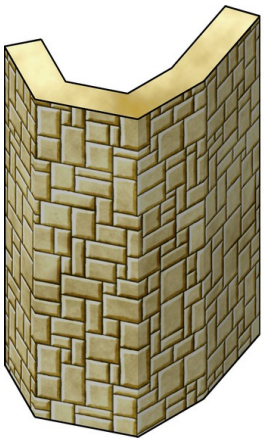
Wrapping the Walls
A CC3+/Perspective 3 Article

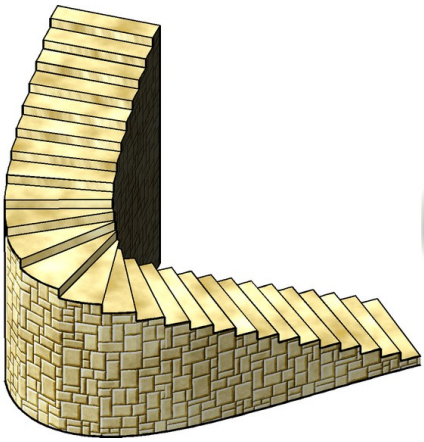
Wrapping the Walls
A CC3+/Perspective 3 Article

Content



4

13



18

24

Credits

Text, layout, maps and methods by Joachim de Ravenbel.
Proofreading and technical advice by KenG.

Introduction

The release of the Perspective 3 (P3) add-on for Campaign Cartographer 3+ gave us a lot of new possibilities, the ability to now use bitmap fill styles not the least. This article will describe a method to create 3D vertical entities, like walls and pillars, with an almost seamless pattern and any bitmap fill style.

The P3 add-on is mostly designed to use image files with no strict patterns (bricks, tiles…) but with hatch styles you can simulate said patterns. This article will show you how to apply even patterned textures with P3, as you can see it on the sample map shown on the front page.

A word of caution though, the process described here takes a lot of time and uses very advanced tools.

Requirements

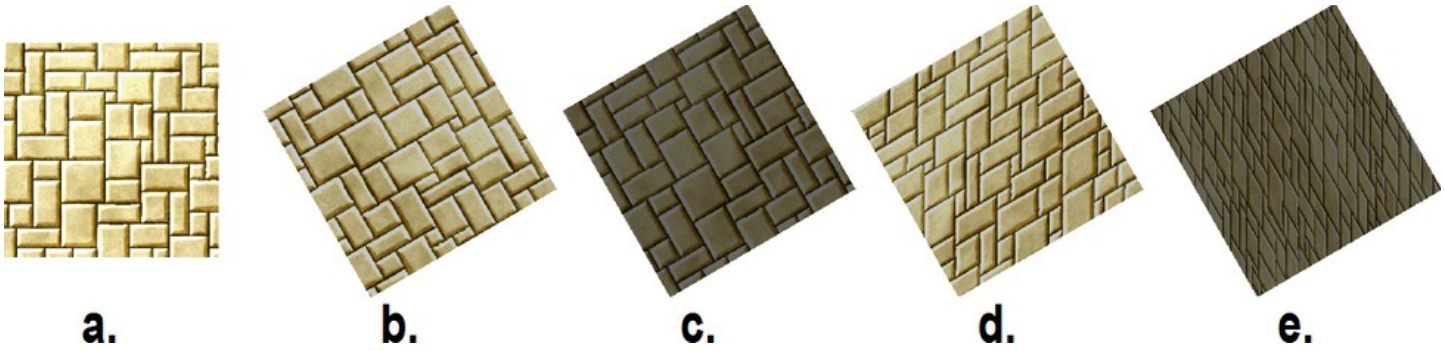
This article assumes that you know how to:

- Draw lines  , polygons  , multipolys  , circles  and arcs  .
- Trim an entity, to anywhere  , to another entity  , two entities to intersection  , especially when one of these entities is an arc and the result is not the expected one (see Appendix A page 42).
- Use the endpoint  (**F5**) and intersection point  (**F6**) modifiers.
- Use the move command  with the displacement option.
- Handle Sheets.
- Use the 3D projection tool  (from Perspective 3).

A basic understanding on how isometric perspective works will also be useful but the main thing you need to know for this article is that heights are vertical and at full length and that most of the rest is distorted, in a graceful way, sure, but nonetheless distorted.

About shaded polygons

P3 relies heavily on a new version of shaded polygons to handle fill styles. Shaded polygons where first designed to rotate a fill style and change its colors to show the different slopes of roofs seen from above.
P3 uses *sheared* shaded polygons where the bitmap file is distorted, following the rules of the isometric perspective.

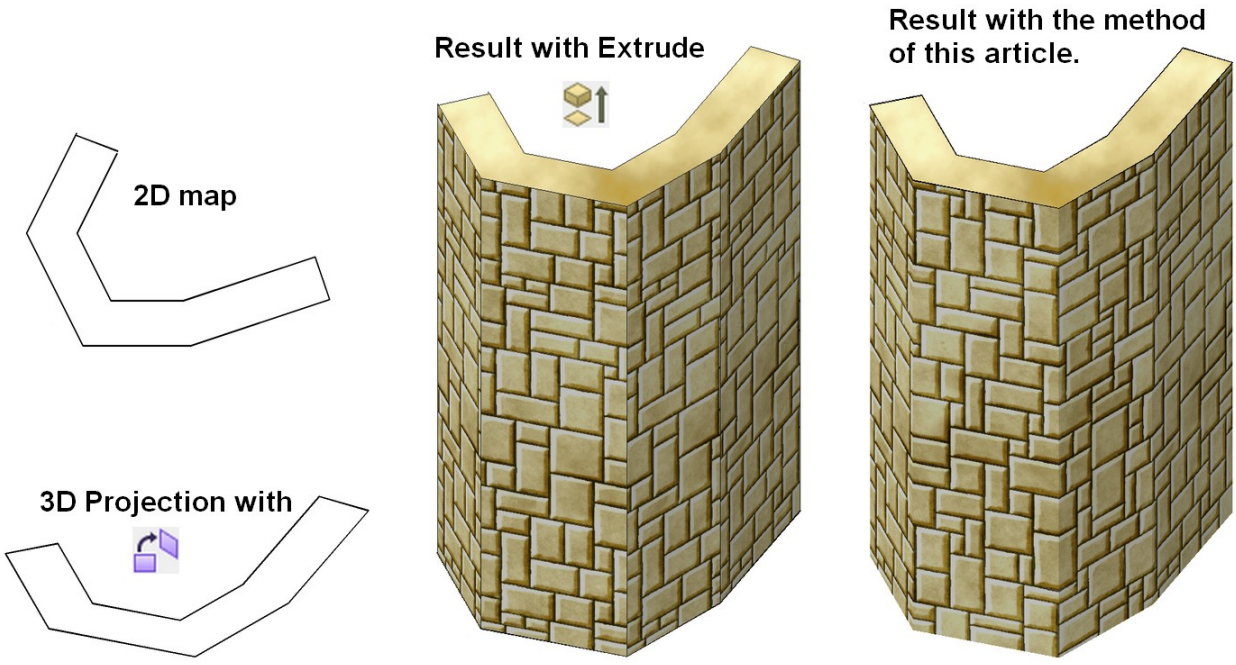


a. Regular polygon. Stone are rectangles. b. and c. *roof* shaded polygons with angles of 30° and 120°. Stones are still rectangles. d. and e. *P3* shaded polygons with angles of 30° and 120°.

To learn more about how to use shaded polygons, please check **Shaded Polygons: Roofs, Rotated Fill Styles and Perspective**.

I-1 A simple wall

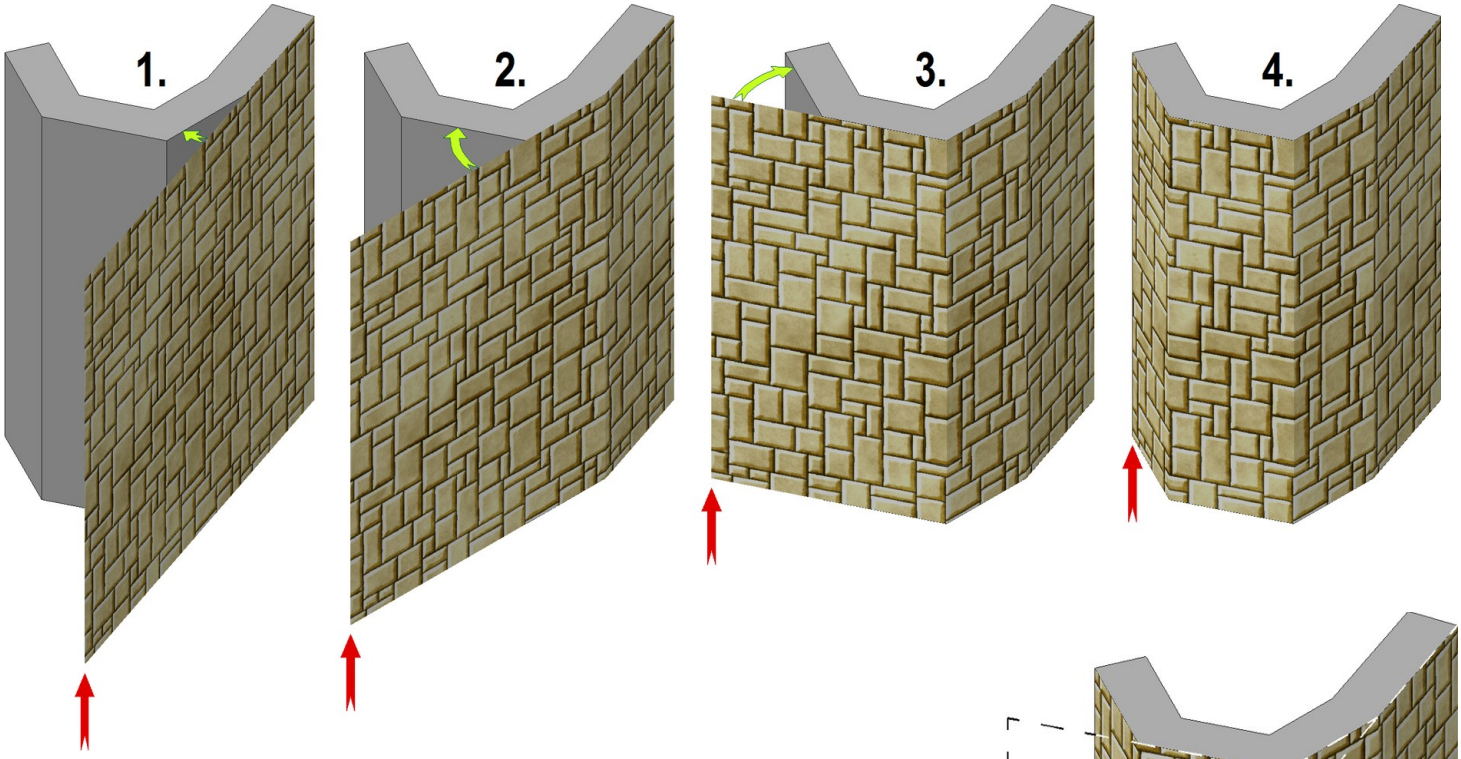
If you've mapped castles or temples set on a rocky outcrop, you probably encountered wall with odd angles before. For the first example, a wall that looks like the top-left picture below in 2D mapping is projected in a flat area in 3D mode that is then extruded. The result is nice but if you look closely, you'll notice that the stone pattern doesn't follow around the edges.



The method described in this article produced the rightmost picture where the joining of faces is almost seamless.

I-2 The theory

To understand how to get a seamless pattern, consider wrapping some textured wallpaper around your 3D shape: first you glue the wallpaper on a face, on the picture below it's the rightmost face (**1.**). Then you brush some glue and fold the paper carefully over the next face (**2.**).
And so on (**3. 4.**)…

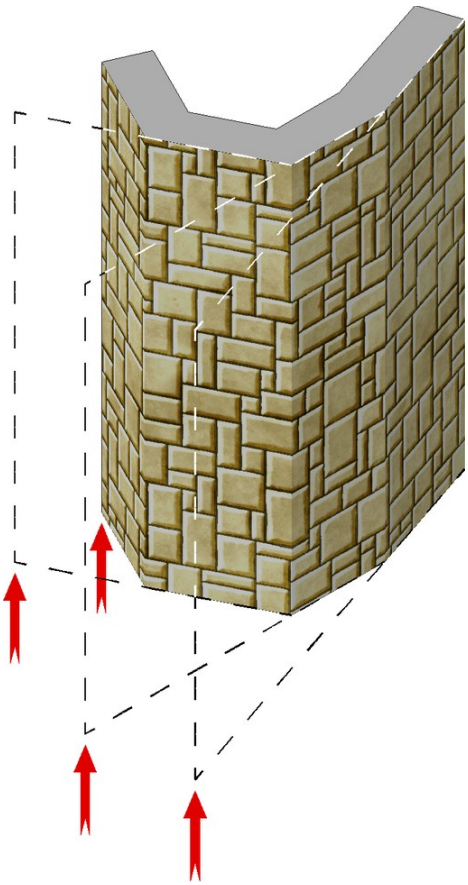


Take a look at the red arrows. They point to a corner always displaying the same combination of stones.
These corners represent the ***fill style origin point*** for each face. It's the point where the bitmap file is applied from. Each of the shaded polygon from the final object uses its fill style origin point.

Getting the fill style origin point of the leftmost face is easy: it's an endpoint of the 3D projection.

The other fill style origin points require more work. To get them, you need to ***unwrap*** your shape.

And as wrapping the wallpaper required folding in a circular motion, unwrapping will need unfolding in the opposite circular motion. To unwrap the wall, arcs will have to be drawn.

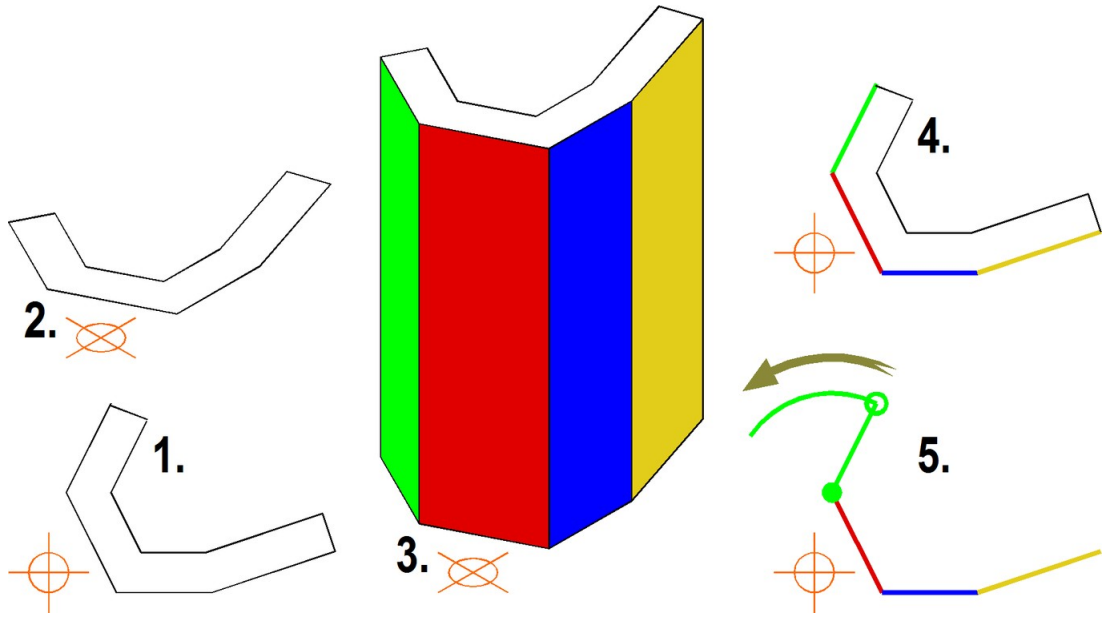


I-3 Unwrapping the wall

1. First, we only have to consider the visible faces of the perspective view. Take your 2d map. If you don't have access to the 2d map anymore, because you want to revamp an old perspective map you've done or found, see appendix B page xxxx.
   Add a visor (draw two lines and a circle) as a reference point. Set the ***map origin point*** at its center using the ***view*** → ***Move Origin*** (**ORIGIN**↵) command and the ***Intersection modifier*** (**F6**). This point is very important, particularly if you like to work on empty spaces on your map, like doodling or writing notes in a margin, to bring a result back in place.
2. Use the ***3D projection*** (**IPROJ**↵) tool to project your map, from the center of the visor to your target point (anyplace with enough room around it).
3. ***Copy*** (**COPY**↵) the 3D projection (but not the visor) at the desired height (for example from 0,0 to 0,10 for a height of 10) then draw the ***Polygons*** (**POLY**↵) representing each face. You can use different solid colors as shown here to better identity the faces. The numbers of the colors used are 1 (bright green), 2 (red), 3 (dark blue) and 134 because yellow 4 is difficult to see, 134 is still yellowish and also ends with 4 so we have faces 1, 2, 3 and (13)4.

   With experience, you can also use the desired fill style instead.
4. Return to or copy the 2D map and change the colors of the lines to match the colors of the polygons, or find another way to keep track of the faces' order.
5. Now start unwrapping by drawing an ***Arc, center, start and end*** (right click or use **ARCS**↵). Set the center on the ***Endpoint*** (**F5**) of the green (or first) line connected to the red (or second) line, start at the other ***Endpoint*** (**F5**) and end so that the second line will go through the arc when lengthened (trimmed) to it. All the black lines have been erased.

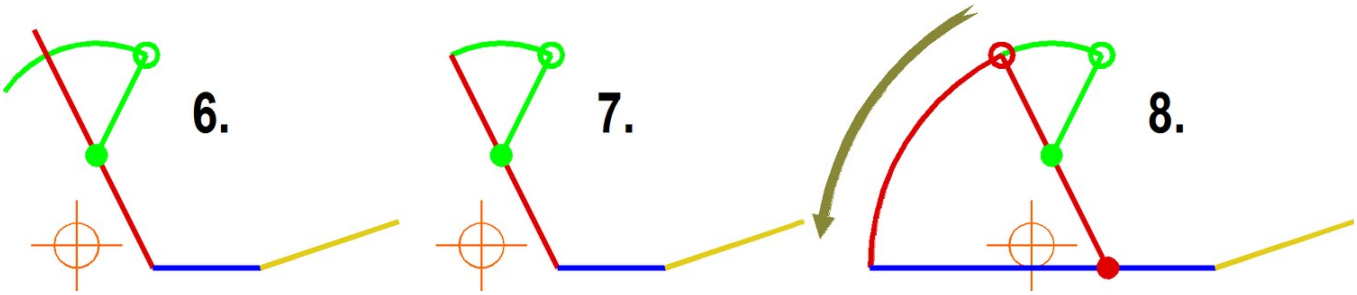
Note: through this article, the center point of each arc will be shown by a solid filled circle, and the first endpoint by a hollow circle.



6. To trim the red line to this arc, so that the red line represents the unwrapping from the first face, you cannot use ~~*Trim to Intersection*~~ ~~(TRIMINT↵)~~ because CC3 uses then the full circle instead of the arc to get the nearest intersection point, resulting in the wrong one. Therefore first *Trim* (TRIM↵) the red line so that it crosses the green arc.

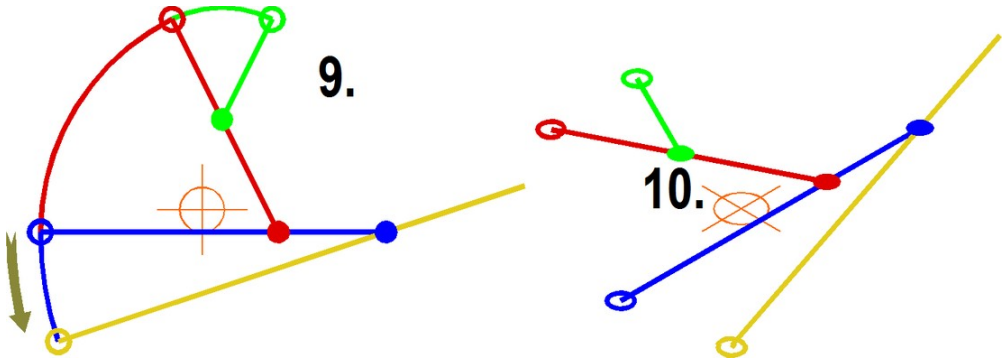
7. Now *Trim to Intersection* (TRIMINT↵) the green arc to the red line.

8. Repeat steps **4.** to **6.** with the second face, using the red line instead of the green, and the blue one instead of the red.



9. And repeat again, swapping blue for red and yellow for blue.

10. Finish the unwrapping by using the *3D projection* (IPROJ↵) tool on the lines and circles (no need to include the arcs). **Reset the origin point on the center of the resulting visor** (***view*** → ***Move Origin*** or ORIGIN↵).



The lines' endpoints where there are hollow circles now **are** the fill style origin points we need to get a seamless texture coating. To keep track of the coordinates of these points, there are many options including using the ***Info*** → ***List*** (LIST↵) to write them down or the macro instruction GP (Get Point) to store a point. Speaking about macros and adding the fact that we will also need the bearing of each of these lines, you can download the GPP.mac (Get Perspective Point) macro file where you found this article. Copy the file to your CC3PLUS data folder (like C:\ProgramData\Profantasy\CC3Plus) **not** in the Program Files folder. To be sure, you must see the FCW32.mac (the main CC3+ macros) file in the target folder

Once you have the macro file in the right folder, use ***tools*** → ***macros*** → ***Load macro…*** (**LOADMAC↵**) and select the GPP.mac file. Now type **GPP↵** to launch the macro. The prompt asks "Select line" so click on the green line, ***near the target endpoint*** (but not ***on*** the hollow circle marking it). Continue to click on the lines then use a right-click to end the macro.

If you want to check what the macro did, use the text-only command **LISTVARS↵** to list all the variables stored. You should get something like the list to the right where the relevant lines are in bold characters (the remaining lines like VARE VARP VARB VARX VARY INDEX VARCOMM and VARNAME are variables that the macro uses internally).

For each line that you selected, you get three variables: Px, Mx, and Bx. For example for the first line you have P1, M1 and B1.

P1 contains the coordinates of the first fill style origin points.

M1 is P1 rotated 180° around the map origin. Its coordinates are the opposite values of the coordinates of P1. You will see in a short while why we need that.

B1 is the bearing of the first line, and will also be the angle of the corresponding shaded polygon.

