



TAPER-PLUS
METRIC EDITION

Advanced Tutorials

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Langley, BC. Canada

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Tutorial 1: Review

In this tutorial, you'll cover some of the basic drawing concepts introduced in the **Taper-Plus Quick Start Guide**. You'll also add a new type of cricket and customize default settings.

Topics Included:

- default project templates
- changing settings
- opening new projects
- drawing in Taper-Plus
- adding roofs
- adding drains
- creating two-way tapered layouts
- adding low areas
- adding full crickets
- adding wide crickets
- viewing tapered layouts

Default Project Templates

Before you start working on your first project, you should check your default project template. You choose a project template whenever you create a new project. But you can change the properties of the project later, and you can even change the properties for each roof section in a project.

Project templates include the following properties:

- the taper and fill material
- the letter scheme
- the slope of the roof structure under the tapered insulation
- the cricket material and letter scheme
- the dimensions and material of cricket edge strips
- the material and thickness of base, overlay, and thermal insulation layers

We'll discuss materials and letter schemes some more in Tutorial 5.

You can create any number of project templates. And you can specify one of the templates as the default template. This is the template that's selected by default if you don't specify a different template.

When you work with Taper-Plus, you should spend some time at first creating comprehensive templates. This will save time down the road and ensure that you create the most accurate estimates for your roofing projects. However, while working through these tutorials, you should use the default project template shown here. This ensures that your projects match the ones illustrated in the tutorials.

Setting the default Project Template

Now you'll check the project template named DEFAULT to make sure that it matches the one shown here.

To set the default project template

1. On the **Setup** menu, click **Default Project Templates**.

The **Setup Default Templates** dialogue box opens.

2. In the **Default Template** area, check that **DEFAULT** is selected, as shown in **Figure 1-1**.

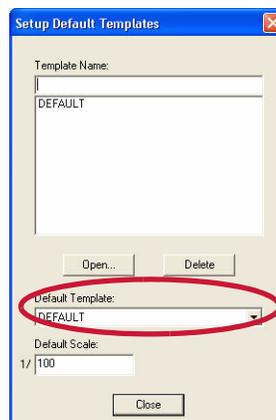


Figure 1-1 The Setup Default Templates dialogue box

In the Setup Default Templates dialogue box, you can create any number of templates for your typical projects. Each template must have a distinct name. To create a new template, just type the name and click Open.

3. In the Template Name area, click DEFAULT, and click Open.

If DEFAULT is not listed, then type DEFAULT, and click Open.

The Setup Defaults dialogue box opens at the Section tab.

4. Edit the options in each tab of the dialogue box so that they match the dialogue box illustrated in Figure 1-2, Figure 1-3, Figure 1-4, and Figure 1-5.

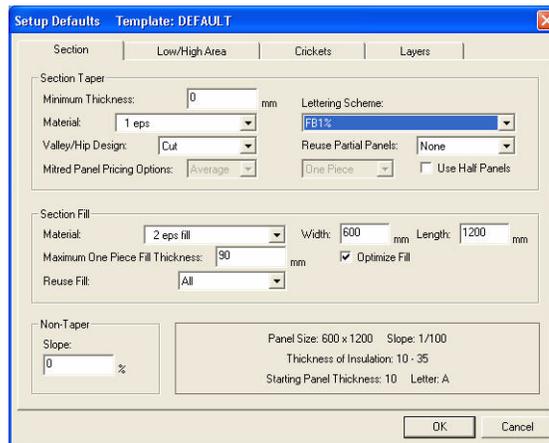


Figure 1-2 The Section tab of the Setup Defaults dialogue box.

In the Section Taper area, the most important properties are:

- **Minimum Thickness: 0**
- **Lettering Scheme: FB1%**

You should have the FB1% letter scheme installed by default. If you don't you can use an equivalent letter scheme with 1/100 slope and 600 mm x 1200 mm panels.

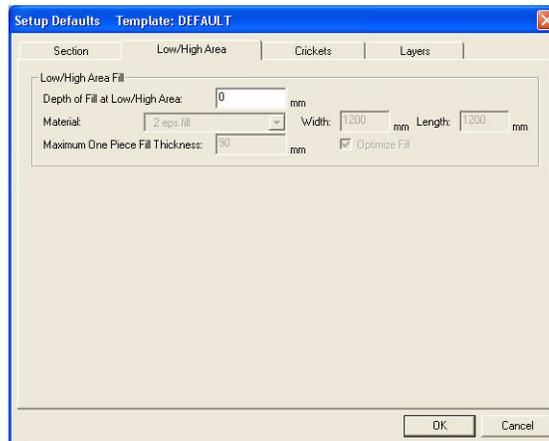


Figure 1-3 The Low/High Area tab of the Setup Defaults dialogue box

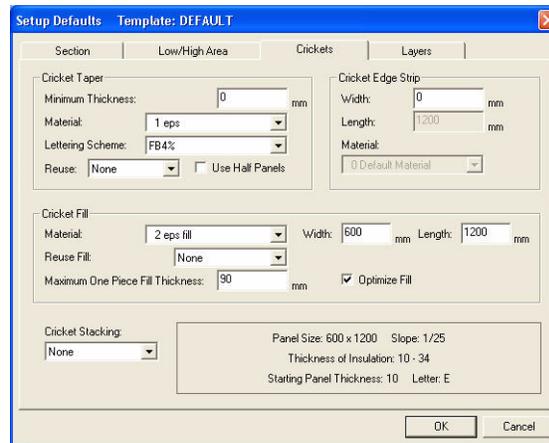


Figure 1-4 The Crickets tab of the Setup Defaults dialog box

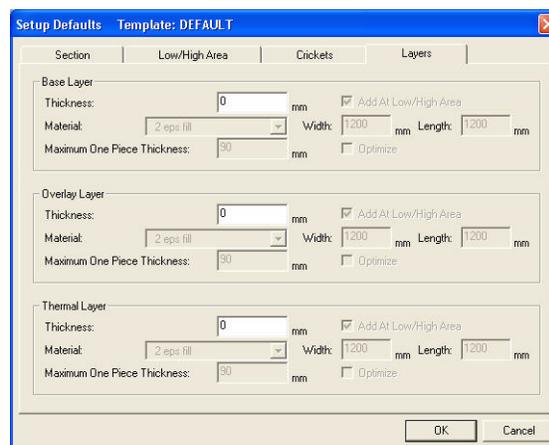


Figure 1-5 The Layers tab of the Setup Defaults dialog box

5. When finished, click **OK**.

The **Setup Defaults** dialog box closes, and you're returned to the **Setup Default Template** dialog box.

6. Click **Close**.

Changing Settings

Before proceeding, you should also check some settings to make sure that they match the settings used here. Right now, you'll check the **Cricket Entering** and the **Repeatable Commands** settings. However, you should look through all of the settings at some point.

The **Cricket Entering** dialog box includes a number of options. Right now, you'll check the **Cricket Width Type** and the **Default Width**. You'll learn more about **Cricket Width Type** in "Tutorial 4: Adjusting Crickets." The **Default Width** determines the width that automatically appears when you add a cricket.

In the **Repeatable Commands** dialog box, you can choose which commands are repeatable. If you select the command once, you can continue to use the command repeatedly without having to select it again. In these tutorials, most procedures describe commands that are repeatable.

To change settings

1. On the **View** menu, click **Settings**.

2. In the **Settings** dialogue box, click **Cricket Entering**.
3. In the **Cricket Entering** dialogue box, check that the following settings are correct:
 - The **Cricket Width Type** is **Normal**.
 - The **Default Width** is **0.5**.
 - The **Default Width Rounding** is **Round to Nearest Meter**.
 - The **Show Cricket Diagram** check box is selected.

The **Cricket Entering** dialogue box should match Figure 1–6.

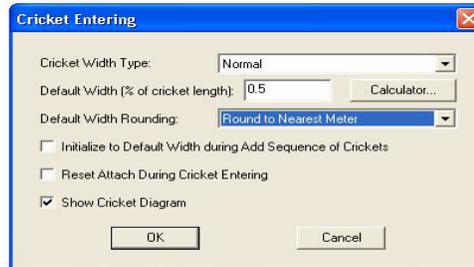


Figure 1–6 Cricket Entering dialogue box

4. Click **OK** to close the **Cricket Entering** dialogue box.
5. In the **Settings** dialogue box, click **Repeatable Commands**.
6. In the **Repeatable Commands** dialogue box, click **Mark All** to select all the commands listed.

Every command in the **Repeatable Commands** dialogue box, should be highlighted, as in Figure 1–7.

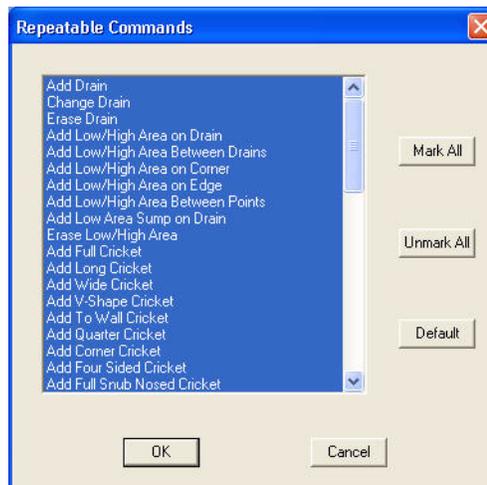


Figure 1–7 The Repeatable Commands dialogue box.

7. Click **OK** to close the **Repeatable Commands** dialogue box.
8. Click **OK** again to close the **Settings** dialogue box.

Check out the Taper-Plus on-line help for details on all the settings.

Opening a New Project

You're now ready to open a new project using the default project template.

To open a new project

1. On the File menu, click Open.

The Open Project dialogue box opens.

Here, you can select an existing project or type in the name of a new project. You can also navigate to a new location to store your project. The default location to store projects is the same location on your computer where Taper-Plus is stored.

2. Type TUTORIAL 1, and press ENTER or click OK.

If there's already a project with that name, you can either type a different name for the project or navigate to a new location to store this project.

A project can have any name of up to 256 letters and can include any of the following characters: A to Z, 0 to 9, or - ^ \$! @ % & _ { } () @ ' + , ; = [] and space.

The Project Title dialogue box opens. Here, you can set a scale and template, and you can enter some reference information about the project.

3. Make sure that the DEFAULT template is selected, and click OK.

The dialogue box closes, and you're left with a blank drawing space.

Drawing in Taper-Plus

As a first step in this project, you'll draw a new roof section. You should already be able to draw this basic roof section with skills learned in the **Taper-Plus Quick Start Guide**.

To refresh your memory, here are a few points to help you draw a roof section:

- You can enter roofs with the mouse or the keyboard.
- If you enter a point incorrectly, you can press B to go back to the previous point.
- At the last point of the roof section, you can press Q or right-click the mouse and then click **Sloped** to close the roof section.
- If your roof section contains only right angles, you can close the roof section one point earlier. Press Q or right-click the mouse, and then click **Right Angle** to close the roof section.
- If you draw the roof with the keyboard, look at the command line to see which options are available, as shown in Figure 1-8.

ENTER NEXT POINT U D R L H V S C A B M or Q (Quit)

Figure 1-8 Entering new point command line

- When you type a key, continue to look at the command line to see what's required to complete the step, as shown in Figure 1-9 for the U key.

UP: ft

Figure 1-9 Command line for U key.

- If you draw with the mouse, look at the coordinate boxes at the top-right and bottom-right corners of the drawing area, as shown in Figure 1-10. They list the horizontal and vertical placement of the mouse pointer from the

reference point (top coordinate box) and from the previous point (bottom coordinate box).

X: 7.0000 Y: 26.0000

Figure 1-10 Coordinate boxes

- If you draw a roof section with only right angles, use ortho mode to only enter points at right angles. Click .

Table 1-1 lists the keys used to draw a roof section.

U = up	S = sloped
D = down	C = circular segment
R = right	A = angled
L = left	B = back up a step
H = horizontal	M = change coordinate display
V = vertical	Q = quit section (closes section)

Table 1-1 Direction short-cut keys

In the Taper-Plus Quick Start Guide, you used the U, D, R, L, S, and Q keys. In Tutorial 2 you'll use the A and C keys.

Adding a Roof Section

You'll now add a roof section. Since the scale of the drawing area is small, you should use the keyboard to enter the roof. Figure 1-11 shows the shape and dimensions of the roof.

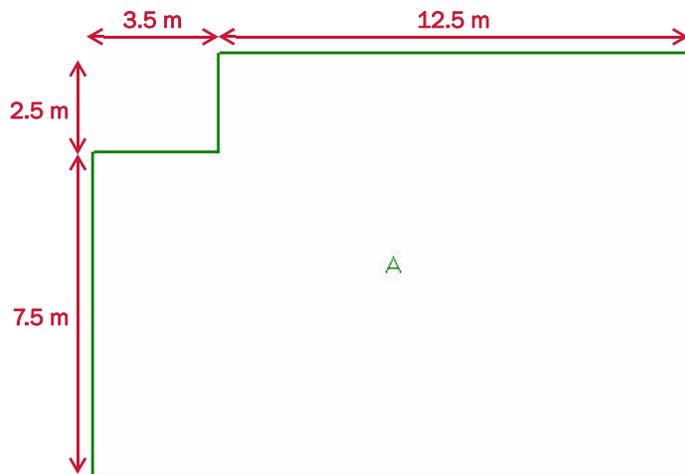


Figure 1-11 Roof section A

To complete this roof section, you only need to use three keys: U, R, and Q. You can go ahead and draw the roof on your own, or you can read the following steps to refresh your memory.

To add a roof section

1. On the main toolbar, click Add Section 

The Add Roof Section dialogue box opens.

2. Click OK to accept the default name.
3. Press ENTER or click in the bottom-left corner of the drawing area to place the first point.

If you don't specify a roof section name, Taper-Plus names roofs with a single capital letter starting at A.

4. Type U, type 7.5, and press ENTER.
5. Type R, type 3.5, and press ENTER.
6. Type U, type 2.5, and press ENTER.
7. Type R, type 12.5, and press ENTER.
8. Type Q, and click **Right Angle** to close the roof section.
9. On the main toolbar, click Zoom Current  to zoom into the roof section.

Your roof should look like Figure 1–11.

If you accepted the default name, the roof should be named A. Throughout these tutorials, this roof section is referred to as roof A.

Adding Drains

You'll now add drains to the roof section. Now that you've zoomed into the roof section, you can easily use the mouse to add the drains. Figure 1–12 shows the roof section with two drains.

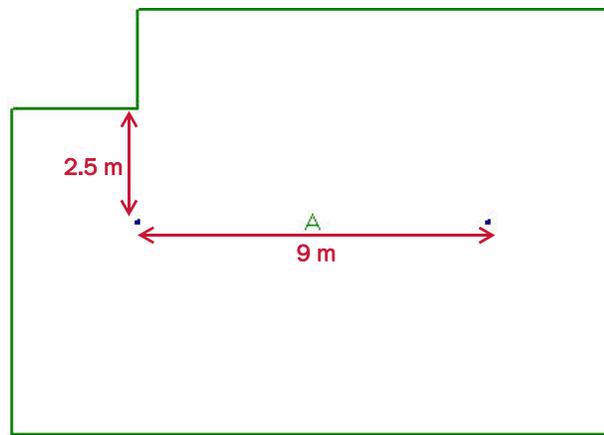
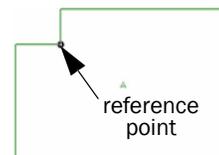


Figure 1–12 Roof section A with two drains

You can go ahead and add the drains on your own, or you can read the following steps to refresh your memory.

To add drains to the roof section

1. On the main toolbar, click Add Drain .
2. Click Reference Point  to move the reference point.
3. Click on the third point of the roof outline, at the inside corner on the top-left side of the roof.
Watch the top coordinate box to place the next point.
4. Move the pointer down 2.5 metres, and click to place the first drain.



If you're unable to place the drain, you may need to change the snap value.

Click , and type 500, to set the snap value at 0.5 metres.

Watch the bottom coordinate box to place the next point.

5. Move the pointer to the right 9 metres, and click to place the second drain.
6. Right-click to stop adding drains.

Creating a Two-Way Tapered Layout

Now that you've drawn a roof section and added drains, you need to create a tapered insulation layout on the roof. You design your layout by adding low or high areas to the roof plan. The tapered insulation slopes up at right angles from low areas and down at right angles from high areas. Most of the time you design your layout with low areas. And throughout these tutorials, we only ask you to add low areas. For information on high areas, see the Taper-Plus on-line help.

A low area can be a point or a line, or it can have an area. For all low area shapes, Taper-Plus lays out the tapered insulation along the edge of the low area.

- If the low area is a single point, the insulation radiates out from the point in four directions.
- If the low areas is a line, the insulation is placed along that line.

Figure 1-13 shows two layouts:

- On the left, the low area is a single point.
- On the right, the low area is a line across the roof.

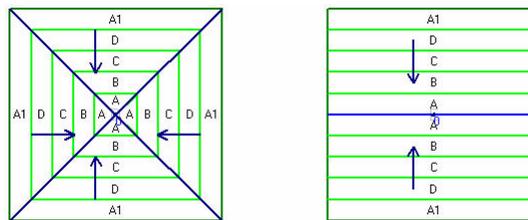


Figure 1-13 Example of four-way and two-way tapered layouts

A low area at a single point creates a four-way tapered layout. The four-way layout provides the quickest drainage for a roof section. However, it's often more expensive than alternative layouts.

A low area across the middle of a roof section creates a two-way layout, as shown in the second example in Figure 1-13. This layout is often cheaper than the four-way layout, but it also requires crickets to divert water to the drains.

In this project, you'll create a two-way tapered layout. And later you'll add three crickets to complete the drainage.

Adding a low area

To get a two-way layout, you'll add a low area in the middle of the roof section extending to the left and to the right edges. When finished, the layout should look like Figure 1-14.

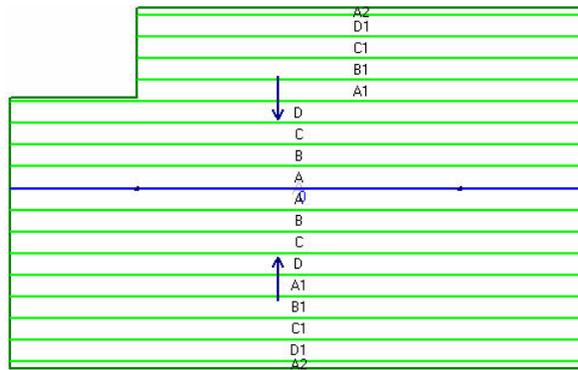


Figure 1-14 Roof section A with low area

There are a number of ways to draw this low area, but the easiest is to add a low area between the two drains and then to extend the low area to the walls.

To add a low area in the centre of the roof

1. On the Add Low Area toolbar, click Add Low Area Between Drains .

Since there are only two drains in the roof section, the low area is added automatically between the drains.

You can locate the Add Low Area toolbar in one of the Toolwindows surrounding the Drawing Areas, You can also right-click in the Toolwindow to choose the toolbar from a popup menu, as shown in Figure 1-15.

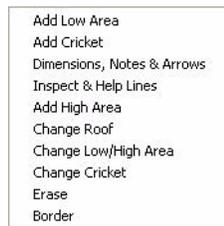


Figure 1-15 Toolbar pop-up menu

2. On the Change Low/High Area toolbar, click Extend Low/High Area .

The low area is automatically extended to the edge of the roof section

Viewing a Tapered Layout

Once you add low areas to a roof, tapered panels are automatically mapped to the roof plan. However, to view the panels and slope, you need to set your drawing options to display them.

To view the tapered layout of a roof

1. On the main toolbar, click Draw . The Drawing Options dialogue box opens.
2. In the Section Taper area, click Short Arrows. And in the Section Letters area, click Rows, as shown in Figure 1-16.

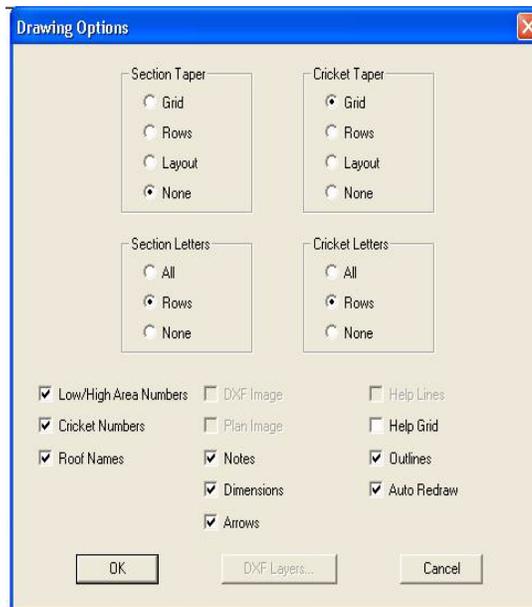


Figure 1-16 Drawing Options dialogue box

3. Click OK.

The roof section is redrawn, showing the panels and the direction of the slope. It should match the roof section shown in Figure 1-14.

Note that you can also use the Quick Draw button on the Status Bar to select some commomdrawing options.

Diverting Water towards Drains

The current tapered layout directs water into a valley at the centre of the roof, where there are two drains. Had you created a four-way layout, the water would flow directly to each drain. But with the two-way layout, water only flows into this valley.

In order to divert the water towards the drains, you need to add three crickets:

- one between the two drains
- one between the left drain and the left edge.
- one between the right drain and the right edge.

You can add 12 types of crickets to your roof section. Right now you'll add one full cricket and two wide crickets. You'll learn about other types of crickets in "Tutorial 3: More About Crickets".

Adding a Full Cricket between Drains

To start, you'll add a full cricket between the two drains. This cricket directs water that falls between the drains to whichever drain is closer.

You've already added a full cricket to a roof in Lesson 1 of the *Taper-Plus Quick Start Guide*, so this should be a review.

To add a full cricket between drains

1. On the Add Cricket toolbar, click Add Full Cricket .

A window opens showing a picture of a full cricket and highlighting the next point.

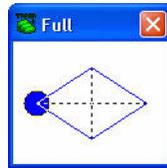


Figure 1-17 Diagram of full cricket

2. Click Attach  to turn on attach mode.
3. Click on the left drain to place the first cricket point.
4. Click on the right drain to place the second cricket point.
5. Type V, type 3, and press ENTER to specify the width.
6. Right-click to stop adding crickets.

Adding Wide Crickets

Next, you'll add wide crickets between each drain and the left or right edge. The wide crickets divert water from the edge of the roof towards the drains.

To add wide crickets

1. On the Add Cricket toolbar, click Add Wide Cricket .

A window opens showing a picture of a wide cricket and highlighting the next point.

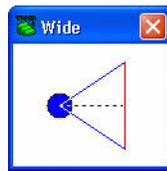
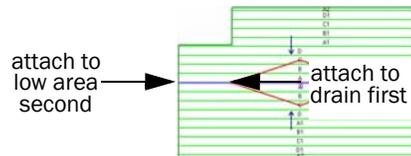


Figure 1-18 Wide cricket diagram

2. With attach mode set, click on the left drain to attach the first point to the drain.
3. Click on the intersection of the low area and the left edge to place the end of the cricket on the wall.
4. Type V, type 3, and press ENTER to specify the width.
5. Add another wide cricket with the same dimensions between the right drain and the right edge.
6. When finished, right-click to stop adding crickets.



Viewing the Tapered Layout of Crickets

To view the slope and layout of the crickets, you need to change the drawing options.

To view the tapered layout of the crickets

1. On the main toolbar, click Draw . The Drawing Options dialogue box opens.

2. In the Cricket Taper area, click Short Arrows. And in the Cricket Arrows area, click Rows.
3. Click OK.

The roof plan updates to show the tapered panels on the crickets.

Figure 1-19 shows the completed roof layout with the three crickets.

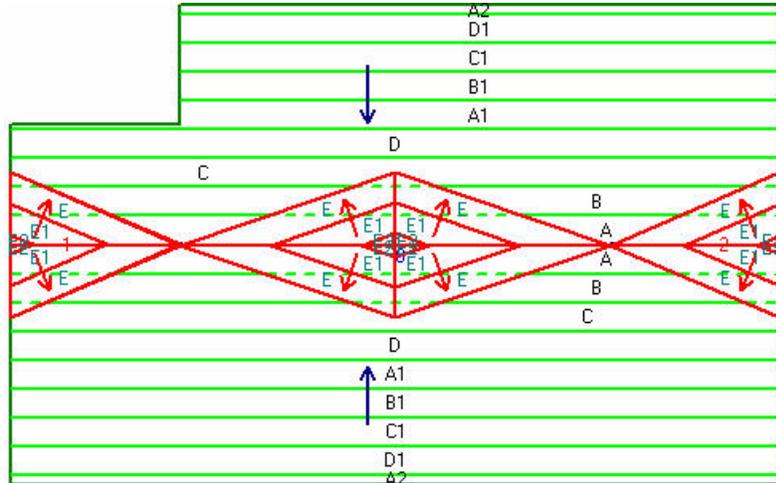


Figure 1-19 Roof A with crickets

You have completed Tutorial 1. This project is continued in Tutorial 2: Arcs and Angles.

Tutorial 2: Arcs and Angles

In this tutorial, you'll continue working on the project started in Tutorial 1. You'll learn to draw more complicated roof plans including a roof with circular and angled line segments.

