This Construction Manual is intended to provide guidance to the Contractor and Construction Administration Personnel for the planning, construction and erection of the ELEVATE, LLC Precast Concrete Counterfort Wall System. The manual is also intended to promote uniformity in the application and delivery of this product to achieve a desired level and standard of quality on each completed project.

This Manual is written to be compatible with the American Association of State Highway and Transportation Officials Design Specifications, 2012. However, it is not a contract document. Contractor obligations referred to in this Manual must be stated or implied by actual contract language.

It should be noted that the Contractor or Construction Administrator will encounter situations during the administration of the contract which are not fully covered by this Manual. In these instances, it will be necessary to use common sense, experience, or seek advice from ELEVATE, LLC or the local licensed structural engineer contracted for the project in question. Although having a standard, documented process is an objective of this Manual, it is not intended to discourage innovation and the appropriate response to unique situations that may occur. However, the Contractor and/or Construction Administration shall make ELEVATE, LLC aware of any modifications to the Precast Concrete Counterfort Wall System and shall take liability for any such changes.

This Manual belongs to ELEVATE, LLC and will be required to be updated periodically in order to maintain a useful and reliable resource that is current with the regulating codes, specifications, and methods to reference for the construction of the Precast Concrete Counterfort Wall System. Therefore, amendments will be made as revisions to this manual with the cover sheet dated accordingly. Users are encouraged to submit suggestions for improvements to this Manual through the construction process of their specific projects and should know that the most current revision to this Manual will be posted on the ELEVATE website at www.elevateinfrastructure.com.

Sincerely,

Tom Heraty
ELEVATE, LLC
2495 West Bungalow Road
Morris, IL 60450
The contents of these drawings are the property of ELEVATE, LLC and are proprietary and confidential. These documents shall not be disseminated for any other use, without the written consent of ELEVATE, LLC. If you receive these drawings in error, return to sender without reading, copying, or disclosing the contents.

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PURPOSE
This construction manual is designed to provide general information and assist in the proper techniques required to build a ELEVATE, LLC Precast Concrete Counterfort Wall System. Look to our website www.elevateinfrastructure.com or a local Licensed Structural Engineer under contract for the site specific project for additional information not included herein. Building structurally sound retaining walls requires a high level of care and expertise that begins with a thorough review of the site and knowledge of this system.

CONSTRUCTION RESPONSIBILITIES

ELEVATE, LLC
The following ELEVATE, LLC representatives may assist the owner, contractor and construction administrator in scheduling of materials, construction procedures, contract documents, plans and specifications. The representative is available to assist and train the contractor and inspectors as requested and necessary.

Engineer or Owner
Engineer or Owner is responsible for the enforcement of the contract documents, plans and specifications. Owner shall employ services of a material engineering firm to provide quality control testing during embankment construction.

Owner and Engineer shall not be responsible for means or methods of construction or for safety of workers or of the public.

Contractor
The contractor will be responsible for:

- Installing Precast Concrete Counterfort wall members to the elevations and offsets shown on the plans and as specified herein.
- Means, methods and safety.
- Checking the materials upon delivery to assure that proper materials have been received.
- Protecting the materials from damage. Damaged material shall not be incorporated into the wall.
- Preventing excessive mud, concrete, adhesives and other substances that may adhere from coming in contact with the wall system members.
WORK TO BE PERFORMED BY CONTRACTOR
- Site preparation, including excavation.
- Wall construction including backfilling.
- Installation of fences, guardrails or other necessary items.

PRODUCTION RATES
- Construction rates for Wall System depend entirely upon the rate at which backfill can be delivered, placed and compacted as well as when the precast concrete wall sections can be delivered. Therefore, Contractor shall coordinate the schedule of construction with producer of Precast Concrete Counterfort Wall System to ensure required delivery of product is on time.

BASIC CONSTRUCTION PROCEDURES
- Prepare sub base for base slab.
- Set base slab section and level.
- Grout below base slab with Low Strength Grout.
- Set stem and counterforts section and level with shims.
- Grout joints between Base and Face/Counterforts and all anchors from Counterforts into Base Slab with High Strength Grout.
- Place filter fabric over vertical joints.
- Place drain.
- Place backfill.
WALL COMPONENTS

Precast Concrete Counterfort Wall System shall be manufactured by a preapproved precast concrete producer under license from ELEVATE, LLC.

ELEVATE, LLC Precast Concrete Counterfort Wall System comprises of two precast concrete components: a Base Slab Section and a Face/Counterfort Section. The Base Slab section is first leveled on shims and set with the use of a Low Strength Grout filling voids between the bottom of the Base Slab and compacted subgrade. The Face/Counterforts Section is leveled with shims on the top of the Base Slab and with the Face Panel fitting into a continuous shear key on the top of the Base Slab and headed anchors protruding out of the bottom of the Counterforts and into the tapered block-outs in the Base Slab. The joint between the two sections and the tapered block-outs are filled with High Strength Grout in order to mechanically fasten the two sections together.

See table and figures on following page.
### WALL COMPONENTS CONT’D...

