THE EFFECTS OF BUILDING MOVEMENT ON INTERIOR FINISHES AND SOLUTIONS

Presented by: TRIM-TEX DRYWALL PRODUCTS

LEARNING OBJECTIVES

After reading this article you will be able to:

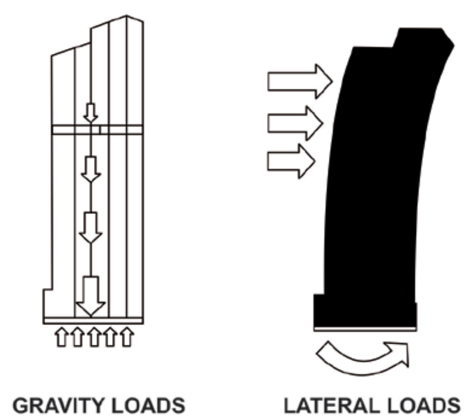
1. Discuss the different types of loads that are applied to a structure, causing movement in the building.
2. Review the types of movement that may occur and how this will affect building components and their connections to each other over time.
3. Examine the effect of movement on interior finishes.
4. Identify solutions and steps that must be taken to prevent damage to building components from movement.

By Paige Lozier

MOVEMENT IN BUILDINGS

The goal of building construction is to achieve a state of equilibrium among all the parts that make up a structure and the forces acting on it. Movement in buildings is caused by different types of loads being applied to the materials, connections, or assemblies of a building. As loads are applied individually or concurrently, changes take place in the shape of a building's components and their connection to each other. These changes can cause internal pressure, which in turn can cause some of the components to deform or fail, resulting in cosmetic or structural damage.

To prevent structural damage certain types of allowable movements, such as deflection track, are incorporated into the design of a building.



There are several types of loads that can have a significant impact on a building's structural integrity and the soundness of finishes.

These designs sometimes fail to take into account how the movement will affect interior and cosmetic surface finishes.

LOAD TYPES—GRAVITY AND LATERAL

There are several types of loads that can have a significant impact on a building's structural integrity and the soundness of finishes. These can be divided into gravity (vertical) loads and lateral (non-vertical) loads. Gravity loads include static and dynamic.

Static Loads, also known as dead loads, are the relatively consistent loads found in any building over time. They include the weight of the structure itself and the immovable components of the building such as partition walls, flooring systems, or mechanical systems.

Dynamic, or live loads, increase or decrease with the building's use and are usually of a shorter duration. They can include people, furniture, and vehicles. Building floors and roofs bear the live loads as they change day-to-day and seasonally. Environmental factors also contribute to the live load; rain, snow, or ice accumulation on a roof are examples of changing loading conditions.

Lateral loads include wind, seismic, impact, and environmental. All buildings move in the wind, which is primarily a horizontal load. Wind pressure on building facades causes sway or drift of the structure itself. The structural design, material rigidity, connection strength, building height, exposure rating, and dampening are all factors in how much "story drift" takes place as the load is applied.

Seismic loads, or earthquakes, cause a multi-directional movement to take place at a building's foundation. The building's inertia resists the movement as it travels vertically up the building, causing deformations in the structural and finished elements. Depending on the building's resistive and ductile qualities the deformations can be slight or severe.

Impacts loads are the sudden acceleration of component parts due to internal or external stresses. Collisions with large moving objects and blast waves can subject a building's systems to sudden deformation.

Finally, environmental loads such as frost heaves, rain water ponding, as well as snow, rain, and ice accumulation are all loads a building must be designed to resist. Failure to do so can result in foundational deformation and roof deflection or collapse.

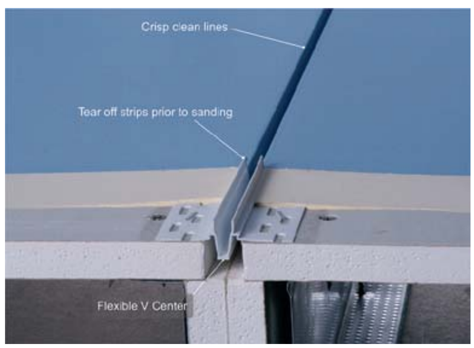
MOVEMENT TYPES AND THEIR EFFECT ON BUILDING COMPONENTS

Reinforcing corners and reveal beads not only provide protection to drywall finishes but can also add aesthetic design elements.

