

1.0 GUIDELINE TECHNICAL SPECIFICATIONS

The following Structural Precast Concrete Specifications have been modified for the specific use of DURA-HOLD and DURA-HOLD II retaining wall systems supplied by DURA-SALES, 2481 Bull Creek Rd., Tarentum, PA 15084. Phone (724)224-7700.

1.1 Description

This work shall consist of furnishing and construction of Dura-Hold retaining wall systems (Dura-Hold, Dura-Hold II and Dura-Crib), including excavation of on-site soils and placement and compaction of select and general backfill, in reasonably close conformity with the lines, grades, dimensions, locations, and sections shown on the approved contract drawings and in accordance with the contract documents, state and local standard specifications for retaining walls, and the requirements set forth herein, to form retaining structures of satisfactory stability.

1.2 Materials

- 1.2.1** Precast Concrete Units: Precast concrete units shall be comprised of dry cast, portland cement concrete achieving a minimum 28-day compressive strength (f'c) of 5,000 pounds per square inch (psi). Portland cement shall conform to the requirements of ASTM C150, with the cement type determined by project specific requirements. The water absorption of finished concrete units shall not exceed five (5) percent.

Dura-Hold and Dura-Hold II tieback units shall be reinforced with a minimum of two (2), No. 5 size, Grade 60, deformed steel reinforcing bars: Dura-Crib tieback units shall be reinforced with a minimum of two (2), No. 3 size, Grade 60, deformed steel reinforcing bars. The bars shall be spaced equidistant from the cross sectional center of gravity along a horizontal line through the center of gravity, while maintaining the required concrete cover.

Aggregate used in the manufacture of precast units shall consist of washed, natural mineral aggregate conforming to the requirements of AASHTO M43 or ASTM D448.

Water used in the manufacture of precast units shall be reasonably clean and free of deleterious materials which could affect the finished product and have a hydrogen ion concentration (ph) between six (6) and eight (8).

- 1.2.2** Cast in place concrete shall be composed of portland cement conforming to ASTM C150. Type of portland cement shall be dictated by field conditions. Concrete shall have a minimum 28 day compressive strength ($f'c$) of 3,000 psi and a slump of three (3) to four (4) inches. Maximum aggregate size in concrete should not exceed 1-1/2 inches. Plain and reinforced concrete construction shall be performed in accordance with the latest editions of ACI 318.1 and ACI 318, respectively.
- 1.2.3** Steel reinforcement shall be Grade 60 deformed steel reinforcing bars of the size specified and smooth, welded wire fabric (WWF) of the grid and size specified, conforming to ASTM A615 and ASTM A185, respectively. Reinforcement shall also be in accordance with ACI 318, Section 3.5. Supports and spacers for reinforcement shall consist of standard steel stays, chairs, hangers, and spacers, and where concrete is cast against earth, precast concrete mortar blocks. The use of stones, brick, wood, or pieces of broken concrete is prohibited. Supports and spacers shall be securely wired to reinforcement and attached to formwork.
- 1.2.4** Expansion and construction joint material shall consist of premolded, bituminous-bonded fiber type joint filler or durable, inert, rubber joint filler.
- 1.2.5** Drainage pipe shall consist of high density polyurethane (HDPE) corrugated, perforated pipe or Schedule 40, polyvinyl chloride (PVC) perforated pipe of the required diameter.
- 1.2.6** Geotextile filter fabric shall consist of durable, nonwoven, polyester filter fabric suitable for segregation of particulate materials.
- 1.2.7** Select backfill shall consist of AASHTO size No. 57 hard, durable, angular gravel, crushed gravel, or crushed stone or a combination thereof, conforming to the requirements of AASHTO M43 or ASTM D448. Slag shall not be used as select backfill without permission of the Engineer. If slag is permitted for use, only blast furnace slag resulting from the production of pig iron is acceptable.
- 1.2.8** General backfill shall consist of inorganic, uncontaminated, compactible site soils or rock deemed suitable by the Engineer for use as general backfill.

1.3 Manufacture of Units

The precast concrete units shall be manufactured by Dura-Sales or a Licensee of Dura-Sales. The units shall be manufactured in a concrete products plant with approved facilities. Before proceeding with production, a model precast unit shall be provided by the Manufacturer for the Engineer's approval to establish a guide and standard for the type of finish to be furnished on the exposed face. This model shall be kept at the Manufacturer's plant to be used for comparison purposes during production. Formed surfaces other than the exposed face shall not require a special finish.

- 1.3.1** Unit Characteristics: Standard rail and tieback units shall be closed-faced and contain offset tongue-and-groove for self-battering. Exposed facing for Dura-Hold and Dura-Hold II units shall be chamfered to create a "random" block appearance.

The standard units shall be cast to the following nominal dimensions:

DURA-HOLD: 12" x 24" x 72"

DURA-HOLD II: 12" x 12" x 72"

DURA-CRIB: 6" x 6" x 48"

One-half standard and one-half coping rail units shall be cast to one-half the standard length dimension. The standard coping unit shall be cast to the same dimensions as the standard rail unit without the tongue. Corner units (ninety degrees) shall be cast to a length of 60 inches for Dura-Hold units, 72 inches for Dura-Hold II units and 48 inches for Dura-Crib units.

