

AutoCAD 2010 Productivity Study

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Acknowledgements:

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AutoCAD 2010 – Performance wins for all

Keeping ahead in the current economic climate is a challenge that we all have to address. The last thing you need is to be let down by slow delivery or poor presentation. Skipping a software release is often posed as an economy measure, but it is one that can backfire if it leaves you without access to the latest efficiency improvements. Delivering quality projects on time and within budget needs those tools to produce the results required by today’s demanding clients.

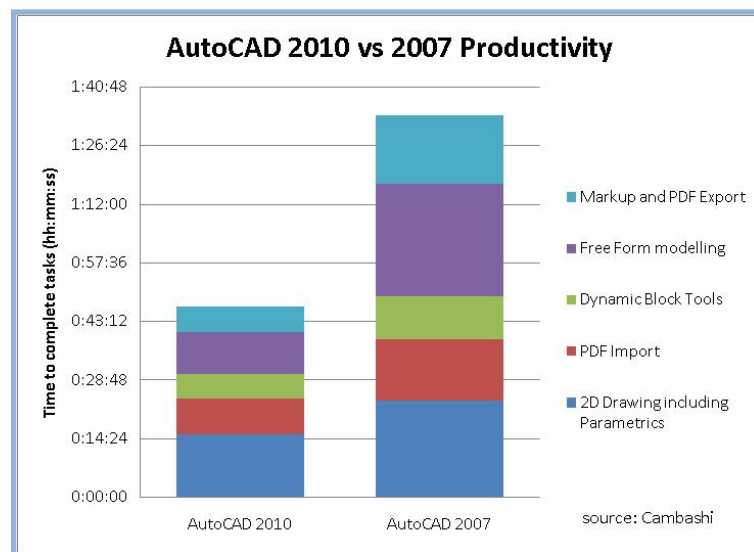
Cambashi and AutoCAD 2010

This report is the result of research and analysis undertaken by Cambashi, an independent consulting and analyst firm with offices in the UK and the US, which has taken a close look at the capabilities of AutoCAD 2010. Working with an architectural practice, we devised and carried out a productivity study comprised of a series of tests to investigate the benefits of AutoCAD 2010 for the architect. By making a comparison with an earlier release of AutoCAD, specifically AutoCAD 2007, these tests have been able to show where real progress towards business goals can be achieved.

Start to finish – a faster job

Five key steps were identified in the activity of designing a single storey building. This included a number of standard building elements plus some more innovative design features. The test enabled a group of users to explore the range of improvements in AutoCAD 2010 from everyday commands to more creative capabilities.

The chart below shows in simple terms how the time taken to perform each of the steps of the documentation exercise was reduced when working with AutoCAD 2010, which took half the time of the earlier release.



Time to complete the design steps in AutoCAD 2010 vs. AutoCAD 2007

Performance, Stability and Usability

To complement the ongoing performance improvements and wider range of tools for the user, a number of background improvements have been included in the release that have not gone unnoticed. This comment was made by a participant in the productivity study ...

Participant Quote: *I do like 2010 a lot [...] It's also very stable as well and they seem to have fixed lots of things 'under the hood' which makes it run a lot better.*

One of our test users also manages the CAD installation for his company and provides support and training to other users. The view from that perspective was...

Participant Quote: *... from a support point of view, I really like 2010. It's also good from a training point of view, I like the fact that everything is there in your face, the ribbon interface is a godsend, it's scary the first time you use it, but when you get to grips with it it's very productive.*

Having a user interface that fits easily into the style of the rest of the desktop is obviously an advantage when it comes to introducing new users. The ribbon interface (first introduced at AutoCAD 2009) provides a familiar look and feel to the software so that new and experienced users alike can get up to speed with new features quickly.

Participant Quote: *We are in the middle of a company-wide rollout and so far the reception for 2010 has been very positive.*

The study in detail

In the study Cambashi compared the time taken by architects using AutoCAD 2010 to that of architects using an earlier release as they worked through a typical design documentation exercise. A small design project was constructed, typical of work undertaken by architects. This task-oriented approach aimed to correlate the productivity enhancements for the users directly to the business benefits for the company.

Participant Quote: *There are hundreds of ways of doing everything but it's still amazingly flexible.*

The exercise involved completing a design for a roadside diner. The brief required both a practical and aesthetically pleasing interior and a signature look to the exterior. The drawings below (fig. 1 and fig. 2) illustrate the test exercise used in this study.

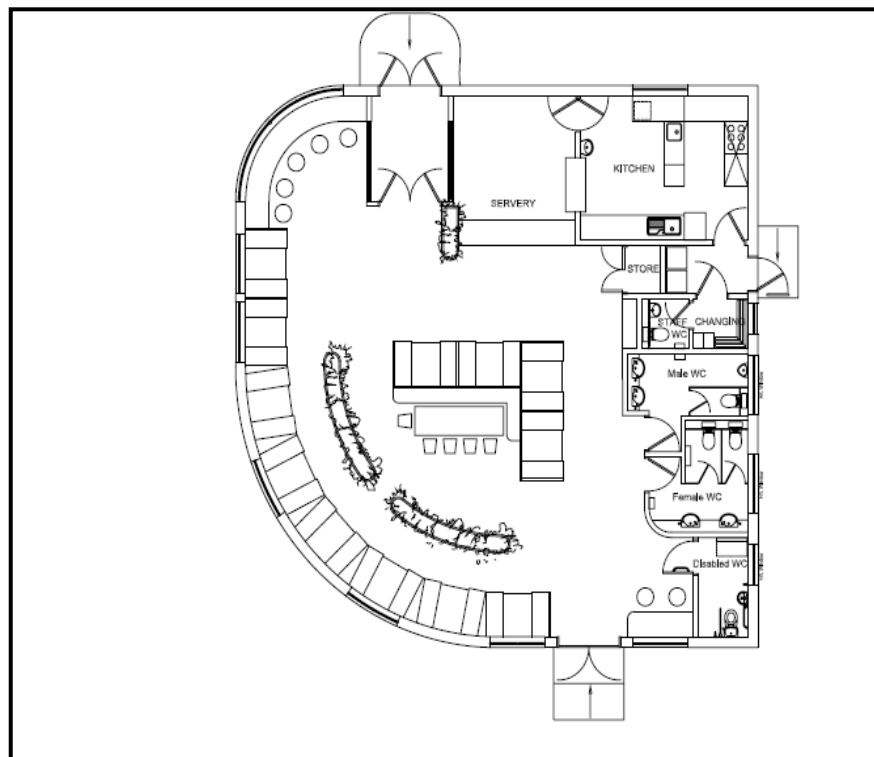


Fig 1: The productivity test – Designing a Diner - interior

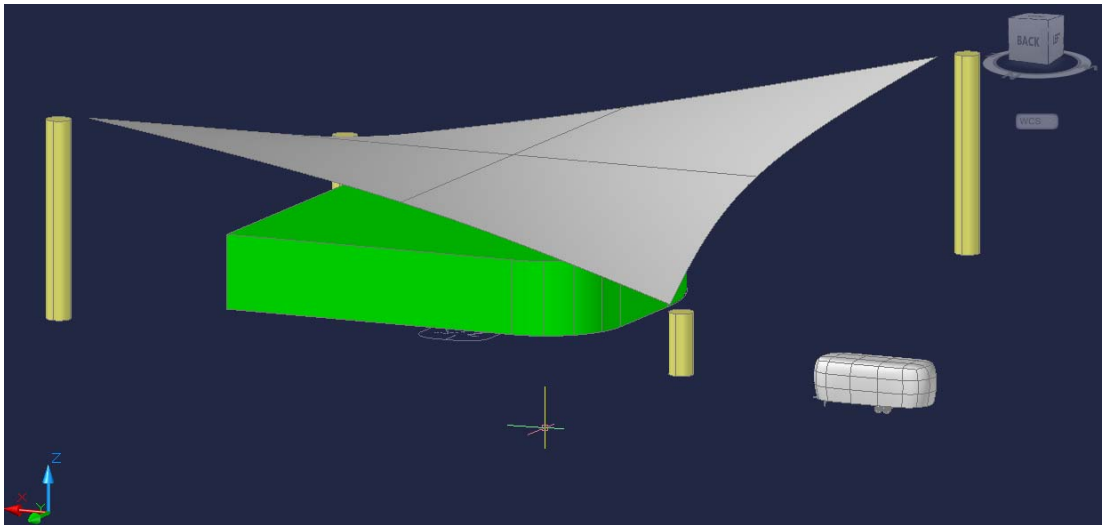


Fig 2: The productivity test – Designing a Diner – exterior concept

Addressing these different design criteria ensured existing capabilities were exercised, together with the headline new features of AutoCAD 2010 including:

- Everyday productivity improvements
- Parametric drawing
- Free-form modeling
- Improved dynamic block handling
- Enhanced PDF handling

The following is an outline of the steps carried out and shows how new features were explored when working in a real-world setting.

Step One - 2 D drawing – in this step, standard drawing techniques were employed to establish the basics of the Diner. This gave an introduction to parametric drawing features as well as a chance to view of some of the everyday productivity improvements.

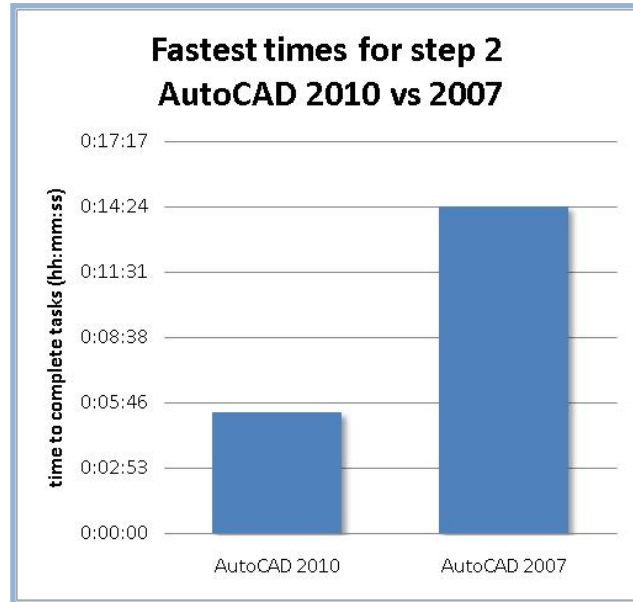
User reactions to parametrics and constraints were mixed, largely due to the one-off nature of much of the design work undertaken by the smaller architectural practices involved in the study. Practices involved in large scale projects that create multiple versions of similar structures, as in a low-cost housing estate or possibly a shopping mall, will find these tools invaluable. As one user commented...

Participant Quote: ... parametrics and constraints [...] are a good thing, and Autoconstrain is brilliant, it does exactly what it says on the box.

On average, using AutoCAD 2010 took our users 35% less time than it took using AutoCAD 2007 for this step.

Step Two - PDF Import – this step provides a first look at the enhanced use of pdf files for sharing data and drawings between client and practitioner. Directly attaching pdf files to an AutoCAD drawing makes for easier collaboration and reuse of designs. This step also shows how using the geographic location command can position an imported drawing in real space.

These are new features to AutoCAD users but provide a key tool for bringing third party data into designs. A simple view of even the fastest users in our test shows that the performance improvement was impressive, at over 60% faster than the time it took using AutoCAD 2007.



Over 60% improvement in performance at step 2

Participant Quote: *2010 is brilliant for a lot of things, especially PDF working ...*

Step Three - Dynamic block tools – another feature that makes reuse easier when working with standard design components. This stage explores the use of dynamic blocks to build on a previously stored block geometry and make alterations without the need to create a new block geometry for each variation.

Participant Quote: *Dynamic blocks are very useful and I love using them.*

Step Four - Free form modeling – this stage looks at the entirely new features that enable a design to take any form quickly and easily. Using the new mesh primitives, building almost any shape becomes straightforward, improving both visualization and design communication to the client.

Not surprisingly, the percentage improvement in performance at this step is impressive, as users took advantage of new features and reduced time to complete the task by over 60%.

Step Five - Mark up and pdf Export – this final stage takes a second look at the improved pdf file handling to create easy-to-distribute drawings and designs by marking up the drawings created in this exercise and combining them into a single, multi-page pdf document in one easy step.

Participant Quote: *I do like 2010 a lot and like the fact that you can pick a hatch and move it around -- you don't have to delete it first. I find this very, very useful.*

Participant Quote: *If you rotate with Viewport Rotate it takes everything underneath with it. We used to use the thing called Dview to do this, but it was impossible to get the right angle so this particular aspect is brilliant to make everything rotate with it.*

Users were agreed that the new pdf handling is an important addition to the product.

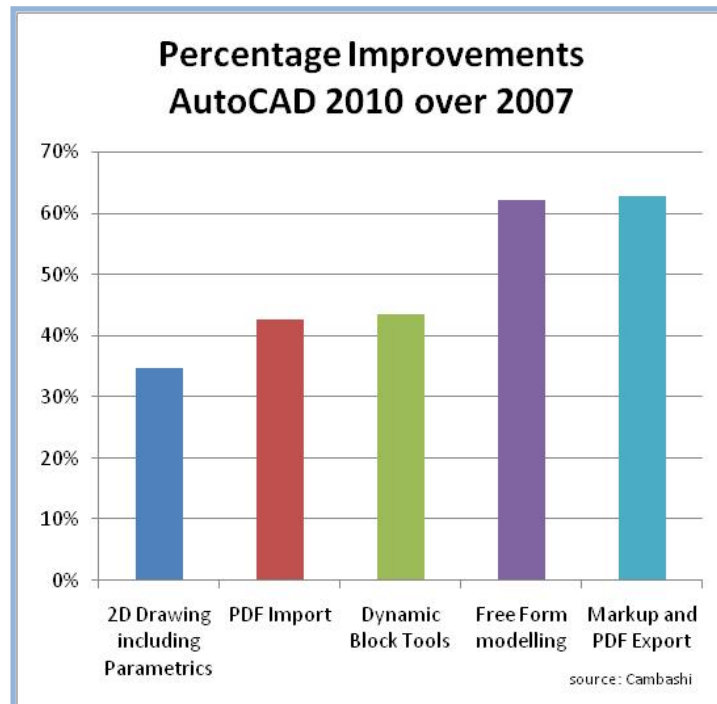
Participant Quote: *PDF working in 2010 is fantastic and to some extent it is quite unbelievable when you consider the way PDFs were regarded and handled in previous releases even just writing PDFs in 2010 you can turn off layers and be very selective.*

Participant Quote: *While I was using the beta I accidentally used it to compile some multi-layout PDFs and people would ring up and say "how did you do that." It's just brilliant*

Again, with new features to take the pain out of pdf creation, performance improvements in this step reached over 60%.

