Standard Drawings Disclaimer:

The Drawings Provided in These Standards are Only Intended to Show the Type of Facilities That Will be Acceptable to ULDC. These Are Not Intended to be Used Directly in the Design of Facilities as Each Encroachment/Crossing Has its Own Unique Circumstance, Dimensions, Design Criteria, etc. It is the Responsibility of the Design Engineer, Who Will Stamp the Drawing, to Ensure That Each Crossing is Designed Properly.

By Using Any Details in These Drawings, You Acknowledge That You Have Verified the Standard Drawing Detail is Adequate for Incorporating into Your Design. Franson Civil Engineers Will Not be Held Liable for Any Use of These Drawings. Contact Vince Hogge from Franson Civil Engineers for Any Questions Regarding These Standard Drawings.
NOTES:
1. Bore Pit Compaction to Be 92% Modified Proctor Density.
2. Trench Plugs are to be placed in locations shown on both sides for width of trench and 12 inches above and below casing pipes. A minimum thickness of 2 inches. Plugs shall be a 10% bentonite and 90% clay mixture, or shall be a flowable fill concrete.
3. Stormwater Runoff Enters the Canal During Storm Events or at Other Unexpected Times. It is the Responsibility of the Contractor to Protect the Work Site.
5. Thrust Blocks are Required on All Bends and Ties for DIP, PVC, or PIP Waterlines.
6. Casing Must Be a Minimum of 2 Feet Below the Bottom of the Existing Canal Box Culvert or 4 Feet Below Earthen Canal Bottom.
8. Carrier Pipe Shall Have Adequate Casing Spacers.

Table 1

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Minimum Wall Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>12&quot;</td>
<td>0.188&quot;</td>
</tr>
<tr>
<td>14&quot; - 16&quot;</td>
<td>0.312&quot;</td>
</tr>
<tr>
<td>18&quot;</td>
<td>0.375&quot;</td>
</tr>
<tr>
<td>20&quot; - 22&quot;</td>
<td>0.438&quot;</td>
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<tr>
<td>28&quot; - 32&quot;</td>
<td>0.562&quot;</td>
</tr>
<tr>
<td>34&quot; - 36&quot;</td>
<td>0.562&quot;</td>
</tr>
</tbody>
</table>

Steel Casing Thickness

A Bore Pit

B Bore Casing Cross Section
NOTES:

1. Bore Pit Compaction to be 92% Modified Proctor Density.

2. Fill Bore Pits with a Mixture of Native Material and 10% Bentonite Powder to Create a Seal that Will Prevent Water from Following the New Conduit.

3. Stormwater Runoff Enters the Canal During Storm Events or at Other Unexpected Times. It is the Responsibility of the Contractor to Protect the Work Site.

4. Conduit Must Be a Minimum of 2 Feet Below the Bottom of the Existing Canal Box Culvert or 4 Feet Below Earthen Canal Bottom.


**A** DIRECTIONAL DRILL UNDER CANAL

NOTES:

- Bore Pit Compaction to Be 92% Modified Proctor Density.
- Fill Bore Pits with a Mixture of Native Material and 10% Bentonite Powder to Create a Seal that Will Prevent Water from Following the New Conduit.
- Stormwater Runoff Enters the Canal During Storm Events or at Other Unexpected Times. It is the Responsibility of the Contractor to Protect the Work Site.
- Conduit Must Be a Minimum of 2 Feet Below the Bottom of the Existing Canal Box Culvert or 4 Feet Below Earthen Canal Bottom.
- Bore Pits Must Be Completely Placed Outside of the Canal Right-of-Way. Canal Right-of-Way is Generally 1 Rod on the Uphill Side and 2 Rods on the Downhill Side from the Center of the Canal. ROW Dimensions May Be Greater in Some Areas.