<table>
<thead>
<tr>
<th>Group:</th>
<th>0</th>
<th>1</th>
<th>2</th>
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<th>4</th>
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<td>5' - 10'</td>
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<td>15' - 19'</td>
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<tr>
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<td>0.583 ft</td>
<td>0.667 ft</td>
</tr>
<tr>
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<td>0.583 ft</td>
<td>0.583 ft</td>
<td>0.5 ft</td>
<td>0.5 ft</td>
<td>0.5 ft</td>
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<tr>
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<td>3.5 ft</td>
<td>3.5 ft</td>
<td>3.5 ft</td>
<td>3.5 ft</td>
<td>3.5 ft</td>
</tr>
<tr>
<td>Wt. of base</td>
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<td>21.08 kip</td>
<td>29.04 kip</td>
<td>42.09 kip</td>
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<td>53.6 kip</td>
<td>45 kip</td>
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<tr>
<td>Wt. of face</td>
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<td>23.99 kip</td>
<td>35.28 kip</td>
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<td>57.74 kip</td>
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<td>30.55 kip</td>
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<td>Req'd Allowable Bearing Capacity =</td>
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<td>2.909 psf</td>
<td>3.636 psf</td>
<td>4.182 psf</td>
<td>4.364 psf</td>
<td>4.873 psf</td>
<td>5.818 psf</td>
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<tr>
<td>Req'd Ultimate Factored Bearing Capacity =</td>
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<td>4,000 psf</td>
<td>5,000 psf</td>
<td>5,750 psf</td>
<td>6,000 psf</td>
<td>6,700 psf</td>
<td>8,000 psf</td>
</tr>
</tbody>
</table>

### Diagrams

- **Top View**
- **Front Elevation**
- **Side Elevation**
MATERIAL SPECIFICATIONS

Precast Concrete Counterfort Wall System shall consist of the following materials:

• Precast Concrete (Performance Based Retaining Wall) Class PC, \( f'c = 6,000 \text{ psi} \) @ 14 days, Density =150 pcf

• All precast concrete to be un-stained. Stain to be applied in the field per project specifications if required by the Contractor in the field.

• Lifting inserts shall have a safety factor of 4:1, shall be hot dipped galvanized, and each component shall have a minimum of two (2) lifting inserts for lifting in each direction during mobilization of the products

• Shims shall be VERSA-A-SHIM High Impact Plastic Shims per ASTM D792 and ASTM D695

• Headed anchors used to connect the stem and counterfort component to the base slab component shall be Dayton Superior D-158 B End Anchors, Peikko Modix T, or equivalent

• Reinforcing Steel of precast concrete components shall be in conformance with ASTM A706, \( F_y = 60,000 \text{ psi} \), and epoxy coated per Article 1006.10(a)(2) of the Illinois Department of Transportation (IDOT) Standard Specifications or Equivalent for state in which specific project is located

• Porous Granular Embankment shall be installed a minimum of 1’-0” width along the back face of the stem section for full height of retaining wall in accordance with the standard specifications if utilized for drainage.

• Formliner finish on front face of counterfort wall shall be in conformance with Section 503.06 (a) of the IDOT Special Provisions or the equivalent for projects outside the state of Illinois

• Structural sub-drain shall comprise of a 4” diameter perforated pipe placed at or near the footing grade in a continuous section of porous granular embankment wrapped in geofilter fabric for the length of the wall and outletted as required in conformance with the Project Specifications,

• Geofilter Fabric, pre-fabricated drainage composite shall be delivered, stored, and handled in accordance with ASTM D 4873

• Concrete Sealant shall be in accordance with section 1026 of the IDOT Standard Specifications or its equivalent if project is located outside of the state of Illinois

• Backfill material used to attain the final design elevations should be structural fill material. Coarse aggregate conforming to the requirements specified in Article 1004, Coarse Aggregates, of the IDOT Standard Specifications (or the equivalent for projects outside of the state of Illinois), or determined to be acceptable by a licensed structural engineer contracted with the specific project. The minimum angle of internal friction for the select fill should be 34 degrees.

• High Strength Grout = Multiple options from IDOT approved materials w/ \( f'c = 8,000 \text{ psi} \) (min) with 6” slump per the manufacturer.

• Low Strength Grout = Grout Mix that is flowable, self leveling cement grout with \( f'c = 1,000 \text{ psi} \) (min).
LIFTING EQUIPMENT, EARTHWORK EQUIPMENT AND TOOLS

The following list comprises recommended, but is not limited to, tools/equipment that should be used in handling the ELEVATE, LLC Precast Concrete Counterfort Wall System. Please note that site conditions may cause need for other equipment, tools or materials.

