could make a rounded vault, and further refine it with the ability to form a crossing – a groin vault.

This is something we cannot do easily with the Slab tool, nor even with the Roof tool. Try using the more powerful Wall tool because it is smoother and more easily manipulated. We will draw a length of vault on its end, using the circular wall variant of the Wall tool. If you are more ambitious, follow this example making it as a Gothic vault (instead of Arched) by having two sections of curved wall meeting each other.

Set the camera at 90°, viewed in 3D elevation, then save as a vault object. Call it 'vault_part1.GSM' if you like.

Bring it into the floor plan and you now have a stretchy vault. You can change its length, width and height. So it may have been round when you first built it, but it could now be elliptical if you wish. Drag a copy of your vault object, and be careful not to change its width – change only the length. We are going to cut (or mitre) the vault at 45° angles to make it usable as a groin vault for the crossing.
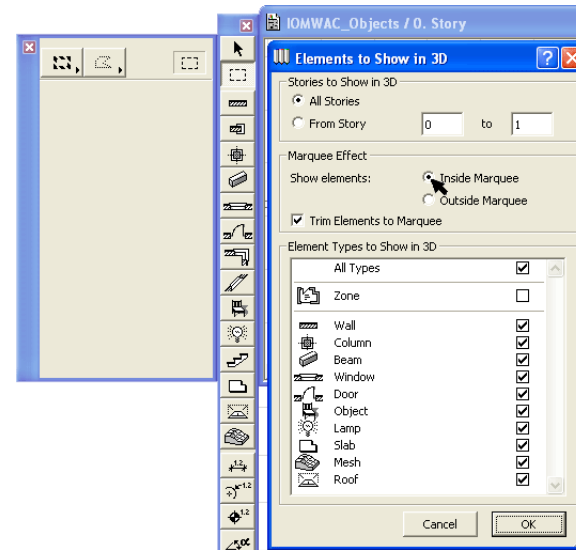
Cutting with the Marquee tool

Now you may have noticed that one function of the Marquee tool is to act as a cutter when you view in 3D. Everything within the marquee is displayed, and everything outside is ignored. It's a great way to do instant 3D sections. By the way, with 'Image>Elements to show in 3D' you can reverse that, and view only things *outside* the marquee.
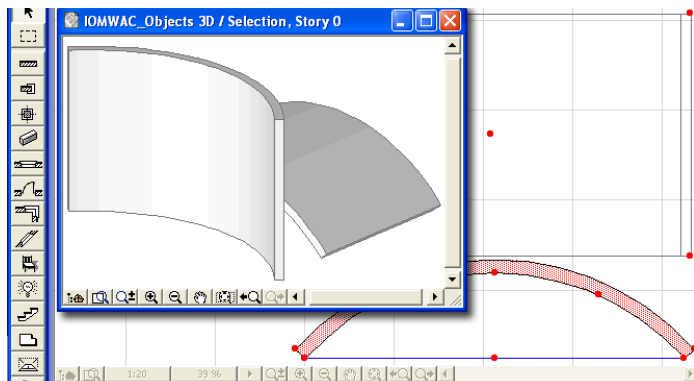

The plan shows the basic wall curved to form a flattened circular vault; above it, the resulting library part – stretchy in three dimensions

The marquee is mostly used as a rectangle but it can be very powerful when used as a polygonal shape, like a fill. First draw one 2D line down the centreline of the vault, using the half point tickmarks. When you hover the cursor over the end of the vault, you should get a little 'tick' mark to indicate the half width of the vault. Now draw two 2D lines from this half point at 45° angles to indicate the line you wish to cut along. By using the Shift key, you can ensure that these lines are at exactly 45°.

Toolbox icon of the Marquee tool with the polygon and rectangle variants. And the 'Elements to Show in 3D' allows you to select the way that the Marquee operates.

