TERRAIN SURVEYS

Overview

With the growing adoption of **Building Information Modelling**, **Terrain Surveys** can support your project by providing surveys as 3D models in **Autodesk Revit** format.

The purpose of this document is to outline some of the factors you will need to consider when requesting a 3D model. Also, outlining other critical information for the project such as project formats, laser scanning requirements, model accuracies and the level of detail (LOD).

Agreeing the specification prior to the modelling process requires more client interaction than a traditional 2D survey.

Benefits of using a 3D model over 2D drawings:

- **Better outcome from improved collaboration, all designers work from a single 3D model.**
- **A more efficient and cost-effective way of working.**
- **Improved visualisation giving greater understanding of the completed project.**
- **The ability to link or embed additional information into the 3D model.**
- **Whole life asset management for all operational and maintenance activities.**
- **A single 3D model will give you all the 2D plans you may require.**

3D Laser Scanning

Laser Scanning has become an essential part in the surveying of an existing building and production of a 3D Model. There are alternatives to laser scanning but the benefits far out way any negatives. The amount of data captured in a short space of time, with minimal disruption, reduces the costs and time spent on site by our surveyors when compared to using traditional survey techniques.

Things to consider:

- **Site extents or building areas to be included in the scanning survey.**
- **Access to roof areas and whether all areas are accessible to survey.**
- **Is the point cloud required as a deliverable and in what format?**
- **Is the pointcloud data to be full colour using HD photography.**
- **Point density, sufficient pointcloud information for the modeling and drawing process.**

Survey Requirements

For us to supply an effective proposal, **please provide us with as much information** as you have for your project, being as clear as possible with your requirements.

Things to consider:

- **Project coordinates, whether you require the survey to an arbitrary or Ordnance Survey grid.**
- **Can you supply any existing plans that you have and a survey specification.**
- **Which LOD is best fit for your project to maximise cost & efficiency.**
- **Which version of Revit should the model be delivered in?**
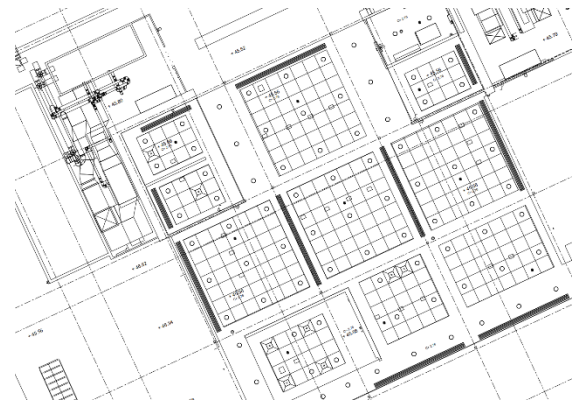- **Project timescales and delivery dates.**

Additional Deliverables

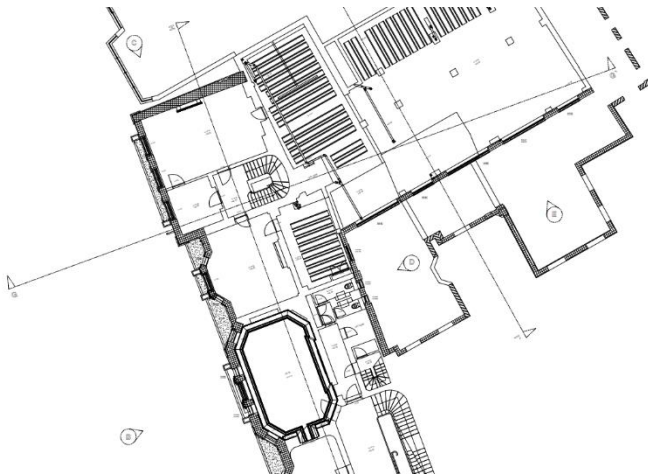As well as a 3D Revit model Terrain Surveys can also provide other deliverables:
- **2D Plans – Floors plans, RCP's, Elevations & Sections.**
- **Point Cloud Data – Formats such as Recap, PTS or e57.**
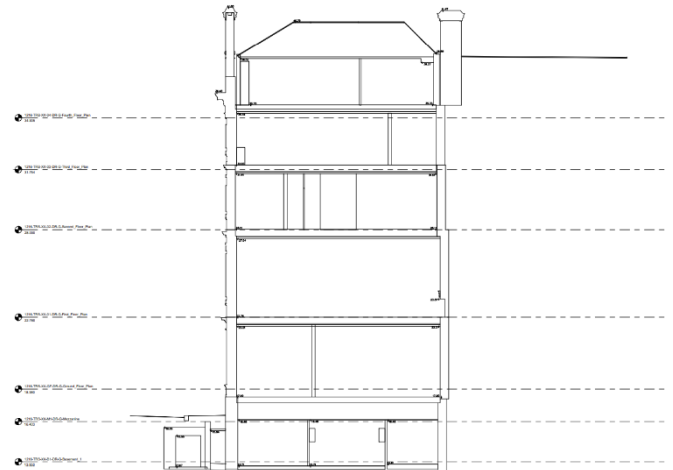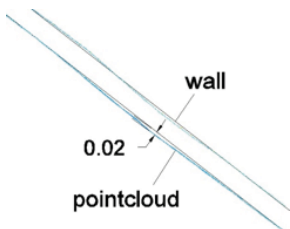- **TruView.**

