## INSTALLATION

For more information on this product or to order samples call 1-877-631-2845 or visit our website at builddirect.com

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- **hip & ridge cap**

- **Achilles Classic, Shingle and Shake**

- **Valley**
  - Length: 8'

- **Channel**
  - Length: 8'

- **Lateral Flashing**
  - Length: 4'

- **Front Flashing**
  - Length: 4'

- **External flashing**
  - Length: 8'
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ACHILLES Comparative Benefits™

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<tr>
<th>Protection and Benefits</th>
<th>Achilles</th>
<th>Clay Tile</th>
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<td>High maintenance</td>
<td>Class 3</td>
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<td>Maintenance Life cycle cost</td>
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<td>High maintenance</td>
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<td>Options for re-roofing</td>
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<td>TEAR OFF required for re-roofing</td>
<td>TEAR OFF required for re-roofing</td>
<td>TEAR OFF required for re-roofing</td>
</tr>
</tbody>
</table>
Care and Recommendations

Installation Recommendations:

Products shall be installed in accordance with these guidelines as established by ACHILLES:
• Do not use accessories that contain copper or lead, with the steel roof system, as they are incompatible metals.
• 3/12 Slope minimum (14 degree minimum pitch) requires additional underlayment
• Recommended Slope 4/12 or greater.

• When handling the product, be careful not to deform.
• Always wear gloves to avoid cuts
• When installing ACHILLES care should be taken to avoid friction between panels, which could damage the coating affecting the durability and appearance.
  • Immediately after and/or during installation, you should remove any steel particles that may remain on ACHILLES due to drilling fasteners and cutting. The remaining particles on the panels will damage them in appearance and durability.
• It is recommended that those working on the roof using use rubber soled shoes to avoid damaging the product.

Maintenance ACHILLES:

• ACHILLES is designed to withstand a most environment, but life can be extended with proper maintenance.

• Upon completion of the installation, check that the roof surface is clean and free of objects that could damage the coating (metal burrs, screws, wire, sheet metal clippings, etc...)

• Avoid foot traffic on the roof panels.

• It is recommended to clean the roof surface every six months (using water, detergent and a soft brush, or have a professional clean) when you are in a highly corrosive area.

• Carry out any work on the roof deck using all safety measures and wooden planks for weight distribution and protect the ACHILLES.

Tips to Users

It is important to carefully read each of the recommendations in this installation manual, prior to installation of Achilles roofing.
ACHILLES is not responsible for improper installation or misinterpretation of this manual.

General recommendations for transportation, handling, and storage. Storage Recommendations:
• Indoors
• In dry and ventilated
• Never on the floor.

• If stored outside: locate close to installation, on a firm surface and protect from damage. Allow for water to drain off of the material and protect from being blown by wind.
• Packages can be stored on each other, to a height of one meter, or on metal racks designed for this purpose, making sure to leave space for air circulation.

• Use tarpaulins but never in direct contact with the material

• Leave space at the ends of the canvas tarps to allow for air circulation.

• Do not use polyethylene or plastic to cover the packages.

• Do not store detergents, solvents, liquids, acidic materials, or alkali such as concrete or plaster with ACHILLES products.

• It is recommended to store products or near where they will be installed to avoid damage by from handling and checking them regularly to ensure they are not damaged.

• Handling material by hand requires special care to avoid damaging the ACHILLES and/or hurting your hands.

Structure: The roof structure should be inspected and any structural problems found should be corrected prior to the installation of the roofing panels.

Decking: Min. 15/32” in. thick, grade B-C APA rate plywood or equal.

Patterns: Wood Patterns are to be 2” x 2”, standard grade Douglas fir or better, nominal thickness 1.5” x 1.5”. Counter Patterns are 1” x 4”, standard grade Douglas fir or better, nominal thickness .75” x 3.625”

Underlayment: A minimum underlayment of #30 felt or synthetic underlayment is required on all new construction and tear-offs. Achilles roofing panels are considered to be non-combustible steel panels, but in certain conditions, special underlayments are required. Check with local Building Departments prior to installation.

