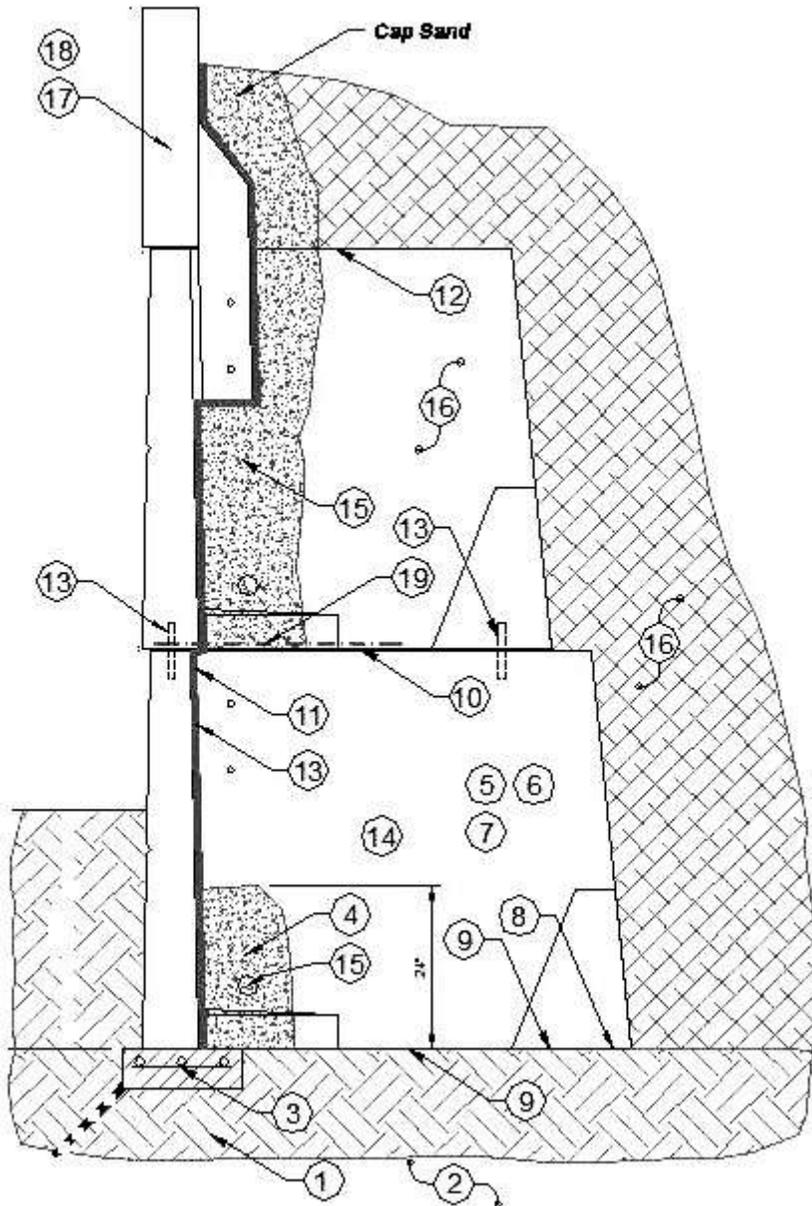




Main Office: 6069 Oakbrook Parkway, Norcross, Atlanta, Georgia 30093, USA, 770 840 7060  
Geissbergstrasse 46 - CH-5408 Ennetbaden - Switzerland Tel. +4156 222 0724 Cell +4179 356 0081  
[www.evergreen-walls.com](http://www.evergreen-walls.com), [jaecklinfelix@netwings.ch](mailto:jaecklinfelix@netwings.ch)

### Notes for Erection of Evergreen Maxi Wall

Retaining Walls for BNSF Project in Nebraska



#### 1. General Notes

- a. **Project drawings** - See project drawings for complete layout of utilities, railroad tracks, existing and proposed structures etc.

- b. **Designer** – Evergreen Walls, Inc., 6069, Oakbrook Parkway, Norcross, Atlanta Georgia 30094, Phone 770 840 7060, Fax 770 840 7069 www.evergreenwalls.com, Felix P. Jaecklin, in cooperation with PE ... registered in the State of Nebraska System Evergreen.
- c. **Precaster and Supplier** - Barbour Concrete Co., 21421 East Truman Road, Independence, MO 64056-2673.
- d. **Precast Evergreen Units** - Supplied by the precaster.
- e. **Precast Shear Keys** - Self aligning devices built into the units.
- f. **Cast in Place Leveling Pads** - Constructed by the contractor, sizes and reinforcing see drawings, min. 16 inches wide and 6 inches deep, grade tolerance: zero plus, minus 1 inch with mortar bed for preventing load concentrations.
- g. **Horizontal Joints** - ½ inch spacing with tolerance +/- ¼ inch.
- h. **Vertical Joints** - ¼ inch nominal spacing with mortar joints for wall protein more than 10 feet below crest of wall. (No mortar joints in upper 10 ft., except for board units)
- i. **Construction** - See Evergreen erection instructions.
- j. **Overall Construction Tolerances for Finished Wall** - Vertical alignment - (plumpness) ¾ inches in 10 ft. Horizontal alignment (Line). ¾ inches in 15.feet.
- k. **Primary Design Reference** - Arema 2002 Manual for railway engineering, AASHTO Standard Specifications for highway bridges, 17th edition 2002.
- l. **Evergreen Wall Description** - Set of units as described in drawings - Panel size 20 x 5 ft. for standard units, board units 1 to 5 ft. x 20 ft. length. Variable stem lengths of standard units depend on height of wall, back slope and loading.