Earthwork Equipment:

- Backhoe or Track-hoe for excavation
- Dump Truck and Front End Loaders for hauling materials
- Dozers for moving materials
- Compaction Equipment
  - Sheepsfoot vibratory roller
  - Walk-behind vibratory roller or plate compactor
- Shovels
- Level
- Survey Equipment

Lifting and Setting Equipment:

- Crane with lifting capacity of handling heaviest section of wall component used for specific project
- Lifting Beams or spreader bars as specified per ELEVATE, LLC or a licensed structural engineer contracted directly with manufacturer under license with ELEVATE, LLC
- Wire Rope and Pulleys
- Chains
- Crow bars and pry bars
- Shims
- Power Drill
- Grout Mixer
- Surveyor Level
- Wrenches
- Grout Pump
LIFTING EQUIPMENT, EARTHWORK EQUIPMENT AND TOOLS CONT’D...

All precast concrete components shall be handled with care. Dunnage shall be placed between members placed in temporary storage. Shims shall be used when setting and leveling Face/Counterforts Section on top of Base Slab Section. Therefore, at no time shall members be placed against each other. It is not recommended to erect or transfer the wall system in wind speeds greater than 30 mph for safety of contractor crew and of the public. If wind speeds reach excess of 60 mph, all faces panels that are erected but not high strength grouted and cured will require temporary bracing.
EARTHWORK AND FOUNDATION PREPARATION

Set layout (horizontal layout and vertical layout) of wall using necessary survey equipment, laser level, and stakes to match approved shop drawings. It is recommended that excavation be done as necessary with proper coordination of scheduling between delivery of units, inspection of foundation soils, and staging of excavation to mitigate delay or missed inspection of foundation subgrade for proper bearing strength.

Excavate as required for installation of the retaining wall system and compact and proof roll foundation substrate. Foundation substrate should be inspected and approved by the owner’s engineer before the base slab is set. If the foundation is soft, the retaining wall will settle. In addition, improper bearing capacity strength of the foundation soils can cause reduction in the stability of the wall and cause potential failure. ELEVATE, LLC Precast Concrete Counterfort Wall System recommends using a compacted CA-6 subbase pad but does not require an aggregate base to be set as long as native foundation soils can be compacted to the required soil bearing capacity since a grout bed will be poured between base slab and subbase foundation soils to fill all voids in the bearing of the base slab on the foundation soils.

Bottom of Base Slab section shall bear on soils that are below frost depth.

Proof roll the foundation soils in accordance with the project specifications and test for approval prior to setting base slab.

All unsuitable materials below subgrade must be removed and replaced with select, compacted backfill at the direction of the engineer of record. It should be noted that structural fill shall be free of organic material.

Foundation is to be inspected and approved by a geotechnical engineer or a professionally licensed testing company for required bearing capacity prior to installation of the Precast Concrete Counterfort Wall base slab.

Once foundation soils are approved to be in conformance with approved ELEVATE, LLC shop drawings, erection of Precast Concrete Counterfort Wall may commence. It is understood that approved ELEVATE, LLC shop drawings are in accordance with the project specific specifications and drawings.
LOW STRENGTH GROUT MIX BENEATH BASE

Grout mix shall consist of a 5 bag grout mix that has the following properties and materials. Contractor shall submit low strength grout mix to ELEVATE, LLC for approval prior to start of construction. It is understood that materials can require change over the course of construction due to availability; therefore, an equivalent or alternate low strength grout mix can also be submitted for approval.

<table>
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<tr>
<td>Description</td>
<td>(5 Bag Grout Mix)</td>
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<tr>
<td>PSI @ 28 days (minimum)</td>
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<table>
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<th>Quantity:</th>
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<td>Fly Ash</td>
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</tr>
<tr>
<td>GGBFS</td>
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</tr>
<tr>
<td>Sand</td>
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<tr>
<td>Accelerator</td>
<td>oz</td>
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</tr>
</tbody>
</table>

Low strength grout mix beneath base shall be self leveling, free flowing grout as noted above or equivalent.
SCHEDULE AND WALL LAYOUT

Prior to start of construction, Contractor and ELEVATE, LLC or Manufacturer under licensed contract with ELEVATE, LLC shall coordinate and develop a construction schedule that includes the material deliverables in order to allow the Manufacturer the ability to match production of the wall components with the construction schedule. Once schedule is coordinated, Contractor shall perform all earthwork & foundation work as described in the previous section. Contractor shall then establish a wall alignment using a chalk line and stakes that is offset from the front edge of the longest toe section to be delivered so that the field alignment can remain in place without being in conflict with the base slab units being placed.

DELIVERY

Contractor shall coordinate schedule of delivery with Producer of the ELEVATE, LLC Precast Concrete Counterfort Wall System to ensure proper staging of material for temporary storage (if available), the delivery truck route is set up on site accordingly, and all further delivery trucks & times are scheduled. All dunnage and plastic edge guards are the property of the Producer and shall be returned to the Producer as soon as possible. Base Slabs can be stacked and shall have dunnage placed between the individual sections. If needed, Face/Counterforts Sections shall be temporarily stored horizontally on the front face of the Face Panel bearing on dunnage to protect the formliner surface of the retaining wall section.
DELIVERY CONT’D…