Roof Saddles: Roof saddles are required behind any roof protrusion 48” in width and above. Panel diverters are easy to make and are a good way of diverting water from the back of the protrusion and should be used where necessary.

Sealants: A one-part polyurethane type sealant is recommended.

Installation - Batten

Install the eave batten even with the front of fascia at the eave edge of the roof. At one end of the eave, measure from the front of the eave batten 13 1/2”, mark and tack a nail. At the other end of the eave measure from the front of the eave batten the same distance, mark and tack a nail. Now string a line between the two tacked nails and measure from the line to the front of the eave batten in at least three places, to make sure the measurement is the same and the fascia is straight. If the measurement is more, move the line down to match the measurement at that point and reset the line. Install the first batten above the eave batten even with this line and fasten with 16-penny nails a maximum of 16” OC into the framing member. All battens above this will be installed at 14 1/2” spacing from front of batten to front of batten up to the last full course from the ridge.
Rake or Gable End Batten Detail
At the rake or gable end, install a 2” x 2” batten up the rake on top of and perpendicular to the horizontal battens.

Hip Batten Detail:
Where the horizontal battens come to the hip, they are to be cut 6” short of Hip. Next install two 2” x 2”s parallel and on top of each other up the hip.

Ridge Batten Detail:
At the ridge, the height of the top course is random on both sides. Measure down from the peak or center of the ridge evenly on both sides and fasten two 2” x 2”s on both sides running parallel along the ridge 6” outside to outside for Shingle and Shake Hip and Ridge (5 1/2” for Classic). These 2 x 2s will be used to fasten the ridge trim and panel upturns at the ridge.

Valley Batten Detail
Begin by laying the Achilles valley at the valley portion of the roof taking care to overlap a minimum of 2”. Horizontal battens are notched and extend over the top of the Achilles Valley. Care should be taken to insure the valley is not penetrated with any fasteners.

Reroofing Preparation
Begin by removing all the old hip and ridge. Cut any overhang flush with the existing fascia. If necessary, at the eave, build up the fascia using 1” x 4”s and 2” x 2”s until the fascia is flush with the top of the old roofing, now fasten with 16-penny nails into the fascia. Repeat the procedure at the rake (cut, remove and build up). At the hips and ridges install one layer of #30 underlayment, evenly on both sides. Now, install 1” x 4”s over the underlayment parallel and adjacent to one another. Fasten the 1” x 4”s with 16-penny nails into the ridge or hip board. Leaving the old valley in place, lay the Achilles valley up the valley, overlapping at least 2”. Now, install two parallel 1” x 4”s adjacent to the Achilles valley and fasten the 1” x 4”s with 16-penny nails.

Reroofing installation of 1” x 4” counter battens
1” x 4” counter battens are installed over the old roof by nailing them with 16-penny nails into the framing member or rafter. If the eave is open at the eave, you can determine if the rafters are 16” or 24” OC. Locate the first rafter on the inside of the rake or gable and nail the counter batten. Next make two wood templates to space your next counter batten directly over the next rafter. Counter battens are nailed 12” OC vertically up the roof from the eave to the ridge.

Note: Install the Battens in the same manner as discussed above.

Installation of Fascia Metal
Begin by fitting the fascia metal tightly against the eave batten and fascia board be sure and overlap a minimum of 2”. Carefully fasten through the top support flange and sparingly along the face of the fascia metal. Hips and valleys are marked, cut and hand bent, as shown in the details. Seal and chip all nail heads and cut edges with the Achilles Touch up kit.

Panel Installation Field Panels
Roofing panels must be installed from right to left. Beginning at the first full course at the top, position the panels against the batten and nail at the back flange of the panel be sure to overlap the side laps. After the panels have been installed at the first full coarse, position the panels in the courses below, staggering the endlaps a minimum of 12”. Take care to seat the panels between the battens, as you install the panels along the course and down the roof.
Note: When starting at a valley or hip be sure that the closest part end lap of the panel is at least 6” away from the hip or valley.

