALUMINUM FINISHES

A. Natural Satin Finish: AA-M32, fine, directional, medium satin polish; buff complying with AA-M20; seal aluminum surfaces with clear, hard-coat wax.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.

B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete. Place and compact drainage material at excavation bottom.

C. Foundation Tube: Place foundation tube, center, and brace to prevent displacement during concreting. Place concrete. Plumb and level foundation tube and allow concrete to cure.

D. Sleeves: Locate and secure sleeves in forms by bracing to reinforcement and forms.

E. Place concrete, as specified in Section 033000 "Cast-in-Place Concrete." Compact concrete in place by using vibrators. Moist-cure exposed concrete for no fewer than seven days or use non staining curing compound.

F. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.2 FLAGPOLE INSTALLATION

A. General: Install flagpoles where indicated and according to manufacturer's written instructions.

B. Foundation Tube: Place flagpole in tube, seated on bottom plate between steel centering wedges, and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch layer of elastomeric joint sealant and cover with flashing collar.

END OF SECTION 107516

SECTION 113013 - APPLIANCES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

B. LEED:
1. Kitchen appliances shall be ENERGY STAR labeled.
2. Kitchen range, gas fire
3. Kitchen ranges must be equipped with hoods and exhaust ducted / vented to the exterior.
4. Refrigerator
5. Microwave

PART 2 - PRODUCTS

2.1 RESIDENTIAL APPLIANCES

A. Regulatory Requirements: Comply with the following:

1. NFPA: Provide electrical appliances listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. ANSI: Provide gas-burning appliances that comply with ANSI Z21 Series standards.

B. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with ADA 804.5 and/or ICC A117.1, 804.5

C. Residential Gas Range: 30-inch wide, freestanding range, Self- cleaning
1. Manufacturer: Frigidaire FGGH3047V D/F
2. Oven Interior (H x W x D): 20-5/8" x 24-3/8" x 19-1/8"
3. Capacity: 5.6 Cu. Ft.
4. Voltage: 120 Volts/60 Hz/5A

D. Residential Exhaust Hood: 30-inch wall-mounted, ventilating, two-speed.
1. Manufacturer: Air King Ventilation Products (ES248ADA, ES308ADA, ES368ADA)
2. Color Options: White, Biscuit, Almond, Black, Stainless Steel
3. Fan Control: Wall mounted dual rocker switch with plate, white finish. Fits into a triple gang box.
4. Horizontal and Vertical Ducting includes duct adapter and damper.
5. Lighting: Includes 8-Watt GU24 Base LED lamp (bulb included).

E. Residential Refrigerator / Freezer: Freestanding, with interior cabinet liners.
1. Manufacturer: Frigidaire FFTR1821T 30” 18.0 cu. ft. freezer refrigerator
2. Color Options: White, Black, Stainless Steel
3. Energy Performance: Energy Star

COMMERCIAL APPLIANCES

F. Commercial Microwave:
   1. Manufacturer: Amana Commercial
   2. Color: Stainless Steel
   3. Energy Performance: Medium Volume, 1000 watts of power

INSTALLATION

G. Built-in Appliances: Securely anchor to supporting cabinetry or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.

H. Freestanding Appliances: Place in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

I. Test each item of residential appliances to verify proper operation. Make necessary adjustments.

J. Verify that accessories required have been furnished and installed.

END OF SECTION 113013

SECTION 115213.50 – PROJECTION SCREENS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrically operated, surface mounted, front projection screens.

B. Electrically operated, ceiling recessed, front projection screens.

C. Front projection screen controls.

1.2 RELATED SECTIONS

A. Division 5 - Metal Fabrications: Suspension systems for projection screens.

B. Section 06 40 23 - Interior Architectural Woodwork: Wood trim for recessed screen installation.

C. Section 09 22 26 - Ceiling Suspension System: Supports and trim for suspended ceilings.

D. Section 09 26 13 - Gypsum Veneer Plastering: Ceiling for recessed screen installation.

E. Section 09 21 16 - Gypsum Board Assemblies: Ceiling for recessed screen installation.

F. Section 09 51 23 - Acoustical Tile Ceilings: Ceiling for recessed screen installation.

G. Division 26 for electrical wiring, connections, and installation of remote-control switches for electrically operated projection screens.

1.3 REFERENCES

A. NFPA 70 - National Electrical Code.

B. NFPA 701-99 - Fire Tests for Flame-Resistant Textiles and Films.

C. GREENGUARD Environmental Institute Gold.

D. US Green Building Council.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 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. Installation methods.

C. Wiring diagram for electrically operated units.

D. Shop Drawings: Shop drawings showing layout and types of projection screens. Show the following:
   1. Location of screen centerline.
   2. Location of wiring connections.

3. Seams in viewing surfaces.
4. Detailed drawings for concealed mounting.
5. Connections to suspension systems.
6. Anchorage details.
7. Accessories.

E. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

F. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain each type of projection screen required from a single manufacturer as a complete unit, including necessary mounting hardware and accessories.

B. Coordination of Work: Coordinate layout and installation of projection screens with other construction supported by, or penetrating through, ceilings, including light fixtures, HVAC equipment, fire-suppression system, and partitions.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver projection screens until building is enclosed and other construction where screens will be installed is substantially complete.

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Protect screens from damage during delivery, handling, storage, and installation.

1.7 COORDINATION

A. Coordinate work with installation of ceilings, walls, electric service power characteristics, and location.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Draper Inc., which is located at: 411 S. Pearl P. O. Box 425; Spiceland, IN 47385-0425; Toll Free Tel: 800-238-7999; Tel: 765-987-7999; Fax: 866-637-5611; Email:request info (drapercontract@draperinc.com); Web:http://www.draperinc.com or similar.

2.2 MOTORIZED, SURFACE MOUNTED, FRONT PROJECTION SCREENS

A. Premier: Electric motor operated, pentagonal-shaped steel case, tab tensioned. Metal roller mounted on rubber isolation mounts. Case is 5-7/8 inches x 5-1/4 inches (150 mm high x 134 mm deep), one piece 22 gauge steel with end caps forming universal wall or ceiling hanging bracket. Case and tensioning dowel finished in flat black.
   1. Motor mounted inside screen roller on rubber isolation insulators. Motor UL certified, rated 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches.
   2. Quiet Motor mounted inside screen roller on rubber isolation insulators. Motor

operates at 44db and is UL certified, rated 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches.

3. System Options:
   a. Case finished black (standard).
   b. Case finished white.
   c. Projected Mounting Brackets with a 6 inch (152 mm) clearance from wall. Finished black.
   d. Floating Mounting Brackets for mounting screen to wall or ceiling.
   e. Ceiling Trim Kit for recessing above acoustical tile ceiling grid.
4. Projection Viewing Surface: Mildew resistant 100 percent vinyl with black masking borders and 12 inch (305 mm) black drop.
   a. Matt White XT1000V - On Axis gain of 1.0. 180 degree viewing cone. GREENGUARD Gold certified. Available with or without black backing. 4K ready.
   b. Pure White XT1300V - On Axis gain of 1.3. 180 degree viewing cone. For use in situations where lighting is well controlled and where enhanced brightness is needed due to limited projector brightness. Available with or without black backing. 4K ready.
   c. Grey XH600V - On Axis gain of 0.6. Provides excellent contrast and color reproduction. GREENGUARD Gold certified. Available with or without black backing. 4K ready.
   d. ClearSound NanoPerf XT1000V - On Axis gain of 1.0. 180 degree viewing cone. Acoustically transparent white PVC fabric with microscopic perforations. 4K ready.
   e. ClearSound Perf XT900V - On Axis gain of 1.0. 180 degree viewing cone. Acoustically transparent. Flexible matt white perforated surface. Reasonable control of ambient light is recommended.
   f. TecVision XH700X Grey - On Axis gain of 0.7. 180 degree viewing cone. Designed for blending applications on curved or flat screens where ambient light is present. Provides very good contrast and color reproduction. Imaging Science Foundation certified and 8K ready. Dark backing.
   g. TecVision XH800X UST ALR - For short-throw and ultra-short throw applications. On Axis gain of 0.8. Rejects 57% of ambient light. 180 degree viewing cone. Provides very good contrast and color reproduction.. Imaging Science Foundation certified. 8K ready. Dark backing.
   h. TecVision XH900X ALR - On Axis gain of 0.9. Rejects 60% of ambient light. 180 degree viewing cone. Provides very good contrast and color reproduction. Imaging Science Foundation certified. 8K ready. Dark backing.
   i. TecVision CS1000X ALR - On Axis gain of 1.0. Rejects 82% of ambient light. 40 degree viewing cone. Provides excellent contrast and color reproduction. Performs well in ambient light. Imaging Science Foundation certified. 8K ready. Dark backing.
   j. TecVision MS1000X ALR - Rejects 73% of ambient light. On Axis gain of 1.0. 70 degree viewing cone. Provides excellent contrast and color reproduction. Performs well in ambient light. Imaging Science Foundation certified. 8K ready. Dark backing.
   k. TecVision XT1000X White - On Axis gain of 1.0. 180 degree viewing cone. Imaging Science Foundation certified. 8K ready reference screen surface for blending applications, precise resolution, and color accuracy. Dark backing.
   l. TecVision XT1100X White - On-Axis gain of 1.1. 180 degree viewing cone. Designed for use when the projector brightness and size of screen require a

minimal increase in gain. Imaging Science Foundation certified and 8K ready. Dark backing.

m. TecVision CS1200X ALR - On Axis gain of 1.2. Rejects 82% of ambient light. 40 degree viewing cone. Provides excellent contrast and color reproduction. Performs well in ambient light. Imaging Science Foundation certified. 8K ready. Dark backing.

n. TecVision XH900X Grey - On Axis gain of 0.9. 180 degree viewing cone. Provides very good contrast and color reproduction. Imaging Science Foundation certified. 8K ready. Dark backing.

o. TecVision MS1000X Grey - On Axis gain of 1.0. 70 degree viewing cone. Provides excellent contrast and color reproduction. Performs well in ambient light. Imaging Science Foundation certified. 8K ready. Dark backing.

p. TecVision XT1300X White - On Axis gain of 1.3. 180 degree viewing cone. Imaging Science Foundation certified. 8K ready. Dark backing.

q. TecVision XT1600X White - On Axis gain of 1.6. 180 degree viewing cone. Imaging Science Foundation certified. 8K ready. Dark backing.

r. TecVision XT1800X White - On Axis gain of 1.8. 180 degree viewing cone. Imaging Science Foundation certified. Suited for active 3D or color combining passive 3D systems. 8K ready. Dark backing.

s. CineFlex CH1200V - On Axis gain of 1.2. 60 degree viewing cone. Neutral grey rear projection diffusing surface. Provides high resolution and excellent contrast, even in lighted rooms. Recommended for use with low to medium output projectors. 4K ready.

t. CineFlex White XT700V - On Axis gain of 0.7. 180 degree viewing cone. White rear projection surface works well for edge matching or edge blending applications, and also for short throw rear projection. Reasonable control of ambient light is recommended. 4K ready.

5. Tab-Tensioning System:
   a. Viewing surface with integrated tabs and cable on each side of fabric to provide tension and ensure flat viewing surface. Viewing surface and tabs CNC cut as a single piece. Tabs RF welded to the back of viewing surface to prevent tab separation. Tab adhesives are not acceptable. Viewing surface inserted into aluminum bottom dowel. Warranted for 5 years against tab separation.
6. Viewing Area H x W. Black masking borders standard. 12 inch (305 mm) black drop standard.
   a. Custom Size: _____ H x _____ W.
   b. NTSC Format (4:3).
      1) 6 foot (1.83 m) diagonal, 42-1/2 inches x 56-1/2 inches (1080 mm x 1435 mm).
      2) 7 foot (2.13 m) diagonal, 50 inches x 66-1/2 inches (1270 mm x 1689 mm).
      3) 100 inch (2540 mm) diagonal, 60 inches x 80 inches (1524 mm x 2032 mm).
      4) 10 foot (3.05 m) diagonal, 72 inches x 96 inches (1829 mm x 2438 mm).
      5) 11 foot (3.35 m) diagonal, 78 inches x 104 inches (1981 mm x 2642 mm).
      6) 150 inch (3810 mm) diagonal, 87 inches x 116 inches (2210 mm x 3658 mm).
      7) 15 foot (4.572 m) diagonal, 108 inches x 144 inches (2743 mm x 3658 mm).
   c. HDTV Format (16:9).

1) 65 inch (1651 mm) diagonal, 31-3/4 inches x 56-1/2 inches (806 mm x 1435 mm).
2) 73 inch (1854 mm) diagonal, 36 inches x 64 inches (914 mm x 1626 mm).
3) 82 inch (2083 mm) diagonal, 40-1/2 inches x 42 inches (1029 mm x 1067 mm).
4) 92 inch (2337 mm) diagonal, 45 inches x 80 inches (1143 mm x 2032 mm).
5) 100 inch (2540 mm) diagonal, 49 inches x 87 inches (1245 mm x 2210 mm)
6) 106 inch (2692 mm) diagonal, 52 inches x 92 inches (1321 mm x 2337 mm).
7) 110 inch (2794 mm) diagonal, 54 inches x 96 inches (1372 mm x 2438 mm)
8) 119 inch (3023 mm) diagonal, 58 inches x 104 inches (1473 mm x 2642 mm).
9) 133 inch (3378 mm) diagonal, 65 inches x 116 inches (1651 mm x 2947 mm).
10) 161 inch (4089 mm) diagonal, 79 inches x 140 inches (2007 mm x 3556 mm).

d. 16:10 Format.
1) 67 inch (1702 mm) diagonal, 35-1/4 inches x 56-1/2 inches (895 mm x 1435 mm).
2) 76 inch (1930 mm) diagonal, 40 inches x 64 inches
3) 85 inch (2159 mm) diagonal, 45 inches x 72 inches (1143 mm x 1829 mm).
4) 94 inch (2438 mm) diagonal, 50 inches x 80 inches (1270 mm x 2032 mm).
5) 109 inch (2769 mm) diagonal, 57-1/2 inches x 92 inches (1461 mm x 2337 mm).
6) 113 inch (2870 mm) diagonal, 60 inches x 96 inches (1524 mm x 2438 mm).
7) 123 inch (3124 mm) diagonal, 65 inches x 104 inches (1351mm x 2642 mm).
8) 137 inch (3480) diagonal, 72-1/2 inches x 116 inches (1842 mm x 2946 mm).
9) 165 inch (4191 mm) diagonal, 87-1/2 inches x 140 inches (2223 mm x 3556 mm).

7. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with top border matching the viewing surface.
8. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with a black masking top border.

B. Premier XL: Electric motor operated, metal case, tab tensioned. Metal roller mounted on rubber isolation mounts. Case consists of a curved front and L-shaped back/top cover fabricated of extruded aluminum, with endcaps forming ceiling hanging bracket. Case 6-3/4 inches high x 6-3/4 inches deep (172 mm high x 172 mm deep). Case and tensioning dowel finished in flat black.
1. Motor mounted inside screen roller on rubber isolation insulators. Motor UL certified, rated 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches.

2. System Options:
   a. Case finished black (standard).
   b. Case finished white.
3. Projection Viewing Surface: Mildew resistant 100 percent vinyl with black masking borders and 12 inch (305 mm) black drop.
   a. Matt White XT1000V - On Axis gain of 1.0. 180 degree viewing cone. GREENGUARD Gold certified. Available with or without black backing. 4K ready.
   b. Pure White XT1300V - On Axis gain of 1.3. 180 degree viewing cone. For use in situations where lighting is well controlled and where enhanced brightness is needed due to limited projector brightness. Available with or without black backing. 4K ready.
   c. Grey XH600V - On Axis gain of 0.6. Provides excellent contrast and color reproduction. GREENGUARD Gold certified. Available with or without black backing. 4K ready.
   d. ClearSound NanoPerf XT1000V - On Axis gain of 1.0. 180 degree viewing cone. Acoustically transparent white PVC fabric with microscopic perforations. 4K ready.
   e. ClearSound Perf XT900V - On Axis gain of 1.0. 180 degree viewing cone. Acoustically transparent. Flexible matt white perforated surface. Reasonable control of ambient light is recommended.
   f. TecVision XH700X Grey - On Axis gain of 0.7. 180 degree viewing cone. Designed for blending applications on curved or flat screens where ambient light is present. Provides very good contrast and color reproduction. Imaging Science Foundation certified and 8K ready. Dark backing.
   g. TecVision XH800X UST ALR - For short-throw and ultra-short throw applications. On Axis gain of 0.8. Rejects 57% of ambient light. 180 degree viewing cone. Provides very good contrast and color reproduction. Imaging Science Foundation certified. 8K ready. Dark backing.
   h. TecVision XH900X ALR - On Axis gain of 0.9. Rejects 60% of ambient light. 180 degree viewing cone. Provides very good contrast and color reproduction. Imaging Science Foundation certified. 8K ready. Dark backing.
   i. TecVision CS1000X ALR - On Axis gain of 1.0. Rejects 82% of ambient light. 40 degree viewing cone. Provides excellent contrast and color reproduction. Performs well in ambient light. Imaging Science Foundation certified. 8K ready. Dark backing.
   j. TecVision MS1000X ALR - Rejects 73% of ambient light. On Axis gain of 1.0. 70 degree viewing cone. Provides excellent contrast and color reproduction. Performs well in ambient light. Imaging Science Foundation certified. 8K ready. Dark backing.
   k. TecVision XT1000X White - On Axis gain of 1.0. 180 degree viewing cone. Imaging Science Foundation certified. 8K ready reference screen surface for blending applications, precise resolution, and color accuracy. Dark backing.
   l. TecVision XT1100X White - On-Axis gain of 1.1. 180 degree viewing cone. Designed for use when the projector brightness and size of screen require a minimal increase in gain. Imaging Science Foundation certified and 8K ready. Dark backing.
   m. TecVision CS1200X ALR - On Axis gain of 1.2. Rejects 82% of ambient light. 40 degree viewing cone. Provides excellent contrast and color reproduction. Performs well in ambient light. Imaging Science Foundation certified. 8K ready. Dark backing.

n. TecVision XH900X Grey - On Axis gain of 0.9. 180 degree viewing cone. Provides very good contrast and color reproduction. Imaging Science Foundation certified. 8K ready. Dark backing.
o. TecVision MS1000X Grey - On Axis gain of 1.0. 70 degree viewing cone. Provides excellent contrast and color reproduction. Performs well in ambient light. Imaging Science Foundation certified. 8K ready. Dark backing.
p. TecVision XT1300X White - On Axis gain of 1.3. 180 degree viewing cone. Imaging Science Foundation certified. 8K ready. Dark backing.
q. TecVision XT1600X White - On Axis gain of 1.6. 180 degree viewing cone. Imaging Science Foundation certified. 8K ready. Dark backing.
r. TecVision XT1800X White - On Axis gain of 1.8. 180 degree viewing cone. Imaging Science Foundation certified. Suited for active 3D or color combining passive 3D systems. 8K ready. Dark backing.
s. CineFlex CH1200V - On Axis gain of 1.2. 60 degree viewing cone. Neutral grey rear projection diffusing surface. Provides high resolution and excellent contrast, even in lighted rooms. Recommended for use with low to medium output projectors. 4K ready.
t. CineFlex White XT700V - On Axis gain of 0.7. 180 degree viewing cone. White rear projection surface works well for edge matching or edge blending applications, and also for short throw rear projection. Reasonable control of ambient light is recommended. 4K ready.

4. Tab-Tensioning System:
   a. Viewing surface with integrated tabs and cable on each side of fabric to provide tension and ensure flat viewing surface. Viewing surface and tabs CNC cut as a single piece. Tabs RF welded to the back of viewing surface to prevent tab separation. Tab adhesives are not acceptable. Viewing surface inserted into aluminum bottom dowel. Warranted for 5 years against tab separation.
5. Viewing Area H x W. Black masking borders standard. 12 inch (305 mm) black drop standard.
   a. Custom Size: _____ H x _____ W.
   b. NTSC Format (4:3).
      1) 200 inch (508 mm) diagonal, 118 inches x 158 inches (2997 mm x 4013 mm).
      2) 210 inch (5.33 m) diagonal, 126 inches x 168 inches (3200 mm x 4267 mm).
      3) 220 inch (5.59 m) diagonal, 132 inches x 176 inches (3353 mm x 4470 mm).
      4) 230 inch (5.84 m) diagonal, 138 inches x 184 inches (3505 mm x 4674 mm).
      5) 20 foot (6.10 m) diagonal, 144 inches x 192 inches (3658 mm x 4877 mm).
   c. HDTV Format (16:9).
      1) 184 inch (4673 mm) diagonal, 90 inches x 160 inches (2286 mm x 4064 mm).
      2) 193 inch (4.90 m) diagonal, 94-1/2 inches x 168 inches (2400 mm x 4267 mm).
      3) 220 inch (5.59 m) diagonal, 108 inches x 192 inches (2743 mm x 4877 mm).
   d. 16:10 Format.
      1) 189 inch (4800 mm) diagonal, 100 inches x 160 inches (2540 mm x 4064 mm).

2) 198 inch (5029 mm) diagonal, 105 inches x 168 inches (2667 mm x 4267 mm).
3) 226 inch (5740 mm) diagonal, 120 inches x 192 inches (3048 mm x 4877 mm).

6. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with top border matching the viewing surface.
7. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with a black masking top border.

C. Targa: Electric motor operated, steel case. Cases are one piece 22 gauge steel with end caps forming universal wall or ceiling hanging bracket. Case size 5-7/8 inches high. x 5-1/4 inches deep (150 mm high x 134 mm deep). White scratch resistant textured finish.
1. Motor mounted inside screen roller on rubber isolation insulators. Motor UL certified, rated 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches.
2. Quiet Motor mounted inside screen roller on rubber isolation insulators. Motor operates at 44db. UL certified, rated 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches.
3. System Options:
   a. Case finished white (standard).
   b. Case finished black.
   c. Projected Mounting Brackets with a 6 inch (152 mm) clearance from wall. Finished white or black.
   d. Floating Mounting Brackets for mounting screen to wall or ceiling
   e. Ceiling Trim Kit for recessing above acoustical tile ceiling grid.
4. Projection Viewing Surface:
   a. Matt White XT1000E - On Axis gain of 1.0. 180 degree viewing cone. Washable surface. GREENGUARD Gold certified. 4K ready.
   b. Argent White XH1500E - On Axis gain of 1.5. High reflectivity fabric with broad viewing cone. Excellent resolution and color balance. Flame and Mildew resistant. 4K ready.
   c. Pearl White CH1900E - On Axis gain of 1.9. Matt white surface with reflective pearlescent coating. 4K ready.
   d. Contrast Grey XH800E - 0.8 On Axis gain. Smooth grey surface provides excellent resolution and enhances color contrast. 180 degree viewing cone. GREENGUARD Gold certified. 4K ready.
   e. Contrast White XH1100E - On Axis gain of 1.1. Diffuse white coating over a grey base material. Recommended for use with low to moderate light output digital projectors, where some provision for light control exists. 4K ready.
   f. ClearSound White Weave XT900E - On Axis gain of 0.9. 180 degree viewing cone. Acoustically transparent woven blend of fiberglass and PVC. Acoustical properties are comparable to the highest quality speaker grille cloth. Some control of ambient light is recommended. Flame and mildew resistant. 4K ready.
   g. ClearSound Grey Weave XH600E - On Axis gain of 0.6. 180 degree viewing cone. Acoustically transparent woven blend of fiberglass and PVC. Grey material for higher contrast. Acoustical properties are comparable to the highest quality speaker grille cloth. Flame and mildew resistant. 4K ready.
   h. Chroma Key Green - Green flexible PVC surface for video production where you need the background to "disappear." Matte finish. Flame retardant, tear resistant, and wrinkle resistant. Offers excellent uniformity and consistent

surface color edge to edge. Works effectively throughout 180 degree viewable range.

5. Viewing Area H x W.
   a. Custom Size: _____ H x _____ W.
   b. NTSC Format (4:3). Black masking borders standard.
      1) 6 foot (1.83 m) diagonal, 42-1/2 inches x 56-1/2 inches (1080 mm x 1435 mm).
      2) 7 foot (2.13 m) diagonal, 50 inches x 66-1/2 inches (1270 mm x 1689 mm).
      3) 100 inch (2540 mm) diagonal, 60 inches x 80 inches (1524 mm x 2032 mm).
      4) 10 foot (3.05 m) diagonal, 69 inches x 92 inches (1753 mm x 2337 mm).
      5) 11 foot (3.35 m) diagonal, 78 inches x 104 inches (1981 mm x 2642 mm).
      6) 150 inch (3810 mm) diagonal, 87 inches x 116 inches (2210 mm x 3658 mm).
      7) 15 foot (4.57 m) diagonal, 105 inches x 140 inches (2667 mm x 3556 mm).
      8) 200 inch (5080 mm) diagonal, 118 inches x 158 inches (2997 mm x 4013 mm).
   c. HDTV Format (16:9). Black masking borders standard.
      1) 65 inch (1651 mm) diagonal, 31-3/4 inch x 56-1/2 inch (781 mm x 1435 mm).
      2) 73 inch (1854 mm) diagonal, 36 inches x 64 inches (
      3) 82 inch (2083 mm) diagonal, 40-1/2 inches x 72 inches (
      4) 92 inch (2337 mm) diagonal, 45 inches x 80 inches (1143 mm x 2032 mm).
      5) 100 inch (2540 mm) diagonal, 49 inches x 87 inches (1245 mm x 2210 mm).
      6) 106 inch (2692 mm) diagonal, 52 inches x 92 inches (1321 mm x 2337 mm).
      7) 110 inch (2794 mm) diagonal, 54 inches x 96 inches (1372 mm x 2438 mm).
      8) 119 inch (3023 mm) diagonal, 58 inches x 104 inches (1473 mm x 2642 mm).
      9) 133 inch (3378 mm) diagonal, 65 inches x 116 inches (1651 mm x 2947 mm).
      10) 161 inch (4089 mm) diagonal, 79 inches x 140 inches (2007 mm x 3556 mm).
      11) 184 inch (4674 mm) diagonal, 90 inches x 160 inches (2286 mm x 4064 mm).
   d. 16:10 Format. Black masking borders standard.
      1) 67 inch (1702 mm) diagonal, 35-1/4 inches x 56-1/2 inches (895 mm x 1435 mm).
      2) 76 inch (1930 mm) diagonal, 40 inches x 64 inches
      3) 85 inch (2159 mm) diagonal, 45 inches x 72 inches (1143 mm x 1829 mm).
      4) 94 inch (2438 mm) diagonal, 50 inches x 80 inches (1270 mm x 2032 mm).
      5) 109 inch (2769 mm) diagonal, 57-1/2 inches x 92 inches (1461 mm x 2337 mm).

6) 113 inch (2870 mm) diagonal, 60 inches x 96 inches (1524 mm x 2438 mm).
7) 123 inch (3124 mm) diagonal, 65 inches x 104 inches (1351mm x 2642 mm).
8) 137 inch (3480) diagonal, 72-1/2 inches x 116 inches (1842 mm x 2946 mm).
9) 165 inch (4191 mm) diagonal, 87-1/2 inches x 140 inches (2223 mm x 3556 mm).
10) 189 inch (4800 mm) diagonal, 100 inches x 160 inches (2540 mm x 4064 mm).

6. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with top border matching the viewing surface.
7. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with a black masking top border.

D. Targa XL: Electric motor operated, metal case. Cases consist of a curved front and L-shaped back/top cover fabricated of extruded aluminum, with endcaps forming ceiling hanging bracket. Case size 6-3/4 inches high x 6-3/4 inches deep (172 mm high x 172 mm deep). White scratch resistant textured finish.
1. Motor mounted inside screen roller on rubber isolation insulators. Motor UL certified, rated 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches.
2. System Options:
a. Case finished textured white (standard).
b. Case finished black.
3. Projection Viewing Surface:
a. Matt White XT1000E - On Axis gain of 1.0. 180 degree viewing cone. Washable surface. GREENGUARD Gold certified. 4K ready.
b. Pearl White CH1900E - On Axis gain of 1.9. Matt white surface with reflective pearlescent coating. 4K ready.
c. Contrast Grey XH800E - 0.8 On Axis gain. Smooth grey surface provides excellent resolution and enhances color contrast. 180 degree viewing cone. GREENGUARD Gold certified. 4K ready.
d. Contrast White XH1100E - On Axis gain of 1.1. Diffuse white coating over a grey base material. Recommended for use with low to moderate light output digital projectors, where some provision for light control exists. 4K ready.
e. ClearSound White Weave XT900E - On Axis gain of 0.9. 180 degree viewing cone. Acoustically transparent woven blend of fiberglass and PVC. Acoustical properties are comparable to the highest quality speaker grille cloth. Some control of ambient light is recommended. Flame and mildew resistant. 4K ready.
f. ClearSound Grey Weave XH600E - On Axis gain of 0.6. 180 degree viewing cone. Acoustically transparent woven blend of fiberglass and PVC. Grey material for higher contrast. Acoustical properties are comparable to the highest quality speaker grille cloth. Flame and mildew resistant. 4K ready.
g. Chroma Key Green - Green flexible PVC surface for video production where you need the background to "disappear." Matte finish. Flame retardant, tear resistant, and wrinkle resistant. Offers excellent uniformity and consistent surface color edge to edge. Works effectively throughout 180 degree viewable range.
4. Viewing Area H x W.

a. NTSC Format (4:3). Black masking borders standard.
   1) 210 inch (5.33 m) diagonal, 126 inches x 168 inches (3200 mm x 4268 mm).
   2) 240 inch (6.10 m) diagonal, 141 inches x 188 inches (3581 mm x 4776 mm).
b. HDTV Format (16:9). Black masking borders standard.
   1) 193 inch (4.90 m) diagonal, 94-1/2 inches x 168 inches (2400 mm x 4268 mm).
   2) 220 inch (5.59 m) diagonal, 106 inches x 188 inches (2692 mm x 4776 mm).
c. 16:10 Format. Black masking borders standard.
   1) 198 inch (5029 mm) diagonal, 105 inches x 168 inches (2667 mm x 4267 mm).
   2) 222 inch (5639 mm) diagonal, 117 inches x 188 inches (2972 mm x 4775 mm).

5. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with top border matching the viewing surface.
6. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with a black masking top border.

2.3 MOTORIZED, CEILING RECESSED, FRONT PROJECTION SCREENS

A. Access XL E: Electric motor operated, steel case. Case size 10-7/16 inches (265 mm) high and 9 inches (229 mm) deep. Steel housing with white paint finish and stamped steel end caps. UL approved "Suitable for use in environmental air space." Bottom closure panel forms slot for passage of viewing surface and can be released to hang down or be removed for access to operating mechanism and viewing surface. Bottom perimeter flange provides support and trim for acoustical ceiling panels and trim for gypsum board ceiling. Housing is symmetrical allowing for left and right hand motor locations and for viewing surface to unroll off front or back of roller. Provided with internal junction box and plug-in wiring connections.
   1. Motor mounted inside screen roller on rubber isolation insulators. Motor UL certified, rated 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches. Motor with overload protection and electric brake.
   2. Projection Viewing Surface:
      a. Matt White XT1000E - On Axis gain of 1.0. 180 degree viewing cone. Washable surface. GREENGUARD Gold certified.
   3. Viewing Area H x W.
      a. NTSC Format (4:3). Black masking borders standard.
         1) 250 inches (635 cm) diagonal, 148 inches x 198 inches (376 x 503 cm).
         2) 270 inches (686 cm) diagonal, 162 inches x 216 inches (411 x 549 cm).
         3) 295 inches (749 cm) diagonal, 177 inches x 236 inches (450 x 599 cm).
      b. HDTV Format (16:9). Black masking borders standard.
         1) 248 inches (630 cm) diagonal, 121-1/2 inches x 216 inches (309 x 549 cm).
         2) 270 inches (686 cm) diagonal, 133 inches x 236 inches (338 x 599 cm).
      c. 16:10 Format. Black masking borders standard.
         1) 255 inches (648 cm) diagonal, 135 inches x 216 inches (343 x 549 cm).
         2) 278 inches (706 cm) diagonal, 147-1/2 inches x 236 inches (375 x 599 cm).
   4. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with

top border matching the viewing surface.

5. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with a black masking top border.

B. Access XL V: Electric motor operated, steel housing, tab tensioned. Case size 10-7/16 inches (265 mm) high and 9 inches (229 mm) deep. Steel housing with white paint finish and stamped steel end caps. UL approved "Suitable for use in environmental air space." Bottom closure panel forms slot for passage of viewing surface and can be released to hang down or be removed for access to operating mechanism and viewing surface. Bottom perimeter flange provides support and trim for acoustical ceiling panels or for trim for gypsum board ceilings. Housing is symmetrical allowing for left and right hand motor locations and for viewing surface to unroll off front or back of roller. Provided with internal junction box and plug-in wiring connections to allow housing.

1. Motor mounted inside screen roller on rubber isolation insulators. Motor UL certified, rated 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches. Motor with overload protection and electric brake.
2. Projection Viewing Surface:
   a. Matt White XT1000 - On Axis gain of 1.0. 180 degree viewing cone. GREENGUARD Gold certified. Available with or without black backing. 4K ready.
   b. Pure White XT1300V - On Axis gain of 1.3. 180 degree viewing cone. For use in situations where lighting is well controlled and where enhanced brightness is needed due to limited projector brightness. Available with or without black backing. 4K ready.
   c. Grey XH600V - On Axis gain of 0.6. Provides excellent contrast and color reproduction. GREENGUARD Gold certified. Maximum size 9 feet x 12 feet (275 cm x 366 cm). Available with or without black backing. 4K ready.
   d. ClearSound NanoPerf XT1000V - On Axis gain of 1.0. 180 degree viewing cone. Acoustically transparent white PVC fabric with microscopic perforations. Not recommended for use in sizes less than 80 inches (203 cm) wide. Not recommended for viewing less than 10 feet (305 cm) from screen. 4K ready.
   e. ClearSound Perf XT900V - On Axis gain of 1.0. 180 degree viewing cone. Acoustically transparent. Flexible matt white perforated surface. Reasonable control of ambient light is recommended. Not recommended for use in sizes less than 80 inches (203 cm) wide. Not recommended for viewing less than 20 feet (610 cm) from screen.
   f. TecVision XH700X Grey - On Axis gain of 0.7. 180 degree viewing cone. Designed for blending applications on curved or flat screens where ambient light is present. Provides very good contrast and color reproduction. Imaging Science Foundation certified and 8K ready. Dark backing.
   g. TecVision XH800X UST ALR - For short-throw and ultra-short throw applications. On Axis gain of 0.8. Rejects 57% of ambient light. 180 degree viewing cone. Provides very good contrast and color reproduction. Imaging Science Foundation certified. 8K ready. Dark backing.
   h. TecVision XH900X ALR - On Axis gain of 0.9. Rejects 60% of ambient light. 180 degree viewing cone. Provides very good contrast and color reproduction. Imaging Science Foundation certified. 8K ready. Dark backing.
   i. TecVision CS1000X ALR - On Axis gain of 1.0. Rejects 82% of ambient light. 40 degree viewing cone. Provides excellent contrast and color reproduction. Performs well in ambient light. Imaging Science Foundation certified. 8K ready. Dark backing.

j. TecVision MS1000X ALR - Rejects 73% of ambient light. On Axis gain of 1.0. 70 degree viewing cone. Provides excellent contrast and color reproduction. Performs well in ambient light. Imaging Science Foundation certified. 8K ready. Dark backing.
k. TecVision XT1000X White - On Axis gain of 1.0. 180 degree viewing cone. Imaging Science Foundation certified. 8K ready reference screen surface for blending applications, precise resolution, and color accuracy. Dark backing.
l. TecVision XT1100X White - On-Axis gain of 1.1. 180 degree viewing cone. Designed for use when the projector brightness and size of screen require a minimal increase in gain. Imaging Science Foundation certified and 8K ready. Dark backing.
m. TecVision CS1200X ALR - On Axis gain of 1.2. Rejects 82% of ambient light. 40 degree viewing cone. Provides excellent contrast and color reproduction. Performs well in ambient light. Imaging Science Foundation certified. 8K ready. Dark backing.
n. TecVision XT1300X White - On Axis gain of 1.3. 180 degree viewing cone. Imaging Science Foundation certified. 8K ready. Dark backing.
o. TecVision XT1600X White - On Axis gain of 1.6. 180 degree viewing cone. Imaging Science Foundation certified. 8K ready. Dark backing.
p. TecVision XT1800X White - On Axis gain of 1.8. 180 degree viewing cone. Imaging Science Foundation certified. Suited for active 3D or color combining passive 3D systems. 8K ready. Dark backing.
q. CineFlex CH1200V - On Axis gain of 1.2. 60 degree viewing cone. Neutral grey rear projection diffusing surface. Provides high resolution and excellent contrast, even in lighted rooms. Recommended for use with low to medium output projectors. 4K ready.
r. CineFlex White XT700V - On Axis gain of 0.7. 180 degree viewing cone. White rear projection surface works well for edge matching or edge blending applications, and also for short throw rear projection. Reasonable control of ambient light is recommended. 4K ready.

3. Tab-Tensioning System.
   a. Viewing surface with integrated tabs and cable on each side of fabric to provide tension and ensure flat viewing surface. Viewing surface and tabs CNC cut as a single piece. Tabs RF welded to the back of viewing surface to prevent tab separation. Tab adhesives are not acceptable. Warranted for 5 years against tab separation. Viewing surface inserted into aluminum bottom dowel.
4. Viewing Area H x W.
   a. NTSC Format (4:3). Black masking borders standard.
      1) 250 inches (635 cm) diagonal, 148 inches x 198 inches (376 cm x 503 cm).
      2) 270 inches (686 cm) diagonal, 162 inches x 216 inches (411 cm x 549 cm).
   b. HDTV Format (16:9). Black masking borders standard.
      1) 248 inches (630 cm) diagonal, 121-1/2 inches x 216 inches (309 cm x 549 cm).
   c. 16:10. Black masking borders standard.
      1) 255 inches (648 cm) diagonal, 135 inches x 216 inches (343 cm x 549 cm).
5. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with top border matching viewing surface color.
6. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with

a black masking top border.

C. Paragon V: Large electrically operated, tab tensioned, extruded aluminum case. Projection screen with motor in roller. 13-1/4 inches high x 12 inches deep (337 mm high x 305 mm deep) case fully enclosed except for slot allowing viewing surface passage. Roller: 6 inches (152 mm) diameter steel tube. Viewing surface securely attached to roller at top and at bottom to weighted dowel. Provided with universal mounting brackets for ceiling or above ceiling mounting.
   1. Motor UL certified, rated 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches.
   2. Wall Mounting Bracket Kit: Kit includes two structural steel brackets and hardware to attach brackets to case. Hardware for mounting to wall structure by others.
   3. Projection Viewing Surface:
      a. Matt White XT1000V - On Axis gain of 1.0. 180 degree viewing cone. GREENGUARD Gold certified. Available with or without black backing. 13-1/4 inches high x 12 inches deep. 4K ready.
      b. Pure White XT1300V - On Axis gain of 1.3. 180 degree viewing cone. For use in situations where lighting is well controlled and where enhanced brightness is needed due to limited projector brightness. Available with or without black backing. 13-1/4 inches high x 12 inches deep. 4K ready.
      c. ClearSound Perf XT900V - On Axis gain of 1.0. 180 degree viewing cone. Acoustically transparent. Flexible matt white perforated surface. Reasonable control of ambient light is recommended. Not recommended for use in sizes less than 80 inches (203 cm) wide. Not recommended for viewing less than 20 feet (610 cm) from screen.
      d. TecVision XH700X Grey - On Axis gain of 0.7. 180 degree viewing cone. Designed for blending applications on curved or flat screens where ambient light is present. Provides very good contrast and color reproduction. Imaging Science Foundation certified and 8K ready. Dark backing.
      e. TecVision XH800X UST ALR - For short-throw and ultra-short throw applications. On Axis gain of 0.8. Rejects 57% of ambient light. 180 degree viewing cone. Provides very good contrast and color reproduction. Imaging Science Foundation certified. 8K ready. Dark backing.
      f. TecVision XH900X ALR - On Axis gain of 0.9. Rejects 60% of ambient light. 180 degree viewing cone. Provides very good contrast and color reproduction. Imaging Science Foundation certified. 8K ready. Dark backing.
      g. TecVision CS1000X ALR - On Axis gain of 1.0. Rejects 82% of ambient light. 40 degree viewing cone. Provides excellent contrast and color reproduction. Performs well in ambient light. Imaging Science Foundation certified. 8K ready. Dark backing.
      h. TecVision MS1000X ALR - Rejects 73% of ambient light. On Axis gain of 1.0. 70 degree viewing cone. Provides excellent contrast and color reproduction. Performs well in ambient light. Imaging Science Foundation certified. 8K ready. Dark backing.
      i. TecVision XT1000X White - On Axis gain of 1.0. 180 degree viewing cone. Imaging Science Foundation certified. 8K ready reference screen surface for blending applications, precise resolution, and color accuracy. Dark backing.
      j. TecVision XT1100X White - On-Axis gain of 1.1. 180 degree viewing cone. Designed for use when the projector brightness and size of screen require a minimal increase in gain. Imaging Science Foundation certified and 8K ready. Dark backing.

k. TecVision CS1200X ALR - On Axis gain of 1.2. Rejects 82% of ambient light. 40 degree viewing cone. Provides excellent contrast and color reproduction. Performs well in ambient light. Imaging Science Foundation certified. 8K ready. Dark backing.
l. TecVision XT1300X White - On Axis gain of 1.3. 180 degree viewing cone. Imaging Science Foundation certified. 8K ready. Dark backing.
m. TecVision XT1600X White - On Axis gain of 1.6. 180 degree viewing cone. Imaging Science Foundation certified. 8K ready. Dark backing.
n. TecVision XT1800X White - On Axis gain of 1.8. 180 degree viewing cone. Imaging Science Foundation certified. Suited for active 3D or color combining passive 3D systems. 8K ready. Dark backing.
o. CineFlex White XT700V - On Axis gain of 0.7. 180 degree viewing cone. White rear projection surface works well for edge matching or edge blending applications, and also for short throw rear projection. Reasonable control of ambient light is recommended. 4K ready.
p. CineFlex CH1200V - On Axis gain of 1.2. 60 degree viewing cone. Neutral grey rear projection diffusing surface. Provides high resolution and excellent contrast, even in lighted rooms. Recommended for use with low to medium output projectors. 4K ready.

4. Tab-Tensioning System.
   a. Viewing surface with integrated tabs and cable on each side of fabric to provide tension and ensure flat viewing surface. Viewing surface and tabs CNC cut as a single piece. Tabs RF welded to the back of viewing surface to prevent tab separation. Tab adhesives are not acceptable. Warranted for 5 years against tab separation. Viewing surface inserted into aluminum bottom dowel.
5. Viewing Area H x W.
   a. NTSC Format (4:3). Black masking borders standard.
      1) 250 inch (6.35 m) diagonal, 148 inches x 198 inches (3759 mm x 5029 mm).
      2) 30 foot (9.14 m) diagonal, 212 inches x 284 inches (5385 mm x 7214 mm).
   b. HDTV Format (16:9). Black masking borders standard.
      1) 324 inch (8230 mm) diagonal, 160 inches x 284 inches (4064 mm x 5994 mm).
   c. 16:10 Format. Black masking borders standard.
      1) 335 inch (8230 mm) diagonal, 177 inches x 284 inches (4496 mm x 5994 mm).
6. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with top border matching the viewing surface.
7. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with a black masking top border.

D. Access V: Electric motor operated, steel case. Ceiling-recessed, 18-gauge steel headbox, 7-3/8 inches high x 8-1/16 inches deep (188 mm high x 205 mm deep), including trim flanges with white paint finish and stamped 13-gauge steel end caps. UL approved "Suitable for use in environmental air space." Bottom closure panel forms slot for passage of viewing surface and can be released to hang down or be removed for access to operating mechanism and viewing surface. Bottom perimeter flange provides support and trim for acoustical ceiling panels and trim for gypsum board ceiling. Access case may be ordered in advance and the screen installed later to eliminate field damage. Screen installs in minutes. Housing is symmetrical allowing for left and right hand motor locations and for viewing surface to

unroll off front or back of roller. Steel mounting brackets slide in extruded aluminum mounting system along top of case. Brackets supporting roller/fabric assembly slide in tracks inside top of the case, allowing viewing surface to be centered in case. Steel leveling brackets are attached to case to prevent deflection. Housing designed with internal junction box and plug-in wiring connections to allow housing to be installed and connected to building power supply separately from motor and viewing surface.

1. Motor mounted inside screen roller on rubber isolation insulators. Motor UL certified, rated 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches.
2. Quiet Motor mounted inside screen roller on rubber isolation insulators. Motor operates at 44db and is UL certified, rated 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches.
3. System Options:
    a. Case finished textured white (standard).
    b. Case finished black.
4. Projection Viewing Surface:
    a. Matt White XT1000V - On Axis gain of 1.0. 180 degree viewing cone. GREENGUARD Gold certified. Available with or without black backing. 4K ready.
    b. Pure White XT1300V - On Axis gain of 1.3. 180 degree viewing cone. For use in situations where lighting is well controlled and where enhanced brightness is needed due to limited projector brightness. Available with or without black backing. 4K ready.
    c. Grey XH600V - On Axis gain of 0.6. Provides excellent contrast and color reproduction. GREENGUARD Gold certified. Maximum size 9 feet x 12 feet (275 cm x 366 cm). Available with or without black backing. 4K ready.
    d. ClearSound NanoPerf XT1000V - On Axis gain of 1.0. 180 degree viewing cone. Acoustically transparent white PVC fabric with microscopic perforations. Not recommended for use in sizes less than 80 inches (203 cm) wide. Not recommended for viewing less than 10 feet (305 cm) from screen. 4K ready.
    e. ClearSound Perf XT900V - On Axis gain of 1.0. 180 degree viewing cone. Acoustically transparent. Flexible matt white perforated surface. Reasonable control of ambient light is recommended. Not recommended for use in sizes less than 80 inches (203 cm) wide. Not recommended for viewing less than 20 feet (610 cm) from screen.
    f. TecVision XH700X Grey - On Axis gain of 0.7. 180 degree viewing cone. Designed for blending applications on curved or flat screens where ambient light is present. Provides very good contrast and color reproduction. Imaging Science Foundation certified and 8K ready. Dark backing.
    g. TecVision XH800X UST ALR - For short-throw and ultra-short throw applications. On Axis gain of 0.8. Rejects 57% of ambient light. 180 degree viewing cone. Provides very good contrast and color reproduction. Imaging Science Foundation certified. 8K ready. Dark backing.
    h. TecVision XH900X ALR - On Axis gain of 0.9. Rejects 60% of ambient light. 180 degree viewing cone. Provides very good contrast and color reproduction. Imaging Science Foundation certified. 8K ready. Dark backing.
    i. TecVision CS1000X ALR - On Axis gain of 1.0. Rejects 82% of ambient light. 40 degree viewing cone. Provides excellent contrast and color reproduction. Performs well in ambient light. Imaging Science Foundation certified. 8K ready. Dark backing.
    j. TecVision MS1000X ALR - Rejects 73% of ambient light. On Axis gain of 1.0.

70 degree viewing cone. Provides excellent contrast and color reproduction. Performs well in ambient light. Imaging Science Foundation certified. 8K ready. Dark backing.

k. TecVision XT1000X White - On Axis gain of 1.0. 180 degree viewing cone. Imaging Science Foundation certified. 8K ready reference screen surface for blending applications, precise resolution, and color accuracy. Dark backing.

l. TecVision XT1100X White - On-Axis gain of 1.1. 180 degree viewing cone. Designed for use when the projector brightness and size of screen require a minimal increase in gain. Imaging Science Foundation certified and 8K ready. Dark backing.

m. TecVision CS1200X ALR - On Axis gain of 1.2. Rejects 82% of ambient light. 40 degree viewing cone. Provides excellent contrast and color reproduction. Performs well in ambient light. Imaging Science Foundation certified. 8K ready. Dark backing.

n. TecVision XT1300X White - On Axis gain of 1.3. 180 degree viewing cone. Imaging Science Foundation certified. 8K ready. Dark backing.

o. TecVision XT1600X White - On Axis gain of 1.6. 180 degree viewing cone. Imaging Science Foundation certified. 8K ready. Dark backing.

p. TecVision XT1800X White - On Axis gain of 1.8. 180 degree viewing cone. Imaging Science Foundation certified. Suited for active 3D or color combining passive 3D systems. 8K ready. Dark backing.

q. CineFlex CH1200V - On Axis gain of 1.2. 60 degree viewing cone. Neutral grey rear projection diffusing surface. Provides high resolution and excellent contrast, even in lighted rooms. Recommended for use with low to medium output projectors. 4K ready.

r. CineFlex White XT700V - On Axis gain of 0.7. 180 degree viewing cone. White rear projection surface works well for edge matching or edge blending applications, and also for short throw rear projection. Reasonable control of ambient light is recommended. 4K ready.

5. Tab-Tensioning System:
   a. Viewing surface with integrated tabs and cable on each side of fabric to provide tension and ensure flat viewing surface. Viewing surface and tabs CNC cut as a single piece. Tabs RF welded to the back of viewing surface to prevent tab separation. Tab adhesives are not acceptable. Viewing surface inserted into aluminum bottom dowel. Warranted for 5 years against tab separation.
6. Viewing Area H x W.
   a. NTSC Format (4:3). Black masking borders standard.
      1) 6 foot (1.83 m) diagonal, 42-1/2 inches x 56-1/2 inches (1080 mm x 1435 mm).
      2) 7 foot (2.13 m) diagonal, 50 inches x 66-1/2 inches (1270 mm x 1689 mm).
      3) 100 inch (2540 mm) diagonal, 60 inches x 80 inches (1524 mm x 2032 mm).
      4) 10 foot (3.05 m) diagonal, 69 inches x 92 inches (1753 mm x 2337 mm).
      5) 11 foot (3.35 m) diagonal, 78 inches x 104 inches (1981 mm x 2642 mm).
      6) 150 inch (3810 mm) diagonal, 87 inches x 116 inches (2210 mm x 3658 mm).
      7) 15 foot (4.57 m) diagonal, 108 inches x 144 inches (2743 mm x 3658 mm).
      8) 200 inch (5.08 m) diagonal, 118 inches x 158 inches (2997 mm x 4013

mm).
9) 210 inches (534 cm) diagonal, 126 inches x 168 inches (300 cm x 427 cm).
10) 220 inches (559 cm) diagonal, 132 inches x 176 inches (335 cm x 447 cm).
11) 240 inches (610 cm) diagonal, 144 inches x 192 inches (366 cm x 488 cm).

b. HDTV Format (16:9). Black masking borders standard.
1) 92 inch (2337 mm) diagonal, 45 inches x 80 inches (1143 mm x 2032 mm).
2) 100 inch (2540 mm) diagonal, 49 inches x 87 inches (1245 mm x 2210 mm)
3) 106 inch (2692 mm) diagonal, 52 inches x 92 inches (1321 mm x 2337 mm).
4) 110 inch (2794 mm) diagonal, 54 inches x 96 inches (1372 mm x 2438 mm)
5) 119 inch (3023 mm) diagonal, 58 inches x 104 inches (1473 mm x 2642 mm).
6) 133 inch (3378 mm) diagonal, 65 inches x 116 inches (1651 mm x 2947 mm).
7) 161 inch (4089 mm) diagonal, 80 inches x 140 inches (2032 mm x 3556 mm).
8) 184 inch (4674 mm) diagonal, 90 inches x 160 inches (2286 mm x 4064 mm).
9) 193 inches (490 cm diagonal, 94-1/2 inches x 168 inches (240 cm x 427 cm).
10) 220 inches (559 cm) diagonal, 108 inches x 192 inches (274 cm x 488 cm).

c. 16:10 Format. Black masking borders standard.
1) 94 inch (2388 mm) diagonal, 50 inches x 80 inches (12070 mm x (2032 mm).
2) 109 inch (2769 mm) diagonal, 57-1/2 inches x 92 inches (1461 mm x 2337 mm).
3) 113 inch (2870 mm) diagonal, 60 inches x 96 inches (1524 mm x 2438 mm).
4) 123 inch (3124 mm) diagonal, 65 inches x 104 inches (1351mm x 2642 mm).
5) 137 inch (3480) diagonal, 72-1/2 inches x 116 inches (1842 mm x 2946 mm).
6) 165 inch (4191 mm) diagonal, 87-1/2 inches x 140 inches (2223 mm x 3556 mm).
7) 189 inch (4800 mm) diagonal, 100 inches x 160 inches (2540 mm x 4064 mm).
8) 198 inches (503 cm) diagonal, 105 inches x 168 inches (267 cm x 427 cm).
9) 226 inches (574 cm) diagonal, 120 inches x 192 inches (305 cm x 488 cm).

7. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with top border matching viewing surface color.
8. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with a black masking top border.

E. Ultimate Access V: Electric motor operated, metal case, independently motorized closure, tab tensioned. Ceiling-recessed, metal headbox, 9-7/8 inches high.x 8 inches deep (251 mm high x 204 mm deep) including trim flanges. UL approved "Suitable for use in environmental air space." Case finished white. Bottom of case consists of an independently motorized trap door that opens up inside the screen case. Trap door and access door both hinge downward to allow access to inside of screen case. Doors remain attached to screen case via a concealed full-length hinge. Releasing one latch at each end of screen case allows doors to hinge downward and a prop arm at each end may be pivoted to engage with endcaps, keeping door assembly in its fully open position. Symmetrical case allows for viewing surface to unroll from the back or front of the roller. Screen is attached to roller with roller brackets. Ultimate Access case may be ordered in advance and the screen installed later to eliminate field damage. Metal roller mounted on rubber isolation mounts.
   1. Motor mounted inside screen roller on rubber isolation insulators. Motor UL certified, rated 110-120V AC, 60 Hz, five wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches. Motor with overload protection and electric brake. Motor shall be left mounted.
   2. Quiet Motor mounted inside screen roller on rubber isolation insulators. Motor operates at 44db and is UL certified, rated 110-120V AC, 60 Hz, five wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches. Motor with overload protection and electric brake. Motor shall be left mounted.
   3. Projection Viewing Surface:
      a. Matt White XT1000V - On Axis gain of 1.0. 180 degree viewing cone. GREENGUARD Gold certified. Available with or without black backing. 4K ready.
      b. Pure White XT1300V - On Axis gain of 1.3. 180 degree viewing cone. For use in situations where lighting is well controlled and where enhanced brightness is needed due to limited projector brightness. Available with or without black backing. 4K ready.
      c. ClearSound NanoPerf XT1000V - On Axis gain of 1.0. 180 degree viewing cone. Acoustically transparent white PVC fabric with microscopic perforations. Not recommended for use in sizes less than 80 inches (203 cm) wide or for viewing less than 10 feet (305 cm) from screen. 4K ready.
      d. ClearSound Perf XT900V - On Axis gain of 1.0. 180 degree viewing cone. Acoustically transparent. Flexible matt white perforated surface. Reasonable control of ambient light is recommended. Not recommended for use in sizes less than 80 inches (203 cm) wide or for viewing less than 20 feet (610 cm) from screen.
      e. TecVision XH700X Grey - On Axis gain of 0.7. 180 degree viewing cone. Designed for blending applications on curved or flat screens where ambient light is present. Provides very good contrast and color reproduction. Imaging Science Foundation certified and 8K ready. Dark backing.
      f. TecVision XH800X UST ALR - For short-throw and ultra-short throw applications. On Axis gain of 0.8. Rejects 57% of ambient light. 180 degree viewing cone. Provides very good contrast and color reproduction. Imaging Science Foundation certified. 8K ready. Dark backing.
      g. TecVision XH900X ALR - On Axis gain of 0.9. Rejects 60% of ambient light. 180 degree viewing cone. Provides very good contrast and color reproduction. Imaging Science Foundation certified. 8K ready. Dark backing.
      h. TecVision CS1000X ALR - On Axis gain of 1.0. Rejects 82% of ambient light. 40 degree viewing cone. Provides excellent contrast and color reproduction. Performs well in ambient light. Imaging Science Foundation certified. 8K

ready. Dark backing.

i. TecVision MS1000X ALR - Rejects 73% of ambient light. On Axis gain of 1.0. 70 degree viewing cone. Provides excellent contrast and color reproduction. Performs well in ambient light. Imaging Science Foundation certified. 8K ready. Dark backing.

j. TecVision XT1000X White - On Axis gain of 1.0. 180 degree viewing cone. Imaging Science Foundation certified. 8K ready reference screen surface for blending applications, precise resolution, and color accuracy. Dark backing.

k. TecVision XT1100X White - On-Axis gain of 1.1. 180 degree viewing cone. Designed for use when the projector brightness and size of screen require a minimal increase in gain. Imaging Science Foundation certified and 8K ready. Dark backing.

l. TecVision CS1200X ALR - On Axis gain of 1.2. Rejects 82% of ambient light. 40 degree viewing cone. Provides excellent contrast and color reproduction. Performs well in ambient light. Imaging Science Foundation certified. 8K ready. Dark backing.

m. TecVision XT1300X White - On Axis gain of 1.3. 180 degree viewing cone. Imaging Science Foundation certified. 8K ready. Dark backing.

n. TecVision XT1600X White - On Axis gain of 1.6. 180 degree viewing cone. Imaging Science Foundation certified. 8K ready. Dark backing.

o. TecVision XT1800X White - On Axis gain of 1.8. 180 degree viewing cone. Imaging Science Foundation certified. Suited for active 3D or color combining passive 3D systems. 8K ready. Dark backing.

p. CineFlex CH1200V - On Axis gain of 1.2. 60 degree viewing cone. Neutral grey rear projection diffusing surface. Provides high resolution and excellent contrast, even in lighted rooms. Recommended for use with low to medium output projectors. 4K ready.

q. CineFlex White XT700V - On Axis gain of 0.7. 180 degree viewing cone. White rear projection surface works well for edge matching or edge blending applications, and also for short throw rear projection. Reasonable control of ambient light is recommended. 4K ready.

