

Felt Tips

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Expansion Joint Covers

They have to resist some tough conditions and must always work, yet be hardly noticed. They result when new buildings are constructed next to existing buildings, or when a building is very long (usually more than 100 m (300 feet)). They occur in hospitals, schools, airports, and shopping malls. They are a part of every bridge. They cover gaps (joints) that can't be filled and still allow for movement. They are usually very wide when compared to other methods used to cover joints. They are expansion joint covers.

Expansion joint covers are available in many profiles and shapes for various needs and locations. However, selecting joint covers involves more than judging aesthetic appearance. Many criteria should be considered when selecting expansion joint covers.

Expansion joint size and movement range are affected by distance between joints in building or bridge; primarily based upon expected amounts of thermal expansion and contraction of the building structure and shear along the joint's length. In some projects, expected movement from seismic activity or wind sway may be included. Expansion joint size should be determined by the architect or structural engineer. A joint's maximum and minimum size dimensions are decided when calculating the joint size. Nominal Joint Cover Size is also called the Design Width, and is usually the average dimension between the smallest and largest dimensions the joint cover must achieve. Movement Range is the maximum and minimum size dimensions of the joint, and are the smallest and largest dimensions the joint cover must achieve.

A constructability concern accompanies joint size and movement range. Drawings or specifications should indicate the joint size to be covered by the joint cover and identify the substrates to which the joint cover will be attached. As the project's structure is constructed, the joint is formed in accordance with the indicated size. Joint size will change from the time it is formed and the time it is covered. As the project nears completion, the joint covers are installed at joints which may not be the same size as those indicated in the drawings or specifications, and "problems" may result. Accommodation of this natural change in the joint size should be factored into the design and specification process.

Minimum joint size for an expansion joint cover is usually 50 mm (2 inches). Very few expansion joint covers are manufactured to cover joints less than 50 mm (2 inches) wide,

although a few are manufactured for 25 mm (1 inch) joints. Maximum size for expansion joint covers varies with the joint cover's design. Gaps less than 50 mm (2 inches) are usually treated with sealants supported by backer materials, if anticipated movement isn't too great.

Expansion joints pass through the entire building and all building systems which attempt to traverse the gap. The joint's size does not change from floor to wall to ceiling to roof. If it is a 50 mm (2 inch) joint in the floor, it must be a 50 mm (2 inch) joint in the walls and a 50 mm (2 inch) joint in the ceiling and roof.

Joints in substrates and framing systems must be carried through the overlying materials. A joint in a concrete slab must be carried through the overlying floor surface. If the overlying material does not have a joint in it where the joint occurs in the substrate, overlying stiff materials (like stone and ceramic tile) will crack and flexible materials (like resilient flooring, carpet, and flexible wall coverings) may deform, bulge, or bend.

Joint covers are designed to accommodate movement in one of several directional groups:

- Two directions (in a single plane).
- Three directions (but not simultaneously).
- Simultaneous movement in three directions (resulting in torsion); these joint covers are usually called "seismic" covers. Some of the more recently introduced designs allow for the cover plate of the joint cover assembly to "pop-out" from the joint cover's frame during the seismic event and be reset afterwards.

Traffic conditions for floor joints affect design and configuration of the joint cover's internal components and configuration. Usually, joint covers which are intended for heavier load conditions are manufactured from thicker components.

- "Traffic Loads": Usually automotive traffic at speeds exceeding 40 kph (25 mph). These joints are associated with highway bridges. High speed and high load impact from cars and trucks (including snow plow blades) must be resisted.
- "Heavy Loads": Usually fork lift trucks and automotive traffic. Vehicle speed influences product selection. Usual anticipated speed for vehicles in buildings is less than 40 kph (25 mph). Also, this includes the ability to resist impact from snow plows.
- "Light Loads": Pedestrian traffic.
- "Light Rolling Traffic": This includes hard rubber wheels from delivery dollies and maintenance equipment. Small rubber wheels produce intense impact forces on joint covers that can cause failure of the joint cover, or cracks at adjoining surface materials. Light rolling traffic often accompanies the light loads of pedestrian traffic

Covers placed in fire-rated assemblies must have the same rating as the fire-rated assembly. This is usually accomplished by placing the manufacturer's ceramic fiber insulation in the joint behind the cover assembly. Fire barriers may conflict with installation of moisture barriers, particularly for narrow joints.

