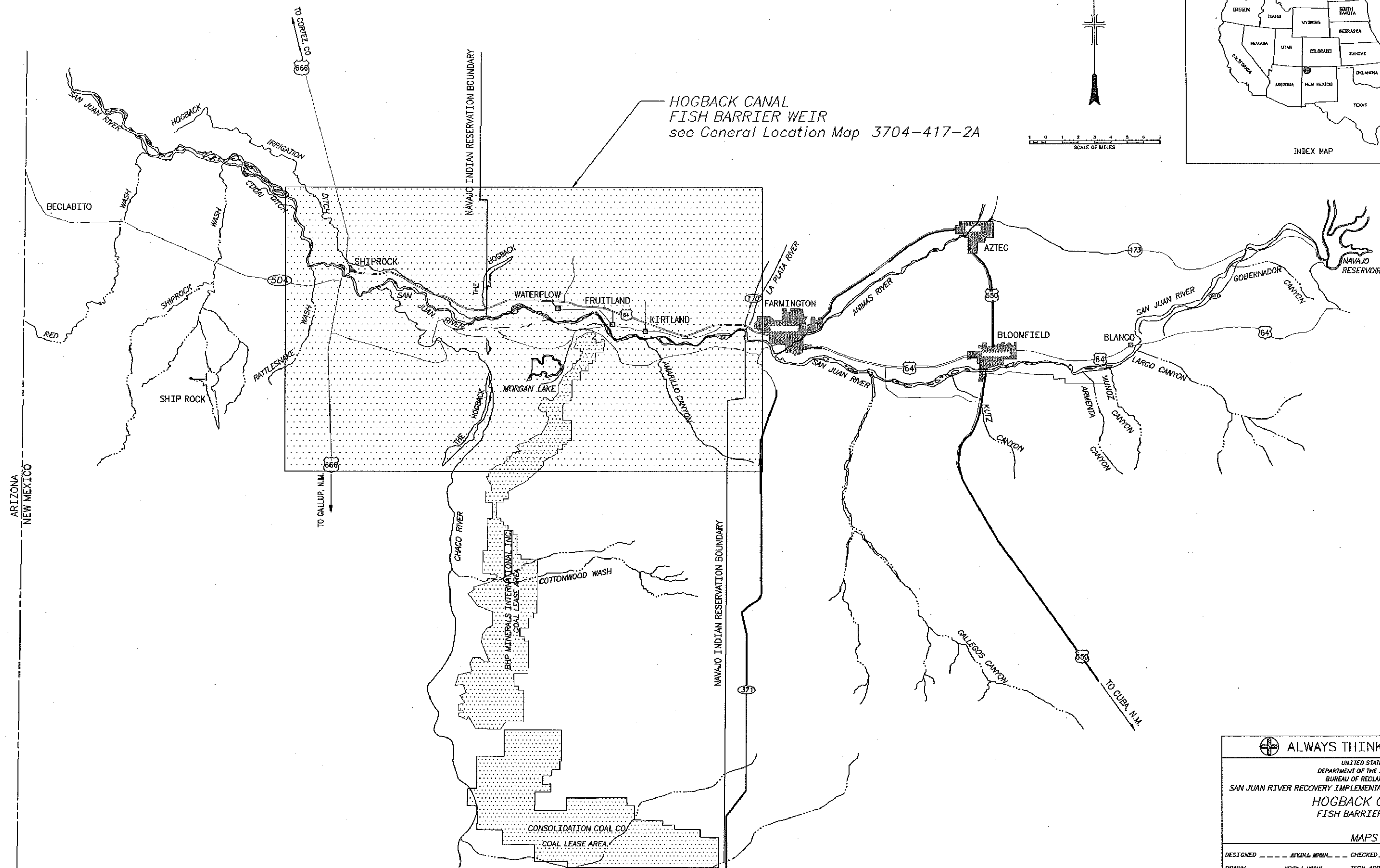
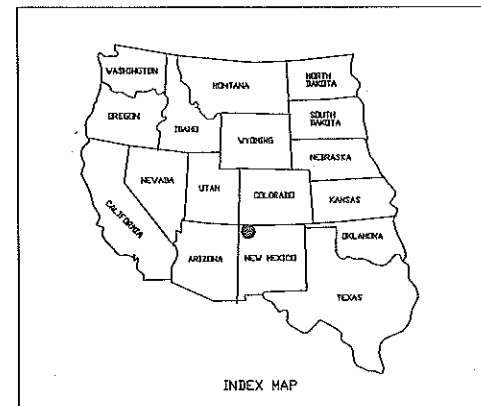


HOGBACK CANAL
FISH BARRIER WEIR
see General Location Map 3704-417-2A

SCALE OF FEET
0 1 2 3 4 5 6 7



ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SAN JUAN RIVER RECOVERY IMPLEMENTATION PROGRAM - NEW MEXICO

HOGBACK CANAL
FISH BARRIER WEIR

MAPS

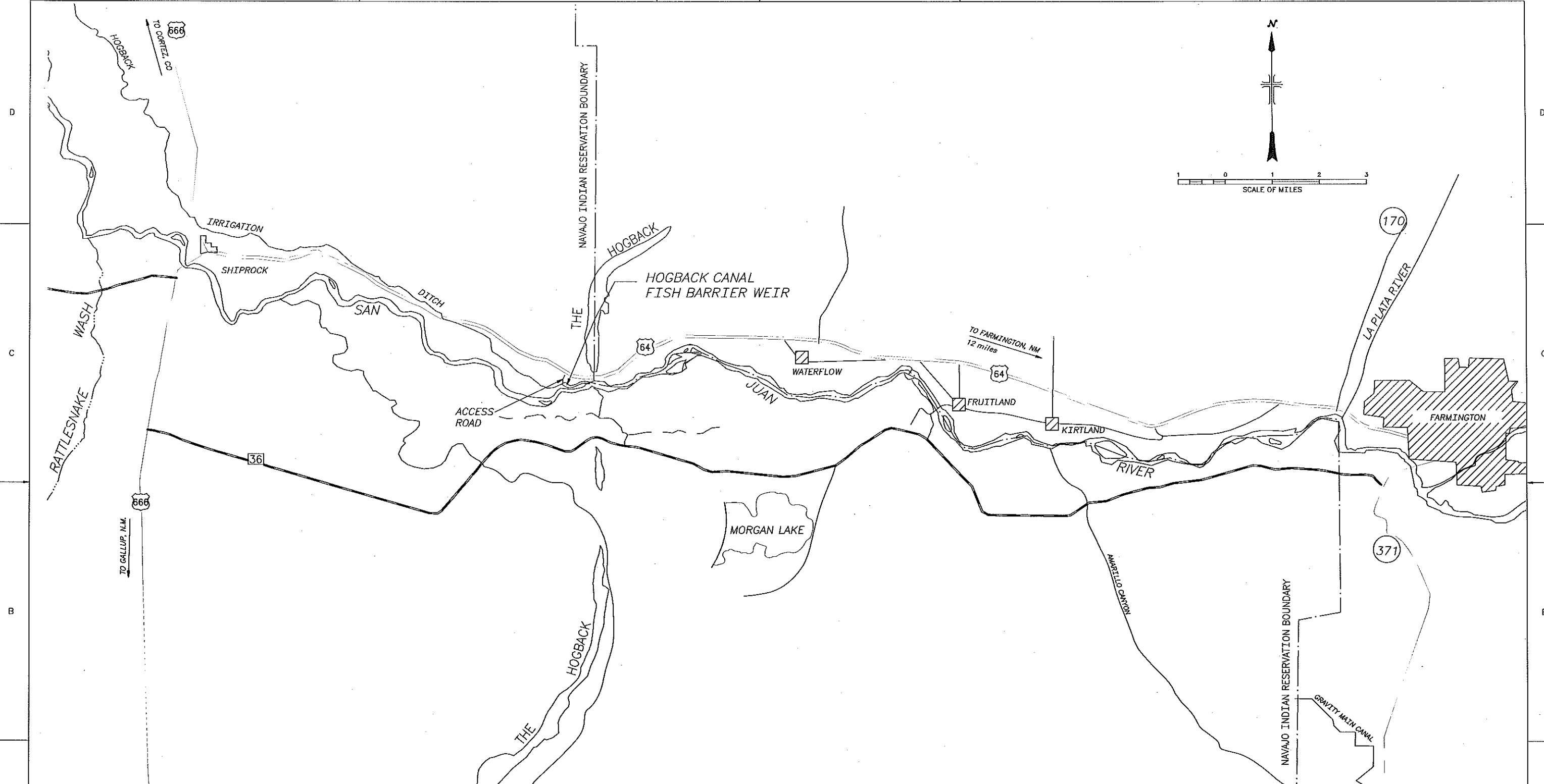
DESIGNED BY JEFFREY M. WILSON CHECKED BY JEFFREY M. WILSON

DRAWN BY JEFFREY M. WILSON TECH. APPR. BY JEFFREY M. WILSON

APPROVED BY JEFFREY M. WILSON

CADD SYSTEM	CADD FILENAME	DATE AND TIME PLOTTED
CADD SYSTEM	CADD FILENAME	DATE AND TIME PLOTTED
GRAND JUNCTION, COLORADO	FEBRUARY 11, 2008	3704-417-1

GRAND JUNCTION, COLORADO SHEET 1 OF 1



ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SAN JUAN RIVER RECOVERY IMPLEMENTATION PROGRAM - NEW MEXICO

HOGBACK CANAL
FISH BARRIER WEIR

GENERAL LOCATION MAP

DESIGNED BY J. L. WILSON CHECKED BY J. L. WILSON

DRAWN BY J. L. WILSON TECH. APPR. BY J. L. WILSON

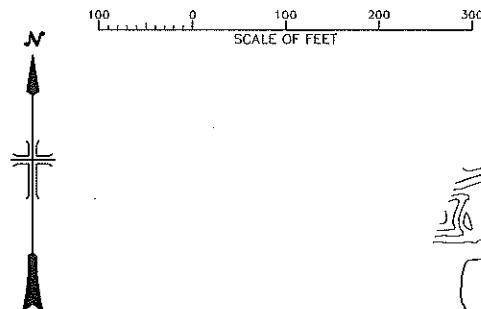
APPROVED BY J. L. WILSON

CADD SYSTEM: FILM DATE AND TIME PLOTTED: FEBRUARY 11, 2008

GRAND JUNCTION, COLORADO SHEET 1 OF 1

3704-417-2A

D

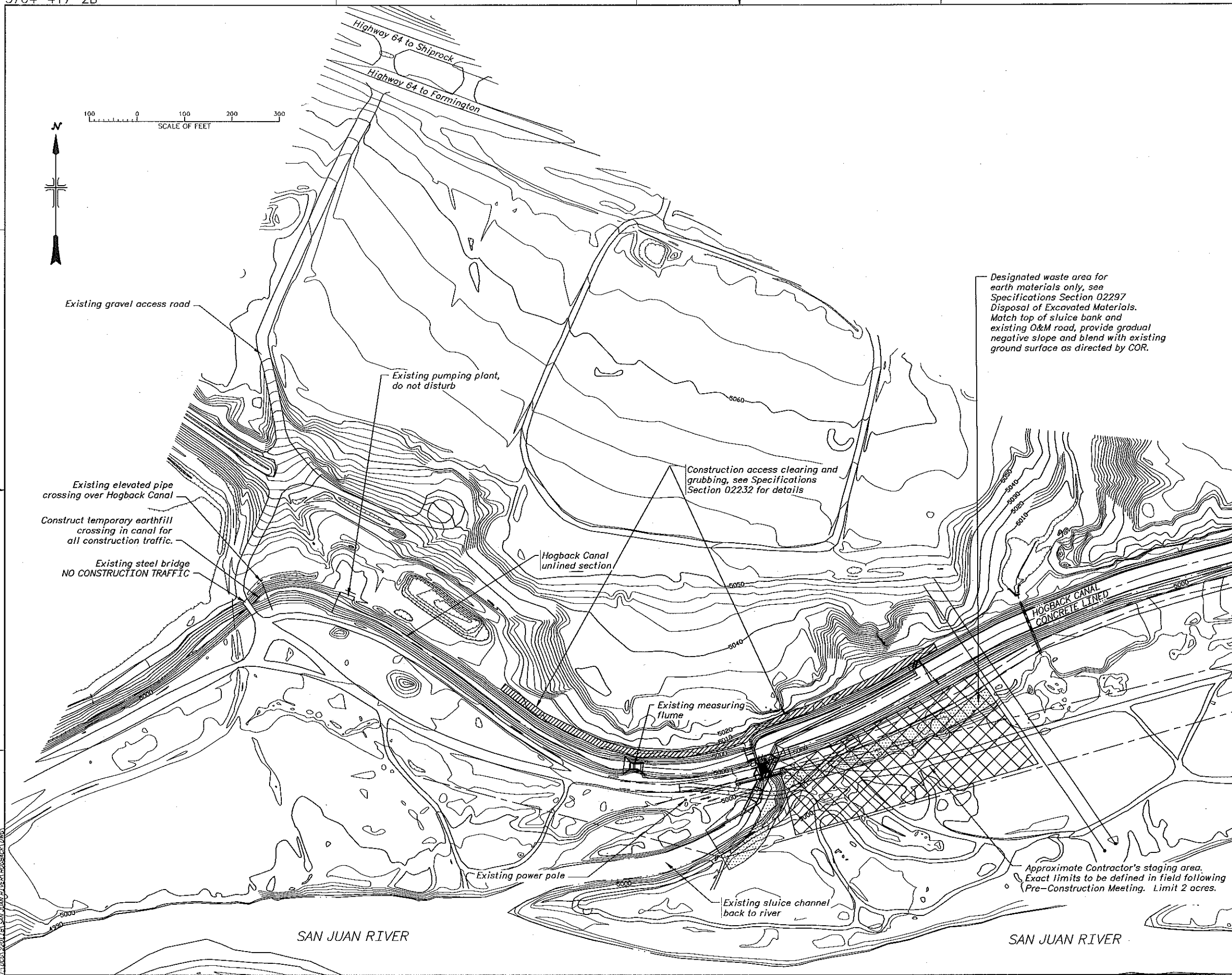


C

B

A

DATE AND TIME PLOTTED
JUNE 28, 2008 08:34
DRAWN BY
ANDREW
CHECKED BY
MARK A. VERNER
DRAWING PATH
C:\DOCUME~1\ANDREW\My Documents\3704-417-2B SAN JUAN RIVER HOGBACK.DWG



D

C

B

A

ALWAYS THINK SAFETY

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SAN JUAN RIVER RECOVERY IMPLEMENTATION PROGRAM - NEW MEXICO

HOGBACK CANAL
FISH BARRIER WEIR

LOWER CANAL SITE PLAN

DESIGNED BY KEVIN L. MORAN CHECKED BY ROBERT E. MORAN

DRAWN BY KEVIN L. MORAN TECH. APPR. MARK A. VERNER

APPROVED BY BRENT R. UTENBERG

CADD SYSTEM AutoCAD Ref. 17.1s

GRAND JUNCTION, COLORADO FEBRUARY 11, 2008

SHEET 1 OF 2

CADD FILENAME 3704-417-2B AND 2C.DWG

3704-417-2B

D

C

B

A

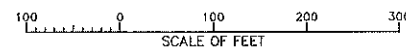
D

C

B

A

MATCH LINE, SEE 3704-417-2B



291609ABLMCLOSINGCORBC
POINT 6087, EL. 5303.58

See Drawing No. 3704-417-21 for
work at existing headworks

New meter pole and end
of new overhead power

Existing concrete bridge

HOGBACK CANAL
CONCRETE LINED

Topography not available

SAN JUAN RIVER

Highway 64 to Shiprock

Highway 64 to Farmington

SAN JUAN RIVER

SAN JUAN RIVER

⊕ ALWAYS THINK SAFETY

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SAN JUAN RIVER RECOVERY IMPLEMENTATION PROGRAM - NEW MEXICO
HOGBACK CANAL
FISH BARRIER WEIR

HEADWORKS SITE PLAN

DESIGNED BY KEVIN L. MORAN CHECKED BY ROBERT E. MORAN

DRAWN BY KEVIN L. MORAN TECH. APPR. BY MARK A. WERNER

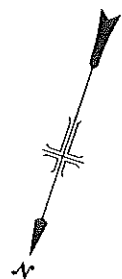
APPROVED BY BRENT A. WILDERBERG

CADD SYSTEM AutoCAD Rel. 17.1s CADD FILENAME 3704-417-2B AND 2C.DWG

GRAND JUNCTION, COLORADO FEBRUARY 11, 2008 SHEET 1 OF 2 3704-417-2C

DATE AND TIME PLOTTED
JUNE 20, 2008 10:05 AM
PLOTTER BY
KMOHAN
DRAWING PATH
H:\WORK\2201121 SAN JUAN RIVER HOGBACK.DWG

Approx. centerline, future
municipal water line



Existing sluice channel

Road
P.C. Sta. 4+59.11
P.T. Sta. 4+88.41
P.T. Sta. 5+17.05
 $\Delta = 21^\circ 0' 33''$ Rt.
 $R = 158.0'$
 $T = 29.30'$
 $L = 57.94'$
N2,091,288.105
E291,905.659

Approx. centerline, existing
16" municipal water line, do
not disturb

End realigned road,
Sta. 5+17.05, El. 5002.5

Top, concrete
canal lining

P.T. Sta. 3+73.57
El. 5001.0

Realigned road

Remove existing guardrail, sluice gate and structure

O&M Road

Above-ground 16"
municipal water line,
do not disturb

Road
P.C. Sta. 1+00.0
P.T. Sta. 1+18.86
P.T. Sta. 1+37.55
 $\Delta = 13^\circ 36' 59''$ Rt.
 $R = 158.0'$
 $T = 18.86'$
 $L = 37.55'$
N2,091,202.251
E291,573.568

Existing power pole

Begin realigned road,
Sta. 1+00, El. 4999.0

Gate structure, for
details, see (5)

Control building

Existing Hogback canal gates

Design $Q = 230 \text{ ft}^3/\text{s}$ @ WS
El. 4996.4 just d/s of gates

Measuring
flume

For details of
upstream walls,
see (4)

Sta. 1+00 Begin
weir

FLOW
A.P. Sta. 2+05.0

Invert, concrete
canal lining

Fish barrier weir, for
details, see (4),
design flow = $258 \text{ ft}^3/\text{s}$

End weir Sta. 4+20.0

Sta. 4+47.52 +

A.P. Sta. 4+22.64

Top, concrete
canal lining

Weir Wall Stationing, South Face

A.P. Sta. 2+05.0
 $\Delta = 3^\circ 0'$ Rt.
N2,091,387.313
E291,954.554

A.P. Sta. 4+22.64
 $\Delta = 37^\circ 40' 12.2''$ Lt.
 $t = 2.64'$
P.C. Sta. 4+20.0
P.T. Sta. 4+25.0
N2,091,292.277
E291,758.758

A.P. Sta. 6+10.24
 $\Delta = 32^\circ 4' 51.3''$ Rt.
N2,091,122.268
E291,678.689

GENERAL PLAN

20 0 20 40 60
SCALE OF FEET

NOTES

Designates structure to be removed.

Designates new 4" concrete canal lining.

Designates extents of gravel surfacing.
Concrete canal lining to be removed is approximately 4" thick.
Remove lining within hatched area and footprints of new
structures.
Canal lining damaged by contractor activities shall be replaced as
approved at contractor expense.

ALWAYS THINK SAFETY

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

SAN JUAN RIVER RECOVERY IMPLEMENTATION PROGRAM - NEW MEXICO

HOGBACK CANAL

FISH BARRIER WEIR

GENERAL PLAN

DESIGNED S/K. A. Sayer TECHNICAL APPROVAL S/S. J. Robertson P.E.

DRAWN S/K. A. Sayer

CHECKED S/S. J. Robertson PEER REVIEW S/ David K. Edwards P.E.

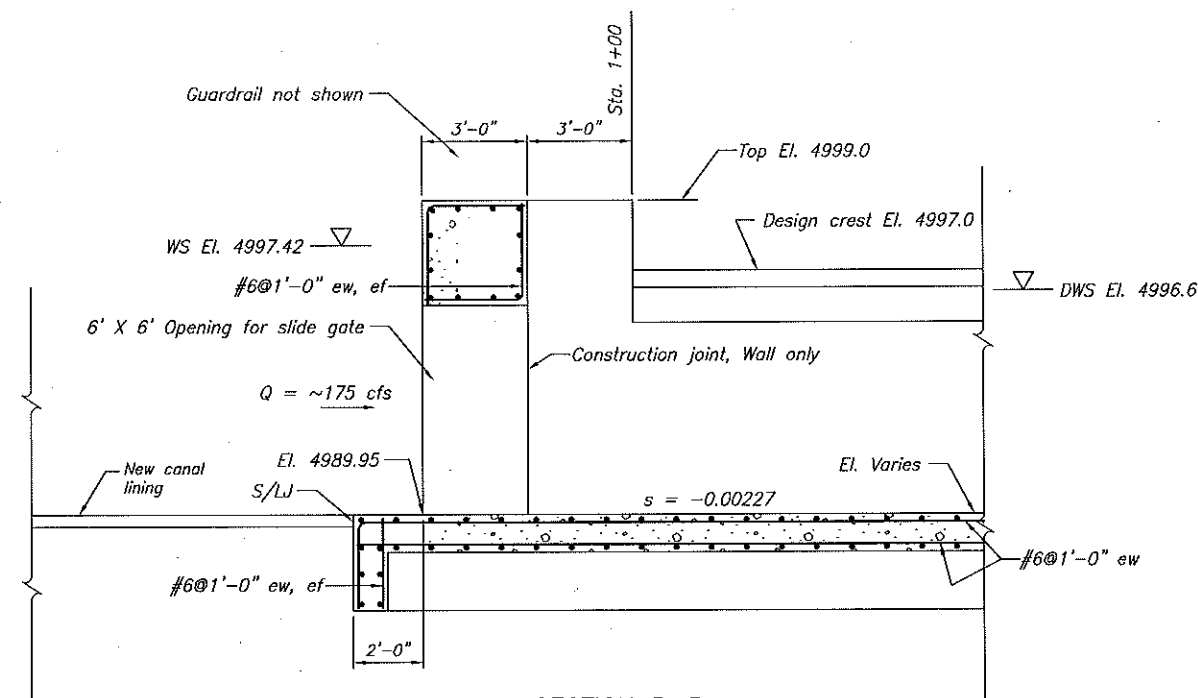
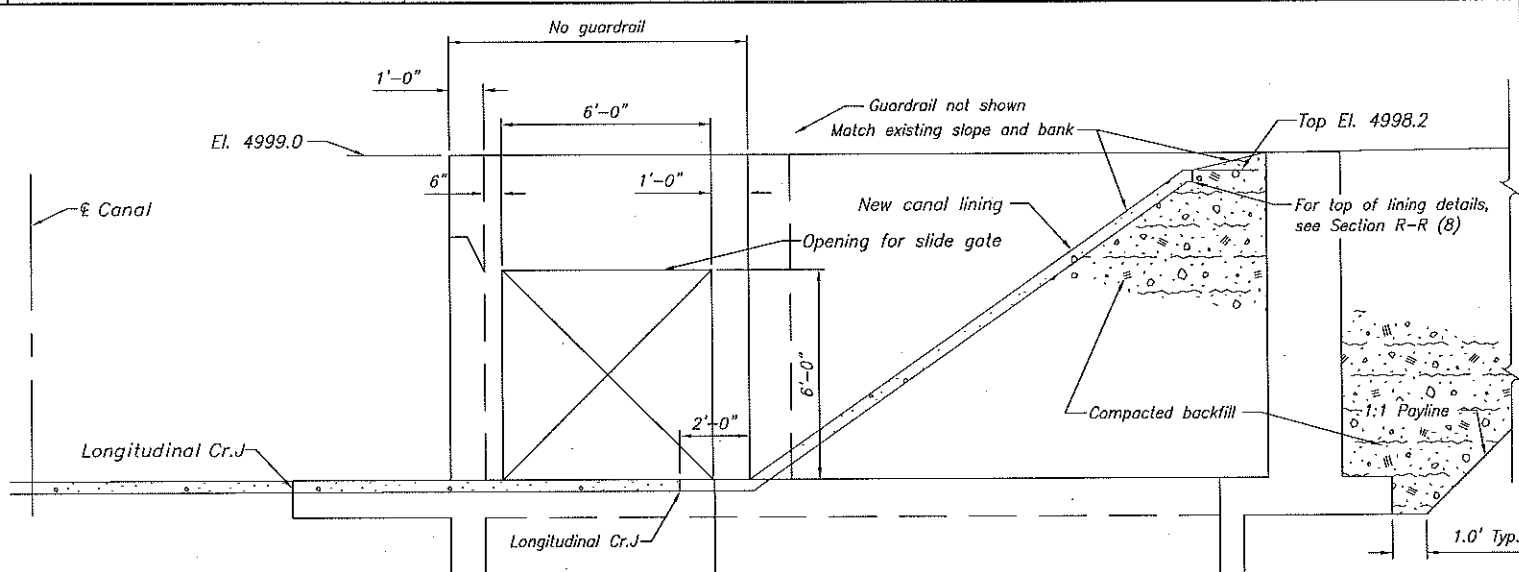
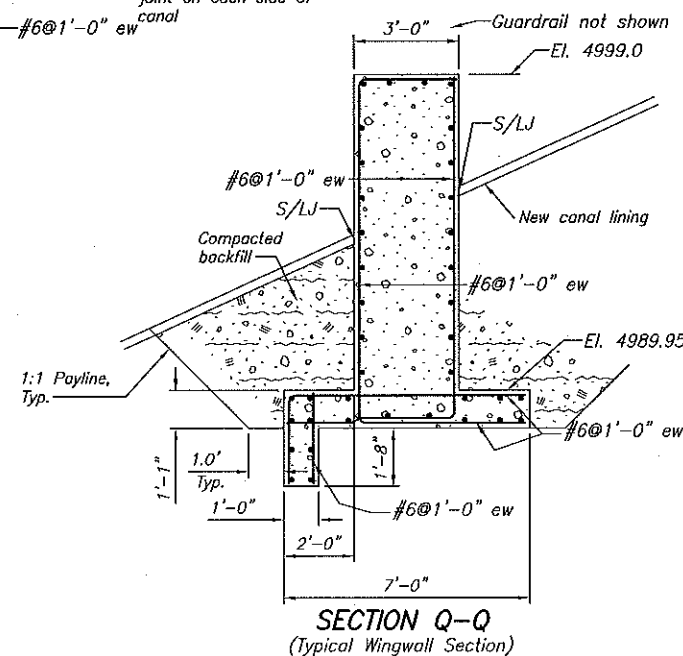
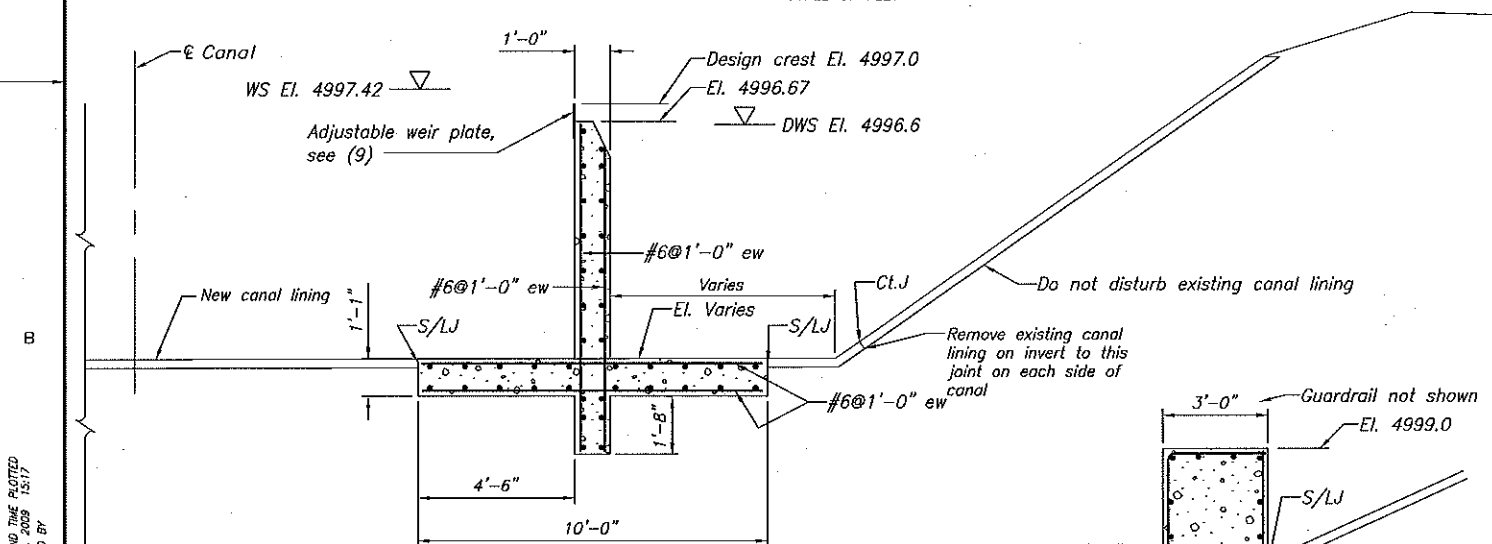
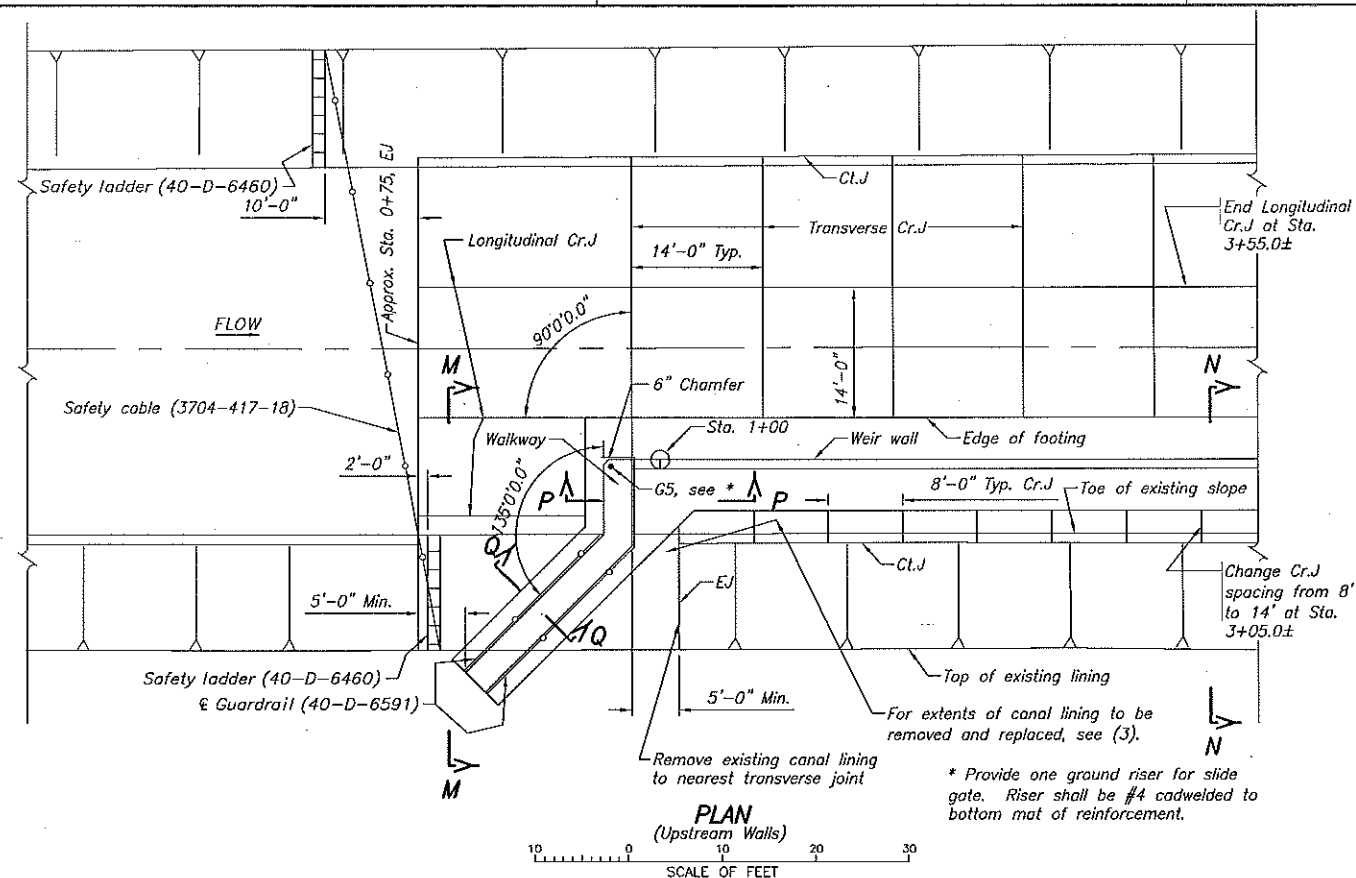
MANAGER, WATER CONVEYANCE GROUP

DENVER, COLORADO

SHEET 1 OF 7

2008-2-1

3704-D-3



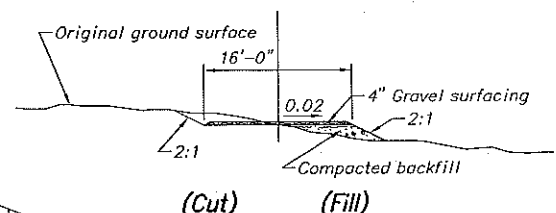
NOTES

1. For details of EJ, Ct.J, Cr.J and S/LJ, see 3704-D-7.
2. For General Notes and details of EJW, see 3704-D-11.

ALWAYS THINK SAFETY

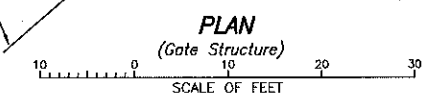
U.S. DEPARTMENT OF THE INTERIOR
 BUREAU OF RECLAMATION
 SAN JUAN RIVER RECOVERY IMPLEMENTATION PROGRAM - NEW MEXICO
HOGBACK CANAL
 FISH BARRIER WEIR
 UPSTREAM WALLS
 PLAN AND SECTIONS

DESIGNED S. J. Robertson TECHNICAL APPROVAL S. J. Robertson P.E.
 DRAWN S. J. Robertson
 CHECKED S. J. Robertson PEER REVIEW S. J. Robertson P.E.
 MANAGER, WATER CONVEYANCE GROUP
 DENVER, COLORADO SHEET 2 OF 7 2008-2-1 **3704-D-4**

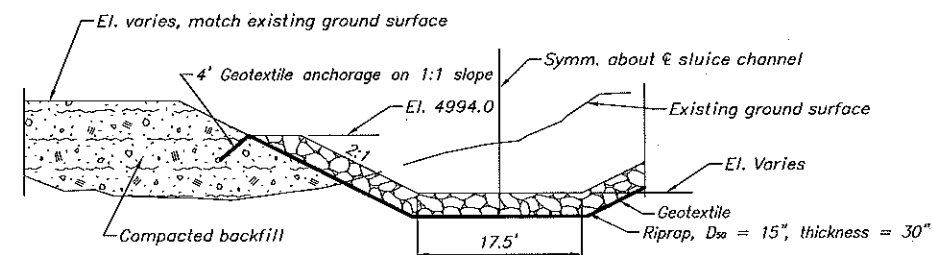


NOTES

- Remove existing radial gate operators, shafts, drums, cables and cable connectors. Install new electric-operated gate hoists, shafts, drums, cables and cable connectors—*



DETAIL 7



SECTION H-H

ALWAYS THINK SAFETY

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

SAN JUAN RIVER RECOVERY IMPLEMENTATION PROGRAM -- NEW MEXICO

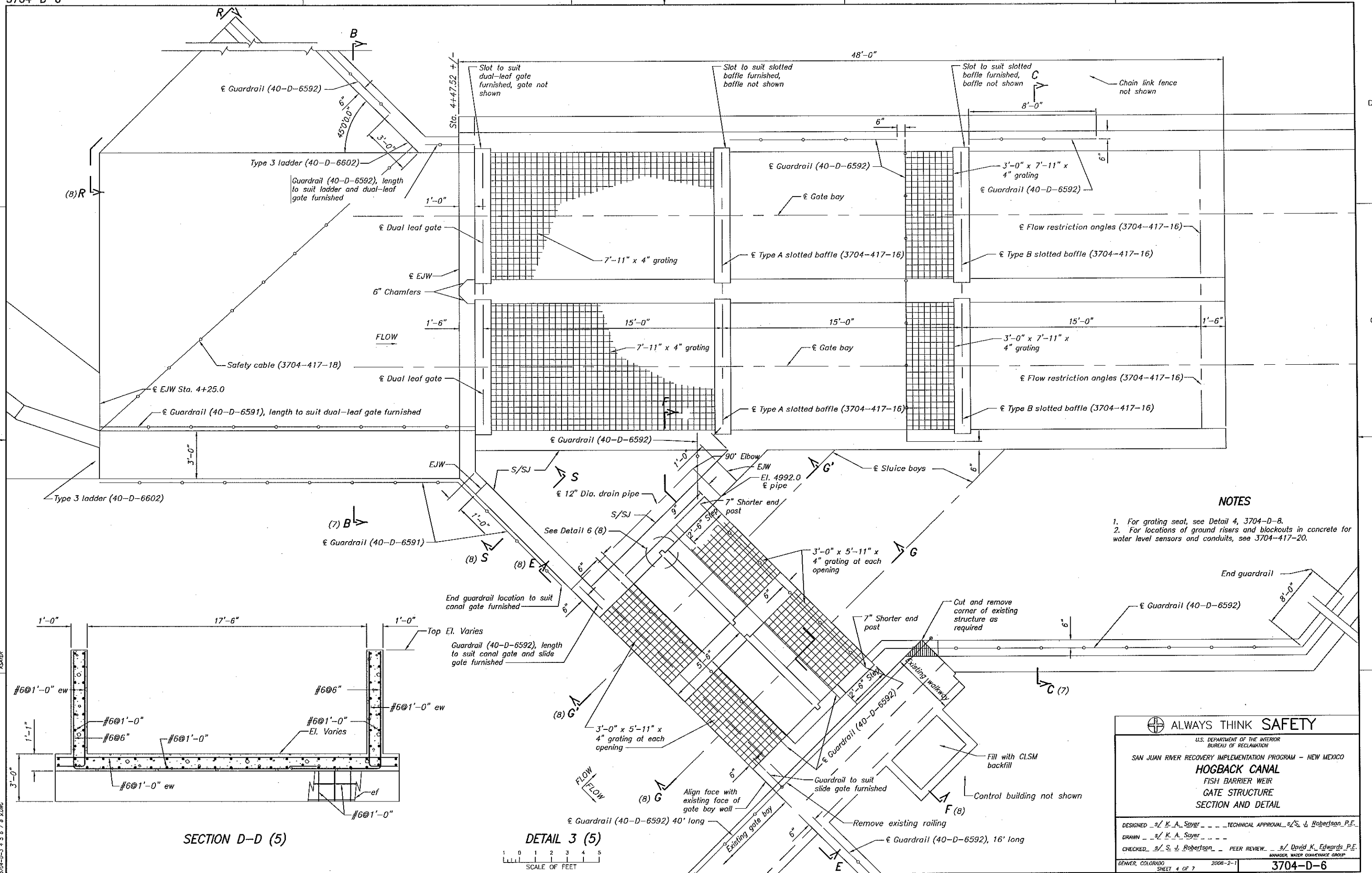
HOGBACK CANAL
FISH BARRIER WEIR
GATE STRUCTURE
PLAN AND SECTIONS

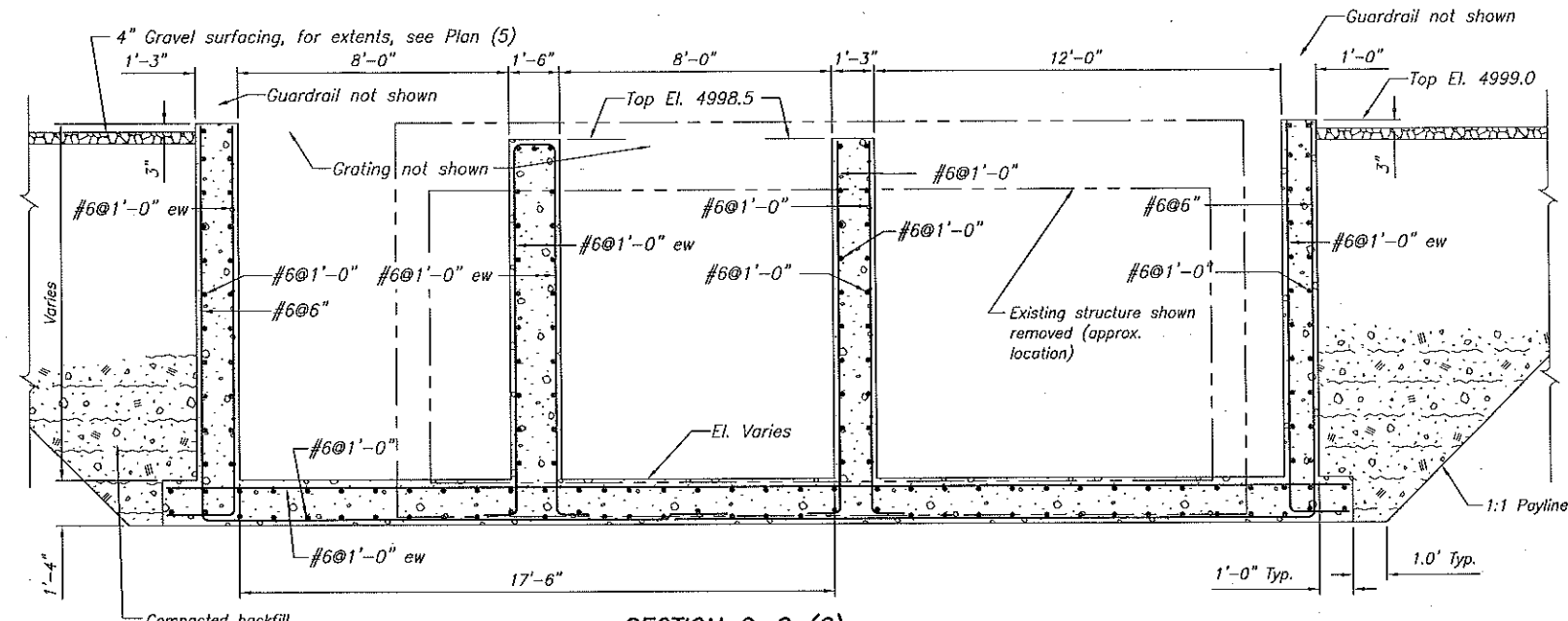
DESIGNED S/ K. A. Sayer TECHNICAL APPROVAL S/S. J. Robertson P.E.
DRAWN S/ K. A. Sayer
CHECKED S/ S. J. Robertson PEER REVIEW S/ David K. Edwards P.E.
MANAGER, WATER CONVEYANCE GROUP

DENVER, COLORADO 2008-2-1
SHEET 3 OF 7

3704-D-5

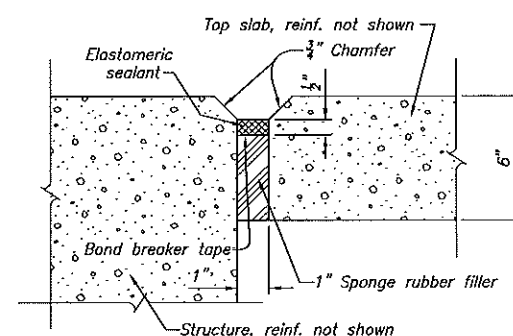
ONE AND TIME PLOTTED
 JUNE 5, 2009 15:17
 PLOTTED BY
 KASPER
 CAD SYSTEM
 AUCAD R17.1s
 CAD FILENAME
 3704-D-6 5 6 7 8 9.DWG



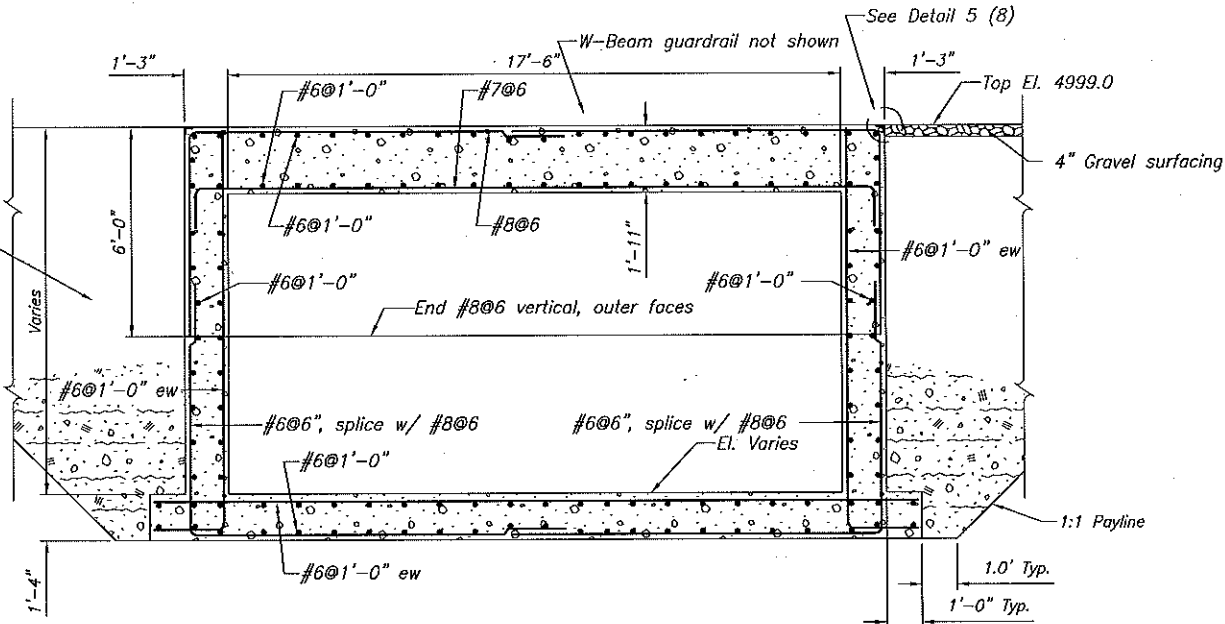


SECTION C-C (6)

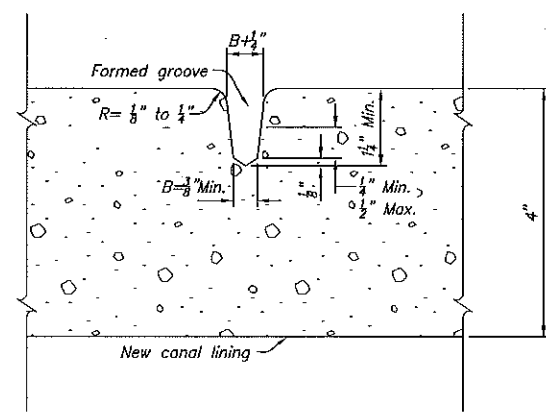
(Typical Gate Structure Section)