Likewise, P2 is the second fill style origin point and M2 its opposite point. B2 is the bearing of the second line and the angle of the second shaded polygon and so on.

```
P1 = -2.31300,2.88820
B1 = 300.00018
M1 = 2.31300,-2.88820
P2 = -4.23869,1.77639
B2 = 349.10663
M2 = 4.23869,-1.77639
P3 = -2.67616,-2.04508
B3 = 29.99996
M3 = 2.67616,2.04508
VARE = 0.27082,-2.47787
VARP = 2 5.74387,3.84188
VARB = 49.10667°
P4 = -0.23435,-3.06119
B4 = 49.10667
VARX =-0.23435
VARY =-3.06119
VARP = 0.23435,3.06119
M4 = 0.23435,3.06119
INDEX = 5
VARCOMM  = GP;
VARNAME  = P5
```

IMPORTANT: if you want to take a break and close CC3+ before ending the process, you can save these values in a file using **SAVEVARS↵** followed by a file name.

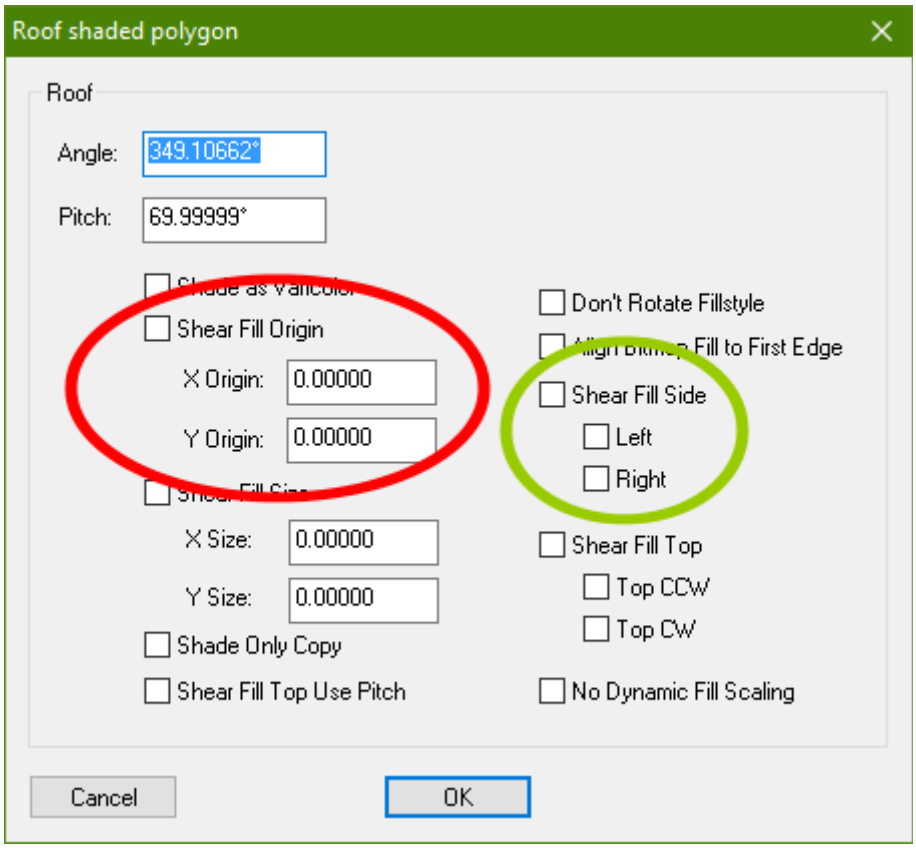
Using "**@**" before the file name will ensure that the file ends in the CC3+ data folder (see above). Otherwise you might get it the Program Files folder. For example "**@WallWrap1**".

Later on, you can retrieve these values using the *tools* → *macros…* → *script file* (**SCRIPT↵**), selecting the saved file when the open file dialog appears.

I-4 And wrapping again

Now comes the hard part. It's hard because there is no easy way to set the origin point of a shaded polygon. If you use the **right-click** ***Edit properties*** → **Numeric Edit** (**EDIT↵**) command on a shaded polygon, you'll get a form with a lot of editable fields (see right). Note that the form is labeled *Roof shaded polygon*.

There is a group, here circled in red, concerning the fill style origin point and containing a check box and two fields for the coordinates of this point, called ***Shear Fill Origin***.



Changing the coordinates through this won't change anything!!!

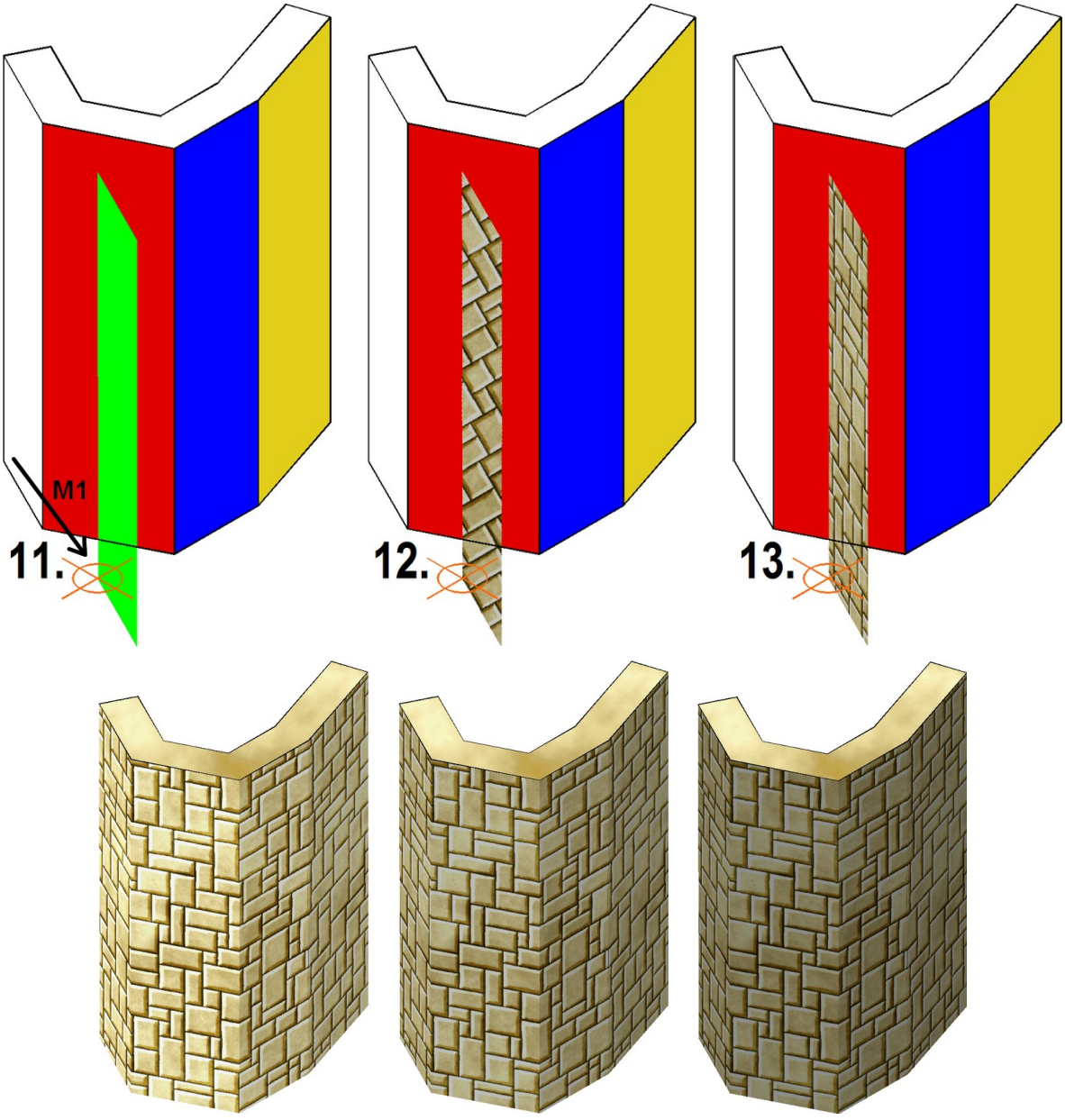
There is another group of interest here, circled in green: the check boxes from ***Shear Fill Side***. There might be some future use of the ***Left/Right*** option but for our purpose, checking ***Shear Fill Side*** and ***Left*** is enough to turn a *Roof* shaded polygon into a *Perspective*, or *sheared*, polygon, regardless of the facing side.

And because the check boxes stays put, there is a way to circumvent the fact that numbers don't. When the ***Shear Fill Origin*** check box **is** checked, the coordinates when you move the shaded polygon and thus the ***Shear Fill Origin*** coordinates can be set to any desired couple of values by moving the polygon away, checking the ***Shear Fill Origin***, ***Shear Fill Side*** and ***Left*** check boxes and moving the polygon back:

11. Set the map origin to the center of the visor if you changed it previously (***view*** → ***Move Origin*** or **ORIGIN↵**). Apply the right-click ***Non visual move*** (**MOVE↵**) tool to the green polygon (select the polygon than use the ***right-click*** → ***Combine*** → ***And (Both)*** → ***right-click*** → ***Color*** → ***1*** → ***right-click*** → ***do-it*** or the keyboard shortcuts **b** → **c** → **1** → **d**). The prompt reads "**Move from [displacement]:**" so right-click or hit ↵ to enter displacement mode and when the prompt reads "**X, Y displacement:**" just type **M1↵**.

12. Change the fill style of the polygon to the desired fill style (right-click the ***Change properties*** button → ***Change fill style*** or **CHANGEFS**↵) then ***right-click*** → ***Polygon*** → ***Shaded polygon*** (**SHADEPOLY**↵). When the prompt reads "**Angle [xxx.xxx°]:**" type **B1**↵ and when the prompt reads "**Pitch [xxx.xxx°]:**" type a value of your choice, but keep it the same for every polygon (see part III for exceptions). P3 uses 70° as the pitch value when extruding so it's a number that can't be wrong. Smaller values will get you lighter shading while values above 70° will make the walls darker (see below). You now have a *Roof shaded polygon*.

13. Use the **right-click** ***Edit properties*** → **Numeric Edit (EDIT↵)** command on the shaded polygon and check ***Shear fill origin***, ***Shear fill side*** and ***Left***. Leave everything else as it is. See page 9 for a picture of the dialog form. Now the polygon is a *Sheared shaded polygon*.

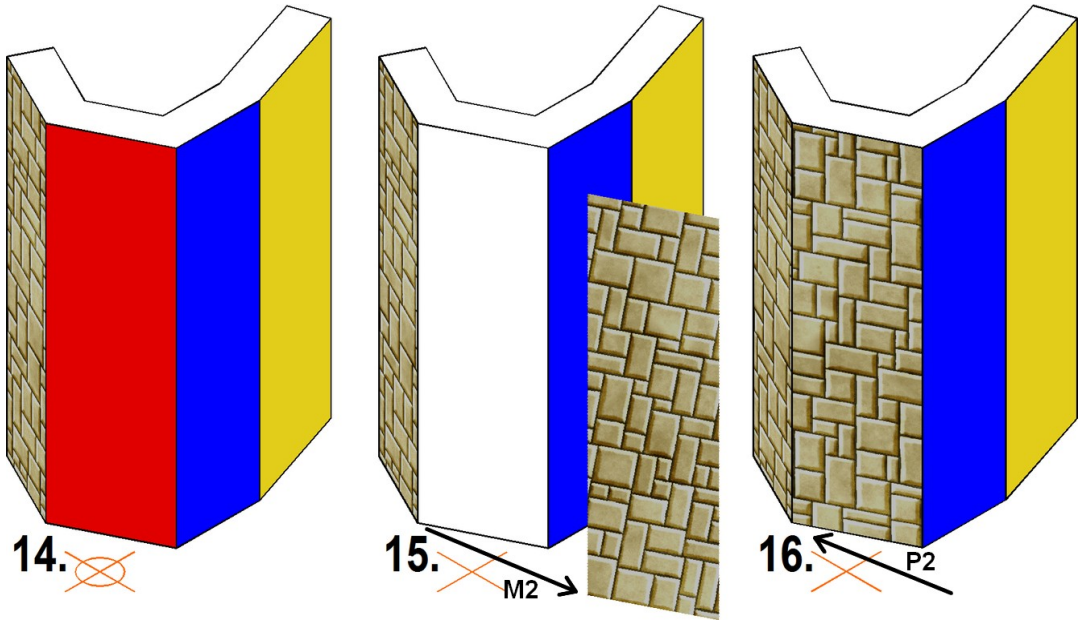


Pitch variations on the shadings: left pitch = 60°, middle 70°, right 80°.

14. Apply the right-click ***Non visual move*** (**MOVE**↵) tool to the shaded polygon (the keyboard shortcuts **p** selects the previous entity automatically and speeds things up). When reads "**Move from [displacement]:**" right-click or hit ↵ to enter displacement mode and when the prompt reads "**X, Y displacement:**" just type **P1**↵. The *sheared shaded polygon* returns to its place with the right *shear fill origin* (you can check it with **right-click** ***Edit properties*** → **Numeric Edit** or **EDIT**↵).

15. Move the red (color 2) polygon by the **M2**↵ relative displacement, change its fill style, turn it into a shaded polygon with an angle of **B2**↵ and the same pitch as before (it should appear in brackets, meaning you just have to right-click or hit ↵ to accept this default value).

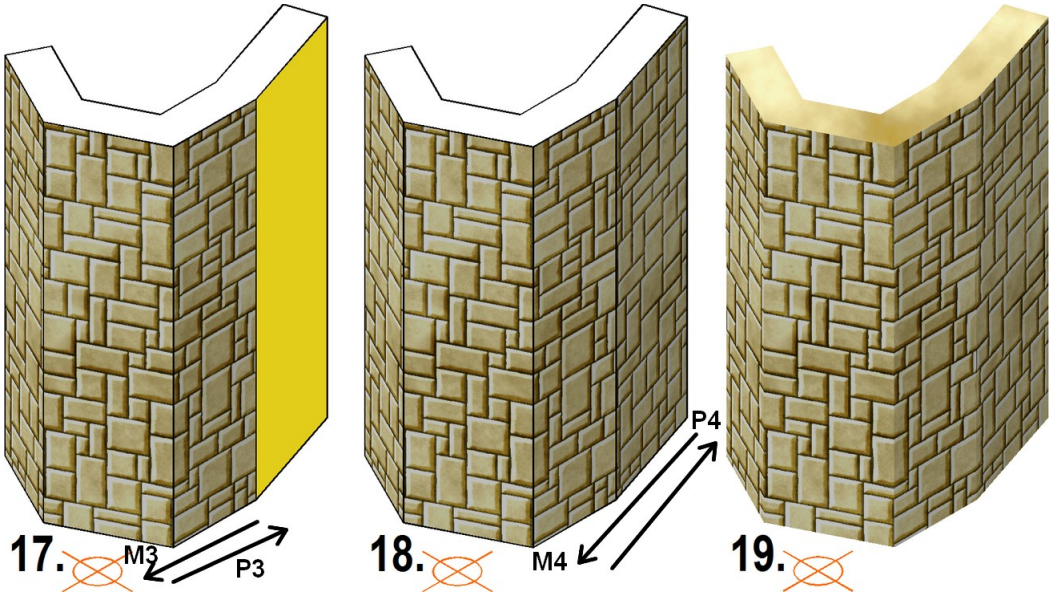
16. Edit the polygon into a *sheared shaded polygon* by checking the same check-boxes as per step 13. and move it back by a relative displacement by **P2**↵.



17. Repeat with the blue polygon (color 3) and the **M3**↵ displacement, the **B3**↵ shaded poly angle, EDIT and the **P3**↵ displacement.

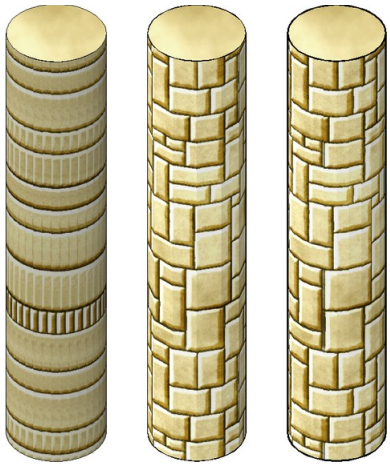
18. Repeat with the blue polygon (color 3) and the **M4**↵ displacement, the **B4**↵ shaded poly angle, EDIT and the **P4**↵ displacement.

19. For the top of the walls, it's better to use a texture with no pattern. Use the ***Polygon*** tool (**POLY↵**) with the ***Endpoint modifier*** (**F5**) to create a new polygon. You can also turn it into a *roof shaded polygon* with an angle of 0° and a pitch of about 50° then turn it into a *sheared shaded polygon* checking this time the ***Shear fill top*** and ***Top CCW*** check boxes instead of the ***Shear fill side*** and ***Left*** ones. No need to bother with the ***Shear fill origin*** here. Note that removing the black contours enhances the seamless quality of the texture.



Note: though this example shows the outside of the wall, the same process can be applied to the inner side of the wall as it will be shown on part IV.

II A cylinder



With cylinders, the way P3 automatically generates the *sheared shaded polygon* is even less suitable to patterned textures.

On this picture you can see; left: the cylinder generated by P3, using 17 polygons and a few clicks; middle: a cylinder generated by the method described here, using 6 polygons and about 12 minutes mapping time and right: a cylinder by the method described here, using 12 polygons and about 20 minutes.

To create a cylinder, you need to follow the same steps as before, but there is a way to save time because we use a regular polygon to simulate the base so unwrapping is easier as each side has the same length: we just have to scale them up.

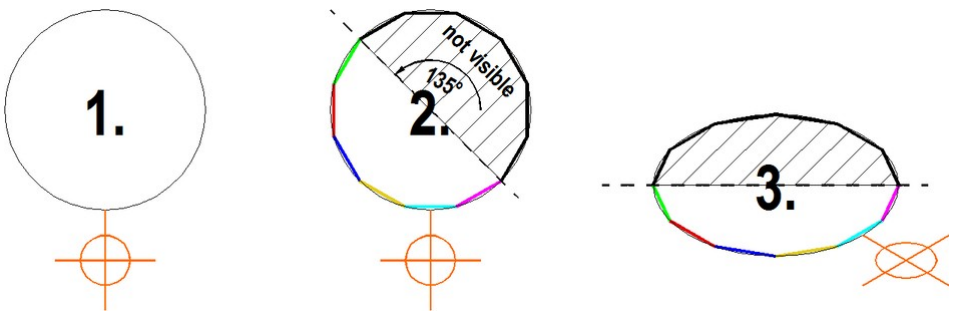
To keep the elliptic shapes of the base and the top, we need to use multipolys instead of polygons. Luckily, the shaded polygons tools work as fine with multipolys as with polygons.

Here is a step by step to create the middle cylinder above:

1. Start by drawing a 2D ***Circle*** (**CIRP↵**) with the desired radius. For this example, the radius is 1' long. Use the relative coordinates **@0,1↵** to achieve this. Alternatively right-click on the circle button and select ***radius and center***. Add a visor to help keep track of the map origin point.

2. Right-click on the ***Polygon*** button (**POLY↵**) and select ***regular polygon***. When the prompt asks "**Number of nodes [6]:**" type **12↵** because we see only half of the cylinder, 12 is the double of the 6 *sheared shaded polygons* we'll create. To avoid partially hidden faces, once you set the center, type something like **<135,1↵** where "**<**" is the polar coordinates sign, 135 is the first angle you see with isometric perspective, and 1 is the radius you should adapt to accommodate your circle if smaller or bigger. ***Explode*** (**EXPLODE↵**) the polygon and change the colors of the sides from 1 to 6 (4 → 134) in counter-clockwise order as shown below.

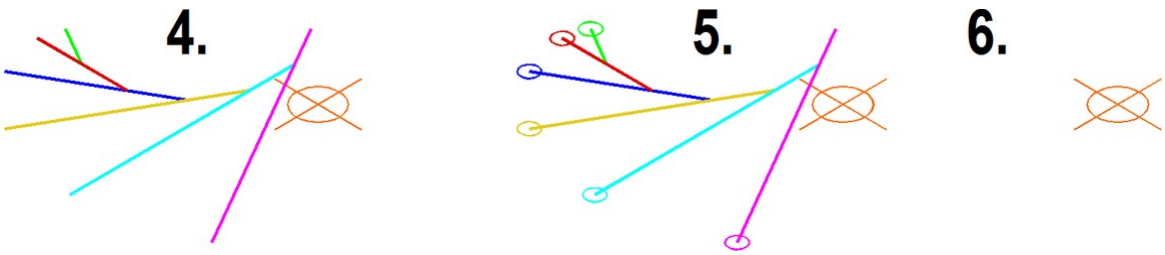
3. Use ***3D projection*** (**IPROJ↵**) to project everything as a 3D floor area.



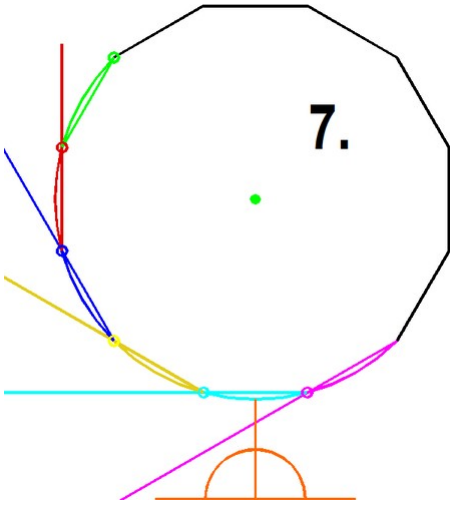
4. On the 3D part, ***Erase*** (**ERA**↵) everything that is still black. Set the map origin to the visor with ***view*** → ***Move Origin*** (**ORIGIN**↵). To unwrap the sides of a regular polygon, we don't need to bother with arcs and trimming. We just use the ***right-click*** ***Scale*** → ***Non visual scale*** (**SCALE**↵) command on each side with its color as scale factor (scale 2 for the red, scale 3 for the blue and so on.), right on the 3D part. The Scale Center is always the ***Endpoint*** (**F5**) connecting a given side to the **next** side.

5. Load and launch the GPP macro, selecting each line near the endpoint ***not*** joining the next line.

6. If you think you'll need to stop before completing the cylinder, use **SAVEVARS**↵ (see page 8). ***Erase*** (**ERA**↵) the lines from the 3D map (or place them on hidden sheet with **MOVESHT**↵), leaving only the visor.



