




Part 4 – Altering the walls

Introduction











The rough masonry has been done and now needs detailing.

In this part, the CA46 **Alcove** tool  (**BAL1**↵) and its derivatives (available when you right-click on the icon) will exclusively be used to create anything going inside a wall like recesses, but also jutting outward: half pillars, buttresses, fireplaces etc.

Half pillars

A single pillar can be drawn as a square or a circle but often you find half pillars attached to a wall.

Adding half pillars, suggesting an arch, where the straight walls of the nave meet the curved walls of the sanctuary will smooth the transition between the 5' thick circular walls and the 3' thick linear ones.

1. Click . If the green grid is visible, remove it by clicking  (see sidebar).
2. Use the **Line** tool  with the **Endpoint**  modifier (or hit function key **F5**) to draw a line segment joining the endpoints of the inner arc.
3. Click the **Move** icon . Select the line and right-click **do it**. Type **0,0**↵ then **0,-2.5**↵. This translates the line 2.5 units down (half of 5', the global width of the arch).
4. Use the **Center Line Scaling** tool  from CA46. Click on the orange line to ensure that it doesn't touch the walls anymore (see sidebar, part 3 page 15). Right-click to end the command.
5. Click on .
6. Click the **Alcove** icon , type **4.5**↵ for the alcove width and **0.25**↵ for the depth.
7. Click on the **Intersection**  modifier (**F6**) and select the orange line then the left wall inner line. Click somewhere to the right of the wall line when the prompt asks to pick a side.
8. While the tool is still active, click again on the **Intersection**  modifier (**F6**) and select the orange line then the right wall inner line. Click to the left side of this line and right-click to end the command.
9. Start again at step 6., but this time with an alcove width of **4**↵ and a depth of **2**↵ (or right-click to accept this number as it is the default half width value).
10. If you want a nice architectural effect, start again with an alcove width of **3.5**↵ and a depth of **0.25**↵ (not the default value).
11. Save as Chapel04.fcw

Working out of the grid

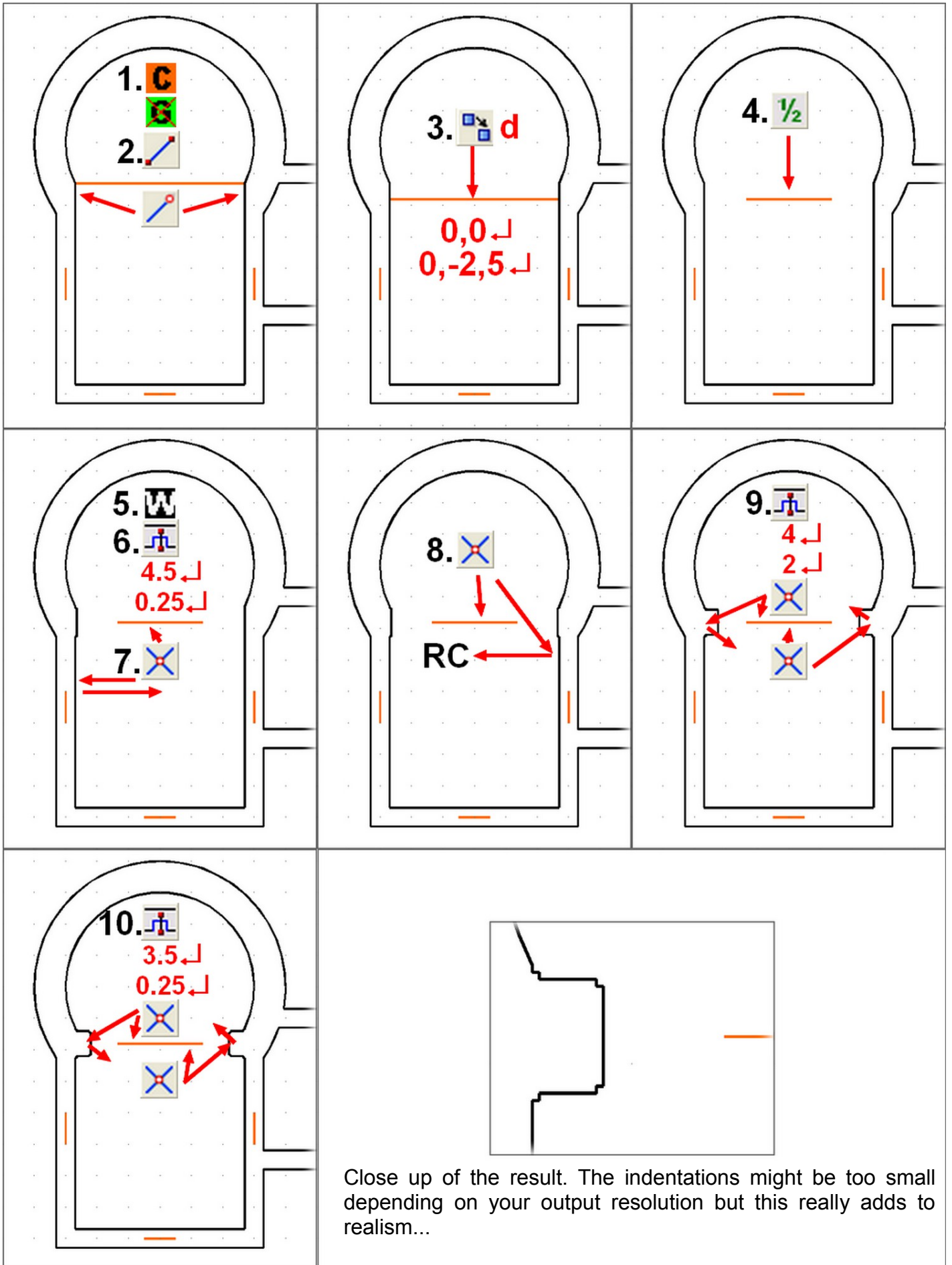
Sometimes you will find yourself with entities that don't fit simply on the grid. This is particularly the case when dealing with circles and arcs.

