EVERGREEN®

EVERGREEN WALLS, INC.

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EVERWALL RETAINING WALL SPECIFICATIONS

1. General

a. Product's designated design consultant to prepare the design calculations of Everwall in accordance with the guidelines specified herein and as indicated on the Standard Detail Drawings. Submit design procedures as permissible variations other thon those contained herewith for approval to the Bureau of Design.

b. The Everwall Retaining Wall design consultant takes full responsibility for the engineering theory, calculations, correctness, and ensuring all design assumptions are validated in the contract documents, either by needed details or construction specifications.

c. Secure District Bridge and Geotechnical (Soils) Engineer's approval before incorporating (Everwall in on project,

d. Limit Everwall Retaining Walls to wall heights as follows:
Everwall Retaining Wall 43'

2. Design

a. Provide at no expense to the Deportment four sets (three sets to District and one set to Central Office Bridge Division) of construction drawings (22"x34') (594x841), calculations, erection methods, and detailed erection calculations, evection methods, and detailed erection methods prior for approval.

- Provide approved drawings, using Department drafting standards.
- Show a professional engineer's seal licensed in Connecticut with valid signature in ink, the date signed, a business name and a business address on the first sheet of the design drawings,

b. On the first sheets of the computations show a professional engineer's seal (Licensed in Connecticut), signature and the date signed.

- Everwall Retaining Wall parameters and other limitations on fill height ore as per manufacturer's standard drawings.

c. In the event that certain design parameters, stresses, or specifications are in conflict, the following order of performance governs:

1. Design requirements listed in "Special Drawings and Specifications' Design Requirements" of the special provision.
2. Design related strike-off letters in effect on the date of project advertisement.

3. DOT Design Manual on Structures.
4. DOT Design Standards.
5. AASHTO Standard LRFD Bridge Design Specifications (1998 Second Edition and approved Interim Specifications)

d. In the event that a clear order of predominance cannot be established or a difference or a divergence in the interpretation of the design connote be solved, the Chief Bridge Engineer will arbitrate and make a final decision.

e. Comply with the design criteria in Design Manual, the AASHTO LRFD Design Specifications for Highway ridges and as specified, subject to exceptions and /or additions under: "SPECIAL DRAWINCS AND SPECIAL DESIGN REOUIREMENTS".

f. Bearing capacity and overall stability: Consider every Everwall module, 10' x until depth, acts as a rigid body in the determination of bearing capacity and overall stability with the follow resistance factors:
- Bearing Capacity: 0.45
- Sliding: 0.9
- Overall Stability:· 0.85 (strength limit state)
  0.65 (service limit state)

g. Do not change bottom of Everwall Foundation Unit elevation unless authorized by the District Bridge Engineer / Distinct Geotechnical (Soils) Engineer.

h. Based on the field condition, provide
- A 6" (152) diameter foundation drain into the two -foot (610) minimum width of select backfill, wrap select fill (not pipe) with Geotextile fabric, Class 1, behind the wall to improve drainage conditions.
- Direct seepage from foundation drain to storm water conveyances or provide 4” (102) diameter weep hole at every Everwall unit with a 2 ft by 2 feet (610) No. 57 Coarse Aggregate wrap with Geotextile Class 2. Type A (Pub 408. Section 735).

i. Place bottom of Everwall foundation Unit on a concrete foundation or on frost proof, compacted select fill material or at a minimum depth of 3 ft. (915) below the finished ground elevation.

j. Place Everwall Foundation Units on a Class A Cement Concrete footing if Ever wall units ore to be used for the construction of bridge abutments.

k. Provide a single faced concrete barrier in front of the wall (for traffic protection if required).

l. Provide the following material for precast concrete walls:
- Minimum 28 day strength of concrete, fc = 5.000 psi (34.5 MPa).
- Chamfer all exposed edges 1" x 1" (25x25) except as noted.
- Reinforcement Bars:
  - Grade 60 reinforcing steel bars that meet the requirements of deformed billet - steel bars (ASTM A615), or low alloy deformed bars (A706).
  - Do not weld Grade 60 reinforcing steel bars unless specified.