7. Return to the 2D map and ***right-click*** ***Arc*** → **center, start and end** or use **ARCS**↵ to draw colored arcs matching the sides of the regular polygon. The center of each arc is the center of the starting circle, and each arc starts and ends with an endpoint of its side (see zoomed picture right).

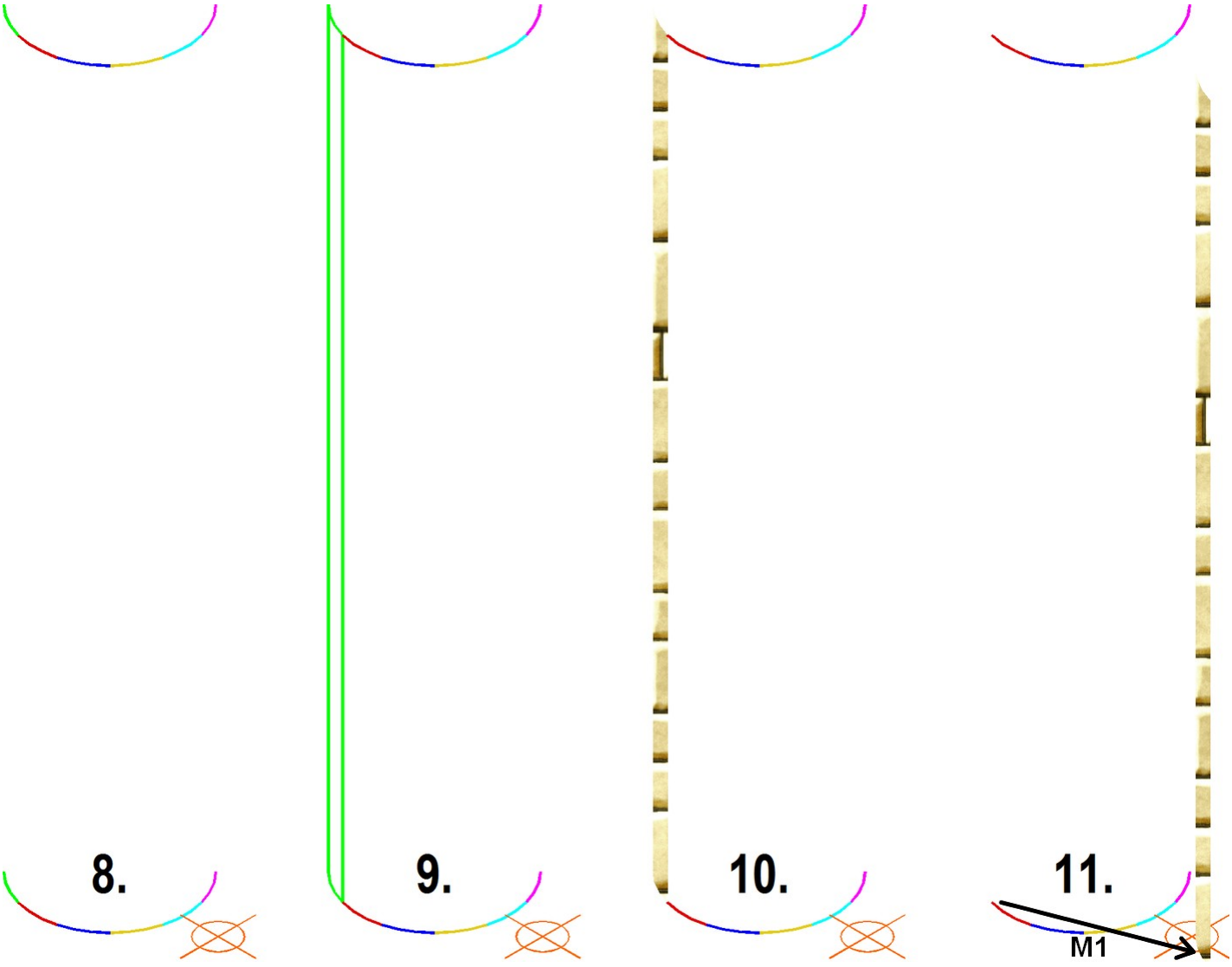


8. Project these arcs to the perspective part and ***Copy*** (**COPY**↵) them at the desired height (for example here 10').

9. Draw two ***Line***s (**LINE**↵), joining vertically the ***Endpoint***s (**F5**) of the projected green arcs.

10. Change the current fill style to the desired one. Use the ***Multipoly*** tool (**MPOLY2**↵) and select the projected green arcs and the two new lines. ***Right-click*** → ***do it*** (**d**).

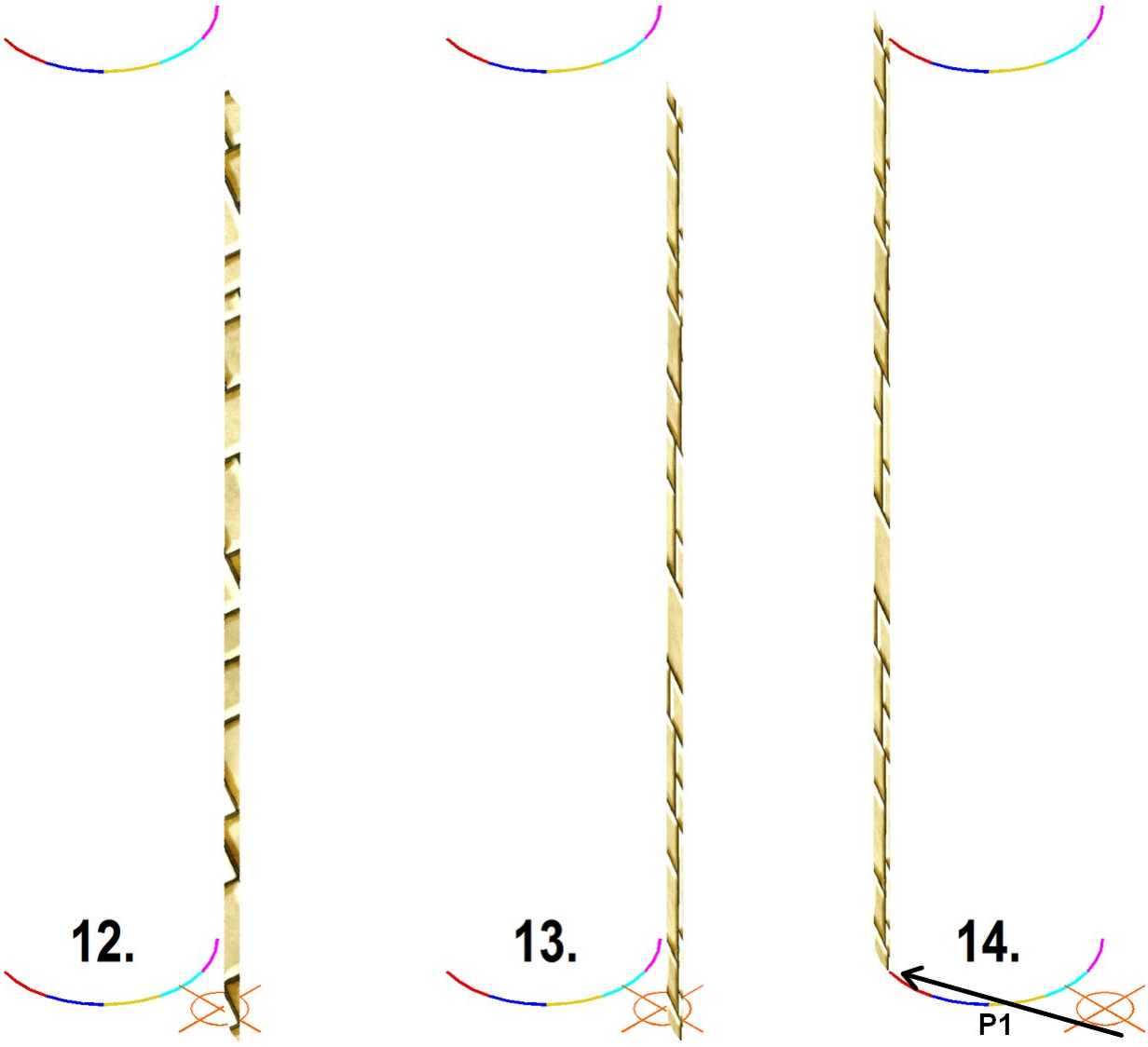
11. Set the map origin to the center of the projected visor if you changed it previously (***view*** → ***Move Origin*** or **ORIGIN**↵). Apply the right-click ***Non visual move*** (**MOVE**↵) tool to the multipoly ***right-click*** → **Prior** (**p**). Right click or hit ↵ when the prompt reads "**Move from [displacement]:**" then type **M1**↵.



12. ***Right-click*** → ***Polygon*** → ***Shaded polygon*** (**SHADEPOLY↵**). When the prompt reads "**Angle [xxx.xxx°]:**" type **B1↵** and when the prompt reads "**Pitch [xxx.xxx°]:**" type a value of your choice (recommended 60°-80° see page 10, bottom).

13. Use the **right-click** ***Edit properties*** → **Numeric Edit (EDIT↵)** command on the shaded polygon and check ***Shear fill origin***, ***Shear fill side*** and ***Left***. Leave everything else as it is (see page 9).

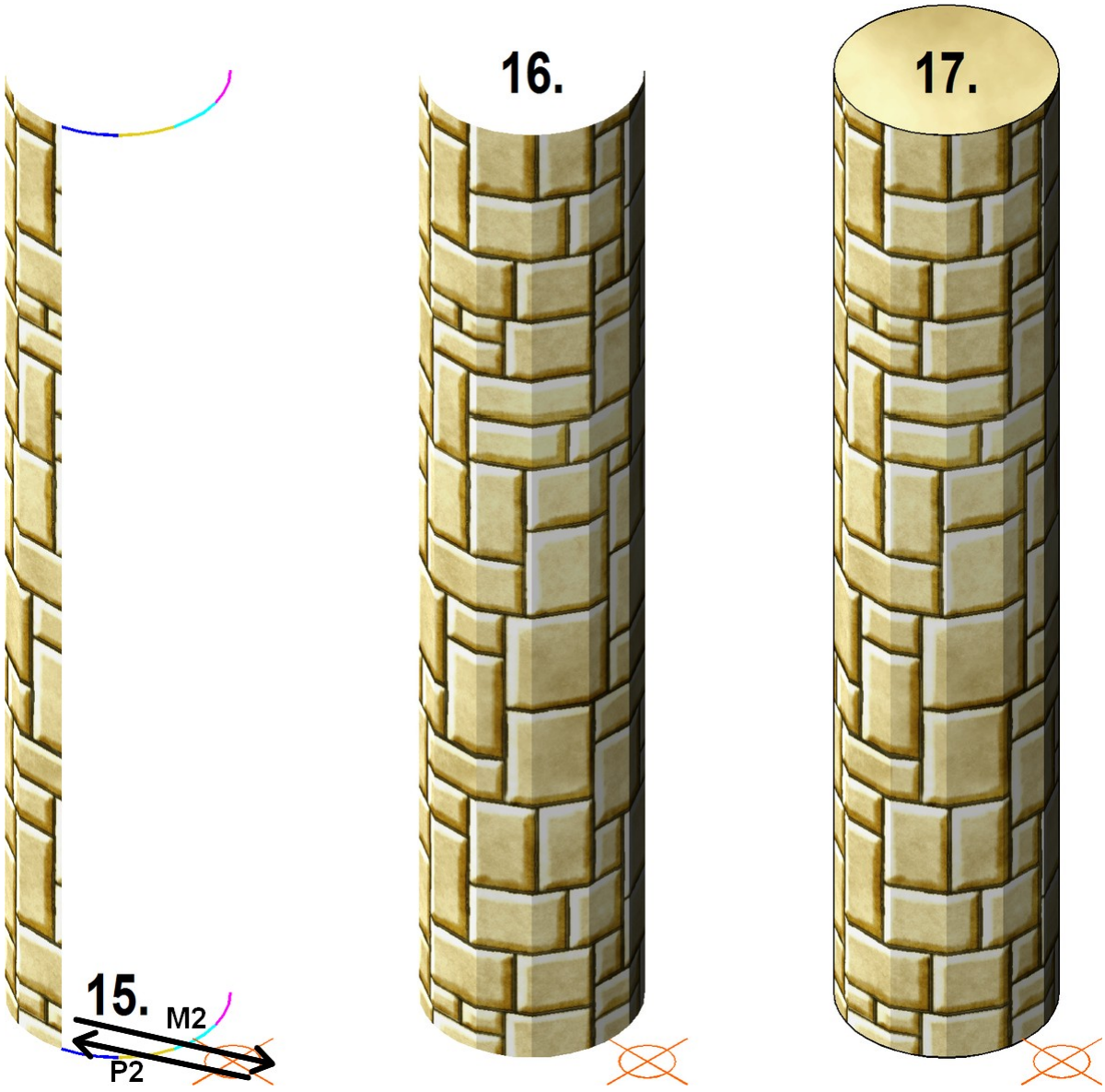
14. Apply the right-click ***Non visual move*** (**MOVE↵**) tool to the shaded polygon. Right click or hit ↵ when the prompt reads "**Move from [displacement]:**" then type **P1↵**.



15. Repeat steps **9.** to **14.** with the red projected arcs and the variables **M2**, **B2**, and **P2**.

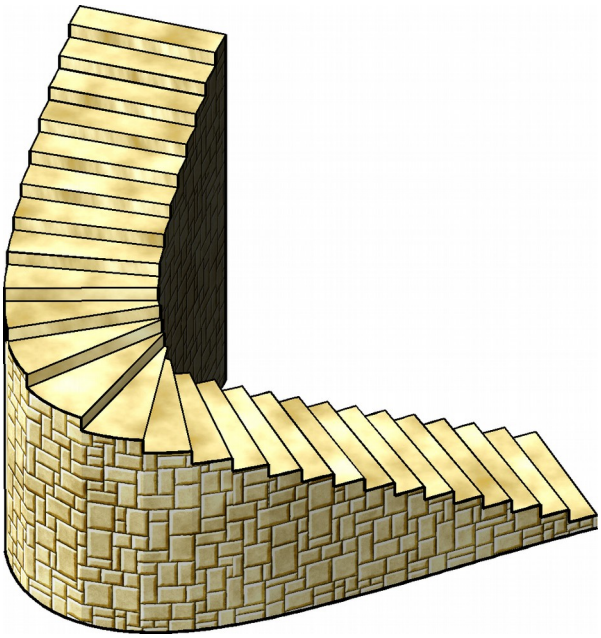
16. And so on.

17. Use ***3D projection*** (**IPROJ**↵) to project the initial circle to the cap ellipse, change the fill style to a non patterned one and optionally turn it into a *sheared shaded polygon* (see step **19.** p .11). Add black contour lines if you wish.



Note: To get a less segmented look, use a regular polygon with more sides at step **2** (see the example picture on the top right of page 13 for a cylinder made with 20 polygons).

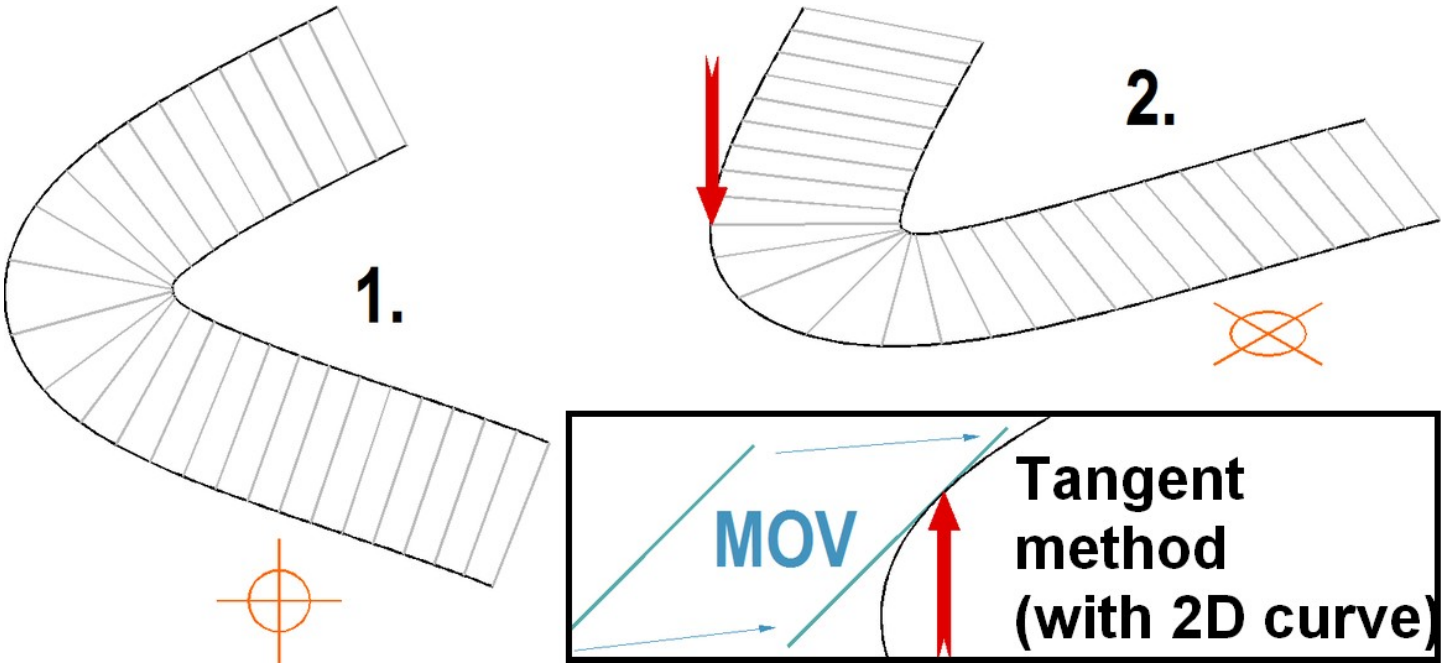
III Other curves



For any curve that isn't a circle or a circle arc, we combine the multipolys and segmentation from part II with the unwrapping of part I.
Any curved section needs to be replaced by as many line segments as you like before using the unwrapping process, and any top shape containing curved contours needs must be created as a multipoly to keep the curves accurate.

1. Here we have a floorplan of irregular yet smooth curved stairs. The first thing to find is where to start unwrapping the wall. For a cylinder it was easy, it was where a radius made an angle of 135°, the end being at an angle of 315° (or -45°), see page 13.

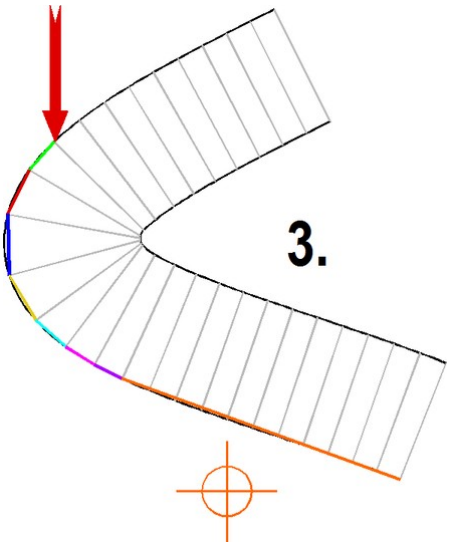
2. One solution is to use the ***3D projection*** (**IPROJ↵**) to find it. Here it's not too complicated as we can count the stair steps. It looks like the isometric view will show the outside wall after the 10th gray line form the top (where the red arrow points).



Another solution could be to draw a line at an angle of 45° on the 2D floorplan (for example click on any point followed by relative coordinates like **@10,10↵**) then to use the visual ***Move*** (**MOV↵**) tool to drag this line and set it by sight where it is tangent to the curve (see boxed picture above).

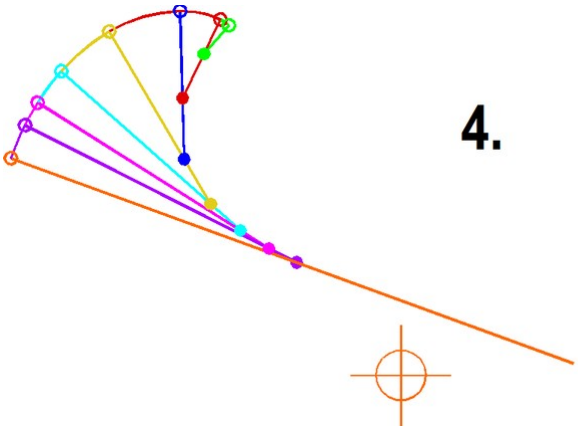
3. To unwrap the walls we now need lines around the outer wall. Instead of the regular polygon we used for a circle, we need here to draw each line, deciding where to place the nodes. Common sense will make us draw the line between the endpoints of the gray lines defining the steps, but we could as well use different, or more lines.

Note that the lower part is almost straight, thus the long bright orange line taking 11 steps together.



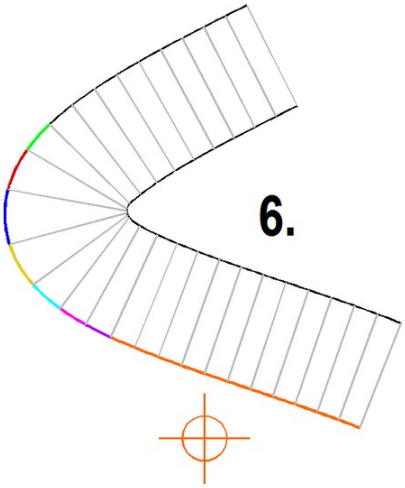
4. Copy these lines (and the visor) elsewhere (or to another sheet) so all the irrelevant lines don't distract you, set the origin point at the visor and perform the unwrapping method on them.

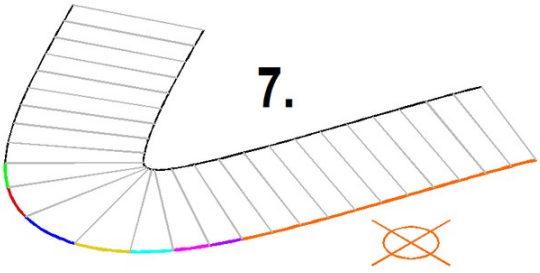
5. Project the lines on the 3D map and apply the GPP macro.



6. Using the ***Split*** tool (**SPLIT**↵), cut the outer wall (a smooth path) into small parts accordingly to the colored lines. The ***Endpoint modifier*** (**F5**) is very handy here. Once done ***Erase*** (**ERA**↵) or move to a hidden sheet the lines from step **4** that are too close to the curved entities.

