



CRAFTING QUALITY HOME PRODUCTS™

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Application Guidelines

- I. *Please read carefully. Failure to follow application guidelines may void product warranty.*
2. Before commencing any work, make certain these guidelines satisfy applicable local building code requirements.
3. Panels should not be jammed tightly together. It is not necessary to remove tape along top and back of panel.
4. Remove clippings and cuttings from the work immediately to prevent scratching or damage to finished work.
5. All attics should be properly vented. (Consult local authorities for building code requirements.)

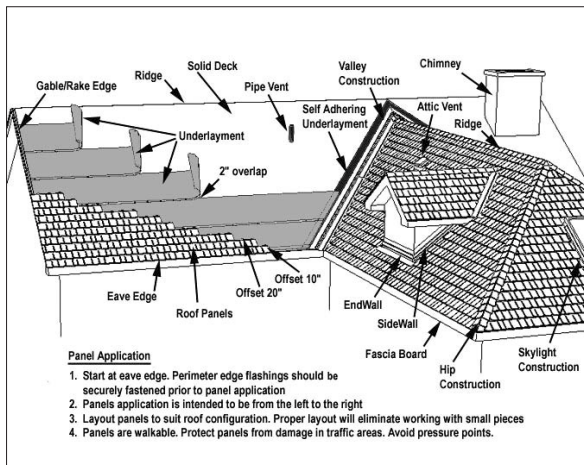


FIGURE 1-1 Application Overview

General Guidelines

Apply panels, flashings and accessories as per application guidelines and in accordance with recognized sheet metal practices. *Failure to comply with these procedures relieves the manufacturer of responsibility for any resultant damage to or deterioration of the product and voids all warranties.* It is the responsibility of architects, builders and roof applicators to ensure that all construction bylaws

and building codes are met and approved. (Consult local authorities for building code requirements.)

All work should be carried out by experienced, competent work crews. Kassel & Irons and/or its customers shall not be liable for special, indirect, or consequential damages. Kassel & Irons assumes no responsibility for leaks or defects resulting from application, failure to properly prepare the surface to be roofed over, or failure to provide proper ventilation in accordance with minimum property standards requirements.

Before commencing any work, familiarize yourself with all application guidelines and applicable building codes. In no case should these guidelines supercede the requirements of the applicable local building codes.

Roof Pitch: The recommended pitch is 4:12 or steeper. If applied to slopes less than 4:12, careful consideration must be given to underlayment specifications and anticipated climatic conditions around valleys and other roof details. Do not apply to roof slopes less than 3:12.

Deck Requirements: Apply over a smooth, dry and securely fastened roof deck. Deck substrate material must be exterior grade plywood, conforming to building code requirements. Half-inch plywood or 15/32 OSB are recommended for best performance. Inspect roof substrate prior to commencement of application work. Weak or rotted substrate or structure supports must be either repaired or replaced prior to underlayment and panel application.

Underlayment: Apply underlayment, consisting of one layer of No. 30 or two layers of No. 15 asphalt-saturated felt and complying with ASTM D-226 to the entire roof area prior to application of panels. In cold climates where ice damage is a concern an ice-dam protection membrane complying

with ASTM D 1970 and suitable for under metal applications (high temperature) is recommended on downslope roof perimeters (e.g. eaves), valleys, and around all penetrations. (Consult local authorities for building code requirements.)

Roof Layout: Before commencing panel application, lay-out work to minimize cutting and waste. Check the proposed layout to see how it will work along any applicable gable/rake edges, sidewalls and ridge situations. Make any adjustments that will simplify application and reduce waste of succeeding courses. Careful consideration at this point can save time by eliminating unnecessary cutting and bending further up the roof or in some cases having to apply small difficult pieces.

ReRoof: Application over an existing asphalt roof is acceptable, if permitted by local building code. All asphalt should be trimmed flush to the eaves and overhang prior to applying new edge flashings. Removal of old metal edge flashings is required. Care should be taken to apply new edge flashings at the appropriate height to accommodate material being roofed over.

Class A Fire Rating: To comply with the Florida Building Code Class A fire rated roof assembly, apply under the roof panels and over the underlayment, a minimum 1/2" thick water resistant core gypsum sheathing complying with ASTM C 79, or 1/4" thick Georgia-Pacific Dens-Deck™ or Elk's VersaShield® as a fire resistant underlayment. All fire resistant underlayment should be applied according to manufacturer's instructions and in accordance with local building codes.

Dissimilar Metals: Avoid contact occurring between dissimilar metals or materials. Insulate roofing and flashings from contact with or runoff from materials such

as copper, lead, graphite, cement and lumber treated with copper or other corrosives.

Storage & Handling: Site storage and handling of roofing materials should be in a clean, dry place and out of traffic areas to prevent damage. Upon receipt of the materials, inspect and insure shipment is complete. Damaged material must be noted at time of delivery. Damaged material shall not be applied.

Warranty: Kasselwood Shakes are covered by a 50 year limited warranty that includes coverage against manufacturing defects. Color fade, chalking and film integrity is covered by a 30 year limited warranty. Refer to the Kassel & Irons Warranty Plan for more details.

Safety Precautions

When working on or over any roof it is important safety precautions and safe work procedures are followed.

- ✓ Proper work attire, including gloves, should be worn to prevent injury while handling metal panels and flashings.
- ✓ Safety glasses must be worn to prevent eye injury when cutting metal panels and flashings with power tools.
- ✓ Use care when walking, sitting or kneeling on a metal roof to avoid fall related injury. The use of non-slip boots is recommended (e.g., Shoes-for-Crews, Tingley and Cougar Paws).
- ✓ Avoid stepping on panels that have not yet been securely fastened to the roof deck.
- ✓ Do not work on a roof when climatic conditions are not suitable. Metal can become slippery when wet and/or icy.

For fall protection guidelines refer to OSHA's Standards and Guidelines for Construction. Training requirements for Fall Protection are outlined in Section 1926.503(a)(1) and (2)(ii) through (vii) of OSHA's Standards and Training Guidelines. Employers shall provide a training program for each employee who might be exposed to fall hazards. It is the employer and applicators responsibility to ensure fall arrest protection is provided and maintained throughout the course of any roof application.

- ✓ Provide a personal fall arrest system for each applicator that is independently fastened to a secure ridge anchor.
- ✓ Provide safe means of access and egress to and from roof for personnel, tools and materials.
- ✓ Always use a fall protection gear consisting of full body harness, lanyard and life line when working on a roof.
- ✓ If feasible, installing a catch platform close to the eaves to minimize the effects of falling. Construction, use and maintenance of catch platforms should comply with OSHA's Subpart L (1926.450) Scaffold Standard.
- ✓ Work should be carried out by fully-trained, competent and experienced work crews.
- ✓ All workers should receive site-specific fall protection training. Training should be from competent fall protection trainer and conform to OSHA's Subpart M (Fall Protection) standard. This standard requires that the training program address the "nature of fall hazards in the work area." OSHA also requires that the exact "roles of employees in fall protection plans" be clearly specified in the program. Worker responsibilities should be assigned and include fall protection installation and removal, regular site safety auditing, emergency action plan participation and competent person training.

- ✓ Fall protection refresher training is necessary whenever:
 1. Workplace or site conditions change rendering previous training obsolete;
 2. Fall protection equipment has been changed
 3. Observed inadequacy in an affected employee's knowledge or use of fall protection equipment.

Kassel & Irons and/or its customers assume no responsibility for any injury and shall not be liable for special, indirect, or consequential damages that may result from failure to perform tasks related to inspection, application and maintenance in a safe and secure manner.

Underlayment

FIELD UNDERLAYMENT

On roofs having a pitch of 4:12 or steeper, apply over the entire deck area a minimum of one layer of No. 30 or two layers of No. 15 asphalt-saturated, non-perforated felt, complying with ASTM D 226. Applications to slopes less than 4:12, careful consideration must be given to underlayment specifications and climatic conditions that may be anticipated around valley flashings and other details.

1. Apply full width underlayments horizontally starting at the eave, with a minimum 2" (50 mm) overlap for No. 30 felt and a 19" overlap of the preceding layer for layers of No. 15 felt. *See Figure 1-2 and Figure 1-3.*
2. Overlap underlayment ends a minimum 4".
3. The underlayment should be fastened appropriately for the roof slope and compliance with local building code requirements. Fasten as necessary to hold the felts in place until the primary roof covering can be applied.

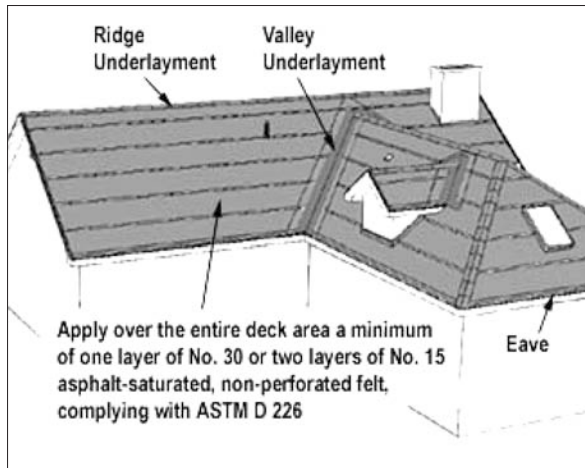


FIGURE 1-2 Field Underlayments

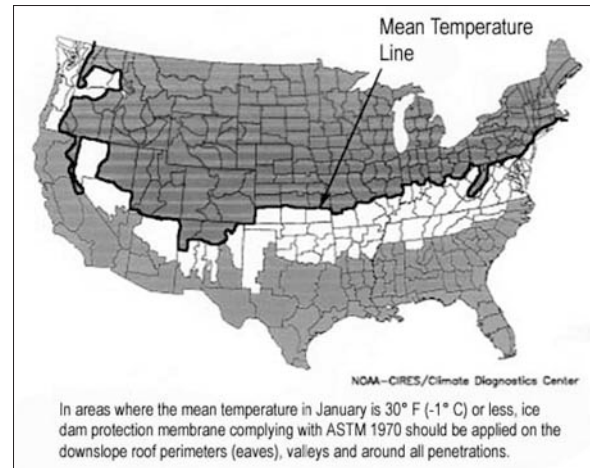


FIGURE 1-4 Mean Temperature Map

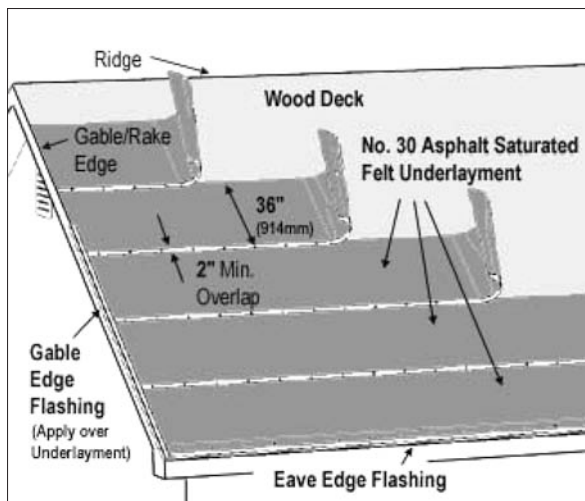


FIGURE 1-3 Underlayment Layout

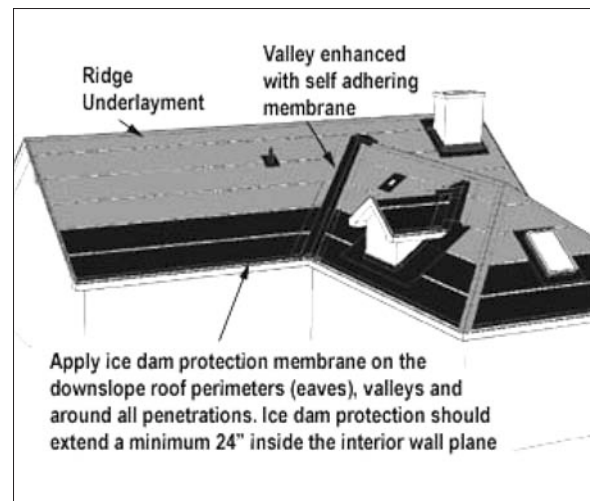


FIGURE 1-5 Ice Dam Protection Underlayments

In cold climates, where snow and ice are common and the mean temperature in January is 30° F (-1° C) or less, ice dam protection membrane should be applied on the downslope roof perimeters (eaves), valleys and around all penetrations. *See Figure 1-4 and Figure 1-5.* Ice dam protection should extend a minimum 24" inside the interior wall plane. Ice dam protection membrane may consist of a self adhering modified bitumen membrane complying with the requirements of ASTM D 1970 and

suitable for under metal applications (high temperature), Self Adhering Polymer Modified Bituminous Sheet Materials used as Steep Slope Roofing Underlayment for Ice Dam Protection. (Consult local authorities for building code requirements.)