4. Tab-Tensioning System:
   a. Viewing surface with integrated tabs and cable on each side of fabric to provide tension and ensure flat viewing surface. Viewing surface and tabs CNC cut as a single piece. Tabs RF welded to the back of viewing surface to prevent tab separation. Tab adhesives are not acceptable. Viewing surface inserted into aluminum bottom dowel. Warranted for 5 years against tab separation.
5. Viewing Area H x W.
   a. Custom Size: _____ H x _____ W.
   b. NTSC Format (4:3). Black masking borders and 12 inches (305 mm) extra black drop are standard.
      1) 6 foot (1.83 m) diagonal, 42-1/2 inches x 56-1/2 inches (1080 mm x 1435 mm).
      2) 7 foot (2.13 m) diagonal, 50 inches x 66-1/2 inches (1270 mm x 1689 mm).
      3) 100 inch (2540 mm) diagonal, 60 inches x 80 inches (1524 mm x 2032 mm).
      4) 10 foot (3.05 m) diagonal, 72 inches x 96 inches (1829 mm x 2438 mm).
      5) 11 foot (3.35 m) diagonal, 78 inches x 104 inches (1981 mm x 2642 mm).
      6) 150 inch (3810 mm) diagonal, 87 inches x 116 inches (2210 mm x 3658

mm).
7) 15 foot (4.57 m) diagonal, 108 inches x 144 inches (2743 mm x 3658 mm).

c. HDTV Format (16:9). Black masking borders and 12 inches (305 mm) extra black drop are standard.
1) 92 inch (2337 mm) diagonal, 45 inches x 80 inches (1143 mm x 2032 mm).
2) 100 inch (2540 mm) diagonal, 49 inches x 87 inches (1245 mm x 2210 mm)
3) 106 inch (2692 mm) diagonal, 52 inches x 92 inches (1321 mm x 2337 mm).
4) 110 inch (2794 mm) diagonal, 54 inches x 96 inches (1372 mm x 2438 mm)
5) 119 inch (3023 mm) diagonal, 58 inches x 104 inches (1473 mm x 2642 mm).
6) 133 inch (3378 mm) diagonal, 65 inches x 116 inches (1651 mm x 2947 mm).
7) 161 inch (4089 mm) diagonal, 79 inches x 140 inches (2007 mm x 3556 mm).

d. 16:10 Format. Black masking borders standard.
1) 94 inch (2438 mm) diagonal, 50 inches x 80 inches (1270 mm x 2032 mm).
2) 109 inch (2769 mm) diagonal, 57-1/2 inches x 92 inches (1461 mm x 2337 mm).
3) 113 inch (2870 mm) diagonal, 60 inches x 96 inches (1524 mm x 2438 mm).
4) 123 inch (3124 mm) diagonal, 65 inches x 104 inches (1351mm x 2642 mm).
5) 137 inch (3480) diagonal, 72-1/2 inches x 116 inches (1842 mm x 2946 mm).
6) 165 inch (4191 mm) diagonal, 87-1/2 inches x 140 inches (2223 mm x 3556 mm).

6. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with top border matching the viewing surface.
7. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with a black masking top border.

F. Ultimate Access XL V: Electric motor operated, metal case, independently motorized closure, tab tensioned. Ceiling-recessed, metal headbox, 14-11/16 inches (373 mm) high x 11 inches (279 mm) deep. UL approved "Suitable for use in environmental air space." Case finished white. Bottom of case consists of an independently motorized trap door that opens up inside screen case. Trap door and access door both hinge downward to allow access to inside of screen case. Doors remain attached to the screen case via a concealed full-length hinge. Releasing one latch at each end of screen case allows doors to hinge downward and a prop arm at each end may be pivoted to engage with endcaps, keeping door assembly in its fully open position. Symmetrical case allows for viewing surface to unroll from the back or front of the roller. Screen is attached to roller with roller brackets. Metal roller mounted on rubber isolation mounts
1. Motor mounted inside screen roller on rubber isolation insulators. Motor UL certified, rated 110-120V AC, 60 Hz, five wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches. Motor with overload protection and electric brake.

Motor shall be left mounted.

2. Quiet Motor mounted inside screen roller on rubber isolation insulators. Motor operates at 44db and is UL certified, rated 110-120V AC, 60 Hz, five wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches. Motor with overload protection and electric brake. Motor shall be left mounted.
3. Projection Viewing Surface:
    a. Matt White XT1000V - On Axis gain of 1.0. 180 degree viewing cone. GREENGUARD Gold certified. Available with or without black backing. 4K ready.
    b. Pure White XT1300V - On Axis gain of 1.3. 180 degree viewing cone. For use in situations where lighting is well controlled and where enhanced brightness is needed due to limited projector brightness. Available with or without black backing. 4K ready.
    c. ClearSound NanoPerf XT1000V - On Axis gain of 1.0. 180 degree viewing cone. Acoustically transparent white PVC fabric with microscopic perforations. Not recommended for use in sizes less than 80 inches (203 cm) wide or for viewing less than 10 feet (305 cm) from screen. 4K ready.
    d. ClearSound Perf XT900V - On Axis gain of 1.0. 180 degree viewing cone. Acoustically transparent. Flexible matt white perforated surface. Reasonable control of ambient light is recommended. Not recommended for use in sizes less than 80 inches (203 cm) wide or for viewing less than 20 feet (610 cm) from screen.
    e. TecVision XH700X Grey - On Axis gain of 0.7. 180 degree viewing cone. Designed for blending applications on curved or flat screens where ambient light is present. Provides very good contrast and color reproduction. Imaging Science Foundation certified and 8K ready. Dark backing.
    f. TecVision XH800X UST ALR - For short-throw and ultra-short throw applications. On Axis gain of 0.8. Rejects 57% of ambient light. 180 degree viewing cone. Provides very good contrast and color reproduction. Imaging Science Foundation certified. 8K ready. Dark backing.
    g. TecVision XH900X ALR - On Axis gain of 0.9. Rejects 60% of ambient light. 180 degree viewing cone. Provides very good contrast and color reproduction. Imaging Science Foundation certified. 8K ready. Dark backing.
    h. TecVision CS1000X ALR - On Axis gain of 1.0. Rejects 82% of ambient light. 40 degree viewing cone. Provides excellent contrast and color reproduction. Performs well in ambient light. Imaging Science Foundation certified. 8K ready. Dark backing.
    i. TecVision MS1000X ALR - Rejects 73% of ambient light. On Axis gain of 1.0. 70 degree viewing cone. Provides excellent contrast and color reproduction. Performs well in ambient light. Imaging Science Foundation certified. 8K ready. Dark backing.
    j. TecVision XT1000X White - On Axis gain of 1.0. 180 degree viewing cone. Imaging Science Foundation certified. 8K ready reference screen surface for blending applications, precise resolution, and color accuracy. Dark backing.
    k. TecVision XT1100X White - On-Axis gain of 1.1. 180 degree viewing cone. Designed for use when the projector brightness and size of screen require a minimal increase in gain. Imaging Science Foundation certified and 8K ready. Dark backing.
    l. TecVision CS1200X ALR - On Axis gain of 1.2. Rejects 82% of ambient light. 40 degree viewing cone. Provides excellent contrast and color reproduction. Performs well in ambient light. Imaging Science Foundation certified. 8K

ready. Dark backing.

m. TecVision XT1300X White - On Axis gain of 1.3. 180 degree viewing cone. Imaging Science Foundation certified. 8K ready. Dark backing.

n. TecVision XT1600X White - On Axis gain of 1.6. 180 degree viewing cone. Imaging Science Foundation certified. 8K ready. Dark backing.

o. TecVision XT1800X White - On Axis gain of 1.8. 180 degree viewing cone. Imaging Science Foundation certified. Suited for active 3D or color combining passive 3D systems. 8K ready. Dark backing.

p. CineFlex CH1200V - On Axis gain of 1.2. 60 degree viewing cone. Neutral grey rear projection diffusing surface. Provides high resolution and excellent contrast, even in lighted rooms. Recommended for use with low to medium output projectors. 4K ready.

q. CineFlex White XT700V - On Axis gain of 0.7. 180 degree viewing cone. White rear projection surface works well for edge matching or edge blending applications, and also for short throw rear projection. Reasonable control of ambient light is recommended. 4K ready.

4. Tab-Tensioning System:
   a. Viewing surface with integrated tabs and cable on each side of fabric to provide tension and ensure flat viewing surface. Viewing surface and tabs CNC cut as a single piece. Tabs RF welded to the back of vi ewing surface to prevent tab separation. Tab adhesives are not acceptable. Viewing surface inserted into aluminum bottom dowel. Warranted for 5 years against tab separation.
5. Viewing Area H x W.
   a. Custom Size: _____ H x _____ W.
   b. NTSC Format (4:3). Black masking borders and 12 inches (305 mm) extra black drop are standard.
      1) 200 inches (5.08 m) diagonal, 118 inches x 158 inches (2997 mm x 4013 mm).
      2) 210 inches (5.33 m) diagonal, 126 inches x 168 inches (3200 mm x 4267 mm).
      3) 220 inches (5.59 m) diagonal, 132 inches x 176 inches (3353 mm x 4470 mm).
      4) 230 inches (5.84 m) diagonal, 138 inches x 184 inches (3505 mm x 4674 mm).
      5) 240 inches (6.10 m) diagonal, 144 inches x 192 inches (3658 mm x 4877 mm).
      6) 25 foot (7.62 m) diagonal, 177 inches x 236 inches (4496 mm x 5994 mm).
      7) 27-1/2 foot (8.38 m) diagonal, 199 inches x 264 inches (5054 mm x 6706 mm).
   c. HDTV Format (16:9). Black masking borders and 12 inches (305 mm) extra black drop are standard.
      1) 184 inches (4.67 m) diagonal, 90 x 160 inches (2286 mm x 4064 mm).
      2) 193 inches (4.90 m) diagonal, 94-1/2 inches x 168 inches (2400 mm x 4267 mm).
      3) 220 inches (5.59 m) diagonal, 108 inches x 192 inches (2743 mm x 4877 mm).
      4) 227 inch (5766 mm) diagonal, 111 inches x 198 inches (2819 mm x 5029 mm).
      5) 248 inches (630 cm) diagonal, 121 1/2 inches x 216 inches (309 cm x 549 cm).

6) 270 inch (6858 mm) diagonal, 133 inch x 236 inches (3378 mm x 5994 mm).
7) 300 inch (7620 mm) diagonal, 146 inches x 260 inches (3708 mm x 6604 mm).

d. 16:10 Format. Black masking borders standard.
1) 189 inch (4800 mm) diagonal, 100 inches x 160 inches (2540 mm x 4064 mm).
2) 198 inch (5029 mm) diagonal, 105 inches x 168 inches (2667 mm x 4267 mm).
3) 226 inch (5740 mm) diagonal, 120 inches x 192 inches (3048 mm x 4877 mm).
4) 234 inch (5944 mm) diagonal, 124 inches x 198 inches (3150 mm x 5029 mm).
5) 255 inches (648 cm) diagonal, 135 inches x 216 inches (343 cm x 549 cm).
6) 278 inch diagonal (7061 mm), 147 inches x 236 inches (3734 mm x 5994 mm).
7) 307 inch (7798 mm) diagonal, 162 inches x 260 inches (4115 mm x 6604 mm).

6. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with top border matching the viewing surface.
7. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with a black masking top border.

G. Access E: Electric motor operated, steel case. Ceiling-recessed, 18-gauge steel headbox, 7-3/8 inches high x 8-1/16 inches deep (188 mm high x 205 mm wide) including trim flanges with white paint finish and stamped 13-gauge steel end caps. UL approved "Suitable for use in environmental air space." Bottom closure panel forms slot for passage of viewing surface and can be released to hang down or be removed for access to operating mechanism and viewing surface. Bottom perimeter flange provides support and trim for acoustical ceiling panels and trim for gypsum board ceiling. Access case may be ordered in advance and the screen installed later to eliminate field damage. Housing is symmetrical allowing for left and right hand motor locations and for viewing surface to unroll off front or back of roller. Steel mounting brackets slide in extruded aluminum mounting system along top of case. Brackets supporting roller/fabric assembly slide in tracks inside top of case, allowing viewing surface to be centered in case. Steel leveling brackets are attached to case to prevent deflection. Housing designed with internal junction box and plug-in wiring connections to allow housing to be installed and connected to building power supply separately from motor and viewing surface.
1. Motor mounted inside screen roller on rubber isolation insulators. Motor UL certified, rated 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches.
2. Quiet Motor mounted inside screen roller on rubber isolation insulators. Motor operates at 44db. UL certified, rated 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches.
3. Projection Viewing Surface:
   a. Matt White XT1000E - On Axis gain of 1.0. 180 degree viewing cone. Washable surface. GREENGUARD Gold certified. 4K ready.
   b. Contrast Grey XH800E - 0.8 On Axis gain. Smooth grey surface provides excellent resolution and enhances color contrast. 180 degree viewing cone. GREENGUARD Gold certified. Maximum size available is 12 feet x 12 feet

(366 cm x 366 cm). 4K ready.

c. ClearSound White Weave XT900E - On Axis gain of 0.9. 180 degree viewing cone. Acoustically transparent woven blend of fiberglass and PVC. Acoustical properties are comparable to the highest quality speaker grille cloth. Some control of ambient light is recommended. Flame and mildew resistant. Not recommended for use in sizes less than 80 inches (203 cm) wide. Not recommended for viewing less than 10 feet (305 cm) from screen. 4K ready.

d. ClearSound Grey Weave XH600E - On Axis gain of 0.6. 180 degree viewing cone. Acoustically transparent woven blend of fiberglass and PVC. Grey material for higher contrast. Acoustical properties are comparable to the highest quality speaker grille cloth. Flame and mildew resistant. Not recommended for use in sizes less than 80 inches (203 cm) wide. Not recommended for viewing less than 10 feet (305 cm) from screen. 4K ready.

e. Chroma Key Green - Green flexible PVC surface for video production where you need the background to "disappear." Matte finish. Flame retardant, tear resistant, and wrinkle resistant. Offers excellent uniformity and consistent surface color edge to edge. Works effectively throughout 180 degree viewable range.

4. Viewing Area H x W.

a. NTSC Format (4:3). Black masking borders standard.

1) 6 foot (1.83 m) diagonal, 42-1/2 inches x 56-1/2 inches (1080 mm x 1435 mm).
2) 7 foot (2.13 m) diagonal, 50 inches x 66-1/2 inches (1270 mm x 1689 mm).
3) 100 inch (2540 mm) diagonal, 60 inches x 80 inches (1524 mm x 2032 mm).
4) 10 foot (3.05 m) diagonal, 69 inches x 92 inches (1753 mm x 2337 mm).
5) 11 foot (3.35 m) diagonal, 78 inches x 104 inches (1981 mm x 2642 mm).
6) 150 inch (3810 mm) diagonal, 87 inches x 116 inches (2210 mm x 3658 mm).
7) 15 foot (4.57 m) diagonal, 105 inches x 140 inches (2667 mm x 3556 mm).
8) 200 inch (5080 mm) diagonal, 118 inches x 158 inches (2997 mm x 4013 mm).
9) 210 inches (534 cm) diagonal, 126 inches x 168 inches (320 x 427 cm).
10) 220 inches (559 cm) diagonal, 132 inches x 176 inches (335 x 447 cm).
11) 240 inches (610 cm) diagonal, 141 inches x 188 inches (358 x 478 cm).

b. HDTV Format (16:9). Black masking borders standard.

1) 92 inch (2337 mm) diagonal, 45 inches x 80 inches (1143 mm x 2032 mm).
2) 100 inch (2540 mm) diagonal, 49 inches x 87 inches (1245 mm x 2210 mm)
3) 106 inch (2692 mm) diagonal, 52 inches x 92 inches (1321 mm x 2337 mm).
4) 110 inch (2794 mm) diagonal, 54 inches x 96 inches (1372 mm x 2438 mm)
5) 119 inch (3023 mm) diagonal, 58 inches x 104 inches (1473 mm x 2642 mm).
6) 133 inch (3378 mm) diagonal, 65 inches x 116 inches (1651 mm x 2947 mm).

7) 161 inch (4089 mm) diagonal, 79 inches x 140 inches (2007 mm x 3556 mm).
8) 184 inch (4674 mm) diagonal, 90 inches x 160 inches (2286 mm x 4064 mm).
9) 193 inches (490 cm) diagonal, 94-1/2 inches x 168 inches (240 x 427 cm).
10) 220 inches (559 cm) diagonal, 106 inches x 188 inches (269 x 478 cm).

c. 16:10 Format. Black masking borders standard.
1) 94 inch (2438 mm) diagonal, 50 inches x 80 inches (1270 mm x 2032 mm).
2) 109 inch (2769 mm) diagonal, 57-1/2 inches x 92 inches (1461 mm x 2337 mm).
3) 113 inch (2870 mm) diagonal, 60 inches x 96 inches (1524 mm x 2438 mm).
4) 123 inch (3124 mm) diagonal, 65 inches x 104 inches (1351mm x 2642 mm).
5) 137 inch (3480) diagonal, 72-1/2 inches x 116 inches (1842 mm x 2946 mm).
6) 165 inch (4191 mm) diagonal, 87-1/2 inches x 140 inches (2223 mm x 3556 mm).
7) 189 inch (4800 mm) diagonal, 100 inches x 160 inches (2540 mm x 4064 mm).
8) 198 inches (503 cm) diagonal, 105 inches x 168 inches (267 x 427 cm).
9) 222 inches (564 cm) diagonal, 117-1/2 inches x 188 inches (298 x 478 cm).

5. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with top border matching the viewing surface.
6. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with a black masking top border.

H. Ultimate Access E: Electric motor operated, metal case, independently motorized closure. Ceiling-recessed, metal headbox, 9-7/8 inches high x 8 inches deep (251 mm high x 204 mm deep) including trim flanges. UL approved "Suitable for use in environmental air space." Case finished white. Bottom of case consists of an independently motorized trap door that opens up inside screen case. Trap door and access door both hinge downward to allow access to inside of screen case. Doors remain attached to screen case via a concealed full-length hinge. Releasing one latch at each end of screen case allows doors to hinge downward and a prop arm at each end may be pivoted to engage with endcaps, keeping door assembly in its fully open position. Symmetrical case allows for viewing surface to unroll from the back or front of the roller. Screen is attached to roller with roller brackets. Ultimate Access case may be ordered in advance and screen installed later to eliminate field damage. Metal roller mounted on rubber isolation mounts.
1. Motor mounted inside screen roller on rubber isolation insulators. Motor UL certified, rated 110-120V AC, 60 Hz, five wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches. Motor with overload protection and electric brake. Motor shall be left mounted.
2. Quiet Motor mounted inside screen roller on rubber isolation insulators. Motor operates at 44db and is UL certified, rated 110-120V AC, 60 Hz, five wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches. Motor with overload protection and electric brake. Motor shall be left mounted.
3. Projection Viewing Surface:

a. Matt White XT1000E - On Axis gain of 1.0. 180 degree viewing cone. Washable surface. GREENGUARD Gold certified. 4K ready.
b. Argent White XH1500E - On Axis gain of 1.5. High reflectivity fabric with broad viewing cone. Excellent resolution and color balance. Flame and Mildew resistant. Maximum size 8 feet x 10 feet (244 cm x 305 cm). 4K ready.
c. Pearl White CH1900E - On Axis gain of 1.9. Matt white surface with reflective pearlescent coating. Maximum size 96 inches x 96 inches (244 cm x 244 cm). 4K ready.
d. Contrast White XH1100E - On Axis gain of 1.1. Diffuse white coating over a grey base material. Recommended for use with low to moderate light output digital projectors, where some provision for light control exists. Maximum size 8 feet x 10 feet (244 cm x 305 cm). 4K ready.
e. Contrast Grey XH800E - 0.8 On Axis gain. Smooth grey surface provides excellent resolution and enhances color contrast. 180 degree viewing cone. GREENGUARD Gold certified. 4K ready.
f. ClearSound White Weave XT900E - On Axis gain of 0.9. 180 degree viewing cone. Acoustically transparent woven blend of fiberglass and PVC. Acoustical properties are comparable to the highest quality speaker grille cloth. Some control of ambient light is recommended. Flame and mildew resistant. Not recommended for use in sizes less than 80 inches (203 cm) wide. Not recommended for viewing less than 10 feet (305 cm) from screen. 4K ready.
g. ClearSound Grey Weave XH600E - On Axis gain of 0.6. 180 degree viewing cone. Acoustically transparent woven blend of fiberglass and PVC. Grey material for higher contrast. Acoustical properties are comparable to the highest quality speaker grille cloth. Flame and mildew resistant. Not recommended for use in sizes less than 80 inches (203 cm) wide. Not recommended for viewing less than 10 feet (305 cm) from screen. 4K ready.
h. Chroma Key Green - Green flexible PVC surface for video production where you need the background to "disappear." Matte finish. Flame retardant, tear resistant, and wrinkle resistant. Offers excellent uniformity and consistent surface color edge to edge. Works effectively throughout 180 degree viewable range.

4. Viewing Area H x W.
   a. NTSC Format (4:3). Black masking borders and 12 inches (305 mm) extra black drop are standard.
      1) 6 foot (1.83 m) diagonal, 42-1/2 inches x 56-1/2 inches (1080 mm x 1435 mm).
      2) 7 foot (2.13 m) diagonal, 50 inches x 66-1/2 inches (1270 mm x 1689 mm).
      3) 100 inch (2540 mm) diagonal, 60 inches x 80 inches (1524 mm x 2032 mm).
      4) 10 foot (3.05 m) diagonal, 72 inches x 96 inches (1829 mm x 2438 mm).
      5) 11 foot (3.35 m) diagonal, 78 inches x 104 inches (1981 mm x 2642 mm).
      6) 150 inch (3810 mm) diagonal, 87 inches x 116 inches (2210 mm x 3658 mm).
      7) 15 foot (4.57 m) diagonal, 108 inches x 144 inches (2743 mm x 3658 mm).
   b. HDTV Format (16:9). Black masking borders and 12 inches (305 mm) extra black drop are standard.
      1) 92 inch (2337 mm) diagonal, 45 inches x 80 inches (1143 mm x 2032

mm).
2) 100 inch (2540 mm) diagonal, 49 inches x 87 inches (1245 mm x 2210 mm)
3) 106 inch (2692 mm) diagonal, 52 inches x 92 inches (1321 mm x 2337 mm).
4) 110 inch (2794 mm) diagonal, 54 inches x 96 inches (1372 mm x 2438 mm)
5) 119 inch (3023 mm) diagonal, 58 inches x 104 inches (1473 mm x 2642 mm).
6) 133 inch (3378 mm) diagonal, 65 inches x 116 inches (1651 mm x 2947 mm).
7) 161 inch (4089 mm) diagonal, 79 inches x 140 inches (2007 mm x 3556 mm).

c. 16:10 Format. Black masking borders standard.
1) 94 inch (2438 mm) diagonal, 50 inches x 80 inches (1270 mm x 2032 mm).
2) 109 inch (2769 mm) diagonal, 57-1/2 inches x 92 inches (1461 mm x 2337 mm).
3) 113 inch (2870 mm) diagonal, 60 inches x 96 inches (1524 mm x 2438 mm).
4) 123 inch (3124 mm) diagonal, 65 inches x 104 inches (1351mm x 2642 mm).
5) 137 inch (3480) diagonal, 72-1/2 inches x 116 inches (1842 mm x 2946 mm).
6) 165 inch (4191 mm) diagonal, 87-1/2 inches x 140 inches (2223 mm x 3556 mm).

5. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with top border matching the viewing surface.
6. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with a black masking top border.

I. Ultimate Access XL E: Electric motor operated, metal case, independently motorized closure. Ceiling-recessed, metal headbox, 14-11/16 inches (373 mm) high x 11 inches (279 mm) deep. UL approved "Suitable for use in environmental air space." Case finished white. Bottom of case consists of an independently motorized trap door that opens up inside the screen case. Trap door and access door both hinge downward to allow access to inside of screen case. Doors remain attached to the screen case via a concealed full-length hinge. Releasing one latch at each end of screen case allows doors to hinge downward and a prop arm at each end may be pivoted to engage with endcaps, keeping the door assembly in its fully open position. Symmetrical case allows for viewing surface to unroll from the back or front of the roller. Screen is attached to roller with roller brackets. Metal roller mounted on rubber isolation mounts.
1. Motor mounted inside screen roller on rubber isolation insulators. Motor UL certified, rated 110-120V AC, 60 Hz, five wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches. Motor with overload protection and electric brake. Motor shall be left mounted.
2. Quiet Motor mounted inside screen roller on rubber isolation insulators. Motor operates at 44db and is UL certified, rated 110-120V AC, 60 Hz, five wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches. Motor with overload protection and electric brake. Motor shall be left mounted.
3. Projection Viewing Surface:

a. Matt White XT1000E - On Axis gain of 1.0. 180 degree viewing cone. Washable surface. GREENGUARD Gold certified. 4K ready.
b. Argent White XH1500E - On Axis gain of 1.5. High reflectivity fabric with broad viewing cone. Excellent resolution and color balance. Flame and Mildew resistant. Maximum size 8 feet x 10 feet (244 cm x 305 cm). 4K ready.
c. Pearl White CH1900E - On Axis gain of 1.9. Matt white surface with reflective pearlescent coating. Maximum size 96 inches x 96 inches (244 cm x 244 cm). 4K ready.
d. Contrast White XH1100E - On Axis gain of 1.1. Diffuse white coating over a grey base material. Recommended for use with low to moderate light output digital projectors, where some provision for light control exists. Maximum size 8 feet x 10 feet (244 cm x 305 cm). 4K ready.
e. Contrast Grey XH800E - 0.8 On Axis gain. Smooth grey surface provides excellent resolution and enhances color contrast. 180 degree viewing cone. GREENGUARD Gold certified. 4K ready.
f. ClearSound White Weave XT900E - On Axis gain of 0.9. 180 degree viewing cone. Acoustically transparent woven blend of fiberglass and PVC. Acoustical properties are comparable to the highest quality speaker grille cloth. Some control of ambient light is recommended. Flame and mildew resistant. Not recommended for use in sizes less than 80 inches (203 cm) wide. Not recommended for viewing less than 10 feet (305 cm) from screen. 4K ready.
g. ClearSound Grey Weave XH600E - On Axis gain of 0.6. 180 degree viewing cone. Acoustically transparent woven blend of fiberglass and PVC. Grey material for higher contrast. Acoustical properties are comparable to the highest quality speaker grille cloth. Flame and mildew resistant. Not recommended for use in sizes less than 80 inches (203 cm) wide. Not recommended for viewing less than 10 feet (305 cm) from screen. 4K ready.
h. Chroma Key Green - Green flexible PVC surface for video production where you need the background to "disappear." Matte finish. Flame retardant, tear resistant, and wrinkle resistant. Offers excellent uniformity and consistent surface color edge to edge. Works effectively throughout 180 degree viewable range.

4. Viewing Area H x W.
   a. NTSC Format (4:3). Black masking borders and 12 inches (305 mm) extra black drop are standard.
      1) 200 inch (5.08 m) diagonal, 118 inches x 158 inches (2997 mm x 4013 mm).
      2) 210 inch (5.33 m) diagonal, 126 inches x 168 inches (3200 mm x 4267 mm).
      3) 220 inch (5.59 m) diagonal, 132 inches x 176 inches (3353 mm x 4470 mm).
      4) 230 inch (5.84 m) diagonal, 138 inches x 184 inches (3505 mm x 4674 mm).
      5) 240 inch (6.10 m) diagonal, 141 inches x 188 inches (3581 mm x 4775 mm).
      6) 250 inch (6.35 m) diagonal, 148 inches x 198 inches (3759 mm x 5029 mm).
      7) 270 inch (686 cm) diagonal, 162 inches x 216 inches (411 x 549 cm).
      8) 295 inch (7.62 m) diagonal, 177 inches x 236 inches (4496 mm x 5994 mm).
      9) 27-1/2 foot (8.38 m) diagonal, 194 inches x 260 inches (4928 mm x 6604

mm).

b. HDTV Format (16:9). Black masking borders and 12 inches (305 mm) extra black drop are standard.
   1) 184 inches (4.67 m) diagonal, 90 x 160 inches (2286 mm x 4064 mm).
   2) 193 inches (4.90 m) diagonal, 94-1/2 inches x 168 inches (2400 mm x 4267 mm).
   3) 220 inches (5.59 m) diagonal, 106 inches x 188 inches (2692 mm x 4775 mm).
   4) 248 inches (630 cm) diagonal, 121 1/2 inches x 216 inches (309 cm x 549 cm).
   5) 270 inch (6858 mm) diagonal, 133 inch x 236 inches (3378 mm x 5994 mm).
   6) 300 inch (7620 mm) diagonal, 146 inches x 260 inches (3708 mm x 6604 mm).

c. 16:10 Format. Black masking borders standard.
   1) 189 inch (4800 mm) diagonal, 100 inches x 160 inches (2540 mm x 4064 mm).
   2) 198 inch (5029 mm) diagonal, 105 inches x 168 inches (2667 mm x 4267 mm).
   3) 222 inch (5638 mm) diagonal, 117-1/2 inches x 188 inches (2985 mm x 4775 mm).
   4) 255 inches (648 cm) diagonal, 135 inches x 216 inches (343 cm x 549 cm).
   5) 278 inch diagonal (7061 mm), 147-1/2 inches x 236 inches (3747 mm x 5994 mm).
   6) 307 inch (7798 mm) diagonal, 162-1/2 inches x 260 inches (4128 mm x 6604 mm).

5. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with top border matching the viewing surface.
6. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with a black masking top border.

J. Paragon E: Large electrically operated, extruded aluminum case. Projection screen with motor in roller. 13-1/4 inches high x 12 inches deep (337 mm high x 305 mm deep) case fully enclosed except for slot allowing viewing surface passage. Roller: 6 inches (152 mm) diameter steel tube. Viewing surface securely attached to roller at top and at bottom to weighted dowel. Provided with universal mounting brackets for wall, ceiling or above ceiling mounting. Viewing surface is concealed when not in use; lower it to any position at the touch of a switch.
   1. Motor UL certified, rated 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches.
   2. Wall Mounting Bracket Kit: Kit includes two structural steel brackets and hardware to attach brackets to case. Hardware for mounting to wall structure by others
   3. Projection Viewing Surface:
      a. Matt White XT1000E - On Axis gain of 1.0. 180 degree viewing cone. Washable surface. GREENGUARD Gold certified. 4K ready.
   4. Viewing Area H x W.
      a. NTSC Format (4:3). Black masking borders standard.
         1) 25 foot (7.62 m) diagonal, 177 inches x 236 inches (4496 mm x 5994 mm).
         2) 30 foot (9.14 m) diagonal, 212 inches x 284 inches (5385 mm x 7214

mm).
3) 32-1/2 foot (991 m) diagonal, 230 inches x 308 inches (5842 mm x 7823 mm).
4) 35 foot (10.67 m) diagonal, 248 inches x 332 inches (6299 mm x 8433 mm).

b. HDTV Format (16:9). Black masking borders standard.
1) 270 inch (6858 mm) diagonal, 133 inches x 236 inches (3378 mm x 5994 mm).
2) 324 inch (8230 mm) diagonal, 160 inches x 284 inches (4216 mm x 7214 mm).
3) 354 inch (8992 mm) diagonal, 173 inches x 308 inches (4392 mm x 7823 mm).
4) 384 inch (9754 mm) diagonal, 187 inches x 332 inches (4750 mm x 8433 mm).

c. 16:10 Format. Black masking borders standard.
1) 278 inch (7061mm) diagonal, 147-1/2 inches x 236 inches (3747 mm x 5994 mm).
2) 335 inch (2159 mm) diagonal, 177-1/2 inches x 284 inches (4508 mm x 7214 mm).
3) 363 inch (2769 mm) diagonal, 192-1/2 inches x 308 inches (4890 mm x 7823 mm).
4) 392 inch (3480) diagonal, 207-1/2 inches x 332 inches (5270 mm x 8433 mm).

5. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with top border matching the viewing surface.
6. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with a black masking top border.

K. Access Fit E: Electric motor operated, steel case. Ceiling-recessed, 18-gauge steel headbox, 5-11/16 inches high x 6-7/16 inches deep (145 mm high x 164 mm deep) including trim flanges with white paint finish and stamped 13-gauge steel end caps. UL approved "Suitable for use in environmental air space." Bottom closure panel forms slot for passage of viewing surface and can be released to hang down or be removed for access to operating mechanism and viewing surface. Bottom perimeter flange provides support and trim for acoustical ceiling panels and trim for gypsum board ceiling. Access Fit case may be ordered in advance and screen installed later to eliminate field damage. Housing is symmetrical allowing for left and right hand motor locations and for viewing surface to unroll off front or back of roller. Steel mounting brackets slide in extruded aluminum mounting system along top of case. Brackets supporting roller/fabric assembly slide in tracks inside top of the case, allowing viewing surface to be centered in case. Steel leveling brackets are attached to case to prevent deflection. Housing designed with internal junction box and plug-in wiring connections to allow housing to be installed and connected to building power supply separately from motor and viewing surface.
1. Motor mounted inside screen roller on rubber isolation insulators. Motor UL certified, rated 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches.
2. Quiet Motor mounted inside screen roller on rubber isolation insulators. Motor operates at 44db. UL certified, rated 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches.
3. Projection Viewing Surface:
a. Matt White XT1000E - On Axis gain of 1.0. 180 degree viewing cone.

Washable surface. GREENGUARD Gold certified. 4K ready.

b. Argent White XH1500E - On Axis gain of 1.5. High reflectivity fabric with broad viewing cone. Excellent resolution and color balance. Flame and Mildew resistant. Maximum size 8 feet x 10 feet (244 cm x 305 cm). 4K ready.

c. Pearl White CH1900E - On Axis gain of 1.9. Matt white surface with reflective pearlescent coating. Maximum size 96 inches x 96 inches (244 cm x 244 cm). 4K ready.

d. Contrast White XH1100E - On Axis gain of 1.1. Diffuse white coating over a grey base material. Recommended for use with low to moderate light output digital projectors, where some provision for light control exists. Maximum size 8 feet x 10 feet (244 cm x 305 cm). 4K ready.

e. Contrast Grey XH800E - 0.8 On Axis gain. Smooth grey surface provides excellent resolution and enhances color contrast. 180 degree viewing cone. GREENGUARD Gold certified. 4K ready.

f. ClearSound White Weave XT900E - On Axis gain of 0.9. 180 degree viewing cone. Acoustically transparent woven blend of fiberglass and PVC. Acoustical properties are comparable to the highest quality speaker grille cloth. Some control of ambient light is recommended. Flame and mildew resistant. Not recommended for use in sizes less than 80 inches (203 cm) wide. Not recommended for viewing less than 10 feet (305 cm) from screen. 4K ready.

g. ClearSound Grey Weave XH600E - On Axis gain of 0.6. 180 degree viewing cone. Acoustically transparent woven blend of fiberglass and PVC. Grey material for higher contrast. Acoustical properties are comparable to the highest quality speaker grille cloth. Flame and mildew resistant. Not recommended for use in sizes less than 80 inches (203 cm) wide. Not recommended for viewing less than 10 feet from screen. 4K ready.

h. Chroma Key Green - Green flexible PVC surface for video production where you need the background to "disappear." Matte finish. Flame retardant, tear resistant, and wrinkle resistant. Offers excellent uniformity and consistent surface color edge to edge. Works effectively throughout 180 degree viewable range.

4. Viewing Area H x W.

a. NTSC Format (4:3). Black masking borders standard.

1) 6 foot (1.83 m) diagonal, 42-1/2 inches x 56-1/2 inches (1080 mm x 1435 mm).
2) 7 foot (2.13 m) diagonal, 50 inches x 66-1/2 inches (1270 mm x 1689 mm).
3) 100 inch (2540 mm) diagonal, 60 inches x 80 inches (1524 mm x 2032 mm).
4) 10 foot (3.05 m) diagonal, 69 inches x 92 inches (1753 mm x 2337 mm).
5) 11 foot (3.35 m) diagonal, 78 inches x 104 inches (1981 mm x 2642 mm).
6) 150 inch (3810 mm) diagonal, 87 inches x 116 inches (2210 mm x 3658 mm).

b. HDTV Format (16:9). Black masking borders standard.

1) 92 inch (2337 mm) diagonal, 45 inches x 80 inches (1143 mm x 2032 mm).
2) 100 inch (2540 mm) diagonal, 49 inches x 87 inches (1245 mm x 2210 mm)
3) 106 inch (2692 mm) diagonal, 52 inches x 92 inches (1321 mm x 2337 mm).

4) 110 inch (2794 mm) diagonal, 54 inches x 96 inches (1372 mm x 2438 mm)
5) 119 inch (3023 mm) diagonal, 58 inches x 104 inches (1473 mm x 2642 mm).
6) 133 inch (3378 mm) diagonal, 65 inches x 116 inches (1651 mm x 2947 mm).

c. 16:10 Format. Black masking borders standard.
1) 94 inch (2438 mm) diagonal, 50 inches x 80 inches (1270 mm x 2032 mm).
2) 109 inch (2769 mm) diagonal, 57-1/2 inches x 92 inches (1461 mm x 2337 mm).
3) 113 inch (2870 mm) diagonal, 60 inches x 96 inches (1524 mm x 2438 mm).
4) 123 inch (3124 mm) diagonal, 65 inches x 104 inches (1351mm x 2642 mm).
5) 137 inch (3480) diagonal, 72-1/2 inches x 116 inches (1842 mm x 2946 mm).

5. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with top border matching the viewing surface.
6. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with a black masking top border.

L. Access Fit V: Electric motor operated, steel case. Ceiling-recessed, 18-gauge steel headbox, 5-11/16 inches high x 6-7/16 inches deep (145 mm high x 164 mm deep) including trim flanges with white paint finish and stamped 13-gauge steel end caps. UL approved "Suitable for use in environmental air space." Bottom closure panel forms slot for passage of viewing surface and can be released to hang down or be removed for access to operating mechanism and viewing surface. Bottom perimeter flange provides support and trim for acoustical ceiling panels and trim for gypsum board ceiling. Access Fit case may be ordered in advance and the screen installed later to eliminate field damage. Housing is symmetrical allowing for left and right hand motor locations and for viewing surface to unroll off front or back of roller. Steel mounting brackets slide in extruded aluminum mounting system along top of case. Brackets supporting roller/fabric assembly slide in tracks inside the top of the case, allowing viewing surface to be centered in case. Steel leveling brackets are attached to case to prevent deflection. Housing designed with internal junction box and plug-in wiring connections to allow housing to be installed and connected to building power supply separately from motor and viewing surface.
1. Motor mounted inside screen roller on rubber isolation insulators. Motor UL certified, rated 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches.
2. Quiet Motor mounted inside screen roller on rubber isolation insulators. Motor operates at 44db. UL certified, rated 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches.
3. Projection Viewing Surface:
a. Matt White XT1000V - On Axis gain of 1.0. 180 degree viewing cone. GREENGUARD Gold certified. Available with or without black backing. 4K ready.
b. Pure White XT1300V - On Axis gain of 1.3. 180 degree viewing cone. For use in situations where lighting is well controlled and where enhanced brightness is needed due to limited projector brightness. Available with or without black backing. 4K ready.

c. Grey XH600V - On Axis gain of 0.6. Provides excellent contrast and color reproduction. GREENGUARD Gold certified. Maximum size 9 feet x 12 feet (275 cm x 366 cm). Available with or without black backing. 4K ready.
d. ClearSound NanoPerf XT1000V - On Axis gain of 1.0. 180 degree viewing cone. Acoustically transparent white PVC fabric with microscopic perforations. Not recommended for use in sizes less than 80 inches (203 cm) wide. Not recommended for viewing less than 10 feet (305 cm) from screen. 4K ready.
e. ClearSound Perf XT900V - On Axis gain of 1.0. 180 degree viewing cone. Acoustically transparent. Flexible matt white perforated surface. Reasonable control of ambient light is recommended. Not recommended for use in sizes less than 80 inches (203 cm) wide. Not recommended for viewing less than 20 feet (610 cm) from screen.
f. TecVision XH700X Grey - On Axis gain of 0.7. 180 degree viewing cone. Designed for blending applications on curved or flat screens where ambient light is present. Provides very good contrast and color reproduction. Imaging Science Foundation certified and 8K ready. Dark backing.
g. TecVision XH800X UST ALR - For short-throw and ultra-short throw applications. On Axis gain of 0.8. Rejects 57% of ambient light. 180 degree viewing cone. Provides very good contrast and color reproduction. Imaging Science Foundation certified. 8K ready. Dark backing.
h. TecVision XH900X ALR - On Axis gain of 0.9. Rejects 60% of ambient light. 180 degree viewing cone. Provides very good contrast and color reproduction. Imaging Science Foundation certified. 8K ready. Dark backing.
i. TecVision CS1000X ALR - On Axis gain of 1.0. Rejects 82% of ambient light. 40 degree viewing cone. Provides excellent contrast and color reproduction. Performs well in ambient light. Imaging Science Foundation certified. 8K ready. Dark backing.
j. TecVision MS1000X ALR - Rejects 73% of ambient light. On Axis gain of 1.0. 70 degree viewing cone. Provides excellent contrast and color reproduction. Performs well in ambient light. Imaging Science Foundation certified. 8K ready. Dark backing.
k. TecVision XT1000X White - On Axis gain of 1.0. 180 degree viewing cone. Imaging Science Foundation certified. 8K ready reference screen surface for blending applications, precise resolution, and color accuracy. Dark backing.
l. TecVision XT1100X White - On-Axis gain of 1.1. 180 degree viewing cone. Designed for use when the projector brightness and size of screen require a minimal increase in gain. Imaging Science Foundation certified and 8K ready. Dark backing.
m. TecVision CS1200X ALR - On Axis gain of 1.2. Rejects 82% of ambient light. 40 degree viewing cone. Provides excellent contrast and color reproduction. Performs well in ambient light. Imaging Science Foundation certified. 8K ready. Dark backing.
n. TecVision XT1300X White - On Axis gain of 1.3. 180 degree viewing cone. Imaging Science Foundation certified. 8K ready. Dark backing.
o. TecVision XT1600X White - On Axis gain of 1.6. 180 degree viewing cone. Imaging Science Foundation certified. 8K ready. Dark backing.
p. TecVision XT1800X White - On Axis gain of 1.8. 180 degree viewing cone. Imaging Science Foundation certified. Suited for active 3D or color combining passive 3D systems. 8K ready. Dark backing.
q. CineFlex CH1200V - On Axis gain of 1.2. 60 degree viewing cone. Neutral grey rear projection diffusing surface. Provides high resolution and excellent

contrast, even in lighted rooms. Recommended for use with low to medium output projectors. 4K ready.

r. CineFlex White XT700V - On Axis gain of 0.7. 180 degree viewing cone. White rear projection surface works well for edge matching or edge blending applications, and also for short throw rear projection. Reasonable control of ambient light is recommended. 4K ready.

4. Tab-Tensioning System:
   a. Viewing surface with integrated tabs and cable on each side of fabric to provide tension and ensure flat viewing surface. Viewing surface and tabs CNC cut as a single piece. Tabs RF welded to the back of viewing surface to prevent tab separation. Tab adhesives are not acceptable. Viewing surface inserted into aluminum bottom dowel. Warranted for 5 years against tab separation
5. Viewing Area H x W.
   a. NTSC Format (4:3). Black masking borders standard.
      1) 6 foot (1.83 m) diagonal, 42-1/2 inches x 56-1/2 inches (1080 mm x 1435 mm).
      2) 7 foot (2.13 m) diagonal, 50 inches x 66-1/2 inches (1270 mm x 1689 mm).
      3) 100 inch (2540 mm) diagonal, 60 inches x 80 inches (1524 mm x 2032 mm).
      4) 10 foot (3.05 m) diagonal, 69 inches x 92 inches (1753 mm x 2337 mm).
      5) 11 foot (3.35 m) diagonal, 78 inches x 104 inches (1981 mm x 2642 mm).
   b. HDTV Format (16:9). Black masking borders standard.
      1) 92 inch (2337 mm) diagonal, 45 inches x 80 inches (1143 mm x 2032 mm).
      2) 100 inch (2540 mm) diagonal, 49 inches x 87 inches (1245 mm x 2210 mm)
      3) 106 inch (2692 mm) diagonal, 52 inches x 92 inches (1321 mm x 2337 mm).
      4) 110 inch (2794 mm) diagonal, 54 inches x 96 inches (1372 mm x 2438 mm)
      5) 119 inch (3023 mm) diagonal, 58 inches x 104 inches (1473 mm x 2642 mm).
      6) 133 inch (3378 mm) diagonal, 65 inches x 116 inches (1651 mm x 2947 mm).
   c. 16:10 Format. Black masking borders standard.
      1) 94 inch (2438 mm) diagonal, 50 inches x 80 inches (1270 mm x 2032 mm).
      2) 109 inch (2769 mm) diagonal, 57-1/2 inches x 92 inches (1461 mm x 2337 mm).
      3) 113 inch (2870 mm) diagonal, 60 inches x 96 inches (1524 mm x 2438 mm).
      4) 123 inch (3124 mm) diagonal, 65 inches x 104 inches (1351mm x 2642 mm).
6. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with top border matching the viewing surface.
7. Provide an extra screen drop with an overall screen drop of ___ inches (___ mm) with a black masking top border.

2.4 FRONT PROJECTION SCREEN CONTROLS

A. General: All controls are UL Certified.
   1. Single station control rated 115V AC, 60 Hz with 3-position rocker switch with cover plate to stop or reverse screen at any point.
   2. Multiple station control rated 115V AC, 60 Hz with 3-position rocker switches with cover plates to stop or reverse screen at any point. Automatic override allows only one signal to reach the motor when operated simultaneously.
   3. Low voltage control unit with three button 24V switches and cover plate to stop or reverse screen at any point, built-in RF receiver, built-in Video Interface Control trigger for 3V-28V, RS232, and dry contact relays.
   4. Low voltage 24V control unit with hand held RF remote three button control switch to stop or reverse screen at any point, built-in RF receiver, built-in Video Interface Control trigger for 3V-28V, RS232, and dry contact relays.
   5. Low voltage 24V control unit with hand held IR remote three button control switch to stop or reverse screen at any point, built-in RF receiver, built-in Video Interface Control trigger for 3V-28V, RS232, and dry contact relays.
   6. Key Operated power supply switch to control power to control system.
   7. Locking switch cover plate for limited access to three position switch.
   8. Key operated 3-position control switch rated 115V AC, 60 Hz to stop or reverse screen at any point.
   9. 3-position low voltage control switch with key locking cover plate rated 24V to stop or reverse screen at any point.
   10. Motor shall be right mounted.
   11. Motor shall be left mounted.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Verify rough-in openings are properly prepared.

C. If substrate 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. 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 instructions.

B. Install front projection screens with screen cases in position and relationship to adjoining construction as indicated, securely anchored to supporting substrate, and in manner that produces a smoothly operating screen with plumb and straight vertical edges and plumb and flat viewing surfaces when screen is lowered.

C. Test electrically operated units to verify that screen, controls, limit switches, closure and other operating components are in optimum functioning condition.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 121113 – PHOTO MURAL

PART I - GENERAL

1.1 SECTION INCLUDES

A. Mounted metal photographic prints.

1.2 SUBMITTALS

A. Shop Drawings: Submit plan, section, and elevation drawings as necessary to determine the required dimensions and placement location for each product specified as well as clarify the manufacturer's recommended installation techniques.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer.

1.4 DELIVERY, STORAGE AND HANDLING

A. Transport, store and handle metal photographs in accordance with manufacturers written instructions. Transport and store metal photographs so that edges and corners are not damaged.

PART 2 - PRODUCTS

2.1 Pre-Cast Splash Blocks
1. Manufacturer
ARI Graphix
4716 McLeod NE
Albuquerque, NM 87109
2. Dimensions: 24” x 36”, Architect to coordinate with manufacturer.
3. Material: Direct printed with Latex ink to 3mm alu-panel [Copper] with 3M 8520 Cast Matte Laminate.

B. FASTENERS/MOUNTING HARDWARE:
1. Standoffs: Architect to select from Options below.
a. Brushed Stainless Steel standoffs 1" diameter x 2" standoffs.
b. Brushed Stainless Steel standoffs 1” diameter x ½” standoff.
c. Brushed Stainless Steel Barrels 1” diameter x 1” (extender).

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set units accurately in location in accordance with drawings.

B. Coordinate with architect for any additional installation requirements.

END OF SECTION 121113

SECTION 122113 - HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product data and Samples.

PART 2 - PRODUCTS

2.1 HORIZONTAL LOUVER BLINDS

A. Provide blinds passing flame-resistance testing according to NFPA 701.

B. Fabrication: Comply with WCMA A 100.1 unless otherwise indicated.

1. Provide color-coated finish on exposed metal parts unless otherwise indicated.
2. Fabricate concealed components from non-corrodible or corrosion-resistant-coated materials.
3. Provide permanently lubricated moving parts.

C. Slats: Aluminum, antistatic polyester coated

D. Slat Width: 1 inch

E. Headrail: Formed steel or extruded aluminum; long edges returned or rolled; fully enclosing operating mechanisms on three sides and ends.

F. Tilt Operation: Manual with wand.

G. Valance: Two slats

H. Mounting: Interior head mount at storefront window frame and cased vinyl window openings, Flush Wall mount at vinyl windows with bullnosed finish,

I. Colors, Textures, Patterns, and Gloss: As selected from manufacturer's full range

1. Provide reflective finish on outside-facing surface of slat to enhance reflection of solar energy.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install blinds level, plumb, and located not closer than 1/4 inch to interior face of glass.

1. Flush Mounted: Install blinds with louver edges flush with finish face of opening when blinds are open. Provide overlap of light gap when measuring width for window coverage.
2. Interior Head Mounted: Install headrail to interior of storefront glazing frame or cased vinyl window opening.

B. Adjust window blinds to operate smoothly and easily throughout entire operational range.

END OF SECTION 122113

SECTION 123530 – CASEWORK

PART 1 GENERAL

1.01 SUMMARY

A. Provide interior architectural woodwork:

1. Standing and running trim.
2. Casework and countertops.
3. Prefabricated Wood Cabinet installations.
4. Door frames and jambs.
5. Shelving and closet specialties.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

B. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Standards: Architectural Woodwork Institute (AWI) "Architectural Woodwork Quality Standards."

C. Formaldehyde Emission Levels:

1. Particleboard: NPA 8 compliance.
2. Medium Density Fiberboard: NPA 9 compliance.
3. Hardwood Plywood: HPMA FE compliance.

PART 2 PRODUCTS

2.01 MATERIALS

A. Interior Door Frames:

1. Species for Opaque Finish: Any closed-grain wood.
2. Finish: Paint.

B. Interior Standing and Running Trim and Rails:

1. Species for Opaque Finish: Any closed-grain wood.
2. Grade: Economy.

C. Interior Plastic Laminate Clad Casework:

1. Laminate: Melamine at enclosed interiors only.
2. Grade: Economy.

D. Casework Hardware and Auxiliary Materials:
   1. Hardware Standard: ANSI/BHMA A156.9.
E. Solid-surface Countertops
   1. Front Profile: Radiused edge.
   2. Backsplash: Integral cove.
F. Door and Drawer Fronts:
   1. Wood
   2. Wood
G. Interior Frames and Jambs:
   1. Species for Opaque Finish: Closed grain wood.
   2. Grade: Economy.
H. Shelving and Closet Specialties:
   1. Shelving: Pre-finished wire shelving and associated manufactures hardware. Painted ¾" x 16" bullnosed particle board shelving.
   2. Closet Rods: Chrome plated steel.
I. Exterior Fasteners:
   1. Nails: Stainless steel, aluminum, or hot-dip galvanized siding nails.
   2. Screws and Anchors: Noncorrosive, type required for secure anchorage.
J. Auxiliary Materials:
   1. Screws: FS FF-S-111.
   2. Nails: FS FF-N-105.
   3. Anchors: Type required for secure anchorage.
K. Factory Finishing of Interior Architectural Woodwork
   1. Transparent Finish
      a. Grade: Custom
      b. Sheen: Dull Satin

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide work to sizes, shapes, and profiles indicated. Install work to comply with quality standards referenced. Back prime work and install plumb, level and straight with tight joints; scribe work to fit.
B. Coordinate with work of other sections.
C. Comply with manufacturer's requirements for cutting, handling, fastening, and working treated materials.
D. Repair minor damage, clean, and protect.

END OF SECTION 064000

SECTION 123623.13 - PLASTIC-LAMINATE-CLAD COUNTERTOPS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Shop drawings.

B. Fabricator Qualifications: Certified participant in AWI's Quality Certification Program.

C. Installer Qualifications: Fabricator of products.

D. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet work is completed, and HVAC system is operating.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE COUNTERTOPS

A. Quality Standard: AWI, AWMAC, and WI's "Architectural Woodwork Standards."

B. Certified Wood: Wood-based material produced from tropical forests shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and to FSC STD-40-004, "FSC Standard for Chain of Custody Certification."

C. Plastic-Laminate Countertops: Custom grade.

1. Laminate Grade: HGS for flat countertops, HGP for post-formed countertops.
2. Grain Direction: Parallel to cabinet fronts.
3. Edge Treatment: Same as laminate cladding on horizontal surfaces.

2.2 MATERIALS

A. Wood Moisture Content: Lumber shall be in accordance with the AWS Grade specified for the product being fabricated. Moisture content shall be 6% to 12% for boards up to 2-inches nominal thickness, and shall not exceed 19% for thicker pieces.

B. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.

C. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.

D. Softwood Plywood: DOC PS 1.

E. High-Pressure Decorative Laminate: NEMA LD 3.

1. Approved Manufacturers:
   a. WilsonArt International, Inc.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install countertops to comply with referenced quality standard for grade specified.

B. Install countertops 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 (3 mm in 2400 mm).

C. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

D. Anchor countertops securely to base units. Seal space between backsplash and wall.

END OF SECTION 123623.13

wiSECTION 123661.16 - SOLID SURFACING COUNTERTOPS

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. Solid surface material countertops.
2. Solid surface vanities.
3. Solid surface material backsplashes.
4. Solid surface material end splashes.
5. Solid surface material apron fronts.
6. Solid surface material sinks.
7. Solid surface adhesives and sealants.

1.3 ACTION SUBMITTALS

A. Product Data: For countertop materials **and sinks** including manufacturer's technical data sheets, and published written instructions.

B. Sustainable Design Submittals:

1. Product Data: For adhesives and sealants, indicating VOC content.
2. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, terminations, and cutouts.

1. Show locations and details of joints.
2. Show direction of directional pattern, if any.

D. Certificates: For the following certifications:

1. United States Food and Drug Administration (FDA) compliance for food contact materials described in 21 CFR 174 to 21 CFR 190.
2. New York City material equipment acceptance, MEA 181-96-M.
3. ANSI/NSF 51 "food zone" and FDA "direct-food contact" compliant.
4. UL GREENGUARD® Gold Certified product for low-chemical emissions.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and fabricator.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: ISO 9001 quality management system certification for manufacturing facility(ies).

B. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.

1. Manufacturer-certified fabricator.

C. Installer Qualifications: Manufacturer certified fabricator of countertops.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements **after base cabinets are installed but** before countertop fabrication is complete.

1.8 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

1.9 WARRANTY

A. Manufacturer's Warranty: Manufacturer and installer agree to repair or replace sheet material not free from defects in materials, fabrication, or workmanship within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP AND WALL MATERIALS

A. Composition Solid-Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Wilsonart LLC; [**051**] [**025**] or a comparable product by one of the following:

    a. Affinity Surfaces; a brand of Domain Industries, Inc.
    b. Avonite Surfaces.
    c. E. I. du Pont de Nemours and Company.
    d. Formica Corporation.
    e. LG Chemical, Ltd.
    f. Meganite Inc.
    g. Samsung Chemical USA, Inc.
    h. Swan Corporation (The).
    i. Transolid Div of Trumbull Industries.

2. Thickness: [**0.490 inch (12.4 mm)**] [**0.240 inch (6.1 mm)**].
3. Panel Weight: [**4.4 lb/sq. ft. (21.5 kg/sq. m)**] [**2.2 lb/sq. ft. (10.7 kg/sq. m)**].
4. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

    a. Flame-Spread Index: 25 or less.
    b. Smoke-Developed Index: [**50**] [**450**] <**Insert value**> or less.
5. Colors and Patterns: As selected by Architect from manufacturer's full range.

2.2 COUNTERTOP FABRICATION

A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."

1. Grade: [**Premium**] [**Custom**] [**Economy**].

B. Configuration:

1. Front: [**Straight, slightly eased at top**] [**Beveled**] [**3/4-inch (19-mm) bullnose**] [**Radius edge with apron, 2 inches (50 mm) high with 3/8-inch (9.5-mm) radius**] [**1-1/2-inch (38-mm) bullnose**] [**1-inch (25-mm) bullnose**] [**Straight, slightly eased at top with separate apron, 6 inches (150 mm) high, recessed 1/4-inch (6.4-mm) behind front edge**].
2. Backsplash: [**Straight, slightly eased at corner**] [**Beveled**] [**Radius edge with 3/8-inch (9.5-mm) radius**].
3. End Splash: matching backsplash

C. Countertops: 1/2-inch (12.7-mm) thick, solid surface material with front edge built up with same material.

D. Countertops: 1/4-inch (6.4-mm) thick, solid surface material laminated to 3/4-inch (19-mm) thick particleboard with [**wood-trimmed exposed edges**] [**exposed edges built up with 3/4-inch (19-mm) thick, solid surface material**] [**exposed edges faced with 1/4-inch (6.4-mm) thick, solid surface material**].

E. Backsplashes: **1/2-inch (12.7-mm)** thick, solid surface material.

F. Fabricate tops with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

1. Fabricate with loose backsplashes for field assembly.
2. Install integral sink bowls in countertops in the shop.

G. Joints: Fabricate countertops without joints.

H. Joints: Fabricate countertops in sections for joining in field with joints at locations indicated.

1. Joint Locations: Not within 3 inches (76 mm) of a cutout or cooktop, 1 inch (25 mm) from inside corner for conventional seams, and not where countertop sections less than 36 inches (900 mm) long would result, unless unavoidable.

I. Cutouts and Holes:

1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.

    a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop.
    b. Provide vertical edges, rounded to 3/8-inch (10-mm) radius at juncture of cutout edges with top surface of countertop, slightly eased at bottom.

2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.
4. Counter-Mounted Cooktops: Prepare countertops in shop for field cutting openings for cooktops. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.

2.3 INSTALLATION MATERIALS

A. Adhesive: Product recommended by solid surface material manufacturer.

1. Adhesives shall have a VOC content of 70 [g/L or less.
2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet (3 mm in 2.4 m), 1/4 inch (6 mm) maximum. Do not exceed 1/64-inch (0.4-mm) difference between planes of adjacent units.

B. Fasten countertops by adhering with 100-percent silicone material in dab format (not bead format) to base units into underside of countertop at 18 to 24 inches (457 to 610 mm) o.c. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

C. Fasten countertops by adhering with 100-percent silicone material in dab format (not bead format) to base units into underside of countertop at 18 to 24 inches (457 to 610 mm) o.c. Shim as needed to align subtops in a level plane.

D. Secure countertops to subtops or wood-web frame with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.

1. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.

F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.

G. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

H. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION 123661.16

SECTION 124813 – ENTRANCE FLOOR MATS AND FRAMES

1 – GENERAL

1.01 SUMMARY

A. Section includes: Entrance floor mats and frames, including fibered roll good entrance systems

B. Related requirements:

1. Drawings and General Provisions of the Contract (including General and Supplementary Conditions and Division 1 References Section)
2. Section 03: Concrete (subfloors)
3. Section 06: Wood (subfloors)
4. Section 07: Thermal and moisture protection

1.02 REFERENCE STANDARDS

A. ASTM International,

1. D 2859 Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials

B. European Norms (EN)

1. EN 1815 Resilient and textile floor coverings. Assessment of static electrical propensity

C. International Standards Organization (ISO)

1. ISO 105 B02 Color fastness to artificial light: Xenon arc fading lamp test
2. ISO 105 E01 Color fastness to water
3. ISO 105 x12 Color fastness to rubbing

D. Other referenced documents

1. Consumer Products Safety Commission (CPSC) FF 1-70: Pill Test
2. Department of Commerce (DOC) FF 1-70: Pill Test
3. British Standard BS 1006: Color fastness to rubbing
4. LEED-NC v. 3

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Install entrance matting after finishing operations, including painting and ceiling operations, have been completed.