Topics Included:

- adding a roof in reference to an existing roof
- adding circular and angled roof segments
- adjusting low area points
- adding a sequence of full crickets
- adding crickets off of a roof section

Drawing a Complicated Roof Section

In Tutorial 1, you drew a very simple roof outline made up of only right angles. In this tutorial, you'll draw a roof section with more complicated line segments, including a circular line segment and an angled line segment. You'll also add the roof section in reference to an existing roof.

You'll work on the project created in Tutorial 1. If you haven't yet completed the first tutorial, you should finish it before proceeding.

Adding a Roof in Reference to an Existing Roof

The second roof in the project will be directly above the first roof, such that:

- the left edge of the new roof lines up with the left edge of the existing roof
- the bottom edge of the new roof is 20 cm above the top edge of the existing roof.

To do this, you can add the roof in reference to the first roof.

You can add the roof in reference to any point on roof A. Since we want the left edges to line up, choose the second point on the roof, directly above the bottom-left corner of the roof section.

This point is 2.5 metres from the top edge, and you want to leave room for a 20 cm wall between the two roofs. So you'll start drawing the new roof 2.7 metres up from the point.

To reference a roof section from an existing roof

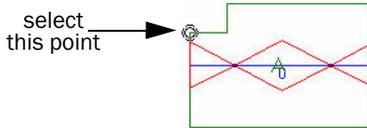
1. Open the project created in Tutorial 1. Or if it's already open, click Unzoom



to zoom out of roof A and leave room to draw the next roof.

2. Click Add Section  to add a new roof section.
3. In the Add Roof Section dialogue box, select the Use a Reference From Another Roof check box, and click OK.
4. In the Select Reference Roof Section dialogue box, make sure that A is highlighted, and click OK.

In the command line, you're prompted to select a corner on roof A.

5. Click on the second point of roof A, the point directly above the bottom left corner. 
6. Move the mouse pointer up a little from the point, and press A. Note that moving the mouse pointer in the appropriate direction makes it possible for the user to enter positive offsets regardless of what direction the new point is in
7. In the command line, enter 0 as the horizontal displacement and 2.7 as the vertical displacement, and press ENTER.

Adding circular and angled roof segments

With the first point of the new roof set, you now need to enter the other points of the roof section. The outline of the roof section is shown in Figure 2-1. To complete this roof you'll use the U, R, C, A, D, and Q keys.

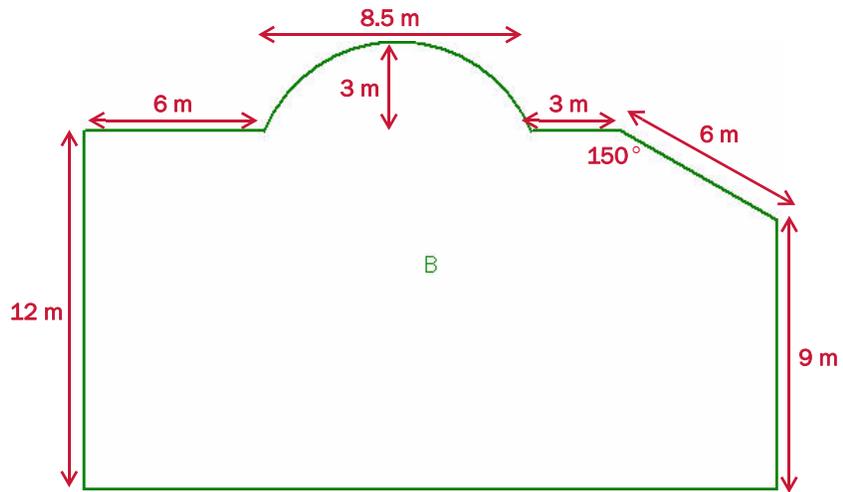


Figure 2-1 Roof section B

To draw the roof section

1. Type U, type 12, and press ENTER.
2. Type R, type 6, and press ENTER.
Next, enter a circular line segment with the C key.
3. Type C, enter 8.5 as the horizontal coordinate and 0 as the vertical coordinate, and press ENTER.
4. Type A, type 3, and press ENTER to specify the height of the arc.
5. Type R, type 3, and press ENTER.
Next enter an angled line segment. Since we know the length and angle of the line segment, you'll use the A key.
6. Type A, enter a length of 6 m and an angle of 330° (as measured from the horizontal line: $180^\circ + 150^\circ = 330^\circ$), and press ENTER.

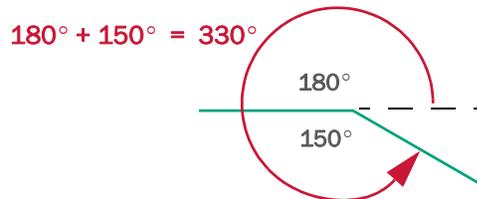


Figure 2-2 Calculating an angle

In Taper-Plus, an angle's coordinates are absolute:

- 0 degrees is always to the right
- 90 degrees is always straight up
- 180 degrees is always to the left
- 270 degrees is always straight down

7. Type D, type 9, and press ENTER.
8. Type Q, and click Horizontal to close the shape.
9. Click Zoom Current  to zoom into the roof section.

The roof should look like Figure 2-1.

If you accepted the default name, the roof should be named B. Throughout these tutorials, this second roof is referred to as roof B.

Adding Drains

You'll now add drains to the roof section. On this roof section, you should add the drains in a certain order. This will make it easier to add crickets later. Figure 2-3 shows the roof section with four drains.

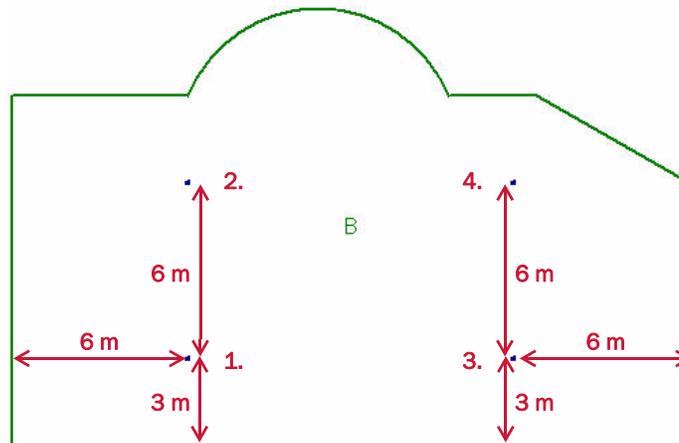


Figure 2-3 Roof B with drains

You can go ahead and add the drains on your own. Just make sure to add the drains in the order that they're numbered on the roof plan.

To add drains to the roof section

1. Click Add Drain .
2. If attach mode is still on from the last tutorial, turn it off.

When attach mode is on, the Attach icon is blue: .

3. Move the pointer up and to the right from the reference point.
The reference point should still be in the bottom-left corner of the roof. If it isn't, move it there.
4. Type A, enter 6 in the Horizontal box and 3 in the Vertical box, and press ENTER.
5. Type A again, enter 6 in the Horizontal box and 9 in the Vertical box, and press ENTER to place the second drain above the first drain.
6. Click Reference Point  to change the reference point.
7. Click in the bottom-right corner of the roof.
8. Add two more drains on this side of the roof, as indicated in Figure 2-3.
9. Right-click to stop adding drains.

Creating a Two-Way Tapered Layout

You now need to add low or high areas to the roof plan to create a tapered layout. Once again, you'll create a two-way layout. But this time you'll add two low areas, the first running between the first and second drains and the second running between the third and fourth drains. So each low area runs along a vertical axis.

Like in Tutorial 2, you'll add low areas between drains, then you'll extend the low areas to the roof edge.

Adding Multiple Low Areas Between Drains

Begin by adding two low areas between the drains on roof B.

To add multiple low areas between drains

1. On the Add Low Area toolbar, click Add Low Area Between Drains .

The command line prompts you to select the first drain, as in Figure 2-4.

SELECT FIRST DRAIN (F2 to walk thru list)

Figure 2-4 Command line for Add Low Area Between Drains

2. Click on the bottom-left drain.

The command line now prompts you to select the second drain.

3. Click on the top-left drain.
4. Add a second low area between the two drains on the right.
5. Right-click to stop adding low areas.

Roof B now has two low areas, numbered 0 and 1, as shown in Figure 2-5.

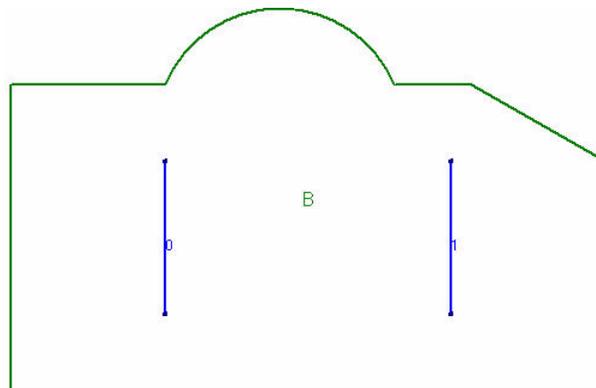


Figure 2-5 Roof B with low areas between drains

Extending Low Areas

As in Tutorial 1, you need to extend these low areas to create a two-way layout. Start by automatically extending the low areas, as you did in the last tutorial. But you'll need to adjust the low areas some more after extending them in order to get a proper two way layout.

Since there are two low areas, you need to make sure you select the correct low area when using these commands.

To extend multiple low areas

1. Click the Area button and click on the right low area, to select it.

The Area button  is located directly above the drawing area in line with the Section and Cricket selection boxes.

2. On the Change Area toolbar, click Extend Low/High Area  to extend the low area to the roof edges.

3. Scroll down the **Low Area** selection box, located directly above the drawing area, and click 0 to select the first low area, as shown in Figure 2-6. Then Click or press Enter



Figure 2-6 Selecting the second low area

4. On the **Change Area** toolbar, click **Extend Low/High Area** .
5. Click **Draw**  to change the drawing options.
6. In the **Section Taper** area, click **Rows**. In the **Section Letters** area, click **Rows**. And click **OK**.

The roof section should look like Figure 2-7. Notice that the tapered layout is not correct.

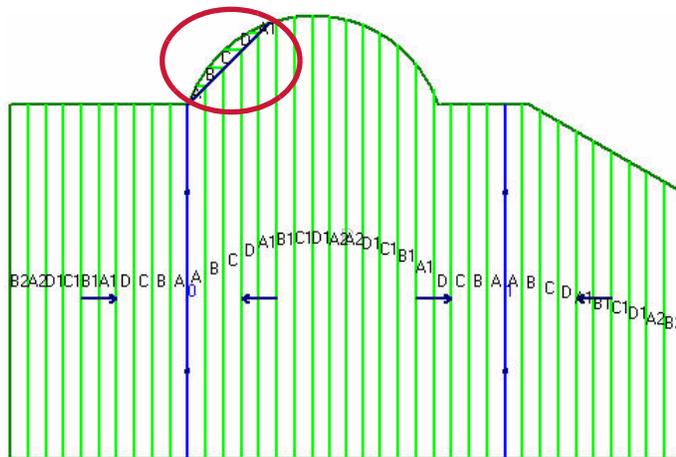


Figure 2-7 Roof B showing tapered layout

Adjusting Low Areas

Even though you've extended the low areas to the edge of the roof section, the roof does not quite have a two-way layout. On the left side of the arc, there's a small area where panels face the wrong direction. To fix this, you need to extend the low area beyond the edge of the roof.

To make sure that the low area is long enough, expand it as far vertically as the roof extends. Since the arc has a height of three metres, you'll move the top point of the low area up three metres.

To adjust a point of a low area

1. Change Reference Point to left drain and select the low area on the left.
2. On the **Change Low/High Area** toolbar, click **Point Adjust Low/High Area** . The command line prompts you to select a point of the low area.
3. Click on the top point of the low area. Watch the bottom coordinate box to place the point.
4. Move the pointer up 3 metres, and click to place the point.
5. Right-click to stop adjusting points.

Your roof plan should automatically adjust to show a complete two-way layout.

Adding Crickets

The roof plan now has a complete two-way layout. But, as in Tutorial 1, the water does not flow to the drains.

You'll add the same types of crickets to the roof plan as you did in Tutorial 1. But since there are two low areas and four drains, you need to add twice as many crickets to create the layout.

When you add these crickets you'll accept the default width for all crickets. That way, all the crickets will have the same angle. You'll need six crickets for this roof section: two full crickets and four wide crickets.

Adding a Sequence of Full Crickets

To make the job a little easier, you'll add the full crickets in a sequence. When you add a sequence of full crickets, Taper-Plus automatically places crickets between the drains in the order that the drains were added to the roof. So this command only works if you add drains in a logical order.

Use this command if you draw a roof plan that requires a long series of full crickets, as in Figure 2-8. First add the drains in the correct order, then add the sequence of crickets.

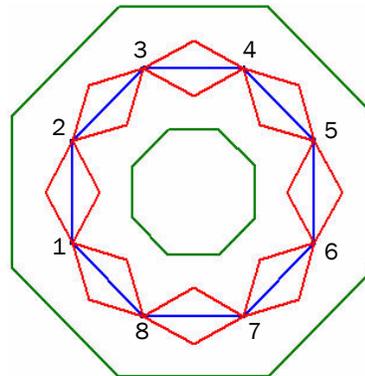


Figure 2-8 A roof with a series of full crickets

In the example in Figure 2-8, drains were added in a circle, in the order that they're numbered. The first cricket is placed between drain 1 and drain 2. Then the second cricket is placed between drain 2 and drain 3. And the series continues until the final cricket is placed between drain 7 and drain 8.

As you add the crickets, you can press TAB to skip a cricket and continue to the next one.

To add a sequence of full crickets

1. On the Add Cricket toolbar, click Add Sequence of Full Crickets .

If you added the drains in the correct order, a cricket is automatically placed on the left hand low area, and you're prompted to enter the correct width.

If you added the drains in a different order, the cricket is placed between the first two drains added to the roof. You can press TAB to choose a different place for the cricket.

2. Press ENTER to accept the default width: 3 m.

A second cricket is automatically placed between the second and third drains.

3. Press TAB to choose different drains for the next cricket.

A cricket is placed between the third and fourth drains.

4. Press ENTER to accept this location and the default width: 3 m.

Note that you will be prompted to add a final cricket between the last and first drains. Press Esc or Tab through this drain

first drain. Press Esc or Tab through this last undesired drain. With this command you can place crickets between any two adjacent drains..

Adding Crickets off a Roof Section

To finish the tapered layout, you need to add four wide crickets between the four drains and the top or bottom edges of the roof plane.

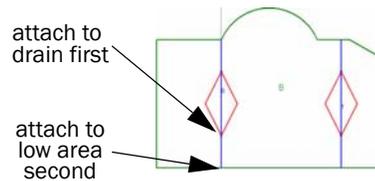
You should already know, from Tutorial 1, how to place the bottom two crickets. However, since the roof outline is irregular, the top crickets are less obvious.

To simplify this problem, Taper-Plus allows you to place cricket points outside of a roof section. The area of the cricket that lies outside of the roof outline is cut off and ignored in reports.

You'll place the bottom two crickets first, then the top right cricket, and finally the top left cricket. For all of these crickets, you should accept the default width.

To add four wide crickets

1. Click Attach  to turn on attach mode.
2. On the Add Cricket toolbar, click Add Wide Cricket .
3. Place the first wide cricket between the bottom left drain and the bottom edge. See "Adding Wide Crickets" on page 14 in Tutorial 1 for more details on wide crickets.
4. Type V, and press ENTER to accept the default width.

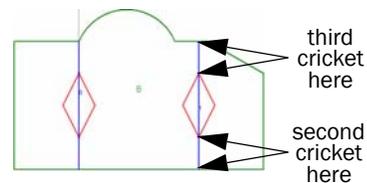


When you're in attach mode, you need to type V or A to accept the default width. Otherwise, you can just press ENTER.

5. Add two more wide crickets with the default width: 3 m.

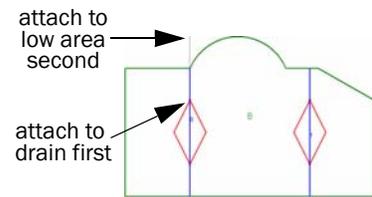
- the second cricket between the bottom-right drain and the bottom edge.
- the third cricket between the top-right drain and the top edge.

The third cricket looks almost identical to the bottom crickets, except that its right corner lays off of the roof section.



Taper-Plus automatically cuts off parts of crickets that don't lie on the roof section. So you can easily draw the cricket.

6. Click on the top-left drain, to place the final cricket.
7. Click on the end of the low area, 3 metres above the edge of the roof section.
8. Type `v`, and press ENTER to accept the default width.



A dialogue box opens, warning that a cricket is entered outside the roof section, as shown in Figure 2-9.



Figure 2-9 Taper-Plus warning

Taper-Plus warns you when you place a cricket outside of the roof outline. This is just to make sure that you know what's happening. It won't cause any problems to your project.

9. Press ENTER or click OK to close the dialogue box. And right-click to stop adding wide crickets.

Your roof section is complete. It should look like Figure 2-10.

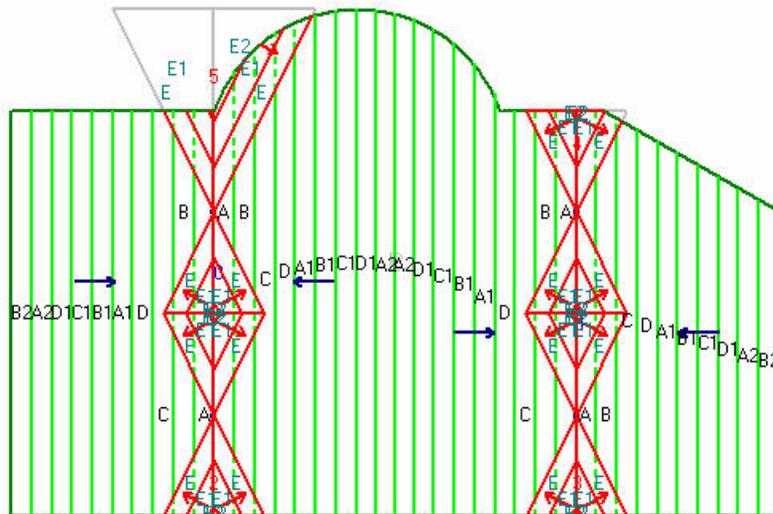


Figure 2-10 Roof section B

You have completed Tutorial 2. This project is continued in Tutorial 3: More About Crickets.

Tutorial 3: More About Crickets

In this tutorial, you'll continue working on the project started in Tutorial 1 and Tutorial 2. You'll learn about five new types of crickets. And you'll also learn some more about low areas.

Topics Included:

- adding low areas on edges
- adding four-sided crickets
- adding to wall crickets
- adding v-shape crickets
- expanding low areas
- adding sumps around drains
- erasing objects in a roof section
- adjusting low area edges
- adding full snub-nosed crickets
- adding wide snub-nosed crickets

Working with Multiple Roof Sections

In this tutorial you'll add a third roof section to the project started in Tutorial 1 and Tutorial 2.

A Taper-Plus project can contain up to 1000 roof sections. As you saw in Tutorial 2, each roof section has its own tapered layout. Properties of one roof don't interfere with the properties of other roof sections. When you're finished, you can create reports that summarize all roof sections in the project. Or you can choose specific roof sections to summarize in your reports.

Adding a Third Roof to a Project

You'll add a third roof to the project with the following characteristics:

- add the roof in reference to a point on roof A
- leave room for a 20 cm wall between the roof sections

This roof has a simple rectangular outline. You'll add it to the right of roof A, with their top edges lined up with each other. The outlines of the three roofs and the dimensions of the third roof are shown in Figure 3-1.

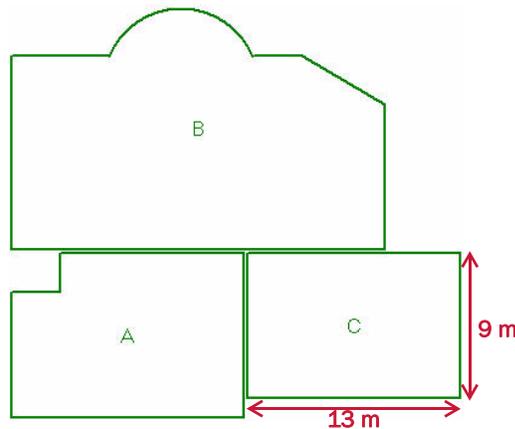


Figure 3-1 Roofs A, B, and C

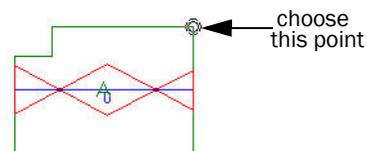
You can go ahead and add the roof section on your own. If you have any problems, read the following steps.

To add a third roof section to the project

1. Open the project created in the Tutorial 1, and click **Zoom Current**  to zoom into the entire project.

2. Click **Add Section**  to add a roof section.
3. In the **Add Roof Section** dialogue box, select **Use Reference From Another Roof Section**, and click **OK**.
4. In the **Select Reference Section** dialogue box, select **A**, and click **OK**.

5. Click on the top-right corner of roof A to select it, then move the mouse pointer to the right



6. Type **A**, type **0.2**, and press **ENTER** to place the starting point of the roof.
7. Type **R**, type **13**, and press **ENTER**.

8. Type D, type 9, and press ENTER.
9. Type Q, and click **Right Angle** to close the roof section.

If you accepted the default name, the roof should be named C. Throughout these tutorials, this third roof section is referred to as roof C.

Adding Drains

You now need to add three drains to roof C. Figure 3–2 shows roof C and the location of the drains.

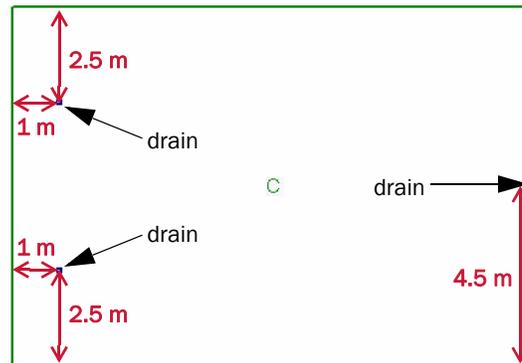


Figure 3–2 Roof C with drains

You can go ahead and add the three drains. If you have any problems, read the following steps.

To add drains

1. Click **Zoom Current**  to zoom into roof C.

Roof C should still be selected from the last step.

Look at the roof selection box to see which roof is currently selected. The roof selection box is directly above the drawing area. You can also scroll down the selection box to select a new roof section, as shown in Figure 3–3.

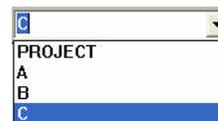


Figure 3–3 Roof selection box

2. Click **Add Drain** .
- Watch the top coordinate box to place the following points.
3. Make sure **Attach** is turned off. With the reference point in the top-left corner, move the pointer 1 metre to the right and 2.5 metres down, and click to place the first drain.

When you select a roof section, the reference point moves to the first point of the roof, in this case: the top-left corner of the roof.

4. Click **Reference Point** , and click the bottom-left corner of the roof, to move the reference point.

5. Move the pointer 1 metre to the right and 2.5 metres up, and click to place the second drain.
6. Click Reference Point , and click the bottom-right corner of the roof, to move the reference point.
7. Move the pointer 4.5 metres up, and click to place the third drain.
8. Right-click to stop adding drains.

Designing a Tapered Layout

Now, you need to direct water towards the drains. Roof C has three drains. One is on the right edge of the roof. The others are close to the left edge of the roof.

Like on the other roof sections in this project, you'll create a two-way layout for roof C. But rather than diverting water towards a valley in the middle of the roof section, you'll divert water towards the right and left edges of the roof, where the drains are located. Later, you'll need to add crickets to divert water towards the drains, not just towards the edge.

Adding Low Areas on Edges

To create a two-way layout, add low areas to the left and right edges of the roof section.

To add low areas on edges

1. On the Add Low Area toolbar, click Add Low Area on Edge .
2. Click on the left edge to select it.
3. Click on the right edge to select it.
4. Right-click to stop adding low areas.
5. Click Draw  to change the drawing options.
6. In the Section Taper area, click Rows. In the Section Letters area, click Rows. And click OK to show the tapered layout.

The drawing area updates to show the tapered layout of the roof plan. Roof C should look like Figure 3-4.

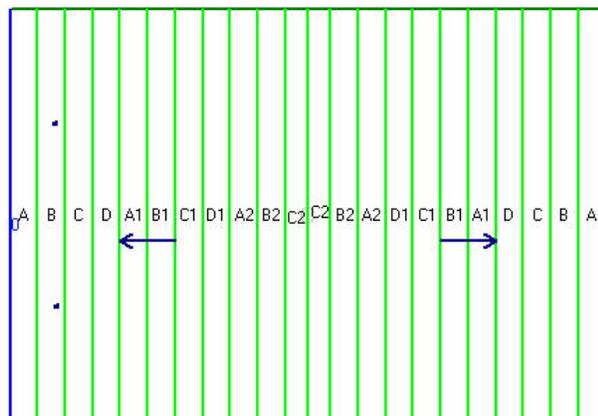


Figure 3-4 Roof C with low areas

Adding Crickets

Now you need to direct water to the drains, not just towards the edges. To do this, you'll add three new types of crickets to roof C.

