Secondary Containment

Installation Manual

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Sub-grade Preparation

- Liner installation should not proceed until a proper base has been prepared to install the geomembrane liner. Base material should be free of:
  - Angular or sharp rocks
  - Roots from tree's or brush
  - Grass
  - Vegetation of any type
  - Any other foreign matter
- Base shall be level and or uniformly sloping as indicated on the drawings (as per design requirements). Base area must exceed containment cell dimensions by 1m around the entire containment system.
- Meridian strongly recommends the use of a cushioned geotextile on both sides of the liner to compensate for any irregular surface or lack of compliance with the above guidelines.

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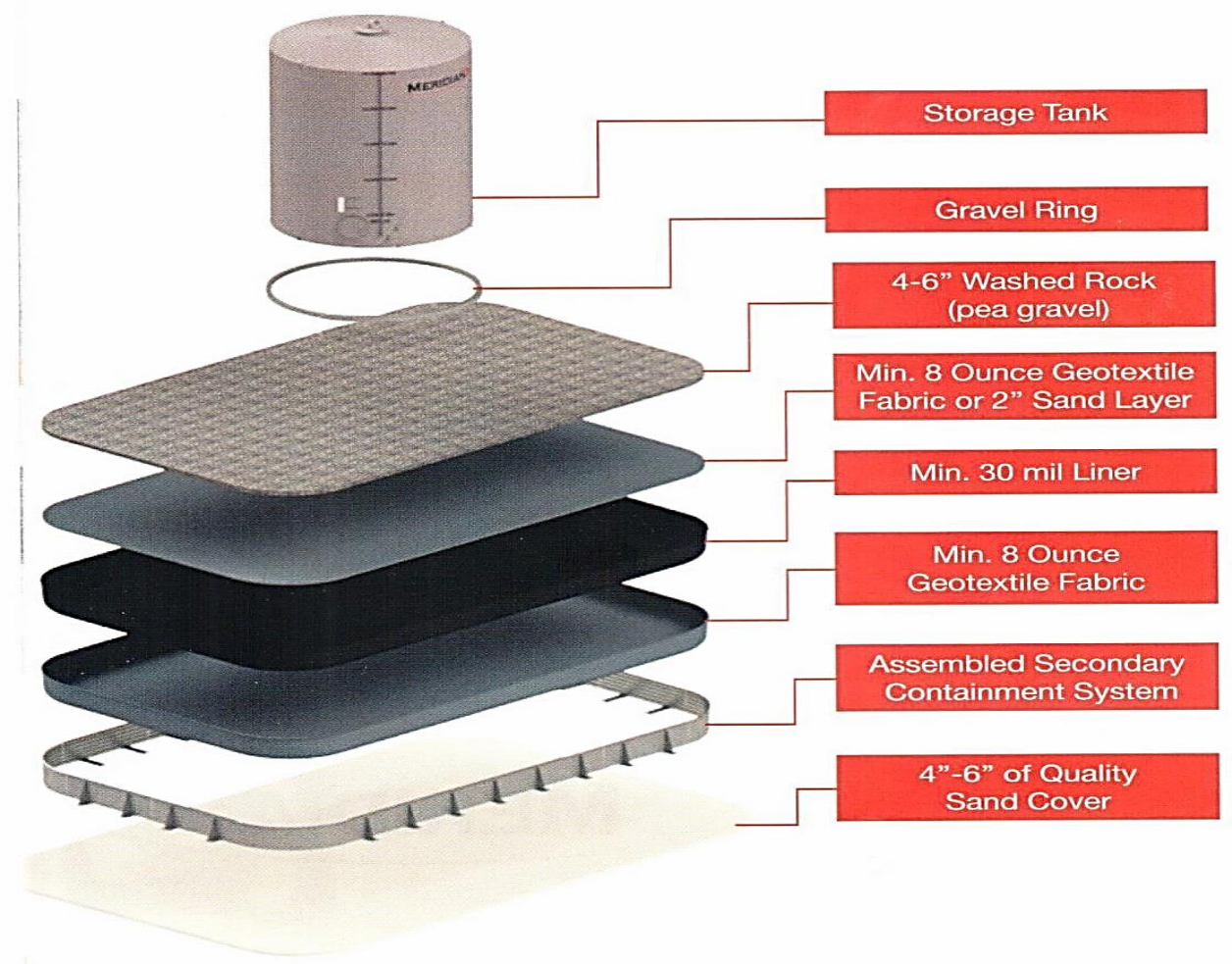
Layers of Protection



