FILL TYPE RETAINING WALL
AESTHETIC TREATMENTS

GEOTECHNICAL ENGINEERING BUREAU
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I. BACKGROUND

A. Definitions Contained in the Specification

Standard Specification Section 554 was revised via EI 10-031. By merging the fill type retaining wall Standard Specifications and special specifications into one generic Standard Specification, the Department developed an expanded Approved List for all proprietary fill type retaining walls (both internally stabilized fill structures and externally stabilized fill structures). The reasons for the change include:

i. Maintains Conformance: This is in conformance with Competitive bidding, provided under 23 CFR 635.411(a)(1), http://www.fhwa.dot.gov/legsregs/directives/fapg/cfr0635d.htm identifying as many acceptable products as possible.

ii. Separates cost: It separates the cost of the wall function from the cost of the wall aesthetics.

iii. Eliminates bias: It eliminates bias in selection of wall type. Under the current system, designers may specify a certain type of wall for project after project, and never find out if other systems provide an advantage, such as greater speed and ease of construction, at reduced cost.

iv. Eliminates losing potential cost savings: It eliminates the State losing potential cost savings to VE proposals. Under the old system, the designer only chooses one system type, locking the other types out unless they were submitted as VE proposals. This new system allows more competition between types and brands of fill type retaining walls. This should result in greater innovation and reduced costs to the State.

v. Eliminates administration problems: It eliminates the problem of the designer sometimes specifying proprietary wall systems, and then needing a spec and a “back-justification”.

Note that this is a Standard Specification, designed to function in the majority of cases. It is understood that there is challenge and compromise concerning aesthetics, which requires flexibility, and designers are encouraged to apply creativity. If aesthetic requirements are so exacting on a given project due to natural surroundings, chronological development and/or local opinions, special requirements may be warranted for the creation and use of a special specification and/or procedures and methods. In order to approve its use, the designer is required to justify this course of action to the FHWA to ensure payment.
In order to maintain the current process for handling submittals during construction and to address particular aspects within an individual wall system given the assortment of fill type retaining walls, the generic Standard Specification developed the following definitions to categorize an individual fill type retaining wall:

i. **Wall System.** A wall system is either (1) a series of open top face units assembled to form bins which are connected in unbroken sequence or (2) a combination of specific solid face units with a characteristic alignment and connection method, which utilize the weight of the wall system elements and the weight of the infill to resist lateral soil pressure. For open top face units, the bin volume is infilled with backfill material to supplement the face unit geometry, adding to the stability of the system.

ii. **Internally Stabilized Wall System.** A wall system which, when constructed beyond wall heights exceeding the maximum allowable unreinforced height per the Approved List, relies on reinforcing elements within the backfill to provide stability.

iii. **Internally Stabilized Earth System.** A series of tensile reinforcing elements which, when placed in multiple layers within the backfill volume, improves the strength such that the vertical face of the stabilized earth volume is essentially self supporting.

iv. **Prefabricated Wall System (PWS).** A PWS is an externally stabilized fill structure comprised of prefabricated face units & coping units, including leveling pads, unit infill, earth backfill, joint filler material and geotextile, and a subsurface drainage system to reduce hydrostatic pressure on the wall system.

v. **Mechanically Stabilized Wall System (MSWS).** When reinforcement is introduced to a PWS, they shall be reclassified as Mechanically Stabilized Wall System.

vi. **Mechanically Stabilized Earth System (MSES).** An MSES is an internally stabilized fill structure comprised of an unreinforced concrete leveling pad, precast concrete face panel units and coping units, earth backfill, subsurface drainage system, and reinforcing elements used to stabilize the backfill.

**B. Specification Outline**

Section 554 *Fill Type Retaining Walls* is outlined to include all fill type retaining walls, both internally stabilized fill structures and externally stabilized fill structures. The proprietary systems identified on the Approved List will be bid based on the maximum height of wall. The specification is broken up into height increments for bid history documentation. The Approved List will identify the maximum unreinforced height available for each identified wall system, along with whether a reinforced application is available (which can extend to heights up to 80’).

The Fill Type Retaining Wall specification identifies a default treatment for the finished face of the chosen wall system. Aesthetic treatments applied to the face either during or after the manufacture of the units to modify the appearance of the units and of the wall as a whole may be identified in the contract documents and paid for under a separate item as discussed in the following section.
II. AESTHETICS

The designer should consult the Regional Landscape Architect to address the need for an aesthetic treatment. Proprietary fill type retaining walls may incorporate various aesthetic treatments to enhance features of the wall or blend the wall into the surrounding environment. Aesthetic treatments are treatments applied to the face of a wall system either during or after the manufacture of the units to modify the appearance of the units and of the wall as a whole. Aesthetic treatments can include modifications to color, texture, architectural pattern, the addition of exposed surface aggregate (real or artificial), the addition of simulated joints or cracks, or any other treatment or material that modifies the appearance, provided that the structural integrity, function, or life span of the wall is not negatively impacted.

