This document has been revised based on current Building Code standards. In all buildings, other than structures classified as essential facilities, suspended ceilings installed in accordance with the prescriptive provisions of the 401 document are deemed to comply with the current building code interpretation.

This document provides the IBC-2009 referenced standards for the installation of suspension systems for acoustical lay-in ceilings. Incorporation of this document will provide a more uniform standard for installation and inspection. This document is designed to accomplish the intent of the International Building Code (IBC) with regard to the requirements for seismic design category D, E and F for suspended ceilings and related items. Unless supported by engineering, the suspension system shall be installed per these requirements. Manufacturers’ recommendations should be followed where applicable.

General Recommendations


- Partitions that are tied to the ceiling and all partitions greater than 6 feet in height shall be laterally braced to the structure. Bracing shall be independent of the ceiling splay bracing system. Source: ASCE 7-05 section 13.5.8.1

- For further information on bracing of non-load bearing partitions refer to NWCB technical document #200-501.

- All main beams are to be Heavy Duty (HD). Source: ASCE 7-05 section 13.5.6.2.2 a

- All cross tees shall be capable of carrying the design load without exceeding deflection equal to 1/360 of its span. Source CISCA zones 3-4

- These recommendations are intended for suspended ceilings including grid, panel or tile, light fixtures and air terminals weighing no more the 4 lbs. per square foot. Source: ASCE 7-05 section 13.5.6.1

- All wire ties are to be three tight turns around itself within three inches. Twelve gage Hanger wire spaced 4 foot on center (figure 1). Source: ASTM C 636 item 2.3.4

- Changes in ceiling planes will require positive bracing. Source: ASCE 7-05 13.5.6.2.2 f
EMT CONDUIT

<table>
<thead>
<tr>
<th>EMT Conduit</th>
<th>Maximum Length</th>
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</thead>
<tbody>
<tr>
<td>½&quot; EMT conduit</td>
<td>up to 5’10&quot;</td>
</tr>
<tr>
<td>¾&quot; EMT conduit</td>
<td>up to 7’8&quot;</td>
</tr>
<tr>
<td>1&quot; EMT conduit</td>
<td>up to 9’9&quot;</td>
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</tbody>
</table>

METAL STUDS

<table>
<thead>
<tr>
<th>Metal Stud</th>
<th>Maximum Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single 1 5/8&quot; metal stud (20 gauge)</td>
<td>up to 12’0&quot;</td>
</tr>
<tr>
<td>Back-to-back 2 1/2&quot; metal stud (20 gauge)</td>
<td>up to 15’0&quot;</td>
</tr>
<tr>
<td>Single 2 ½&quot; metal stud (20 gauge)</td>
<td>up to 13’6&quot;</td>
</tr>
<tr>
<td>Back-to-back 2 1/4&quot; metal stud (25 gauge)</td>
<td>up to 15’0&quot;</td>
</tr>
</tbody>
</table>

Note: Plenum areas greater than 15’0” will require engineering calculations.

Wall Moldings

<p>| | |</p>
<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Attached Wall Molding Requirements</td>
<td>Unattached Wall Molding Requirements</td>
</tr>
<tr>
<td>WALL</td>
<td>WALL</td>
</tr>
<tr>
<td>maximum 2” (50 mm)</td>
<td>maximum 8” (202 mm)</td>
</tr>
</tbody>
</table>

Speader bar or other suitable system required to keep perimeter components from spreading apart.
• The grid shall be attached at two adjacent walls (pop rivets or approved method). Soffits extending to a point at least level with the bottom plane of the grid and independently supported and laterally braced to the structure above are deemed to be equivalent to walls. *Source: State of Oregon, Building Codes Division*

• **Spreader Bars** *(figure 4b)*
  
  Spreader (spacer) bars shall be used to prevent the ends of the main beams and cross tees at perimeter walls from spreading open during a seismic event. Perimeter wires shall not be in lieu of spreader bars. *Source: CISCA Seismic zones 3-4*

  - Spreader bars are not required at perimeters where runners are attached directly to closure angles.
  - Wire tying is an acceptable alternative to spreader bars.
  - Spreader bars are not required if a 90 degree intersecting cross or main is within 8 inches of the perimeter wall.
  - Where substantiating documentation has been provided to the local jurisdiction, perimeter clips may be used to satisfy the requirements for spreader bars.
    *Source: State of Oregon, Building Codes Division*

**Hanger (Suspension) Wires** *(figures 5a and 5b)*

- Hanger and perimeter wires must be plumb within 1 in 6 unless *(figure 5a)* counter sloping wires are provided *(figure 5b)*. *Source: ASTM C 636 section 2.1.4*

- Hanger wires shall be 12 gage and spaced 4 feet on center or 10 gage spaced 5 feet on center. *Source: ASTM C 636*

- Any connection device at the supporting construction shall be capable of carrying not less than 100 pounds. *Source: CISCA zones 3-4*

- Powder-driven shot-in anchors (PAFs) are an approved method of attachment for hanger wires. *Source: State of Oregon, Building Codes Division*

- Terminal ends of each main beam and cross tee must be supported within 8 inches of each wall with a perimeter wire *(see figure 4 & 5 b)*. *Source: CISCA zones 3-4*

- 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 1¼ inch cold-rolled channels for spans exceeding 48 inches. *Source: CISCA zones 3-4*