Panel Installation Nailing Points
(A) Field panel: Fastening through the nose end of the panel and into 2” x 2” behind it with 5 fasteners per panel.
(B) The last course at the fascia or eave, is the only course that must be top fastened. This course of nails must be sealed and chipped using the Achilles Touch up kit.

Panel Installation Random Ridge Course
Measure the distance from the back of last full panel at the ridge and mark the bend line. Add 2” to the measurement and mark the “cut line”. Place the panel in the break and bend. Using the guillotine cutter cut along the cutting line. Begin the installation by fitting the nose end of the panel to be installed with the corrugations of the full panel in front of it and fit tightly in place. Nail the right and left side nose ends first and then in the center of the panel. Next, nail the turn-up on the back of the panel into the side of the 2 x 2 at the ridge, taking care to keep the panel level with the panel in front of it. Repeat the procedure until the installation of the “Random Ridge” course is complete.

Note:
In areas prone to hurricane force winds, installation must meet local building codes. Nails should be placed at seven points across the panel along the first two and last two courses along the eave and ridge. Additionally, nailed at seven points across the panel within a panel length of a hip, valley or gable end.

Hip Installation
Install Achilles channel on each side of hip battens and fasten. Overlap end laps a mini mum of 2”. Cut panels at hip to hip battens and channels.

Note: Each panel should provide two cut pieces for both the hip and the valley. Valley installation- cutting
Cut and fit panels to valley metal. Gable or rake ends Detail
At the gable or rake end, the field panels are measured, cut and bent up 1 1/2”, to match the height of the vertical 2 x 2 installed on top and perpendicular to the 2 x 2 battens. The Shingle and Shake or Classic hip and ridge is installed from the bottom up and you should begin with a “rake starter”. The rake starter is made by inserting an End Cap into the end of a Shingle and Shake or Classic hip and ridge. A bead of adhesive sealant is applied on the inside lip of the Shingle and Shake or Classic hip and ridge to hold the End Cap in place. Fasten the rake starter and install the next Shingle and Shake or Classic hip and ridge. At the intersection of the ridge, miter both sides of the rake or gable.

Ridge Intersection of gable or rake end
Ridge Starters are made by inserting the End Cap into the end of the Shingle and Shake or Classic hip and ridge and adhering the End Cap into a bead of adhesive sealant. With your hand shears cut the sides of the mission trim to match the contour of the previously installed mitered rake trim. Install over the mitered rake trim and fasten through the panel ridge bend up and into the 2 x 2s at the ridge. If your installing a straight gable roof, repeat this step at the opposite end of the of the ridge and install the Shingle and Shake or Classic hip and ridge from the outside into the center. At the intersection of the ridge trim in the center of the roof install a Shingle and Shake or Classic hip and ridge by overlapping.
Hip Intersection of the ridge
At the intersection of the hip and ridge, miter the hip trims to fit and fasten. Cut the Ridge trim to fit the contour of the hip trims and install sealant at the overlap of the mitered hip trims. Cut a piece of stone coated flat stock to a shape to fit in remaining openings. Seal around the edges and fasten.

Installation of the hip
Begin the installation of the hip at the fascia by making the hip starter. Start by inserting the End Cap into the nose end of a Shingle and Shake or Classic hip and ridge, place a bead of sealant inside the nose end to hold the End Cap in place. Fasten the bottom portion to the top with 3/4" hex head #8 self drilling screws on either side of the trim. Seal and chip the screw heads using the Achilles Touch-up kit. The next trim will overlap the rear of the trim in front.

New construction end wall and side wall
On side walls exiting at the eave, Z-bar should be installed prior to stuccoing or installing siding. Achilles Channel can be inserted under the Z-bar to carry water down the roof exiting at the eave.

Note: the nose end of the last panel at the eave should be notched to allow water to flow from the tile pan into the gutter.

2 x 2s are flush with the Achilles Channel. The Achilles panels are installed next to the Z-bar without bending up the edges.

