JLC Tech T-bar LED Lights in DesignFlex

Full scale seismic testing was performed the week of July 9, 2018 utilizing the University at Buffalo Earthquake Simulator (shake table) apparatus. The full-scale dynamic testing was performed according to a modified ICC Acceptance Criteria for Seismic Qualification Testing of Nonstructural Components, AC 156. This criterion was modified to make if specific for the testing of grid system types, i.e. JLC Tech T-bar LED Lights in DesignFlex. The complete test protocol and test program is contained in Report No. UB SEESL-2018-32, Dated December 14, 2018.

Armstrong conducted tests on the JLC Tech T-bar LED Lights and DesignFlex metal suspension system. The seismic simulation for both designs was based on the mapped spectra accelerations at short periods of S_S up to 2.25 g (from the International Building Code, 2015). Spectra were generated for horizontal and vertical earthquake shaking.

Ceiling System 18 and 18B: DesignFlex triangles and parallelogram combination
Ceiling system 18 occupied the entire test frame. A suspension grid was attached to the test frame and panels were placed in each grid opening. The suspension grid for ceiling system 18B was the same as that installed for system 18. The layout of the ceiling grid and the panels for ceiling systems 18 and 18B are presented in Figure 1. Figure 2 presents typical details of the ceiling systems.

A 7/8 in. wall angle molding was installed on all four walls of the test frame. The main runners spanned in the east-west direction at 48 in. on center, starting 48 in. from the north wall. Special 60° and 90° angle brackets were installed on the main runners. Cross tees were installed to complete the grid.

The main runners and cross tees were supported by wall angles on all sides of the test frame. Each grid member was attached to the wall molding by a BERC2 clip with one metal screw. On the north and east walls, the web of the grid member was screwed to the BERC2, providing uniaxial horizontal restraint. This connection type is denoted as “fixed”. On the south and west walls, the web of the grid member was screwed through a slotted hole into the BERC2, allowing uniaxial horizontal movement. This connection type is denoted as “floating”. The clearance between the grid members and the wall molding was between 1/2 in. and 3/4 in. BERC2 clips were bent as required to accommodate the 60° angle on the cross tees.

The main runners were supported by #12 gage, soft annealed, galvanized, steel wires at the locations indicated in Figure 1. Each hanger wire was attached to a ceiling suspension member and to the test frame with a minimum of three turns within 3 in. of its ends.

Two compression posts were installed on the north side of the test frame; see Figure 1 for locations. The compression posts were screwed to the web of a main runner and clamped to the top of the test frame. Four #12 gage steel wires were attached to the main beam at the base of each compression post to restrain it in the plane of the ceiling. These wires were splayed 90° from each other and were attached to the test frame maintaining an angle of approximately 45° to the plane of the ceiling.

One layer of MDF parallelogram ceiling panels were installed in each grid opening located within 144 in. of the north wall. The parallelogram tiles had edge lengths of 48 in. and 55 in., an internal angle of 60°, and weighed 2.42 lb./ft^2. One layer of wooden triangular ceiling panels were installed in each grid opening located within 96 in. of the south wall. The triangular panels were right-angled isosceles shaped, with edge lengths of 48 in., 48 in. and 68 in, and weighed 2.51 lb./ft^2.The weight of the grid was approximately 0.65 lb./ft^2. MBAC clips were installed on the panels to secure them.

Damage to a cross tee connection to main runner was observed on the south side of ceiling system 18 at the end of testing. The damaged connection was replaced. Additionally, three cross tees were replaced with custom cross tee lights, as located in Figure 1. Views of the ceiling system 18B installed in the test frame is presented in Figure 3.

Table 1 presents summary information on the components of the ceiling system.

Figure 2 - Custom cross tee lights (system 18B)