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Recommended Installation Equipment

- Transit
- Carpenter's Magnetic Level (6-8")
- Tape measure 100' minimum
- Sockets & wrenches x 2
- Tek screw driver 3/8"
- Industrial grade drill & bits
- Cut off grinder or hack saw
- Impact driver x 2 – battery or electric
- Survey ground marking paint
- Tube caulking applicator (bottom mount liner clamps)
- Heavy duty utility knives x 2
- Sharp one end drift pins x 4
- Spring clamps x 12
- Banding cutters
- Generator
- Skid loader
- Shovel's
- Cut resistant gloves
- Roll of cord and 4 drive in pegs
- Step ladders x 2

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Markings and Layout

1. Using tape measure, string and pegs mark out the containment system, check for squareness
2. Using inverted spray paint, mark out the diameter of the containment system, and brace positioning
3. Roll out and unfold base layer of geotextile
4. Roll out and unfold geomembrane liner
    1. Position liner over any pilings or pipe penetrations
5. Roll out and unfold second layer of geotextile (where applicable)
6. Fold in corners of geomembrane and geotextile as shown in figure 1
7. Folded liners do not need to be exactly as shown in the previous slide, so long as the marked perimeter of the containment is completely exposed and visible.
6. Place geomembrane liner at one corner of the containment cell
7. Unroll geomembrane liner to the length of the containment area
8. Pull liner across width of the containment cell

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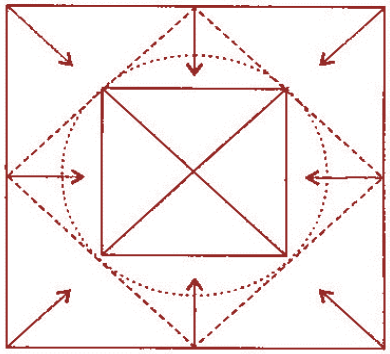
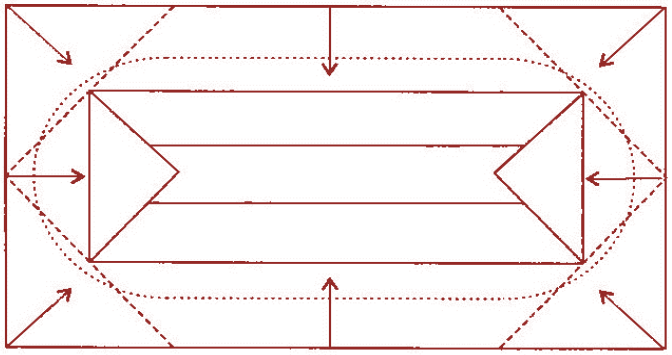
Markings and Layout