Elevation

Reflective Ceiling Plan

Floor Plan

Section

Model Accuracies & Tolerances

wall

0.02

pointcloud

It is important to consider the purpose of the project and the nature of the building to understand some of the limitations. Prior to any work carried out an understanding of the accuracy expectations of the model must be agreed by all parties. On older buildings, walls and other elements may not be vertical and these features can be modelled to fully highlight site conditions, but this can be time consuming, costly, and unnecessary.

This image demonstrates how a Revit wall is best fit to the pointcloud data. Walls and other elements can be modelled to the true shape captured by the point- cloud data; however, the modelling process takes time and is therefore more costly.
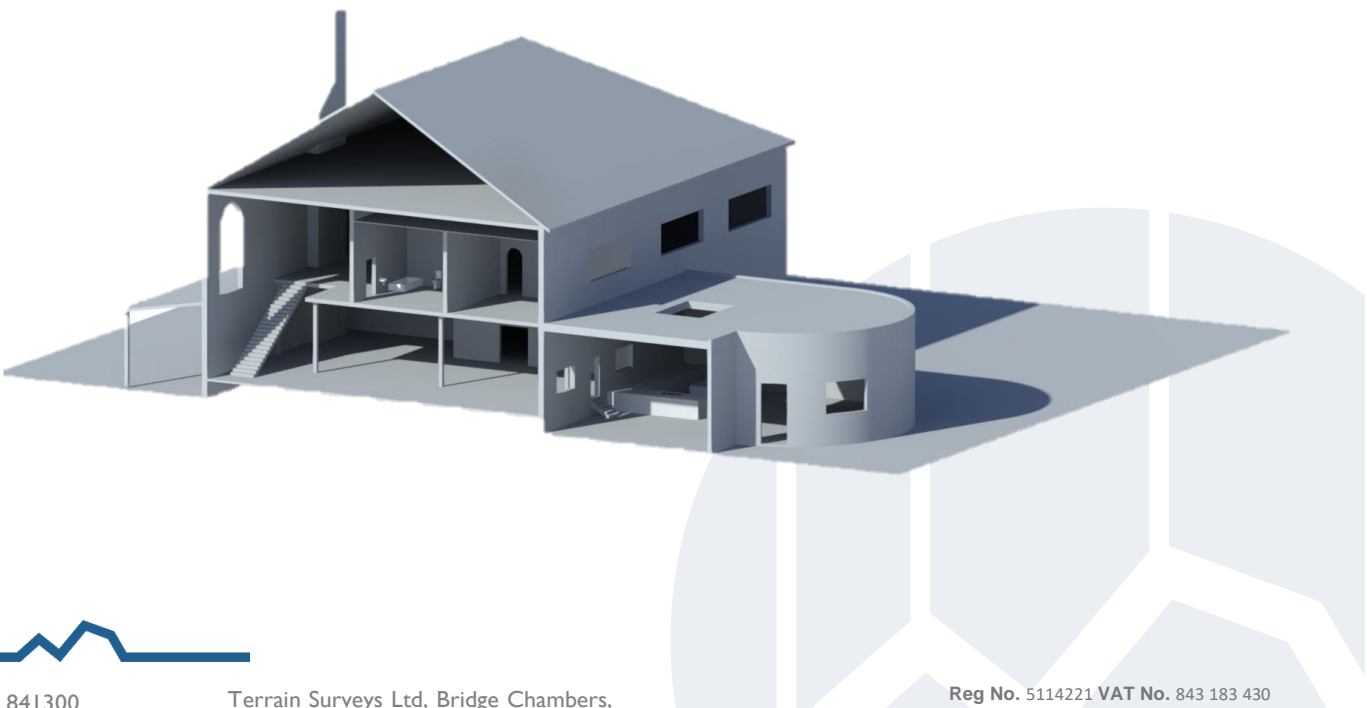
Levels Of Detail