- Four-sided crickets, to the top-left and bottom-left corners of the roof.
- To-wall cricket, in the middle of the left edge.
- V-shape cricket along the right edge.

Adding Four-Sided Crickets

Four-sided crickets have a trapezoidal shape. You'll generally place a four-sided cricket against two edges, in a corner of a roof. You can use four-sided crickets to divert water away from a corner towards a drain that's placed away from the roof edge.

When you input the points of a four-sided cricket, the first two points indicate its high edge and the second two points indicate its low edge.

You'll add two four-sided crickets in the top- and bottom-left corners of the roof.

To add four-sided crickets to the roof

1. On the Add Cricket toolbar, click Add Four Sided Cricket .

A window opens showing a picture of a four-sided cricket and highlighting the next point, as in Figure 3-5.

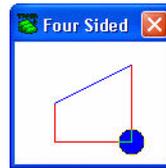
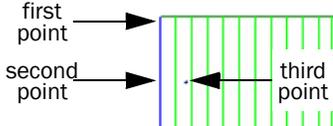


Figure 3-5 Diagram of four-sided cricket

2. Click Attach  to turn on attach mode.
3. Click on the top left corner of the roof section.

You want to place the second point of the cricket on the left edge, in line with the drain.


4. Move the pointer down from the top edge, and press A.
5. Specify a 0 horizontal displacement and a 2.5 metre vertical displacement and, and press ENTER to place the second point.
6. Click on the top drain to attach the third point of the cricket.
7. Type V type 2.5, and press ENTER to enter a width of 2.5 metres.
8. Add a second four-sided cricket with the same dimensions in the bottom-left corner of the roof.
9. Right-click to stop adding crickets.

Your roof plan should look like Figure 3-6.

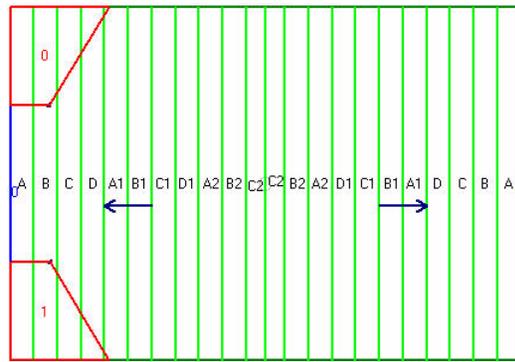


Figure 3-6 Roof C with four-sided crickets

Adding To-Wall Crickets

To-wall crickets are shaped like two four-sided crickets placed back-to-back. You can add a to-wall cricket between two drains, like a full cricket, but also against an edge.

When you add a to-wall cricket, you first select the two drains. Then, you select the edge. The cricket extends at right angles from the drains to the edge. Finally, you set the width of the cricket, as measured from the wall.

To add a to-wall cricket

1. On the Add Cricket toolbar, click Add To Wall Cricket .

A window opens showing a picture of a to-wall cricket and highlighting the next point, as in Figure 3-7.

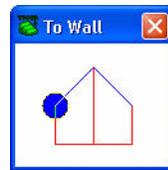
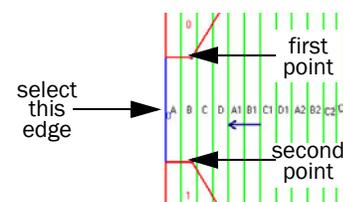


Figure 3-7 Diagram of to-wall cricket

2. With attach mode on, click on the top drain.
3. Click on the bottom drain.
4. Click on the left edge of the roof, to extend the cricket to the wall.
5. Type V, type 2.5, and press ENTER to enter a width of 2.5 metres.
6. Right-click to stop adding crickets.



Your roof should have three crickets along the left edge, as in Figure 3-8

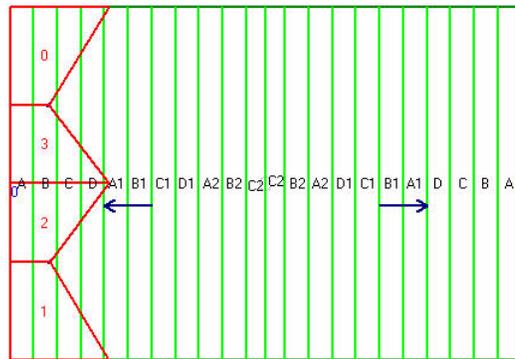


Figure 3-8 Roof C with to-wall cricket

Adding V-Shape Crickets

Your roof now has proper drainage on its left side. Now you need to fix the right side and direct water towards the single drain on that side of the roof. This drain is positioned directly on the edge of the roof, like a scupper.

You can add crickets on this side in two ways:

- Add two corner or two quarter crickets at each corner of the right edge.
- Add a single v-shape cricket along the entire right edge.

You can use v-shape crickets to divert water to a single drain along an edge. A single v-shape cricket is equivalent to two of the following crickets:

- four-sided crickets when the drain is away from the edge
- quarter crickets when the drain is on the edge

If you have a series of scuppers along a roof edge, add the following crickets along the edge of the roof.

- **long crickets between the scuppers**
- **corner crickets at the corners**

See the Taper-Plus on-line help for details on these and other types of crickets.

To Add a v-shape cricket

1. On the Add Cricket toolbar, click Add V-Shape Cricket .

A window opens showing a picture of a v-shape cricket and highlighting the next point, as in Figure 3-9.

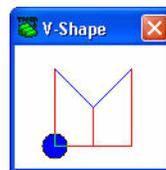
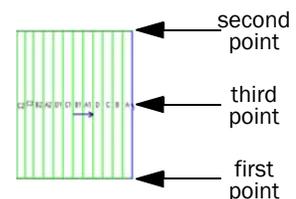


Figure 3-9 Diagram of v-shape cricket

2. With attach mode on, click on the bottom-right corner to place the first point.
3. Click on the top-right corner to place the second point.
4. Click on the drain in the middle of the right edge.
5. Type v, type 2.5, and press ENTER to enter a width of 2.5 metres.



6. Click Yes to confirm that the cricket is entered on the correct side.
7. Right-click to stop adding crickets.

Your roof section now has four crickets, as shown in Figure 3–10.

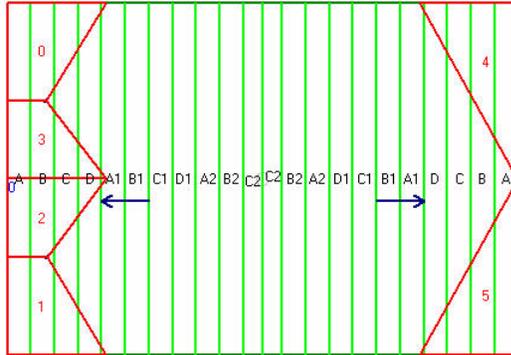


Figure 3–10 Roof C with v-shape cricket

Adjusting the Tapered Layout

The tapered layout seems complete:

- A two-way layout diverts water to the left and right edges.
- Four crickets divert water to the three drains.

However, this layout wastes tapered panels. The elevation at the highest point of the roof is greater than necessary, so the thick C2 panels are wasted. This is illustrated in Figure 3–11.

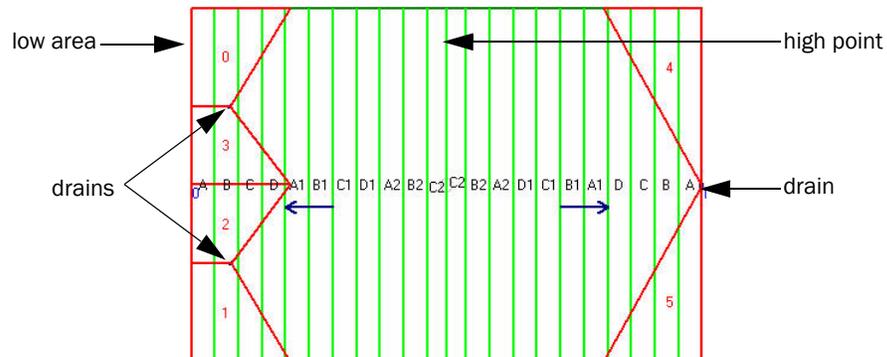


Figure 3–11 Roof C showing tapered layout.

There's a low area on the far left edge of the roof and two drains one metre from the low area. This means that the two drains on the left side of the roof are not at the same elevation as the drain on the right side of the roof. But all drains should be at the lowest elevation on the roof: the low area.

If the low area were lined up with the left drains, the ridge at the high point of the roof would have a lower elevation. This would eliminate the C2 panel and save material.

An obvious way to put the low area in line with the drains is to move the present low area one metre to the right. This would slope the roof section from the left edge down to the drains. However, you've already added crickets along that edge, so you don't need the extra slope provided by tapered panels.

A better solution is to expand the low area on the left edge. You'll expand the low area so that it includes all of the area to the left of the drains. Then you won't have extra tapered panels under the crickets on the left side of the roof.

Expanding Low Areas

You'll use the **Manual Expand Low/High Area** command to increase the size of the low area. With this command, you can expand a low area in right angles: up, down, to the right, and to the left. You press an arrow key, and the low area expands by the snap value in that direction. The low area can even take on more dimensions: a point becomes a line and a line may become a rectangle.

You'll expand the left low area by one metre to the right. But first, you should check the snap value to know how far the low area will expand with each keystroke.

To expand the low area

1. On the main toolbar, click **Snap Value**  to check the snap value.

The **Snap Value** dialogue box opens, as in Figure 3–12.

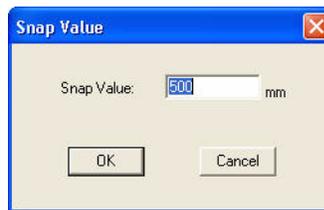


Figure 3–12 The **Snap Value** dialogue box

2. In the **Snap Value** box, enter 500, and click **OK** to set the snap value at 0.5 metres.
3. Click the **Area** selection box, and click the left edge to select the left low area.
4. On the **Change Low/High Area** toolbar, click **Manual Expand Low/High Area** .

The command line tells you which keys you can press, as shown in Figure 3–13.

EXPAND LOW AREA Arrow Keys <Enter> Accept <Esc> Quit

Figure 3–13 Command line

5. Press the right arrow key two times to expand the low area one metre to the right.
6. Press ENTER to set the low area.

The tapered layout updates, as shown in Figure 3–14.

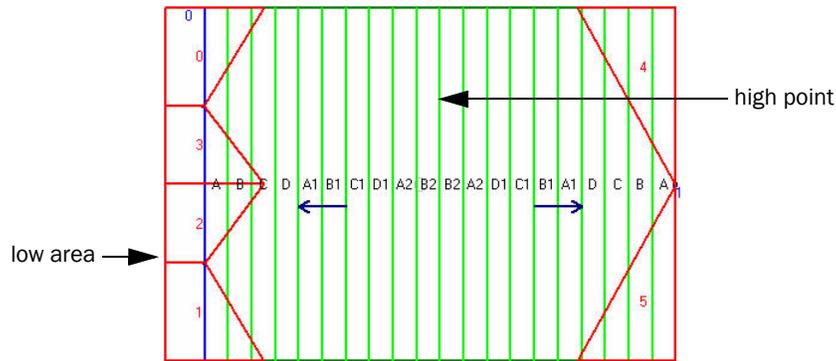


Figure 3-14 Roof C, with final tapered layout

Notice the new features of the layout:

- The high point moves to the right.
- The C2 panels are no longer used.
- There are no tapered panels to the left of the drains.
- B2 is the thickest panel.

The layout in roof C is complete. We'll now move back to roof A and take a closer look at its layout.

Removing Partial Panels

Zoom into roof A, or look at Figure 1-19 on page 14.

The tapered panels slope towards the top and bottom edges of the roof section in two planes. Both planes use eight whole panels and part of a ninth panel to get from the low area to the edge, as illustrated in Figure 3-15.

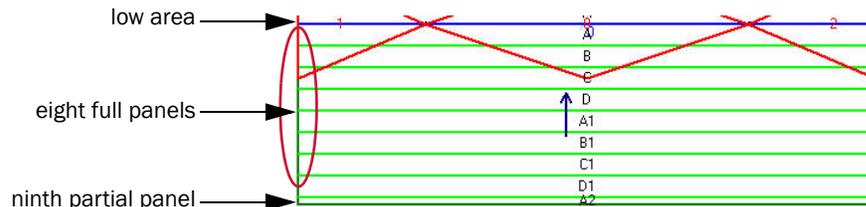


Figure 3-15 Bottom of roof A

Though this layout provides proper drainage, it's preferable not to use any partial panels. The layout uses the thinnest part of the A2 panel. You can't reuse the excess panel, so the thickest part of the A2 panel is wasted.

Adding Sumps Around Drains

In order to get rid of the partial panels, you'll add sumps around the two drains. In Taper-Plus, a sump is simply an expanded low area around a drain. Many layouts call for expanded sumps around drains because the size of the drain requires a larger area around it.

If you design a four-way layout, the easiest way to add a sump around a drain is to use the **Add Sump on Drain** command. With this command, you select the drain and the dimensions of the sump, and a low area with those dimensions is centred on the drain. The low area is either square or rectangular.

In this project, you've created a two-way layout with one long low area through two drains. Adding a sump on each drain would produce a four-way layout. Instead, you need to expand the low area towards the top and the bottom of the roof. This will leave an area around each drain and keep the two-way layout intact.

Erasing Objects in a Roof Section

Before adjusting the low area, you'll erase all of the crickets on roof A. Since you'll create a sump around each drain, you won't want the cricket tips attached to the drain. Instead, you'll replace the current crickets with snub-nosed crickets.

To erase all the crickets in a roof section

1. Double click on roof A to select it.
2. On the Erase toolbar, click Erase All .

The Erase All dialogue box opens.

3. Select the Erase All Crickets in Current Section check box, as shown in Figure 3-16

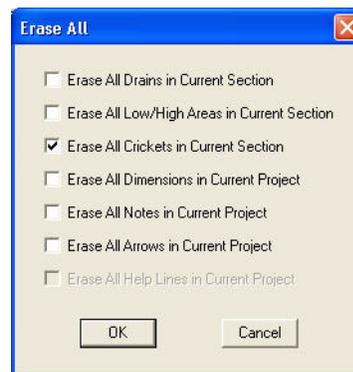


Figure 3-16 The Erase All dialogue box

4. Click OK.

The dialogue box closes, and all crickets in the roof section are deleted.

Adjusting Low Area Edges

You saw in Figure 3-15 on page 38 that each half of the roof uses eight whole panels and part of a ninth panel. You'll now expand the low area so it only uses the eight complete panels. The panels in the FB2% letter scheme have a width of 600 cm or 0.6 m.



So in order to use only eight panels in the roof plane, the edge of the roof must be 4.8 metres from the low area.

To complete this, you'll use the **Edge Adjust Low/High Area** command. This command lets you specify the distance between the edge of a low area and another edge, parallel to the low area. The dimensions of the low area adjust to produce the correct distance.

To adjust the edge of the low area

1. Select roof A.
2. On the Change Low/High Area toolbar, click Edge Adjust Low/High Area .

The command line prompts you to select an edge of the low area, as shown in Figure 3-17.

SELECT LOW AREA EDGE TO ADJUST (F2 to walk thru list)

Figure 3-17 Command line for Edge Adjust

Even though the low area has only one edge, you need to select it. A low area that's shaped like a line has two edges on top of each other.

3. Click on the low area.

The command line prompts you to select a reference edge, as shown in Figure 3-18

SELECT REFERENCE EDGE (F2 to walk thru list)

Figure 3-18 Command line prompting for reference edge

4. Click on the bottom edge of the roof section.

The command line displays the current distance between the two edges, as shown in Figure 3-19. This is where you can set a new distance.

DISTANCE BETWEEN EDGES: M

Figure 3-19 Command line prompting for distance between edges

5. Type 4.8, and press ENTER. To set a new distance of 4.8 metres.

The low area expands so that the lower edge is 4.8 metres from the bottom roof edge. The other edge of the low area remains at the centre of the roof section.

6. Repeat with the top edge of the low area.
7. When finished, right-click to stop selecting low area edges.

Roof A should now have a large low area along the centre valley of the roof section. As well, it should no longer contain any partial panels. The roof should look like Figure 3-20

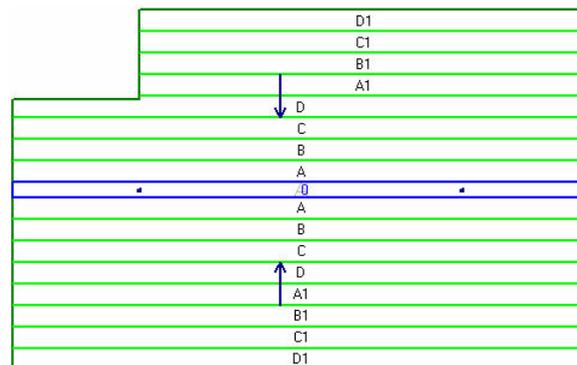


Figure 3-20 Roof A with expanded low area

Snub-Nosed Crickets

Now that you've offset the tapered panels from the drains, you need to add crickets that are also offset from the drains. Since you've created a sump at each drain, you'll add snub-nosed crickets in place of the full and wide crickets you added earlier.

Snub-nosed crickets are designed to be used with drains surrounded by sumps. Instead of coming to a point at the drain, the cricket point is cut off, giving the appearance of a snub nose. The tapered panels start 20 cm up and down from the drains. So you'll offset the snub-nosed crickets, by 20 cm to the left and right of the drains.

Adding Full Snub-Nosed Crickets

In place of the full cricket that you added earlier, you'll now add a full snub-nosed cricket. You can only add full snub-nosed crickets between drains. You first specify the distance to offset the cricket from the drains, and then you select the two drains. The result is a full cricket between two drains with its tips cut off.

To add a full snub nosed cricket

1. On the Add Cricket toolbar, click Add Full Snub Nosed Cricket .

The Add Full Snub Nosed Cricket dialogue box opens.

2. In the Orientation area, click Horizontal, and in the Offset from Drains box, type 0.2, as shown in Figure 3–21. **Automatically Enter Boundary Points** must be checked

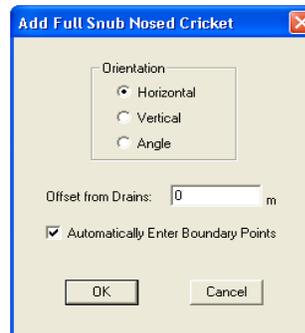


Figure 3–21 The Add Full Snub Nosed Cricket dialogue box.

Unlike with other crickets, you need to specify the angle of snub-nosed crickets. If the cricket isn't along a horizontal or vertical axis, you can select Angle. Then, click on the end points of a line (presumably the drains) to determine the angle of the cricket.

3. When finished, click OK.

A window opens showing a picture of a full snub-nosed cricket and highlighting the next point, as shown in Figure 3–22.

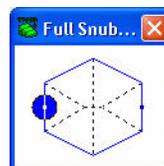


Figure 3–22 Diagram of a full snub-nosed cricket

4. Click on the left drain, to place one end of the cricket.
5. Click on the right drain, to place the other end of the cricket.
6. Press V, type 3, and press ENTER to enter a width of 3 metres.
7. In the Add Full Snub Nosed Cricket dialogue box, click Cancel to stop adding crickets.

The length of the edge closest to the drain is determined by the low area. Since the low area in that section is 0.4 m wide, the length of the snub edge is also 0.4 m.

Adding Wide Snub-Nosed Crickets

Now you'll add two wide snub-nosed crickets in place of the two wide crickets. Wide snub-nosed crickets are much like full snub-nosed crickets. You specify the offset and angle in a dialogue box, and you place the first point on a drain.

To add wide snub nosed crickets

1. On the Add Cricket toolbar, click Add Wide Snub Nosed Cricket . The Add Wide Snub Nosed Cricket dialogue box opens.
2. In the Orientation area, click Horizontal, and in the Offset from Drains box, type 0.2.
3. Click OK to close the dialogue box.

A window opens showing a picture of a wide snub-nosed cricket and highlighting the next point, as shown in Figure 3–23.

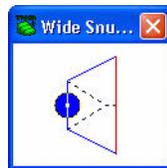


Figure 3–23 Diagram of a wide snub-nosed cricket

4. Click on the left drain.
5. Click on the left edge of the roof section.

If attach mode is set, you can attach to any point along the left edge. Since the angle of the cricket is already set, you don't have to select a point that's along a horizontal line from the drain.

6. Press V, type 3, and press ENTER to enter a width of 3 metres.
7. Add a second wide cricket between the right drain and the right edge of the roof section.
8. In the Add Wide Snub Nosed Cricket dialogue box, click Cancel to stop adding crickets.

Your roof section now has three snub-nosed crickets, providing drainage to sumps around two drains, as shown in Figure 3–24.

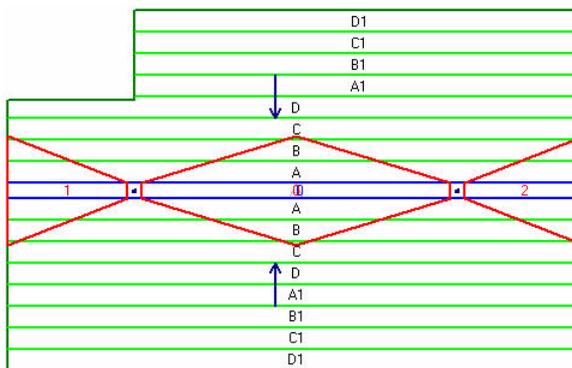


Figure 3-24 Roof A

You have completed Tutorial 3. This project is continued in Tutorial 4: Adjusting Crickets.

Tutorial 4: Adjusting Crickets

In this tutorial, you'll continue to work on the project started in Tutorial 1, Tutorial 2, and Tutorial 3. You'll revisit two of the roof sections and adjust the crickets.

Topics Included:

- removing partial panels on crickets
- adjusting cricket width
- cricket width types
- adjusting multiple cricket widths
- using help lines
- adding parallel help lines
- creating parallel crickets
- moving cricket points
- deleting help lines

Reviewing the Project

To start, let's open the project that you worked on in Tutorial 1, Tutorial 2, and Tutorial 3, and then view its tapered layout.

To view the project

1. Open the project created in Tutorial 1.
2. Click Zoom Current  to zoom into the entire project.
3. Click Draw  to change the drawing options.
4. In the Section Taper area, click Short Arrows. In the Section Letters area, click Rows. In the Cricket Taper area, click Short Arrows. And in the Cricket Letters area, click Rows.
5. Click OK to set the drawing options and return to the drawing area.

Your project should look like Figure 4-1.

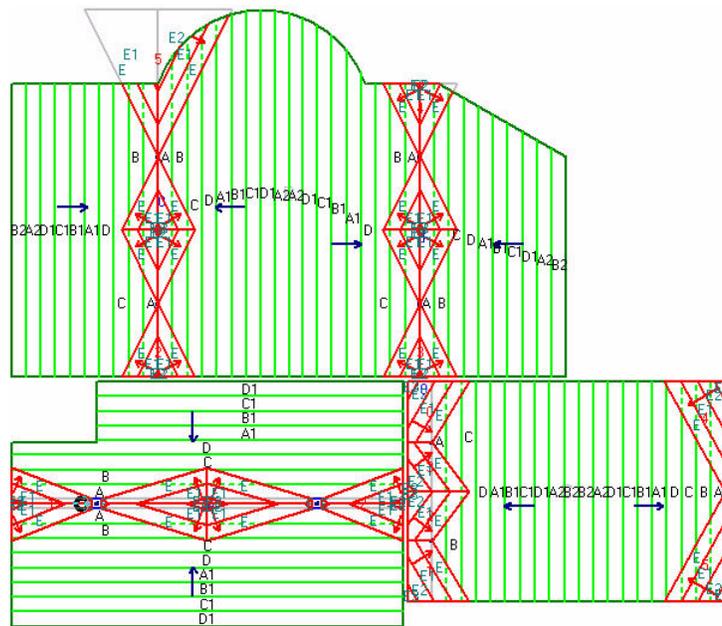


Figure 4-1 Entire project

Let's review the main features of this project:

- It contains three roof sections.
- Each roof uses the FB1% letter scheme.
- Each roof has a two-way layout.
- Each roof uses crickets to divert water to drains.
- B2 is the thickest panel with a maximum thickness of 70 mm.

At the end of Tutorial 3, you expanded the low area on roof A, creating a sump around each drain. This reduced the area with tapered panels and eliminated the partial panels. The project doesn't contain many wasted tapered panels. But if you inspect the crickets, you should notice that they contain partial panels.

Removing Partial Panels on Crickets

Look at the crickets on roof A and roof B. Most of the crickets use full E and E1 panels and a small part of the thicker E2 panel, as shown in Figure 4–2.

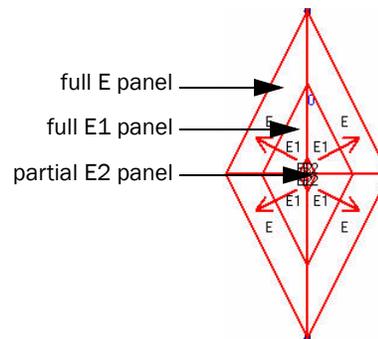


Figure 4–2 Detail of full cricket on roof B

This layout uses a very small fraction of each E2 panel. It cuts off most of the panel, only using the thinnest part. It would be much more economic to reduce the size of the crickets on roof A and roof B so they only use the E and E1 panels.