B. Preinstallation Meetings: Meet to confirm project requirements, substrate conditions, manufacturer's installation instructions and warranty requirements in compliance with Division 1 requirements.

1.04 ACTION SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures.

B. Product Data: For specified products, submit latest edition of product supplier's technical specifications data (available from www.matsinc.com).

C. Shop Drawings: Submit shop drawings showing layout, profiles, and product components.

D. Samples: Submit selection and verification samples showing the required finishes, colors, designs, and textures for flooring, as well as samples of adhesives and applicable accessories such as nosing, frames, etc.

1.05 INFORMATION SUBMITTALS

A. Test and Evaluation Reports

1. Product test reports: As required by Conditions of the Contract and Division 1 Regulatory Requirements Section, submit test certificates from an independent test laboratory showing compliance with specified performance characteristics and physical properties.
2. Compatibility and adhesion test reports: Submit test reports confirming adhesive's effectiveness with the product(s) specified.

B. Manufacturer Instructions: For specified products, submit latest editions of product supplier's installation and cleaning & maintenance instructions (available from www.matsinc.com).

C. Sustainable Design Submittals: For projects requiring LEED submittal based on LEED-NC version 3

1. Submit documentation substantiating that Supreme Nop contains a minimum of 15% post-consumer recycled content and therefore contributes to Materials & Resources Credit 4.
2. For Supreme Nop indoor installations: submit documentation substantiating that Mats Inc. Multi-Bond adhesive is GreenLabelPlus certified and therefore contributes to Indoor Environmental Quality Credit 4.1.
3. Submit documentation substantiating that the project has permanently installed Supreme Nop that is at least ten feet in length and therefore contributes to Indoor Environmental Quality Credit 5.
4. Submit documentation substantiating that Supreme Nop is Green Label Plus certified and therefore contributes to Indoor Environmental Quality Credit 4.3.

1.06 CLOSEOUT SUBMITTALS

A. Warranty documentation: For specified products and accessories, submit product supplier's warranty documents (available from www.matsinc.com).

1.07 QUALITY ASSURANCE

A. Installer: Installer shall be highly experienced in performing work of this section, having previous done fiber roll goods installation work similar to that required for this project.

B. Testing Agency: Agency(ies) shall be independent and qualified to perform the specified product tests.

1.08 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with Division 1 Product Requirements Section

B. Delivery and Acceptance Requirements: Comply with the product supplier's ordering and lead time requirements to avoid construction delays, and to allow material to acclimatize as required in the specified product's installation instructions. Accept delivery of materials only if they are in unopened, undamaged packaging that bears the name and brand of the manufacturer/product supplier, project identification, and shipping and handling instructions.

C. Storage and Handling Requirements: Store material -- including any adhesive and accessories -- in the original packaging (as delivered) in areas that are enclosed and weather tight with the permanent HVAC system set at a temperature of between 65°F and 80°F for a minimum of 48 hours prior to commencement of installation. In addition, comply with storage and handling requirements listed on product packaging, and described in the latest edition of the product's installation instructions (available from www.matsinc.com).

1.09 AMBIENT SITE CONDITIONS

The permanent HVAC system shall be operational and set at a temperature of between 65°F and 80°F for a minimum of 48 hours prior to commencement of installation, during the time of installation, and for 48 hours after installation has been completed. Thereafter, minimum temperature shall be 55°F.

2 – PRODUCTS

2.01 MANUFACTURERS

A. Supplier: Mats Inc., 37 Shuman Avenue, Stoughton, MA 02072; telephone: 1.800.MATS.INC (1.800.628.7462); fax: 1.781.344.1537; email: info@matsinc.com; website: www.matsinc.com.

B. Substitutions: no substitutions permitted.
[Specifier note: edit this paragraph to suit project requirements. If substitutions are permitted, edit text. Add text to refer to Division 1 Project Requirements (Product Substitutions Procedures) Section.]

C. Product: Supreme Nop

Construction:	100% solution-dyed polypropylene fiber with rubber backing
Width:	[6'7"] [13'2"]
Length:	approximately 82'
Thickness:	7/16"
Weight:	73 ounces/square yard
Colors:	[Charcoal] [Spruce] [Midnight Blue] [Autumn Red] [Natural] [Sable Brown] [Sapphire] [Tweed Brown] [Black Walnut] [Dark Gray]

D. Performance: Physical properties of the entrance matting shall conform to the following minimums:

Supreme Nop

Safety

Surface flammability	ASTM D2859	Pass (equal to CPSC FF 1-70 and DOC FF 1-70)

Performance

Static electrical propensity	EN 1815: < 2 kV
Color fastness to light	ISO 105 B02: ≥ 6
Color fastness to water	ISO 105 E01: 5
Color fastness to rubbing	ISO 105 X12: dry: 4 - 5; wet: 4 - 5

Color fastness to shampoo	BS 1006: 5
LEED	
MR Credit 4	15% post-consumer recycled
IEQ Credit 4.1	Multi-Bond VOC: 0 g/L
IEQ Credit 5	Supreme Nop is designed for semi-permanent installation
IEQ Credit 4.3	Supreme Nop is Green Label Plus certified.

2.02 ACCESSORY PRODUCTS

A. Adhesive: Architect to specify adhesive and trowel notch size per the latest edition of the installation instructions (available from www.matsinc.com).

B. Other:

1. Standard sew-on nosing
2. Aluminum framing: specify as recommended by Mats Inc.

3 – EXECUTION

3.01 EXAMINATION

A. Overall: Follow guidelines laid out in Division 01, Section 01 71 00 – Examination and Preparation as well as Section 01 43 00 – Quality Assurance.

B. Verification of Conditions: Subfloors shall be clean and dry. Inspect all substrates and subfloors for proper tolerances, and report any discrepancies to the general contractor in writing.

C. Preinstallation Measurements: Verify actual measurement by field measuring before any onsite cutting, if applicable. To avoid construction delays, coordinate field measurements based upon construction progress.

D. Evaluation and Assessment: See the state requirements for the project location.

3.02 SURFACE PREPARATION

A. Follow guidelines laid out in Division 01, Section 01 71 00 – Examination and Preparation.

B. Concrete subfloors: Where concrete subfloors are present, all work required to put the concrete subfloor in acceptable condition shall be the responsibility of the general contractor. See the state requirements for the project location.

3.03 INSTALLATION

A. Follow Division 01 relevant guidelines, and the latest edition of the manufacturer's installation instructions (available from www.matsinc.com)

B. Interface with Other Work: If transitions are required to and/or from the specified entrance matting, contact Mats Inc. for suitable transition material.

C. Sizes: Where not indicated otherwise, provide single unit for each mat installation, but do not exceed manufacturer's maximum size recommendation for units intended for removal and cleaning. Where possible, verify sizes by field measurement before shop fabrication.

D. Accessory selection: Where indicated for recessed or wall-to-wall applications provide aluminum framework as recommended by manufacturer. Where indicated for surface-

mounted applications, provide tapered vinyl moldings with flanges sewn to back of mat on all four sides with mitered corners.

3.04 CLEANING

A. General: Clean up job site, including sweeping or dust mopping the floor to remove all dirt or grit, and put all waste in general contractor's dumpster. Follow overall cleaning guidelines described in Division 01.

B. Initial Maintenance: Conduct a full initial maintenance following the latest edition of the manufacturer's maintenance instructions (available from www.matsinc.com). Instruct owner's cleaning staff in proper maintenance procedures.

3.05 CLOSEOUT ACTIVITIES

Follow state requirements and Division 01 Section 01 76 00 – Protecting Installed Construction and Section 01 78 00 – Closeout Submittals requirements for these activities.

END OF SECTION 124813

SECTION 129300 - SITE FURNISHINGS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data and Samples.

PART 2 - PRODUCTS

2.1 SITE FURNISHINGS

A. Bicycle Racks:

1. Manufacturer: Barco Products, Park-It Bike Racks (SKU # 05CL1693-BK)
2. Bicycle Rack Construction: Steel, Powder-Coated steel in Black Onyx
3. Style: Double-side parking
   a. Capacity: Designed to accommodate no fewer than five (5) bicycles. Total of 4 for twenty (20) bicycles.
   b. Steel Tube: 1 7/8'' OD 11- gauge round steel tubing
4. Installation Method: Inground Mount

B. Trash Receptacles:

1. Manufacturer: Barco Products Houston Waste Receptacle/ 32 Gallon/ Liner/ Black (SKU # KTR2600-BK)
2. Material: Recycled Plastic
3. Capacity: 32 Gallon
4. Diameter: 28”
5. Height: 29”
6. Weight: 78 lbs.

2.2 MATERIALS

A. Steel and Iron:

1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M[, hot-dip galvanized.
2. Steel Pipe: ASTM A 53/A 53M or ASTM A 135/A 135M[, hot-dip galvanized.
3. Steel Tubing: ASTM A 500/A 500M, hot-dip galvanized.
4. Steel Sheet: ASTM A 1011/A 1011M.
5. Iron Castings: Malleable iron, ASTM A 47/A 47M, or gray iron, ASTM A 48/A 48M.
6. Steel Finish: Powder coat.

B. Plastic: Recycled

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Anchor site furnishings securely, positioned at locations and elevations indicated.

B. Post Setting: Set cast-in support posts in concrete footing.

C. Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete and fill annular space between post and concrete with grout.

D. Pipe Sleeves: Use steel pipe sleeves anchored into concrete for installing posts. After posts have been inserted, fill annular space between post and sleeve with grout.

END OF SECTION 129300

SECTION 284621.11 – INTELLIGENT FIRE ALARM SYSTEM

INTELLIGENT ADDRESSABLE FIRE ALARM DETECTION SYSTEM

PART 1.0 - GENERAL

1.1 DESCRIPTION:

A. This section of the specifications includes the furnishing, installation, and connection of the microprocessor controlled; addressable reporting fire alarm equipment required to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, fire alarm control panel, auxiliary control devices, annunciators, and wiring as shown on the drawings and specified herein.

B. The fire alarm system shall comply with requirements of NFPA standard No. 72 for protected premises signaling systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.

1.2 SCOPE:

A. A new addressable reporting, microprocessor-controlled fire detection system shall be installed in accordance with the specifications and drawings.

B. Basic Performance:

1. Alarm, trouble and supervisory signals from all intelligent addressable reporting devices shall be encoded onto a Class B (NFPA Style 4), or Class A (NFPA Style 6, 7) Signaling Line Circuit (SLC).
2. Initiation Device Circuits (IDCs) shall be wired Class B (NFPA Style B) or Class A (NFPA Style D).
3. Notification Appliance Circuits shall be wired Class B (NFPA Style Y) or Class A (NFPA Style Z).
4. Built-in Horn Strobe Synchronization w/ selective silence.
5. Digitized electronic signals shall employ check digits or multiple polling.
6. A single ground or open on the system Signaling Line Circuit (SLC) shall not cause system malfunction, loss of operating power or the ability to report an alarm.
7. Alarm signals arriving at the main FACP shall not be lost following a power failure (or outage) until the alarm signal is processed and recorded.

C. Basic System Functional Operation

When a fire alarm condition is detected and reported by one of the system initiating devices the following functions shall immediately occur:

1. The System Alarm LED shall flash.
2. A local piezo electric signal in the control panel shall sound.
3. A 80-character, backlit LCD display shall indicate all information associated with the Fire Alarm condition, including the type of alarm point and its location within the protected premises.
4. Printing and history storage equipment shall log the information associated with each new Fire Alarm Control Panel condition, along with time and date of occurrence.
5. All system output programs assigned via control-by-event equations to be activated by the particular point in alarm shall be executed, and the associated System Outputs (alarm Notification Appliances and/or Relays) shall be activated.

1.3 SUBMITTALS

A. General:
1. Two copies of all submittals shall be submitted to the Architect/Engineer for review.
2. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent equipment (compatible UL-Listed) from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.
3. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

B. Shop Drawings:
1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
3. Show remote annunciator(s) layout, configurations, and terminations.

C. Manuals:
1. Submit simultaneously with the shop drawings, complete operating and maintenance manual listing the manufacturer's name(s) including technical data sheets.
2. Wiring diagrams shall indicate internal wiring for each item of equipment and the interconnections between the items of equipment.
3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

D. Certifications:
Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

1.4 GUARANTEE:

All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one-year period shall be included in the submittal bid.

1.5 MAINTENANCE:

Maintenance and testing shall be on a semi-annual basis or as required by the local AHJ. A preventive maintenance schedule shall be provided by the Contractor that shall describe the protocol for preventive maintenance. The schedule shall include:
1. Systematic examination, adjustment and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, relays, water flow switches and all accessories of the fire alarm system.
2. Each circuit in the fire alarm system shall be tested semi-annually.
3. Each smoke detector shall be tested in accordance with the requirements of NFPA 72 Chapter 7.

1.6 POST CONTRACT EXPANSIONS:

A. The contractor shall provide parts and labor to expand the system specified, if so requested, for a period of one (1) year from the date of acceptance.

B. As part of the submittal include a quotation for all parts and material, and all installation and test labor as needed to increase the number of addressable devices by ten percent (10%). This quotation shall include addressable smoke detectors, addressable heat detectors, addressable duct detectors, addressable manual stations, addressable monitor modules and addressable control modules equal in number to one tenth of the number required to meet this specification (list actual quantity of each type).
C. Quotation shall include installation and test labor and labor to reprogram the system for this 10% expansion. If additional FACP hardware would be required, include the material and labor necessary to install this hardware.
D. Submittals that do not include this estimate of post contract expansion cost will not be accepted.

1.7 APPLICABLE SPECIFICATIONS:

The specifications and standards listed below form a part of this specification. The system shall fully comply with these standards.

A. National Fire Protection Association (NFPA) - USA:
No. 70 National Electrical Code (NEC)
No. 72 Central Station Signaling Systems
No. 72 Protective Signaling Systems
No. 72 Automatic Fire Detectors
No. 72 Notification Appliances for Protective Signaling Systems.
No. 72 Testing Procedures for Signaling Systems.
No. 101 Life Safety Code
B. Underwriters Laboratories Inc. (UL) - USA:
No. 268 Smoke Detectors for Fire Protective Signaling Systems
No. 864 Control Units for Fire Protective Signaling Systems
No. 268ASmoke Detectors for Duct Applications.
No. 521 Heat Detectors for Fire Protective Signaling Systems
No. 464 Audible Signaling Appliances.
No. 38 Manually Actuated Signaling Boxes.
No. 346 Waterflow Indicators for Fire Protective Signaling Systems.
No. 1971Visual Notification Appliances for the hearing impaired.
C. Local and State Building Codes
D. All requirements of the Authority Having Jurisdiction (AHJ).

1.8 APPROVALS:

The system shall have proper listing and/or approval from the following nationally recognized agencies:

- UL Underwriters Laboratories Inc.
- FM Factory Mutual Systems
- CSFM California State Fire Marshal
- MEA NYC Materials and Equipment Acceptance
- ULC Underwriters Laboratories of Canada

PART 2.0 PRODUCTS

2.1 EQUIPMENT AND MATERIAL, GENERAL:

A. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment, and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protected premises protective signaling (fire alarm) system.

B. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.
C. All Equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.
D. Equipment should be manufactured by an ISO 9001 Certified Company.

2.2 CONDUIT AND WIRE:

A. Conduit:
1. Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.
2. Conduit fill shall not exceed 40 percent of interior cross-sectional area where three or more cables are contained within a single conduit.
3. Cable must be separated from any open conductors of Power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, as per NEC Article 760-29.
4. Wiring for 24-volt control, alarm notification, emergency communication and similar power limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.
5. Conduit shall not enter the Fire Alarm Control Panel, or any other remotely mounted Control Panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.
6. Conduit shall be 3/4-inch (19.1 mm) minimum.

B. Wire:
1. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG (1.02 mm) for Initiating Device Circuits and Signaling Line Circuits, and 14 AWG (1.63 mm) for Notification Appliance Circuits.
2. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
3. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in NFPA 70 (e.g., FPLR).
4. Wiring used for the multiplex communication loop shall be twisted and shielded and installed in conduit unless specifically excepted by the fire alarm equipment manufacturer. The system shall permit use of IDC and NAC wiring in the same conduit with the communication loop.
5. All field wiring shall be completely supervised.

C. Terminal Boxes, Junction Boxes and Cabinets:
D. All boxes and cabinets shall be UL listed for their use and purpose.
E. The Fire Alarm Control Panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the Main Power Distribution Panel as FIRE ALARM. Fire Alarm Control Panel Primary Power wiring shall be 12 AWG. The Control Panel Cabinet shall be grounded securely to either a cold-water pipe or grounding rod.

2.3 MAIN FIRE ALARM CONTROL PANEL:

A. The FACP shall be a Fire-Lite Alarms model MS-9600 and shall contain a microprocessor based Central Processing Unit (CPU). The CPU shall communicate with and control the following types

of equipment used to make up the system: addressable detectors, addressable modules, printer, annunciators, and other system-controlled devices.

B. System Capacity and General Operation
   1. The control panel shall provide or be capable of expansion to 318 addressable detectors and 318 monitor or control modules (636 addressable devices).
   2. The Fire Alarm Control Panel shall include a full featured operator interface control and annunciation panel that shall include a backlit, 80-character Liquid Crystal Display, individual, color coded system status LEDs, and an alphanumeric keypad for the Field Programming and control of the Fire Alarm System.
   3. All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the Fire Alarm Control Panel.
   4. The FACP shall provide the following features: Maintenance Alert to warn of excessive detector dirt or dust. Detector sensitivity read/test information and System Status Reports to display or print. Smoke Detector Alarm Verification. Pre-signal, meeting NFPA 72 requirements. Rapid manual station reporting (under 3 seconds). Periodic Detector Test, conducted automatically by the control panel every two hours. March time, temporal (ANSI Cadence) and California Code coding options. Walk Test will check for two detectors set to same address.
   5. The main CPU shall contain Form-C relay contacts rated at 2.0 amps/30VDC for the following: Alarm, Trouble, Supervisory.
   6. The CPU shall contain two Class B or A (NFPA Style Y or Z) programmable Notification Appliance Circuits.

C. Central Microprocessor
   1. The Microprocessor shall communicate with, monitor, and control all external interfaces with the control panel. It shall include EPROM for system program storage; non-volatile memory for building-specific program storage; and a "watch dog" timer circuit to detect and report microprocessor failure.
   2. The Microprocessor shall contain and execute all programming for specific action to be taken if an alarm condition is detected by the system. Such programming shall be held in non-volatile programmable memory and shall not be lost if both the system primary and secondary power failure occurs.
   3. he Microprocessor Unit shall also provide a Real- Time Clock for time annotation of system displays, printer, and history file.
   4. The Microprocessor Unit shall contain flash memory capabilities for easy upload/download for upgrades of software.
   5. All clock, date and history files shall be maintained during power loss.

D. Display
   1. The Display shall provide all the controls and indicators used by the system operator and may also be used to program all system operational parameters.
   2. The Display shall include status information and custom alphanumeric labels for all Addressable Detectors, Addressable Modules and Software zones.
   3. The Display shall provide a 80-character backlit alphanumeric Liquid Crystal Display (LCD). It shall also provide 9 Light-Emitting-Diodes (LEDs), consisting of and not limited to the following: AC POWER, FIRE ALARM, SUPERVISORY, SYSTEM TROUBLE, MAINTENANCE, ALARM SILENCED, DISABLED, BATTERY, and GROUND.
   4. The Display shall provide a 25-key touch keypad with control capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels shall be provided to prevent unauthorized system control or programming.

5. The Display shall include the following operator switches: ACKNOWLEDGE/STEP ALARM SILENCE, DRILL, and SYSTEM RESET (also serving as a lamp test switch).

E. Signaling Line Circuit Interface
1. The SLC Interface shall provide power to, and communicate with, all of the Addressable Detectors and Addressable Modules over a single pair of wires. This SLC Loop shall be capable of NFPA Style 4, Style 6, or Style 7 operation.
2. The SLC interface shall receive information from all Addressable Devices. This information shall be processed to determine whether normal, alarm, or trouble conditions exist for each detector. This information may also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.
3. The Signaling Line Circuit shall be capable of distances of 10,000 feet (@ 12 AWG, twisted). For retrofit applications, the system shall support up to 3,000 feet of untwisted, unshielded wire. (Loop 1 only)

F. Serial Interfaces
1. An EIA-232 interface between the Fire Alarm Control Panel and UL Listed Electronic Data Processing (EDP) peripherals shall be provided. The EIA-232 interface shall allow the use of printers, or for an interface to an off-line PC programmer.
2. An EIA-485 port shall be available for the serial connection of optional remote led-type annunciators. EIA-485 in terminal mode shall allow serial connection of optional LCD, English language remote system displays. LED (per zone or point) annunciators shall also be provided. The maximum distance to the furthest annunciator shall be 3,000 feet. The system shall support a maximum of 32, remote annunciators on a single twisted, shielded pair. The maximum distance to the furthest annunciator shall be 6,000 feet.
3. A PS2/PC keyboard connection shall be provided to support the connection of a PC keyboard for local programming of the fire alarm system.

G. Enclosures:
1. The control panel shall be housed in a UL listed cabinet suitable for surface or semi-flush mounting. Cabinet and front shall be corrosion protected.
2. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators.
3. An optional semi-flush trim ring shall be available for a neat cabinet dress.

H. All interfaces and associated equipment are to be protected so that they will not be affected by voltage surges or line transients consistent with UL standard 864.

I. Optional plug-in modules shall be provided for NFPA 72 auxiliary and remote station fire alarm systems as well as a Digital Alarm Communicator Transmitter for NFPA 72 Central Station systems. The DACT (Fire-Lite Alarms model UDACT) shall meet all current UL requirements for delayed AC fail reporting and shall be capable of reporting individual signals for all 636 points.

J. Optional modules (FireLite Alarms model ACM-8RF) shall provide eight Form-C relays rated at 5.0 amps (Relays shall track programmable software zones) and (Fire-Lite Alarms model 4XTMF) Municipal box connection and reverse polarity connection.

K. Power Supply:
1. The Power Supply shall operate on 120 VAC, 60 Hz, and shall provide all necessary power for the FACP.
   a. 240 VAC, 50 Hz version shall be available where required.
2. It shall provide a minimum of 6.0 amps of usable Notification Appliance power.
3. It shall provide a battery charger for 24 or 60 hours of standby using dual-rate charging techniques for fast battery recharge.
4. It shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults on sensitive addressable modules.

5. It shall be power-limited using fuse-less, quick-acting electronic circuitry meeting the latest UL requirements.

L. Operators Controls
1. Acknowledge Switch:
   a. Activation of the control panel Acknowledge switch in response to new Alarms and/or Troubles shall silence the local panel piezo electric signal and change the Alarm and Trouble LEDs from flashing mode to steady-ON mode. If multiple Alarm or Trouble conditions exist, depression of this switch shall advance the 80-character LCD display to the next Alarm or Trouble condition.
   b. Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.
2. Signal Silence Switch: Activation of the Signal Silence Switch shall cause all programmed Notification Appliances and relays to return to the normal condition after an alarm condition. The selection of Notification circuits and relays that are silenceable by this switch shall be fully field programmable within the confines of all applicable standards. The FACP software shall include silence inhibit, auto-silence timers, and an option to silence horns and keep strobes flashing.
3. System Reset Switch: Activation of the System Reset Switch shall cause all electronically latched initiating devices, appliances, or software zones, as well as all associated output devices and circuits, to return to their normal condition. Holding the RESET switch shall perform a Lamp Test function.
4. Drill (Evacuate) Switch: Press and hold of the Drill switch shall activate all Silenceable Notification Appliance circuits. The Drill function shall latch until press of Signal Silence or Reset.

M. Printer

A printer may be connected to provide hard-copy printout of all changes in status of the system and shall time-stamp such printouts with the current time-of-day and date. The printer shall communicate with the control panel using an interface complying with Electrical Industries Association standard EIA-232D.

N. Field Programming
1. The system and its respective devices (i.e. smoke detectors and modules) shall be programmable, configurable and expandable in the field without the need for special tools or electronic equipment and shall not require field replacement of electronic integrated circuits.
2. All programming may be accomplished through the standard FACP built-in keypad. As well through using a PC keyboard (connection provided on UNIMODE-9600 main circuit board.)
3. All field-defined programs shall be stored in non-volatile memory and shall not be lost if AC mains and/or battery is lost.
4. The programming function shall be enabled with a password that may be defined specifically for the system when it is installed. Two levels of password protection shall be provided in addition to a key-lock cabinet. One level is used for status level changes such as zone disable or manual on/off commands. A second (higher-level) is used for actual change of program information.
5. Program edit shall not interfere with normal operation and fire protection. If a fire condition is detected during programming operation, the system shall exit programming and perform fire protection functions as programmed.
6. A special program check function shall be provided to detect common operator errors.
7. An Auto-Program (self-learn) function shall be provided to quickly program initial functions within several seconds. During this operation, smoke detectors connected to the Signaling Line Circuit shall be automatically installed without labor intensive operator key commands and the using additional electronic equipment to program each individual detector.

8. For flexibility, an optional off-line programming function, with batch upload/download, shall also be available.

O. Specific System Operations
1. Alarm Verification: The Fire alarm control panel shall have the ability to alarm verify addressable smoke detectors.
2. Point Disable: Any device in the system may be Enabled or Disabled through the system keypad.
3. Point Read: The system shall be able to display or print the following point status diagnostic functions: a. Device Status, b. Device Type, c. Device Label, d. Device Zone Assignments and e. Program Parameters
4. System Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing all system status.
5. Device Sensitivity Reports: Upon command from the operator, the detectors sensitivity can be read and results printed
6. System History Recording and Reporting: The Fire Alarm Control Panel shall contain a History Buffer that will be capable of storing up to 1,000 system alarms, troubles, or operator actions.
7. Automatic Detector Maintenance Alert: The Fire Alarm Control Panel shall automatically interrogate each Addressable Smoke Detector and shall analyze the detector responses over a period of time. If any addressable Smoke Detector in the system responds with a reading that is below or above normal limits, then the system will enter the Trouble Mode, and the particular detector will be annunciated on the system display and printed on the optional printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.
8. Software Zones: The FACP shall provide 99 software zones. All addressable devices may be field programmed, to be grouped into these zones for control activation and annunciation purposes. Systems that utilize limited programmability, such as general alarm operation, are unacceptable.

2.4 SYSTEM COMPONENTS:

A. Programmable Electronic Sounders
1. Electronic sounders shall operate on 24 VDC nominal.
2. Electronic sounders shall be field programmable without the use of special tools, to provide slow whoop, continuous, or interrupted tones (Temporal Pattern) with an output sound level of at least 90 dBA measured at 10 feet from the device.
3. Shall be flush or surface mounted as shown on plans.

B. Strobe Lights:
1. Shall operate on 24 VDC nominal.
2. Shall meet the requirements of the ADA (Americans with Disabilities Act) as well as UL Standard 1971.

C. Audible/Visual Combination Devices:
1. Shall meet the applicable requirements of Section A listed above for audibility.
2. Shall meet the requirements of Section B listed above for visibility.

D. Addressable Manual Pull Box (Fire-Lite Alarms model BG-12LX)
1. Addressable Manual Stations shall be provided to connect to the Fire Alarm Control Panel Signaling Line Circuit (SLC) Loops. Up to 159 addressable manual stations may be connected to each SLC loop.
2. The Manual Pull Box shall, on command from the Control Panel, send data to the panel representing the state of the manual switch. Manual Fire Alarm Stations shall use a key operated test-reset lock and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.

3. All operated stations shall have a positive, visual indication of operation that cannot be reset without the use of a key.
4. Manual Stations shall be constructed of LEXAN (or polycarbonate equivalent) with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches or larger.
5. Stations shall be suitable for surface mounting, or semi flush mounting as shown on the plans, and shall be installed in accordance with ADA and local codes.
6. The Manual Station shall provide address-setting means using decimal switches. Addressable manual stations that use binary address setting methods, such as a dip switch, are much more difficult to install and are subject to installation error and are not allowable substitutes.

E. Addressable Photoelectric Detectors (Fire-Lite Alarms model SD350)
1. Smoke detectors shall be addressable and shall connect with two wires to the Fire Alarm Control Panel Signaling Line Circuit. Up to 318 addressable detectors may connect to two separate SLC loops.
2. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density.
3. The detectors shall be low profile ceiling-mount and shall include a twist-lock base.
4. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a switch) or initiated remotely on command from the control panel.
5. The detectors shall provide address-setting means on the detector head using decimal switches. Because of the possibility of installation error, systems that use binary jumpers on dipswitches to set the detector address are not acceptable. The detectors shall also store an internal identifying code that the control panel shall use to identify the type of detector.
6. The detectors shall provide an alarm and power LED. The LED shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel. The LED is placed into steady illumination by the control panel indicating that an alarm condition has been detected. An output connection shall also be provided in the base to connect an external remote alarm LED (Fire-Lite Alarms model RA400Z).

F. Addressable Photoelectric Detectors with Fixed Thermal Sensor (Fire-Lite Alarms model SD350T)
1. Smoke detectors shall be addressable and shall connect with two wires to the Fire Alarm Control Panel Signaling Line Circuit. Up to 318 addressable detectors with fixed thermal sensors (135 degree F) connect to two SLC loops.
2. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density.
3. The detectors with fixed thermal sensors shall alarm at a fixed temperature of 135 degree F.
4. The detectors shall be ceiling-mount and shall include a twist-lock base.
5. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a switch) or initiated remotely on command from the control panel.
6. The detectors shall provide address-setting means on the detector head using decimal switches. Because of the possibility of installation error, systems that use binary jumpers on dipswitches to set the detector address are not acceptable. Systems that require a special programmer to set the detector address (including temporary connection at the panel) are labor intensive and not acceptable. The detectors shall also store an internal identifying code that the control panel shall use to identify the type of detector.
7. The detectors shall provide an alarm and power LED. The LED shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel. The LED is placed into steady illumination by the control panel indicating that an alarm condition has been detected. An output connection shall also be provided in the base to connect an external remote alarm LED (Fire-Lite Alarms model RA400Z).

