COMMONLY USED DRAWINGS FOR OPEN IRRIGATION SYSTEMS

REPORT NO. CB-5

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

OFFICE OF CHIEF ENGINEER
CANALS BRANCH

DENVER, COLORADO

MARCH 1968
REVISED AUGUST 1970
PREFACE

Report No. CB-5 is a selection of reusable base drawings and standard drawings commonly used by the Canals Branch, Division of Design, Office of Chief Engineer, Denver, Colorado. These drawings incorporate current design practices as used in the Canals Branch and as outlined in the Reclamation Manual, Volume X, Design Standards No. 3, CANALS AND RELATED STRUCTURES. Basically, it is intended that these drawings be used for open waterways or structures with a capacity of 100 second-feet or less, although in some cases a larger capacity is indicated.

Reusable base drawings included under Part I of this report are intended to be used in planning and to produce specifications or construction drawings for open waterways and related structures. These drawings will be updated from time to time to reflect technical advances and current practices. A finished drawing suitable for specifications use may be obtained by completing the title and, in most cases, recording tabular values for variable factors on a reproducible print. The originals of these reusable base drawings are maintained by the Canals Branch.

Also included in this report under Part II are some of the more commonly used USBR Standard Drawings. The originals of these drawings are maintained by Drawing and Data Files of the Office of Chief Engineer, Denver, Colorado.

The design engineer who uses these drawings must realize that sound engineering principles must be exercised in the selection and utilization of these drawings and that structural limitations not necessarily shown on the drawings may apply. Before these drawings are used on a project they should be reviewed to determine whether they are applicable. If not applicable, new drawings should be developed. The use of drawings in this report in no way relieves the design engineer of his responsibility to prepare functional, economical designs.

The August 1970 revision consists of the addition of a few drawings and minor changes and updating for many of the reusable base drawings. This revision reflects the changes that have been made on the drawings since the March 1968 printing.
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<td>Safety Ladder for Concrete-Lined Canals</td>
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<td>Enamelled Weir Gages</td>
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<td>Adjustable Weir W = 2' and 3'</td>
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<td>Movable Weir - Q = 6.5</td>
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<td>Movable Weir - Q = 15 cfs</td>
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<td>40-D-6022</td>
<td>42&quot; Two-Rail Handrail</td>
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<td>42&quot; Three-Rail Handrail</td>
<td>134</td>
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<td>40-D-6002</td>
<td>16&quot; Steel Ladder</td>
<td>135</td>
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<tr>
<td>40-D-6003</td>
<td>18&quot; Steel Ladder</td>
<td>136</td>
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<td>40-D-6004</td>
<td>18&quot; Steel Ladder</td>
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<td>Pipe Side Rails</td>
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<td>40-D-5931</td>
<td>Pipe Safety Barrier</td>
<td>138</td>
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<td>40-D-5651</td>
<td>Trashrack - Grating Type</td>
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<td>Title of Drawing</td>
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<td>Rubber Waterstops - Types A, B, G, and H</td>
<td>140</td>
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<td>40-D-7004</td>
<td>General Notes and Minimum Requirements for Detailing Reinforcement - Class 40 and Class 50</td>
<td>141</td>
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<td>General Notes and Minimum Requirements for Detailing Reinforcement - Class 60</td>
<td>142</td>
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<tr>
<td>40-D-5241</td>
<td>Precast Concrete Pipe Joint - Unreinforced Band - Type A</td>
<td>143</td>
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<td>40-D-5242</td>
<td>Precast Concrete Pipe Joint - Reinforced Band - Types B and B-1</td>
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<td>40-D-5243</td>
<td>Precast Concrete Pipe Joint - Type C</td>
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<td>40-D-5129</td>
<td>Monolithic Siphon Barrel - Elliptical Hoop Reinforcement - Contraction Joint with Rubber Waterstop</td>
<td>146</td>
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<td>40-D-5130</td>
<td>Monolithic Siphon Barrel - Two-Layer Reinforcement - Contraction Joint with Rubber Waterstop</td>
<td>147</td>
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TABLE OF LOCATIONS AND ELEVATIONS

<table>
<thead>
<tr>
<th>STATION</th>
<th>ELEVATIONS</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

NOTES

For general notes and minimum requirements for detailing reinforcement, see 40-D-0-612.
- Thickness of concrete in any direction between dimensions shown.
- Precast concrete to be continuous in width and floor.
- Precast concrete details as shown on #046442-0003. Concrete to be placed as directed for precast concrete deck.
- Set grout in the top of the deck and a #6 Precast Waterway Concrete.
- Gate frame height required when #2-#6.

REFERENCES

- Typical protection
- Concrete checks - Type 10
- Handrail details
- Gate frame guide details
- Plan of precast concrete deck
- Typical slice gate assembly
- Typical pipe handrail post connection details
- Section A-A
- Section B-B
- Section C-C
- Section D-D
- Reference drawings

CONCRETE CHECKS - TYPE 10

<table>
<thead>
<tr>
<th>STATION</th>
<th>EST/MADE</th>
<th>TIES</th>
</tr>
</thead>
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</table>

REFERENCE DRAWINGS

- Typical protection
- Concrete checks - Type 10
- Handrail details
- Gate frame guide details
- Plan of precast concrete deck
- Typical slice gate assembly
- Typical pipe handrail post connection details
- Section A-A
- Section B-B
- Section C-C
- Section D-D
- Reference drawings
Steel slide gate with flat seat and hand wheel lift. From height 5'. Gate not shown.

*NOTES*
- Check drop type I unless otherwise shown.
- Add vertical or lateral reinforcement as directed on site.
- Use 40-0-6123 reinforcing bars for general design and minimum requirements for detailing.
- Steel pipe handrails are required.
- Gate frame height is measured from center line of gate opening.
Earth transition where required

Section shown in profile

Station shown in profile

Precast concrete deck

Top of bank

Elevation on profile

Pipe handrail post connections, see details

Section E-E

Handrail not shown

Edge bar

Precast concrete deck

Top of deck

Reinforcement not shown

Section C-C

Pipe handrail post connections, see details

Section F-F

Outlet pipe height

Concrete in structure

Reinforcement steel

Miscellaneous metal

NOTES

Check dimensions and tolerances

For general notes and minimum requirements for detailing reinforcement, see 40-0-6122

Gate frame height measured from top of gate opening.
Precast concrete deck, 12 3/4" high:

- Standard pipe handrail, 1 5/8" dia.
- Reinforcement shown on profile
- Anchors shown
- Bar size 5/8"
- Anchor bolts with square mesh
- 1/8" bar, and cut washers, project 1/2"
- Place grouting mortar as shown in joint details
- Layers of asbestos sheet packing, graphite at one side only with graphite surfaces in contact

Door frame guide details:
- Gate frame guide details, see details
- Edge bar
- Gate not shown
- Precoat concrete deck

Section A-A

Section C-C

Section D-D

Section F-F

Plan of precast concrete deck

Earth transition where required.

Gate frame guide, see details

Symmetrical about fulcrum.

Precast concrete deck, see detailed

Concrete in structure:
5.1 cubic yards
Plan of precast concrete deck reinforcement:
580 pounds
Miscellaneous metal:
21 pounds

Notes:
- Chamfer all exposed corners unless otherwise shown.
- For general notes and requirements for detailing reinforcement, see 40-1206123.
- Edge bar: 4 5/8" dia., wedges to angle
- Gate frame height measured from top of gate opening
- Gate frame not shown
- Anchor bolts with square heads, hex. nuts, and cut washers. Project 1/2"
Precast concrete deck ond pipe handroil not shown.

Bottle C

Precast concrete deck and pipe handrail not shown.

SECTION C-C

Edge bar

SECTION F-F

Pipe handrail post

SECTION D-D

Pipe sleeve

SECTION G-G

Concrete in structure _____________________ 7.2 Cu. Yds.

Reinforcement steel ____________________________________________ 890 Lbs.

Machine bolt with nut and washer. Space to Miscellaneous metal ____________________________________________ 144 Lbs.

NOTES

Chamfer all exposed corners unless otherwise shown.

For general notes and minimum requirements for detailing reinforcement, see 4Q-D-6123.

Pipe handrail post connections, see details...

Precast concrete deck and pipe handrail not shown.

Concrete in structure: 4,5 Cu. Yds.

Machine bolt with reinforcement steel: 470 Lbs.

Nut and washer: 160 Lbs.

Pipe handrail post connections, see details. See Section G-G.

Checking drop type 3 with movable weir.

Edge bars: Top of bank.

For general notes and minimum requirements for detailing reinforcement, see Section H-H.

Always think safety.
Precast concrete deck and pipe handrail not shown.

SECTION G-G

Concrete in structure...

PROJECT IF

SECTION C-C

Concrete connection details...

SECTION D-D

Concrete in structure...

ELEVATION B-B

Concrete in structure...

SECTION F-F

Concrete in structure...

NOTE:

Check drop type 4 with movable weir.

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CHECK Drop TYPE 4 WITH MOVABLE WEIR

NOTES:

For general notes and minimum requirements for detailing reinforcement, see 40-0-6123.
Precast concrete deck and
Station shown:
Provide movable weir
See 40-0-3734
Chamfer all exposed corners
unless otherwise shown.
For general notes and minimum requirements for detailing reinforcement,
see 40-0-6123.
Pipe handrail post connections, see details, see 40-D-6022.
Place grating sewer or directed as shown on top of rebar
Sheet to provide fine bearing surfaces for precast concrete deck.
1.5 mm of rebar sheet spacing, graphite on one side only
with graphite surfaces in contact.

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CHECK DROP TYPE S WITH MOVABLE WEIR

CHECKING UNION:
DENVER, CO. 80203

DATE:
ENGINEER:
PROJECT:
OWNER:

UNITED STATES
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CHECK DROP TYPE S WITH MOVABLE WEIR

CHECKING UNION:
DENVER, CO. 80203

DATE:
ENGINEER:
PROJECT:
OWNER:

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BUREAU OF RECLAMATION

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CHECKING UNION:
DENVER, CO. 80203

DATE:
ENGINEER:
PROJECT:
OWNER:

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CHECK DROP TYPE S WITH MOVABLE WEIR

CHECKING UNION:
DENVER, CO. 80203

DATE:
ENGINEER:
PROJECT:
OWNER:
**ESTIMATED QUANTITIES**

Concrete: 79 cu yd
Reinforcement steel: 733 lbs
Wire mesh: 190 lbs
Movable weir: 0.175 ft

**NOTES**

- Chamber end cover shown unless otherwise shown.
- General notes and minimum requirements for site-specific reinforcement, see drawings.
- For general notes, see A/A details, E/E details, B/B, C/C, F/F, notes, and table for final locations, see A/A.