**B** DIRECTIONAL DRILL CROSS SECTION

NOTES:

- Bore Pit Compaction to Be 92% Modified Proctor Density.
- Fill Bore Pits with a Mixture of Native Material and 10% Bentonite Powder to Create a Seal that Will Prevent Water from Following the New Conduit.
- Stormwater Runoff Enters the Canal During Storm Events or at Other Unexpected Times. It is the Responsibility of the Contractor to Protect the Work Site.
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6" Min. or as Required by Engineer

Compact to 92% Modified Proctor Density

#4 Bars @ 12" O.C. Minimum Rebar

6" Min. or as Required by Engineer

Indicate High Water Level

NOTE:
Engineer to determine Rebar size and spacing in Cutoff Wall.

Cutoff Wall Cross Section

Cutoff Wall Both Sides

Concrete Liner Plan

Concrete Liner Cross Section
End Casing at Canal R.O.W., Both Sides (See Note 2 for Trench Plug Details)

Canal Right-of-Way

Top of Canal Bank

Parapet Wall

Casing Must be 4' Min. From Bottom of Earth Canal or 2' Min. From Bottom of Box Culvert (See Note 2)

Concrete Liner is Required, See Note 8

Place Trench Plugs at Ends of Casing on both Sides (See Note 2) for Steel Casing If Soil Resistivity is Less Than 2500 ohm-cm Fill Annular Space With Cellular Concrete, Present Soil Resistivity Results to Engineer

Casing Installed Through Entire Width of R.O.W. (State Type, Size, Thickness, and Ratings of Casing)

Open Cut Placement of Pipe or Casing Through Canal Bank Will Require Cutting Back at 2 Foot Horizontal to 1 Foot Vertical Slope

Top of Open Cut Trench

Removal and Replacement of Canal Floor and Banks Will Require Testing and Proctors By a Licensed Soils Lab. Compaction to Be 92% Modified Proctor Density.

Trench Plugs Are to Be Placed in Locations Shown on Both Sides For Width of Trench and 12 Inches Above and Below Casing Pipes and a Minimum Thickness of 24 Inches. Plugs Shall Be a 10% Bentonite and 90% Clay Mixture, or Shall be A Flowable Fill Concrete.

Storm Water Runoff Enters the Canal During Storm Events or at Other Unexpected Times. It is the Responsibility of the Contractor to Protect the Work Site.

Waterline Pipe Inside of Casing Shall Have Restraining Joints.

Thrust Blocks Are Required on All Bends and Tees For DIP, PVC, or PIP Waterlines.

Casing Must be 4' Min. From Bottom of Earth Canal or 2' Min. From Bottom of Box Culvert.

Canal Right-of-Way is Generally 1-Rod on the Uphill Side and 2-Rods on the Downhill Side From the Center of the Canal. R.O.W. Dimensions May Be Greater in Some Areas.

Concrete Liner is to be Installed in the Canal Extending 5 Feet Past the Extents of Canal Disturbance see Detail.

Carrier Pipe Shall Have Adequate Casing Spacers.

### Table 1: Steel Casing Thickness

<table>
<thead>
<tr>
<th>Diameter (Inches)</th>
<th>Minimum Wall Thickness (Inches)</th>
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<tbody>
<tr>
<td>8&quot;</td>
<td>0.188&quot;</td>
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<tr>
<td>10&quot;</td>
<td>0.252&quot;</td>
</tr>
<tr>
<td>12&quot;</td>
<td>0.312&quot;</td>
</tr>
<tr>
<td>14&quot; − 16&quot;</td>
<td>0.375&quot;</td>
</tr>
<tr>
<td>18&quot;</td>
<td>0.438&quot;</td>
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<td>0.562&quot;</td>
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<td>0.562&quot;</td>
</tr>
<tr>
<td>32&quot; − 34&quot;</td>
<td>0.562&quot;</td>
</tr>
</tbody>
</table>

### Notes:


2. Trench Plugs Are to Be Placed in Locations Shown on Both Sides For Width of Trench and 12 Inches Above and Below Casing Pipes and a Minimum Thickness of 24 Inches. Plugs Shall Be a 10% Bentonite and 90% Clay Mixture, or Shall be A Flowable Fill Concrete.

3. Storm Water Runoff Enters the Canal During Storm Events or at Other Unexpected Times. It is the Responsibility of the Contractor to Protect the Work Site.