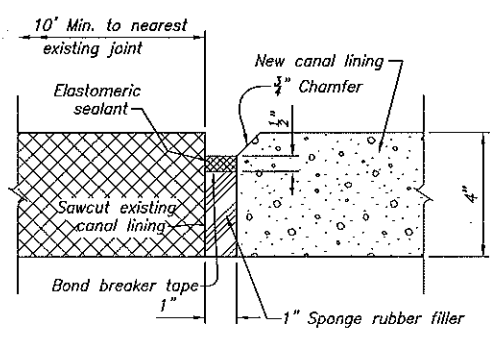
STRUCTURE/SLAB JOINT (S/SJ) DETAIL



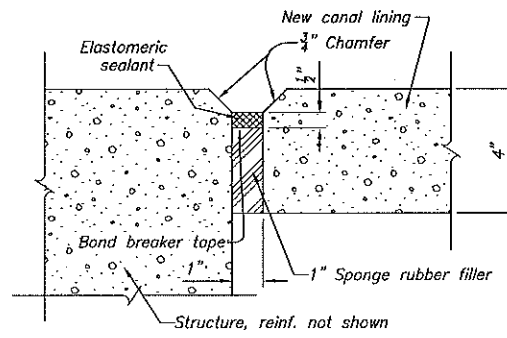
(Typical Bridge Structure Section)



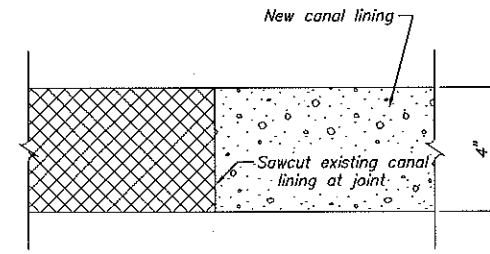
CONTRACTION JOINT (Cr.J) DETAIL



EXPANSION JOINT (EJ) DETAIL

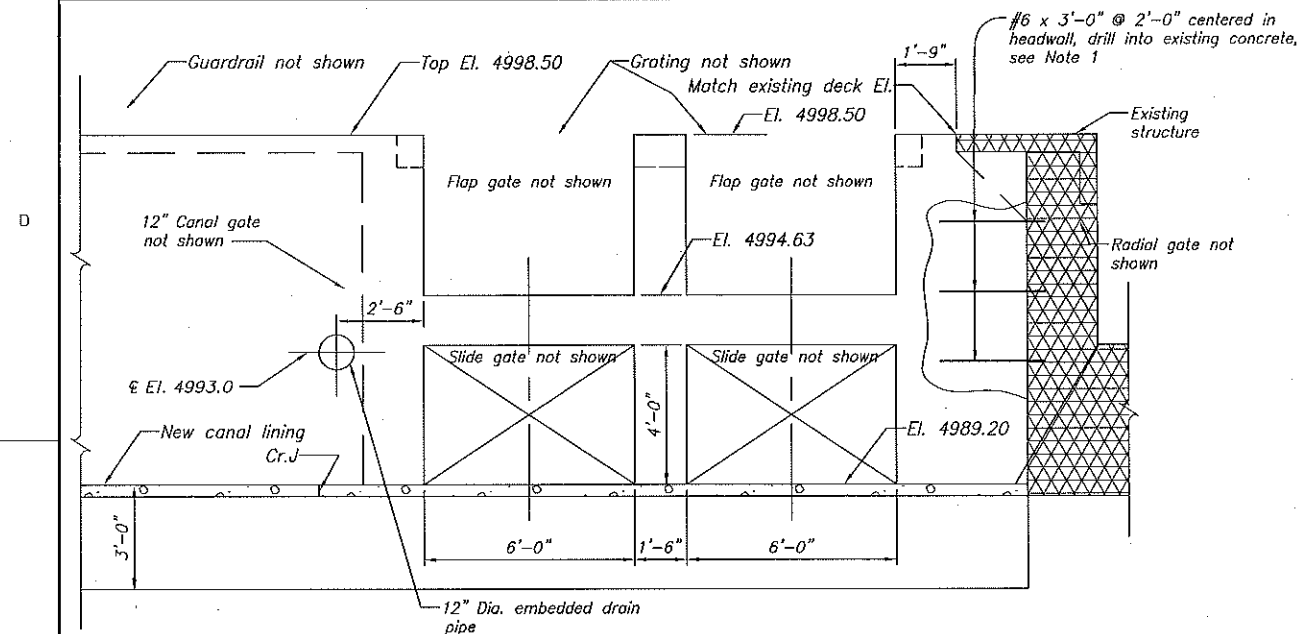


STRUCTURE/NEW CANAL LINING JOINT (S/LJ) DETAIL



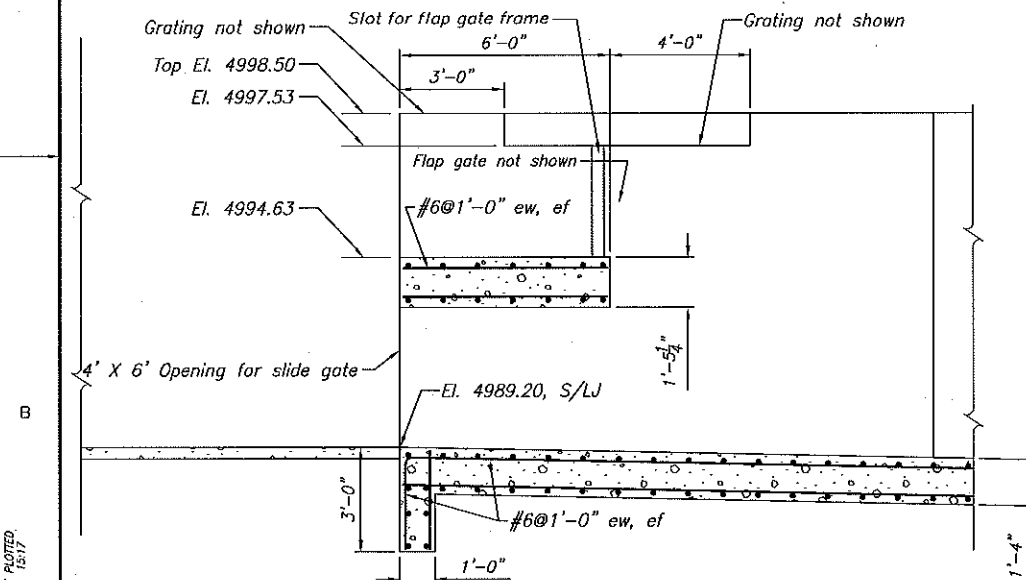
CONTROL JOINT (Ct.J) DETAIL

	ALWAYS THINK SAFETY
U.S. DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION SAN JUAN RIVER RECOVERY IMPLEMENTATION PROGRAM -- NEW MEXICO HOGBACK CANAL FISH BARRIER WEIR GATE STRUCTURE SECTIONS AND DETAILS	
DESIGNED <u>S/ K. A. Soyler</u> TECHNICAL APPROVAL <u>S/S J. Robertson P.E.</u> DRAWN <u>S/ K. A. Soyler</u> CHECKED <u>S/ S. J. Robertson</u> PEER REVIEW <u>S/ David K. Edwards P.E.</u> MANAGER, WATER CONVEYANCE GROUP	
DENVER, COLORADO SHEET 5 OF 7	2006-2-1 3704-D-7



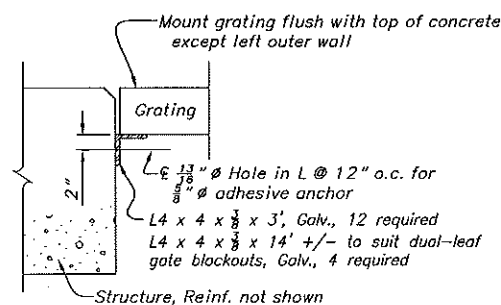
SECTION E-E (6)

(Headwall)
SCALE OF FEET

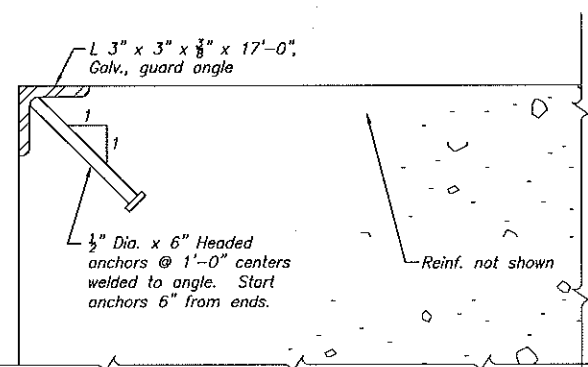


SECTION G-G (6)

(Section G'-G' Similar)

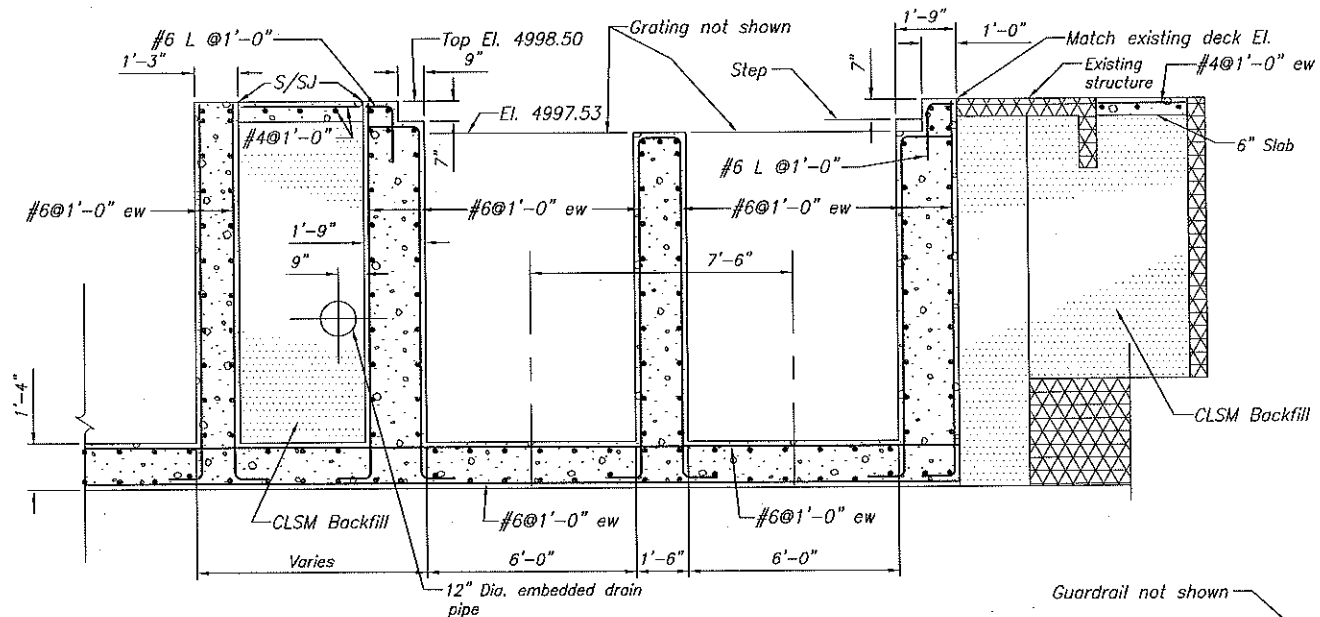


DETAIL 4

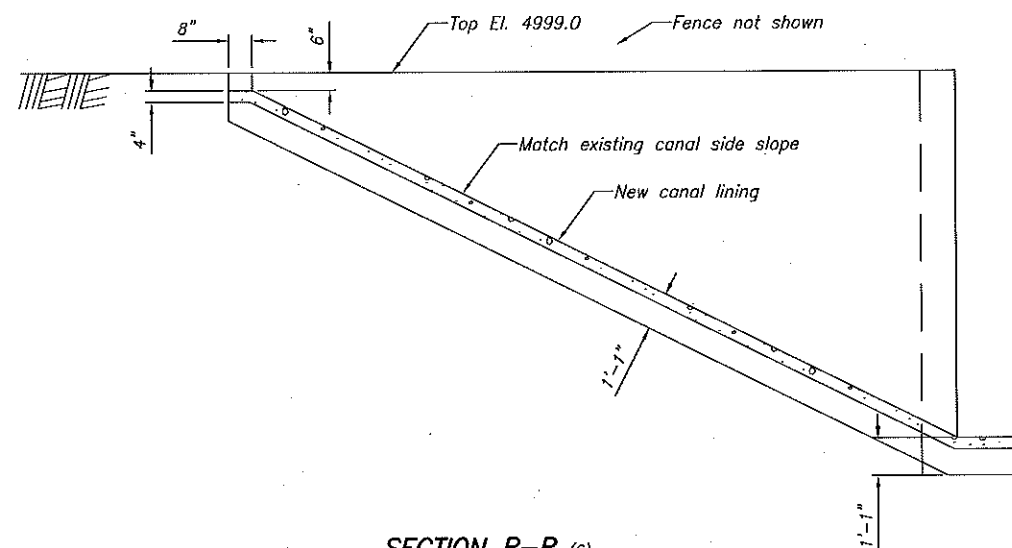


DETAIL 5

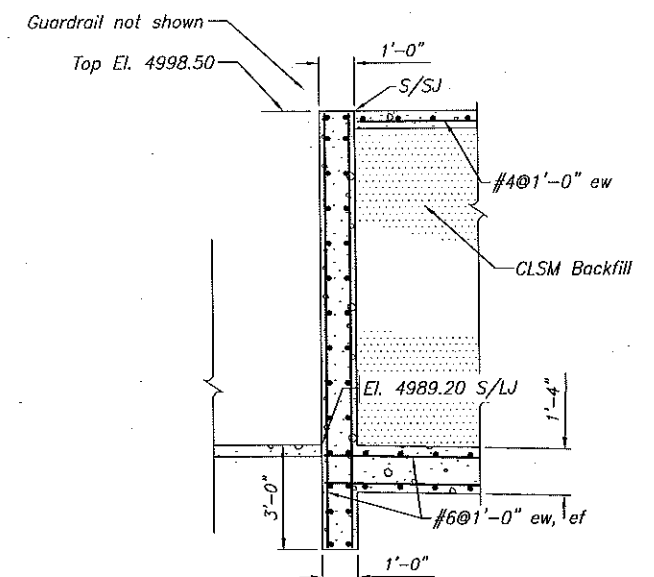
(Typical, Both Ends of Structure)



SECTION F-F (6)



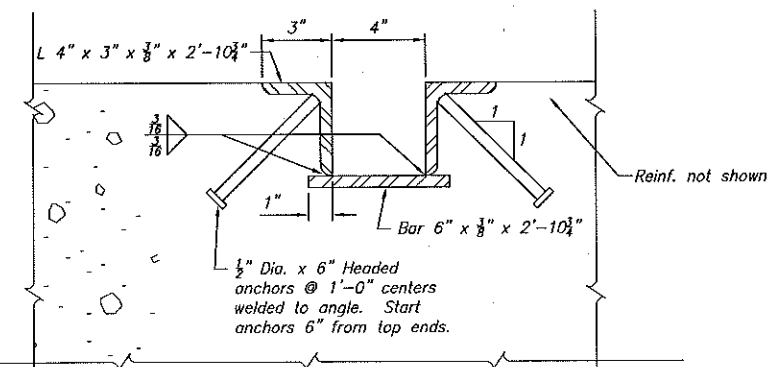
SECTION R-R (6)



SECTION S-S (6)

NOTES

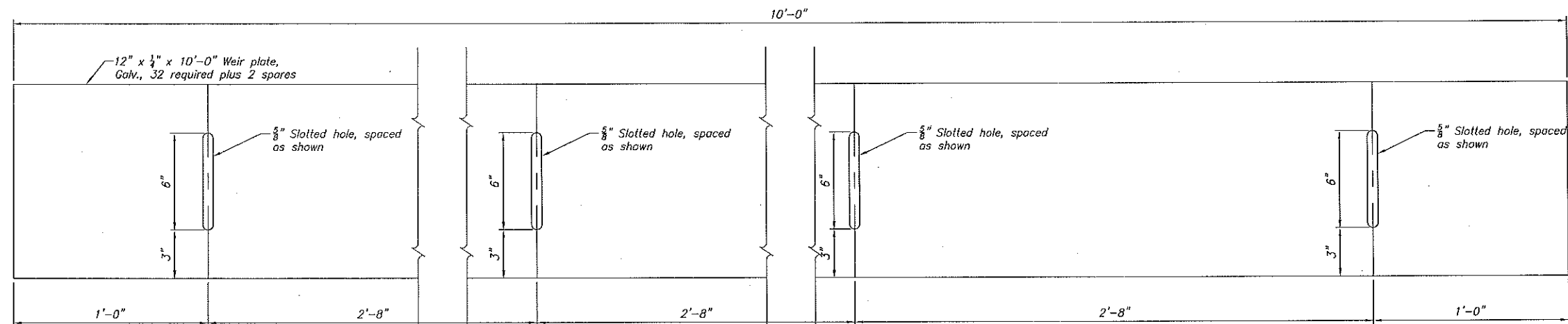
1. See specifications paragraphs for the depth and diameter of holes drilled in existing concrete for anchor bars.
2. Remove deteriorated and spalled existing concrete upon which new concrete will be placed. Existing concrete shall be sound and cleaned and roughened as approved.
3. Galvanize metalwork after fabrication.
4. For details of flap gate, see 3704-417-14.



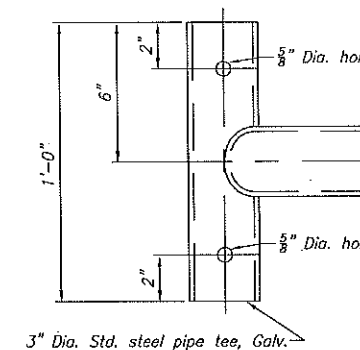
DETAIL 6

(4 units required)

ALWAYS THINK SAFETY	
U.S. DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION	
SAN JUAN RIVER RECOVERY IMPLEMENTATION PROGRAM - NEW MEXICO HOGBACK CANAL FISH BARRIER WEIR GATE STRUCTURE SECTIONS AND DETAILS	
DESIGNED <u>S. J. Robertson</u>	TECHNICAL APPROVAL <u>S. J. Robertson P.E.</u>
DRAWN <u>S. J. Robertson</u>	PEER REVIEW <u>S. J. Robertson</u>
CHECKED <u>S. J. Robertson</u>	MANAGER, WATER CONSTRUCTION GROUP
DENVER, COLORADO	2008-2-1
SHEET 6 OF 7	3704-D-8

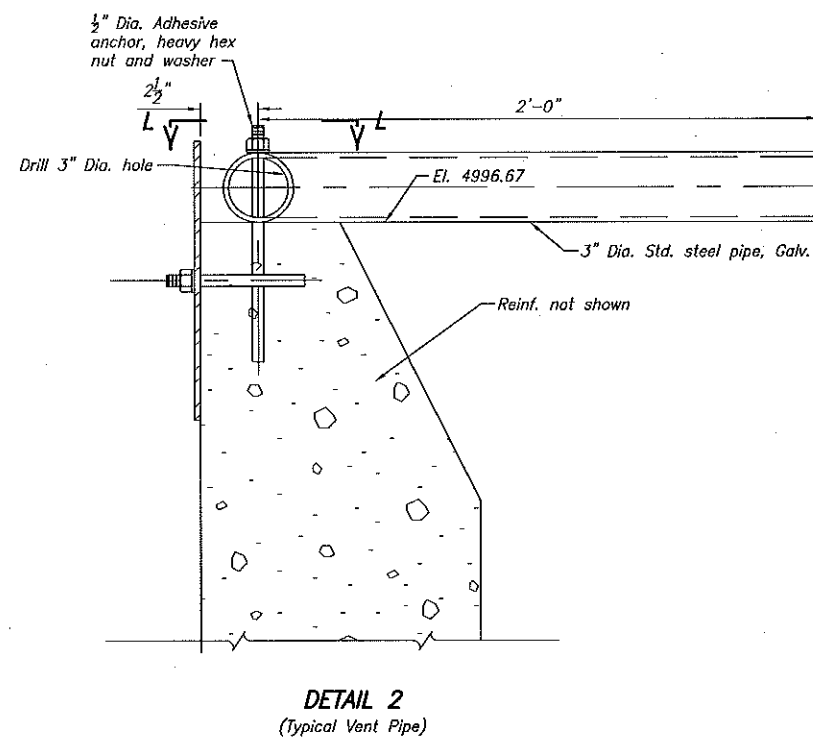
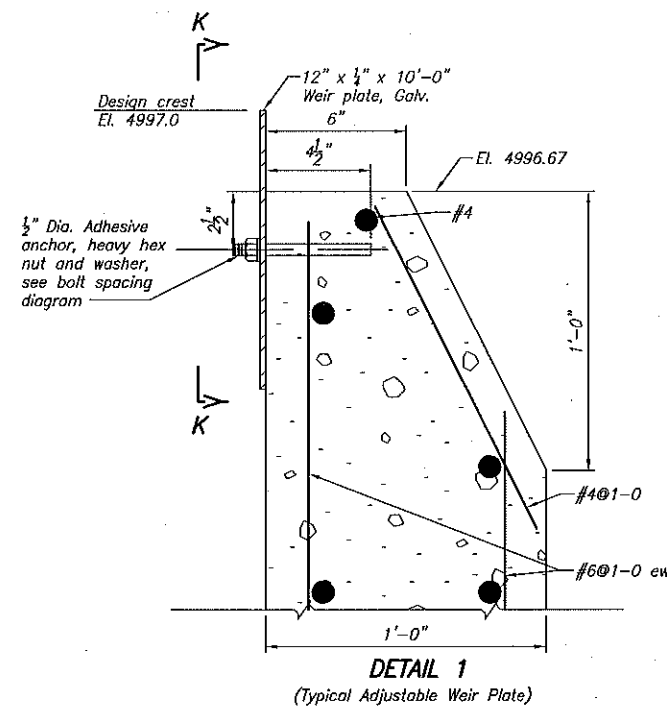


SECTION K-K
0 3 6 9 12
SCALE OF FEET



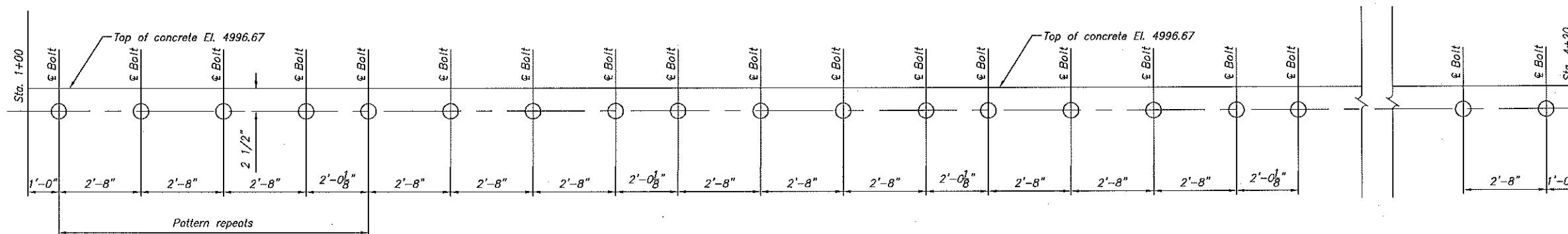
SECTION L-L

Note: Provide one vent pipe every 20' along crest centered on weir plate, 16 required



NOTES

1. Galvanize metalwork after fabrication.
2. Grind all welds smooth.
3. Install top of weir plate at El. 4997.0.
4. Provide 1/8" gap between weir plate sections and seal gap with silicone sealant.



ELEVATION
(Bolt Spacing Diagram, No Scale)

ALWAYS THINK SAFETY

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SAN JUAN RIVER RECOVERY IMPLEMENTATION PROGRAM - NEW MEXICO
HOGBACK CANAL
FISH BARRIER WEIR
ADJUSTABLE WEIR PLATE
SECTIONS AND DETAILS

DESIGNED S. J. Robertson TECHNICAL APPROVAL S. J. Robertson, P.E.

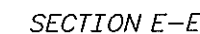
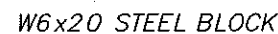
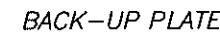
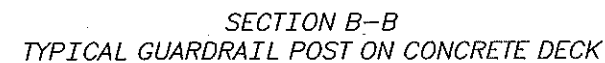
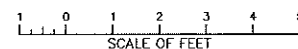
DRAWN S. J. Robertson

CHECKED S. J. Robertson PEER REVIEW S. J. Robertson, P.E.

MANAGER, WATER CONVEYANCE GROUP

DENVER, COLORADO SHEET 7 OF 7 2008-2-1

3704-D-9



- ## NOTES

1. Guardrail hardware is detailed in the publication "A GUIDE TO STANDARDIZED HIGHWAY BARRIER HARDWARE", prepared by AASHTO-AGC-ARTBA Joint Committee.
2. All holes in steel posts and blocks shall be $\frac{1}{8}$ " ϕ minimum.
3. Back-up plate to be used between guard rail element and steel block on steel post where there is no rail element splice.

 ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SAN JUAN RIVER RECOVERY IMPLEMENTATION PROGRAM - NEW MEXICO
HOGBACK CANAL
FISH BARRIER WEIR
W-BEAM GUARDRAIL
SECTIONS AND DETAILS

DESIGNED s/ K. A. Sayer CHECKED s/ S. J. Robertson

DRAWN s/K. A. Sayer TECH. APPR. s/S. J. Robertson P.E.

APPROVED *s/ David K. Edwards P.E.*

PEER REVIEWER	
CADD SYSTEM	CADD FILENAME

AutoCAD Rel. 16.2s	GUARDRAIL.DWG
FEBRUARY 1, 2008	3704 D 10

SHEET 1 OF 1 3704-D-10

GENERAL NOTES FOR CAST-IN-PLACE CONCRETE

For general concrete outline notes, see 40-D-7012.
Where concrete with varying thickness is shown on structural drawings, vary thickness of concrete uniformly between dimensions shown.
Dimensions are to centerline of joint unless otherwise shown.
Unless otherwise shown, all exposed concrete edges are to be chamfered $\frac{3}{4}$ ".
Waterstop shall be continuous throughout structure unless otherwise shown.
All waterstop shall be PVC. For details of PVC waterstop, see 40-D-6463.
Dimensions not shown are the same as dimensions for identical details shown elsewhere on the drawings.
Pipe sleeves and embedded piping 12 inches in diameter and larger are shown on the outline drawings. Smaller diameter pipe sleeves or piping may or may not be shown. Not all embedded items are shown on the outline drawings.

REINFORCEMENT DESIGN GENERAL NOTES

For general notes and minimum requirements for detailing reinforcement, see 40-D-6263.
Structural design is based on concrete with a f'c compressive strength of 4,000 psi at 28 days and on reinforcement with a minimum yield strength fy of 60,000 psi.
Reinforcement shall be continuous through construction joints (CJ).
Reinforcement not shown in a section or detail is similar to that shown elsewhere on drawings for similar details.

GENERAL NOTES FOR CONSTRUCTION

Contractor shall submit for review and approval equipment loads prior to placing equipment adjacent to walls or on bridge decks.
Before placing concrete on grade, make sure that all buried utilities, pipelines, etc. below the concrete are in place.
Backfill shall not be placed against walls until the concrete has attained a compressive strength of 4,000 psi.
Adding, omitting, or relocating of construction joints shall be approved by the Contracting Officer.
Splices in reinforcement may be shifted, as approved, to suit sequence of construction.
Bridge decks shall have a minimum concrete compressive strength of 4,000 psi prior to use.

MISCELLANEOUS METALWORK FOR STRUCTURES

For top mounted pipe guardrails, see 40-D-6592.
Provide 12-inch returns on guardrails indicated on drawings as:
whereas indicates no returns:
Place guardrail centerline 6-inches from open edge of concrete unless otherwise indicated.
For chain link fencing requirements, see 40-D-7016 and 40-D-7017.
For Type 3 ladder, see 40-D-6602.
For side mounted guardrail, see 40-D-6591.

EXPLANATION OF CONCRETE SYMBOLS

	Sponge rubber joint filler
	Concrete, in plan or elevation
	New concrete, in section
	Existing structure to be removed, see 3704-D-3
	Extents of new 4" concrete canal lining, see 3704-D-3
	Existing structure in section or elevation, see 3704-D-8

DATUM

Datum Control and Surveys—Coordinates are New Mexico West Zone State Plane NAD-27 in US feet. Elevations are NGVD-29. A shift of 2.92' lower than NAVD-88 was used to obtain NGVD-29. This shift was gained by utilizing NGS superseded data on NGS stations in the area. Contour interval is 1 foot.

Topography was based on datum above and surveys conducted in 2006.

Horizontal and vertical control points will be established by the Contracting Officer Representative prior to construction and will use the above noted horizontal and vertical datum.

DESIGN LOADS FOR CONCRETE STRUCTURES

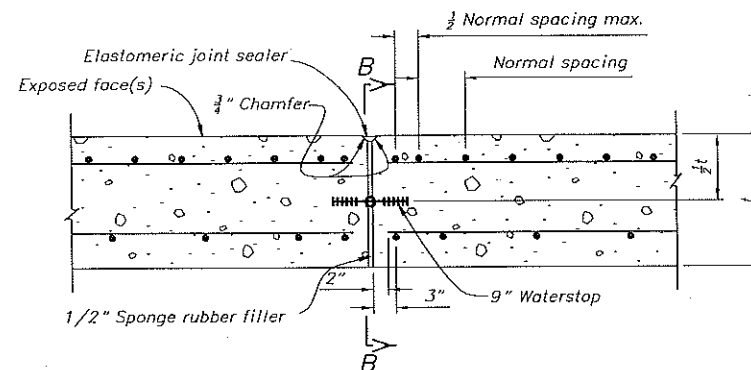
- Structural Design loads:
 - Lateral Earth
 - Compacted Moist At Rest = 60 lbs/ft.²/ft.
 - Saturated Earth = 90 lbs/ft.²/ft.
 - Uniform surcharge = 2 feet at 40 lbs/ft.²/ft.
 - Vertical
 - Live load on gratings = 100 lbs/ft.²(Min.)
- Live Load on box section = 75,000 lb axle load or 10 lbs/in.² track pressure.
- Horizontal seismic loading = Negligible.

Structures are designed in accordance with the American Concrete Institute ACI-318-05, "Building Code Requirements for Reinforced Concrete", except temperature and shrinkage reinforcement are designed in accordance with Bureau of Reclamation "Design Standards No. 3, Water Conveyance Systems."

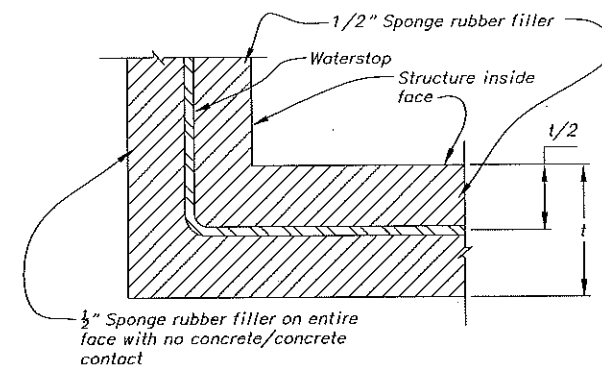
NOTES FOR STRUCTURE WATERSTOP JOINTS

- For typical expansion joint, see joint details shown on this drawing.
- Install waterstop in center of member with thickness of "t" unless otherwise shown on the structural drawing.
- Unless otherwise shown, trim waterstop 6" from top exposed surface on vertical walls.

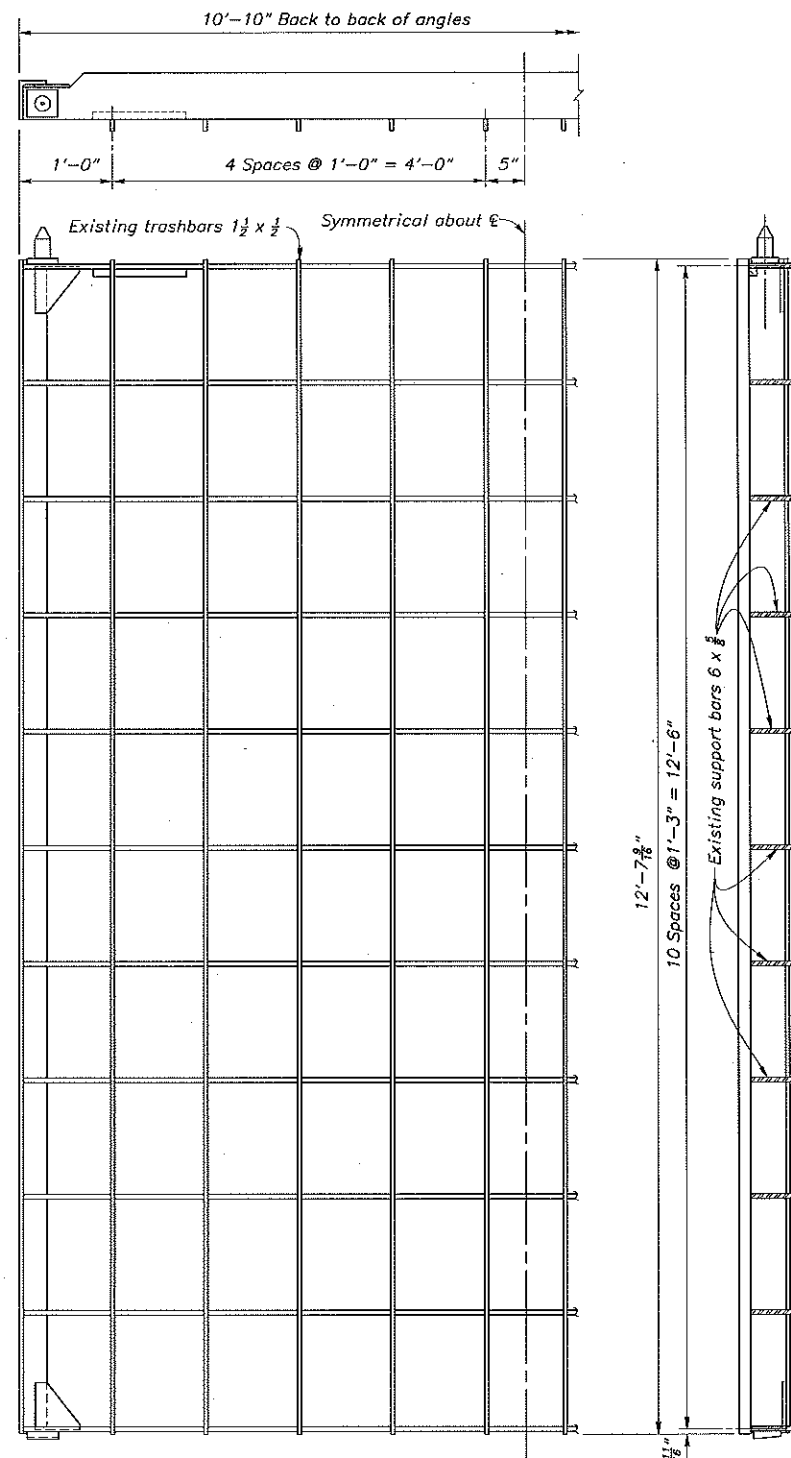
STRUCTURE WATERSTOP JOINT DETAILS



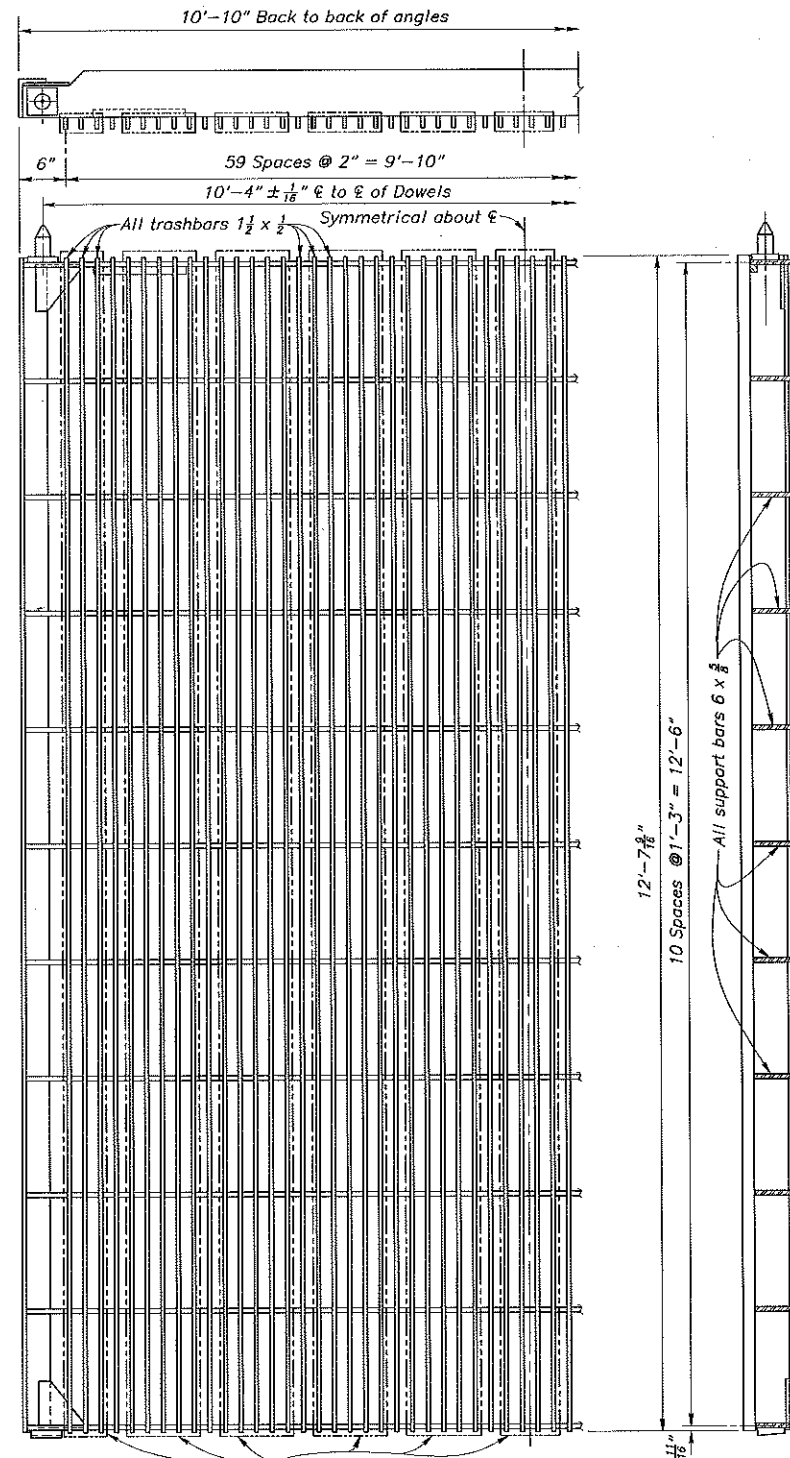
EXPANSION JOINT (EJW)



SECTION B-B



MODIFIED LOWER TRASHRACK PANEL
FIVE MODIFIED PANELS REQUIRED



EXISTING LOWER TRASHRACK PANEL
(FOR REFERENCE AND INFORMATION)
FIVE EXISTING PANELS

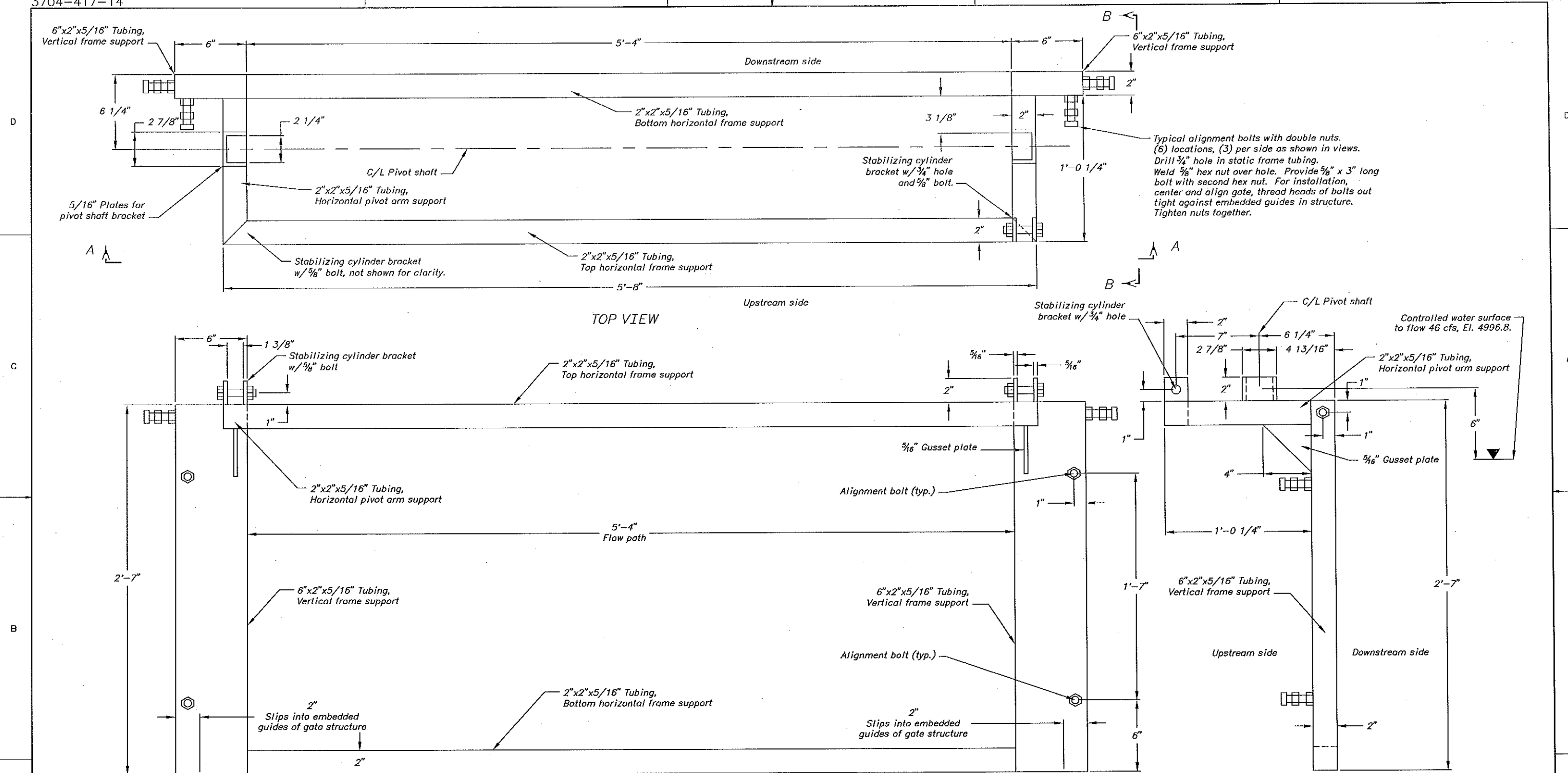
NOTES

1. Remove existing trashbars 1 1/2 x 1/2" (50 bars/panel) as noted on the existing lower trashrack panel detail and as shown on the modified lower trashrack panel detail.
2. All areas of removed trashbars on the trashrack panels shall be ground smooth, and if required, fill voids with weld then grind smooth.
3. Modified lower trashrack panels shall be free from burrs and irregularities.
4. Surfaces of the modified trashrack panels shall be prepared and coated in accordance with the requirements of the Division 9 specifications.
5. Estimated weight of each existing lower trashrack panel is 3850 pounds.

REFERENCE DRAWINGS

TRASHRACK	
INSTALLATION - GUIDES - DETAILS	809-D-5723
TRASHRACK PANELS - DETAILS	809-D-5724
FISH BARRIER WEIR	
DIVERSION HEADWORKS	
PLAN	3704-417-21

ALWAYS THINK SAFETY			
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION SAN JUAN RIVER RECOVERY IMPLEMENTATION PROGRAM - NEW MEXICO HOGBACK DIVERSION DAM TRASHRACK STRUCTURE TRASHRACK MODIFICATION LOWER TRASHRACK PANELS - DETAILS			
DESIGNED <u>RICK CHRISTENSEN</u>	CHECKED <u>RYAN STEPHEN</u>		
DRAWN <u>RICK CHRISTENSEN</u>	TECH. APPR. <u>WAYNE DELZER, P.E.</u>		
APPROVED <u>DAVID O. HULSE</u>			
MANAGER, MECHANICAL EQUIPMENT GROUP			
CADD SYSTEM AutoCAD Rev. 17.2	CADD FILENAME 3704-D-13.DWG	DATE AND TIME PLOTTED JUNE 6, 2009 09:07	
DENVER, COLORADO	SHEET 1 OF 1	APRIL 25, 2008	3704-D-13



GENERAL NOTES

Fabricate and install two static frames and two dynamic flap gates.

Static frames and flap gates are symmetrical on each side of their respective vertical centerlines.

Install static frames and dynamic flap gates in gate structures shown on 3704-D-6.

See Drawing No. 3704-417-15 for dynamic flap gates.

Pre-fit static frames and flap gates in fabrication shop prior to galvanizing. Report any conflict in measurements and dimensions to engineer for clarification. Most measurements shown are critical to the intended operation of the gate.

All welding and fabrication shall comply with the latest edition of AWS Structural Welding Code (ASW D1.1) and AISC Specifications. All welding terms shall be interpreted in accordance with AWS definitions of welding terms (AWS A3.0). Minimum welds shall be continuous 1/4" fillets. Weld all members and components continuously to minimize corrosion between components. Grind all welds smooth prior to application of coating.

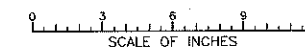
SECTION A-A
(Upstream Side)

All fabricated components, shall be hot-dipped galvanized.

The 2" Pivot shaft shall also be galvanized. Coordinate fabrication pivot shaft and galvanizing for proper fit of bearing installation.

Provide two stabilization cylinders (for each gate) with "eye" or "loop" end fittings, Monroe Part. No. SC-2913.

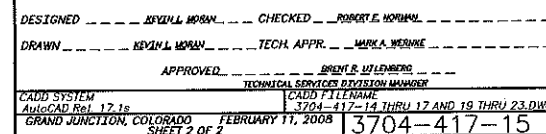
Install stabilization cylinders so they compress when gate opens.

SECTION B-B
SIDE VIEW

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SAN JUAN RIVER RECOVERY IMPLEMENTATION PROGRAM - NEW MEXICO
HOGBACK CANAL
FISH BARRIER WEIR
STATIC FRAME FOR FLAP GATE
VIEWS AND SECTIONS

DESIGNED BY KYLE L. MORAN CHECKED BY ROBERT L. MORAN
DRAWN BY KYLE L. MORAN TECH. APPR. MARK A. WERNKE
APPROVED BY BRENT R. ULLMANN
CADD SYSTEM AutoCAD Rev. 17.1s
3704-417-14 THRU 17 AND 19 THRU 23.DWG
GRAND JUNCTION, COLORADO FEBRUARY 11, 2008
SHEET 1 OF 2 3704-417-14



(2) Intermediate frame members spaced 14" below for fall protection

Provide (1) frame member to be 42" above grating for fall protection.