Overall Results

Overall improvements between the two versions of the software when used to perform these documentation tasks were impressive.



Average percentage performance improvement using AutoCAD 2010 over AutoCAD 2007
A detailed description of the tests, with their associated drawings, is included in Appendix 1.

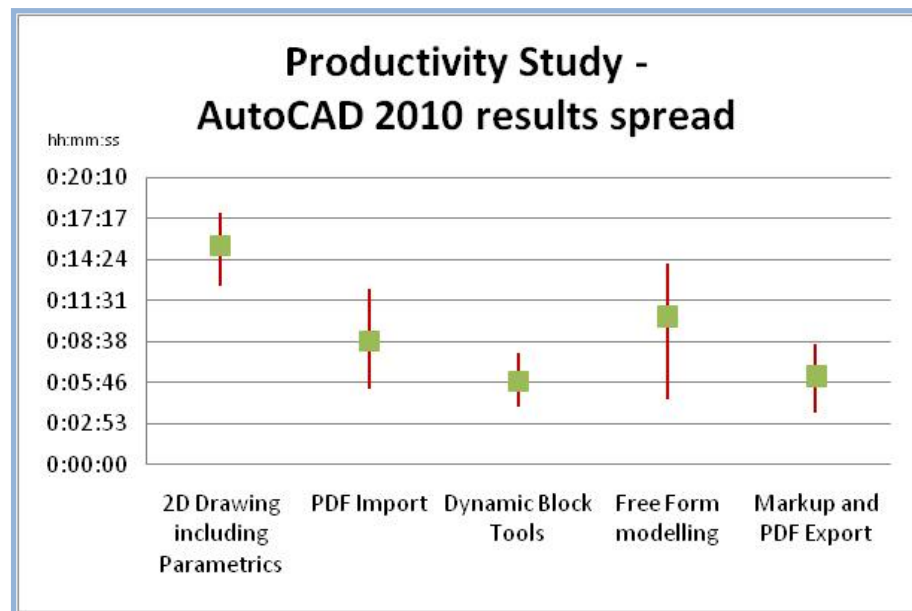
The test methodology

The methodology behind the test gives an objective view of the performance and user acceptance of AutoCAD 2010 against an earlier release for a number of architectural documentation tasks.

The approach was to construct a small design project together with a set of tasks that represented the work typically undertaken by architects. The tasks involved accessing existing files, manipulating drawings, navigation, visualization and output. The whole exercise was designed to be completed in about one hour. To reflect 'real world' conditions, the users could approach the tasks in their own way based on their understanding of the software - this would provide a fairer comparison of overall, day-to-day improvements for users.

Initial trials were undertaken to identify any issues and refine the exercise. The set of tasks was then finalized for time trials with architectural users of AutoCAD; the tasks and drawings used are set out in Appendix 1, with specific pointers for users of the new features at AutoCAD 2010.

The test was undertaken by a small group of practicing architects that regularly use AutoCAD and each step was timed. The size of the group was not statistically significant and should be considered an indicator of performance rather than a robust statistical proof. However, the group represented a typical cross-section of the user community. The majority of these users had been involved in the AutoCAD 2010 Beta program and so all had had similar exposure to the new features and facilities of the release.

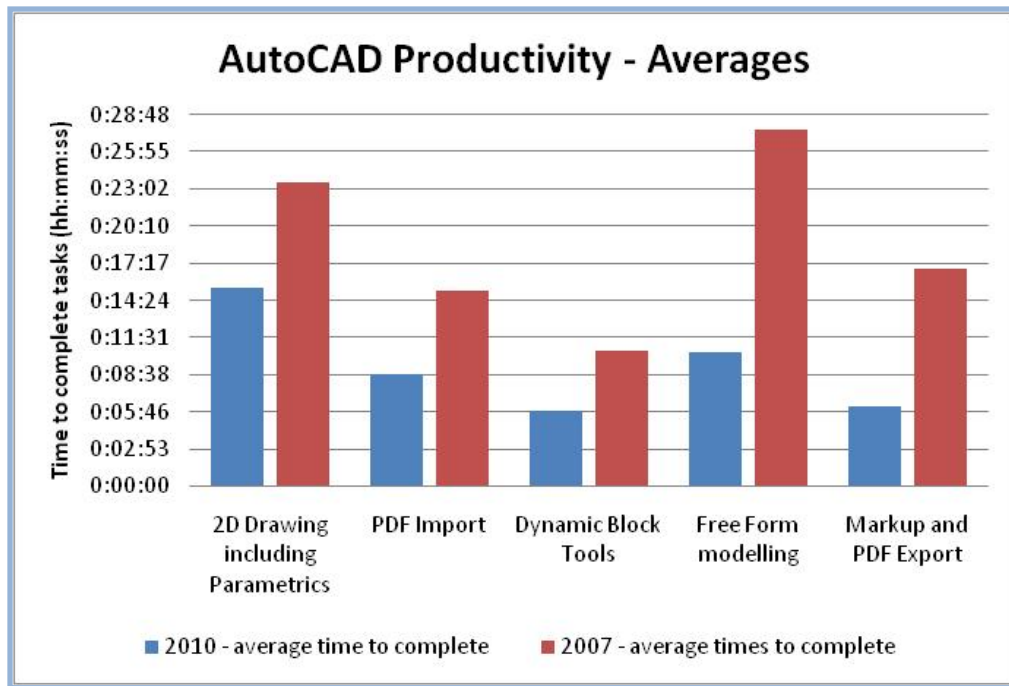


Range of results among users of AutoCAD 2010

In addition to the quantitative data, qualitative feedback from the users on their impressions and experiences of using the software was collected. Specific quotes are featured in this report as 'Participant quotes' and presented in highlighted boxes throughout the text.

Conclusions

This study set out to investigate the benefits of AutoCAD 2010 for the architect. By making a comparison with an earlier release of AutoCAD, specifically AutoCAD 2007, these tests have been able to show where real improvements can be made.



A summary of the percentage improvements for each step measured in this study is:

Productivity Study Step	Average performance improvement
1. 2D Drawing, including Parametrics	35%
2. PDF Import	43%
3. Dynamic Block Modelling	44%
4. Free Form Modelling	62%
5. Markup and PDF Export	63%

Based on a realistic documentation exercise that centred on the design of a roadside diner, the study has shown that using AutoCAD 2010 can bring considerable performance improvements to the average user. As well as reducing the time to undertake different tasks, the new features of AutoCAD 2010 – particularly the enhanced PDF handling - extend the reach of the AutoCAD user and make collaboration simpler.

Participant Quote: *I wouldn't want to go back to the previous release.*

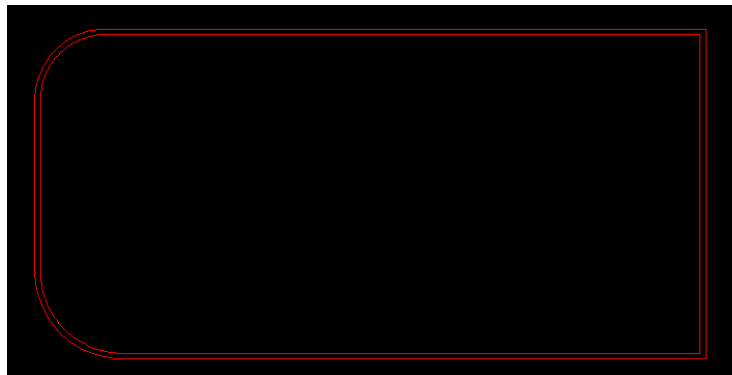
Appendix 1 - Description of the test

The test comprised a set of activities to be completed under a timed test environment. All users were provided with the materials needed to complete the test, including basic training where requested and a number of partially completed drawings to keep the test to a manageable time. The steps of the test follow – where new features of AutoCAD 2010 were used these have been explained but typically the users chose whatever their normal workflow would be for the task in hand.

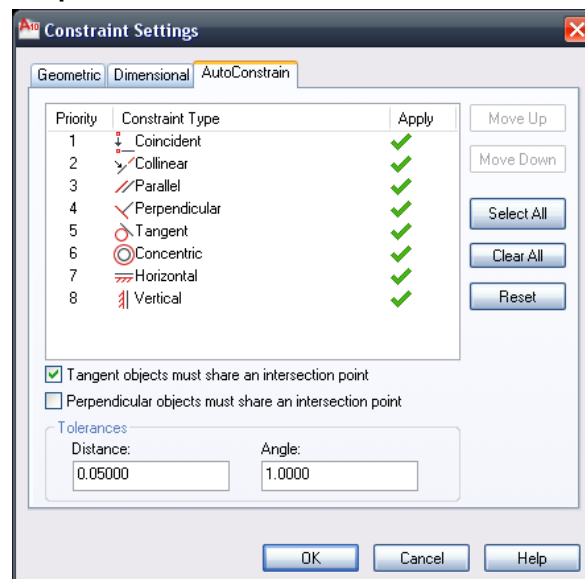
Step One - 2D drawing

Lay down the basic shape and internal layout of the diner.

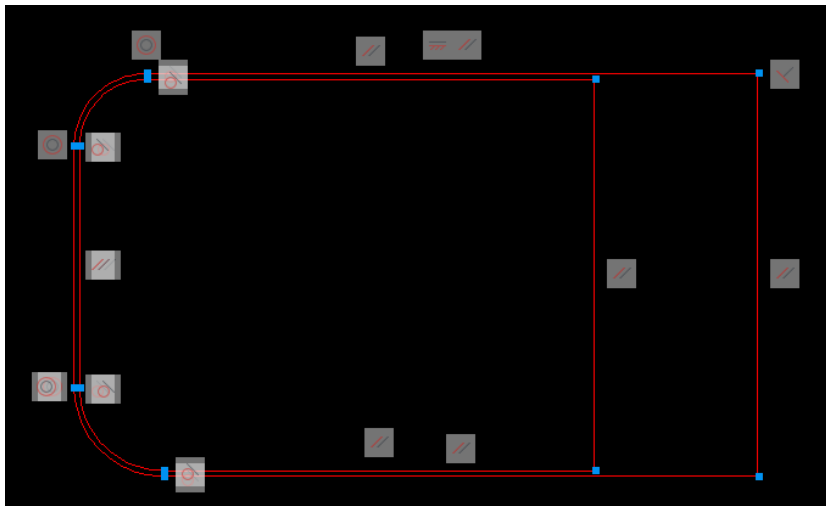
1. Open 01.Diner.dwg
2. On the *EX_Wall* layer draw a rectangle 12000x6000 with 2 corners as arcs, radius 1300 and offset all inside by 100.



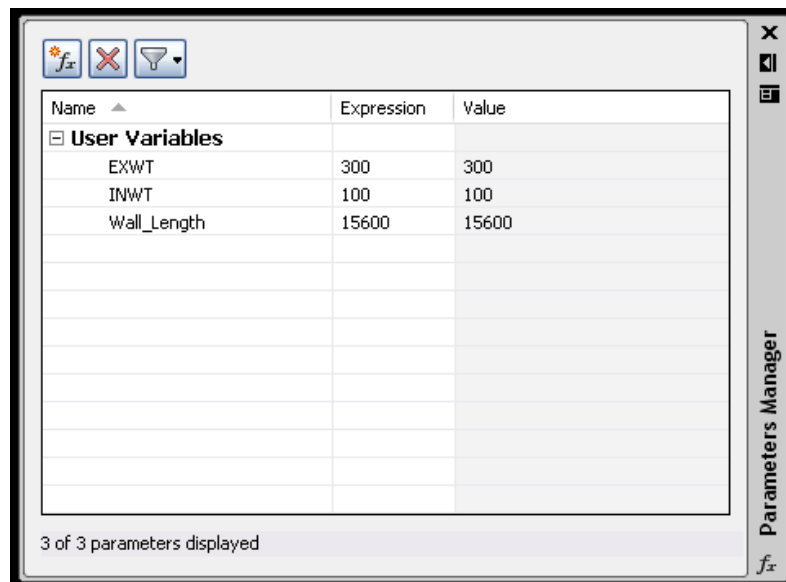
3. Check all Auto-Constraint options are ticked



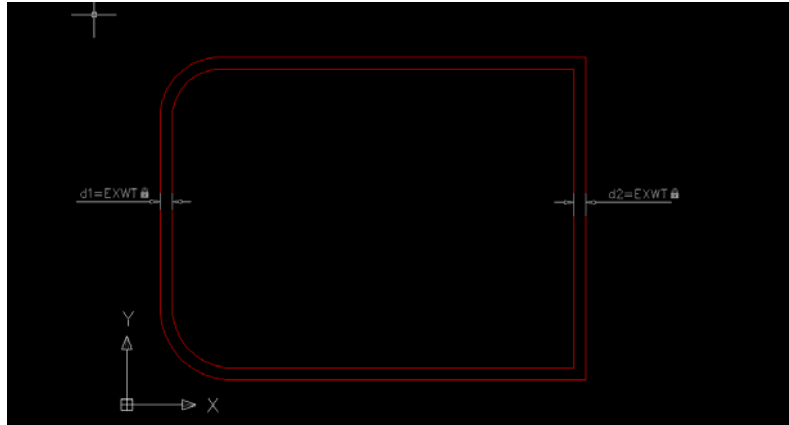
4. Auto constrain and test by moving the far right side



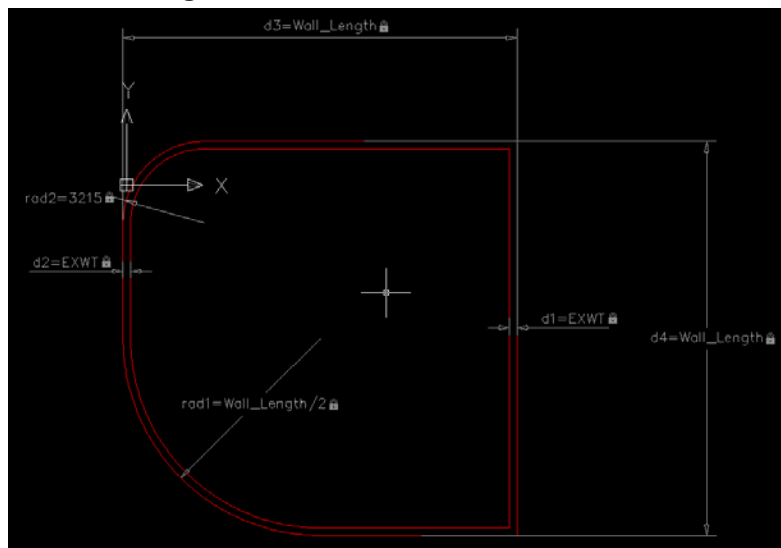
5. Open the parameters manager and add 3 variables as shown