**CHECK DROPOUT TYPE WITH MOBILE WEIR**

- Chamber end cover shown unless otherwise shown.
- General notes and minimum requirements for site-specific reinforcement, see drawings.
- For general notes, see A/A details, E/E details, B/B, C/C, F/F, notes, and table for final locations, see A/A.

**SECT/ON D-D PIPE**

- Elevation shown.
- Pipe handrail post connections: see details.

**SECT/ON F-F**

- Elevation shown.
- Pipe handrail post connections: see details.

**SECT/ON C-C**

- Elevation shown.
- Pipe handrail post connections: see details.

**PLAN OF PRECAST CONCRETE DECK**

- Weir pool shown on profile.
- El. shown on profile.
- Pipe handrail post connections: see details.

**SECTION A-A**

- Elevation shown.
- Pipe handrail post connections: see details.

**SECTION D-D**

- Elevation shown.
- Pipe handrail post connections: see details.

**SECTION B-B**

- Elevation shown.
- Pipe handrail post connections: see details.

**SECTION C-C**

- Elevation shown.
- Pipe handrail post connections: see details.

**SECTION E-E**

- Elevation shown.
- Pipe handrail post connections: see details.

**SECTION F-F**

- Elevation shown.
- Pipe handrail post connections: see details.

**SECTION G-G**

- Elevation shown.
- Pipe handrail post connections: see details.

**SECTION H-H**

- Elevation shown.
- Pipe handrail post connections: see details.

**SECTION E-E**

- Elevation shown.
- Pipe handrail post connections: see details.

**SECTION F-F**

- Elevation shown.
- Pipe handrail post connections: see details.

**SECTION C-C**

- Elevation shown.
- Pipe handrail post connections: see details.

**SECTION A-A**

- Elevation shown.
- Pipe handrail post connections: see details.

**SECTION D-D**

- Elevation shown.
- Pipe handrail post connections: see details.

**SECTION B-B**

- Elevation shown.
- Pipe handrail post connections: see details.

**SECTION C-C**

- Elevation shown.
- Pipe handrail post connections: see details.

**SECTION E-E**

- Elevation shown.
- Pipe handrail post connections: see details.

**SECTION F-F**

- Elevation shown.
- Pipe handrail post connections: see details.

**SECTION G-G**

- Elevation shown.
- Pipe handrail post connections: see details.
### Single Layer Reinforcement in Pool Floor

<table>
<thead>
<tr>
<th>Layer</th>
<th>Lin. ft.</th>
<th>REIN.</th>
<th>REIN.</th>
<th>POOL</th>
<th>QUANTITIES</th>
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<tr>
<td>1</td>
<td>10.0</td>
<td>5/16&quot;</td>
<td>5/8&quot;</td>
<td>7/8&quot;</td>
<td>4&quot;</td>
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<tr>
<td>2</td>
<td>5.0</td>
<td>5/16&quot;</td>
<td>5/8&quot;</td>
<td>7/8&quot;</td>
<td>4&quot;</td>
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<tr>
<td>3</td>
<td>10.0</td>
<td>5/16&quot;</td>
<td>5/8&quot;</td>
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<tr>
<td>4</td>
<td>5.0</td>
<td>5/16&quot;</td>
<td>5/8&quot;</td>
<td>7/8&quot;</td>
<td>4&quot;</td>
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### Double Layer Reinforcement in Pool Floor

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<th>Layer</th>
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<th>REIN.</th>
<th>POOL</th>
<th>QUANTITIES</th>
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<tbody>
<tr>
<td>1</td>
<td>10.0</td>
<td>5/16&quot;</td>
<td>5/8&quot;</td>
<td>7/8&quot;</td>
<td>4&quot;</td>
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<tr>
<td>2</td>
<td>5.0</td>
<td>5/16&quot;</td>
<td>5/8&quot;</td>
<td>7/8&quot;</td>
<td>4&quot;</td>
</tr>
<tr>
<td>3</td>
<td>10.0</td>
<td>5/16&quot;</td>
<td>5/8&quot;</td>
<td>7/8&quot;</td>
<td>4&quot;</td>
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<tr>
<td>4</td>
<td>5.0</td>
<td>5/16&quot;</td>
<td>5/8&quot;</td>
<td>7/8&quot;</td>
<td>4&quot;</td>
</tr>
</tbody>
</table>

### Design Criteria

- **Structure No. 1**: Designed per ALTA-P15-95 and ASCE 7-95.
- **Structure No. 2**: Designed per ALTA-P15-95 and ASCE 7-95.

The minimum reinforcement in the vertical direction must be 1/4" of the shear. The minimum reinforcement in the horizontal direction must be 1/2" of the shear.

The maximum beam size should be equal to the beam size of the structure.

The maximum beam size should be equal to the beam size of the structure.

The difference between the design and the existing shall be determined from the analysis.

The maximum deflection energy gradient for full design capacity is determined by dividing the applied A' value by the deflection energy gradient from the analysis.

**L**: The horizontal distance from the normal to the plan.

**K**: The distance from the floor to the horizontal distance.

**T**: The thickness of the material at the floor.

**Z**: The height of the horizontal distance from the top of the material to the floor.

- The radius of the curve is determined by the analysis.

The bottom grade of the existing pool is fixed by selecting a thickness. T≥800 mm from the horizontal distance.

The minimum thickness of the existing pool is 500 mm. The minimum thickness of the existing pool is 500 mm. The minimum thickness of the existing pool is 500 mm.

- The thickness of the material at the floor is determined by the analysis.

**L**: The horizontal distance from the normal to the plan.

**K**: The distance from the floor to the horizontal distance.

**T**: The thickness of the material at the floor.

**Z**: The height of the horizontal distance from the top of the material to the floor.

- The radius of the curve is determined by the analysis.

Special consideration should be given to the selection of side girths of steel pour where reinforcement is placed because the side girths included may not operate satisfactorily with other TAPs.

**Standard Designs**

- A1: Drop Type 1...
- A1: Drop Type 2...

**Designs**

- **STANDARD DESIGNS**
  - **REINFORCED CONCRETE**
  - **WATERWAY SYSTEMS**
  - **RECTANGULAR INCLINED DROPS**
  - **CANALS AND LATERALS**

**Check Inlet**

- **Type Only**

**Dimensions**

- **Check Inlet**

**Type Only**

- **Type Only**
Station 1:-1. --'

Structure symmetrical about E.

Plan:
- Course gravel
- Riprap on 6" sand and gravel bedding
- Compacted backfill

Sections:
- A-A
- B-B
- C-C
- D-D
- E-E
- F-F
- G-G

Notes:
- Extend cutoff horizontally or vertically with unreinforced concrete as directed.
- For general notes and minimum requirements for detailing reinforcement, see 40-0-6123.

Baffle Apron Drop Data

<table>
<thead>
<tr>
<th>Station</th>
<th>E</th>
<th>B</th>
<th>A</th>
<th>D</th>
<th>C</th>
<th>E</th>
<th>T</th>
<th>O</th>
<th>X</th>
<th>L</th>
<th>A</th>
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</tbody>
</table>

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ALWAYS THINK SAFETY
ENLINED OR EARTH LINED

PLAN

LONGITUDINAL SECTION

TRANSITION OUTLET

SECTION C-C

P pipe drop shall have earth outlet unless otherwise specified.

If lining similar to the lining in the adjoining portions shall be placed at the inlet or outlet of the pipe drop, as shown.

NOTES: For general rules and minimum requirements for detailing, see 40-0-6123.

REFERENCES

REFERENCE DRAWINGS

NOTES: For general rules and minimum requirements for detailing, see 40-0-6123.
NOTE:
May be constructed with a headwall in lieu of 6' headwall and collar shown.

#4 hoops

SECTION C-C

SECTION A-A

NOTE:
May be constructed with a headwall in lieu of 6' headwall and collar shown.

#4 hoops

SECTION D-D

SECTION F-F

NOTE:
May be constructed with a headwall in lieu of 6' headwall and collar shown.

#4 hoops

SECTION G-G

SECTION H-H

NOTE:
May be constructed with a headwall in lieu of 6' headwall and collar shown.

#4 hoops

SECTION J-J

SECTION B-B

SECTION E-E

ELEVATION E-E

ELEVATION K-K

SECTION S-S

NOTE:
May be constructed with a headwall in lieu of 6' headwall and collar shown.

#4 hoops

ESTIMATED QUANTITIES

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<tr>
<th>Item</th>
<th>Type 1</th>
<th>Type 2</th>
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<tbody>
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<td>Concrete, Cu.Yds.</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Reinforcement Steel Ibs.</td>
<td>210</td>
<td>420</td>
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</table>

NOTES
Quarter of exposed corners if not otherwise shown.
For general notes and minimum requirements for detailing reinforcement, see 40-0-6123.

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BAFFLED OUTLET TYPES 3 AND 4

Drawn: ____________________________
Submitted: ____________________________
Traced: ____________________________
Recommended: ____________________________
Approved: ____________________________
TABLE OF LOCATIONS, TYPES, DIMENSIONS & ELEVATIONS

<table>
<thead>
<tr>
<th>TOTAL</th>
<th>STATION</th>
<th>Lateral / Pipe Unit</th>
<th>Size No.</th>
<th>M</th>
<th>Type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>ELEV</th>
<th>Length</th>
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</table>

Section A-A

Protection for lateral freefall only.

SECTION C-C

TYPICAL DIRECTIONS

PIPE TURNOUTS-TYPES 2, 3, AND 4
TABLE OF LOCATIONS, TYPES, DIMENSIONS & ELEVATIONS

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>TYPE</th>
<th>DIMENSIONS</th>
<th>ELEVATIONS</th>
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</thead>
<tbody>
<tr>
<td>Lateral Station</td>
<td>No.</td>
<td>DIR.</td>
<td>M</td>
</tr>
<tr>
<td>Pipe Turnout</td>
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<td></td>
</tr>
<tr>
<td>Left, Right, or Vertical</td>
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<td></td>
</tr>
</tbody>
</table>

NOTES

1. Connect to road crossing at station L and elevation J.
2. Connect to pipe line.
3. Connect to weir box.
4. Connect to pipe drop.

