CHAM

Geometry Creation

Geometry creation

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- Geometry can be created either:
  - from 'primitives' supplied with PHOENICS,
 - by import from CAD (in a variety of formats).

Object Shape

- Within the "bounding box" of an object, the shape is determined by the geometry file (".dat") associated with that object.

- The shape is defined by a set of quadrilateral facets.

- A large selection of basic geometry files are available (e.g. cylinder, wedge, etc).

- The default object shape is a rectangular block, which completely fills the object bounding box.

- Other shapes can be imported from the Geometry dialog box, or from CAD.

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Object Shape

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- All this is controlled from the 'Shape' page of the Object Specification dialog.
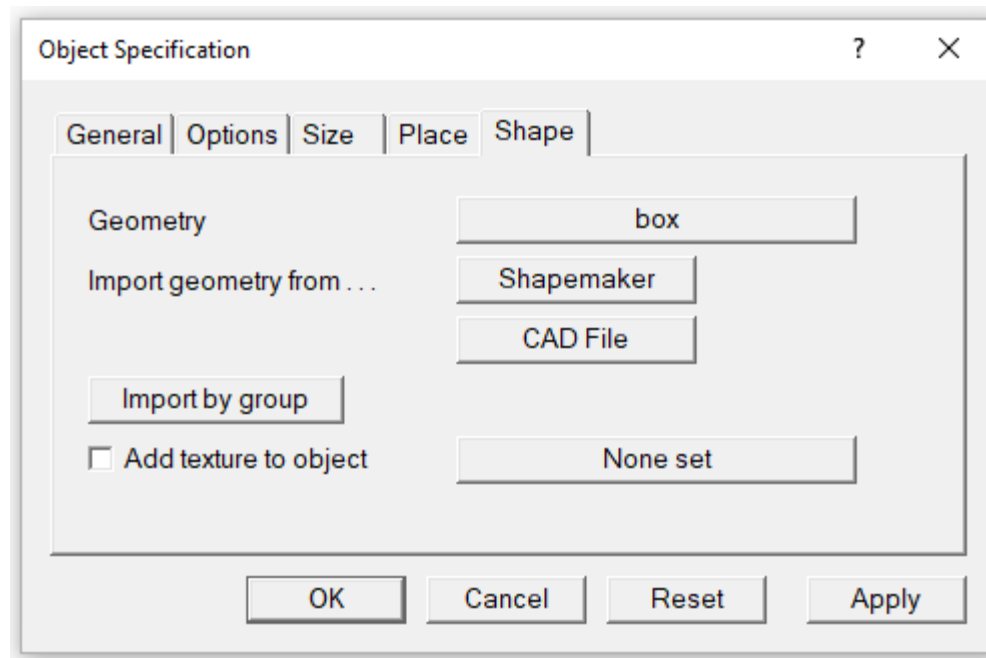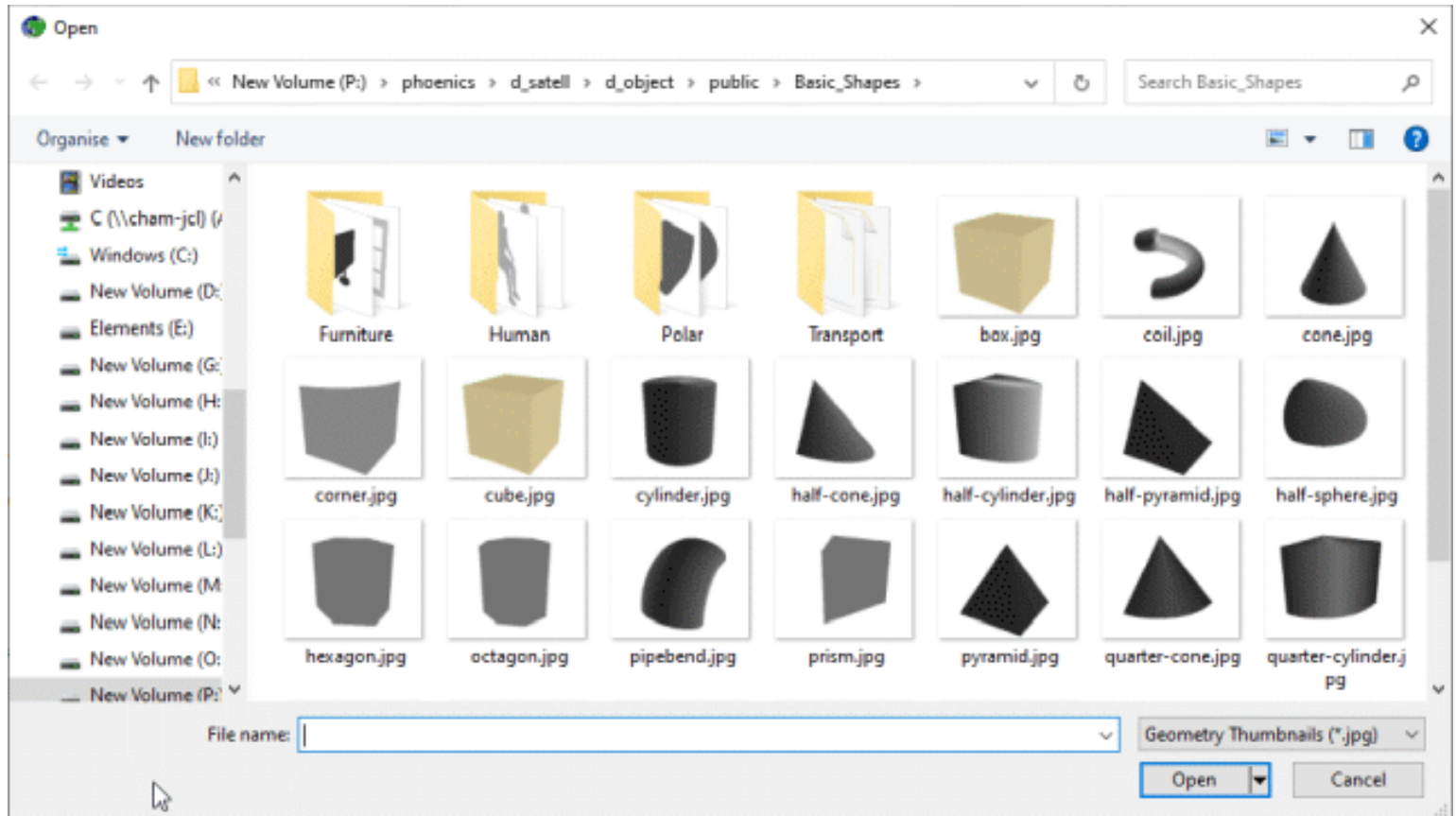
Supplied Geometries

