EVALUATION SUBJECT: Mega Tandem Segmental Retaining Wall System

REPORT HOLDER: Oldcastle, Inc.
900 Ashwood Parkway, Suite 600
Atlanta, Georgia 30338
www.oldcastle.com

CSI Division: 320000 Exterior Improvements
CSI Section: 323200 Retaining Walls
CSI Section: 323223 Segmental Retaining Wall

1.0 SCOPE OF EVALUATION

1.1 Compliance to the following codes & regulations:
- 2015 International Building Code® (IBC)
- 2012 International Building Code® (IBC)
- 2009 International Building Code® (IBC)

1.2 Evaluated in accordance with:
- ICC-ES AC276, Approved October 2004, editorially revised May 2014

1.3 Properties assessed:
- Physical Properties
- Structural

2.0 PRODUCT USE

The Mega Tandem Segmental Retaining Wall System is used in the construction of gravity retaining walls. The system complies with requirements for retaining walls as set forth in Section 1807 of the IBC.

3.0 PRODUCT DESCRIPTION

3.1 Product information: The Mega Tandem Segmental Retaining Wall System consists of dry-cast concrete panels and fiber reinforced polymer web connectors assembled in running bond patterns without mortar or grout used to construct gravity retaining walls. The area between the concrete panels is in-filled with approved material. The system is available in nominally 27 inch or 46 inch (686 mm or 1168 mm) wall thicknesses.

3.2 Material information:

3.2.1 Concrete Panels: Mega Tandem dry cast concrete panels are manufactured concrete units made from portland cement and aggregate. The panels are manufactured with the appearance of natural stone in various textures on the exposed face and dovetail slots on the interior face. The panels are nominally 24 inches wide by 12 inches high by 3 inches thick (610 x 305 x 76 mm) and weigh approximately 65 pounds (29.5 kg) each. The concrete panels shall have a minimum 28-day net area compressive strength of 8,500 psi (58.6 MPa) and a maximum water absorption of 7 pcf (112 kg/m³) when tested in accordance with ASTM C140.

3.2.2 Web Connectors: The fiber-reinforced polypropylene web connectors are nominally 22-5/16 inch or 41-5/16 inch (567 or 1050 mm) long, designated as MT2 and MT4 respectively, and shall comply with the requirements of AC276. The web connectors fit into the dovetail slots of the dry cast concrete panels.

3.2.3 In-fill Material: Material used as in-fill between the concrete panels shall consist of approved materials complying with Size Number 57 Coarse Aggregate, in accordance with ASTM C33, or as specified by the registered design professional per recognized design procedures.

3.2.4 Backfill Material: Material used as backfill behind the gravity retaining wall shall consist of approved suitable fine grain or coarse grain materials as specified by the registered design professional per recognized design procedures.

4.0 DESIGN AND INSTALLATION

4.1 General: The Mega Tandem segmental retaining walls are designed as gravity retaining walls that rely on the weight and geometry of the Mega Tandem Segmental Retaining Wall System to resist lateral earth pressures. The gravity wall design shall be based on standard engineering principles for segmental concrete retaining walls. Figure 1 of this report illustrates a typical cross section of the Mega Tandem Segmental Retaining Wall System. Shear strength and shear strength equations for the Mega Tandem Segmental Retaining Wall System are shown in Table 1 of this report.

<table>
<thead>
<tr>
<th>Table 1 – Mega Tandem SRW Unit Shear Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultimate (peak) Shear Strength</td>
</tr>
<tr>
<td>Service-state Shear</td>
</tr>
<tr>
<td>Strength</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Maximum</th>
<th>Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>MT2</td>
<td>3,095 lbs/ft</td>
<td>S = 996 + 0.67*N</td>
</tr>
<tr>
<td>MT4</td>
<td>3,546 lbs/ft</td>
<td>S = 942 + 0.29*N</td>
</tr>
</tbody>
</table>

For SI: 1 lbs/ft = 14.6 N/m,
N = superimposed normal (applied) load, for any depth, in lbs/ft of wall length. The serviceability shear strength shown in Table 1 is based on a prescribed deformation criterion of 0.24 inch (6 mm), which is a value equal to 2 percent of the block unit height.
4.2 Design: Structural calculations shall be submitted to the code official for each wall system installation. The design of Mega Tandem Segmental Retaining Walls shall be based on accepted engineering principles for gravity structures. The retaining wall system shall be designed as a gravity retaining wall that depends on the weight and geometry of the assembled units and soil to resist lateral earth pressures and other lateral forces. Lateral earth pressures shall be determined using either Coulomb or Rankine earth pressure theory. The design shall include evaluation of both external and internal stability of the earth retaining structure including consideration of external loads such as surcharges and seismic forces as well as consideration of movement between courses, as applicable.

External stability analysis shall be similar to that required for conventional retaining walls as set forth in Section 1807.2 of the IBC, and shall consider base (lateral) sliding, overturning, bearing capacity (including excessive settlement), water uplift, and overall slope stability (deep-seated). Internal stability analysis shall consider movement between courses.

Minimum safety factors used in design for external stability check shall be 1.5 for base sliding, deep-seated (global) stability and overturning, and 2.0 for bearing capacity. The minimum safety factor for internal stability between units shall be 1.5 for shear strength in accordance with Section 1807.2.3 of the IBC. Load combinations used in the analysis shall comply with Section 1807.2.3 of the IBC. Seismic safety factors for all other limit states related to the retaining wall design may be 75 percent of the corresponding minimum allowable static safety factors.

4.2.1 Soils Investigation: A site specific soils investigation report is required, in accordance with Section 1803 of the IBC. The soils investigation report shall provide a global slope stability analysis that considers the influence of site geometry, subsoil properties, groundwater conditions, and the existing (or proposed) slopes above and below the retaining wall. Where the retaining wall is assigned to Seismic Design Category C, D, E or F, the site-specific soils report shall include the information required by Section 1803.5.11 of the IBC. Where the wall is assigned to Seismic Design Category D, E or F, the site-specific soils report shall include the information required by Section 1803.5.12 of the IBC.

4.3 Installation: Mega Tandem Segmental Retaining Walls are assembled in a running bond pattern and assembled without mortar or grout. The Mega Tandem Segmental Retaining Wall System is installed in accordance with the manufacturer’s installation instructions, which generally are as follows:

1. After the soils investigation and structural design are completed, as described in Sections 4.2 and 4.2.1 of this report, excavations for leveling pad and footing shall be conducted.
2. The foundation excavations shall be inspected for adequate bearing capacity of the soils and observation of groundwater conditions by a qualified geotechnical engineer.
3. A leveling pad consisting of an unreinforced concrete pad shall be installed in accordance with Section 1809.8 of the IBC. Alternatively, a minimum 6-inch-thick (152 mm) layer of crushed stone, compacted to at least 90 percent of the maximum dry density, determined in accordance with ASTM D1557, as specified by the registered design professional may be used.
4. The first course of dry-cast concrete panels shall be installed using Mega Tandem jigs to temporarily maintain the concrete panels in place.
5. The web connectors are inserted into the dovetail slots of the concrete panels. There shall be a minimum of two web connectors for each face panel.
6. The temporary jigs shall be removed and infill shall be placed between the concrete panels with material complying with Section 3.2.3 of this report. Infill material shall be compacted in accordance with the manufacturer’s installation instructions and the registered design professional.
7. Backfill shall occur using material complying with Section 3.2.4 of this report, which shall be compacted in accordance with the manufacturer’s installation instructions and the design plans.
8. The placement of concrete panels, web connectors, infill material and backfill material shall be repeated as shown on plans.

4.4 Special Inspection: Special inspection during installation shall be provided in accordance with Section 1705.1.1, 1705.4 and 1705.6 of the 2015 IBC (and 2012 IBC; or Sections 1704.5, 1704.7 and 1704.15 of the 2009 IBC, as applicable). The inspection shall include verification of:

1. Dry cast concrete panel dimensions and compliance with the requirements of ASTM C1372 for compressive strength and water absorption, as described in Section 3.2.1 of this report;
2. Web connector dimensions;
3. Leveling pad and footing;
4. Placement of concrete panels and web connectors;
5. In-fill and backfill placement and compaction; and
6. Drainage provisions.
5.0 LIMITATIONS

The Mega Tandem Segmental Retaining Wall System described in this report is in compliance with, or is an acceptable alternative to, retaining wall systems specified in, those codes listed in Section 1.0 of this report subject to the following conditions:

5.1 The Mega Tandem Segmental Retaining Wall system shall be installed in accordance with the IBC, Oldcastle Inc.’s published installation instructions, and this report. Where conflicts occur, the more restrictive shall govern.

5.2 The retaining wall’s design calculations, described in Section 4.1 of this report, prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed, shall be submitted to, and approved by, the code official.

5.3 The site specific soils investigation report described in Section 4.2.1 of this report shall be provided for each project site.

5.4 Special inspection shall be provided as described in Section 4.4 of this report.

5.5 Under the 2015 IBC, project specifications for soil and water conditions that include sulfate concentrations identified in ACI 318-14 Table 19.3.1.1 as severe (S2) or very severe (S3), shall include mix designs for the concrete that comply with the intent of ACI 318-14 Table 19.3.1.1. See IBC Section 1904.

5.6 Under the 2012 IBC, project specifications for soil and water conditions that include sulfate concentrations identified in ACI 318-11 Table 4.2.1 as severe (S2) or very severe (S3), shall include mix designs for the concrete that comply with the intent of ACI 318-11 Table 4.3.1. See IBC Section 1904.

5.7 Under the 2009 IBC, project specifications for soil and water conditions that include sulfate concentrations identified in ACI 318-08 Table 4.2.1 as severe (S2) or very severe (S3), shall include mix designs for the concrete that comply with the intent of ACI 318-08 Table 4.3.1. See IBC Section 1904.

5.8 Design and installation of the Mega Tandem Segmental Retaining Wall system in areas where free-flowing ground water is encountered, or where the wall system is submerged, shall be in accordance with the recommendations of the soils engineer and the applicable sections of the NCMA Design Manual for Segmental Retaining Walls, and shall be approved by the code official.

6.0 SUBSTANTIATING DATA

Data and test reports in accordance with the ICC-ES Acceptance Criteria for Segmental Retaining Walls (AC276), dated October 2004 (editorially revised May 2014).

7.0 IDENTIFICATION

A Mega Tandem Segmental Retaining Wall system described in this report is identified with the manufacturer’s identification label on the packaging. Packaging is labeled with the manufacturer’s name, Oldcastle, Inc., address, and the number of this evaluation report (ER-348). Either Mark of Conformity may be used as shown below:

For additional information about this evaluation report please visit www.uniform-es.org or email at info@uniform-es.org
The product described in this Uniform Evaluation Service (UES) Report has been evaluated as an alternative material, design or method of construction in order to satisfy and comply with the intent of the provision of the code, as noted in this report, and for at least equivalence to that prescribed in the code in quality, strength, effectiveness, fire resistance, durability and safety, as applicable, in accordance with IBC Section 104.11.

Assembled Panels

Back Veneer Module
24 x 12 x 3 in.
(600 x 300 x 76 mm)

Typical Concrete Panel

Figure 1 - Mega Tandem Segmental Retaining Wall System
Figure 1 - Mega Tandem Segmental Retaining Wall System (Continued)