7. Project everything on a 3D map.





8. And create your isometric view of the stairs (see appendix C page 48 on how to do that step by step). Of course, if you just want to design a curved wall, just copy everything at the desired height (see part II page 15 step **8.**) Use the ***Multipoly*** tool (**MPOLY2↵**) to create the colored areas with the curves still round.

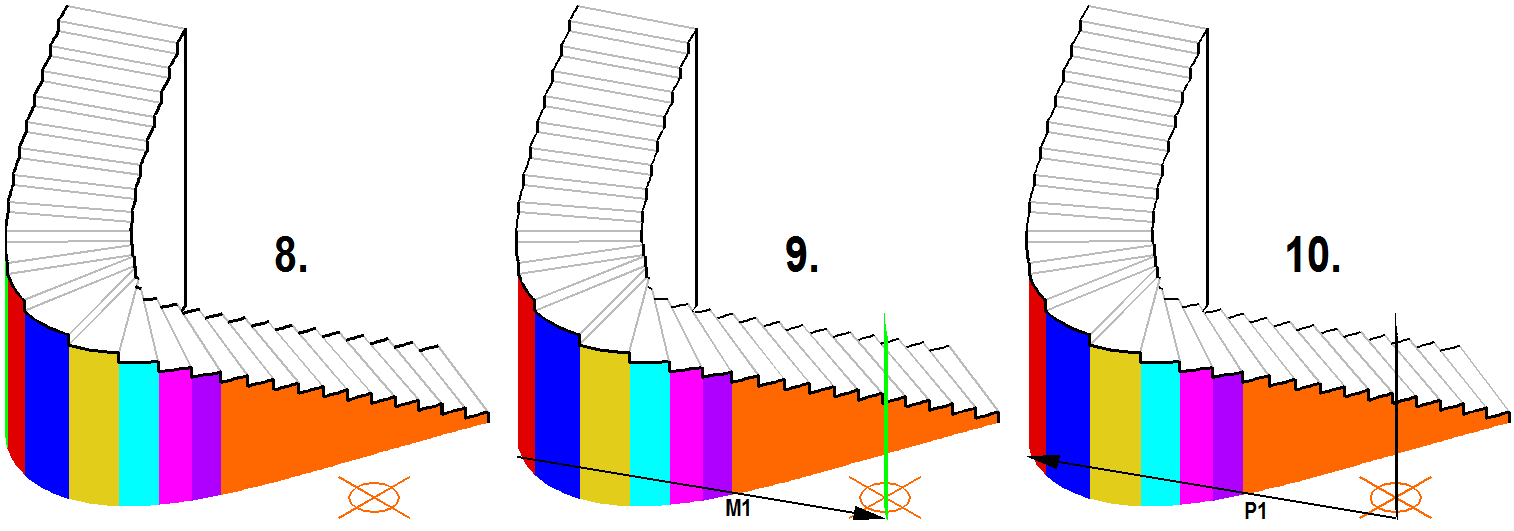
9. Apply the right-click ***Non visual move*** (**MOVE↵**) tool to it, ***right-click*** → **Prior** (**p**). Right click or hit ↵ when the prompt reads "**Move from [displacement]:**" then type **M1↵**.

10. Change the fill style of the green multipoly to the desired patterned fill style and set the map origin to the center of the projected visor if you changed it previously (***view*** → ***Move Origin*** or **ORIGIN↵**).

Right-click → ***Polygon*** → ***Shaded polygon*** (**SHADEPOLY↵**). Type **B1↵** for the angle and type a value of your choice for the pitch (recommended 60°-80° see page 10, bottom).

Right-click → ***Edit properties*** → **Numeric Edit (EDIT↵)** command on the shaded polygon and check ***Shear fill origin***, ***Shear fill side*** and ***Left***. Leave everything else as it is (see page 10).

Apply the right-click ***Non visual move*** (**MOVE↵**) tool to the shaded polygon. Right click or hit ↵ then type **P1↵**.



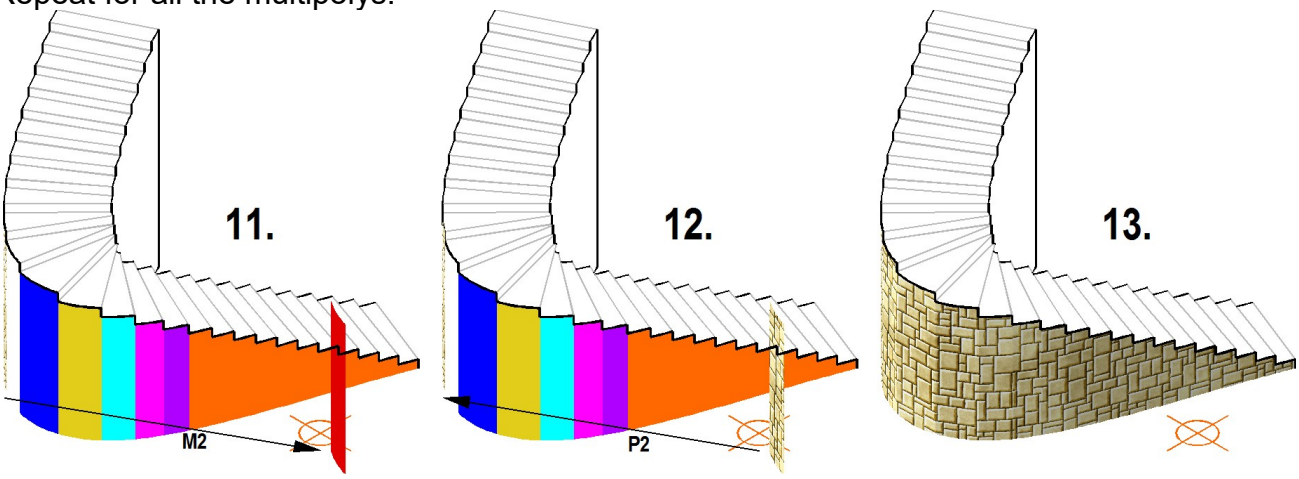
11. Move the red multipoly by **M2↵**.

12. Change its fill style, turn it into a *roof shaded polygon* with ***right-click*** → ***Polygon*** → ***Shaded polygon*** (**SHADEPOLY↵**),

Turn it into a *sheared shaded polygon* with ***right-click*** → ***Edit properties*** → **Numeric Edit (EDIT↵)** and check ***Shear fill origin***, ***Shear fill side*** and ***Left***.

Move it back by **P2↵**.

13. Repeat for all the multipolys.

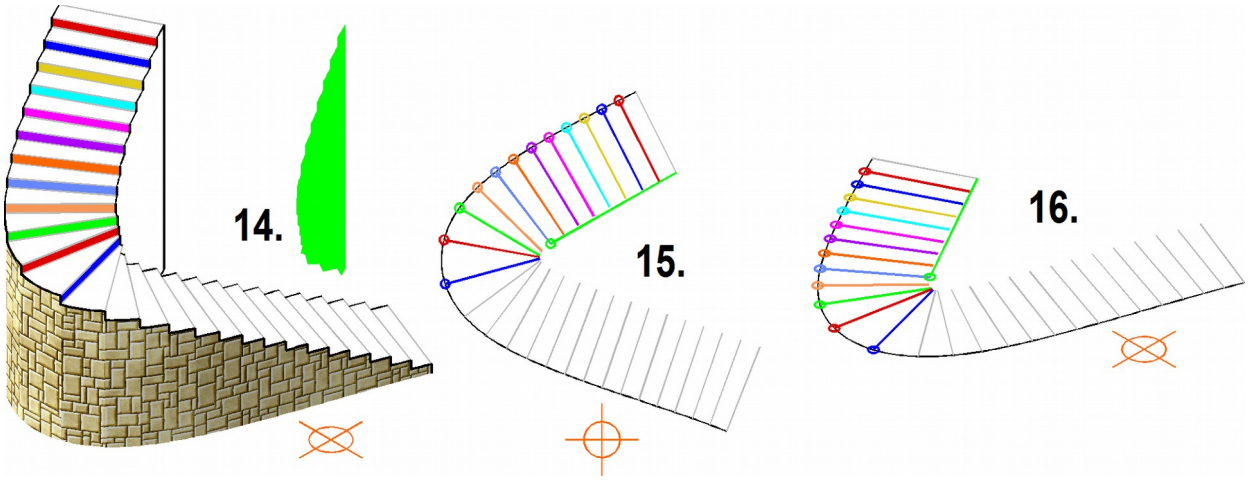


14. For the remaining vertical areas, we use the same color coding, starting from the top here. The back of the wall has been turned into a multipoly a little bit away from its place, to isolate the shape and avoid distracting entities.

Note: after color number 10 it's recommended to start again at color 1 for 11, color 2 for 12 instead of using the colors number 11, 12 etc… The reason why is that you'll soon recognize colors 1 to 10 easily whereas the following colors are less pronounced and you might reach color 15 which is white. Sure, if you have another, or better way, to identify entities, go for it!

15. The color coding is applied to the 2D floorplan.

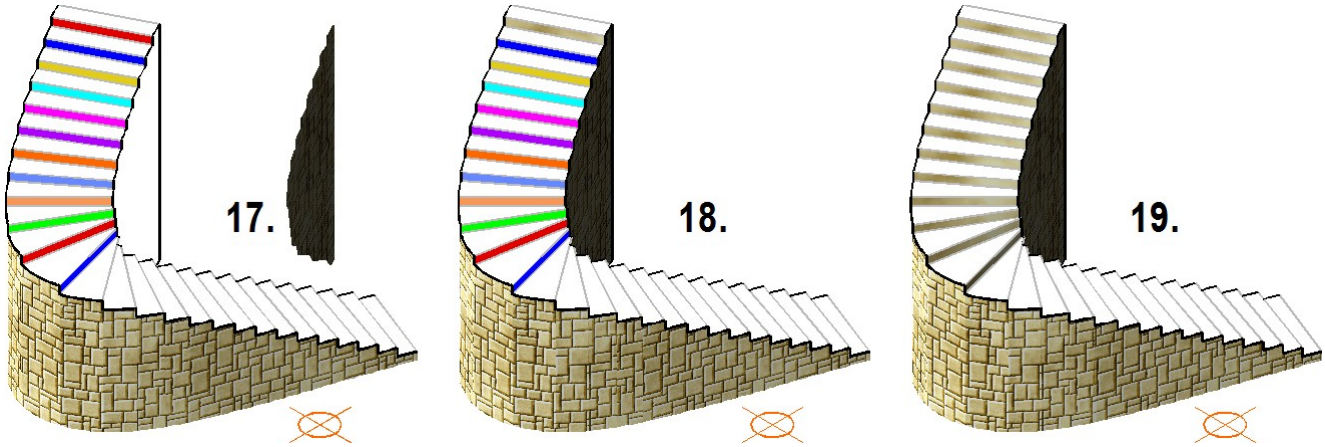
16. The steps are projected in 3D (find some empty space on your map to avoid confusion. See page 36 how your file could look like.) then the GPP macro is launched, only to store the angles because for the raisers, a non patterned fill style is used so the *Shear fill origins* is not important.



17. Change the fill style of the inside wall. Turn it into a *roof shaded polygon* with ***right-click*** → ***Polygon*** → ***Shaded polygon*** (**SHADEPOLY↵**), and the angle **B1↵**. then into a *sheared shaded polygons* with ***right-click*** → ***Edit properties*** → **Numeric Edit (EDIT↵)** just checking ***Shear fill side*** and ***Left***.

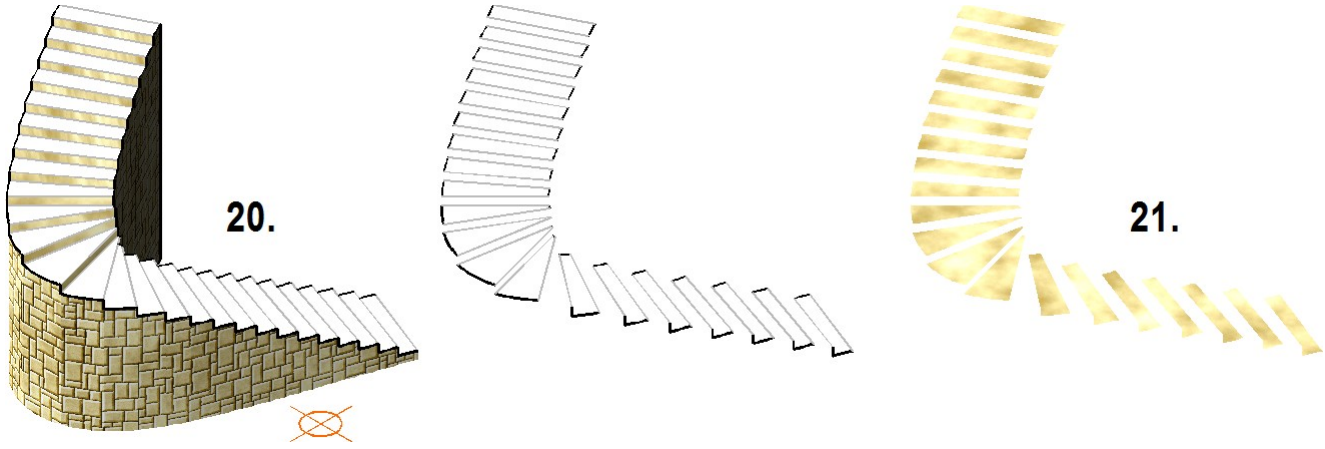
18. Move the polygon back to its rightful place then set the current fill style to what you want to use for the risers (here a non-patterned style). Change the fill style to the first riser, selecting by color (here red 2), and turn it into a *roof shaded polygon* then into a *sheared shaded polygon* as per step **17.** but with an angle of **B2↵**.

19. Repeat step **18.** for every visible riser.

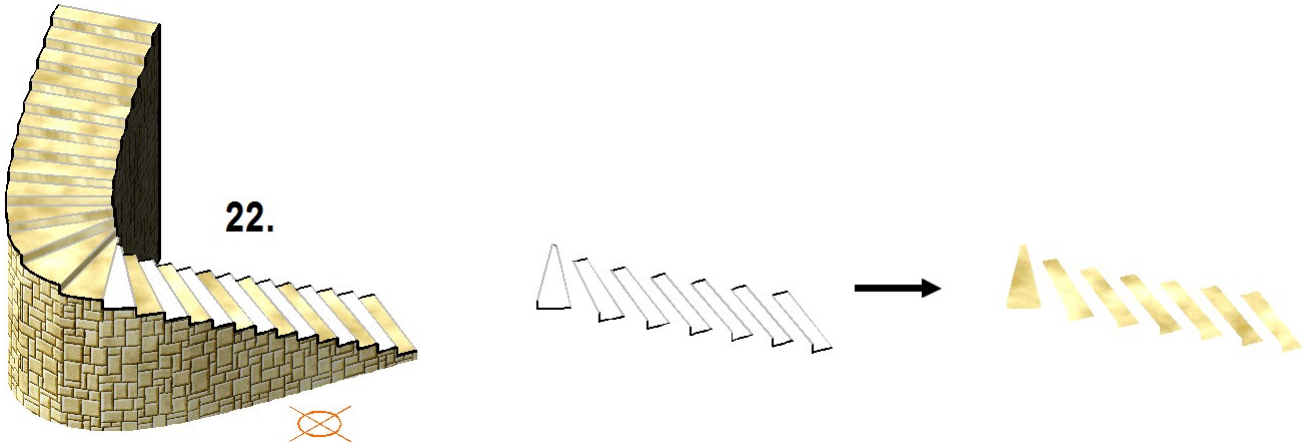


20. To create the treads, copy all the entities forming the treads that aren't connected, then every other tread to the right to the 3D map to avoid (or anywhere else where there is empty space). You'll need to ***Trim*** (**TRIM↵**) some lines.

21. ***Multipoly*** tool (**MPOLY2↵**) all these entities then turn them into *roof shaded polygon* with any angle (usually 30° for floor entities) then into *sheared shaded polygon* checking this time ***Shear fill top*** and ***Top CCW*** to indicate horizontal areas.

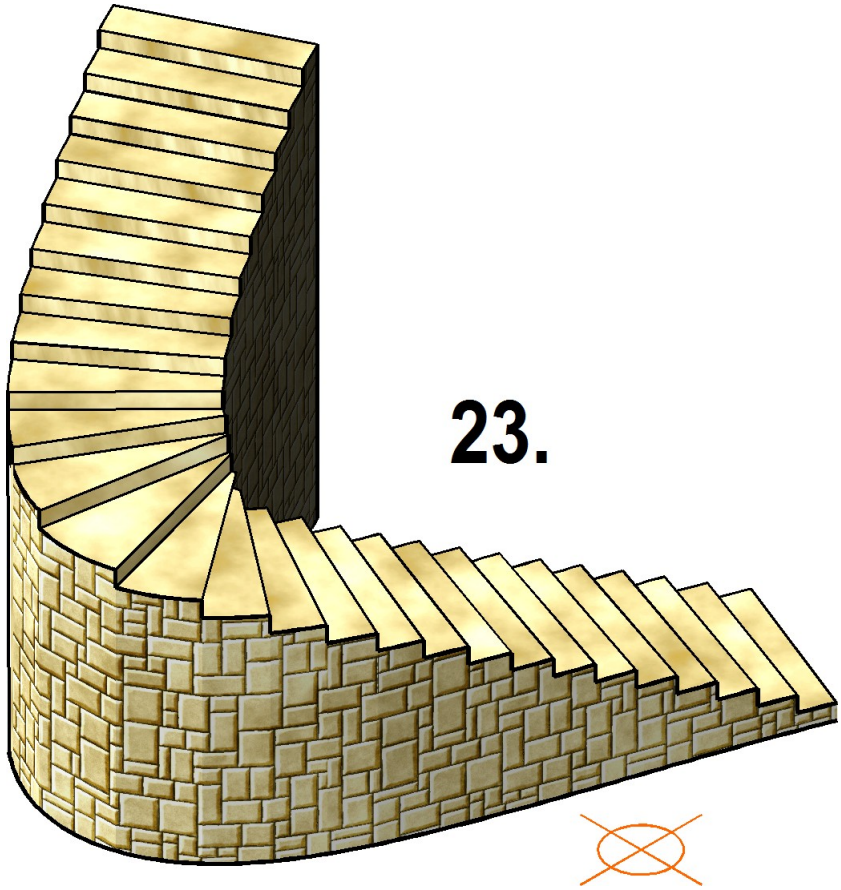


22. Place these treads back to place and repeat the process for the remaining treads.



Note: you could turn all the treads in a single polygon but the fill style would be applied continuously are here we definitely don't want this. It's most of the time acceptable for unconnected treads though.

23. Change the color of the gray lines to black and you're done!



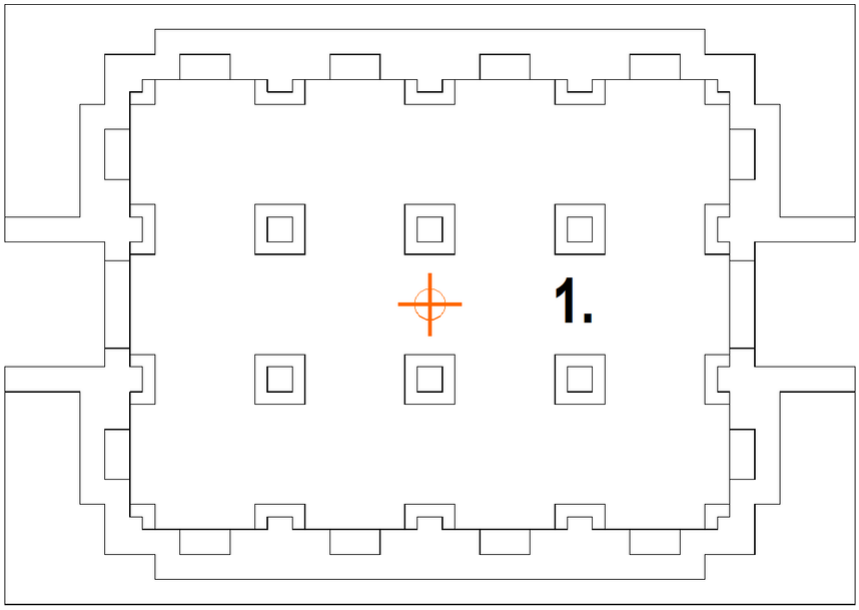
IV-1 A more complex project: the Pillar Hall

This last part will take you to even more advanced features to create this dungeon room.

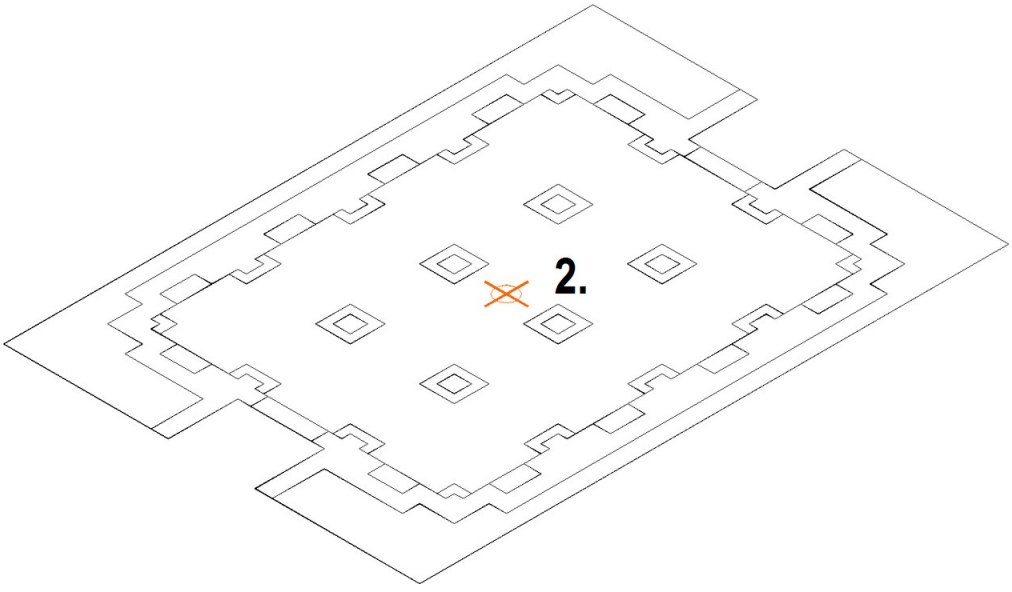
1. Start with a 2D floor plan. Remember, if you don't have access to a 2D map because you only have an old 3D perspective you want to refresh, see Appendix B page XXX to get you on the tracks.

Don't forget the visor.