A. Add-On Aesthetic Treatment

Aesthetic treatments that are added to an installed retaining wall (add-on features) are not part of the Section 554 aesthetic treatment pay item. For example, stone masonry is the craft of shaping rough pieces of rock into accurate geometrical shapes and arranging the resulting stones together with mortar to form structures. Stone masonry is often used to “face” a fill type retaining wall to mimic the appearance of surrounding structures or to give the appearance of old-world craftsmanship. If it is desired to utilize stone masonry on a fill type retaining wall, the fill type retaining wall pay item (which identifies a default aesthetic treatment) will suffice to address the retaining wall system. Stone masonry, insert strips, and dovetail anchors (or other anchoring mechanisms) shall be paid for under Item 560.0401 Stone Masonry.

B. Fill Type Retaining Wall Aesthetic Treatment Pay Item

Aesthetic treatments that are applied by the manufacturer to the wall system units are included in Section 554 under an aesthetic treatment pay item. The specification identifies some categories for organizational and bidding purposes. Since the Approved List allows the Contractor to choose the type of wall, the categories only provide a general idea of the type of aesthetic treatment for either a face block or face panel/unit as described below:

i. **Textured Surface**: Texturing precast concrete panels or open top face units can be achieved through formliners to develop the desired texture of grooves, ribs, ropes, or flutes. Solid face units may be manufactured in rib configurations and split to reveal the texture of the aggregate with the ribbed appearance.

ii. **Exposed Aggregate Finish**: Precast concrete panels or open top face units can achieve an exposed aggregate finish through formliners and releasing agents developing the appearance of sandblast, aggregate, or round stone. Solid face units are manufactured and split to reveal the texture of the aggregate.

iii. **Architectural Pattern**: Precast concrete panels or open top face units can achieve an architectural pattern through formliners to develop the pattern of stacked stone, or block. Solid face units are themselves stacked blocks.
Although the above categories provide a general idea of the type of aesthetic treatment, the specific requirements should be vividly described in the contract documents using special notes and sketches, as needed. The requirements for color, texture and pattern should use industry-standard descriptions and terminology. The following Section explores these descriptions.
III. SPECIAL NOTE FOR THE CONTRACT PLANS

The following Special Note may be used, or expanded upon, to describe the aesthetic treatment for the proposed fill type retaining wall. The Special Note needs to be completed for the specific wall location and the portions of the note to be completed have references to subsections of this chapter for further direction:

“Retaining walls shall simulate (A. Material) and display an (B. Architectural Pattern) pattern. The wall will have a (C. Texture) texture. The colors present in the wall will complement the natural surroundings, and if possible adhere to a (D. Colors/Palettes) palette. The coping will be of (E. Coping Options) form.”

It should be noted that the specific wall system to be constructed will be chosen by the Contractor, given the constraints identified in the contract documents. The Contractor may select any wall system appearing on the Approved List that meets the project requirements. This approach is intended to spur competition, invoke greater innovation, and result in reduced costs to the State.

In order to provide competition, fairness between similar fill type retaining wall systems was realized through research and development of new testing procedures. Specifically, precast products (open top face units and precast panel units) and drycast products (solid face units) had different acceptance procedures, which harmed competition. Material Procedure MP 9-03: Concrete Masonry Unit QA/QC Procedures rectified the situation.

With the above in mind, the Special Note should be written so as to not eliminate competition between manufacturer’s appearing on the Approved List. It is understood that there are inherent differences between all products on the Approved List, which makes them unique in their own shape and manufacture. However, the use of descriptors such as Material, Architectural Pattern, Texture, Colors, and Coping Options should provide enough of a broad brush to develop the look and feel of either type of retaining wall to meet the desired aesthetic goals while not needlessly restriction competition and innovation.

In addition to the note, the Regional Landscape Architect may wish to provide sketches or details (as needed) to describe the specific requirements of the retaining wall.
A. Material

**Limestone:** Limestone is a sedimentary rock composed largely of calcite and aragonite, which are different crystal forms of calcium carbonate (CaCO$_3$).