Finding the intersections of a line and a circle, or of two circles, involves solving quadratic equations which rarely leads to exact numbers.

It doesn't mean that you cannot deal with such cases, only that both the CC3 internal grid and our green grid are here useless.

The modifiers, especially the **Endpoint** (**F5**) and the **Intersection** (**F6**) modifier, find the root of these equations for us.


















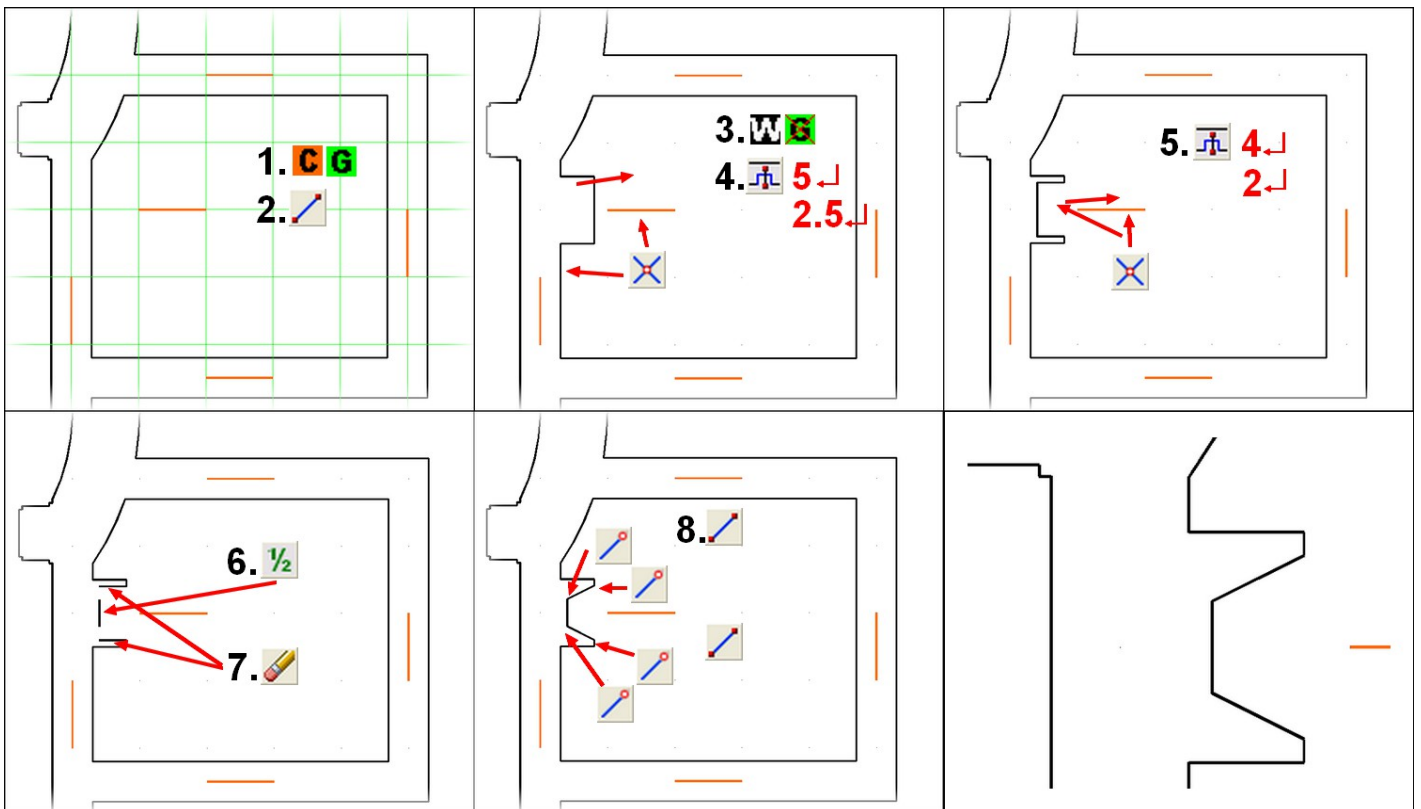




Fireplace

The same tool can be used to create a fireplace, first by pulling the wall outward, then pushing a smaller part inward. Scaling and editing further shape the wall around the foyer:

1. Click **C** and **G**.
2. Draw a short **Line**  to define the fireplace's axis.
3. Click **W** and **G**.
4. Click **Alcove** , alcove width **5'** , alcove depth **2.5'**  (or right-click, default value), **Intersection**  modifier (**F6**) and select the orange line then the target wall line to break. Click to the right to pick a side. Right-click to end.
5. Click **Alcove** , alcove width **4'** , alcove depth **2'**  (or right-click, default value), use the **Intersection**  modifier (**F6**) and select the orange line then the jutting wall side from step 4., pick the left side now. Right-click to end.
6. Use the **Center Line Scaling** tool  $\frac{1}{2}$ and select the foyer back line. Right-click.
7. **Erase**  (**ERA**) the dangling lines.
8. Join the unconnected lines with **Line**  and the **Endpoint**  modifier (**F5**). Alternatively to steps 7. and 8. you can **Node edit**  the dangling lines, also combined with the **Endpoint**  modifier (**F5**), instead of erasing them and draw new ones.
9. save as Chapel05.fcw





Adding alcoves (recesses) to the curved sanctuary wall

If you look at the sketch page 11 you see that we need 8 alcoves evenly spaced along the inner curved wall. As each alcove is obtained by rotating the previous one, the angle of this rotation must be calculated.

1. Perform an **Info**→**List** (**LIST**↵) command on the target arc to get the following information:

```
T List
+---Sheet: WALLS -----
2D Arc: color 0 (black) layer 319 (WALLS)
line style 0 (Solid) fill style 0 (Hollow)
line width 0.00000 tag # 20109 pen: 0.000 mm 2nd color 0
center at 70.00000, 50.00000, radius 15.00000
starting angle 334.15807, angle width 231.68395°
arc length 60.65472
```