- Grade 40 reinforcing steel bars may be substituted with a proportional increase in cross sectional area.
- Steel Welded Wire Fabric: AASHTO M55 (ASTM 185)
- Epoxy coating (when indicated), ASTM A884/AB84M. Type 1

m. Modify the top unit of Everwall panel by the following options if required to match the finished ground surface:
- Extend front -face panel of bock wall unit for the height varying from 0' to 3'-6" (1066).
- Saw cut standard Ever wall Unit by boxing out the vertical panels and front face panels of Everwall unit in the mold to cast triangular faced precast units, or cast 2' (600) high or 3' (9OO) high Everwall Unit with front faced panel extension with height varying from 0' to 3'-6" (1066) maximum.

n. All dimensions for metric unit ore in millimeter unless otherwise noted. Metric mm (millimeters) units are in parentheses.
- Either all metric or all English values must be used on plans.
- Metric and English values shown may not be mixed.

CONSTRUCTION SPECIFICATIONS for EVERWALL RETAINING WALL

I. DESCRIPTION

- This Work is the designing, furnishing, and erecting of Everwall Systems used as retaining walls.
- These systems, some of which ore propriety, consist of precast concrete units erected to form a gravity retaining wall.

II. MATERIAL

a. Provide materials and workmanship in accordance with Publications, and as specified herein.

b. Everwall Units. Furnish precast wall units in Accordance with Section, except provide concrete for precast wall units having a 28-day minimum compressive strength of 5’000 psi (34.5 MPa) when tested in accordance common concrete standards.

Place reinforcement and handling devices. to the dimensions and tolerances indicated or as approved by the Engineer, prior to casting.

1. Testing and Inspection - Acceptability of the precast wall units will be determined on the basis of entrained air contend testing of the concrete mixture, compressive strength testing, and visual inspection.

- Furnish facilities for the Department to perform all necessary sampling and testing in on expeditious and satisfactory manner.
- Acceptance will be as herein specified.
- Acceptance of Everwall units with respect to compressive strength will be based on the results of production lot testing.
- A production lot is defined as the wall units represented by one day’s production.
- Four cylinders per foot will be selected in accordance with PTM No. 601.
- Cylinder specimens will be cured with the product and tested in accordance with PTM No. 611.
- Acceptance will be based on compliance with the requirements of Sections 714.4(b) and 114.7(0), except the 101 compressive strength will be determined as the average of the compressive strength testing of 2 cylinders and no individual test result may be below 3400 psi (23 MPa).
- Acceptance with respect to visual inspection will be based on compliance with the requirements of Section 7l3.2(d).
- In addition. precast wall units may be rejected for color or texture variations of the front face due to excess form oil or other causes.
- Completed Everwall units will be inspected before shipment, and cracked, damaged, or otherwise unsatisfactory units will be rejected.
- Properly patch all excessive voids and other defections on exterior surfaces in accordance with the approved Quality Control Plan.
- Repairs and repair procedures require the approval of the Engineer.

- Mark rejected precast units with the words "Rejected for Deportment Use" using waterproof point.

2. Forms - Construct forms of steel in a manner that assures the production of uniform units, and leave forms in place until they can be removed without damage to the unit.
- Replace damaged forms or forms having a deteriorated surface.

3. Mixing and Placing Concrete - Mix and deliver concrete as specified in Section 704.
- For transporting, placement, and consolidation of concrete, use methods that will prevent segregation of concrete.
- Use methods that will prevent segregation of concrete materials and displacement of steel reinforcement from its proper position in the form.
- Do not place concrete when ambient temperature or below 40 degrees Fahrenheit (5 degrees Celsius) or oboe 100 degrees Fahrenheit (38 degrees Celsius).
- Do not use admixtures containing chlorides.

4. Casting - Carefully place concrete in the forms and vibrate sufficiently to produce a surface free from imperfections such as honeycombing. Segregation, or cracking.
- Use clear form oil from the same manufacturer throughout the entire production of units.