5. Thrust Blocks Are Required on All Bends and Tees For DIP, PVC, or PIP Waterlines.

6. Casing Must be 4' Min. From Bottom of Earth Canal or 2' Min. From Bottom of Box Culvert.


8. Concrete Liner is to be Installed in the Canal Extending 5 Feet Past the Extents of Canal Disturbance see Detail.

9. Carrier Pipe Shall Have Adequate Casing Spacers.

---

**Open Cut Plan View**

**Open Cut Canal Crossing Cross Section**

**Open Cut Canal Crossing Profile**
NOTES:

1. Box Culverts to have a minimum height of 6 feet.
2. Width of Box Culvert is to match existing channel bottom.
3. No riprap allowed in the canal.
4. Access to Canal Operation and Maintenance Road shall be installed with curb cuts at drive approaches and thickened concrete at sidewalks.
5. Cutoff walls and aprons between wing walls are required.
6. End of wing wall shall not interfere with operation and maintenance road.
7. 6 foot chain link fence or 4 foot parapet wall is required on all box culverts that carry pedestrian traffic. Exceptions may occur where local ordinances note otherwise and upon approval by canal company.
8. Drawings submitted for review are to show plan and profile views, note slope, include detail indicating rebar size and spacing, and state traffic loading.
9. Casings must have a minimum of 2 feet between top of casing and bottom of box culvert.
10. All concrete used in construction shall have a minimum compressive strength of 4,000 psi. The concrete mix shall include between 5% and 7% air entrainment.

A Plan View of Box Culvert

1 Cutoff Wall Detail

2 Cutoff Front View Detail

3 End of Wing Wall Detail
**TABLE 1**

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Min. Slope, ft/ft</th>
<th>Min. Slope, %</th>
</tr>
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<tbody>
<tr>
<td>12&quot;</td>
<td>0.002</td>
<td>0.2%</td>
</tr>
<tr>
<td>15&quot;</td>
<td>0.0015</td>
<td>0.15%</td>
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<td>18&quot;</td>
<td>0.002</td>
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</tr>
<tr>
<td>24&quot;</td>
<td>0.0085</td>
<td>0.85%</td>
</tr>
<tr>
<td>30&quot;</td>
<td>0.00058</td>
<td>0.058%</td>
</tr>
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NOTES:
1. L:G Details For Box Shown on Sheet A
2. Box Not to be Placed in Driveways, Roads, or Other Traffic Areas.
3. All Pits in Boxes Shall Be Grouted and Watertight.
4. Box Wall Thickness and Reinforcement Are Dependent on Site Conditions and Depth. Minimum Size as Shown.
5. Dimensions Shown on Walls and Boxes Are Minimum Size. Specific Site Conditions of Boxes and Walls May Require Additional Thickness or Width.
6. Trench Plug to be Placed in Location Shown for Both of Trench and 12" Joints. Above and Below Pipe and a Thickness of 24". Plug Shall be a 10% Bentonite and 90% Clay Mixture, or a Flowable Fill Concrete.
7. Minimum Pipe Slopes

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### Minimum Pipe Slopes

1. L:G Details For Box Shown on Sheet A
2. Box Not to be Placed in Driveways, Roads, or Other Traffic Areas.
**Notes:**

1. If box is cast in place rebar to be placed at 12 inches O.C. E.W. Min./Max.
2. Details for cast in place box see.
3. All pipes in box shall be grouted and watertight.
4. Submit to Canal Company Engineer for review on final dimensions on rebar reinforcement and concrete components.
5. Grate to be galvanized.

---

**Table I**

<table>
<thead>
<tr>
<th>Q (cfs)</th>
<th>H (ft)</th>
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<tbody>
<tr>
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<tr>
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<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>0.6</td>
<td>0.6</td>
</tr>
</tbody>
</table>

**Table 1**

Q=3.367 LHS @ L=3

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**Weir Section**

- Embed weir plate into concrete or bolt plate. Plate to be sealed water tight.
- Baffle may be embedded into concrete or bolted.