Materials shall be checked upon delivery to assure that proper material has been received. ELEVATE, LLC should be notified of damaged or otherwise unsuitable material before removed from the trailer. Exposed faces of ELEVATE, LLC Precast Concrete Counterfort Wall System shall be free of imperfections such as chips, cracks, waffling, stains, and other imperfections distracting from their appearance when viewed from a distance of 15 feet. Prevent mud, concrete adhesives and other substances that may harm the appearance of the precast concrete wall sections from coming in contact with the wall system. Materials shall be delivered free of defects and stored by leaning the members with sound racking or stacking no more than three members on top of each other using dunnage between each component. If stacking bases, ELEVATE, LLC should be notified to ensure proper dunnage is used within the group. The materials shall be temporarily stored on sound substrates that are proof rolled to prevent uneven settlement and shall be free of moisture. Base slabs shall be shipped flat on flat-bed semi-truck trailers with dunnage under quarter points of base slab. Stem and Counterforts section shall be shipped front face of stem down with counterforts sticking up like fins on flat-bed semi-truck trailers with dunnage perpendicular to the counterforts. Caution shall be taken to not damage form liner pattern on front face of stem when transporting stem and counterforts system.
DELIVERY CONT’D…

Contractor shall lift sections of the wall by the lifting inserts provided by the Producer using lifting devices supplied by the Contractor that are in conformance to the requirements specified in the approved contract plans and recommended by ELEVATE, LLC. Lifting devices shall be kept in good working order for safe lifting and replaced if any visible deterioration or damage to the lifting device is observed. Contractor shall not lift individual precast wall members by other points other than at specified lifting inserts in accordance with the approved shop drawings unless a lifting insert is observed to be damaged. In the event that a lifting insert is observed to be damaged or missing, Contractor shall coordinate with Producer of other acceptable means of lifting and setting the member in question.

BASE CONSTRUCTION

Base Slab is not required to bear on aggregate subgrade as long as soil provides proper bearing capacity in accordance with the approved contract drawings and approved wall calculations. If unsuitable soils are encountered, Contractor shall undercut foundation soils, remove unsuitable soils from project site and place structural fill in 8” compacted lifts in accordance with the approved contract drawings or as directed by the Owner’s Geotechnical Engineer on site. Contractor shall set subbase material as required per approved contract drawings in well compacted lifts per ASTM D 698, Standard Proctor. Once the foundation substrate is set, the precast concrete Base Slab shall be installed.

It is recommended that the Contractor start installation at the start/end of the wall, a corner point, or at a tie-in to an existing structure. Preferably set direction should start with the lowest bearing elevation in order to prevent undermining of an adjacent section of wall when having to excavate below its base slab to install an adjacent base slab. Base Slab shall be placed and leveled on 1” minimum thickness shims with Backer Rod or forming placed around the perimeter of the Base Slab. Low Strength Grout shall then be pumped through grout ports in the Base Slab to fill the voids between the bottom of the Base Slab and surface of the compacted subgrade.
WALL CONSTRUCTION

The Low Strength Grout shall be placed through the grout ports in the Base Slab in a rotating pattern as necessary to evenly fill the void beneath the Base Slab. However, the Low Strength Grout shall not extend up into the Grout Port more than 1/2” above the bottom of the Base Slab in the tapered block-outs where High Strength Grout is to be placed for fastening the headed anchors from the Counterforts into the Base Slab. If this occurs, the Contractor shall clean out the holes to ensure proper depth and bonding of the high strength grout. Low Strength Grout shall be given proper time to cure and reach strengths noted in approved drawings before placing any construction loads on top of the Base Slab. It should be noted that adjacent base slabs shall be set with a 1½” gap between each other. Once Low Strength Grout has reached required strength, the Contractor shall install the Face/Counterforts Section. Contractor shall use shims when setting Face/Counterforts Section on top of Base Slab and plum the Face Panel as required. Contractor shall also take caution when setting the Face/Counterfort Section as to the exposed headed anchors protruding out from the bottom of each counterfort could be easily damaged. The headed anchors shall fit within each tapered block-out in the Base Slab per the approved shop drawings. Once the Face/Counterforts is plum and set, Contractor shall apply formwork around the base perimeter of the Face/Counterforts and use High Strength Grout to fill the tapered block-outs and all voids between the two precast concrete sections. Contractor shall wait per the Times stated in the approved ELEVATE, LLC shop drawings or as required per the product manufacturer to ensure that the grout has set prior to commencing partial backfilling on top of the Base Slab. During this waiting period, the Contractor shall cut 12” wide filter fabric sections and place fabric at each vertical joint between individual sections of the Face Sections. The filter fabric shall be centered on the vertical joint between the adjacent Face Panels. Contractor shall hang the excess length of the filter fabric over the top of the Stem so that it can be folded back over the backfill once backfill is completed. The filter fabric will prevent the migration of backfill material from seeping through the ½” joint at the front face of the wall. A wall
BACKFILLING AND DRAINAGE

Drain or filter fabric shall be installed prior to placement of any backfill. If utilizing the filter fabric drainage layer, the Contractor shall set the end of filter fabric 2ft above the bottom of Stem, directly against stem, and then wrapping it down and up around the area of Porous Granular Backfill. A wall drain shall be installed against the back face between the counterforts. Once grout is set and Filter Fabric or wall drain is installed, Contractor shall commence backfilling. Contractor shall place backfill in accordance to the approved shop drawings and project specifications. Contractor shall follow drainage details as specified in the approved shop drawings on the back face of the Counterfort.