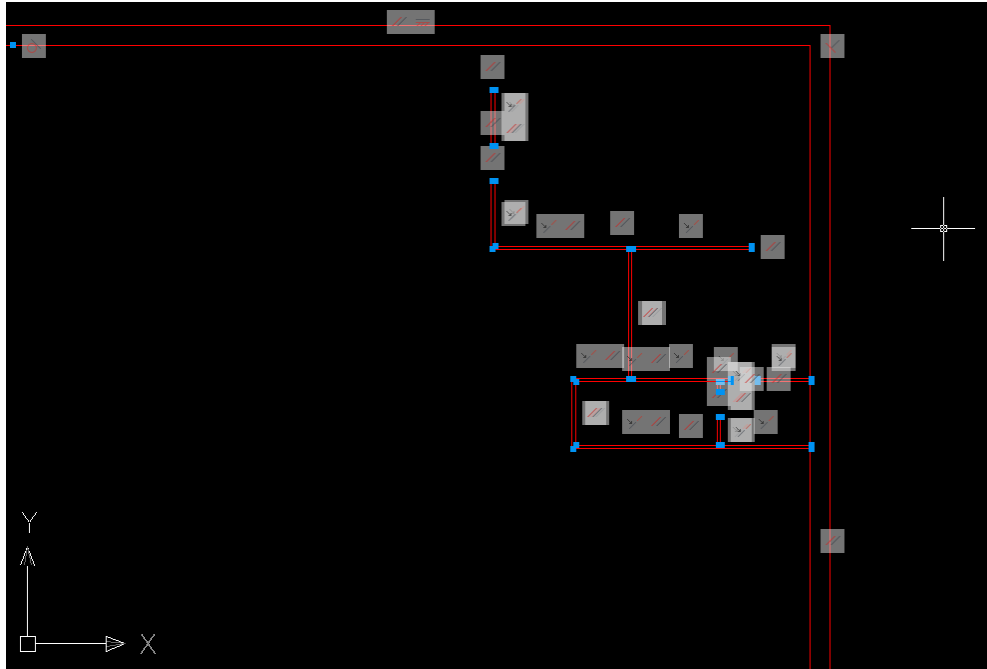
6. Apply dynamic constraints to govern wall thickness



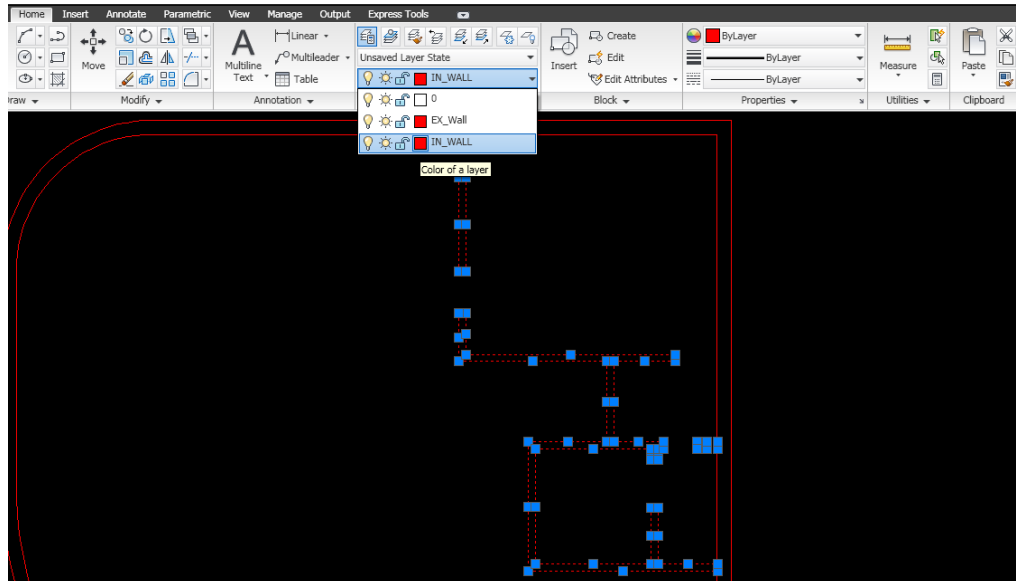
7. Apply dynamic constraints to govern overall dimensions



8. Unhiding the IN_Wall layer, move the internal walls layout to the inside of the top right corner as below and auto constrain. Check that it was constrained to the external wall, and use coincident constraints if not



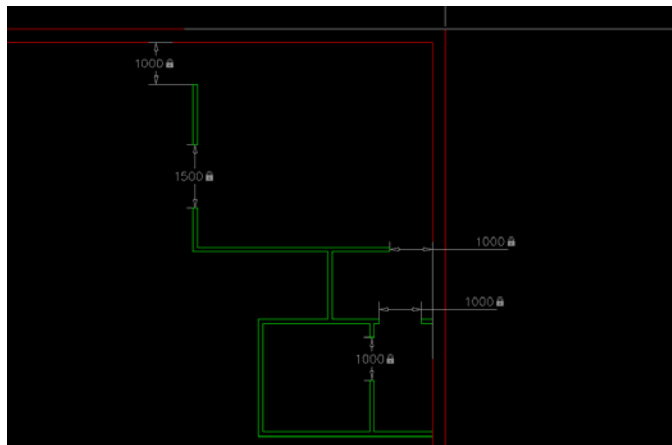
9. Use the layer drop down menu on the HOME tab to change IN_Wall's colour to green



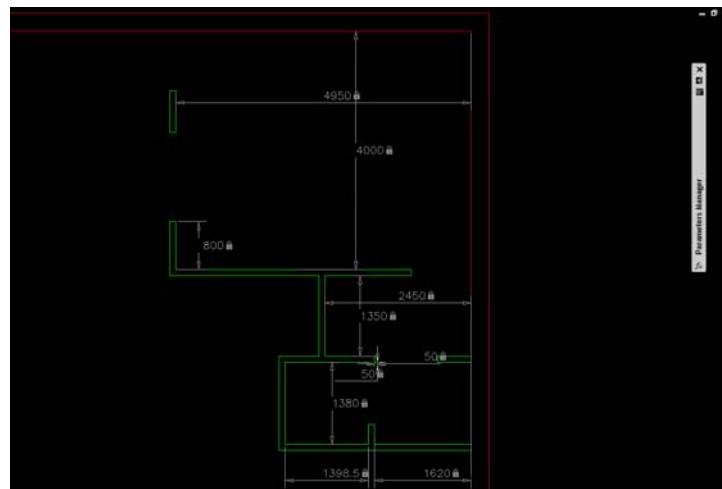
10. Apply dynamic constraints to govern the wall thickness



11. Apply constraints to govern openings, then overall room dimensions



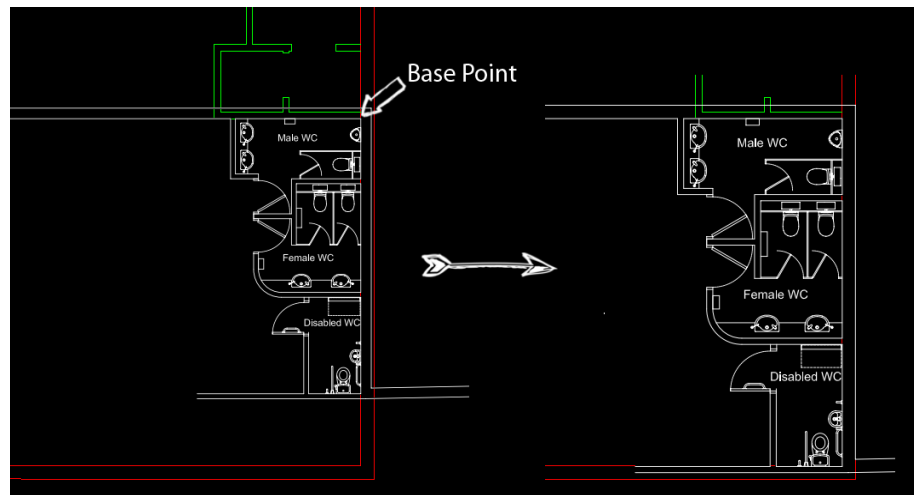
12. Change all interior wall thicknesses to 150mm



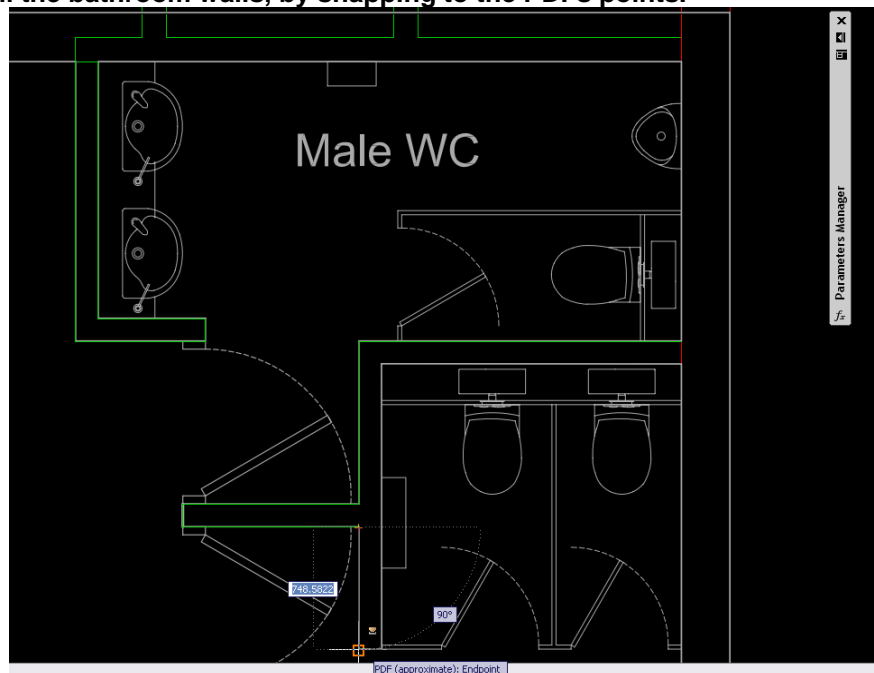
Step Two - PDF importing and Xrefs

Use a previously created design for the toilet block in this drawing.

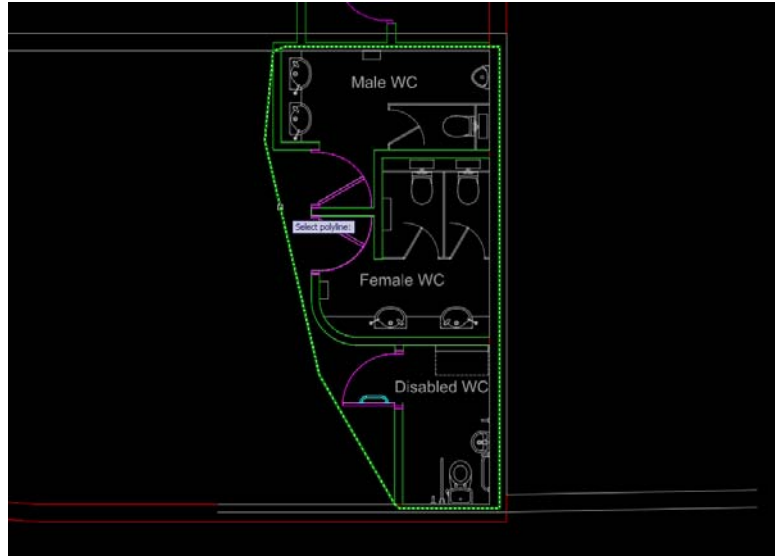
1. Open 02.pdfxref.dwg
2. Import Toilets.pdf, scale by 1000x with a rotation of 90 and locate as shown. Then scale the size to match existing building around the shown base point.



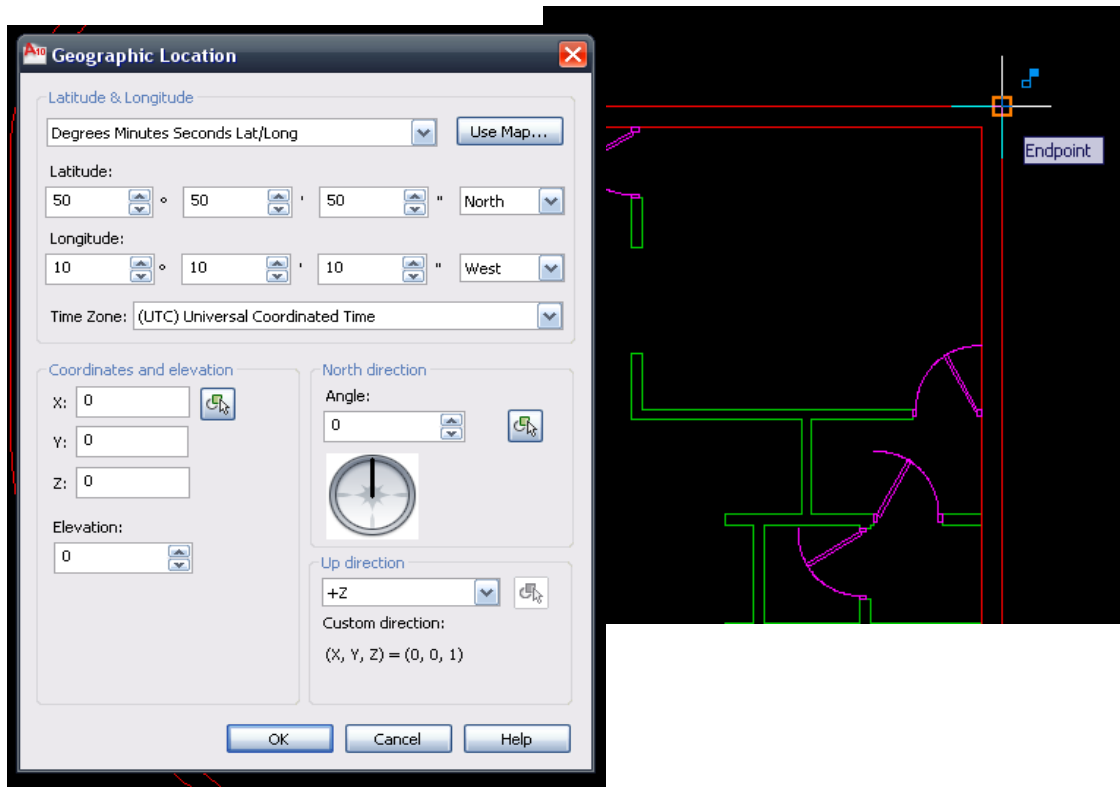
3. Draw over all the bathroom walls, by snapping to the PDFs points.