At the End Wall or Head Wall portion of the roof the Z-bar is installed prior to stuccoing or installing siding at a height a minimum of 3" above the Plywood sheathing. Place a 2 x 2 at the vertical intersection to support the last panel course, which will be cut and bent up to fit under the Z-Bar.

Skylight, Chimney, and Roof to wall detail
Begin by preparing the area to be flashed. If, as in the above example, the area is a chimney proceed as follows:

1) Measure 7" above the roof sheathing or 1 x 4" in the case of a reroof and mark around the chimney.
2) Snap a chalk line at the 7" mark around the brick chimney.
3) Using a diamond or masonry blade notch into the brick with a circular saw, the width of the blade.
4) Install the panels along the front side of the chimney first. Measure for the bend line and add 2" for the cut line. At the vertical intersections on both sides, cut the upturn on a 45 degree angle and bend the upturn around the vertical surface and secure.

Note: Be sure and use sealant in this area.

5) Install panels along both sides of the chimney in the same manner.
6) Install the back section in the same manner as the front, taking care to wrap around both sides and fasten. Apply sealant to all four corners and chip with the Achilles Touch-up kit. Additionally a diverter can be installed over the rear panel to aid in the waterproofing.
7) Insert and install the counter flashing into the notched brick on all four sides, fasten and seal.
Pitch Change Detail
Be sure and keep a proper spacing between battens.

Pipe Flashing Detail
Install the base pipe flashing directly on the solid sheathing. Install your underlayment below the front edge and on top of the back edge of the base flashing. Install the battens (Fig. 28). Install the full panels around the vent pipe by cutting a hole with your hand shears to fit the size of the pipe vent.

Cut the skirt on the top pipe flashing to fit height of the course, and fit it over the vent pipe. Mold the skirt of the flashing to fit the corrugations of the panel. Using a width of panel, that is wide enough to cover the entire pipe flashing skirt, carefully cut a hole to fit around the cone of the flashing. Install the “cover panel” and fasten. Be sure to seal and chip around the cone using the Achilles Touch-up kit.

Ventilation Eave and ridge
An over-heated attic can reach over 170 degrees, resulting in higher utility bills. Proper ventilation will reduce the heat and reduce the moisture in your home. Inadequate ventilation will also cause ice damming in the winter, shortening the life of most roofs. Venting at the ridge draws cooler air through your soffit vent into your attic and allows hotter air to escape through the ridge vent. Venting under your Achilles panels will help reduce heat transfer once from your roof into your attic. Proper ventilation and insulation will keep your home comfortable and lower your utility costs.

Installation - Battenless

Rake or Gable End Batten Detail
At the rake or gable end, install a 2” x 2” batten up the rake.

Hip Battenless Detail:
Install two 2” x 2”s parallel and on top of each other up the hip.

Ridge Battenless Detail:
At the ridge, the height of the top course is random on both sides. Measure down from the peak or center of the ridge evenly on both side and fasten a 2” x 2”s on both sides running parallel along the ridge 6” outside to outside for Shingle and Shake Hip and Ridge (5 1/2” for Classic). These 2 x 2s will be used to fasten the ridge trim and panel upturns at the ridge.

Valley Detail
Lay the Achilles valley at the valley portion of the roof taking care to overlap a minimum of 2”. Care should be taken to insure the valley is not penetrated with any fasteners.

Installation of Fascia Metal
Begin by installing a 1” x 4” batten at the eaves. Install the fascia metal tightly against the eave batten and fascia board be sure and overlap a minimum of 2”. Carefully fasten through the top support flange and sparingly along the face of the fascia metal. Hips and valleys are marked, cut and hand bent, as shown in the details. Seal and chip all nail heads and cut edges with the Achilles Touchup kit.
Panel Installation Field Panels
Start by measuring from the outside of fascia 15.75” up the roof at each end of the roof area and chalking a line. Check this line for consistency at several points along the fascia. If the line is more than 16” at any point along the fascia, then the line must be adjusted to accommodate this measurement. Starting at the right hand edge and working left install the back of the first panel along this line fastening the back flange with a minimum 5 - 8d x 2-3/8” Ring Shank Nails or #10 x 2-1/2” screws. After first full course are installed, position subsequent panels making sure to stagger the end laps a minimum of 12”. (see below for fastening) Care should be taken to insure the nose of the upper panel is properly seated on the back flange of previous row.