Weep holes or a perforated pipe meeting requirements of the approved shop drawings and project specific specifications shall be installed at same elevation as the proposed grade at front face of the wall. If utilizing weep holes, the diameter, spacing, and details shall follow the approved drawings. If utilizing perforated pipe, it shall be continuous, extending through the Counterforts, and shall be sloped to encourage drainage of water behind the Face. The pipes shall be outletted through the Face or through other means of drainage structures/pipes behind the wall. It is recommended that this work be coordinated with the Producer prior to fabrication so that the holes through the Counterforts and Face can be precast to avoid conflict with reinforcement. It is recommended that Porous Granular Backfill be placed in congruence with regular compacted backfill behind the wall. Contractor shall continue placing successive lifts of backfill behind the wall until embankment is installed per approved contract drawings. Before Backfill is above five feet from top of Base Slab, Contractor shall backfill and compact fill in front of the wall in accordance with the shop drawings. Contractor shall provide temporary swales and sloping of backfill to divert runoff away from wall excavation and away from the face of the retaining wall during the construction phase. Contractor shall also protect Porous Granular Embankment drainage layer from being filled with fines during construction in order to maintain a free drainage layer directly behind the Stem of the wall. Final grade above and below the retaining wall shall provide positive drainage and prevent ponding.

Once wall is fully constructed and embankment is in place, the Contractor shall remove debris and any excess backfill materials from site. The Contractor shall avoid storing heavy equipment on high side of wall during construction and post construction that exceed the design surcharge loads.
EXAMPLES:

Base Slab
Patent Pending

Stem
TYPICAL DETAILS:

NOTE: DIMENSIONS OF TAPERED BLOCK OUT VARY BASED ON THICKNESS OF BASE SLAB

SLOPE=0.4285 IN/FT

TYP HEADED BAR ANCHOR DTL

FACE WITH FORMLINER-TEXTURED SURFACE

1'-0" WIDE CONTINUOUS GEOFABRIC FILTER FABRIC MATERIAL CENTERED ON FULL HEIGHT OF THE VERTICAL JOINT BTW ADJACENT FACES.
TYPICAL DETAILS:

- **Typical Shear Key Detail**
  - 1" Plastic SHS, TYP
  - 1/4" Holes
  - 3/4" + 1/2" + Max Formliner Relief
  - High Strength Grout at Shear Key and Joint Between Face/Counters and Base Slab

- **Typical Bottom Keyway Detail**
  - 4" Port Hole as Required to Pump Low Strength Grout
  - 1/4" Holes
  - 3/4" Holes
  - Low Strength Grout
  - Existing Ground
BAR END ANCHOR DETAILS:

End Anchorage

The Dayton Superior D-158-B Plain End Anchor is a one-piece, forged-head anchor available in bar sizes #4 through #11. The D-158-B anchor has a plain end and can be furnished in lengths up to 60 feet in plain or epoxy-coated finish.

D-158-B Plain End Anchor (Forged Head)

<table>
<thead>
<tr>
<th>Bar Size Designation</th>
<th>US Metric (mm)</th>
<th>CH (MM)</th>
<th>Bar Diameter</th>
<th>Head Diameter</th>
<th>Head Thickness</th>
<th>Ultimate Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>#4</td>
<td>(14)</td>
<td>(18)</td>
<td>.54&quot; (13.72)</td>
<td>1.646&quot; (41.8)</td>
<td>3/16&quot; (4.76)</td>
<td>5,000 lbs.</td>
</tr>
<tr>
<td>#5</td>
<td>(16)</td>
<td>(19)</td>
<td>.680&quot; (17.27)</td>
<td>1.927&quot; (49.0)</td>
<td>1/4&quot; (6.35)</td>
<td>7,900 lbs.</td>
</tr>
<tr>
<td>#6</td>
<td>(18)</td>
<td>(20)</td>
<td>.835&quot; (21.26)</td>
<td>2.167&quot; (55.0)</td>
<td>3/16&quot; (4.76)</td>
<td>11,400 lbs.</td>
</tr>
<tr>
<td>#7</td>
<td>(21)</td>
<td>(22)</td>
<td>1.000&quot; (25.4)</td>
<td>2.764&quot; (66.0)</td>
<td>1/4&quot; (6.35)</td>
<td>15,700 lbs.</td>
</tr>
<tr>
<td>#8</td>
<td>(25)</td>
<td>(24)</td>
<td>1.175&quot; (30.0)</td>
<td>3.172&quot; (80.5)</td>
<td>3/16&quot; (4.76)</td>
<td>19,000 lbs.</td>
</tr>
<tr>
<td>#9</td>
<td>(29)</td>
<td>(28)</td>
<td>1.350&quot; (34.29)</td>
<td>3.569&quot; (90.6)</td>
<td>1/4&quot; (6.35)</td>
<td>25,300 lbs.</td>
</tr>
<tr>
<td>#10</td>
<td>(32)</td>
<td>(32)</td>
<td>1.500&quot; (38.1)</td>
<td>4.024&quot; (102.2)</td>
<td>3/16&quot; (4.76)</td>
<td>31,000 lbs.</td>
</tr>
</tbody>
</table>

*Ultimate Strength based on 160% f_y, specified Minimum Mfg. Length – 12’ overall.