Consideration should be given to applying an isolator sheet or strip (e.g., a strip of asphalt-saturated felt) between the wood roof deck and the metal drip-edge flashing to minimize the potential for condensation that could cause decay. *See Figure 1-6.*

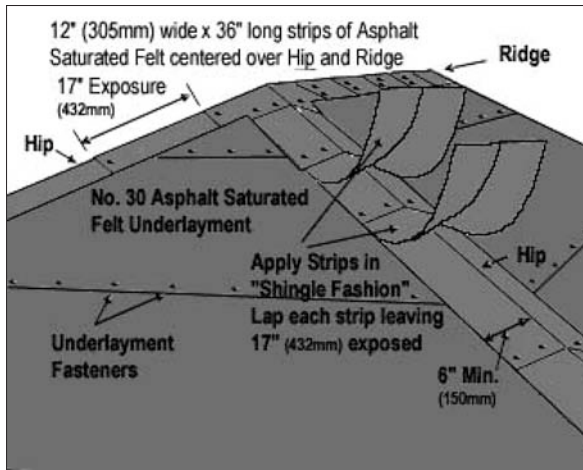


FIGURE 1-6 Eave Flashing Construction

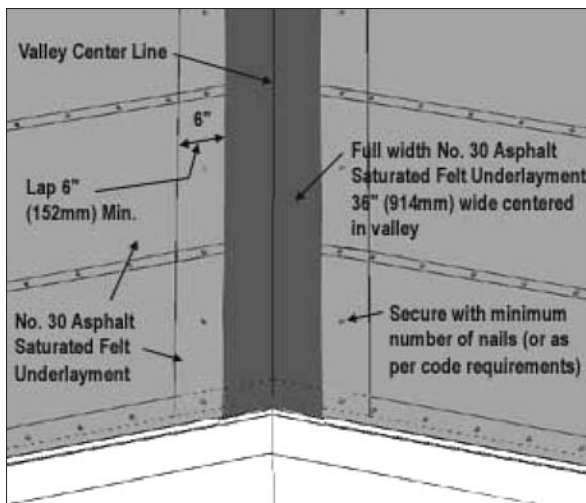


FIGURE 1-7 Valley Underlayment Construction

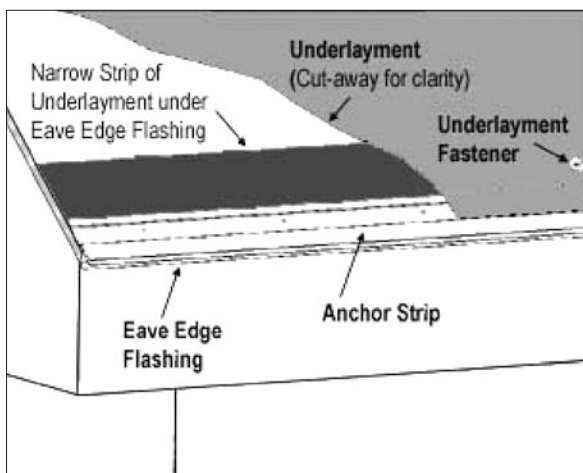


FIGURE 1-8 Hip & Ridge Underlayment Construction

VALLEY UNDERLAYMENT *See Figure 1-7.*

1. For long valleys, particularly on lower slopes, and in snow and ice regions, valley underlayment should be lapped a minimum 12" and adhered in vertical grade roof cement.
2. A self adhering modified bitumen membrane is recommended as an ice dam protection membrane in valleys in climates with significant snow accumulation.

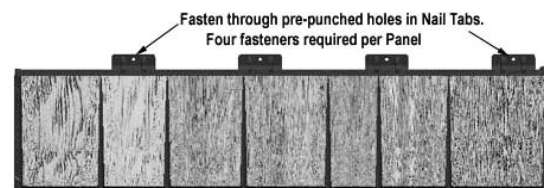
HIP & RIDGE UNDERLAYMENT

See Figure 1-8.

1. Apply 12" wide x 36" strips of asphalt saturated felt in "shingle" fashion centered over hip and ridge areas to yield an overlapping 17" exposed area.

Fastening and Attachment

Secure panel to the roof deck using a minimum of four fasteners per full panel. Fasten through the pre-punched holes located in the nailing tabs along the panel top using either a fastening screw or ring shank nail. All fasteners must penetrate entirely through roof decking by a minimum of 1/2". Should any fastener be removed during application, the subsequent hole should be closed with the appropriate sealant.



In order to achieve the wind rating when using pneumatic tools and fasteners the following must be adhered to:

1. The nail must be the same ring-shank nail as specified for manual application.
2. The pattern should be the same spacing as specified for manual application. A minimum edge distance for all nails must be about the same distance as the pre-punched nail holes.
3. The force in the pneumatic tool must be set so as to completely seat the nail, so nails are not over-driven or crimping the metal panel. (Follow fastening tool manufacturer recommendations.)

FASTENER SPECIFICATIONS

Roofing Nails: Use 11 Gauge x 1-1/4" long (minimum) with 11/32" diameter head, ring shank hot-dipped galvanized or stainless steel nails.



Screws: Use #10 - 12 x 1" long (minimum), Pancake Head Screw with #2 Phillips Head and Threaded Point. Screws may be stainless steel or coated with a polymer coating meeting the corrosion resistance requirements of FM4470.



Panel Cut-Off and Edge Treatment

When a roof condition requires a panel to be cut to fit, it is important that the cut edge is not left exposed. Hemming this edge under and protecting it from the environment is a standard sheet metal practice. When this hemmed edge is visible (e.g. the gable/rake edge, valley, etc.), it is important this hem be completed in an aesthetically pleasing manner.

See Figure 1-9.

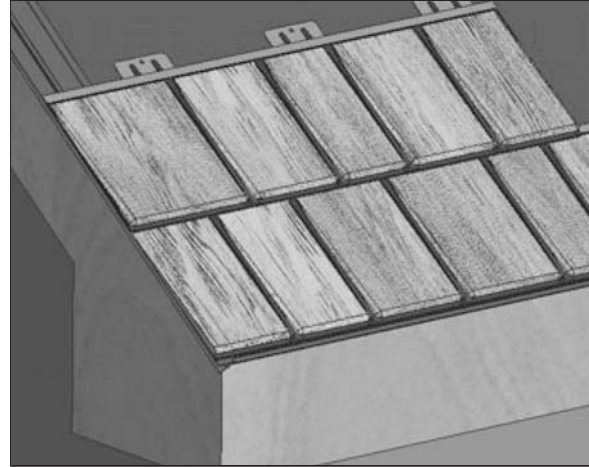


FIGURE 1-9 Roof Corner Showing Cutoff Panels

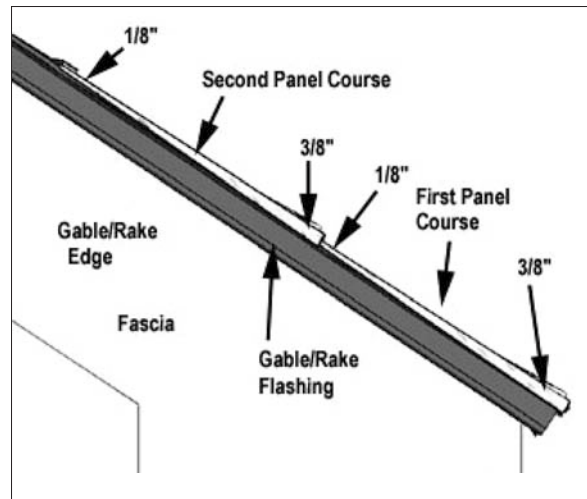


FIGURE 1-10 End View of Gable/Rake Edge

A **Tapered-Hem** bend involves bending or folding the cut-edge of the panel so that the terminated end of the cut-off panel is tapered. The bottom end should be approximately 3/8" thick and tapering to 1/8" at the top of the panel. While providing a layered appearance, similar to the look of traditional slate or cedar, this **Tapered-Hem** ensures a sound, weather resistant termination of the panel while protecting the cut edge from the environment. See Figure 1-10 and Figure 1-11.

TAPERED-HEM IS MADE AS FOLLOWS:

1. After establishing the desired finished width of the panel, add $\frac{3}{4}$ " to the top and $1\text{-}\frac{1}{8}$ " to the bottom. Cut the panel on a taper from the $\frac{3}{4}$ " mark at the top to the $1\text{-}\frac{1}{8}$ " mark at the bottom of the panel.
2. Using the **Tapered-Hem seamers**, fold the cut edge of the panel so that when completed the bottom edge of the fold will be $\frac{3}{8}$ " thick and returned back approximately $\frac{1}{2}$ ". The fold at the top edge of the panel will be approximately $\frac{1}{8}$ " thick and also returned back approximately $\frac{1}{2}$ ". See *Figure 1-12* and *Figure 1-13*.
3. This under-turned panel edge now can be used to secure the panel along the gable/rake, in the valley and along the sidewall by hooking under the receiving edge of the Anchor Strip in each of these locations. At the gable/rake edge this Tapered-Hem can sit on the Edge Flashing when the Anchor Strip is not used. In areas prone to high perimeter edge winds, the Anchor Strip must be used in conjunction with the Edge Flashing. The panel edge can be secured under the receiving edge of the Anchor Strip.

Panel Application

Before commencing panel application, lay-out work to minimize cutting and waste. Proceed only after:

1. Ensuring all supporting members are straight, level, plumb, and true and roof deck is smooth, dry, solid and securely fastened.
2. Underlayment, including ice dam protection, has been completed as specified.