Note: When starting at a valley or hip be sure that the closest part end lap of the panel is at least 6” away from the hip or valley.

Panel Installation Nailing Points
(A) Field panel: Fastening through the nose end of the panel and into the decking with 5 fasteners per panel.
(B) The last course at the fascia or eave, is the only course that must be top fastened. This course of nails must be sealed and chipped using the Terrabella Touchup kit.

Panel Installation Random Ridge Coarse
Measure the distance from the back of last full panel at the ridge and mark the bend line Add 2” to the measurement and mark the “cut line”. Place the panel in the break and bend. Using the guillotine cutter cut along the cutting line. Begin the installation by fitting the nose end of the panel to be installed with the corrugations of the full panel in front of it and fit tightly in place. Nail the right and left side nose ends first and then in the center of the panel. Next, nail the turn-up on the back of the panel into the side of the 2 x 2 at the ridge, taking care to keep the panel level with the panel in front of it. Repeat the procedure until the installation of the “Random Ridge” course is complete.

Note: In areas prone to hurricane force winds, installation must meet local building codes. Nails should be placed at seven points across the panel along the first two and last two courses along the eave and ridge. Additionally, nailed at seven points across the panel within a panel length of a hip, valley or gable end.

Hip Installation
Install Terrabella channel on each side of hip battens and fasten. Overlap end laps a minimum of 2”. Cut panels at hip to hip battens and channels.

Note: Each panel should provide two cut pieces for both the hip and the valley.

Valley installation - cutting
Cut and fit panels to valley metal.

Gable or rake ends Detail
At the gable or rake end, the field panels are measured, cut and bent up 1 1/2”, to match the height of the vertical 2 x 2 installed along the rake edge. The Shingle and Shake or Classic hip and ridge is installed from the bottom up and you should begin with a “rake starter”. The rake starter is made by inserting an End Cap into the end of a Shingle and Shake or Classic hip and ridge. A bead of adhesive sealant is applied on the inside lip of the Shingle and Shake or Classic hip and ridge to hold the End Cap in place. Fasten the rake starter and install the next Shingle and Shake or Classic hip and ridge. At the intersection of the ridge, miter both sides of the rake or gable.
Ridge Intersection of gable or rake end
Ridge Starters are made by inserting the End Cap into the end of the Shingle and Shake or Classic hip and ridge and adhering the End Cap into a bead of adhesive sealant. With your hand shears cut the sides of the mission trim to match the contour of the previously installed mitered rake trim. Install over the mitered rake trim and fasten through the panel ridge bend up and into the 2 x 2s at the ridge. If your installing a straight gable roof, repeat this step at the opposite end of the of the ridge and install the Shingle and Shake or Classic hip and ridge from the outside into the center. At the intersection of the ridge trim in the center of the roof install a Shingle and Shake or Classic hip and ridge by overlapping.

Hip Intersection of the ridge
At the intersection of the hip and ridge, miter the hip trims to fit and fasten. Cut the Ridge trim to fit the contour of the hip trims and install sealant at the overlap of the mitered hip trims. Cut a piece of stone coated flat stock to a shape to fit in remaining openings. Seal around the edges and fasten.

Installation of the hip
Begin the installation of the hip at the fascia by making the hip starter. Start by inserting the End Cap into the nose end of a Shingle and Shake or Classic hip and ridge, place a bead of sealant inside the nose end to hold the End Cap in place. Fasten the bottom portion to the top with 3/4” hex head #8 self drilling screws on either side of the trim. Seal and chip the screw heads using the Achilles Touch-up kit. The next trim will overlap the rear of the trim in front.