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- All the standard geometry files are kept in the directory **\phoenics\d_satell\d_object**, and its sub-directories.

- Geometry files can also be stored in the current working directory and its subdirectories.

- These will be searched before **\phoenics\d_satell\d_object**, allowing local user-created geometries to replace the standard ones.

- The supplied geometries are divided into a number of categories, with fairly self-explanatory names.

- The folder **public\basic_shapes** contains a number of geometry primitives, including box, cylinder, cone and wedge.

Supplied Geometries

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Import from CAD

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- CAD generated geometries may be imported in a number of common formats.

- Clicking on the CAD button on the Shape dialog will bring up a file browser, which can be used to locate the required CAD file.

- The interface will translate the CAD file to a ".dat" file in local Phoenics format. This will be stored in the local working directory, or alternatively in the fromCAD folder. A JPEG thumbnail of the imported geometry is also created.

- Once translated, the geometries is attached to the current object, and is also available for use with other objects of the same shape.

Import from CAD

CHAM

- When a CAD file is imported, the full name of the CAD file is retained and is written to Q1.

- When the Q1 is next read, a check is made to see if the equivalent DAT file already exists.

- If it does and it is newer than the CAD file, the existing DAT file is used.

- If the CAD file is newer, or the DAT does not exist, the import process is invoked silently to create the DAT file.

Import from CAD

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- The formats supported directly by VR are:
  - STL   available in many popular CAD programs as an export format.
  - DXF   (AutoCAD)
  - 3DS   (Autodesk)
  - WRL
  - DW   DesignWorkshop from Artifice
  - AC   AC3D from Invis
  - IV   Open Inventor

Import from CAD

CHAM

- <u>Many further formats</u> are supported indirectly by translation to .3ds using SimLab Composer from ***SimLab****Soft*.

- This software is shipped with PHOENICS and runs silently whenever required.