## 2. **Material Notes**

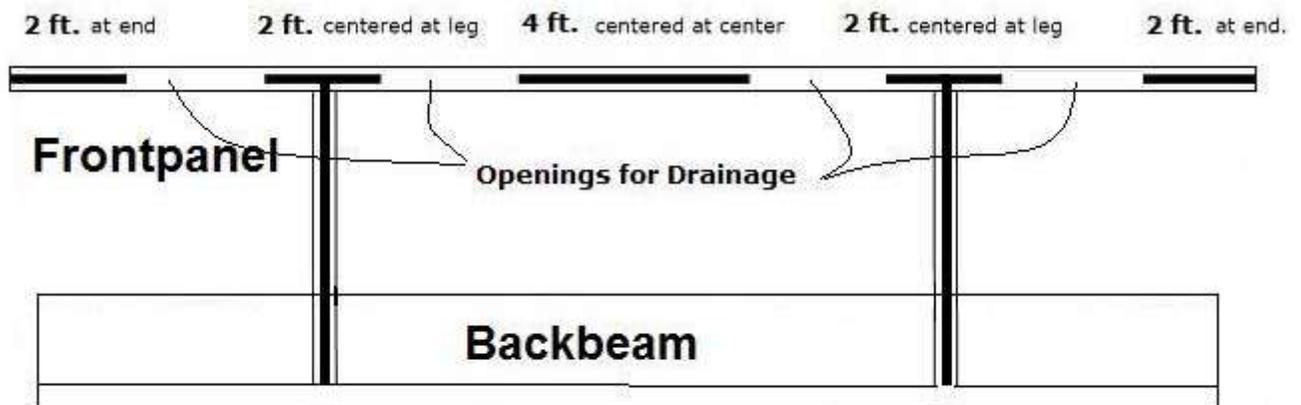
- m. **Concrete** - Precast Evergreen® units - 5000 psi at 28 days with precast shear keys built in of same quality - CIP Leveling Pads 2500 psi.
- n. **Reinforcing Steel** - Precast Evergreen® units - ASTM A515, grade 60 black steel - CIP Leveling pads - grade 60 black steel.
- o. **Joint Material, Vertical Joints**, ½ inch wide x joint height, with filter fabric centered at joint.
- p. **Horizontal Joints** - layer of wet joint filler consisting of 1/3 cement, 1/3 sand, 1/3 water for eliminating load concentrations and providing friction plus filter fabric centered at joint on each Evergreen panel.
- q. **Shear Keys** - Shear resistance from built in by self alignment keys and dowels see drawings.
- r. **Fill Inside of Units** - Use a min. of 1ft. of free draining material next to the front face for preventing water back-up and undrained direct freezing. For the bulk of the fill use regular backfill material, provided fill material shall not have more than 10 to 15% fines passing sieve #200; 100% passing sieve 3 in.  
**If fill contains 15 to 25% fines**, then PL, Plastic Limit, must be below 6 and fraction below 15 microns shall not exceed 15%.
  - This means that silt or clay materials are not acceptable, for their poor compaction and drainage capabilities.
  - No select fill is required, provided the fill material inside of precast units is max. + 2% off optimum water content and provided it reaches a friction angle after compaction of min. phi = 35° degrees.
  - Fill in lifts of about 15 inches, thus min. 4 lifts per unit.
  - Compact to min. moist density of 118 pcf, which may result in min. 90%, max. 95% relative density measured at the center of the units.
  - Moist density is important, not relative density. Thus most excavation material of proper water content is allowable.