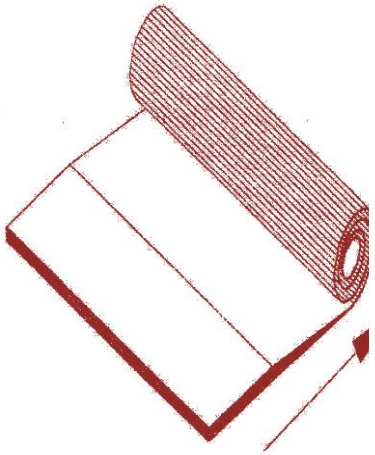
Figure 1

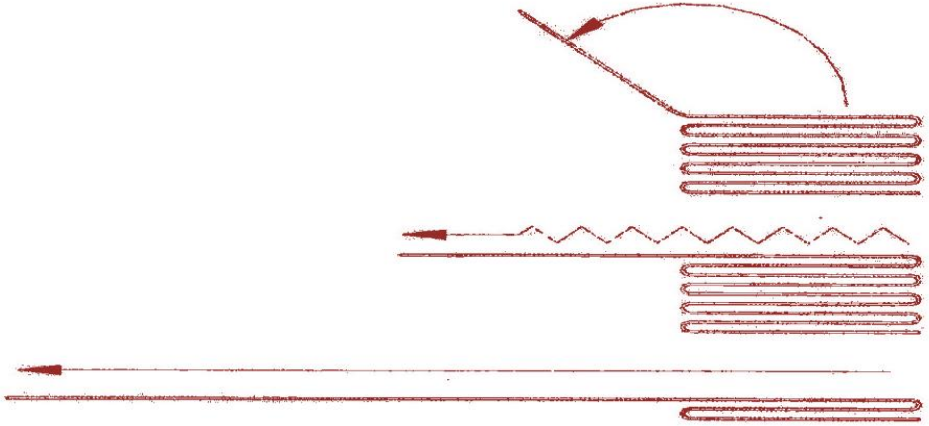


Fold pattern for round and square containment's



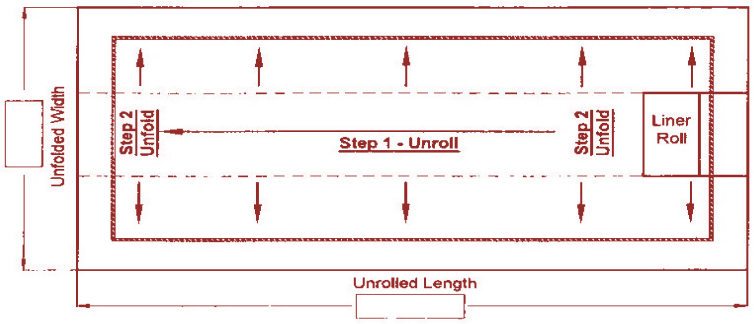
Fold pattern for oblong and radius corner containment's



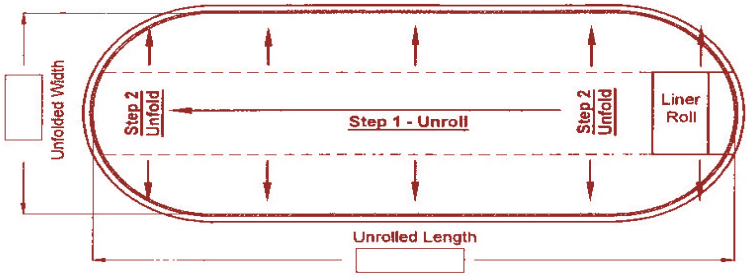


Markings and Layout

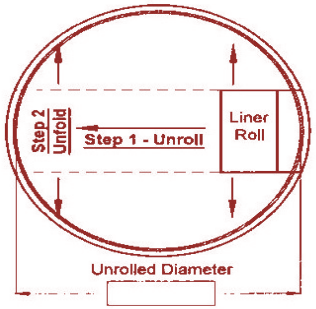
Galvanized Steel Systems (Rectangular)



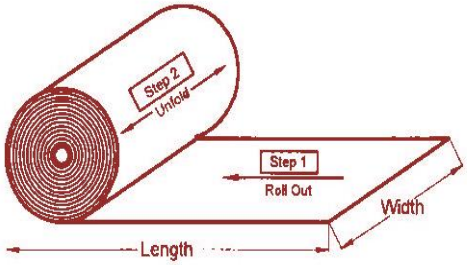
Galvanized Steel Systems (Oblong/Oval)



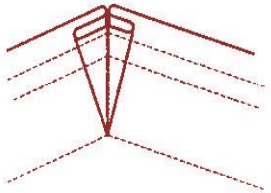
Galvanized Steel Systems (Round)