- A licence key can be obtained directly from CHAM.

- The actual import and translation process is handled by the DatMaker module of PHOENICS.

Import from CAD

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•The formats handled by Simlab Composer are:

|			
*.dxf	AutoCAD	***.iam, *.ipt**	Autodesk Inventor
*.dwg	AutoCAD	***.sat**	3D ACIS
*.dwf	AutoCAD	***.obj**	Wavefront Technologies
*.skp	SketchUp	***.xaml**	XAML file
*.3dm	Rhino	***.3dxml** 3DXML	Dassault 3DVIA
*.sldasm, *.sldprt	SolidWorks	***.u3d**	Universal 3D
*.asm, *.par, *.psm	SolidEdge	***.dae**	COLLADA
*.stp	STEP	***.fbx**	Autodesk FBX
*.igs, *.iges	IGES		

The CAD Import process

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- During the import process the control dialog allows you to:
  - Change the scaling. Often a CAD file will be in millimetres not metres.
  - Align the CAD and CFD axes.
  - Change the size of the object to match the size from the CAD file (usually required).
  - Change the position of the object to match that determined from the CAD file (with an offset if required).
  - Perform geometry repair operations as mentioned later.
- CAD files can be imported singly, or as a group with each file generating a new object.

Geometry creation

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- A few points must be observed prior to generating files which are to be imported into PHOENICS, regardless of what CAD program is used:

  - The geometry must be a 3D closed volume. Holes in the surface may lead to detection errors.

  - It must be defined by single-sided facets with normals all pointing outwards. Inward-facing facets will lead to detection errors.
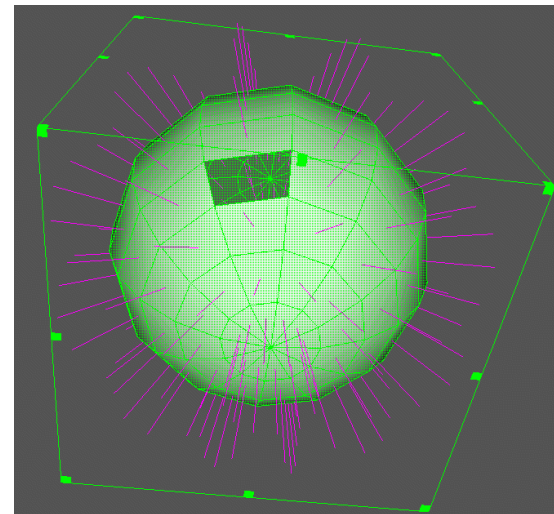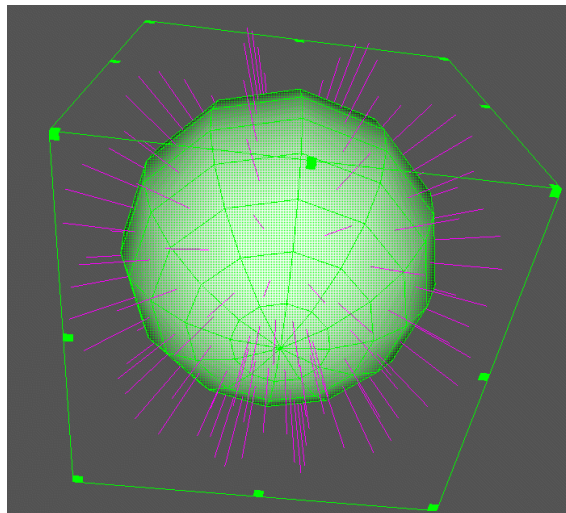
Geometry creation

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- More points which must be observed prior to generating files to be imported into PHOENICS:

    - Wireframe geometries cannot be used as they do not define closed volumes.