The low edge of a cricket panel is placed along the outside edge of the cricket. So the length of the cricket edge determines how many of the thinnest cricket panels are needed, E panels in this letter scheme. The cricket panels then slope towards the high point of the cricket. So the width of the cricket determines how many types of cricket panels are needed. This is illustrated in Figure 4–3.

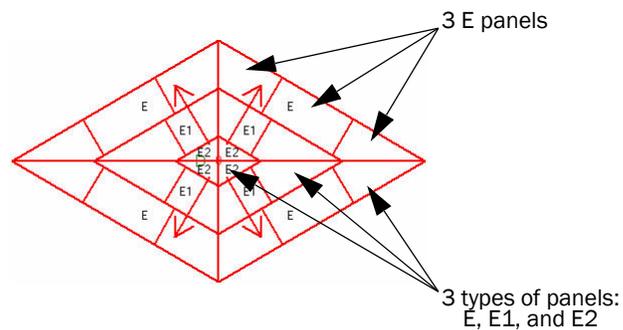


Figure 4–3 Full cricket

To get rid of the partial E2 panels in roof A and roof B, you need to reduce the width of the crickets.

Adjusting Cricket Widths

Let's start on roof A with the snub-nosed crickets. All three crickets have a width of 3 m, and all three crickets have partial E2 panels. You'll reduce the width of each cricket a little to 2.5 m.

To adjust cricket widths

1. Select roof A.
2. Click the **Cricket** button, and click on the full snub-nosed cricket to select it.

The **Cricket** button  is located directly above the drawing area, to the right of the **Area** button.

3. On the **Change Cricket** toolbar, click **Width Adjust Cricket** .

The Cricket selection box, next to the Cricket button, shows which cricket is selected. The full snub-nosed cricket should be cricket 0.

The command line prompts you to enter the width of the cricket, as shown in Figure 4-4.



Figure 4-4 Command line for adjust cricket width command

4. Type 2.5 and press ENTER to set a new width for the cricket.

You can experiment with other widths for this cricket to see which gives the best layout.

The cricket adjusts to show the new width.

5. Click the Cricket button, and click the wide snub-nosed cricket on the left to select it.
6. Repeat Step 3 and Step 4 for this cricket.
7. Adjust the width of the wide snub-nosed cricket on the right so that it matches the widths of the other two snub-nosed crickets.

The crickets on roof A no longer use any E2 panels. Roof A should look like Figure 4-5.

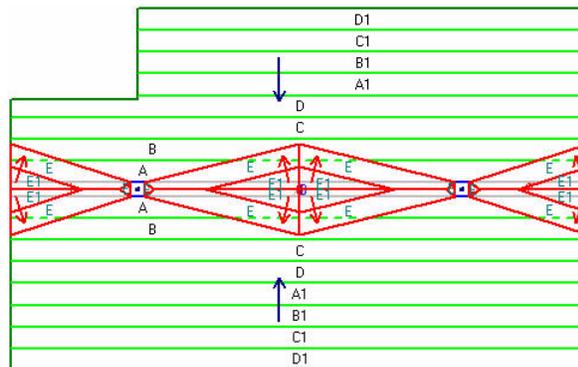


Figure 4-5 Roof A with new cricket width

Cricket Width Types

In Tutorial 1: Review, you checked the **Cricket Entering** settings to make sure that you add crickets with the same dimensions as demonstrated in these tutorials. You might have noticed that there are two cricket width types: Normal and Perpendicular.

- **Normal:** The width is the distance between the two cricket tips.
- **Perpendicular:** The width is the perpendicular distance between the cricket edge and the cricket high point.

The difference between the two methods for entering cricket width is illustrated in Figure 4-6 for a full cricket.

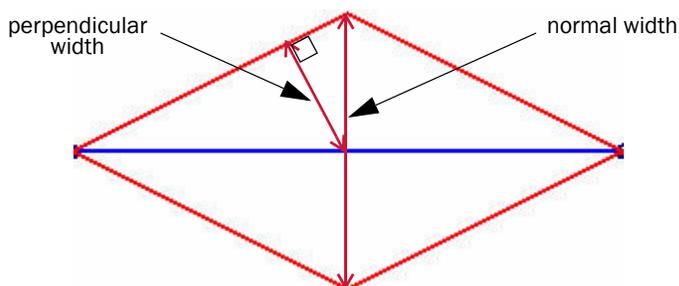


Figure 4-6 Perpendicular and normal width for a full cricket

So far, you've specified cricket dimensions with the Normal width. This is the most intuitive way to specify width, since this is how we imagine the width of a cricket. However, when you want the width of the cricket panels to determine the size of the cricket, the best way to enter the cricket width is by specifying a perpendicular width.

Look at Figure 4-3 on page 47 once more. Notice how the cricket panels are lined up along the edge of the cricket. The panels then slope in towards the high point at a right angle from the cricket edge. So the perpendicular distance from the cricket edge to the cricket high point determines how many types of cricket panels are needed.

In this project, the crickets use the FB4% letter scheme, where each panel is 0.6 metres wide. In order to use only two types of panel on a cricket, its perpendicular width must equal the width of two cricket panels: 1.2 metres.

Adjusting Multiple Cricket Widths

You'll now adjust the perpendicular width of the crickets on roof B. Right now, all of the crickets use portions of E2 panels. To omit the E2 panels from the plan, all the crickets, except one, should have a 1.2 metre perpendicular width.

The last cricket that you added to the roof, the wide cricket in the top left corner of roof B, requires a different width than the others. The perpendicular width of this cricket is useless to us, since there are no panels at the cricket high point. You'll adjust the width of this cricket later.

Since five crickets require the same width, you can adjust the width of all these crickets at the same time.

To adjust the width of multiple crickets

1. Select roof B.
2. On the Change Cricket toolbar, click **Multiple Width Adjust Crickets** .

The Multiple Width Adjust dialogue box opens, as in Figure 4-7.

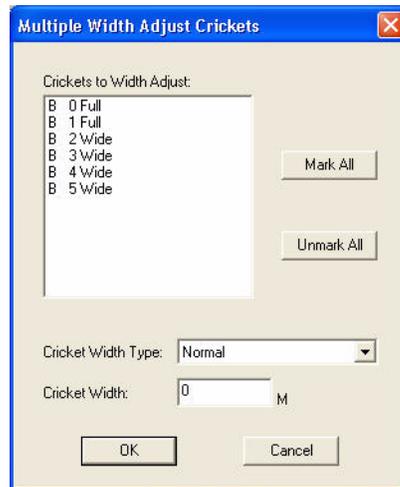


Figure 4-7 The Multiple Width Adjust dialog box

The **Crickets to Width Adjust** area of the dialog box lists all of the crickets in the current roof section. You'll adjust the width of all but the last cricket added.

3. Click **Mark All** to select all of the crickets.
4. Click on the last row **B 5Wide** to remove the last cricket from the selection.

Crickets are numbered in the order that you add them to the roof plan. If you added the crickets in a different order than instructed, you might need to select a different cricket number.

5. Scroll the **Cricket Width Type** box, and click **Perpendicular**.
6. In the **Cricket Width** box, enter **1.2**.
7. When finished, click **OK**.

The five crickets adjust to the new width. They should use only two types of panel, as in Figure 4-8.

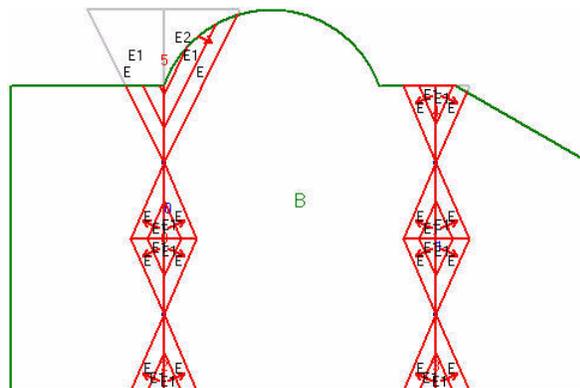


Figure 4-8 Roof B with five adjusted crickets

You'll adjust the final cricket shortly.

Using Help Lines

Before adjusting the final cricket, you'll learn a bit about help lines. You'll find more information on help lines and more examples of ways to use them in Tutorial 6: Using Help Lines.

Help lines are continuous lines that you can add anywhere in a Taper-Plus project. When you add a help line to a project, the intersecting points between the help line and other lines in the project are attachable. That means you can select these points when you turn on attach mode. This can make drawing and adjusting roofs much quicker and more precise.

For now you'll only use parallel help lines. Add parallel help lines to draw continuous lines, parallel to existing edges. You'll learn about some other types of help lines in Tutorial 6.

Adding Parallel Help Lines

You'll add three parallel help lines to roof B: two parallel to edges on the full cricket and one parallel to the end of the final wide cricket. With these help lines, you can adjust this last cricket so that it has the same angle as the other crickets on the roof.

To add parallel help lines

1. Click Zoom Current  to zoom into roof B.

Roof B should still be selected from earlier.

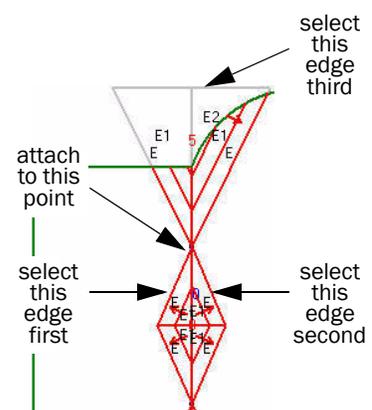
2. On the Inspect & Help Line toolbar, click Add Help Line .
3. Type P to add a parallel help line.

The command line instructs you to select an edge, as shown in Figure 4-9.

SELECT PARALLEL EDGE (F2 to walk thru list)

Figure 4-9 Command line for parallel help line

4. On the full cricket to the left, click on the top left edge to select it.
5. Click Attach  to turn on attach mode.
6. Click on the point at the top of the cricket to place the help line.
7. Type P, select the top-right edge of the full cricket, and attach it to the same point.
8. Type P, click on the top edge of the largest wide cricket, then click on an end of the edge to place the help line without moving it.
9. Right-click to stop adding help lines.



Roof B should have three help lines, all parallel to cricket edges, as shown in Figure 4-10.

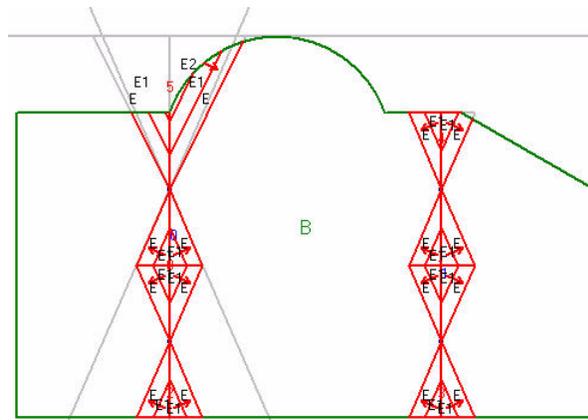


Figure 4-10 Roof B with parallel help lines

Creating Parallel Crickets

Compare the help lines with the cricket lines on roof B. The bottom help lines are parallel to the full cricket. While the top help line is on top of the wide cricket, as shown in detail in Figure 4-11.

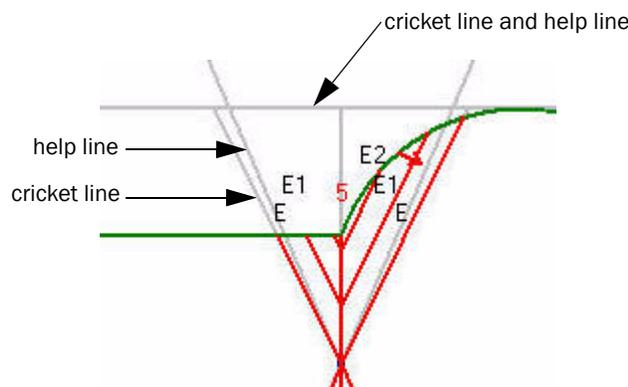


Figure 4-11 Detail of help lines on roof B.

Notice that the outline formed by the three help lines represents the outline of a wide cricket that's parallel to the full cricket. So we want to change the outline of the wide cricket so that it has the same outline as the help lines.

Moving Cricket Points

As you saw earlier, it's very easy to adjust a cricket by simply specifying its width. But you can also adjust crickets manually, by moving one point at a time.

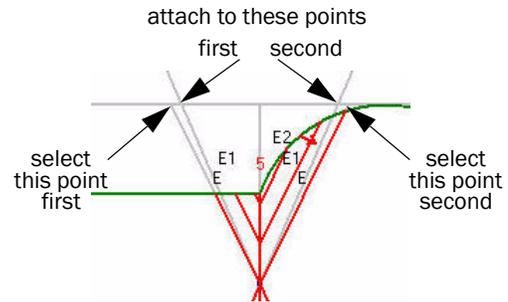
In Tutorial 2, you saw how to move a low area point (see "Adjusting Low Areas" on page 20). There's a similar command for crickets that lets you move individual cricket points.

In Tutorial 2, you specified the distance to move the low area point by watching the coordinate boxes and moving the mouse pointer. In this case, you don't know how far to move the cricket points. Instead of calculating the exact displacement, you can use the help lines to place the new cricket points.

You can use attach mode to attach the end points of the cricket to the intersecting points of the help lines.

To adjust cricket points

1. Select roof B if it isn't already selected.
2. Click the **Cricket** button, and click on the wide cricket in the top left corner of the roof to select it.
3. On the **Change Cricket** toolbar, click **Point Adjust Cricket** .
4. Click on the top left point of the cricket.
5. With attach mode on, move the mouse pointer a bit to the right and click on the closest intersection point between help lines.
6. Click on the top right point of the cricket.
7. Move the mouse pointer a little to the left and click on the other intersection point between help lines.
8. Right-click to stop selecting cricket points.



The help lines are now parallel to the edges on both crickets. So all the crickets on the roof section have parallel edges, as in Figure 4–12.

The **Cricket Width Calculator** can be used instead when entering crickets to make sure they are all at the same angle. See View - Setting - Cricket Entering. This is useful if a specific cricket valley slope is specified for a project. Just specify the roof slope and the desired cricket valley slope and the calculator will fill in the required default width.

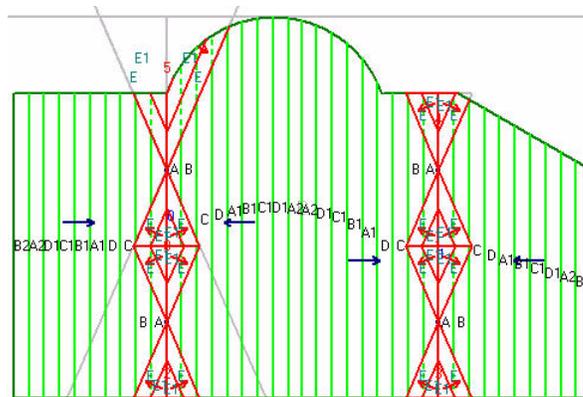


Figure 4–12 Roof B finished

Deleting Help Lines

The final step in this project is to delete the help lines. Since there are only three help lines on the roof, you'll delete them individually. But you can also use the **Erase All** command to delete all of the help lines at once (see "Erasing Objects in a Roof Section" on page 35 for details).

To delete help lines

1. On the **Inspect & Help Line** toolbar, click **Delete Help Line** .
2. Click on each help line on roof B to delete it.
3. Right-click to stop deleting help lines.

All three roof sections in the project are now complete. The finished project should look like Figure 4–13.

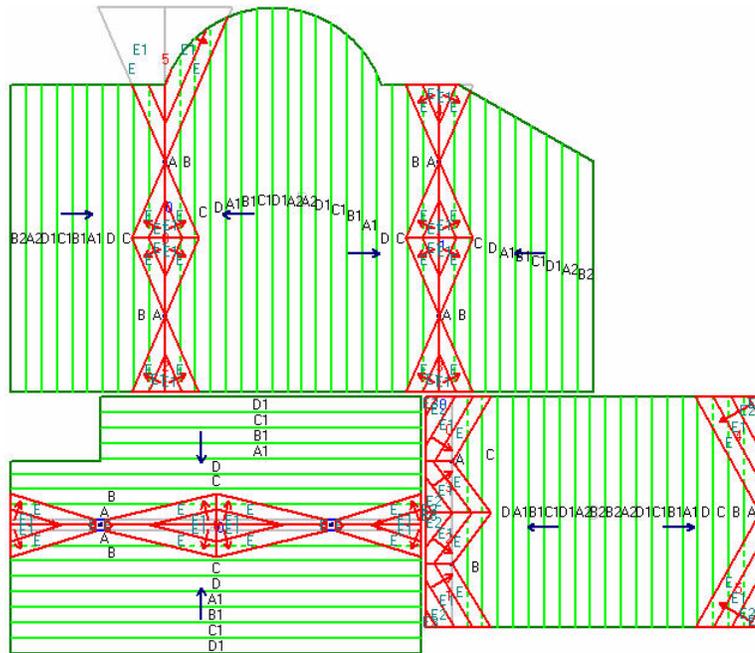


Figure 4–13 Finished project

You have completed Tutorial 4. In Tutorial 5: Letter Schemes and Materials, you'll learn about customizing materials.

Tutorial 5: Letter Schemes and Materials

This tutorial expands on ideas introduced in “Lesson4: Letter schemes and the Materials Database” in the **Taper-Plus Quick Start Guide**. You’ll learn to create more complicated letter schemes and to itemize materials.

Topics Included

- viewing letter schemes
- creating multi-slope letter schemes
- adding zones to letter schemes
- adding flat panels to letter schemes
- adding materials
- itemizing materials
- applying materials

About Letter Schemes

Taper-Plus uses letters to identify different panels applied to a roof section. The letter scheme determines a number of properties on the roof plan:

- the dimensions of the tapered panels
- the slope of the tapered insulation
- the maximum thickness of tapered insulation before applying fill
- the letters and numbers that refer to panels

You added a single-slope letter scheme in “Lesson4: Letter schemes and the Materials Database” in the **Taper-Plus Quick Start Guide**. In this tutorial, you’ll add a multi-slope letter scheme.

First, you’ll review two existing letter schemes: **FB1%** and **FB2%**, which are both default letter schemes.

Viewing Letter Schemes

You’ll first view the **FB2%** letter scheme, and then the **FB1%** letter scheme later. If you don’t have either of these letter schemes, review “Creating letter schemes” on page 33 of the **Taper-Plus Quick Start Guide**. The **FB1%** letter scheme has a 1/100 slope, and the **FB2%** letter scheme has a 1/50 slope. Both letter schemes use 600 mm by 1200 mm panels.

To view existing letter schemes

1. On the **Setup** menu, click **Letter Schemes**.

The **Setup Letter Schemes** dialogue box opens, listing all of the letter schemes stored in your program, similar to Figure 5–1.

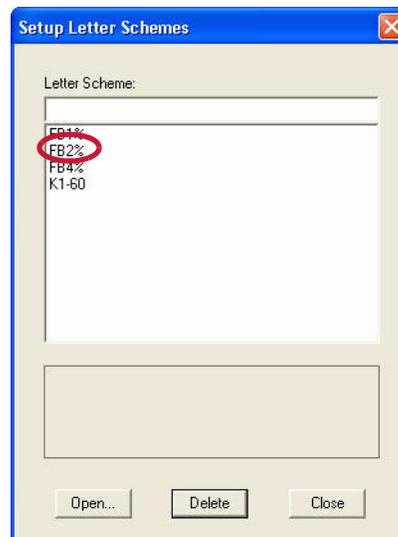


Figure 5–1 The Setup Letter Schemes dialogue box

If you’ve used Taper-Plus for a while, your program likely contains many more letter schemes than we have listed here. As long as you have the three top letter schemes: **FB1%, **FB2%**, and **FB4%**, you’ll have no problems completing these tutorials.**

2. Click **FB2%**, and click **Open**.

The **Setup Letter Scheme: FB2%** dialogue box opens, listing the panels, slopes and thicknesses used in the **FB2%** letter scheme, as in Figure 5–2.

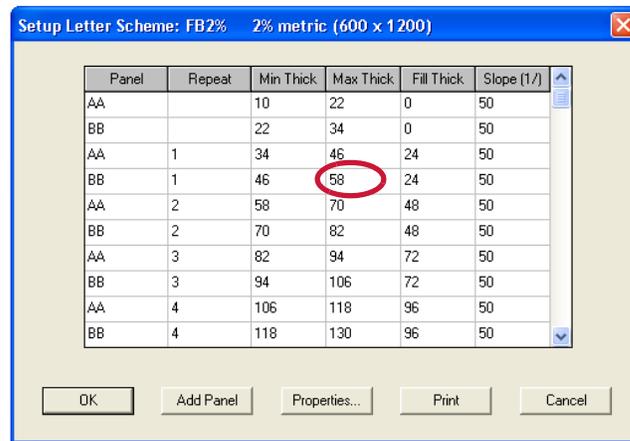


Figure 5-2 The Setup Letter Scheme: FB2% dialog box

We specifically want to know the maximum thickness of the fourth panel: the BB1 panel. It should be 58 mm.

3. Check the Max Thick column of the BB1 row, and click OK.

You can scroll down to view more panels in the letter scheme.

4. Click Close, to close the Setup Letter Schemes dialog box and return to the drawing area.

Multi-slope Letter Schemes

A multi-slope letter scheme is composed of multiple single slope letter schemes.

You split up the multi-slope letter scheme into different zones, each defined by a minimum and a maximum thickness. Then you assign an existing single-slope letter scheme to each zone. The slope of each letter scheme and its minimum and maximum thickness determine the distance from a low area where it starts and ends.

In this project, you'll create a multi-slope letter scheme with three zones. It will use the FB2% letter scheme closest to the low area, the FB1% letter scheme further out, and flat panels furthest from the low area.

Determining Zone Thickness

This multi-slope letter scheme will use four panels of the FB2% letter scheme closest to the low area and eight panels of the FB1% letter scheme further out.

Earlier, you opened the FB2% letter scheme to check the maximum thickness of the fourth panel, it should be 58 mm. So the first zone will run to a thickness of 58 mm. To define the size of the second zone, you need to figure out the thickness of eight panels of FB1% insulation.

Since FB1% is in the second zone, the first panel has a minimum thickness of 58 mm. So you need to find the maximum thickness of four FB1% panels after this first one.

You can view the FB1% letter scheme to find this thickness.

To view the FB1% letter scheme

1. On the **Setup** menu, click **Letter Schemes**.
2. In the **Setup Letter Schemes** dialogue box, click **FB1%** to select it, and click **Open**.

The **Setup Letter Scheme: FB1%** dialogue box opens listing all of the panels in the **FB1%** letter scheme.

3. Scan the **Min Thick** column and locate the row with the minimum thickness of 58 mm.

As shown in Figure 5–3, this should be the ninth row of the letter scheme: the **A2** row.

Panel	Repeat	Min Thick	Max Thick	Fill Thick	Slope (1/)
A		10	16	0	100
B		16	22	0	100
C		22	28	0	100
D		28	34	0	100
A	1	34	40	24	100
B	1	40	46	24	100
C	1	46	52	24	100
D	1	52	58	24	100
A	2	58	64	48	100
B	2	64	70	48	100

Figure 5–3 **FB1%** letter scheme

4. Scroll down the dialogue box so that the next seven rows are visible.
These eight rows, starting at the **A2** row and including the seven rows after it, represent the eight **FB1%** panels in our multi-slope letter scheme.
5. In the seventh row after the **A2** row, check the **Max Thick** column.
This is the **D3** row. The maximum thickness should be 106 mm, as shown in Figure 5–4.

Panel	Repeat	Min Thick	Max Thick	Fill Thick	Slope (1/)
C	1	46	52	24	100
D	1	52	58	24	100
A	2	58	64	48	100
B	2	64	70	48	100
C	2	70	76	48	100
D	2	76	82	48	100
A	3	82	88	72	100
B	3	88	94	72	100
C	3	94	100	72	100
D	3	100	106	72	100

Figure 5–4 Further down the **FB1%** letter scheme

6. Click **OK** to close the **Setup Letter Scheme: FB1%** dialogue box.
7. Click **Close** to return to the drawing area. Or you can leave the **Setup Letter Scheme** dialogue box open for the next procedure.

Creating a new letter scheme

You created a single-slope letter scheme in [Lesson4: Letter schemes and the Materials Database of the Taper-Plus Quick Start Guide](#). There's a similar procedure to create multi-slope letter schemes.

To create a multi-slope letter scheme

1. On the **Setup** menu, click **Letter Scheme**.

The **Setup Letter Scheme** dialogue box opens, as in [Figure 5–1](#) on page 56.

2. Type **MULTISLOPE** as the name for the new letter scheme, and click **Open**.

If there's already a letter scheme named **MULTISLOPE, you need to type a different name. You can use any name as long as it's distinct from existing letter schemes.**

The **Generate New Letter Scheme** dialogue box opens.

3. In the **Generate New Letter Scheme** dialogue box, click **Multi Slope**, and click **OK**.

The **Setup Multi Slope Letter Scheme** dialogue box opens,

4. In the **Letter Scheme Description** box, enter a brief description of the letter scheme. For example: **FB2%/FB1% multi-slope**.
5. In the **Panel Width** box enter **600 mm** as the width of the panels.
6. In the **Panel Length** box, enter **1200 mm** as the length of the panels.