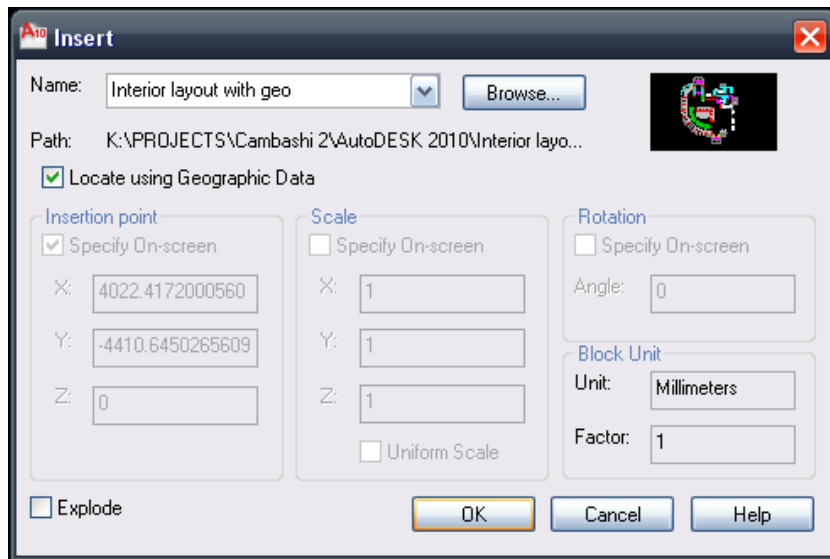
4. Create clipping boundary and clip as shown



5. Enter geographic location data using the GEOGRAPHICLOCATION command and choose coordinates, elevation and insert point as shown below



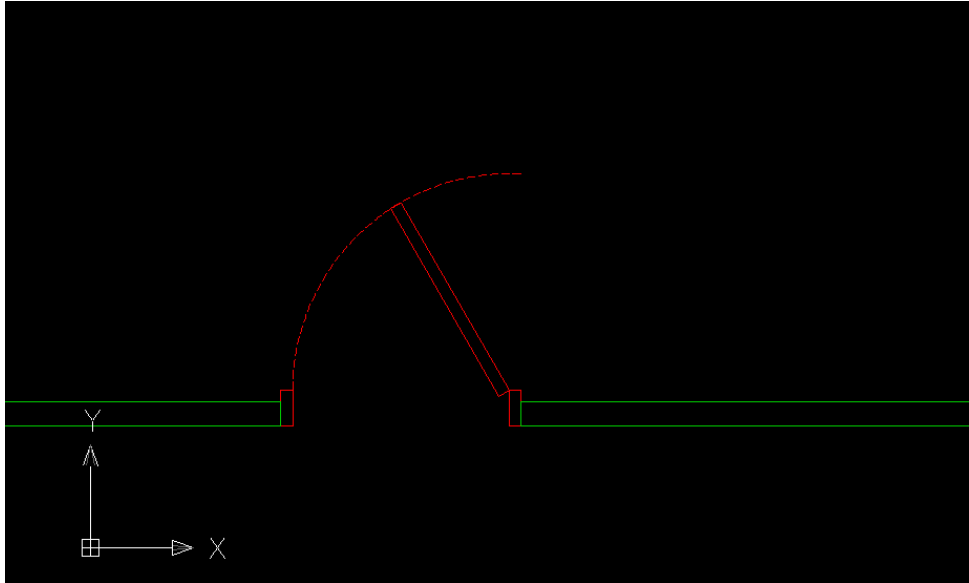
6. Attach Interior layout with geo.dwg, tick 'Locate using Geographic Data'



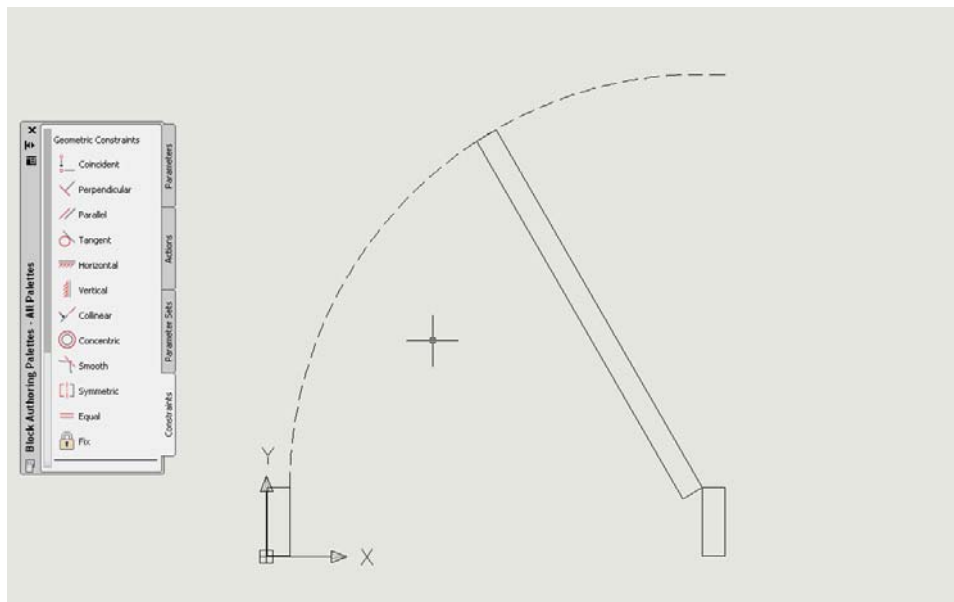
Step Three – Dynamic blocks

Base the doors in the drawing on a standard block, amend parameters to fit this design exactly

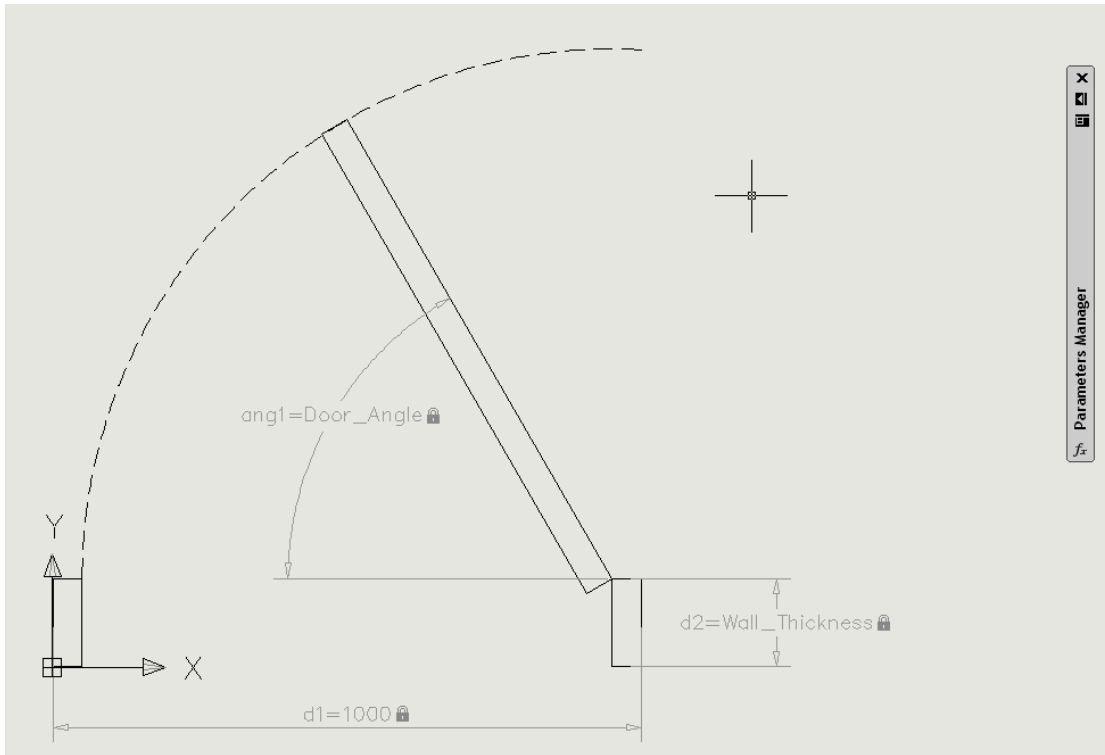
1 Open 03.Dblocks.dwg.



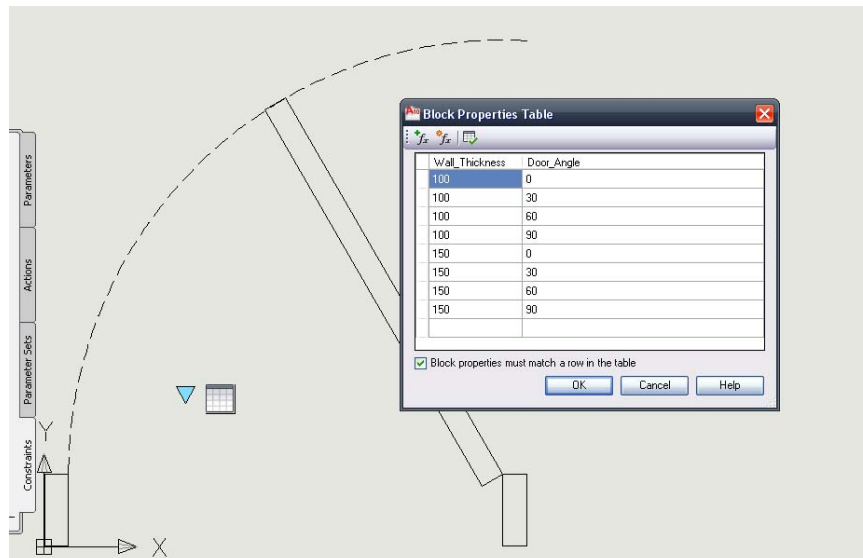
2 Open door_standard in block editor.



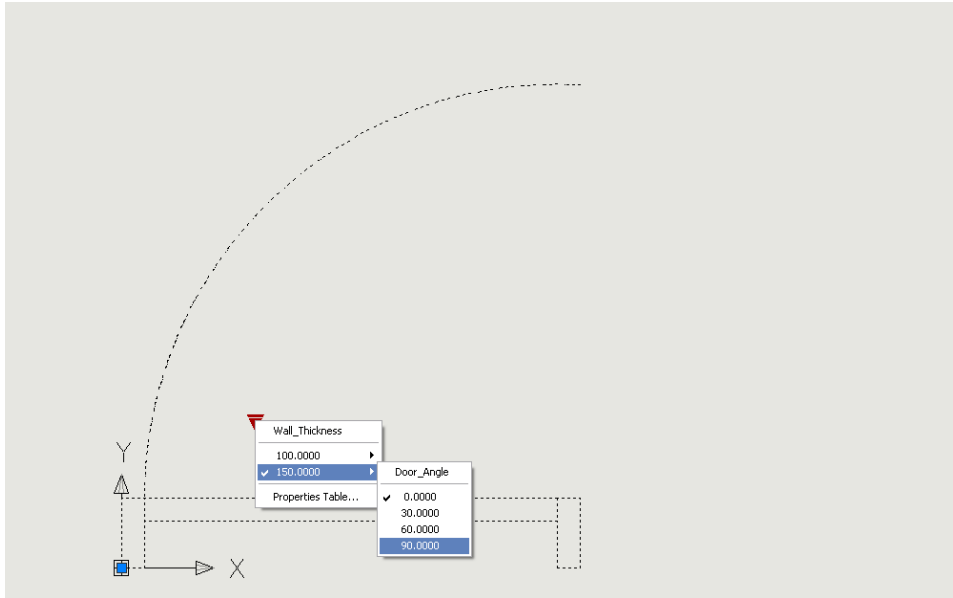
- Apply Dynamic constraints to govern dimensions and angle of door, specifying no grips each time.



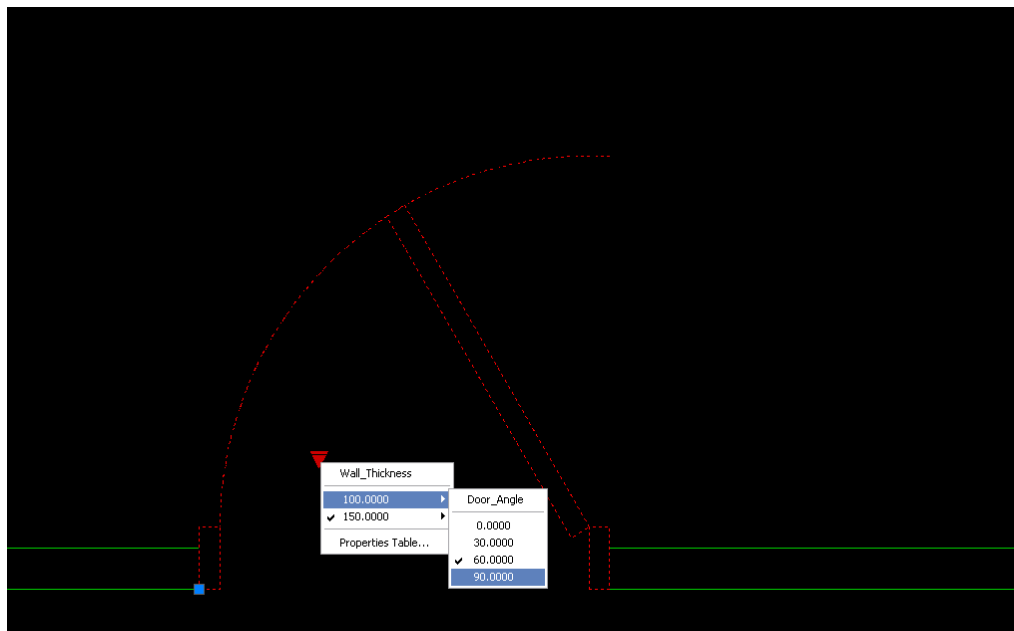
- Insert a block properties table, and add columns and data as below



7 Test block via the block editor tab



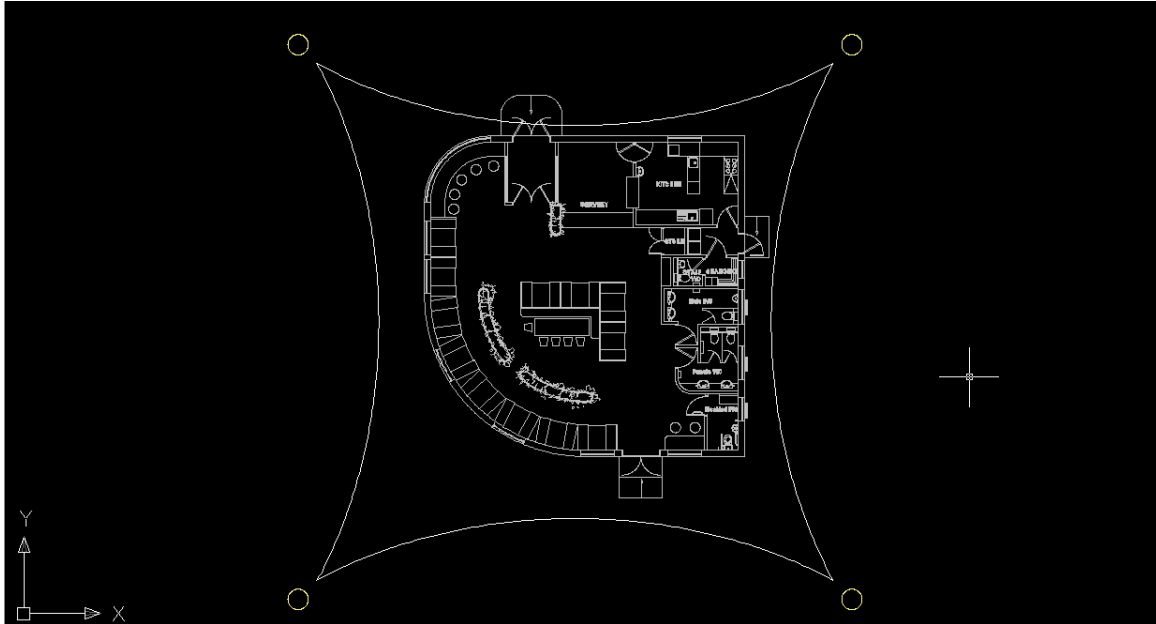
8 Exit block editor, and update the door to fit the surrounding wall thickness, and give it an angle of 90 degrees.