Typical Roll Shipment



Corner Pleat Fold



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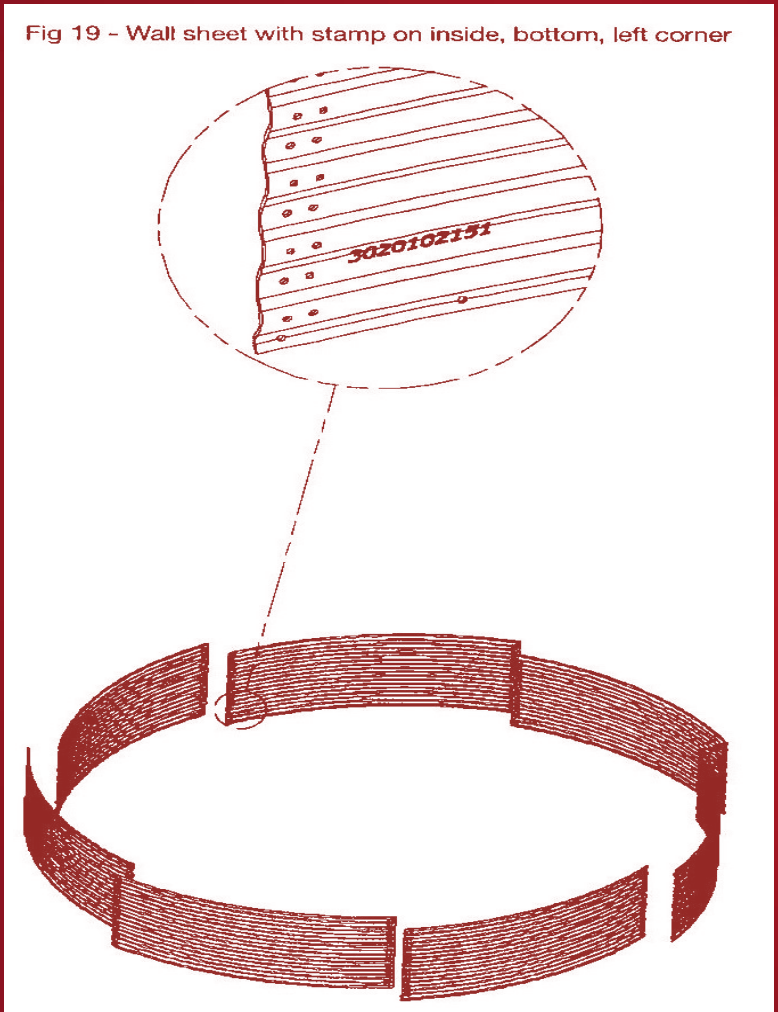
Steel Wall Panel Assembly



- Overlap pattern of wall sheets
- Wall sheet identification stamp

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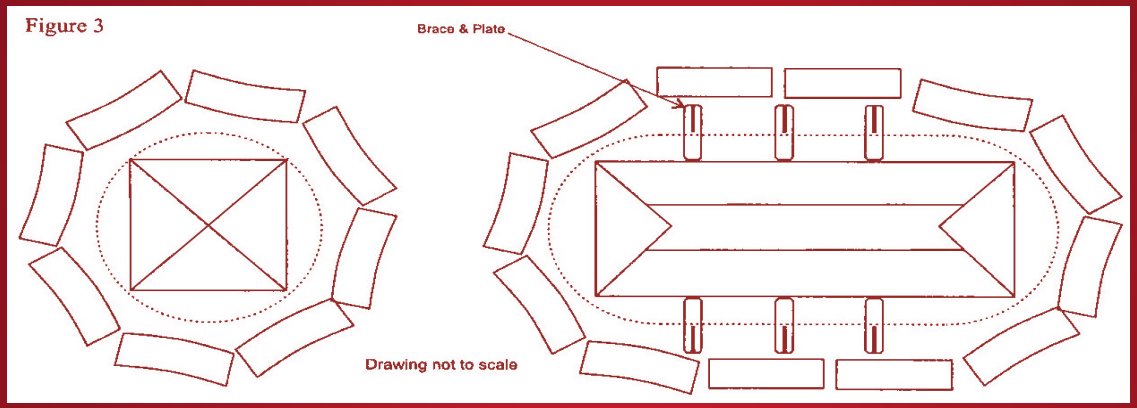
Steel Wall Panel Assembly

- Lay panels around containment perimeter



- Bolt sheets together using nuts and bolts provided (3/8” x 1”)

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Pad and Brace Assembly

- Using nuts and bolts provided (3/8” x 1”) attach brace to pad by aligning the pre-drilled holes in each piece
- Secure the braces to wall panels with self drilling screws paying attention to the layout instructions and spacing (slide 9/10), screw heads must be on the interior of the containment cell, apply poly safety nipple to the exposed sharp screw end on the exterior
- Use a magnetic level to insure the pad and brace is level vertically before attaching