El. 4999.00, Top of wall

Baffle lowered for normal operation

Lifting device, type and location may vary from that shown

El. 4998.50, Top of wall

U/S WS

3'-9" Slot width

8'-0" Slot height

8'-0"

El. 4988.82

(2) Intermediate frame members spaced 14" below for fall protection

Provide (1) frame member to be 42" above grating for fall protection.

El. 4999.00, Top of wall

Baffle lowered for normal operation

Lifting device, type and location may vary from that shown

El. 4998.50, Top of wall

U/S WS

5'-2" Slot width

6'-6" Slot height

8'-0"

El. 4988.69

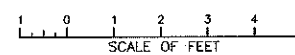
Baffle raised 4.0' for sluicing

El. 4998.50, Top of wall

U/S WS

4'-0" 8'-0"

SLOTTED BAFFLE TYPE A
(Section Cut Thru Gate Structure)



Notes on the slotted baffles:

See specifications section 11285 for requirements of slotted baffles.

For details of gate structure, see Dwg. No. 3704-D-5, 6 and 7.

Used to control water surface drop from weir wall elevation to sluice channel water surface.

Normal return flows range from 100 cfs up to 225 cfs (per bay).

Install slotted baffles in blockouts recommended by manufacturer.

Slotted baffles shall provide smooth side walls and bottom.

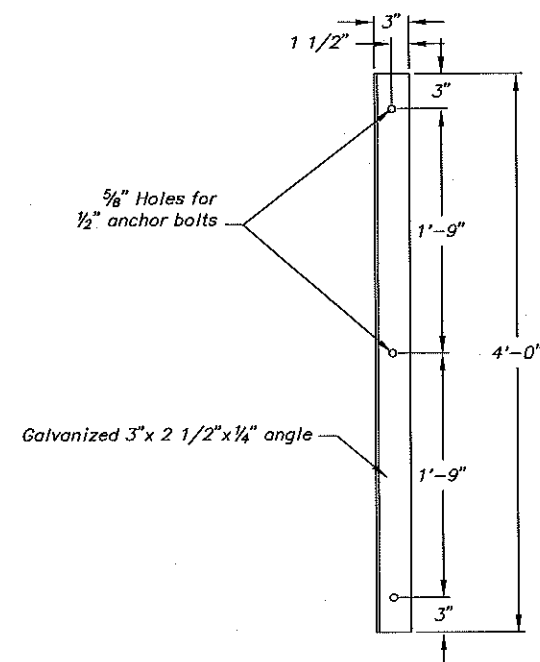
Maximum head across each baffle is 3 feet

Each baffle needs to be capable of being lifted 4.0 feet above structure's invert for end of year sluicing.

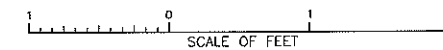
Widths of baffles and water surface have been designed by BOR using HECRAS.

Supported metal grating planks are not shown.

SLOTTED BAFFLE TYPE B
(Section Cut Thru Gate Structure)



FLOW RESTRICTION ANGLES
(One shown, four required)



Notes for flow restriction angles:

See specifications section 05500 for requirements of slotted baffles.

Install flow restriction angles vertically on walls of gate structure at locations shown on Dwg. No. 3704-D-6 with epoxy anchor bolts.

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SAN JUAN RIVER RECOVERY IMPLEMENTATION PROGRAM - NEW MEXICO
HOGBACK CANAL
FISH BARRIER WEIR
SLOTTED BAFFLES AND FLOW RESTRICTION ANGLES
TYPICAL SECTIONS

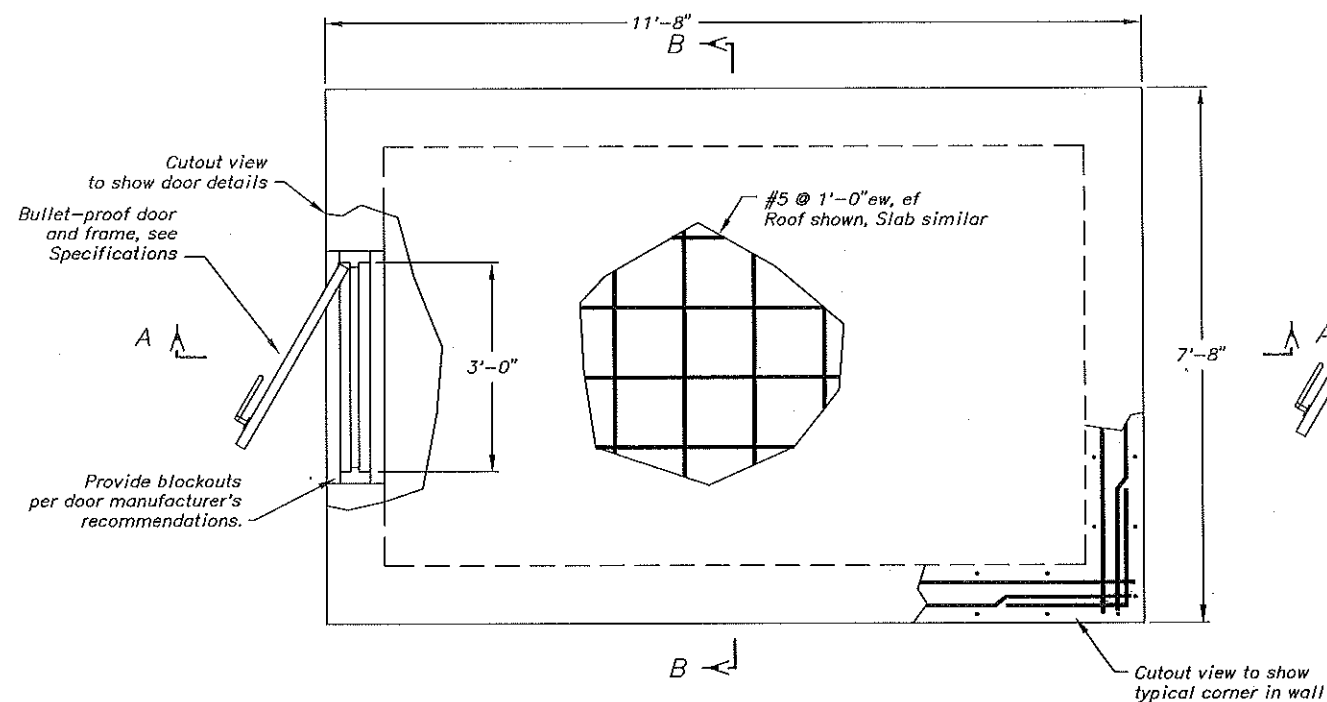
DESIGNED BY KENNETH M. BROWN CHECKED BY ROBERT E. NORMAN

DRAWN BY KENNETH M. BROWN TECH. APPR. BY MARK A. WERNKE

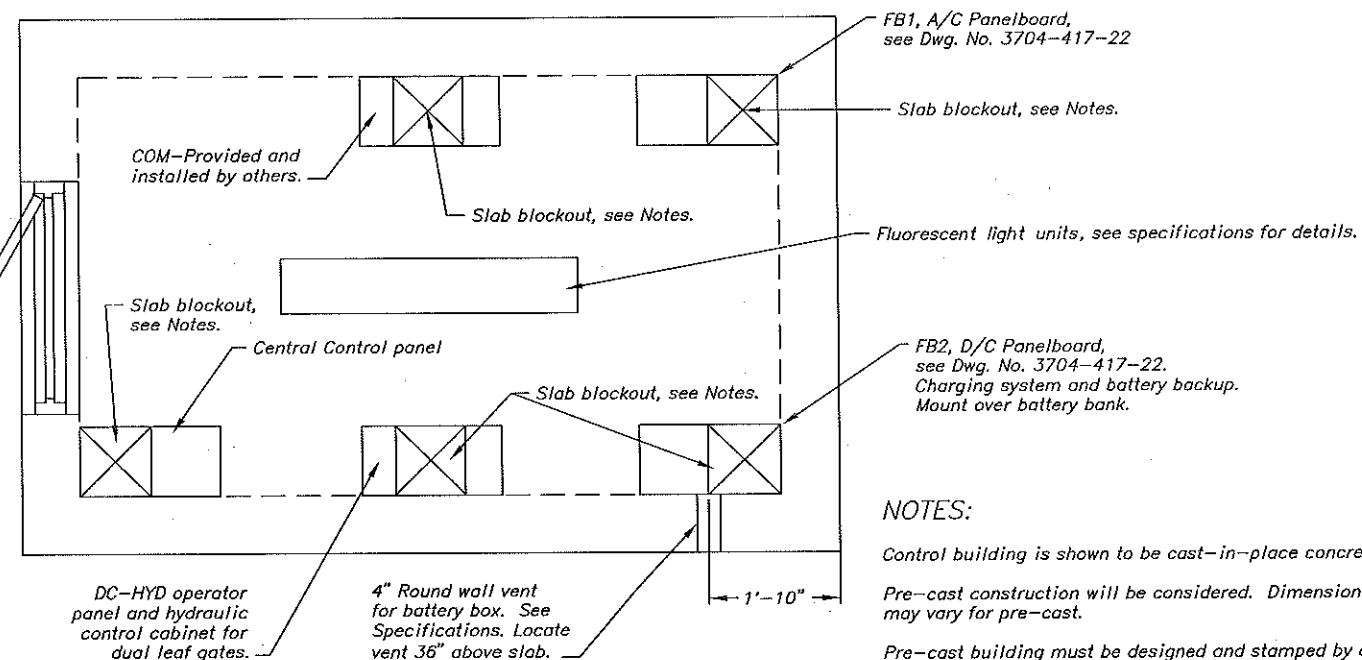
APPROVED BY BRYAN R. WILSON

TECHNICAL SERVICES DIVISION MANAGER

CADD SYSTEM AutoCAD Rev. 17.1s
3704-417-14 THRU 17 AND 19 THRU 23.DWG
GRAND JUNCTION, COLORADO FEBRUARY 11, 2008
SHEET 1 OF 1 3704-417-16



PLAN



EQUIPMENT LAYOUT PLAN

NOTES:

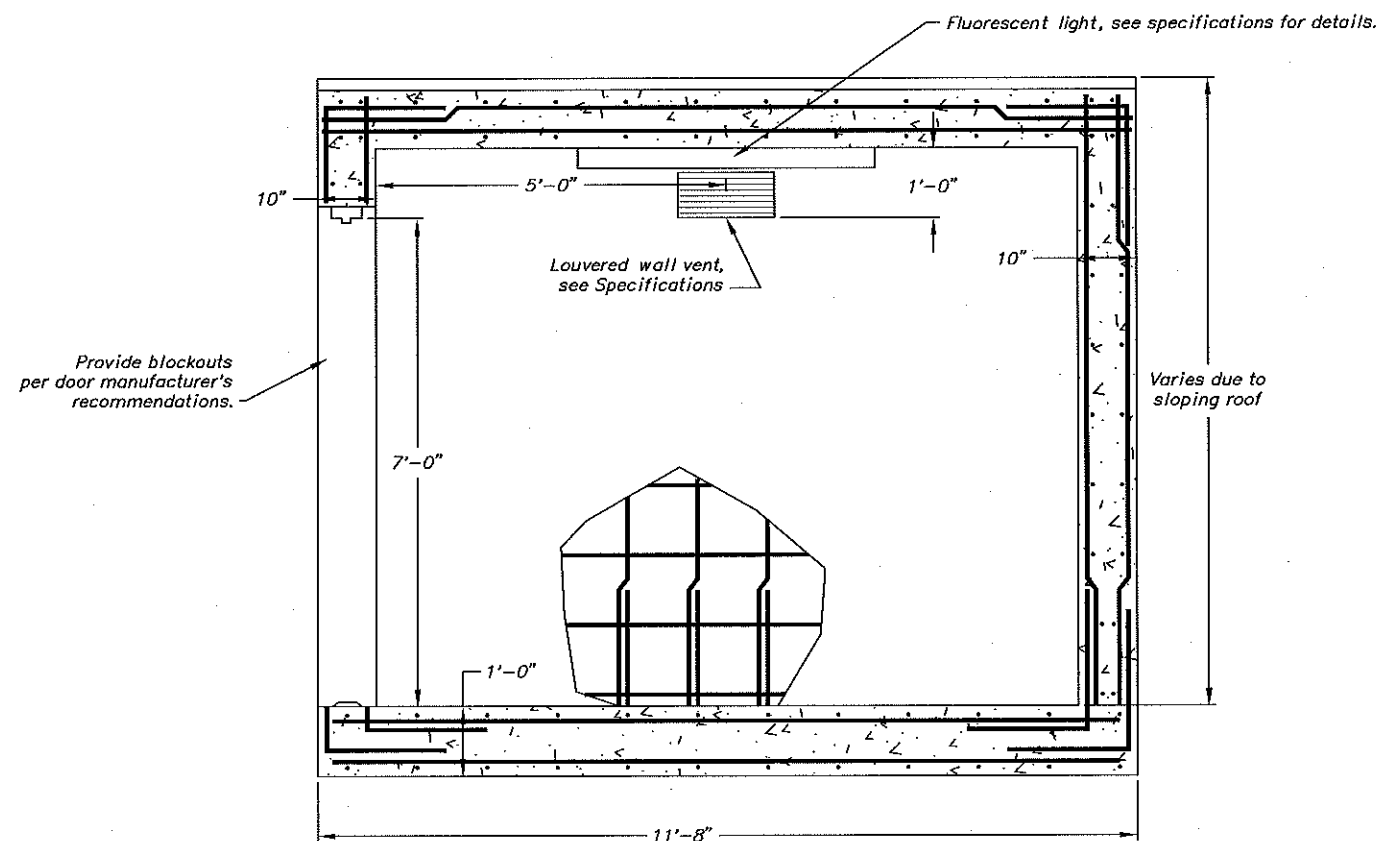
Control building is shown to be cast-in-place concrete.

Pre-cast construction will be considered. Dimensions shown may vary for pre-cast.

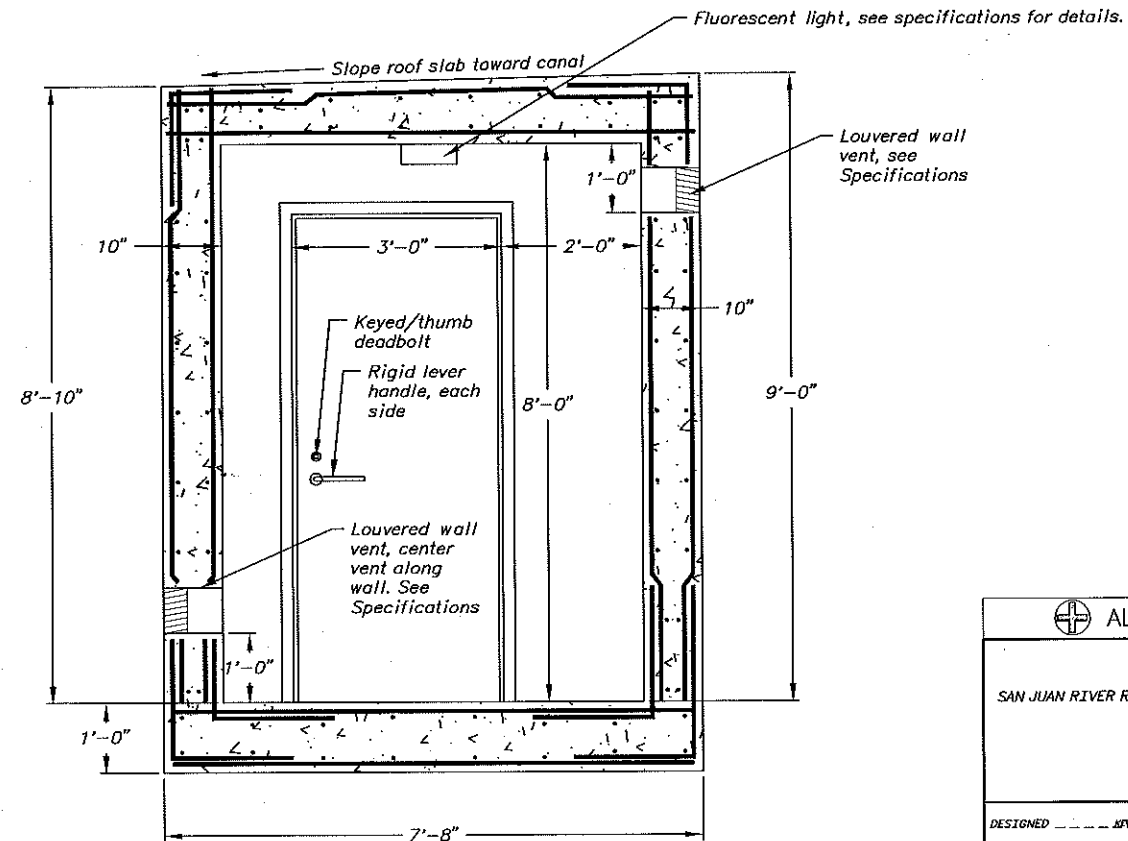
Pre-cast building must be designed and stamped by a Professional Engineer, registered in the State of New Mexico. Fabrication of a pre-cast structure must be by a supplier with at least 10-years experience in pre-cast fabrication.

If pre-cast, provide 12"x12" blockouts in slab as shown for conduits and hydraulic tubing. Fill blockouts with non-shrink grout upon completion of construction.

Specified doors, lights, and ventilation must meet the requirements of those specified or approved equal.



SECTION A-A



SECTION B-B



ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SAN JUAN RIVER RECOVERY IMPLEMENTATION PROGRAM - NEW MEXICO
HOGBACK CANAL
FISH BARRIER WEIR
CONTROL BUILDING
PLANS AND SECTIONS

DESIGNED BY SPILL MONITOR CHECKED BY SPILL MONITOR

DRAWN BY KEVIN L. MORAN TECH. APPR. BY MARIA WENZKE

APPROVED BY JOHN H. WILSON

TECHNICAL SURVEYS DIVISION MANAGER

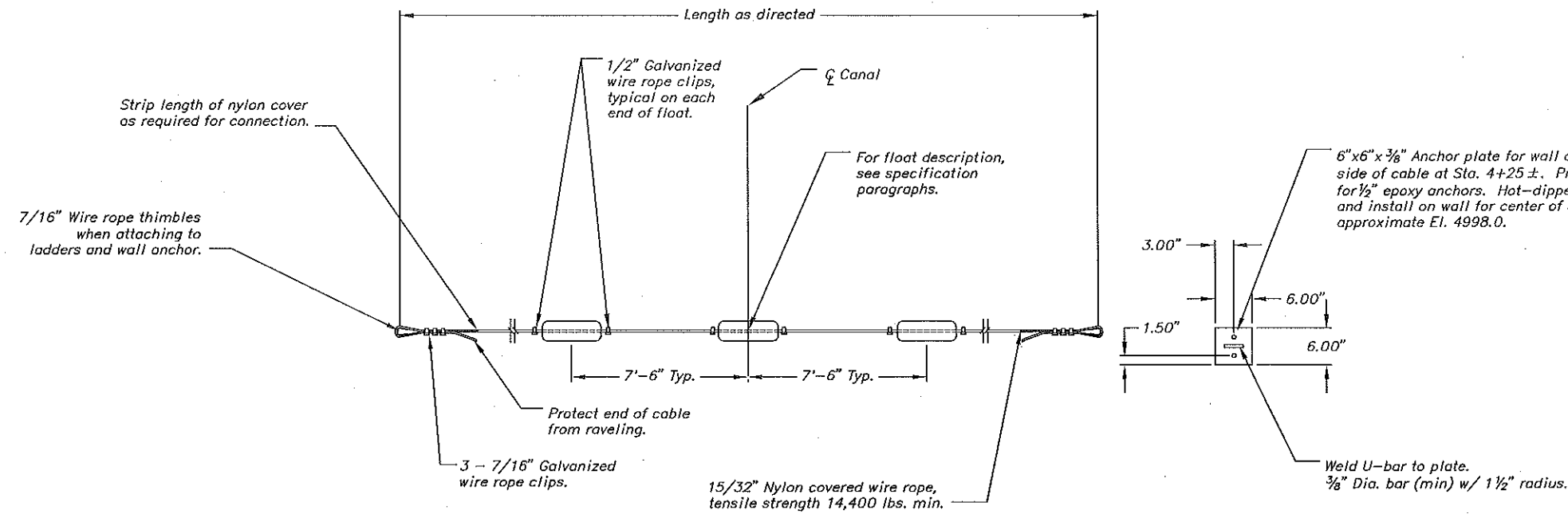
CADD SYSTEM: AUCAD R17.1s

3704-417-14 THRU 17 AND 19 THRU 22.DWG

GRAND JUNCTION, COLORADO FEBRUARY 11, 2008

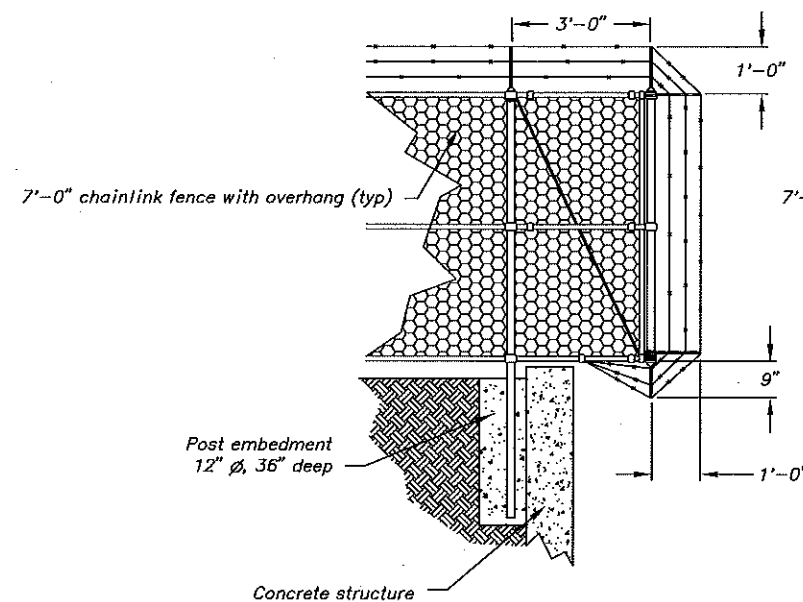
SHEET 1 OF 1

3704-417-17

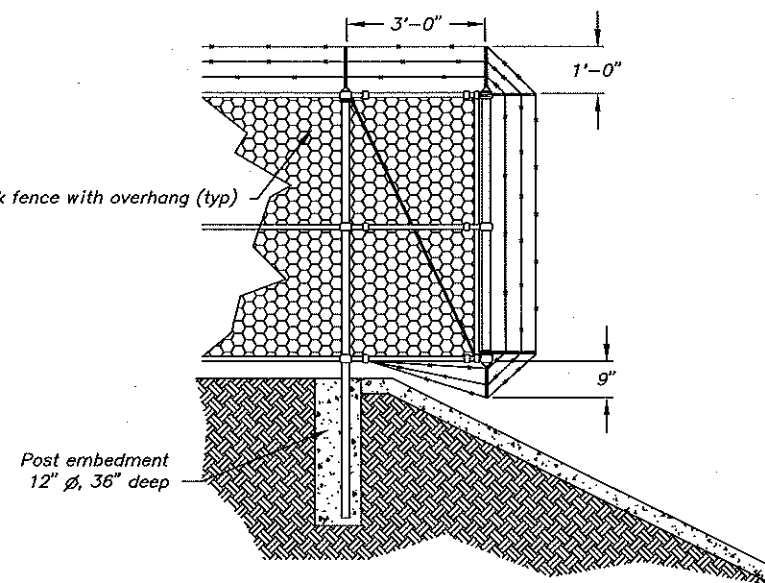


SAFETY CABLE DETAIL

SAFETY CABLE WALL ANCHOR DETAIL
(1 Required)



TYPICAL FENCE OVERHANG
AT CONCRETE STRUCTURES
(Two required)



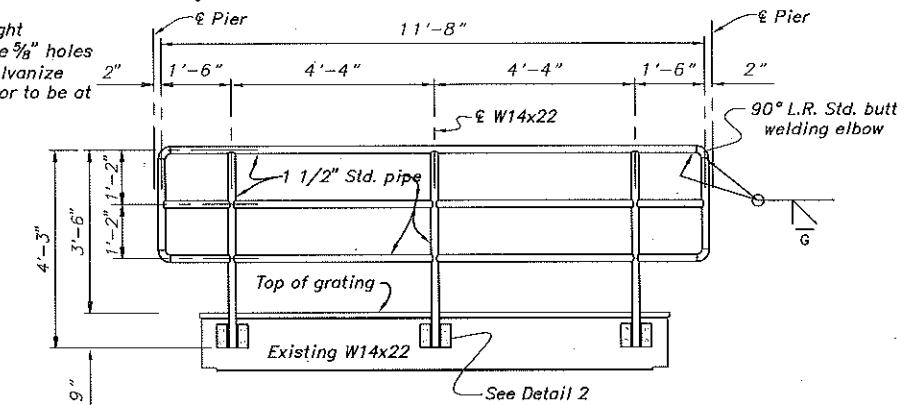
TYPICAL FENCE OVERHANG
FOR CONCRETE LINED CANALS
(Earth-lined Canals Similar)
(Two required, one each)

Notes:

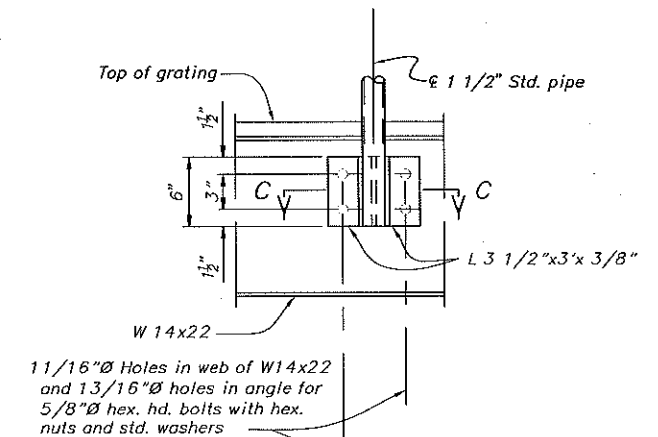
Guardrail MK 5705-A is to be placed at the headworks where one section of guardrail is missing.

An additional section of top mounted pipe guardrail is also required to be replaced, see Dwg. No. 40-D-6592.

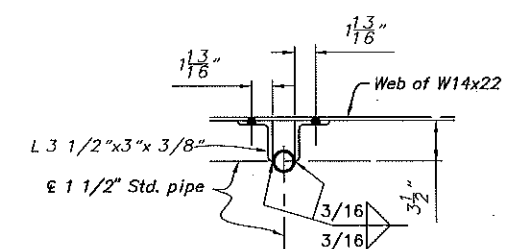
For mounting locations and additional details, see
Dwg. No. 3704-417-21.



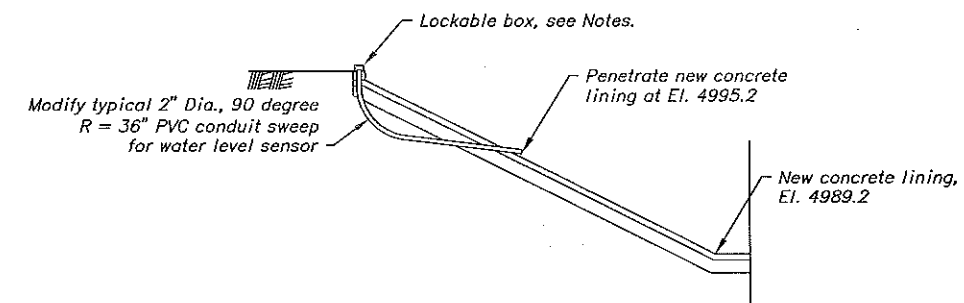
GUARDRAIL
ONE REQ'D., MK. 5708 - A



DETAIL 2



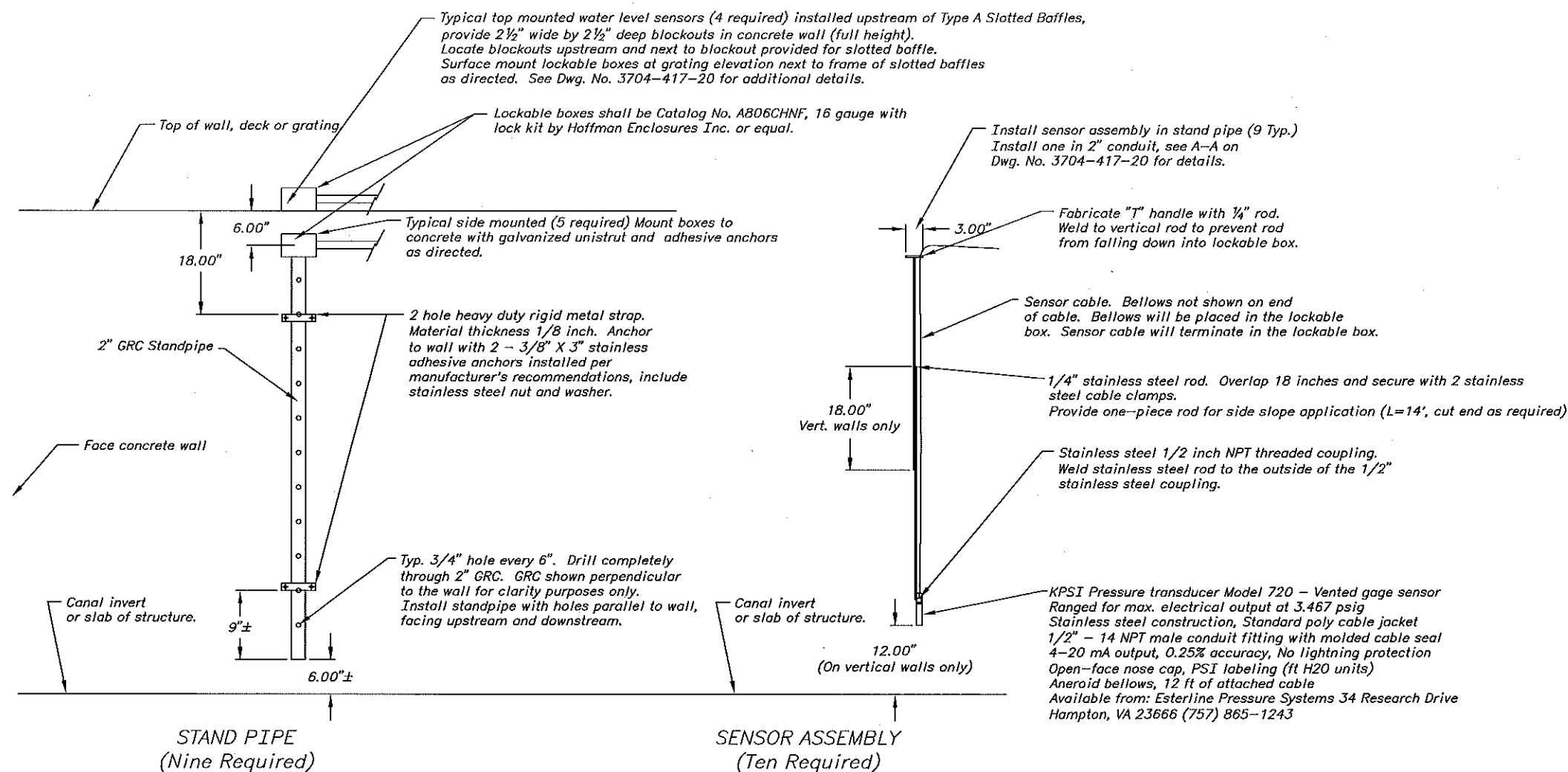
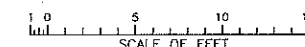
SECTION C-C

SECTION A-A
(20)

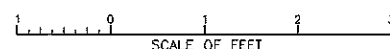
Notes:

Boxes shall be Catalog No. A806CHNF, 16 gauge with lock kit by Hoffman Enclosures Inc. or equal.

Mount boxes to concrete with galvanized unistrut and adhesive anchors as directed.



ELEVATION VIEWS



NOTES:

GRC = Galvanized rigid steel conduit.

Furnish and install ten water level sensors.

Five sensors to be side mounted on concrete walls as shown.

Four sensors to be top mounted and in blockouts in concrete walls just upstream of the Type A Slotted Baffles.

One sensor to be mounted next to concrete transition, see Section A-A and Dwg. No. 3704-417-20 for details.

For all location of water level sensors, see Dwg. No. 3704-417-20 for details.

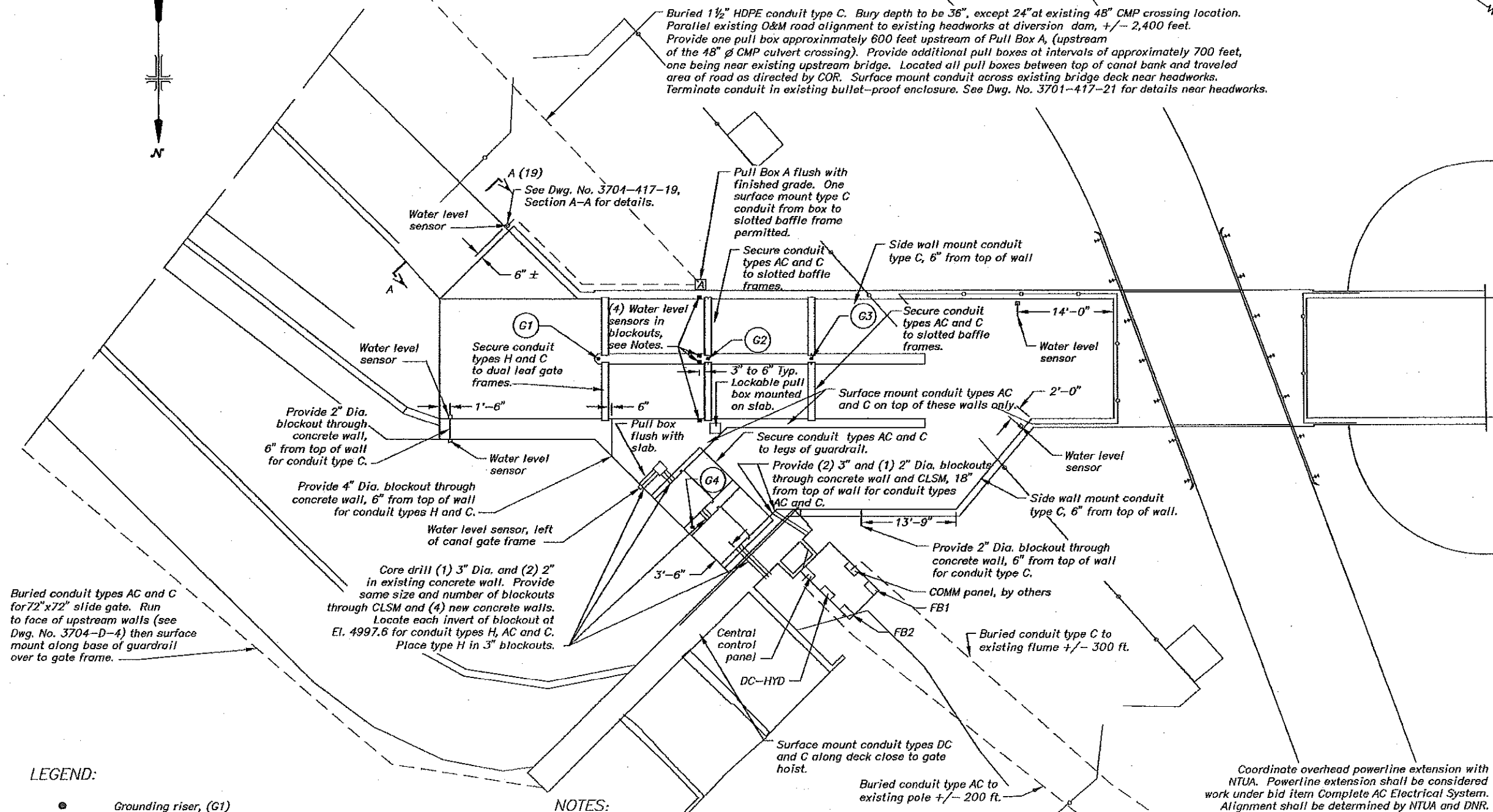
DATE AND TIME PLOTTED
JUNE 4, 2003 16:02
PLOTTED BY
AMORAN
DRAWING PATH
C:\WORK\3704-417-19\3704-417-19.DWG

⊕ ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SAN JUAN RIVER RECOVERY IMPLEMENTATION PROGRAM - NEW MEXICO
HOGBACK CANAL
FISH BARRIER WEIR
WATER LEVEL SENSORS
ELEVATIONS AND SECTION

DESIGNED BY: AMORAN CHECKED BY: AMORAN
DRAWN BY: AMORAN TECH. APPR. BY: AMORAN
APPROVED BY: AMORAN
CADD SYSTEM: AutoCAD Rev. 17.16
CADD FILENAME: 3704-417-14 THRU 17 AND 19 THRU 22.DWG
GRAND JUNCTION, COLORADO FEBRUARY 11, 2008
SHEET 1 OF 1

3704-417-19



LEGEND:

- Grounding riser, (G1)
- 2½" Wide by 2½" Deep blackout in concrete wall (full height) for top mounted water level sensors. Mount lockable box over blackout at top of grating, see Dwg. No. 3704-417-19 and Notes under Section A-A for box details.
- Side mounted water level sensors, see Dwg. No. 3704-417-19 and Notes under Section A-A for box details.

NOTES:

See Drawing No. 3704-417-23 for Conduit and Cable Schedule.

See Specifications Section 16130 for requirements of Electrical Conduit.

See Specifications Section 11286 for requirements of hydraulic tubing for dual leaf gates.

All conduit and tubing runs shown are general locations. Field verify all runs for embedment, burial or surface mount prior to installation.

No conduits shall be placed below the slab of a structure or below the canal water surface.

Conduit inside of Control Building not shown for clarity.

See Dwg. No. 3704-417-17 for conduit blockouts in floor of Control Building.

Surface mount conduit to guardrail near top of concrete when possible. When guardrail is not present, surface mount to concrete on inside face of walls or on slab and walkways to avoid tripping hazard. All surface mount installations shall be coordinated with the COR.

Ground risers shall be #4-0 Cadwelded to bottom mat of reinforcement steel.

Pull box sizes, number of and exact locations to be determined by contractor.

REV NO 1	2011-12-6 417 K.MORAN	Updated notes to reflect bullet-proof enclosure was installed.
ALWAYS THINK SAFETY		
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION SAN JUAN RIVER RECOVERY IMPLEMENTATION PROGRAM - NEW MEXICO HOGBACK CANAL FISH BARRIER WEIR GROUNDING, ELECTRICAL CONDUITS AND HYDRAULIC TUBING PLAN VIEW		
DESIGNED	BY: K.M.M.	CHECKED: R.M.M.
DRAWN	BY: K.M.M.	TECH. APPR.: M.M.M.
APPROVED:		BY: S. WILSON
CADD SYSTEM		TECHNICAL SERVICES DIVISION
AutoCAD R14.1a		3704-417-14 THRU 17 AND 19 THRU 23.DWG
GRAND JUNCTION, COLORADO		FEBRUARY 11, 2008
SHEET 1 OF 1		3704-417-20

D

C

B

A

D

C

B

A

Exit of fish passage

FLOW

FLOW

For modifications of trashracks,
see Dwg. No. 3704-D-13Furnish and install one missing
section of guardrail (MK 5708-A),
see Dwg. No. 3704-417-18Furnish and install one missing
section of top mounted guardrail
see Dwg. No. 40-D-659211'-6"
4'-2"EXISTING HEADWORKS
PLAN VIEW

Existing chain link fence.

NOTES:

See Drawing No. 3704-417-20 for Conduit Notes and Legend.

See Drawing No. 3704-417-23 for Conduit and Cable Schedule
and Panelboard DD1 Schedule.

Sluice channel

Existing radial gates
and hoistsSurface mount conduit types
AC and C on concrete deck
as directed by COR.Existing
radial gate
and hoistInstall panelboard DD1 and Diversion Dam control panel
in existing bullet-proof enclosure. See Dwg. No. 3704-417-23
for details of DD1. Include all costs for furnishing and installing
Panelboard DD1 in the bid item Complete AC Electrical System.
Include the cost of furnishing and installing the Diversion Dam
Control Panel in the bid item Control Panels.

O&M Road

Bridge

Surface mount 1 1/2" HDPE conduit type C
to concrete deck below guardrail
or to guardrail as directed by COR.Install new meter pole,
provide buried conduit type
U to bullet-proof enclosure and
Diversion Dam control panel.

HOGBACK CANAL

FLOW

Coordinate overhead powerline extension with
NTUA. Powerline extension shall be considered
work under bid item Complete AC Electrical System.
Alignment shall be determined by NTUA and DNR.Buried 1 1/2" HDPE conduit type C. Bury depth to be 36", except 24" at
existing 48" CMP crossing location. Parallel existing O&M road
alignment to Pull Box A at gate structure, +/- 2,400 feet.
Provide one pull box approximately 600 feet upstream of Pull
Box A, (upstream of the 48" Ø CMP culvert crossing). Provide
additional pull boxes at intervals of approximately 700 feet.
Located all pull boxes between top of canal bank and traveled
area of road as directed by COR. Surface mount conduit across
existing bridge deck. Terminate conduit in Government furnished
bullet-proof enclosure. See Dwg. No. 3701-417-20 for details
near gate structure.

O&M Road

REV NO 1	2011-12-8 417 KAMORAN	Updated notes to reflect bullet-proof enclosure was installed.
 ALWAYS THINK SAFETY		
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION SAN JUAN RIVER RECOVERY IMPLEMENTATION PROGRAM - NEW MEXICO HOGBACK CANAL FISH BARRIER WEIR ELECTRICAL SYSTEM AND NEW GUARDRAILS FOR HEADWORKS PLAN VIEW		
DESIGNED	REVIEWED	CHECKED
DRAWN	TECH. APPR.	APPROVED
CADD SYSTEM AutoCAD Rev. 17.1s GRAND JUNCTION, COLORADO SHEET 1 OF 1		
CADD FILENAME 3704-417-21 THRU 17 AND 19 THRU 22.DWG FEBRUARY 11, 2008 3704-417-21		

PANELBOARD SCHEDULE FOR A/C
POWER IN CONTROL BUILDING

Panel No. : FB1		Section : Fish Barrier		BUS: 240/120 Volts		☒ Main Ckt. Breaker 200 AMP						
Location : Hogback		Serving : Entire Facility		1 PH 4 WIRE 225 AMP		☐ Main Lugs Only						
Fully Rated SCI 10,000 RMS SYS AMPS		☐ Feed ThroughLugs ☐ SubFeed Lugs		☐ Isolated Ground Bus		☐ Flush Mount ☒ Surface Mount ☐ Top Feed ☒ Bottom Feed						
LOAD TYPE	CIRCUIT DESCRIPTION	CONN VA	AMP	C.B. POLE	CKT	PH	C.B. CT	POLE	AMP	CONN VA	CIRCUIT DESCRIPTION	LOAD TYPE
	DC Charging System	1152	15	2	1	N/A	2	2	20	1763	U/S Slide Gate (72 x 72)	M
	----- -----	1152	15	2	3	N/A	4	2	20	1763	----- -----	M
M	Left Sluice Gate (72 x 48)	1763	20	2	5	N/A	6	2	20	1763	Right Sluice Gate (72 x 48)	M
M	----- -----	1763	20	2	7	N/A	8	2	20	1763	----- -----	M
M	Left Type A Slotted baffle	1763	20	2	9	N/A	10	2	20	1763	Right Type A Slotted baffle	M
M	----- -----	1763	20	2	11	N/A	12	2	20	1763	----- -----	M
M	Left Type B Slotted baffle	1763	20	2	13	N/A	14	2	20	1763	Right Type B Slotted baffle	M
M	----- -----	1763	20	2	15	N/A	16	2	20	1763	----- -----	M
R	Motor Controls	2400	20	1	17	N/A	18	1	20	2400	Lighting	L
R	Receptacle	2400	20	1	19	N/A	20	1	20	2400	Receptacle	R
	Space				21	N/A	22				Space	
	Space				23	N/A	24				Space	
	Space				25	N/A	26				Space	
	Space				27	N/A	28				Space	
	Space				29	N/A	30				Space	
	Space				31	N/A	32				Space	
	Space				33	N/A	34				Space	
	Space				35	N/A	36				Space	
	Space				37	N/A	38				Space	
	Space				39	N/A	40				Space	
	Space				41	N/A	42				Space	
Total Receptacle (R) Load @ 180VA/each=>100% for first 10KVA & 50% for remainder: 9.60 kVA												
Total Non-coincidental (E) Load: 0.00kVA												
Total Lighting (L) Load @ 125% : 0.00 kVA												
Total Motor (M) Load : 12.3 kVA												
Total Heating (H) Load : 0.00 kVA												
Total Non-continuous (N) Load : 0.00kVA												
Largest Motor (25% added to demand load): 0.75HP 2.20kVA												
TOTAL CONNECTED LOAD :		kVA	CONNECTED AMP Total Amp / PH :	A	B	C	TOTAL DEMAND LOAD		AMP	kVA		

PANELBOARD SCHEDULE FOR D/C
POWER IN CONTROL BUILDING

Panel No. : FB2		Section : Fish Barrier		BUS: 24 Volts DC		☒ Main Ckt. Breaker 50 AMP						
Location : Hogback		Serving : DC Loads		1 PH 4 WIRE 225 AMP		☐ Main Lugs Only						
Fully Rated SCI 10,000 RMS SYS AMPS		☐ Feed ThroughLugs ☐ SubFeed Lugs		☒ Isolated Ground Bus		☐ Flush Mount ☒ Surface Mount ☐ Top Feed ☒ Bottom Feed						
LOAD TYPE	CIRCUIT DESCRIPTION	CONN VA	AMP	C.B. POLE	CKT	PH	C.B. CT	POLE	AMP	CONN VA	CIRCUIT DESCRIPTION	LOAD TYPE
M	Radial gate hoist motor	414	30	1	1	N/A	2	1	30	414	Dual leaf gate motor	M
R	Motor Controls	480	20	1	3	N/A	4	1	20	480	Motor Controls	R
	Space				5	N/A	6				Space	
	Space				7	N/A	8				Space	
	Space				9	N/A	10				Space	
	Space				11	N/A	12				Space	
	Space				13	N/A	14				Space	
	Space				15	N/A	16				Space	
	Space				17	N/A	18				Space	
Total Receptacle (R) Load @ 180VA/each=>100% for first 10KVA & 50% for remainder: 0.00kVA												
Total Non-coincidental (E) Load: 0.00kVA												
Total Lighting (L) Load @ 125% : 0.00 kVA												
Total Motor (M) Load : 0.83 kVA												
Total Heating (H) Load : 0.00 kVA												
Total Non-continuous (N) Load : 0.00kVA												
Largest Motor (25% added to demand load): 0.5 HP 0.47 kVA												
TOTAL CONNECTED LOAD :		kVA	CONNECTED AMP Total Amp / PH :	A	B	C	TOTAL DEMAND LOAD		AMP	kVA		

DATE AND TIME PLOTTED
JUNE 4, 2009 16:14
PLOTTED BY
KMOHRAN
DRAWING PATH
C:\WORK\220121 SAN JUAN RIVER\HOGBACK.DWG

⚠ ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SAN JUAN RIVER RECOVERY IMPLEMENTATION PROGRAM - NEW MEXICO
HOGBACK CANAL
FISH BARRIER WEIR
PANELBOARD SCHEDULES FOR CONTROL BUILDING
TABLES

DESIGNED _____ CHECKED _____
DRAWN _____ TECH. APPR. _____
APPROVED _____
TECHNICAL SERVICES DIVISION MANAGER

CADD SYSTEM
AutoCAD 2004 17.1s
CADD FILENAME
3704-417-14 THRU 17 AND 19 THRU 22.DWG
GRAND JUNCTION, COLORADO
FEBRUARY 11, 2008
SHEET 1 OF 1

3704-417-22

PANELBOARD SCHEDULE FOR A/C POWER AT DIVERSION DAM HEADWORKS

Panel No. : DD1		Section : Diversion Dam		BUS: 240/120 Volts		☒ Main Ckt. Breaker 100 AMP						
Location : Hogback		Serving : Entire Facility		1 PH 4 WIRE 225 AMP		☐ Main Lugs Only						
Fully Rated SCI 10,000 RMS SYS AMPS		☐ Feed Through Lugs ☐ SubFeed Lugs		☐ Isolated Ground Bus		☐ Flush Mount ☒ Surface Mount						
						☐ Top Feed ☒ Bottom Feed						
LOAD TYPE	CIRCUIT DESCRIPTION	CONN VA	C.B.			PH	C.B.			CONN VA	CIRCUIT DESCRIPTION	LOAD TYPE
			AMP	POLE	CKT		CKT	POLE	AMP			
M	Motor	1763	20	2	1	N/A	2	2	20	1763	Motor	M
M	——— ———	1763	20	2	3	N/A	4	2	20	1763	——— ———	M
M	Motor	1763	20	2	5	N/A	6	1	20	2400	Motor Controls	R
M	——— ———	1763	20	2	7	N/A	8	1	20	2400	Receptacle	R
	Space				9	N/A	10				Space	
	Space				11	N/A	12				Space	
	Space				13	N/A	14				Space	
	Space				15	N/A	16				Space	
	Space				17	N/A	18				Space	
Total Receptacle (R) Load @ 180VA/each=>100% for first 10KVA & 50% for remainder: 4.80 kVA												
Total Non-coincidental (E) Load: 0.00kVA												
Total Lighting (L) Load @ 125% : 0.00 kVA												
Total Motor (M) Load : 5.29 kVA												
Total Heating (H) Load : 0.00 kVA												
Total Non-continuous (N) Load : 0.00kVA												
Largest Motor (25% added to demand load): 0.75HP 2.20kVA												
TOTAL CONNECTED LOAD : 10.090kVA		CONNECTED AMP Total Amp / PH :		A	B	C	TOTAL DEMAND LOAD		54.9 AMP 10.5 kVA			

CONDUIT & CABLE SCHEDULE

Conduit Type	Cable	Conduit Size	From	To	Remarks
U	3-1C No. 4/0	2-1/2"	Utility Service Meter 1	Panel FB1	Buried/Embedded
U	3-1C No. 2	2-1/2"	Utility Service Meter 2	Panel DD1	Buried/Embedded
AC	4-1C No. 10	3/4"	Panel FB1	Motor(s) Starter	Buried/Embedded/Surface Mount
DC	4-1C No. 10	3/4"	Panel DD1	Motor(s) Starter	Buried/Embedded/Surface Mount
AC	3-1C No. 12	3/4"	Panel FB1/DD1	Receptacle	Buried/Embedded/Surface Mount
AC	3-1C No. 10	3/4"	Panel FB2	Motor(s) Starter	Buried/Embedded/Surface Mount
C	1-4C No. 18	3/4"	Central Control Panel	Water level sensor	Buried/Embedded/Surface Mount
C	1-4C No. 18	3/4"	Central Control Panel	Gate position sensor	Buried/Embedded/Surface Mount
C	1-10C No. 18 or 10-1C No. 16	3/4"	Central Control Panel	Gate actuator control	Buried/Embedded/Surface Mount
C	1-4C No. 18	3/4"	Dual Leaf Control Panel	Dual leaf gate limit	Buried/Embedded/Surface Mount
C	1-4C No. 18	1"	COM	Flume	Buried/Embedded/Surface Mount
C	None	1 1/2"	Central Control Panel	Pull Box A	Buried/Embedded/Surface Mount
C (HDPE)	None	1 1/2"	Pull Box A	Diversion Dam bullet-proof enclosure	Buried/Surface Mount

For C conduits, when more than 20-No. 18 conductors are in a conduit, increase the conduit size to 1-1/4".