REFERENCE DRAWINGS

PRECAST PIPE EMBEDMENT

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PIPE TURNOUTS TYPES 7 AND 8

AIR VENT DETAIL

SECTION C-C

SECTION D-D
Provide 2 steel slide gates with flat back seat and square bottom side. Lifts and anchorage bolts as required, gates not shown.

**PLAN**

Provide p. c. i. side gates with flat back seat and square bottom side. Lifts and anchorage bolts as required, gates not shown. See Detail A.

**NOTES**

For general notes and minimum requirements for stitching reinforcement, see 4 G. 2 (2-06).

State of structure to be shown on end view or earthwork. Where pressure is not a standard, use the most recent I. B. R. and pressure pipe for design. Discharges assumed to be as indicated in Table 1. U.S. B.R. 20th Amendment, 1979. Discharges should be verified by calculation.

Gates from height measured above 6 ft. of gate opening.

**REFERENCE DRAWINGS**

Typical protecting lines and return should be shown.

**DRAWING SHEET 42**

**DATE**

6-1-96

**SCALE**

1/2" = 1'-0" (8000)

**DESIGNER**

K. W. D.

**REVIEWED**

J. W. D.

**CONSTRUCTION MANAGER**

R. M. W.

**C. H. O. - TYPE 14**

**DEPARTMENT OF THE INTERIOR**

U.S. G. C. O.

**TUNE OUT C. H. O. - TYPE 14**

**LICENSED PROFESSIONAL ENGINEER**

J. A. W.

**NOTES**

For general notes and minimum requirements for stitching reinforcement, see 4 G. 2 (2-06).

State of structure to be shown on end view or earthwork. Where pressure is not a standard, use the most recent I. B. R. and pressure pipe for design. Discharges assumed to be as indicated in Table 1. U.S. B.R. 20th Amendment, 1979. Discharges should be verified by calculation.

Gates from height measured above 6 ft. of gate opening.
TABLE OF LOCATIONS AND ELEVATIONS

STATION
N.
W.
S.
B.
WEIR
CREST
K.
---
---
---
---

REFERENCE DRAWINGS

WEIR DETAILS

SECTION A-A

SECTION C-C

SECTIOB B-B

ANCHOR BOLT AND WEIR BLADE DATA

NOTES

Weir crest

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TABLE OF LOCATIONS AND ELEVATIONS

<table>
<thead>
<tr>
<th>STR. NO.</th>
<th>LATERAL</th>
<th>TURNOUT STATION</th>
<th>WEIR STATION</th>
<th>ELEVATIONS</th>
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<tbody>
<tr>
<td></td>
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</table>

NOTES
For general safety and minimum requirements for detailing reinforcement see 40-D-6. The weir may be designed to obtain a maximum drop in water surface of 1' in so that surface of water above weir will not be higher than the weir crest.

SECTION A-A

PLAN

SECTION B-B

SECTION C-C

CONCRETE FARM WEIRS
## Waterway (Lateral slope)

- Structure symmetrical about E
- Plan turnover as shown in detail sections
- Station of weir box
- Figure is center of side

### Longitudinal Section

- Drainage slough where required, X-dotted.
- Point of delivery

### Waterway Details

- Structure symmetrical about E

### Installation Data

<table>
<thead>
<tr>
<th>Waterway</th>
<th>Station</th>
<th>DELIVERY TO</th>
<th>PIPE DIA.</th>
<th>LENGTH OF PIPE</th>
<th>DIMENSIONS'h'</th>
<th>INSTALLATION DATA</th>
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</thead>
<tbody>
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</table>

### Exploded View of Stilling Well

#### WEIR BLADE DETAILS

- Reinforcement steel
- Miscellaneous metalwork

#### DISCHARGE TABLE

<table>
<thead>
<tr>
<th>WATERWAY</th>
<th>STATION</th>
<th>DELIVERY TO</th>
<th>PIPE DIA.</th>
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### Estimated Quantities

- WEIR BLADE
- Weir box (includes all materials required for installation)
- Concrete
- Precast pipe embedment
- Protection

### Reference Drawings

- Section C-C
- Section B-B
- Section A-A

### Notes

- Always think safety
- For general notes and minimum requirements for detailing, reinforcement, see 40-0-6123.
- Anchor bolts to have square heads and hex nuts.
- Bolted or welded fabrication of the stilling well may be used. If welded, use Minimum 3/4" bollard
  bolts; if bolted, use continuous 3" flanger washers.
### Table of Locations and Elevations

<table>
<thead>
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<th>Type</th>
<th>Lateral Station</th>
<th>Top of Side</th>
<th>Top of Bed</th>
<th>D</th>
<th>Elevation (m)</th>
<th>O</th>
<th>Elev. (m)</th>
<th>D</th>
<th>Elev. (m)</th>
<th>O</th>
<th>Elev. (m)</th>
<th>Remarks</th>
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**Sections**

- **SECTION A-A**
  - Lateral section where required
  - Lateral section where required
  - Lateral section where required
  - Lateral section where required
  - Lateral section where required
  - Lateral section where required
  - Lateral section where required

- **SECTION B-B**
  - Lateral section where required
  - Lateral section where required
  - Lateral section where required
  - Lateral section where required
  - Lateral section where required
  - Lateral section where required
  - Lateral section where required

### Estimated Quantities

- Concrete: 4.2 Cu. Yds.
- Reinforcement steel: 360 Lbs.

### Notes

For general notes and minimum requirements for detailing, refer to Section 40-0-6123. See general notes and supplementary requirements for prestressed concrete cut-off as directed. For precast concrete culvert pipe, Class II with Type B joints, where otherwise shown.

**Columns**

- **For Adjustable Weir**
  - E and A ADJ. WEIR
  - Details of Opening for Adjustable Weir

**Reference Drawings**

- Available as per 40-0-6123
- Typical Protection
- Precast Pipe Connections

### Division Box Types 5 and 6

- DEPARTMENT OF THE INTERIOR
- BUREAU OF RECLAMATION
- UNITED STATES

- SUBMITTED
- APPROVED
- APPROVED
- DRAWN

- Checks:
  - Drafted
  - Checked
  - Approved
TABLE OF LOCATIONS AND ELEVATIONS

<table>
<thead>
<tr>
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<th>LAT. OR Q NORMAL</th>
<th>CD</th>
<th>JF.</th>
<th>W.S.</th>
<th>LATERAL SLOPE</th>
<th>PANEL ANGLE</th>
<th>LIST</th>
<th>REMARKS</th>
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</table>

(1) Connect to road crossing
(2) Connect to pipe line
(3) Connect to pipe drop

ESTIMATED QUANTITIES

Concrete........................................ 5.3 cu.yds.
Reinforcement steel............................. 450 lbs.

NOTES

For general notes and minimum requirements for detailing reinforcement, see 40·0'6123.
Extend cutoff and wingwalls vertically and horizontally with unreinforced concrete as directed.

Max. Q for 2' adjustable weir is 4 sec. ft.
Max. Q for 3' adjustable weir is 6 sec ft.

REFERENCE DRAWINGS

ADJUSTABLE WEIR Wo2'0" AND 3'0·...
PRECAST PIPE EMBEDMENT

SECTION A-A

TYPICAL PROTECTION

SECTION B-B

DETAIL OF PRECAST CONCRETE PLANK

DETAILED OPENING FOR ADJUSTABLE WEIR
TABLE OF LOCATIONS AND ELEVATIONS

<table>
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NOTES
- For general notes and minimum requirements for detailing reinforcement, see 40-0-6.3.
- Existing curve andieg walls laterally and horizontally with additional concrete as directed.
- Max. 6 for 2 adjustable weir is 4 sec. feet.
- Max. 6 for 3 adjustable weir is 6 sec. feet.

REFERENCE DRAWINGS
- DIVISION BOX TYPE 10

DETAIL OF PRECAST CONCRETE PLANK
Section I

Alternative construction to CMP or waste bank gap outlets.

1. Min.
2. Max.

Original ground surface

Waste fill

Waste at CMP outlet

SECTION 2

Alternative construction to CMP outlets.

Operating berm

Waste fill

Windrows

SECTION 3

Alternative construction to CMP outlets.

Operating berm

Waste fill

Waste bank

Bottom grade

TYPICAL PROFILE

NOTE

For typical canal sections see...

ELEVATION A-A

PROFILE

CONCRETE DROP TYPE DRAIN INLET

PLAN

CONCRETE INLET DETAIL

PLAN

CONCRETE INLET DETAIL
For general notes and minimum requirements for detailing reinforcement, see 40-D-6 123.

Backfill above top of pipe as directed. 2.0 Min. For dimensions b, d, H, W, and W0, see Plan and Profile drawings.

**Elevations**

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<thead>
<tr>
<th>STA</th>
<th>QA</th>
<th>BQ</th>
<th>A</th>
<th>D</th>
<th>C</th>
<th>E</th>
<th>F</th>
<th>G</th>
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**Pipe Data**

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<tr>
<th>SLOPE</th>
<th>LENGTHS</th>
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<th>ESTIMATED QUANTITIES</th>
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</table>

**Pipe Data**

<table>
<thead>
<tr>
<th>DIAMETER</th>
<th>LENGTH</th>
<th>TRANSITIONS</th>
<th>ESTIMATED QUANTITIES</th>
</tr>
</thead>
</table>

**Notes**

For general notes and section requirements for detailing reinforcement, see 40-D-6 123.

Backfill above top of pipe as directed. 2.0 Min. For dimensions b, d, H, W, and W0, see Plan and Profile drawings.

(5 = Inside pipe diameter)

---

**Sections**

- **Section D-D**
- **Section E-E**
- **Section F-F**
- **Section G-G**

---

**Profile**

Typical cross-section surface, Sleeve type coupling.

**Longitudinal Section**

Sleeve type coupling.

**Notes**

For general notes and requirements for detailing reinforcement, see 40-D-6 123.

Backfill above top of pipe as directed. 2.0 Min. For dimensions b, d, H, W, and W0, see Plan and Profile drawings.

(5 = Inside pipe diameter)

---

**Steel Pipe Irrigation Crossings**

- **Sections**
- **Details**
- **Profiles**

---

**Safety**

Always follow safety procedures.

---

**Dimensions**

- Heights, lengths, and diameters as shown.

---

**Acknowledgments**

- Designated by: [Designation]
- Approved by: [Approval]

---

**Drawings**

- D 99 12-1126
- D 99 12-1127
- D 99 12-1128
- D 99 12-1129
- D 99 12-1130

---

**Stencils**

- D 99 12-1131
- D 99 12-1132
- D 99 12-1133
- D 99 12-1134
- D 99 12-1135

---

**Signatures**

- [Signature]
- [Signature]
- [Signature]

---

**Revision History**

- [Revision Information]
Construct inlet channel as directed.

