

## **Module 11 – Internal Gutters and Transitions**

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### **Chapter 1**

At this point in the Quality and Craftsmanship series you should have watched and learned all the major steps needed to erect a common metal building from the previous DVD modules. In this module we will cover two areas that you most likely will not see in your average building. The first is an internal gutter. Internal gutters are used to divert water off of a roof system when a parapet condition occurs. Internal or interior gutters are also used when the architect does not want to see gutters or downspouts. The second area we will cover in this module is a transition. This is a location where special trim, flashing, and other components are installed to create a connection between vertical and horizontal surfaces, such as between a roof and a parapet wall. Step transitions are used on a long roof when expansion is a concern and the manufacturer limits the length of a roof panel run.

As an example, consider a building with a roof that is 500 ft wide. Manufacturers require that the maximum roof panel runs not be exceeded by an installer. In those cases, you will need to install one or more step transitions to cover the expanse of the roof. The first step in creating either of these two systems is to review the drawings and erection manual carefully to determine the process, building components, placement, and the materials that will be needed to complete each step of the task.

### **Chapter 2**

Let's take a few minutes now to review the terminology associated with installing internal gutters and transitions. Flashing is generally a piece of galvanized sheet metal that is used to protect water from penetrating the building at a seam adjacent to a wall or roof panel. Flashing can also be used as a termination or a transition between a wall and a roof. Flashing by and large is not visible from the ground by an observer once the building is completed.

Trim is used mostly for decorative purposes as well as to terminate a transition. Trim is also the most fragile of the metal building components. Great care needs to be used when handling and installing trim.

Gutters are used for gathering and diverting water from the roof to the downspouts in a controlled manner. Downspouts are metal conduits used to carry water from the gutters to the ground in a controlled manner. Gutters and downspouts coupled together will help prevent erosion around your building.

The eave is the point at which the roof and sidewall intersect. On a single slope building the term "low eave" is used to describe the side that water flows to. This is where external

gutters are installed if the owner has required gutters. Gutters are never installed along the high eave.

The end walls of a metal building are also often called rake walls or gable walls. The end walls are recognized by the fact that they most often have wall sheeting that varies in height. And the end wall can be found on double slope buildings and on single slope buildings. The end wall is always parallel to the rafters. You will never find a gutter on an end wall. However, the manufacturer will always provide gable trim for the top of the end wall where the wall sheets intersect with the roof.

The rake is the plane at which the roof and an end wall intersect. The ridge is the high point of a double sloped roof. Most often, but not always, it will be at the center of the building and always runs perpendicular to the rafters.

### **Chapter 3**

During this module we will emphasize the importance of developing and following a fall protection plan as well as some vital rules for safety when creating internal gutters and transitions. You and your crew members should be in a constant state of training and retraining when it comes to safety. The first step towards safety begins before you ever arrive at the job site. Your supervisor has the responsibility to develop and provide to you a comprehensive safety plan that can be thoroughly reviewed by the entire crew. You see, if just one of your crew members is not aware of the plan or is not committed to following it he will not only be a danger to himself but also to the entire crew. In addition to good training it is vital that you have the proper safety equipment. This includes personal protective equipment required by OSHA as well as fall protection equipment that may be attached to the structure. It is also necessary that you have the right tools and lift equipment both for personnel and materials available on the job site. These will vary with each job.

Some of the rules that must be followed include: Stay alert constantly. The roof is no place for daydreaming on the job. Hard hats must be worn to prevent injury from falling objects or from equipment and materials being moved around personnel. Never step on light transmitting panels or translucent panels. They are not designed to support the weight of an installer or heavy tools or materials. All safety precautions referred to throughout this module required currently by OSHA as well as other statutory or customary practices must be followed carefully in order to maximize safety.