2. Round the angle width down to a suitable value: 230° here (see sidebar). Divide the rounded angle width by the number of alcoves: $230^\circ \div 8 = 23.75^\circ$.
3. Click **C** then **G**.
4. Draw a vertical line from the arc's center up (you can use the **center** modifier or function key **F4** but the center is a grid node so the snapping is enough).
5. Rotate the line by 100.625° (see sidebar) around the arc's center (reference). This is a counterclockwise rotation.
6. Use the **Circular Array** tool (right-click or **CARY**↵). Select the construction line, hit **d** and type
8↵ for the number of strokes
1↵ for the number of rings (or right-click or to accept default)
click on the arc center for the array center
click anywhere for the origin point
-28.75↵ for the angle between spokes. Be sure to have a negative value, to rotate now clockwise.
7. Click **W** and **G**. Right-click and select **Arc alcove with round columns** (last menu item) then type:
1/6↵ for the column radius (or 2"). It's more a frame than a column
5↵ for the alcove width
Use the **Intersection** modifier (**F6**) and select the leftmost orange line from the array then the inner arc.
Click a point to the left (inside the wall for example).
8. While the alcove tool is still active, do the same (**Intersection** modifier (**F6**) and select the next orange line from the array then the inner arc, pick a side) for every other axis then right-click to end the command.
9. Save as Chapel06.fcw

Even and odd number of alcoves and rounding

If you have an even number of alcoves, as 8, there is no vertically aligned axis and the nearest axes from the vertical are at half the angle width for a single alcove:

$$28.75^\circ \div 2 = 14.375^\circ$$

For every other alcove add 28.75°. The last is at:

$$14.375^\circ + 3 \times 28.75^\circ = 100.625^\circ$$

With an odd number of alcoves, there is a vertical axis and every further axis must be rotate by the alcove angle width. Proceed the same way as we need the last axis to obtain all the other with the **Circular Array**.

For example, if you want 9 alcoves, round the global angle width to 230.4, or even 225 (because you can easily divide them by 9) . Never round up or the wall might be to short to take all the alcoves.