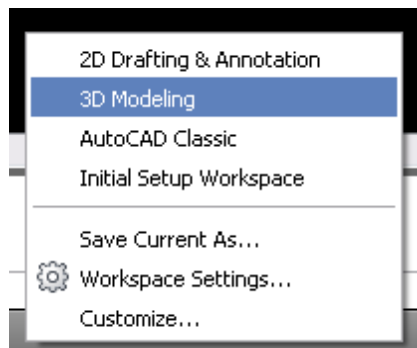
Step Four – Free form drawing

Create the exterior signature look and place a vehicle outside to show scale and context

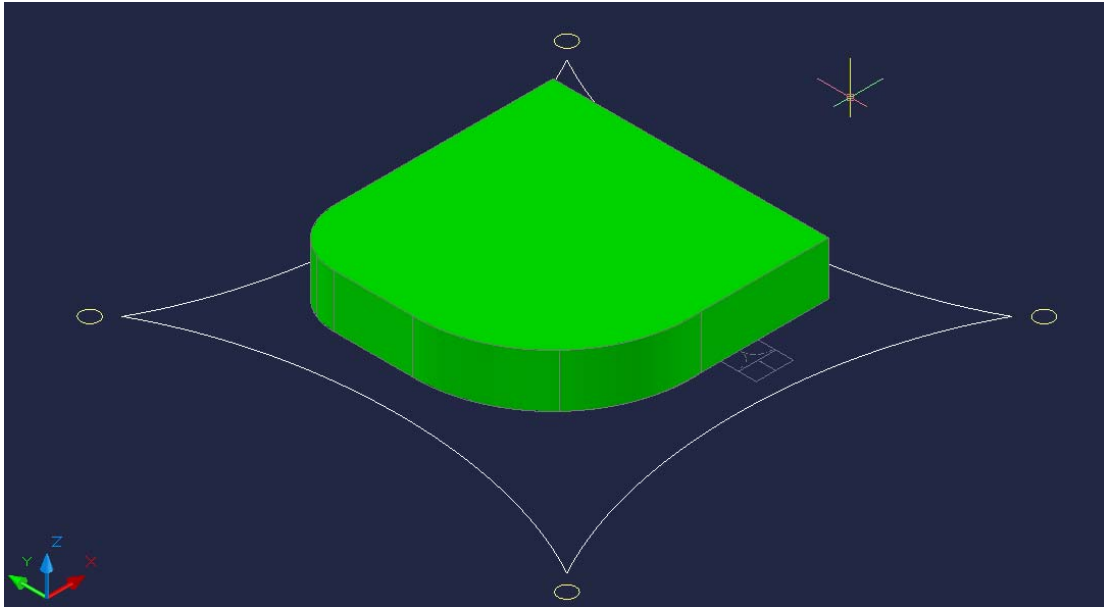
1 Open 04.Freeform.dwg



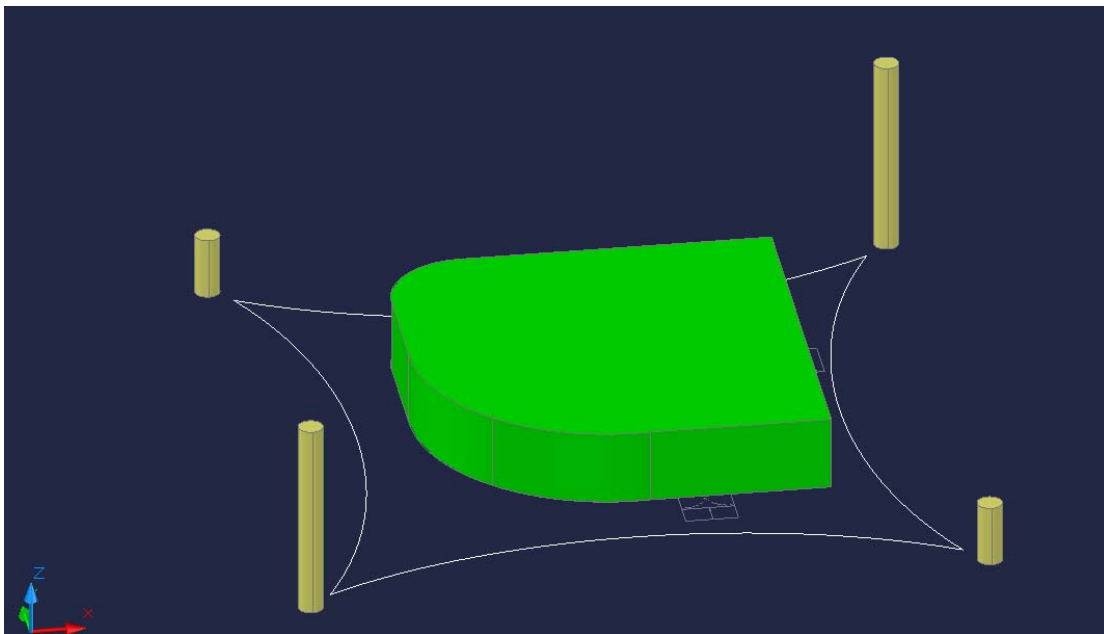
2 Change to 3D Modelling User interface



- 3 Draw a polyline over the buildings perimeter, and extrude to a height of 3000mm

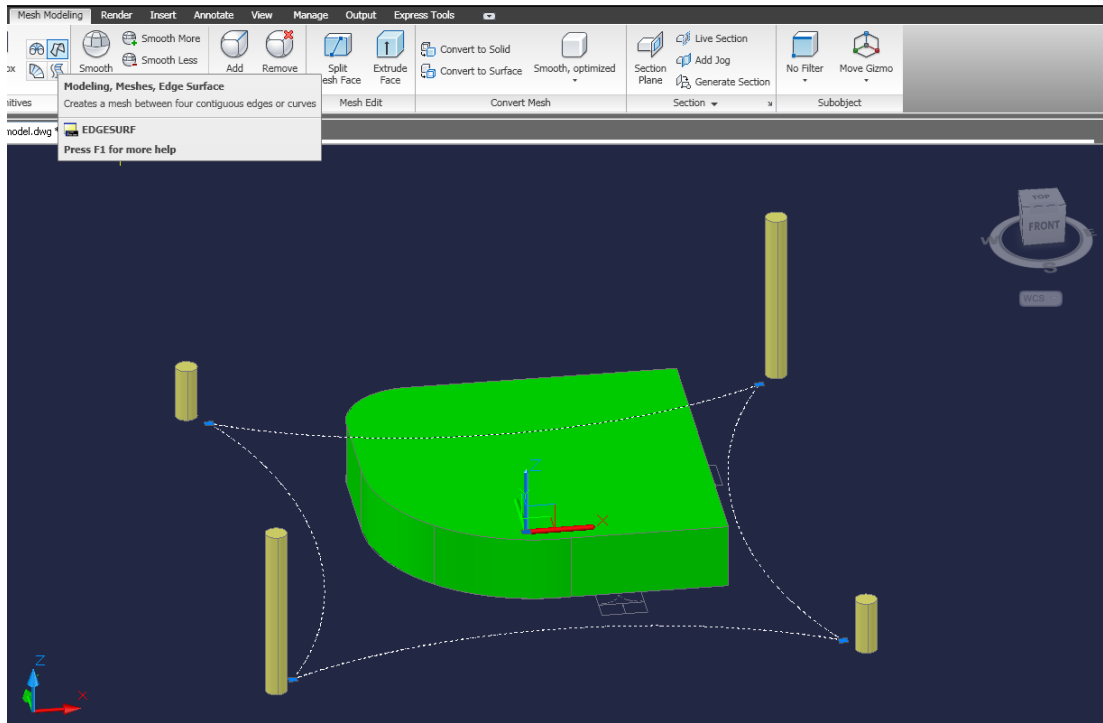


- 4 Draw top right and bottom left corner pillars to a height of 8000mm, and the other two to a height of 2500mm

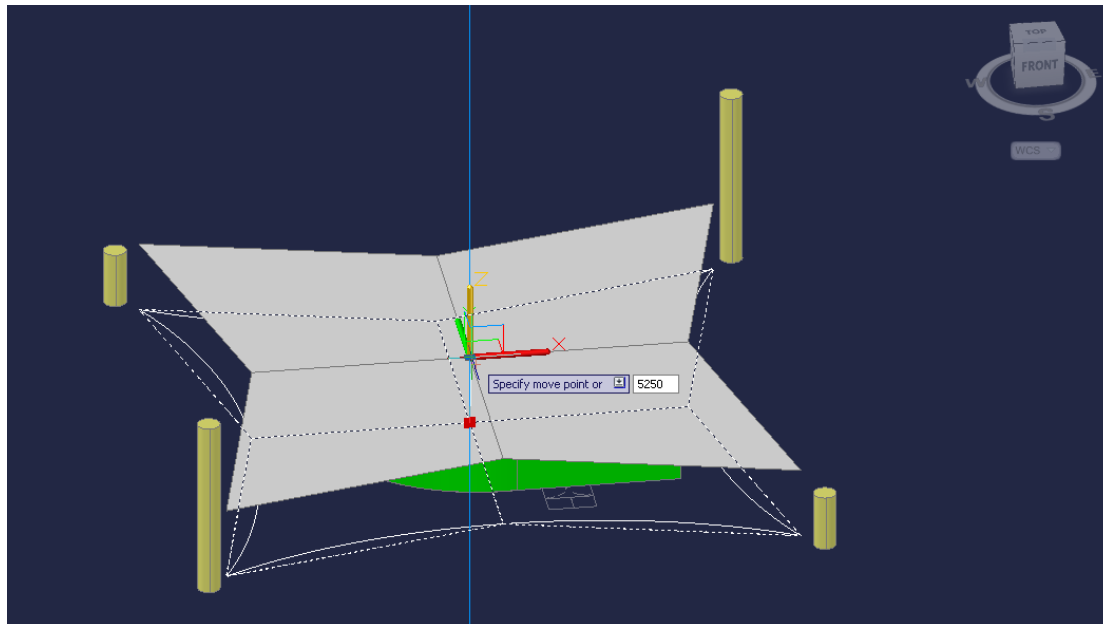


5 Set surftab1 and surftab2 variables to 2

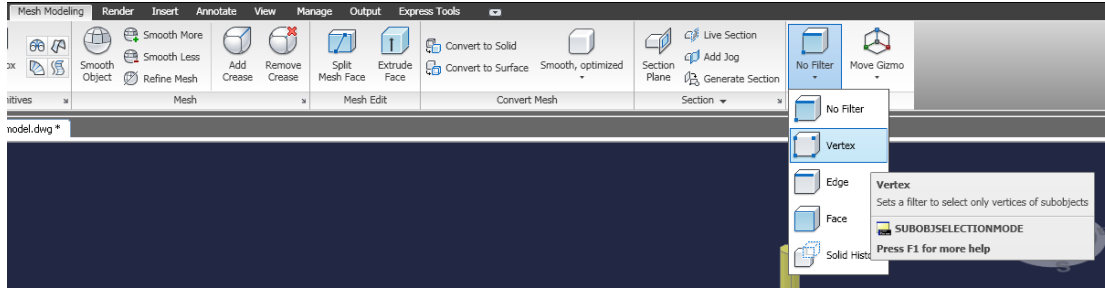
6 Use pre-existing arcs to draw canvas with edgesurf