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On side walls exiting at the eave, Z-bar should be installed prior to stuccoing or installing siding. Achilles Channel can be inserted under the Z-bar to carry water down the roof exiting at the eave.

Note: the nose end of the last panel at the eave should be notched to allow water to flow from the tile pan into the gutter.

The Achilles panels are installed next to the Z-bar without bending up the edges. At the End Wall or Head Wall portion of the roof the Z-bar is installed prior to stuccoing or installing siding at a height a minimum of 3” above the Plywood sheathing. Place a 1 x 4 at the vertical intersection to support the last panel course, which will be cut and bent up to fit under the Z-Bar.

Skylight, Chimney, and Roof to wall detail
Begin by preparing the area to be flashed. If, as in the above example, the area is a chimney proceed as follows:
1) Measure 7” above the roof sheathing or 1”x4” in the case of a re roof and mark around the chimney.
2) Snap a chalk line at the 7” mark around the brick chimney.
3) Using a diamond or masonry blade notch into the brick with a circular saw, the width of the blade.
4) Install the panels along the front side of the chimney first. Measure for the bend line and add 2” for the cut line. At the vertical intersections on both sides, cut the upturn on a 45 degree angle and bend the upturn around the vertical surface and secure.

Note: Be sure and use sealant in this area.
5) Install panels along both sides of the chimney in the same manner.
6) Install the back section in the same manner as the front, taking care to wrap around both sides and fasten. Apply sealant to all four corners and chip with the Achilles Touch-up kit. Additionally a diverter can be installed over the rear panel to aid in the waterproofing.
7) Insert and install the counter flashing into the notched brick on all four sides, fasten and seal.
Pipe Flashing Detail
Install the base pipe flashing directly on the solid sheathing. Install your underlayment below the front edge and on top of the back edge of the base flashing. Install the battens (Fig. 28). Install the full panels around the vent pipe by cutting a hole with your hand shears to fit the size of the pipe vent.

Cut the skirt on the top pipe flashing to fit height of the course, and fit it over the vent pipe. Mold the skirt of the flashing to fit the corrugations of the panel. Using a width of panel, that is wide enough to cover the entire pipe flashing skirt, carefully cut a hole to fit around the cone of the flashing. Install the “cover panel” and fasten. Be sure to seal and chip around the cone using the Achilles Touch-up kit.

Ventilation Eave and ridge
An over-heated attic can reach over 170 degrees, resulting in higher utility bills. Proper ventilation will reduce the heat and reduce the moisture in your home. Inadequate ventilation will also cause ice damming in the winter, shortening the life of most roofs. Venting at the ridge draws cooler air through your soffit vent into your attic and allows hotter air to escape through the ridge vent. Venting under your Achilles panels will help reduce heat transference from your roof into your attic. Proper ventilation and insulation will keep your home comfortable and lower your utility costs.
Achilles Classic

Achilles Classic is manufactured using a steel core coated Acrylum (Aluminum+ Zinc) AZ-150 which gives greater resistance to corroding and ceramic stone coating adds protect, providing unsurpassed finish. An acrylic layer that seals the stone giving a satin finish further protects the product from moisture and UV rays.

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<td>Panels per square</td>
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Achilles Shingle

For more information on this product or to order samples call 1-877-631-2845 or visit our website at builddirect.com

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<tr>
<th>Achilles Shingle</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel thickness</td>
<td>0.43mm</td>
</tr>
<tr>
<td>Face finish</td>
<td>Chips stone</td>
</tr>
<tr>
<td>Distance between supports</td>
<td>14% in.</td>
</tr>
<tr>
<td>Weight kg/m²</td>
<td>5.82</td>
</tr>
<tr>
<td>Minimum slope</td>
<td>15%</td>
</tr>
<tr>
<td>Panels per square</td>
<td>19.8</td>
</tr>
</tbody>
</table>

370 mm (14.6 in)

402 mm (15.8 in)

