

November 25, 2015

Mr. Ali Chitsaz  
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**Subject: Decoustics Ceilencio Suspended Ceiling, Seismic Testing  
MI1401101.00**

Dear Mr. Chitsaz:

Structural Engineers, Bob Glasgow and Amir Gilani, from this office, were present during the testing at the University of Berkeley Seismic Testing Laboratory, November 9<sup>th</sup> through November 13<sup>th</sup> and November 16<sup>th</sup>, to observe shake table testing for Decoustics Ceilencio Suspended Ceiling Systems, as noted below. The testing was performed using the test protocol of ICC-ES AC-156.

The testing was performed on a 16 ft. x 16 ft. steel elevated frame structure, mounted to the shake table in the Seismic Testing Laboratory at the University of Berkeley (Photo 1). The ceiling was installed with two sides fixed (south and west), and two sides free (north and east). The Decoustics Ceilencio Suspended Ceiling System consists of extruded aluminum grid members with a continuous threaded channel on top and a horizontal flange on the bottom. The grid members between panels have an additional vertical fin at the bottom of the grid member that acts as a spacer and guide between panel edges. The grid members are connected together at the intersections with a flat metal plate ("butterfly") that is screwed down to the top continuous threaded channel (Photo 2). The grid members were suspended from the frame with 12 ga. wires at 4 ft. on center each way and at the perimeter of the ceiling. A 4-way splay wire group with compression post (Photo 3) was installed 4 to 5 ft. from the north-east corner (intersection of the two free edges). The aluminum grid members (main members and cross members) installed parallel to the wall ledger of the frame were fixed on two sides with a steel wall angle clip at 24 in. on center, with two wood screws into the ledger and one sheet metal screw into the top of the grid member (Photo 4). The ceiling panels were attached to the "butterfly" plates with a spring wire through a slot in the plate (Photo 2). The ceiling panels were held clear of all edges and supported by the "butterfly" plates at the perimeter. Ten tests were performed with four different types of ceiling panels. Table 1-1 is a matrix of the ten tests performed.

Before the seismic tests were conducted, white noise and a sine sweep input to the table were conducted in each of the principle directions in order to determine the natural frequencies of the system and to verify that the instruments (accelerometers and displacement transducers) were functioning. Time history input to table was conducted, such that the required response spectrum at the level of the table was met, per AC-156. Tests were conducted at SDS levels of 0.25g, 1.00g, 1.25g, 1.50g, 1.75g and 2.00g (with 2.50g vertical). After the test level of 0.25g, the instrumentation was verified to be functioning. During the test levels above 1.00g, members of the Decoustics and Miyamoto team periodically inspected the suspended ceiling systems as needed. After the 1.75g test level was conducted, members of the Decoustics and Miyamoto team walked around the perimeter of the table to inspect and document any damage to the suspended ceiling system.

Test Number	Specimen	Panel Size [ft]	Panel Type	Number of Panels	Springs per Panel	Splay Wire and Post	Light Fixture
1	DSG15-01	2 x 4	Claro	32	4	Yes	No
2	DSG15-02	2 x 4	Fabric	32	4	Yes	No
3	DSG15-03	2 x 4	Quadrillo	32	6	Yes	No
4	DSG15-04	2 x 4	Solo-M	32	6	Yes	No
5	DSG15-05	4 x 5.33	Claro	12	4	Yes	Yes
6	DSG15-06	4 x 5.33	Fabric	12	4	Yes	No
7	DSG15-07	4 x 6 and 2 x 4	Quadrillo	(10) - 4 x 6 (8) - 2 x 4	16 for 4 x 6 10 for 2 x 4	Yes	No
8	DSG15-08	2.67 x 5.33	Solo-M	15	10	Yes	No
9	DSG15-09	4 x 8	Claro	8	6	Yes	No
10	DSG15-10	4 x 8	Fabric	8	6	Yes	No

Table 1-1 Test Matrix



Photo 1: Test Frame with Claro Installed

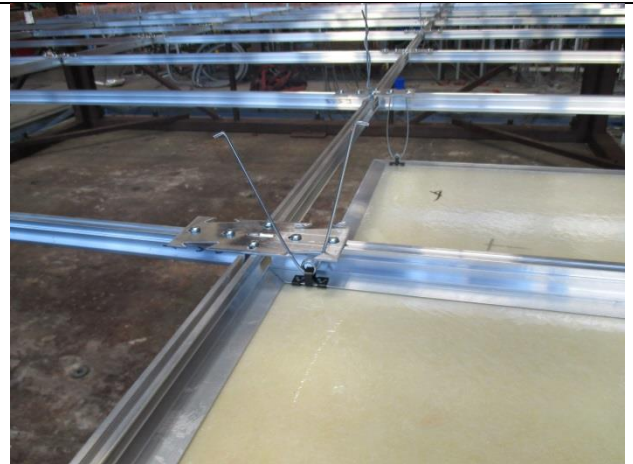


Photo 2: Grid Member, Butterfly Plate and Spring



Photo 3: Four Way Splay Wires and Compression Post



Photo 4: Clip Angle at Fixed Sides

Based on our observations made during the testing and our review of the test data provided by the Seismic Testing Laboratory at the University of Berkeley, the Decoustics Ceilencio Suspended Ceiling Systems that were tested were taken to the maximum level of the building code (SDS 2.00g) with no damage to the ceiling grid members and no damage to the ceiling panels. In all ten tests, no panels fell out or were dislodged after the test maximum test level (SDS 2.00g). As a result, the Decoustics Ceilencio Suspended Ceiling Systems, installed as tested, and per the requirements of the International (or California) Building Code and ASTM standards, can be considered to be certified for all regions of United States with high seismicity.

**Limitations:**

This report does not express or imply any warranty of the product and was developed based solely on visual observations and noted test results obtained during the testing conducted at the Seismic Testing Laboratory of UC Berkeley. Our services have been provided at a level consistent with the level and care of engineers in the practice of structural engineering.

Very truly yours,  
Miyamoto International, Inc.

Bob Glasgow, M.S., S.E.  
Principal

Amir Gilani, PhD., S.E.  
Expert Structural Specialist