G. Addressable Ionization Smoke Detectors (Fire-Lite Alarms model CP350)

1. Smoke Detectors shall be low profile addressable and connect with two wires to the Fire Alarm Control Panel Signaling Line Circuit. Up to 318 addressable detectors may connect to two SLC loops.
2. The detectors shall use the dual-chamber ionization principal to measure products of combustion.
3. The detectors shall be low profile ceiling-mount and shall include a twist-lock base.
4. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself, by activating a switch, or may be activated remotely on command from the control panel.
5. The detectors shall provide address-setting means on the detector head using decimal switches. Because of the possibility of installation error, systems that use binary jumpers or dipswitches to set the address are not acceptable. They shall also store an internal identifying code that the control panel shall use to identify the type of detector.
6. The detectors shall provide an alarm and power LED. The LED shall flash under normal conditions. The LED is placed into steady illumination by the control panel, indicating that an alarm condition has been detected. An output connection shall also be provided in the base to connect a remote alarm LED (Fire-Lite Alarms model RA400Z).

H. Addressable Monitor Module (Fire-Lite Alarms model MMF-300)
1. Addressable Monitor modules shall be provided to connect one supervised IDC (zone) of conventional Alarm Initiating Devices (any N.O. dry contact device) to the Fire Alarm Control Panel Signaling Line Circuit (SLC) Loop.
2. The monitor module shall mount in a 4-inch square, 2-1/8" deep electrical box.
3. The IDC (zone) may be wired for Style D (Class A) or Style B (Class B) operation. The Monitor module shall provide address-setting means using decimal switches and shall also store an internal identifying code that the Fire Alarm Control Panel shall use to identify the type of device. Modules that use binary jumpers or dipswitches are subject to installation errors and are not acceptable. An LED shall be provided that shall flash under normal conditions, indicating that the Monitor module is operational and in regular communication with the control panel.
4. For difficult to reach areas, the Monitor Module shall be available in a miniature package and shall be no larger than 2-3/4"W x 1-1/4"H x 1/2"D (Fire-Lite Alarms model MMF-301). This version does not support Style D operation or include an LED.

I. Addressable 2-Wire Smoke Detector Monitor Module (Fire-Lite Alarms model MMF-302)
1. Addressable 2-Wire Smoke Detector Monitor Modules shall be provided to connect one supervised IDC (zone) of two-wire conventional smoke detectors to the Fire Alarm Control Panel Signaling Line Circuit (SLC) Loop.
2. The monitor module shall mount in a 4-inch square, 2-1/8" deep electrical box.
3. The monitor module shall provide terminal connections for a resettable external supply voltage to provide power to the IDC (zone) of two-wire smoke detectors.
4. The IDC (zone) may be wired for Style D (Class A) or Style B (Class B) operation. The monitor module shall provide address-setting means using decimal switches and shall also store an internal identifying code that the Fire Alarm Control Panel shall use to identify the type of device. Modules that use binary jumpers or dipswitches are subject to installation errors and are not acceptable. An LED shall be provided that shall flash under normal conditions, indicating that the Monitor module is operational and in regular communication with the control panel.

J. Addressable Dual-Circuit Monitor Module (Fire-Lite Alarms model MDF-300)
1. Addressable Dual-Circuit Monitor Modules shall be provided to connect two supervised IDCs (zones) of conventional Alarm Initiating Devices (any N.O. dry contact device) to the Fire Alarm Control Panel Signaling Line Circuit (SLC) Loop.
2. The-monitor module shall mount in a 4-inch square, 2-1/8" deep electrical box.

3. The IDCs (zones) may be wired for Style B (Class B) operation only. The Monitor module shall provide address-setting means using decimal switches and shall also store an internal identifying code that the Fire Alarm Control Panel shall use to identify the type of device. Modules that use binary jumpers or dipswitches are subject to installation errors and are not acceptable. An LED shall be provided that shall flash under normal conditions, indicating that the Monitor module is operational and in regular communication with the control panel.

K. Addressable Control Module (Fire-Lite Alarms Model CMF-300)

1. Addressable Control Modules shall be provided to supervise and control the operation of one conventional Notification Appliance Circuit (NAC) of compatible, 24 VDC powered, polarized Audio/Visual appliances or audio speakers.
2. The Control Module shall mount in a standard 4-inch square, 2-1/8" deep electrical box or to a surface mounted backbox.
3. The NAC shall wire in a Class B (Style Y) or Class A (Style Z) fashion. Each control module shall support up to 1 Amp of Inductive or 2 Amps of Resistive Audible/Visual signals.
4. Audio/Visual power shall be provided by a separate supervised power Loop from the main Fire Alarm Control Panel or from a supervised, UL listed Remote Power Supply.
5. The Control Module shall provide address-setting means using decimal switches and shall also store an internal identifying code that the Control Panel shall use to identify the type of device. Modules that use binary jumpers or dipswitches are subject to installation errors and are not acceptable. An LED shall be provided that shall flash under normal conditions, indicating that the Control Module is operational and is in regular communication with the control panel.
6. A magnetic test switch shall be provided to test the module without opening or shorting its NAC circuit wiring.

M. Addressable Relay Module (Fire-Lite Alarms model CRF-300)

1. Addressable Relay Modules shall be provided to allow a compatible control panel to switch discrete contacts by code command.
2. The Relay Module shall mount in a standard 4-inch square, 2-1/8" deep electrical box or to a surface mounted backbox.
3. The Relay Module shall provide two isolated sets of Form-C contacts for fan shutdown and other auxiliary control functions.
4. The Relay Module contact ratings shall support up to 1 Amp/30 VDC of Inductive load or 2 Amps/30VDC (coded) of Resistive load (up to 3 Amps in non-coded applications). The relay coil shall be magnetically latched to reduce wiring connection requirements and to ensure that 100% of all auxiliary relays or may be energized at the same time on the same pair of wires.
5. The Control Module shall provide address-setting means using decimal switches and shall also store an internal identifying code that the Control Panel shall use to identify the type of device. Modules that use binary jumpers or dipswitches are subject to installation errors and are not acceptable. An LED shall be provided that shall flash under normal conditions, indicating that the Control Module is operational and is in regular communication with the control panel.
6. A magnetic test switch shall be provided to test the module without opening or shorting its NAC circuit wiring.

N. Isolator Module (Fire-Lite Alarms model I300).

1. Isolator Modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC loop. The Isolator Module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC Loop. At least one isolator module shall be provided for each floor or protected zone of the building.
2. If a wire-to-wire short occurs, the Isolator Module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected, the Isolator Module shall automatically reconnect the isolated section of the SLC loop.

3. The Isolator Module shall not require any address setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an Isolator Module after its normal operation.
4. The Isolator Module shall mount in a standard 4-inch-deep electrical box or in a surface mounted backbox. It shall provide a single LED that shall flash to indicate that the Isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

O. Waterflow Switches (System Sensor WFD Series)
1. Flow switches shall be integral, mechanical, non-coded, non-accumulative retard type.
2. Flow switches shall have an alarm transmission delay time that is conveniently adjustable from 0 to 60 seconds.
3. Flow switches shall be located a minimum of one (1) foot from a fitting that changes the direction of the flow and a minimum of three (3) feet from a valve.

P. Sprinkler and Standpipe Valve Supervisory Switches:
1. Each sprinkler system water supply control valve riser or zone control valve, and each standpipe system riser control valve shall be equipped with a supervisory switch. Standpipe hose valves, and test and drain valves shall not be equipped with supervisory switches.
2. Each Post Indicator Valve (PIV) or main gate valve shall be equipped with a supervisory switch.
3. Mount switch so as not to interfere with the normal operation of the valve and adjust to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one-fifth of the distance from its normal position.
4. The mechanism shall be contained in a weatherproof aluminum housing, that shall provide a 3/4-inch tapped conduit entrance and incorporate the necessary facilities for attachment to the valves.
5. Switch housing to be finished in red baked enamel.
6. The entire installed assembly shall be tampering proof and arranged to cause a switch operation if the housing cover is removed, or if the unit is removed from its mounting.
7. Valve supervisory switches shall be provided and connected under this section and installed by mechanical contractor.

Q. Serial, LED-Type, Remote Annunciation (Fire-Lite Alarms AFM Series)
1. The annunciator shall communicate with the fire alarm control panel via an EIA 485 (ACS mode) communications loop and shall annunciate all zones in the system. Up to 32 annunciators may be connected to the EIA 485 communications loop.
2. The annunciator shall need no more than four wires to connect to the FACP.
3. The annunciator shall provide a red Alarm LED per zone, and a yellow Trouble LED per zone. The annunciator will also have an "ON-LINE" LED, local piezo sounder, local acknowledge/lamp test switch, and custom zone/function identification labels.
4. The annunciator switches may be used for System control such as, Global Acknowledge, Global Signal Silence, and Global System Reset.

R. Serial, LCD-Type, Remote System Display (Fire-Lite Alarms LCD-80 Series)
1. The annunciator shall communicate with the fire alarm control panel via an EIA-485 (Terminal Mode) communications loop and shall include a 80-character, backlit, LCD display which mimics the integral fire alarm control panel LCD display. Up to 32 annunciators may be connected to the EIA-485 communications loop.
2. The annunciator shall require no more than four wires on the communication loop (two for communication, two for supervision) and two additional wires for power.
3. In addition to the LCD, English language display, the annunciator shall also include a Power LED, Alarm LED, Trouble LED and Supervisory LED.
4. A local piezo sounder shall also be included on the annunciator.

5. Switches for Acknowledge/Lamp Test, Silence, Drill and Reset shall be included on the annunciator protected from unauthorized usage by a key switch (keyed alike to the host FACP).

2.5 BATTERIES:

A. Shall be 12 volt, Gell-Cell type (two required).
B. Batteries (two required) shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 5 minutes of alarm upon a normal AC power failure.
C. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks refilling, spills and leakage shall not be required.

PART 3.0 - EXECUTION

3.1 INSTALLATION:

A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.
B. All conduit, junction boxes, conduit supports, and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.
C. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

3.2 TEST:

Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system.

1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
2. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
3. Verify activation of all flow switches.
4. Open initiating device circuits and verify that the trouble signal actuates.
5. Open and short signaling line circuits and verify that the trouble signal actuates.
6. Open and short Notification Appliance Circuits and verify that trouble signal actuates.
7. Ground all circuits and verify response of trouble signals.
8. Check presence and audibility of tone at all alarm notification devices.
9. Check installation, supervision, and operation of all addressable smoke detectors using the Walk Test.
10. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
11. When the system is equipped with optional features, the manufacturer's manual should be consulted to determine the proper testing procedures. This is intended to address such items as verifying the controls performance by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

3.3 FINAL INSPECTION:

At the final inspection, a manufacturer-trained representative shall demonstrate that the system functions properly in every respect.

3.4 INSTRUCTION:

Provide instruction as required for operating the system. "Hands-on" demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided. The Contractor and/or the Systems Manufacturer's representatives shall provide a typewritten "Sequence of Operation" to the Owner if required.

END OF SECTION 284621.11

SECTION 311000 - SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Clearing and protection of vegetation.

B. Removal of existing debris.

1.02 RELATED REQUIREMENTS

1.03

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Section 01 1000 - Summary: Limitations on Contractor's use of site and premises.

C. Section 01 1000 - Summary: Sequencing and staging requirements.

D. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

E. Section 01 7000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products.

F. Section 31 2200 - Grading: Topsoil removal.

G. Section 31 2200 - Grading: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

H. Section 31 2323 - Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

I. Section 31 2323 - Fill: Filling holes, pits, and excavations generated as a result of removal operations.

1.04

1.05 QUALITY ASSURANCE

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

PART 2 PRODUCTS

2.01 MATERIALS

A. Fill Material: As specified in Section 31 2200 – Grading

PART 3 EXECUTION

3.01 SITE CLEARING

A. Comply with other requirements specified in Section 01 7000.

B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.02 EXISTING UTILITIES AND BUILT ELEMENTS

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Protect existing structures and other elements that are not to be removed.

3.03 VEGETATION

A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, playing fields, lawns, and planting beds.

B. Do not begin clearing until vegetation to be relocated has been removed.

C. Do not remove or damage vegetation beyond the following limits:
   1. 40 feet outside the building perimeter.
   2. 10 feet each side of surface walkways, patios, surface parking, and utility lines less than 12 inches in diameter.
   3. 15 feet each side of roadway curbs and main utility trenches.
   4. 25 feet outside perimeter of pervious paving areas that must not be compacted by construction traffic.
   5. Exception: Specific trees and vegetation indicated on drawings to be removed.
   6. Exception: Selective thinning of undergrowth specified elsewhere.

D. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:
   1. At vegetation removal limits.
   2. Around trees to remain within vegetation removal limits; locate no closer to tree than at the drip line.
   3. Around other vegetation to remain within vegetation removal limits.

E. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.

F. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.
   1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
   2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
   3. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.
   4. Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and smooth enough not to constitute a hazard to pedestrians.

G. Dead Wood: Remove all dead trees (standing or down), limbs, and dry brush on entire site; treat as specified for vegetation removed.

H. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

3.04 DEBRIS

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 311000

SECTION 312200 – GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of topsoil.

B. Rough grading and clearing the site for structures, building pads, and roadway improvements.

C. Finish grading.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Section 31 1000 - Site Clearing.

C. Section 31 2316 - Excavation.

D. Section 31 2323 - Fill: Filling and compaction.

1.03 SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.04 QUALITY ASSURANCE

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

1.05 PROJECT CONDITIONS

A. Protect above- and below-grade utilities that remain.

B. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from grading equipment and vehicular traffic.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil: See Section 31 2323.

B. Other Fill Materials: See Section 31 2323.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Locate, identify, and protect from damage above- and below-grade utilities to remain.

D. Notify utility company to remove and relocate utilities.

3.03 ROUGH GRADING

A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.

B. Do not remove topsoil when wet.

C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.

D. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.

E. When excavating through roots, perform work by hand and cut roots with sharp axe.

F. See Section 31 2323 for filling procedures.

G. Benching Slopes: Horizontally bench existing slopes greater than 1:4 to key fill material to slope for firm bearing.

H. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

3.04 SOIL REMOVAL

A. Remove excavated topsoil from site.

B. Stockpile excavated subsoil on site.

C. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion.

3.05 FINISH GRADING

A. Before Finish Grading:
   1. Verify building and trench backfilling have been inspected.
   2. Verify subgrade has been contoured and compacted.

B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.

C. Where topsoil is to be placed, scarify surface to depth of 3 inches.

D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.

E. Place topsoil in areas where seeding are indicated.

F. Place topsoil where required to level finish grade.

G. Place topsoil to thickness as scheduled.

H. Place topsoil during dry weather.

I. Remove roots, weeds, rocks, and foreign material while spreading.

J. Near plants spread topsoil manually to prevent damage.

K. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

L. Lightly compact placed topsoil.

3.06 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.

B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).

C. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.

D. Top Surface of Finish Grade: Plus or minus 1/2 inch.

3.07 FIELD QUALITY CONTROL

A. See Section 31 2323 for compaction density testing.

3.08 CLEANING

A. Remove unused stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water.

B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION 312200

SECTION 312316 – EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating for building volume below grade, footings, pile caps, slabs-on-grade, paving, site structures, and utilities within the building.

B. Trenching for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Section 31 2200 - Grading: Soil removal from surface of site.

C. Section 31 2200 - Grading: Grading.

D. Section 31 2323 - Fill: Fill materials, filling, and compacting.

1.03 PROJECT CONDITIONS

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

B. Protect plants, lawns, rock outcroppings, and other features to remain.

C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

PART 3 EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 31 2200 for additional requirements.

3.02 EXCAVATING

A. Underpin adjacent structures that could be damaged by excavating work.

B. Excavate to accommodate new structures and construction operations.

C. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

D. Preparation for Piling Work: Excavate to working elevations. Coordinate special requirements for piling.

E. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

F. Do not interfere with 45 degree bearing splay of foundations.

G. Cut utility trenches wide enough to allow inspection of installed utilities.

H. Hand trim excavations. Remove loose matter.

I. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 2323.

J. Grade top perimeter of excavation to prevent surface water from draining into excavation.

K. Remove excavated material that is unsuitable for re-use from site.

L. Stockpile excavated material to be re-used in area designated on site in accordance with Section 31 2200.

M. Remove excess excavated material from site.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

B. Provide for visual inspection of load-bearing excavated surfaces before placement of foundations.

3.04 PROTECTION

A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

END OF SECTION 312316

SECTION 312316.13 – TRENCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backfilling and compacting for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Section 31 2200 - Grading: Site grading.

C. Section 31 2316 - Excavation: Building and foundation excavating.

D. Section 31 2323 - Fill: Backfilling at building and foundations.

1.03 REFERENCES

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 2010.

C. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2006.

D. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

E. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.

F. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.

G. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.

H. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

I. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.

J. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

K. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.

L. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2010

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Compaction Density Test Reports.

1.05 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where indicated by architect and/or construction manager.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. Perform all work in accordance with the geotechnical report.

PART 3 EXECUTION

3.01 EXAMINATION

3.02 TRENCHING

A. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

B. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Cut trenches wide enough to allow inspection of installed utilities.

E. Hand trim excavations. Remove loose matter.

F. Remove excavated material that is unsuitable for re-use from site.

G. Remove excess excavated material from site.

3.03 PREPARATION FOR UTILITY PLACEMENT

A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.04 BACKFILLING

A. Backfill to contours and elevations indicated using unfrozen materials.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

F. Correct areas that are over-excavated.
   1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

G. Compaction Density Unless Otherwise Specified or Indicated:

H. Reshape and re-compact fills subjected to vehicular traffic.

3.05 BEDDING AND FILL AT SPECIFIC LOCATIONS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

3.06 FIELD QUALITY CONTROL

A. Perform compaction testing in accordance with recommendations contained in the geotechnical report.

B. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

C. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D2922, or ASTM D3017.

D. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor"), or AASHTO T 180.

E. If tests indicate work does not meet specified requirements, remove work, replace and retest.

END OF SECTION 312316.13

SECTION 312323 – FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Filling, backfilling, and compacting for building volume below grade.

B. Backfilling and compacting for utilities outside the building to utility main connections.

C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Section 31 2200 - Grading: Removal and handling of soil to be re-used.

C. Section 31 2200 - Grading: Site grading.

D. Section 31 2316 - Excavation: Removal and handling of soil to be re-used.

E. Section 31 3700 - Riprap.

1.03 REFERENCE STANDARDS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 2010.

C. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2006.

D. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

E. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.

F. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.

G. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.

H. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

I. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.

J. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

K. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.

L. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2010.

1.04 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

B. Subgrade Elevations: Indicated on drawings.

1.05 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where indicated.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.

C. Verify that survey bench marks and intended elevations for the Work are as indicated.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. Perform all work in accordance with the Geotechnical Report

B. Concrete for Fill: Lean concrete.

C. Topsoil: See Section 31 2200.

PART 3 EXECUTION

3.01 EXAMINATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 31 2200 for additional requirements.

C. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

D. Verify structural ability of unsupported walls to support imposed loads by the fill.

E. Verify underground tanks are anchored to their own foundations to avoid flotation after backfilling.

3.02 PREPARATION

A. Scarify subgrade surface to a depth of 6 inches to identify soft spots.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 FILLING

A. Fill to contours and elevations indicated using unfrozen materials.

B. Fill up to subgrade elevations unless otherwise indicated.

C. Employ a placement method that does not disturb or damage other work.

D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

G. Correct areas that are over-excavated.
   1. Load-bearing foundation surfaces: Fill with concrete.
   2. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

H. Compaction Density Unless Otherwise Specified or Indicated:

I. Reshape and re-compact fills subjected to vehicular traffic.

3.04 FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

B. Under Interior Slabs-On-Grade:
   1. Use granular fill.
   2. Compact to 95 percent of maximum dry density.
   3. Cover with sand.
      a. Depth: 2 inches.
      b. Compact to 95 percent of maximum dry density.

C. At Foundation Walls and Footings:
   1. Use general fill.
   2. Fill up to subgrade elevation.
   3. Compact each lift to 90 percent of maximum dry density.
   4. Do not backfill against unsupported foundation walls.

3.05 FIELD QUALITY CONTROL

A. Perform compaction testing in accordance with recommendations contained in the geotechnical report.

B. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

C. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D2922, or ASTM D3017.

D. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor"), or AASHTO T 180.

E. If tests indicate work does not meet specified requirements, remove work, replace and retest.

3.06 CLEANING

A. Leave unused materials in a neat, compact stockpile.

B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION 312323

SECTION 313700 – RIPRAP

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Riprap.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Section 31 2323 - Fill: Aggregate requirements.

1.03 QUALITY ASSURANCE

A. Perform all work in accordance with Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Maintain one copy of each document on site.

PART 2 PRODUCTS

2.01 MATERIALS

A. Riprap: Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Aggregate: Granular fill as specified in Section 31 2323.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not place riprap bags over frozen or spongy subgrade surfaces.

3.02 PLACEMENT

A. Place geotextile fabric over substrate, lap edges and ends.

B. Place riprap at culvert pipe ends, embankment slopes, and at locations specified in plans.

C. Place into position. Knead, ram, or pack filled bags to conform to contour of adjacent material and other bags previously placed.

D. Reference sheet C-101 for shape and dimensions. Reference sheet C-502 for required thickness.

E. Place rock evenly and carefully over bagged riprap to minimize voids, do not tear bag fabric, place bags and rock in one consistent operation to preclude disturbance or displacement of substrate.

F. After placement, spray with water to moisten the bagged mix. Maintain moist for 24 hours.

3.03 SCHEDULES

A. Culvert Pipe Ends: Bagged, placed one layer thick, 6 inch average thickness, concealed with topsoil fill.

B. Sloped Grade at Retaining Wall: Individual riprap units, 6 inch thickness; placed prior to finish topsoil.

END OF SECTION 313700

SECTION 321123 - AGGREGATE BASE COURSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aggregate base course.

B. Paving aggregates.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Section 31 2200 - Grading: Preparation of site for base course.

C. Section 31 2323 - Fill: Compacted fill under base course.

D. Section 32 1216 - Asphalt Paving: Binder and finish asphalt courses.

1.03 REFERENCE STANDARDS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses; American Association of State Highway and Transportation Officials; 1965 (2004).

C. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 2010.

D. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2006.

E. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

F. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.

G. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.

H. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.

I. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

J. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.

K. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

L. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.

1.04 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When aggregate materials need to be stored on site, locate stockpiles where indicated.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.

C. Verify that survey bench marks and intended elevations for the Work are as indicated.

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide material in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

2.02 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for testing and analysis of aggregate materials.

B. Where aggregate materials are specified using ASTM D2487 classification, test and analyze samples for compliance before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.02 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place aggregate on soft, muddy, or frozen surfaces.

3.03 INSTALLATION

A. Place aggregate in maximum 4 inch layers and roller compact to specified density.

B. Level and contour surfaces to elevations and gradients indicated.

C. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

D. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

E. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.04 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION 321123

SECTION 321216 - ASPHALT PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aggregate base course.

B. Single course bituminous concrete paving.

C. Double course bituminous concrete paving.

D. Surface sealer.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Section 31 2200 - Grading: Preparation of site for paving and base.

C. Section 31 2323 - Fill: Compacted subgrade for paving.

1.03 REFERENCE STANDARDS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types; The Asphalt Institute; 1997.

C. AI MS-19 - A Basic Asphalt Emulsion Manual; The Asphalt Institute; Fourth Edition.

D. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction; 2009a.

1.04 QUALITY ASSURANCE

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Mixing Plant: Provide material in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

C. Obtain materials from same source throughout.

1.05 REGULATORY REQUIREMENTS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Conform to applicable code for paving work on public property.

PART 2 PRODUCTS

2.01 MATERIALS

A. Aggregate for Base Course: Provide material in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Obtain materials from quarries located within a 500 mile radius of project site.

2.02 ASPHALT PAVING MIXES AND MIX DESIGN

A. Provide material in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

2.03 SUBMITTALS

A. Mix design

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 BASE COURSE

A. Place and compact base course.

3.03 PLACING ASPHALT PAVEMENT - SINGLE COURSE

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Place asphalt within 24 hours of applying primer or tack coat.

C. Install gutter drainage grilles and frames in correct position and elevation.

D. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

E. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.04 PLACING ASPHALT PAVEMENT - DOUBLE COURSE

A. Place asphalt binder course within 24 hours of applying primer or tack coat.

B. Place wearing course within two hours of placing and compacting binder course.

C. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

D. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.05 SEAL COAT

A. Apply seal coat to surface course and asphalt curbs in accordance with AI MS-19.

3.06 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Compacted Thickness: Within 1/4 inch of specified or indicated thickness.

C. Variation from True Elevation: Within 1/2 inch.

3.07 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for quality control.

B. Provide field inspection and testing. Take samples and perform tests in accordance with AI MS-2.

END OF SECTION 321216

SECTION 321313 - CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete sidewalks, stair steps, integral curbs, gutters, median barriers, parking areas, and roads.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Section 31 2200 - Grading: Preparation of site for paving and base and preparation of subsoil at pavement perimeter for planting.

C. Section 31 2323 - Fill: Compacted subbase for paving.

D. Section 32 1123 - Aggregate Base Courses: Aggregate base course.

E. Section 32 1216 - Asphalt Paving: Asphalt wearing course.

F. Section 03 2000 - Concrete Reinforcing.

1.03 REFERENCE STANDARDS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991 (Reapproved 2002).

C. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2010.

D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 2000.

E. ACI 305R - Hot Weather Concreting; American Concrete Institute International; 2010.

F. ACI 306R - Cold Weather Concreting; American Concrete Institute International; 2010.

G. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.

H. ASTM A497/A497M - Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete; 2007.

I. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2012.

J. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2011a.

K. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2012a.

L. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2012.

M. ASTM C150/C150M - Standard Specification for Portland Cement; 2012.

N. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2010b.

O. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.

P. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.

Q. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2012.

R. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2012.

S. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2011.

T. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2008).

U. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction; 2004a (Reapproved 2008).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Design Data: Indicate pavement thickness, designed concrete strength, reinforcement, and typical details.

PART 2 PRODUCTS

2.01 PAVING ASSEMBLIES

A. Comply with applicable requirements of ACI 301.

B. Design paving for parking and residential streets.

C. Concrete Sidewalks and Median Barrier: 3,000 psi, 28 day concrete. See plans for sections.

D. Parking Area Pavement: 4,000 psi, 28 day concrete. See plans for sections.

2.02 FORM MATERIALS

A. Form Materials: Conform to ACI 301.

B. Joint Filler: Preformed; non-extruding bituminous type (ASTM D1751) or sponge rubber or cork (ASTM D1752).
   1. Thickness: 1/2 inch.

2.03 REINFORCEMENT

A. Reinforcing Steel and Welded Wire Reinforcement: Types specified in Section 03 2000.

2.04 CONCRETE MATERIALS

A. Obtain materials from quarries located within a 500 mile radius of project site.

B. Provide for 20% fly ash replacement of cement.

2.05 ACCESSORIES

A. Acid Etch Solution: Muriatic type mixed to a five percent solution.

2.06 CONCRETE MIX DESIGN

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

2.07 MIXING

A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C94M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

B. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 SUBBASE

A. See Section 32 1123 for construction of base course for work of this Section.

3.03 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.

B. Coat surfaces of manhole frames with oil to prevent bond with concrete pavement.

C. Notify Architect minimum 24 hours prior to commencement of concreting operations.

3.04 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.05 REINFORCEMENT

A. Place reinforcement at top of slabs-on-grade.

B. Interrupt reinforcement at contraction joints.

C. Place dowels to achieve pavement and curb alignment as detailed.

3.06 COLD AND HOT WEATHER CONCRETING

A. Follow recommendations of ACI 305R when concreting during hot weather.

B. Follow recommendations of ACI 306R when concreting during cold weather.

C. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

3.07 PLACING CONCRETE

A. Coordinate installation of snow melting components.

B. Place concrete in accordance with ACI 304R.

C. Do not place concrete when base surface is wet.

D. Place concrete using the slip form technique.

E. Ensure reinforcement, inserts, embedded parts, formed joints and expansion joints are not disturbed during concrete placement.

3.08 JOINTS

A. Align curb, gutter, and sidewalk joints.

B. Place 3/8 inch wide expansion joints at 20 foot intervals and to separate paving from vertical surfaces and other components and in pattern indicated.
   1. Form joints with joint filler extending from bottom of pavement to within 1/2 inch of finished surface.
   2. Secure to resist movement by wet concrete.

C. Provide scored joints:
   1. At 3 feet intervals.
   2. Between sidewalks and curbs.
   3. Between curbs and pavement.

D. Provide keyed joints as indicated.

E. Saw cut contraction joints 3/16 inch wide at an optimum time after finishing. Cut 1/3 into depth of slab.

3.09 EXPOSED AGGREGATE

A. Wash scheduled concrete surfaces with acid etch solution exposing aggregate to match sample panel.

3.10 FINISHING

A. Area Paving: Light broom, texture perpendicular to pavement direction.

B. Sidewalk Paving: Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/4 inch radius.

C. Median Barrier: Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/4 inch radius.

D. Curbs and Gutters: Light broom, texture parallel to pavement direction.

E. Inclined Vehicular Ramps: Broomed perpendicular to slope.

F. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.11 TOLERANCES

A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.

B. Maximum Variation From True Position: 1/4 inch.

3.12 PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Do not permit pedestrian traffic over pavement for 7 days minimum after finishing.

END OF SECTION 321313

SECTION 321723.13 - PAINTED PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Parking lot markings, including parking bays, crosswalks, arrows, handicapped symbols, and curb markings.