The map shown here represents a small hall with 6 pillars, two entryways and recesses in the walls.



2. The next step is using the ***3D projection***  (**IPROJ**↵). If we assume that north is up on the 2D map above, we see here that the north wall makes the back of the room, meaning that we can raise it in height without masking too much of the map (the north western corner will be lost).



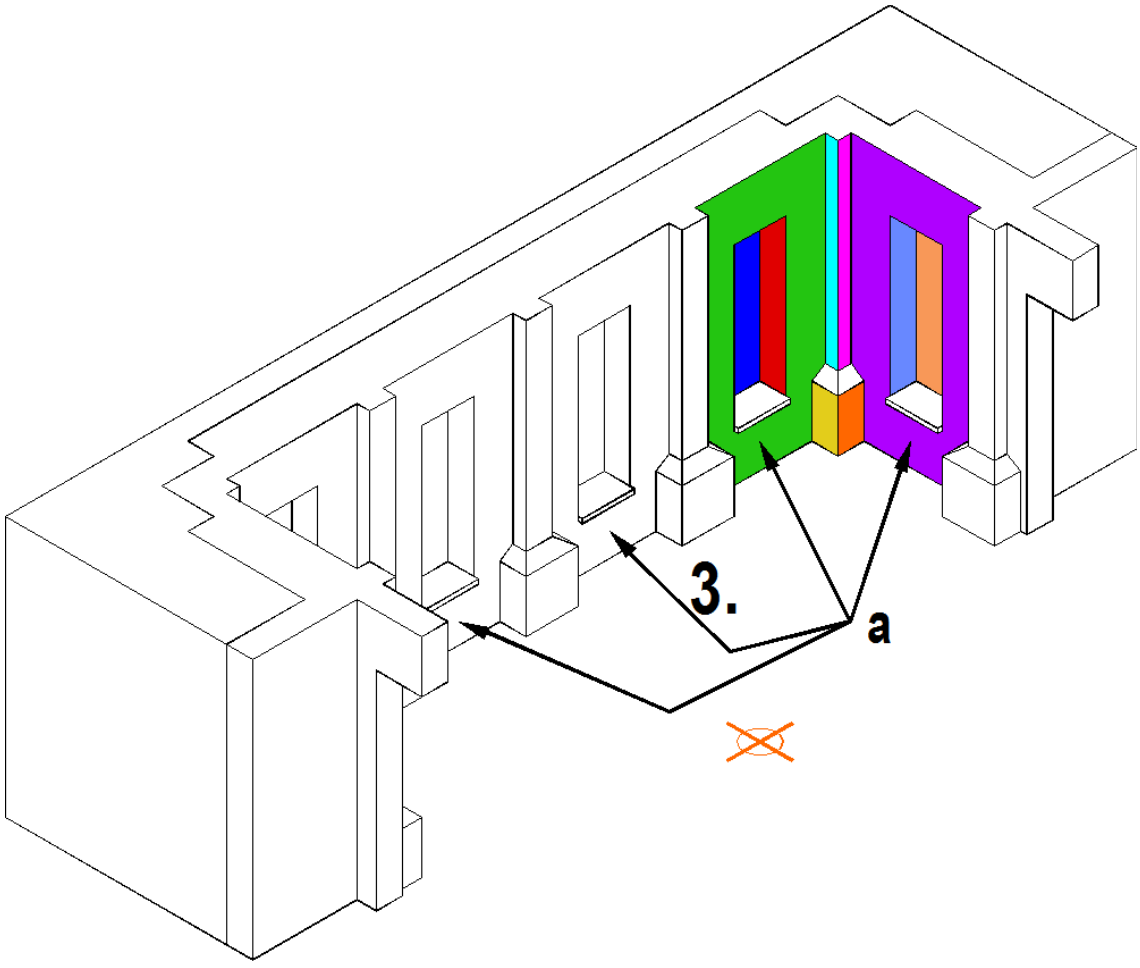
3. Next focus on this northern wall and create a line version of the 3D map. Remember that with isometric perspective, heights stay exact, so if the recesses start at 2' high, move the corresponding lines 2' upward. The thin parts of the pillars –shafts– are moved 3' high.

Then copy every line at the top height, 10' for the walls and the thin parts of the pillars, 8' for the top of the recesses and 2' for the top of the bases of the pillars.

Oblique lines join the bases of the pillars to their shafts.

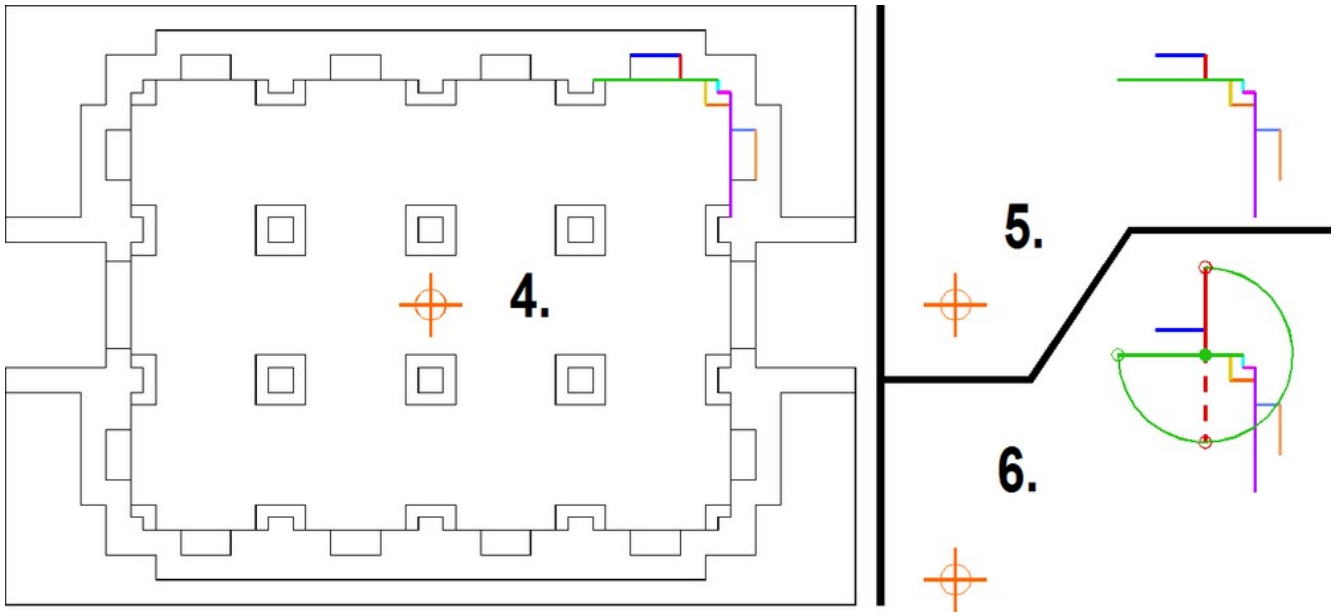
Next add vertical lines and erase/trim hidden edges. In accordance with the first three parts, the polygons to focus on were drawn with colors number 1 to 10 (with the usual exception of 134 instead of 4).

Small offset tiles have been added to the bottom of the recesses (detail a). The reason why will be discussed a bit later.



4. The color coding is applied to the 2D map.

5. And copied to an empty space for clarity's sake (or copied on a new sheet, hiding all the other sheets).



Let's take some time to analyze this peculiar arrangement of lines. They don't follow each other nicely like in the first parts.

The first line (green 1) is connected to three other lines: the second (red 2), the fourth (yellow 134) and the fifth (sky blue 5).

Furthermore, the second line goes up while the fourth and the fifth go down.

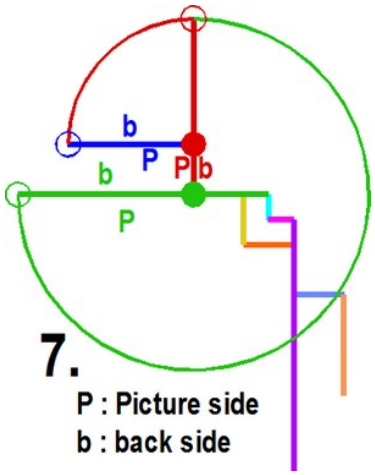
Next, the second line (red 2) connects to the third (dark blue 3) and it ends with the dark blue. But the fourth line (yellow 134) connects to the eighth (bright orange 8) and the fifth (sky blue 5) connects to the sixth (pink 6).

Both the sixth and the eighth connect to the seventh (violet 7) which next connects to ninth (blue 9) that connects to the tenth (orange 10).

6. Now unwrap the left part of the green line to the red one, from the intersection point of the green line with the red (filled green disc). Here is something new. Consider again using a wallpaper. If the line is unwrapped a quarter circle counterclockwise (shown here by a red dotted line), the ***back*** of the wallpaper (which is usually almost white) will be on the wall. To get the picture side, it should unwrap a quarter circle ***clockwise***. But CC3+ only draws this kind of arcs ***counterclockwise***. The answer in that case is to draw a ***three quarters circle*** and then trim the red line upwards to get our shear fill origin point.

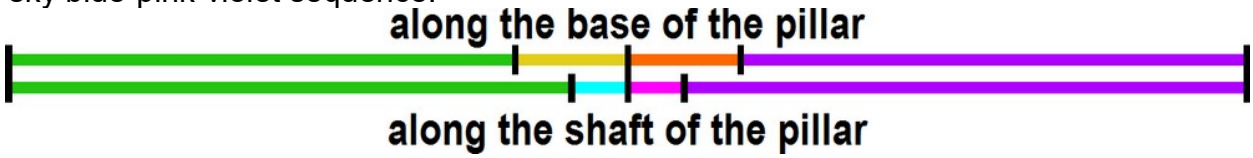
7. To unwrap the red part follow the motion with only a quarter circle to get the needed point.

When faced (!) with doubt about the angle width of an arc try to think again of a real wallpaper, or perhaps at the kind of paper used to wrap gifts, to get a sense of picture/back side.



8. Following this rule of picture/back side, another three quarter circle is needed to unwrap the green line to the yellow one, starting where the green and yellow lines intersect (new filled green disc), followed by a quarter circle from yellow to the orange. Note that the previous arcs have been erased for clarity.

About this orange line… It should join seamlessly with the violet line but the pink line should also join the violet one. Will it be so? The answer is yes! Because we deal here with parallel lines. The length of wallpaper needed to wrap the green-yellow-bright orange-violet sequence is the same as the green-sky blue-pink-violet sequence.

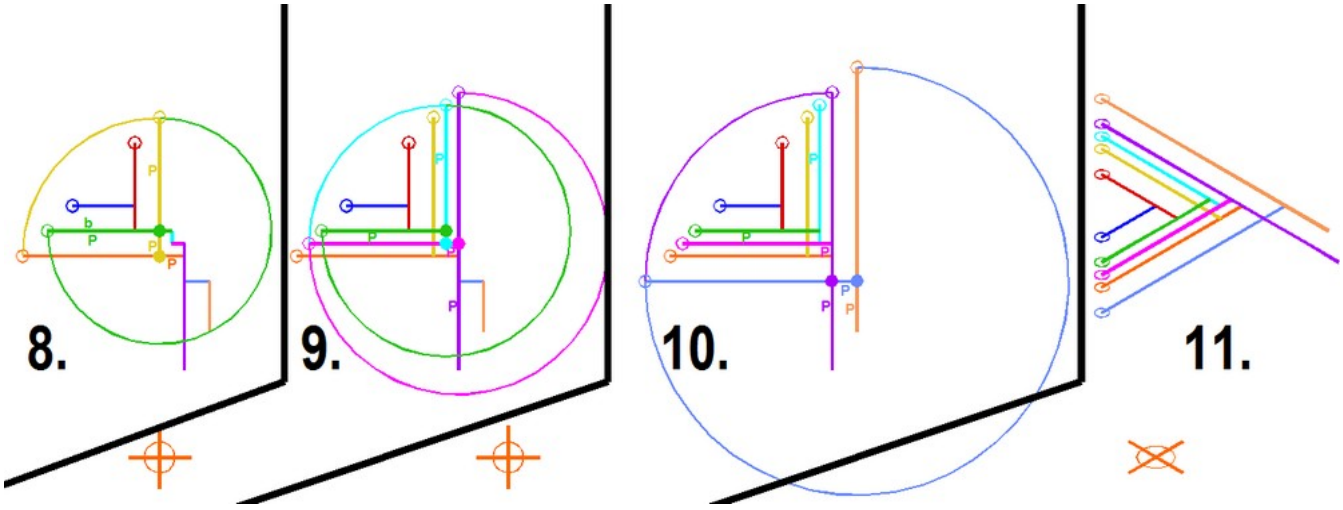


Were the pillar round, or a regular polygon of more than 4 nodes, it wouldn't be the case. We'll see later what to do in such situations.

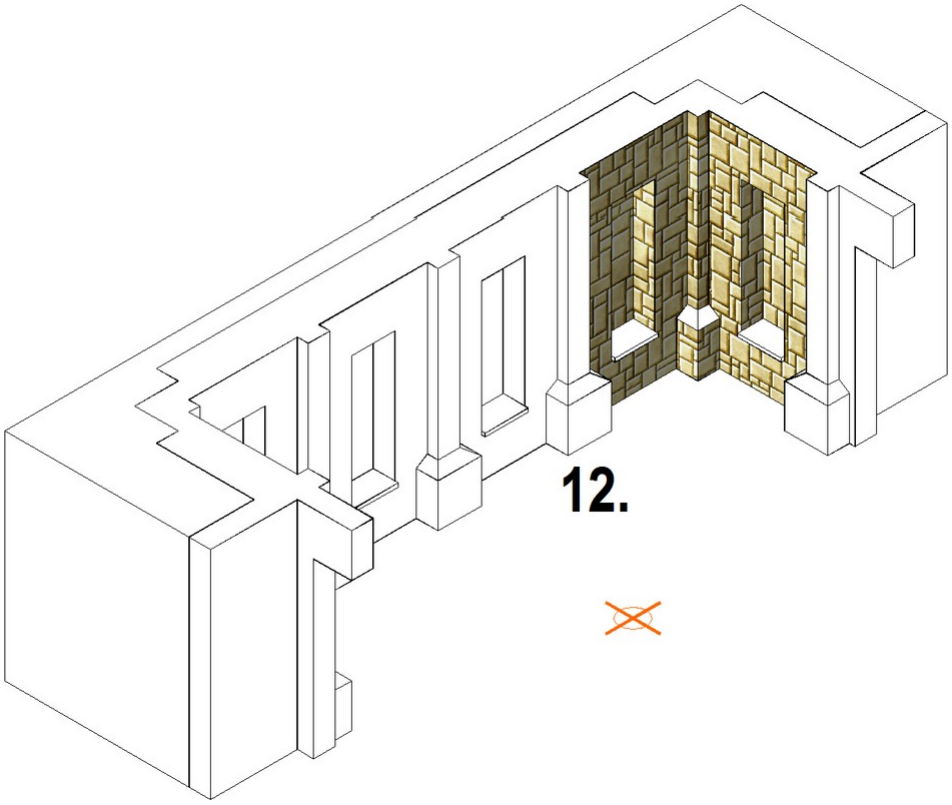
9. The green line is totally unwrapped to the sky blue, the sky-blue to the pink and the pink to the violet (see above, boxed explanation).

10. And the violet is unwrapped to the blue (color 9) and the blue to the orange (color 10).

11. Use the ***3D projection*** (**IPROJ**↵) command then the GPP macro to store all the reference values in variables (M1 to M10, B1 to B10 and P1 to P10). Save them with **SAVEVARS**↵.



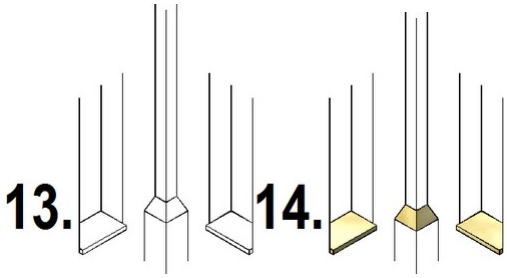
12. Move the first polygon in the relative M1 direction. Change its fill style, turn it into a *roof shaded polygon* with the angle B1, turn it into a *sheared shaded polygon*, move it in the relative P1 direction. Repeat for all the polygons (see page 9-11 steps **11.-14.**)



13. Now there are these remaining white areas, the bottoms of the recesses and the sloped pillar junction. One thing this method doesn't cover is the seamless connection of non vertical surfaces. In this case, it would require a ***3D texture***.

One solution is to use another, non patterned, texture that matches the overall style of the map, making clear that another material has been used (or applied, painted, etc.)

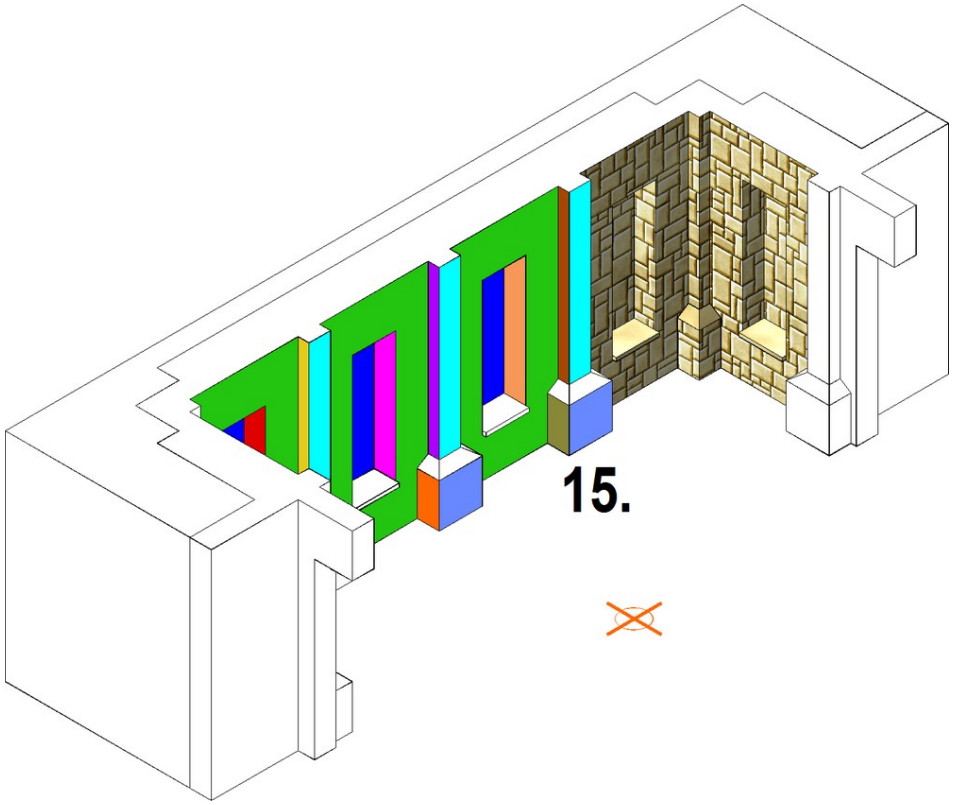
Just copy the lines elsewhere on your map (or on another work sheet).



14. Then create *roof shaded polygons* to turn into *sheared shaded polygons* without bothering to calculate the *shear fill origins* unneeded with a not patterned texture**.** For the thin vertical areas and the slopes areas, the angles where set, from left to right, to B1, B4, B8 and B7. For the flat areas, the angle was set to 0°.

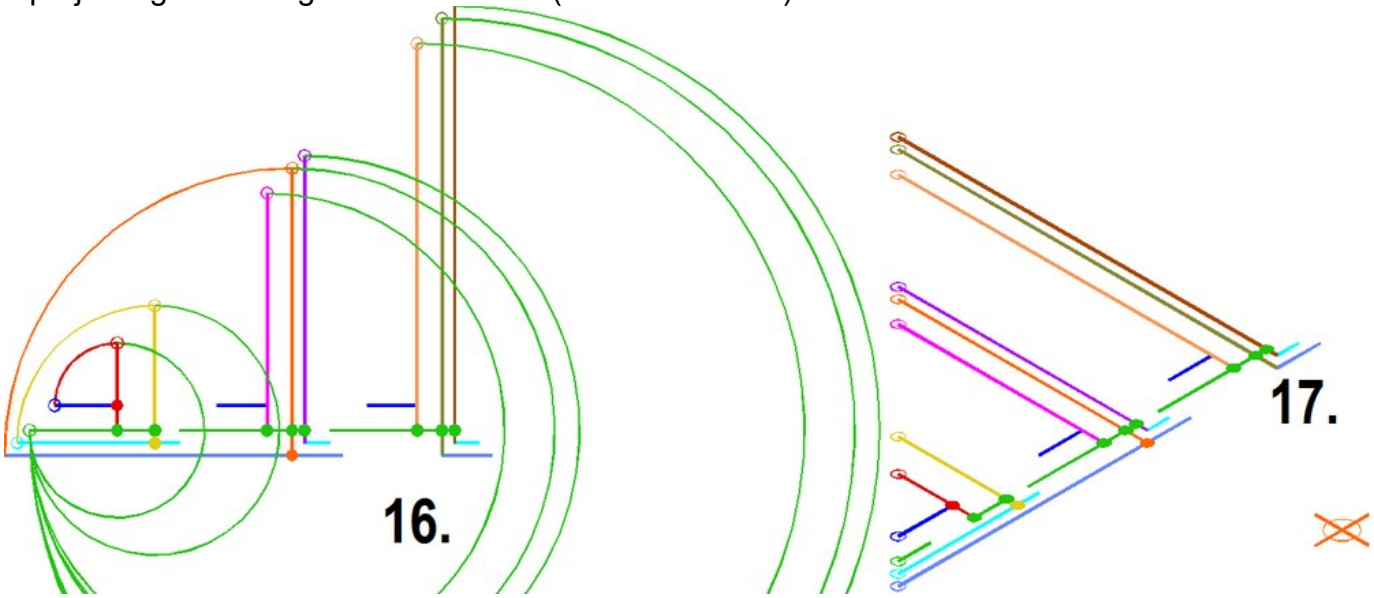
For the vertical faces, the pitch was set to 60° like all the rest of map, to 55° for the sloped ones, and to 50° for the flat surfaces to reflect the fact that non vertical surfaces should receive more light from a light source supposed to be somewhere above the map.

15. Now analyze the next part of the back wall. Each section between two pillars could be done separately, but all the green, all the dark blue, all the sky-blue and all the blue (color 9) areas have the same *shear fill origin*[1], so select all the shapes with the same color together when turning them into *roof shaded polygons* to speed things up.