    - Too many inter-penetrating items within a single file can lead to detection errors. It is best to keep items which penetrate each other as separate objects, or to perform a Boolean join on them (in the CAD program) to create a single item with no internal structures.
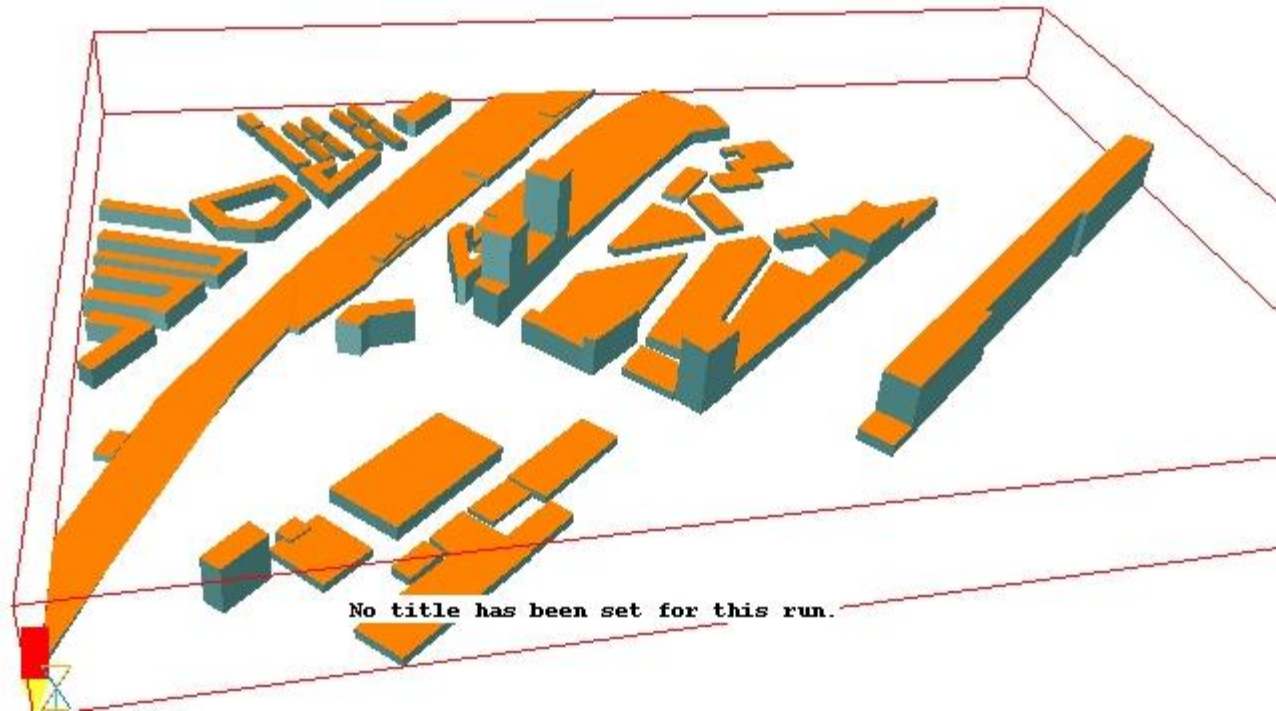
Geometry problems

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- At first sight, viewed from above, this geometry looks acceptable:

No title has been set for this run.
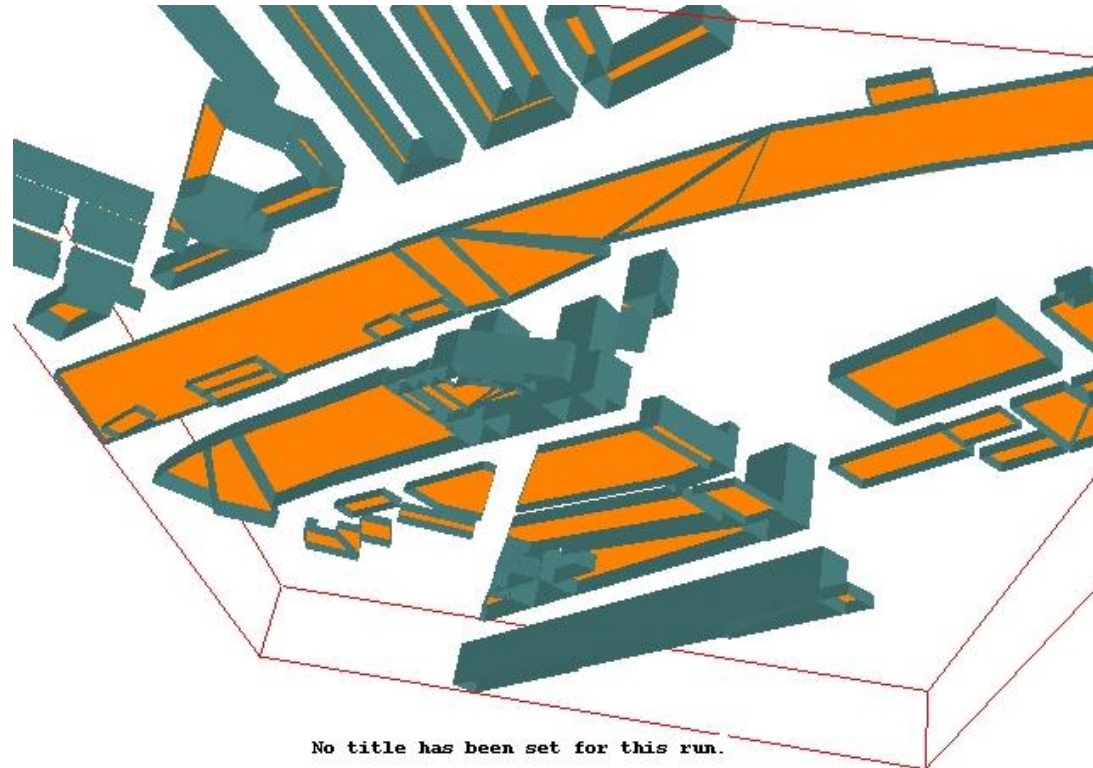
Geometry problems