- 1.3.2** Unit Casting: Concrete wall units shall be cast in substantial, unyielding steel forms. The forms shall be properly assembled, cleaned, and oiled before any concrete is placed therein. During the placing and setting of the concrete, the forms shall be rigidly held in place.

Reinforcement, where required, must be so held in the required position in the forms that it will not be displaced during placement of the concrete.

Satisfactory vibration and pressure shall be applied to the fresh concrete to insure filling all space in the form, to densify the concrete, and to completely and intimately contact the reinforcement. Over-vibration or excessive pressure causing segregation of the concrete materials will not be permitted, and such units with segregated areas shall be rejected.

1.3.3 Unit Handling and Storage: After molding and extraction, freshly cast units shall be transported to and stored for preliminary curing within a temperature controlled enclosure for a minimum period of eight (8) hours. The air temperature of the enclosure shall range between 50 degrees Fahrenheit and 80 degrees Fahrenheit. After initial curing, units may be stored for additional curing outside temperature controlled enclosure. The units shall not be shipped before attaining two-thirds of the required 28 day concrete compressive strength (f'c).

1.3.4 Unit Quality Control: Precast concrete units will be subject to rejection for any of the following reasons: (1) exposure of the reinforcing; (2) defects which indicate imperfect mixing, placing, or curing of concrete; (3) fractures and cracks, except that small spalls or broken edges may not be considered cause for rejection; (4) dimensions not conforming to the following tolerances:

Length, height, and width of unit: $\pm 3/16''$

Key (tongue and groove) dimensions: $\pm 1/8''$

Deviation from square along base length diagonal: $\pm 1/8''$

1.4 Construction Methods

1.4.1 Excavation: Excavation for the foundation shall be performed to the grade shown on the contract drawings. Subgrade materials for bearing of the foundation shall be firm and stable. The bottom of the foundation excavation shall be proofrolled and shall be inspected by the Engineer for adequacy, just prior to constructing the foundation.

In cut applications, the geometry of temporary cut slopes behind the wall shall constitute stable, unyielding, erosion resistant configurations, which provide adequate space for construction of the wall and appurtenances and maintain safe working conditions.

1.4.2 Foundation Construction: Foundations shall be constructed to the proper dimensions, grades, and alignments as shown on the contract drawings. Where required by design, leveling pad shall consist of a minimum nine (9) inch thickness of compacted select backfill or six (6) inch thickness of concrete. Where reinforced concrete foundations are required, reinforcement shall be developed through construction joints and shear keys shall be provided to integrate discontinuous concrete pours. The foundations

shall be protected from the effects of frost through sufficient embedment, or other means.

- 1.4.3** Placement of Precast Units: Precast units shall be carefully handled and erected so as to avoid damage to the units. Any members damaged to the extent where their aesthetics or structural integrity is compromised shall be replaced by the contractor at his own expense.

The units shall be assembled as shown on the Engineer approved contract drawings and in accordance with the manufacturer's recommendations. Shimming of units to maintain levelness shall only be performed using a freshly applied, thin mortar pad (not exceeding 1/8" thickness). Full bearing of the precast units shall be maintained and joints on alternating layers shall be staggered. Blocks, wedges or other devices shall not be used for permanent shimming of wall units.

As shown on the Engineer approved drawings, the center to center spacing between tiebacks along a given rail level shall be 8'-0" for Dura-Hold units, 7'-0" for Dura-Hold II units and 4'-6" for Dura-Crib units, unless an independent design by a qualified, registered professional engineer determines that an alternate arrangement is adequate.

The base rails of single and double crib walls shall be embedded a minimum of one (1) foot below finished grade in front of the wall.

- 1.4.4** Backfill and Compaction: Select backfill shall be placed in the cribs and to a minimum of two (2) feet behind the wall in 12 inch maximum loose lifts. Each lift shall be compacted by a minimum of five (5) complete passes of a hand-operated, vibratory plate tamper, or other piece of hand-compaction equipment that can be operated inside the cribs and within close proximity of the wall without damaging the precast units. Each lift of select backfill shall be compacted to a minimum relative density of 70 percent.

General backfill shall be placed and compacted in eight (8) inch maximum loose lifts. General backfill which is granular (sand and/or gravel with less than 12 percent passing No. 200 sieve) shall be compacted to minimum relative density of 70 percent. General backfill which does not meet the above gradational criterion shall be compacted to a minimum of 95 percent of the maximum dry density obtained by the Modified Proctor Method (ASTM D1557, Method A), at a water content between three (3) percent below and two (2) percent above the optimum water content.

All backfill shall be chemically stable and free of trash, rubble, roots, organics, frozen matter, debris or other unsuitable material.

General backfill shall be keyed into the slopes of undisturbed material at least every third lift.

Backfilling shall progress simultaneously with erection of the precast concrete wall units, unless, in the opinion of the Engineer, a different procedure is required.

- 1.4.5** Drainage: All interfacing materials of distinctly different gradation shall be separated by geotextile filter fabric.

Where significant seepage or relatively rapid accumulation of water is anticipated behind the wall, drainage pipe shall be incorporated into the two (2) foot minimum width of select backfill behind the wall to improve drainage conditions. Seepage from drainage pipe shall be directed to weep holes along the exterior face of the wall or directly to storm water conveyances.