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Pad and Brace Spacing

- Meridian secondary containment (SC) zero-ground disturbance (ZGD) systems are designed to meet Directive 055 (Storage Requirements for the Upstream Petroleum Industry) to protect against primary containment leaks or failures.
- The SC systems are modular in design and can be installed in various shapes, the most common being round, square/rectangle, and oblong.
- Straight wall sheet panels require ZGD pads and braces as part of their design. Please see below for a summary of the location and spacing of the pads and braces.
- Wall sheet panels that are curved (round systems, radius corners, and oblong ends) do not require ZGD pads and braces, unless the curve diameter is greater than 78 feet. In which case, they require the same quantity as straight panels.

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Straight Wall Panel Brace Locations

- Start measurements on the left from the corner or oblong end (where curved panel meets straight panel) to the first vertical brace location. Adjustments should be made so that subsequent braces do not interfere with a wall sheet panel vertical seam, always erring on the conservative side. The spacing from the last brace to the end should be less than or equal to the spacing at the start.
- Panel height 34” with SG ≤ 1.0
  - Start: 38” from corner/end
  - ZGD brace spacing: 76”
- Panel height 47” with SG ≤ 1.0
  - Start: 28.5” from corner/end
  - ZGD brace spacing: 57” Panel heights 17” or 24” with SG ≤ 1.4
  - Start: 38” from corner/end
  - ZGD brace spacing: 76”
- Panel height 34” with 1.0 < SG ≤ 1.4
  - Start: 28.5” from corner/end
  - ZGD brace spacing: 57”
- Panel height 47” with 1.0 < SG ≤ 1.4
  - Start: 19” from corner/end
  - ZGD brace spacing: 38”

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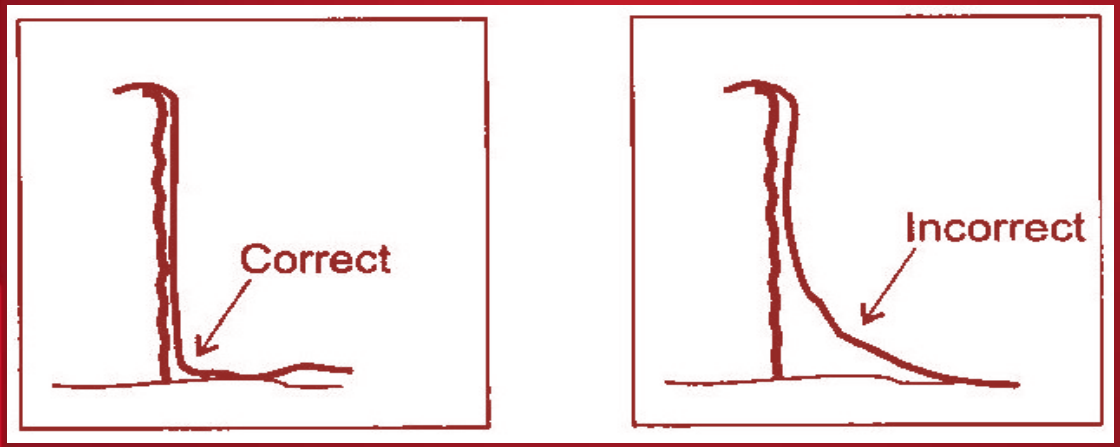
Liner Attachment – Top Mount

1. After containment wall panels, pads and braces are securely fastened and all hardware is tightened, unfold the geomembrane liner and geotextile fabric.
2. Lay the liner and textile over the top of the wall panels making sure to leave slack in all areas and also making sure the liner meets the bottom of the wall panel in all areas and runs straight up the wall vertically before draping over the top of the panel as shown below
3. If your containment system requires pile or pipe penetrations please refer to the liner manufacturers instructions for completing that as this is the time to do that prior to attaching liner clamps.