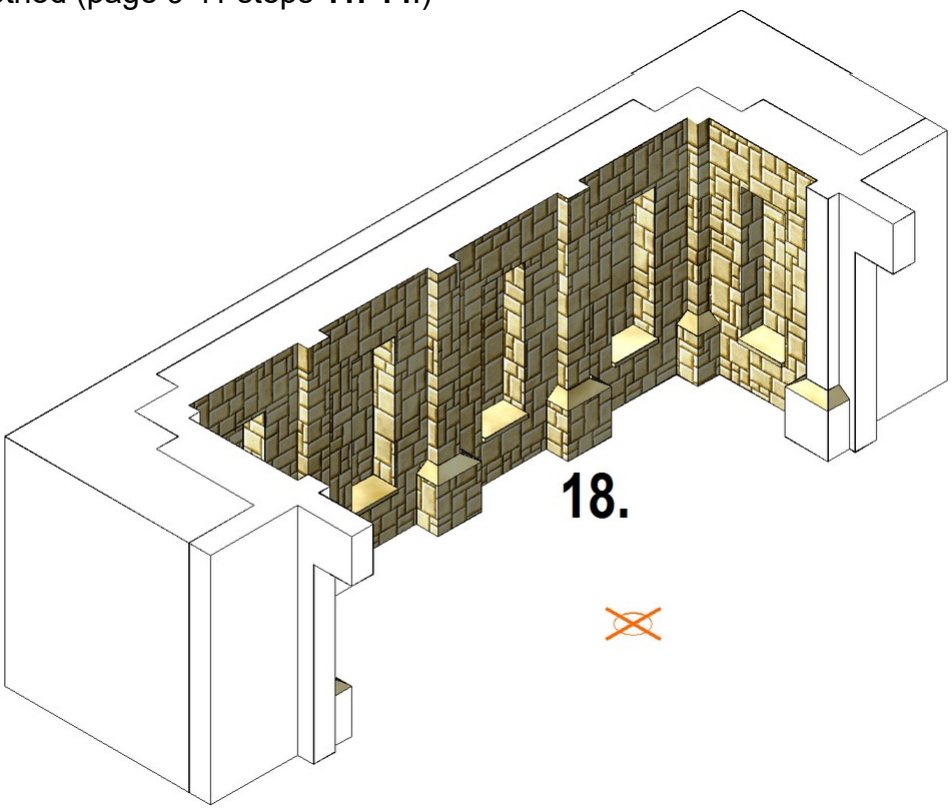
16. Back to unwrapping,

17. projecting and using the GPP macro (+ **SAVEVARS↵**).



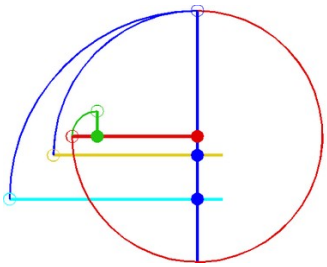
1 Because all pillars have the same width thus offsetting the wallpaper that much. This can also be noticed the hard way, by unwrapping and seeing that all the trimmed lines met (experience talking).

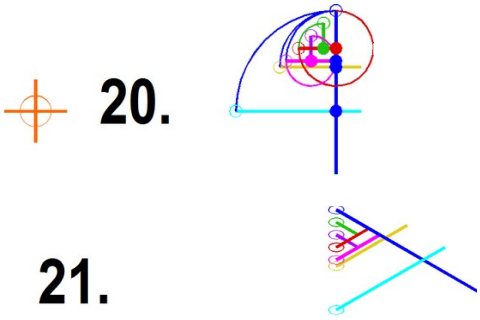
18. Apply the method (page 9-11 steps **11.-14.**)



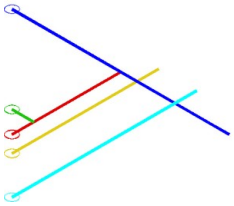
19. Now the front part of this wall. Here the same colored areas are treated separately, it's just to speed things up but the left and right parts are independent.

20. Unwrap both parts.

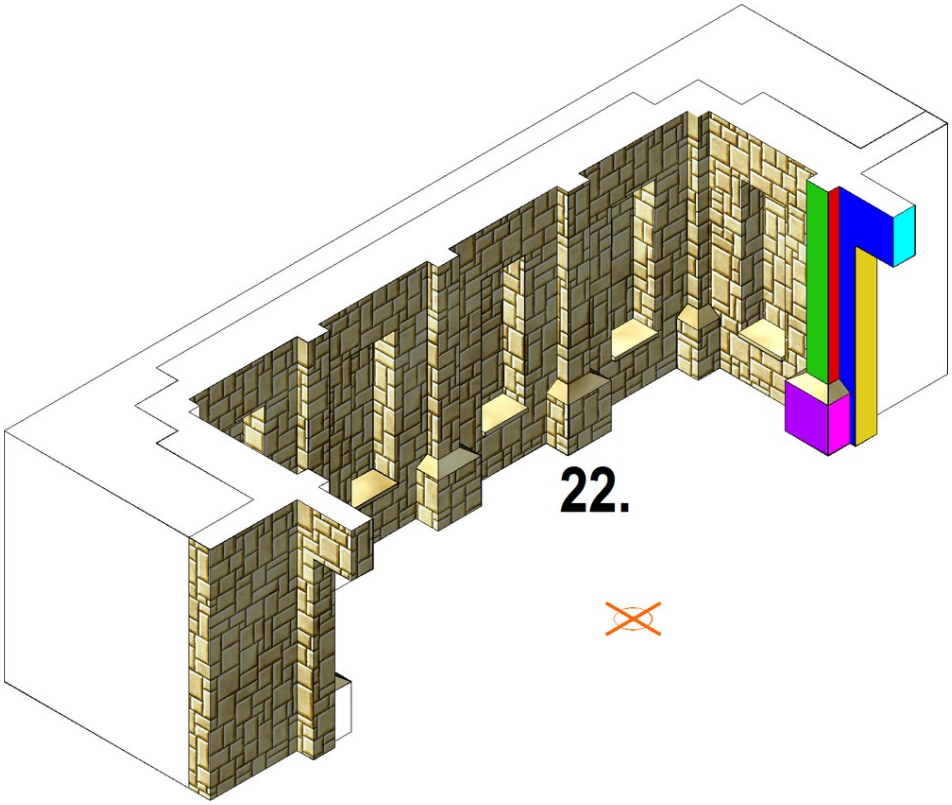




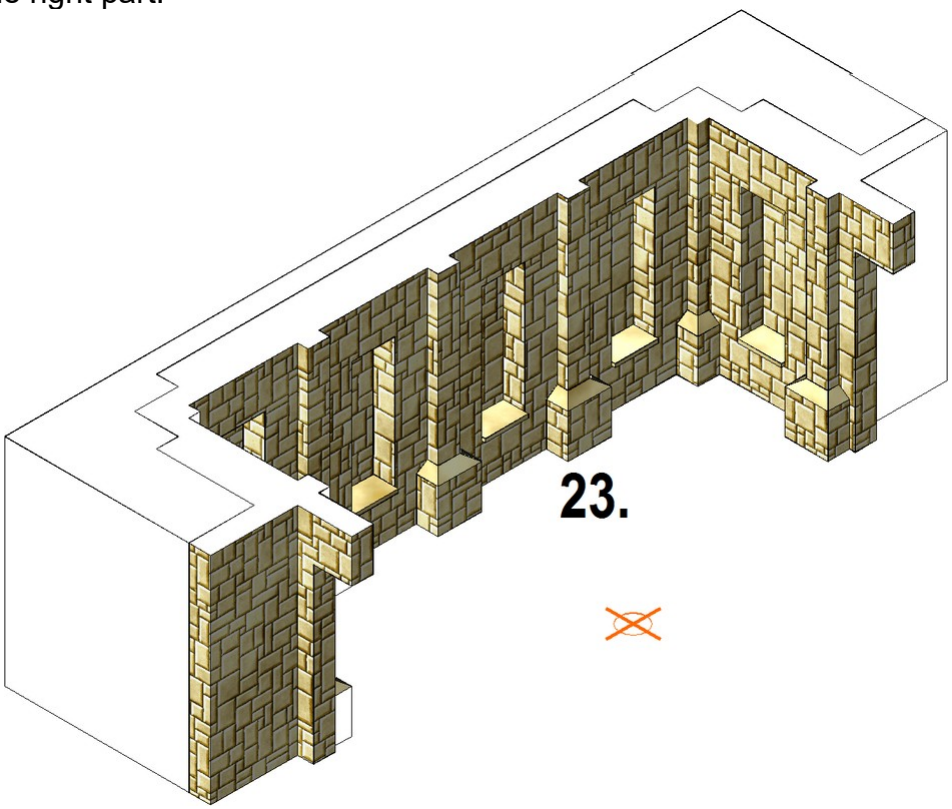
21. Project and use GPP on the left part.



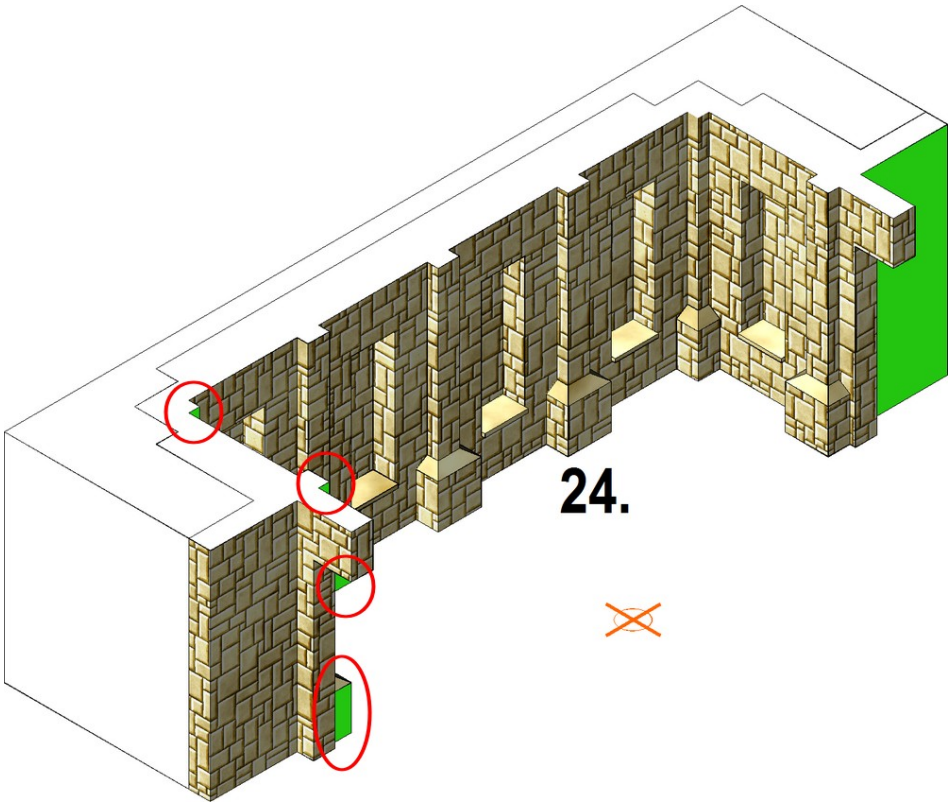
22. Use the method.



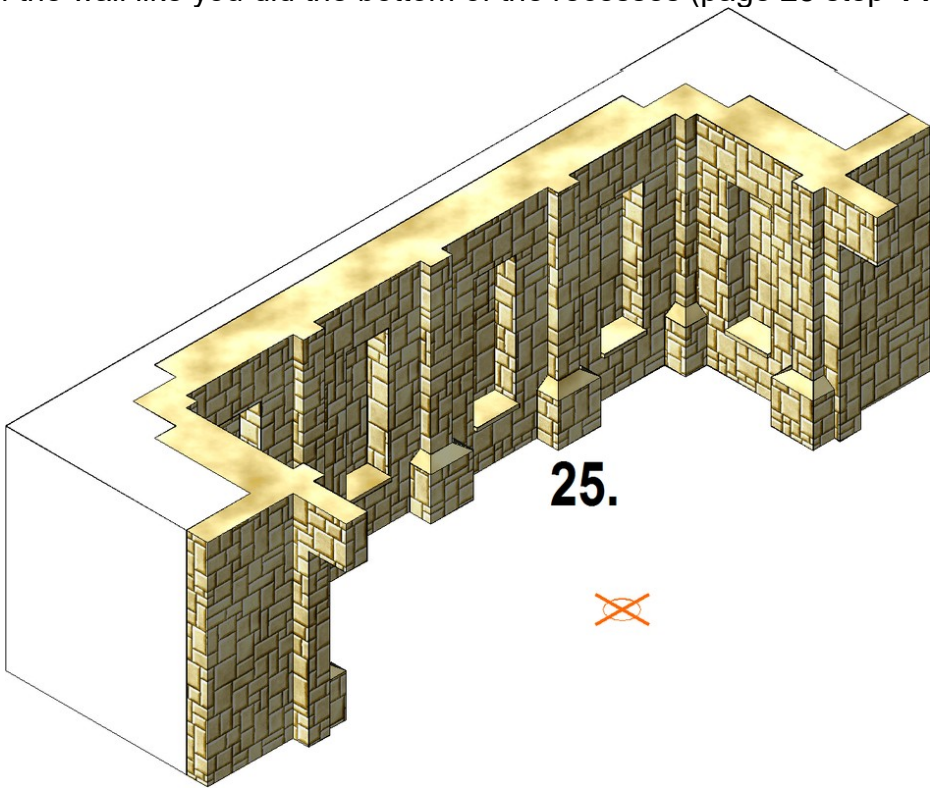
23. Repeat for the right part.



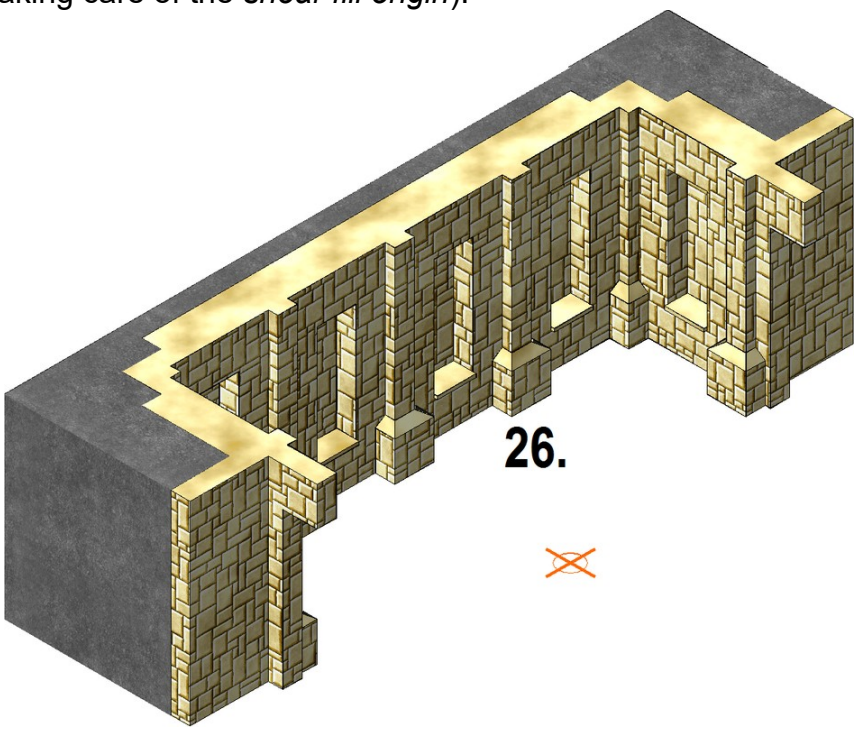
24. The only vertical areas remaining are all isolated, unconnected to any other vertical surface.



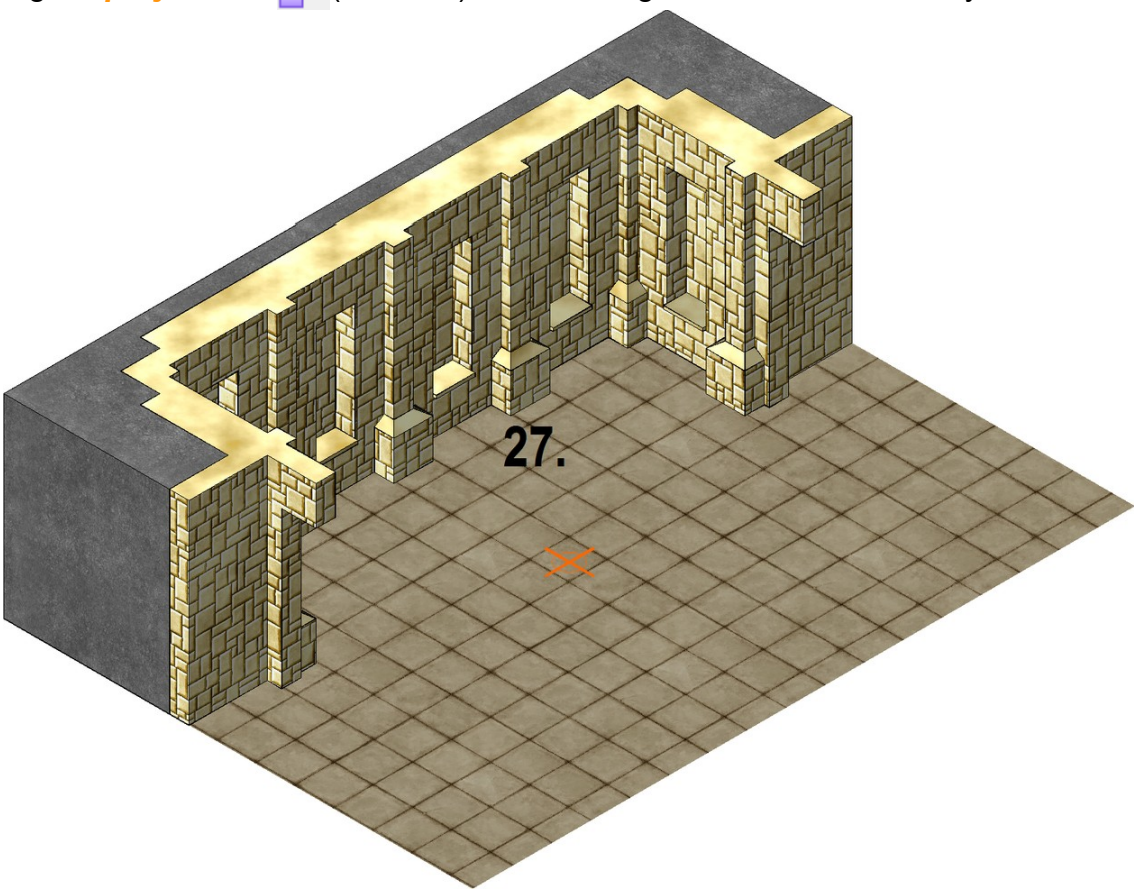
25. It is possible to treat each of these 5 polygons separately, but as they do not connect with any other wall entity, use a single one when you turn them into a *roof shaded polygon* with the angle b2 from step **22.** For the same reason, you don't need to bother with the *shear fill origin* point. Add the top of the wall like you did the bottom of the recesses (page 28 step **14.**)



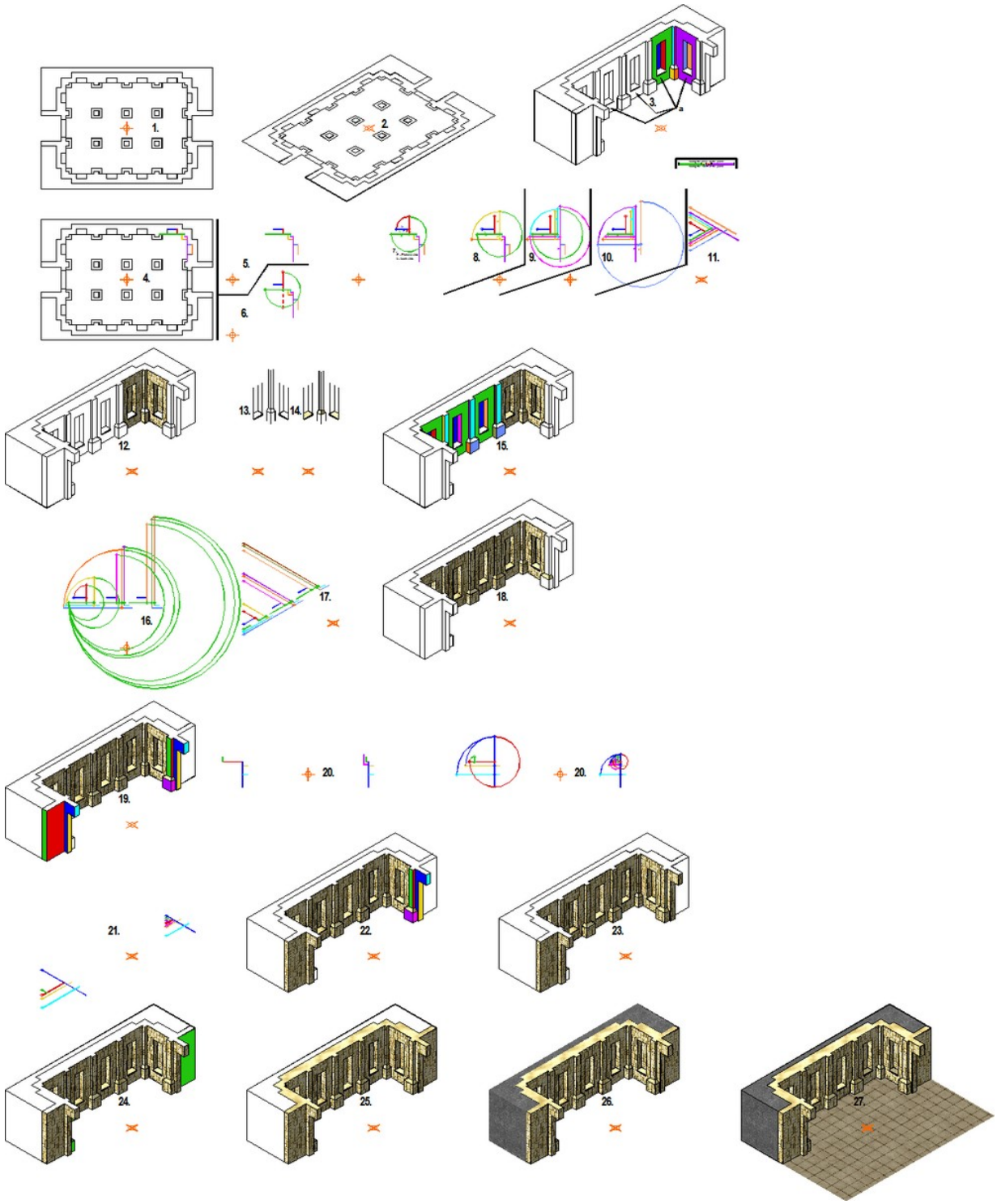
26. Using a non-patterned fill style for the rocky part is also done that way (*sheared shaded polygons* without taking care of the *shear fill origin*).