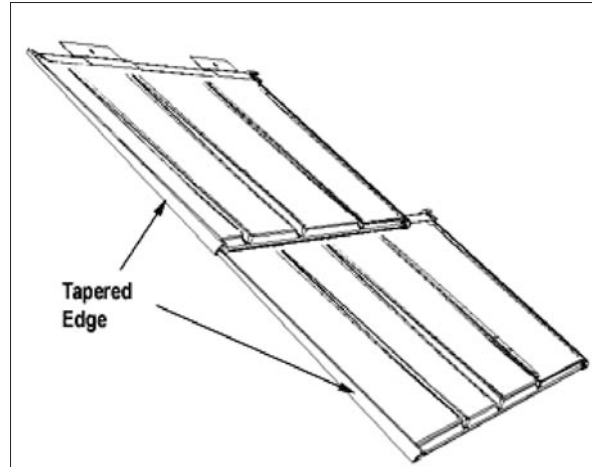


FIGURE 1-11 Pictorial View of Gable/Rake Edge

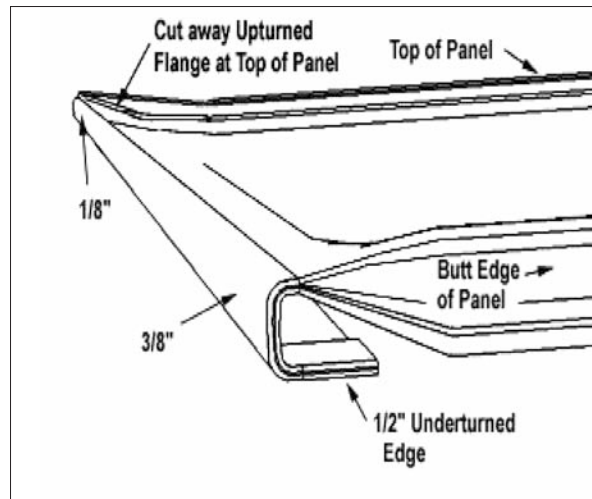


FIGURE 1-12 Close up View of Tapered Edge

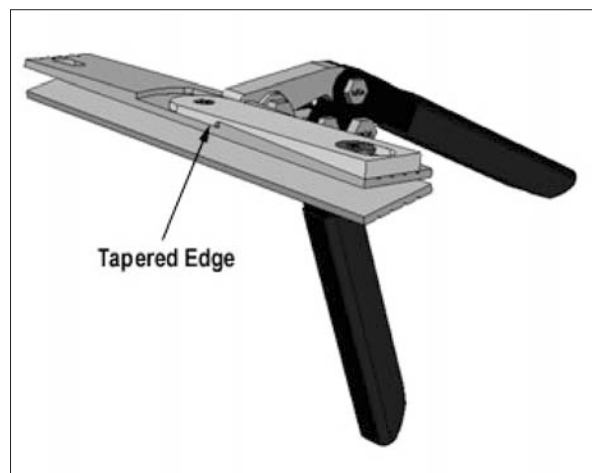


FIGURE 1-13 Tapered Hem Seamers

3. Edge Flashing has been applied.
If applicable, Valley and Sidewall Flashing have been applied.
4. Make certain all clippings and cuttings will be cleaned from the work immediately to prevent scratching or damage to finished work.

Panels are designed to be applied in typical “shingle fashion”, starting at the eave. The bottom edge of the first course of panels locks under the Anchor Strip of the Edge/Anchor Flashing. Subsequent panel courses interlock into place horizontally by sliding the underturned flange of the panel’s bottom edge into the upturned flange of the panel’s top edge. Each panel course will have an exposure of 8-5/8". Although the panels are self aligning and have been designed to snap-lock into position, snapping lines to align each course is preferred and ensures proper panel position. *See Figure 1-14.*

Panels within the same course are interlocked together by inserting the left edge of a panel (1/2" tongue) into the right edge (groove) of the adjacent panel. Panels are generally intended to be applied from “left to right” however, “right to left” application is doable if necessary to facilitate certain roof conditions.

FIRST COURSE

1. With the Edge/Anchor Flashing secured in place, the first course of panels can be applied. Chalk a line parallel to the eave 10-1/4" up from the receiving edge of the Anchor Strip. This line will serve as a guide to align the top of the panels and ensure panels are properly positioned into the Edge/Anchor Flashing and the first course is applied straight and true.
2. Check the proposed layout to see how it will work along any applicable gable/rake edges or sidewall situations. Make any adjustments that will simplify application and reduce waste of succeeding courses.

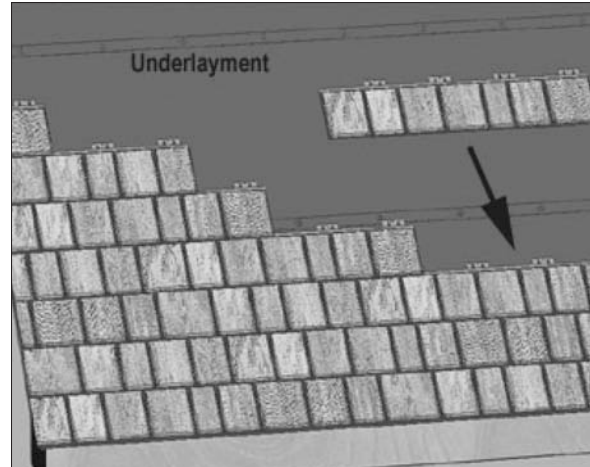


FIGURE 1-14 Pictorial View of Panels

Careful consideration at this point can save time by eliminating unnecessary cutting and bending further up the roof or in some cases having to apply small difficult pieces.

3. Although it is not necessary to start the panel lay-out from the gable/rake edge, in most cases, after allowing enough material to make the Tapered-Hem along the gable/rake edge removing approximately 1" to 2" (plus the tongue) from the left edge of the first panel to start will be suitable.
4. When the first panel has been placed in its desired location, fasten panel into place. As panel application proceeds across the roof, position full panels into their interlocked position and secure each panel by fastening through the pre-punched holes in the nail tabs. Try to alternate the “A” and “B” panels to enhance variability in roof layout.

SECOND COURSE

1. For panel application proceeding across the roof using the Standard 10" Offset or the Staggered Offset, the second course should be offset to the left by 10 inches. This will mean the second course; first panel at the gable/rake edge will be 10" shorter than the first course panel. Allow enough material to make the Tapered-Hem along gable/rake edge. *See Figure 1-15 and Figure 1-16.*

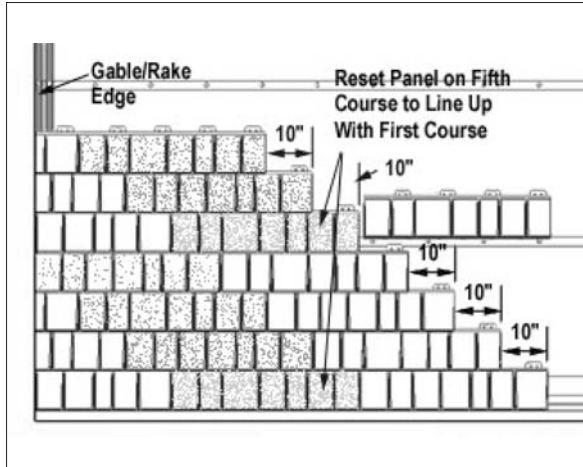


FIGURE 1-15 Standard 10" Offset

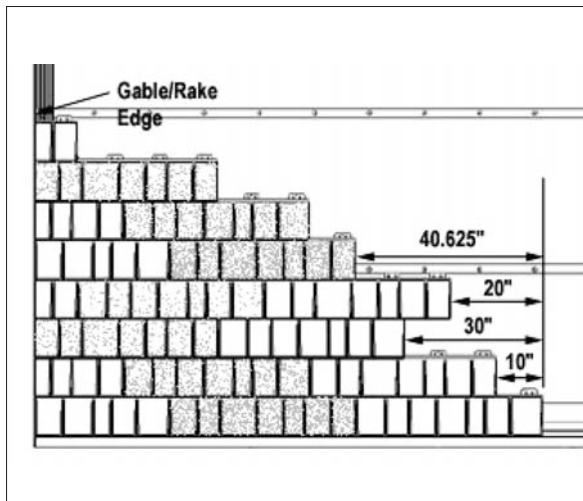


FIGURE 1-16 Staggered Offset

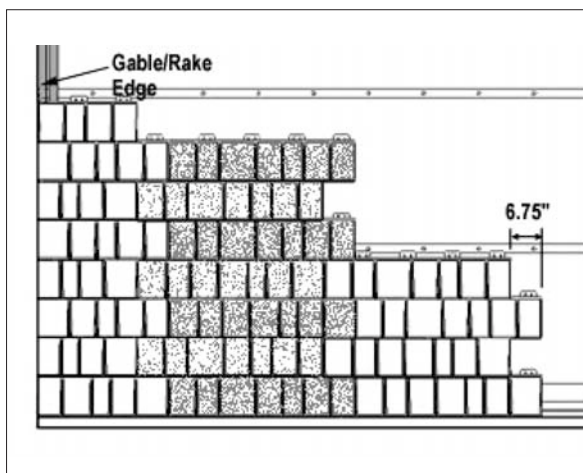


FIGURE 1-17 Racked Coursing

2. If the panel application is being Racked, offset the second course panel to the left 6-3/4". This will ensure that all the pre-punched holes in the nail tabs are accessible when securing the next vertical row of panels. *See Figure 1-17.*
3. Continue course application by positioning full panels into their interlocked position and secure each panel by fastening through the pre-punched holes in the nail tabs. Again, try to alternate the "A" and "B" panels to enhance variability in panel layout.

THIRD COURSE

1. For panel application proceeding across the roof using the Standard 10" Offset, the third course should be offset from the second course by 10 inches. This will mean the third course; first panel at the gable (rake) edge will be 20" shorter than the first course panel. Allow enough material to make the Tapered-Hem along gable/rake edge.
2. For panel application using the Staggered Offset, the third course should be offset from the second course by 20 inches. This will mean the third course; first panel at the gable/rake edge will be 30" shorter than the first course panel. Allow enough material to make the Tapered-Hem along gable/rake edge.
3. If the panel application is being Racked, the third course panel will be positioned directly above the first course panel. This will mean the third panel at the gable/rake edge will be the same length as the first course panel.
4. Continue course application by positioning full panels into their interlocked position and secure each panel by fastening through the pre-punched holes in the nail tabs. Try to alternate the "A" and "B" panels to enhance variability in panel layout.

FOURTH COURSE

1. For panel application proceeding across the roof using the Standard 10" Offset the fourth course should be offset from the third course by 10 inches. This will mean the fourth course; first panel at the gable (rake) edge will be 30" shorter than the first course panel.
2. For panel application using the Staggered Offset, the fourth course should be offset from the first course by 20 inches. This will mean the fourth course; first panel at the gable (rake) edge will be 20" shorter than the first course panel.
3. If the panel application is being Racked, the fourth course panel will be offset 6-3/4" and positioned directly above the second course panel. This will mean the fourth panel at the gable/rake edge will be the same length as the second course panel.
4. Continue course application by positioning full panels into their interlocked position and secure each panel by fastening through the pre-punched holes in the nail tabs. Again, try to alternate the "A" and "B" panels to enhance variability in panel layout.

FIFTH AND SUBSEQUENT COURSES

1. For panel application using the Standard 10" Offset, position the fifth course panel directly above the first course. This will mean the fifth course; first panel at the gable/rake edge will be the same length as the first course panel.
2. For panel application using the Staggered Offset, position the fifth course panel directly above the first course panel. This will mean the fifth course; first panel at the gable/rake edge will be the same length as the first course panel.
3. If the panel application is being Racked, position the fifth course panel directly above the third course panel. This will

mean the fifth, third and first panel at the gable/rake edge will be the same length.

4. Continue application, repeating course offset as established through courses two, three and four. Position full panels into their interlocked position and secure each panel by fastening through the pre-punched holes in the nail tabs. Try to alternate the "A" and "B" panels to enhance variability in panel layout.