5. Finish - Provide a conventional surface finish unless otherwise indicated.
- When a special or decorative surface finish is required, display for approval a typical sample of the precast unit, showing the color, the texture, the end finish intended to be used prior to standard production of units.

6. Curing - Cure units in accordance with Section 714 and the approved QC for the period of time required for the concrete to obtain the specified minimum compressive strength.
- Control curing unlit! a compressive strength of 3.400 psi (2.3 MPa). 80% fc', is achieved.

7. Tolerance - Manufacture all units within the following tolerances:
- General dimensions, position of lifting devices within 1 inch (25); (other dimensions within 1/4 inch (5).

- Unit dimensions: Not to exceed 1/2 inch (13) as determined by length and transverse width near the legs.
- Unit surface finish: Not to exceed 1/4 inch (6) on smooth formed surface measured over a length of 5 feet (1500).
- Location of reinforcement steel: Cover tolerance; Minimum 1/4 to + inch (6 to 13). Otherwise within plus or minus 1/2 inch (13).

- CI ACI 117. (Others not specified).

8. Marking - Cleary scribed or point with waterproof point on the interior surface of each unit the date of manufacture, lot, production number, piece mark. and QC inspection date, and stamp.

9. Handling, Storing, and Shipping - Handle, store, and ship all units in such a manner as to eliminate the danger of chipping, cracking, fracture, excessive handling stress,

- Do not ship units until the 28-day minimum compressive strength is attained.
- Provide 24-hour advance notice of loading and shipping schedule.
- Repair or replace only unit damaged during handling. Transporting. , or backfilling. or on)' unit that cannot be placed satisfactorily in the in accordance with the approved Quality Control Plan.

(c) Cement Concrete: Section 704. Use Class M Cement Concrete far single face barrier, backwall, check walls, capping, curbs, parapet, barriers, and moment slab, and Class A Cement Concrete fore cast-in-place footing, beam pedestals end abutment cap beams, if required.

(d) Reinforcement Bars - Grade 60. Section 709.1(a)1, except No. 3 (No. 10) stirrup bars may be Grade 40.

- Provide epoxy coated reinforcement bars, as specified in Section 709.1(c), for cast-in-place or precast single face concrete barrier, and precast wall unit if indicated and specified.

(e) Steel Welded Wire Fabric - Section 7093.

(f) Joint Filler

- For Expansion Joint Material - Section 705.1
- For Horizontal Joints:
  - Provide a thin quick set mortar meeting the requirements of Section 100,1.2(d) on the full contact surface of precast concrete units and the footing, if required, where the Everwall Foundation Units are placed.
  - For joints under the first unit:
    Provide a joint filler consisting of 1/.3 sand, 1/3 cement on 1/3 water and accelerator.
    For joint exceeding ¾ inch: mix a 'dry pack' or rather stiff consistency.

(g) Granular Fill Material for Everwall Units

- Provide the granular fill materiel to meet the following requirements for the Gradation as determined by AASHTO - T27:

Sieve size	Percent passing
3 inches (75)	100%
No 200 (77mu m)	10-25%

- Granular Fill Material for Everwall: Type 2A Material – Section 703

- Granular Fill Material for MSE wall with Everwall units (using geogrid reinforcement)

Sieve Size	Percent Passing
3 inches (75)	100%

¾ inches (19)	20-100%
No. 40 (450 mu m)	0-60%
No 200 (75 mu m)	0-5%

(h) Select Borrow Excavation

- Structure Backfill as shown on the Standard Everwall Drawings.

(i) Structural Foundation Drains - Section 610.2(0).

(j) Geotextiles **-** Class 1 and Class 2. Section 735.

(k) Aggregate

- Coarse Aggregate No. 5 - Section 703.2.
- Coarse Aggregate No. 57 - Section 703.2.
- Coarse Aggregate No. 2RC - Section 70.3.3.

(l) Styrofoam

- ASTM e578. Type I, except limit the water absorption to 2% by volume.