Concrete Transition Type 2 shown.

Precast concrete pressure pipe to Canal or lateral on curves.

Construct outlet channel as directed.

Concrete colors shown.

Precast concrete pressure pipe to Canal or lateral on curves.

Concrete Transition Type 1 shown.

Protect Canal or lateral on curves.

Concrete Transition Type 3 shown (Inlet only).

REFERENCE DRAWINGS
CONCRETE TRANSITIONS: TYPE 1, TYPE 2, TYPE 3
CONCRETE TRANSITIONS-Detail
PIPE COLLAR DETAILS
BENDS FOR PRECAST CONCRETE PRESSURE PIPE
TYPICAL PROTECTION

UNITED STATES
DEPARTMENT OF THE
INTERIOR
BUREAU OF RECLAMATION
CULVERTS

NOTES
For details of each section see Plan and Profile drawings.
Mix entire structure in a foundation of undisturbed earth or thoroughly compacted fill.

SKEW ANGLE DEFINITION

PROFILE

SECTION A-A

TYPICAL PLAN

TYPICAL PROTECT/ON...
### Longitudinal Section

#### Method of Strutting Corrugated Metal Pipe

No strutting required for pipes less than 10 inches in diameter. Corrugated metal pipe must be supported and held in place until embankment is completed.

#### Table of Locations and Elevations

<table>
<thead>
<tr>
<th>Station</th>
<th>Road Width</th>
<th>Original Ground Surface</th>
<th>Elevation</th>
<th>Pipe Width</th>
<th>Outlet Elevation</th>
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</thead>
<tbody>
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<td>000</td>
<td>10 ft</td>
<td>5 ft</td>
<td></td>
<td>4 ft</td>
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<td>500</td>
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<td>5 ft</td>
<td></td>
<td>4 ft</td>
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<tr>
<td>1000</td>
<td>10 ft</td>
<td>5 ft</td>
<td></td>
<td>4 ft</td>
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</table>

#### Notes

1. The pipe may terminate in concrete structure or transition of either end as directed.
2. Elevation F is approximate elevation of finished grade of road.
3. Elevation G is elevation of invert of pipe at top of road.

---

**METHOD OF STRUTTING CORRUGATED METAL PIPE**

No strutting required for pipes less than 10 inches in diameter. Corrugated metal pipe must be supported and held in place until embankment is completed.

**TABLE OF LOCATIONS AND ELEVATIONS**

<table>
<thead>
<tr>
<th>Station</th>
<th>Road Width</th>
<th>Original Ground Surface</th>
<th>Elevation</th>
<th>Pipe Width</th>
<th>Outlet Elevation</th>
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<tbody>
<tr>
<td>000</td>
<td>10 ft</td>
<td>5 ft</td>
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<td>4 ft</td>
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<tr>
<td>500</td>
<td>10 ft</td>
<td>5 ft</td>
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<td>4 ft</td>
<td></td>
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<tr>
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<td>10 ft</td>
<td>5 ft</td>
<td></td>
<td>4 ft</td>
<td></td>
</tr>
</tbody>
</table>

**Notes**

1. The pipe may terminate in concrete structure or transition of either end as directed.
2. Elevation F is approximate elevation of finished grade of road.
3. Elevation G is elevation of invert of pipe at top of road.
NOTES
For general notes and minimum requirements for detailing reinforcement, see 40-0-6123.
For details of embedment of precast pipe in monolithic concrete, see 40-6124.

SECTION A-A
A4-01 DRAWN 
ST. J. ISMITTED

LONGITUDINAL SECTIONS

TABLE OF DIMENSIONS AND EST. QUANTITIES

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<th>Size</th>
<th>E-F f</th>
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</table>

CONCRETE TRANSITIONS-TYPE 2
NOTE

For general notes and minimum requirements for detailing, see 40-0-6123.

For details of embedment of prestressed pipe in monolithic concrete, see ___ 4@9f ___ 4

See Longitudinal Sections for spacing and embedment.

LENGTH from floor:

9 1/2" Bend into wall

SECTION A-A

SECTION B-B SIMILAR

TABLE OF DIMENSIONS AND ESTIMATED QUANTITIES

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<th>B</th>
<th>C</th>
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<th>H</th>
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ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

CONCRETE TRANSITIONS-TYPE 2L

SUBMITTED

RECOMMEND

CHECKED

APPROVED

COMMENTS

81-0-6123 SAFETY

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ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

CONCRETE TRANSITIONS-TYPE 2L

SUBMITTED

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APPROVED

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<td>100</td>
<td>120</td>
<td>150</td>
<td>170</td>
<td>36.0</td>
</tr>
</tbody>
</table>

- Pipe may be mitered for elevations as specified on drawings.
- For general notes and minimum requirements for detailing reinforcement, see 40-0-6123.
- Slabs are cast in sections.

NOTES

United States Department of the Interior
United States Bureau of Reclamation
PRECAST CONCRETE PIPE CULVERT TRANSITIONS - TYPE 2

TABLE OF DIMENSIONS & QUANTITIES

<table>
<thead>
<tr>
<th>DIA.</th>
<th>E</th>
<th>#</th>
<th>L</th>
<th>C</th>
<th>T</th>
<th>H</th>
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<td>150</td>
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</tr>
</tbody>
</table>
For general notes and minimum requirements for detailing reinforcement, see 40-0-623.

For details of embedment of precast pipe in monolithic concrete, see 40-0-622.
PLAN

Clean and roughen contact surface of pipe.

For elevation, see culvert drawings.

SECTION A-A

NOTES

Chamfer 01/ exposed corners.

For general notes and minimum requirements for detailing reinforcement, see 40-D-6123.

SECTION B-B

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

TABLE OF DIMENSIONS AND QUANTITIES

<table>
<thead>
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<th>Dia.</th>
<th>#A</th>
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<th>B</th>
<th>C</th>
<th>t</th>
<th>T</th>
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<td>24</td>
<td>4'</td>
<td>4'</td>
<td>4'</td>
<td>11</td>
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<td>30</td>
<td>4'</td>
<td>4'</td>
<td>5'</td>
<td>11</td>
<td>24</td>
</tr>
<tr>
<td>96</td>
<td>36</td>
<td>5'</td>
<td>5'</td>
<td>6'</td>
<td>11</td>
<td>24</td>
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<tr>
<td>108</td>
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<td>6'</td>
<td>6'</td>
<td>7'</td>
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<td>24</td>
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<tr>
<td>120</td>
<td>60</td>
<td>7'</td>
<td>7'</td>
<td>8'</td>
<td>11</td>
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UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

PRECAST CONCRETE PIPE CULVERT
TRANSITIONS - DROP INLET

Chamfer 01/ exposed corners.

For general notes and minimum requirements for detailing reinforcement, see 40-D-6123.
### TABLE OF LOCATIONS AND ELEVATIONS

<table>
<thead>
<tr>
<th>Station</th>
<th>Lateral Station</th>
<th>N.W.S. Inlet DIA.</th>
<th>Elevation</th>
<th>Q</th>
<th>V</th>
<th>N.W.S. Outlet DIA.</th>
<th>Elevation</th>
<th>Q</th>
<th>V</th>
<th>Notes</th>
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<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- For general notes and minimum requirements for detailing reinforcement, see 40'0'0-23.
- All reinforcement in headwall to be placed in center of mass.

---

**Concrete Headwalls**

- **PLAN OF INLET**
  - Cement mortar around pipe
  - Cement mortar fillets
- **PLAN OF OUTLET**
  - Cement mortar around pipe
  - Cement mortar fillets

**LONGITUDINAL SECTION**

- Precast concrete pipe
- Joint with sealing compound
- Precast concrete pipe

**SECTION A - A**

- Cement mortar around pipe
- Cement mortar fillets

---

**UNITED STATES DEPARTMENT OF THE INTERIOR**

**BUREAU OF RECLAMATION**

**CONCRETE HEADWALLS**

**TRADE**

**CHECKED**

**APPROVED**

---

**HARRIS TRAVIS SAFETY**

---

**UNITED STATES DEPARTMENT OF THE INTERIOR**

**BUREAU OF RECLAMATION**

**CONCRETE HEADWALLS**

**TRADE**

**CHECKED**

**APPROVED**

---
TYPICAL SLIDE GATE ASSEMBLY

SECTION A-A

PRECAST CONCRETE WALK PLANK

SECTION B-B

WALK PLANK SUPPORT ANGLE

REFERENCE DRAWINGS

NOTE

For general notes and minimum requirements for detailing reinforcement, see 40-0-6123.

Gate frame height measured from top of gate opening.

TABLE OF LOCATIONS AND ELEVATIONS

STANDARD DIMENSIONS

ESTIMATED QUANTITIES

NOTE: When a gate with a specified height is not available, a gate with next greater available height shall be used with appropriate frame height.
Alternative design for Dia. = 27" or less

Structures without gate at headwall (typical)

Structures with gate at headwall (typical)

Elevation of headwall

Notes:
Where pressure pipe is used, pipe joint shall be placed within air flow inside face of structure for pipe dia. 27" or less
Cutoffs may or may not be required in structures with or without gates, see structure drawings.
For details of reinforcement in structures, see structure drawings.

Notes:
Pipe reinforcement not shown, Reinf may be cut

Precast concrete elbow units of approved design

Encasement required for 42" pipe 36" and larger

Encased Precast Elbow Bends for Precast Concrete Culvert Pipe

Pipe reinforcement not shown

Precast concrete elbow units of approved design

Complete hoops (one or two pieces) with total area computed for bursting stress of 14,000 psi with hydrostatic head applied an

Band Thickness Data

<table>
<thead>
<tr>
<th>Pipe Dia. (INCHES)</th>
<th>Band Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>1</td>
</tr>
<tr>
<td>24</td>
<td>2</td>
</tr>
<tr>
<td>36</td>
<td>3</td>
</tr>
</tbody>
</table>

Elevatior; of compacted backfill for unencased elbow bends and banded pipe bends shall be the same as the elevation of compacted backfill specified for the adjacent pipe. Compact backfill to top of concrete at all encased bends.