Flashings

Because steep-slope roofs are frequently interrupted by the intersection of adjoining roof sections (valleys), adjacent walls (side wall and end wall), or penetrations such as chimneys and plumbing soil-pipe stacks, special provisions for weather protection must be made at these locations. *See Figure 1-18.* The components used to control water entry at these locations are commonly called flashings. Careful attention to flashing details is essential to successful long-term roof performance, regardless of the type of roof construction.

Except for Ridge/Hip Cap, most flashings are generally applied prior to applying the roof panels.

Perimeter Edge Construction

Perimeter edge flashing is an integral part of the panel system and is referred to as Edge Flashing. When applied along the eave as the drip edge the Edge Flashing must be applied in conjunction with the Anchor Strip and is referred to as the Edge/Anchor Flashing. The Anchor Strip secures the bottom edge of the first course panels; the Edge Flashing allows water to drip off the edge of the roof without affecting the underlying construction. *See Figure 1-19.*

When the Edge Flashing component is applied along the gable/rake (sloped edge

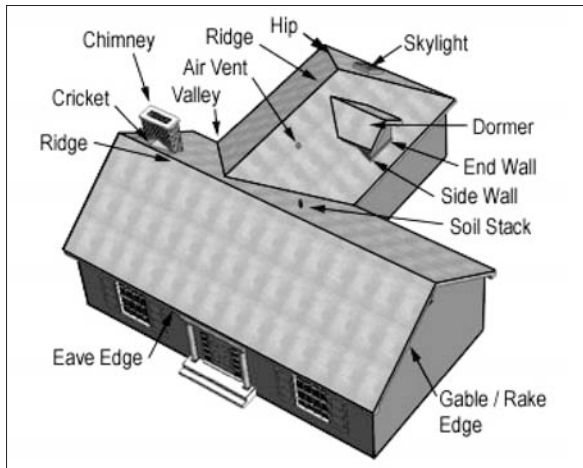


FIGURE 1-18 Required Flashing Areas

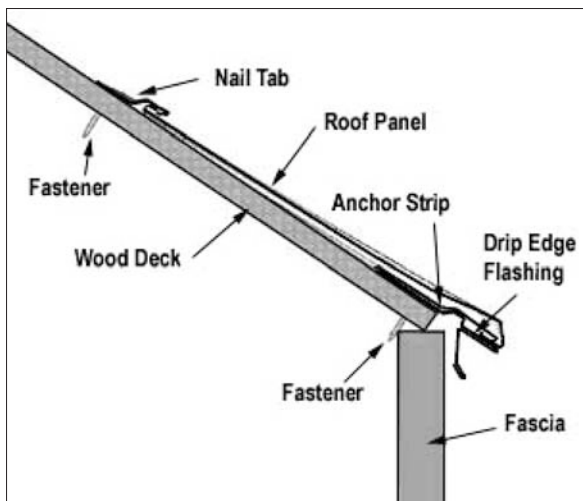


FIGURE 1-19 Eave Edge Flashing Detail

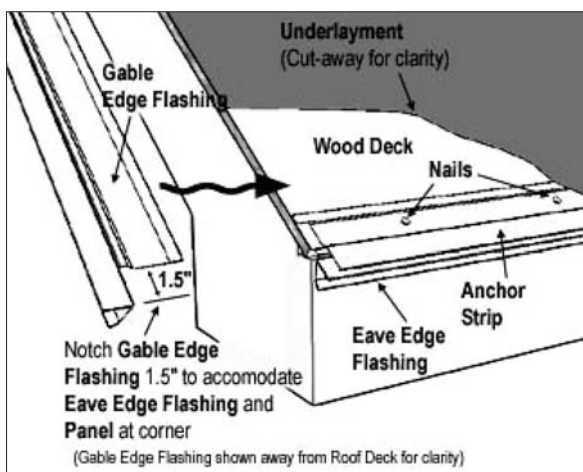


FIGURE 1-20 Eave Edge and Gable/Rake Junction

of the roof) it is referred to as Gable Edge Flashing. The Edge Flashing may be applied along the gable/rake with or without the Anchor Strip. In areas prone to high perimeter edge winds and wind gusts the use of the Anchor Strip with the Edge Flashing (Edge/Anchor flashing) along the gable/rake edge is required.

EAVE EDGE APPLICATION

1. The Edge/Anchor Flashing should be applied below the underlayment at eave edge. This helps prevent any water shed by the underlayment from becoming trapped below the metal at the downslope edge. Applying a narrow width of No. 15 or 30 asphalt-saturated felt, to separate the metal Eave Flashing from direct contact with the roof deck, is recommended.
2. Snap a line at the bottom edge of the roof (representing the top edge the Edge Flashing) to ensure straight and true alignment of the flashing and in turn proper placement of the first panel coursing.
3. Apply Edge Flashing. Particular attention should be given to the area where the Edge/Anchor Flashing and the Gable Edge Flashing intersect. By cutting and removing a small portion of the bottom end of the Gable Edge flashing, makes this intersection point and the application of the corner panel relatively easy.
See Figure 1-20 and Figure 1-21.
4. Apply Anchor Strip into Edge Flashing and secure with appropriate length nails or screws through pre-punched holes in Anchor Strip. Nails should be spaced approximately 10 inches (254mm) on center.
5. Apply and securely fasten Edge/Anchor Flashing along all roof eaves and Gable Flashing along the gable/rake edge before applying panels.

GABLE/RAKE EDGE APPLICATION

1. Apply the Gable Edge Flashing on top of the underlayment along the gable/rake edges (sloped edge of the roof). Use of the Anchor Strip is recommended. In areas prone to high perimeter edge winds and wind gusts the use of the Anchor Strip with the Edge Flashing (Edge/Anchor Flashing) along the gable/rake edge is required.
2. Snap a line along the edge of the roof (representing the inside edge the Gable Edge Flashing) to ensure straight and true alignment of the flashing.
3. Apply Gable/Rake Edge flashing as shown. Gable Edge Flashing joints must be lapped a minimum of 2 inches (50 mm) and in the direction of water flow. *See Figure 1-22.*
4. Secure with appropriate length nails spaced approximately 8 to 10 inches (203 to 254 mm) on centre. In high wind areas, nail spacing should be more conservative to resist the higher wind uplift pressures. A rule of thumb is to fasten the perimeter flashing approximately 4 inches (102 mm) on centre in high wind areas.

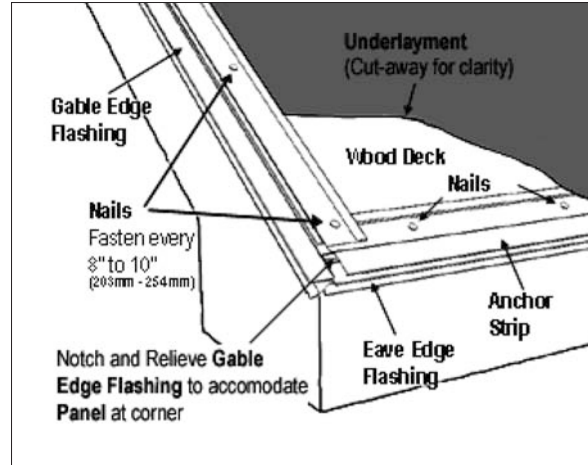


FIGURE 1-21 Completed Eave and Gable/Rake Corner

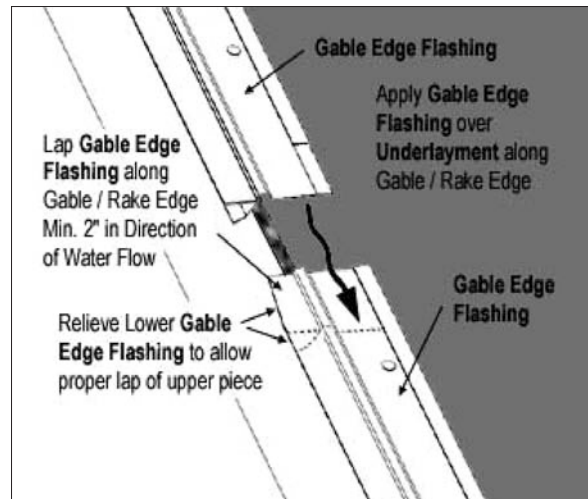


FIGURE 1-22 Gable/Rake Junctions

Valley Construction

Valleys exist where two sloping roofs intersect. Depending upon the layout of the intersecting roof areas, water runoff that accumulates in the valley can make the valley especially vulnerable to leakage. The use of an “open valley” application is recommended. This type of valley application will provide a clear, unobstructed drainage way to carry water away quickly and perform successfully for the life of the roof.

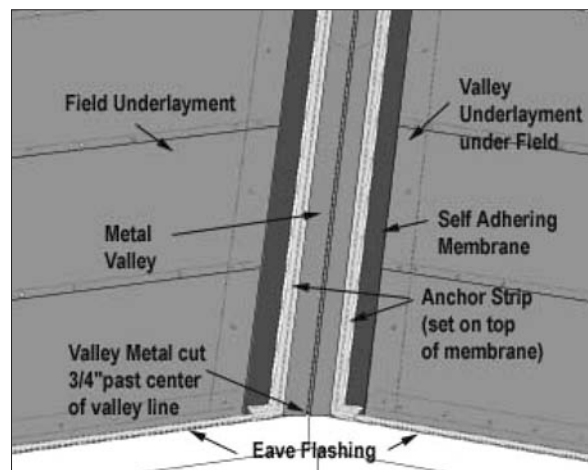


FIGURE 1-23 Metal Valley Construction

In climates areas prone to accumulations of snow and ice, or with regular freeze-thaw cycling during the winter months, it is recommended that the valley construction be enhanced by lining with a self-adhering modified bitumen underlayment material, before application of the metal valley. See valley underlayment requirements for details.

METAL VALLEY APPLICATION

1. Apply valley metal only after the necessary layers of underlayment and any valley-lining material specified have been applied to the deck.
2. Place the first piece of valley metal into valley area straight and true and temporarily hold into position. Mark and cut away the required relief necessary at the lower end of the valley metal to conform to the downslope roof edge. Ensure the relief cut will allow the valley metal to protrude past the Edge Flashing by a minimum of 3/4".
3. Succeeding valley metal lengths should overlap underlying lengths by a minimum of 8 inches (205 mm). Blind nail each section across its upper end with flat-headed, barbed or ringed shank roofing nails. Nailing at this time should only occur along the top of the piece being applied. Continue applying the remainder of the valley metal, keeping in mind the finished valley should be straight and true. If hydrokinetic backflow at the valley metal overlap junction is a possibility and a concern, the use of a sealant tape in this location is recommended.
4. When the valley metal has been properly positioned and adequately secured into place, chalk a straight line the entire length on each side of the valley 4" to 5" away from and running parallel with the "V" crimp. These lines will be used to locate and properly position the Anchor strip in the valley. By tapering the lines together

towards the top of the valley, at a rate of 1/8 inch per foot, will cause the panels to flare apart from top to bottom and thus eliminating the possibility of edges catching water, debris, snow and ice.