As buildings are subjected to various types of loads, movement will inevitably occur. The types of movement include in-plane, out-of-plane, deflection, thermal expansion and contraction, and hygrometric expansion and contraction. Other types of movements are building racking, building settling, and building creep.

In-plane movement occurs as a force is applied to a component in the same direction as its dominant section. An example is a gypsum panel moving along a surface on its face. Out-of-plane movement occurs when a force is applied perpendicular to the dominant face of a component.

Dead and live loads cause deflection (bending) in floors and roofs. This is the bending of joists, trusses, or rafters associated with loaded structures.



As a general rule control joints should be spaced no more than 30' apart.

Thermal Expansion and Contraction

All materials expand and contract when the ambient temperature changes. This change in size occurs at a material's edges, which can cause stress to occur when vulnerable materials meet and apply pressure to one another. Interior components experience less expansion and contraction than exterior ones due to a more controlled temperature. Never the less, interior components need to be able to accommodate the overall expansion and contraction of the building as it changes temperature due to environmental changes throughout the day and seasons.

Thermal expansion and contraction is most prevalent on long runs of wall or ceiling materials. As a general rule control joints should be spaced no more than 30' apart. Also, due to differing coefficients of expansion, control joints should be placed where differing materials meet. Source: USG Gypsum Construction Handbook

Hygrometric Expansion and Contraction

Depending on a component's materials, as it takes on or loses moisture it can expand and contract. As an example, wood swells when exposed to excessive moisture, and shrinks as it dries. Even kiln dried lumber can continue to dry enough, post installation, to contract and cause deformation of interior finishes. The same is true for gypsum panels.

Racking, Settling, and Creep

As force is applied laterally to a building, the components experience stress to move horizontally and in an over-turning direction. This is called building racking. This lateral and rotational movement is realized by the building swaying to one side, which is called "story drift".

Building settling occurs when there is a gradual or sudden subsidence of a portion of the supporting soil under a building which results in a differential settlement of its foundation. This causes external walls, internal partitions, and support members to shift and can cause damage to structural and finished elements.

Most building construction components exhibit signs of subtle deformation over time. Creep is when those components gradually change shape in response to consistently applied forces over a protracted length of time. Creep in concrete, steel, and wood can sometimes be accounted for during the design of a building. Floors, roofs, and walls that experience higher than anticipated loading can develop creep faster than appropriately loaded ones. Creep is a common cause of cracks where interior walls meet the floor/roof above. This is known as a deflection crack.

Roof Truss Uplift

Roof truss uplift is the upward bowing of the roof trusses to which the ceilings are attached. Arched roof trusses, moving in response to moisture and temperature variations across the truss, can lift the building ceiling enough to cause nail pops or cracks at ceiling and wall junctures.

Roof truss uplift occurs when the bottom chord of the truss is exposed to significantly different moisture or temperature conditions than the rest of the roof truss. The differences in temperature, and perhaps humidity in the case of wood trusses, can cause the roof truss to arch upwards at its center, often seasonally as attic temperatures and moisture conditions vary.

Because the truss ends are secured to building's exterior walls—a location that resists outward thrust—as the truss bottom chord wants to expand along its length, the force pushes it upwards into the attic space. Therefore roof truss uplift is usually observed at the ceiling-wall juncture of central interior wall partitions that run at right angles to the direction of the roof trusses.

Roof uplift can also be caused by wind loading. As wind moves along flat surfaces, such as roofs, it can create negative pressure, similar to an airplane wing. This negative pressure can result in an uplift force on the roof. Roof structures generally must be designed to resist both gravity (snow, dead loading) and uplift (wind, thermal) forces. This can result in a larger range of deflection.

MOVEMENT'S EFFECTS ON INTERIOR FINISHES

Movement can have a great effect on interior finishes, from cracking, crushing, degradation, and noise, to fastener imperfections and joint/surface defects.

Cracking

Cracking is the splitting of interior or exterior finishes and can occur as different building components move due to stress being applied to them. There are several types of cracking.

Joint cracking appears either directly over the long edge or butt ends of boards or panel systems, or may appear along the edge of taped joints. Joint cracking is often caused by structural movement and/or hygrometric and thermal expansion and contraction, or by excessively fast drying of joint compounds, adhesives, or other gap filling materials.