NOTES

For general rules and minimum requirements for detailing reinforcement, see 40-D-6123

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UNITED STATES DEPARTMENT OF THE INTERIOR

BUREAU OF RECLAMATION

Bends for Precast Concrete Culvert Pipe

Drawn: Submitted: Approved:

[Diagram of pipe bend diagrams]
Longitudinal reinf. Mortar filled as from precast pipe joint
Transverse reinf. to be welded or lapped shown at splices

"a": '/2:15:18" PIPE DIA.
BAND THICKNESS DATA
30"
24"11 36"
42"
inches Lap all bars
11
36
11
1#

BAR DIAMETER (VERTICAL OR HORIZONTAL BENDS) (VERTICAL BEND - DOWNWARD DEFLECTION)

NOTE:
Pipe to be laid before concrete is placed
Pay lines for cradle
Pay lines for blocking

PRECAST ELBOWS WITH CRADLE, CAP OR BLOCKING
(Inserted for cap-See Section E-E)
ENCASED PRECAST ELBOWS
PNEUMATICALLY APPLIED MORTAR ENCASED MITERED PIPE BEND
(ANTIFOR IN CONCRETE ENCASED MITERED PIPE BEND)

NOTES
Up all bar diameters as specified, unless otherwise shown. A place choice of approved sizes may be used. For any bend not shown on the drawings, regulations of the type of bent used shall be the same as the elevation of compacted backfill specified for the adjacent pipe. Bonded horizontal pipe bends shall have compacted backfill in the top of the pipe or blocking. Bonded vertical pipe bends shall have compacted backfill in the top of the pipe or blocking. In case of mortar encasement, the mortar bedding shall extend not less than that required for welded wire fabric. Mortar bedding shall be provided so that the load is uniformly spread over C.D. of pipe i.e. 12".
Banded mitered pipe bend for reinforced concrete pressure pipe

Encased mitered pipe bend for reinforced concrete pressure pipe

Pipe joints:

Bend thickness data

<table>
<thead>
<tr>
<th>Pipe dia.</th>
<th>Band thickness</th>
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</thead>
<tbody>
<tr>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>14</td>
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<td>24</td>
<td>4</td>
</tr>
<tr>
<td>30</td>
<td>5</td>
</tr>
<tr>
<td>36</td>
<td>6</td>
</tr>
</tbody>
</table>

NOTES

For general notes see 40-0-6123.

Compact backfill to top of encasement at all bends.

Elevation of compacted backfill shall be the same as the elevation of compacted backfill specified for the adjacent pipe.

Pipe extension shall be 18" max. when Ø < 36" and 0 max. when Ø > 36'.

Encase all miter bends when Ø ≤ 36'.

Always think safety.
Mortar lined fabricated steel bend for reinforced concrete pressure pipe or pretensioned concrete pipe

Mortar filling

Band thickness data

Notes:
For general notes and minimum requirements for detailing reinforcement, see 40-0-6123

Compaction of compacted backfill for banded mitered pipe bends shall be the same as the elevation of compacted backfill specified for the adjacent pipe.

Pipe extension shall be 18" max. when 0 to 36" and 0 max. when 0 > 36".
Complete hoops (one or two pieces) with total area computed for bursting stress of 14,000 psi with hydrostatic head at 6% pipe applied on outside diameter of pipe for encasement length.

NOTES
For general notes and minimum requirements for detailing reinforcement, see 40-0-612.
Compact backfill to top of encasement at all bends.

SECTION A-A
Precast concrete pipe to be centered in collar.

DIMENSIONS AND ESTIMATED QUANTITIES

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<tr>
<th>PIPE DIA</th>
<th>H</th>
<th>T</th>
<th>CONCRETE</th>
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<th>TOTAL</th>
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<td>1.60</td>
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NOTE
For general notes and minimum requirements for detailing reinforcement, see 40-2-601.
TABLE OF LOCATIONS AND ELEVATIONS

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<th>STATION</th>
<th>ELEVATION</th>
<th>PIPELINE</th>
<th>PIPE VENT</th>
<th>CONC</th>
<th>REMARKS</th>
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</table>

NOTES
Clean and roughen all pipe surfaces encased in concrete. For general notes and minimum requirements for detailing reinforcement, see 40-D-6/23.
Typical ground surface

Optional top of first stage, compacted embankment

Top of first stage compacted embankment

Slope as directed

Typical ground surface

NOTICE

Pay lines apply to concrete and earthwork based on trenching method or measuring virgin earthwork construction to be paid for on the basis of pay lines shown.

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

CONCRETE BACKFILL UNDER EMBANKMENT
TYPICAL SECTION

STEEL SLEEVE JOINT
(TYPE R-1)

TONGUE AND GROOVE JOINT
(TYPE R-2)

BELL AND SPIGOT JOINT
(TYPE R-3 AND R-4)

SECTIONS THROUGH TYPICAL JOINTS

UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION

PRECAST CONCRETE PRESSURE PIPE
REINFORCED CONCRETE ENCASEMENT

DRAWN... S.E.E.  SUBMITTED

TRADED... S.M.M.  RECOMMENDED

CHECKED... APPROVED

DENVER, COLO.
I. Dio. Precast concrete culvert pipe, Closs III.

- Cavity original ground surface
- Longitudinal seams on outside of nozzle I and inside of sleeve to be ground smooth

- Siphon 6" Ring flange
- Class D
- 2"x.125" corrosion ring
- Top of concrete 6" Sch 40 steel pipe, Shope bottom to fit inner surface of P.

- 6" Schedule 40 steel pipe drain.
- Discharge to right or left as required
- Provide riprap at end of pipe as directed

- Transverse reinforcement

- TWO LAYER REINF. STEEL
- ONE LAYER REINF. STEEL

- Section C-C
- Section F-F
- Section E-E

- Detail of Cover

- Section A-A

- Notes
  - For general notes and minimum requirements for detailing, refer to 40-0-6113.
  - No reinforcement shall be of steel when Dia. = 24" and 36" Dia. (see 41-0-6101)
  - Cast iron shall be spacing only, double disk.
  - Steel pipe to be used with either ground or oxidized steel pipe.
  - When long reinforcement lengths are used, the diameter of cast iron blowoff shall be increased to provide the required weight of 0.01 lbs.

- Diagram and details for concrete and metal components.

- UNITED STATES DEPARTMENT OF THE INTERIOR
- BUREAU OF RECLAMATION

- BLOWOFF
- NON-CYLINDER PRECAST CONCRETE PIPE

- Diagram includes: pay lines for concrete, notes for anchor, and detail of anchor.
OVER 6'

IN THOROUGH CUT

TYPICAL UNLINED LATERAL SECTION

Original ground surface

IN THOROUGH CUT

TYPICAL WASTEWAY AND DRAIN SECTION

Original ground surface

NOTES

For values of b and e, minimum values of H, W, and d as directed for location of O&M Roads, see Plans and Profiles of waterways.

Section designations, as shown on profiles: Section 22-12 indicates b=22, H=12, W=5, d=2. Section 22-12-1 indicates b=22, H=12 and d=1-2. Section 22-12-1 indicates b=22, H=12 and d=1-2.
NOTES
For values of b and d, minimum values of W, and H, and
for location of OBM Roads, see plans and profiles of waterways.

Concrete Section Designations:
First figure at section designation as shown on profiles indicates
finished base width, b. Second and third figures indicate
finished bank height, H, in feet and tenths. Figures following
section designation are water depth. Typical designation
is 3f-2.0, showing b of 3', H of 2.0', and water depth of 1.0'.

Lined Section Designations:
First figure at section designation as shown on profiles indicates
finished base width, b. The letter indicates height of lining, h, as
shown in each table of sections. Figures following section
designation are water depth. Typical designation is 3f-2.0,
showing b of 3', water depth of 2.0', and h of 0.5'.

REFERENCE DRAWINGS
SAFETY LADDERS
ALWAYS THINK SAFETY
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
TYPICAL SECTIONS FOR
CANALS, LATERALS, AND WASTeways
DRAWN
SUBMITTED
CHIEF, CIVIL ENGINEERING
DEPARTMENT
APPROVED
CHIEF, ENGINEERING
COLORADO
LONGITUDINAL GROOVE DETAIL
(Required when e > 0')
TYPICAL CONCRETE LINED SECTIONS
IN THOROUGH CUT
IN FILL OR PART FILL
TYPICAL WASTEWAY SECTION
IN THOROUGH CUT
IN FILL OR PART FILL
TYPICAL JOINT DETAIL
Concrete lining to structure
TYPICAL SECTION CANALS AND LATERALS
IN FILL OR PART FILL
TYPICAL SECTION CANALS AND LATERALS
IN FILL OR PART FILL
Note: Transverse grooves to be
spaced at 10' maximum.
GROOVE DETAIL
TYPICAL JOINT DETAIL
Concrete lining to structure
TYPICAL UNLINED LATERAL SECTION

Variable

WINDROW DESIGNATION AS SHOWN ON PLANS AND PROFILES

TYPICAL WASTEWAY AND DRAIN SECTION

IN THOROUGH CUT

TYPICAL CONCRETE LINED LATERAL SECTION

LONGITUDINAL GROOVE DETAIL

TYPICAL JOINT DETAIL

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

NOTES

IN THOROUGH CUT

IN FILL OR PART FILL

FOR WIDEBELA WIDTHS, MAXIMUM VALUES OF H, W, AND FOR LOCATION OF EMBANKMENTS, SEE PLANS AND PROFILES OF WATERWAYS.

IN THOROUGH CUT

IN FILL OR PART FILL

FOR DETAILS OF SAFETY DEVICES, SEE 40-0-5927, OR 40-0-6/12.

FOR USE OF TYPICAL LATERAL, WASTEWAY, AND DRAIN SECTIONS, SEE 40-0-3927, OR 40-0-6/12.
**SECTION A-A PROTECTION**

<table>
<thead>
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<th>Layer</th>
<th>Type</th>
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<td>None</td>
<td>0.00'</td>
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<tr>
<td>1.0' to 2.0'</td>
<td>None</td>
<td>0.00'</td>
</tr>
<tr>
<td>3.5' to 7.0'</td>
<td>Coarse gravel</td>
<td>2.0</td>
</tr>
<tr>
<td>Top of berm</td>
<td>Coarse gravel</td>
<td>1.0</td>
</tr>
</tbody>
</table>

**PLAN**
- Earth transition: 3.0'
- Top of berm

**PROFILE**
- Length of protective wall: 5.0'

**TRANSITIONS FOR CONCRETE LINING**

<table>
<thead>
<tr>
<th>LATERAL STATION</th>
<th>INLET OF CONCRETE</th>
<th>ELEVATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>b</td>
</tr>
<tr>
<td></td>
<td>d</td>
<td>e</td>
</tr>
<tr>
<td></td>
<td>f</td>
<td>g</td>
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<tr>
<td></td>
<td>h</td>
<td>i</td>
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<tr>
<td></td>
<td>j</td>
<td>k</td>
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</table>

**UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION**

ALWAYS THINK SAFETY

TRAFIC, S.P.W. PROJECT SUPERVISOR:

J.A.R. PROJECT ENGINEER:

R.E.A. CONTRACTOR:

T.R.A. MAIN CONTRACTOR:
IN THOROUGH CUT

TYPICAL LATERAL SECTION

IN THOROUGH CUT

TYPICAL WASTEWAY SECTION

* Seed 3" Cortice dirt when there is no waste bank.
Use for inlet and outlet of road crossings, pipe drops, discharge pipes from constant head orifice and pipe turnouts. Required when discharging to farm unit from any pipe or to weir pool from turnout.