APPLICATION OF ANCHOR STRIP IN METAL VALLEY

1. With the valley metal in place, applying the Anchor Strip in the valley will provide a "hook" to secure the panels as they are cut to fit into the slope of the valley. *See Figure 1-23.*
2. Before applying the Anchor Strip, apply or "strip in" on either side of the metal valley a 9" to 12" inch (230 to 305 mm) wide strip of self-adhering modified bitumen underlayment material. This waterproof sheet should lap the valley metal from under the Anchor Strip up onto the roof underlayment. While providing a seal around nail penetrations that result from the attachment of the Anchor Strip to the valley, it will also seal around any nail penetrations that may occur in the valley area as the panels are applied. Keep the waterproof sheet back from the chalk line approximately 3/4" so as not to interfere with panels hooking under the Anchor Strip.
3. Align the front edge of the Anchor Strip with the chalk lines snapped previously. Mark and cut away the required relief necessary at the lower end of the valley.
4. Secure the Anchor Strip into the valley by nailing or screwing through the pre-punched holes in the Anchor Strip. Make sure fastening of the Anchor Strip occurs only where the waterproof sheet is located.
5. Continue applying the Anchor Strip up both sides of the valley so when complete a "hook" to secure the panel exists along both surfaces of the entire valley.

APPLICATION OF THE PANELS INTO VALLEY *See Figure 1-24.*

1. Use caution and care when fitting panels into the valley. Scratching or marking of the valley can occur if care is not taken as panels are fitted and slid into their fixed position.
2. Properly position the panel in the desired location. Mark the panel where it crosses over the Anchor Strip. Cut and bend using the Tapered-Hem method, the panel as previously detailed. Carefully slide the panel into its desired location.
3. Proceed on up the valley with each succeeding panel course being marked, cut, bent and fixed into its proper location.

Side Wall Construction

See Figure 1-25 and Figure 1-26.

Apply Sidewall Flashing at vertical walls prior to the application of the wall cladding or siding. This type of Sidewall Flashing is properly referred to as “channel flashing” rather than “step-flashing”.

1. Apply Sidewall Flashing only after the necessary layers of underlayment have been applied to the deck. Extend the underlayment felt approximately 4" (102 mm) up the vertical wall.
2. Position the first piece of Sidewall Flashing. Blind nail each section at its upper end with flat-headed ringed shank roofing nails. Nailing at this time should only occur at the top of the piece being applied. Succeeding metal lengths should overlap underlying lengths by at least 8 inches (205mm) and in the direction of water flow.
3. Align the Anchor Strip with the Sidewall Flashing so that the Anchor Strip provides a hook for the panels as they terminate along the vertical wall.

4. Fix the Anchor Strip to the roof deck by nailing or screwing through the pre-punched holes in the Anchor Strip.

APPLICATION OF THE PANELS ALONG A SIDE WALL:

1. Application of panels along a side wall is similar to a gable/rake edge application. Use caution and care when fitting panels along and into the Sidewall Flashing.
 2. Properly position the panel in the desired location. Mark the panel where it crosses over the Anchor Strip. Cut and bend using the Tapered-Hem method, the panel as previously detailed. Carefully slide the panel into its desired location.
 3. Proceed on up the sidewall with each succeeding panel course being marked, cut, bent and fixed into its proper location.
-

Hip and Ridge Cap Application

A proprietary Hip/Ridge Cap has been designed for use along the hip and ridge areas of a roof. While the Hip/Ridge Cap interlock together to eliminate exposed fasteners and cut edges, it is not designed to provide a weather-tight seal on its own. Care must be taken during the application of the panels located along the hip and ridge areas of each roof area to provide the necessary seal prior to the application Hip/Ridge Cap.

To simplify the explanation of the application procedures, the roof slopes on either side of the hip involved will be referred to as **Hip Slope #1** and **Hip Slope #2**. In most roofing applications, Hip Slope #1 and Hip Slope #2 are not undertaken or completed simultaneously, but both roof areas must be completed before the Hip/Ridge Cap can be applied.

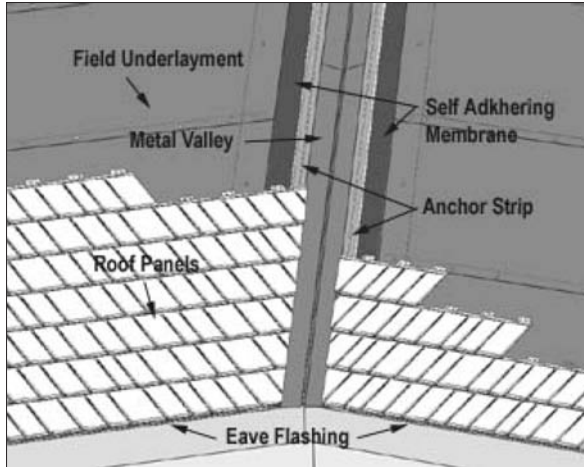


FIGURE 1-24 Metal Valley Construction with Panels

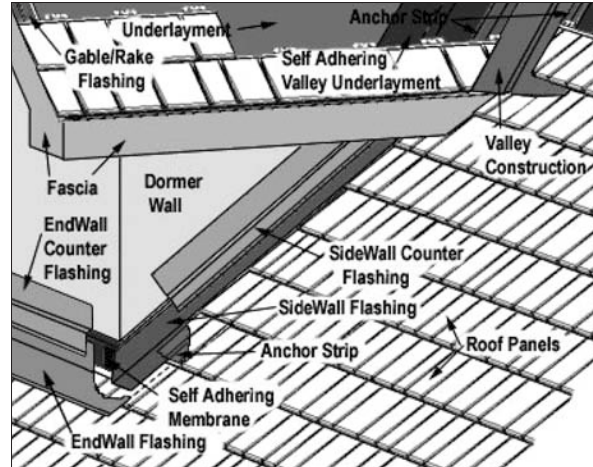


FIGURE 1-25 Dormer Construction

PANEL APPLICATION ON HIP SLOPE #1

1. Apply roof underlayment including hip/ridge underlayment and Edge Flashings. Place a minimum of one layer of 12" wide No. 30 asphalt saturated felt in "shingle fashion" over the entire hip area.
2. As the first course of panels on Hip Slope #1 are run over the hip, cut the panel 1" past the center of the hip. The cut angle should match the hip angle. Cut away the bottom "under-turned" flange of the panel 1/4" back from the center of the hip. By cutting away the bottom edge of the panel ensures any moisture that may be present along the bottom interlocking portion of the panel will not be trapped.
3. Using a pair of wide flange pliers or the bar folder bend the panel 90 degrees up.
4. As each course is applied, cut away the bottom "under-turned" edge to allow for drainage and bend the overhanging 1" flange up 90 degrees. After the panels have been applied along the entire hip, bend the upturned flange of the panel back onto the panel to provide a water stop.

See Figure 1-27.

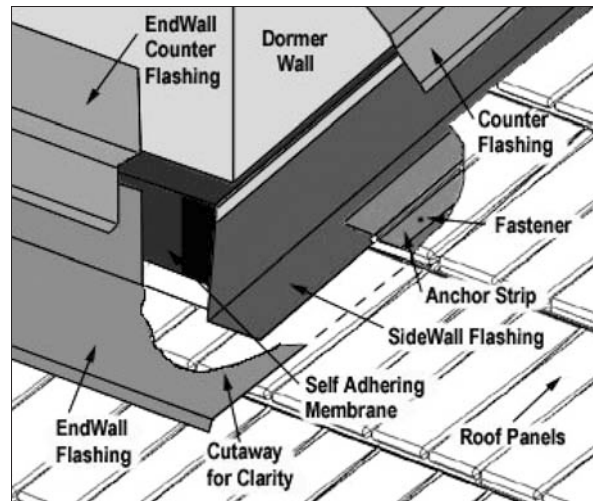


FIGURE 1-26 Dormer SideWall Detail

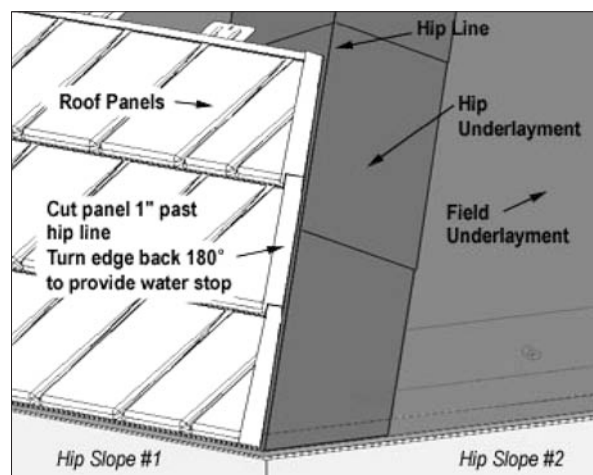


FIGURE 1-27 Hip Slope #1 Construction

PANEL APPLICATION ON HIP SLOPE #2

1. Apply roof underlayment including hip/ridge underlayment and Edge Flashings. Place a minimum of one layer of 12" wide No. 30 asphalt saturated felt in "shingle fashion" over the entire hip area.
2. As the first course of panels are run into the hip, cut the panel so that it ends 2" past the center of the hip. The cut angle should match the hip angle. Again, cut away the bottom "under-turned" flange of the panel 1/4" back from the center of the hip.
3. At the center of the hip and/or the junction of the panel from Hip Slope #1 it may be necessary to form the panel from Hip Slope #2 to roll up and over the down-turn flange of the panel on Hip Slope #1. The joint of these two panels should be tight and the use of a site applied sealant is recommended. *See Figure 1-28.*
4. Proceed to apply the rest of the panel courses for Hip Slope #2, paying particular care to maintaining the layered effect with each course.

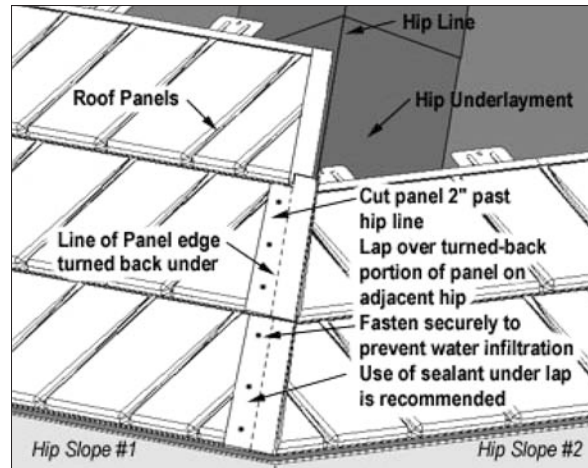


FIGURE 1-28 Hip Slope #1 and #2 Construction

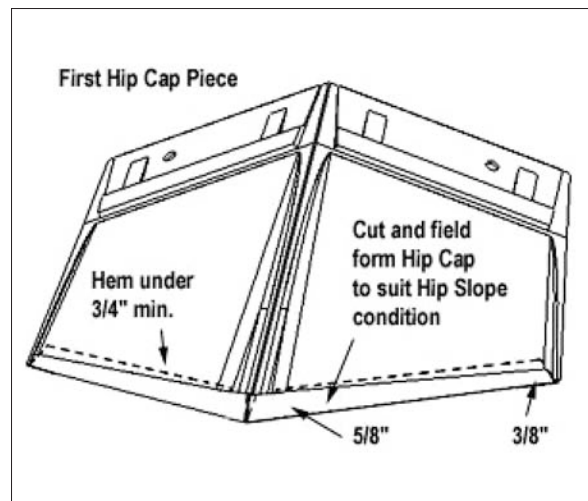


FIGURE 1-29 Custom Fabricated Hip Cap

HIP CAP APPLICATION

See Figure 1-30 and Figure 1-31.