Leave the dialogue box open for the next procedure.

When finished, the **Setup Multi Slope Letter Scheme** dialogue box should look like [Figure 5–5](#).

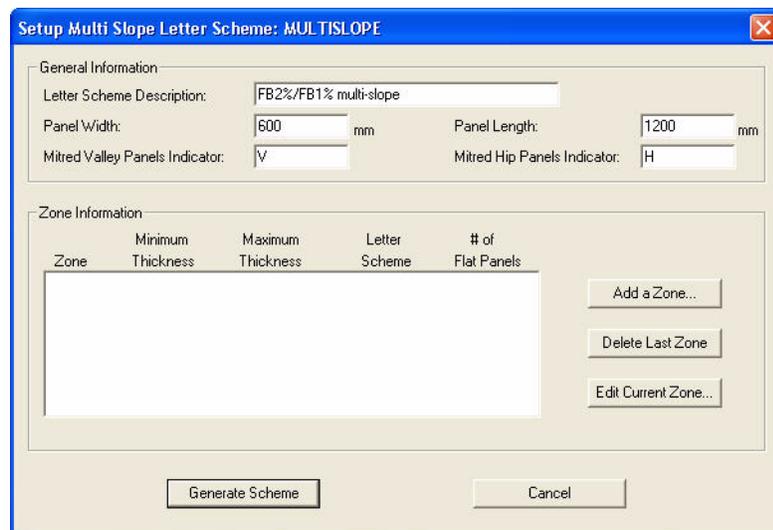


Figure 5–5 The Setup Multi Slope Letter Scheme dialogue box

Adding Zones to Letter Schemes

You've started to create your letter scheme, but so far you've only specified the size of the panels. Next you need to specify zones that use existing single-slope letter schemes.

To add the first zone to the letter scheme

1. In the **Setup Multi Slope Letter Scheme** dialogue box, click **Add a Zone**.

The **Add A Zone** button is on the right side of the **Zone Information** area of the dialogue box, as shown in Figure 5–6.

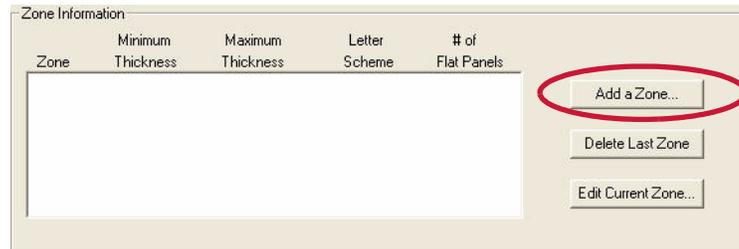


Figure 5–6 Zone Information area

The **Zone Information** dialogue box opens. The minimum thickness is already set to zero since this is the first zone. You need to enter a maximum thickness.

- In the **Maximum Thickness** box, enter 58.
- Scroll down the **Letter Scheme** box, and click **FB2%**.

When you select the letter scheme, its properties displayed at the bottom of the dialogue box, as shown in Figure 5–7.

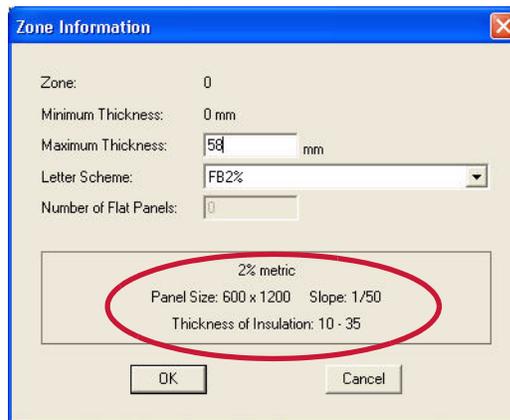


Figure 5–7 Zone 0 information

- Click **OK** to set the properties of zone 0.

The **Zone Information** dialogue box closes and you're returned to the **Setup Multi Slope Letter Scheme** dialogue box.

The zone information should match Figure 5–8.

Zone	Minimum Thickness	Maximum Thickness	Letter Scheme	# of Flat Panels
0	0	58	FB2%	

Figure 5–8 Detail of zone information for Zone 0

You now need to add a second zone to the multi-slope letter scheme. This zone will contain eight panels of **FB1%** insulation. The maximum thickness of this zone is 106 mm, as determined earlier. (See “Determining Zone Thickness” on page 57 for details.)

To add the second zone to the letter scheme

- In the **Setup Multi Slope Letter Scheme** dialogue box, click **Add a Zone** to add a second zone to the letter scheme.

The **Zone Information** dialogue box opens again. The minimum thickness is already set, equal to the maximum thickness of zone 0.

- In the **Maximum Thickness** box, enter 106.
- Scroll down the **Letter Scheme** box, and click **FB1%**.

The **Zone Information** dialogue box should match Figure 5–9.

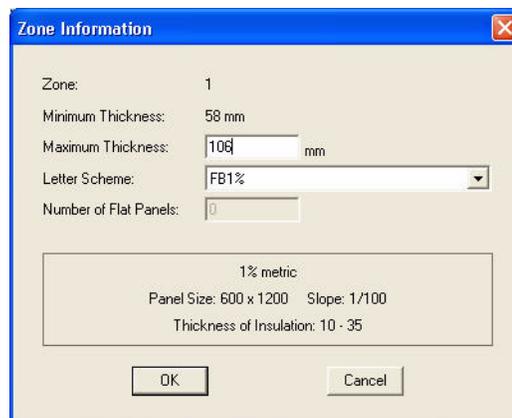


Figure 5–9 Zone 1 Information

- Click **OK** to close the **Zone Information** dialogue box.

The **Zone Information** dialogue box closes, and you're returned to the **Setup Multi Slope Letter Scheme** dialogue box. Leave the dialogue box open for the next procedure.

The **Zone Information** area should now match Figure 5–10.

Zone	Minimum Thickness	Maximum Thickness	Letter Scheme	# of Flat Panels
0	0	58	FB2%	
1	58	106	FB1%	

Figure 5–10 Detail of Zone Information area.

Adding Flat Panels to a Multi-Slope Letter Scheme

The multi-slope letter scheme now has two zones with different letter schemes and different slopes. But there's still one zone left. At the end of these two zones, we want to add ten flat panels.

When you add flat panels, you don't need to specify a thickness, since the panels don't change thickness. Instead you specify the number of panels. The size of the panels in the letter scheme determines the distance the flat panels occupy. You specified the dimensions of the panels earlier. (See "Creating a new letter scheme" on page 59 for details.)

To add flat panels to a multi-slope letter scheme

- In the **Setup Multi Slope Letter Scheme** dialogue box, click **Add Zone** to add a third zone to the letter scheme.

The **Zone Information** dialogue box opens for zone 2.

- In the **Number of Flat Panels** box, enter 10.

As long as the **Maximum Thickness** box displays the same value as the minimum thickness, you can edit the number of flat panels.

- Click **OK**.

The Zone Information dialogue box closes, and you're returned to the Setup Multi Slope Letter Scheme dialogue box. Leave this dialogue box open for the next procedure.

The Zone Information area now displays three zones. It should match Figure 5–12.

Zone	Minimum Thickness	Maximum Thickness	Letter Scheme	# of Flat Panels
0	0	58	FB2%	
1	58	106	FB1%	
2	106	106		10

Figure 5–11 Zone Information area with three zones

Generating a Letter Scheme

Now that the properties of the letter scheme are set, you need to generate it. Once it's generated, you can view properties of each panel in the letter scheme.

To generate the multi-slope letter scheme.

1. In the Setup Multi Slope Letter Scheme dialogue box, click Generate.

The Setup Letter Scheme: Multislope dialogue box opens, listing the thicknesses and slopes of all the panels in the letter scheme.

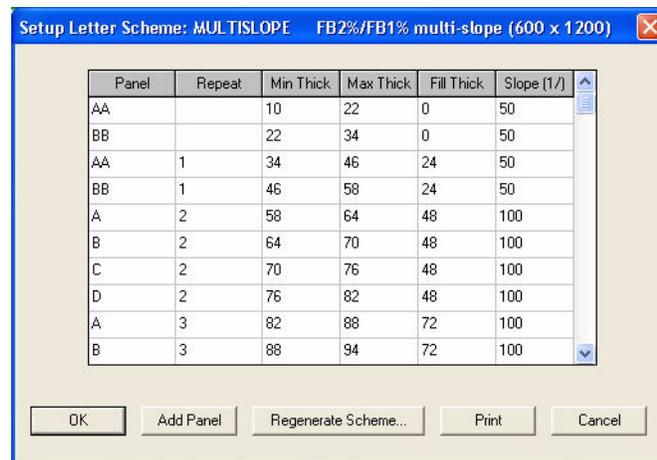


Figure 5–12 The Setup Letter Scheme: Multislope dialogue box

You can edit the properties of each panel in the letter scheme and add additional panels to the letter scheme.

2. Scroll down the dialogue box to view the remaining panels.
3. Click OK to close the dialogue box and save the new letter scheme.
4. In the Setup Letter Scheme dialogue box, click Close to return to the drawing area.

Using Materials

In order to get proper estimates, you need to specify all of the materials used in your project. You choose the materials to use on each roof in the Project Defaults.

You can specify eight different materials on a roof plan:

- tapered material on a section

- fill material under the tapered material
- fill material at low areas
- tapered and fill material for crickets
- cricket edge strips
- base layer
- overlay layer
- thermal layer

For fill materials, you can specify the thickness and dimensions of panels. For tapered insulation, you can specify the type of material and the letter scheme. All other properties are specified in the letter scheme.

In order to select a material, you first need to add it to the material database.

Adding Materials

When you add a new material to Taper-Plus, you need to specify the type of material: either taper or fill insulation. Then you can specify the price and K-value of the material.

In the *Taper-Plus Quick Start Guide*, you added a tapered panel to your materials called *eps-north*. With it you specified a price, mark-up percentage, and K-value. When you apply the material to a roof section, each panel takes these values. (See “Adding material data” on page 36 of the *Taper-Plus Quick Start Guide* for details.)

You’ll now add a new tapered panel to the material database called *eps - MultiSlope*. You’ll use it with the new multi-slope letter scheme.

To add a material

1. On the **Setup** menu, click **Materials**.

The **Setup Materials** dialogue box opens, as in Figure 5–13.

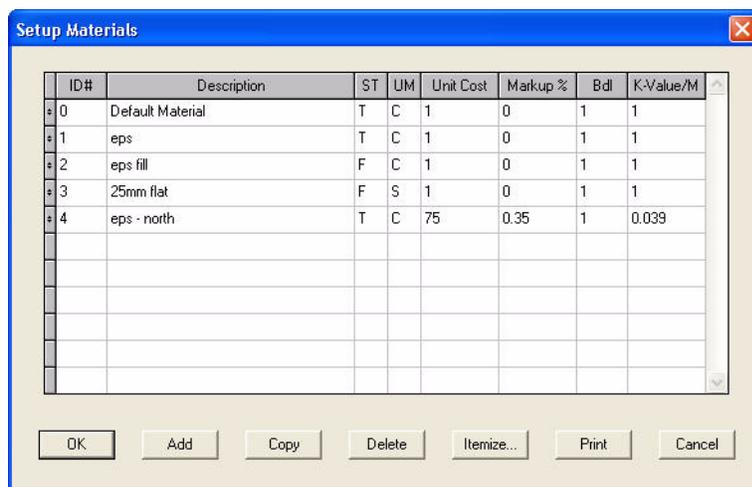


Figure 5–13 The Setup Materials dialogue box

If you've used Taper-Plus for a while, your program likely contains many more materials than listed here.

2. Click **Add**.

A new row is added to the list of materials.

3. Click in the **Description** column of the new row, or press TAB to move your cursor into the **Description** column.
4. Type **eps - MultiSlope** as a name for the new material.

You don't need to specify all the properties for this material. You'll itemize the material and specify properties for each panel. But you do need to specify the correct type of material and the unit.

5. In the **ST** (material sub type) column, enter T.

You can also right-click in the ST or UM columns to choose a value from a list.

6. In the **UM** (unit of measure) column, enter I for item.

You can leave the dialogue box open for the next procedure. If you want to close the dialogue box, click OK and the information will be saved.

Itemizing Materials

You can only select one type of tapered panel on each roof section. So in order to use panels with different properties, you must itemize the panels. Otherwise, all the panels have the same K-value and price per cubic or square metre.

When you itemize a tapered material, you list a series of panels. The panels in the list must match panels in your letter schemes. To match, panels must have these two properties:

- name, normally a letter
- slope

You don't need to specify the minimum and maximum thicknesses. Taper-Plus only uses name and slope to identify panels.

You'll itemize the **eps - MultiSlope** material that you added in the last section. Later, you'll use this material with the new multi-slope letter scheme.

You need to add 6 panels: two with a 1/50 slope and four with a 1/100 slope. These represent the six panels in the **FB1%** and **FB2%** letter schemes.

- The panels in the **FB2%** letter scheme have a 1/50 slope. They're called **AA** and **BB**.
- The panels in the **FB1%** letter scheme have a 1/100 slope. They're called **A**, **B**, **C**, and **D**.

To itemize a taper material

1. If needed, open the **Setup Materials** dialogue box, and select the new material: **ISO - MultiSlope**.
2. Click **Itemize**.

The **Itemize Taper Material** dialogue box opens, as in Figure 5-14.

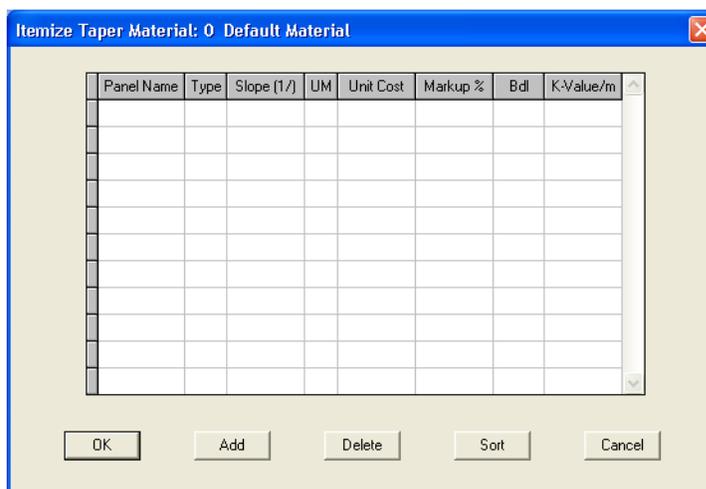


Figure 5-14 The Itemize Taper Material dialogue box.

3. Click Add six times, to add six panels.
4. In the Panel Name column of the first row, type AA, and continue to enter the names BB, A, B, C, and D in the five remaining rows.

The name column appears as in Figure 5-15.

Panel Name
AA
BB
A
B
C
D

Figure 5-15 Panel Name column of the Itemize Taper Material dialogue box

If the panels in your letter schemes have different names, make sure to use the correct names.

5. Click in the Slope column of the first row, and type 50. Continue to enter a 50 slope for the next panel and a 100 slope in the bottom four rows.

The Slope column appears as in Figure 5-16.

Slope (1/)
50
50
100
100
100
100

Figure 5-16 Slope column of the Itemize Taper Material dialogue box

All panels will use the same mark-up value. You'll edit the complete column rather than each individual panel.

6. In the UM (Unit of Measure) column click on the heading and select P for Panel
7. Click the heading of the Markup % column, Markup %.
8. Enter 0.40 in the Markup % box, as in Figure 5-17, and click OK.

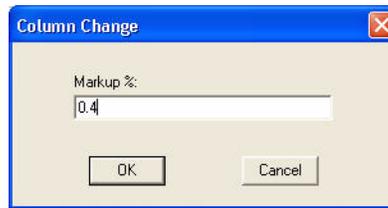


Figure 5-17 The Column Change dialog box.

The mark-up column is filled in for all six panels.

9. Fill in the remaining columns so that the dialog box matches the one shown in Figure 5-18.

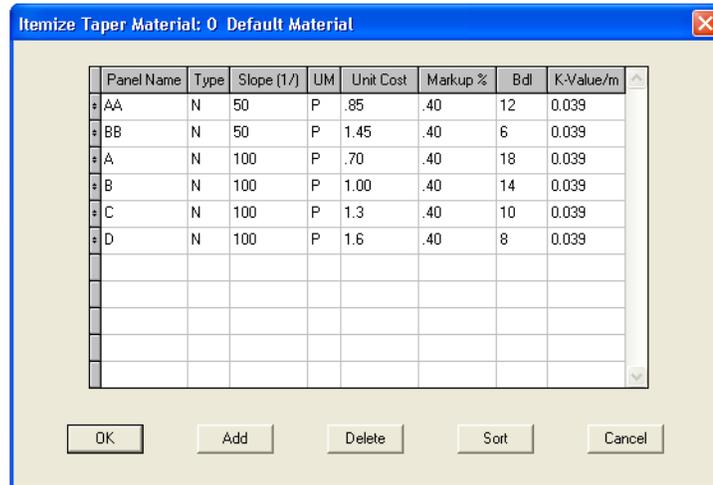


Figure 5-18 Itemize Taper Material dialog box, finished

10. When finished, click OK to close the Itemize Taper Material dialog box and save the new itemize information, and click OK again to close the Setup Materials dialog box and save all changes.

You can also itemize a fill material to setup panels with different thicknesses. As with the tapered panels, you can specify unit of measure, unit cost, mark-up %, bundle, and K-Value/m.

Applying Materials

Now that you've added a new letter scheme and materials you'll apply them to the project that you've worked on throughout Tutorial 1, Tutorial 2, Tutorial 3, and Tutorial 4.

To change a material, you need to change the project defaults. You can use different defaults for each roof section. But for now you'll apply change the material and letter scheme on all three roof sections.

To change letter schemes and materials

1. Open the project created in Tutorial 1.
2. In the Section selection box, make sure that Project is selected.
3. On the Project menu, click Defaults.

The Defaults dialog box opens at the Section tab.

4. In the Section Taper area, scroll down the Material box, and click ISO - MultSlope.

5. Scroll down the **Lettering Scheme** box, and click **MULTISLOPE**.

The **Defaults** dialogue box should match the one in Figure 5–19.

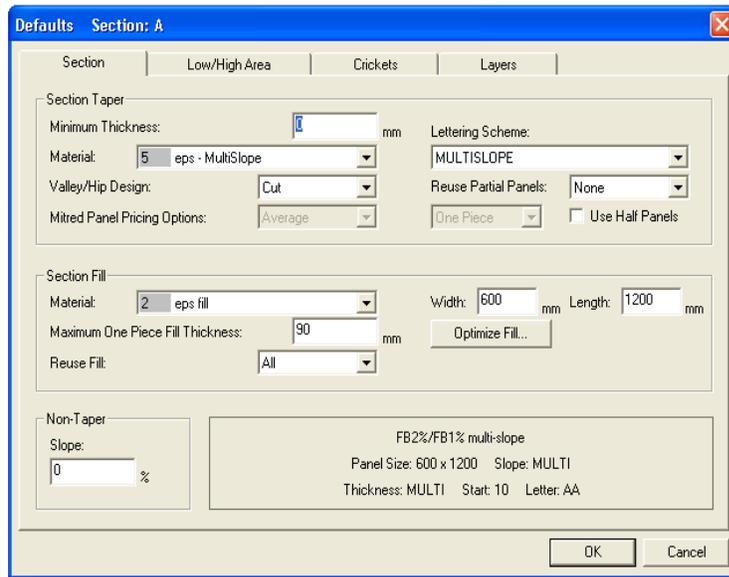


Figure 5–19 Defaults dialogue box

6. Click **OK** to close the dialogue box.

A new dialogue box opens asking if you want to copy the defaults to all the roof sections.

7. Click **Yes**.

The roof plan now uses the new letter scheme. The tapered layout should look like Figure 5–20.

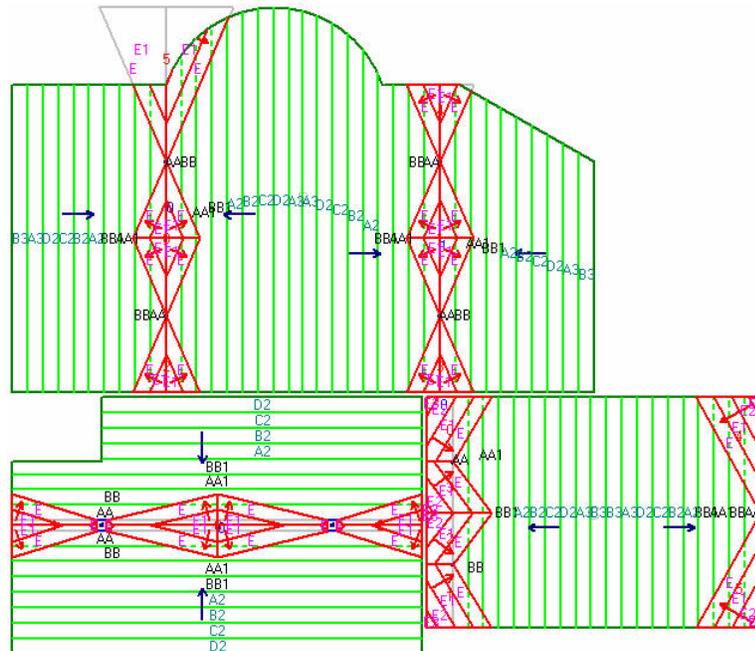


Figure 5–20 Project with new letter scheme

You have completed Tutorial 5. In Tutorial 6: Using Help Lines you'll create a new project and learn more about help lines.

Tutorial 6: Using Help Lines

In this tutorial you'll learn more about help lines. You'll add four types of help lines to a project to help draw a roof outline and add low areas in the centre of the roof.

Topics Included

- angle help lines
- bisecting help lines
- perpendicular help lines
- changing roof outlines
- adding points to roof outlines
- adding a low area between points
- adjusting cricket tips

Drawing an Angled Roof

Until now, you've drawn roofs that are oriented horizontally and vertically on the roof plan. While some roof edges might have been sloped or curved, the general orientation of the roof was perpendicular. This simplifies drawing with the keyboard. And since the Taper-Plus coordinate system uses a perpendicular orientation, it makes it easier to add points in reference to existing points.

In this tutorial, we'll deviate a little from these perpendicular roofs. You'll draw a simple roof with two wings. One wing is oriented at a right angle, while the other wing is oriented at a 45 degree angle. The roof is pictured in Figure 6-1.

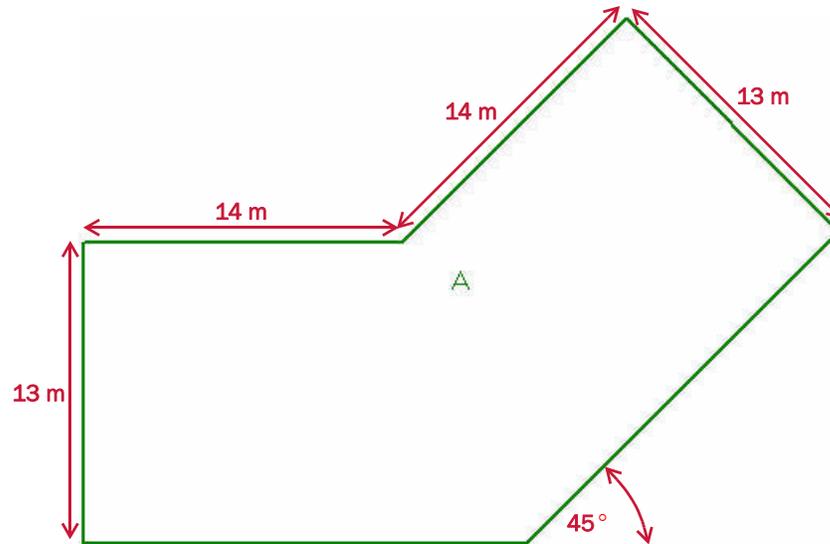


Figure 6-1 Roof outline

While you can easily enter perpendicular roof points with the standard keyboard commands, you'll see that it's also easy to draw roofs at different angles when you use help lines. You'll use help lines to place many of the points in this project.

Adding a New Roof Section

You'll first create a new project and draw a roof section. You won't complete the roof just yet. Later you'll add two help lines before adding the final point of the roof outline.

To draw the roof section

1. Create a new project named **Tutorial 6**, using the default template.
2. Click **Add Section**  and click OK to add a new roof section.
3. Press ENTER to accept the section start point, or click at some other point in the bottom left corner of the drawing area. Make sure **Attach** is off
4. Type **U**, type **13**, and press ENTER.
5. Type **R**, type **14**, and press ENTER.
6. Type **A**, and enter a length of **14 m** and an angle of **45°**.
7. Type **A**, and enter a length of **13 m** and an angle of **315°**.
We'll stop here since we don't know the length of the next edge.
8. Type **Q**, and click **Sloped** to close the roof section.

The roof should look like Figure 6–2.

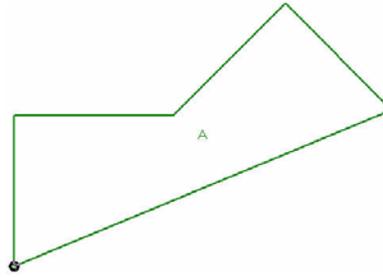


Figure 6–2 Unfinished roof.