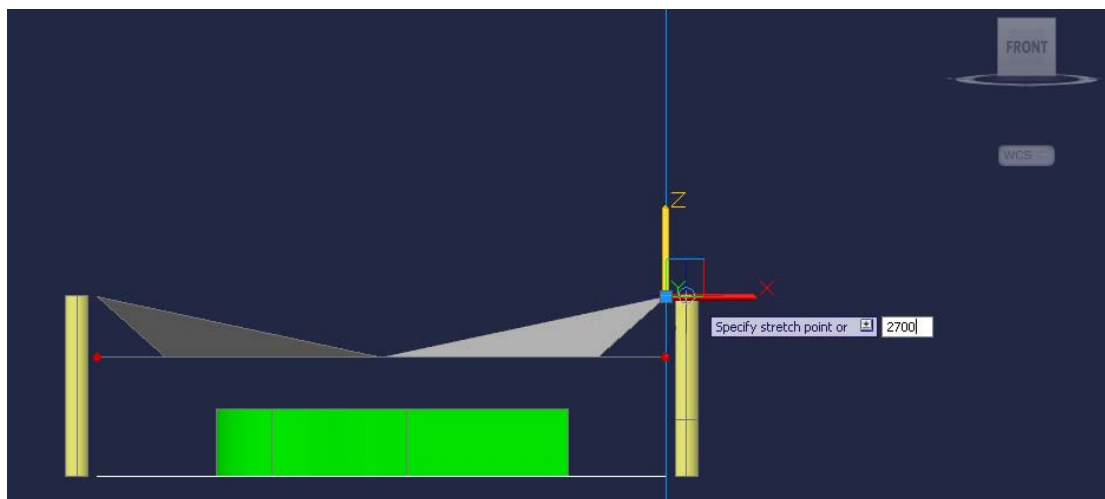
7 Move canvas to a height of 5250mm



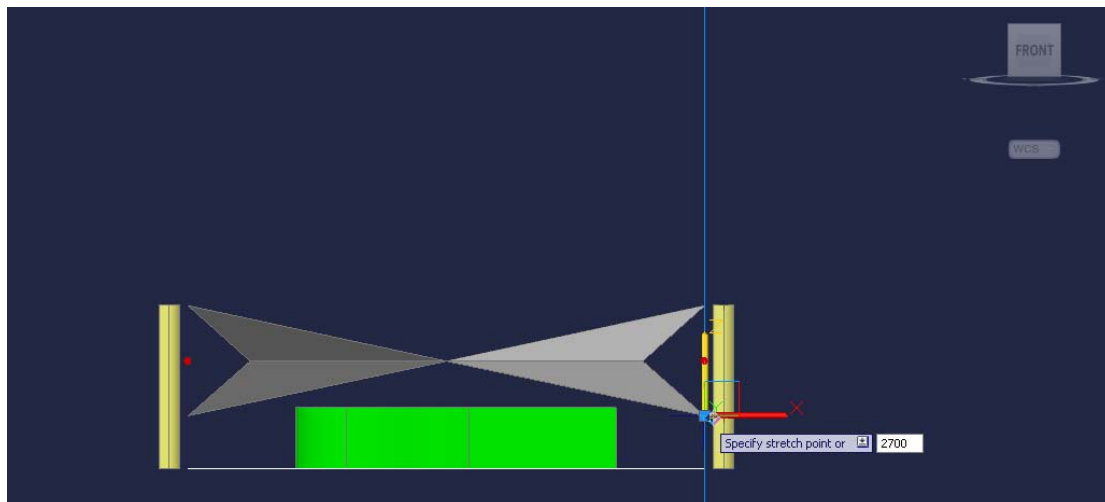
8 Enable vertex selection mode



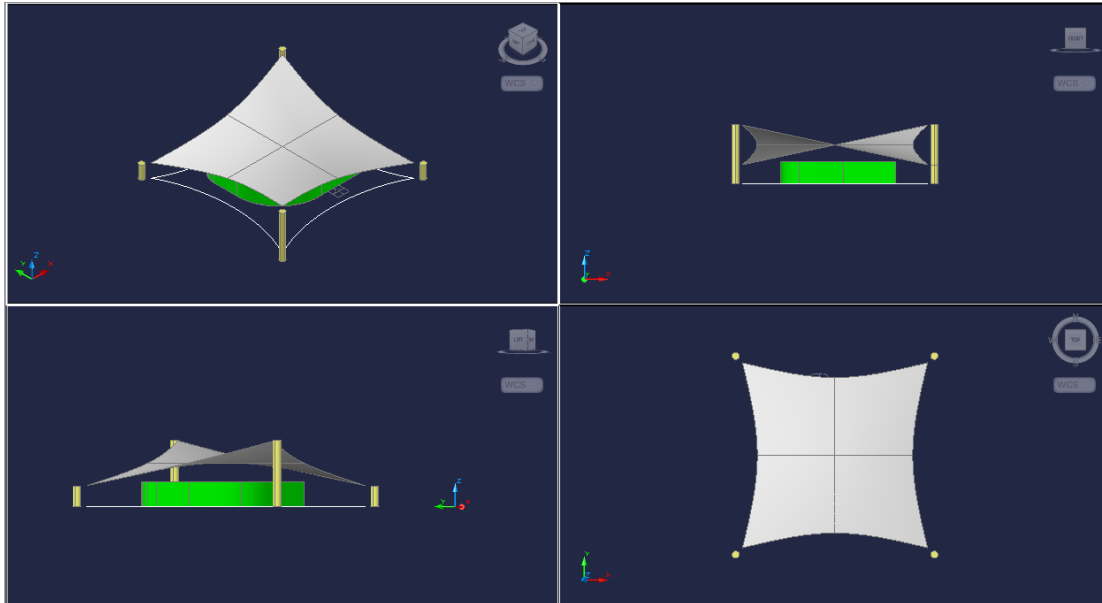
9 Using control to select the top right and bottom left corner vertex, move them 2700 up on the Z axis



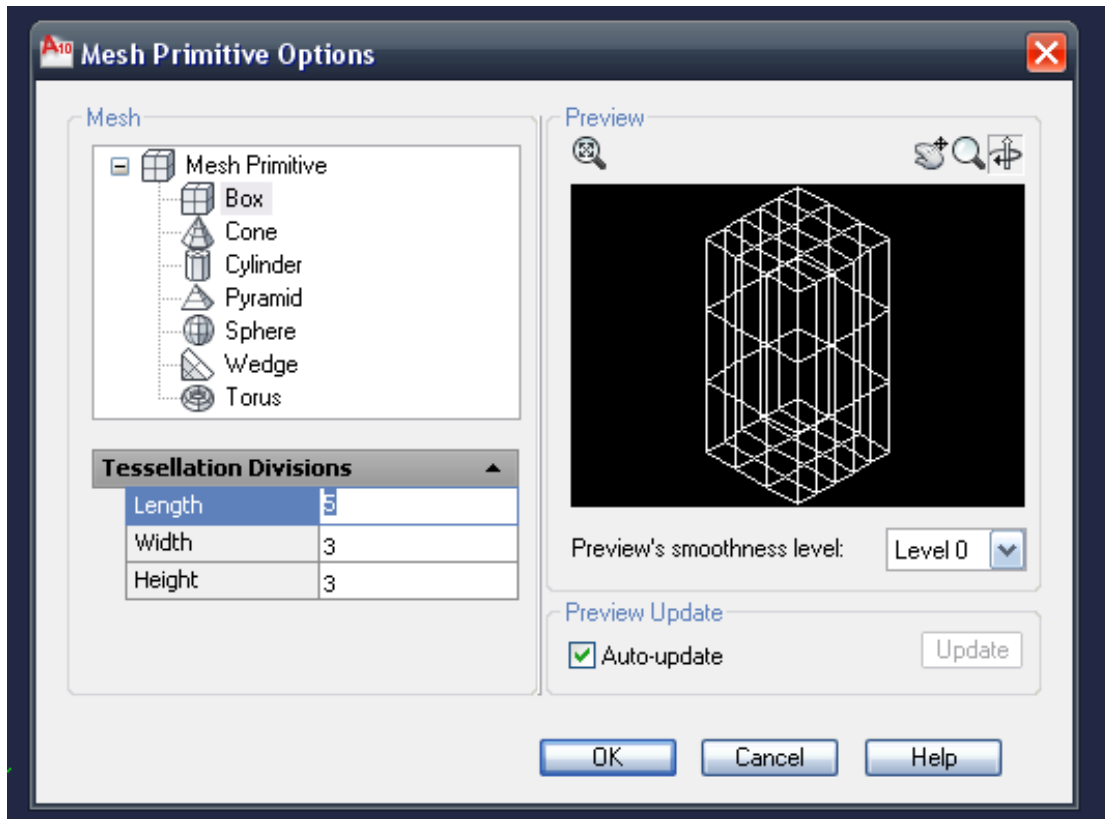
10 Selecting the top left and bottom right corner vertex, move them 2700 down on the Z axis



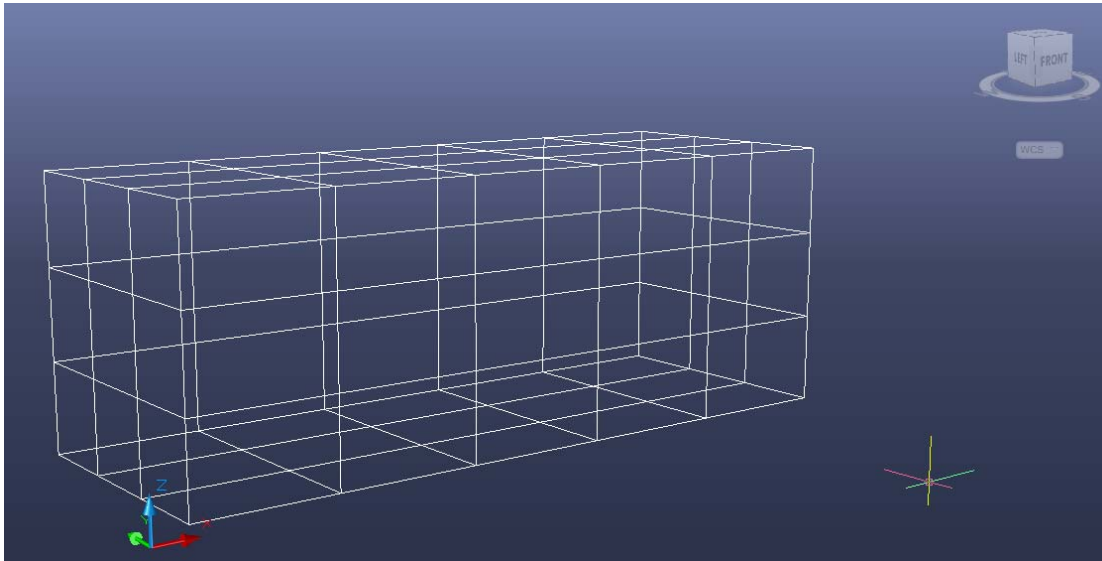
11 Apply a smooth level 4



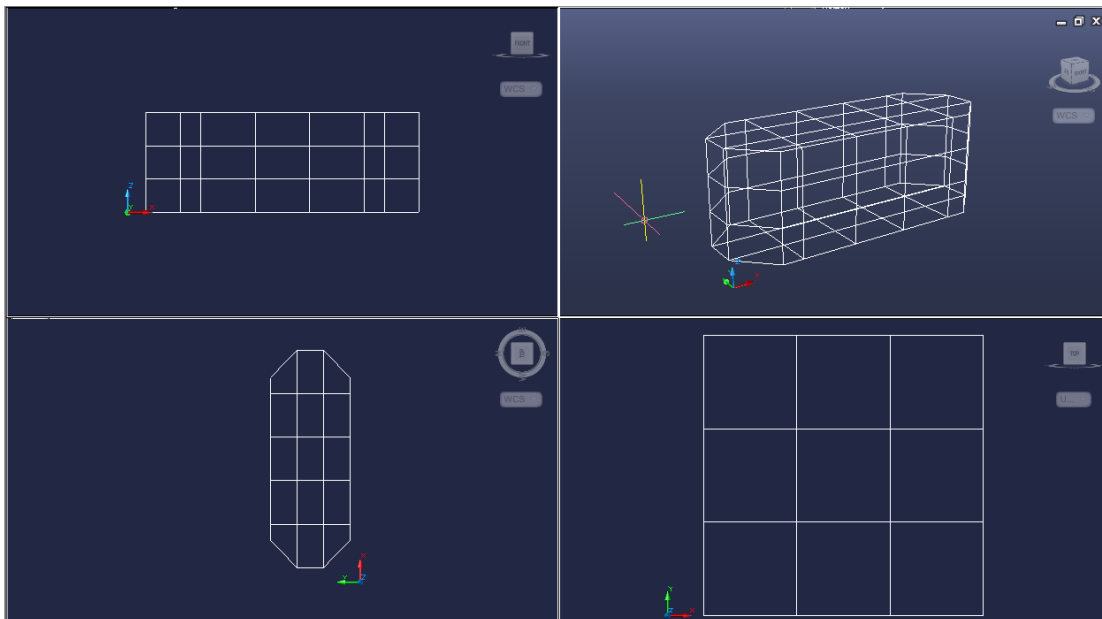
12 Change the default mesh primitive options as below



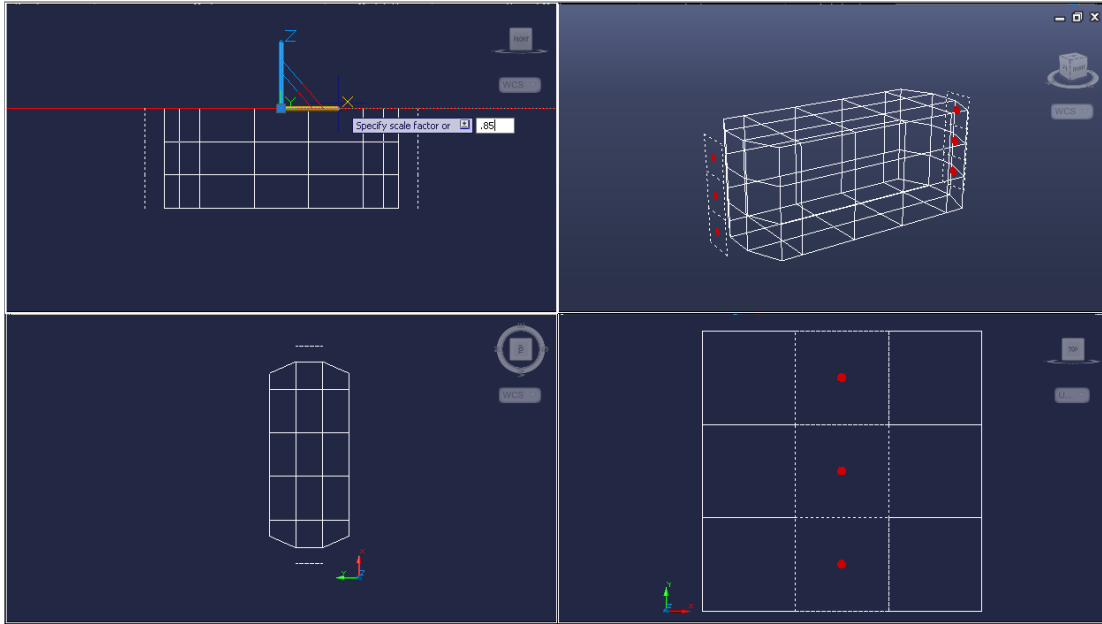
- 13 Insert mesh box 6000(x axis)x2200 (y axis)x1650 (z axis) at 0,0,0. At any point you can switch to '4 Views' Layout to view the caravan in progress