Because of the complex nature of creating internal gutters and transitions the Metal Buildings Institute asked SPAN Construction Company of Fresno, California to erect a special frame that stands less than six feet off the slab. This way we were able to give you a look at the process that would normally be very hard to show on video and would put the production crew at an unnecessary risk. Keep in mind that as you watch this module the erectors you see are in full compliance with OSHA fall protection regulations as they are never more than four feet off the slab. When you are in the field installing an internal gutter system or transition you will most likely be in a situation that requires a full complement of fall protection devices that you will not see being used in this demonstration.

### **Chapter 4**

Let's look now at the process of installing an internal gutter system. Internal gutters are always installed prior to the roof system and prior to the transition as well. In this demonstration module we will use a frame just like the one used on this building that has a parapet wall around the entire perimeter of the building. This wall is used both to hide the gutters and downspouts as well as keep the HVAC equipment out of view from the street. The internal gutter and transition corner we will be building will look just like this one when it is completed with the slope of the roof running this way.

We have already reviewed the manufacturer's drawings and specifications carefully. So the first step in this process is to apply double stick tape on the back of the c channel parapet high to hold the insulation temporarily in place. Next install the gutter support angle as shown. The inside edge of the gutter will be supported by this piece. Be sure to use the specified fasteners in the required spacing to secure the support angle. Now double stick tape is applied along the flashing as shown.

Next unroll the insulation across the purlins. The protective tab on the double stick tape has been removed and the vapor retarder is secured to the c channel. The insulation is draped to cradle the interior gutter as shown. The protective tab is now removed from the purlin and the insulation is pressed down securely against it.

Next the fabricated end wall is measured for fastener placement and marked according to the specifications. Next predrill for fasteners in the end wall of the gutter dam. The interior gutter which was fabricated off site should be placed on the ground at the site for preparation. Remember that any experienced erector knows that any task that can be done on the ground instead of up in the air or on the roof is safer, faster, and more cost-effective. Now with acetone clean the surface of the gutter prior to installing mastic. This is done to remove oil and dirt that will interfere with the mastic seal. When you are using acetone be sure to use approved chemical resistant rubber gloves to prevent contact with your skin. Be sure to clean the surface of the end wall dam as well where mastic will be attached.

Next apply mastic to the gutter end wall as shown. Now remove the protective layer from the mastic. Next install the end wall beginning with the lower corner. Now press down securely. Using c grips clamp the end wall in place. Using the specified fasteners and a screw gun, attach the gutter dam to the gutter using the pre-drilled holes. After the fasteners are secure you can remove c clamps. Now we will prepare the first section of gutter for the next section to be added.

At a gutter overlap, thoroughly clean the surfaces prior to attaching the next gutter section using acetone and industrial wipes. Here the installer cleans the outside of the second section at the lap where mastic will form the seal. Now measure and mark with a permanent marker or grease pencil for pre-drilling of the gutter lap according to the specifications. Remember to never use a lead pencil as this will cause galvanized metal to rust.

Now with the correct size bit pre-drill for the fasteners. On the roof place the first section with the end wall dam in place. Now apply mastic for the overlap on the top surface of the downhill section. Next remove the protective coating from the mastic. Now place the next section of gutter to overlap the specified length. Carefully clamp this section in place prior to fastening the top of the gutter on both sides. Using the pre-drilled holes insert the fasteners and tighten them with your screw gun. Be sure you check for proper nesting prior to installing the second fastener. Install the rest of the fasteners in the specified spacing. Now with a utility knife, trim the excess mastic off prior to applying the polyurethane sealant because the two materials are not chemically compatible.

Next clean the overlap with acetone prior to applying polyurethane. Now apply a bead of polyurethane sealant. Remember that it is vital that the sealants be applied correctly in the internal gutter to prevent leaking. With a wet finger in a swirling motion work the sealant into the seam. It should look like a weld joint when you are finished. Next seal the end dam in the same manner. Looks are not nearly as important as being sure that the sealant adequately covers the seam.