Field cracking usually appears as a diagonal crack originating from a corner of a partition or intersection with structural elements. Field cracking is also seen directly over a structural element in the center of a partition. It may originate from corners of doors, light fixtures and other weak areas in the surface related by the penetration.

Angle cracking appears directly in the apex of the wall-ceiling junction or interior angles where partitions intersect. It can also appear as cracking at the edge of paper reinforcing taped near surface intersections of wall sheathing systems. Angle cracking can be caused by structural movement or improper application of joint compound in a corner angle. Angle cracking is very commonly seen in cathedral and vaulted ceilings constructed of large dimensional lumber. The lumber shrinks on both sides of the cathedral putting stresses on the inside peak.

Bead cracking shows up along the edge of flanged components. It is caused by improper bead attachment, a faulty bead, or improper joint compound application in wall sheathing systems. To prevent cracking on outside corners due to the settling of wall partitions, leave a ¼" gap between the bottom of the bead and floor.

Crushing, Degradation, and Noise

Crushing can occur from the localized collapse of a material's inherent properties due to excessive point loading, or from a denser, more substantial material applying stress to its surface as it experiences movement.

Degradation is a breakdown of a material's finish, cohesiveness, internal structure, or performance properties. Degradation can result from the sudden or protracted contact, and subsequent friction, between materials as they experience movement.

Excessive or irregular noise can be created when two materials come in contact with one another through building movement. Noise can be irritating to a building's occupants. Sound proofing systems become less effective or even fail as materials, which are supposed to be separated, come into contact with one another and enable sound to be transmitted through their assemblies.

Fastener imperfections

Faster imperfections are a common result from building movement on finishes and may appear as darkening, localized cracking, a depression over fastener heads, or a pop or protrusion of the fastener or the surface area immediately surrounding the fastener. This is usually caused where framing or fastener application was improperly installed.

Joint/Surface Defects

Defects at joints usually occur in a straight-line pattern and appear as ridges, depressions, or blisters at a material's joints and edges. Imperfections may result from incorrect framing or joint treatment application at the location of the component movement.

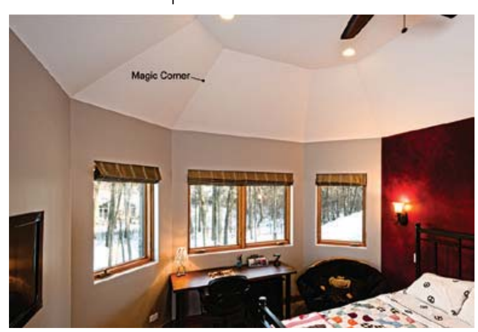
To summarize, material assemblies need additional attention and care taken in regard to movement in the following areas of concern:

- At locations where in-plane seams between two materials meet.
- At changes in material or material geometry.
- At the reentrant corners of window or door openings.
- At the exposed corners of wall intersections where foot traffic or impact is expected.
- The perpendicular meeting of two materials where in-plane movement is expected in a normal direction from the first material to the other.
- Where nonstructural elements and finishes meet structural assemblies.

SOLUTIONS FOR PREVENTING DAMAGE TO COMPONENTS

Bracing assemblies, reinforcing corners, and allowing room for the movement of materials are the fundamental steps that must be taken to prevent damage to building components. The following are general recommended best practices for products and installation that can help minimize damage to interior finishes from movement.

That being said, the major cause of job site issues and poor performance after application is failure to follow a manufacturer's directions and architect's specifications. Proper detailing and specifications will ensure that products are installed per current, proven standards in lieu of outdated techniques.



Large dimensional lumber used in framing cathedral and vault ceilings require inside expansion beads to be installed.

Expansion Products

There are many products that can help to control movement and protect finishes when movement does occur, including furring strips and resilient channels, deflection track, deflection beads, expansion beads, corner beads, and reveals.

Furring strips and resilient channels should be used to isolate panel systems from other parallel wall systems to prevent the transfer of movement or sound from one to another. Flexible screeds and gap filling materials should be embedded in joints and at edges to absorb the differential movement of materials and prevent their failure through contact.