Peikko Modix-T

By using the mechanical end anchors, hook bars are eliminated and rebar congestion is minimized.

The headed mechanical end couplers create a large shear cone in the concrete. The embedded depth and the coupler diameter determine the development strength in the concrete. The coupler head can be round, square or hex. Peikko Modix-T complies with ASTM A970.

The table below shows minimum embed length per base size in minimum 2000 psi normal weight concrete. For custom applications, Peikko can supply calculations upon request.

<table>
<thead>
<tr>
<th>Type Bar Size</th>
<th>Anchor Minimum Working Load kgf/bars (lbs)</th>
<th>B Min. (in.)</th>
<th>CD (in.)</th>
<th>C Min. (in.)</th>
<th>T Min. (in.)</th>
<th>Concrete Strength</th>
<th>D Min. (Round) Square or Hex (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M28</td>
<td>17,000</td>
<td>7&quot;</td>
<td>2.34&quot;</td>
<td>6.86&quot;</td>
<td>1.06&quot;</td>
<td>10,000 psi</td>
<td>1.75&quot;</td>
</tr>
<tr>
<td>M24</td>
<td>17,000</td>
<td>8&quot;</td>
<td>2.34&quot;</td>
<td>6.86&quot;</td>
<td>1.06&quot;</td>
<td>10,000 psi</td>
<td>1.75&quot;</td>
</tr>
<tr>
<td>M20</td>
<td>17,000</td>
<td>8&quot;</td>
<td>2.34&quot;</td>
<td>6.86&quot;</td>
<td>1.06&quot;</td>
<td>10,000 psi</td>
<td>1.75&quot;</td>
</tr>
<tr>
<td>M16</td>
<td>12,000</td>
<td>10&quot;</td>
<td>3.75&quot;</td>
<td>9.16&quot;</td>
<td>1.57&quot;</td>
<td>6,000 psi</td>
<td>1.64&quot;</td>
</tr>
<tr>
<td>M12</td>
<td>12,000</td>
<td>12&quot;</td>
<td>3.75&quot;</td>
<td>9.16&quot;</td>
<td>1.57&quot;</td>
<td>6,000 psi</td>
<td>1.64&quot;</td>
</tr>
<tr>
<td>M10</td>
<td>12,000</td>
<td>12&quot;</td>
<td>3.75&quot;</td>
<td>9.16&quot;</td>
<td>1.57&quot;</td>
<td>6,000 psi</td>
<td>1.64&quot;</td>
</tr>
<tr>
<td>M8</td>
<td>12,000</td>
<td>14&quot;</td>
<td>5.82&quot;</td>
<td>11.20&quot;</td>
<td>2.39&quot;</td>
<td>3,000 psi</td>
<td>1.30&quot;</td>
</tr>
<tr>
<td>M6</td>
<td>12,000</td>
<td>14&quot;</td>
<td>5.82&quot;</td>
<td>11.20&quot;</td>
<td>2.39&quot;</td>
<td>3,000 psi</td>
<td>1.30&quot;</td>
</tr>
<tr>
<td>M4</td>
<td>12,000</td>
<td>14&quot;</td>
<td>5.82&quot;</td>
<td>11.20&quot;</td>
<td>2.39&quot;</td>
<td>3,000 psi</td>
<td>1.30&quot;</td>
</tr>
</tbody>
</table>

Shear cone is based on 1.5 safety factor on normal weight concrete.

*Size D to be specified at order and approved by engineer of record.
## Sure-Grip® High Performance Grout

### Tex Technical Data Sheet

**Cement Based Grout**

**Description:**
Sure-Grip High Performance Grout is a cement-based, non-thermosetting, non-shrink grout designed to provide a controlled, positive expansion and to ensure an excellent bearing area. Sure-Grip High Performance Grout can be mixed from a dry mix to a stiff plastic consistency.

**Use:**
Sure-Grip High Performance Grout is ideal for interior or exterior grouting of architectural and structural precast concrete components, decorative concrete, floors, slabs, walls, bridges, and retaining walls, docks, bearing pads, expansion joints, and other applications requiring a high quality, non-shrink grout.

**Features:**
- High expansion strength reaching 0.5% in one day
- High compressive strength reaching 18,000 psi in 28 days
- High early strength
- High density
- High abrasion resistance
- Simple mixing
- Easy to apply
- Easy cleanup
- High-quality, non-shrink grout

**Properties:**
- High strength
- High early strength
- High abrasion resistance
- High density
- Simple mixing
- Easy to apply
- Easy cleanup
- High-quality, non-shrink grout

**Storage:**
Store at a cool, dry area free from direct sunlight. Shall be of a high quality, non-shrink grout, stored at the temperature and humidity as determined by the test methods and procedures.