---

**Inlet and Outlet Cross Section**

- Install staff gauge with 1/100th foot increments. Bottom of staff gauge shall be placed at the elevation of the bottom of the weir.

---

**Plan View**

- See detail elevation above bank of canal.
- Place outlet near bottom of drain box.

---

**Diagram Notes:**

- Weir plate to be sealed water tight.
- All pipes in box shall be grouted and watertight.
- Submit to Canal Company Engineer for review on final dimensions on rebar reinforcement and concrete components.
- Grate to be galvanized.
**Flume Plan View**

**Notes:**
1. Reinforcing to be minimum of #4 Rebar @ 12 inches on center, each way with 20 inch minimum splice length.
2. Applicant to submit actual plans and material of Flume prior to construction.

**Flume Profile View**

**Table 1: Head-Flow Relationship for Concrete Flume**

<table>
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<tr>
<th>Head (feet)</th>
<th>Flow (cfs)</th>
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<tbody>
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</tr>
<tr>
<td>0.65</td>
<td>0.70</td>
</tr>
</tbody>
</table>

**Note:** This Flume is shown as an example. The exact Flume dimensions & Flow Table to be determined by Applicants Engineer.
**A. Turnout Box Plan**
- Place 3 feet of 6 to 6 inch riprap at end of pipe to prevent scour.

**B. Turnout Box Section**
- Gate must be installed and sealed according to manufacturer's specifications.
- Pipes must be sealed and grouted.
- Secure pipes in place with concrete collar.

**C. Diversion Box**
- Gate must be installed and sealed according to manufacturer's specifications.
- Pipes must be sealed and grouted.
- Secure pipes in place with concrete collar.

**D. Diversion Box Section**
- Gate must be installed and sealed according to manufacturer's specifications.
- Pipes must be sealed and grouted.
- Secure pipes in place with concrete collar.

**E. Grate Detail - Top View**
- Leave opening for valve guide rail.
- Weld 2" x 2" x 2'−6" angle iron to under side for support across corner.

**F. Grating Lip Section**
- Grating to be galvanized.

**Notes:**
1. All pipes into box shall be grouted and watertight with concrete collar.
2. Boxes may be precast or cast in place. Boxes shall have a minimum interior width and length of 6' with minimum of #4 rebar @ 12" O.C. Boxes must be submitted for review.
3. Turnout and diversion boxes shall not be placed in roadway.
4. Grate to be galvanized.
Welded Grating 2" Max. Spacing or Solid Lid Detail. Type of Lid to Be Specified by Engineer.

W2 - 2" Min. Slab or Waterman Gate as Required.

Weir Walls - Detail

Wingwall Detail

Tall Weir Wall Section

Footing Between Weir Walls - Detail

Short Weir Wall Section

Wall Section

Tall Weir Wall Section

NOTES:

1. Minimum of #4 Rebar @ 12 inches O.C. E.W. in Box and Check Structure. Final Dimensions and Reinforcement Must Be Submitted and Reviewed by Company Engineer.

2. Trench Plug to Be Placed In Location Shown For Width of Trench and 12 inches Above and Below Pipe and a thickness of 24 inches.  Plugs Shall Be a 10% Bentonite and 90% Clay Mixture or a Flowable Fill Concrete.

3. All Backfill Material in Canal R.O.W. to be Compacted to 92% Modified Proctor Density.
NOTES:
1. All planned storm drain discharges must be pre-approved and have signed agreement with all parties (including Salt Lake County Flood Control if applicable).
2. Pre-treatment to storm drain pipe discharge is required. Treatment and discharge rate to be determined by applicants engineer and Salt Lake County Flood Control.
3. All storm drain pipes shall be RCP.
4. Drawing is for pipe entering canal at 90°; other dimensions may apply for varying angles.
5. The length of concrete in channel is 10 feet plus the outer diameter of the discharge pipe.
6. Pipe to be cut flush with concrete.

1. June 2010 Update
2. March 5, 2018
3. January 2018 MG, VH Updated