Corner beads and edge trim pieces should be used to reinforce the edges of interior finish materials as they meet to form corners and surfaces. Proper installation of adhesives, fasteners, and joint compound are also vital to reinforcing material corners. Specifying the proper corner bead is very important. Metal corner beads are still very commonly used but do not offer the rust-proof and impact protection that newer materials such as vinyl can provide.

You may want to consider installing deflection track at the head-of-wall to prevent loading and movement from upper floors, which may cause cracking on interior partition walls. This allows for a satisfactory appearance and prevents contact between two construction systems which are experiencing different loading.

Resilient Channels

For the prevention of ceiling cracking, the Gypsum Association recommends using resilient channels. As we discussed earlier, every building material undergoes some amount of dimensional change from temperature and moisture content, and therefore the building assemblies as a whole undergo this shrinkage and expansion as the moisture content and temperature of the materials change over time. The thermal and hygrometric coefficients of expansion are not the same for all materials, so the amount of dimensional change will be different for different materials. When two materials with significantly different coefficients of expansion, such as drywall and wood framing, are rigidly attached to each other stresses will build up in the materials as their moisture contents and/or temperatures change.

QUIZ

1 Which type of loads increase or decrease with the building's use and are usually of a shorter duration?

Static	Dynamic
Seismic	Impact

2 Which type of movement is caused by ambient temperature changes?

Thermal expansion and contraction	Hygrometric expansion and contraction
Deflection	Racking

3 True or False: Roof truss uplift occurs when the bottom chord of the truss is exposed to significantly different moisture or temperature conditions than the rest of the roof truss.

4 Which type of cracking appears directly in the apex of the wall-ceiling junction or interior angles where partitions intersect?

Field cracking	Angle cracking
Bead cracking	Joint cracking

5 Which type of expansion product should be used to reinforce the edges of interior finish materials as they meet to form corners and surfaces?

Resilient channels	Deflection track
Reveals	Corner beads

6 True or False: Resilient channels can improve the sound insulation of partition and ceiling assemblies.

7 True or False: Reveal beads are often used in multi-story buildings where typical poured concrete and truss framing systems can move a great deal.

8 Which expansion control products provide twice the movement and superior expansion control?

Zinc	Vinyl

9 True or False: There should always be a gap between sheets of drywall in order to accommodate expansion and contraction, but this gap must be supported and bridged by an expansion bead.

10 True or False: A control joint is not necessary in long walls that are themselves broken up by floor-to-ceiling openings such as windows or doors if the resulting un-broken areas are less than 30 feet.

SPONSOR INFORMATION

TRIM-TEX DRYWALL PRODUCTS

Trim-Tex has been designing and producing drywall solutions for over 45 years. Besides being economical, vinyl drywall accessories are more flexible and durable than metal and will not rust, kink or dent. Trim-Tex beads have been used in many large commercial projects. The United Center, Chicago, IL has over 150,000' of Trim-Tex bead and the McCormick Place Annex has over 500,000' of Trim-Tex bead.

Note:

- Coefficient of expansion of drywall due to temperature variation = 0.0162
- Coefficient of expansion of drywall due to moisture level changes = 0.0072

In many cases, the amount of dimensional change, as a percent of the material's original dimension, is insignificant and uneventful. However, the actual amount of dimensional change is a function of the size of the individual elements. When framing spans approach or exceed 15 feet, the difference between the expansion coefficients of these two materials becomes significant. Typically, the result can be ceiling cracks at drywall joints located near the centerline of the span.

One effective method of minimizing centerline cracks is to use resilient channels to create a less rigid attachment of the drywall to framing. By isolating these two materials with a resilient channel, the potential for cracking is reduced, and each material is allowed to shrink or expand independently of the other.

Some general areas where you should consider using resilient channels:

- Large ceiling areas where framing members span more than 15 feet.
- Where there is a change in framing member span direction, such as with girder trusses and standard hip construction.
- Where adjacent parallel framing members within the same ceiling area have different span lengths or different stiffness or rigidity.
- Areas with large temperature and humidity variation such as garages, etc.
- Interior areas of construction that may be left unconditioned over long periods of time.