**Application:**
**Surface Preparation:** Thoroughly clean all contact surfaces. Existing concrete should be free of dust and water. Surfaces should be roughened to secure a firm bond. Mortar or other materials should be mixed and applied to the joint area.

**Mixing:**
Mix Sure-Grip High Performance Grout with water. The mixing ratio should be 1 part grout to 1 part water (by volume). Mix thoroughly until all dry materials are incorporated into a homogeneous mixture. No admixtures, retarders, or accelerators are recommended.

**Curing:**
Exposure of the cured grout must be controlled. Any exposed grout should be protected from exposure to weather or exposure to direct sunlight. Grout should be protected from the weather during the curing period. After the initial cure has hardened, the grout should be protected from exposure to direct sunlight or weather until it has reached its final strength.

**Limitations:**
For professional use only.
Do not use for exterior applications.

**Warranty:**
Sure-Grip High Performance Grout is warranted for 30 years from the date of installation. Dayton Superior warrants that the products will be free from defects in material and workmanship for a period of 30 years from the date of installation. The warranty does not cover any damages resulting from abuse or misuse of the product. The warranty is not transferable to any subsequent owner of the property.
HIGH STRENGTH GROUT DETAILS:

1107 Advantage™ Grout

details:

TECHNICAL DATA SHEET

DESCRIPTION
1107 Advantage™ Grout is a non-shrink, non-settling, non-segregating, non-hydraulic grout. 1107 Advantage™ Grout is designed to provide a controlled, positive expansion to ensure a positive bearing area. 1107 Advantage™ Grout can be mixed from a fluid to a stiff plastic consistency.

USE
1107 Advantage™ Grout is designed for interior and exterior grouting of structural columns, base pads, and machinery bases, leveling bodies, beam pads, and lineup pads. It finds applications in paper mills, oil refineries, food plants, chemical plants, sewage and water treatment plants, etc.

FEATURES
- Controlled, non-positive expansion
- Non-shrink
- Non-settling or non-segregating
- Non-hydraulic
- Non-delaminating or non-peel bond
- Non-degradable
- Non-solvent

PROPERTIES
- Expansion: 0.001% to 0.003%
- Curing time: 28 days
- Hardness: 1200 psi
- Density: 155 lb/ft³

APPLICATION
Surface Preparation: Thoroughly clean all contact surfaces. Existing concrete should be strong and sound. Surface should be free of moisture and other contaminants. Maintain contact areas between 37°C (100°F) and 90°C (194°F) before grouting and during curing. Thoroughly wet concrete contact areas 24 hours prior to grouting. Keep wet and remove all surface water just prior to placement. If 24 hours is not possible, then saturate with water for at least 4 hours. Seal forms to prevent water or grout loss. On the placement site, provide an ample mix of hot enough to assist in grouting and to maintain the heat of the grout during the wetting process. Forms should be at least 1 in. (2.5 cm) higher than the bottom of the base plates.

Mixing: A mechanical mixer with rotating blades like a mortar mixer is best. Small quantities can be mixed with a drill and paddle. When mixing less than a full bag, always first agitate the bag thoroughly so that a representative sample is obtained. Mix approximately 3/4 of the anticipated mix water into the mixer and add the grout mix, adding the minimum additional water necessary to achieve desired consistency. For hot weather conditions, greater than 95°F (35°C), mix with cold water approximately 20°F (10°C). For cold weather conditions, less than 65°F (19°C), mix with warm water, approximately 20°F (10°C) for additional hot and cold weather applications, contact Dayton Superior.

PRECAUTIONS
- Do not mix with other materials.
- Do not mix with other materials.
- Do not mix with other materials.
- Do not mix with other materials.

WARRANTY
Dayton Superior Corporation offers a warranty for its products, subject to the terms and conditions described on the warranty card or in the Dayton Superior grout product literature. For more information, please visit website: www.daytonsuperior.com
HIGH STRENGTH GROUT DETAILS:

- Planigrout 712 cementitious, unshrinkable, cementitious grout details: www.elevateinfrastructure.com

INSTRUCTIONS:

1. Surface Preparation
   a. Surfaces must be thoroughly cleaned, dry and free from any loose materials.
   b. Surfaces must be free of oil, alkali or any other material that would interfere with the adhesion of the grout.
   c. Surfaces must be made sure to be free of dust, dirt, grease, oil or any other material that would interfere with the adhesion of the grout.
   d. Surfaces must be made sure to be free of dust, dirt, grease, oil or any other material that would interfere with the adhesion of the grout.
   e. Surfaces must be made sure to be free of dust, dirt, grease, oil or any other material that would interfere with the adhesion of the grout.

2. Mixing
   a. Mix the dry and water grout according to the manufacturer's instructions.
   b. Mix the grout until it is smooth and free of lumps.
   c. Mix the grout until it is smooth and free of lumps.
   d. Mix the grout until it is smooth and free of lumps.