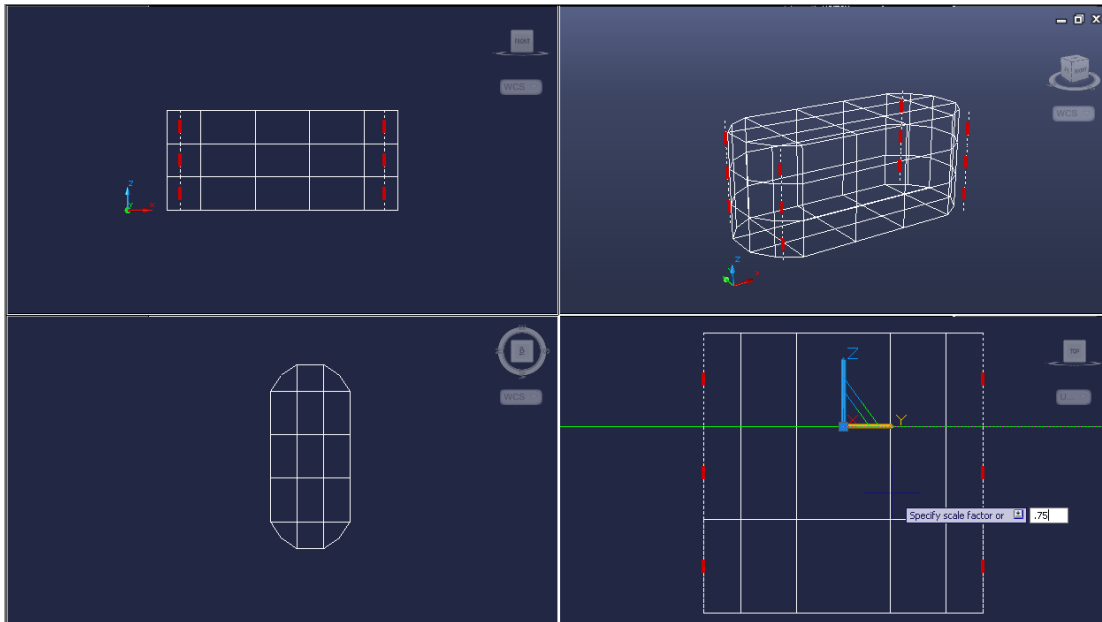
- 14 Change the subobject selection mode to edge, and the gizmo to scale. Select all vertical corner edges, move the Gizmo to the middle, select XY constraint and scale by .75



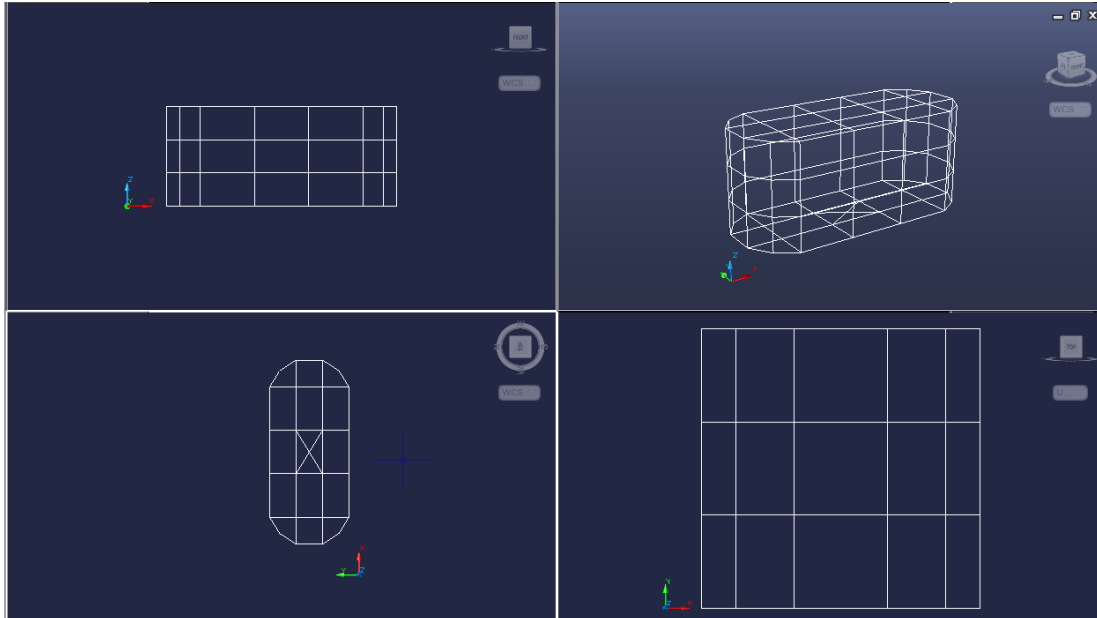
- 15 Change the subobject selection mode to face. Select the end faces, move the Gizmo to the middle, and using the Gizmo grip scale along the X axis by .95



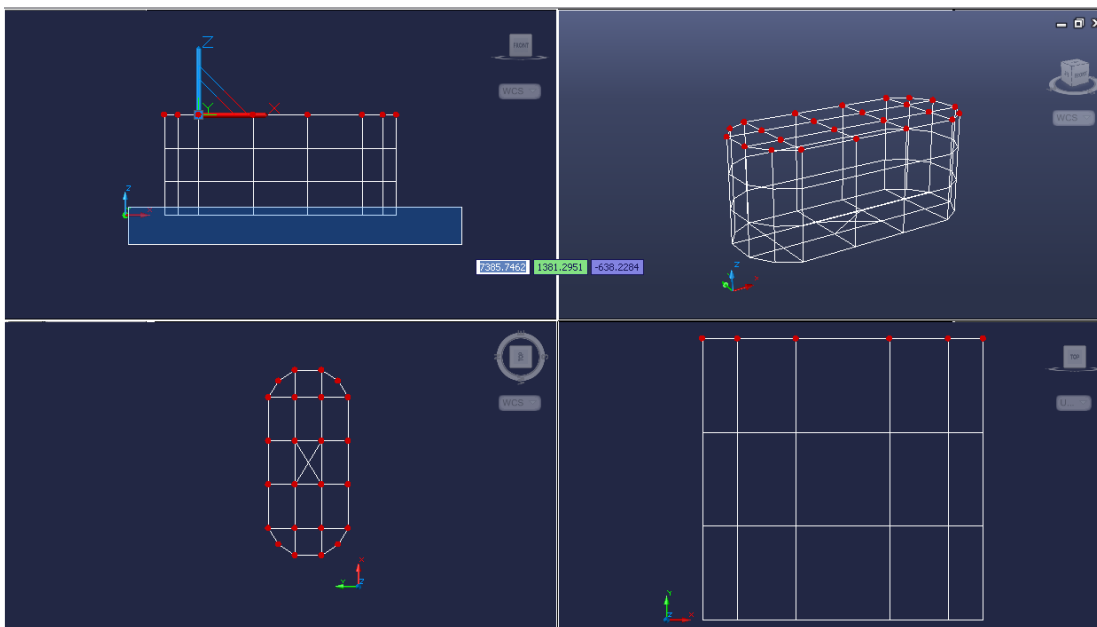
- 16 Change the subobject selection mode back to edge. Select the vertical corner edges as shown below, move the Gizmo to the middle and scale along the Y axis by .75



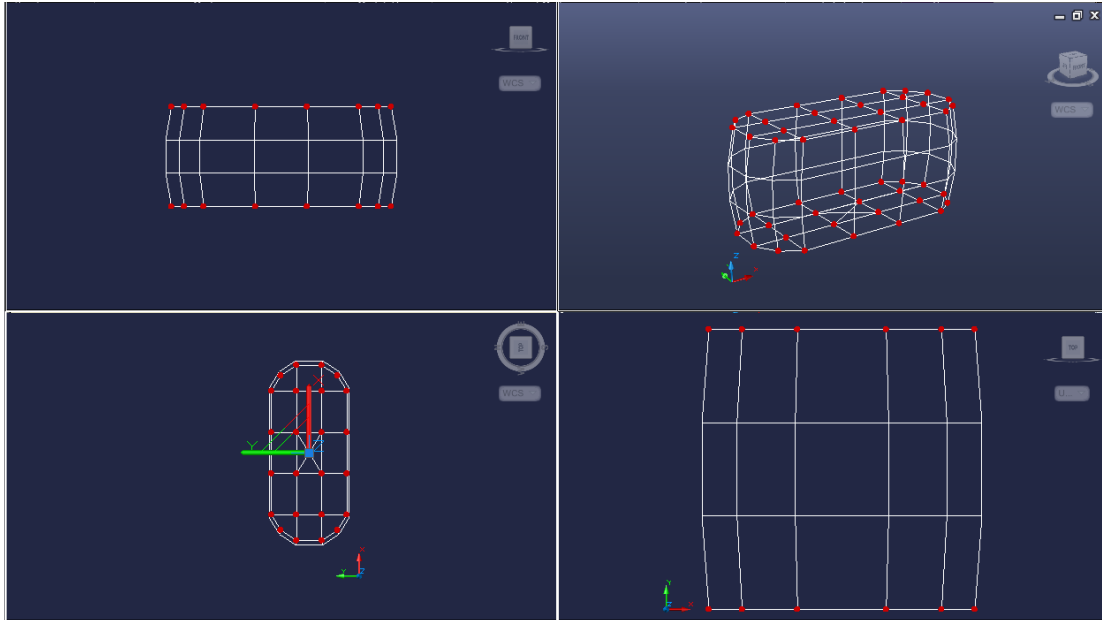
17 With the line tool, draw a cross in the centre of the top or bottom face



18 Change the subobject selection mode to vertex and select all points on the top and bottom faces

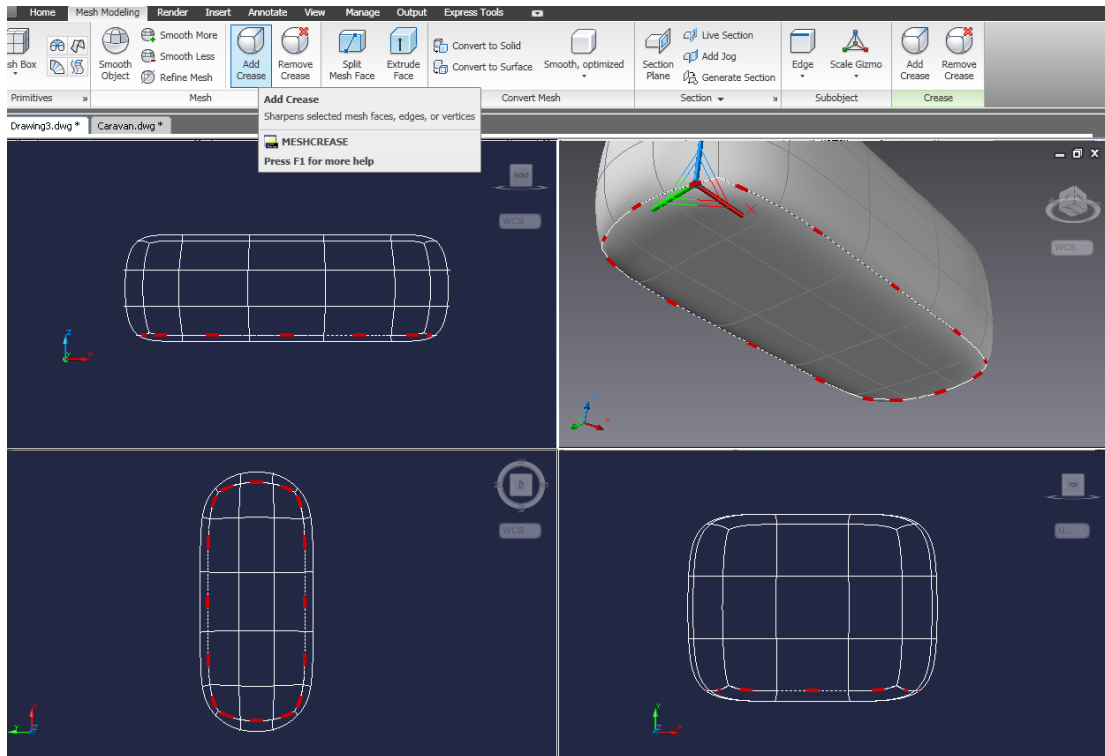


19 Move the Gizmo to the centre of the cross, and scale in the XY plane by .85

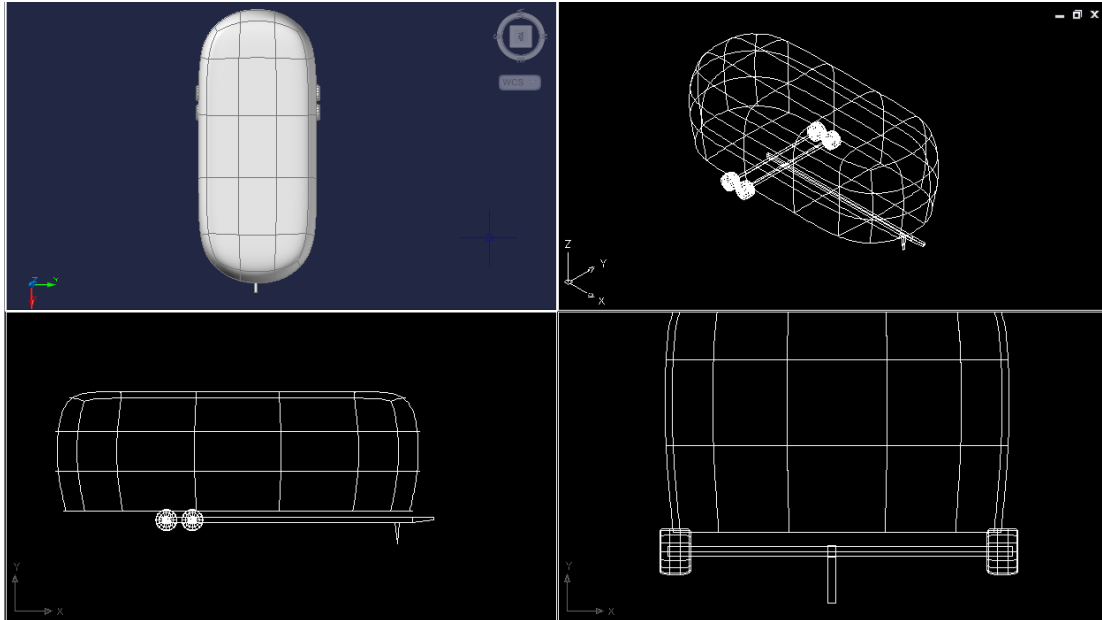


20 Apply a Level 4 smooth to the object

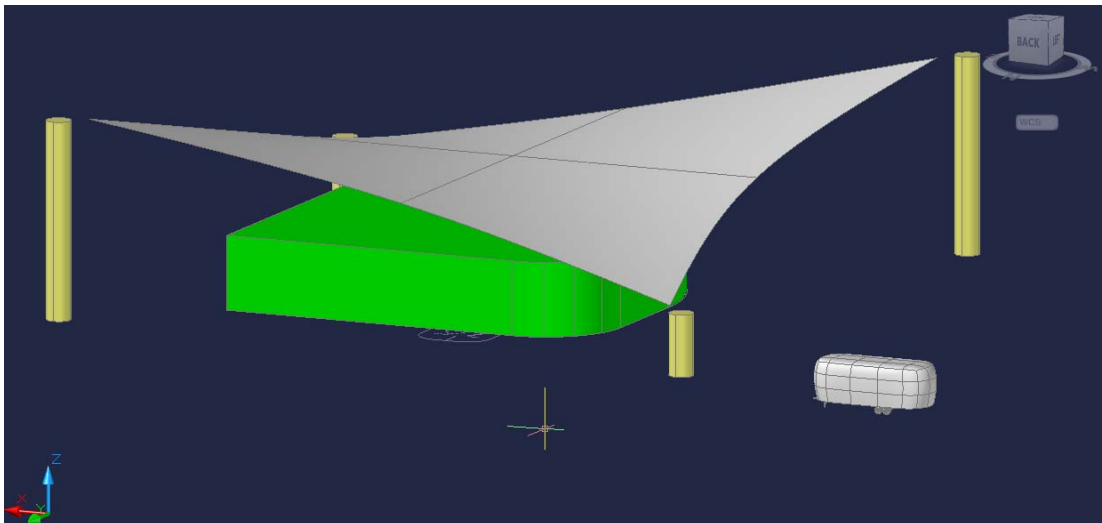
21 Change the subobject selection mode to edge. Select all the bottom edges, and crease using the default value (always).