The use of resilient channels between materials, assemblies, or whole parts of the building can reduce the undesired contact between parts as they expand, contract, move, or bend in response to applied external or internal loads. An added benefit of resilient channels is that they can improve the sound insulation of partition and ceiling assemblies, as the channel effectively isolates drywall from the framing studwork, which results in substantial weakening of sound waves.

Truss Uplift Backing Angle

Truss uplift can cause unsightly damage to the inside corner where the wall meets the ceiling. A rigid PVC truss backing angle is designed to keep your inside corner stationary and prevent damage during truss uplift. The backing angle will keep the ceiling board tight to the wall board during a truss uplift condition. This will prevent damage to the inside corner caused by the truss uplift. The backing angle should be used on all interior partition walls where truss uplift conditions exist. Install backing angle around the whole interior perimeter of a room.

Wall mounted deflection beads are designed to attach to drywall and compress against the concrete deck during deflection to prevent inside corner cracking.

Ceiling mounted deflection beads also prevent inside corner ceiling cracking due to deflection in multi-story structures, but they are mounted to the roof deck, allowing the bead to slide up and down the wall during deflection.

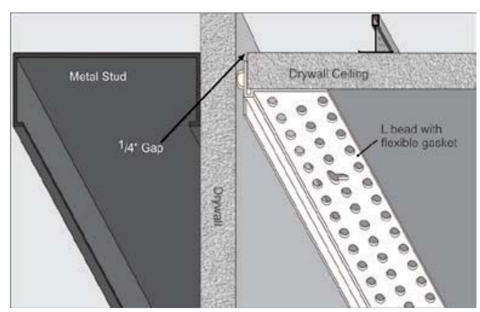
Deflection Beads

Deflection beads are often used in multi-story buildings where typical poured concrete and truss framing systems can move a great deal. The floor below moves up and down the wall, which is typically combatted with a deflection track that has slots in it so that the top track moves up and down with the flooring system. This is good for a structural solution, but there is still not a finish solution. Deflection beads solve this because they have a flexible gasket at the top that is designed to attach to drywall and compress against the concrete deck when the floor moves (deflection), preventing inside corner ceiling cracking when installed against a ceiling or concrete deck subject to movement. Deflection track systems are available that are fire-rated and STC-rated.

Wall Mounted vs. Ceiling Mounted Deflection Beads

There are two types of deflection beads, wall mounted and ceiling mounted. Wall mounted deflection beads are designed to attach to drywall and compress against the concrete deck during deflection to prevent inside corner cracking. A co-extruded flexible gasket compresses and expands during deflection and provides protection for approximately 7/16" of deflection. This type of product is designed for interior use only and is not designed for major uplifts. Small gaps caused by minor uplift can be easily caulked.

Ceiling mounted deflection beads also prevent inside corner ceiling cracking due to deflection in multi-story structures, but they are mounted to the roof deck, allowing the bead to slide up and down the wall during deflection. A leg approximately 1" long hangs down the wall to cover the gap left between the drywall and the floor deck. This leaves a crisp shadow line along the length of the wall. Such a system provides protection for approximately ¾" of deflection.



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Suspended Drywall Ceilings

In certain situations it may be desirable to isolate the movement of a suspended drywall ceiling from the rest of the structure. To achieve this install the drywall on the ceiling leaving approximately a ¼" gap around the perimeter of the room. Install an L bead with a flexible gasket in the gap to provide structural relief.

CONTROL JOINTS

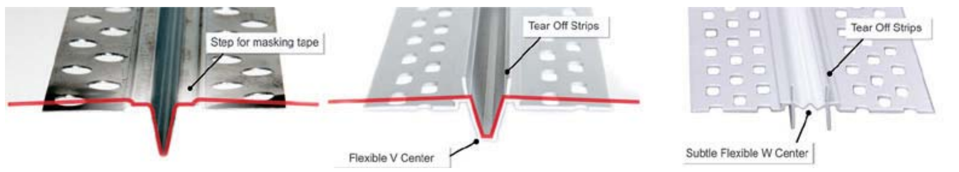
A drywall control joint product is installed to provide a cosmetically-finished edge and surface that accommodates movement without damage between sections of drywall. These products are referred to by a variety of names: drywall expansion joint, drywall control joint, drywall expansion bead, plasterboard control joint, zinc control joints, or vinyl plastic control joints, among others. All drywall control joint products require that framing, whether wood or metal studs, are installed on either side of the control joint with a suitable gap between them.