3. Placement
   a. Place the grout in the forms or模板 and tamp it gently to ensure a uniform flow of the grout.
   b. Place the grout in the forms or模板 and tamp it gently to ensure a uniform flow of the grout.
   c. Place the grout in the forms or模板 and tamp it gently to ensure a uniform flow of the grout.
   d. Place the grout in the forms or模板 and tamp it gently to ensure a uniform flow of the grout.

4. Curing
   a. Cure the grout by applying a curing compound or by spraying it with water at least every other day until it is fully cured.
   b. Cure the grout by applying a curing compound or by spraying it with water at least every other day until it is fully cured.
   c. Cure the grout by applying a curing compound or by spraying it with water at least every other day until it is fully cured.
   d. Cure the grout by applying a curing compound or by spraying it with water at least every other day until it is fully cured.

TECHNICAL DATA:

- Planigrout 712 is a high-performance, non-shrinkage, cementitious grout.
- It is designed for use in structural applications where a high degree of accuracy and consolidation is required.
- It is capable of withstanding high stresses and is resistant to cracking and deformation.
- It is suitable for use in applications where a high degree of accuracy and consolidation is required.
- It is suitable for use in applications where a high degree of accuracy and consolidation is required.

RECOMMENDED APPLICATIONS:

- Planigrout 712 is suitable for use in applications requiring a high degree of consolidation and accuracy.
- It is suitable for use in applications requiring a high degree of consolidation and accuracy.
- It is suitable for use in applications requiring a high degree of consolidation and accuracy.
- It is suitable for use in applications requiring a high degree of consolidation and accuracy.

USES:

- Planigrout 712 is suitable for use in applications requiring a high degree of consolidation and accuracy.
- It is suitable for use in applications requiring a high degree of consolidation and accuracy.
- It is suitable for use in applications requiring a high degree of consolidation and accuracy.
- It is suitable for use in applications requiring a high degree of consolidation and accuracy.

TECHNICAL NOTES:

- Planigrout 712 is a high-performance, non-shrinkage, cementitious grout.
- It is designed for use in structural applications where a high degree of accuracy and consolidation is required.
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APPLICATIONS:

- Planigrout 712 is suitable for use in applications requiring a high degree of consolidation and accuracy.
- It is suitable for use in applications requiring a high degree of consolidation and accuracy.
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- It is suitable for use in applications requiring a high degree of consolidation and accuracy.

NOTICE:

- Planigrout 712 is a high-performance, non-shrinkage, cementitious grout.
- It is designed for use in structural applications where a high degree of accuracy and consolidation is required.
- It is capable of withstanding high stresses and is resistant to cracking and deformation.
- It is suitable for use in applications where a high degree of accuracy and consolidation is required.
Approved Contract Documents – Written and graphic information that has been reviewed, accepted, and forms the legal agreement between the Owner and the Contractor including the completed contract forms, Terms and Conditions of the Contract, Specifications, Drawings, Addenda, Notice of Award, Notice-to-Proceed, and Contract Change Orders; may be in hard copy, paper format, or electronic file format. The drawings, specifications, and calculations have been reviewed and accepted by Owner and are sealed by a licensed structural engineer for use as a guide by Contractor.

Backfill - Earth or other material place between a retaining wall and existing ground.

Contract - A formal agreement, in writing, between two parties establishing a scope of work in return for consideration that has been established prior to start of work.

Contractor – The organization or individual that contracts with another organization or individual (the Owner) for the construction of the retaining wall.

Engineer – The Owners designated organization or individual who is trained and professionally engaged with authoritative charge over design functions and responsibilities of the Work.

Owner – The Owner of the project for whom a contract has been made for the payment for the work performed under the terms of the contract.

Production Rates – Measurement of time for fabrication and delivery of materials to Contractor as required to perform Work.

Project – Total construction to be built on the site as designed by the Engineer.
GLOSSARY CONT...

**Shop Drawings** – Drawings, diagrams, illustrations, standard schedules, performance charts, instructions, and other data prepared by and/or for the Contractor to illustrate some part of the Work, or by a Supplier and submitted by the Contractor to illustrate items of material or equipment.

**Soil compaction** - Proper placement and compaction of soils is essential to the successful performance of retaining wall structures. Soils must be compacted in lifts to achieve maximum soil shear strength and validate the design.

**Specifications** – Parts of the Contract Document that are organized into divisions to define Work.

**Wall base** - A gravel or concrete pad installed to create a level horizontal surface for wall construction.

**Work** – Construction completed in its entirety as required by the Contract Documents, resulting from furnishing and performing all services, obligations, responsibilities, management, supervision, labor, materials, equipment, construction equipment, general conditions, permits, taxes, patent fees and royalties, testing, inspection and approval responsibilities, warranties, temporary facilities, small tools, field supplies, Bonds, insurance, mobilization, close-out, overhead, and incidental items of any kind or nature required and/or made necessary by the Contract Documents.
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