When more than 35-No. 18 conductors are in one conduit, increase the conduit size to 1-1/2". Add an additional conduit if there are more than 60-No. 18 conductors.

For AC and DC conduits, use a maximum fill of 30 percent.

Similar conduit types can be combined in a common conduit. Do not mix conduit types in a common conduit.

Different conduit types can be mixed in pull boxes and blockouts.

 ALWAYS THINK SAFETY

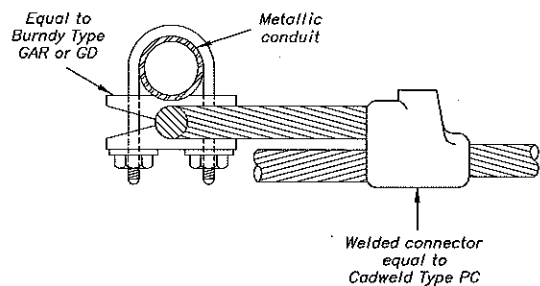
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SAN JUAN RIVER RECOVERY IMPLEMENTATION PROGRAM - NEW MEXICO
HOGBACK CANAL
FISH BARRIER WEIR
PANELBOARD SCHEDULE FOR HEADWORKS
AND PROJECT CONDUIT AND CABLE SCHEDULE
TABLE

DESIGNED _____ BY _____ CHECKED _____ BY _____
DRAWN _____ BY _____ TECH. APPR. _____ BY _____
APPROVED _____ BY _____
CADD SYSTEM
AutoCAD 2011
3704-417-23
FEBRUARY 11, 2008
SHEET 1 OF 1

3704-417-23

FIGURE 1

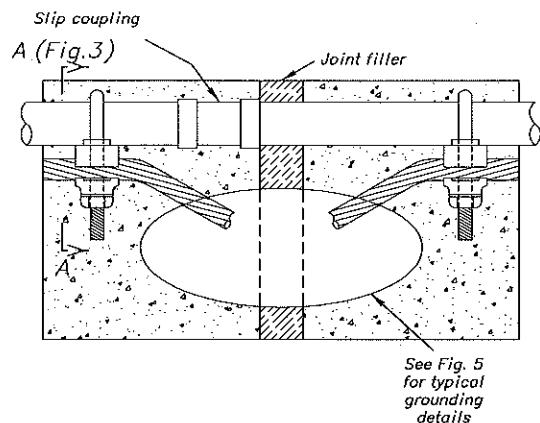
GROUNDING METAL CONDUITS



METAL CONDUIT GROUNDING TABLE			
CONDUIT SIZE	MINIMUM SIZE OF GROUND CABLE	NUMBER CLAMP SIMILAR OF TAPS TO BURNDY TYPE	
$\frac{3}{4}$ " to $1\frac{1}{2}$ "	No. 4 A.W.G.	1	GAR
2" to 3"	No. 1 A.W.G.	1	GAR
Above 3"	No. 1 A.W.G.	2	GD

FIGURE 2

BONDING CONDUITS AT EXPANSION JOINTS

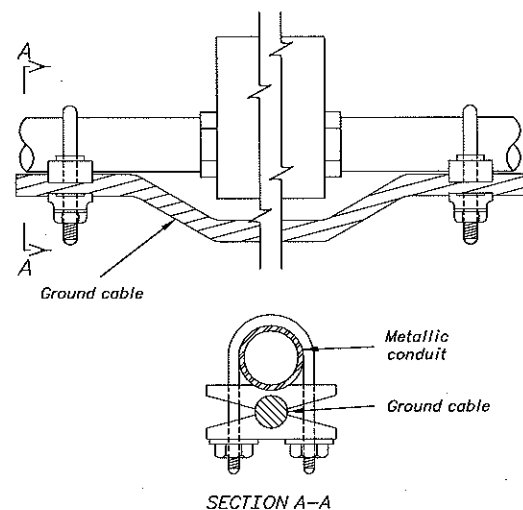


NOTE

CLAMPS SHALL BE EQUAL TO BURNDY TYPE GAR OR GD AND BARE COPPER CABLE IN ACCORDANCE WITH THE TABLE IN FIGURE 1 OR A BONDING JUMPER EQUAL TO O.Z. TYPE BJ (WITH BRONZE FITTINGS) MAY BE USED.

FIGURE 3

BONDING CONDUITS AROUND JUNCTION BOXES

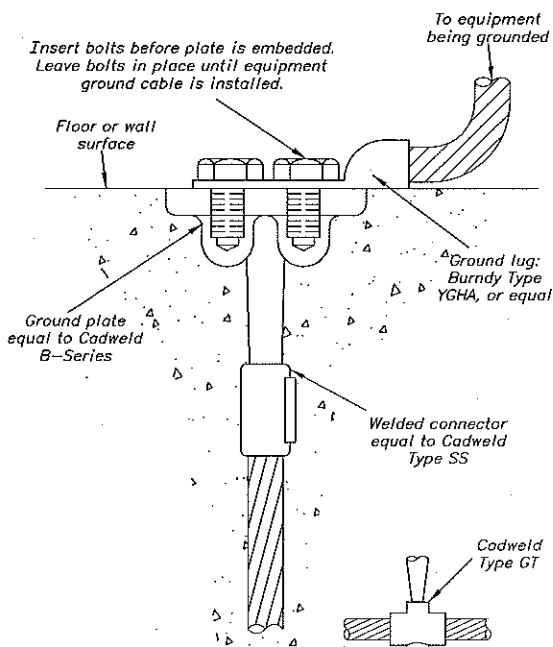


NOTE

CLAMPS SHALL BE EQUAL TO BURNDY TYPE GAR OR GD AND BARE COPPER CABLE IN ACCORDANCE WITH THE TABLE IN FIGURE 1 OR A BONDING JUMPER EQUAL TO O.Z. TYPE BJ (WITH BRONZE FITTINGS) MAY BE USED.

FIGURE 4

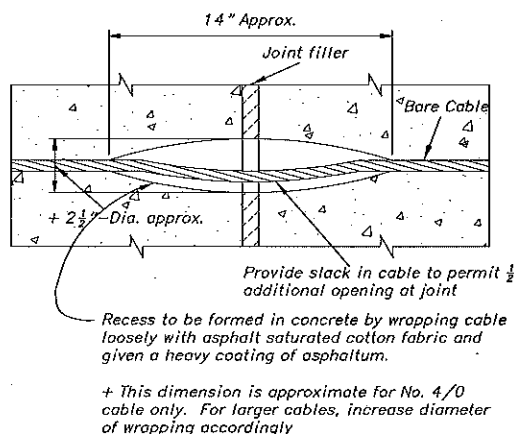
EMBEDDED GROUND CONNECTOR WITH EQUIPMENT GROUND CABLE



SIDE VIEWS

FIGURE 5

CROSSING EXPANSION AND CONTRACTION JOINTS WITH GROUNDING CABLE

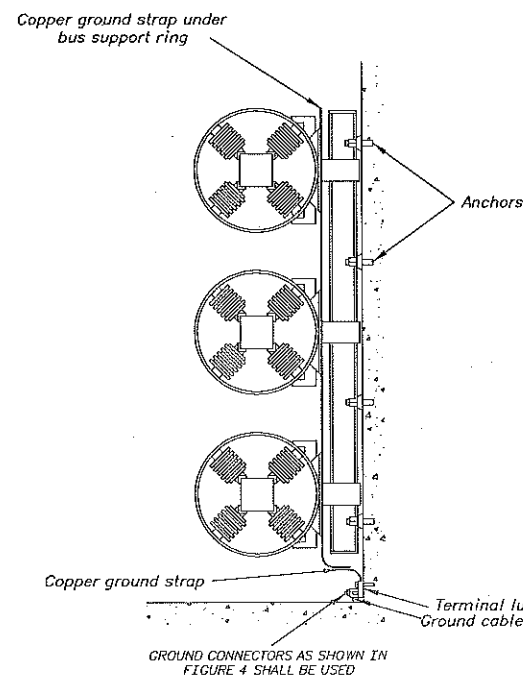


NOTE

THE CROSSING OF EXPANSION JOINTS WITH EMBEDDED GROUND CABLE SHOULD BE AVOIDED WHENEVER POSSIBLE. THE EMBEDDED GROUNDING SYSTEM FOR EACH UNIT OR BLOCK SHOULD BE SELF CONTAINED.

FIGURE 6

GROUNDING OF THREE PHASE BUS STRUCTURE



NOTES

- Ground cables for connection to equipment shall be of sufficient length to bolt to equipment when ultimately installed. Terminations as shown in Figure 4 Dwg 40-D-4334 shall be used in lieu of stubouts. Approximate locations only are shown on drawings. Exact locations to be determined in field.
- Refer to conduit drawings or general arrangement drawings whenever available, for more exact location of equipment.
- Metal conduits shall be grounded at both ends. If a break occurs in a run of metal conduit, the conduit shall be bonded across the break. In case the above is not feasible, the each section shall be grounded separately. Each contractor shall ground each metal conduit run, or portion thereof, that he installs. Junction or pull boxes not containing protective equipment in which the conduits are installed with a locknut and bondnut shall not be considered a break when the voltage is below 240 volts to ground, but shall be so considered for higher voltages. All junction or pull boxes in runs of non-metallic conduit shall be individually grounded. All boxes containing overload protective devices shall be individually grounded.
- Ground cable shall be No. 4 A.W.G. or larger.
- All paint, enamel, and scale shall be removed from point of contact on metal surfaces before applying ground connections.
- All bolts, machine screws, nuts and washers used in making grounding connections shall be silicon bronze.
- Cable shields and one conductor of multiconductor cable shall be grounded at both ends.
- Thermoweld, Cadweld, or an approved equivalent process shall be used in making connections between cables where embedded in concrete, direct buried, or under plant superstructure.
- Where Thermoweld, Cadweld, or an approved equivalent process is used it shall be performed with heavy duty welding equipment in accordance with manufacturer's instructions and the material shall be new fresh stock.
- All ground connectors shall be UL listed. All below grade connectors to be in accordance with IEEE 837.

REFERENCE DRAWINGS

TYPICAL GROUNDING DETAILS (SHT 2 OF 2)	40-D-4335
SWITCHYARDS & SUBSTATIONS - GROUNDING DETAILS	40-D-4753
PLATFORM GROUNDING DETAILS	40-D-4874
CABLE TRENCH GROUNDING	40-D-6182
GROUNDING SUPPORTS ON TUBULAR STEEL STRUCTURES	40-D-6309
FENCE GROUNDING DETAILS	40-D-6376

REV. NO.	2004-07-05	CHANGED NOTE 10, ADDED FIG. 4 CONNECTOR REF., ADDED REF. D - J. R. Z.
3	0 - J. R. Z.	DRAWINGS, OTHER MINOR REVISIONS.
3	0 - J. R. Z.	REDRAWN IN AUTOCAD R.14 FORMAT
0	0 - L.G.	
12	2 - 85	REVISED TO SHOW CURRENT PRODUCTS OR PRACTICES.
0	0 - G.D.O.	

THIS DRAWING SUPERSEDES
IN PART DRAWING 40-D-4336, 01-14-2003

ALWAYS THINK SAFETY

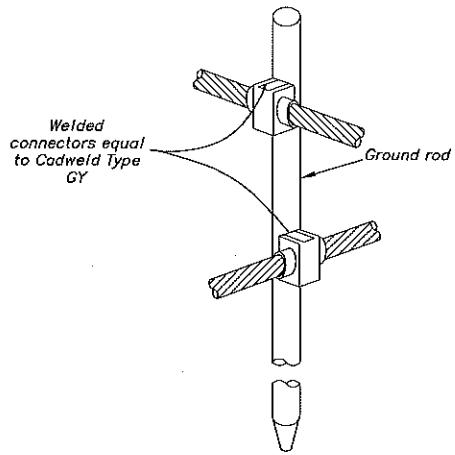
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
STANDARD DESIGNS

ELECTRICAL INSTALLATION
TYPICAL GROUNDING DETAILS

DRAWN - J.R.M. - S.J.S.	SUBMITTED - D. CLARK
TRACED - J.M.H.	RECOMMENDED - H.H. PLUMB
CHECKED - K.A.P. - R.F.H. - T.J.L.	APPROVED - J.N. McCLELLAN
ACTING CHIEF ENGINEER	

DENVER, COLORADO
SHEET 1 OF 2
MAY 1, 1947
40-D-4334

FIGURE 1
GROUND MATS



GROUND ROD DETAILS

FIGURE 2
GROUND MATS

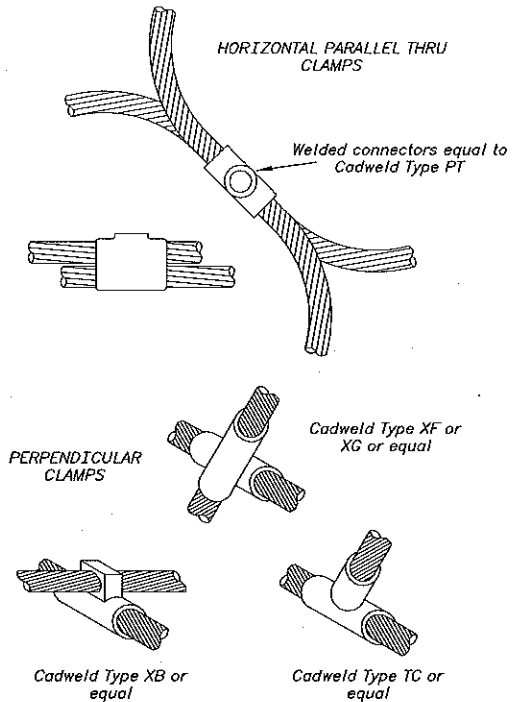


FIGURE 3
LIGHTING OR MISC POWER CABINETS

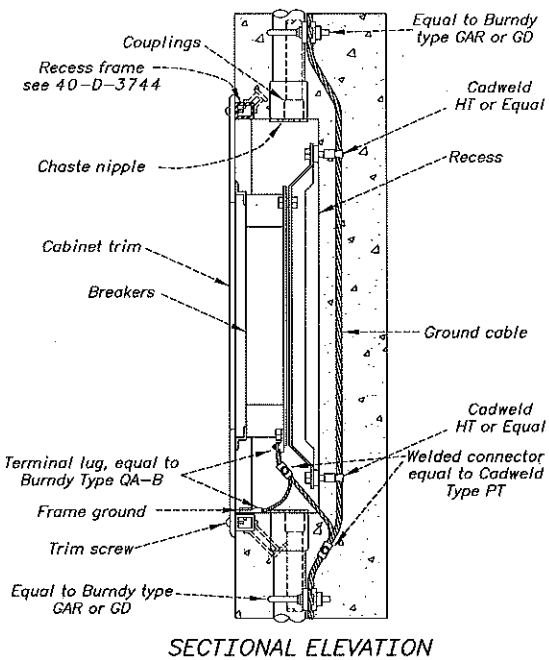
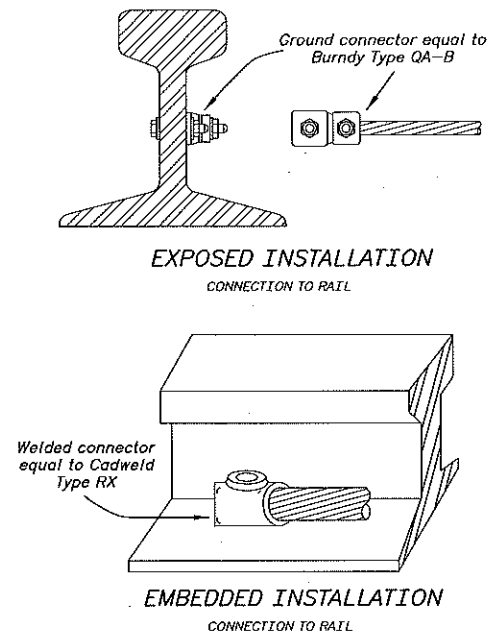


FIGURE 4
RAILS



NOTES

1. See drawing 40-D-4334 for notes and list of reference drawings.

GROUND SYMBOLS
(Used on Plan Drawings)

- Indicates ground cable embedded in concrete
- - - Indicates ground cable concealed but not embedded in concrete
- Indicates ground cable exposed
- ⊙ Indicates ground rod
- Indicates ground connection
- Indicates ground cable riser
- Indicates embedded ground plate

FIGURE 5
FLOOR FRAMES

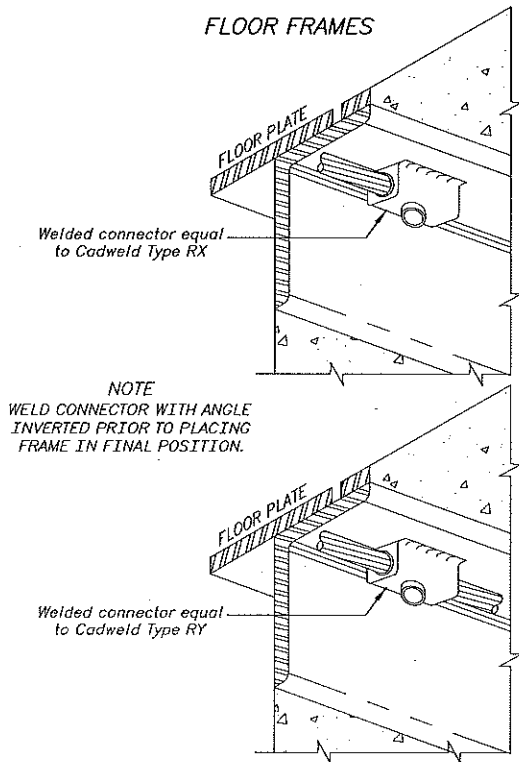


FIGURE 6
RAILING POST BASES AND HANDRAIL SUPPORTS

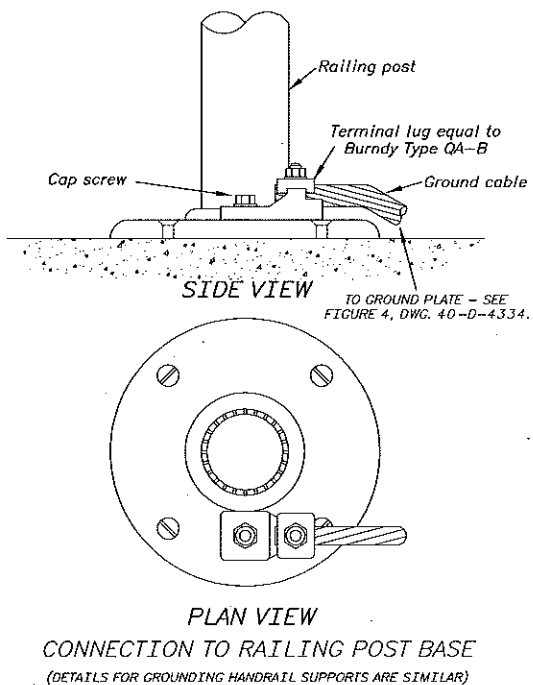


FIGURE 7
OIL TANK GROUNDING DETAILS

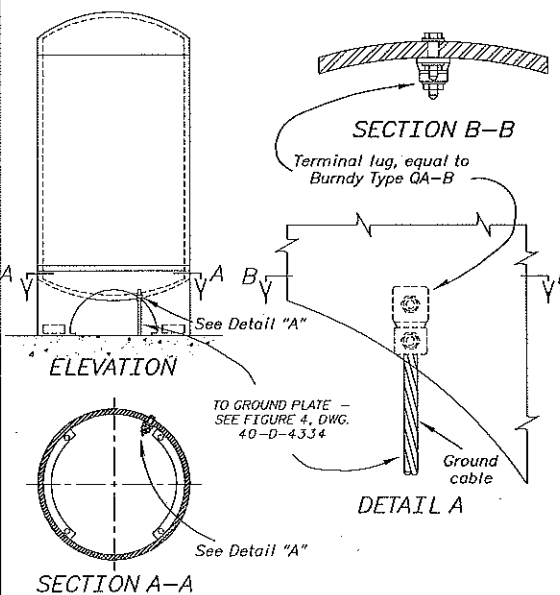
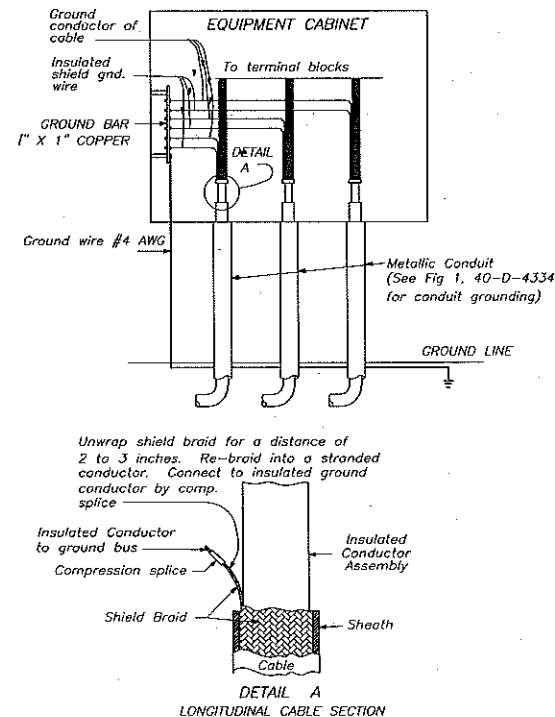


FIGURE 8
CONTROL CABLE SHIELD



REFERENCE DRAWINGS

ELECTRICAL INSTALLATION - TYPICAL
GROUNDING DETAILS (SHT 1 OF 2) 40-D-4334

REV NO 2004-07-06 MINOR REVISIONS; ADDED FIG'S 2 AND 8.
3 0 - J. R. Z.
3 - 10 - 00 REDRAWN IN AUTOCAD R.14 FORMAT
D - L.G.
12 - 2 - 65 REVISED TO SHOW CURRENT PRODUCTS OR PRACTICES.
D - C.D.O.

THIS DRAWING SUPERSEDES DRAWING
40-D-4336 IN PART (2003-01-14);
AND DRAWING 104-D-944 (2004-07-06)

⊕ ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
STANDARD DESIGNS

ELECTRICAL INSTALLATION
TYPICAL GROUNDING DETAILS

DRAWN - J.R.Z. - S.H.S. SUBMITTED - D. CLARK
TRACED - J.M.H. RECOMMENDED - M.H. PLUMB
CHECKED - V.N.P. - R.F.H. - T.J.L. APPROVED - J.N. McLELLAN
ACTING CHIEF ENGINEER

DENVER, COLORADO APRIL 24, 1947
SHEET 2 OF 2 40-D-4335

FIGURE 1

GROUNDING TO FLAT SURFACE

Use (8) or (4) on approx. 5'-0" centers when ground wire continues to other equipment.

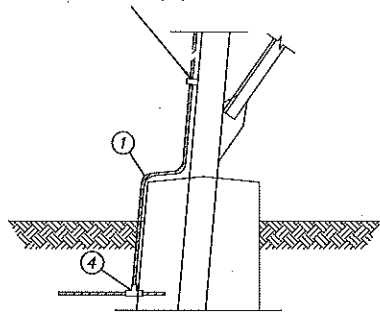
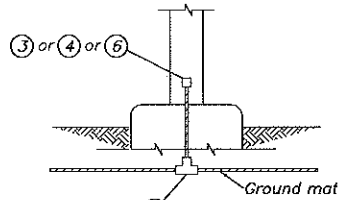
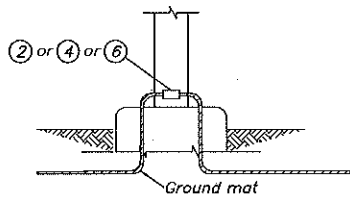


FIGURE 2

GROUNDING TO FENCE POST OR PIPE-TYPE SWITCHYARD LIGHTING POLE



OPTION A



OPTION B

FIGURE 3

GROUNDING TO CABLE TRENCH OR RACK

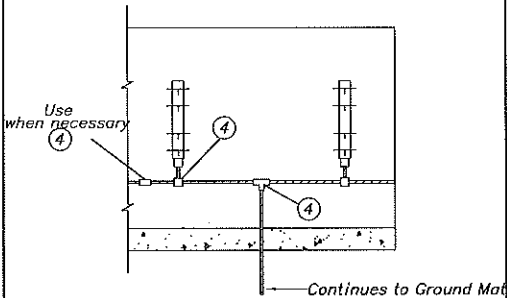


FIGURE 4

GROUNDING TO TUBULAR STEEL STRUCTURE

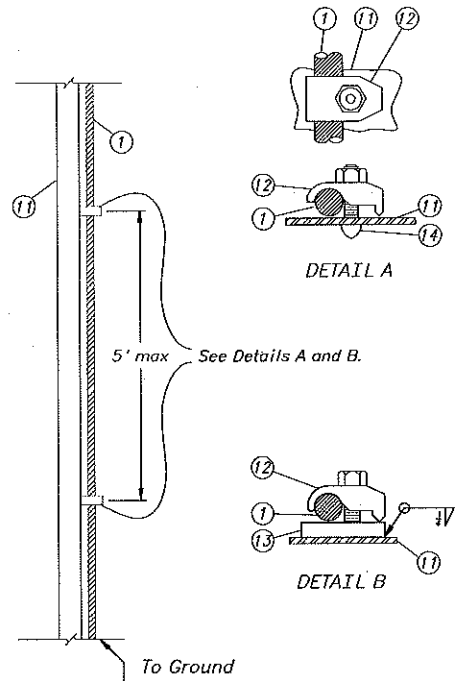
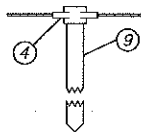
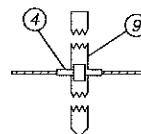


FIGURE 5

GROUND ROD CONNECTIONS



OPTION A



OPTION B

FIGURE 6

GROUNDING TO CABLE TUNNEL CABLE TRAYS

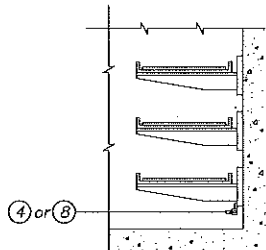
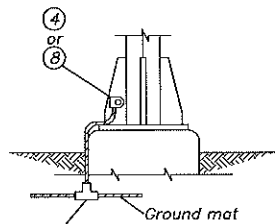
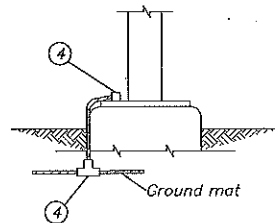


FIGURE 7

GROUNDING TO STRUCTURE BASES



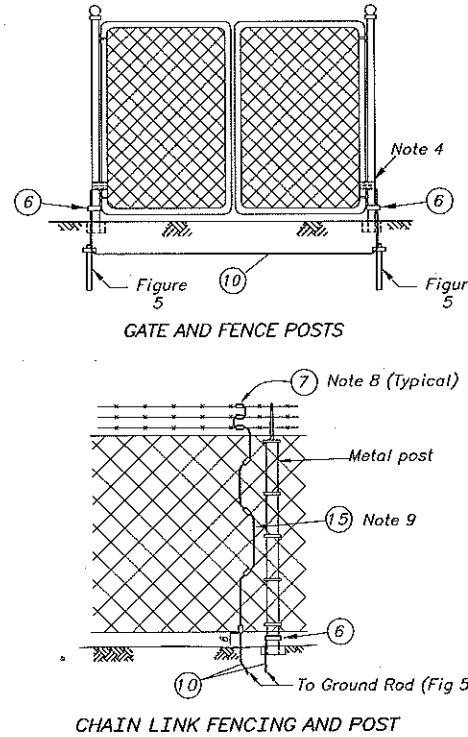
TYPICAL PIPE BUS SUPPORT OR PIPE TIE DOWN CONNECTION



TYPICAL GROUNDING TO TUBULAR STRUCTURE

FIGURE 8

FENCE GROUNDING



LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1	Copper cable, bare, 4/0 AWG minimum
2	Bolted ground connector similar to Burndy type GB
3	Bolted ground clamp similar to Penn-Union type GWL
4	Exothermic welded ground connector similar to Cadweld or ThermoWeld
5	Bolt: 1/2" silicon-bronze with nut and lock washer. Length as required for Item 5.
6	Bolted ground connector similar to Burndy type GAR
7	Compression-type ground connector
8	Cable to flat bar connector similar to Burndy QA or GB
9	Ground rod, 10"x3/4", copper-clad steel
10	Copper-clad steel stranded cable, bare, 7 No. 5
11	Tubular steel structure
12	Bolted ground connector similar to Burndy type GBM
13	Steel plate, 1-inch thick (Notes 5, 7)
14	3/8" stud, power driven (Note 6)
15	Copper-clad steel stranded cable, bare, 7 No. 9

NOTES

- See drawing 40-D-4334 for general notes and list of reference drawings.
- See drawing 40-D-4335 for typical ground system symbols.
- All ground cables to be stubbed out approx. where indicated on plan drawings and be of sufficient length to bolt to equipment.
- Ground all metal gates or each half of all double gates to the gate post with flexible metal braid installed across gate hinges.
- Steel plate size to be larger than projected area of clamp.
- Power driven stud equal to Ramset Fastening System as manufactured by Illinois Tool Works, Wood Dale, IL.
- Plate to be welded to structure and be drilled and tapped for a 1/2" US standard bolt.
- All grounding connections shall be as close as possible to the fence post.
- Weave ground cable thru fencing and attach to fence with at least three (3) connectors.

REFERENCE DRAWINGS

TYPICAL GROUNDING DETAILS (SHT 1 OF 2) . . . 40-D-4334
TYPICAL GROUNDING DETAILS (SHT 2 OF 2) . . . 40-D-4335

THIS DRAWING SUPERSEDES DRAWING
40-D-6309, 2004-09-30 IN PART

REV NO.	DATE	BY	DESCRIPTION
4	2004-09-30	D - J. R. Z.	ADDED FIGURES 4 AND 8; RENUMBERED FIGURES ACCORDINGLY; ADDED NOTES 8 & 9; ADDED ITEMS 7 & 15.
3	2004-07-06	D - J. R. Z.	ADDED ITEMS 2 & 3 TO FIG. 2 AND GROUND CABLE SIZE (ITEM 1); REPLACED 'DETAIL' VIEWS w/ 'FIGURES'; OTHER MINOR REVISIONS.
2	2004-07-06	D - J. R. Z.	REPLACED 'DETAIL' VIEWS w/ 'FIGURES'; OTHER MINOR REVISIONS.
1	2004-07-06	D - J. R. Z.	REPLACED 'DETAIL' VIEWS w/ 'FIGURES'; OTHER MINOR REVISIONS.

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
STANDARD DESIGNS

ELECTRICAL INSTALLATION

TYPICAL GROUNDING DETAILS
FOR SWITCHYARDS AND SUBSTATIONS

DRAWN	J. L. L. - P. J. S.	CHECKED	H. H. PILLAY
TRACED	L. W. G.	RECOMMENDED	O. L. RICE
CHECKED	J. A. W. - D. C. M. - M. L. K.	APPROVED	L. N. MCCLELLAN
		CHIEF ENGINEER	

LINE	Identification of motor (Unit No., Item No., etc as applicable) (Note 2)						
1	Manufacturer (Nameplate)						
2	Horsepower rating (Nameplate)						
3	Time rating (Nameplate)						
4	Temperature rise of windings by resistance (Not ambient temperature)						
5	Calculated starting time of the pumping unit under specified conditions, seconds (Note 1)						
6	Rated load speed, R.P.M. (Nameplate)						
7	Number of phases (Nameplate)						
8	Armature connected (delta or wye)						
9	Voltage (Nameplate)						
10	Rated load amperes (Nameplate)						
11	Code letter for locked-rotor Kva/hp. (Nameplate)						
12	Design letter						
13	Power factor at nameplate rated load						
	Power factor at 3/4 load (Note 4)						
	Power factor at 1/2 load (Note 4)						
14	Capacitor KVAR rating to correct power factor over range of pump (Notes 3 and 4)						
15	Corrected power factor (minimum) (Note 4)						
16	Efficiency at nameplate rated load						
	Efficiency at 3/4 load (Note 4)						
	Efficiency at 1/2 load (Note 4)						
17	Type of enclosure (open, drip-proof, TEFC)						
18	Stator insulation, class						
19	Type of stator windings (form wound or random wound)						
20	Type of bearings (ball, roller, sleeve)						
21	Net weight each motor, lbs.						
22	Motor WR^2 - (lb-ft ²)						

NOTES.

1. Applicable only to pumping units with motors above 20 hp.
2. Provide column for each different size motor at each plant or structure. All reference to nameplates means the data shall be as it appears on the nameplate furnished.
3. Capacitor KVAR rating should be at capacitor rated voltage but capacitor must be sized for operation at motor rated voltage.
4. Applicable only to units where power factor correction is specified.

Specifications or Solicitation No. _____

Project _____

Name of structure _____

2 - 19 - 99
D - L.J.R.

REVISED AND REDRAWN INTO AUTOCAD FORMAT.

8 - 1 - 73
D - P.L.A.

GENERAL REVISIONS, RETRACED

 ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

STANDARD DESIGNS

INDUCTION MOTORS

DESIGN AND NAMEPLATE DATA TO BE
FURNISHED BY THE CONTACTOR

DESIGNED R.S.N. _____ SUBMITTED J.V. BAPTIST _____

TRACED L. McFarlane _____ RECOMMENDED H.G. ARTHUR _____

CHECKED E.M.J. - P.L.A. _____ APPROVED B.P. BELLFORT _____
CHIEF ENGINEER

CADD SYSTEM
AutoCAD Rel. 15.05
DENVER, COLORADO

CADD FILENAME
40D6032.DWG
MARCH 18, 1965

DATE AND TIME PLOTTED
NOVEMBER 20, 2001 13:42
40-D-6032

SAMPLE NAMEPLATES

STRAINER DRAIN

EXTENDED TYPE

STRAINER
DRAIN

COMPACT TYPE

FIRE PROTECTION
WATER SUPPLY
CAUTION

2 1/2" OUTLET FOR FIRE
DEPARTMENT USE ONLY

INSCRIPTION AND CLOSE RANGE
INFORMATIONAL LETTERING

GOTHIC LETTERING CHART

NORMAL (Avg. width .271")
1/4" ABCDEFGHIJKLMNOP
CONDENSED (Avg. width .234")

NORMAL (Avg. width .203")
3/16" ABCDEFGHIJKLMNOPQR
CONDENSED (Avg. width .175")

NORMAL (Avg. width .163")
5/32" ABCDEFGHIJKLMNOPQRSTU
CONDENSED (Avg. width .140")

NORMAL (Avg. width .135")
1/8" ABCDEFGHIJKLMNOPQRSTUVWXYZ
CONDENSED (Avg. width .116")

NORMAL (Avg. width .103")
3/32" ABCDEFGHIJKLMNOPQRSTUVWXYZ
CONDENSED (Avg. width .086")

*Average widths listed include spacing
between letters.

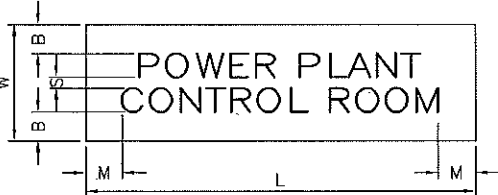
All lettering to be done with
flat groove type tool

Laminated
nameplate
material

Groove width of letters to be approximately 0.025"
for lettering sizes up to and including 1/4". For
larger lettering, groove width to be approximately
one-tenth of letter size.

LETTERING DETAIL

SIZES AND LETTER SPACING OF NAMEPLATES



FOR DIMENSIONS SEE TABLES 1 & 2

TABLE 1
WIDTH

TABLE FOR ALL LETTERING THE SAME SIZE

GOTHIC LETTER SIZE	NO. OF LINES								
	1			2			3		
	W	B	S	W	B	S	W	B	S
1/4	1.00	.375	.125	.15	.30	.175	.15	.35	
3/16	.75	.28	.100	.11	.26	.125	.11	.23	
5/32	.50	.17	.075	.08	.18	.100	.09	.18	
1/8	.50	.19	.075	.08	.21	.100	.08	.23	
3/32	.50	.20	.050	.07	.12	.075	.08	.15	

For other lettering sizes, more than three lines, or various size lettering on same nameplate, arrange width as follows:

Space(S)=Average of letter sizes on each side of space x 0.6.

Border(B)=Largest lettering size on name-plate x 1.2 + half of odd amounts to give total width(W) to even 1/4".

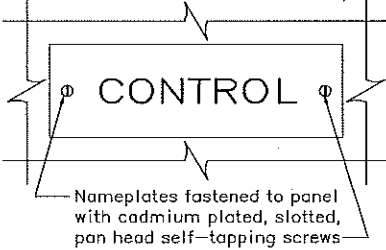
TABLE 3
STANDARD NAMEPLATES
FOR ELECTRICAL EQUIPMENT ONLY

NAMEPLATE NO.	NAMEPLATE DIMENSIONS			LETTERING SIZE
	L	W	B	
1	1 1/8	7/16	1/16	3/32
2	1 1/2	9/16	1/8	3/32
3	1 3/4	5/8	1/8	1/8
4	2 1/4	3/4	1/8	3/16
5	3	1	7/32	3/16
6	4	1 1/4	1/4	1/4
7	6	1 3/4	1/4	1/2

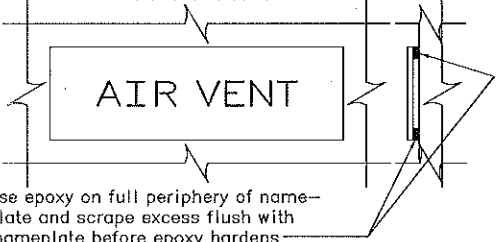
Above nameplates shall be used for electrical equipment unless otherwise specified.

MOUNTING OF NAMEPLATES

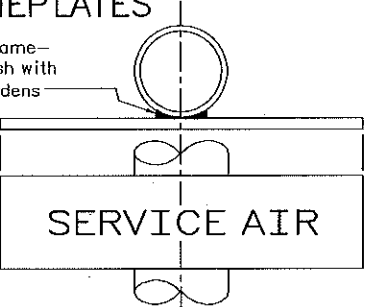
Use epoxy on full width of name-plate and scrape excess flush with nameplate before epoxy hardens



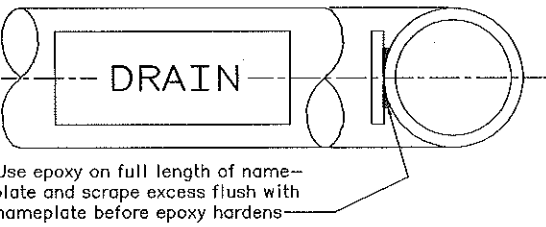
TYPICAL MOUNTING
ON PANEL



TYPICAL MOUNTING
ON CONCRETE WALL



TYPICAL MOUNTING
ON VERTICAL PIPE



TYPICAL MOUNTING
ON HORIZONTAL PIPE

TABLE 2
LENGTH

NO. OF LETTERS AND SPACES	LETTERING SIZE ON LONGEST LINE (NORM=NORMAL; COND=CONDENSED)									
	1/4		3/16		5/32		1/8		3/32	
	NORM	COND	NORM	COND	NORM	COND	NORM	COND	NORM	COND
1										
2										
3										
4	3		3		3		3			
5		3		3		3		3		
6										
7	3 1/2				3					
8		3 1/2				3		3		
9	4									
10		4	3 1/2							
11	4 1/2									
12		4 1/2	4	3 1/2					3	
13	5				3 1/2					
14										3
15	5 1/2		5	4 1/2	4		3 1/2			
16		5 1/2		5		4 1/2				
17	6 1/2		6	5 1/2	5		4		3 1/2	
18		6 1/2		6		5	4 1/2			
19										3 1/2
20	7									
21		7								
22	7 1/2									
23		7 1/2								
24	8									
25		8								
26	8 1/2	7 1/2	6 1/2	6	5 1/2	5	5	4 1/2	4	3 1/2

For other lettering sizes or longer nameplates, use the following formula:

L = A(N+n) + 2M (Nameplate length cut to nearest 1/2").

L - Length of nameplate.

A - Average letter width on longest line.

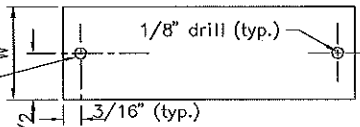
N - Number of letters on longest line.

n - Number of spaces on longest line.

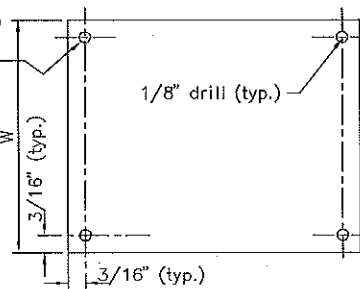
M - Margin=Average letter width plus 5/8".

DRILLING OF NAMEPLATES

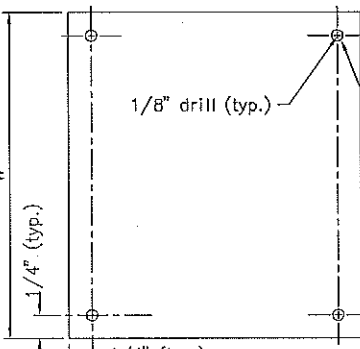
(For panel mounting only)



FOR WIDTHS UP TO 1 3/4"



FOR WIDTHS OF 2" TO 3"



FOR WIDTHS OVER 3"

NAMEPLATE MATERIAL

NOTE - All nameplate material shall be suitable for exposure to direct sunlight without detrimental fading.

TYPE A - Material shall be laminated phenolic resin sheets 1/16" or 3/32" thick (as specified) opaque black surface, white layer adjacent to surface layer, buffed or satin finish. Sheets to be cut to size with square edges. Engraving to cut through black surface to white layer. Shall conform to Military Specification MIL - P - 78A and Federal Specification L-P-509a.

TYPE B - Same as Type A except Chinese red surface or equivalent.

TYPE C - Same as Type A except 1/8", 3/16", or 1/4" thick (as specified).

TYPE D - Same as Type A except Chinese red surface or equivalent and 1/8", 3/16", or 1/4" thick (as specified).

NAMEPLATE USES

TYPE A - For panel mounting with self-tapping screws. For concrete wall or other flat mounting to identify valves, equipment, etc. Mount with epoxy cement-indoors or outdoors.

TYPE B - Red nameplates are restricted to uses such as fire protection equipment, warning inscriptions, and emergency devices. Methods of mounting shall be the same as for Type A.

TYPE C - For mounting on non-flat surface with epoxy cement.