Pipe inlet or outlet

Division box with adjustable weirs

Typical protection

Notes:
- "Normal length of outlet 12".
- Where not given use diameter of pipe in place of 12" for calculation of protection.
- Protection to extend the length of earth transition and 12" above normal water surface for structures other than shown above.
- Protection to be extended when outlet is in material not readily erodible such as concrete or rock.
- Protection units to be filled with rock, pebbles or gravel.
Provide suitable anchorage to secure pipe to concrete. Locate in clear reinforcement.

Locate to clear reinforcement. Outside face of wall.

Boundary surfaces tangent to 6" min. radial lone surfaces.

DETAIL OF WEEP PIPE
(ALTERNATIVES)

NOTE
The configuration of the filter envelope may be changed by suit construction, provided that a minimum radial thickness of 6" is maintained for each row.

GRADATION OF FILTER MATERIALS

PERCENT (by weight) RETAINED ON STANDARD SIEVE

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>No. 12</th>
<th>No. 16</th>
<th>No. 8</th>
<th>No. 200</th>
<th>No. 100</th>
<th>No. 50</th>
<th>No. 30</th>
<th>0-5</th>
<th>5-25</th>
<th>15-45</th>
<th>25-75</th>
<th>38-70</th>
<th>60-90</th>
<th>90-100</th>
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<tbody>
<tr>
<td>SAND</td>
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<td>100</td>
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<td>AGGREGATE</td>
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<td>76</td>
<td>74</td>
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</tr>
</tbody>
</table>

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

WEEP HOLE

CHECKED BY
APPROVED BY
REVIEWED BY
DATE: 07-12-71

TYPICAL VULCANIZED FIELD SPLICE

TYPE 1 INTERSECTION

TYPE 2 INTERSECTION

TYPE 3 INTERSECTION

TYPE THROUGH INTERSECTIONS

NOTES
Plug hole in center bulb where center bulb is crosshatched. Government molds available for intersection types 1, 2 and 3.

ILLUSTRATOR
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
RUBBER WATERSTOP INTERSECTIONS

RUBBER WATERSTOP INTERSECTIONS

MATERIALS

NOTES
EI> ALWAYS THINK SAFETY

Drill ¥­ I

NWS.

4.1" long.

4xix

r,

4x holes in plate. Bolt:

x4 Bolt with lock-washer. Plate.

Plate x2.8X ~ ~ ~/ -5'!..--->-i --/' i, ...

若. -4x Anchor spacing 

See Dwg.40-0-5907

Stainless steel strip. 

ELEVATION OF CRST SECTION SHOWING INTERIOR WALL 

SECTION A-A 

SECTION B-B 

SECTION C-C

SECTION D-D

SECTION E-E,

SECTION F-F

SECTION G-G

SECTION H-H

SECTION J-J

SECTION K-K

SECTION L-L

SECTION M-M

SECTION N-N

SECTION O-O

SECTION P-P

SECTION Q-Q

SECTION R-R

SECTION S-S

SECTION T-T

SECTION U-U

SECTION V-V

SECTION W-W

SECTION X-X

SECTION Y-Y

SECTION Z-Z

FIG. 1. ADJUSTABLE CREST AND AIR VENT FOR SIPHON SPILLWAY

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

CHECKED ___ TRACED ___ DRAWN ___

FOR SIPHON SPILLWAY

NOTES

Reinforcement not shown.

When used adjustable crest plate to be one piece, leaving splice plate and vertical stiffener angles.

Air Vent

DETAILS OF ADJUSTABLE AIR VENT

Air Vent

ADJUSTABLE CREST AND AIR VENT
FOR SIPHON SPILLWAY

ALS Always Think SAFETY

ADJUSTABLE CREST AND AIR VENT FOR SIPHON SPILLWAY

SHOWING INTERIOR WALL OF MULTIPLE BARREL SIPHON

DETAILS OF 5/8" ANCHORS
NOTES
1. With weir in fully lowered position set zero of weir gage below crest of weir a distance equal to A.
2. For any position of weir crest equal or greater than stem projection above hondwheel hub.
3. Standard strength steel pipe with bar (see specifications).
4. Weir gage, see 40-C-71.
5. "L" = 0' for Q<4
6. "L" =L'+2 for Q>4

SCALE OF FEET
BAR DETAIL
Not to scale

SECTION A-A

SECTION B-B
Not to scale
TYPICAL FENCE CROSSING

SECTION A-A

SCALE OF FEET

NOTES
All parts shall be placed with butt ends even.

Chief, Canal Branch

DENVER, COLORADO

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

CHIEF, CANALSBRANCH

RECOMMENDED

APPROVED

SUBMITTED

FENCE CROSSINGS

<table>
<thead>
<tr>
<th>STATION</th>
<th>F</th>
<th>T</th>
</tr>
</thead>
</table>

DETAIL OF FENCE CROSSING PANEL

SCALE OF FEET

TYPICAL PLAN OF FENCE CROSSING
Maximum length of fence without a corner post, end post or brace post shall be 1000 ft. Additional posts shall be placed where directed by the contracting officer.

Fence on curve shall have brace posts spaced as follows:
- Curve radius less than 500 ft., every 2nd post
- Curve radius 500-1000 ft., every 5th post
- Curve radius over 1000 ft., every 7th post.

DETAIL OF GATE CLOSER

Barbed wire type fence:
- Ground surface
- 3'-6" Min. deep
- 2-point barbs not more than 5" apart
- Gate post
- 2-6" Dia., 5' pitch spiraled loops of No. 8 gage wire

Wire mesh type fence:
- Ground surface
- 3'-6" Min. deep
- 2-6" Dia., 5' pitch spiraled loops of No. 8 gage wire
Backfill over pipe shall be to the original ground surface except the minimum shall be 3 feet and the maximum shall be 5 ft. for Class A pipe, 10 ft. for Class B, 15 ft. for Class C, and 20 ft. for Class D unless otherwise indicated on the structure drawings. Backfill shall be compacted as shown unless otherwise specified.
COMPACTED BACKFILL

Typical original ground surface

Pay lines for excavation

Remove indurated or other unsuitable material and replace with selected compacted backfill where directed.

NOTES
Backfill over pipe shall be to the original ground surface except the minimum shall be 3 feet and the maximum shall be 5 ft for Class A pipe, 10 ft for Class B, 15 ft for Class C, and 20 ft for Class D unless otherwise indicated on the structure drawings. Backfill shall be compacted as shown unless otherwise specified.

ALWAYS THINK SAFETY

UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION

PIPE EARTHWORK DETAILS
PRECAST CONCRETE OR ASBESTOS-CEMENT PIPE UNCLASSIFIED EXCAVATION

CHECKED APPROVED

DENVER, COL. AUG. 8, 1952
NOTES
Backfill over pipe shall be to the original ground surface except the minimum shall be 3 feet and the maximum shall be 5 ft. for Class A pipe, 10 ft. for Class B, 15 ft. for Class C, and 20 ft. for Class D unless otherwise indicated on the structure drawings. Backfill shall be compacted as shown unless otherwise specified.
EARTH NOTES

Backfill over pipe shall be to the original ground surface except the minimum shall be 3 feet and the maximum shall be 5 ft. for Class A pipe, 10 ft. for Class B, 15 ft. for Class C, and 20 ft. for Class D unless otherwise indicated on the structure drawings. Backfill shall be compacted as shown unless otherwise specified.

No compaction required for 10 inch dia. pipe.

Compact backfill to $D_2$ for pretensioned concrete pipe with diameter of 12 inches to 18 inches.
NOTES
Backfill over pipe shall be to the original ground surface except the minimum shall be 3 feet and the maximum shall be 5 ft for Class A pipe, 10 ft for Class B, 15 ft for Class C, and 20 ft for Class D unless otherwise indicated on the structure drawings.
Backfill shall be compacted as shown unless otherwise specified.
No compaction required for 10 inch dia. pipe.
Compact backfill to \( \frac{3}{2} D_o \) for pretensioned concrete pipe with diameter of 12 inches to 18 inches.
Backfill over pipe shall be to the original ground surface except the minimum shall be 3 feet and the maximum shall be 5 ft. for Class A pipe, 10 ft. for Class B, 16 ft. for Class C, and 20 ft. for Class D unless otherwise indicated on the structure drawings. Backfill shall be compacted as shown unless otherwise specified.

Compact backfill \( \frac{2}{5} D_p \) for pretensioned concrete pipe with diameter of 12 inches to 18 inches. No compaction required for 10" dia. pipe.
NOTES

Backfill over pipe shall be to the original ground surface except the minimum shall be 3 feet unless otherwise indicated on the structure drawings. Backfill shall be compacted where required by the specifications.
NOTES
Backfill over pipe shall be to the original ground surface except the minimum shall be 3 feet unless otherwise indicated on the structure drawings. Backfill shall be compacted where required by the specifications.
NOTES

Backfill over pipe shall be to the original ground surface except the minimum shall be 3 feet; unless otherwise indicated on the structure drawings. Backfill shall be compacted where required by the specifications.
TYPICAL TRENCH

- Original ground surface
- Compacted backfill where shown on the profiles or where directed
- Mound or spread as directed or backfill to limits shown on profiles
- Payline for excavation
- Compacted backfill on outside of horizontal curves
- Compacted backfill where shown on the profiles or where directed
- Payline for excavation
- Overexcavate in rock or unsuitable material as directed and replace with uncompacted backfill

NOTES

1. If compacted backfill for bedding is compacted by tamping, rolling or surface vibration, the trench width, w, is the minimum width allowed. Mound or spread as directed or backfill to limits shown on profiles or where directed. Payline for excavation.

