CISCA Prepares New Recommendations for Seismic Restraint

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With the support of the National Science Foundation, the Ceilings and Interior Systems Construction Association (CISCA) for the past seven years has been conducting tests to determine whether the current Uniform Building Code requirements for suspended T-Bar ceiling seismic restraint is effective. The CISCA Seismic Committee has recommended changes to the Uniform Building Code, particularly affecting Zones 0, 1 and 2.

CISCA originally researched and drafted the first Standard for life safety in seismic areas in 1972. This was incorporated in the UBC in 1978. More recently, CISCA officials, working with engineers at ANCO Engineering, Inc., in Culver City, California, decided to review the original standards, testing them for effectiveness. The result of this recent research is that CISCA now recommends clarification of and changes in the UBC for Zones 0-2. An article describing CISCA’s new recommendations for Zones 0-2 appears in the November issue of Interior Construction magazine.

One of the issues identified by the CISCA Seismic Committee is the need for industry education on current UBC Standards for seismic restraint of ceilings. The following comments review recommendations in the current Standard, which does not distinguish between zones. The comments are intended to clarify currently recommended procedures for Zones 3 and 4; however, like Zones 0-2, CISCA leadership and the Seismic Committee anticipate that the Code for Zones 3-4 will be modified as the testing and committee review continues through the balance of 1990 and during 1991.

The current UBC Standard 47-18 covers metal ceiling suspension used...
primarily to support acoustical tile or acoustical lay-in panels as follows:

1. SCOPE

Suspended ceilings which are designed and constructed to support ceiling panels or tiles, with or without lighting fixtures, ceiling mounted air terminals or other ceiling mounted services shall comply with the requirements of this standard.

Exceptions:

1. Ceiling area of 144 square feet or less surrounded by walls which connect directly to the structure above shall be exempt from the lateral load design requirements of these standards.

2. Ceilings constructed of lath and plaster or gypsum board, screw or nail attached to suspended members that support a ceiling on one level extending from wall to wall.

2. MINIMUM DESIGN LOADS

1. Lateral Forces:

Such ceiling systems and their connections to the building structure shall be designed and constructed to resist a lateral force specified in Chapter 23 of the Uniform Building Code.

Connection of lighting fixtures to the ceiling system shall be designed for a lateral force of 100% of the weight of the fixture.

2. Grid Members, Connectors and Expansion Devices:

The main runners and cross runners of the ceiling system and their splices, intersection connectors and expansion devices shall be designed and constructed to carry a mean ultimate test load of not less than 180 pounds or twice the actual load, whichever is greater, in tension with a 5-degree misalignment of the members in any direction, and in compression. In lieu of 5-degree misalignment, the load may be applied with a 1-inch eccentricity on a sample not more than 24 inches long each side of the splice. The connections at splices and intersections all shall be of the mechanical interlocking type.

Where the composition or configuration of ceiling system members or assemblies and their connections are such that calculations of their allowable load-carrying capacity cannot be made in accordance with established methods of analysis, their performance shall be established by test.

Evaluation of test results shall be made on the basis of the mean values resulting from tests of not fewer than three identical specimens, provided the deviation of any individual test result from the mean value does not exceed plus or minus 10%. The allowable load-carrying capacity as determined by test shall not exceed one half of the mean ultimate test value.

3. Substantiation:

Each ceiling system manufacturer shall furnish lateral loading capacity and displacement or elongation characteristics for their systems, indicating the following:

a. Maximum bracing pattern and minimum wire sizes.

b. Tension and compression force capabilities of main runner splices, cross runner connections and expansion devices.

All tests shall be conducted by an approved testing agency.

3. INSTALLATION

1. Vertical Hangers:

Suspension wires shall not be smaller than No. 12 gauge spaced at not less than No. 10 gauge at five feet on center along each main runner unless calculations justifying the increased spacing are provided.

Each vertical wire shall be attached to the ceiling suspension member and to the support above with a minimum of three turns. Any connection device at the supporting construction shall be capable of carrying not less than 100 pounds.

Suspension wires shall not hang more than one in six out-of-plumb unless countersloping wires are provided. Wires shall not attach to or bend around interfering material or equipment. A trapeze or equivalent device shall be used where obstructions preclude direct suspension.