TYPE D - Restricted to uses such as fire protection, equipment warning inscriptions, and emergency devices. For mounting on non-flat surfaces with epoxy cement.

LETTERING

Use normal or condensed letter types shown on the Gothic Lettering Chart. The normal size of lettering shall be not less than 3/16" high (1/4" preferred), except that 5/32" and smaller may be used for information and instructions that may be read at close range. Larger size lettering may be specified for out-of-doors installations or where necessary.

NOTES

This drawing supersedes Drawings No. 40-D-5173, 106-D-341, and 106-D-342.

This drawing and Drawings No. 40-D-6124, -6130, and -6187 supersede Drawing No. 40-D-2567.

Table 3 for ELECTRICAL EQUIPMENT ONLY, Tables 1 and 2 for all other equipment.

10 - 13 - 00	Redrawn in AutoCAD
D - L.G.	
12 - 11 - 79	Redrawn
D - L.H.	
11 - 6 - 70	Add Table 3 and Note
D - D.A.W.	
ALWAYS THINK SAFETY	
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION	
STANDARD DESIGNS	
STANDARD NAMEPLATES	
DESIGNED D.A.W.	TECHNICAL APPROVAL C.G.Boles
DRAWN J.M.E.	SUBMITTED Jock W. Hill
CHECKED D.M.B. - S.X.K. - E.M.J.	APPROVED B.P.Boyle
CHIEF ENGINEER	
CADD SYSTEM AutoCAD Release 12.02-a	CADD FILENAME 4006324.DWG
DENVER, COLORADO	DATE AND TIME PLOTTED NOVEMBER 29, 1994 12:28
	MAY 1970
	40-D-6234

GENERAL NOTES^{1/}

UNLESS OTHERWISE SHOWN ON THE REINFORCEMENT SPECIFICATIONS DRAWINGS, THE DETAILS AND NOTES SHOWN ARE MINIMUM REQUIREMENTS AND TYPICAL FOR ALL REINFORCEMENT DRAWINGS THAT REFER TO THIS DRAWING

ABBREVIATIONS :

bf = bottom face
tf = top face
nf = near face
ff = far face
ef = each face
if = inside face
of = outside face

br = bottom row
tr = top row
nr = near row
fr = far row
er = each row
ir = inside row
or = outside row
mr = middle row

bl = bottom layer
tl = top layer
ml = middle layer
ns = near side
ls = far side
es = each side
ew = each way
ec = each corner

sfc. = space or spaces
eq. spc. = equally spaced, equal spaces
db = nominal diameter of reinforcing bar
uv = uniformly varying lengths of bars between lengths shown
cl. = clear
ctr. = center or centers
add'l = additional
ld = development length

SYMBOLS :

Bars shown thus indicate a group of the same size bars equally spaced.
An open circle at the end of a bar indicates a bend with the bar turned away from the observer.
A closed circle at the end of a bar indicates a bend with the bar turned towards the observer.
Splices shown thus indicate a lap splice, not a bend in the bar.
 Mechanical splice

DIMENSIONS :

Dimensions are to the centerline of the bars except for embedment of hooks, which are dimensioned to the outside of the bar.
Clear cover dimensions are marked "cl." and are dimensioned to the outside of the bar.

COVER :

Place the reinforcement so that the clear distance between face of concrete and nearest reinforcement is 1 1/2" for #5 bars and smaller, 2" for #6 bars through #8 bars and 3" for #9 bars through #11 bars. Provide 3" clear distance from face of concrete for all bars when the concrete is placed against earth or rock. Clear distance is to the design dimension line.

Reinforcement parallel to construction joints shall have a minimum of 2" clear cover.

PLACING :

Reinforcement at small openings (max 1'-6") in walls and slabs may be spread apart not more than 1.50 times the bar spacing.

Reinforcement shall be adjusted laterally to maintain a clear distance of at least 1" between the reinforcement and keys, waterstops, anchor bolts, form ties, conduits, and other embedded materials. In heavily reinforced areas, relocation of the embedded material or cutting of reinforcement must be approved.

When bars are bent due to offsets less than 3" and recesses less than 3" deep, the slope of the inclined portion must not exceed 6 to 1.

Reinforcement parallel to anchor bolts or other embedded material shall be placed to maintain a clear distance of at least 1.33 times the maximum size aggregate.

SPACING :

The first and last bars in walls and slabs, stirrups in beams, and ties in columns are to start and end at a maximum of one half of the adjacent bar spacing. The minimum edge spacing shall be the smaller of either 2.5db or 0.5 of the adjacent bar spacing. For #9 through #11 bars where minimum centerline bar spacing is 6" and the lap splice lengths requiring staggered placement shown in Tables 3-60 and 4-60 are used, the minimum edge spacing shall be 3".

ACCESSORIES :

Bar supports, spacers, and other accessories are not shown on the design drawings. The recommendations of the ACI Detailing Manual-2004 (SP-66), or other approved supporting systems may be used.

DRAWING REFERENCES :

Numerals in parentheses () following notes and section letters or numbers indicate the number of the drawing upon which the section or detail is shown; for example (524) denotes Drawing No. 557-D-524.

^{1/} Unless otherwise shown on the reinforcement specifications drawings or this drawing, follow the recommendations established by the ACI Detailing Manual - 2004 (SP-66).

STANDARD HOOKS :

- 180-degree bend plus 4db extension, but not less than 2 1/2" at the free end of the bar.
- 90-degree bend plus 12db extension at free end of the bar.

STIRRUP AND TIE HOOKS :

- #5 bar and smaller, 90-degree bend plus 6db extension at the free end of the bar.
- #6, #7, and #8 bars, 90-degree bend plus 12db extension at the free end of the bar.
- #8 bars and smaller, 135-degree bend plus 6db extension at the free end of the bar.

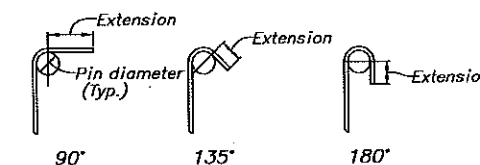


TABLE OF PIN DIAMETERS IN INCHES

BAR NO.	3	4	5	6	7	8	9	10	11
Standard bends	2 1/2	3	3 1/2	4 1/2	5 1/2	6	9 1/2	10 1/2	12
Stirrups and tie bends	1 1/2	2	2 1/2	4 1/2	5 1/2	6			

REINFORCEMENT DOWELS :

Dowels indicated on the drawing, such as #8(d), shall be embedded a length equal to ld and shall have a projection equal to that required for lap splicing to a bar of the same diameter.

PLAIN DOWELS :

Plain dowels across contraction joints shall be smooth bars uniformly coated with a film of oil before concrete placement. Viscosity of the oil shall have a SAE rating of not less than 250.

CODE AND DETAILING REFERENCES :

ACI Building Code Requirements for Structural Concrete (ACI 318-05).
ACI Detailing Manual - 2004 (SP-66)

NOTES TO DESIGNERS AND DETAILERS :

Splice lengths shown in the tables on this drawing are for Class B tension lap splices in accordance with ACI 318-05. Assumed conditions for these tables in addition to the requirements shown on this drawing are uncoated reinforcement, normal weight concrete, and the transverse reinforcement index (Ktr) equal to zero. Splices or development lengths other than those shown in the tables must be detailed on the reinforcement specifications drawings.

Some factors which require additional consideration are: Beams or columns with ties, lightweight aggregate concrete, epoxy-coated reinforcement, excess reinforcement, bars in compression, bundled bars, and special seismic provisions per ACI 318-05 (Chapter 21 - Special Provisions For Seismic Design).

The centerline to centerline spacing requirements shown in Tables 3-60 and 4-60 shall not be used when using crack control criteria for beams and one-way slabs described in ACI 318-05, Section 10.6.4. The spacing requirements shall be calculated using Eq. 10-4.

Recalculation of lap splice lengths and development lengths may be required for changes in combinations of controlling variables per ACI 318-05, Section 12.2.

Lap splices and development lengths for horizontal bars in walls are designated as top bar splices and development lengths unless otherwise noted or detailed on the reinforcement specifications drawings.

Development lengths for deformed bars in tension terminating in a standard hook shall be calculated in accordance with ACI 318-05, Section 12.5. In cases where a restricted member thickness does not allow for the full development length, the designer shall use a reduced tensile capacity

SPICES :

The minimum length of lap for splicing parallel bars shall be as given in Tables 3-60 and 4-60. Staggered splices shall be separated to give 12 inches clear between ends of adjacent splices. Bars spliced by noncontact lap splices shall not be spaced transversely farther apart than one-fifth the required lap splice length, nor 6" on centers. When reinforcing bars of different size are to be spliced, the length of lap shall be governed by the smaller diameter bar. Splices are to be made so that the required clear distances to face of concrete will be maintained.

Bar size No. *** IP (SM)	MINIMUM LAP SPACING (INCHES)	TABLE 3 - 60		TABLE 4 - 60	
		LAP SPICE LENGTH (INCHES)		DEVELOPMENT LENGTH ld (INCHES)	
		TOP BARS *	OTHER BARS	TOP BARS *	OTHER BARS
3 (10)	3	17	16	13	12
4 (13)	3	23	18	18	14
5 (16)	4	28	22	22	17
6 (19)	5	34	26	26	20
7 (22)	6	49	38	38	29
8 (25)	6	56	43	43	33
9 (29)	7	63	49	49	38
10 (32)	8	71	55	55	42
11 (36)	9	79	61	61	47
9 (29)	6	63 **	49 **	49	38
10 (32)	6	75 **	58 **	58	45
11 (36)	6	93 **	71 **	71	55

Bar size No. *** IP (SM)	MINIMUM LAP SPACING (INCHES)	TABLE 3 - 60		TABLE 4 - 60	
		LAP SPICE LENGTH (INCHES)		DEVELOPMENT LENGTH ld (INCHES)	
		TOP BARS *	OTHER BARS	TOP BARS *	OTHER BARS
3 (10)	3	16	16	12	12
4 (13)	3	20	16	15	12
5 (16)	4	25	19	19	15
6 (19)	5	29	23	23	18
7 (22)	6	43	33	33	25
8 (25)	6	49	37	37	29
9 (29)	7	55	42	42	33
10 (32)	8	62	47	47	37
11 (36)	9	68	53	53	41
9 (29)	6	55 **	42 **	42	33
10 (32)	6	65 **	50 **	50	39
11 (36)	6	80 **	62 **	62	48

TABLES 3-60 and 4-60 generated using ACI 318-05 Eq. 12-1

* Top bars are all horizontal bars so placed that more than 12 inches of fresh concrete is cast below the development length or splice. (See NOTES TO DESIGNERS AND DETAILERS)

** Splices must be staggered.

*** IP = Inch-Pound Bar Size Designation.
SM = Soft Metric Bar Size Designation.

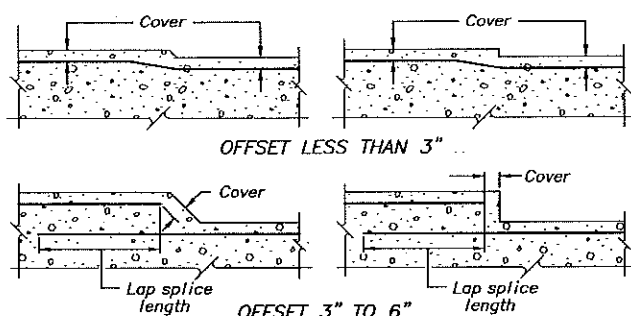
7-23-07 D - 015, P.F.	REVISED TO CONFORM TO ACI 318-05. ADDED THREE NOTES TO NOTES TO DESIGNERS AND DETAILERS. OTHER MINOR REVISIONS
6-1-03 D - AIR, PE	REVISED TO CONFORM TO ACI 318-99. REVISED SYMBOLS, SPACING, NOTES TO DESIGNERS AND DETAILERS. ADDED SOFT METRIC BAR SIZES IN TABLES. MINOR REVISIONS.
6-1-97 D - GPG	CONVERTED TO AUTOCAD DRAWING. REVISED TO CONFORM TO ACI 318-95. OTHER MINOR REVISIONS.
2-29-92 D - R.O.A.	TOP BAR DEFINITION REVISED AND MINOR PUNCTUATION REVISION IN PLACING NOTE.
12-7-90 D - J.D.S.	REDRAWN TO NEW DRAFTING STANDARDS. REVISED CONCRETE COVER, NOTES TO DESIGNERS, TABLES, REINFORCEMENT AROUND OPENINGS, AND OTHER MINOR REVISIONS. REVISED TO CONFORM TO ACI 318-89.
9-27-84 D - NEP, DG	REVISED PIN DIAMETER TABLE. REFERENCED THE ACI DETAILING MANUAL 1980. ADDED NOTES UNDER PLACING AND STANDARD HOOKS.
12-8-76 D - WRW	MINOR REVISIONS

ALWAYS THINK SAFETY

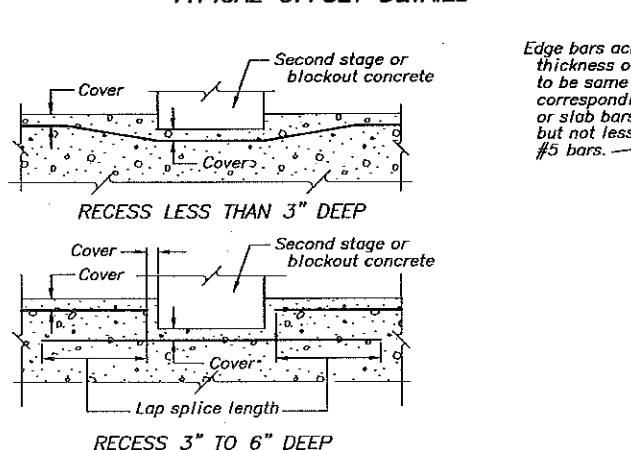
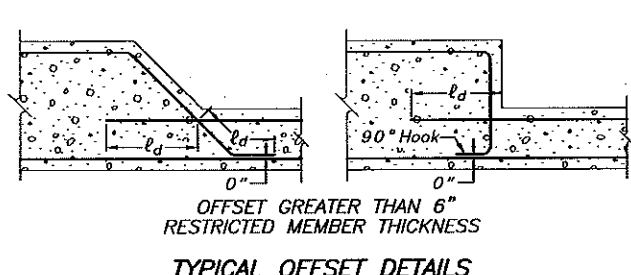
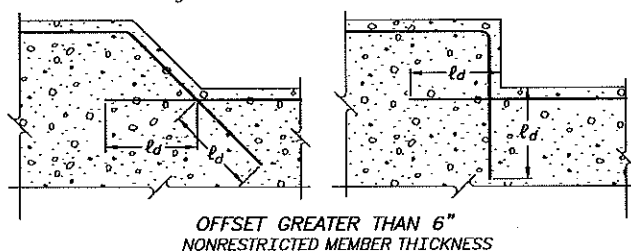
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

GENERAL NOTES AND MINIMUM REQUIREMENTS FOR DETAILING REINFORCEMENT

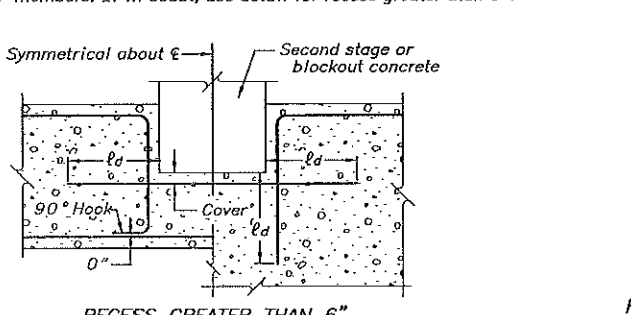
DESIGNED M. F. WARD, J. G. STARBUCK	TECHNICAL APPROVAL E. D. MORGAN
DRAWN M. CAMPBELL	SUBMITTED JACK W. HILF
CHECKED GAYLE A. ERICKSON	APPROVED H. G. ARTHUR
ACTING DIRECTOR, DESIGN AND CONSTRUCTION	
CADD SYSTEM AutoCAD R14.1	CADD FILENAME 40-D-6263
DATE AND TIME PLOTTED 10/12/2007 14:36	DATE AND TIME PLOTTED 10/12/2007 14:36
DENVER, COLORADO	JUNE 12, 1972
40-D-6263	



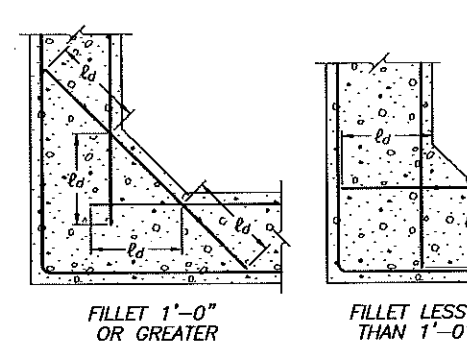
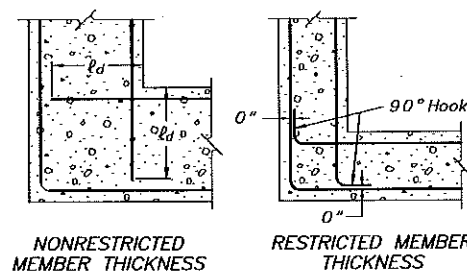
NOTE TO DESIGNERS AND DETAILERS: This detail may not be appropriate for tension areas of shallow structural members. If in doubt, use detail for offset greater than 6".



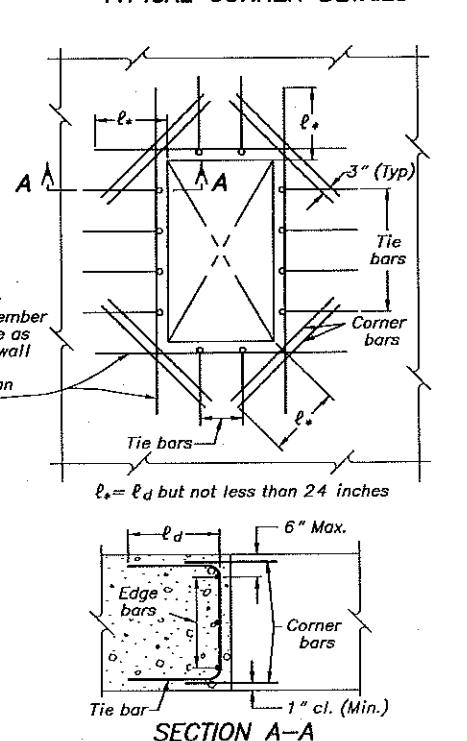
NOTE TO DESIGNERS AND DETAILERS: This detail may not be appropriate for tension areas of shallow structural members. If in doubt, use detail for recess greater than 6".



RECESS GREATER THAN 6"



TYPICAL CORNER DETAILS



SECTION A-A

MEMBER THICKNESS	TIE BARS	EDGE BARS	CORNER BARS
Less than 9"	None	1 - ctr.	2 - #4 ctr.
9" thru 1'-6"	None	2 - (1 ef)	4 - #4 (2 ef)
1'-7" thru 3'-0"	#4 @ 1'-0	3 - eq. spc.	4 - #4 (2 ef)
Over 3'-0"	#6 @ 1'-0	Spc. @ 1'-0	4 - #5 (2 ef)

Omit edge and tie bars along sides of openings where dimension is less than 1'-6".

Omit corner bars at sides of openings adjacent to floors, walls, or beams.

Omit corner bars if both dimensions of opening are less than 1'-6".

RECESSES :

Use corner bars in face of recesses deeper than 4" if either dimension of recess is equal to or greater than 1'-6".

ADDITIONAL REINFORCEMENT AROUND OPENINGS AND RECESSES

LIST OF MATERIALS

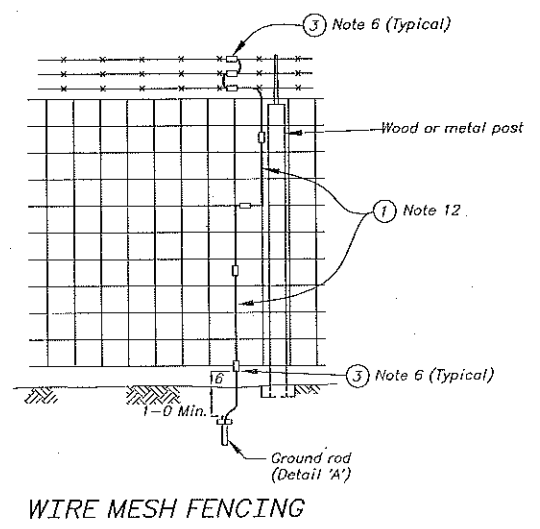
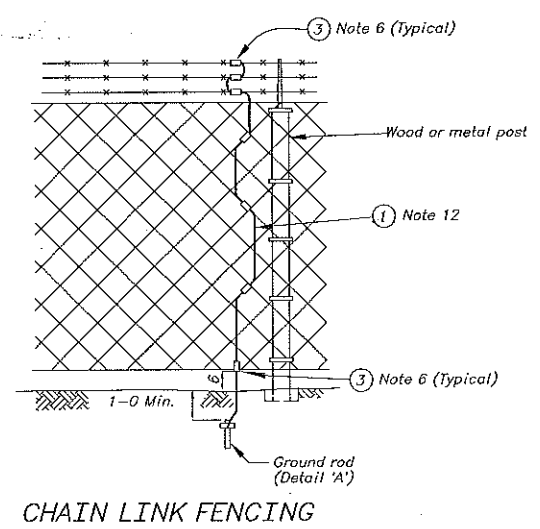
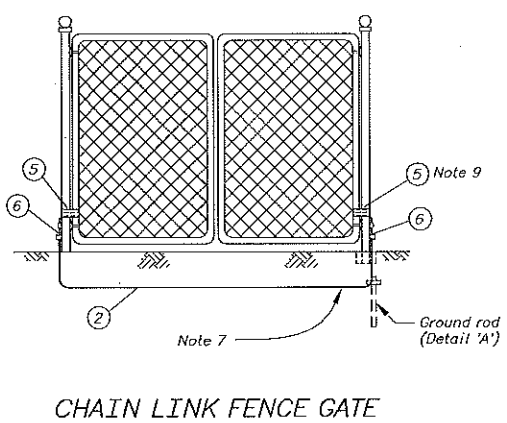
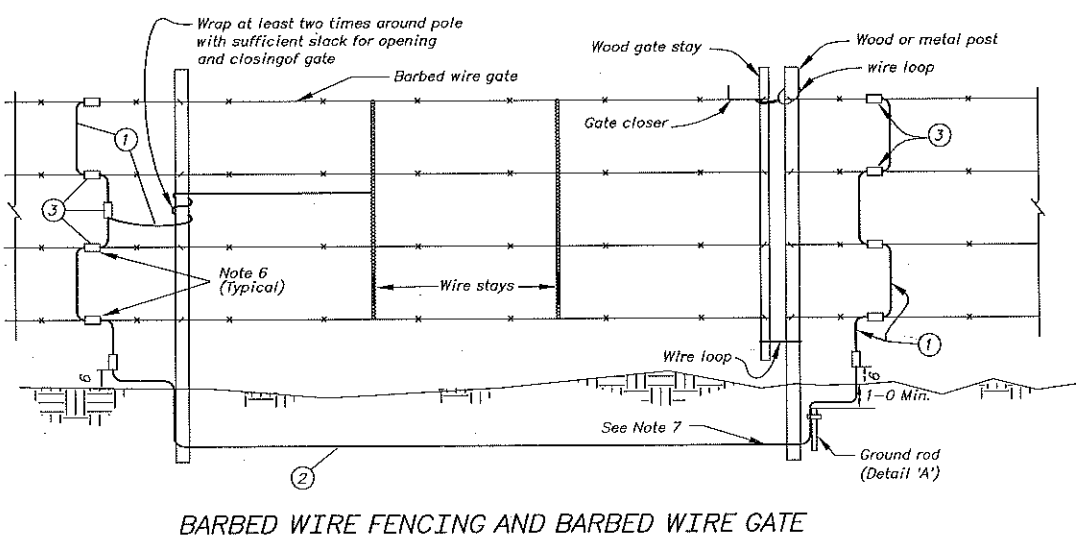
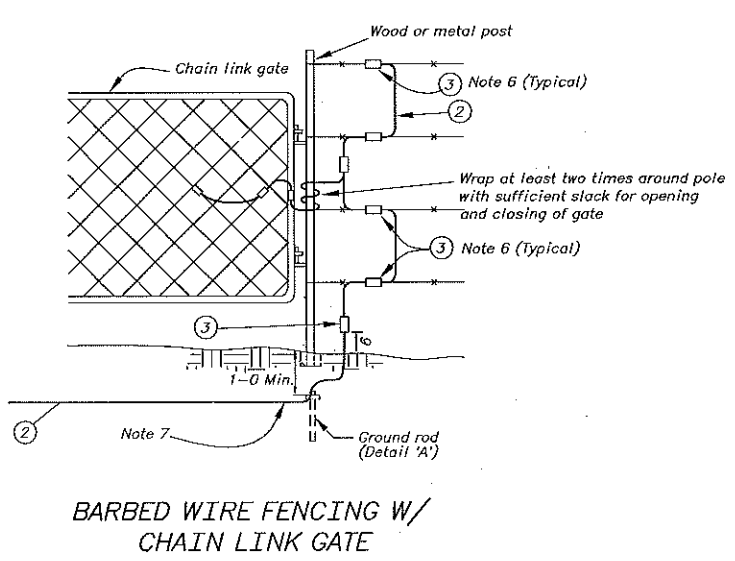
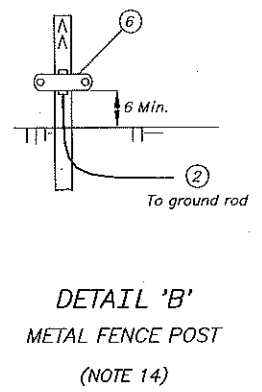
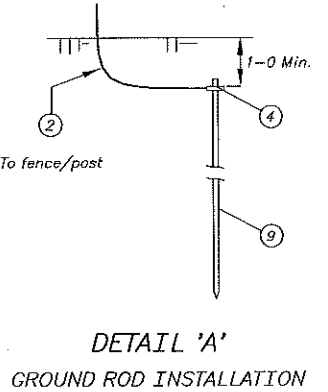
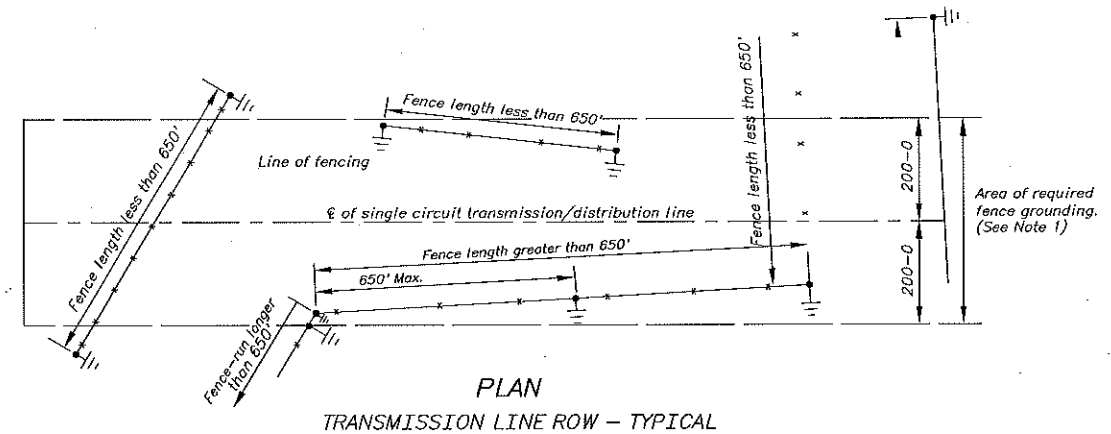
ITEM NO.	DESCRIPTION
1	Copper-clad steel stranded cable, 7 No. 9 (11/32")
2	Copper-clad steel stranded cable, 7 No. 5 (9/16")
3	Compression-type ground connector
4	Exothermic welded ground connector similar to Cadweld or Thermoweld
5	Flexible copper braid
6	Bolted ground connector similar to Burndy type GAR or GA-H.
7	
8	
9	Ground rod, 10'x3/4", copper-clad steel

SYMBOLS

- ⊥ Indicates ground rod installation.
- Indicates ground connection.

NOTES

- Ground all fencing located within 200 feet of transmission line center line as shown in plan. If fencing is interrupted by a gate, ground fencing and gate as shown.
- For fences less than 650 feet, provide a ground at each end of the fence.
- For fences longer than 650 feet, ground each end of fence and provide a fence ground where the fence-run crosses the area of required grounding.
- The maximum interval between ground connections is 650 ft.
- Non-continuous intervals of fence run shall be grounded at each end of the continuous interval. Ground wire jumpers 11/32-inch (7 No. 9) may be provided.
- All grounding connections shall be as close as possible to the fence post.
- Where a ground rod is located near a gate or a gate post, the fence shall be grounded around the gate opening to the fence on the opposite side with a 9/16" (7 No. 5) copper-clad steel stranded ground cable.
- Fence grounding shall not be connected to the existing transmission line grounding system.
- Ground all gates or each half of all double gates to the gate post with flexible braid.
- Ground cable sizes listed are minimum size allowable.
- This drawing does not apply to switchyards and substations.
- Weave ground cable thru fencing and attach to fence with at least three (3) connectors.
- All ground connectors shall be UL listed.
- Ground all metal corner, end, and gate posts directly to ground rod.



REV NO. 5
2004-09-30
D - J. R. Z.

REVISED TITLE BLOCK; ADDED REF. MATERIAL LIST AND ITEMS; SPLIT 'DETAIL B' INTO TWO DETAILS; DELETED 'BARBED WIRE FENCING', 'STEEL FENCE POST', 'TUBULAR POST FENCING', & 'WOOD POST CHAIN LINK FENCING' VIEWS; ADDED NOTES 11-14.

2-7-96
D - T. L. W.
1-18-90
D - M. A. M.
6-6-83
D - D. A. G.
3-31-81
D - D. A. G.

REDRAWN ON AUTOCAD REL. 12
MINOR REVISIONS
AS BUILT BY 330, LTR. 5-31-89

REVISED TITLE BLOCK
ADDED NOTE 11

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
STANDARD DESIGNS
TRANSMISSION LINES
FENCING WITHIN RIGHT-OF-WAY
TYPICAL GROUNDING DETAILS

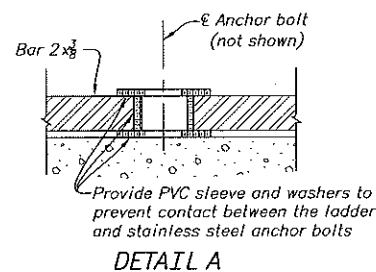
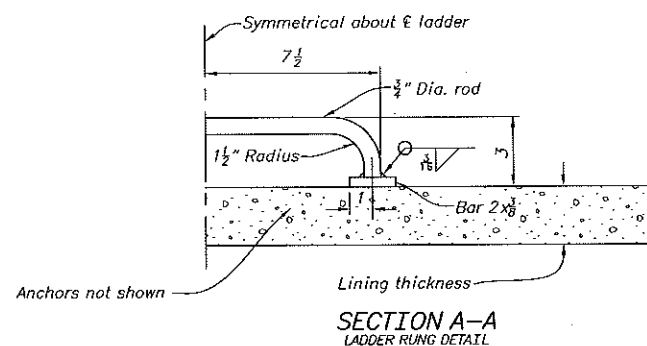
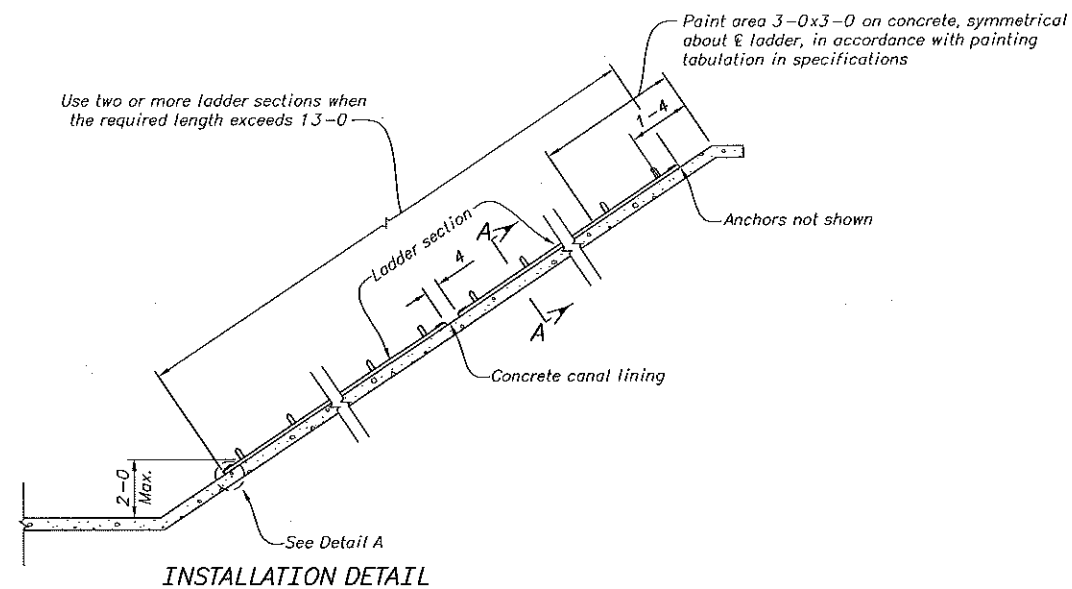
DESIGNED: EUGENE A. MOISEY
DRAWN: J. VEISOM
CHECKED: D. GREEN, J.B.KIRKPATRICK

TECHNICAL APPROVAL: R. R. FILLENBERG
SUBMITTED: E. H. TOMSIC
APPROVED: Wm. R. GROSECLOSE
ACTING, DIRECTOR OF DESIGN AND CONSTRUCTION

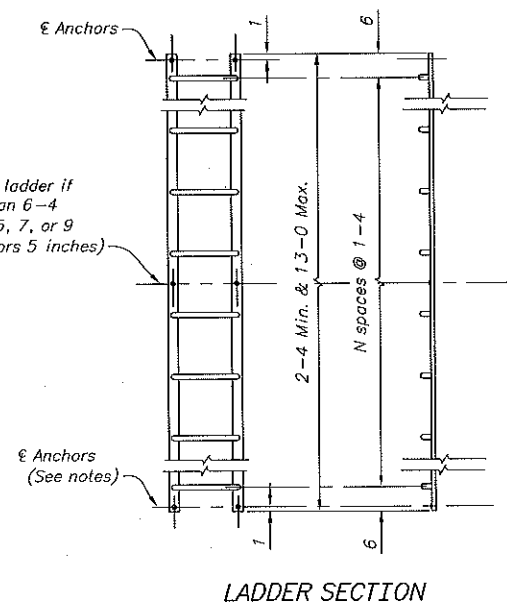
DENVER, COLORADO
SHEET 1 OF 1
JULY 15, 1977

40-D-6376

CAD SYSTEM
Autocad Rel. 10.0a
40-D-6376.DWG
DATE AND TIME PLOTTED
SAPPHIRE, EDD00001202:55
PLOTTED BY
DCHMOR



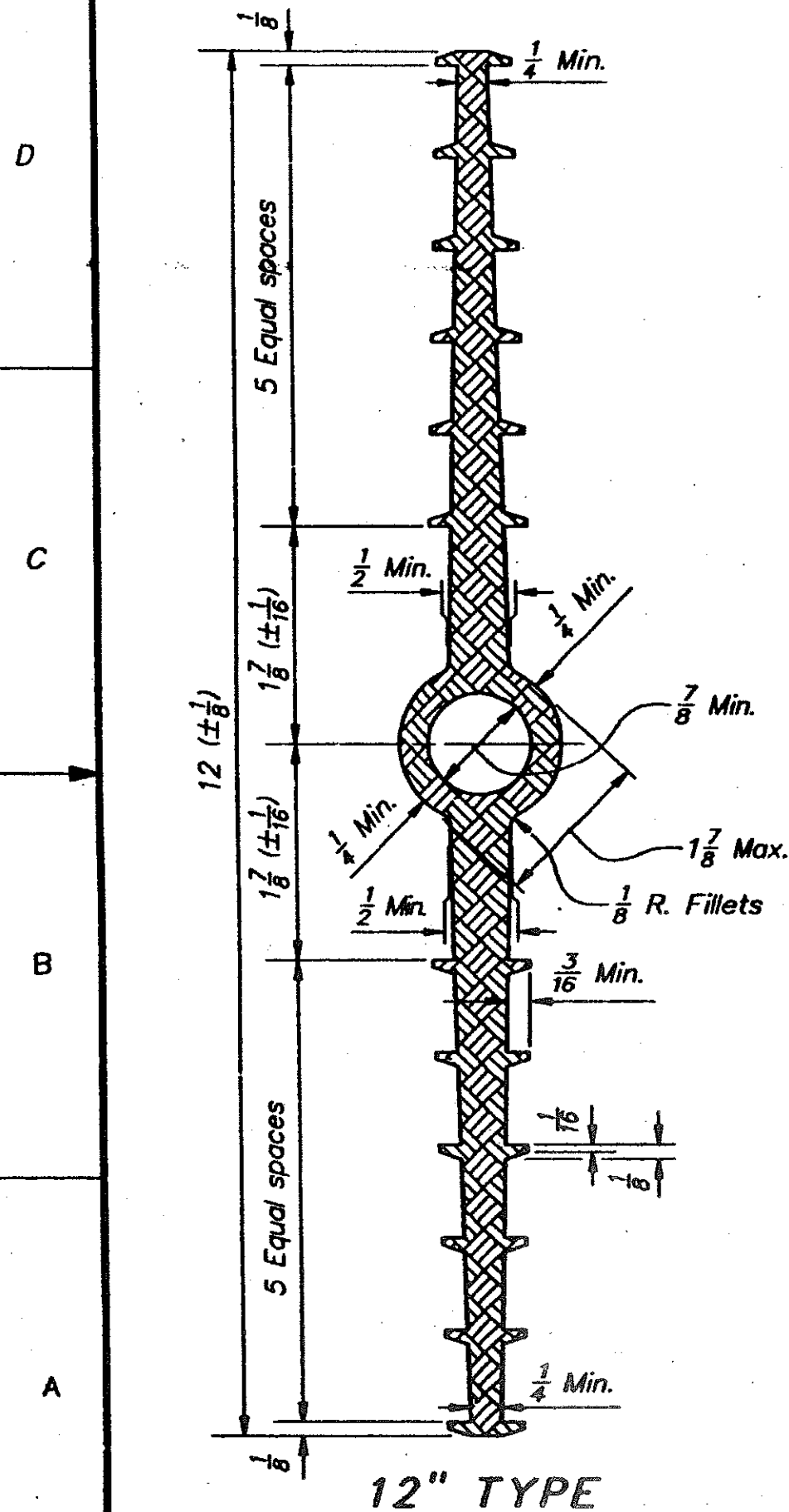
Anchor at center of ladder if sections longer than 6'-4" (For ladders with 5, 7, or 9 rungs, offset anchors 5 inches)



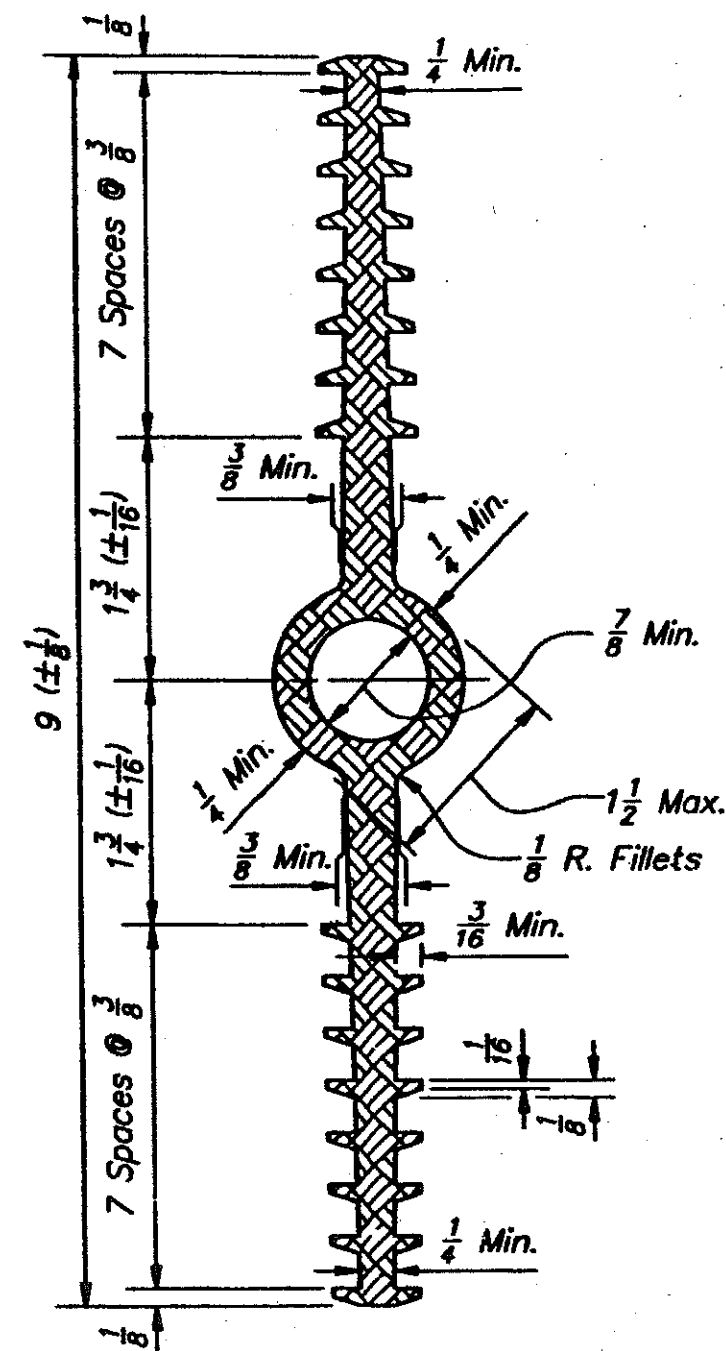
NOTES

Ladders shall be installed on sides of canal when the vertical lining height is 2'-6" or greater.
Ladders shall be located opposite each other at 750-foot intervals along the canal and upstream of structures as directed.
Ladders shall be fabricated from aluminum alloy 6061, T6 unless otherwise specified. See specification paragraphs for protective coating requirements.
Ladders shall be anchored to the canal lining with corrosion-resisting (stainless) steel expansion anchors. See specifications paragraph for anchor, PVC sleeve, and PVC washer requirements.

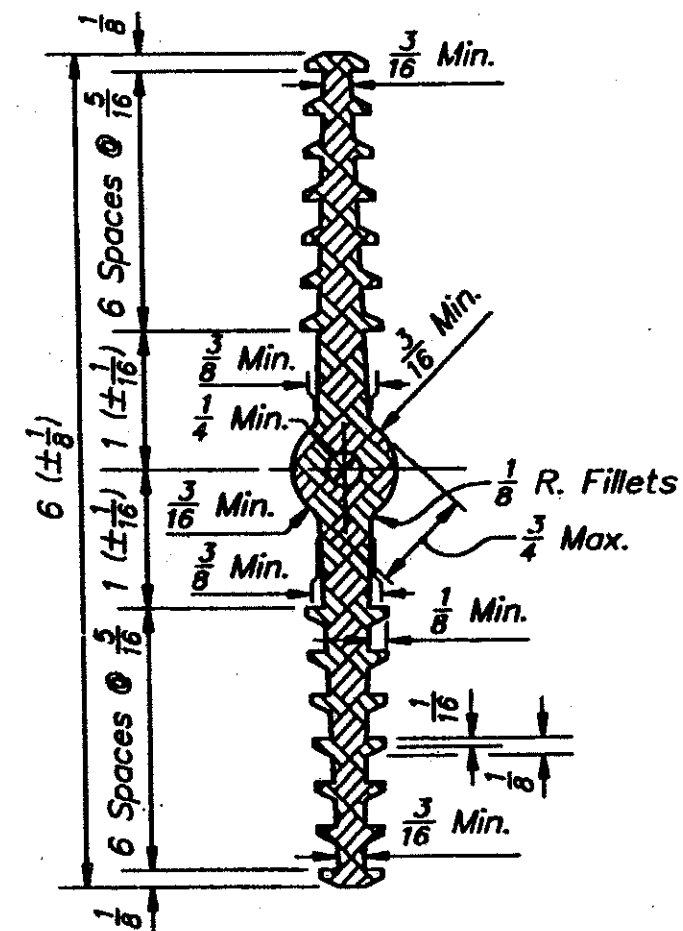
REV NO.	12-23-2003	REDRAWN IN AUTOCAD.
2	D - J. E. A.	
1-18-90	AS BUILT BY J30, LTR. 5-31-89.	
D - M. A. M.		
THIS DRAWING SUPERSEDES DRAWING 40-D-6112		
ALWAYS THINK SAFETY		
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION STANDARD DESIGNS		
SAFETY LADDER FOR CONCRETE LINED CANALS		
DESIGNED	T. R. HAIDER	TECHNICAL APPROVAL
		J. E. JOHNSON
DRAWN	D. E. BINGAMAN	SUBMITTED
		W. L. LONG, R. FERRESE
CHECKED	J. E. JOHNSON	APPROVED
		R. E. MELLIN
		CHIEF, WATER CONVEYANCE BRANCH
CADD SYSTEM	AutoCAD Ver. 15.06	CADD FILENAME
DENVER, COLORADO	JULY 18, 1979	40-D-6460.DWG
		40-D-6460



9" TYPE



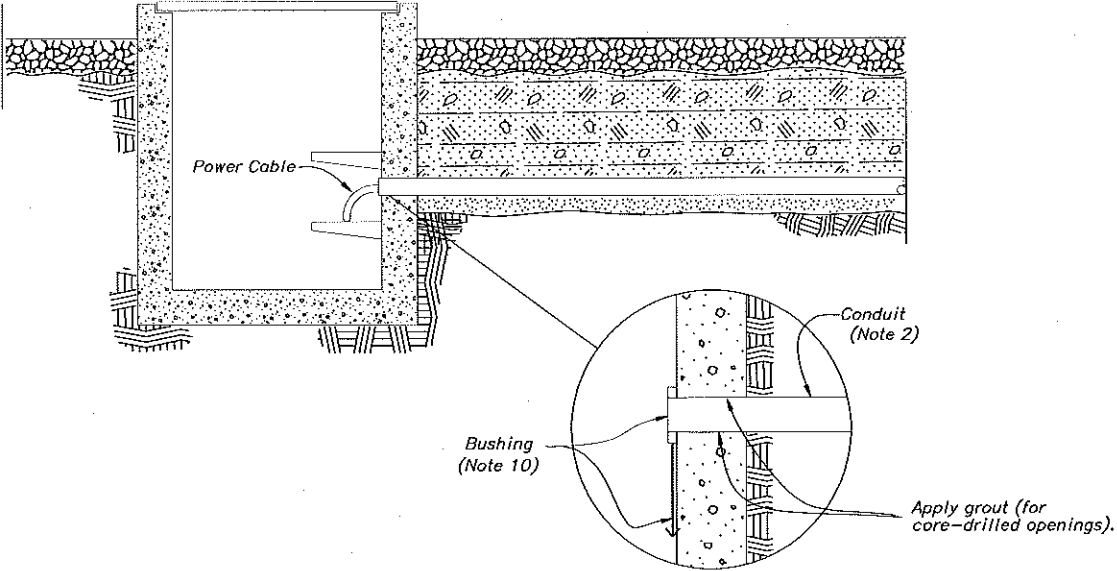
6" TYPE



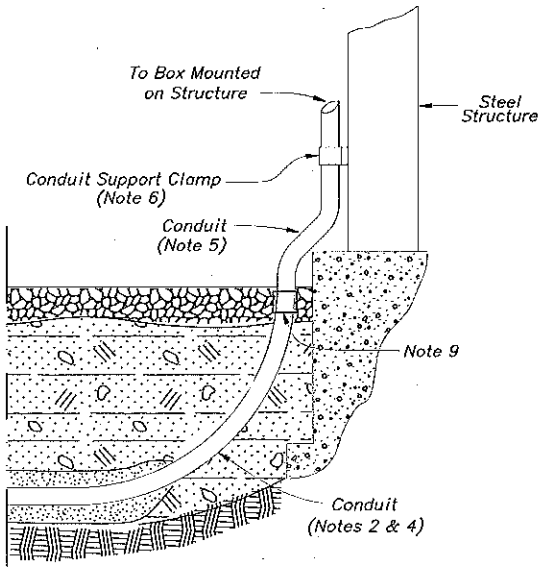
NOTE

Tips of fins may be rounded provided they meet the minimum dimensions shown.