2. If compacted backfill for bedding is compacted by saturation and internal vibration, the minimum trench width is $D_p + 18\text{in}$.

3. The minimum trench width is $D_p + 18\text{in}$ to limits shown on profiles.

<table>
<thead>
<tr>
<th>PIPE I.D.</th>
<th>$D_p$</th>
<th>$w$</th>
</tr>
</thead>
<tbody>
<tr>
<td>INCHES</td>
<td>INCHES</td>
<td>FEET</td>
</tr>
<tr>
<td>E Pipe</td>
<td>6</td>
<td>2.00</td>
</tr>
<tr>
<td>Over 6</td>
<td>$D_p$</td>
<td>$D_p + 18\text{in}$</td>
</tr>
<tr>
<td>Over 6</td>
<td>Over 6</td>
<td>$D_p + 18\text{in}$</td>
</tr>
</tbody>
</table>

Note: $D_p$ = Inside diameter of pipe in inches, and sizes of pipe shown refer to I.D.

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
STANDARD DESIGNS

PRESSURE PIPE

TYPICAL TRENCHES

ALL PIPE 10" AND SMALLER

FOR压存 MADE IN JAPAN WITH COMPLIES TO"
Bronze cop screw and washer.
N.C. Round head brass machine screw, brass washer and brass nut.
Bosal disk at minimum thickness.
Flap weeps Brass disk minimum thickness. 
Flap weeps plastic companion flange.

8−inch slots, each band, equally spaced.

Alternative construction.

TYPICAL INSTALLATION

Flap to ensure filling of voids with concrete.

SECTION A−A

GRADATION OF FILTER MATERIALS

<table>
<thead>
<tr>
<th>FILTER MATERIAL</th>
<th>PERCENT (BY WEIGHT) RETAINED ON STANDARD SIEVE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No 200</td>
</tr>
<tr>
<td>Sand</td>
<td>85−90</td>
</tr>
<tr>
<td>Coarse Aggregate</td>
<td>95−100</td>
</tr>
</tbody>
</table>

FLAP VALVE DETAILS

FLAP VALVE WEEPS

1. Bronze cop screw and washer.
2. N.C. Round head brass machine screw, brass washer and brass nut.
3. Brass disk at minimum thickness.
4. Flap weeps plastic companion flange with band "A" parallel to axis.
5. Plastic companion flange.

103−0−044
Extend sideslopes to original ground surface where O.B.M. Road is not required.

In Thorough Cut

Original ground surface

Compacted embankment

TYPICAL SECTION

Berm of 12'-0" or 5' or more

O.B.M. Road width

Berm of 4' to 6' as directed; see specifications.

Compaction

IN THOROUGH CUT

IN FILL OR PART FILL

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

TYPICAL UNLINED SECTION FOR
CANALS AND LATERALS

CHIEF DESIGNER: NEIL NEE
DENVER, COLORADO
103-0-828
TYPICAL EARTH LINED SECTION

TABLE FOR EARTH LINING

<table>
<thead>
<tr>
<th>d</th>
<th>s</th>
<th>f</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0 or less</td>
<td>1.0</td>
<td>3.0</td>
</tr>
<tr>
<td>&gt;2.0' to 4.0'</td>
<td>1.5'</td>
<td>4.0</td>
</tr>
<tr>
<td>&gt;4.0' to 6.0'</td>
<td>2.0'</td>
<td>6.0</td>
</tr>
<tr>
<td>&gt;6.0'</td>
<td>12.0'</td>
<td>12.0'</td>
</tr>
</tbody>
</table>

NOTES
If lining material requires a protective cover of gravel or riprap to prevent scour or erosion, excavation shall be extended to provide for the designated thickness of the gravel or riprap.
For freeboard, see OWG.104-D-341 (Rev.3-10-60)
Notes: Graph based on Manning's formula, \( n = 0.011 \).

 Depths shown are water depths.

 The slope of the section should not exceed the recommended maximum slope to ensure that critical velocities will not be reached with a grade departure of \( r \) and Manning's \( n \) based on the section.

 TYPICAL SECTION

 Flow in cubic feet per second

 Properties for concrete lined canals

 Standard sections A-1 and A-2

 United States Department of the Interior
 Bureau of Reclamation

 Standard designs

 October 30, 1966

 Linen 0.001
 Flow 0.001
 Width 0.001
 Depth 0.001

 Flow in cubic feet per second

 Standard dimensions on typical section and standard grading cycle

 Drawing 10.5-1042
DIMENSIONS

<table>
<thead>
<tr>
<th>SECTION</th>
<th>a</th>
<th>b</th>
<th>a Min.</th>
<th>a Max.</th>
<th>b Min.</th>
<th>b Max.</th>
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</thead>
<tbody>
<tr>
<td>8-1</td>
<td>125</td>
<td>125</td>
<td>125</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>8-2</td>
<td>125</td>
<td>125</td>
<td>125</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>8-3</td>
<td>125</td>
<td>125</td>
<td>125</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>8-4</td>
<td>125</td>
<td>125</td>
<td>125</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>8-5</td>
<td>125</td>
<td>125</td>
<td>125</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
</tbody>
</table>

TYPICAL SECTION

Notes: Depth shown are water depths.

The slope of the section should exceed the recommended minimum slope to ensure that critical weaknesses will not be reached with a grade departure of 1/4 and Manning's n based on 0.01

Recommended Maximum Slope

FLOW IN CUBIC FEET PER SECOND

DEPARTMENT OF THE INTERIOR
OFFICE OF RECREATION
STANDARD DESIGNS

PROPERTIES FOR CONCRETE LINED CANALS
STANDARD SECTIONS 8-2, 8-3, 8-4, 8-5, 8-6

DRAWING TITLE: 103-D-630
ANCHOR TRENCH FOR PREFABRICATED SHEETS...

BURIED MEMBRANE LINING

ANCHOR TRENCH FOR PREFABRICATED SHEETS...

LONGITUDINAL SECTION

WATERWAY INVERT

MEMBRANE AT STRUCTURES

LONGITUDINAL SECTION

METHOD OF ENDING MEMBRANE LINING

DETAILS OF BURIED MEMBRANE LININGS

<table>
<thead>
<tr>
<th>b</th>
<th>R</th>
<th>C</th>
<th>WP</th>
<th>A</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>3.0</td>
<td>6.7</td>
<td>15</td>
<td>32</td>
<td>52</td>
</tr>
<tr>
<td>2.0</td>
<td>4.0</td>
<td>9.0</td>
<td>20</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>2.5</td>
<td>5.0</td>
<td>12.5</td>
<td>25</td>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td>3.0</td>
<td>6.0</td>
<td>16.0</td>
<td>30</td>
<td>60</td>
<td>90</td>
</tr>
</tbody>
</table>

NOTES

The gradation, type and thickness of the cover material is dependent on tractive forces and velocities in the section, and the type of material available in the area.

Wp is the difference between 2T and the arc length. To obtain the wetted perimeter for a section, subtract 2Wp from the wetted perimeter for a trapezoidal section of width b.

A is the area of the fillet. To obtain the area for a section, subtract 2A from the area of a trapezoidal section of width b.

For freeboard see 103-D-541.
NOTES

Ladder rungs to be placed during concrete lining operations, located opposite each other at 150 ft. intervals on each side of the canal, and upstream of structures as directed. Ladder rungs are not required on sides of canals where the vertical lining height is less than 2 ft. feet.

Ladder rungs @ 24" centers

Min. operating water surface

Point area 16' x 18" on concrete with two coats of traffic yellow paint.

2" Min. for water depth less than 8' 6". 5' Min. for water depth equal to or greater than 8' 6".

Lining thickness

1" - 10"

Liner thickness

1/16"

4" Min.

Ladder rungs to be placed during concrete lining operations, located opposite each other at 150 ft. intervals on each side of the canal, and upstream of structures as directed. Ladder rungs are not required on sides of canals where the vertical lining height is less than 2 ft.

Flatten end of tube.

LADDER RUNG

1/4" R.

End of mild steel rod encased in 3/4" tube of 90-10 soft tempered cupro-nickel with 0.049 inch wall thickness.

NOTES

Ladder rungs to be placed during concrete lining operations, located opposite each other at 150 ft. intervals on each side of the canal, and upstream of structures as directed. Ladder rungs are not required on sides of canals where the vertical lining height is less than 2 ft. feet.

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Flatten end of tube.

LADDER RUNG

1/4" R.

End of mild steel rod encased in 3/4" tube of 90-10 soft tempered cupro-nickel with 0.049 inch wall thickness.
Use two or more ladder sections when the required length exceeds 13'-3".

Pour area of 16" x 18" concrete with two coats of traffic yellow paint.

Min. operating water surface 14".

Min. for water depth equal to or greater than 8.0'--- 24" Max. for water depth less than 8.0'.

Foundation detail.

Sections.

Radius of curve.

Lining thickness (2")

NOTES

Ladders to be used on sides of canal where the vertical lining height is 2 ft. or more.

Ladders to be located opposite to each other at intervals to be determined by the contracting officer.

Ladders to be fabricated from steel or 6061-T6 aluminum.

Ladders shall be anchored to the canal lining with stainless steel expansion type or impact type anchors, subject to the approval of the contracting officer.

Ladders to be painted yellow after fabrication.

Anchor at center of ladder for sections longer than 6-3'.

For ladders with 5 or 7 rungs, offset anchors 5".

ANCHOR AT CENTER OF LADDER

FOR SECTIONS LONGER THAN 6'-3"

(LADDER SECTION)

ANCHORS NOT SHOWN

LADDER SECTION

ANCHORS (SEE NOTES)

INSTALLATION DETAIL

CONCRETE CANAL LINING

ANCHORS NOT SHOWN

SECTION A-A

LADDERただ DETAIL

ANCHORS NOT SHOWN

UNITED STATES

DEPARTMENT OF THE INTERIOR

BUREAU OF RECLAMATION

STANDARD DESIGNS

SAFETY LADDER FOR CONCRETE LINED CANALS

ANCHORS NOT SHOWN

LADDER SECTION

ANCHORS (SEE NOTES)
NOTES

Gages to be made of No. 18 gauge (U.S. standard) mild steel plate and to be coated with vitreous enamel with a minimum thickness of 0.002 on numeral side and 0.003 on reverse side, and on edges where plate has been cut, punched, or drilled.

All cutting, drilling, and punching of the plates shall be completed before the vitreous enamel is applied. The faces of the gages, numerals and graduations shall be white.