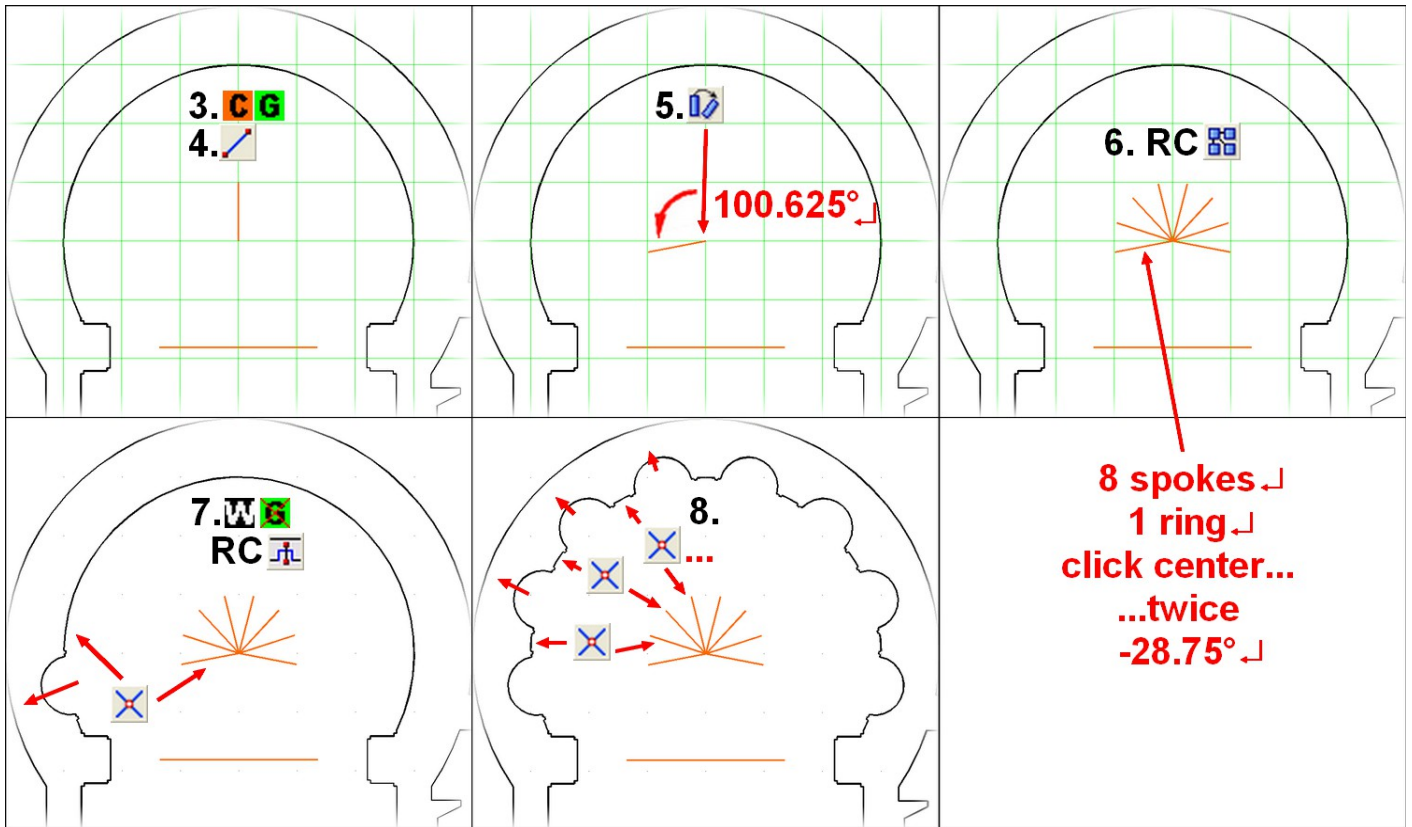
$$230.4^\circ \div 9 = 25.6^\circ$$

so the last axis will be at an angle of :

$$25.6^\circ \times 4 = 102.4^\circ \text{ to the vertical.}$$

Note: if you end the tool too soon, just right-click again and start over, the numerals are kept.







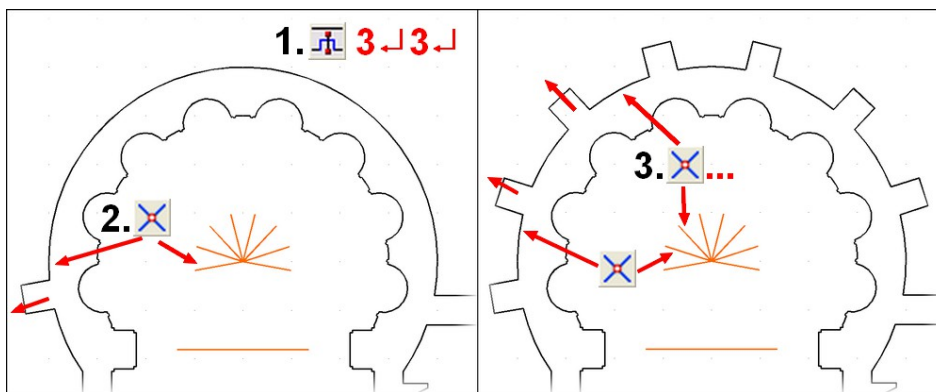
8 spokes ↴
 1 ring ↴
 click center...
 ...twice
 -28.75° ↴

Adding buttresses

A buttress is a structure jutting from the wall (or built against it) that provides support against outward forces generated by the building's height or roof.

Using the convenient lines from the alcoves it's easy to add multiple matching buttresses:

1. Select the **Alcove**  tool, alcove width **3** ↴, alcove depth **3** ↴.
2. Use the **Intersection**  modifier (**F6**) and select one construction line from the array then the outer arc. Choose a point to make the buttress lean outside.
3. Repeat for all the construction lines except the rightmost one where the lodging provides enough support.