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- But - this will not work because none of the buildings have bottoms, so they are not closed volumes. This can be seen when viewed from below.
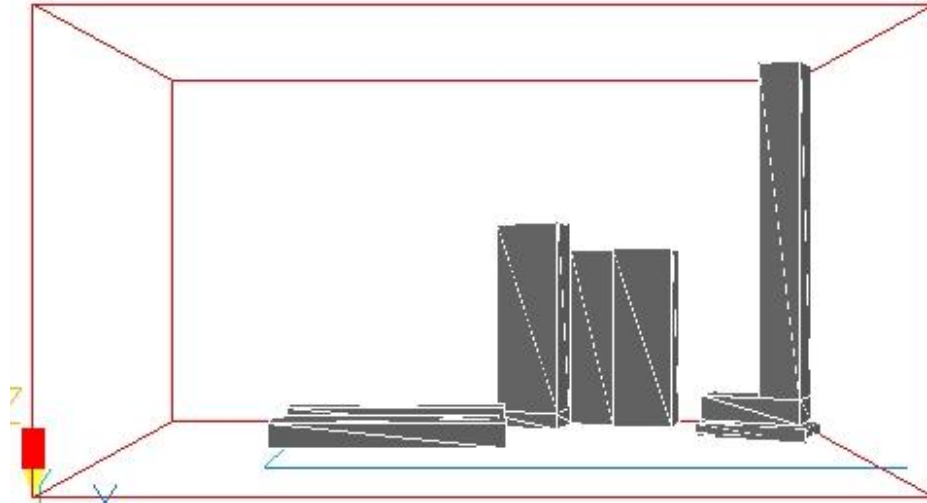
No title has been set for this run.

Geometry problems

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- Here is a geometry imported from a 3DS file

- It looks OK at first sight...
- But...

Geometry problems

- If the view is changed, we see that

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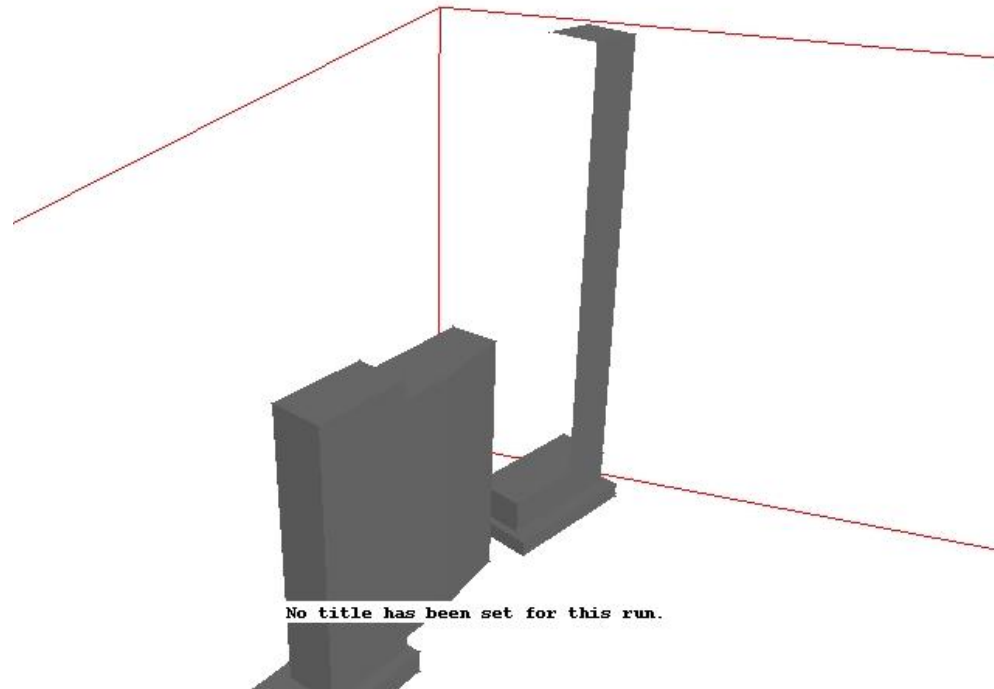
part of the building appears missing however we look at it