More About Help Lines

In “Tutorial 4: Adjusting Crickets”, you used parallel help lines to move cricket points. With the parallel help lines, you were able to adjust a cricket so that its edges were parallel with the edges of other crickets.

While parallel help lines are very useful, they represent just one option for adding help lines. You can add help lines in five ways:

- between two points: either attach to existing points or create new points
- parallel to an existing line
- perpendicular to an existing line
- at a specified angle
- bisecting two existing lines

Note that you can add parallel and perpendicular help lines either singly by selecting Single in the Add Help Line Mode in Interface Settings or you can add multiple help lines at a time by selecting Multiple in the Add Help Line Mode

Help lines can give a visual reference on the roof plan. But they’re most useful used with attach mode. You can attach to any point where a help line intersects with another line on the roof plan, including another help line.

To draw the roof in this project, you’ll add angle, bisecting, parallel, and perpendicular help lines.

Adding Angle Help Lines

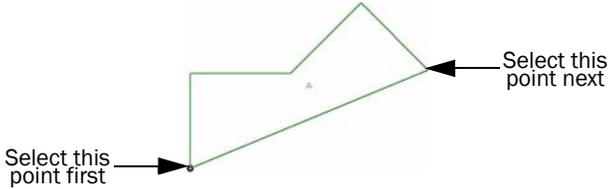
Compare the roof outline with Figure 6–1. Your roof section is still missing one point. You didn’t add it earlier because you didn’t know the length of the last edge. But if you look at Figure 6–1, you can see the angles of the edges:

- One edge is horizontal, at a 0° angle.
- One edge is at a 45° angle.

You can also find points on the current roof outline that each line passes through. So you can add two angle help lines to the roof to represent the desired roof outline. You can later attach the final point on the roof outline to the intersection of the two help lines.

To add angle help lines

1. Click Zoom Current  to zoom into the roof section.
2. On the Inspect & Help Lines toolbar, click Add Help Line .

3. Click Attach  to turn on attach mode.
 4. Click on the bottom-left point of the roof to attach the first help line to the bottom-left corner.
 5. Type A, type 0, and press ENTER to add a horizontal help line.
 6. Click on the last point of the roof section. 
 7. Type A, type 225, and press ENTER to add a help line at 225° ($180^\circ + 45^\circ$).
 8. Right-click to stop adding help lines.
- The roof plan should like Figure 6-3.

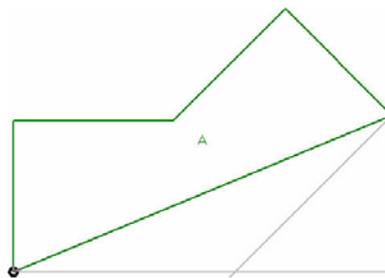


Figure 6-3 Roof A with two angle help lines

Changing the Roof Outline

Now you need to change the shape of the roof outline. On the **Change Roof** toolbar, there are three commands that you can use to explicitly change the shape of the roof outline. In “Tutorial 2: Arcs and Angles” and “Tutorial 4: Adjusting Crickets,” you learned to move points on low areas and crickets. You can use a similar command, to move points on roof outlines. As well, you can add and delete points from a roof outline. There are similar commands on the **Change Low/High Area** toolbar, that move, add, and delete points in low and high areas.

Table 6-1 explains how the change roof point commands affect the shape of the roof outline.

Change Roof Point Commands

Command	Effect on the roof outline
Adjust Point	Changes the length and/or angle of adjacent roof edges
Add Point	Adds another edge to the roof.
Delete Point	Deletes an edge from the roof.

Table 6-1 Change Roof Outline commands

Adding Points to the Roof Outline

You added the angle help lines to indicate where to place the last point of the roof outline. So now, using attach mode, you’ll add a final point to the outline, attaching to the intersection between the two help lines.

To add a point to the roof outline

1. Turn on attach mode if it isn't already set.

2. On the **Change Roof** toolbar, click **Add Point to Section** 

3. Select the bottom edge of the roof.

The mouse pointer jumps to the last point of the roof section.

4. Click on the intersection of the two help lines to place the point.

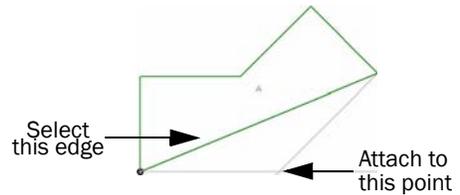
5. Right-click to stop adding points.

6. On the **Inspect & Help Line** toolbar, click **Delete Help Line** .

7. Click on each help line to delete it.

8. Right-click to stop deleting help lines.

The roof outline is complete. It should look like Figure 6-1 on page 70.



Adding Drains on an Angled Roof

Now, you need to add drains to the roof. Both drains should be along a line in the centre of the roof, each 7.5 metres from the edge, as shown in Figure 6-4.

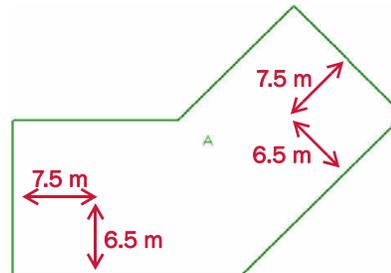


Figure 6-4 Placement of drains

You can easily add one of the drains in reference to the bottom-left point of the roof. However, you don't know the absolute position of the second drain in reference to any point. You only know the position of the drain relative to two angled lines.

Adding Bisecting Help Lines

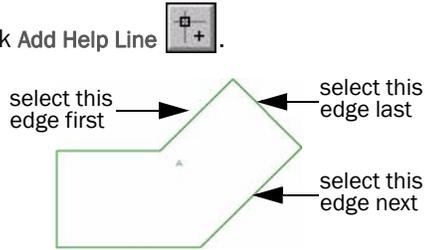
We're designing the drainage of this roof along a line down the centre of the roof. We want drains at points along this line and later low areas along this line as well. Since you're concerned with a line along the centre axis of the roof, you can use bisecting help lines to help visualize this axis.

With bisecting help lines, you need to select two existing lines on the roof plan. Then, Taper-Plus automatically draws a help line, bisecting the two original lines. The angle of the help line is the average of the two angles, and the help line is placed at a distance directly between the two lines. If the lines are parallel, the help line is drawn at the same angle as the other lines, but it's placed directly between them.

In the current project, you'll add a bisecting help line to determine the centre axis of the right side of the roof. You'll also add a second help line, parallel to the far edge to determine where to place the right drain.

To add two help lines

1. On the **Inspect & Help Lines** toolbar, click **Add Help Line** .
2. Type **B** to add a bisecting help line.
3. Click on the top-right edge.
4. Click on the bottom-right edge.
The help line is automatically drawn bisecting the two roof edges.
5. Type **P** to add a parallel help line.
6. Click on the far-right edge to select it.
7. Move the pointer in towards the centre of the roof section.
8. Type **A**, type **7.5**, and press **ENTER** to place the line 7.5 metres towards the centre of the roof.
9. Right-click to stop adding help lines.



Your roof plan should look like Figure 6-5.

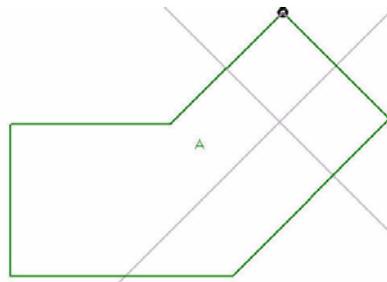


Figure 6-5 Roof with bisecting and parallel help lines.

Adding Drains

Now you'll add the two drains. Add the first drain in reference to the bottom-left corner of the roof. Then, add the second drain at the intersection of the two help lines.

To add two drains

1. Click **Reference Point**  to select a new reference point.
2. Click the bottom-left corner of the roof.
3. Click **Add Drain**  and move the mouse pointer up and to the right from the reference point.
4. Type **A**, enter a horizontal displacement of 7.5 m and a vertical displacement of 16.5 m.
5. Turn on attach mode if it isn't already set.
6. Click on the intersection of the two help lines to place the second drain.
7. Right-click to stop adding drains.

Your roof should have two drains in the places indicated in Figure 6-4.

Adding a Low Area through the Centre of a Roof

Next you need to add a low area along the same axis as the two drains. The low area will go through both drains and create separate two way layouts in each wing of the roof.

In order to draw the low area easily, you'll add another help line along the centre axis of the roof. This help line will run through the first drain, bisecting the top and bottom edges on the left wing of the roof. the low area will then run along the two help lines at the centre of the roof, from the far left edge of the roof to the far right edge.

You can add this help line in a number of ways:

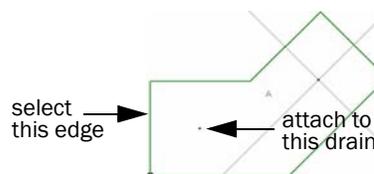
- bisecting the top and bottom edges
- parallel to the top edge and attached to the drain
- perpendicular to the left edge and attached to the drain

Adding Perpendicular Help Lines

As you've already seen, it would be very easy to add a bisecting help line between these two edges. But since you've already added a drain along this line, it's just as easy to add another type of help line. Since you've already added a parallel and a bisecting help line in this project, you'll now add a perpendicular help line. However, the type of help line you add makes no difference to the final result.

To add a perpendicular help line

1. Turn on attach mode if it isn't already set.
2. On the **Inspect & Help Line** toolbar, click **Add Help Line** .
3. Type **D** to add a perpendicular help line.
4. Click on the far left edge of the roof.
5. Click on the left drain to attach the help line to it.
6. Right-click to stop adding help lines.



Adding Low Areas Between Points

You'll use these two help lines to draw the low area along the centre of the roof section. You can add the low area in two ways:

- add an arbitrary low area through multiple points
- add two low areas between two points

We'll add two low areas to the roof. But if you prefer, try using the **Add Arbitrary Low Area** command, and add a single low area. The first low area runs from the far left edge of the roof to the intersection of the help lines. The second low area runs from the end of the first low area to the far right edge of the roof.

To add the low areas

1. On the **Add Low Area** toolbar, click **Add Low Area Between Points** .
2. Click on the intersecting point between the far left edge and the help line.

- Click on the intersection between the two help lines.

The first low area is drawn between these two points.

- Click on the intersection between the two help lines again.

- Click on the intersection between the help line and the far right edge.

The second low area is drawn along the bisecting help line.

- Right-click to stop adding low areas.

- On the **Inspect & Help Lines** toolbar, click **Delete Help Line** , click on all three help lines to delete them, and right-click to stop selecting help lines.

- Click **Draw**  to redraw the roof showing the tapered layout.

- In the **Section Taper** area, click **Rows**. In the **Section Letters** area, click **Rows**. And click **OK**.

Your roof plan should look like Figure 6-6.

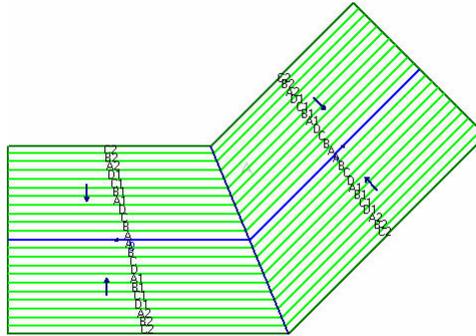


Figure 6-6 Roof with low areas showing tapered layout

Adding Crickets

Next, you need to add crickets to divert water towards the two drains. Like in Tutorial 1 and Tutorial 2, you'll add a full cricket between the two drains and two wide crickets between each drain and the roof edge.

Adding Wide Crickets

You'll first add the two wide crickets since they're easier to add in this project. You'll add these crickets exactly the same way that you've added wide crickets in previous tutorials. It doesn't matter that one of the crickets is on an angle.

To add wide crickets

- On the **Add Cricket** toolbar, click **Add Wide Cricket** .
- With attach mode on, click on the left drain.
- Click on the intersection between the low area and the left roof edge.
- Confirm that **Cricket Entering Settings** is using a **Cricket Width Type** of **Normal**. Type **V**, type **6**, and press **ENTER** to set the width of the cricket.
- Click on the right drain to attach the second cricket.
- Click on the intersection between the low area and the right edge.

7. Type **V**, type **6**, and press **ENTER** to set the width of the second cricket.
8. Right-click to stop adding crickets.

Your roof plan should like Figure 6–7

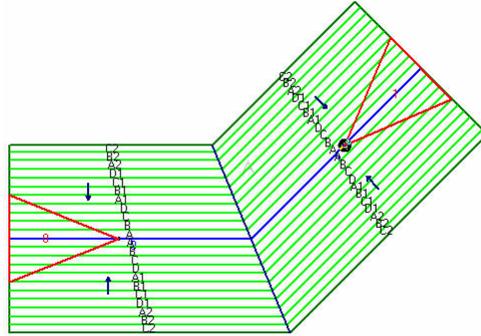


Figure 6–7 Roof with wide crickets

Adding a Full Cricket

You'll now add a full cricket between the two drains. Since the low area isn't straight between these drains, the full cricket shouldn't be straight either. However, all full crickets are symmetric across at least one axis when you add them to the roof plan. You specify the two end points and a tip point. The other tip point is then automatically drawn opposite the first tip.

For now, you'll add the full cricket in the same way as any others. But afterwards you'll need to fix the cricket to account for the irregular roof shape.

To add a full cricket between drains

1. On the **Add Cricket** toolbar, click **Add Full Cricket** .
2. With attach mode set, click on the left drain.
3. Click on the right drain.
4. Click on any point to finish adding the cricket.

You may need to disable attach mode to place the last point of the cricket. You can also type **V and accept the default cricket width.**

Don't worry about the width of the cricket right now. You'll need to adjust the two tips of the crickets in the next step.

5. Right-click to stop adding full crickets.

Adjusting Cricket Tips

We now need to adjust the cricket tips. We want to place the cricket tips at the intersection of the sixth panel line from the low area. In order to do this with accuracy, we'll zoom into the centre of the roof section and change the snap value.

To adjust the cricket tips

1. Turn off attach mode.
2. Click **Zoom**  to specify the area to zoom into.
3. Click on two opposite corners of a box that's big enough to contain both tips of the full cricket and six panel widths of tapered insulation (see Figure 6–8).

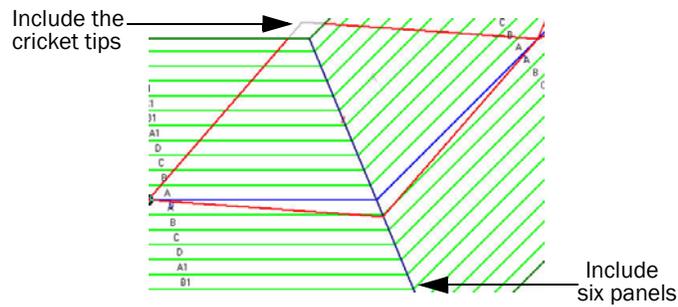
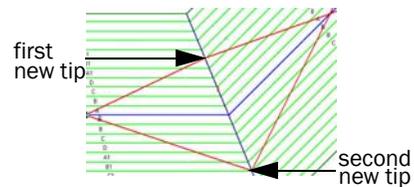


Figure 6-8 Zoomed into the centre of the roof

4. Click Snap Value , type 10, and press ENTER to specify a snap value of 1 cm.
5. On the Change Cricket toolbar, click Point Adjust Cricket .
6. Click on the full cricket to select it.
7. Click on the top point of the cricket to select it, and click where the sixth panel line above the low area meets the valley.
8. Click on the bottom point of the cricket to select it, and click where the sixth panel line below the low area meets the valley.
9. Right-click to stop moving cricket points.



You should change the snap value back to a more reasonable value before continuing to the next tutorial. The snap value is usually 500 mm. You can also zoom out of the roof to view the finished results. The final roof section looks like Figure 6-9.

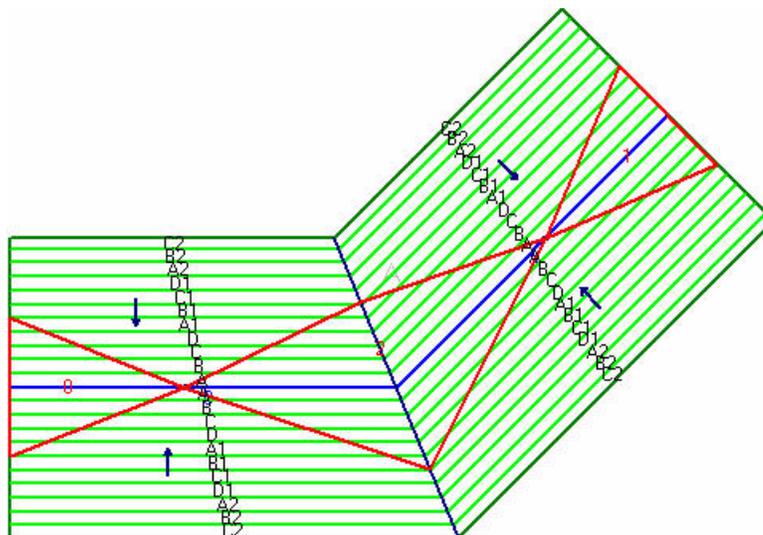


Figure 6-9 Finished roof section

You have completed Tutorial 6. In Tutorial 7: Aligning Panels, you'll create a new project and learn to align insulation panels between different roof sections.

Tutorial 7: Aligning Panels

In this tutorial, you'll explore more ways to design complicated roof layouts. You'll learn to move valleys and align roof panels in order to achieve a correct drainage pattern.

Topics Included

- diverting water around corners
- splitting roofs
- creating one-way layouts
- aligning panels
- measuring distances
- moving low areas
- matching panel thicknesses
- changing roof thicknesses

Drawing a Roof

For this project, you'll continue to use the default template with the FB1% letter scheme (see "Default Project Templates" on page 4.). In this tutorial, you'll match panel thicknesses, so it's important that you use the same letter scheme as shown. If you don't have the FB1% letter scheme, add it before proceeding. Or, if you rather, you can use another 1/100 slope letter scheme with 600 mm by 1200 mm panels.

"Lesson4: Letter schemes and the Materials Database" of the **Taper-Plus Quick Start Guide** contains detailed instructions for adding a letter scheme.

First, you need to open a new project and draw a roof section. The roof in this tutorial is a simple rectangular roof with a protruding section at the top, as shown in Figure 7-1.

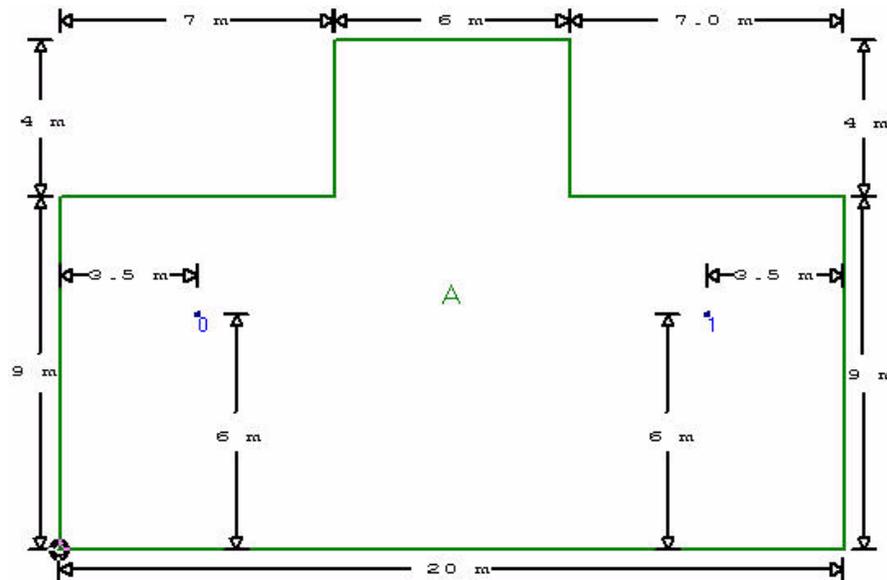


Figure 7-1 Roof Section A

To draw the roof section

1. Open a new project using the default template.
2. Add a roof section using the default name: A.
3. Draw the roof pictured in Figure 7-1, using the U, R, D, and Q keys.

You can stop drawing the roof in the upper right corner and use the Right Angle option to close the roof if you started the roof at the bottom left corner.

4. Add two drains to the roof, as shown in Figure 7-1.

Move the reference point to the bottom right corner to add the right drain.

5. On the Add Low Area toolbar, click Low All Drains .
6. Click Zoom Current  to zoom into the roof.

7. Click Draw  to change the drawing options.
8. In the Section Taper area, click Arrows. And click OK.

The drawing area updates to show the direction of water flow. Your roof section should look like Figure 7-2.

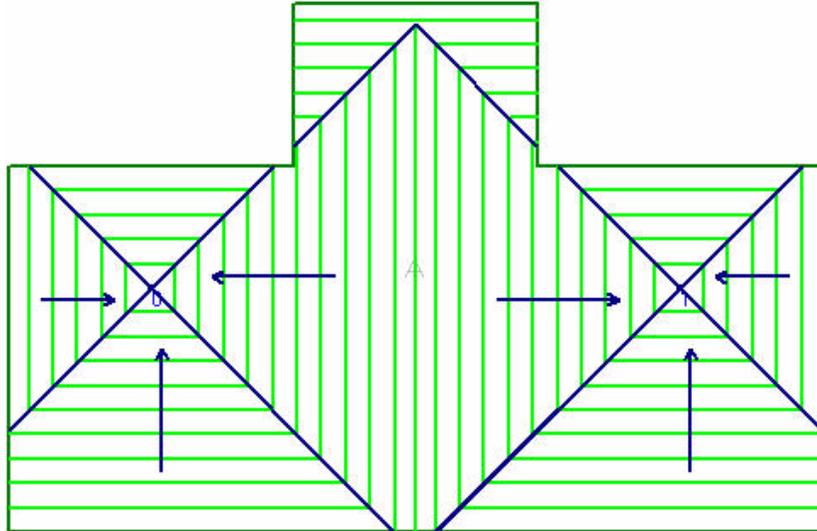


Figure 7-2 Roof A showing direction of water flow

Analysing the Tapered Layout

When you look at the tapered layout of a roof section, you can see the direction that tapered panels are sloped. In Figure 7-2, the arrows represent the direction of slope. This project has a four-way tapered layout, directing water to two different drains. The water flows either directly towards a drain or to a valley that angles towards a drain. Figure 7-3 illustrates this in a close up of the area around the left drain.

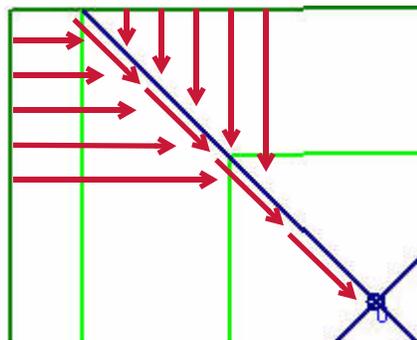


Figure 7-3 Direction of water flow around a valley

On the main part of the roof in Figure 7-2, all water that falls on the roof flows to a drain. However, on the protruding section at the top of the roof, the tapered layout does not work. The valleys do not connect with the main part of the roof. So any water directed into the valleys flows towards the edge of the roof, as shown in Figure 7-4. At the point where the valley meets the edge, water will pool.

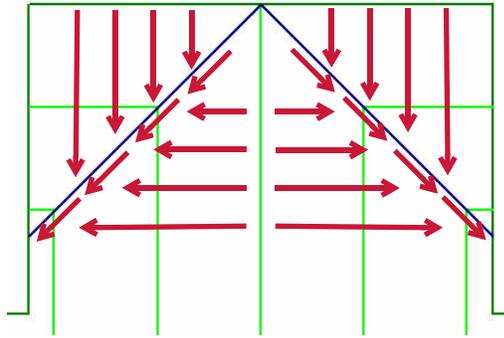


Figure 7-4 Direction of water flow on roof protrusion

Diverting Water Around Corners

To fix the water flow, we need to change the position of the valleys. Instead of leading to the edge of the roof, they should lead onto the main part of the roof. This would direct water around the corners of the roof and towards the drains.

For proper drainage, the valleys at the top of the roof should look like those pictured in Figure 7-5.

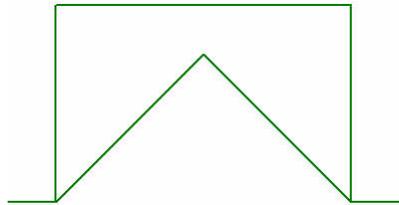


Figure 7-5 Roof protrusion with new valleys

Splitting a Roof

In order to change the tapered layout, you need to split roof A into two separate roof sections. You create separate low areas for each roof section in a project. The low areas on one roof section don't affect the tapered layout on another roof section. You can use these separate low areas to control the tapered layout in different parts of the roof.

Adding a Second Roof

In this example, you'll create new valleys lines by adding a roof section along those lines. When finished, the original roof in your plan will comprise two separate roof sections. The second roof section is shown in Figure 7-6.