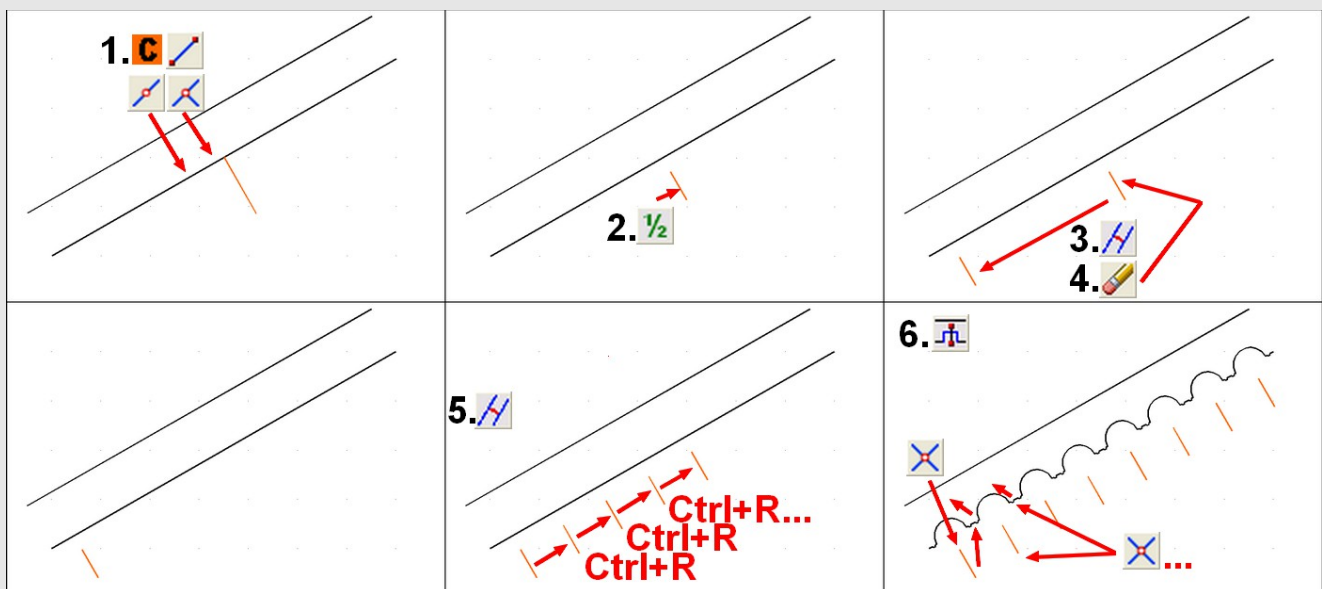
Inserting alcoves along a straight wall

The best way is to stick to the grid. If this is not an option, you can adapt the method described for the circular wall.

Instead of using the angle width, you divide the wall length by the desired number of alcoves to get the interval width:


1. Using the **Midpoint**  modifier (**F3**) and the **Perpendicular**  modifier (**F12**) draw a line  from the midpoint of the wall line, going outward.
2. Use the **Center Line Scaling** tool  to ensure this construction line does not touch the wall.
3. Select the **Offset One**  (**OFFSET1**) tool. Type the calculated amount of displacement (see the **Even and odd** sidebar). For example, to place 8 alcoves, you need to multiply the interval by 3.5. To place 9 alcoves, multiply by 4 (the formula is $\text{interval} \times \frac{N-1}{2}$ where N is the number of items). Click on the construction line then pick a side.
4. Erase the centered construction line.
5. Select the **Offset One**  (**OFFSET1**) tool. Type the calculated interval. Click on the construction line, then on the relevant side. Type **Ctrl+R** to redraw the map and show the new line. Offset this line, **Ctrl+R** and so on till the last axis. Right-click to exist the command.
6. Insert the alcoves with the previous method: **Intersection**  modifier (**F6**) on the orange axis and the wall line, pick a side, go to the next... The alcove width, including the columns if you chose to add them, must fit the interval length.




Note: if the wall is vertical or horizontal, you can use the **Move**  command at step 3. and the **Rectangular Array** tool (right-click  or **REPEAT**) at step 4. instead of the offset method.