1. Take the first piece of Hip/Ridge Cap and along the center, fold or crease as required to suit the roof or hip pitch. *See Figure 1-29.*
2. Place the Hip/Ridge Cap at the bottom of the hip and mark the outer edge of the cap. Repeat this at the top of the hip, and snap a chalk line between the marks on one edge. This will serve as a guide for placing the rest of the Hip/Ridge Cap.
3. The first Hip/Ridge Cap will need to be trimmed and formed to match the roof edge. Allow enough material for forming, so that when the bottom bent-back portion (3/4") is secured under the Anchor strip of the Edge flashing. Care should be taken

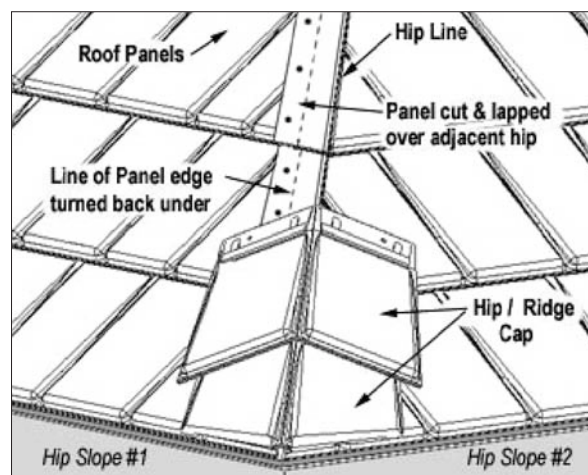


FIGURE 1-30 Hip Cap Application

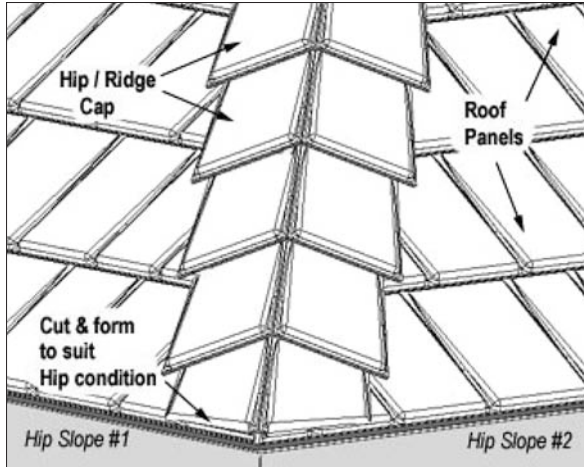


FIGURE 1-31 Completed Hip Cap Application

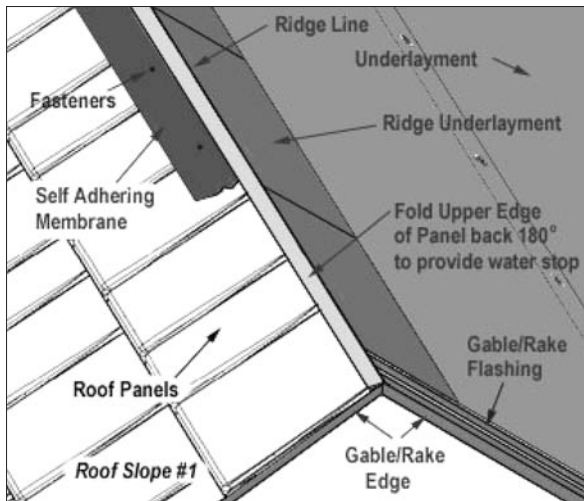


FIGURE 1-32 Roof Slope #1 Construction

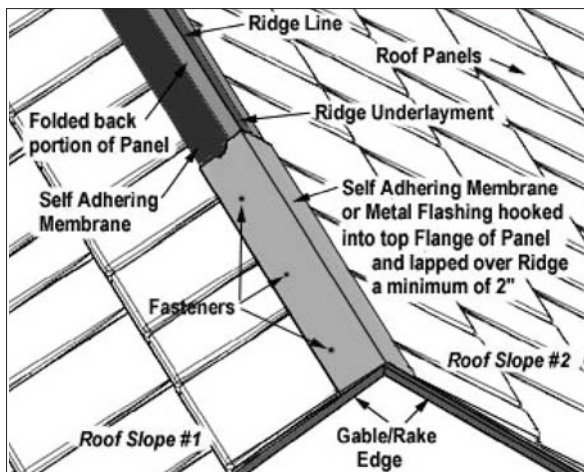


FIGURE 1-33 Roof Slope #1 and #2 Construction

to ensure that the plane of the first Hip/Ridge Cap will be the same as the following Hip/Ridge Caps. In some cases, it may be practical to apply a small piece of Anchor Strip on top of the panel below to attach the front edge of the Ridge/Cap to.

4. Using only approved nails or screws of a length long enough to adequately penetrate the substrate below, fasten the Ridge/Hip Cap through the pre-punched hole in the anchor portion of the cap. Use one nail per side. Fold the second piece of Ridge/Hip Cap along the center crease as required to suit the roof or hip pitch. Position the Hip/Ridge Cap on the cap below approximately 1" below its finished location. Carefully slide the cap up into position, making sure the bottom edge of the cap being applied engages the hook portion of the anchor portion of the cap already in its fixed position. Check Hip/Ridge Cap position with alignment chalk line and if satisfactory, the cap can be fixed into place.
5. Continue applying the Hip/Ridge Cap up the entire hip, each time making sure the bottom edge of the cap being applied engages the hook of the anchor portion of the cap previously applied. The exposure of each cap is 8". Any other measurement would indicate the hip cap has not been properly positioned.
6. At the junction of two hips and ridge (i.e. a cottage roof), trim the last hip panels so that they meet smoothly. Be sure when cutting any cap to allow enough material to provide a 1/2" fold back to eliminate any exposed cut edges.

RIDGE APPLICATION

See Figure 1-32 and Figure 1-33.

The application procedures for applying panels and Hip/Ridge capping at ridge locations is very similar to the hip locations.

As before to simplify the explanation of the application procedures, the roof slopes on either side of the ridge involved will be referred to as Roof Slope #1 and Roof Slope #2. In most roofing applications, Roof Slope #1 and Roof Slope #2 are not undertaken or completed simultaneously, but both roof areas must be completed before the Hip/Ridge capping can be applied.

PANEL APPLICATION ON ROOF SLOPE #1

1. Apply roof underlayment including hip/ridge underlayment and Edge flashings. Place a minimum of one layer of 12" wide No. 30 asphalt saturated felt in "shingle fashion" over the entire ridge area.
2. As the last course of panels on Roof Slope #1 are run up to the ridge, cut the panel so that it ends approximately 1" past the center of the ridge.
3. Using a pair of wide flange pliers or the bar folder bend the panel 180 degrees (back on itself) at the center of the ridge.

PANEL APPLICATION ON ROOF SLOPE #2

1. Apply roof underlayment including hip/ridge underlayment and Edge flashings. Place a minimum of one layer of 12" wide No. 30 asphalt saturated felt in "shingle fashion" over the entire ridge area.
2. As the last course of panels on Roof Slope #2 are run up to the ridge, cut the panel so that it ends 2" past the center of the ridge. Fold this portion of the panel over the ridge and the down-turned flange of panel on Roof Slope #1. The joint of these two panels should be tight and the use of a site applied sealant is recommended.

APPLYING HIP/RIDGE CAP ALONG THE RIDGE

See Figure 1-34 and Figure 1-35.

1. Take the first piece of Hip/Ridge Cap and along the center, fold or crease as required to suit the roof (ridge) pitch.
2. Place a piece of Hip/Ridge Cap at one end of the ridge and mark the outer edge of the cap. Repeat this at the other end of the ridge, and snap a chalk line between the marks on one edge. This will serve as a guide for placing the rest of the Hip/Ridge Cap.
3. The first Hip/Ridge Cap will need to be formed to hook under the Edge Flashing or panel to secure it. In some cases, it maybe practical to apply a small piece of Anchor Strip on top of the panel below to attach the front edge of the Ridge/Cap to. *See Figure 1-34.*
4. Using only approved nails or screws of a length long enough to adequately penetrate the substrate below, fasten the Hip/Ridge Cap through the anchor portion of the cap using one nail per side.
5. Fold the second piece of Hip/Ridge Cap along the center crease as required to suit the roof or hip pitch. Position the Hip/Ridge Cap on the cap below approximately 1" past its finished location, carefully slide the cap up into position, making sure the bottom edge of the cap being applied engages the hook of the anchor portion of the cap already in its fixed position. Check Hip/Ridge Cap position with alignment chalk line and if satisfactory the cap can be fixed into place.
6. Continue applying the Hip/Ridge Cap along the entire ridge, each time making sure the bottom edge of the cap being applied engages the hook of the anchor portion of the cap previously applied.

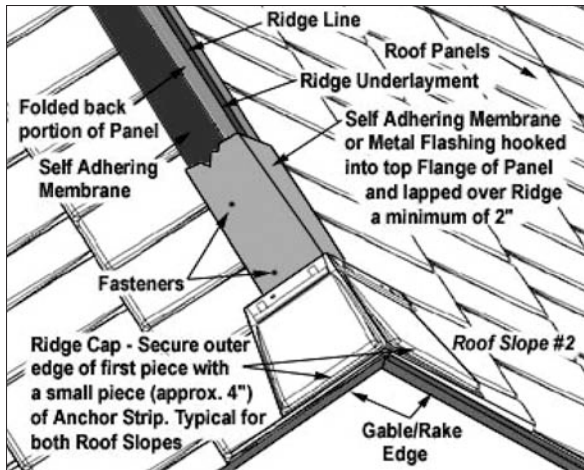


FIGURE 1-34 Ridge Cap Application

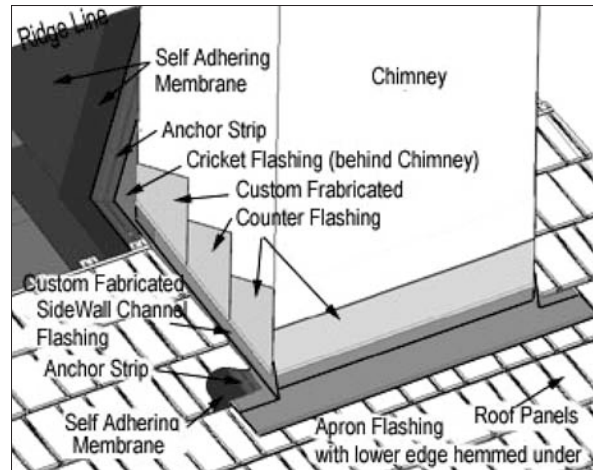


FIGURE 1-37 Panel Application

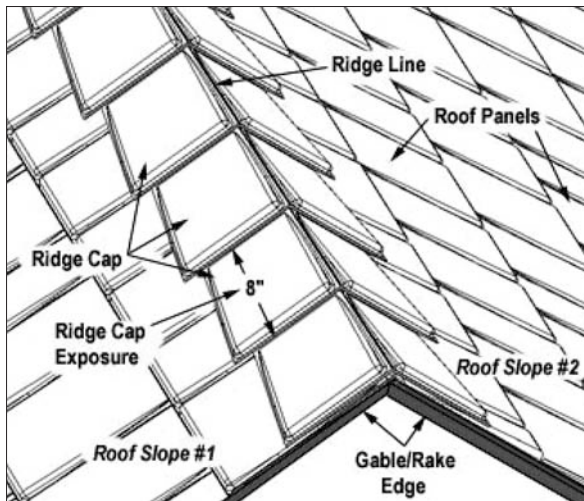


FIGURE 1-35 Completed Ridge Application

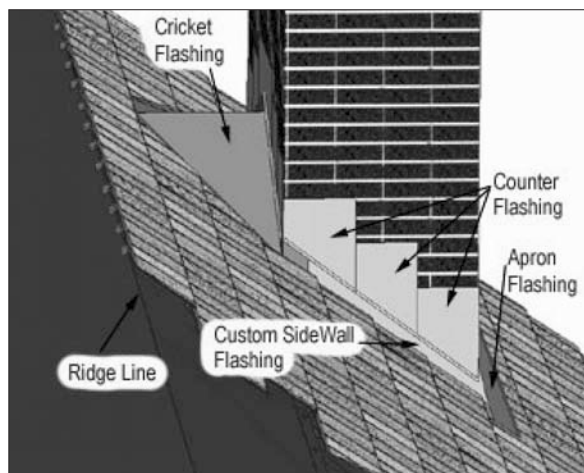


FIGURE 1-36 Panel Application

The exposure of each cap is 8". Any other measurement would indicate the Hip/Ridge Cap has not been properly positioned.