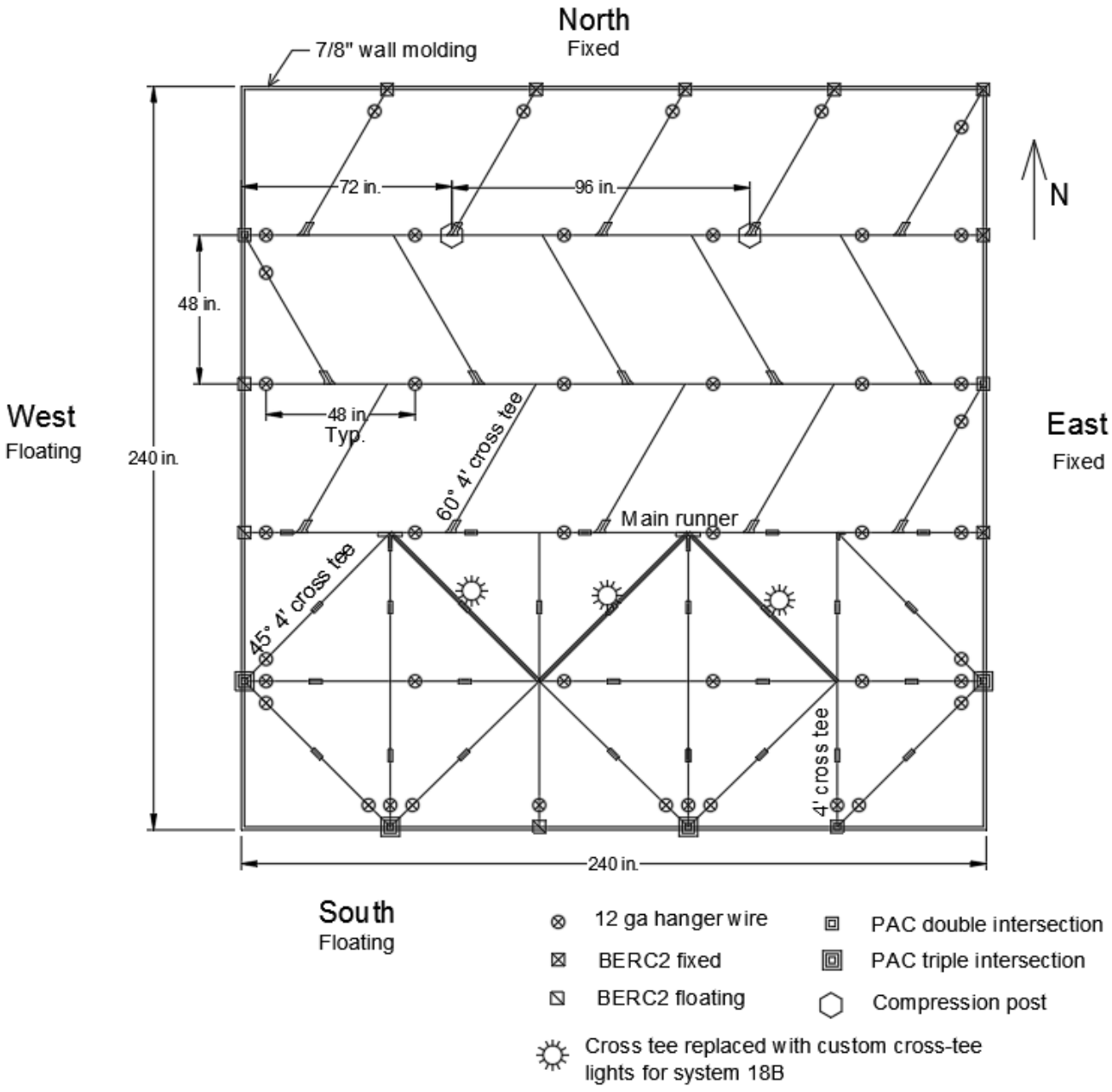

Figure 1: Layout of grid and panels for ceiling systems 18 and 18B

View from south-east

Figure 3: Views of ceiling system 18B installed in test frame

Table 1: Summary information on the components of ceiling system 18[1]

Component	Item number	Dimensions	Comments
Wall angle molding	7800	144 in. × 7/8 in. × 7/8 in.	Installed on all four walls
Main runners	7501	144 in. × 15/16 in. × 1-11/16 in.	East - west
Special cross tees	-	9/16 in. × 49-3/8 in.	North - south
90° panels (triangles)	Wood	48 in. × 54 in. × 54 in.	2.51 lb/ft^2
60° panels (parallelograms)	MDF	48 in. × 48 in.	2.42 lb/ft^2
60° angle right bracket	BP75CB60R	-	Installed along main runner
60° angle left bracket	BP75CB60L	-	Installed along main runner
45° double angle bracket	BP75AB45D	-	Installed along main runner
45° angle left bracket	BP75AB45L	-	Installed along main runner

45° angle right bracket	BP75AB45R	-	Installed along main runner
Stabilizer clip	STAC	-	Installed on perimeter panels
BERC2	BERC2	-	Installed along perimeter ledger beam
JLC cross tee light	XM754548	-	Per light
Compression post	-	2 in. × 3-5/8 in.	20-gauge metal stud; length cut to fit

Seismic Conclusion

For this system, two performance limit states were defined as no damage to the suspension system or lights and no loss of any ceiling panel. Qualification levels were determined as one level of shaking below the level at which the limit state was reached.

For these evaluation tests the JLC Tech T-bar LED Lights in DesignFlex ceiling system was tested to a maximum shaking intensity of 2.0 g.

		Qualification Level	
Ceiling System ID	System Description	Limit state 1[1]	Limit state 2[2]
18B	JLC Tech T-bar LED Lights in DesignFlex.	1.75	1.75

[1.] Limit state 1 is the loss of one or more panels.

[2.] Limit state 2 is the substantial failure of the suspension system requiring replacement of the system.

If you have any further questions regarding the seismic performance of this Armstrong product, please contact Armstrong's TechLine at 877.276.7876, options 1, 2, 3.

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