**Bluestone:** Bluestone not a geological term, but a popular name given to feldspathic sandstone. Feldspars (KAlSi$_3$O$_8$ – NaAlSi$_3$O$_8$ – CaAl$_2$Si$_2$O$_8$) are a group of rock-forming tectosilicate minerals.
**Granite:** Granite is a common type of intrusive, felsic, igneous rock. Granites usually have a medium to coarse grained texture.

**Quartzite:** Quartzite is a hard metamorphic rock which was originally sandstone. Sandstone is converted into quartzite through heating and pressure usually related to tectonic compression within orogenic belts.
B. Architectural Pattern

**Running Bond:** This is a pattern, also known as *stretcher bond*, consists of units laid with only their long narrow sides (stretchers) showing, overlapping midway with the courses of units below and above.

**Ashlar:** Ashlar blocks are rectangular units that have square edges and smooth or cut stone faces. The blocks are generally about 14 in. in height. When shorter than 12 in., they are usually called “small ashlar”.
**Linear Intrusion:** A linear intrusion can occur in any pattern. A linear intrusion is added to augment or divide a pattern by the use of a meander, boarder, or vertical separator that adds a distinctive accent.

**Mosaic:** Mosaic is the art of creating images with an assemblage of small pieces of colored stone or other materials. Small pieces, normally roughly cubic in shape, of stone of different colors are used to create a pattern.
**Surface Relief:** Surface relief can occur in any pattern. Surface relief is prominence caused by contrast, which is added to augment or divide a pattern through the use of offsetting or protruding units.

Open Top Face
Prefabricated Wall System (precast unit or panel)  
Solid Face
Prefabricated Wall System (drycast unit)
C. Texture

Smooth/Sealed: Smooth is a texture that lacks friction (not rough), creating a basic plain finish free from pockets, voids and other surface distortions. A smooth-faced concrete unit can have a surface sealer added to prevent deterioration of the face.

Hand Tooled, Raked Effect: A texturing technique implemented in the manufacturing process in which the concrete is manipulated by pressing (formliner), raking, tooling, etc. to create various reliefs in the final surface of the unit.
**Exposed Aggregate:** An exposed aggregate finish is a texturing technique implemented in the manufacturing process in which the aggregate (stone, pebble, rocks or sand) is left exposed in the final surface of the unit.
D. Colors/Palettes

The Geological Rock-Color Chart produced by Munsell Color is available at: http://munsellstore.com/files/CIPA00011%5C599.pdf. The following colors were selected from the chart:

**Olive:** The Geological Rock-Color Chart identifies the following color as Pale Olive 10Y 6/2:

![Olive Color Sample]

**Ochre:** The Geological Rock-Color Chart identifies the following color as Pale Yellowish Orange 10YR 8/6:

![Ochre Color Sample]

**Mahogany:** The Geological Rock-Color Chart identifies the following color as Moderate Reddish Brown 10R 4/6:

![Mahogany Color Sample]
**Brownstone Red:** The Geological Rock-Color Chart identifies the following color as Moderate Red 5R 4/6:

![Brownstone Red](image)

**Pewter:** The Geological Rock-Color Chart identifies the following color as Grayish Orange Pink 5YR 7/2:

![Pewter](image)

**Granite**

**Buff:** The Geological Rock-Color Chart identifies the following color as Yellowish Gray 5Y 8/1:

![Buff](image)
**Gray:** The Geological Rock-Color Chart identifies the following color as Light Brownish Gray 5YR 6/1:

![Gray swatch](image)

**Black:** The Geological Rock-Color Chart identifies the following color as Black N1:

![Black swatch](image)

**Taupe:** The Geological Rock-Color Chart identifies the following color as Light Greenish Gray 5GY 8/1:

![Taupe swatch](image)
**Salmon:** The Geological Rock-Color Chart identifies the following color as Moderate Orange Pink 10R 7/4:

![Salmon color example](image)

**Sandstone:** The Geological Rock-Color Chart identifies the following color as Grayish Orange 10YR 7/4:

![Sandstone color example](image)

**Sepia:** The Geological Rock-Color Chart identifies the following color as Dusky Yellow 5Y 6/4:

![Sepia color example](image)
**Raw Umber:** The Geological Rock-Color Chart identifies the following color as Moderate Olive Brown 5Y 4/4:
E. Coping Options

Section 3 Shapes and Widths of The Coping and Capping Design Guide produced by IBStock is available at: http://www.ibstock.com/pdfs/architects/coping-and-capping.pdf. The following shapes were selected from the chart:

**Saddleback Coping:**

**Half Round Coping:**

**Double Bullnose Coping:**

**Double Cant Coping:**
Bishops Mitre Coping:

Faceted Coping:

Asymmetrical Coping:

Single Weathered Coping:

Wave Coping: