MT Group
MATERIALS TESTING

# Terracotta Panel System

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**Test Specifications:**

**ASTM E 330:** Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

**Test protocol:**

1) An additional load equal to the weight of the brick facade is hung from the top hat sections channels resulting in a overall dead load that is double that of the terracotta panels. There where four vertical top hats which the weights were hung from. When viewing the rig from the exterior the additional weights added to the wall from left to right are 100 lbf, 300 lbf, 300 lbf, and 100 lbf.
2) The additional weights are then reduced to (from left to right) 50 lbf, 150 lbf, and 150 lbf, 50 lbf. This is done in order to achieve a total dead load (including the terracotta panels) of 1.5 times. With this load applied, several positive uniform test loads are applied in accordance with ASTM 330.
3) Additional dead loads are then removed. With no additional dead load applied, several negative uniform test loads are applied in accordance with ASTM 330.

Note: The pressure differential used to obtain uniform structural loads was induced across the outer most layer (terracotta panel) of the system. This was accomplished by cutting holes in the dry wall, so that pressure can equilibrate across the dry wall. To verify this effect, pressure was measured and determined to be the same on either side of the dry wall during testing.


# Test Specimen:

**Stud Wall:** A Free standing test buck in 12” wide steel 'C' channel was prepared by MT Group. The size of the test specimen was 7'-11” wide and 9'-11” tall. The load-bearing/panel-supporting substrate was constructed with 6” deep 16 gauge steel studs fitted into tracks at the top and bottom of the panel with a 16” spacing. Studs and tracks are both 16 gauge galvanized steel with a yield strength of 50 ksi. The tracks where fastened to the buck using self taping number 12 screws with pitch of 24 threads/inch, a length of 1.5”, and a flanged 5/16” hex head. There is two of these screws spaced every 24”. The studs where fastened to the tracks with one screw on the top and one on the bottom. These screws are gauge 12 with a pitch of 13 threads/inch, 1 inch long and with a flanged 5/16” hex head. Dry wall is fastened to both the studs and the tracks with 1.5” long countersunk gauge 10 screws with a pitch of 9 and a Philips number two drive. These screws are placed every 6” on center along every stud. The dry wall was 5/8 gypsum board coated in a fiber glass layer. A self adhering weather barrier was applied to the dry wall.

**Panel-Supporting System:** A number of extrusions are utilized in this design. L shaped dead load brackets (figure 1) are fastened to some of the steel studs in the pattern specified in figure 2.

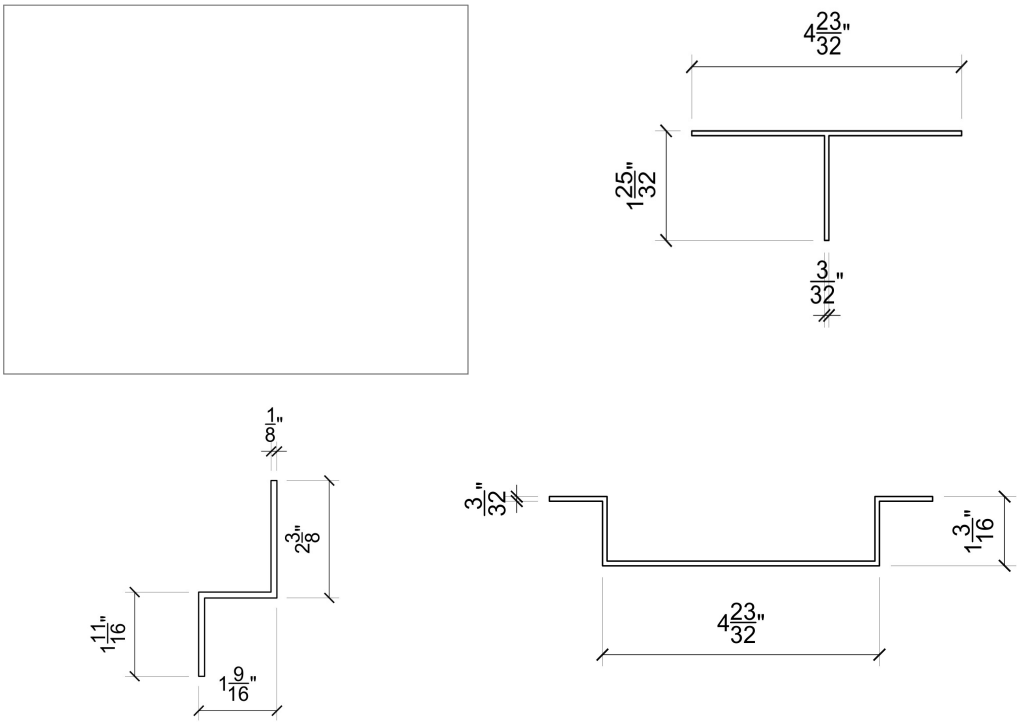


**Figure 1:** Wall bracket (top left) 100mm deep 3mm thick bracket 85mm long aluminum grade 6063T6. Horizontal support section (bottom left) 40mm deep 3mm thick zed section aluminum grade 6063T6. Support bracket (bottom left) 120x45x2mm T section 60mm long aluminum grade 6063T6. Vertical support section (bottom right) 30mm deep 2mm thick top-hat section aluminum grade 6063T6