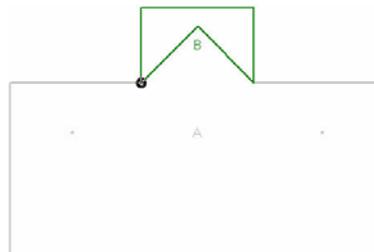
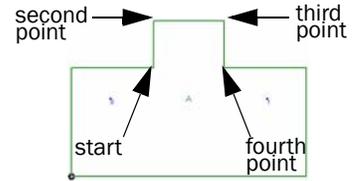


Figure 7-6 Roof A and roof B

To add a second roof section

1. Click Draw  to redraw the roof.
2. In the Section Taper area, click None. And click OK.
3. Click Add Roof Section , and accept the default name: B.
4. Click Attach  to turn on attach mode.
5. Click on the bottom left point of the protrusion in roof A as the starting point.
6. Working clock-wise, click on the three other corners of the protrusion to attach the new roof to these points.
7. Click Attach  to turn off attach mode.
Watch the lower coordinate box to place the last point.
8. Move the pointer up 3 metres and to the left 3 metres, and click to place the last point.
9. Right-click, and click **Sloped** to close the roof section.



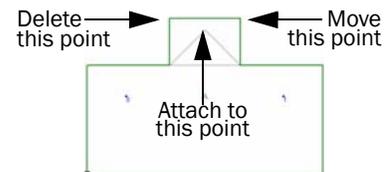
Your project should look like Figure 7–6.

Changing a Roof Outline

You now have two roof sections that overlap, so you need to change the outline of roof A so that it doesn't overlap with roof B. First, delete one of the corners of the protrusion. Then, move the other corner to match it up with the inside tip of roof B.

To change the outline of roof A

1. Select roof A.
2. On the Change Roof toolbar, click Remove Point from Section .
3. Click on the top-left corner of the protrusion of roof A to delete it.
4. Right-click to stop deleting points.
5. On the Change Roof toolbar, click Point Adjust Section .
6. Click on the top-right corner of the protrusion of roof A to select it.
7. Click Attach  to turn on attach mode.
8. Click on the inside tip of roof B to place the corner of roof A.
9. Right-click to stop moving points.



Roof A should look like Figure 7–7.

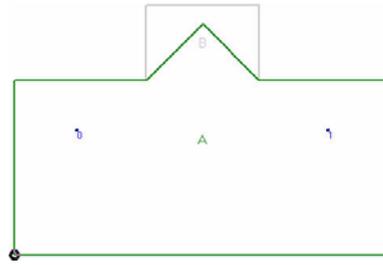


Figure 7-7 Roof A

Creating a One-Way Layout

You still need to design a tapered layout for the new roof section:

- The water flow on roof B should mimic the water flow on the protrusion of the original roof.
- The two bottom edges of roof B represent the two valleys in the protrusion of the original roof.

Look at Figure 7-4 on page 82 to see the tapered layout on the protrusion of the original roof. Notice that the area above the two valley lines slopes down towards the valleys. The four-way layout of the original roof section led to that design.

In order to mimic the slope of the original roof on the new roof section, you need to create a one-way tapered layout on roof B. Since all of roof B is above the valley lines (the bottom edges of roof B), we want all of roof B to slope straight down towards roof A. Figure 7-8 illustrates this layout.

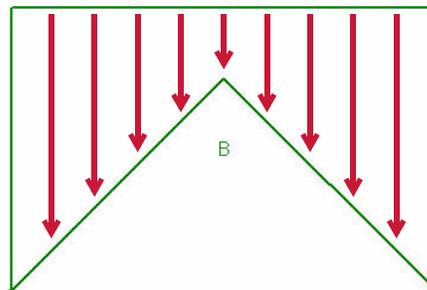


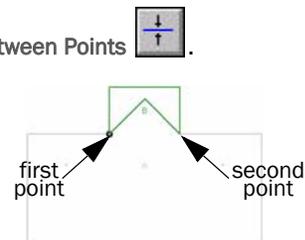
Figure 7-8 Tapered layout of roof B.

Adding a Low Area Between Points

In order to create a one-way tapered layout, you'll add a low area between the two bottom points of roof B.

To add a low area between points

1. Select roof B.
2. On the Add Low Area toolbar, click Add Low Area Between Points .
3. With attach mode turned on, click on the bottom-left point of roof B.
4. Click on the bottom-right point of roof B.
5. Right-click to stop adding low areas.
6. With the Section selection box, select Project to select both roof sections.



7. Click Draw  to change the drawing options.
8. In the Section Taper area, click Short Arrow. In the Section Letters area, click Rows. And click OK.

Your roof plan should look like Figure 7–9.

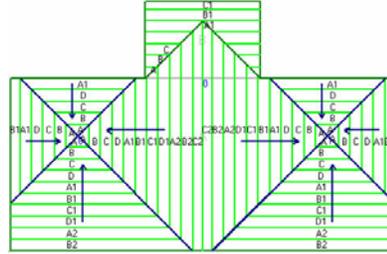


Figure 7–9 Tapered layout

The valleys at the top of the roof section now lead to the corners of the roof. Water should now flow from the protrusion onto the main section of the roof and eventually into the two drains.

Aligning Panels

Look at your roof layout, and examine the border between the two roof sections. You should notice that the panels lines don't match along the border. Figure 7–10 shows this area in detail.

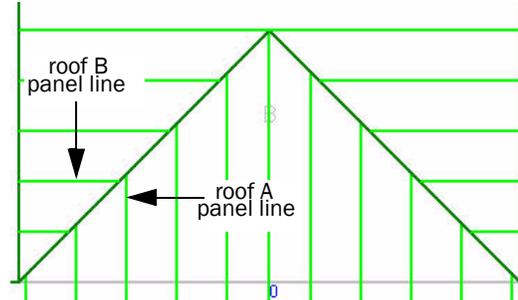


Figure 7–10 Detail of border between roof sections

On the roof plan, a panel line represents the end of one tapered panel and the beginning of the next. Since tapered insulation panels have exact starting and ending thicknesses, the panel lines represent exact elevations. If panel lines are not aligned, then elevations are not equal. This means that there's a change in elevation from one roof section to the next. You need to fix this to create a proper layout.

Taper-Plus starts placing panels at low areas. The thin edge of the first panels lines up with the edge of the low area. The thin edge of the second panel is then placed at the thick edge of the first panel. Subsequent panels are placed one after the other up to the edge of the roof. If the dimensions of the roof require panels with only partial widths, they're placed at the farthest distance from the low area. A roof requiring partial panels is shown in Figure 7–11.

If you choose to use high areas instead of low areas, the full panel is placed at the highest area, and partial panels are placed at the furthest distance from the high area: the lowest points on the roof.

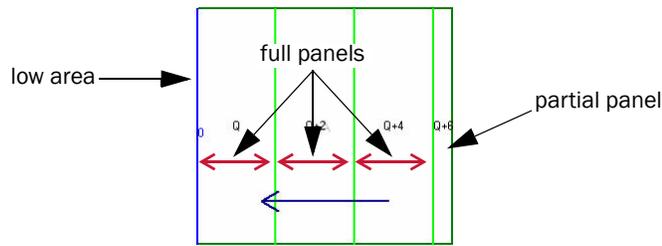


Figure 7-11 Roof requiring partial panels

In our example, one full panel is placed at the bottom of roof B since that's where the low area begins. However, the bottom of roof B does not line up with a full panel on roof A. Roof B meets roof A towards the end of a panel, as illustrated in Figure 7-12.

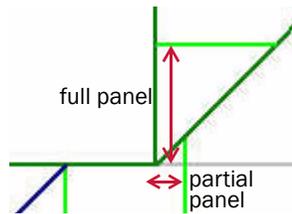


Figure 7-12 Bottom corner of roof B

Measuring Distances

In order to fix the panels, you need to find the distance between the low area of roof A and the intersection with roof B. The total distance doesn't matter, but the horizontal distance determines how many panels are needed and the length of any partial panels.

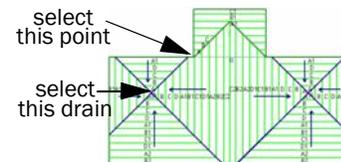
You'll use a Taper-Plus feature to measure the distance between the left drain and the bottom corner of roof B.

To measure the distance between points

1. On the **Inspect & Help Lines** toolbar, click

Measure Distance 

2. Click on the left drain
3. Click on the bottom-left corner of roof B.



The Measure Distance dialogue box opens, as in Figure 7-13.

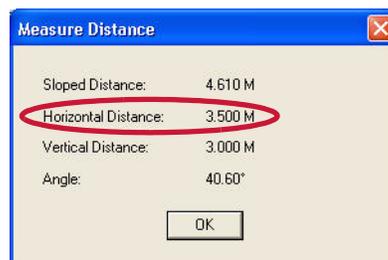


Figure 7-13 The Measure Distance dialogue box

4. Note the horizontal distance, and click **OK**.
5. Right-click to stop measuring distances.

The horizontal distance from the drain to the corner of the roof is 3.5 metres as shown in Figure 7-13. And the panels in our letter scheme (FB1%) are 0.6 metres wide.

Let's analyse the horizontal distance from the low area of roof A to the low area of roof B.

$$\text{distance between low areas} \rightarrow 3.5\text{m} = 5(0.6\text{m}) + 0.5\text{m} \leftarrow \text{0.5 m partial panel}$$

↖ five full panels

So there is 0.1 metre left over on the sixth panel on roof A. This is illustrated in Figure 7-14.

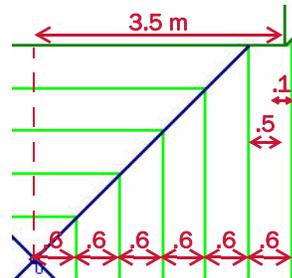


Figure 7-14 Length of panels on roof A.

In order for the panels on the two roof sections to align, you need the first panel on roof B to have a width of only 0.1 metres.

Moving Low Areas

You've seen that complete panels are placed at low (or high) areas. So in order to realign panels, you must move the low area. Taper-Plus calculates where the first panel begins, even if the panel does not begin on the roof section itself.

In this project, you want the first panel on roof B to have a width of 0.1 metres. This means the second panel on roof B will line up with a panel on roof A. Since the panels in the letter scheme (FB1%) are 0.6 metres wide, you need to move the low area down by 0.5 metres. Then the first panel would begin 0.5 metres below the beginning of the roof section and roof B would only use the last 0.1 metres of the panel, as shown in Figure 7-15.

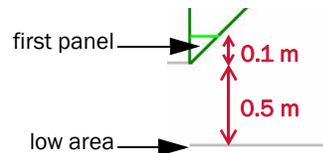


Figure 7-15 Detail of roof B and low area

To move the low area

1. Select roof B.
2. On the Change Low/High Area toolbar, click Move Low/High Area .
3. If attach mode is still set, click Attach  to turn it off.
Watch the top coordinate box to place the low area.
4. Move the mouse pointer down 0.5 m, and click to place the low area.

Make sure that you don't move the low area to the left or right while placing the low area.

5. With the Section selection box, select **Project** once again to view the tapered layout of both roof sections.

The panels on your roof plan should all align. The roof plan should look like Figure 7-16

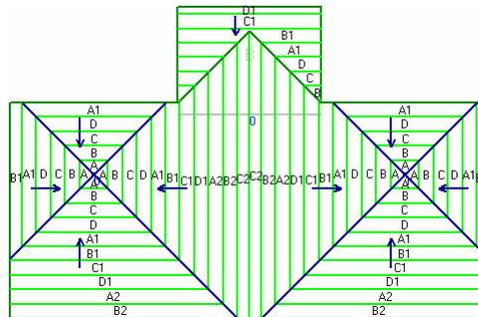


Figure 7-16 Panels aligned

Matching Panel Thicknesses

The panels in the roof sections now appear to be aligned. Every panel line on roof A matches up with a panel line on roof B. However, on closer inspection, you can see that panels on roof A line up with different panels on roof B. A close up of the roof is shown in Figure 7-17.

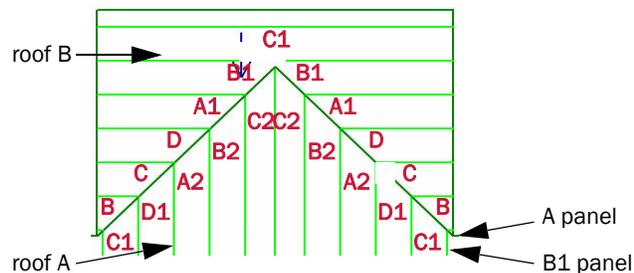


Figure 7-17 Close up of panels

The first panel on roof B is the A panel, the first panel of the FB1% letter scheme. However, it lines up with the sixth panel on roof A, the B1 panel. The panels on roof B are not as thick as the panels on roof A.

In order to match the correct panel thickness you need to change the starting thickness of roof B. This changes the thickness of the first panel at the low area of roof B.

Checking the Letter Scheme

The low area of roof B lines up with the B1 panel on roof A. Before changing the thickness of roof B, you'll check the FB1% letter scheme to see the starting thickness of the B1 panel.

To verify the FB1% letter scheme

1. On the **Setup** menu, click **Letter Schemes**.
2. In the **Setup Letter Schemes** dialogue box, click **FB1%**, and click **Open**.

The Setup Letter Scheme: FB1% dialogue box opens as in Figure 7–18

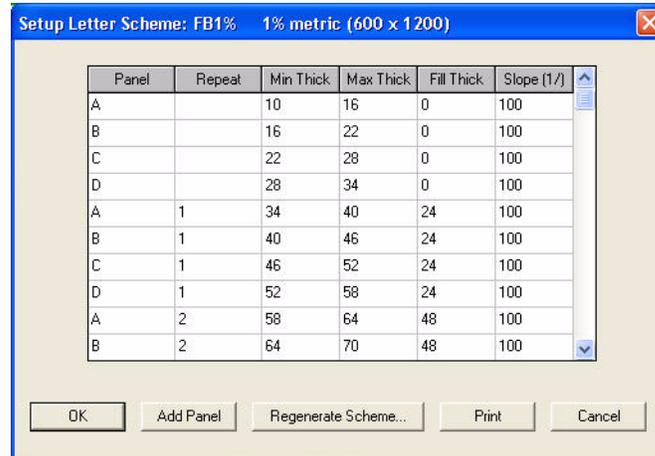


Figure 7–18 Setup Letter Scheme: FB1% dialogue box

3. Note the minimum thickness of the B1 panel.

The B1 panel is the sixth row (as shown in Figure 7–19), and the minimum thickness is listed in the third column.

B	1	40	46	24	100
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Figure 7–19 The B1 row of the FB1% letter scheme

4. Click OK to close the Setup Letter Scheme FB1% dialogue box, and click Close to return to the drawing area.

Changing Minimum Thickness

We want the first panel on roof B to be the B1 panel. So, you'll change the minimum thickness of roof B to 40 mm, the minimum thickness of the B1 panel.

To change the minimum thickness of a roof section

1. With the Section selection box, select roof B.
2. On the Project menu, click Defaults.

The Defaults dialogue box opens at the Section tab.

3. In the Minimum Thickness box, enter 40.

The Minimum Thickness box is in the Section Taper area of the Project Defaults dialogue box. It's shown in Figure 7–20.

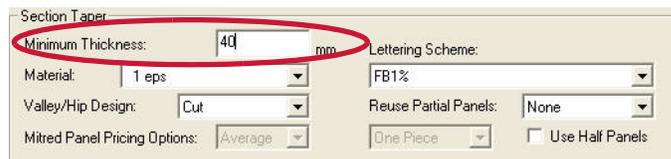


Figure 7–20 Section Taper area of the Project Defaults dialogue box.

4. Click OK to set the new defaults and close the dialogue box.
5. With the Section selection box, select Project to view the tapered layout of the entire roof plan.

Your roof plan is now complete. All water now flows to a drain, and all panels are aligned. It should look like Figure 7–21.

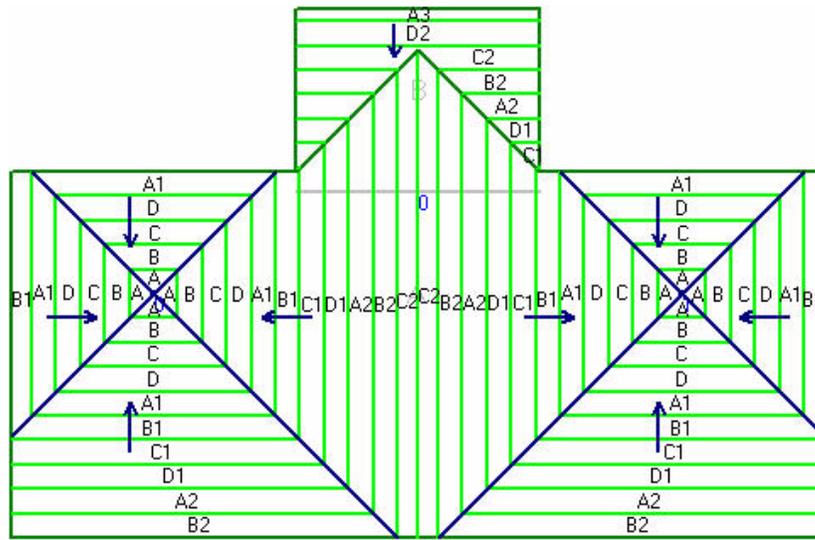


Figure 7-21 Completed roof plan

You have completed Tutorial 7. In Tutorial 8: Constant Perimeter Roofs you'll create a new project and learn to create a roof layout with a constant elevation at the perimeter.

Tutorial 8: Constant Perimeter Roofs

In this lesson you'll look at a simple roof with a constant elevation at the perimeter. You'll design two different tapered layouts for the roof.

Topics Included

- designing a layout with a constant perimeter
- reducing panel waste
- creating a sump at a low area
- erasing crickets and low areas
- using different letter schemes
- adding interior roofs
- adding crickets to interior roofs

Constant Perimeter Roofs

Conditions at the perimeter of roofs often affect tapered insulation layouts. The thickness of flashing may limit the thickness of insulation at the roof edge. The height of adjacent walls and the location of openings in the walls can also affect the layout. As well, many designs require a uniform insulation thickness along roof edges to give a constant fascia profile along an edge or to provide room for other roof details.

When working with Taper-Plus, you normally worry about the insulation thickness at the drains, setting this as the lowest point and building up the insulation towards the perimeter. So conditions at the perimeter of the roof add a further complication to tapered layout designs.

In this tutorial, you'll create a tapered layout for a simple rectangular roof section with one major design criterion: the insulation must have a constant thickness at the perimeter of the roof. We'll approach the problem in two different ways. They both create accurate tapered layouts.

Drawing a Roof

Before worrying about the insulation layout, you'll open a new project and draw the roof outline. This project contains a simple roof section with a single drain at the centre and a low area on the drain. The roof will look like Figure 8-1.

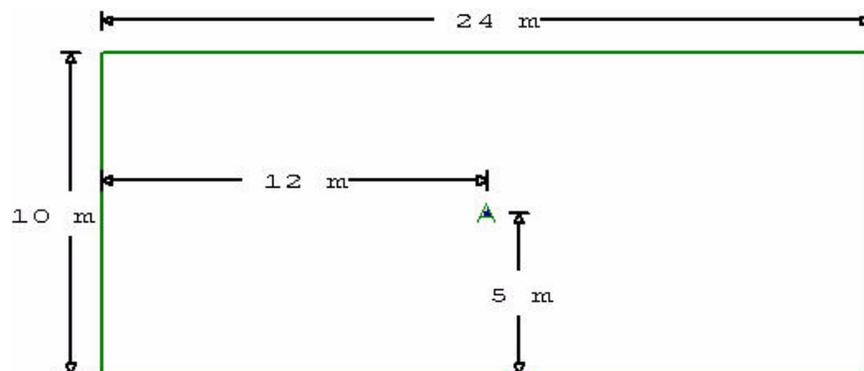


Figure 8-1 Roof outline with drain

To draw the roof outline

1. Open a new project.
2. Add a roof section with the dimensions of the roof in Figure 8-1.
You can draw the roof outline in three steps using the U, R, and Q: Right Angle commands.
3. Add a drain in the centre of the roof, as indicated in Figure 8-1.
4. Add a low area on the drain.
5. Click Zoom Current  to zoom into the roof.
6. Click Draw  to change the drawing options.
7. In the Section Taper area, click Short Arrows. In the Section Letters area, click Rows. And click OK.

The tapered layout of the roof plan should match the layout shown in Figure 8-2.

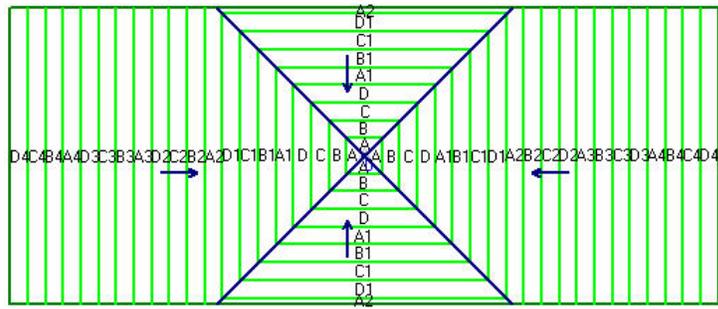


Figure 8-2 Roof outline showing tapered layout

Analysing the Tapered Layout

Look at the tapered layout of the roof section (Figure 8-2). The roof has a four-way layout, directing towards a single point at the centre. Since the length of the roof is much larger than the width of the roof, there are more insulation panels in the horizontal direction than in the vertical direction.

In the horizontal direction, the thickest panel is the D4 panel. In the vertical direction, the thickest panel is A2 panel. So the insulation at the left and right walls is more than six centimetres thicker than at the top and bottom walls. As well, the insulation at the top and bottom walls slopes as it approaches the corners.

A diagram of the insulation at the top wall is shown in Figure 8-3.

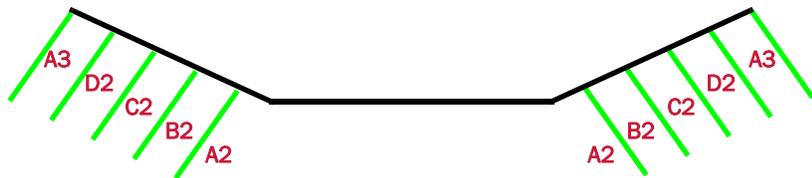


Figure 8-3 Insulation thickness at the top wall

This roof does not have a constant elevation at its perimeter.

Designing a Layout with Constant Perimeter

As you've seen in previous tutorials, the thickness at any one point is determined by the letter scheme and the distance to the low area. In order to have a constant elevation at the roof perimeter, there must be equal distances between all walls on the perimeter and a low area.

Figure 8-4 shows two roofs with constant perimeter elevation. The first roof is a square with a single drain at its centre. The second roof is a rectangle with two drains, each spaced at an equal distance from the side wall and from the top and bottom walls.

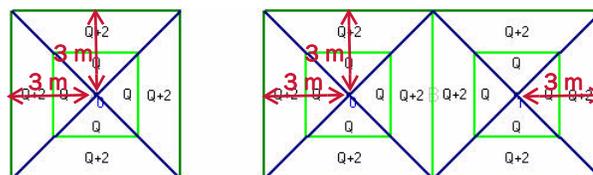


Figure 8-4 Two examples of roofs with constant perimeters

In order for this roof to have a constant elevation at the perimeter, each wall needs to be the same distance from the low area. Since you can't change the dimensions of the roof, you'll need to change the dimensions of the low area.

Currently the top and bottom walls are 5 metres from the low area, and the left and right walls are 12 metres from the low area (see Figure 8-1 on page 92).

Tight now, the distance to the low area is the same as the distance to the drain.

We need the left and right walls to be the same distance from the low area as the top and bottom walls. Instead of keeping the low area at a single point at the drain, you can create a longer low area along a horizontal line in the centre of the roof, as shown in Figure 8-5. All four walls will then be the same distance from the low area. You can fix the drainage later with crickets.

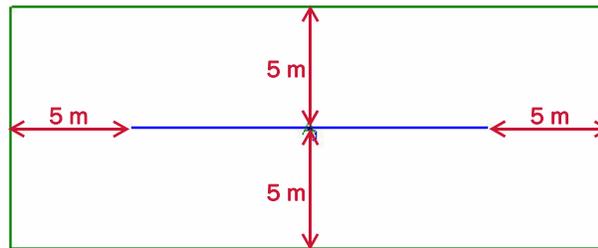


Figure 8-5 Roof with equal distance to low area

Changing the Low Area

You can use a number of techniques to create this long low area. The most obvious way is to use the **Manual Expand Low/High Area** command. However, since you know the distance from the wall to the edge of the low area, you'll start by expanding the low area to the edges of the roof. Then, you'll move each end point 5 metres towards the centre.

It would be very easy to calculate the distance to expand the low area. However, it's just as simple to use these commands, and it avoids unnecessary calculations.

To change the low area

1. On the **Change Low/High Area** toolbar, click **Extend Low/High Area** .

In the command line you're prompted to select the direction to extend the low area, as shown in Figure 8-6.



Figure 8-6 Command line for Extend Low/High Area command

2. Click **Horizontal**.

The low area automatically extends to the sides of the roof.

3. On the **Change Low/High Area** toolbar, click **Point Adjust Low/High Area** .

4. Click on the left point of the low area to select it. Make sure the Reference Point is set on a point which is an even snap value from the low area point being moved.

Watch the bottom coordinate box to place the following points.

5. Move the mouse 5 metres to the right, and click to place the point.

6. Click on the right point of the low area to select it.
7. Move the mouse 5 metres to the left, and click to place the point.
8. Right-click to stop selecting points.

The roof plan automatically updates to show the roof with a constant elevation at the perimeter, as shown in Figure 8-7.

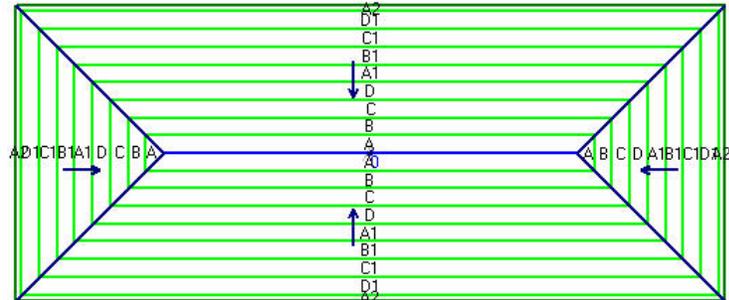


Figure 8-7 Updated tapered layout with constant perimeter

Adding Crickets

The tapered layout is still not complete. To compensate for the long low area, you need to add two full crickets on either side of the drain. The crickets must extend so their tips reach the valleys that lead to the corners of the roof. You'll attach one end of each cricket to the drain at the centre of the roof.

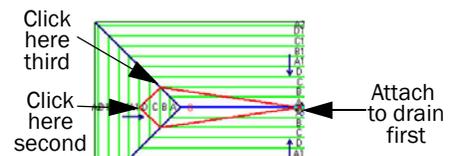
To add full crickets

1. On the Add Cricket toolbar, click Add Full Cricket . Make sure Snap Value is 12"
2. Click Attach  to turn on attach mode.
3. Click on the drain to attach the first cricket point to the drain.
4. Click Attach  again to turn off attach mode.
5. Place the other end of the cricket at a point along a horizontal line from the drain, four panel widths from the end of the low area.

You can place this point in a number of ways:

- watch the coordinate boxes to make sure that you only move the pointer in a horizontal line
- move the reference point to the end of the low area, and change the snap value to 600 mm, the width of a panel
- turn on Ortho mode to make sure you only move in right angles from the reference point

6. Click on the intersection between the valley line and the corner of the B panel.
7. Repeat on the other side of the roof, to add another full cricket mirroring the first one.
8. Right-click to stop adding full crickets.
9. If you wish, redraw the roof to show the cricket panels.



The roof layout should appear as in Figure 8–8.

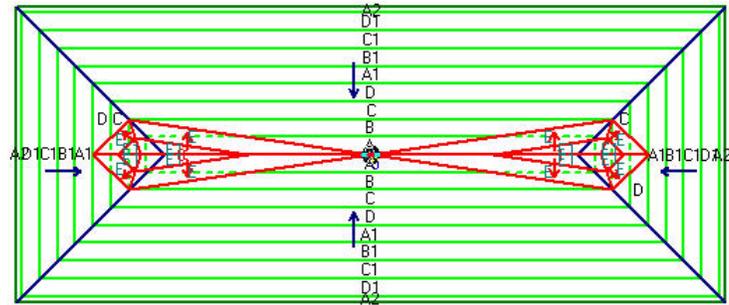


Figure 8–8 Constant perimeter roof with crickets

Reducing Panel Waste

The tapered layout shown in Figure 8–8 is complete. There's a constant elevation at the perimeter of the roof. And, after adding the crickets, the water now flows towards the drain.

However, notice that only a small portion of A2 panels are used at the perimeter of the roof. Given the distance from the low area to each wall, 5 metres, there's room for eight complete panels and 20 cm of a ninth panel in each direction from the low area:

$$\begin{array}{l} \text{distance to} \\ \text{low area} \end{array} \rightarrow 5\text{m} = 8(0.6\text{m}) + 0.2\text{m} \leftarrow \begin{array}{l} \text{8 complete panels} \\ \text{0.2m remaining} \end{array}$$

The layout only uses the thinnest part of the A2 insulation panels at the perimeter. So for every Y+2 panel in the layout, you waste the thickest three feet of the panel.

Creating a sump at the low area

To reduce the waste, you'll create a sump around the drain, like in Tutorial 3. Since there are crickets covering most of the low area, this won't affect the drainage of the system very much and it will greatly decrease the amount of wasted panels.

To create the sump, expand the low area by 0.2 metres in every direction.

To expand the low area

1. Click Snap Value .
2. Type 200 to set the snap value 20 cm.
3. On the Change Low/High Area toolbar, click Manual Expand Low/High Area .
4. Press the UP ARROW KEY, to expand the low area up by 20 cm.
5. Press the RIGHT ARROW KEY, to expand the low area to the right by 20 cm.
6. Press the DOWN ARROW KEY, to expand the low area down by 20 cm.
7. Press the LEFT ARROW KEY, to expand the low area to the left by 20 cm.
8. Press ENTER to accept the new dimensions.

The tapered layout should be complete. The roof no longer uses the A2 panels. The update layout is shown in Figure 8–9.

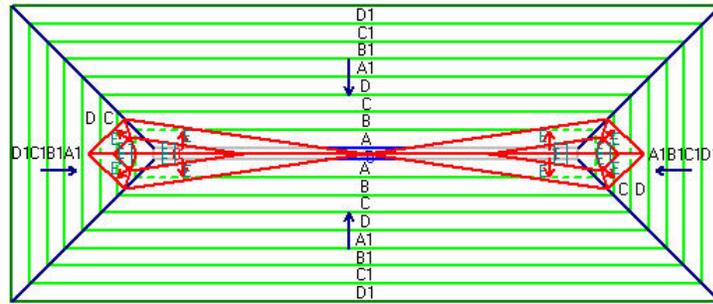


Figure 8–9 Completed tapered layout

Now that you've created a sump around the drain, you should replace the two full crickets with snub-nosed crickets. For more information, see "Snub-Nosed Crickets" on page 37.

Another Approach

Like with any tapered insulation project, there is more than one possible design for this roof. We'll now consider a different approach to this problem. If you want to compare the price of the two systems, you can estimate the project and create a price report. You might also want to open a new project and redraw the roof to compare the two layouts later. Otherwise, just erase the crickets and low area.

Erasing crickets and low areas

On the **Erase** toolbar, you can access a number of commands that let you individually select roof sections, drains, low/high areas, and crickets. You just select the command and click on the objects that you want to erase.

In our present case, we want to create a new layout from scratch. For reference, it's easiest to start cricket and low area numbering at zero. It isn't important in this project with such a simple roof, but in larger projects it's much simpler always to start the numbering at zero.

You'll use the **Erase All** command to erase both crickets and the low area at the same time. As well, with this command, the numbering of the crickets and low areas starts again at zero.

To erase the crickets and low areas

1. If the **Section** selection box shows that **PROJECT** is selected, select roof **A** instead.
2. On the **Erase** toolbar, click **Erase All** . The **Erase All** dialogue box opens.
3. Click **Erase All Low/High Areas in Current Section**, and click **Erase All Crickets in Current Section**, as shown in Figure 8–10.

If these options are not available, it's because the project is selected. Close the dialogue box, and double-click on roof A to make sure it's selected.

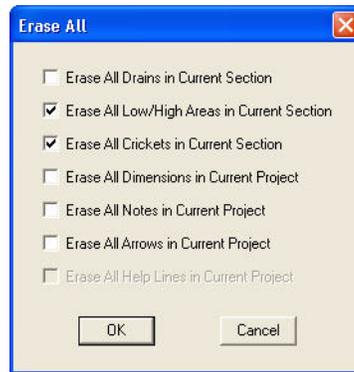


Figure 8–10 Erase All dialog box

4. Click OK.

The roof plan should now contain only the roof outline and the drain as in Figure 8–1 on page 92.

Using Different Letter Schemes

Up until now we've designed tapered layouts using the FB1% letter scheme. Now we'll try using two different letter schemes in the same roof plan.

We still want to design a roof with a constant elevation at the perimeter. Since the roof is much longer from left to right than from top to bottom, we'll use a flatter letter scheme in the horizontal direction than in the vertical direction.

You'll continue to use the FB1% letter scheme on the sides of the roof plan, and you'll use the FB2% letter scheme at the top and bottom. The slope at the top and bottom will be twice as steep as the slope at the two sides.

If you don't have the FB2% letter scheme or an equivalent with 1/50 slope and 600 mm by 1200 mm panels, add this letter scheme before proceeding. See "Lesson4: Letter schemes and the Materials Database" in the *Taper-Plus Quick Start Guide* for instructions.

Designing a Layout

In the first part of this tutorial, we saw that each wall needs to be the same distance from the low area in order to create a constant elevation at the perimeter of the roof. However, now you'll use two different letter schemes to create the layout, and you need to determine the following:

- The distance from the wall to the low area for each letter scheme.
- The shape of the area occupied by each letter scheme.

Calculating the distance to the low area

Since the slope at the right and left sides of the roof will be different than at the top and bottom, the distance to the low area should also be different.

To get to an equal elevation, a letter scheme with half the slope needs twice the distance. This is illustrated in Figure 8–11.

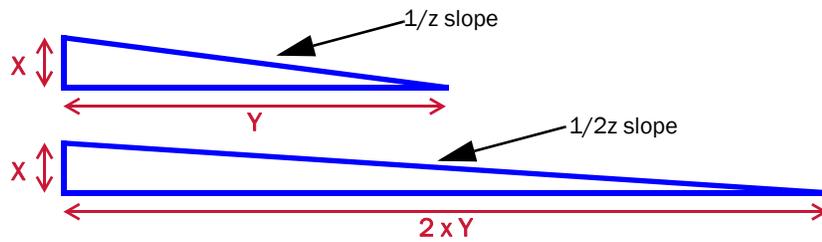
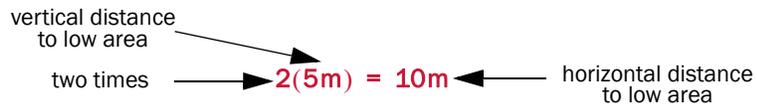


Figure 8-11 Relative distances and elevations of letter schemes

In this project, a 1/100 letter scheme has half the slope as a 1/50 letter scheme. To get to an equal elevation, the FB1% letter scheme will need to cover twice the distance as the FB2% letter scheme. Or, put another way, the distance to the low area will be twice as long.

You know that the distance from the top and bottom walls to the low area is 5 metres. Next, you need to calculate the distance from the right and left walls to the low area:



So the vertical distance is 5 metres, and the horizontal distance is 10 metres.

The shape of each letter scheme

We want to design a four-way layout for the roof. Figure 8-12 shows two perfect four-way layouts. The left roof is square and it uses only one letter scheme. The right roof is rectangular and it uses two letter schemes. The width of the rectangle is twice as long as the height. Both roofs have a constant elevation at the perimeter.

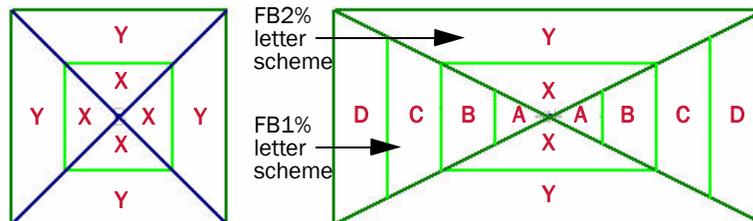


Figure 8-12 Example four-way layouts

Look at the roof on the right in Figure 8-12:

- The letter schemes change along valley lines.
- The area covered by each letter scheme is triangular.

To summarize, the tapered layout in this project has the following properties:

- It uses the FB2% letter scheme at the top and bottom of the roof and the FB1% letter scheme at the left and right.
- The top and bottom walls are 5 metres from the low area.
- The left and right walls are 10 metres from the low area.
- The areas using each letter scheme are triangular, with its edges representing valleys.

Figure 8-13 shows the roof in this project outlining the areas occupied by each letter scheme.

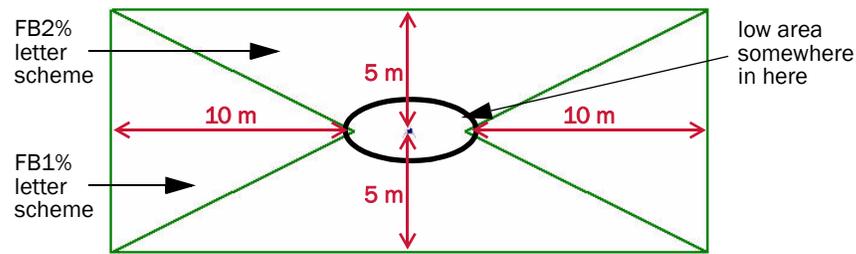


Figure 8-13 Outlines of areas with different letter schemes.

Interior Roofs

In Taper-Plus, you can only assign one letter scheme to a roof section. In order to define an area with a different letter scheme, you need to add a separate roof. In “Tutorial 7: Aligning Panels,” you added a second roof section, and then you changed the outline of the original roof so that they didn’t overlap. You’ll complete a similar task now, except you’ll add an interior roof section instead of a regular roof section.

Interior roofs are attached to existing roofs. When you select the primary roof you also select all of its interior roofs. When you add an interior roof, the areas on the primary roof that it overlaps are erased from the section. This means that you don’t need to change the shape of the initial roof outline after adding interior roofs.

So when you add an interior roof section you complete two tasks:

- You add a new roof section to the project.
- You either change the roof outline of the primary roof or add a void to the primary roof where they overlap.

Adding Interior Roofs

You’ll now add two interior roof sections to the areas where we want to use the FB1% letter scheme.

To add interior roof sections

1. Click Add Section  to add a new roof section.

The Add Roof Section dialogue box opens.

2. In the Roof Section Type area, click Interior (as shown in Figure 8-14), and then click OK.

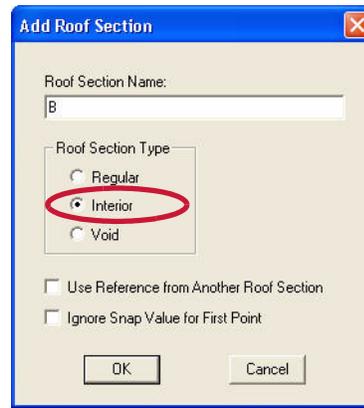
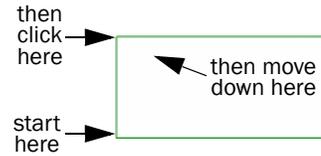


Figure 8-14 Add Roof Section dialog box

You can accept the default name, as shown here, or give the roof a more descriptive name.

3. Click Attach  to turn on attach mode.
4. Click on the bottom left corner of roof A to place the starting point.
5. Click on the top-left corner of roof A.
6. Move the pointer down and to the right, then press S to specify a sloped point.
7. Enter a horizontal displacement of 10 metres and a vertical displacement of 5 metres, and press ENTER.



Remember from before that these coordinates are the distances from the walls to the low area.

8. Type Q, and click Sloped to close the roof section.
The **Select Enclosing Roof Section** dialogue box opens. This is where you select the roof section that contains the interior roof. Since there's only one roof section in our roof plan, it only lists roof A.
9. Click OK to select roof A and close the roof section.
10. Add a second interior roof on the other side of roof A.

If you accepted the default names, the roofs should be named B and C. In this tutorial, the second roof is referred to as roof B, and the third roof is referred to as roof C.

You can add roof C in a number of ways:

- Draw the roof the same way as roof B.
- Use the **Mirror Section** command to create a mirror image of roof B and attach it to the corner of roof A.

Your roof plan should look like Figure 8-13 on page 100.

Specifying Letter Schemes

Next, you need to specify a different letter scheme for roof A. You'll use the FB2% letter scheme, one of the Taper-Plus default letter schemes. The two interior roofs will continue to use the FB1% letter scheme.

To specify a letter scheme

1. Select roof A.
2. On the Project menu, click Defaults.

The Project Defaults dialogue box opens at the Section tab.

3. Scroll down the Lettering Scheme box, and click FB2%.

The Lettering Scheme box is located in the Section Taper area of the dialogue box, shown in Figure 8-15.

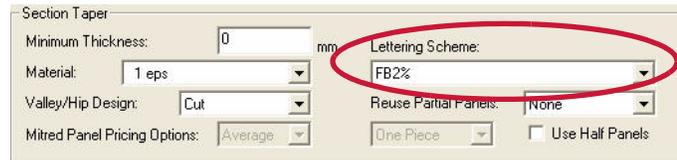


Figure 8-15 The Section Taper area of the Project Defaults dialogue box

4. Click OK to save the settings.

Creating the Tapered Layout

Next we need to create the tapered layout for this project. In general we want to design a four-way layout. But since the project contains three roof sections, you need to create three tapered layouts, one for each section.

The borders between the interior roofs and the main roof represent valley lines. So you have already created the valleys just by adding the interior roofs, and none of the roof sections will have its own four-way layout.

On the main roof section, we want to create a two-way layout directing water towards a horizontal line at the centre of the roof. On the two interior roofs, we want to create one-way layouts directing water towards the tip of each roof section.

Unlike the roofs pictured in Figure 8-12 on page 99, this roof shape does not produce a perfect four-way layout. So you'll also need to add crickets to divert water to the drain in the middle of roof A.

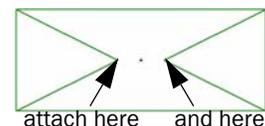
Adding Low Areas

You now need to add low areas to the roof plan. Since there are three roof sections, you need to add three low areas. You'll start by adding simple low areas, which you'll later fix to get the correct layout.

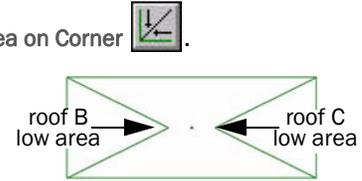
Add a low area between points to roof A, attaching the ends to the tips of the interior roofs. Then add corner low areas to the tip of each of the interior roofs.

To add low areas to the roof

1. Select roof A.
2. On the Add Low Area toolbar, click Add Low Area Between Points .
3. With attach mode turned on, click on the point at the tip of roof B to place one end of the low area, then click on the point at the tip of roof C to place the other end of the low area.
4. Right-click to stop adding low areas.
5. Select roof B.



6. On the Add Low Area toolbar, click Add Low Area on Corner .
7. Click on the tip of roof B, and right-click to stop adding low areas.
8. Select roof C, and add a low area on its tip.
9. Select roof A in order to view the tapered layout of all roof sections.



Remember, selecting roof A selects all interior roofs in roof A as well.

The tapered layout automatically updates. The roof plan should look like Figure 8–16. Notice that roof B and roof C use different panels than roof A.

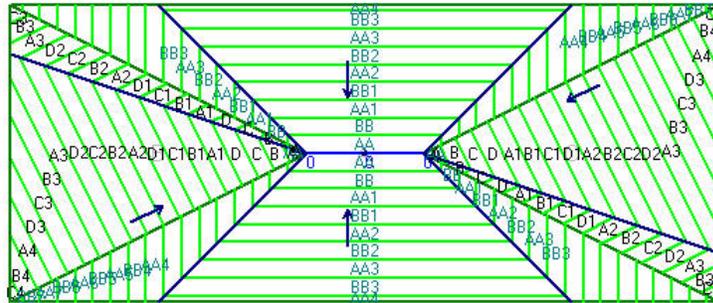


Figure 8–16 Roofs A, B, and C with low areas

Fixing the low areas

The layout that you created is obviously not complete. But you can easily fix the low areas to produce a correct layout in each section. You'll now use the Extend Low Area command, and Taper-Plus will automatically expand the low areas to create the proper layout.

To extend the low areas

1. Select roof A.
2. On the Change Low/High Area toolbar, click Extend Low/High Area .
3. Select roof B.
4. On the Change Low/High Area toolbar, **Point Adjust Low/High Area** .
5. Click on points and extend the low area up and down.
6. Select roof C.
7. On the Change Low/High Area toolbar, click **Point Adjust Low/High Area** .
8. Click on points and extend the low area up and down.
9. Select roof A in order to view the tapered layout.

Your roofs should now have the correct tapered layout, as shown in Figure 8–17.

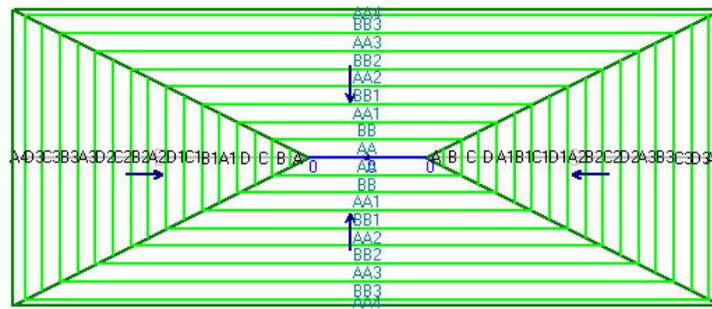


Figure 8-17 Roofs A, B, and C with correct layout

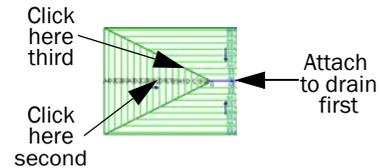
Adding Crickets

You've created a tapered layout that directs water towards a valley at the centre of the roof. You now need to direct the water to the drain in the middle of the valley. Like in the first half of this tutorial, you'll add full crickets to complete the layout.

To add the full crickets

1. Select roof A.
2. On the Add Cricket toolbar, click Add Full Cricket.
3. With attach mode turned on, click on the drain at the centre of the roof.
4. Turn off attach mode to enter the other cricket points.

5. Move the pointer directly to the left and click at the intersection between the low area and the eighth panel line.
6. Click at the intersection between the valley line and the fourth panel line



A window opens stating that points might have been entered outside of the roof section.

7. Click OK.

The cricket is added, but any cricket lines that are outside of the roof section are grey.

8. Add another full cricket on the other side of roof A.
9. Right-click to stop adding full crickets.

Your roof plan should look like Figure 8-18.

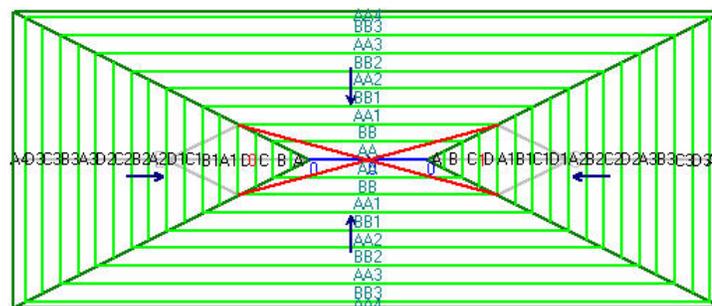


Figure 8-18 Full crickets on roof A.

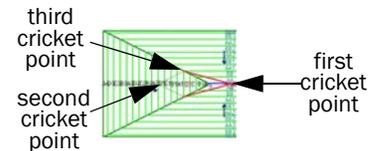
Adding Crickets to Interior Roofs

You should notice that the cricket lines that lie outside of roof A are grey. In Tutorial 2, you saw that Taper-Plus automatically cuts off cricket panels that are outside of a roof section. Since the area occupied by roof B and roof C is no longer part of roof A, the crickets in this area are cut off.

To make up for this, you need to add two new crickets: one on roof B and one on roof C. You'll attach the new crickets to the crickets on roof A to make sure that they have the same shape.

To add crickets to the interior roof sections

1. Select roof B.
2. On the Add Cricket toolbar, click Add Full Cricket .
3. Click Attach  to turn on attach mode.
4. Click on the drain to attach the cricket to it.
5. Click on the far end of the full cricket on roof A.
6. Click on one of the tips of the cricket on roof A.
7. Right-click to stop adding crickets to roof B.
8. Add a full cricket to roof C on top of the right cricket on roof A.
9. Select roof A to view the tapered layout all roof sections.



The project is complete. Your roof plan should look like Figure 8-19.

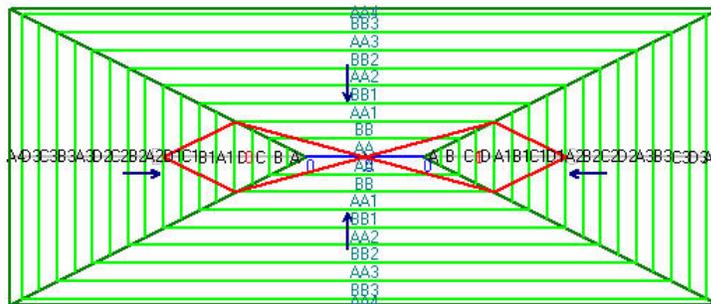


Figure 8-19 Finished roof plan

Going Further

Like in the first half of this tutorial, this roof layout uses partial panels all along its perimeter. You can fix this easily, though it will take a few more steps than it did earlier. Here's an outline of some steps you can take to reduce the panel waste.

- Expand the low area on roof A 20 cm up and 20 cm down.
- Expand the low area on roof B 40 cm to the left, 20 cm up, and 20 cm down.
- Expand the low area on roof C 40 cm to the right, 20 cm up, and 20 cm down.

You can also replace the full crickets on roof A with snub-nosed crickets.

Congratulations, you've completed the Taper-Plus Advanced Tutorials.

For further information on any of these topics, see the Taper-Plus on-line help.