Trapeze suspensions shall be a minimum of back-to-back 1-1/4 inch cold-rolled channels for spans exceeding 48 inches.

2. Perimeter Hangers:

The terminal ends of each cross runner and main runner shall be supported independently a maximum of eight inches from each wall or ceiling discontinuity with No. 12 gauge wire or approved wall support.

3. Lateral Force Bracing:

Where substantiating design calculations are not provided, horizontal restraints shall be effected by four No. 12 gauge wires secured to the main runner within two inches of the cross runner intersection and splayed 90 degrees from each other at an angle not exceeding 45 degrees from the plane of the ceiling. A strut fastened to the main runner shall be extended to and fastened to the structural members supporting the roof or floor above. The strut shall be adequate to resist the vertical component induced by the bracing wires. These horizontal restraint points shall be placed 12 feet on center in both directions with the first point within six feet from each wall. Attachment of the restraint wires to the structure above shall be adequate for the load imposed.

Lateral force bracing membranes shall be spaced to not interface with horizontal piping or duct work that is not provided with bracing restraints for horizontal forces. Bracing wires shall be attached to the grid and to the structure in such a manner that they can support a design load of not less than 200 pounds or the actual design load, whichever is greater, with a safety factor of two.

4. Perimeter Members:

Unless perimeter members are a structural part of the approved system, wall angles or channels shall be considered as aesthetic closers and shall have no structural value assessed to themselves or their method of attachment to the wall. Ends of main runners and cross members shall be tied together to prevent their spreading.

5. Attachment of Members to the Perimeter:
To facilitate installation, main runners and cross runners may be attached to the perimeter member at two adjacent walls with clearance between the wall and the runners maintained at the other two walls or as otherwise shown or described for the approved system.

4. LIGHTING FIXTURES

Only “intermediate” and “heavy duty” ceiling systems as defined in Paragraph B may be used for the support of lighting fixtures.

All lighting fixtures shall be positively attached to the suspended ceiling system. The attachment device shall have a capacity of 100% of the lighting fixture weight acting in any direction.

When “intermediate” systems are used, No. 12 gauge hangers shall be attached to the grid members within three inches of each comer of each fixture. Tandem fixtures may utilize common wires.

Where “heavy duty” systems are used, supplemental hangers are not required if a 48-inch modular hanger pattern is followed. When cross runners are used without supplemental hangers to support lighting fixtures, these cross runners must provide the same carrying capacity as the main runner.

Lighting fixtures weighing less than 56 pounds shall have, in addition to the requirements outlined above, two No. 12 gauge hangers connected from the fixture housing to the structure above. These wires may be slack.

Lighting fixtures weighing 56 pounds or more shall be supported directly from the structure above by approved hangers.

6. PARTITIONS

Where the suspended ceiling system is required to provide lateral support for permanent or relocatable partitions, the connection of the partition to the ceiling system, the ceiling system members and their connections, and the lateral force bracing shall be designed to support the reaction force of the partition from prescribed loads applied perpendicular to the face of the partition. These partition reaction forces shall be in addition to the loads described in Section 47.1811 of the Uniform Building Code. Partition connectors, the suspended ceiling system and the lateral form bracing shall all be engineered to suit the individual partition application and shall be shown or defined in the drawing or specifications.

7. DRAWINGS AND SPECIFICATIONS

The drawings shall clearly identify all systems and shall define or show all supporting details, lighting fixture attachment, lateral force bracing, partition bracing, etc. Such definition may be by reference to this standard, or approved system, in whole or in part. Deviations or variations must be shown or defined in detail.

Conclusion

CISCA officials, working with ANCO Engineers, will review the above stated standards during the course of 1990-1991 with the intention of modifying the current recommendations so that life safety can be provided in a cost-effective manner. The final approval process includes review by the International Conference of Building Officials (ICBO) who publish the Uniform Building Code, the Building Officials and Code Administrators International (BOCA) who publish the National Building Code, and the Southern Building Code Congress International (SBCCI), who publish the Standard Building Code. CISCA will continue to provide information on developments in this critical area.