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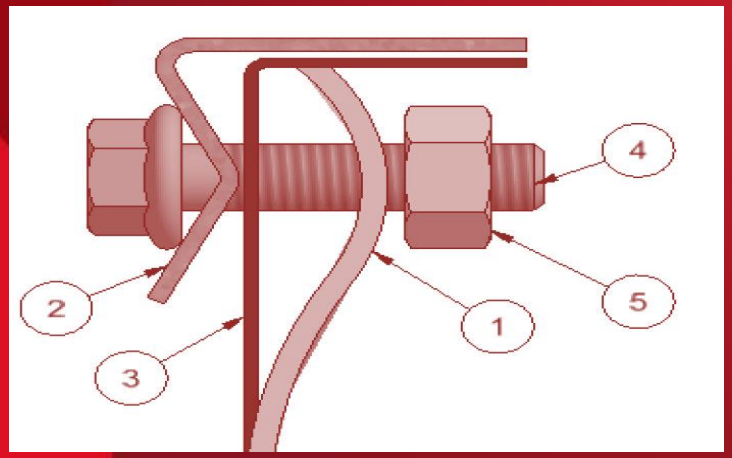
Liner Attachment – Top Mount

4. The liner is mechanically attached utilizing the wall sheet panel (Item 1), a 90 degree angle (Item 2), and 3/8 x 1.5 bolts & nuts (Items 4&5) to sandwich the liner (Item 3) into place.
5. Sandwich the liner with the angle with the flange facing outwards, the V in the angle should allow a fit tight with the corrugation of the wall sheet.
6. Using a punch tool, bore holes through the liner to align the holes on the wall sheet with the holes on the angle.
7. Use the bolts and nuts to finalize the installation, making sure the bolt head is on the inside of the system.



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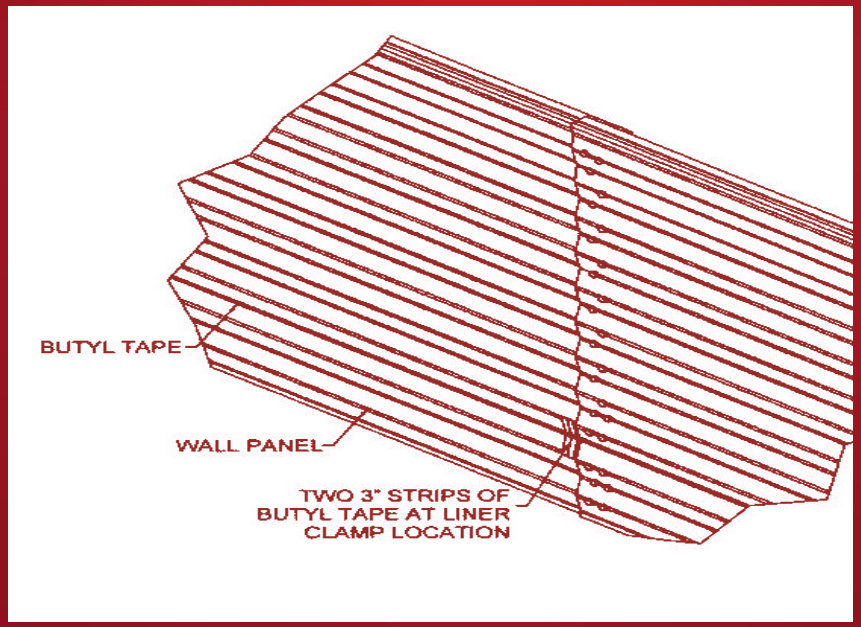
Liner Attachment – Bottom Mount

- Bottom mount liners clamps require (before installing liner) two 3” long strips of butyl tape in the “valley” at the bottom liner clamp location as shown below.
- The butyl strip needs to be butted up against the edge of the overlapping wall panel. You need to do this prior to the placement of the continuous butyl tape strip around the entire cell.