Depending on the individual product design and materials, drywall control joints can handle up to about 3/8"of horizontal movement due to thermal or moisture-related expansion or contraction. The required joint width between the abutting drywall panels ranges depending on the specifications of the control joint's manufacturer, but is typically somewhere between ¼" and 1" in width.

Drywall control joints are made of plastic (vinyl), aluminum, or zinc strips with a "V" groove in the center and flanges that are taped to the otherwise abutting edges of drywall ceiling or wall panels. PVC control joints are a rust-proof alternative to traditional metal corner beads that do not have the expansion capability of vinyl. Expansion control products with co-extruded technology provide twice the movement of zinc and provide superior expansion control.

For fire rated assemblies, expansion beads can be used with the appropriate backing materials. Walls should be constructed using the proper number of layers of drywall to achieve the desired rating. The cavity behind the expansion bead should be filled with appropriate fire rated materials. For example, a 1 hour fire wall is shown in the Gypsum Association Fire Resistance Design Manual, GA-600-2012, as file # SRS1101.

There are a wide range products available with expansion capabilities depending on which aesthetics fit your particular project. In addition to the V groove, zinc expansion beads have a recess where the masking tape rests to prevent drywall compound from filling the V, making it the most visible expansion product. Vinyl V expansions utilize tear off strips to protect the center from drywall compound, resulting in a cleaner and sharper V groove. Finally, the least noticeable look can be achieved using the hideaway expansion which results in a small W groove appearing on the surface of the drywall.



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V Expansion Beads

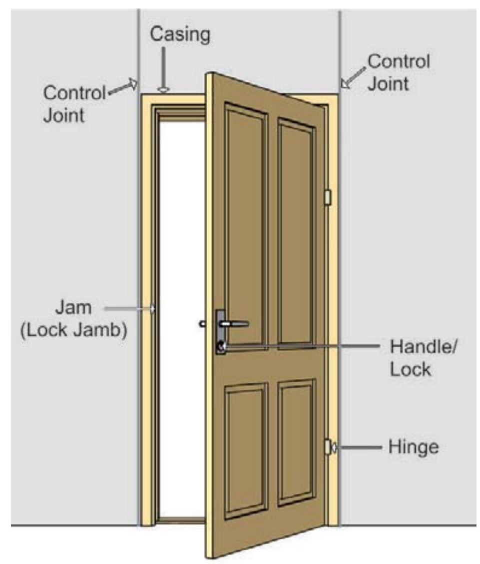
As we discussed earlier, there should always be a gap between sheets of drywall in order to accommodate expansion and contraction, but this gap must be supported and bridged by an expansion bead. There are different shapes of expansion beads. For example, one with a deep, rigid "V" that is joined at the bottom (center) with a co-extruded flexible PVC connection allows a full 3/8" of controlled movement and protection against the stresses of expansion and contraction. These expansion beads can be UV stabilized for interior and exterior applications. For fire rated assemblies, a deep "V" expansion bead can be used with the appropriate backing materials. For example, a 1 hour fire wall is shown in the Gypsum Association Fire Resistance Design Manual, GA-600-2012, as file # SRS1101. PVC products do not support combustion and are self-extinguishing when the source of the flame or heat is removed. Products that carry a Class A rating for flame spread and smoke developed are preferred.

V expansion beads should be painted with a high quality paint as they bond better and have more flexibility than inexpensive paint brands. Factory mitered "C" and "T" Expansion intersections are also available from some manufacturers.

Hideaway and Inside Corner Expansion Beads

A low profile alternative to the "V" expansion bead is a hideaway expansion with a soft coextruded flexible PVC center "W" that flexes for approximately 3/8" in controlled movement

Inside corner expansion beads can be used on any inside corner where movement is an issue to prevent cracking. They eliminate edge cracking on all off-angle walls and vaulted ceilings and also provide approximately 3/8" in controlled movement. Many inside corner tapes do not have any built in expansion. Be sure to specify a product that has a flexible center that can absorb the movement and prevent unsightly cracks.



While it is common to place a control joint on one corner of the door jamb, it may be more aesthetically pleasing to install the control joint on both sides of the door.