27. Move everything to a “WALLS, BACK” sheet and add a “FLOOR” sheet underneath and a floor, just using ***3D projection*** (**IPROJ↵**) on a rectangle with the select fill style.



Just a screen shot to show the in progress steps of the map:

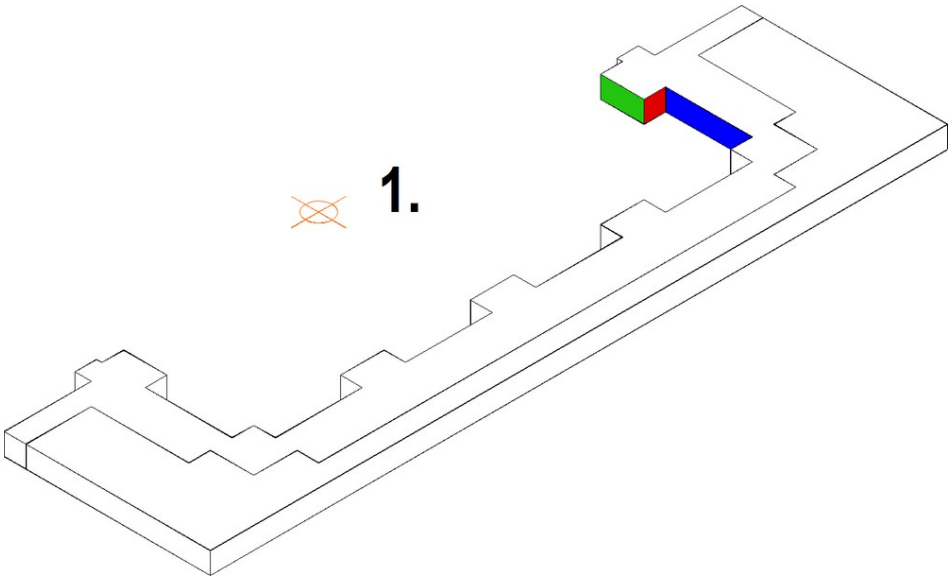


And hmmm… yes, the page has been neatly rearranged for this display ;).

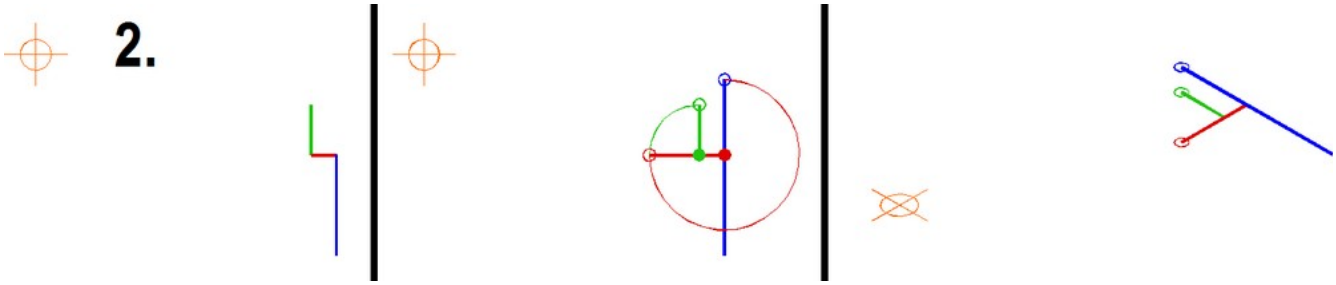
IV-2 The front wall

This section will cover the front part that will have a very small height (1') to let the rest of the map show.

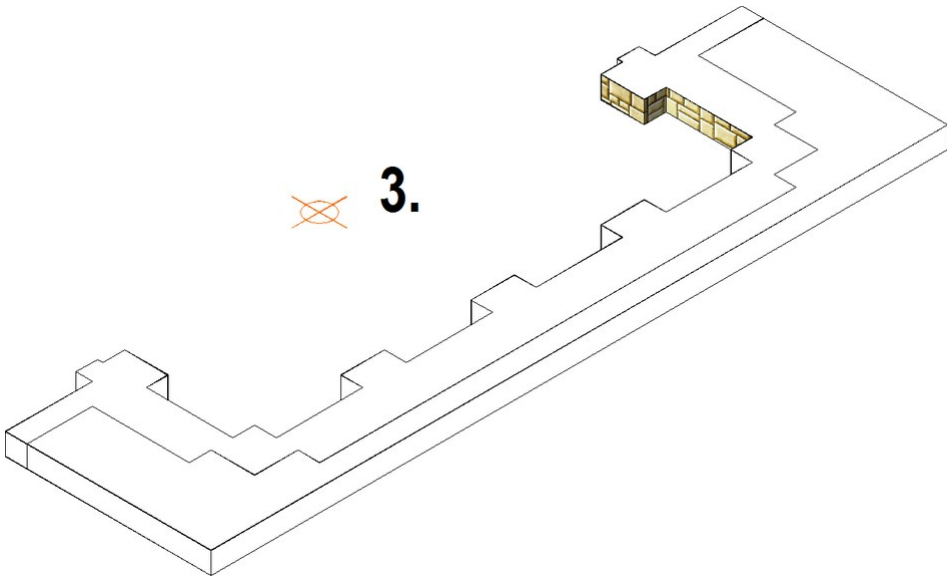
1. Start here with the line perspective work and color the only connected surfaces of this part.



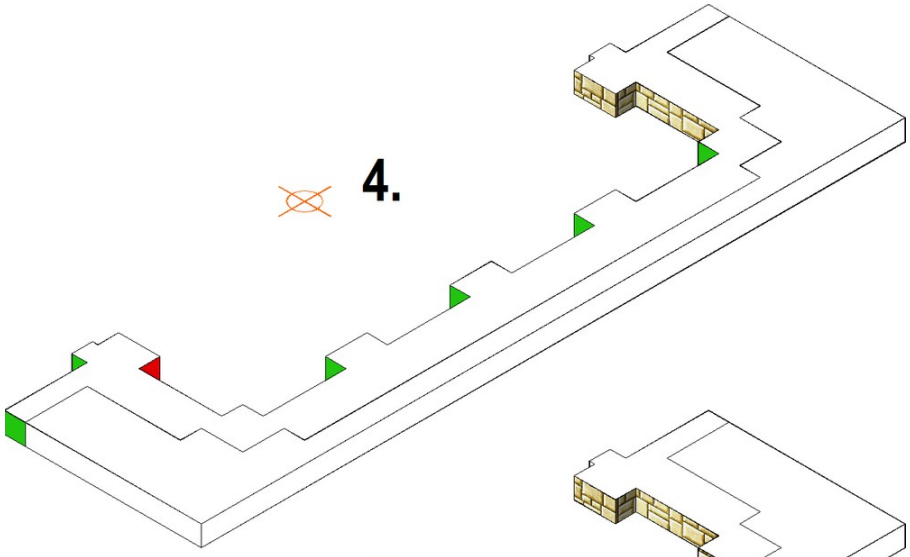
2. The unwrapping part is very limited and should be straightforward.



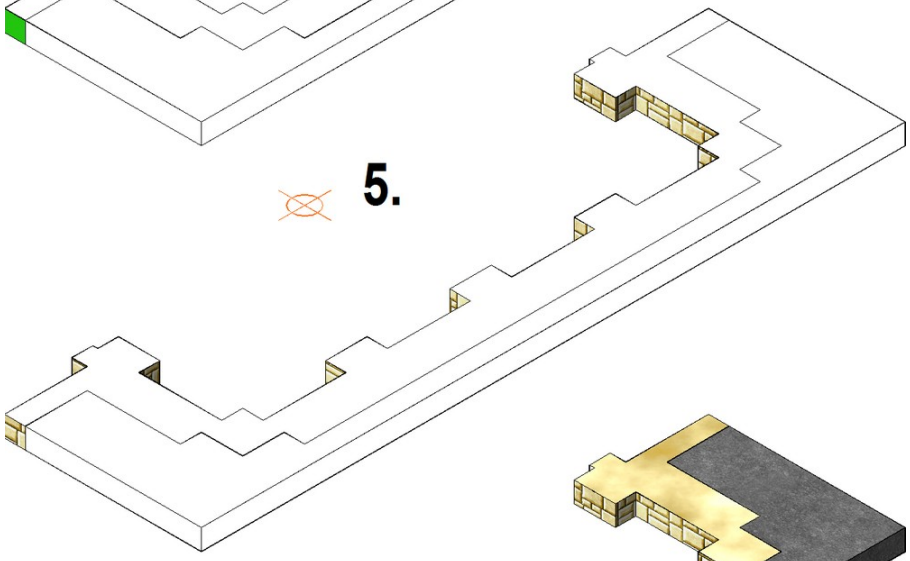
3. And apply the method.



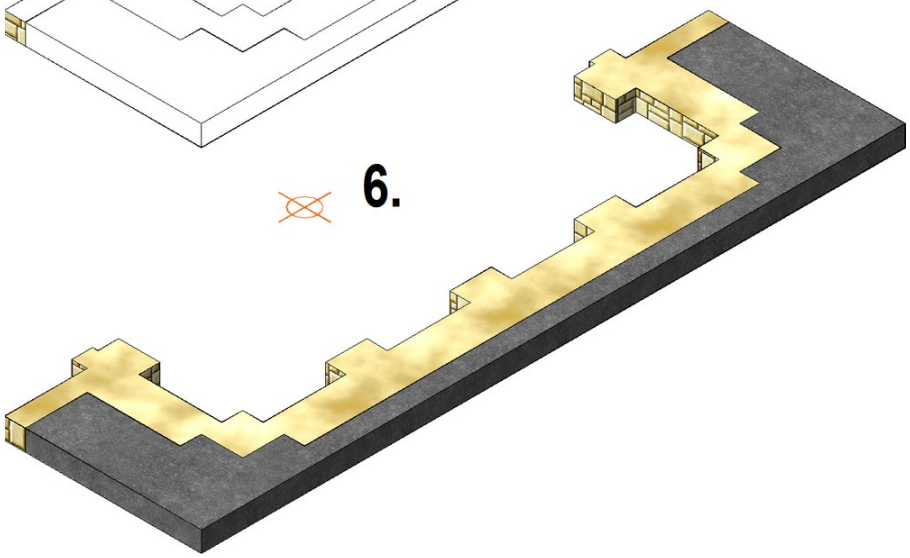
4. The remaining vertical surfaces are independent.



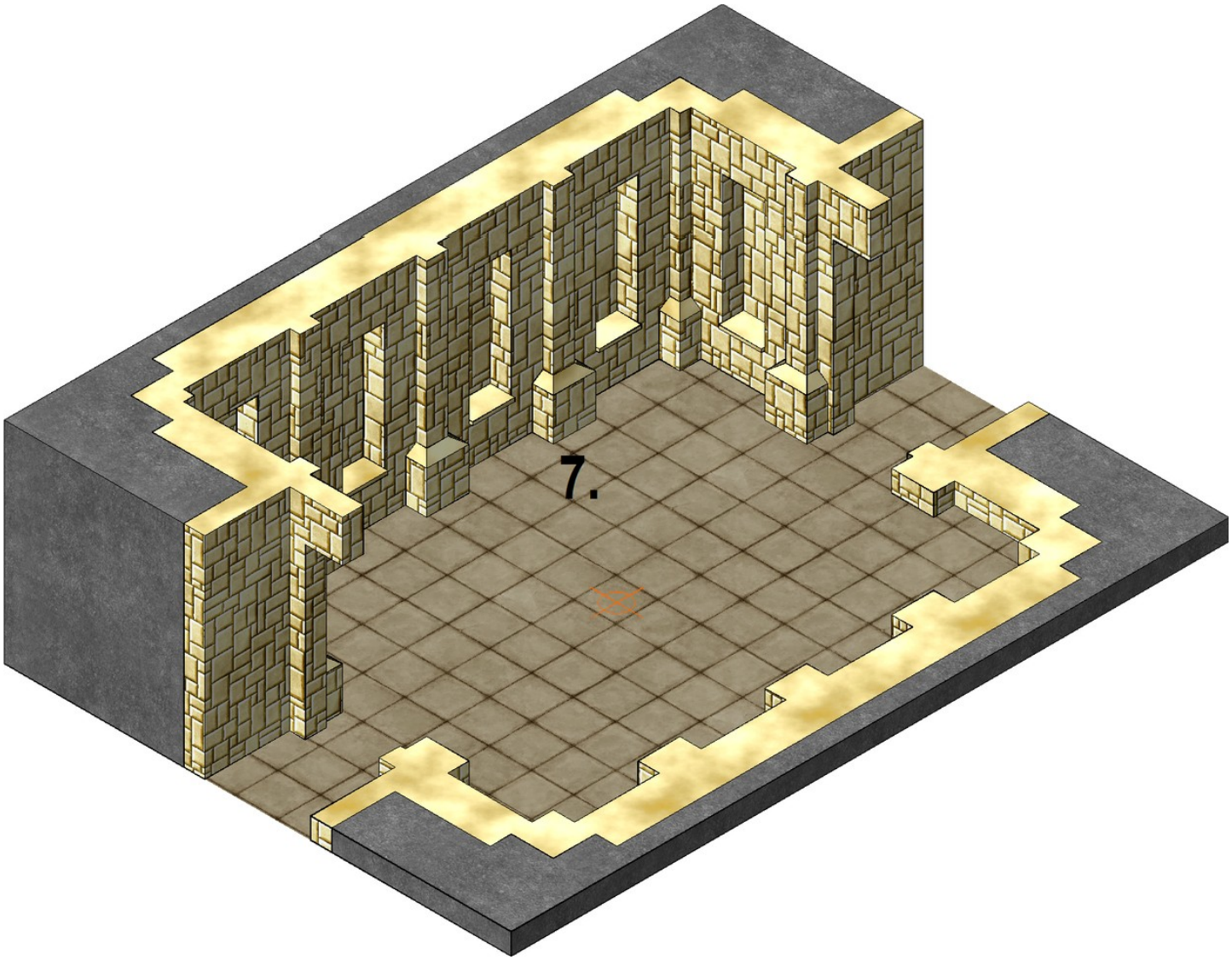
5. All the green polygons can be treated together with the angle b1 from step 2. The red polygon is a standalone with angle b2.



6. Now add the top and the rocky parts.

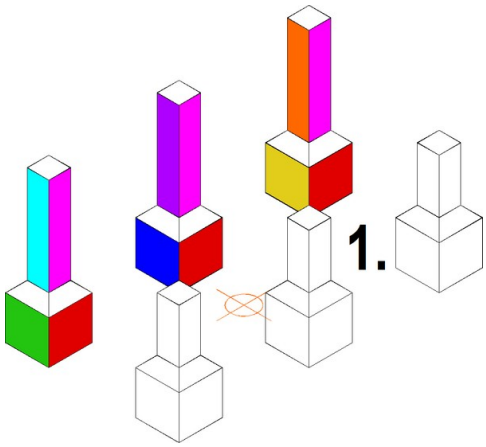


7. Depending of the setting, copy this part to the main file or to the main area of the map. Send it to a WALLS, FRONT sheet.



IV-3 The pillars

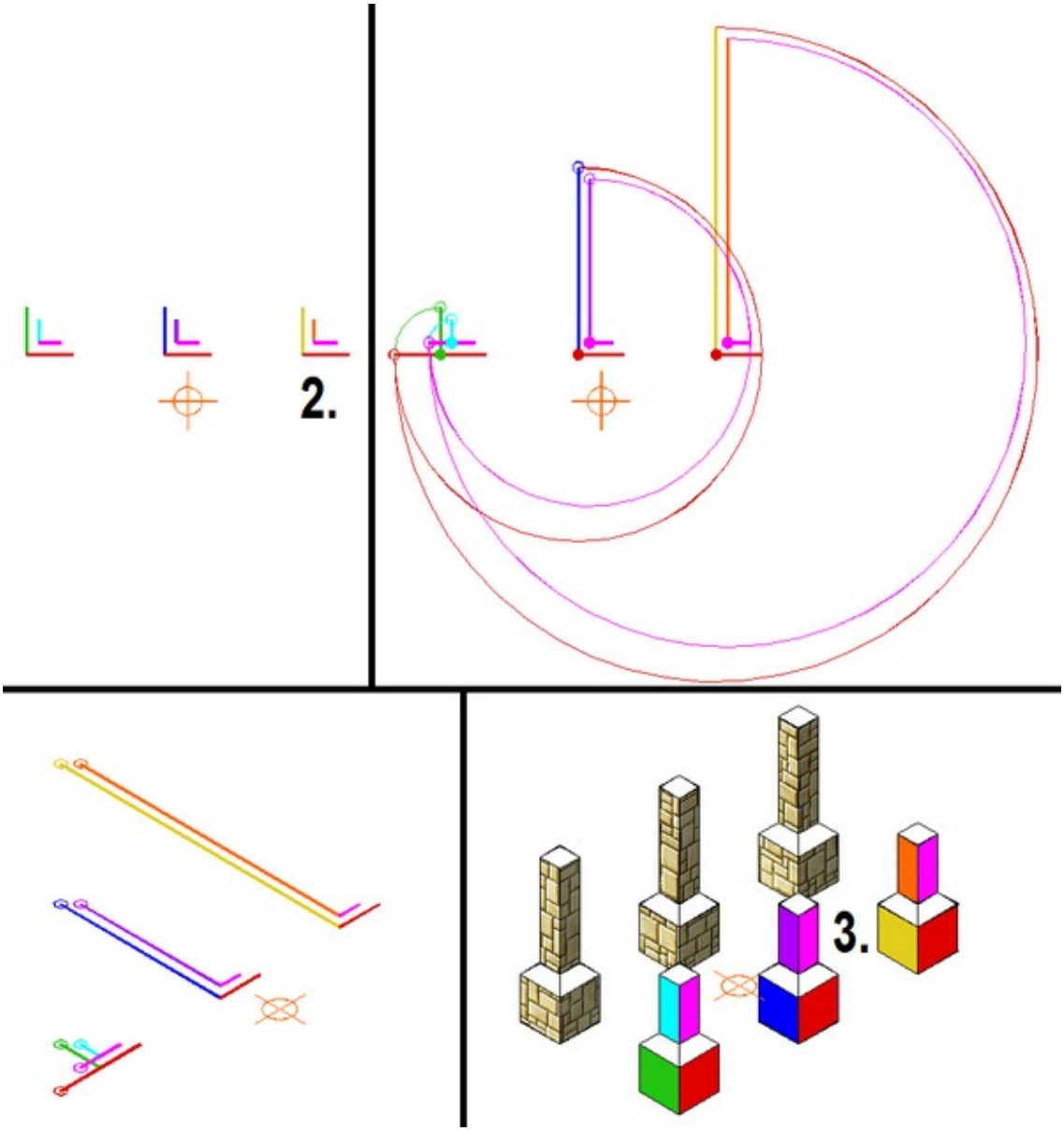
The north wall is 10' high and the south wall is 1' high. To get a gradual decrease of height from back to front, a height of 7' has been chosen for the back row of pillars and a height of 4' for the front row. It's of course also possible to use other options, for example keep the 1' height of the front wall.



1. One pillar of each height could be created and copied/pasted thrice but it would yield clones. Start with the three back pillars that can be wrapped together, given that all the red areas will turn in a single entity, and that all the pink areas will also turn in a single entity (see footnote page 29.)

2. Unwrap, project in 3D, and use the GPP macro.

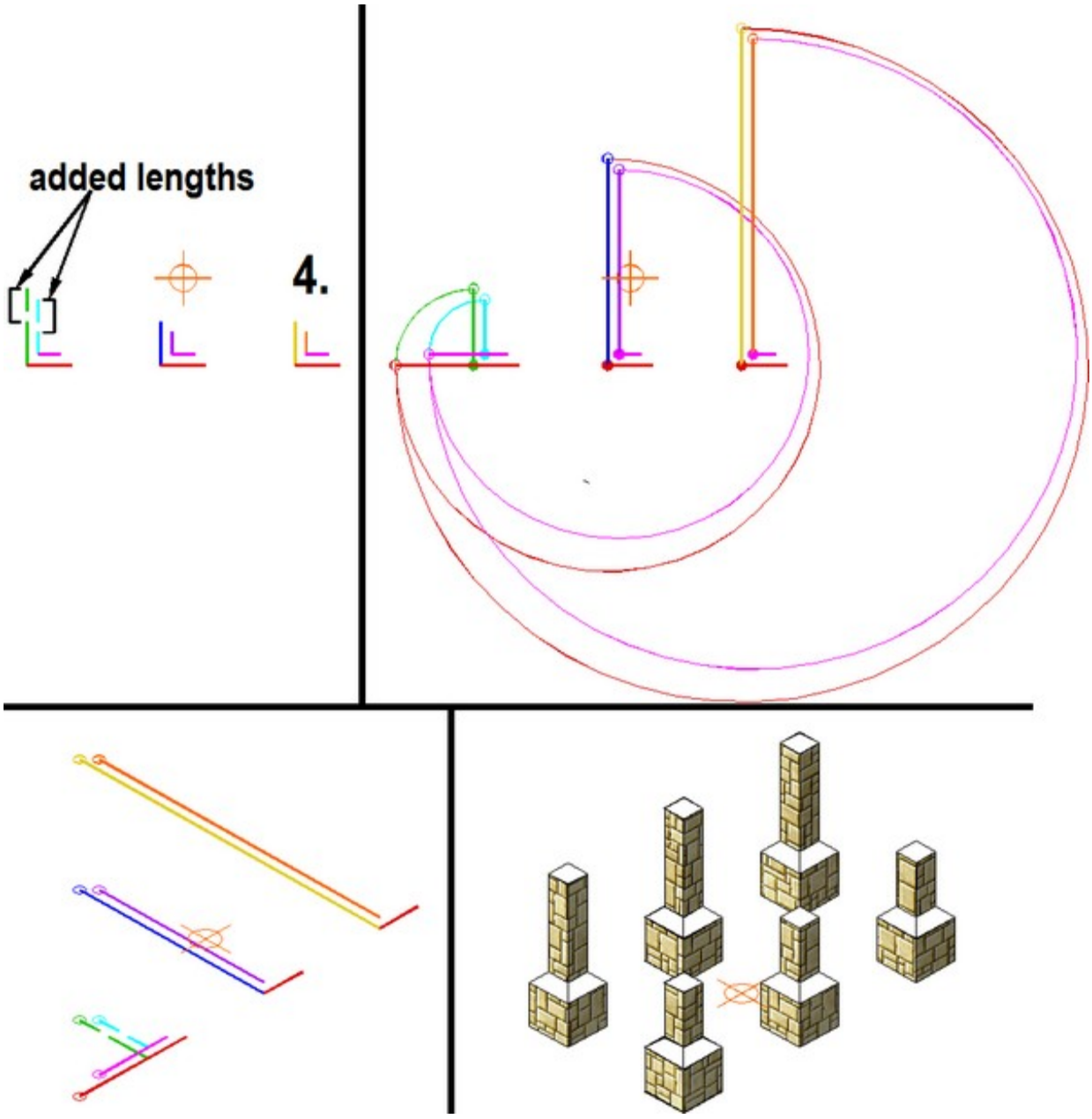
3. Create the shaded polygons.