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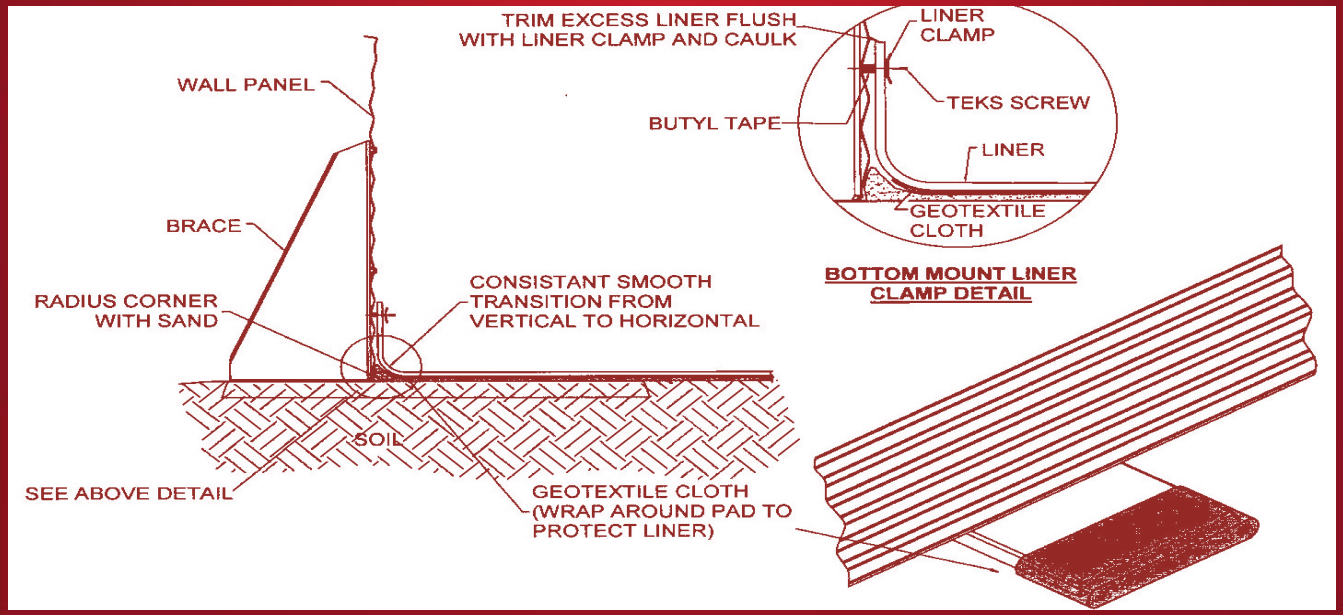
Liner Attachment – Bottom Mount

- The liner must transitioned smoothly from the wall sheet (vertical rise) to the ground (horizontal fall) as shown below.
- After the liner is fully installed and all of the clamps are securely in place, trim away the excess liner, using the top edge of the liner clamp as a guide.
- Apply a bead of Dynomic tube caulking at the wall/clamp interface, all around the containment cell.



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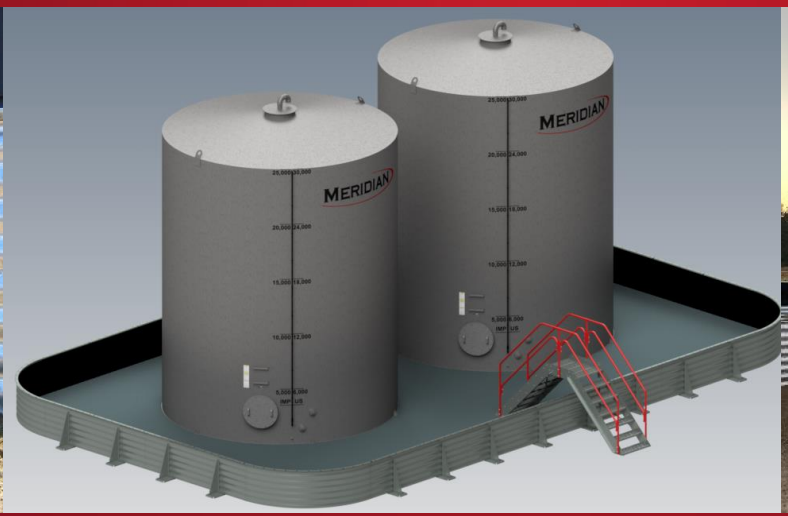
Final Requirements

- Once all top and bottom clamps are securely fastened trim off excess geotextile & geomembrane to achieve a clean look.
- Install any accessories like tank foundation rings, cross over stairs, de-sand doors, etc. at this time (see applicable accessory install manuals).
- Lay down the top layer of geotextile and add aggregate material as required to the inner cell.
- Backfill as needed around the exterior perimeter of the containment system as required.



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