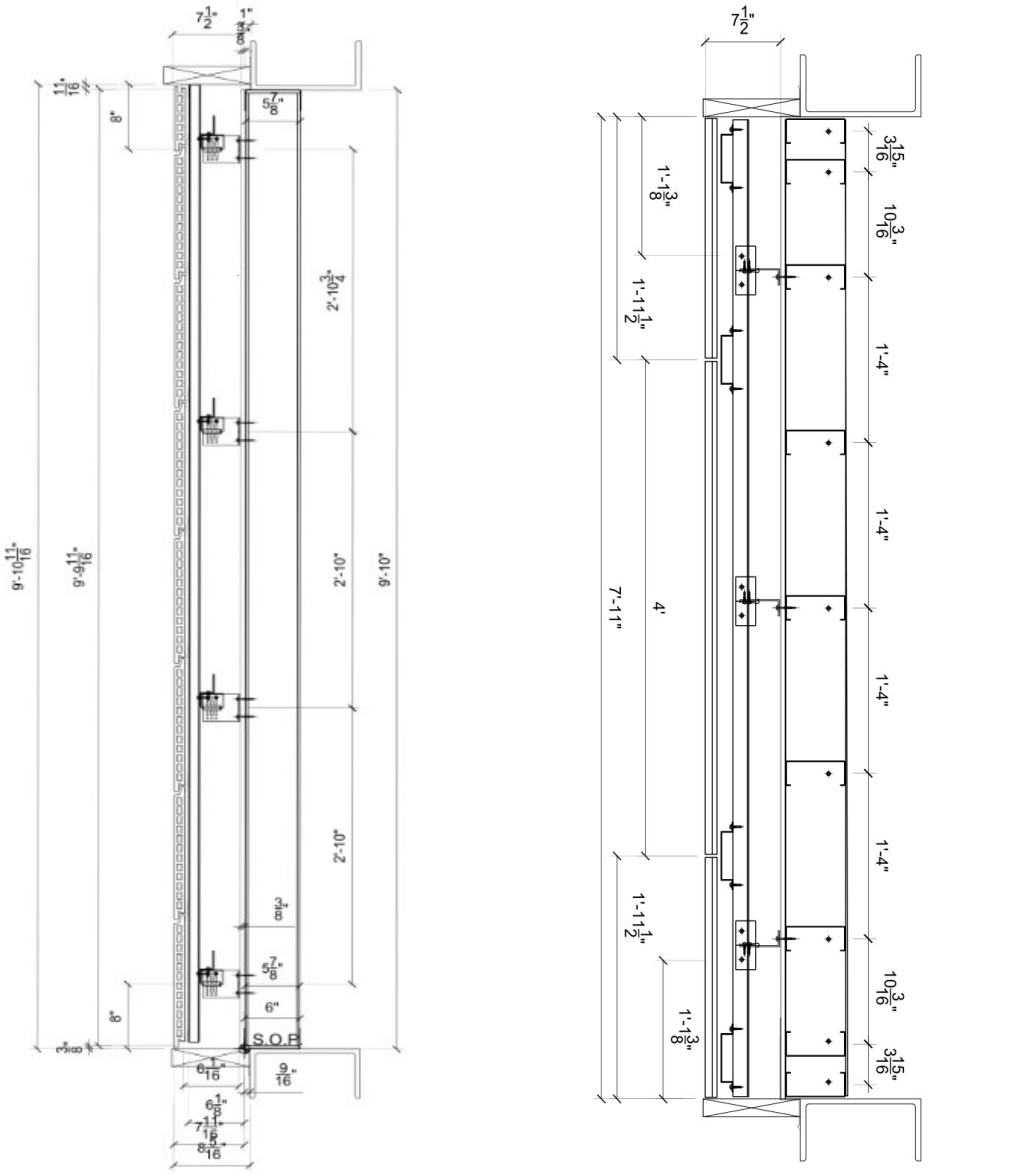


**Figure 2:** Component locations in system

Each L-bracket is fastened to the studs by its short leg with two self tapping number 12 tek-screws with a pitch of 13, a length of 2” and a flanged hex head of 3/8”.