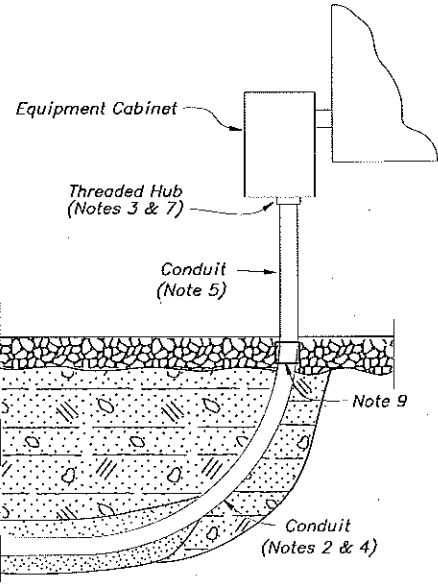
8-15-82 D- <i>PMR</i>	REDRAWN TO INCLUDE 12" TYPE.
8-15-81 D- M.A.M.	AS BUILT BY JOI LTR. 7-26-81.
12-8-80 D- M.C.S.	REVISED FMS ON 6" TYPE.
 ALWAYS THINK SAFETY	
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION STANDARD DESIGNS	
PVC WATERSTOPS 6" TYPE, 9" TYPE AND 12" TYPE	
DESIGNED BY <u>W. C. STEVENSON</u>	DRAWN BY <u>W. A. ANDERSON</u>
CHECKED BY <u>W. C. STEVENSON</u>	APPROVED BY <u>W. A. ANDERSON</u>
ACT. CHIEF, DIVISION OF DESIGN	
ADDITIONAL DATA	DATE <u>12, 1979</u>
40-D-6463	



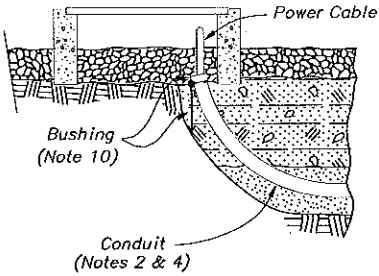
DETAIL A
(TERMINATION AT TYPE "A" & "B"
CABLE TRENCHES)



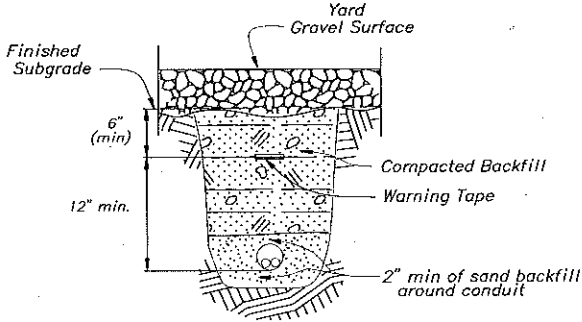
DETAIL C
(TERMINATION AT STRUCTURE)



DETAIL D
(TERMINATION AT ELECTRICAL
EQUIPMENT CABINET)



DETAIL B
(TERMINATION AT TYPE "C"
CABLE TRENCH)



DETAIL E
(CONDUIT TRENCH)
(Note 8)

NOTES

1. This drawing applies to buried conduit runs in new installations.
2. Plastic-coated, rigid-steel (PCRS) or HDPE conduit, or if installing one single-conductor cable per conduit, use Schedule 80 PVC or HDPE conduit. Note, 1-phase circuit may be installed in PCRS conduit provided that the phase conductor and its neutral are run together in the conduit.
3. After cables are installed, fill entrance with a sealing material.
4. Minimum bending radius shall be 12 x the diameter of the conduit except if fiber cable is installed in conduit, min. bending radius shall be 15 x the conduit diameter.
5. Metal conduit riser. Ground in accordance with standard drawing 40-D-4334.
6. Conduit clamping in accordance with dwg. 40-D-7094.
7. Crouse-Hinds Type HUB, or equal.
8. Conduits to be buried at depth indicated wherever possible, thus keeping conduits above the ground mat cables. For conduits greater than 1.5" IPS, conduit burial depth can be greater to account for bends. However, do not place warning tape greater than 18" above conduit.
9. Where using HDPE conduit, provide coupling to transition to steel equipment/cabinet conduit risers; Or, transition from PCRS to GRS risers, if specified or desired.
10. For metal conduit, use grounding-type bushing. Use No. 4 AWG stranded copper cable to trench ground or ground mat.

REFERENCE DRAWINGS

TYPICAL GROUNDING DETAILS	40-D-4334
CABLE TRENCH - TYPES "A" & "B" - OUTLINE AND REINFORCEMENT	40-D-4632
CABLE TRENCH - TYPE "C" - OUTLINE AND REINFORCEMENT	40-D-5350
CONDUIT CLAMP AND SUPPORTS - TYPICAL DETAILS	40-D-7094

REV NO 2008-03-11
2
D - F. L. W.
2005-10-28
1
D - L. G. P.E.

ADDED HDPE CONDUIT (REVISED NOTES 2, 5 AND ADDED NOTES 9, 10); ADDED NOTE 8; OTHER MINOR CHANGES. (-68430; D.R.C.)
REVISED TITLE BLOCK AND NOTES 4 & 5, ADDED NOTES 6 & 7, OTHER MINOR REVISIONS. (D.R.C.: D-8440)

ALWAYS THINK SAFETY

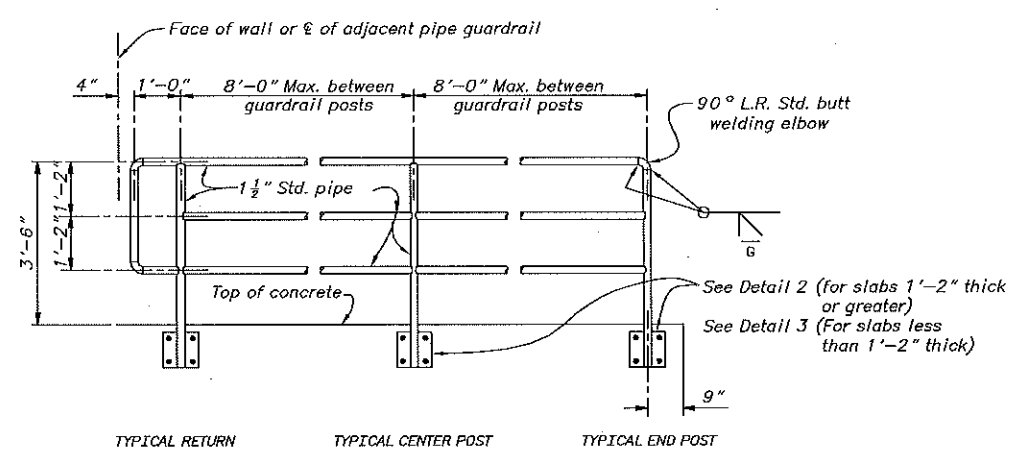
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
STANDARD DESIGNS
SWITCHYARDS AND SUBSTATIONS
ELECTRICAL INSTALLATION
BURIED CONDUIT
FOR LOW VOLTAGE CABLES

DESIGNED D. R. C. TECH. APPROVAL L. GAMMUTELLO
DRAWN D. R. C. SUBMITTED L. GAMMUTELLO
CHECKED E. R. LANGLEY APPROVED V. B. NOKES, JR.
CHIEF, ELECTRICAL DIVISION

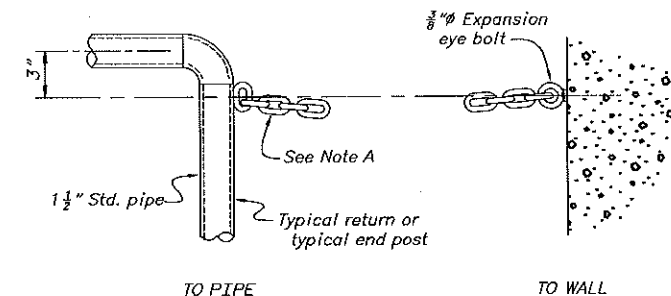
DENVER, COLORADO OCTOBER 23, 1991
SHEET 1 OF 1

40-D-6576

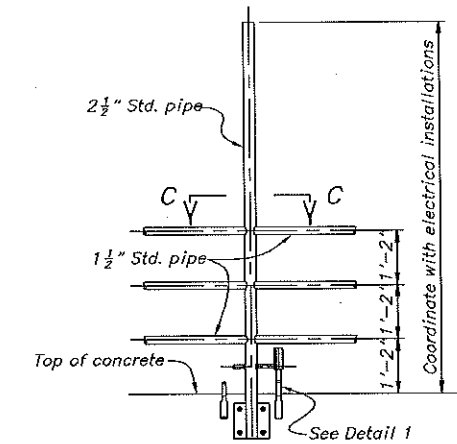
CAD SYSTEM
AutoCAD R14.2
CADD FILENAME
40-D-6576 REV.DWG
DATE AND TIME PLOTTED
MARCH 15, 2008 14:26
PLOTTED BY
P. LANGLEY



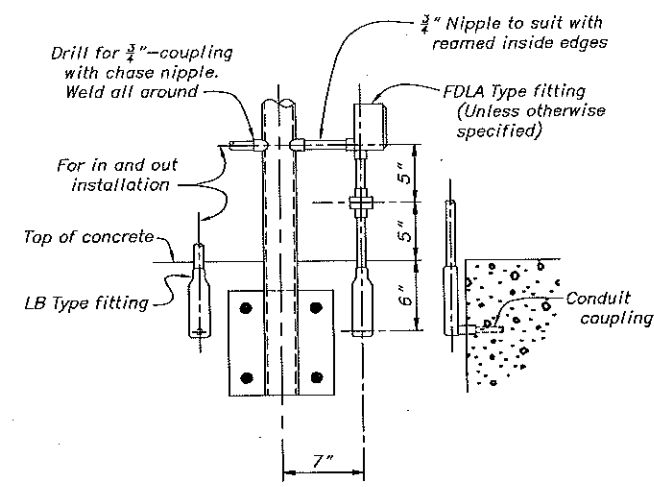
SIDE MOUNTED PIPE GUARDRAIL



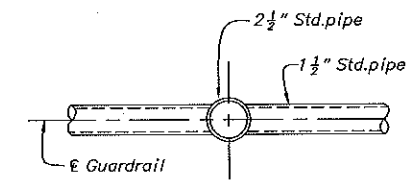
TYPICAL CHAIN DETAILS AS REQUIRED



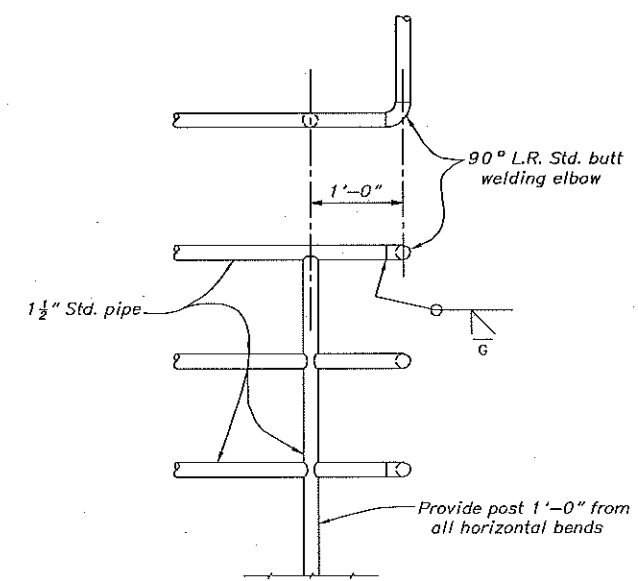
TYPICAL LIGHT POST



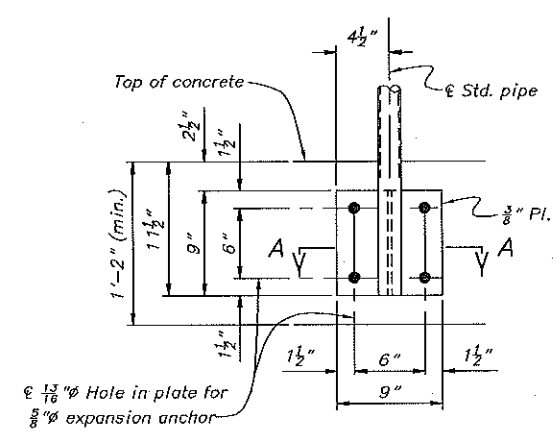
DETAIL 1



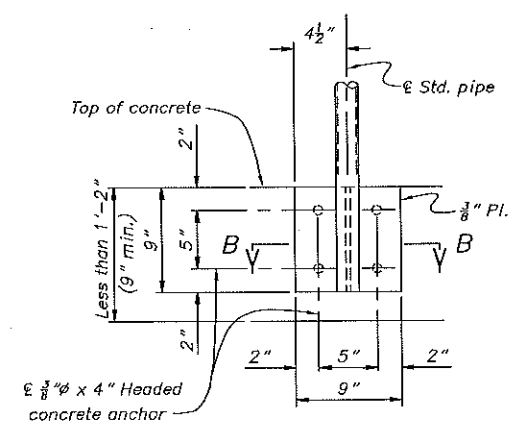
SECTION C-C



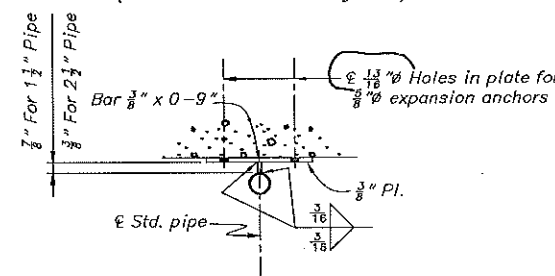
TYPICAL GUARDRAIL HORIZONTAL BEND



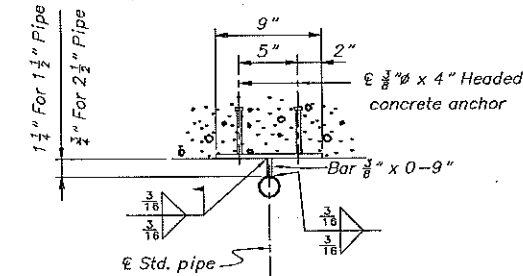
DETAIL 2 (For slabs 1'-2 inch thick or greater)



DETAIL 3 (For slabs less than 1'-2 inch thick)



SECTION A-A



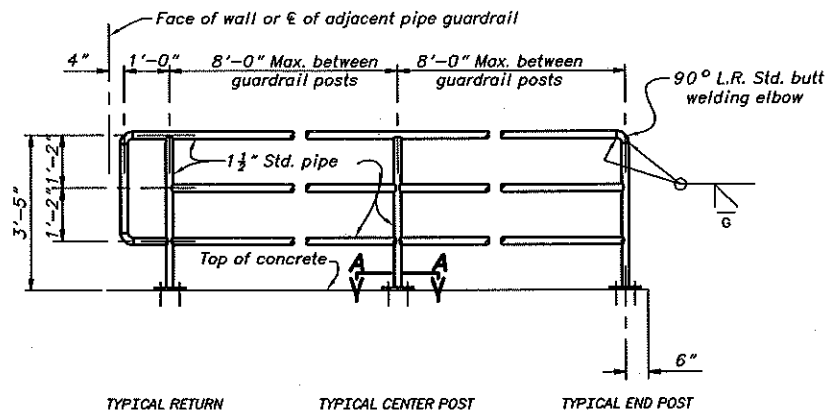
SECTION B-B

Note A: 1/4 inch Galvanized chain with maximum sag of 2-inches. Provide "S" hook and heavy duty swivel snap at one end. Weld single chain link to opposite end.

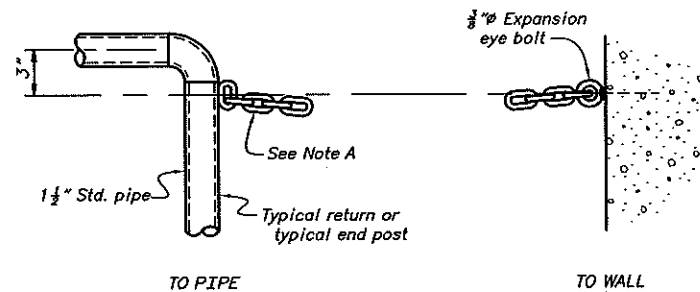
NOTES

Not all information shown on this drawing may be needed for every job. Use information on this drawing as required. Galvanize all ferrous metalwork after fabrication. Provide vent holes as required in bottom of pipe. All material is steel unless otherwise noted. Splice guardrail as required with splice locks. Provide splice lock suitable for expansion joint at 50 foot centers maximum and at expansion joints in concrete. Contractor determines guardrail lengths based on dimensions of structures. See structure drawings for location and extent of guardrails. Grind all welds smooth. Details, welds, and other connections shown are typical for all similar conditions.

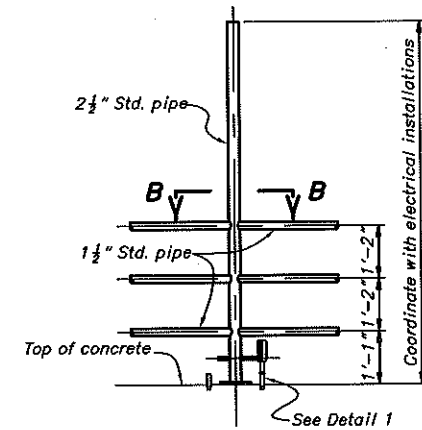
11-4-99	MINOR REVISION
D	
ALWAYS THINK SAFETY	
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION STANDARD DESIGN MISCELLANEOUS METALWORK SIDE MOUNTED PIPE GUARDRAILS	
DESIGNED T.E. SADUSKY	TECHNICAL APPROVAL T.C. GRABER
DRAWN T.E. SADUSKY	SUBMITTED JAMES W. HILL
CHECKED T.C. GRABER / DCD	APPROVED JOHN D. SMART
CADD SYSTEM AutoCAD Rev. 15.05	CADD FILENAME 40-D-6591.DWG
DENVER, COLORADO	DATE AND TIME PLOTTED NOVEMBER 20, 2001 1:3:57
40-D-6591	



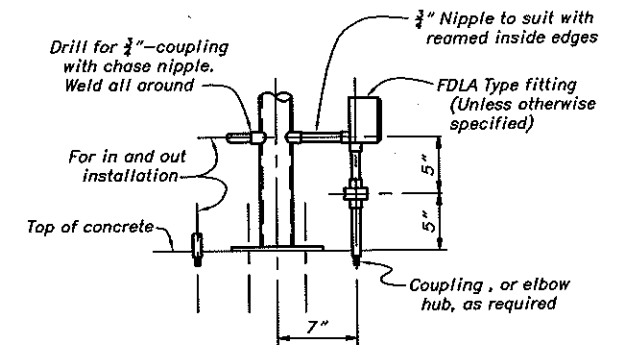
TOP MOUNTED PIPE GUARDRAIL



TYPICAL CHAIN DETAILS AS REQUIRED



TYPICAL LIGHT POST

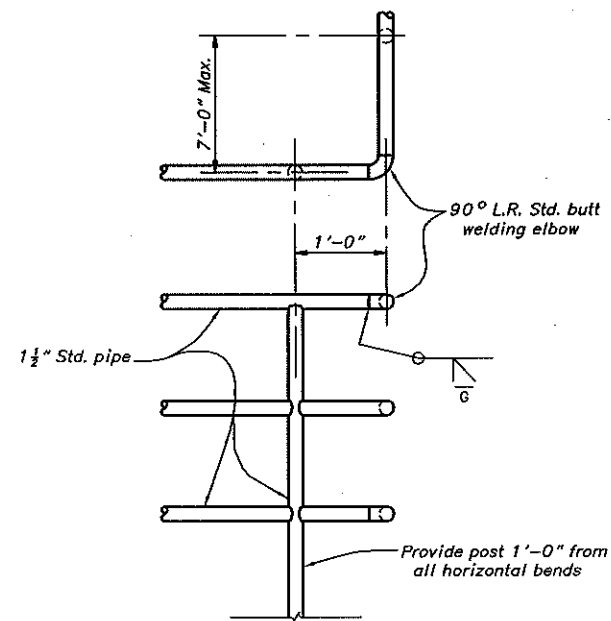


DETAIL 1

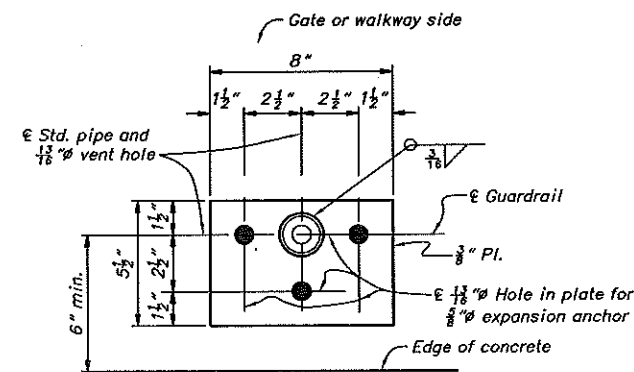
Note A: 1/4" Galvanized chain with maximum sag of 2-inches. Provide "S" hook and heavy duty swivel snap at one end. Weld single chain link to opposite end.

NOTES

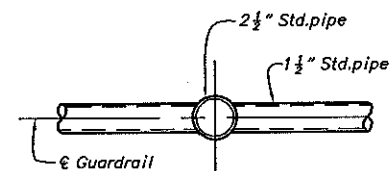
Not all information shown on this drawing may be needed for every job. Use information on this drawing as required. Galvanize all ferrous metalwork after fabrication. Provide vent holes as required in bottom of pipe. All material is steel unless otherwise noted. Splice guardrail as required with splice locks. Provide splice lock suitable for expansion joint at 50 foot centers maximum and at expansion joints in concrete. Contractor determines guardrail lengths based on dimensions of structures. See structure drawings for location and extent of guardrails. Grind all welds smooth. Details, welds, and other connections shown are typical for all similar conditions.



TYPICAL GUARDRAIL HORIZONTAL BEND



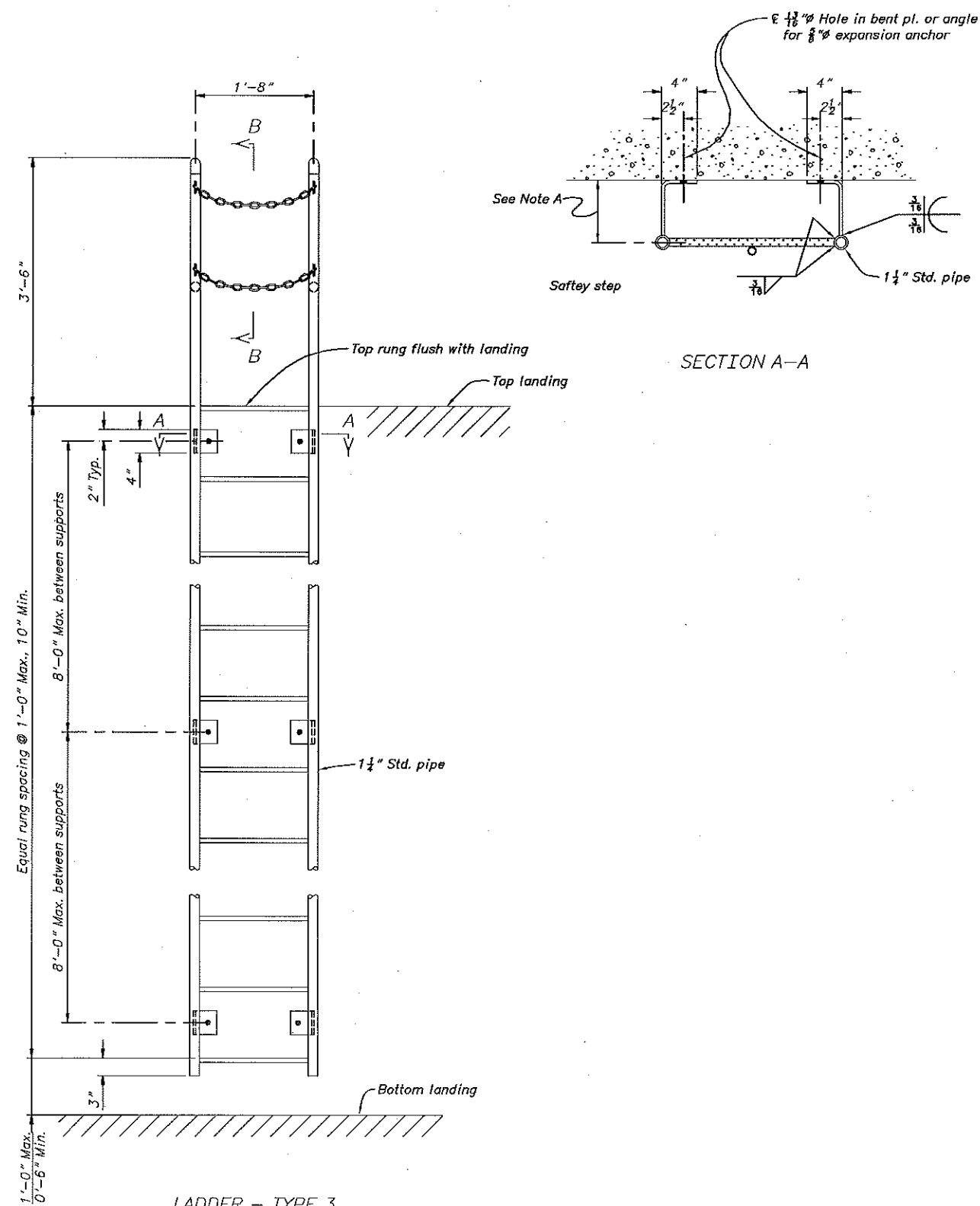
SECTION A-A



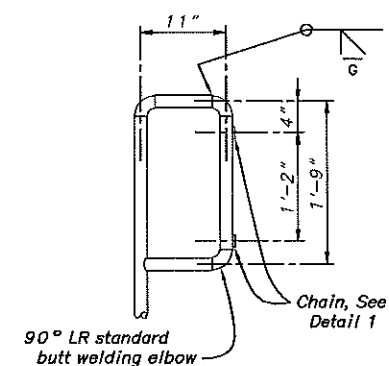
SECTION B-B

9-17-02 D- M.P.O.	ADDED ANCHOR TO SECTION A-A; CHANGED GUARDRAIL HEIGHT FROM 3'-6" TO 3'-5".
ALWAYS THINK SAFETY	
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION STANDARD DESIGN MISCELLANEOUS METALWORK TOP MOUNTED PIPE GUARDRAILS	
DESIGNED T.E. SADUSKY	TECHNICAL APPROVAL T.C. GRABER
DRAWN T.E. SADUSKY	SUBMITTED JAMES W. HILL
CHECKED T.C. GRABER / DCD	APPROVED JOHN D. SMART CHIEF, CIVIL ENGINE DIVISION
DATE AND TIME PLOTTED 40-D-6592.DWG SEPTEMBER 17, 2002 13:59 DENVER, COLORADO	DATE AND TIME PLOTTED 40-D-6592.DWG JANUARY 8, 1993 40-D-6592

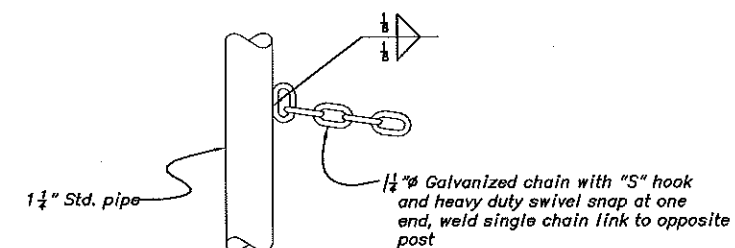
Note A: 7 inches unless noted otherwise on structure drawing.



SECTION A-A



SECTION B-B



DETAIL 1

NOTES

All material is steel unless otherwise noted. Details, welds, and other connections shown are typical for all similar conditions. Dimensions shown are typical for similar details. Galvanize all ferrous metalwork after fabrication. Provide vent holes as required. Contractor determines length of ladders and rung spacings based on elevation difference. See structure drawings. Grind all welds smooth.

		ALWAYS THINK SAFETY	
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION			
STANDARD DESIGNS			
MISCELLANEOUS METALWORK			
LADDER - TYPE 3			
DESIGNED <u>A. M. TUCKER</u>		TECH. APPR. <u>T. C. GRABER</u>	
DRAWN <u>A. M. TUCKER</u>		SUBMITTED <u>JAMES W. HILL</u>	
CHECKED <u>T. E. SADUSKY/DCD</u>		APPROVED <u>JOHN D. SMART</u>	
CADD SYSTEM AutoCAD Rev. 15.05		CADD FILENAME 40-D-6602.DWG	
DENVER, COLORADO		JANUARY 8, 1993	
		DATE AND TIME PLOTTED DECEMBER 29, 2001 11:25	
		40-D-6602	

GENERAL NOTES

UNLESS OTHERWISE SHOWN, THESE NOTES ARE TYPICAL FOR ALL DRAWINGS THAT REFER TO THIS DRAWING.

ABBREVIATIONS

El. = Elevation
HP = High point
LP = Low point
WP = Working point
bf = bottom face
ef = each face
ff = far face
nf = near face
tf = top face
SP = Sewer pipe
TW = Tailwater
WS = Water surface, waterstop
CJ = Construction joint
EJ = Expansion joint
OCJ = Optional construction joint
VCJ = Vertical construction joint
Cr.J = Contraction joint
Ct.J = Control joint

WSA = Waterstop---Type A
WSB = Waterstop---Type B
WSD = Waterstop---Type D
WSE = Waterstop---Type E
WSF = Waterstop---Type F
WSG = Waterstop---Type G
WSH = Waterstop---Type H
MSN1 = Metal seal---Type N1
MSN2 = Metal seal---Type N2
MSZ = Metal seal---Type Z

EMBEDDED MATERIALS

Before placing concrete, care shall be taken that all embedded items are in position and securely fastened in place. Anchor bolt locations and settings are shown on the structural steel, miscellaneous metal, concrete, and equipment drawings. Conduits and grounding cables are shown on the manufacturer's drawings and the electrical drawings. All projecting waterstops and metal seats shall be supported and protected from damage and exposure.

FINISHES

For location and classes of finishes for formed and unformed concrete surfaces, see the specifications drawings and/or paragraphs.

JOINTS

All construction joints, identified as CJ, shall be provided where shown on the drawings. All optional construction joints, identified as OCJ, are to reduce the volume of placements or to facilitate construction. If optional joints are provided they shall be only at the locations shown. Additional construction joints may be used subject to approval.

CHAMFER

Chamfer edges of permanently exposed concrete surfaces with a 45° bevel, 3/4" x 3/4".

CONCRETE PLACEMENT

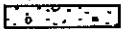
Before placing concrete, see all drawings released to the contractor as suitable for construction, including manufacturer's drawings, for all embedded material which is required in the placement.

REFERENCES

Numerals in parentheses that follow notes, details and section letters or numbers indicate the number of the drawing upon which the section or detail is indicated or shown. For example, (524) denotes Drawing No. XXX-D-524. The letters XXX shown here will be numbers denoting the project.

CONCRETE SYMBOLS

The different concrete placements are indicated by the following symbols:

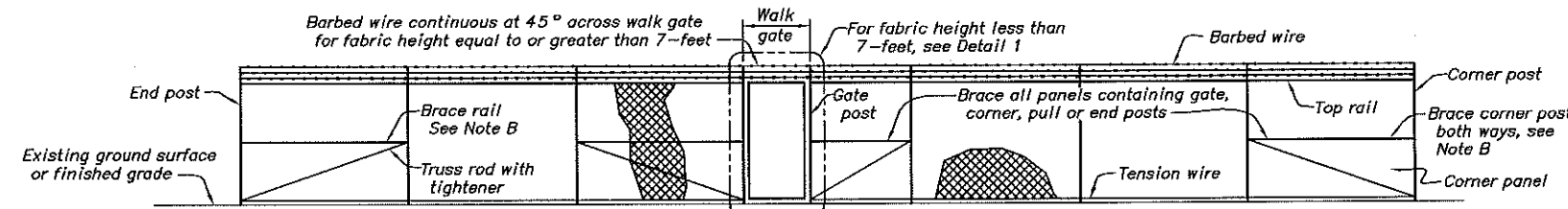
-  Concrete -- First stage
-  Concrete -- Second stage
-  Concrete -- Blockout
-  Existing concrete or concrete in adjacent structures
-  Grout

DIMENSIONS

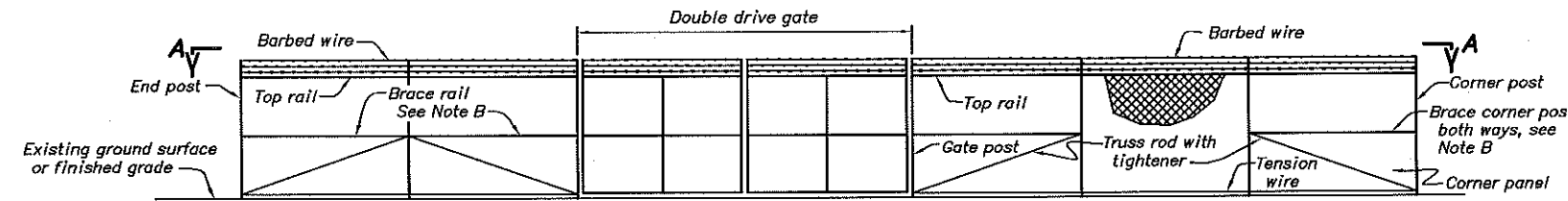
All dimensions to a joint are to the centerline of the joint unless otherwise shown.
Dimensions to beams, columns, and walls are from reference lines or other control points.
Dimensions in parentheses () on plans are beam depths. Beam and slab depths shall be measured from the top of the structural slab. Dimensions given for the depth of recesses are from the surface of the structural concrete.
Thicknesses shown for walls and slabs placed against soil or rock are minimum dimensions.

THIS DRAWING SUPERSEDES DRAWING 40-D-7006

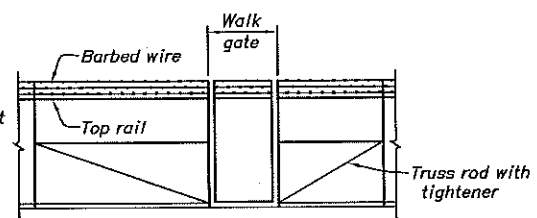
REV NO	2004-12-28	REDRAWN IN AUTOCAD
1	D-R.S.D.	
 ALWAYS THINK SAFETY		
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION		
STANDARD DESIGN		
GENERAL CONCRETE OUTLINE NOTES		
DESIGNED	DL BURLING	TECH. APPR.
DRAWN	DL BURLING	
CHECKED	GARY SNIDER	APPROVED
CADD SYSTEM	CADD FILENAME	DATE AND TIME PLOTTED
AUTOCAD Release 14.0	40-D-7012.DWG	JANUARY 6, 2005 13:47
DENVER, COLORADO	MARCH 23, 1998	40-D-7012



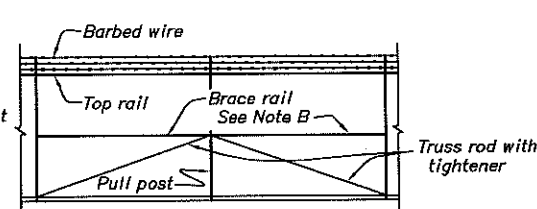
TYPICAL ELEVATION



TYPICAL ELEVATION



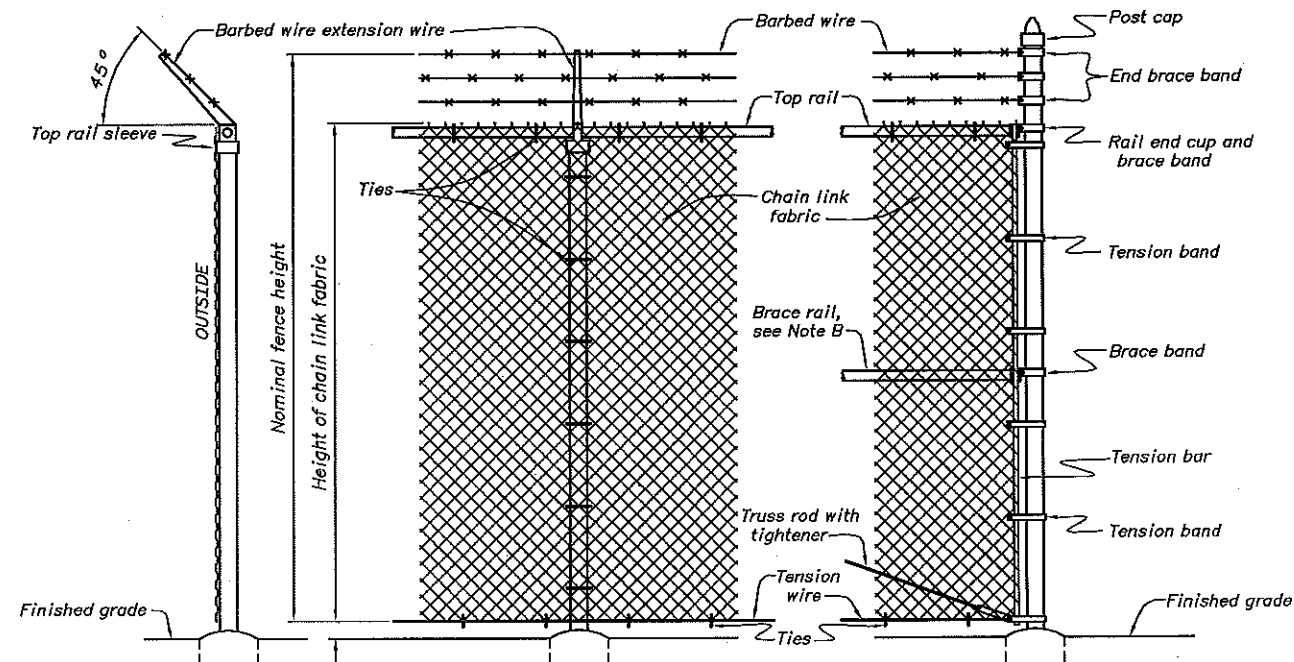
DETAIL 1



PANELS ADJOINING PULL POST

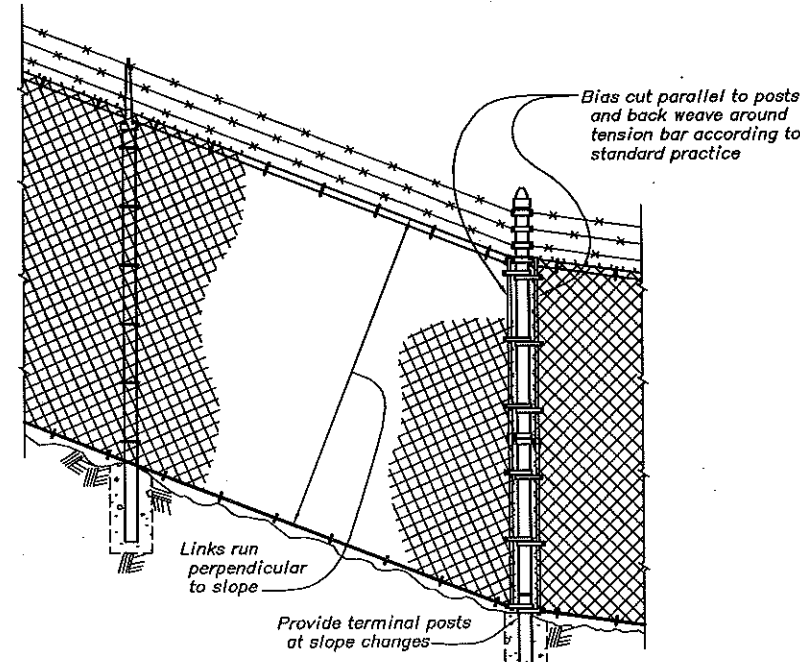


VIEW A-A



LINE POST

END POST, CORNER POST, OR GATE POST

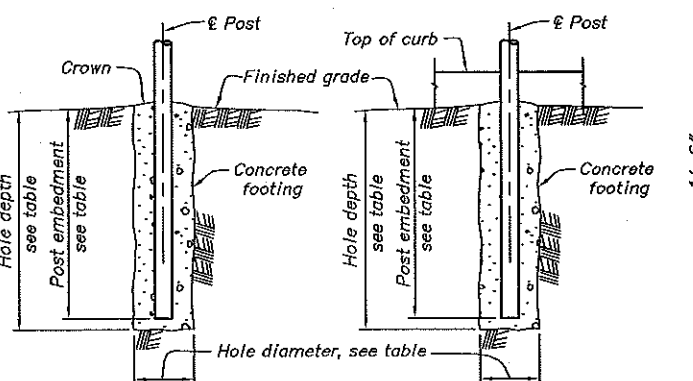


FENCE INSTALLATION ON STEEP SLOPES

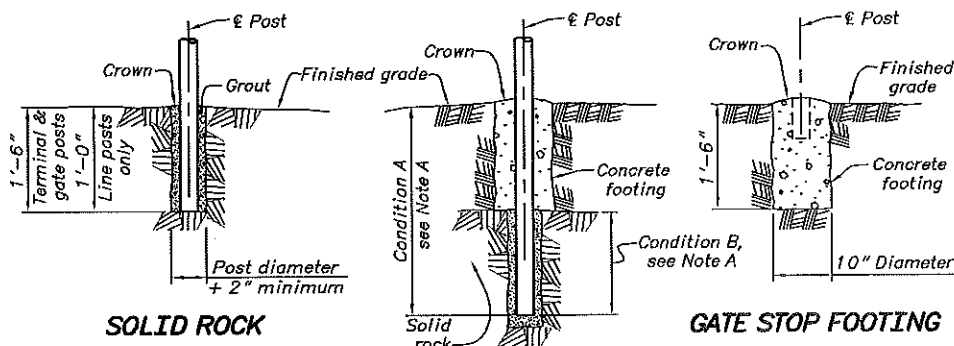
POST FOOTING SIZES IN SOIL OR LOOSE ROCK

POST	FABRIC HEIGHT OR GATE LEAF WIDTH	HOLE DIAMETER	HOLE DEPTH	POST EMBEDMENT
Line	3 ft. to 4 ft.	6 inches	24 inches	22 inches
Line	5 ft.	8 inches	30 inches	28 inches
Line	6 ft. to 12 ft.	9 inches	38 inches	36 inches
Terminal	3 ft. to 5 ft.	10 inches	32 inches	30 inches
Terminal	6 ft. to 12 ft.	12 inches	38 inches	36 inches
Gate	≤ 6 ft.	12 inches	38 inches	36 inches
Gate	6 ft. to 13 ft.	16 inches	44 inches	42 inches
Gate	> 13 ft.	26 inches	50 inches	48 inches

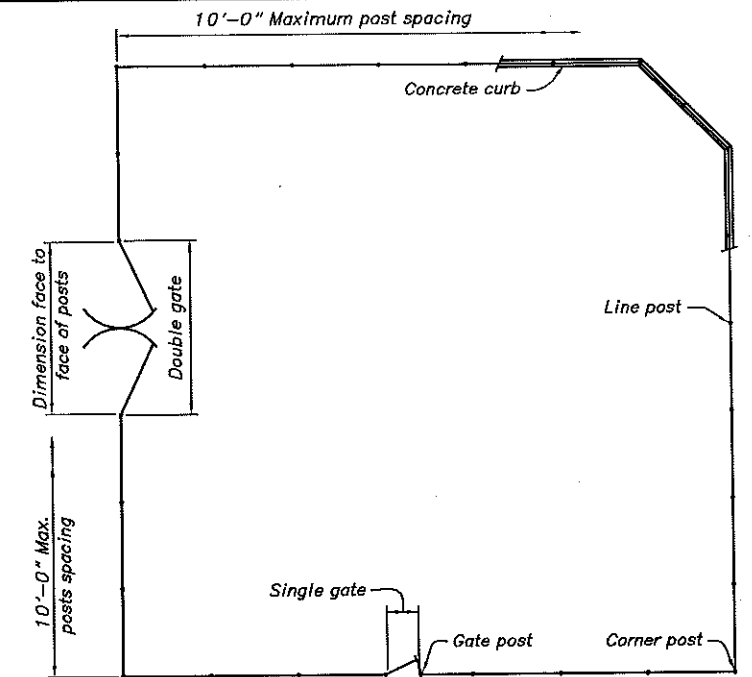
Condition A: Depth required for footing in soil or loose rock.
 Condition B: Depth required for embedment in rock.
 Note A: Satisfy the minimum requirements for Condition A or Condition B.
 Note B: Brace rails and truss rods are not required for fabric height of 6 feet or less.



SOIL OR LOOSE ROCK POST FOOTING UNDER CURB



POST FOOTING IN SOLID ROCK WITH OVERBURDEN OF SOIL OR LOOSE ROCK



TYPICAL FENCING PLAN

NOTES

See specific site plan for overall fence dimensions and size, location and swing of gates.

Install pull posts at the end of each run, at maximum intervals of 500 feet, and at vertical and horizontal changes in alignment greater than 30 degrees.

Weld all joints between tubular gate frame members or use heavy fittings to provide rigid and watertight connections.

Gate dimensions are face to face of gate posts.

Provide latches, stops and keepers for all gates as specified.

End post, corner posts, and pull posts, are designated as terminal posts.

See site plans for curb details and locations where curb is required.

Chain link fabric shall be attached to fence framework in accordance with the Chain Link Fence Manufacturer's Institute (CLFMI) Product Manual.