Where to Use Control Joints—Walls, Ceilings, and Doorways

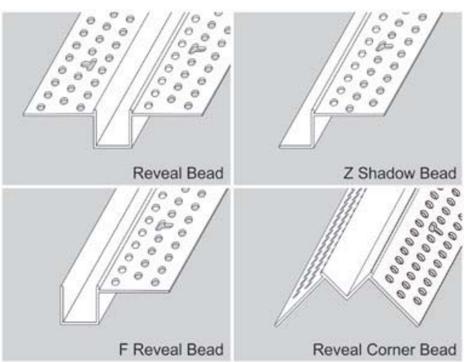
Control joints should be used in long expanses of walls or partitions at 30-foot intervals, with the control joint extending from floor to ceiling. A control joint is not necessary in long walls that are themselves broken up by floor-to-ceiling openings such as windows or doors if the resulting un-broken areas are less than 30 feet.

Control joints should also be used in long expanses of ceilings at 30-foot intervals (maximum), with the drywall expansion joint extending the full width of the ceiling, from partition wall to partition wall.

Control joints at doorjambs should extend from the door head to the ceiling for door openings that do not themselves extend the full wall height from floor to ceiling. While it is common to place a control joint on one corner of the door jamb, it may be more aesthetically pleasing to install the control joint on both sides of the door.

Intersections of rectangular areas such as where a large room ceiling intersects with a hallway ceiling form a natural and recommended location for control joints. Other key locations for drywall control joints are at irregular intersections between expanses of ceilings and walls, such as at the I-joint, T-joint or U-joint formed were ceilings are continuous across openings between rooms or areas of rooms divided by partition walls. It is less common to find drywall movement control joints in residential construction except where regular building movement is anticipated.

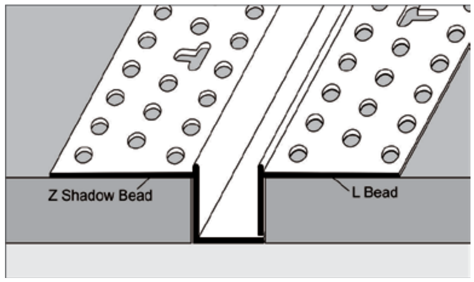
Control joints should also be placed where an addition is added to an existing structure as the two sections of the building will tend to move differently.



Vinyl reveals can be used to break up long runs of drywall, wrap around windows and doors, or where the wall meets the ceiling. A variety of shapes are available to achieve these details including reveal bead, F Reveal bead, Z Shadow bead, and reveal corner bead.

Reveal Beads

Reveal beads create a reveal look in drywall and are available in a variety of widths and depths. Vinyl reveals, unlike metal, are flexible and will absorb a certain amount of expansion and contraction. Vinyl reveals can be used to break up long runs of drywall, wrap around windows and doors, or where the wall meets the ceiling. A variety of shapes are available to achieve these details including reveal bead, F Reveal bead, and Z Shadow bead. As a complement to the reveal look a reveal corner bead is also available.



While vinyl reveals have a certain amount of built in expansion, larger movements can be accommodated by creating a floating reveal.

While vinyl reveals have a certain amount of built in expansion, larger movements can be accommodated by creating a floating reveal. To create a floating reveal a ½" deep shadow bead can be used with a 7/16" L bead as shown. Different widths of shadow bead can be used depending on how wide of a reveal is desired. The floating reveal works as the ultimate expansion joint in commercial applications, but it must have proper backing on fire rated walls.

The flexibility of vinyl reveals also allows them to conform to curved walls and soffits. The minimum inside and outside radius is determined by the width and depth of the reveal, the ¼" x ¼" reveal being the most flexible. See the associated chart for radii for other reveal sizes.

Factory mitered intersections to create L, T and crosses are available to expedite job site installation. Intersections that wrap around an inside or outside corner are also available.

INDUSTRY STANDARDS

Standards of acceptability for installation of finish materials can vary. Nevertheless, several organizations, including the Association of the Wall and Ceiling Industries International, Metal Lath/Steel Framing Association, American Concrete Institute, Gypsum Association and American Society for Testing and Materials (ASTM), have published recommendations, standards and/or tolerances that may be required for a specific project.