1255 mm (49.4 in) Effective Cover

1335 mm (52.6 in)
Achilles Shake

<p>| | |</p>
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Steel thickness</strong></td>
<td>0.43mm</td>
</tr>
<tr>
<td><strong>Face finish higher</strong></td>
<td>Chips stone</td>
</tr>
<tr>
<td><strong>Distance between supports</strong></td>
<td>14 1/2 in.</td>
</tr>
<tr>
<td><strong>Weight kg/m²</strong></td>
<td>5.74</td>
</tr>
<tr>
<td><strong>Minimum slope</strong></td>
<td>15%</td>
</tr>
<tr>
<td><strong>Panels per square</strong></td>
<td>19.6</td>
</tr>
</tbody>
</table>

For more information on this product or to order samples call 1-877-631-2845 or visit our website at builddirect.com
We started the installation with full panels on the front lines, they should look at each of their crests. In the second line we start the installation with a section of ACHILLES CLASSIC to prevent panels are aligned vertically.

Panel Installation Hip
You must first install the channel on both sides of the slopes and special care must be taken that the distance between the tiles on both sides as low as possible to prevent leaks.

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Valley

Side flashing (optional)

Self tapping screw 1" x 10 (@ 80cm)

Terrabella Classic

Support

Self tapping screw 2 1/2" X 14
(one @ 80cm maximum at each support)

Lateral Flashing

Gable channel
Installing Hip and Ridge

With the installation of the stand at the eaves, we achieve a better finish, sealing and protecting the structure winds leaks that endanger the building.
High Velocity Hurricane zone (HVHZ)

Direct to Deck
- **Roof wind zone:** Field (P1) allowable design pressure [-80.5 PSF]
- **Decking:** Min., 15/32” in. thick, grade B-C APA ratė plywood or equal.
- **Tiles:** Panels attached with seven (7) 3” x 10 long hex head screws through the front downturn nose and six nose and seven (7) 3” x 10 long hex head screws across the back flange.

Batten
- **Roof wind zone:** Field (P1) allowable design pressure [-80.5 PSF]
- **Decking:** Min., 15/32” in. thick, grade B-C APA ratė plywood or equal. Each course must have continual support across roof at the back-lip of each panel.
- **Battens:** 2”x2” in. panel battens laid perpendicular to rafters and spaced at 14 1/2” in O/C up the rafter and attached with one (1) 4” x 10 screw at 24” O/C at each rafter & 2” x 2” intersection.
- **Tiles:** Panels attached through front downturn nose with five (5) 3”x 10 long hex head screws per panel.
High Velocity Hurricane zone (HVHZ)

Direct to Deck

Roof wind zone: Perimeter edge (P2) & Corner (P3) allowable design pressure [-146 PSF]

Decking: Min., 15/32” in. thick, grade B-C APA rate plywood or equal.
Tiles: Panels attached with seven (7) 3” x 10 long hex head screws through the front downturn nose and six nose and seven (7) 3” x 10 long hex head screws across the back flange.

Batten

Roof wind zone: Perimeter edge (P2) & Corner (P3) allowable design pressure [-146 PSF]

Decking: Min., 15/32” in. thick, grade B-C APA rate plywood or equal. Each course must have continual support across roof at the back-lip of each panel.

Battens: 2”x2” in. panel battens laid perpendicular to rafters and spaced at 14 1/2”.
in O/C up the rafter and attached with one (1) 4” x 10 screw@ 12” O/C at each rafter & 2” x 2” intersection.
Tiles: Panels attached through front downturn nose with seven (7) 3”x10 long hex head screws per panel.
<table>
<thead>
<tr>
<th>Tools</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tape measure</td>
<td>Safety glasses</td>
<td>Gloves</td>
</tr>
<tr>
<td>Hand bender</td>
<td>Bucket for screwing</td>
<td>Drill</td>
</tr>
<tr>
<td>Silicon gun</td>
<td>Aviation or tin snips</td>
<td>Cutter/Guillotine</td>
</tr>
</tbody>
</table>