**Electrical fixtures**

- Light fixtures weighing less than 10 pounds shall have one 12 gage hanger wire connected from the fixture to the structure above. This wire may be slack. *Source: CISCA Seismic zones 3-4*

- Light fixtures weighing more than 10 pounds and less than 56 lbs. shall have two 12 gage wires attached at opposing corners of the light fixture to the structure above. These wires may be slack. *Source: CISCA Seismic zones 3-4*
• Light Fixtures weighing more than 56 lbs. shall be supported directly from the structure above. These wires must be taut. Source: CISCA Seismic zones 3-4

• Pendant mounted fixtures shall be directly supported from the structure above using a 9 gage wire or an approved alternate support without using the ceiling suspension system for direct support. Source: CISCA Seismic zones 3-4

• Tandem fixtures may utilize common wires.

Mechanical Services

• Terminals or services weighing 20 lbs. but not more than 56 lbs. must have two 12 gage wires connecting them to the ceiling system hangers or the structure above. These wires may be slack. Source: CISCA Seismic zones 3-4

• Terminals or services weighing more than 56 lbs. must be independently supported directly from the structure above. These wires must be taut. Source: CISCA Seismic zones 3-4

Seismic Separation Joints (figure 7)

• For ceiling areas exceeding 2,500 square feet, a seismic separation joint or full height wall partition that breaks the ceiling shall be provided unless analyses are performed of the ceilings bracing system, closure angles and penetrations to provide sufficient clearance. Source: ASCE 7-05 section section 13.5.6.2.2 d

• The layout and location of the seismic separation joint shall be per the designer of record and noted on the plans. If a seismic separation joint is required by the designer, the designer may use the generic joint detailed in this document or a proprietary joint. The amount of free movement (gap design) shall be a minimum of \( \frac{3}{4} \) inch. Source: State of Oregon, Building Codes Division

• In lieu of seismic separation joints, the ceiling may be divided into areas less than 2500 square feet by the use of partitions or soffits as follows: partitions shall extend a minimum of 6 inches above the level of the plane of the grid and shall be independently braced to the structure above. Soffits shall extend to a point at least level with the bottom plane of the grid and shall be independently supported and laterally braced to the structure above. Source: State of Oregon Building Codes Division

• Other than partitions and soffits, seismic joints may not be used as part of a fire rated ceiling assembly unless substantiating documentation is provided. Source: State of Oregon Building Codes Division

Sprinklers

For ceilings without rigid bracing, sprinkler head penetrations shall have a 2 inch oversize ring, sleeve or adapter through the ceiling tile to allow free movement of at least 1 inch in all horizontal directions. Flexible head design that can accommodate 1 inch free movement shall be permitted as an alternate. Source: ASCE 7-05 13.5.6.2.2 e
Glossary for this Document (regional terminology may vary)

CROSS TEES
The cross member that interlock with the main beams, also known as cross runners or cross T-bars.

DIFFUSER
A circular or rectangular metal grill used for the passage of air from a ducted system.

ESSENTIAL SERVICE BUILDINGS
Any buildings designed to be used by public agencies as a fire station, police station, emergency operations center, State Patrol office, sheriff’s office, or emergency communication dispatch center.

GRID
The main beams and cross tees of the suspension system.

HANGER WIRE
10 or 12 gage soft annealed wire used as primary support for the grid system. Also called suspension wires.

LATERAL FORCE BRACING
The bracing method used to prevent ceiling uplift or restrict lateral movement during a seismic event. Lateral force bracing consists of vertical struts and splay wires.

MAIN BEAM
The primary suspension member supported by hanger wires, also known as the main runner, carrying tee, carrying runner or mains.

MOLDING/CLOSURE ANGLE
A light gauge metal angle or channel fastened to the perimeter wall or partition to support the perimeter ends of an acoustical ceiling grid.

PERIMETER CLIPS
Proprietary angle bracket attached directly to the wall molding/closure angle which allows for ¾” movement in the event of seismic activity and interlocks properly with ends of grid system.

PERIMETER WIRES
Hanger wires placed within eight inches of the surrounding walls.

PLENUM
The space above a suspended ceiling.

SLACK WIRE
A 12 gage wire that is not tight or taut.

SPREADER or SPACER BAR
A bar with notches to prevent the suspension system from separating, also called a stabilizer bar.

SPLAY WIRES
Wires installed at an angle rather than perpendicular to the grid.

VERTICAL STRUTS
The rigid vertical member used in lateral force bracing of the suspension system. Also known as compression posts, seismic pods, seismic struts. Common materials are electrical conduit (EMT), metal studs or proprietary products.

The NWCB has been serving the construction industry for over forty years. It is recognized as a technical authority, educational body and spokesperson for the wall and ceiling industry. It provides services to architects and the construction community on all matters relating to the diversified wall and ceiling industry. As the industry’s development and coordination organization, the NWCB saw the need to establish a document to provide clarification and the intent of NEHRP (National Earthquake Hazards Reduction Program) an agency of FEMA (Federal Emergency Management Agency). It is meant to serve as a set of recommendations and is not intended for any specific construction project. This technical document is to serve as a guideline and it is not intended for any specific construction projects. NWCB makes no express or implied warranty or guarantee of the techniques, construction methods or materials identified herein.