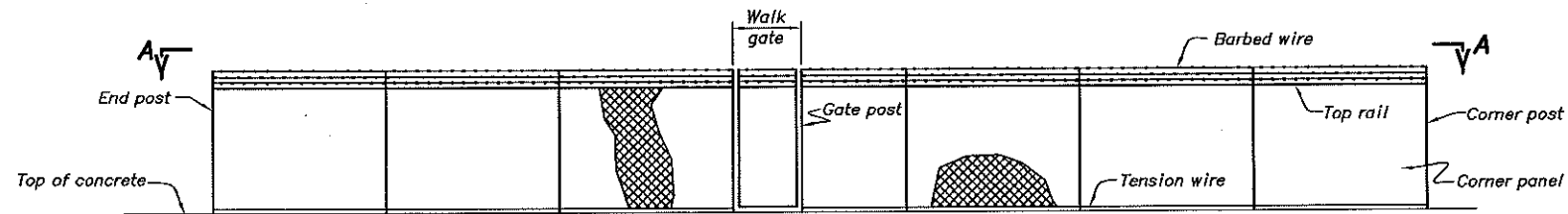
Chain link fences are 6 foot high fabric unless otherwise noted on specific site plans.

⊕ ALWAYS THINK SAFETY

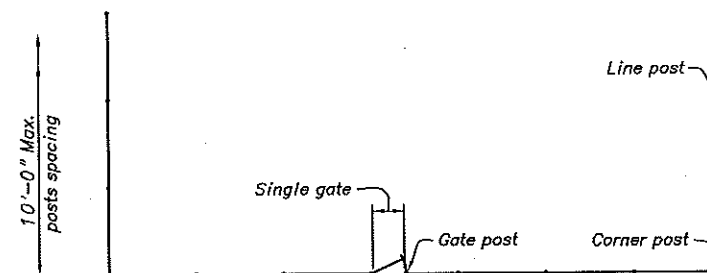
UNITED STATES
 DEPARTMENT OF THE INTERIOR
 BUREAU OF RECLAMATION
 STANDARD DESIGN

CHAIN LINK FENCING CHAIN LINK FENCING REQUIREMENTS SOIL INSTALLATION

DESIGNED BY E. SHERARD
 DRAWN BY D. BORING
 CHECKED BY T. C. GRABER
 APPROVED BY
 DATE AND TIME PLOTTED
 NOVEMBER 20, 2001 1:14:17
 40-D-7016.DWG
 MAY 1, 1999
 40-D-7016



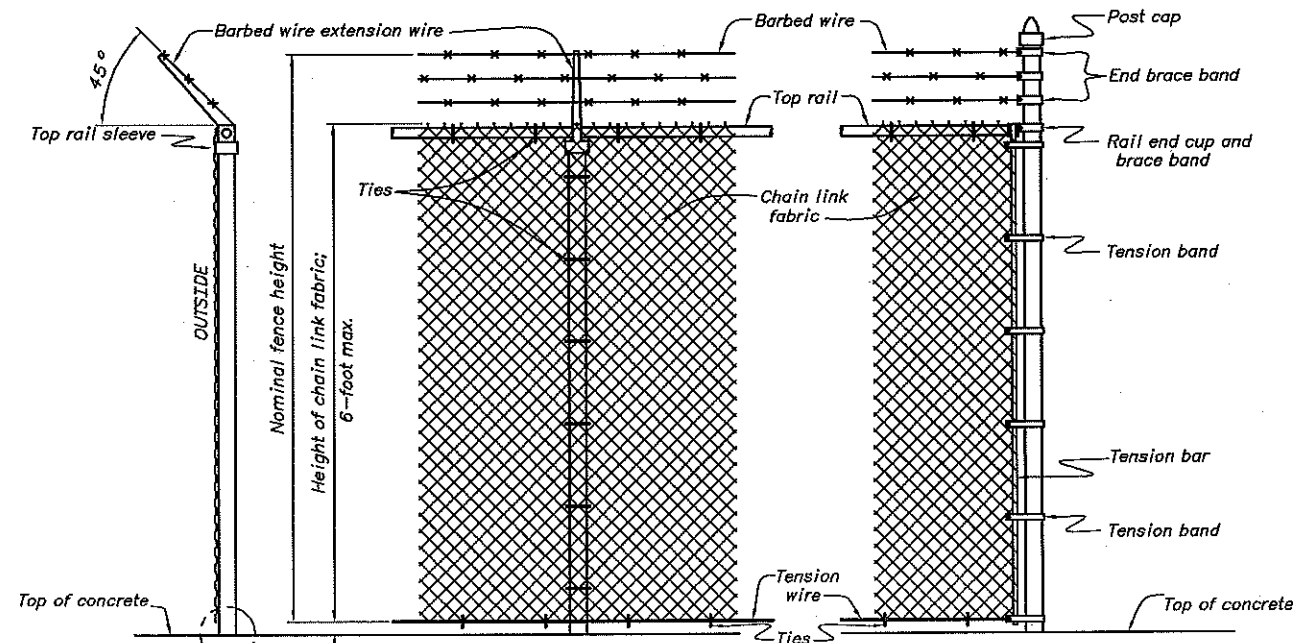
TYPICAL ELEVATION



TYPICAL FENCING PLAN

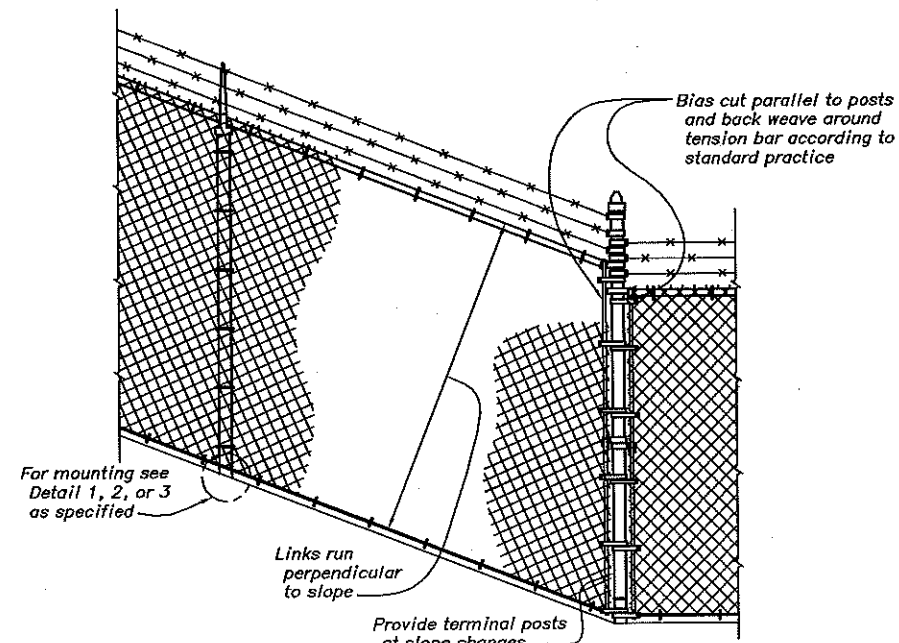


VIEW A-A



LINE POST

END POST, CORNER POST, OR GATE POST



FENCE INSTALLATION ON STEEP SLOPES

NOTES

See specific site plan for overall fence dimensions and size,
location and swing of gates.

Install pull posts at the end of each run, at maximum intervals of 500 feet, and at vertical and horizontal changes in alignment greater than 30 degrees.

Weld all joints between tubular gate frame members or use heavy fittings to provide rigid and watertight connections.

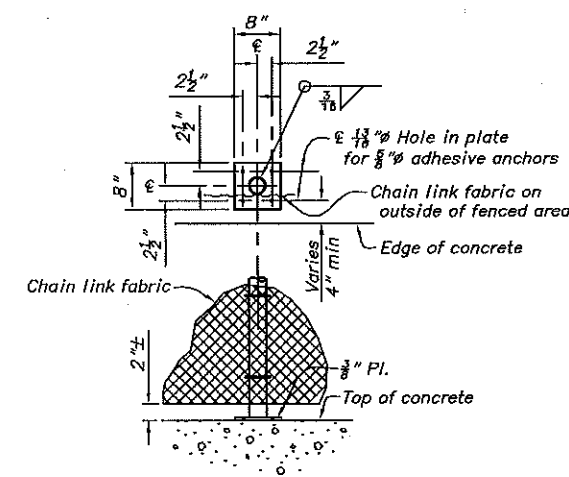
Gate dimensions are face to face of gate posts.

Provide latches, stops and keepers for all gates as specified.

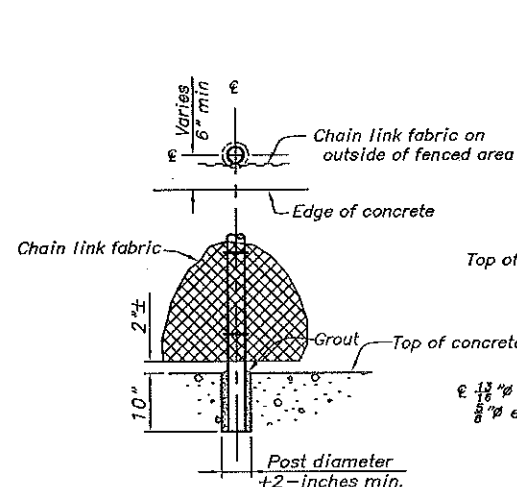
End post, corner posts, pull posts, and gate posts are designated as terminal posts.

Chain link fabric shall be attached to fence framework in accordance with the Chain Link Fence Manufacturer's Institute (CLFMI) Product Manual.

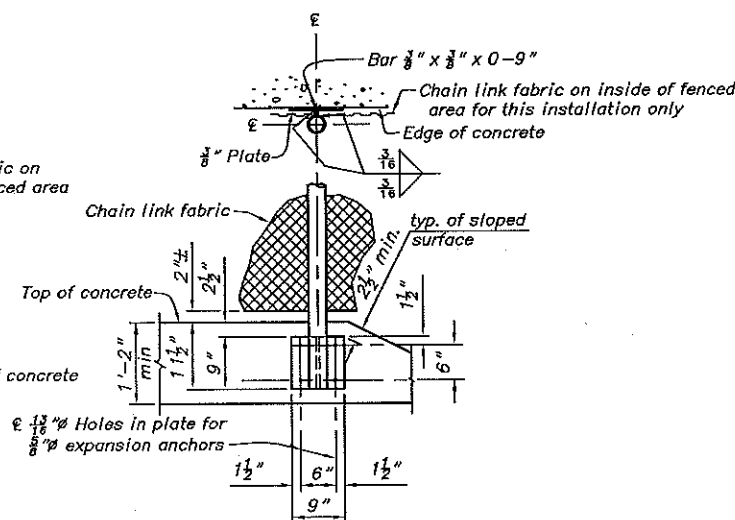
Chain link fences are 6 foot high fabric unless otherwise noted on specific site plans.



DETAIL 1
SURFACE MOUNTED POST



DETAIL 2
EMBEDDED POST



DETAIL 3
SIDE MOUNTED POST
(For slabs 1'-2" thick or greater or wall surfaces)

	UNITED STATES
	DEPARTMENT OF THE INTERIOR
	BUREAU OF RECLAMATION
	STANDARD DESIGN
CHAIN LINK FENCING	
CHAIN LINK FENCING REQUIREMENTS	
CONCRETE INSTALLATION	
DESIGNED <u>C. E. SHERARD</u>	TECH. APPR. <u>T. C. GRABER</u>
DRAWN <u>D. L. BORTING</u>	
CHECKED <u>T. C. GRABER</u>	APPROVED <u>M. R. O'SHEA</u>
CADD SYSTEM AutoCAD Rev. 15.05 DENVER, COLORADO	STRUCTURAL AND ARCHITECTURAL GROUP WORK AND TIME PLOTTED NOVEMBER 20, 2001 14:05 40-D-7017 MAY 1, 1999

MISCELLANEOUS DESIGNATIONS

ALT	Alternator
A	Suffix designation for auxiliary control circuit
ASC	Adjustable speed controller
BFV	Butterfly valve
C or CAP	Capacitor
CB	Circuit breaker
CLF	Current limiting fuse
CNT	Counter
DV	Discharge valve
EXC	Exciter
FU	Fuse
GFCI	Ground fault circuit interrupter
GRD	Ground
GRS	Galvanized rigid steel conduit
GV	Gate or guard valve
HR	Hand reset (Use as suffix)
I	Input
IL	Indicating lamp, add prefix for color
IMC	Intermediate steel conduit
MCE	Motor control equipment (2500 - 5000 volts)
M	Motor
MCC	Motor control center (600 - volts and lower)
NP	Nameplate
NC	Normally closed
NO	Normally open
NSPB	Nonsegregated phase bus
O	Output
PB	Pushbutton (Momentary contact type)
PBM	Pushbutton (Maintaining contact type)
PC	Programmable controller
PR	Probe operated relay (Refer to FS for suffix)
REC	Rectifier
R/I	Resistance to current transducer
SF	Service factor
SO	Solenoid oiler
SV	Solenoid operated valve
TE	Time delay on energization
TD	Time delay on deenergization
TT	Thermal switch
V/I	Voltage to current transducer
VLV	Valve
WL	Water level contact on telemeter receiver (Refer to FS for suffix)

WRM ----- Wound rotor motor
X,Y,X ----- Suffix for auxiliary relay, switch, or contactor (ALX,CSX,FLX, etc.)

-1,-2,-3, etc. ----- Suffix for unit number for pumping units, gates, valves, ect.

1,2,3, etc. ----- Suffix for electrical device numbering, such as TR1, TR2, ect.

* ----- Estimated rating

RELAY DESIGNATIONS

AL	Alarm relay
BG	Bearing temperature relay
CR	Control relay
FL	Field loss relay
FR	Field application relay
GP	Ground protective relay
IS	Incomplete sequence relay
LO	Lockout relay
OC	Overcurrent relay
OL	Overload relay
OV	Overvoltage relay
PO	Pullout (Loss of synchronism relay)
RC	Remote control relay
RSR	Remote sensing relay
SC	Squirrel cage (damper winding) relay
SR	Shift register
TR	Time delay relay
UF	Under frequency relay
UV-OPR	Undervoltage single and reverse phase relay
WT	Winding temperature relay

CONTACTOR DESIGNATIONS

FC	Field contactor
LC	Lighting contactor
M	Main contactor
MA	Air compressor motor contactor
MF	Vent fan motor contactor
MG*	Gate motor contactor
MO*	Oil pump motor contactor
MV*	Valve motor contactor
*Use suffix as application	
-C	Closing function
-L	Lowering function
-O	Opening function
-R	Raising function
S	Starting contactor
TS	Start contactor
2S	Start transition contactor
R	Run contactor

SWITCH DESIGNATIONS

CS	Control switch
FCD	Foreign circuit disconnect switch
FS	Float switch (Use suffix letter: C-canal, P-pipe, R-reservoir, S-sump, T-tank)
LS	Limit switch
PS	Pressure switch
SS	Selector switch
TQ	Torque switch
TSW	Transfer switch

TRANSFORMER DESIGNATIONS

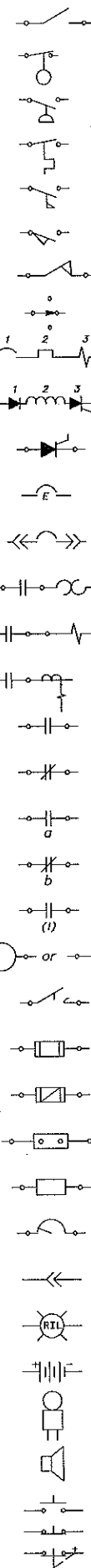
CCT	Control circuit transformer
CT	Current transformer
PT	Potential transformer
T	Transformer
TH	Transformer oil temperature
TL	Transformer oil level
TP	Transformer pressure relief
SST	Station service transformer

INSTRUMENT AND METER DESIGNATIONS

AM	Ammeter
AS	Ammeter transfer switch
CNT	Start counter
INT	Integrating instrument
PF	Power-factor meter
PST	Phase shifting transformer
RDM	Recording demand meter
TM	Time meter
V	Voltmeter
VAR	Varmeter
VARH	Varhour meter
VS	Voltmeter transfer switch
W	Wattmeter
WH	Watt-hour meter
WHD	Watt-hour demand meter
(R)	Indicates recording instruments
The asterisk is not part of the symbol.	
Replace the asterisk with letter or letters depending on the function of the instrument.	

DEVICE SYMBOLS

(CS)	Control switch
(AS)	Ammeter transfer switch
(VS)	Voltmeter transfer switch
— —	Surge arrester
— — —	Capacitor
— — — —	Reactor
— — — — —	Potential transformer
— — — — — —	Current transformer
— — — — — — —	Power or distribution transformer
Y	3 ϕ , Wye grounded connection
Δ	3 ϕ , Delta connection
Δ	3 ϕ , Broken delta connection
— — — — — — — —	3 ϕ , Open delta connection (corner grounded)



Disconnecting switch

Liquid level switch (Normally open)

Vacuum and pressure switch (Normally closed)

Temperature actuated switch (Normally open)

Flow actuated switch (Normally open)

Limit switch—direct actuated (Normally open)

Torque switch (Normally closed)

3-Position selector switch

Air circuit breaker thermomagnetic trip 1 Frame size,
2 Inverse time trip, 3 Instantaneous trip

1 Rectifier, 2 Reactor, 3 Inverter

Silicon controlled rectifier (Solid state DC switch)

Air circuit breaker, electrically operated

Air circuit breaker, withdraw type

Contactor with thermal trip

Contactor with magnetic trip

Contactor with CT and magnetic trip relay

Contactor (Normally open)

Contactor (Normally closed)

Auxiliary contactor (Closes when main device is closed)

Auxiliary contactor (Open when main device is closed)

Relay contact number

Relay coil, contactor coil

Horn-gap disconnecting switch

Fuse

Fuse, current limiting type

Instrument shunt

Resistor

Rheostat, or potentiometer

Separable connector

Indicating lamp W—white, R—red, G—green,
Y—yellow, A—amber, B—blue

Battery

Bell

Horn

Pushbutton (Normally open, momentary contact)

Pushbutton (Normally closed, momentary contact)

Maintained contact pushbutton

Probe, water level detector

Load interrupter switch

Motor

Triac (Solid state AC switch)

Wound rotor motor

WIRING SYMBOLS

Ground connection
Interconnection between separately owned systems
Duplex single-gang plug receptacle
Single weatherproof plug receptacle
Watertight three-phase power receptacle
Single pole switch
Three way switch
Luminaire, letter indicates type, number indicates wattage
Represents connection from external equipment. Does not necessarily represent a terminal block.
High voltage cable termination
Represents connection from external equipment via-multi-pair control (signal) cable.

GROUND SYMBOLS

Cable exposed
Cable embedded in concrete
Cable concealed but not embedded
Cable buried directly in earth
Ground rod
Welded or bolted connection
Cable riser
Indicates ground when required for clarity
Ground connector per 40-D-4334, Fig. 4
Ground ring

CONDUIT SYMBOLS

Exposed
Embedded in concrete
Concealed but not embedded
Buried directly in earth
Bending toward observer
Bending away from observer
Capped
Pull box or junction box

Designation number
Liquid tight flexible metal conduit
Sealing bushing, conduit to cable

NOTES

1. If designations and symbols other than the ones shown on this drawing used, they shall be shown on the appropriate drawing.
2. For additional designations and symbols refer to NEMA Standards Pub. ICS-1970.
3. Contacts in control circuits are shown in the deenergized position. Liquid level switches are shown with liquid container empty. Vacuum and pressure switches are shown at ambient pressure. Temperature switches are shown at ambient temperature.

3-24-00	REVISED TITLE BLOCK AND REDRAWN IN AUTOCAD 14.
D-L.G.	
3-11-81	MINOR REVISIONS
D-D.G.	
ALWAYS THINK SAFETY	
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION STANDARD DESIGNS	
PUMPING PLANT ELECTRICAL INSTALLATIONS DESIGNATIONS AND SYMBOLS	
DESIGNED	N.J.B.
TECH. APPR.	P.L. ANNA
DRAWN	D.D. DROULLARD
SUBMITTED	S.M. DENTON
CHECKED	E.M.T.
APPROVED	M.H. KITCH
CADD SYSTEM	CHIEF ELECTRICAL ENGINEER
AUTOCAD Ver. 15.02	DATE AND TIME PLOTTED
DENVER, COLORADO	104-D-757.DWG
	NOVEMBER 20, 2001 13:02
	FEBRUARY 13, 1982
	104-D-757

IEEE STANDARD CONTROL & PROTECTION DEVICE FUNCTION NUMBERS

(SEE NOTES 1, 2, AND 3)

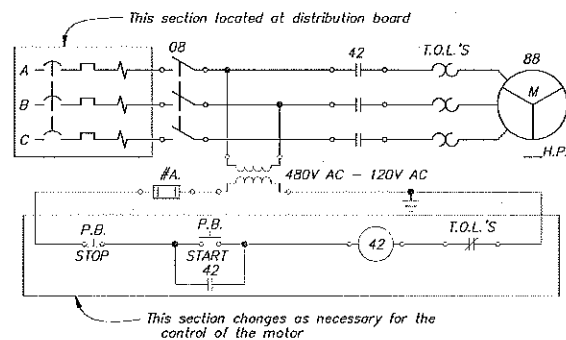
- 01 Master Element
02 Time-Delay Starting or Closing Relay (TDPU)
03 Checking or Interlocking Relay
04 Master Contactor
05 Stopping Device
06 Starting Circuit Breaker
07 Rate-of-Charge Relay
08 Control Power Disconnecting Device
09 Reversing Device
10 Unit Sequence Switch
11 Multifunction Device
12 Overspeed Device
13 Synchronous-speed Device
14 Underspeed Device
15 Speed or Frequency Matching Device
16 Reserved for future application
17 Shunting or Discharge Switch
18 Accelerating or Decelerating Device
19 Starting-to-Running Transition Contactor
20 Electrically Operated Valve
21 Distance Relay
22 Equalizer Circuit Breaker
23 Temperature Control Device
24 Volts Per Hertz Relay
25 Synchronizing or Synchronism-Check Device
26 Apparatus Thermal Device
27 Undervoltage Relay
28 Flame Detector
29 Isolating Contactor
30 Annunciator Relay
31 Separate Excitation Device
32 Directional Power Relay
33 Position Switch
34 Master Sequence Device
35 Brush-Operating or Slip-Ring Short-Circuiting Device
36 Polarity or Polarizing Voltage Device
37 Undercurrent or Underpower Relay
38 Bearing Protective Device
39 Mechanical Condition Monitor
40 Field Relay
41 Field Circuit Breaker
42 Running Circuit Breaker
43 Manual Transfer or Selector Device
44 Unit Sequence Starting Relay
45 Atmospheric Condition Monitor
46 Reverse-Phase or Phase-Balance Current Relay
47 Phase-Sequence Voltage Relay
48 Incomplete Sequence Relay
49 Machine or Transformer Thermal Relay
50 Instantaneous Overcurrent or Rate-of-Rise Relay
51 AC Time Overcurrent Relay
52 AC Circuit Breaker
53 Exciter or DC Generator Relay
54 Turning Gear Engaging Device
55 Power Factor Relay
56 Field Application Relay
57 Short-Circuiting or Grounding Device
58 Rectification Failure Relay
59 Overvoltage Relay
60 Voltage or Current Balance Relay
61 Density Switch or Sensor
62 Time-Delay Stopping or Opening Relay (TDDO)
63 Pressure Switch
64 Ground Detector Relay
65 Governor
66 Notching or Jogging Device
67 AC Directional Overcurrent Relay
68 Blocking Relay
69 Permissive Control Device
70 Rheostat
71 Level Switch
72 DC Circuit Breaker
73 Load-Resistor Contactor
74 Alarm Relay
75 Position Changing Mechanism
76 DC Overcurrent Relay
77 Pulse Transmitter
78 Phase-Angle Measuring or Out-of-Step Protective Relay
79 AC Reclosing Relay
80 Flow Switch
81 Frequency Relay
82 DC Reclosing Relay
83 Automatic Selective Control or Transfer Relay
84 Operating Mechanism
85 Carrier or Pilot-Wire Receiver Relay
86 Lockout Relay
87 Differential Protective Relay
88 Auxiliary Motor or Motor Generator
89 Line Switch
90 Regulating Device
91 Voltage Directional Relay
92 Voltage and Power Directional Relay
93 Field-Changing Contactor
94 Tripping or Trip-Free Relay
95 Reserved for future application
96 Reserved for future application
97 Reserved for future application
98 Creep Detector Device
99 Reserved for future application

FIRST LETTER SUFFIX OF THE DEVICE DESIGNATION (SEE NOTES 1, 2, AND 3)

- A Governor System (or Actuator Systems—gates)
B Battery Charging & Monitoring System
C High-Voltage Cable System
D Data Acquisition System
E Excitation System including Transformer and Regulator but not Main Field
F Fire and CO₂ System
G Main Generator including Auxiliary Systems
G/M Generator Motor including Auxiliary Systems in Pumped Storage Applications
H Turbine or Main Pump including Auxiliary Systems
I Isolated and Other Power Bus Systems (not High Voltage Cable)
J Power Circuit Breaker including Auxiliary Systems
K Power Transformer including Auxiliary Systems
L Annunciator System, Security System
M Main Pump Motor including Auxiliary Systems and Variable Speed Drive
N Air (Pneumatic) System
O Not used
P Penstock or Discharge Line System
Q Oil Storage, Handling, Purification System
R Field Flashing System or Phase Reversal Switch including Auxiliary Systems
S Station Service Substation System including Engine/Generator System
T Time and Transfer Trip System
U Unit Control Circuit System or Uninterruptible Power Supply System
V Intake and/or Discharge Valve System
W Water Systems including Intake/Outlet Works and Plant
X Water and Sump Systems
Y Defined for systems unique to a facility
Z Defined for systems unique to a facility

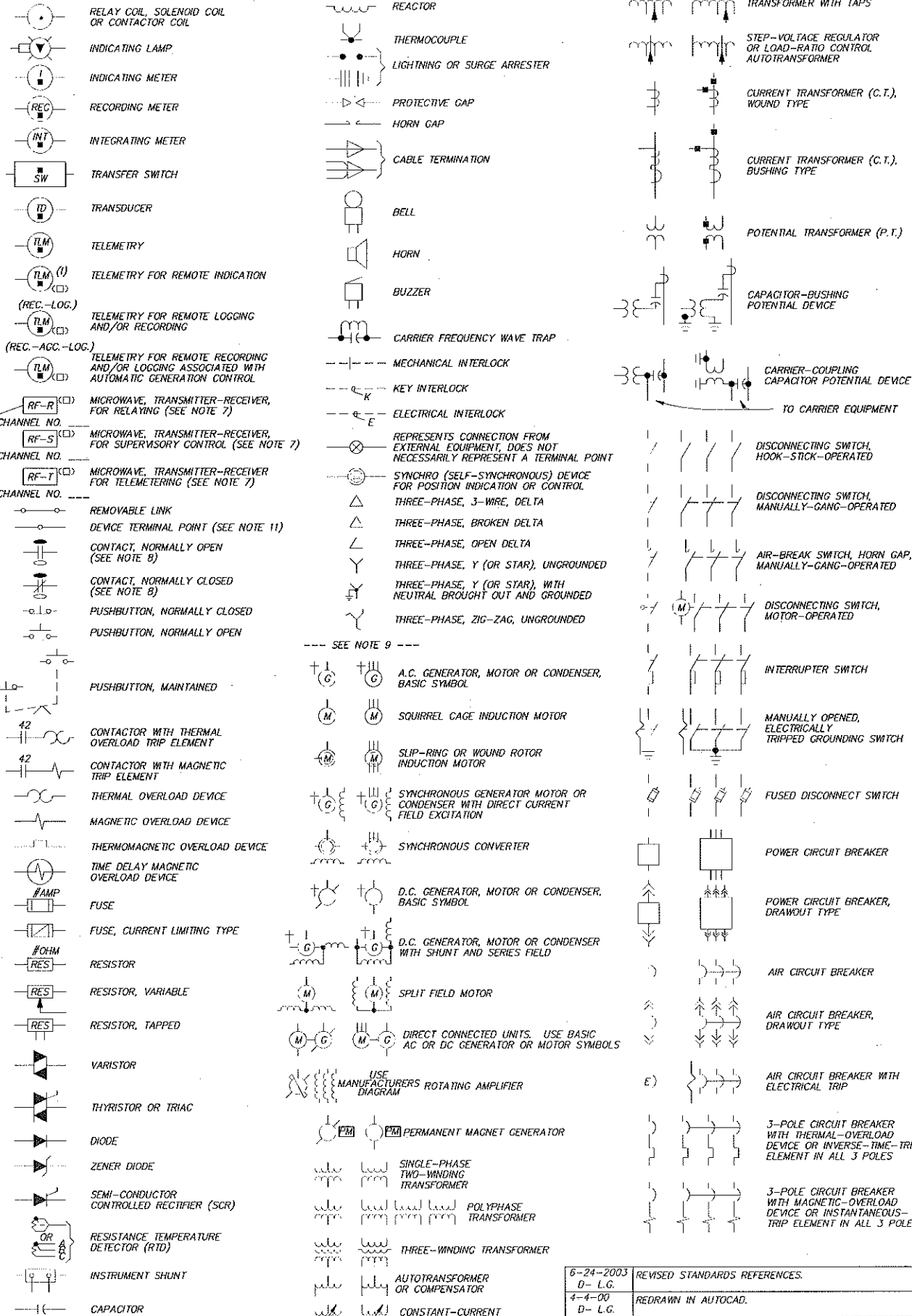
SECOND AND SUBSEQUENT LETTER SUFFIXES OF THE DEVICE DESIGNATION (SEE NOTES 1, 2, AND 3)

- A Abnormal, A.C., Acceleration, Admission, Alarm, Amperes, Automatic, Auxiliaries, Phase A, etc.
B Backup, Bearing, Block, Blower, Booster, Brokes, Bus, Button, Bypass, Phase B, etc.
C Cable, Carrier, Charger, Check, Chlorination, Close, Collector, Common, Compensator, Compressor, Control, Cooling, Current, Cycle, Cylinder, Phase C, Conveyor, etc.
D D.C., Deceleration, Delay, Depress, Detector, Dielectric, Differential, Discharge, Disconnect, Discardance, Domestic, Down, Downstream, Draft Tube, Drain, etc.
E Ejector, Elevator, Emergency, Explosive, etc.
F Failure, Fan, Fault, Feeder, Field, Filter, Fire, Flame, Flow, Follower, Forward, Frequency, Full, Fumes, Fuse, etc.
G Gas, Gate, Gating (SGR), Generate, Ground, Guide Bearing, etc.
H Holon, Hand, Heat, Heaters, High, Hoist, Horn, Hot, Housing, Hydropneumatic Tank, etc.
I Indication, Initial, Inlet, Input, Instantaneous, Intake, Interface, Interlock, Interrupt, Inverter, Ionization, etc.
J Jacking, Jet, etc.
K Key, Transformer
L Lamps, Left, Level, Lights, Limit, Line, Liquid, Local, Logic, Loss, Louvers, Low, Lower, Lubrication, etc.
M Main, Multifunction, Manual, Meter, Metering, Motor, etc.
N Negative, Network, Neutral, Normal, etc.
O Open, Outlet, Output, etc.
P Packing Box, Parallel, Parameter, Penstock, Phase, Phaseback, Pilot, P/L, Position, Positive, Potential, Potable, Power, Pressure, Primary, Protection, Pulse, Pump, Purification, Push, etc.
Q Oil, etc.
R Raise, Reactor, Reclose, Record, Rectifier, Reed, Refrigeration, Regulate, Relay, Release, Relief, Remote, Reservoir, Reset, Resistor, Right, Rotation, Rotor, Runner, etc.
S Seals, Secondary, Selector, Sewage, Shorting, Shutdown, Signal, Skimmer, Sludge, Smoke, Solenoid, Speed, Spiral or Scroll Case, Splice, Stabilizer, Standby, Starting, Stator, Stepping, Storage, Strainer, Suction, Sump, Supply, Switch, Synchronizing, etc.
T Tank, Temperature, Test, Thermal, Thrust Bearing, Thyatron, Tie, Time, Transducer, Transfer, Transmitter, Trip, Trouble, Trashrake, etc.
U Unit, Unloader, Unwinding, Up, Upper, Upstream, etc.
V Valve, Vars, Vibration, Voltage, etc.
W Water, Watts, Winding, etc.
X Auxiliary Device, etc.
Y Auxiliary to Device X, Antipump Relay, etc.
Z Auxiliary to Device Y



BASIC MOTOR CONTACTOR SCHEMATIC

DEVICE SYMBOLS (SEE NOTES 5 AND 6)



NOTES

- Select the most appropriate ANSI device function number which identifies the device used by function and the most appropriate suffix letters which further identify the device by system, subsystem, quantity or condition monitored or controlled.
Examples: 127UC...Unit 1 Unit Control Bus Undervoltage Relay
251EF...Unit 2 Exciter Field Time Delay Overcurrent Relay
71WSH...Plant Sump High Water Level Switch
- Device numbers 1 through 99 are used for the overall plant and switchyard operation. Device numbers 101 through 199, 201 through 299, 301 through 399, etc. are used for Units 1, 2, 3, etc. Device numbers prefixed by letters RE indicates devices controlled by a supervisory system.
- No device designation shall be duplicated in the plant or switchyard. When two or more devices perform exactly the same function, the designations will be followed by a number, starting at number 1, to differentiate between the devices.
Examples: 127UCX1, 2...Auxiliary Relays to Device 127UC
71WSHX1, 2, 3...Auxiliary Relays to Device 71WSH
104UC1, 2...Unit 1 Master Control Starting Relays
- All schematic diagrams shall have an explanation list for devices shown on that diagram. This explanation list shall consist of a device designation with a concise description for each device and be located above the title block (e.g. See the examples in Notes 1 and 3 above).
- This list of device symbols shows the preferred symbol to be used on Bureau of Reclamation single-line and schematic diagrams.
- The following symbols are not part of the device symbols they are shown with, always replace these symbols by the following:
 - ...Show device function numbers and letter suffixes within circle.
 - ...Show color of lamp by the following: A-Amber, B-Blue, C-Clear, G-Green, O-Orange, R-Red, W-White.
 - ...Substitute symbol from the following list:

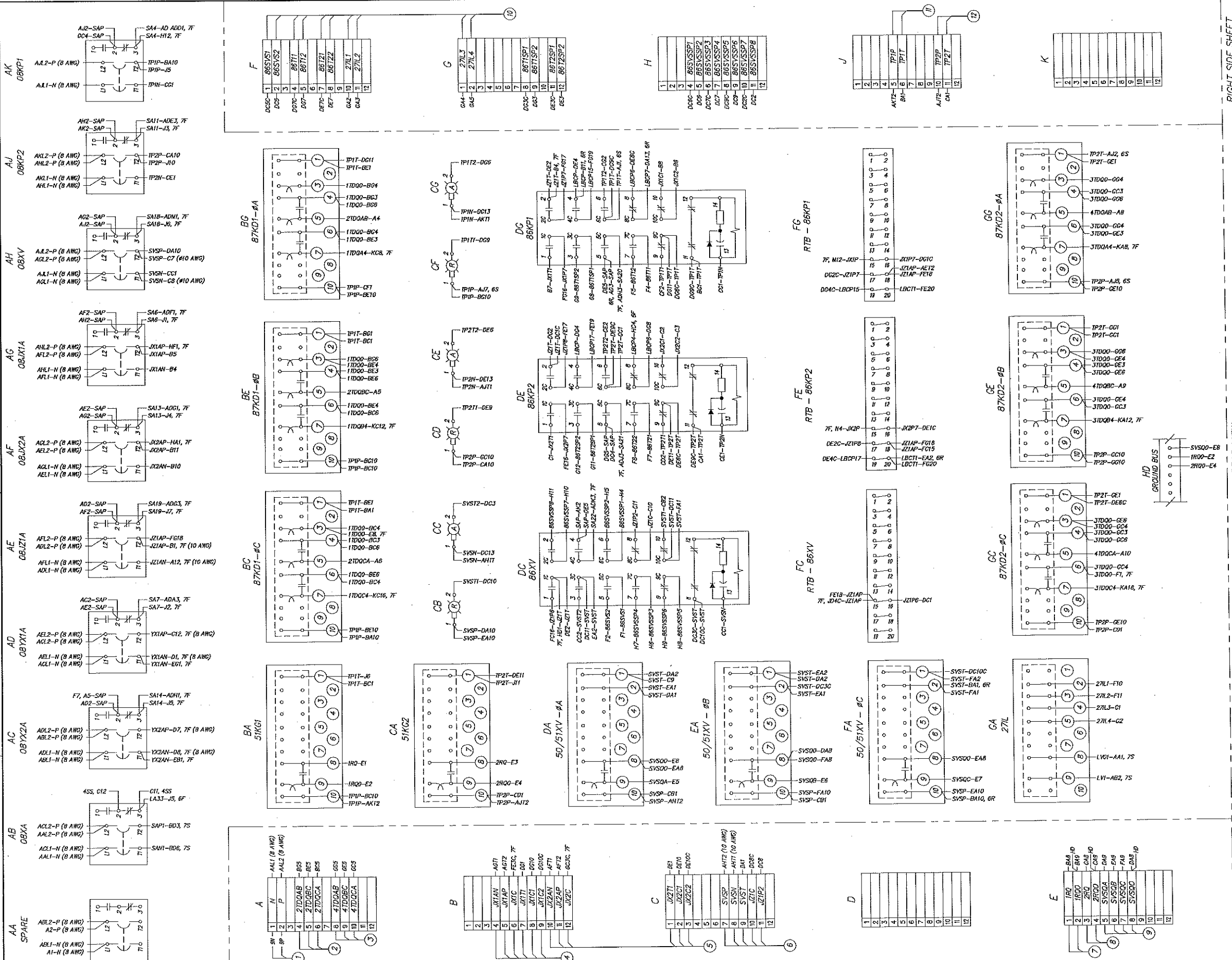
ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
STANDARD DESIGNS

MAJOR POWER/PUMPING PLANTS ELECTRICAL INSTALLATION DEVICE DESIGNATIONS AND SYMBOLS TO BE USED ON SINGLE-LINE AND SCHEMATIC DIAGRAMS

DESIGNED	R.W.M.	TECHNICAL APPROVAL	J. REIF
DRAWN	D.D. DROULAND	SUBMITTED	H.H. VANDERPLAATS
CHECKED	P.W.	APPROVED	R.H. AUERBACH
CADD SYSTEM	AutoCAD Ver. 16.0	CADD FILENAME	1150.DWG
	DENVER, COLORADO	DATE AND TIME PLOTTED	OCTOBER 21, 1993
			104-D-1150

6-24-2003 D-L.G.	REVISED STANDARDS REFERENCES.
4-4-00 D-L.G.	REDRAWN IN AUTOCAD.
6-1-90 D-J.W.R.	ADDED LIST OF SPERCEDED DRAWINGS, NEW TITLE BLOCK, AND DRAWING NUMBER IN UPPER LEFT CORNER.



MANUFACTURER'S NAME
MANUFACTURER'S DRAWING NUMBER
SPECIFICATIONS NUMBER

CABLE LIST

CABLE NUMBER	CABLE DESIGNATION	DESTINATION REFERENCE DRAWING	CABLE SIZE
1	9BSA-CSA7R (6300)	2-1/C-8	
2	1JX1A-CSA7R (6121)	1-5/C-10	
3	1JX2A-CSA7R (6230)	1-5/C-10	
4	1CSA7R-JX1A (6121)	1-9/C-10	
5	2CSA7R-JX2A (6230)	1-9/C-10	
6	3CSA7R-JZ1A (6249)	1-12/C-10	
7	1KX1A-CSA7R (6097)	1-3/C-10	
8	1KX2A-CSA7R (6201)	1-3/C-10	
9	1JX1A-CSA7R (6249)	1-5/C-10	
10	4CSA7R-RTU (6599)	1-12/C-16	
11	5CSA7R-KX1A (6097)	1-5/C-10	
12	6CSA7R-KX2A (6201)	1-5/C-10	

EXPLANATION OF POINT-TO-POINT WIRING DIAGRAMS

A. Double letters in bold face, such as **AA**, indicate the location of each device on the wiring diagram except for terminal blocks.

B. Single letters in bold face, such as **A**, indicate the location of each terminal block on the wiring diagram.

C. A control board is made of many sections which in turn are made of different panels. The sections are designated numerically 1 through "n" with "n" being the last section of the control board. The different panels are designated alphabetically as follows:

1. F - Indicates the front panel.
2. R - Indicates the rear panel.
3. S - Indicates the swing panel when there is only one swing panel per section.
4. FS and RS - Indicate the front and the rear swing panels, respectively, when there are two swing panels per section.
5. SS - Indicates the shipping split terminal block panel/section location.

D. All point-to-point wiring diagrams shall be drawn as follows:

1. All devices shown on the drawing shall represent the relative physical location of the devices.
2. Circuit (wire) designations shall be located next to the device stud (pin).
3. The circuit (wire) termination point shall be placed second from the device stud with a hyphen between the circuit designation and the circuit termination point.
4. The panel destination (number) of the wire shall be placed in the last position from the device stud with a comma between the circuit termination point and the panel destination. All panel wiring within the same panel will not require a panel destination.
5. Therefore, an example of point-to-point wiring is "LBCP4-HC4, 6F" which is located at device **B** stud 8 on this drawing. The circuit (wire) designation is LBCP4. The circuit (wire) termination point is at device **HC**, stud (pin) number 4, located on the front panel of section 6.

NOTES

1. All cable shields and spare conductors shall be connected to the ground bus.
2. An internal wiring diagram of each type of protective relay, except lockout relays, shall be shown on a separate drawing. All other devices, including lockout relays, shall have their internal wiring diagrams shown on their external point-to-point wiring diagrams.

4-3-00 REDRAWN BY AUTOCAD.

3-1-91 REVISOR TO NEW DRAFTING STANDARDS.

D-JHR

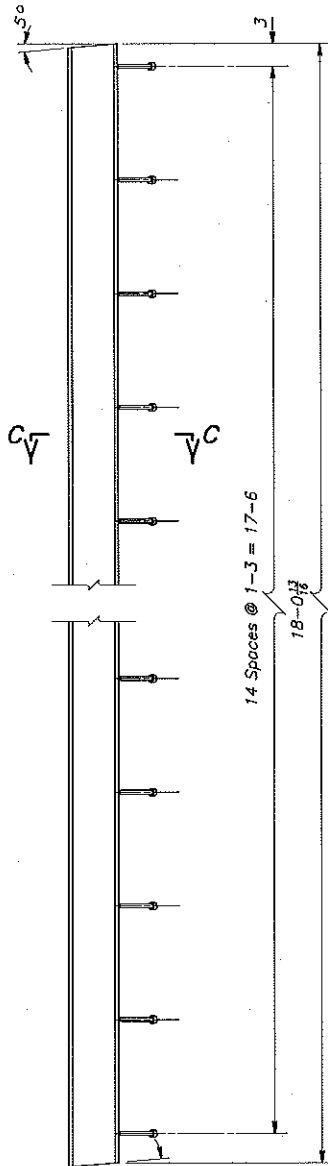
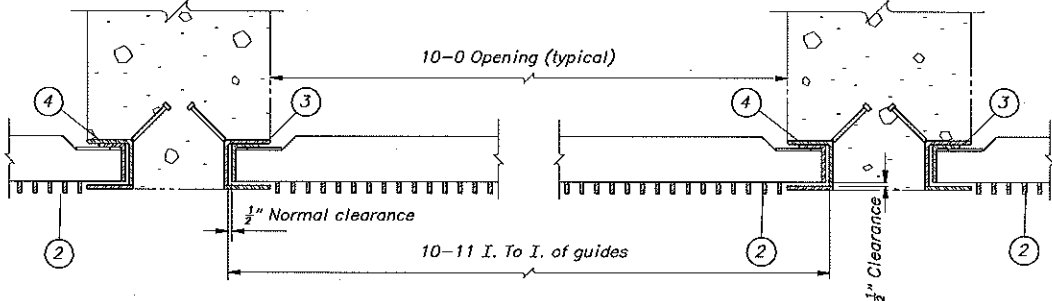
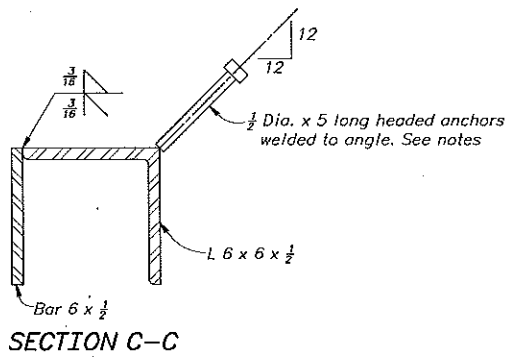
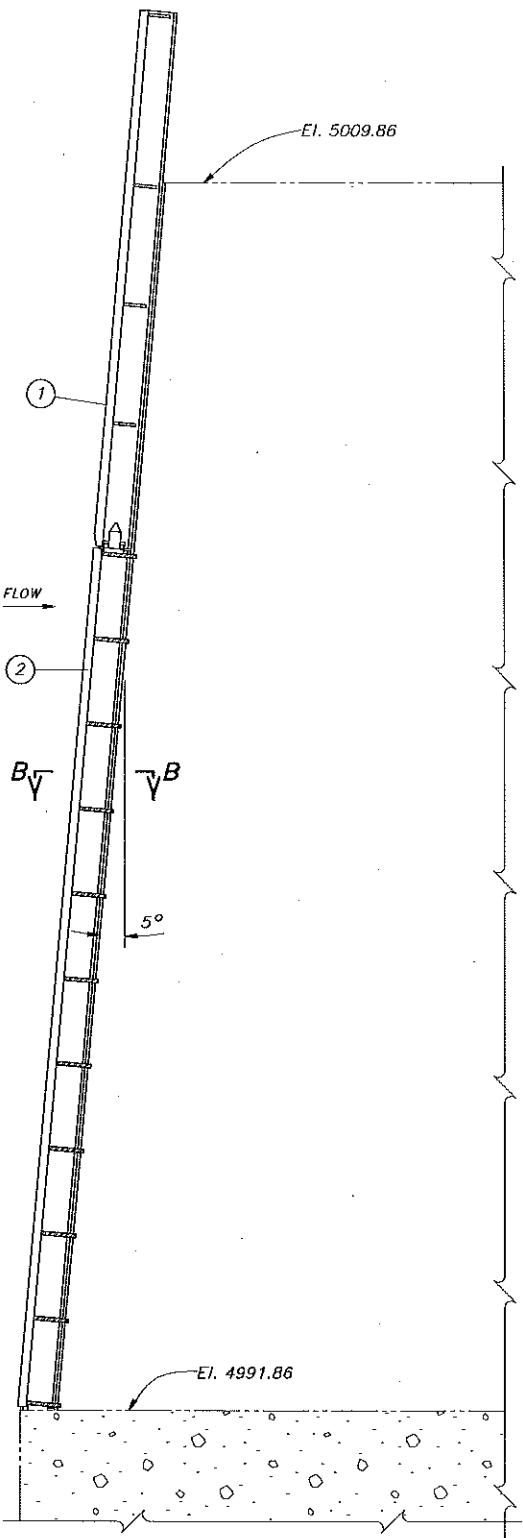
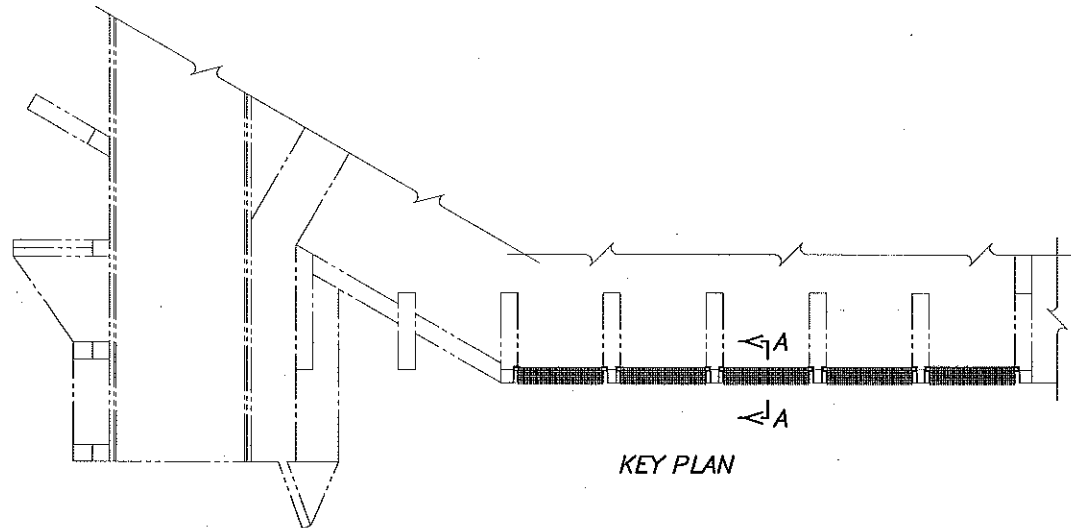
THIS DRAWING SUPERSEDES 104-D-873 AND 1032.