Now, using the Marquee tool in polygonal mode, Magic wand the Marquee tool to the 2D lines so that it encircles most of the vault that you intend to retain.
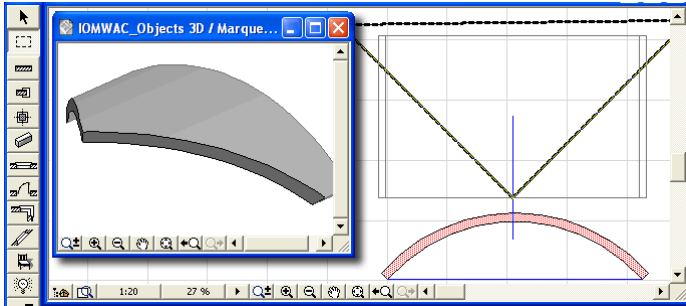
Plan of the shimmering marquee over the vault object. The thin 2D lines ensure that your cutter is at exactly the right angle. Use the Coordinate Box if you like to type the angle in. Now you see the groin vault part in 3D.

View this in 3D axonometric and you will find that you have a groin vault mitred at 45°. If the cutting effect does not occur, close the 3D window, use the Display> Rebuild command, and then try 3D again. If it is cutting correctly, use the 3D projection settings to set the camera position to 270° and the view type to Parallel>Plan. Save this as a library part and you can call it 'vault_part2.GSM'.

Return to the floor plan, and place your new vault piece. Now this object has default 'Bounding Box' hotspots. You can make your life easier – open the 2D Symbol in the GDL dialog and customize your hotspots. Place your own 2D hotspots at the corners, including one in the middle. Zoom in real close and place one at the pointy apex of the groin-vault.

Personalised hotspots will remove the bounding box. The hotspot at the pointy corner can now be used as a hinge around which to Edit>Multiply>Rotate.
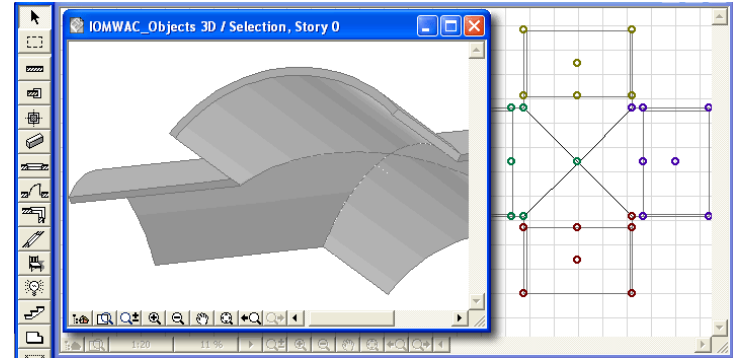
Place the result next to a piece of straight vaulting and you can now group these two. Now use Edit>Multiply to Rotate yourself another three and you have the complete groin vault!
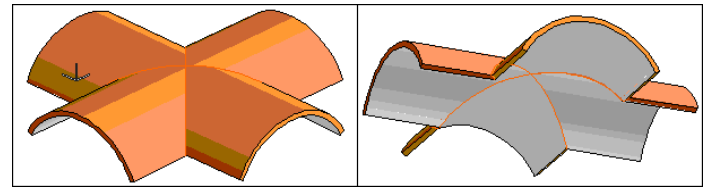
Picture of the four vaults in 3D axo

You can now add in more uncut vault objects alongside these, stretch to appropriate lengths and before you know it, you have your church roof. You can use the same technique with the polygonal marquee to take a sideways 'bite' out of a large vault and have a pair of smaller vaults intersecting.

Try making a Doric column with Profiler, add a square base top and bottom. Bring it all together.

All this can be done without GDL, and yet, when they see it, your friends and colleagues will be convinced you have become a GDL expert.

Graphisoft

Visit the Graphisoft website at *http://www.graphisoft.com* for local distributor and product availability information.

Introduction to Object Making

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