Appearance:

- Joints may have a minimally exposed appearance (usually preferred by Architects since the joint cover is hardly seen; often accomplished by recessing into the adjoining construction) or fully-exposed appearance (usually when they are surface-mounted).
- Profile: This affects smoothness of transitions between joint components. Consider floor joint "bumpiness" for hospitals and health care facilities. Some resilient joint cover materials (which provide a smooth joint cover surface) may bulge when compressed, and may create a potential tripping hazard.
- Surface treatment of metal plate covers: Smooth, fluted (grooved), abrasive-coated, or carpet or resilient flooring inserts are the common options. Flutes and abrasives increase slip-resistance but may be difficult to keep clean.

Joint cover profile and surface treatment may increase or decrease its ability to collect dirt and be cleaned. Resistance to chemicals in anticipated cleaning materials or other materials (like pavement de-icing chemicals) which may come in contact with the joint cover should also be considered.

Joint covers may handle moisture infiltration in one of three ways:

- They may let moisture pass through without being collected. Most expansion joint covers are in this category and allow liquids to pass through.
- They may let moisture pass through but control its collection and drainage. Some expansion joint covers may be obtained with built-in gutters which collect water passing through the joint cover and prevent its passage into the building. They must be connected to drainage pipes. Some designers may take a "belt and suspenders" approach and place gutters, independent of the joint cover, behind the joint's gap to collect water which passes through. If independent gutters are used, they must also accommodate joint movement.
- They make act as a barrier and prevent the moisture from entering and passing through the joint cover. Very few joint covers are manufactured to prevent entry and passage of liquids. Often, these waterproof joints have elastomeric bellows which are tied into a waterproofing membrane in the construction adjoining the cover assembly.

Moisture infiltration control varies with the location of the joint cover:

- Floors and Parking Decks: Floor joint covers use moisture barriers behind the cover to collect and drain away dripping water. Special elastomeric joint covers can be used for parking decks that can prevent water passage. If the joint is to allow water to pass through the cover to a gutter, resistance to intense pressure from winter ice formations must be accommodated.
- Walls and ceilings: They use a flexible membrane seal behind cover assembly. Usually required for covers in exterior walls.
- Roofs: Roof expansion joint covers integrate a moisture barrier behind the cover to collect and drain moisture infiltration that may get past the outer cover.

A special group of expansion joint covers are used for roof expansion joint covers. Types:

- A flexible bellow mounted on separate roof curbs. This places the cover 200 to 300 mm (8 to 12 inches) above the roof plane (which is preferred by some building designers and recommended by good roofing practice). A difficulty with this method is the need for special detailing of the transition to exterior wall joint covers. Expansion joint covers can be tapered down to interface smoothly with flush perimeter conditions (such as copings and gravel stops).
- Integrated manufactured assembly combining curb and cover components. Most units usually place the cover's top less than 150 mm (6 inches) above the roof plane, yet allow for manufacturer-standard transitions to exterior wall joint covers.

Various materials are used in expansion joint cover assemblies. They include metals and resilient materials. Metals are often used for the joint cover's frame and structural elements. Resilient components may be used for covering the gap. The materials are combined together in various configurations based upon the need to satisfy the criteria described above.

- Metals: Used for the joint cover's frame. Aluminum is usually used for building joints; some are available in stainless steel and bronze (\$\$\$). Bridge joint covers are usually entirely manufactured of steel components. Avoid anodized aluminum finishes on floor covers, since anodizing will be worn off by abrasion from the traffic. Specify metal floor covers with a mill finish, which will hide scratches.
- Resilient components. Materials used vary with joint location. Options:
 - EPDM: A synthetic rubber; interior/exterior uses; black color only.
 - Neoprene : A synthetic rubber; interior/exterior uses; black color only.
 - Santoprene : A thermoplastic rubber; interior/exterior uses; variety of colors.
 - Silicone: A synthetic rubber; interior/exterior uses; variety of colors. This is a recent introduction into the marketplace and is not available from most manufacturers.
 - Polyvinyl chloride (PVC): A thermoplastic; interior use only (has a tendency to degrade when exposed to sunlight); variety of colors.
- Other specialized materials are available for custom fabricated joint covers to resist a variety of chemicals.

Joints covers may have to accommodate various transitions as the expansion joint passes through the project.

- Cover Transitions from Flat Surfaces to Corners: Covers may have to be positioned in corners (intersection of wall and floor) besides being in the middle of a flat surface (floor or wall).
- Transition to Adjoining Finish Surfaces: Avoid applying stiff materials on top of joint covers. Joint cover components move. Thin set stone and ceramic tile on joint covers will experience cracking and delamination failures. Butt these surface finishes (with an intervening sealant joint) to the side of the joint cover assembly.

Select expansion joint cover assemblies carefully. It isn't difficult or complicated, but it does involve more than judging appearance.

Contributed by Scott Sider, CCS