B. Roadway lane markings and crosswalk markings.

C. "No Parking" curb painting. Fire lane curb painting.

1.02 RELATED REQUIREMENTS

A. Section 32 1216 - Asphalt Paving.

B. Section 32 1313 - Concrete Paving.

1.03 REFERENCE STANDARDS

A. Perform all work in accordance with Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. FS TT-B-1325 - Beads (Glass Spheres); Retro-Reflective; Rev. D, 2007.

C. FS TT-P-1952 - Paint, Traffic Black, and Airfield Marking, Waterborne; Rev. E, 2007.

D. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.

E. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; 2004.

F. FHWA MUTCD - Manual on Uniform Traffic Control Devices for Streets and Highways; U.S. Department of Transportation, Federal Highway Administration; http://mutcd.fhwa.dot.gov; current edition.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver paint in containers of at least 5 gallons accompanied by batch certificate.

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MATERIALS

A. Line and Zone Marking Paint: MPI No. 97 Latex Traffic Marking Paint; color(s) as indicated.
   1. Roadway Markings: As required by authorities having jurisdiction.
   2. Parking Lots: Yellow.
   3. Handicapped Symbols: Blue.
   4. Fire lane curb as required by Fire Mashall.

B. Temporary Marking Tape: Preformed, reflective, pressure sensitive adhesive tape in color(s) required; Contractor is responsible for selection of material of sufficient durability as to perform satisfactorily during period for which its use is required.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of marking materials.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Clean surfaces thoroughly prior to installation.
   1. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods.

D. Where oil or grease are present, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application; after cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint.

E. Establish survey control points to determine locations and dimensions of markings; provide templates to control paint application by type and color at necessary intervals.

F. Temporary Pavement Markings: When required or directed by Architect, apply temporary markings of the color(s), width(s) and length(s) as indicated or directed.
   1. After temporary marking has served its purpose, remove temporary marking by carefully controlled sandblasting, approved grinding equipment, or other approved method so that surface to which the marking was applied will not be damaged.
   2. At Contractor's option, temporary marking tape may used in lieu of temporary painted marking; remove unsatisfactory tape and replace with painted markings at no additional cost to Owner.

3.03 INSTALLATION

A. Begin pavement marking as soon as practicable after surface has been cleaned and dried.

B. Do not apply paint if temperature of surface to be painted or the atmosphere is less than 50 degrees F or more than 95 degrees F.

C. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts.

D. Comply with FHWA MUTCD manual (http://mutcd.fhwa.dot.gov) for details not shown.

E. Apply markings in locations determined by measurement from survey control points; preserve control points until after markings have been accepted.

F. Apply uniformly painted markings of color(s), lengths, and widths as indicated on the drawings true, sharp edges and ends.
   1. Apply paint in one coat only.
   2. Wet Film Thickness: 0.015 inch, minimum.
   3. Width Tolerance: Plus or minus 1/8 inch.

G. Roadway Traffic Lanes: Use suitable mobile mechanical equipment that provides constant agitation of paint and travels at controlled speeds.
   1. Conduct operations in such a manner that necessary traffic can move without hindrance.
   2. Place warning signs at the beginning of the wet line, and at points well in advance of the marking equipment for alerting approaching traffic from both directions. Place small flags or other similarly effective small objects near freshly applied markings at frequent intervals to reduce crossing by traffic.
   3. If paint does not dry within expected time, discontinue paint operations until cause of slow drying is determined and corrected.
   4. Skip Markings: Synchronize one or more paint "guns" to automatically begin and cut off paint flow; make length of intervals as indicated.
   5. Use hand application by pneumatic spray for application of paint in areas where a mobile paint applicator cannot be used.

H. Parking Lots: Apply parking space lines, entrance and exit arrows, painted curbs, and other markings indicated on drawings.
   1. Mark the International Handicapped Symbol at indicated parking spaces.
   2. Hand application by pneumatic spray is acceptable.

I. Symbols: Use a suitable template that will provide a pavement marking with true, sharp edges and ends, of the design and size indicated.

END OF SECTION 321723.13

SECTION 329219 – SEEDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preparation of subsoil.

B. Placing topsoil.

C. Hydroseeding, mulching and fertilizer.

D. Maintenance.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Section 31 2200 - Grading: Topsoil material.

C. Section 31 2200 - Grading: Preparation of subsoil and placement of topsoil in preparation for the work of this section.

D. Section 31 2323 - Fill: Topsoil material.

E. Section 32 1125 - Turf Surfaced Aggregate Base Course: Additional seeding requirements.

1.03 DEFINITIONS

A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.04 REGULATORY REQUIREMENTS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Comply with regulatory agencies for fertilizer and herbicide composition.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of seed mixture.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable. Deliver seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

C. Furnish maintenance of seeded areas for three months from Date of Substantial Completion.

D. Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition.

PART 2 PRODUCTS

2.01 SEED MIXTURE

A. Seed Mixture: See general note sheet CG-001 and Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared soil base is ready to receive the work of this Section.

3.02 PREPARATION

A. Prepare subgrade in accordance with Section 31 2200.

B. Place topsoil in accordance with Section 31 2200.

C. Install edging at periphery of seeded areas in straight lines to consistent depth.

3.03 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Apply after smooth raking of topsoil and prior to roller compaction.

C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.

D. Mix thoroughly into upper 2 inches of topsoil.

E. Lightly water to aid the dissipation of fertilizer.

3.04 HYDROSEEDING

A. Apply seeded slurry with a hydraulic seeder at a rate of 100 lbs per 1000 sq ft evenly in two intersecting directions.

B. Do not hydroseed area in excess of that which can be mulched on same day.

C. Immediately following seeding, apply mulch to a thickness of 1/8 inches. Maintain clear of shrubs and trees.

D. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

E. Following germination, immediately re-seed areas without germinated seeds that are larger than 4 by 4 inches.

3.05 MAINTENANCE

A. Provide maintenance at no extra cost to Owner; Owner will pay for water.

B. See Section 01 7000 - Execution Requirements, for additional requirements relating to maintenance service.

C. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing.

D. Neatly trim edges and hand clip where necessary.

E. Immediately remove clippings after mowing and trimming.

F. Water to prevent grass and soil from drying out.

G. Roll surface to remove minor depressions or irregularities.

H. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.

I. Immediately reseed areas that show bare spots.

J. Protect seeded areas with warning signs during maintenance period.

END OF SECTION 329219

SECTION 330513 - MANHOLES AND STRUCTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Monolithic concrete manholes with masonry transition to lid frame, covers, anchorage, and accessories.

B. Modular precast concrete manhole sections with tongue-and-groove joints with masonry transition to lid frame, covers, anchorage, and accessories.

C. Monolithic FRP manholes with transition to lid frame, covers, anchorage, and accessories.

D. Masonry manhole sections with masonry transition to lid frame, covers, anchorage, and accessories.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

B. Section 03 3000 - Cast-in-Place Concrete.

C. Section 04 2000 - Unit Masonry: Masonry units and mortar and grout.

1.03 REFERENCE STANDARDS

A. Perform all work in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

B. ACI 530/530.1/ERTA - Building Code Requirements and Specification for Masonry Structures and Related Commentaries; American Concrete Institute International; 2011.

C. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2003 (Reapproved 2008).

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2012.

E. ASTM C55 - Standard Specification for Concrete Building Brick; 2011.

F. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale); 2012.

G. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections; 2012.

H. ASTM C478M - Standard Specification for Precast Reinforced Concrete Manhole Sections [Metric]; 2012.

I. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals; 2008.

J. ASTM C923M - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals [Metric]; 2008b.

K. ASTM D3753 - Standard Specification for Glass-Fiber-Reinforced Polyester Manholes and Wetwells; 2012.

1.04 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of ACI 530/530.1/ERTA or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 MATERIALS

A. Manhole Sections: Reinforced precast concrete in accordance with ASTM C478 (ASTM C478M), with resilient connectors complying with ASTM C923 (ASTM C923M).

B. Manhole Sections: ASTM D3753, glass-fiber reinforced polyester with integral steps.

C. Concrete: As specified in Section 03 3000.

D. Mortar and Grout: As specified in Section 04 2000, Type S.

E. Concrete Reinforcement: As specified in Section 03 3000.

2.02 CONFIGURATION

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify items provided by other sections of Work are properly sized and located.

B. Verify that built-in items are in proper location, and ready for roughing into Work.

C. Verify excavation for manholes is correct.

3.02 PREPARATION

A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

3.03 MANHOLES

A. Place concrete base pad, trowel top surface level.

B. Place manhole sections plumb and level, trim to correct elevations, anchor to base pad.

C. Form and place manhole cylinder plumb and level, to correct dimensions and elevations. As work progresses, build in fabricated metal items.

D. Cut and fit for pipe.

E. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour as required.

F. Coordinate with other sections of work to provide correct size, shape, and location.

3.04 MASONRY WORK

A. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

B. Lay masonry units in running bond. Course one unit and one mortar joint to equal 8 inches.

C. Form concave mortar joints.

D. Lay masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

E. Install joint reinforcement 16 inches on center.

F. Place joint reinforcement in first and second horizontal joints above base pad and below lid frame opening.

END OF SECTION 330513

SECTION 331116 - SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe and fittings for site water lines including domestic water lines and fire water lines.

B. Valves, Fire hydrants, and Domestic water hydrants.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

B. Section 03 3000 - Cast-in-Place Concrete: Concrete for thrust restraints.

C. Section 31 2316 - Excavation: Excavating of trenches.

D. Section 31 2323 - Fill: Bedding and backfilling.

E. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.

F. Section 33 0513 - Manholes and Structures.

G. Section 03 3000 - Cast-in-Place Concrete: Concrete for thrust restraints.

H. Section 09 9000 - Painting and Coating.

1.03 REFERENCES

A. Perform all work in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2012 (ANSI B16.18).

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; The American Society of Mechanical Engineers; 2001 (R2010).

D. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2009.

E. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2012.

F. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2009.

G. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2006.

H. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2010).

I. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter; 2012.

J. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals; 1998 (Reapproved 2011).

K. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society; 2011 and errata.

L. AWWA C104/A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water; American Water Works Association; 2008 (ANSI/AWWA C104/A21.4).

M. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; American Water Works Association; 2010 (ANSI/AWWA C105/A21.5).

N. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; American Water Works Association; 2007 (ANSI/AWWA C111/A21.11).

O. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast, for Water; American Water Works Association; 2009 (ANSI/AWWA C151/A21.51).

P. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service; American Water Works Association; 2009.

Q. AWWA C502 - Dry Barrel Fire Hydrants; American Water Works Association; 2005 (ANSI/AWWA C502/C502a).

R. AWWA C504 - Rubber Seated Butterfly Valves; American Water Works Association; 2010.

S. AWWA C508 - Swing-Check Valves for Waterworks Service, 2 In. (50 mm) Through 24 In. (600 mm) NPS; American Water Works Association; 2011 (ANSI/AWWA C508).

T. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service; American Water Works Association; 2009 (ANSI/AWWA C509).

U. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances; American Water Works Association; 2010 (ANSI/AWWA C600).

V. AWWA C606 - Grooved and Shouldered Joints; American Water Works Association; 2011.

W. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Distribution; American Water Works Association; 2008 (ANSI/AWWA C900/C900a).

X. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service; American Water Works Association; 2008.

Y. UL 246 - Hydrants for Fire-Protection Service; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

1.05 QUALITY ASSURANCE

A. Perform all work in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers with labeling in place.

PART 2 PRODUCTS

2.01 WATER PIPE

A. Provide material in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

2.02 VALVES

A. Provide valves in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

B. Valves: Manufacturer's name and pressure rating marked on valve body.

2.03 HYDRANTS

A. Provide hydrants in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

B. Hydrants: AWWA C502, UL 246, dry barrel type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building service connection and municipal utility water main size, location, and invert are as indicated.

3.02 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

3.03 TRENCHING

A. See the sections on excavation and fill for additional requirements.

B. See Section 31 2316.13 for additional requirements.

C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.04 INSTALLATION - PIPE

A. Route pipe in straight line.

B. Install pipe to allow for expansion and contraction without stressing pipe or joints.

C. Slope water pipe and position drains at low points.

3.05 INSTALLATION - VALVES AND HYDRANTS

A. Set valves on solid bearing.

B. Center and plumb valve box over valve. Set box cover flush with finished grade.

C. Set hydrants plumb; locate pumper nozzle perpendicular to and facing roadway.

D. Set hydrants to grade, with nozzles at least 20 inches above ground.

E. Locate control valve 4 inches away from hydrant.

F. Provide a drainage pit 36 inches square by 24 inches deep filled with 2 inches washed gravel. Encase elbow of hydrant in gravel to 6 inches above drain opening. Do not connect drain opening to sewer.

G. Paint hydrants in accordance with Section 09 9000.

3.06 SERVICE CONNECTIONS

A. Provide water service to utility company requirements with reduced pressure backflow preventer and water meter with by-pass valves and sand strainer.

B. Provide sleeve in retaining wall for service main. Support with reinforced concrete bridge. Calk enlarged sleeve watertight.

C. Anchor service main to interior surface of foundation wall.

D. Provide 18 gage galvanized sheet metal sleeve surrounding service main to 6 inches above floor and 6 feet minimum below grade. Size for 2 inches minimum of glass fiber insulation stuffing.

END OF SECTION 331116

SECTION 331300 - DISINFECTING OF WATER UTILITY DISTRIBUTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Disinfection of site domestic water lines and site fire water lines specified in Section 33 1116.

B. Disinfection of building domestic water piping specified in Section 22 1005.

C. Disinfection of water storage tanks.

D. Testing and reporting results.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

B. Section 33 1116 - Site Water Utility Distribution Piping.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 2200 - Unit Prices, for additional unit price requirements.

B. Disinfection: By the linear foot. Includes preparing, disinfecting, testing, and reporting.

1.04 REFERENCE STANDARDS

A. Perform all work in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

B. AWWA B300 - Hypochlorites; American Water Works Association; 2011 (ANSI/AWWA B300).

C. AWWA B301 - Liquid Chlorine; American Water Works Association; 2010 (ANSI/AWWA B301).

D. AWWA B302 - Ammonium Sulfate; American Water Works Association; 2010 (ANSI/AWWA B302).

E. AWWA B303 - Sodium Chlorite; American Water Works Association; 2010.

F. AWWA C651 - Disinfecting Water Mains; American Water Works Association; 2005 (ANSI/AWWA C651).

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Test Reports: Indicate results comparative to specified requirements.

C. Disinfection report:
   1. Type and form of disinfectant used.
   2. Date and time of disinfectant injection start and time of completion.
   3. Test locations.
   4. Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
   5. Date and time of flushing start and completion.

6. Disinfectant residual after flushing in ppm for each outlet tested.

D. Bacteriological report:
   1. Date issued, project name, and testing laboratory name, address, and telephone number.
   2. Time and date of water sample collection.
   3. Name of person collecting samples.
   4. Test locations.
   5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
   6. Coliform bacteria test results for each outlet tested.
   7. Certification that water conforms, or fails to conform, to bacterial standards of the NTUA Underground Electric Construction Standards (2014 Edition).

PART 3 EXECUTION

3.01 DISINFECTION

A. Use method prescribed by the applicable state or local codes, or health authority or water purveyor having jurisdiction, or in the absence of any of these follow AWWA C651.

B. Provide and attach equipment required to perform the work.

C. Inject treatment disinfectant into piping system.

D. Maintain disinfectant in system for 24 hours.

E. Flush, circulate, and clean until required cleanliness is achieved; use municipal domestic water.

F. Replace permanent system devices removed for disinfection.

END OF SECTION 331300

SECTION 333111 - SITE SANITARY UTILITY SEWERAGE PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sanitary sewerage drainage piping, fittings, and accessories.

B. Connection of building sanitary drainage system to municipal sewers.

C. Cleanout Access.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

B. Section 03 3000 - Cast-in-Place Concrete: Concrete for cleanout base pad construction.

C. Section 31 2316 - Excavation: Excavating of trenches.

D. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.

E. Section 31 2323 - Fill: Bedding and backfilling.

F. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.

G. Section 33 0513 - Manholes and Structures.

H. Section 03 3000 - Cast-in-Place Concrete: Concrete for cleanout base pad construction.

1.03 REFERENCE STANDARDS

A. Perform all work in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

B. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2009.

C. ASTM A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe; 2009.

D. ASTM C12 - Standard Practice for Installing Vitrified Clay Pipe Lines; 2009.

E. ASTM C14 - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe; 2011.

F. ASTM C14M - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe [Metric]; 2011.

G. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; 2012a.

H. ASTM C76M - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe (Metric); 2012a.

I. ASTM C425 - Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings; 2004 (Reapproved 2009).

J. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2012.

K. ASTM C443M - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric); 2011.

L. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2011.

M. ASTM C700 - Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated; 2011.

N. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2012.

O. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2011.

P. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.

Q. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings; 2005.

R. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2008.

S. AWWA C111/A21.11 - American National Standard for Rubber Gasket Joints For Cast Iron and Ductile Iron Pressure Pipe and Fittings; 2007. (ANSI/AWWA C111/A21.11)

1.04 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.05 REGULATORY REQUIREMENTS

A. Perform all work in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

1.06 PROJECT CONDITIONS

A. Coordinate the Work with termination of sanitary sewer connection outside building, connection to municipal sewer utility service, and trenching.

PART 2 PRODUCTS

2.01 SEWER PIPE MATERIALS

A. Provide material in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

B. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

2.02 PIPE ACCESSORIES

A. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Sewer Service " in large letters.

2.03 BEDDING AND COVER MATERIALS

A. Pipe Bedding Material: As specified in Section 31 2316.13.

B. Pipe Cover Material: As specified in Section 31 2316.13.

PART 3 EXECUTION

3.01 GENERAL

A. Perform work in accordance with applicable code(s).

3.02 TRENCHING

A. See Section 31 2316.13 for additional requirements.

B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.03 INSTALLATION - PIPE

A. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

B. Connect to building sanitary sewer outlet, through installed sleeves.

C. Install trace wire 6 inches above top of pipe; coordinate with Section 31 2316.13.

END OF SECTION 333111

SECTION 33 4213 - PIPE CULVERTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe culvert, joints and accessories.

B. Bedding and slope protection at pipe end.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

B. Section 31 2316 - Excavation: Excavating of trenches.

C. Section 31 2323 - Fill: Bedding and backfilling.

D. Section 31 3700 - Riprap.

1.03 REFERENCE STANDARDS

A. Perform all work in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

B. ASTM A929/A929M - Standard Specification for Steel Sheet, Metallic-Coated by the Hot-Dip Process for Corrugated Steel Pipe; 2001 (Reapproved 2007).

C. ASTM C14 - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe; 2011.

D. ASTM C14M - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe [Metric]; 2011.

E. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; 2012a.

F. ASTM C76M - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe (Metric); 2012a.

G. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2012.

H. ASTM C443M - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric); 2011.

PART 2 PRODUCTS

2.01 STEEL CULVERT PIPE

A. Provide material in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

B. Corrugated Steel Pipe: Fabricated of ASTM A929/A929M galvanized steel sheet:

C. Coupling Bands: Galvanized steel, 0.052 inches thick x 10 inches wide; connected with two neoprene "O" ring gaskets and two galvanized steel bolts.

2.02 BEDDING AND COVER MATERIALS

A. Bedding: As specified in Section 31 2316.13.

B. Cover: As specified in Section 31 2316.13.

END OF SECTION 334213

SECTION 323113 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

PART 2 - PRODUCTS

2.1 FENCE COMPONENTS

A. Fabric: Metallic-coated steel, 72” x 2-1/4” x 9-gauge black residential wire-knuckle knuckle
   1. Manufacturer: America’s Fence Store
   2. Vinyl Coating: ASTM F 668, Class 2a or 2b.
   3. Color: Black
   4. Selvage: Knuckled on both selvages.

B. Posts and Rails: Galvanized-steel pipe complying with ASTM F 1043 requirements for heavy industrial fence and color coated to match fabric.

C. Tension Wire: Metallic-coated steel, ASTM A 817 and ASTM A 824 vinyl-coated steel, ASTM F 1664, in color matching fabric.

D. Fittings and Accessories: ASTM F 626, color coated to match fabric, and as follows:

   1. Post and Line Caps: Provide weathertight cap for each post. Provide line post caps with loop to receive tension wire or top rail.
   2. Post Brace Assembly: Same material as top rail with 3/8-inch- (9.5-mm-) diameter rod and adjustable tightener.
   3. Bottom and Center Rail: Same material as top rail with cap on each end.

E. Gate Posts, Swing Gates, and Accessories: ASTM F 900, same metal and finish as posts and rails, with galvanized hardware and accessories.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fence to comply with ASTM F 567.

B. Excavation: Drill post holes 8 inches (200 mm) in diameter and 40 inches (1.02 m) in depth, equally spaced, but not more than 10 feet (3.05 m) apart.

C. Setting Posts: Set posts in holes approximately 4 inches (102 mm) above bottom of excavation. Align posts vertically and align tops. Pour concrete footings with tops 2 inches (50.8 mm) above grade, troweled to a crown to shed water.

END OF SECTION 323113

SECTION 311000 - SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Clearing and protection of vegetation.

B. Removal of existing debris.

1.02 RELATED REQUIREMENTS

1.03

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Section 01 1000 - Summary: Limitations on Contractor's use of site and premises.

C. Section 01 1000 - Summary: Sequencing and staging requirements.

D. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

E. Section 01 7000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products.

F. Section 31 2200 - Grading: Topsoil removal.

G. Section 31 2200 - Grading: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

H. Section 31 2323 - Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

I. Section 31 2323 - Fill: Filling holes, pits, and excavations generated as a result of removal operations.

1.04

1.05 QUALITY ASSURANCE

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

PART 2 PRODUCTS

2.01 MATERIALS

A. Fill Material: As specified in Section 31 2200 – Grading

PART 3 EXECUTION

3.01 SITE CLEARING

A. Comply with other requirements specified in Section 01 7000.

B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.02 EXISTING UTILITIES AND BUILT ELEMENTS

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Protect existing structures and other elements that are not to be removed.

3.03 VEGETATION

A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, playing fields, lawns, and planting beds.

B. Do not begin clearing until vegetation to be relocated has been removed.

C. Do not remove or damage vegetation beyond the following limits:
   1. 40 feet outside the building perimeter.
   2. 10 feet each side of surface walkways, patios, surface parking, and utility lines less than 12 inches in diameter.
   3. 15 feet each side of roadway curbs and main utility trenches.
   4. 25 feet outside perimeter of pervious paving areas that must not be compacted by construction traffic.
   5. Exception: Specific trees and vegetation indicated on drawings to be removed.
   6. Exception: Selective thinning of undergrowth specified elsewhere.

D. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:
   1. At vegetation removal limits.
   2. Around trees to remain within vegetation removal limits; locate no closer to tree than at the drip line.
   3. Around other vegetation to remain within vegetation removal limits.

E. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.

F. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.
   1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
   2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
   3. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.
   4. Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and smooth enough not to constitute a hazard to pedestrians.

G. Dead Wood: Remove all dead trees (standing or down), limbs, and dry brush on entire site; treat as specified for vegetation removed.

H. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

3.04 DEBRIS

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 311000

SECTION 312200 – GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of topsoil.

B. Rough grading and clearing the site for structures, building pads, and roadway improvements.

C. Finish grading.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Section 31 1000 - Site Clearing.

C. Section 31 2316 - Excavation.

D. Section 31 2323 - Fill: Filling and compaction.

1.03 SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.04 QUALITY ASSURANCE

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

1.05 PROJECT CONDITIONS

A. Protect above- and below-grade utilities that remain.

B. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from grading equipment and vehicular traffic.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil: See Section 31 2323.

B. Other Fill Materials: See Section 31 2323.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Locate, identify, and protect from damage above- and below-grade utilities to remain.

D. Notify utility company to remove and relocate utilities.

3.03 ROUGH GRADING

A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.

B. Do not remove topsoil when wet.

C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.

D. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.

E. When excavating through roots, perform work by hand and cut roots with sharp axe.

F. See Section 31 2323 for filling procedures.

G. Benching Slopes: Horizontally bench existing slopes greater than 1:4 to key fill material to slope for firm bearing.

H. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

3.04 SOIL REMOVAL

A. Remove excavated topsoil from site.

B. Stockpile excavated subsoil on site.

C. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion.

3.05 FINISH GRADING

A. Before Finish Grading:
   1. Verify building and trench backfilling have been inspected.
   2. Verify subgrade has been contoured and compacted.

B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.

C. Where topsoil is to be placed, scarify surface to depth of 3 inches.

D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.

E. Place topsoil in areas where seeding are indicated.

F. Place topsoil where required to level finish grade.

G. Place topsoil to thickness as scheduled.

H. Place topsoil during dry weather.

I. Remove roots, weeds, rocks, and foreign material while spreading.

J. Near plants spread topsoil manually to prevent damage.

K. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

L. Lightly compact placed topsoil.

3.06 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.

B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).

C. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.

D. Top Surface of Finish Grade: Plus or minus 1/2 inch.

3.07 FIELD QUALITY CONTROL

A. See Section 31 2323 for compaction density testing.

3.08 CLEANING

A. Remove unused stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water.

B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION 312200

SECTION 312316 – EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating for building volume below grade, footings, pile caps, slabs-on-grade, paving, site structures, and utilities within the building.

B. Trenching for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Section 31 2200 - Grading: Soil removal from surface of site.

C. Section 31 2200 - Grading: Grading.

D. Section 31 2323 - Fill: Fill materials, filling, and compacting.

1.03 PROJECT CONDITIONS

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

B. Protect plants, lawns, rock outcroppings, and other features to remain.

C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

PART 3 EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 31 2200 for additional requirements.

3.02 EXCAVATING

A. Underpin adjacent structures that could be damaged by excavating work.

B. Excavate to accommodate new structures and construction operations.

C. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

D. Preparation for Piling Work: Excavate to working elevations. Coordinate special requirements for piling.

E. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

F. Do not interfere with 45 degree bearing splay of foundations.

G. Cut utility trenches wide enough to allow inspection of installed utilities.

H. Hand trim excavations. Remove loose matter.

I. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 2323.

J. Grade top perimeter of excavation to prevent surface water from draining into excavation.

K. Remove excavated material that is unsuitable for re-use from site.

L. Stockpile excavated material to be re-used in area designated on site in accordance with Section 31 2200.

M. Remove excess excavated material from site.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

B. Provide for visual inspection of load-bearing excavated surfaces before placement of foundations.

3.04 PROTECTION

A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

END OF SECTION 312316

SECTION 312316.13 – TRENCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backfilling and compacting for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Section 31 2200 - Grading: Site grading.

C. Section 31 2316 - Excavation: Building and foundation excavating.

D. Section 31 2323 - Fill: Backfilling at building and foundations.

1.03 REFERENCES

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 2010.

C. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2006.

D. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

E. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.

F. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.

G. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.

H. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

I. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.

J. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

K. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.

L. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2010

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Compaction Density Test Reports.

1.05 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where indicated by architect and/or construction manager.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. Perform all work in accordance with the geotechnical report.

PART 3 EXECUTION

3.01 EXAMINATION

3.02 TRENCHING

A. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

B. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Cut trenches wide enough to allow inspection of installed utilities.

E. Hand trim excavations. Remove loose matter.

F. Remove excavated material that is unsuitable for re-use from site.

G. Remove excess excavated material from site.

3.03 PREPARATION FOR UTILITY PLACEMENT

A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.04 BACKFILLING

A. Backfill to contours and elevations indicated using unfrozen materials.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

F. Correct areas that are over-excavated.
   1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

G. Compaction Density Unless Otherwise Specified or Indicated:

H. Reshape and re-compact fills subjected to vehicular traffic.

3.05 BEDDING AND FILL AT SPECIFIC LOCATIONS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

3.06 FIELD QUALITY CONTROL

A. Perform compaction testing in accordance with recommendations contained in the geotechnical report.

B. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

C. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D2922, or ASTM D3017.

D. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor"), or AASHTO T 180.

E. If tests indicate work does not meet specified requirements, remove work, replace and retest.

END OF SECTION 312316.13

SECTION 312323 – FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Filling, backfilling, and compacting for building volume below grade.

B. Backfilling and compacting for utilities outside the building to utility main connections.

C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the Geotechnical Report.

B. Section 31 2200 - Grading: Removal and handling of soil to be re-used.

C. Section 31 2200 - Grading: Site grading.

D. Section 31 2316 - Excavation: Removal and handling of soil to be re-used.

E. Section 31 3700 - Riprap.

1.03 REFERENCE STANDARDS

A. Perform all work in accordance with the Geotechnical Report

B. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 2010.

C. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2006.

D. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

E. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.

F. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.

G. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.

H. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

I. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.

J. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

K. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.

L. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and

Soil-Aggregate by Nuclear Methods (Shallow Depth); 2010.

1.04 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

B. Subgrade Elevations: Indicated on drawings.

1.05 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where indicated.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.

C. Verify that survey bench marks and intended elevations for the Work are as indicated.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. Perform all work in accordance with the Geotechnical Report

B. Concrete for Fill: Lean concrete.

C. Topsoil: See Section 31 2200.

PART 3 EXECUTION

3.01 EXAMINATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 31 2200 for additional requirements.

C. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

D. Verify structural ability of unsupported walls to support imposed loads by the fill.

E. Verify underground tanks are anchored to their own foundations to avoid flotation after backfilling.

3.02 PREPARATION

A. Scarify subgrade surface to a depth of 6 inches to identify soft spots.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 FILLING

A. Fill to contours and elevations indicated using unfrozen materials.

B. Fill up to subgrade elevations unless otherwise indicated.

C. Employ a placement method that does not disturb or damage other work.

D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

G. Correct areas that are over-excavated.
   1. Load-bearing foundation surfaces: Fill with concrete.
   2. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

H. Compaction Density Unless Otherwise Specified or Indicated:

I. Reshape and re-compact fills subjected to vehicular traffic.

3.04 FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

B. Under Interior Slabs-On-Grade:
   1. Use granular fill.
   2. Compact to 95 percent of maximum dry density.
   3. Cover with sand.
      a. Depth: 2 inches.
      b. Compact to 95 percent of maximum dry density.