Multiple LOD's can be used on a single project to create a price and model that is most suitable for the client. For example, an LOD 3 topo could be paired with LOD 1 buildings, or a building could have an LOD 3 exterior paired with an LOD 2 interior.
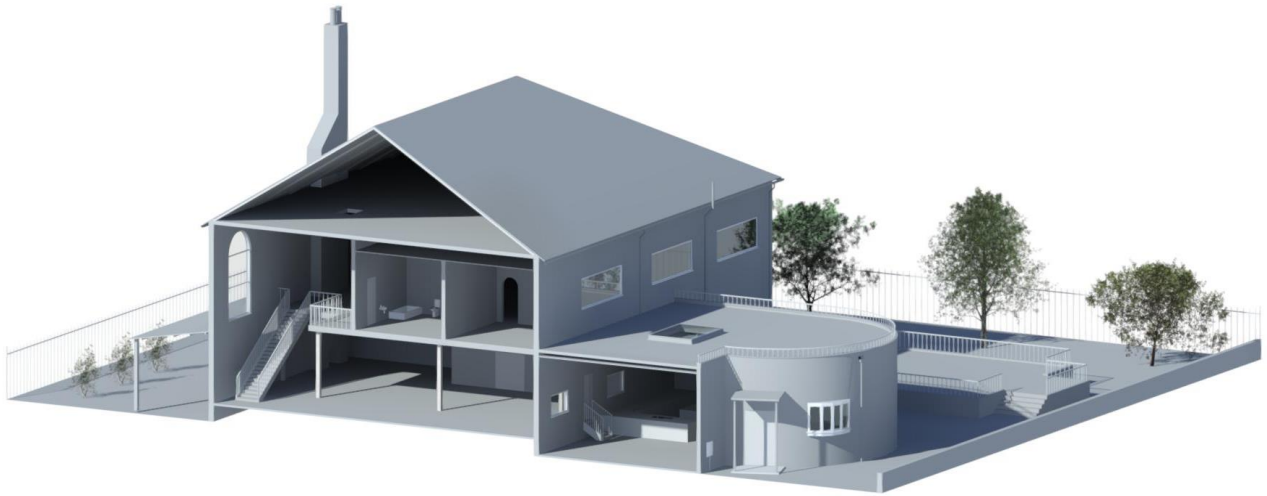
LOD 0
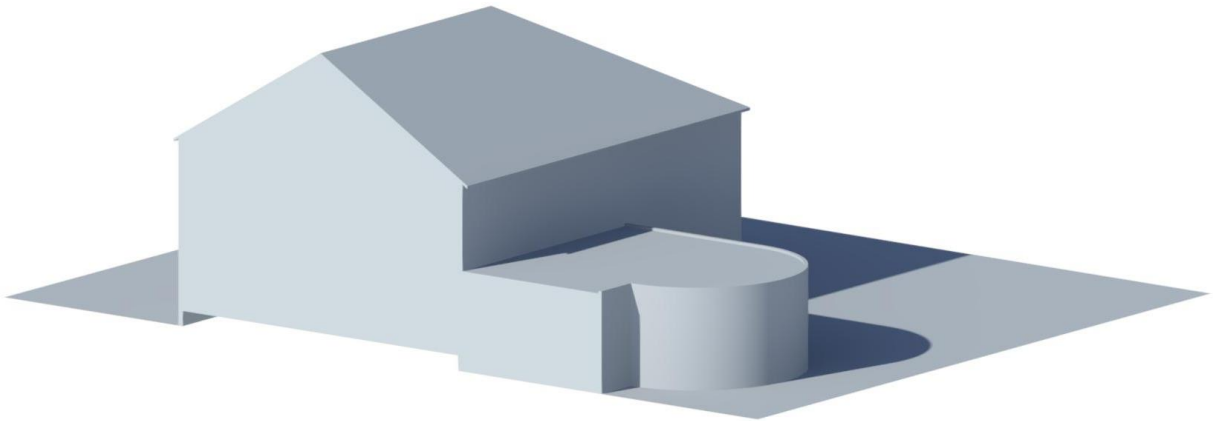
Basic mass model using generic wall & roof thicknesses, window and door cut outs can also be added to this level if required for rights of light. Topography is basic generated from contours.
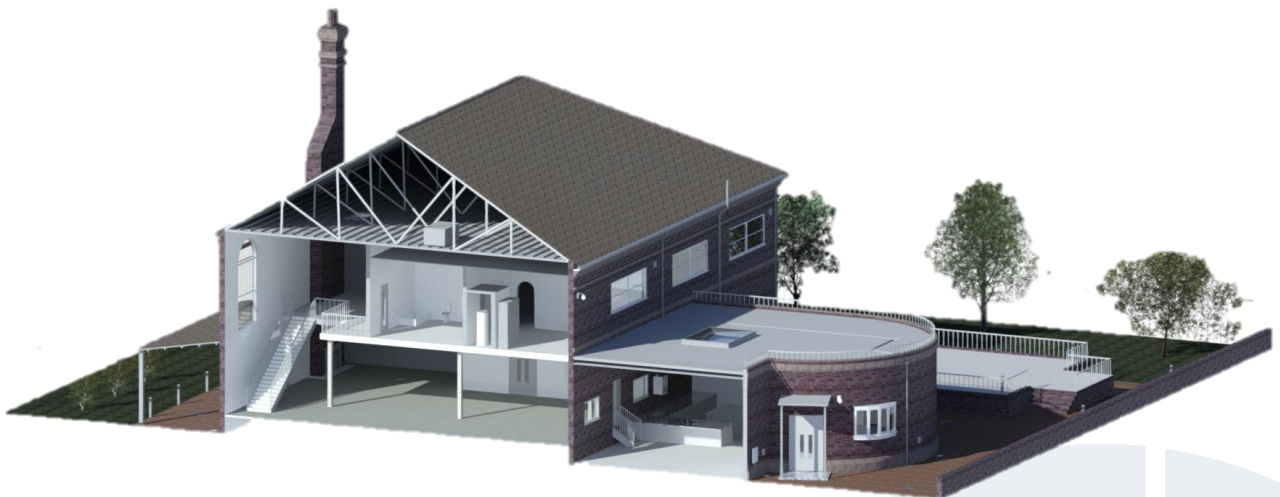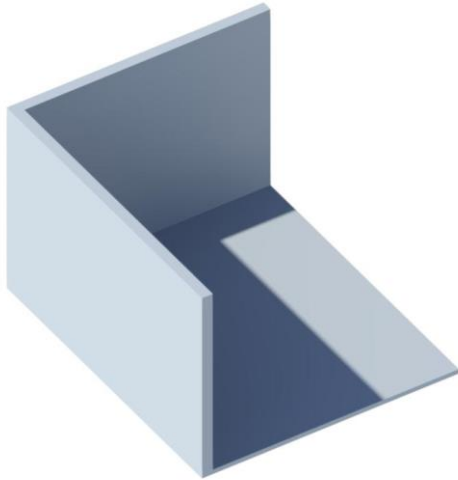
LOD 1