(m) Waterproofing - Sector 680

(n) Close Cell Neoprene Sponge - Section 1107.02 (n) 1.

(o) For Corner Connection

- Expansion Bolts - Section 101 7.2(h)
- Carbon Steel Bent Plate - Section 1105.02(0)
- Galvanizing - Section 1105.02(s)

(p) For M.S.E. Wall Construction

- Reinforcing Mesh. Galvanizing - ASTM A82, A 185 and Section 1105.02(s)
- Clevis Loop, Galvanized - ASTM A82. A 185 and Section , 105.02(s)
- Connector Bar. Galvanized - ASTM Aa2, Section 1105.02(5)
- Reinforcing Strips Galvanized - ASTM A5 72. Grade 65 and Section 1105.02(s)
- Everwall Tie Strips - ASTM A570. Grade 50 and Section 1105.02(s)
- H.S. Bolt. Galvanized - Section 1105_02(d)3 and Section 110S.02(s)

III. CONSTRUCTION SPECIFICATIONS FOR EVERWALL RETAINING WALL SYSTEM

(a) Shop Drawings.

- Prior to fabrication, submit and obtain approval for shop drawings.
- Show complete fabrication details and dimensions.
- As well as handling, transportation, and construction procedures for all Everwall units.

(b) Excavation and Foundations.

- Grade The structure foundation level, or
- Indicate slope for the width required or as indicated in accordance with Section 203.
- Prior to wall construction. except where constructed in rock, compact the foundation with a smooth wheel vibratory roller.
- Remove any foundation soils found to be unsuitable and
- replace it with granular material 2RC or directed.
- Excavate in accordance with Section 204,
- To the limits and construction stages indicated.

- Do not begin wall erection until the foundation has been approved.
- Construct the concrete leveling pad or footing or
- Construct No. 57 coarse aggregate leveling pad as indicated and specified in applicable portions of Section 1001.3. to the dimensions and details indicated and within the right-of-way, prior to placement of precast wall units.
- Construct in conformance with the grades and cross slopes indicated.

- Place the bottom of the footing or the bottom of Everwall Foundation Unit at a minimum depth equal to prevailing frost depth but not less than 3 feet (915) below finished ground elevation. unless otherwise indicated.

(c) Wall Erection.

1. **Install Everwall** units as shown on the approved shop drawings and in compliance with the lines and grades as indicated.
   - Erection of units typically should begin or the lowest elevation and proceed laterally along the wall length.
   - Where the wall meets a fixed structure or a critical location, such as a bend point, erection should begin or that point, provided the site configuration is suitable.
   - Set Everwall units of the front faces in line with the plan layout of the structure.
   - For vertical walls set the front faces of walls in vertically.
   - For battered walls set Everwall units at the batter rate of the structure using an engineer’s level.

- Adjust first level of units using small wooden wedges or shims.
- Do NOT use plastic shims or metal shims, because they never transfer the load to the mortar beds.
- Adjust first level of units to proper wall batter within 1/8 inch tolerance for easing erection of upper units. Take special care to set first layer of units to true line and grade for that reason.
- Push 'dry' fast setting mortar under the legs to ensure proper and extended contact surface area or use ample amount of fast set mortar.
- Gauge vertical joint width with a flat piece of wood to prevent damaging the units while setting.

2. Install Foundation Drain behind the wall as indicated or as shown on the approved shop drawings.

3. Special Handling of Units

- Use long suspension gear with minimum angle of 1: 1 = 45 degrees or steeper.
- Use special gear with 4 point equal suspension for stripping element from mold, never 2 or 3 points only.
- Use 4 point suspension for any later handling or hang units at transverse beams.
- Prepare three point stock pile wooden pads in yard and on site to ovoid twist and creep in green concrete units.

4. Erection of Wall Units

- Use wooden sticks or similar tools to push joint filler under the bearing surfaces of the first Everwall unit, including the front leg after careful shimming of the first Everwall unit to proper elevation and exact wall batter.
- Place other levels of Everwall units: on a thin quick set mortar on the full contact surface, Use dowels or connecting shear blocks to prevent dislocation, except for three(3) top rows and except Everwall Units cast face down, i.e. with (exact) steel formed contact surfaces.
- Use Geotextile. Class 2. Type A, to bridge the joints between the Everwall Units to the front face of units to prevent erosion.