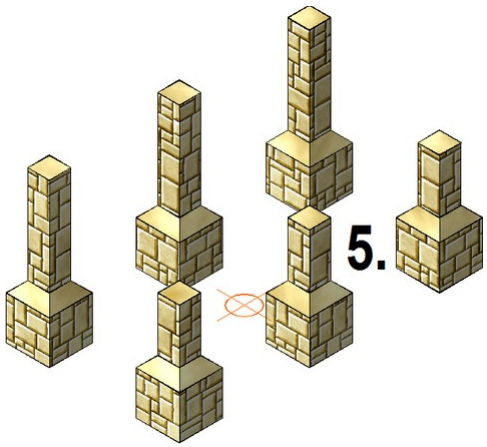
4. The three pillars to the front form the same situation, they are just smaller than the pillars to the back.

The corresponding pillars will have the same bases and shafts pattern as the back pillars.

There is a solution to avoid this: lengthen the green and sky blue lines with ***Trim***  (**TRIM↵**). Any length will do, no need to add the same length to both. Because the polygons themselves are not changed, this will just offset the first *shear fill origin* for the bases and the first for the shafts. And because every over line is trimmed to the unwrapping of the previous one, the offset will stay to the end, making a change in the look of the pillars but keeping the seamless aspect.



5. Just add the tops (pitch 50°) and the slopes (pitch 55°) using the angles b1 and b2 for the slopes.



6. Add the pillars to a PILLARS sheet between the WALLS, BACK and WALLS FRONT sheet, place some symbols and here you are:

Note: all the contour lines have been placed on the LINES, BACK, LINES PILLARS and LINES, FRONT sheet with a little blur effect.

Conclusion

The Perspective 3 add-on for Campaign Cartographer 3+ gives a new way to create wonderful isometric views of any creations and the method described in this article takes it further with a seamless application of any bitmap fill style to any vertical surface. Make your buildings pop!

The investment is only time. A *lot* of time. But as with many things, practice will make it quicker.

Happy mapping!
Joachim de Ravenbel
August 2018

Other articles you may like:

Hanin's Chapel: a tutorial to design a dungeon battle map from scratch but also to learn how to use CC3+'s tools and commands.

Multiple use of Multipolys: an article on… multipolys and what can be done with them.

CC3 and Perspective: a tutorial to create a top down view of a room (not the isometric perspective from P3).

Shaded Polygons: Roofs, Rotated Fill Styles and Perspective: all that can be done with shaded polygons in a regional or dungeon map.

Light Effects: an article to make dungeons alive with light sources.

Map Bits as Fill Styles: how to use exported parts in a dungeon map.

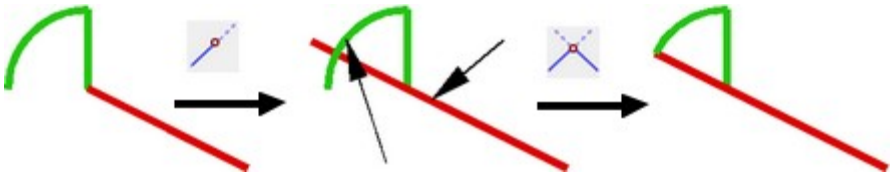
False Spirals: how to create and use them.

Appendix A: About arc trimming

The complexity of arc trimming might result in unexpected results.

- Usually CC3+ trims to the circle with the same center and the same radius as the arc. If there is a point on the circle but not on the arc that is nearer then the expected arc point, CC3+ will trim to this point. For example, when using ***Trim to Intersection*** (**TRIMINT**↵) and clicking on the points shown by the arrows:

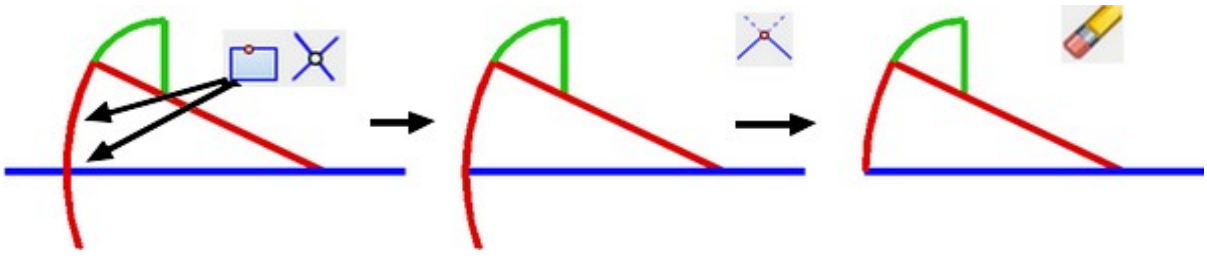
One solution is to first ***Trim*** (**TRIM**↵) the red line so it crosses the arc and using ***Trim to Intersection*** (**TRIMINT**↵) after:



Another solution is to carefully select the click points to achieve the expected results, but in the end, it takes probably more time than the solution presented here.

- Sometimes, CC3+ trims the arc on the wrong side. An example also with ***Trim to Intersection*** (**TRIMINT**↵)

One solution would be to select the arc on the other part. Doesn't always work though… Another solution is to first ***Split*** (**SPLIT**↵) the arc with the ***Intersection modifier*** (**F6**), ***Trim to Intersection*** (**TRIMINT**↵) and ***Erase*** (**ERA**↵) the unwanted arc part:



Appendix B: What ifs?

- **What if some commands don't work anymore?**
  Some commands, like ***Zoom In***  (**ZIN↵**) and ***Zoom Out***  (**ZOUT↵**) tool are macros contained in the CC3+ main macro file: FCW32.mac. When you load another macro file like the GPP.mac file, you don't have access to these macros anymore.
  The solution is to ***save the variables*** first with **SAVEVARS↵** then to load the FCW32.mac file back with **LOADMAC↵**. Next, if needed, retrieve the variables with **SCRIPT↵**.

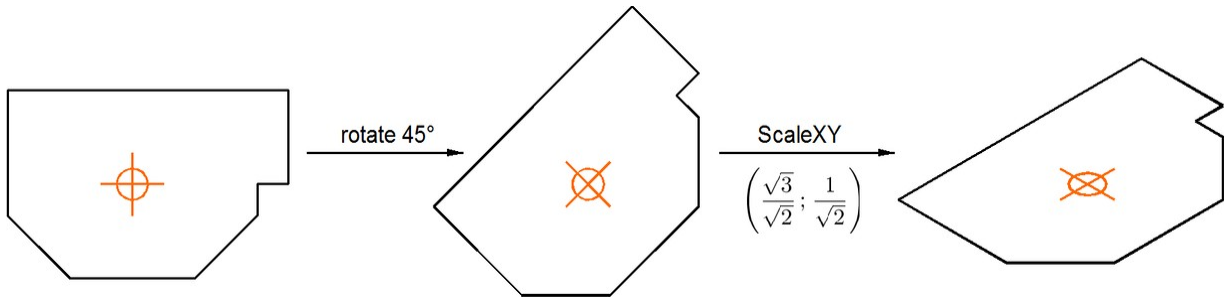
Each time a macro file is loaded, all the variables disappear!!!

- **What if the GPP macro crashes**?
  Sometimes, the target endpoints are so close CC3+ chooses another entity or any other bad weather event caused a macro crash which usually display a message box. The GPP doesn't alter the settings (fill style, line style, color, selection method…) so the things to do are:
  - Clear the variables by reloading the macro file with ***tools*** → ***macros*** → ***Load macro…*** (**LOADMAC↵**).
  - Restart, perhaps after a ***Zoom In***  (**ZIN↵**) click.

- **What if the GPP macro causes CC3+ to crash?**
  Nothing else to do but to reload the file (you save regularly, do you?) and restart (see above).

- **What if the fill style doesn't apply seamlessly?**
  The wrong end or the wrong entity has probably been clicked with GPP, or the wrong angle/displacement value has been used (using the colors as shown in this article helps to prevent this but sure, it's not 100% safe).
  The only solution is alas to use the ***Undo***  (**UNDO↵**) command or reload a file and restart.

- **What if I don't have the 2D floorplan anymore?**
  Basically, the ***3D projection***  (**IPROJ↵**) tool takes the target entities, rotate them by 45° (CCW or counter-clockwise projection) or by -45° (CW or clockwise projection) and uses and independent scaling, the ***right-click*** → ***Scale***  ***Non visual ScaleXY*** (**SCALEXY↵**) ***tool*** with an X-scaling (horizontal scaling) of $\frac{\sqrt{3}}{\sqrt{2}}$ and a Y-scaling (vertical scaling) of $\frac{\sqrt{2}}{2}$.



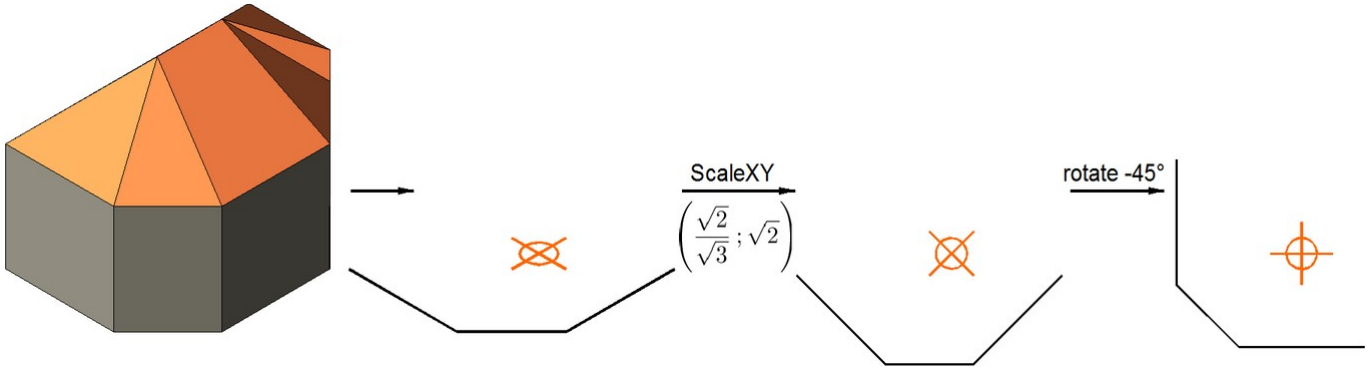
To transform a perspective floor into a 2D one perform the reverse transformations: a ***ScaleXY*** with an X-scaling of $\frac{\sqrt{2}}{\sqrt{3}}$ and a Y-scaling of $\sqrt{2}$.

CC3+ doesn't usually give square roots but by trigonometry these values can be obtained. $\sqrt{3}$ is the tangent of 60° so typing **GTAN ↵ TAN ↵ 60 ↵** will store $\sqrt{3}$ in a variable called "TAN".

$\frac{1}{\sqrt{2}}$ is the cosine (and the sine) of 45° so typing **GCOS ↵ COS ↵ 45 ↵** will store this value in a variable called "COS".

To reverse the perspective process:

- Trace the bottom of the walls with lines
- ***Right-click*** → ***Scale***  ***Non visual ScaleXY*** (**SCALEXY↵**) the result and when the prompt asks "**Scale X by [1.00000]:**" answer **1/TAN/COS ↵** and when it asks "**Scale Y by [1.00000]:**" answer **1/COS ↵**.
- ***Rotate***  (**ROT↵**) the result by -45°.

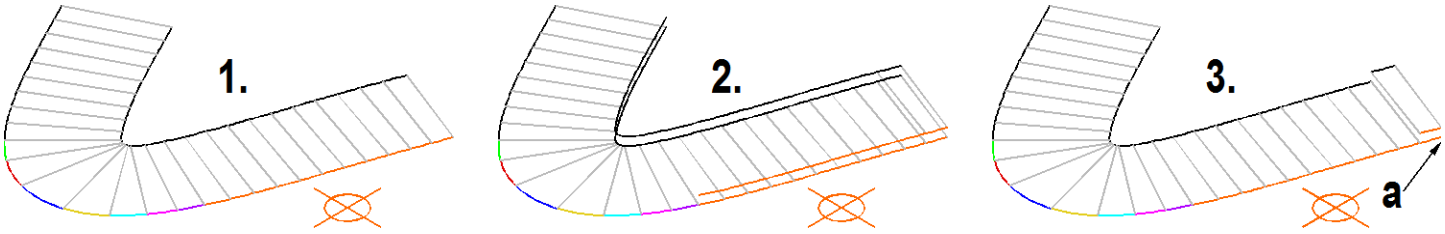


Appendix C: creating isometric stairs step by step

1. This appendix shows how to create the isometric stairs from part III, page 20 step **8**.

2. ***Copy*** the four entities defining the first step (the two rightmost gray lines, the black outside contour smooth path and the orange front path) from 0,0 to 0,0.5 (height of a step).

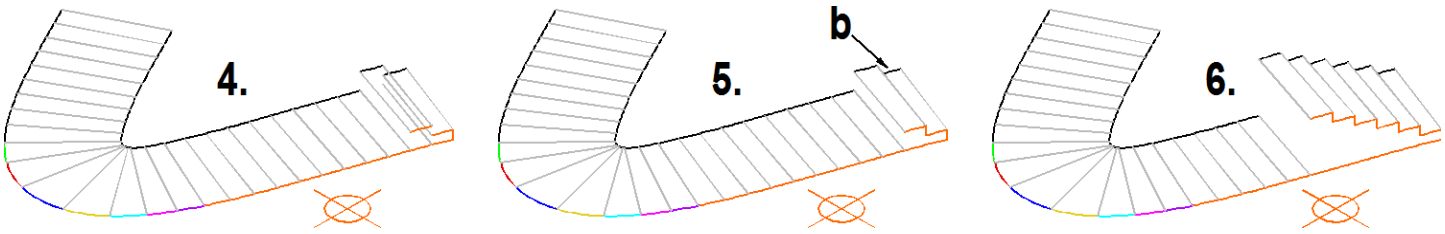
3. ***Trim to Intersection*** (**TRIMINT**↵) the new black and orange lines to the new gray lines (optionally also trim the old black line to the next step for clarity's sake). ***Erase*** (**ERA**↵) the rightmost gray line and add the small orange ***Line*** (**LINE**↵ detail **a**) with the ***Endpoint modifier*** (**F5**).



4. ***Copy*** the four entities defining the second step, ***Trim to Intersection*** (**TRIMINT**↵) the black and orange lines (only the new orange line). ***Trim to*** (**TRIMTO**↵) tool.

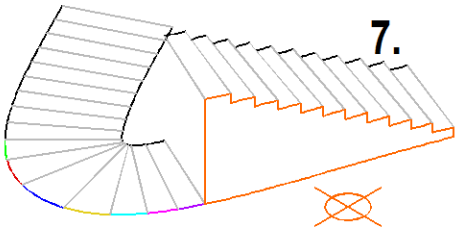
5. Trim the back of the first step to the second one with the ***Trim to*** (**TRIMTO**↵) tool (detail b.) ***Erase*** (**ERA**↵) the old gray line and add the small orange ***Line*** (**LINE**↵) connecting the first step to the second with the ***Endpoint modifier*** (**F5**).

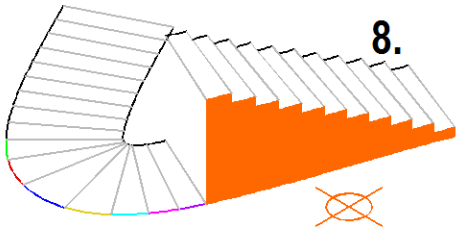
6. Repeat the process.



7. When the last step built on the orange floor line is reached, draw an orange line from the bottom (*Endpoint* F5) of the floor line to the top of this last step.

8. Use the *Multipoly* tool (MPOLY2↵) and select all the orange parts (if selecting by color, which is quite convenient here, don't select the visor if it happens to be orange too) to create the first wall segment.

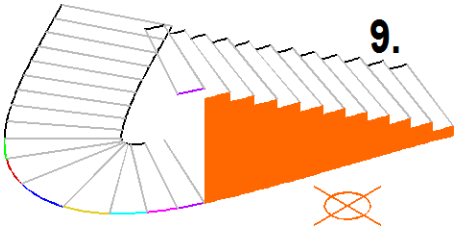


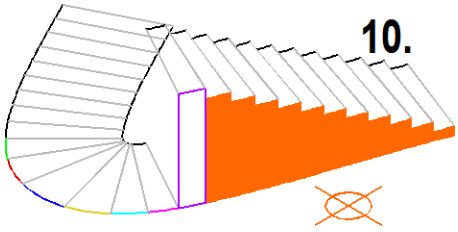


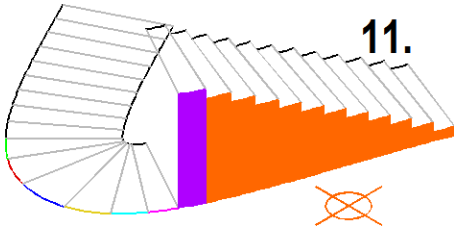
9. *Copy* the four entities defining the next step, *Trim to Intersection* (TRIMINT↵) the black lines. *Trim* the back of the previous step *to* the new one (TRIMTO↵).

10. Change the color to 7 and add two vertical *Lines* (LINE↵) at the front from the floor to the top of this step.

11. Create the *Multipoly* (MPOLY2↵), selecting all the violet parts.



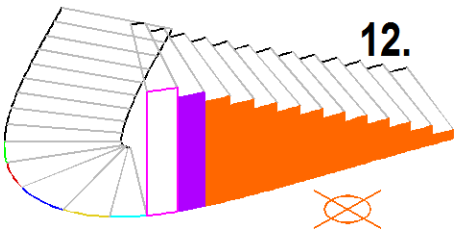


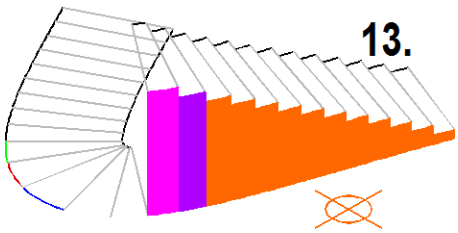


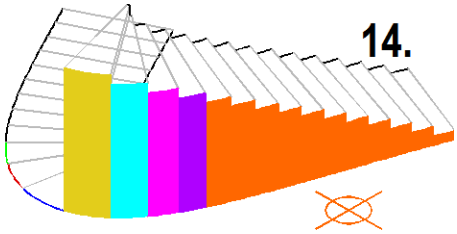
12. Repeat for the pink part, again drawing *Lines* (LINE↵) at the front from the floor to the top of the step.

13. Turn into a *Multipoly* (MPOLY2↵).

14. Repeat for each new step.



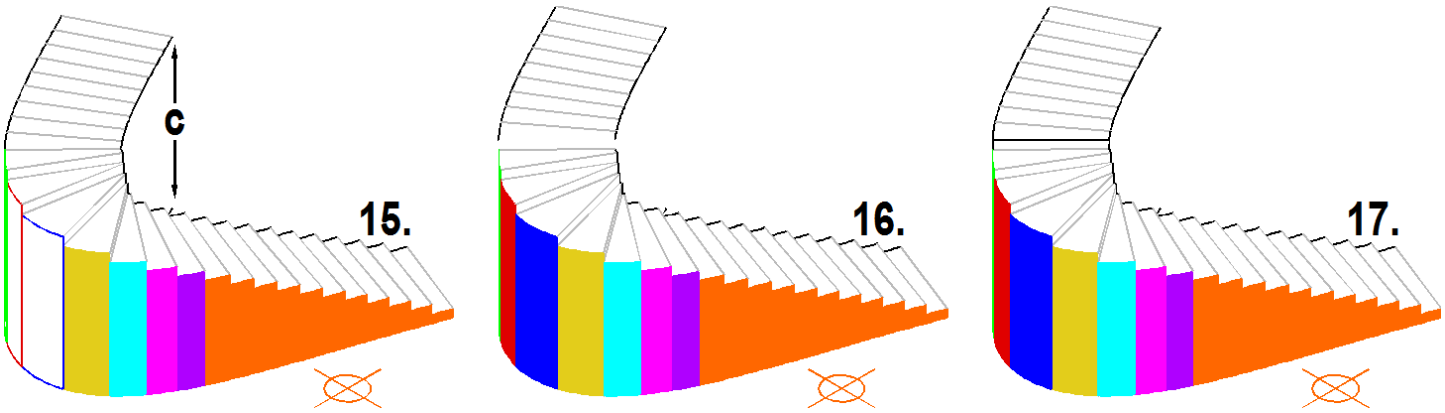




15. For the last step, all the lines have been moved to the current height except the black line that has been copied then trimmed at floor level (detail c). Moving most of the lines instead of copying like the previous ones is possible because the outside wall isn't visible anymore. Keep the small part of the inside wall to close the shape at the end (see step **19.** below).

16. ***Move*** (**MOV**↵) all the last steps except the gray line connected to the step with the green wall section.

17. Finish the new step with black ***Lines*** (**LINE**↵) and the ***Endpoint modifier*** (**F5**).



18. Further proceed step by step or ***Split*** (**SPLIT**↵) the contours black paths at the ***Endpoints*** (**F5**) of each step. Move every part at the correct height (add 0.5' for each new step). This speeds things a bit up.

19. Finish by adding all the black ***Lines*** (**LINE**↵) joining the steps and don't forget to close the inside wall. To wrap with the fill style, return to page 20, step **8.**