**Installation**

The horizontal section (length to be determined by each specific installation) containing both valves should be prefabricated in a shop.

- Type of installation will be decided at some point (6' to 10' from end) between the two valves. If the entrance end of the pipe (inside structure or dike) is resting on undisturbed earth, then the main length of pipe will be resting on varying depths of new fill. If the fill is not uniformly and well-compacted below the pipe, a settling of the pipe will occur and could cause the safety valve to bind. In addition to good compaction of earth below pipe, a provision on the support should be provided allowing the discharge end of pipe to be lowered if necessary, to reverse the stress on the valve section.

- It is suggested that, when fabricating either the vertical safety or butterfly valves, a short section of pipe be used, length not to be less than the diameter of the pipe. This allows for easier installation of the valves. A simplified field installation could be made using:
  1. Two butt welds.  
  2. Clamping with bands (as shown).  
  3. Fastening together with a continuous flange (not shown).

**Operation**

Clamping valves can be operated either hydraulically or manually (levered).

- The two valves should not be operated with the same hydraulic power source. Manually and/or hydraulically operated valves will provide greater assurance of "shut-off" in case of power source failure.

**Horizontal Valve**

The horizontal end loading valve will be operated with each load. This could conveniently be powered by a hydraulic pump driven by a tractor, small engine or electric motor.

- Two inch diameter hydraulic cylinders are sufficient, but larger can be used.

- Pump capacity of one gpm at 1000 psi is adequate, however, if used with a larger cylinder, operation will be slow.

**Vertical Safety Valve**

The safety valve, preferably located 2' or more below grade in an enclosed chamber, should be manually operated as shown with a lever.

- The initial opening of the vertical safety valve (with no pressure downstream of valve) will require a pipe support at some point. Once pressure has equalized across valve, valve should slide freely.

- Coarse bedding in the manifold might cause some problem in closing the butterfly valve completely. If this occurs, opening slowly to let bedding pass through will alleviate problem. The same is true for the vertical valve.

**Construction Notes**

- All angle steel is 2" x 2" x 1/4" mild steel.

- All welds are continuous.

- Check all pipe for roundness before cutting any material. Some parts may have to be "fitted".

- Pipe wall thickness is not critical; preferably not less than 1/4", when CWP (corrugated metal pipe) is used, special connections, adaptation and welding procedures will be necessary.

- Grease fittings are shown and suggested as a preventative maintenance option. Recommended greasing after each period of use.

- Do not use a cylinder with longer than 10" stroke on horizontal valve. Make sure hydraulic cylinder "bottoms" internally and will not force against valve frame when extended.

- Corner fill gussets (item No. 5) in vertical safety valve must be welded all around and ground if necessary to provide a smooth, flush surface next to slide valve.

<table>
<thead>
<tr>
<th>Item</th>
<th>Horizontal Valve</th>
<th>Vertical Safety Valve</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Angle &quot;</td>
<td>18&quot;</td>
</tr>
<tr>
<td>2.</td>
<td>1/4&quot; x 2&quot; x 2&quot;</td>
<td>24&quot; (1)</td>
</tr>
<tr>
<td>3.</td>
<td>Flat Stock</td>
<td>6&quot;</td>
</tr>
<tr>
<td>4.</td>
<td>Sliding Valve</td>
<td>20&quot; x 42&quot;</td>
</tr>
<tr>
<td>5.</td>
<td>C-Hinge - 1/4&quot; Sheet</td>
<td>2-5&quot; x 10&quot;</td>
</tr>
<tr>
<td>6.</td>
<td>Valve Hole Reinfordcement - 1/4&quot; Sheet</td>
<td>2.5&quot; x 10&quot;</td>
</tr>
<tr>
<td>7.</td>
<td>Corner Gussets</td>
<td>1/4&quot; Sheet</td>
</tr>
<tr>
<td>8.</td>
<td>End Closure</td>
<td>1/4&quot; Sheet</td>
</tr>
<tr>
<td>9.</td>
<td>Pipe, 2&quot; + 2 Caps</td>
<td>24&quot; x 24&quot;</td>
</tr>
<tr>
<td>10.</td>
<td>Cylinder Anchor Plate</td>
<td>24&quot; x 24&quot;</td>
</tr>
</tbody>
</table>

(1) More may be needed if frame is extended to support hydraulic cylinder.
(2) Each square makes two gussets.
(3) These may have to be slightly bigger if pipe is not round.
NOTE:
ALL WELDS TO BE CONTINUOUS ⅛" FILLET WELDS