Even if control joints do not appear to be specified they are often covered by reference specifications such as ASTM C840, ASTM D3678, ASTM D1784, ASTM C1047, ATM C840 or GA-216, the Gypsum Association Recommended Specification for Application and Finishing of Gypsum Board.

ASTM C840 covers requirements for the methods of application and finishing of gypsum board, including control joints.

ASTM D3678-14 is the standard specification for rigid polyvinyl chloride (PVC) interior-profile

Architectural Reveal Radius Chart

Minimum inside and outside radius the reveal can finish

REVEALS			
STOCK NO.	A+B SIZE	INSIDE	OUTSIDE
AS5150	¼" x ¼"	1'	1'
AS5160	½" x ¼"	6'	3'
AS5170	¼" x ¾"	2'	2'
AS5110	½" x ½"	6'	3'
AS5210	½" x ¾"	8'	6'
AS5310	½" x 1"	9'	4'
AS5320	⅝" x ½"	8'	4'
AS5325	⅝" x ⅝"	9'	4'
AS5340	⅝" x 1"	24'	12'
AS5350	⅝" x 2"	30'	15'

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extrusions. The specification establishes requirements for the material properties, including dimensional stability and extrusion quality, of PVC extrusions and provides methods for identifying interior-profile extrusions that comply with the requirements of this specification. PVC expansion bead products, which we will discuss in a bit fall under ASTM D3678-14 Class 2, which are rated for intermediate impact.

ASTM D1784-11 is the standard specification for rigid polyvinyl chloride (PVC) compounds and chlorinated poly vinyl chloride (CPVC) compounds. The specification is intended for general purpose use of extruded or molded

PVC and CPVC containing at least 80% vinyl chloride, and the necessary compounding ingredients, which may consist of lubricants, stabilizers, non-polyvinyl chloride resin modifiers, pigments, and inorganic fillers. Selection of specific compounds for particular end uses or applications requires consideration of other characteristics such as thermal properties, optical properties, weather resistance, etc.

ASTM C1047-14 is the standard specification for accessories used in conjunction with assemblies of gypsum wallboard and gypsum veneer base to protect edges and corners and to provide architectural features. Accessories should be free of twist or camber that would prevent their use in an intended assembly. Edges of accessories shall be free of burrs and sharp edges.

Vinyl expansion products achieve an ASTME84-15 Class A rating for flame spread and smoke developed when tested under Standard Test Method for Surface Burning Characteristics of Building Materials. This fire-test-response standard for the comparative surface burning behavior of building materials is applicable to exposed surfaces such as walls and ceilings. The test is conducted with the specimen in the ceiling position with the surface to be evaluated exposed face down to the ignition source. The material, product, or assembly should be capable of being mounted in the test position during the test, meaning it is either self-supporting by its own structural quality, held in place by added supports along the test surface, or secured from the back side.

The purpose of this test method is to determine the relative burning behavior of the material by observing the flame spread along the specimen. Flame spread and smoke developed index are reported. However, there is not necessarily a relationship between these two measurements.

This standard is used to measure and describe the response of materials, products, or assemblies to heat and flame under controlled conditions, but does not by itself incorporate all factors required for fire-hazard or fire-risk assessment of the materials, products, or assemblies under actual fire conditions.

CASE STUDIES

Marriott Mall of America

The new JW Marriott Mall of America, a $105 million project, is a 342-room hotel. The hotel's developer is Mortenson and it's owned by Hotel Development LLC, an arm of the Shakopee Mdewakanton Sioux Community. Marriott International will manage the property. This project will be using a PVC deflection bead throughout the entire building to prevent cracking at the head of walls caused by concrete sag.

Southwest Energy Office Building, Houston

At the Southwest Energy office building in Houston, TX, a PVC "V" expansion joint was used in place of a metal version. There was a shortage of time so they couldn't special order the curved metal expansion joint that would take 6–8 weeks minimum for delivery, and at a much higher cost.

SUMMARY

Building components, especially finishes, have to contend with many structural and environmental factors. In order to maintain their appearance, integrity, and function, proper installation, spacing, and materials must be used to maximize the longevity of the system. Special care must be taken when multiple materials come into contact with one another or where joints, edges, or corners are formed. Using new construction technology and products that absorb or resist movement will give finishes the best chance to endure and be enjoyed for the life of the building. ■