Here we will measure for layout of the fasteners to be used for the gutter support. The specifications call for 12 inch centers to assure that the fastener heads fall behind the high of the wall sheet panels that will be installed. Use a torpedo level to assure that the water will flow the right direction in the gutter. Now screw in the fasteners along the top edge of the gutter along the parapet wall.

## Chapter 5

Probably the most common type of transition you will encounter in the field is between a roof and a wall. In this chapter we will show you how one manufacturer requires this to be done. Remember that every manufacturer will specify their particular way of creating a transition on a metal building. The first step here is to attach the support angle as shown. This will be used to carry the outside edge of the standing seam roof panel and allow it to move freely with climatic changes. Next attach the flashing aligned with the support angle. You will need to bend the roof panel at the outside edge that will be against the parapet wall so it will not slip up and under the wall panel. At the downhill slope end of the roof along the top edge of the interior gutter where the roof panel will overlap the gutter, clean the surface with acetone. Now apply mastic along the top of the sheet metal on the interior edge of the gutter.

This manufacturer calls for a strip of mastic to be cut for each of the rubber closures used at the end of the standing seam panels along the interior gutter edge. Now the installer will wrap the rubber closure with mastic. Be sure to follow the contour carefully as shown. Now attach the end plug, pressing it firmly against the mastic. Next position the roof panel to align it with the gutter, maintaining the required overlap, and install the fasteners through the end of the roof panel. Next place the roof high change member along the end wall of the building to carry the flashing. This will also provide support for the end wall sheeting. Be sure and place it according to specifications. Be careful to maintain proper alignment. Then clean the bottom with acetone prior to applying the mastic. Now remove the protective mastic tab. Push the flashing member down firmly with the mastic compressing against the bottom member as shown. Now measure for fastener placement.

Remember that guessing where a fastener should be installed when you're dealing with trim is one of the worst mistakes you can make. Be sure that the fasteners compress tightly. Clean the bottom of the next flashing member with acetone. Here mastic is applied to the top of the change member and the protective tab is removed. Next the flashing piece is installed over the change member as shown. Press down firmly to ensure a good seal. Here the tab is removed from the double stick tape at the top edge of the change member. Then foam closures are installed on the tape. These will be used behind the internal wall sheets on the parapet wall. Next apply mastic to the outside edge of the foam closure. Now remove the protective coating and install the first wall panel. Install structural fasteners at the specified intervals to the girts. Use a stitch fastener at the girt line lap.

Now at the inside of the lap of the back panels you must install mastic to prevent water running down the wall. The next panel is now positioned to overlap the previous one. The specs call for stitch screws at the overlap of the wall panels. Then the rest of the fasteners are installed in the specified manner. Look carefully at these wall panels. Know that they are specially fabricated with closed-ends crimped to prevent water from getting into the wall. Now the foam closures are installed over a run of double face tape at the high edge of the internal gutter. Next apply mastic along the foam closure face. Remove the protective mastic coating. Position the wall panel properly for fastening.

Now with the screw gun attach the panel with structural fasteners. On the corner flashing we have cleaned the surface with acetone and applied mastic on both sides. Now install the corner flashing as shown. Be sure and press firmly against the panel to make sure the mastic compresses properly. Here we will use structural fasteners to attach the corner flashing. It is critical that you use the specified fasteners in these applications. Now with a caulking gun apply polyurethane sealant along the bottom and also along the side edge of the corner flashing. Use a wet finger to swirl the sealant properly. Finally apply polyurethane sealant along the rest of the bottom edge of the wall panels. Be sure there are no gaps that might allow for water to pass through. This completes the process of installing a roof to wall transition. You are now ready for roof installation.

This concludes the Quality and Craftsmanship module on internal gutters and transitions. This presentation was created by the Metal Buildings Institute and is one of several training modules available to building erectors. We hope that it has helped you in understanding the basics of installing internal gutters and trim.