7. Secure the last piece of Hip/Ridge Cap in place with two exposed fasteners. Cover with a sealant suitable for this application and in a color to match the roof.

Chimney Flashings

See Figure 1-36 and Figure 1-37.

Before applying any flashings or panels around the chimney, apply underlayment as specified to the roof deck. In moderate and severe climates apply an ice dam protection membrane to assist in keeping water from migrating into the roof system at the intersection with the chimney during times of severe winter freeze-thaw cycling. Depending upon the size of the chimney, a cricket may need to be applied at the upslope side of the chimney to direct water runoff around the chimney. Apply crickets when any of the following roof conditions exist:

1. The chimney is more than 24 inches (610mm) wide.
2. The roof slope is 6 inches per foot (50%) or greater.

3. The mean January temperature is 30°F (-1° C) or lower and significant accumulations of snow and ice are anticipated on the up slope side of the chimney.

Generally, there are four separate types of flashings required around the chimney and are referred to as:

1. **Apron Flashing:** The use of color matched standard Endwall Flashing or site fabricated from color matched flat stock is recommended. Apply the apron flashing around the down-slope side of the chimney, after panels have been applied up to the downslope side of the chimney. The apron flashing should be formed so that the lower flange extends at least 4 inches (102mm) over the panels on the down-slope side. The vertical flange should extend at least 6 inches (153mm) up the face of the chimney. *See Figure 1-38.*

2. **Sidewall Flashing:** Apply along the upslope sides of the chimney. The use of site fabricated sidewall flashing from color matched flat stock is recommended. This customized Sidewall flashing must be a minimum of 6" (150mm) wide and will accommodate the Anchor Strip and water run off from the cricket or backer flashing located above. After the Apron Flashing has been attached, the first pieces of customized sidewall flashing can be held in place, marked for cutting and bending as needed and fit around the downslope corners of the chimney. Make sure these lower most pieces of side wall flashing overlap the upslope flange of the apron flashing by at least 2 inches (51 mm). Apply Anchor Strip with butyl strip on top of site fabricated sidewall. Set both pieces of the Sidewall flashing in vertical-grade asphalt roof cement or polyurethane sealant, if the flashing is not a formed and soldered corner component. If conditions dictate, seal each piece of

Sidewall flashing to the masonry with sealant. Fasten the Sidewall flashing to the chimney with stainless steel screws in a location high enough that they will be covered by the counter flashing.

See Figure 1-39.

3. **Cricket or Upslope Backer Flashing:** *See Figure 1-38.* Apply on the upslope side or back of the chimney. Shop or site fabricated from color matched flat stock is recommended. If the size of the chimney is relatively small (e.g., less than 24 inches (610mm) wide), a cricket may not be necessary. In this condition, a sheet metal backer flashing or a membrane material that is intended to be left exposed to the weather may be applicable for flashing the upslope side of the chimney. A sloped cricket may be needed (depending upon the climate, roof slope and chimney size) on the upslope side of the chimney if a relatively large chimney is present. The sloping wood cricket may be roofed with panels and flashed with a valley flashing.
 - a) After the customized sidewall flashing and panel courses have been applied up both sides of the chimney, and the two uppermost pieces of side wall flashing have been wrapped around the back corners of the chimney, the upslope cricket or backer flashing may be applied.
 - b) When using a metal cricket flashing, the fabricated flashing should conform to and cover the underlying sloped cricket substrate, and fit snugly to the back of the chimney. The metal cricket must extend beyond the valley centre line and overlap onto the field of the main roof deck at least 6 inches (152 mm). The vertical flange should extend a minimum of 6 inches (152 mm) up the back side of the chimney. Apply the panels up to and over the cricket.

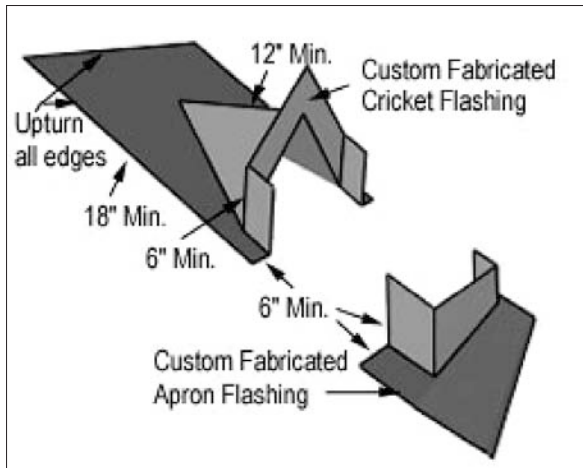


FIGURE 1-38 Panel Application

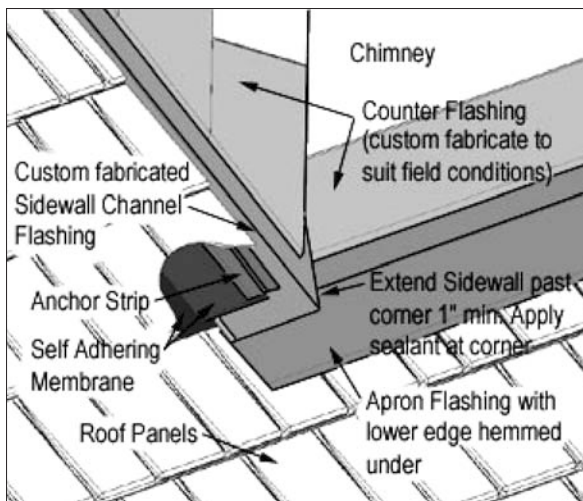


FIGURE 1-39 Apron Sidewall Detail

- c) When using a metal backer flashing, the fabricated flashing should conform to the roof deck and fit snugly to the back of the chimney. The metal backer must completely cover the immediate area upslope of the chimney, and extend beyond the sides of the chimney by a minimum of 6 inches (152mm). The upslope flange must be a minimum of 18 inches (457mm) wide. However, an upslope flange dimension of 24 inches (610mm) is not uncommon, and is suggested when repeated freeze-thaw cycling is anticipated.

The vertical flange should extend a minimum of 6 inches (152mm) up the back side of the chimney.

- d) After fitting, trimming (as necessary) and adjusting the bend at the chimney-to-main roof intersection, the backer may be set in a bead of sealant, and fastened to the roof deck along the upper edge of the upslope flange.
- e) Prior to applying panels over the metal backer, it may be necessary to “strip-in” the sides and upslope flanges of the backer flashing depending on the roof slope and climate. The flanges may be “stripped-in” with membrane stripping plies composed of 8 to 12 inch (203 to 305mm) wide strips of a self-adhering modified asphalt membrane, or strips of asphalt-saturated felt set in vertical grade asphalt roof cement.
- f) After the sheet metal backer has been fit to the chimney, set in a bead of sealant, fastened to the roof deck and “stripped-in” (if necessary), the remaining panel courses may be applied over the backer and up the slope of the roof.

4. **Counter Flashing:** Sheet metal counter flashing must be applied to overlap all vertical flashing flanges that have been extended up the sides of the chimney. Site fabricate counter flashing from color matched flat stock and secured to the masonry is recommended. Inset counter flashing is often best set by the mason during construction. A through-masonry flashing is usually the best way to prevent water entry at the counter flashing-to-masonry intersection. However, inset counter flashing may be used by cutting or routing the mortar joint just above the top of the vertical flashing flanges. This open joint is referred to as a reglet joint. Inset counter flashing may be applied in the following manner:

- a) The depth of the reglet should be a minimum of 1-1/2 inches (40mm).
- b) The metal counter flashing may be formed with a friction fit extension along its upper edge. This extension should be a minimum of 1/2 inch (13mm), and be under-broken so that the counter flashing will fit tight into the reglet joint.
- c) Once the reglet is cut, fit a small sample piece of the counter flashing to be sure the reglet is deep enough. Cut the counter flashing into appropriate lengths. Use one continuous counter flashing piece on the front and back of the chimney. Use several similar pieces stepped up the sides, trimmed to fit the particular location.
- d) Clean the joints with compressed air or brush to remove mortar dust, and inject a bead of polyurethane sealant into the joint. Set the counter flashing into the reglet, and drive it back into the joint with a wide blade screwdriver to seat the back of the metal fully into the joint. Be sure the friction fit is tight and the counter flashing is secure. The upper exposed flange of the counter flashing, extending out of the masonry, should be sloped down to promote runoff away from the masonry joint.
- e) Refill the joint with polyurethane sealant. Before the sealant skins over, tool it into the joint to be sure the joint is fully sealed. The sealant should achieve positive contact with the masonry along the sealant's upper edge and with the metal along the lower edge.

Other flashing details that are often encountered with steep-slope roof construction are those for plumbing soil pipe vents, equipment stands, air vents, skylights and roof-to-roof transitions.

PIPE VENT CONSTRUCTION

A universal flashing boot with a flexible metal flashing collar is recommended for panel application with a plumbing soil pipe vent or equipment support stand detail. The manufacturer's instructions should be followed. Water flow and water tightness should be a consideration at all times.

While providing the flexibility of conforming to specific roof conditions, applying a flashing boot with exposed fasteners allows for the opportunity to replace the flashing boot if necessary without damaging the roof assembly.

1. Applying the flashing boot to a flat metal pan rather than the panels will ensure a tighter seal around the flashing base. *See Figure 1-40.*
2. Prior to applying the metal pan, apply a layer of Self Adhering Membrane Underlayment around the entire penetration area.
3. Hem all non exposed edges of the metal pan up to provide a positive weather stop under the panels. *See Figure 1-40.*
4. Secure the down-slope portion of the metal pan by hemming the bottom edge of the pan. Secure the hemmed edge into a piece of Anchor Strip. Mount the Anchor Strip on top of a strip of Self Adhering Membrane to ensure a seal around fastener penetration of the panel below.
5. To secure the Tapered Hem of the Panel on top of the metal pan apply Anchor Strips. *See Figure 1-41.* Prior to applying the Anchor Strip on top of the metal pan, apply or "strip in" Self Adhering Membrane to seal around nail penetrations.
6. Apply the Anchor Strip around the boot flashing allowing enough space to apply the panel and making sure all fasteners go through the self-sealing membrane.