### 3. Erection Procedure

- a. Foundation Excavation** – provide a min. 3 feet deep structural fill as shown on drawings.
- extend structural fill laterally min. 3 feet beyond the edges of the lowest wall unit.
  - The fill material should be compacted to min. 95% relative compaction.
  - In some cases drawings indicate that the fill material extends further out and deeper.
  - Foundation excavation must reach well bearing soil as approved by the engineer.
  - Excavate deeper as approved by the engineer as noted in the specs and as suggested by Geotechnical Services, Inc.
  - Use Gophers as defined by the engineer.
- b. Sub-Ground Requirements** - Any soft, wet or organic or otherwise unsuited material encountered in the footing area shall be removed and replaced with a minimum of 3 ft. of structural fill as defined in the specs.
- Minimum requirement material beneath foundation depends on project design as shown in the typical drawing (friction angle  $\phi = 35^\circ$ , cohesion  $c' = 0$ , gamma moist = 120 pcf. Excavate to the top of the area be covered by Evergreen wall.
  - Then compact sub grade to 95% modified proctor density (AASHTO T180), or provide foundation remediation as recommended.
  - The sub grade level of the wall and embankment shall be proof rolled prior to backfill of wall.
  - Unstable areas discovered during proof rolling shall be compacted to suitable state or undercut and replaced with compacted granular fill as directed by the Engineer.
- c. Leveling Pads** – Excavate top of structural fill, place reinforcing bars and
- pour concrete foundation leveling pads on full length of front face with min. 2500 psi concrete and grade 60 rebars.
  - Place reinforcing bars as specified and cast concrete directly against excavation with finished top to ensure proper grade and elevation.
  - Tolerance for top of leveling pad is zero plus, to minus 1 inch.
- d. Drain Pipe** - Use continuous foundation drain min. 4 in. pipe PVC, schedule 80 or equal
- Place with a longitudinal grade min. 0.5% and
  - add min. of 12 in. of free draining material,
  - cover drain material by a Geotextile.
- e. Start Erection** - Start erection of each wall directly adjacent to bridge abutments, next to existing structures, or at lowest foundation elevation, as indicated on the drawings for proper adjustment and alignment.
- f. Adjustments** - Walls are designed to stand vertical after erection with front face units flush.
- Lowest Evergreen unit shall be adjusted with small wooden wedges and mortar beds using engineer's level to set front parts level and legs at slant for proper wall batter if applicable within 1/8 in. tolerance.
  - Consider future slight turning of gravity walls during backfilling, compaction and settlement during or shortly after construction by placing the wall with a minimum batter, correcting itself to some extent by natural settlement and backfilling operation.
- g. Shims** - Plastic, Neoprene or steel shims or any other material more slippery than concrete or mortar or material with less than  $35^\circ$  friction angle are not allowed, since friction is needed for the transfer of lateral earth pressures.
- Any joint shim that may transfer permanent loads instead of transferring such loads through the joint material is not allowed.
  - Place first unit on dry pack fast set mortar.

- If foundation level was built within tolerance of plus zero, minus ¼ inch, then use wooden wedges and thin mortar beds pushed under the legs until mortar is visible on the other side.
- h. Final Adjustment for Verticality** - When the entire row has placed, sight down the top front edge of the units, adjust and shim those units still not properly aligned.
- i. Mortar Beds for Upper Units** - Place upper units placed on thin mortar beds.
  - Use wooden wedges as needed for adjustments.
  - Upper units, less than 10 ft. from the top, do not need mortar beds, provided units have smooth contact surfaces.
  - Board units need continuous mortar beds in any case and wooden shims as needed.
  - Do NOT use plastic shims or metallic shims.
- j. Geotextile to Cover Joints** - Cover vertical and horizontal joints between precast concrete units with Geotextile pieces before backfilling to prevent loss of fill material.
- k. Compact Fill Inside of Units First** - The Evergreen wall and the backfill shall be built up simultaneously.
  - Always fill inside of units first and compact, then backfill behind units and compact,
  - This helps for preventing elements from sliding.
  - It is desirable to keep the elevation of the fill behind the wall shall about within 2 feet of the fill inside the units.
- l. Backfill Behind Wall** - Remove debris and topsoil before backfilling.
  - Add finger drains of min. 1 x 1 ft. or geotextile or drainage sheet behind wall to intercept seepage water as directed by the engineer.
  - Add additional drains at wet spots behind the wall and across the wall as weep holes.
- m. General Backfill Requirements** - Fill (backfill BEHIND walls in lifts of max. 15 in.:
  - keep fill dry with a water content for compaction within + 2% off optimum water content
  - compact to min. 118 pcf, about 90 max. 95% relative density measured within 4 ft. of back of wall.
  - Do not use heavy equipment in this area within 4 ft.
  - Further away compact with heavy equipment to min. 95%, max. 98% relative density.
  - Soil properties of backfill must conform to minimum requirements of design as shown on the typical section (friction angle  $\phi' = \text{min. } 35^\circ$ , cohesion  $c' = 0$ , gamma = min. 118pcf).
- n. Evergreen Erection Instructions** - The contractor shall consult and follow the 'Erection Instructions for Evergreen Walls' and Specifications as provided by the manufacturer.

**4. Mortar Bed Locations (on Top of each Evergreen Maxi Unit)**



Front face of Evergreen Maxi 5 x 20 ft.

Dashed line: back beam, not seen

The mortar beds provide 4 x 2 ft. openings for drainage after heavy rains.