Geometry problems

- If we draw the facets double-sided

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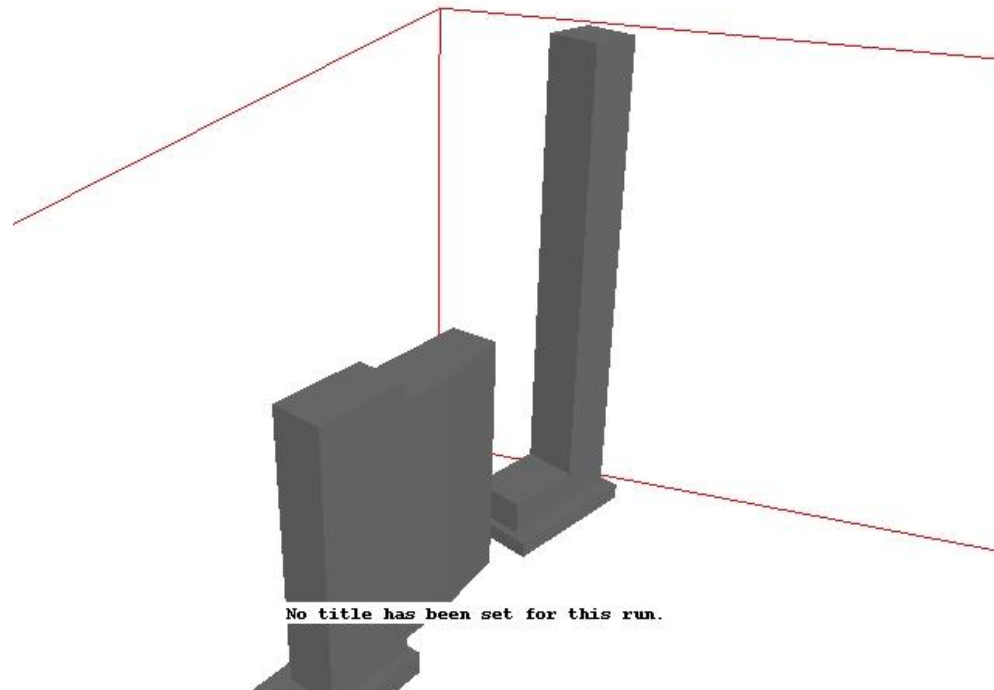
the missing part comes back – this part is inside out!

Geometry Repair

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- Some defects in the CAD file can be corrected by DatMaker during the import process or for existing objects.

- DatMaker can
  - Fill in holes
  - Reverse inside-out geometries
  - Repair folded surfaces
  - Optionally split CAD entities into separate objects
  - Optionally split closed volumes into separate objects

- For existing objects it can also perform Boolean joins between several objects to eliminate internal facets which may be causing detection problems.

Geometry Repair

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- To repair an existing object, such as the inside-out tower, either:
  - Select the object in the Object Management dialog, then select 'Datmaker operations' from the right-click context menu; or
  - Click 'Settings', 'Datmaker operations'; or
  - Select the object on the screen, then select 'Datmaker operations' from the right-click context menu.

Geometry Repair

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- Ensure the required object is selected as the 'first object', then choose the repair operation and click OK.