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
DESIGN DATA

TYPICAL POWERPLANT / PUMPING PLANT ELECTRICAL INSTALLATION MAIN CONTROL BOARD CSA - PANEL 7R WIRING DIAGRAM

DESIGNED: R.M. MC ALEE TECHNICAL APPROVAL: G.D. OSBURN
DRAWN: M.E. JOYLA SUBMITTED: J.W. REIF
CHECKED: R.M. MC ALEE APPROVED: F.W. COOK, SR.
CADD SYSTEM: AutoCAD R15.0S CADD FILENAME: 104-D-1165.DWG DATE AND TIME PLOTTED: NOVEMBER 20, 2001 13:11
DENVER, COLORADO DECEMBER 21, 1990 104-D-1165



NOTES
Welding symbols apply to the joints of all members of similar identification.
Unless otherwise noted, joints not covered by a weld symbol shall be seal welded, wherever possible, to exclude water.
All fillet welds shall be returned.
Headed anchors shall be flux filled stud anchors suitable for end welding with automatic end welding guns or equivalent manually welded anchors.

Estimated weights ----- 33,700 lbs

LIST OF DRAWINGS

TRASHRACK	
INSTALLATION - GUIDES - DETAILS	809-D-5723
TRASHRACK PANELS - DETAILS	809-D-5724

REFERENCE DRAWINGS

TRASHRACK STRUCTURE	
PLAN	809-D-5719

THE HOGBACK DIVERSION DAM IS PART OF THE
HOGBACK PROJECT-NEW MEXICO,
CONSTRUCTED BY THE BUREAU OF RECLAMATION
WITH FUNDING APPROPRIATED FOR THE
NAVAJO INDIAN IRRIGATION PROJECT-NEW MEXICO

FOR INFORMATION ONLY

6-19-2000 ADD HOGBACK DIVERSION DAM FUNDING NOTE AND
DELETE PROJECT NAME IN THE TITLE BLOCK (SEE NOTE)
D-100

ALWAYS THINK SAFETY

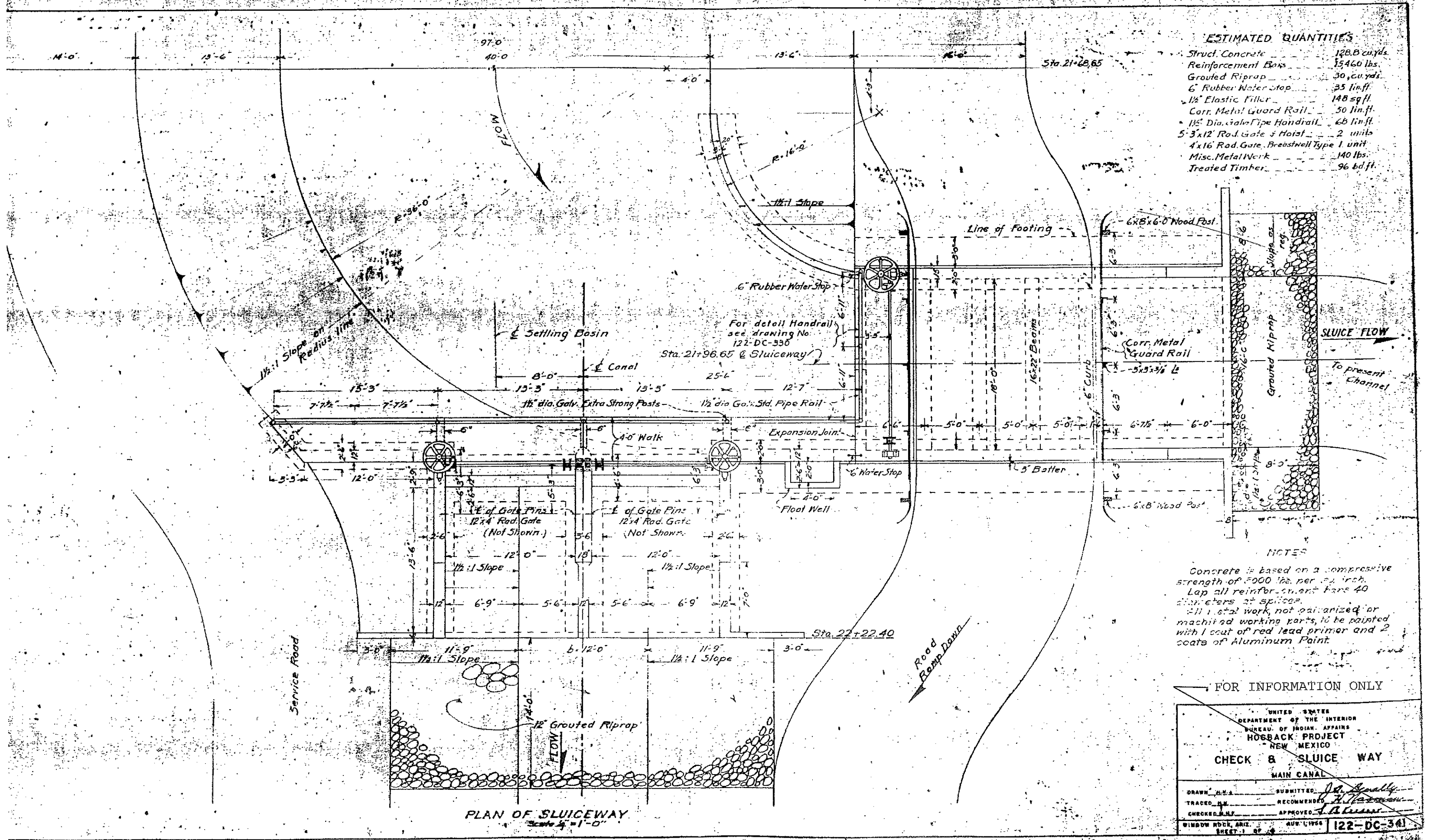
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

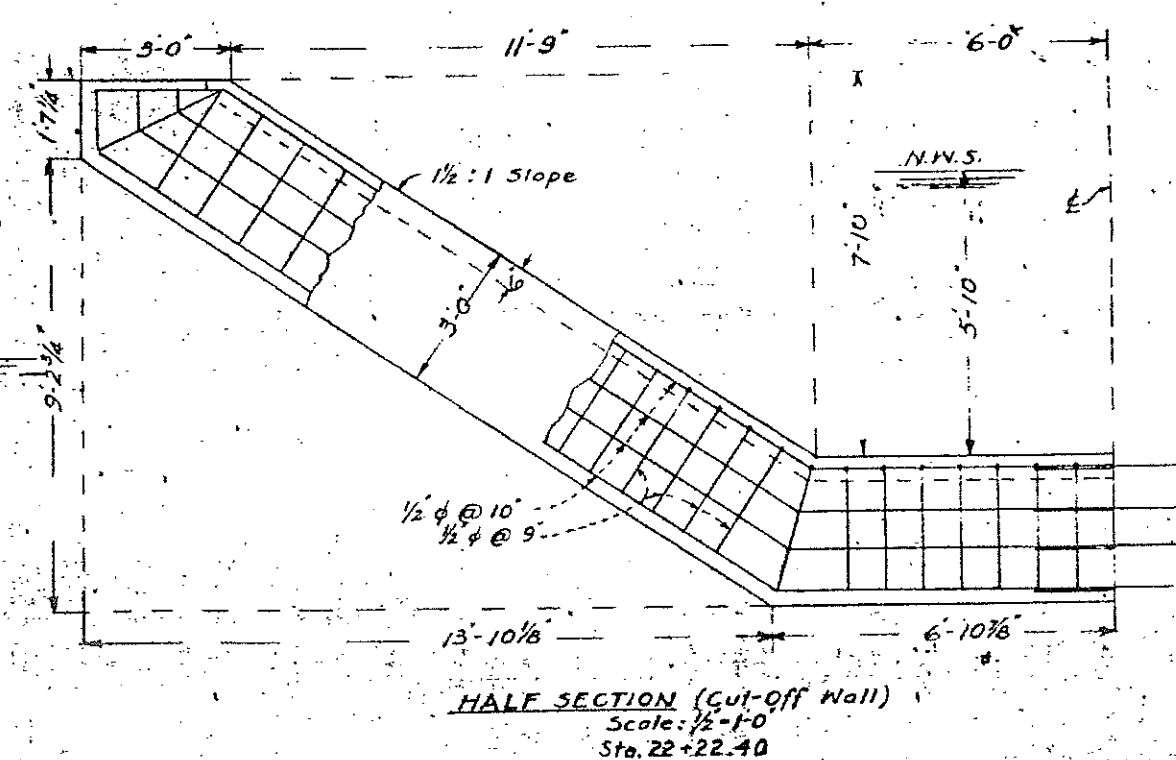
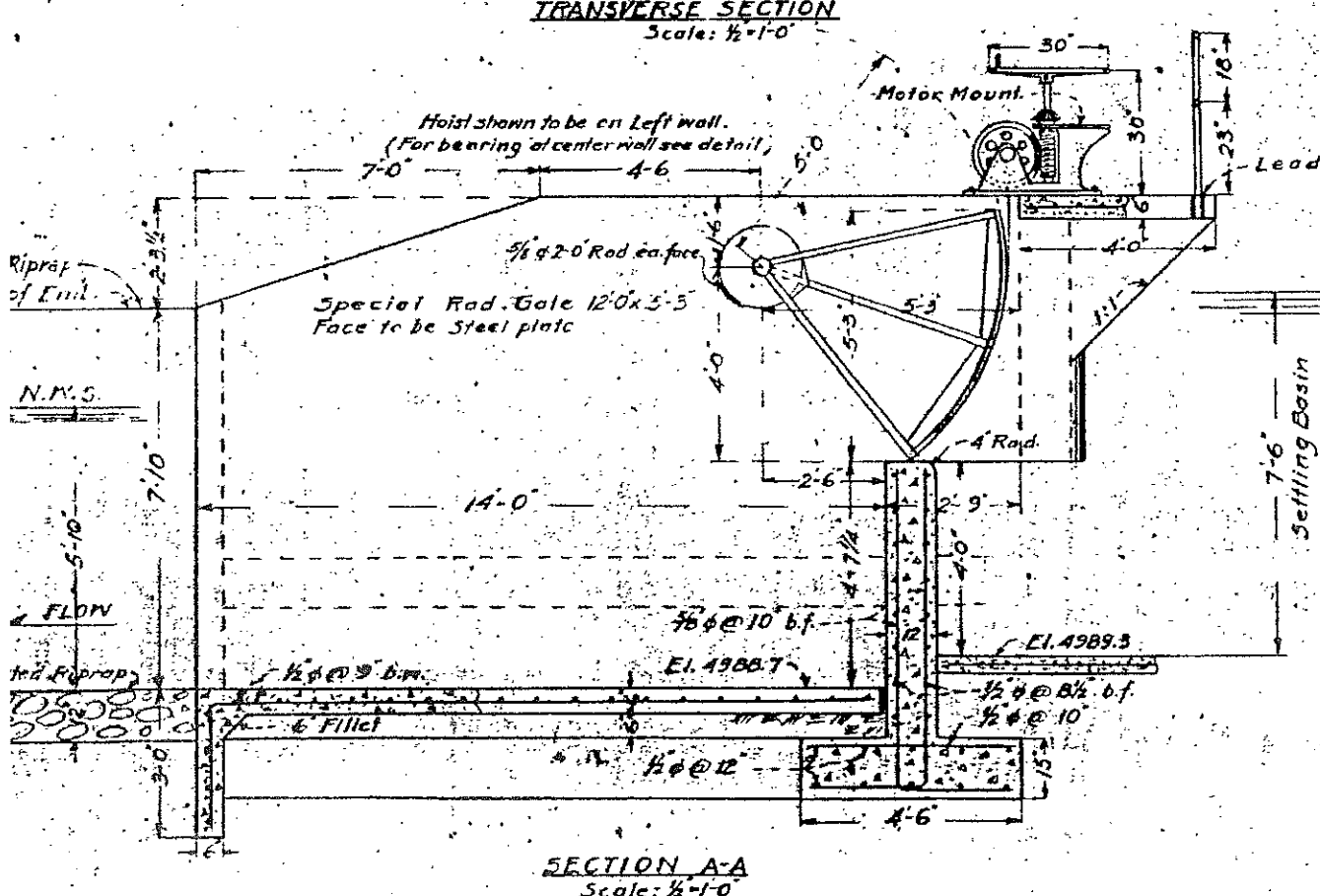
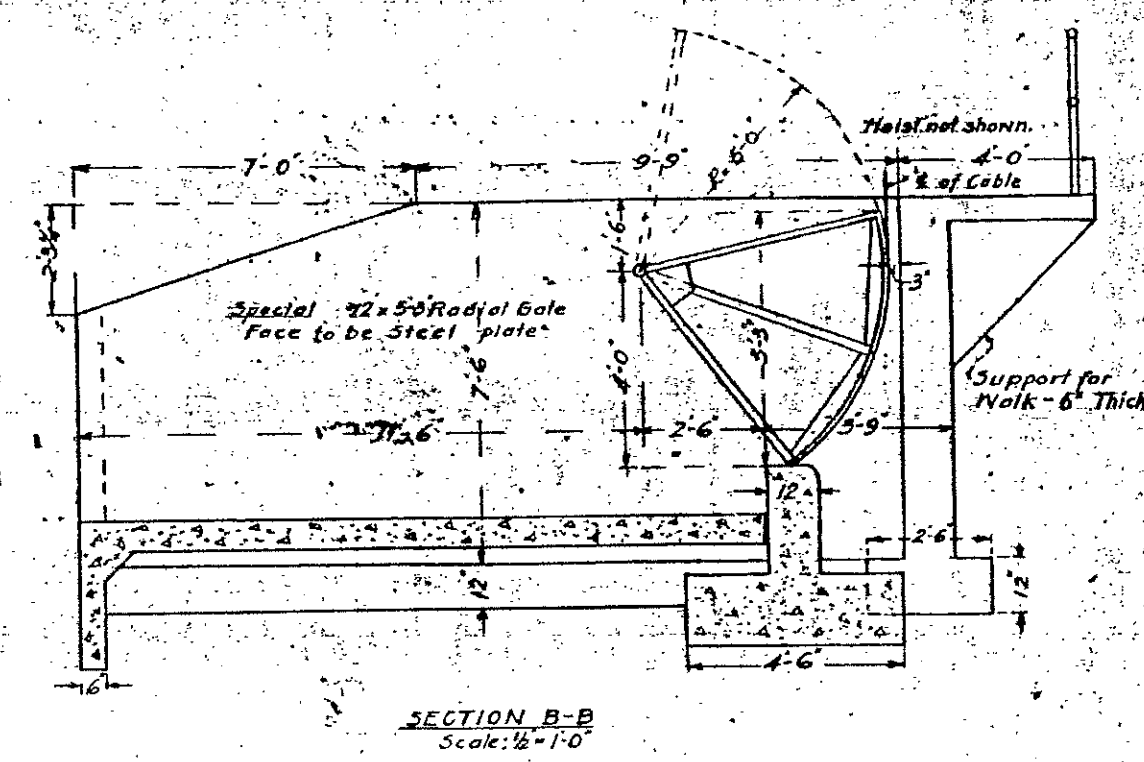
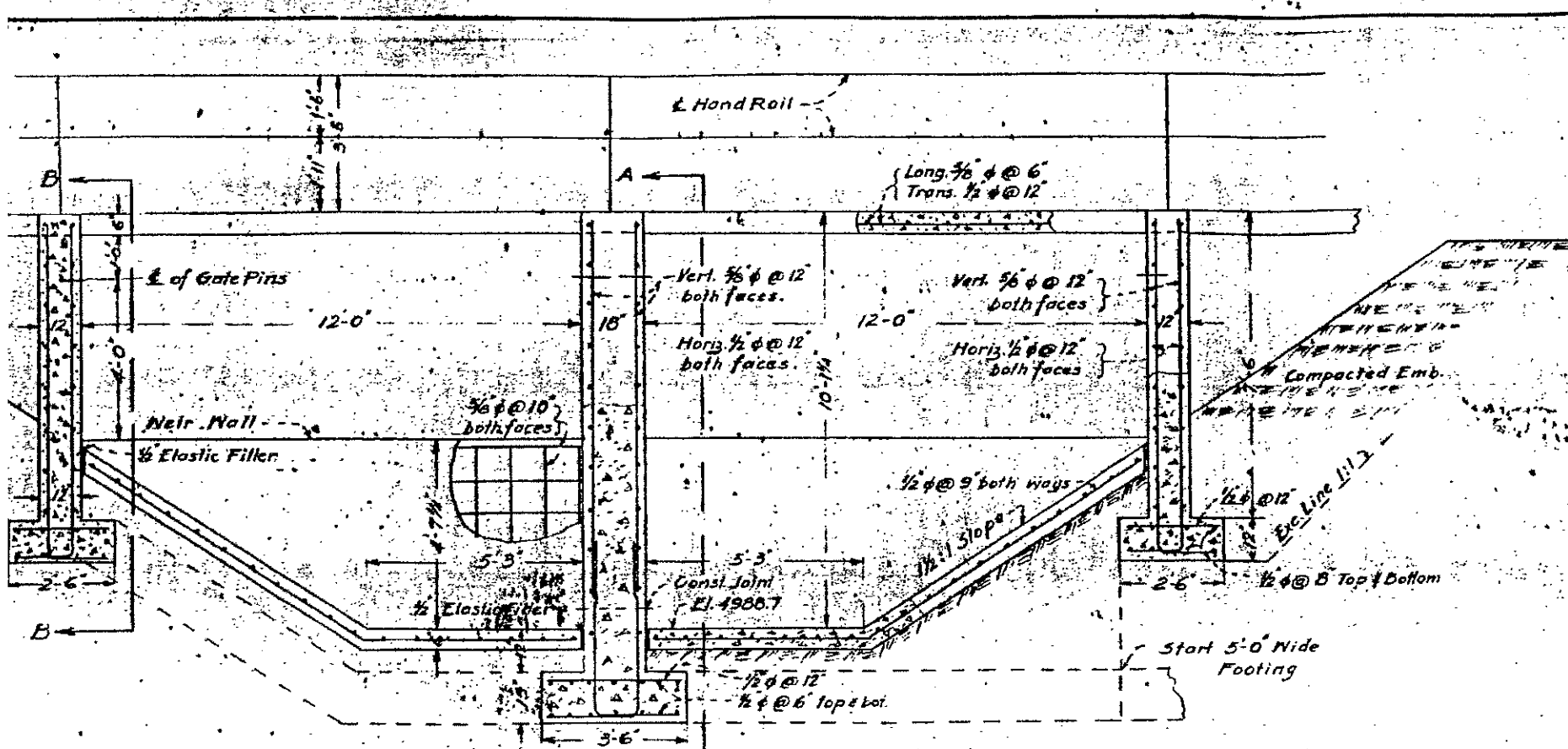
HOGBACK DIVERSION DAM
TRASHRACK STRUCTURE
TRASHRACK
INSTALLATION - GUIDES - DETAILS

DESIGNED V.F. AGUIRRE CHECKED R. CHRISTENSEN
DRAWN V.F. AGUIRRE TECH. APPR. R.L. SUND
APPROVED J. L. RODRIGUEZ
BUREAU MECHANICAL EQUIPMENT GROUP

CADD SYSTEM AutoCAD Rev. 16.0a CADD FILENAME 809D5723.DWG DATE AND TIME PLOTTED APRIL 23, 2008 07:55
DENVER, COLORADO SHEET 1 OF 2 JUNE 9, 2008

809-D-5723

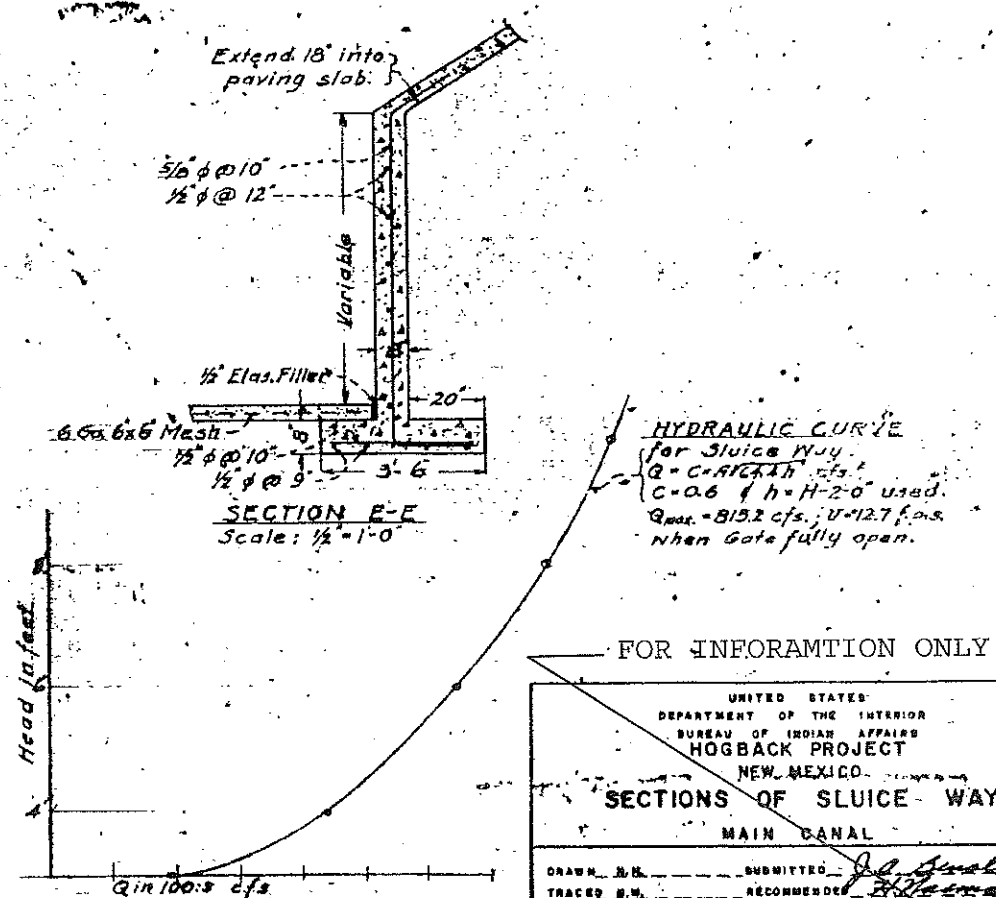
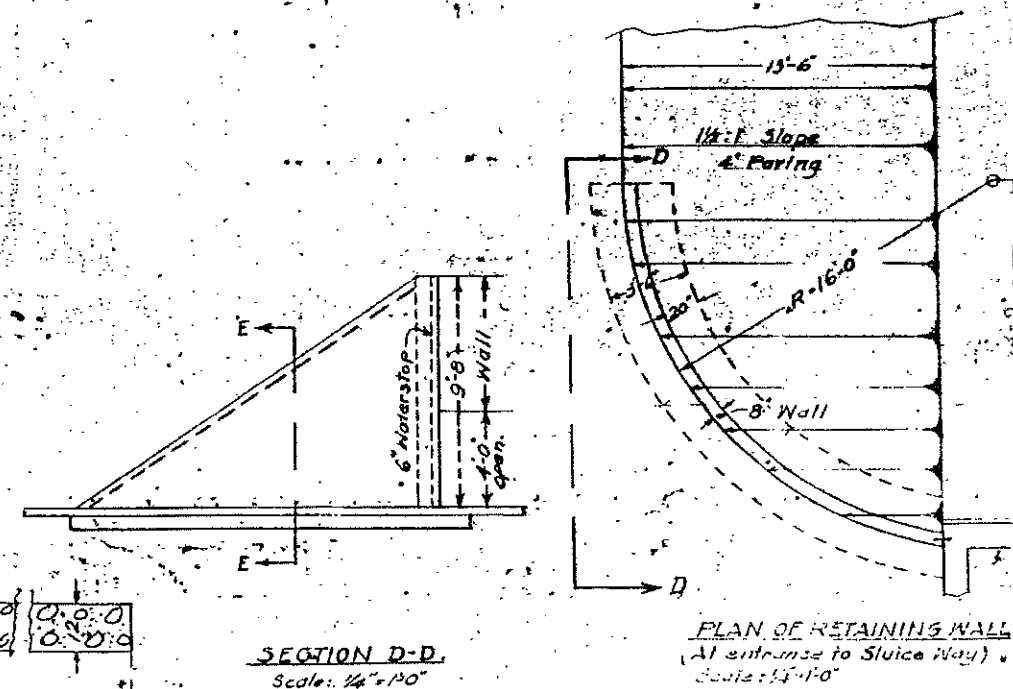
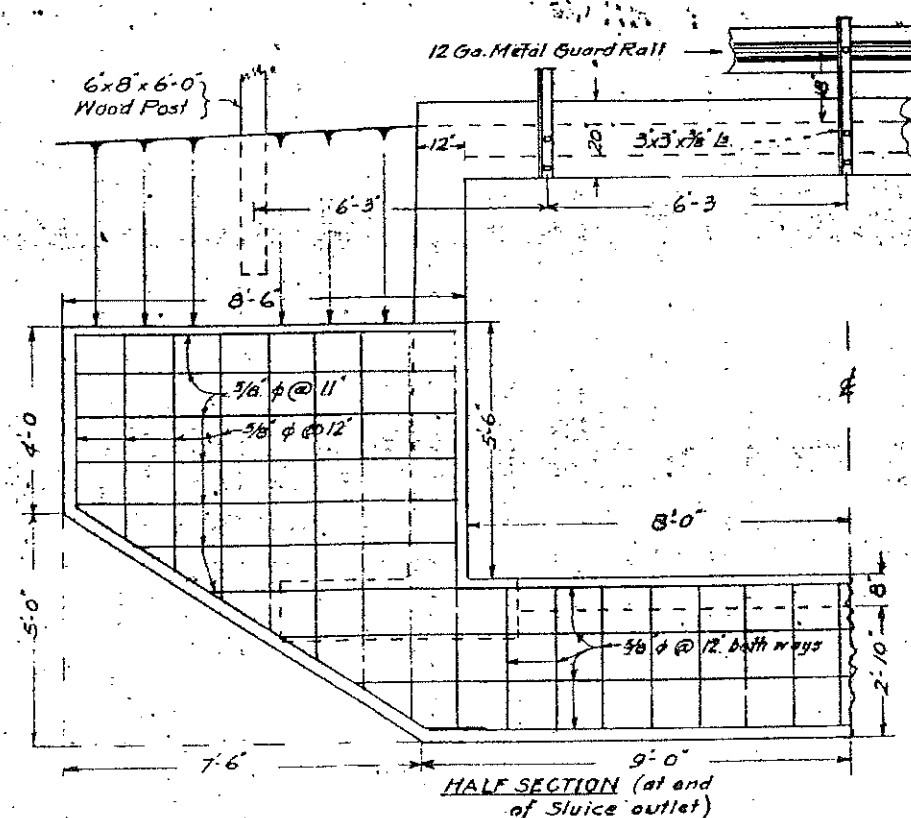
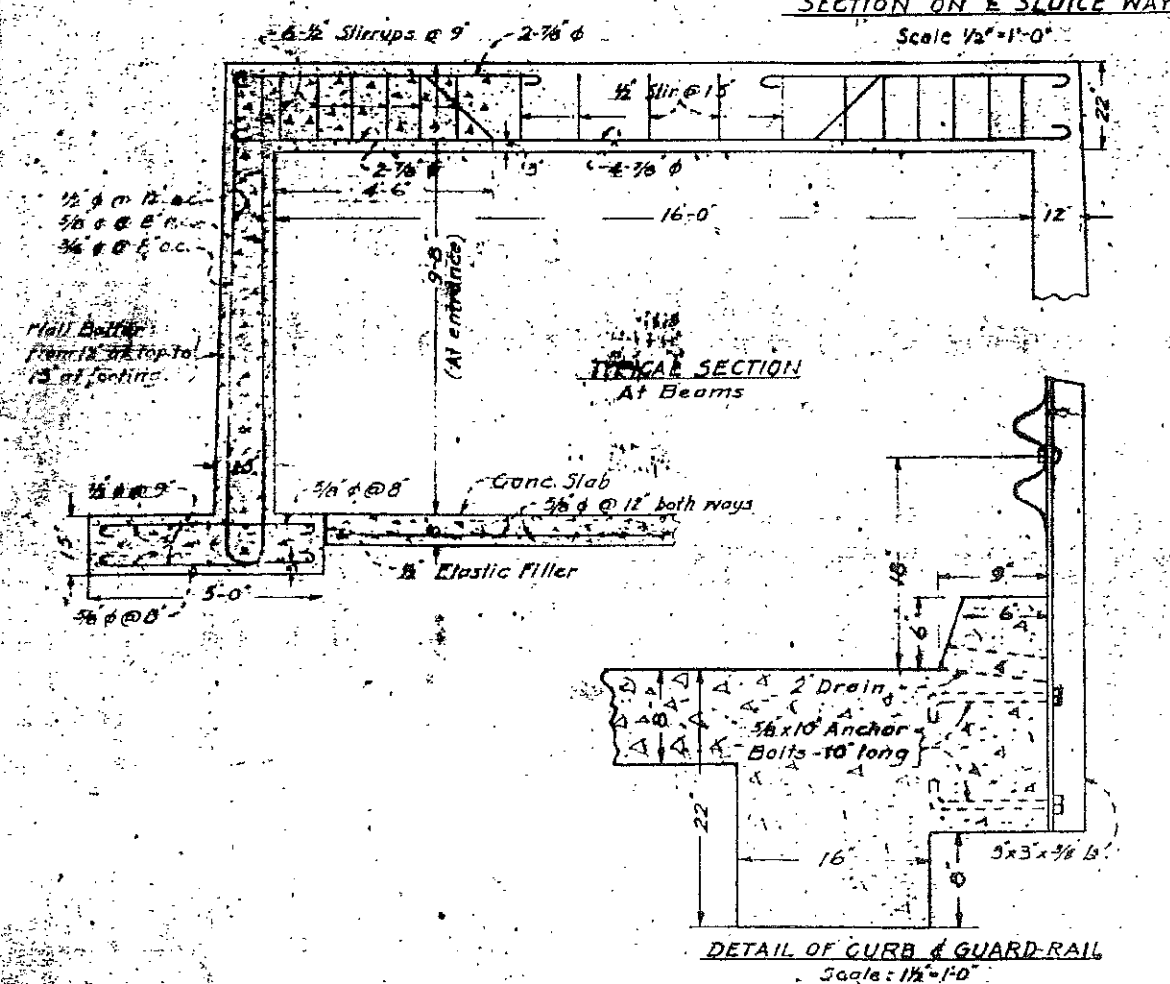
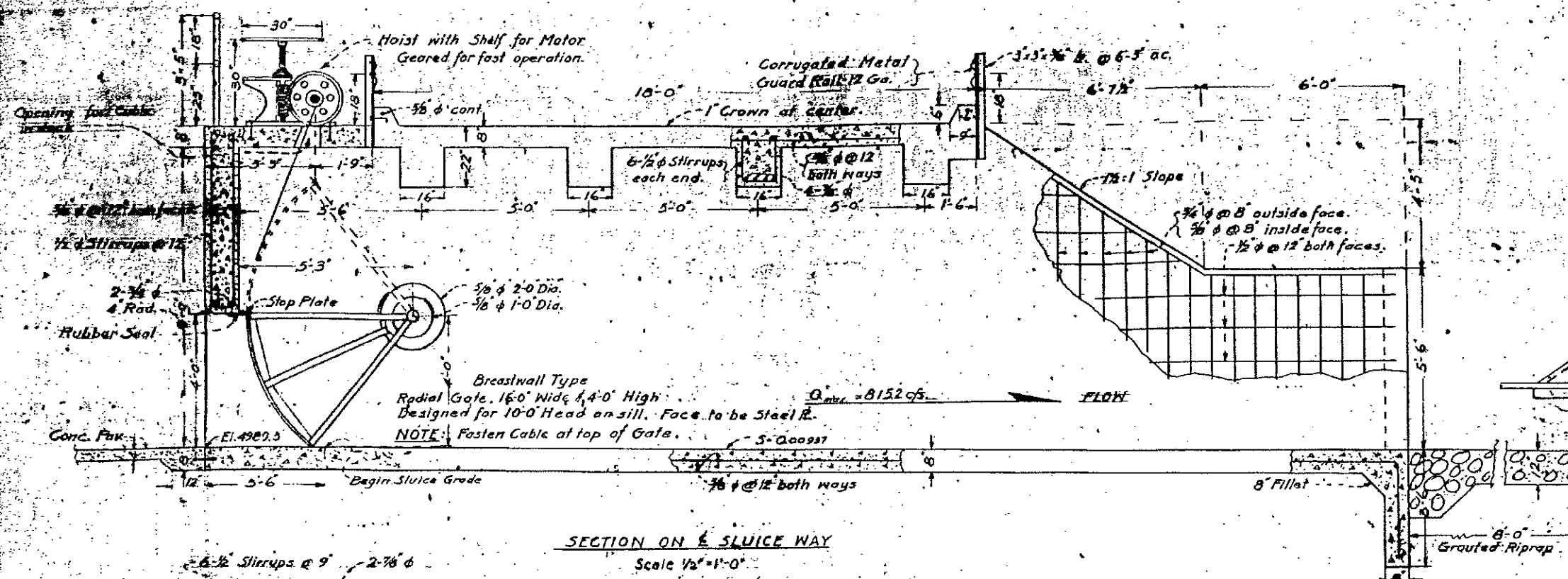


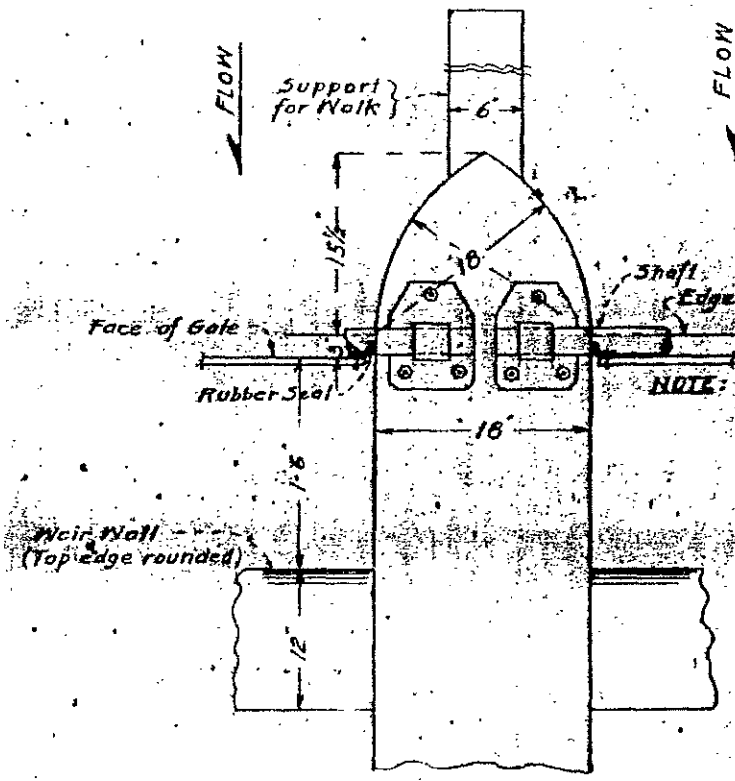


NOTE:
Radial Gates to be 12'-0" wide and 5'-5" high with radius of 5'-0". Face to be steel plate designed for min. 6'-0" head of water.
Slides to be furnished with rubber seal belts against walls and bottom edge with hard rubber seat.
Two Gates required.

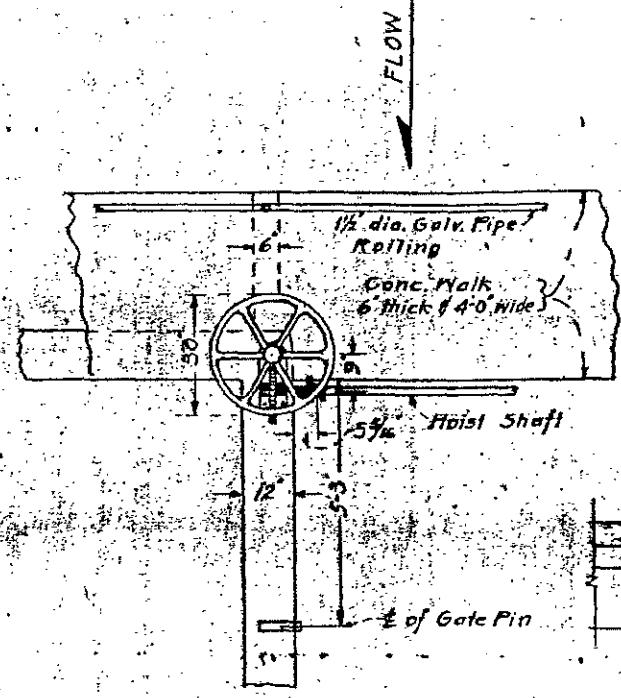
FOR INFORMATION ONLY

UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF INDIAN AFFAIRS ROSBACK PROJECT NEW MEXICO	
WEIR WALL & RAD. GATES MAIN CANAL	
DRAWN BY TRACED BY CHECKED BY	DESIGNED BY RECOMMENDED BY APPROVED BY
WINDO ROCK, ARIZ. AUG. 8, 1933 122-DC-342	

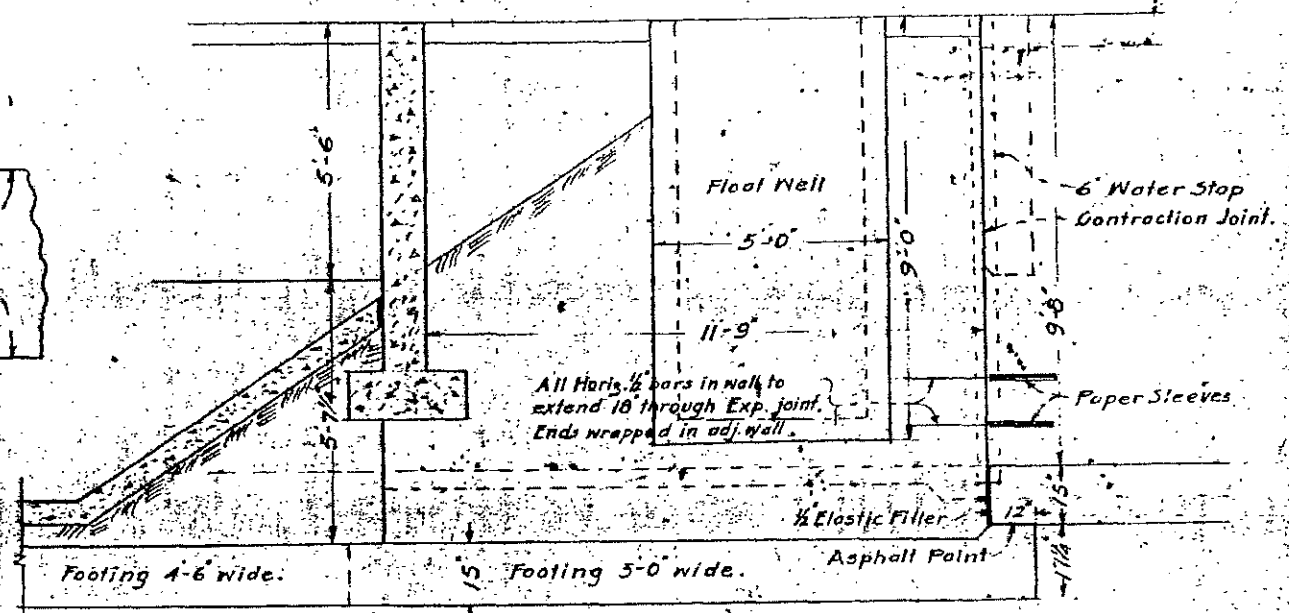




NOTE: Fasten Cable at bottom of Gates. Use R-Iron for face.

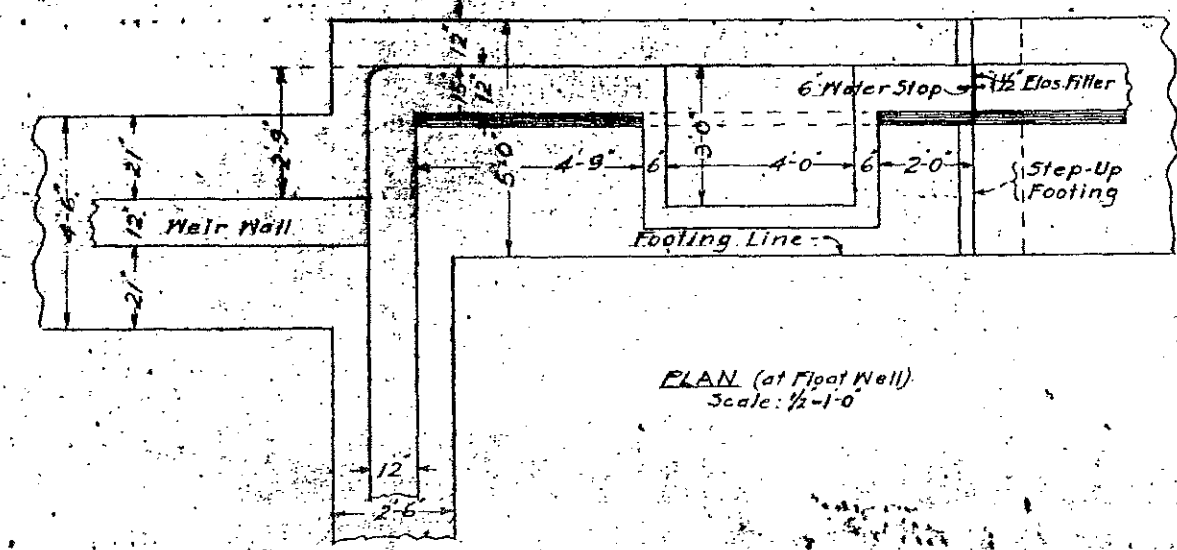


PLAN OF HOIST (At right Wall) Scale: 1/2" = 1'-0"

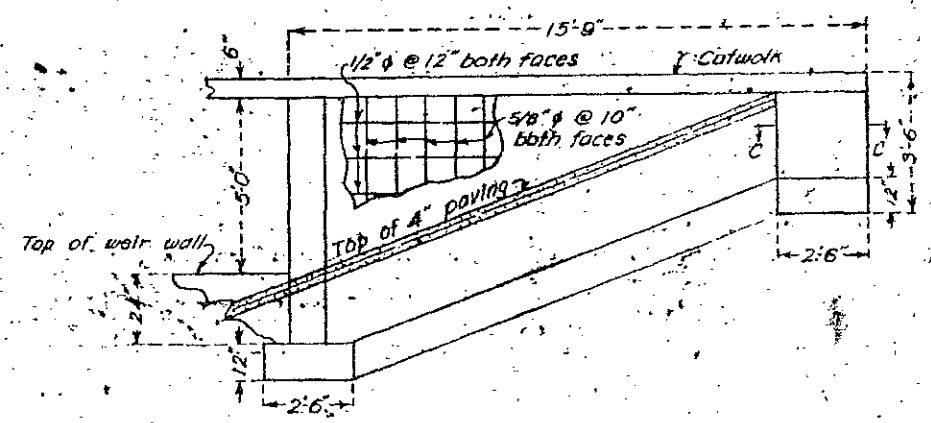


DETAIL (At contraction joint) Scale: 1/2" = 1'-0"

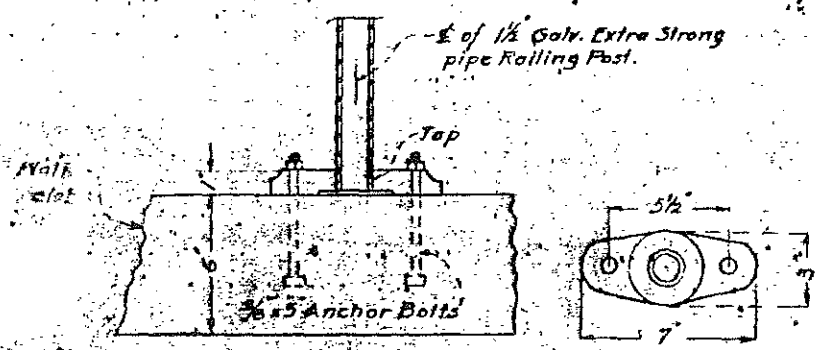
DETAIL CENTER WALL Scale: 1/2" = 1'-0"



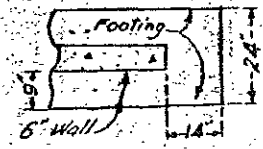
PLAN (at Float Well) Scale: 1/2" = 1'-0"



RIGHT WALL UPSTREAM OF WEIR Scale: 3/8" = 1'-0"



Standard Malleable Iron Connection. One reg. or Scale: 3/4" = 1'-0"



SECTION C-C Scale: 1/2" = 1'-0"

FOR INFORMATION ONLY

UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF INDIAN AFFAIRS HOGBACK PROJECT NEW MEXICO	
DETAILS MAIN CANAL	
DRAWN H. H.	SUBMITTED H. H.
TRACED H. H.	RECOMMENDED H. H.
CHECKED H. H.	APPROVED H. H.
WINDOW ROCK, ARIZ.	122-DC-544
SHEET 4 OF 4	