C. At Foundation Walls and Footings:
   1. Use general fill.
   2. Fill up to subgrade elevation.
   3. Compact each lift to 90 percent of maximum dry density.
   4. Do not backfill against unsupported foundation walls.

3.05 FIELD QUALITY CONTROL

A. Perform compaction testing in accordance with recommendations contained in the geotechnical report.

B. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

C. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D2922, or ASTM D3017.

D. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor"), or AASHTO T 180.

E. If tests indicate work does not meet specified requirements, remove work, replace and retest.

3.06 CLEANING

A. Leave unused materials in a neat, compact stockpile.

B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION 312323

SECTION 313700 – RIPRAP

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Riprap.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Section 31 2323 - Fill: Aggregate requirements.

1.03 QUALITY ASSURANCE

A. Perform all work in accordance with Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Maintain one copy of each document on site.

PART 2 PRODUCTS

2.01 MATERIALS

A. Riprap: Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Aggregate: Granular fill as specified in Section 31 2323.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not place riprap bags over frozen or spongy subgrade surfaces.

3.02 PLACEMENT

A. Place geotextile fabric over substrate, lap edges and ends.

B. Place riprap at culvert pipe ends, embankment slopes, and at locations specified in plans.

C. Place into position. Knead, ram, or pack filled bags to conform to contour of adjacent material and other bags previously placed.

D. Reference sheet C-101 for shape and dimensions. Reference sheet C-502 for required thickness.

E. Place rock evenly and carefully over bagged riprap to minimize voids, do not tear bag fabric, place bags and rock in one consistent operation to preclude disturbance or displacement of substrate.

F. After placement, spray with water to moisten the bagged mix. Maintain moist for 24 hours.

3.03 SCHEDULES

A. Culvert Pipe Ends: Bagged, placed one layer thick, 6 inch average thickness, concealed with topsoil fill.

B. Sloped Grade at Retaining Wall: Individual riprap units, 6 inch thickness; placed prior to finish topsoil.

END OF SECTION 313700

SECTION 321123 - AGGREGATE BASE COURSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aggregate base course.

B. Paving aggregates.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Section 31 2200 - Grading: Preparation of site for base course.

C. Section 31 2323 - Fill: Compacted fill under base course.

D. Section 32 1216 - Asphalt Paving: Binder and finish asphalt courses.

1.03 REFERENCE STANDARDS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses; American Association of State Highway and Transportation Officials; 1965 (2004).

C. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 2010.

D. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2006.

E. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

F. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.

G. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.

H. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.

I. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

J. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.

K. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

L. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.

1.04 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When aggregate materials need to be stored on site, locate stockpiles where indicated.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.

C. Verify that survey bench marks and intended elevations for the Work are as indicated.

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide material in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

2.02 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for testing and analysis of aggregate materials.

B. Where aggregate materials are specified using ASTM D2487 classification, test and analyze samples for compliance before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.02 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place aggregate on soft, muddy, or frozen surfaces.

3.03 INSTALLATION

A. Place aggregate in maximum 4 inch layers and roller compact to specified density.

B. Level and contour surfaces to elevations and gradients indicated.

C. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

D. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

E. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.04 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION 321123

SECTION 321216 - ASPHALT PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aggregate base course.

B. Single course bituminous concrete paving.

C. Double course bituminous concrete paving.

D. Surface sealer.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Section 31 2200 - Grading: Preparation of site for paving and base.

C. Section 31 2323 - Fill: Compacted subgrade for paving.

1.03 REFERENCE STANDARDS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types; The Asphalt Institute; 1997.

C. AI MS-19 - A Basic Asphalt Emulsion Manual; The Asphalt Institute; Fourth Edition.

D. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction; 2009a.

1.04 QUALITY ASSURANCE

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Mixing Plant: Provide material in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

C. Obtain materials from same source throughout.

1.05 REGULATORY REQUIREMENTS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Conform to applicable code for paving work on public property.

PART 2 PRODUCTS

2.01 MATERIALS

A. Aggregate for Base Course: Provide material in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Obtain materials from quarries located within a 500 mile radius of project site.

2.02 ASPHALT PAVING MIXES AND MIX DESIGN

A. Provide material in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

2.03 SUBMITTALS

A. Mix design

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 BASE COURSE

A. Place and compact base course.

3.03 PLACING ASPHALT PAVEMENT - SINGLE COURSE

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Place asphalt within 24 hours of applying primer or tack coat.

C. Install gutter drainage grilles and frames in correct position and elevation.

D. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

E. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.04 PLACING ASPHALT PAVEMENT - DOUBLE COURSE

A. Place asphalt binder course within 24 hours of applying primer or tack coat.

B. Place wearing course within two hours of placing and compacting binder course.

C. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

D. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.05 SEAL COAT

A. Apply seal coat to surface course and asphalt curbs in accordance with AI MS-19.

3.06 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Compacted Thickness: Within 1/4 inch of specified or indicated thickness.

C. Variation from True Elevation: Within 1/2 inch.

3.07 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for quality control.

B. Provide field inspection and testing. Take samples and perform tests in accordance with AI MS-2.

END OF SECTION 321216

SECTION 321313 - CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete sidewalks, stair steps, integral curbs, gutters, median barriers, parking areas, and roads.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Section 31 2200 - Grading: Preparation of site for paving and base and preparation of subsoil at pavement perimeter for planting.

C. Section 31 2323 - Fill: Compacted subbase for paving.

D. Section 32 1123 - Aggregate Base Courses: Aggregate base course.

E. Section 32 1216 - Asphalt Paving: Asphalt wearing course.

F. Section 03 2000 - Concrete Reinforcing.

1.03 REFERENCE STANDARDS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991 (Reapproved 2002).

C. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2010.

D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 2000.

E. ACI 305R - Hot Weather Concreting; American Concrete Institute International; 2010.

F. ACI 306R - Cold Weather Concreting; American Concrete Institute International; 2010.

G. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.

H. ASTM A497/A497M - Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete; 2007.

I. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2012.

J. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2011a.

K. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2012a.

L. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2012.

M. ASTM C150/C150M - Standard Specification for Portland Cement; 2012.

N. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2010b.

O. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.

P. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.

Q. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2012.

R. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2012.

S. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2011.

T. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2008).

U. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction; 2004a (Reapproved 2008).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Design Data: Indicate pavement thickness, designed concrete strength, reinforcement, and typical details.

PART 2 PRODUCTS

2.01 PAVING ASSEMBLIES

A. Comply with applicable requirements of ACI 301.

B. Design paving for parking and residential streets.

C. Concrete Sidewalks and Median Barrier: 3,000 psi, 28 day concrete. See plans for sections.

D. Parking Area Pavement: 4,000 psi, 28 day concrete. See plans for sections.

2.02 FORM MATERIALS

A. Form Materials: Conform to ACI 301.

B. Joint Filler: Preformed; non-extruding bituminous type (ASTM D1751) or sponge rubber or cork (ASTM D1752).
   1. Thickness: 1/2 inch.

2.03 REINFORCEMENT

A. Reinforcing Steel and Welded Wire Reinforcement: Types specified in Section 03 2000.

2.04 CONCRETE MATERIALS

A. Obtain materials from quarries located within a 500 mile radius of project site.

B. Provide for 20% fly ash replacement of cement.

2.05 ACCESSORIES

A. Acid Etch Solution: Muriatic type mixed to a five percent solution.

2.06 CONCRETE MIX DESIGN

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

2.07 MIXING

A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C94M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

B. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 SUBBASE

A. See Section 32 1123 for construction of base course for work of this Section.

3.03 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.

B. Coat surfaces of manhole frames with oil to prevent bond with concrete pavement.

C. Notify Architect minimum 24 hours prior to commencement of concreting operations.

3.04 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.05 REINFORCEMENT

A. Place reinforcement at top of slabs-on-grade.

B. Interrupt reinforcement at contraction joints.

C. Place dowels to achieve pavement and curb alignment as detailed.

3.06 COLD AND HOT WEATHER CONCRETING

A. Follow recommendations of ACI 305R when concreting during hot weather.

B. Follow recommendations of ACI 306R when concreting during cold weather.

C. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

3.07 PLACING CONCRETE

A. Coordinate installation of snow melting components.

B. Place concrete in accordance with ACI 304R.

C. Do not place concrete when base surface is wet.

D. Place concrete using the slip form technique.

E. Ensure reinforcement, inserts, embedded parts, formed joints and expansion joints are not disturbed during concrete placement.

3.08 JOINTS

A. Align curb, gutter, and sidewalk joints.

B. Place 3/8 inch wide expansion joints at 20 foot intervals and to separate paving from vertical surfaces and other components and in pattern indicated.
   1. Form joints with joint filler extending from bottom of pavement to within 1/2 inch of finished surface.
   2. Secure to resist movement by wet concrete.

C. Provide scored joints:
   1. At 3 feet intervals.
   2. Between sidewalks and curbs.
   3. Between curbs and pavement.

D. Provide keyed joints as indicated.

E. Saw cut contraction joints 3/16 inch wide at an optimum time after finishing. Cut 1/3 into depth of slab.

3.09 EXPOSED AGGREGATE

A. Wash scheduled concrete surfaces with acid etch solution exposing aggregate to match sample panel.

3.10 FINISHING

A. Area Paving: Light broom, texture perpendicular to pavement direction.

B. Sidewalk Paving: Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/4 inch radius.

C. Median Barrier: Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/4 inch radius.

D. Curbs and Gutters: Light broom, texture parallel to pavement direction.

E. Inclined Vehicular Ramps: Broomed perpendicular to slope.

F. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.11 TOLERANCES

A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.

B. Maximum Variation From True Position: 1/4 inch.

3.12 PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Do not permit pedestrian traffic over pavement for 7 days minimum after finishing.

END OF SECTION 321313

SECTION 321723.13 - PAINTED PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Parking lot markings, including parking bays, crosswalks, arrows, handicapped symbols, and curb markings.

B. Roadway lane markings and crosswalk markings.

C. "No Parking" curb painting. Fire lane curb painting.

1.02 RELATED REQUIREMENTS

A. Section 32 1216 - Asphalt Paving.

B. Section 32 1313 - Concrete Paving.

1.03 REFERENCE STANDARDS

A. Perform all work in accordance with Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. FS TT-B-1325 - Beads (Glass Spheres); Retro-Reflective; Rev. D, 2007.

C. FS TT-P-1952 - Paint, Traffic Black, and Airfield Marking, Waterborne; Rev. E, 2007.

D. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.

E. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; 2004.

F. FHWA MUTCD - Manual on Uniform Traffic Control Devices for Streets and Highways; U.S. Department of Transportation, Federal Highway Administration; http://mutcd.fhwa.dot.gov; current edition.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver paint in containers of at least 5 gallons accompanied by batch certificate.

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MATERIALS

A. Line and Zone Marking Paint: MPI No. 97 Latex Traffic Marking Paint; color(s) as indicated.
   1. Roadway Markings: As required by authorities having jurisdiction.
   2. Parking Lots: Yellow.
   3. Handicapped Symbols: Blue.
   4. Fire lane curb as required by Fire Mashall.

B. Temporary Marking Tape: Preformed, reflective, pressure sensitive adhesive tape in color(s) required; Contractor is responsible for selection of material of sufficient durability as to perform satisfactorily during period for which its use is required.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of marking materials.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Clean surfaces thoroughly prior to installation.
   1. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods.

D. Where oil or grease are present, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application; after cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint.

E. Establish survey control points to determine locations and dimensions of markings; provide templates to control paint application by type and color at necessary intervals.

F. Temporary Pavement Markings: When required or directed by Architect, apply temporary markings of the color(s), width(s) and length(s) as indicated or directed.
   1. After temporary marking has served its purpose, remove temporary marking by carefully controlled sandblasting, approved grinding equipment, or other approved method so that surface to which the marking was applied will not be damaged.
   2. At Contractor's option, temporary marking tape may used in lieu of temporary painted marking; remove unsatisfactory tape and replace with painted markings at no additional cost to Owner.

3.03 INSTALLATION

A. Begin pavement marking as soon as practicable after surface has been cleaned and dried.

B. Do not apply paint if temperature of surface to be painted or the atmosphere is less than 50 degrees F or more than 95 degrees F.

C. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts.

D. Comply with FHWA MUTCD manual (http://mutcd.fhwa.dot.gov) for details not shown.

E. Apply markings in locations determined by measurement from survey control points; preserve control points until after markings have been accepted.

F. Apply uniformly painted markings of color(s), lengths, and widths as indicated on the drawings true, sharp edges and ends.
   1. Apply paint in one coat only.
   2. Wet Film Thickness: 0.015 inch, minimum.
   3. Width Tolerance: Plus or minus 1/8 inch.

G. Roadway Traffic Lanes: Use suitable mobile mechanical equipment that provides constant agitation of paint and travels at controlled speeds.
   1. Conduct operations in such a manner that necessary traffic can move without hindrance.
   2. Place warning signs at the beginning of the wet line, and at points well in advance of the marking equipment for alerting approaching traffic from both directions. Place small flags or other similarly effective small objects near freshly applied markings at frequent intervals to reduce crossing by traffic.
   3. If paint does not dry within expected time, discontinue paint operations until cause of slow drying is determined and corrected.
   4. Skip Markings: Synchronize one or more paint "guns" to automatically begin and cut off paint flow; make length of intervals as indicated.
   5. Use hand application by pneumatic spray for application of paint in areas where a mobile paint applicator cannot be used.

H. Parking Lots: Apply parking space lines, entrance and exit arrows, painted curbs, and other markings indicated on drawings.
   1. Mark the International Handicapped Symbol at indicated parking spaces.
   2. Hand application by pneumatic spray is acceptable.

I. Symbols: Use a suitable template that will provide a pavement marking with true, sharp edges and ends, of the design and size indicated.

END OF SECTION 321723.13

SECTION 329219 – SEEDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preparation of subsoil.

B. Placing topsoil.

C. Hydroseeding, mulching and fertilizer.

D. Maintenance.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Section 31 2200 - Grading: Topsoil material.

C. Section 31 2200 - Grading: Preparation of subsoil and placement of topsoil in preparation for the work of this section.

D. Section 31 2323 - Fill: Topsoil material.

E. Section 32 1125 - Turf Surfaced Aggregate Base Course: Additional seeding requirements.

1.03 DEFINITIONS

A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.04 REGULATORY REQUIREMENTS

A. Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

B. Comply with regulatory agencies for fertilizer and herbicide composition.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of seed mixture.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable. Deliver seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

C. Furnish maintenance of seeded areas for three months from Date of Substantial Completion.

D. Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition.

PART 2 PRODUCTS

2.01 SEED MIXTURE

A. Seed Mixture: See general note sheet CG-001 and Perform all work in accordance with the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction (Latest Edition).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared soil base is ready to receive the work of this Section.

3.02 PREPARATION

A. Prepare subgrade in accordance with Section 31 2200.

B. Place topsoil in accordance with Section 31 2200.

C. Install edging at periphery of seeded areas in straight lines to consistent depth.

3.03 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Apply after smooth raking of topsoil and prior to roller compaction.

C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.

D. Mix thoroughly into upper 2 inches of topsoil.

E. Lightly water to aid the dissipation of fertilizer.

3.04 HYDROSEEDING

A. Apply seeded slurry with a hydraulic seeder at a rate of 100 lbs per 1000 sq ft evenly in two intersecting directions.

B. Do not hydroseed area in excess of that which can be mulched on same day.

C. Immediately following seeding, apply mulch to a thickness of 1/8 inches. Maintain clear of shrubs and trees.

D. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

E. Following germination, immediately re-seed areas without germinated seeds that are larger than 4 by 4 inches.

3.05 MAINTENANCE

A. Provide maintenance at no extra cost to Owner; Owner will pay for water.

B. See Section 01 7000 - Execution Requirements, for additional requirements relating to maintenance service.

C. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing.

D. Neatly trim edges and hand clip where necessary.

E. Immediately remove clippings after mowing and trimming.

F. Water to prevent grass and soil from drying out.

G. Roll surface to remove minor depressions or irregularities.

H. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.

I. Immediately reseed areas that show bare spots.

J. Protect seeded areas with warning signs during maintenance period.

END OF SECTION 329219

SECTION 330513 - MANHOLES AND STRUCTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Monolithic concrete manholes with masonry transition to lid frame, covers, anchorage, and accessories.

B. Modular precast concrete manhole sections with tongue-and-groove joints with masonry transition to lid frame, covers, anchorage, and accessories.

C. Monolithic FRP manholes with transition to lid frame, covers, anchorage, and accessories.

D. Masonry manhole sections with masonry transition to lid frame, covers, anchorage, and accessories.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

B. Section 03 3000 - Cast-in-Place Concrete.

C. Section 04 2000 - Unit Masonry: Masonry units and mortar and grout.

1.03 REFERENCE STANDARDS

A. Perform all work in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

B. ACI 530/530.1/ERTA - Building Code Requirements and Specification for Masonry Structures and Related Commentaries; American Concrete Institute International; 2011.

C. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2003 (Reapproved 2008).

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2012.

E. ASTM C55 - Standard Specification for Concrete Building Brick; 2011.

F. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale); 2012.

G. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections; 2012.

H. ASTM C478M - Standard Specification for Precast Reinforced Concrete Manhole Sections [Metric]; 2012.

I. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals; 2008.

J. ASTM C923M - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals [Metric]; 2008b.

K. ASTM D3753 - Standard Specification for Glass-Fiber-Reinforced Polyester Manholes and Wetwells; 2012.

1.04 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of ACI 530/530.1/ERTA or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 MATERIALS

A. Manhole Sections: Reinforced precast concrete in accordance with ASTM C478 (ASTM C478M), with resilient connectors complying with ASTM C923 (ASTM C923M).

B. Manhole Sections: ASTM D3753, glass-fiber reinforced polyester with integral steps.

C. Concrete: As specified in Section 03 3000.

D. Mortar and Grout: As specified in Section 04 2000, Type S.

E. Concrete Reinforcement: As specified in Section 03 3000.

2.02 CONFIGURATION

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify items provided by other sections of Work are properly sized and located.

B. Verify that built-in items are in proper location, and ready for roughing into Work.

C. Verify excavation for manholes is correct.

3.02 PREPARATION

A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

3.03 MANHOLES

A. Place concrete base pad, trowel top surface level.

B. Place manhole sections plumb and level, trim to correct elevations, anchor to base pad.

C. Form and place manhole cylinder plumb and level, to correct dimensions and elevations. As work progresses, build in fabricated metal items.

D. Cut and fit for pipe.

E. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour as required.

F. Coordinate with other sections of work to provide correct size, shape, and location.

3.04 MASONRY WORK

A. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

B. Lay masonry units in running bond. Course one unit and one mortar joint to equal 8 inches.

C. Form concave mortar joints.

D. Lay masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

E. Install joint reinforcement 16 inches on center.

F. Place joint reinforcement in first and second horizontal joints above base pad and below lid frame opening.

END OF SECTION 330513

SECTION 331116 - SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe and fittings for site water lines including domestic water lines and fire water lines.

B. Valves, Fire hydrants, and Domestic water hydrants.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

B. Section 03 3000 - Cast-in-Place Concrete: Concrete for thrust restraints.

C. Section 31 2316 - Excavation: Excavating of trenches.

D. Section 31 2323 - Fill: Bedding and backfilling.

E. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.

F. Section 33 0513 - Manholes and Structures.

G. Section 03 3000 - Cast-in-Place Concrete: Concrete for thrust restraints.

H. Section 09 9000 - Painting and Coating.

1.03 REFERENCES

A. Perform all work in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2012 (ANSI B16.18).

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; The American Society of Mechanical Engineers; 2001 (R2010).

D. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2009.

E. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2012.

F. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2009.

G. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2006.

H. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2010).

I. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter; 2012.

J. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals; 1998 (Reapproved 2011).

K. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society; 2011 and errata.

L. AWWA C104/A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water; American Water Works Association; 2008 (ANSI/AWWA C104/A21.4).

M. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; American Water Works Association; 2010 (ANSI/AWWA C105/A21.5).

N. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; American Water Works Association; 2007 (ANSI/AWWA C111/A21.11).

O. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast, for Water; American Water Works Association; 2009 (ANSI/AWWA C151/A21.51).

P. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service; American Water Works Association; 2009.

Q. AWWA C502 - Dry Barrel Fire Hydrants; American Water Works Association; 2005 (ANSI/AWWA C502/C502a).

R. AWWA C504 - Rubber Seated Butterfly Valves; American Water Works Association; 2010.

S. AWWA C508 - Swing-Check Valves for Waterworks Service, 2 In. (50 mm) Through 24 In. (600 mm) NPS; American Water Works Association; 2011 (ANSI/AWWA C508).

T. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service; American Water Works Association; 2009 (ANSI/AWWA C509).

U. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances; American Water Works Association; 2010 (ANSI/AWWA C600).

V. AWWA C606 - Grooved and Shouldered Joints; American Water Works Association; 2011.

W. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Distribution; American Water Works Association; 2008 (ANSI/AWWA C900/C900a).

X. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service; American Water Works Association; 2008.

Y. UL 246 - Hydrants for Fire-Protection Service; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

1.05 QUALITY ASSURANCE

A. Perform all work in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers with labeling in place.

PART 2 PRODUCTS

2.01 WATER PIPE

A. Provide material in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

2.02 VALVES

A. Provide valves in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

B. Valves: Manufacturer's name and pressure rating marked on valve body.

2.03 HYDRANTS

A. Provide hydrants in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

B. Hydrants: AWWA C502, UL 246, dry barrel type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building service connection and municipal utility water main size, location, and invert are as indicated.

3.02 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

3.03 TRENCHING

A. See the sections on excavation and fill for additional requirements.

B. See Section 31 2316.13 for additional requirements.

C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.04 INSTALLATION - PIPE

A. Route pipe in straight line.

B. Install pipe to allow for expansion and contraction without stressing pipe or joints.

C. Slope water pipe and position drains at low points.

3.05 INSTALLATION - VALVES AND HYDRANTS

A. Set valves on solid bearing.

B. Center and plumb valve box over valve. Set box cover flush with finished grade.

C. Set hydrants plumb; locate pumper nozzle perpendicular to and facing roadway.

D. Set hydrants to grade, with nozzles at least 20 inches above ground.

E. Locate control valve 4 inches away from hydrant.

F. Provide a drainage pit 36 inches square by 24 inches deep filled with 2 inches washed gravel. Encase elbow of hydrant in gravel to 6 inches above drain opening. Do not connect drain opening to sewer.

G. Paint hydrants in accordance with Section 09 9000.

3.06 SERVICE CONNECTIONS

A. Provide water service to utility company requirements with reduced pressure backflow preventer and water meter with by-pass valves and sand strainer.

B. Provide sleeve in retaining wall for service main. Support with reinforced concrete bridge. Calk enlarged sleeve watertight.

C. Anchor service main to interior surface of foundation wall.

D. Provide 18 gage galvanized sheet metal sleeve surrounding service main to 6 inches above floor and 6 feet minimum below grade. Size for 2 inches minimum of glass fiber insulation stuffing.

END OF SECTION 331116

SECTION 331300 - DISINFECTING OF WATER UTILITY DISTRIBUTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Disinfection of site domestic water lines and site fire water lines specified in Section 33 1116.

B. Disinfection of building domestic water piping specified in Section 22 1005.

C. Disinfection of water storage tanks.

D. Testing and reporting results.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

B. Section 33 1116 - Site Water Utility Distribution Piping.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 2200 - Unit Prices, for additional unit price requirements.

B. Disinfection: By the linear foot. Includes preparing, disinfecting, testing, and reporting.

1.04 REFERENCE STANDARDS

A. Perform all work in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

B. AWWA B300 - Hypochlorites; American Water Works Association; 2011 (ANSI/AWWA B300).

C. AWWA B301 - Liquid Chlorine; American Water Works Association; 2010 (ANSI/AWWA B301).

D. AWWA B302 - Ammonium Sulfate; American Water Works Association; 2010 (ANSI/AWWA B302).

E. AWWA B303 - Sodium Chlorite; American Water Works Association; 2010.

F. AWWA C651 - Disinfecting Water Mains; American Water Works Association; 2005 (ANSI/AWWA C651).

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Test Reports: Indicate results comparative to specified requirements.

C. Disinfection report:
   1. Type and form of disinfectant used.
   2. Date and time of disinfectant injection start and time of completion.
   3. Test locations.
   4. Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
   5. Date and time of flushing start and completion.

6. Disinfectant residual after flushing in ppm for each outlet tested.

D. Bacteriological report:
   1. Date issued, project name, and testing laboratory name, address, and telephone number.
   2. Time and date of water sample collection.
   3. Name of person collecting samples.
   4. Test locations.
   5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
   6. Coliform bacteria test results for each outlet tested.
   7. Certification that water conforms, or fails to conform, to bacterial standards of the NTUA Underground Electric Construction Standards (2014 Edition).

PART 3 EXECUTION

3.01 DISINFECTION

A. Use method prescribed by the applicable state or local codes, or health authority or water purveyor having jurisdiction, or in the absence of any of these follow AWWA C651.

B. Provide and attach equipment required to perform the work.

C. Inject treatment disinfectant into piping system.

D. Maintain disinfectant in system for 24 hours.

E. Flush, circulate, and clean until required cleanliness is achieved; use municipal domestic water.

F. Replace permanent system devices removed for disinfection.

END OF SECTION 331300

SECTION 333111 - SITE SANITARY UTILITY SEWERAGE PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sanitary sewerage drainage piping, fittings, and accessories.

B. Connection of building sanitary drainage system to municipal sewers.

C. Cleanout Access.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

B. Section 03 3000 - Cast-in-Place Concrete: Concrete for cleanout base pad construction.

C. Section 31 2316 - Excavation: Excavating of trenches.

D. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.

E. Section 31 2323 - Fill: Bedding and backfilling.

F. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.

G. Section 33 0513 - Manholes and Structures.

H. Section 03 3000 - Cast-in-Place Concrete: Concrete for cleanout base pad construction.

1.03 REFERENCE STANDARDS

A. Perform all work in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

B. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2009.

C. ASTM A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe; 2009.

D. ASTM C12 - Standard Practice for Installing Vitrified Clay Pipe Lines; 2009.

E. ASTM C14 - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe; 2011.

F. ASTM C14M - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe [Metric]; 2011.

G. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; 2012a.

H. ASTM C76M - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe (Metric); 2012a.

I. ASTM C425 - Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings; 2004 (Reapproved 2009).

J. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2012.

K. ASTM C443M - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric); 2011.

L. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2011.

M. ASTM C700 - Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated; 2011.

N. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2012.

O. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2011.

P. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.

Q. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings; 2005.

R. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2008.

S. AWWA C111/A21.11 - American National Standard for Rubber Gasket Joints For Cast Iron and Ductile Iron Pressure Pipe and Fittings; 2007. (ANSI/AWWA C111/A21.11)

1.04 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.05 REGULATORY REQUIREMENTS

A. Perform all work in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

1.06 PROJECT CONDITIONS

A. Coordinate the Work with termination of sanitary sewer connection outside building, connection to municipal sewer utility service, and trenching.

PART 2 PRODUCTS

2.01 SEWER PIPE MATERIALS

A. Provide material in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

B. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

2.02 PIPE ACCESSORIES

A. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Sewer Service " in large letters.

2.03 BEDDING AND COVER MATERIALS

A. Pipe Bedding Material: As specified in Section 31 2316.13.

B. Pipe Cover Material: As specified in Section 31 2316.13.

PART 3 EXECUTION

3.01 GENERAL

A. Perform work in accordance with applicable code(s).

3.02 TRENCHING

A. See Section 31 2316.13 for additional requirements.

B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.03 INSTALLATION - PIPE

A. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

B. Connect to building sanitary sewer outlet, through installed sleeves.

C. Install trace wire 6 inches above top of pipe; coordinate with Section 31 2316.13.

END OF SECTION 333111

SECTION 33 4213 - PIPE CULVERTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe culvert, joints and accessories.

B. Bedding and slope protection at pipe end.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

B. Section 31 2316 - Excavation: Excavating of trenches.

C. Section 31 2323 - Fill: Bedding and backfilling.

D. Section 31 3700 - Riprap.

1.03 REFERENCE STANDARDS

A. Perform all work in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

B. ASTM A929/A929M - Standard Specification for Steel Sheet, Metallic-Coated by the Hot-Dip Process for Corrugated Steel Pipe; 2001 (Reapproved 2007).

C. ASTM C14 - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe; 2011.

D. ASTM C14M - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe [Metric]; 2011.

E. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; 2012a.

F. ASTM C76M - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe (Metric); 2012a.

G. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2012.

H. ASTM C443M - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric); 2011.

PART 2 PRODUCTS

2.01 STEEL CULVERT PIPE

A. Provide material in accordance with the NTUA Underground Electric Construction Standards (2014 Edition).

B. Corrugated Steel Pipe: Fabricated of ASTM A929/A929M galvanized steel sheet:

C. Coupling Bands: Galvanized steel, 0.052 inches thick x 10 inches wide; connected with two neoprene "O" ring gaskets and two galvanized steel bolts.

2.02 BEDDING AND COVER MATERIALS

A. Bedding: As specified in Section 31 2316.13.

B. Cover: As specified in Section 31 2316.13.

END OF SECTION 334213

SECTION 33 5111 - SITE NATURAL-GAS DISTRIBUTION

PART 2 PRODUCTS

1.01 PIPE

1.02 GAS COCKS AND VALVES

END OF SECTION