5. Corners

- Where walls join to on angle. Produce to saw-cut modified units corner use corner inserts of precast units or cast-in-place concrete units to provide neatly joined corners preventing fill erosion. lf corners ore foreseen Then start erection at the corner and proceed away from 11. wherever possible.
- Where a wall is curved in plan view to a radius of less than 100 feet (30'000), provide special elements or saw-cuts made where necessary, to ensure that the gap between two elements does not exceed 1 inch (25mm) or additional joint ports ore to be added to bridge the gap (thin pieces of non-corrosive material).

(d) Backfilling

1. **Compact fill backfill material inside of units** and within a zone of 4 feet (' 200) to a minimum of 90% and 0 maximum of 95% dry density as determined by ASTM Test 01557.
   - Do not over compact 10 ovoid damage 10 units.
   - Fill and compact each unit with specified backfill material in equal lifts of each successive course of precast wall units.
   - Do not overfill Everwall Units.

2. **Place structure backfill material behind the wall** within the limits shown 00 the Standard Drawings. as indicated or as directed.
   - in accordance with the requirements of Section 1001.3 (t).
   - except the 10-doy waiting period is not required.
   - Limit the placement of the structure bockfi!1 in maximum Il-inch (305) thick lifts and
   - compact to a minimum 90% or to maximum 95" of maximum dry density
   - as determined by ASTM Test 1557 with 4 feet (1220) from the backside of the wall.
   - Do not use heavy equipment in this area.
   - Compact structure backfill beyond 4 feet (1220) from bock of wall units in accordance with Section 1001.3 (I).

3. **Build up the Everwall units and backfilling simultaneously** to ensure that the elevation of the fill behind the wall and the fill within the units do not differ by more than 30 inches (762).
   - Fill the units first and behind the wall second to prevent the units from sliding,
   - At the end of each day slope the last level of backfill away from the wall in order to direct runoff away from the wall face.
   - In addition do not allow surplice runoff from adjacent areas to enter the wall construction site.

4. **Do not disturb the alignment of the Everwall** units during backfilling and compaction operations.
   - Remove and replace any wall materials which become damaged during backfill placemen.
   - Correct any misalignment or distortion of the wall units due to placement or backfill.

5. **Compaction Requirements**
   - Unless otherwise specified by soils report ensure compaction within the Everwall unit framework to a minimum of 90% relative compaction per ASTM 01556
   - Compaction tests shall be taken at the center of the Everwall units, approximately third of the distance from the back.

6. Tolerances of Finished Walls

The finished front face of the wall shall be as shown on the project plans, within the following tolerances:

(1) Variation in any course:
- Not more than 1 inch (25) variation from 1 foot (300) straight edge.

(2) Relative position of adjacent in any one course in plan or elevation:
- Within 1 inch (25) of true alignment.

(3) Variation in front batter slope from design slope:
- + or – 1 inch (25) of true alignment

(4) Variation within batter slope
- Not more than ½ inch (13). From a 10 foot (3050) straight edge.

(5) Variation from plane surface along the wall for straight walls:
- Not more than ½ inch (13) from a 10 foot (3050) straight edge.

(6) Opening of gaps between elements:
- + or – 2 inches (52) except in curved areas + or – 4 inches (104).

(e) Technical Assistance

- Arrange for a company representative to be present at the project site to assist the fabricator, Contractor. and Engineer until they are familiar and confident in casting, installation, and erection procedures.
- Arrange for monthly visits to the project site by a company representative and or engineer during wall construction.
- Provide a technical representative to assist in the event unusual problems or special circumstances arise.

MEASUREMENT AND PAYMENT

Everwall Retaining Wall System - Square Foot or (Square Meter) measured along the slanted wall face from the top of foundation to the top of the highest unit measured along the slanted face if battered.