**Figure 3:** Wall bracket fastened to support T-bracket with two screws which is then fastened to the horizontal support section with two self tapping tek 1” long number 12 fasteners with a pitch of 13 and a flanged hex head that is 5/16”. This is done once for every bracket

Using the same self taping #12 tek-screws the vertical support sections are fastened to the horizontal support. Cantilever hanging hook brackets are then riveted to the vertical support section. A vertical drainage track placed between panels at the middle of the vertical supports is held in place via compression. The drainage track in the middle has one track and the drainage tracks at the perimeter of the specimen have two tracks. The terracotta panels are then hung in place on the brackets. There is a cantilever hanging hook bracket for every corner of every panel. An intersection of 4 panels requires two cantilever hanging hooks. Each cantilever hanging hook is fasted with one aluminum rivet that is about 0.2” in diameter.

**Figure 4:** Panel mounting scheme makes use of many parts


**Test Results :**

| Test | Pressure | Results | Allowable |
|---|---|---|---|
| **2x Dead Load** | 0 Psf | No damage | Reported |
| **Uniform Load**<br>**Max Deflection**<br>ASTM E330<br>With 1.5x Dead load | + 60 Psf | 0.30”<br>No damage | Reported |
| **Uniform Load**<br>**Max Deflection**<br>ASTM E330 | - 60 Psf | 0.47”<br>No damage | Reported |
| **Uniform Load Permanent Deflection**<br>ASTM E330<br>With 1.5x Dead load | + 90 Psf | 0.060”<br>No damage | Reported |
| **Uniform Load Permanent Deflection**<br>ASTM E330 | - 90 Psf | 0.026”<br>No damage | Reported |

Note: Weights where hung as specified in test protocol to simulate dead load. Weights were suspended by cables that are fastened to vertical supports to achieve full effect of cantilever moment arm loads via L-bracket.

Note: The pressure differential used to obtain uniform structural loads was induced across the outer most layer (brick) of the system. This was accomplished by cutting holes in the dry wall, so that pressure can equilibrate across the dry wall. To verify this effect, pressure was measured and determined to be the same on either side of the dry wall during testing.

Note: View Figure 3 for deflection measurement locations. These locations were chosen because it is where the most deflection occurs due to the long unsupported span of the steel drywall studs.

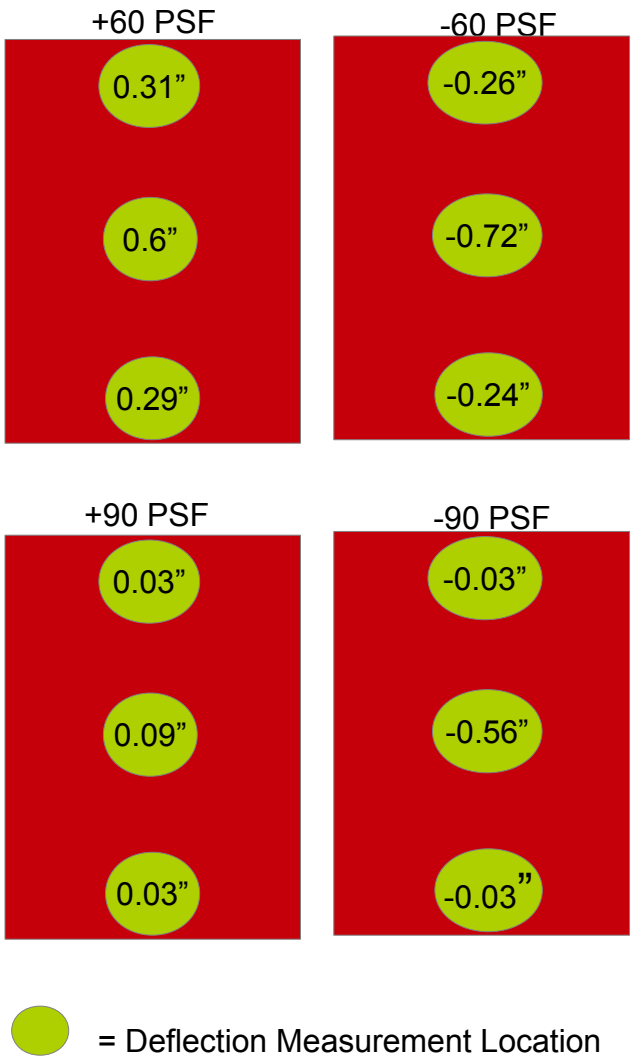


**Figure 3:** Deflection Measurement raw data

Note: Top measurement is dead center of specimen 1” from top of specimens brick wall
Bottom measurement is dead center of specimen 1” from bottom of specimens brick wall
Center measurement is dead center of specimen.


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