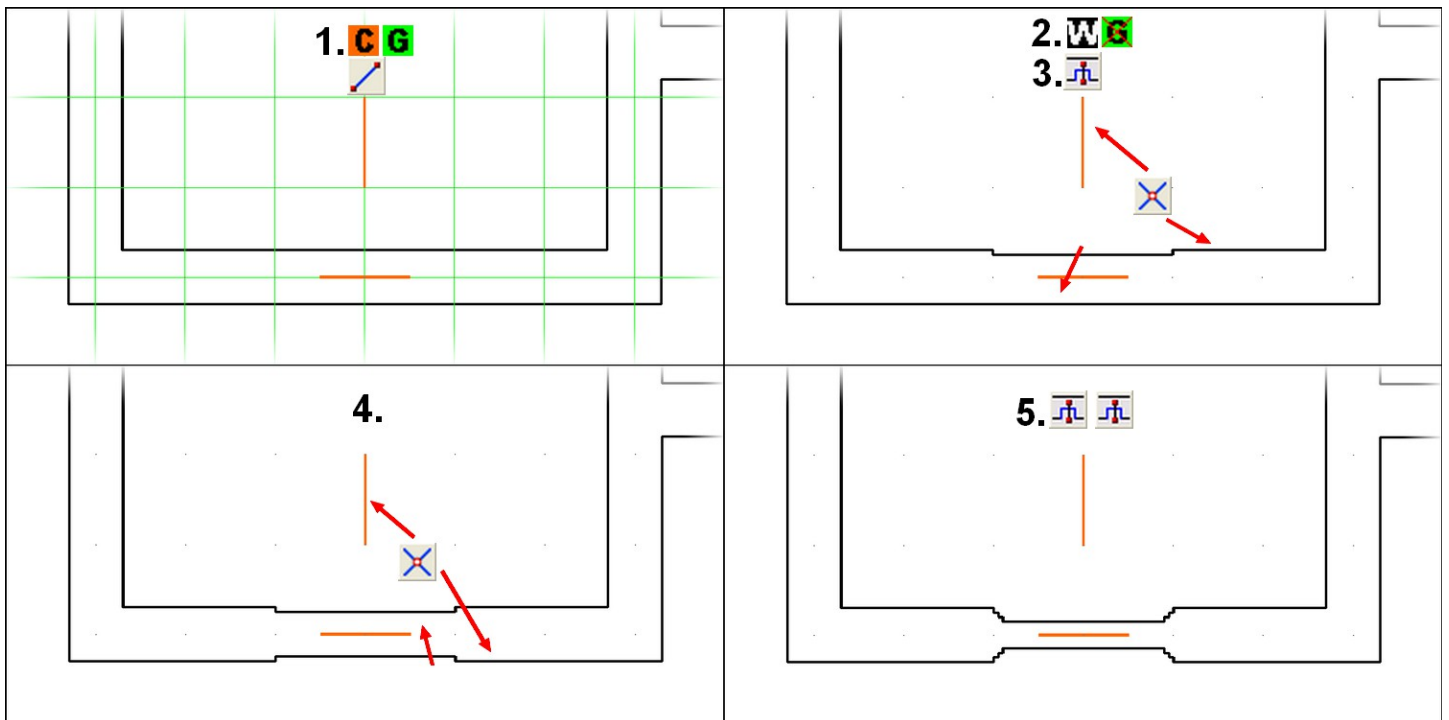




Elaborate door frames

The door tool  includes the possibility of adding a doorway with a single door frame. If you want more frames, create a bunch of alcoves on each side of the future door's location. For an 8' wide door, you can add pairs of alcoves 10', 9.5' and 9' wide and 0.25' deep. The 8.5' wide frame will be drawn by the door tool (see part 5):

1. Click **C** then **G**. Draw a vertical line  above the future door's midpoint.
2. Click **W** and **G**.
3. Click  and type **10** and **0.25** then use the **Intersection**  modifier (**F6**) and select the new construction line and one of the wall line. Pick a side making the alcove go into the wall.
4. Repeat step 3. on the other side of the wall. Right-click to end the tool.
5. Repeat steps 3. and 4. first with an alcove width of **9.5** then a second time with an alcove width of **9**. In both cases enter a depth of **0.25** (the default depth is always half the width, not the last value entered).
6. Save as Chapel08.fcw



Conclusion

The alcove tool has been applied to the walls to give them a more architectural look, adding many kinds of features.

In the next part, doors and windows will be added, and the walls will be turned into filled shapes.