22 Position the caravan body centrally, about 100mm vertically above the trailer.



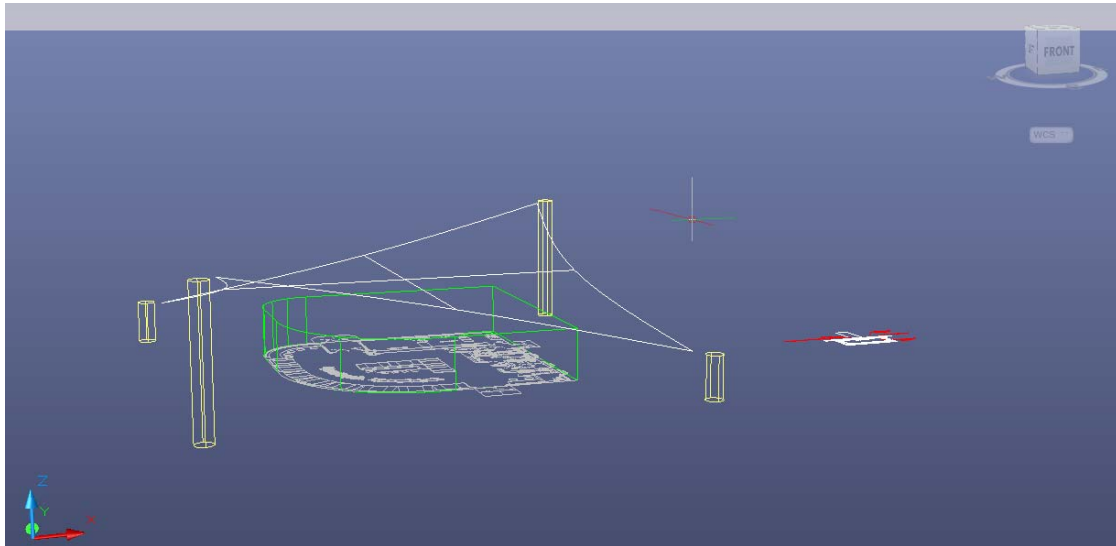
The completed view should be as below.



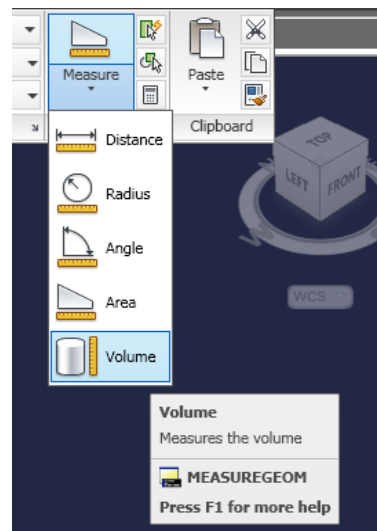
Step Five – Mark-up and exporting

Add hatching and dimensions to the drawing to annotate the design and create a single pdf document containing the design drawings so far to distribute to the project stakeholders.

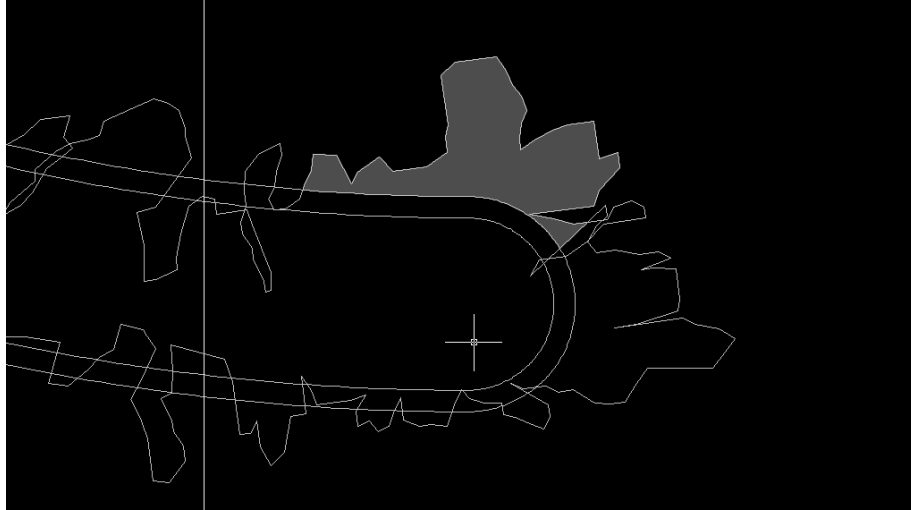
1 Open 05.Export.dwg



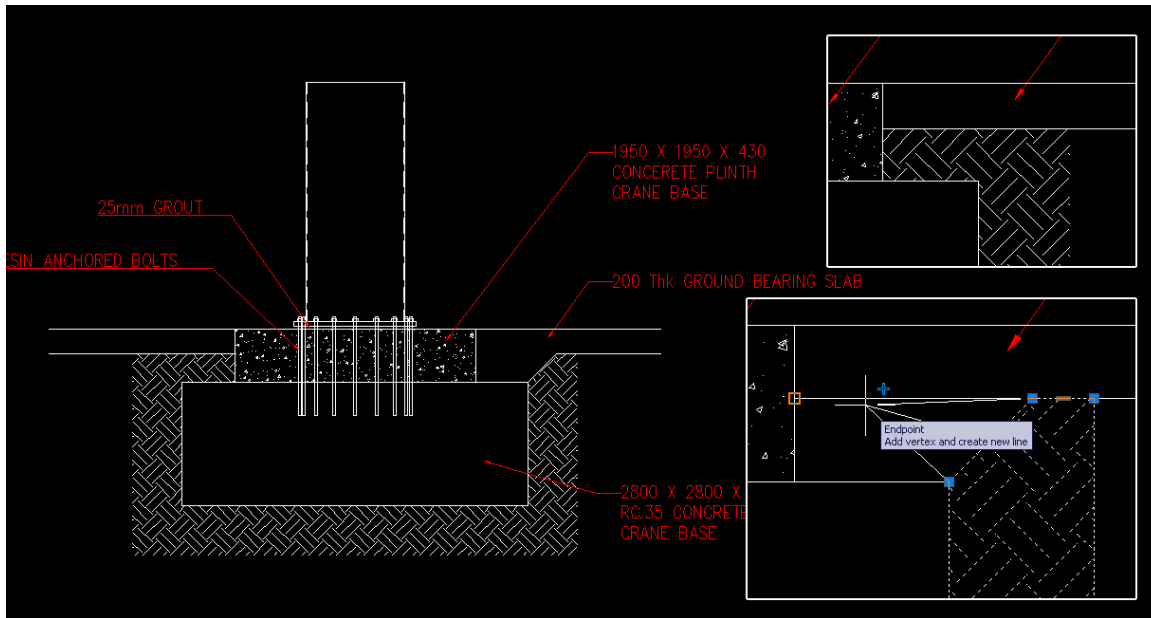
2 Measure the volume of the building mass (6.8438E11), then delete it



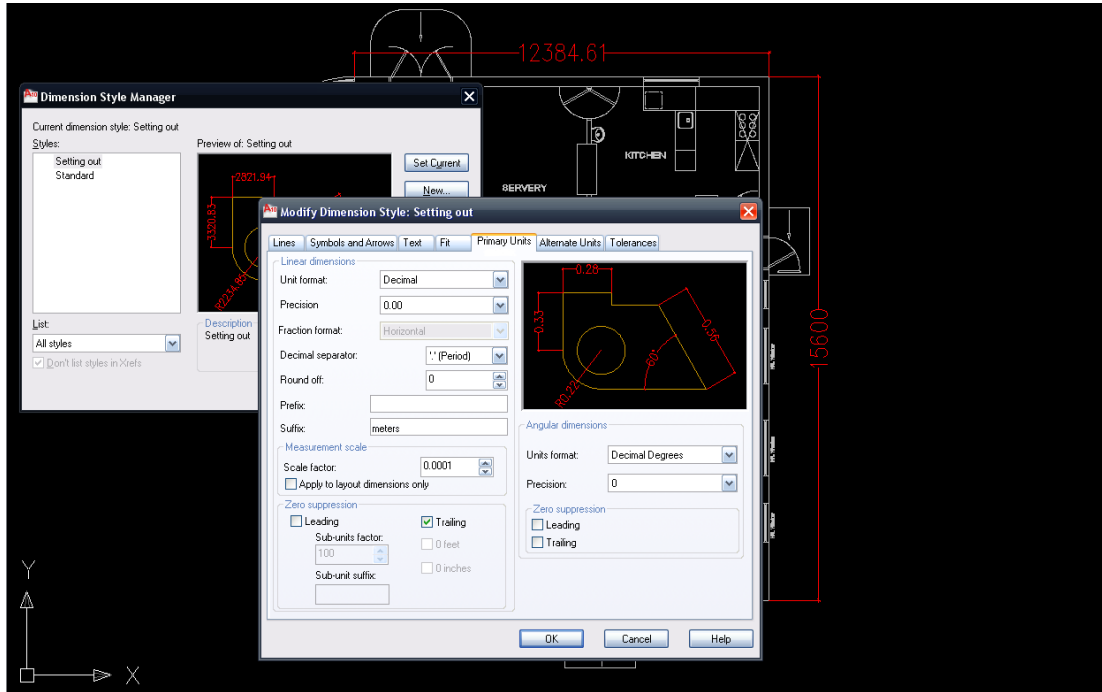
- 3 Try to hatch the shaded area of vegetation in the bottom right planter, highlighted below. There is a hole in the vegetation. The red circle displays around the hole, close it and hatch correctly.



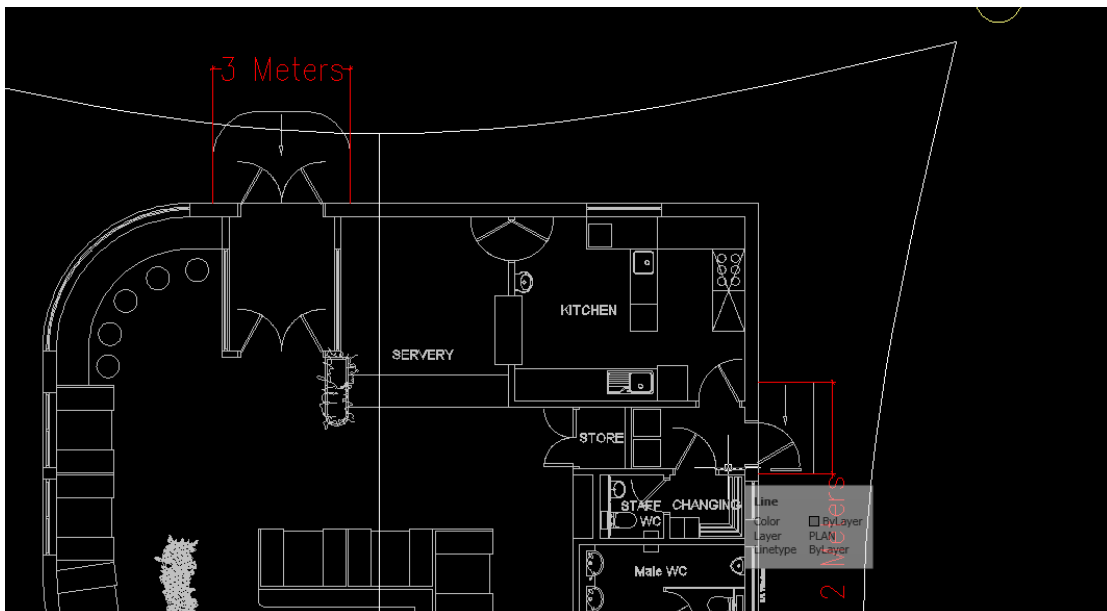
- 4 Scroll to the construction detail to the right of the model. Extend the baseline of the right ground slab to the crane base, and use the hatch grips to infill to match left of detail.



- Change the units to Meters by applying a scaling factor of 0.001 via DIMSTYLE. Enter ' Meters' as a suffix



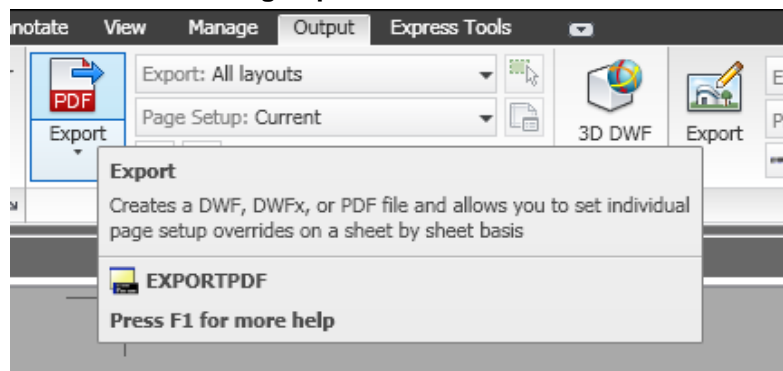
- Move the dimensions so the top one measures the width of the entry ramp and the right one measures the length of the door ramp



- 7 Switch to Layout PLAN and assign VPROTATEASSOC a value of 1. Turn on the canvas layer and rotate the viewport -90 degrees around the centre of the canvas



- 8 Export all layouts into one PDF using Export tab



End of timed test