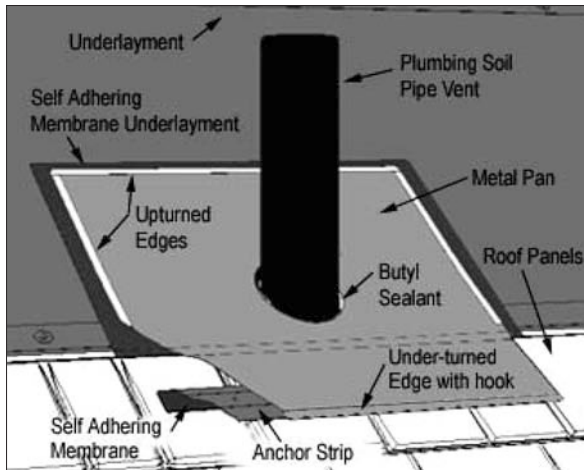


FIGURE 1-40 Completed Pipe Penetration Construction

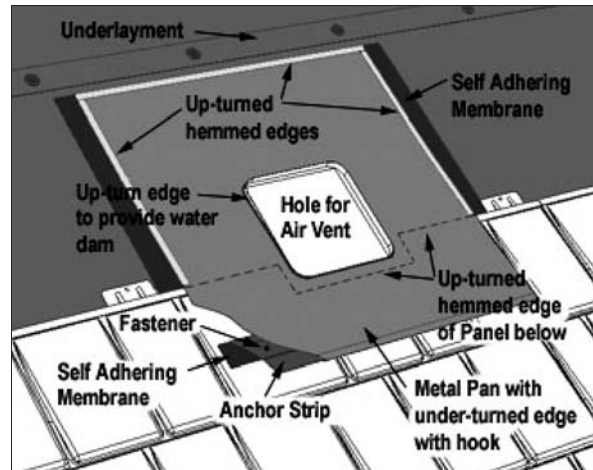


FIGURE 1-43 Roof Vent Construction Detail #1

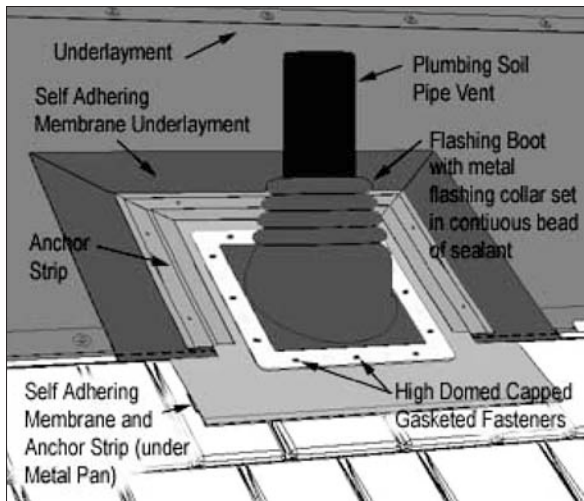


FIGURE 1-41 Completed Pipe Penetration Construction

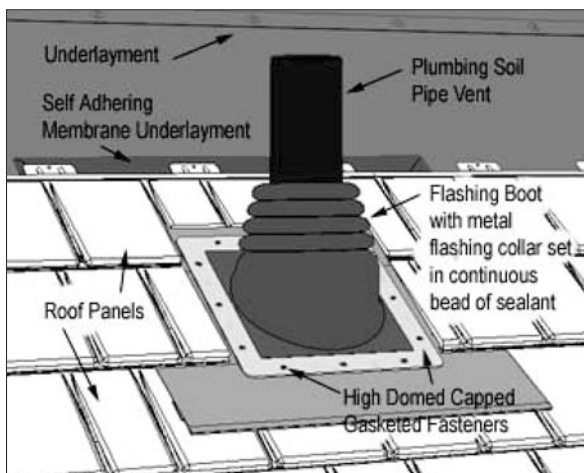


FIGURE 1-42 Completed Pipe Penetration Construction

7. Apply the panels up to and around the pipe penetration. Ensure all cut panels are hemmed under and securely locked into the Anchor Strip. *See Figure 1-42.*
8. A continuous bead of sealant should be used around the perimeter of the cut in the boot. A continuous sealing gasket or butyl sealant tape should be applied under the base of the pipe boot. Fasten in accordance with the manufacturer's specifications.

ROOF VENT CONSTRUCTION

Attic air vents made from steel or aluminum can usually be hemmed under to hook into the top edge of the panel below the penetration and hemmed up to provide the hook for the panel above. The side edges must be hemmed up to provide a water stop along the side edges. This hemmed edge can be used in conjunction with the Anchor Strip to secure the hemmed edge of the panel. For applications of air vents where hemming and tying into the roof assembly is either not possible (plastic vent) or the option of removing the vent at some time in the future is a possibility than the application should be done over a metal pan. *See Figure 1-43.*

1. Prior to applying the metal pan or an air vent with hemmed edges, apply a layer of Self Adhering Membrane Underlayment around the entire penetration area.
2. Hem all non exposed edges of the metal pan up to provide a positive weather stop under the panels. *See Figure 1-43.*
3. Secure the down-slope portion of the metal pan by hemming the bottom edge of the pan. Secure the hemmed edge into a piece of Anchor Strip. Mount the Anchor Strip on top of a strip of Self Adhering Membrane to ensure a seal around fastener penetration of the panel below.
4. To secure the Tapered Hem of the Panel on top of the metal pan apply Anchor Strips. *See Figure 1-41.* Prior to applying the Anchor Strip on top of the metal pan, apply or “strip in” Self Adhering Membrane to seal around nail penetrations.
5. Apply the Anchor Strip around the air vent, allowing enough space to apply the panel and making sure all fasteners go through the self-sealing membrane.
6. Apply the panels up to and around the air vent penetration. Ensure all cut panels are hemmed under and securely locked into the Anchor Strip. *See Figure 1-44.*
7. A continuous sealing gasket or butyl sealant tape should be applied under the base of the pipe boot. Fasten through the air vent using high Domed gasketed fasteners. *See Figure 1-45.*

SKYLIGHT CONSTRUCTION

See Figure 1-46, Figure 1-47 and Figure 1-48.

Application of Roof Panels up to, around and above a skylight is similar in construction and complexity to a chimney application. For greater detail refer to Chimney Construction located earlier in this document.

1. Skylight construction details and flashing dimensions may vary according to local weather conditions, skylight type and size, skylight location, slope of roof, and rafter length behind skylight.
2. Apply self adhering ice-dam protection membrane around all penetrations including skylights.
3. An upslope backer flashing may be used for skylights and other penetrations 24" or less in width. Extend approximately 6" up skylight and a minimum of 18" upslope. (24" minimum is suggested in snow and ice regions.)
4. A saddle or cricket flashing is recommended for skylights and other penetrations equal to or greater than 24" in width to promote positive runoff.
5. Sheet metal backer flashing should be a minimum of 26 ga. pre-finished galvanized steel or an equivalent longevity non-corrosive metal suitable for soldered fabrication.
6. The profile of specific components, their configuration or sequencing; can vary with the roof system, with climatic differences, and regional or area practices.

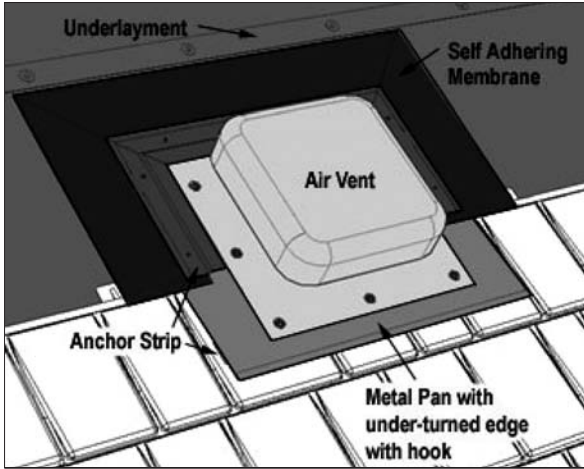


FIGURE 1-44 Roof Vent Construction Detail #2

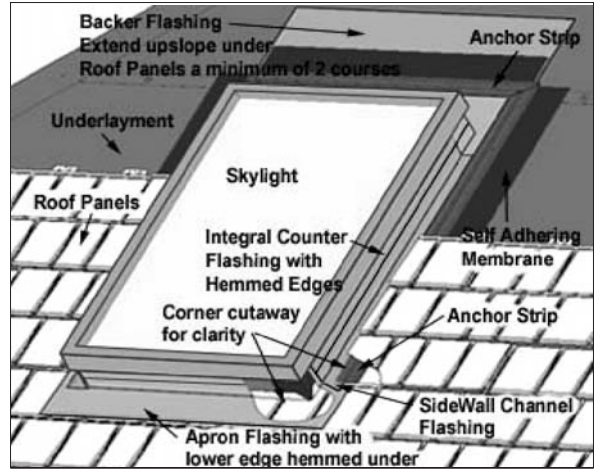


FIGURE 1-47 Skylight Construction

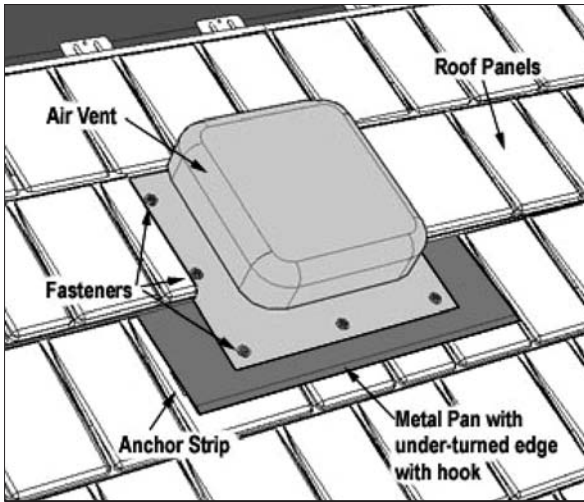


FIGURE 1-45 Completed Roof Vent Construction

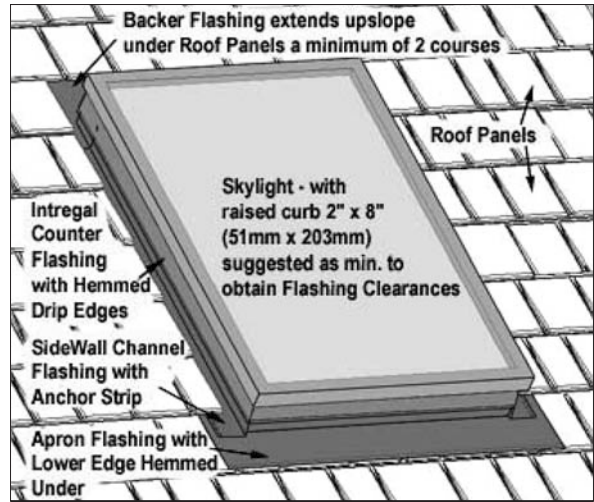


FIGURE 1-48 Completed Skylight Construction

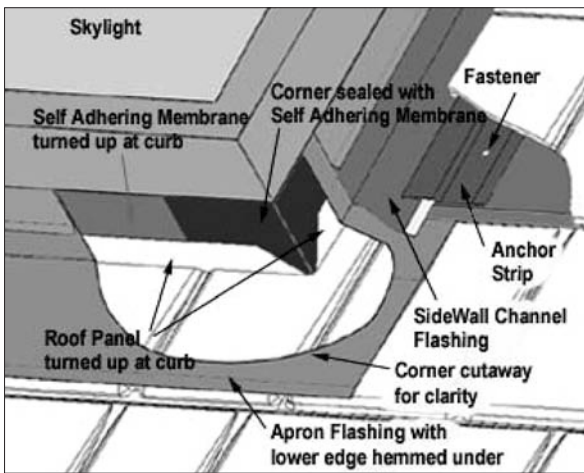


FIGURE 1-46 Skylight Construction Detail