Graduations shall be sharp and accurate to the dimensions shown. The length shall be as given in the schedule. If a greater length than 4'-0" is required, the details shall be similar to those shown for shorter lengths.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
STANDARD DESIGNS
ENAMELED WEIR GAGES

CHANGED TừCEIL TO VITREOUS IN NOTES
Concrete surface in contact with bar shall be smooth and straight.

SECTION C-C

SECTION A-A

Cover plate

Single Acme threads, 4 per inch.

Flatten stem to 2 thick x 22 long.

Drill for bolt:

Tap of wall:

Drill for:

Guide bar:

For:

Blade details:

Frame details:

Weir assembly:

Table of Dimensions

<table>
<thead>
<tr>
<th>Dim.</th>
<th>WEIR 1</th>
<th>WEIR 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>3'-0&quot;</td>
<td>4'-0&quot;</td>
</tr>
<tr>
<td>b</td>
<td>6'-0&quot;</td>
<td>5'-0&quot;</td>
</tr>
<tr>
<td>c</td>
<td>1'-0&quot;</td>
<td>1'-0&quot;</td>
</tr>
<tr>
<td>e</td>
<td>0'-8&quot;</td>
<td>0'-8&quot;</td>
</tr>
<tr>
<td>f</td>
<td>1'-0&quot;</td>
<td>1'-0&quot;</td>
</tr>
<tr>
<td>g</td>
<td>2'-0&quot;</td>
<td>2'-0&quot;</td>
</tr>
<tr>
<td>h</td>
<td>0'-10&quot;</td>
<td>1'-0&quot;</td>
</tr>
<tr>
<td>i</td>
<td>0'-10&quot;</td>
<td>1'-0&quot;</td>
</tr>
<tr>
<td>j</td>
<td>3'-0&quot;</td>
<td>4'-0&quot;</td>
</tr>
<tr>
<td>k</td>
<td>0'-10&quot;</td>
<td>1'-0&quot;</td>
</tr>
<tr>
<td>l</td>
<td>0'-10&quot;</td>
<td>1'-0&quot;</td>
</tr>
</tbody>
</table>

NOTE

For details of hand wheel, lifting nut, and cover plate, see ADJ-0-45.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
COLUMBIA BASIN PROJECT-WASHINGTON

DISTRIBUTION SYSTEM
ADJUSTABLE WEIR
W=2'-0" and W=3'-0"

NARROWS TYPHO SAFETY

TRACED
REMARKS:
APPROVED

222-0-7729
222-0-14596
Provide 2-½" x 2½" machined bolts with hex nuts.

Weld crest in raised position is to be set at or slightly above normal water surface elevation.

Weir crest in raised position is to be set at or slightly above normal water surface elevation.

Assembly for shipping, Denver Office

United States Department of the Interior

Bureau of Reclamation

Movable Weir - Q = 6.5

Until rated, see Bureau booklet, 'Water Measurement Manual', for discharge tables.
Note: Edges of slotted weir crest and sloping sides of weir must be square and straight with burrs removed. Assemble for shipping.

Weir crest in raised position is to be set at or slightly above normal water surface elevation.

Additional lumber 10 ft. to be added under weir guide assembly when required.

NOTE: Edges of slotted weir crest and sloping sides of weir must be square and straight with burrs removed. Assemble for shipping.

Always test SAFETY
**NOTES**

1. All ladder end sections shall be mounted to the floor as shown in phantom and the lower wall mounting shall be omitted.

2. Cut out lower wall mounting when A is out and B is in.

3. Maximum distance between landings is 10 feet. 16" ladder has the minimum width which will comply with all requirements of the American Standards Association Safety Code for Fixed Ladders.

4. Welding symbols apply to the joints of all members.

5. See splice details for typical wall mounting detail.

6. Maximum span between mountings is 8 feet.

7. All expansion anchors or hook bolts shall be provided as required for complete installation.

8. See specifications for type of expansion anchor required. Referring symbols apply to the joint of all members of ladder identification.

9. All ladder and rail members shall be provided with safety cages in accordance with the latest American Standards Association Safety Code for Fixed Ladders.

10. Minimum distance between landings is 10 feet.

11. This ladder has the minimum width which will comply with all requirements of the American Standards Association Safety Code for Fixed Ladders.

12. All splices shall be furnished and provided.

13. See specifications for type of expansion anchor required.
INTERMEDIATE SECTION

BOTTOM SECTION

TOP SECTION No. 1

TOP SECTION No. 2

LADDER No. 3

MOUNTINGS TURNED IN

MOUNTINGS TURNED OUT

TOP SECTION No. 1

TOP SECTION No. 2

LADDER No. 3

NOTES

Maximum span between mountings - 8 feet.
All expansion anchors or mach. bolts shall be provided as required for complete installation.
Welding symbols apply to the joints of all members of similar identification.
When floor mounting is specified, the side bars shall continue to the floor as shown in phantom and the lower wall mounting shall be omitted.
All ladders exceeding 20 feet between landings shall be provided with safety cages.
All safety cages shall be in accordance with the latest American Standards Association Safety Code for Fixed Ladders.
Maximum distance between landings - 30 feet.

MOUNTINGS TURNED IN

MOUNTINGS TURNED OUT

TYPICAL WALL MOUNTING DETAIL

RUNG DETAIL

(TYPICAL)

SIDE BAR DETAIL

(TYPICAL TOP AND BOTTOM)

FLOOR MOUNTING DETAIL

(TYPICAL TOP AND BOTTOM)

SPLICE DETAIL

(TYPICAL)

Note: Either type of mounting is symmetrical about this center line.
PLAN OF PIPE SAFETY BARRIER

SECTION B-B

SECTION A-A

STEEL PIPE

DETAIL B

SECTION C-C

NOTE
Two Pipe Safety Barriers required at each pipe crossing.

STANDARD DESIGNS
PIPE SAFETY BARRIER

UNITED STATES
DEPARTMENT OF THE INTERIOR
WASHINGTON, D.C.

H. H. RAY, Chief, Water Supply Planning Division

DECEMBER, 1963

40-D-5931
Trashrack may be Type I welded, commercial grating, conforming to Federal Specification RR-G-661a, except the cross members shall be located as shown on this drawing.

Number of covers making up the overall width of trashrack is optional, but no panel shall be less than 12" wide.

The upstream face of the trashbars shall lie in a common plane within ±1/8". See specifications for size of trashbars, length of trashrack, opening length of trashrack, and nominal center to center of bars (1/2" or 3/8").

Notes:
The upstream face of the trashbars shall lie in a common plane within ±1/8".
Min. Radius \( R \).

Type A = 8 inches

Type B, G and H = 4 inches

FOR FIELD INSTALLATION

TYPES "G" AND "H"

TYPE "B"

TYPE "A"

TOLERANCES

- \( \frac{1}{4} \) "Width", Type A.
- \( \frac{1}{8} \) "Width", Type B, G, and H.
- \( \frac{1}{16} \) "Web thickness", end bulb diameter, and wall thickness on center bulb, all types.
- \( \frac{1}{8} \) "Diameter of center bulb", both I, D, and G, D, Types A, G, and H.

ALWAYS THINK SAFETY

NOT ORIGINALLY INTENDED OR RECOMMENDED FOR USE WITHOUT U.S. ADMINISTRATION'S WRITTEN APPROVAL.

UNITED STATES DEPARTMENT OF THE INTERIOR

STANDARD DESIGNS

RUBBER WATERSTOPS

TYPES "A", "B", "G", "H"

DRAWN, M.C., SUBMITTED, M.E., McBirney...

TRACED, E.J.C., RECOMMENDED, J.R. Hopson...

CHECKED, E.M.T., APPROVED, Walter R. Young...

DENVER, COLO. 8/7/41 40-0-2867
TYPE A

(For use with unreinforced irrigation pipe only)
Inside cement mortar joint, hand packed for 24" dia. and larger.

Cement mortar joint for 21" dia. and smaller.

**TONGUE AND GROOVE JOINT**

**TYPE B**

*Preceding diagrams and text are not visible.*
The amount of circumferential reinforcement in the collar shall not be less than that required for an equivalent length of the adjacent pipe.

Inside face

Inside cement mortar joint, finish smooth

Table for Collar Dimensions

<table>
<thead>
<tr>
<th>Dia of Pipe</th>
<th>6&quot; to 15&quot;</th>
<th>18&quot;</th>
<th>24&quot; to 45&quot;</th>
<th>48&quot; to 63&quot;</th>
<th>66&quot; to 72&quot;</th>
<th>78&quot;</th>
<th>84&quot;</th>
<th>90&quot;</th>
<th>96&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. Thickness (L)</td>
<td>1 1/2&quot;</td>
<td>2 1/2&quot;</td>
<td>2 1/2&quot;</td>
<td>3&quot;</td>
<td>3 1/2&quot;</td>
<td>4&quot;</td>
<td>5&quot;</td>
<td>6 1/2&quot;</td>
<td>7&quot;</td>
</tr>
<tr>
<td>Min. Length (L)</td>
<td>6&quot;</td>
<td>6&quot;</td>
<td>7 1/2&quot;</td>
<td>9&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min. Galking Space</td>
<td>3/8&quot;</td>
<td>3/4&quot;</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Contraction joint. Paint to prevent bond.

Elliptical hoops

9" Rubber waterstop

Elliptical hoops. Same size as elliptical barrel reinforcement.

Longitudinal bars. Space same as longitudinal bars.

NOTES

Contraction joints at 25' intervals, and at connections with closed transitions.
See Dwg. 40-D-2867 for details of 9" rubber waterstop.

SECTION A-A AT CONTRACTION JOINT

HALF SECTION OF BARREL

AT JOINT

HALF SECTION OF BARREL

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
STANDARD DESIGNS

MONOLITHIC SIPHON BARREL
ELLPTICAL HOOP REINFORCEMENT
CONTRACTION JOINT WITH RUBBER WATERSTOP

ALWAYS THINK SAFETY

DENVER, COLORADO MARCH 16, 1915

40-D-5129
NOTES
Contraction joints to be at 25' intervals and at connections with closed transitions. See Dwg. 40-D-2867 for details of 9" rubber waterstop.

SECTION A-A AT CONTRACTION JOINT

SCALE OF FEET

THIS DRAWING SUPERSEDES DWS. 40-D-9164

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
STANDARD DESIGNS

MIONOLITHIC SIPHON BARREL
TWO LAYER REINFORCEMENT
CONTRACTION JOINT WITH RUBBER WATERSTOP

ALWAYS THINK SAFETY