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LOD 2

LOD 3

Walls

LOD 1

All structural walls and main internal walls will be modelled with a correct thickness based on the collected data. Walls in which it was not possible to measure both sides will be labelled as approximate with the side in question made clear within the model. Voids/openings will be shown but ornate detail will be left off. All finishes will be left as default. Walls will generally be shown as straight and flat.
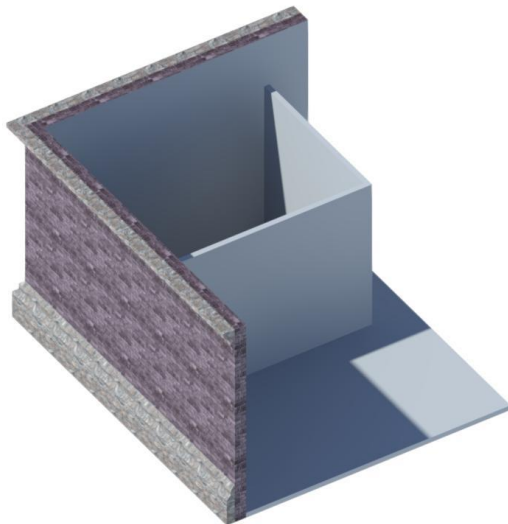
LOD 2

All walls will be modelled internally and externally including curtain walls. Ornate features such as plinths and capping will be shown externally as well as surface finishes that best resemble the makeup of the wall. Sloping or bowing will generally only be modelled when exceeding a tolerance of (+/-30mm) as it can affect the performance of the model. Finish will be added upon request only.
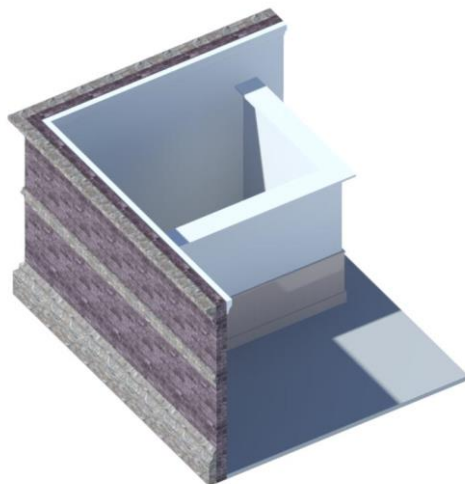
LOD 3

All walls will be modelled internally and externally including curtain walls. All ornate features such as plinths, capping and other decorative features will be shown externally & internally as well as surface finishes that best resemble the makeup of the wall. Sloping or bowing will generally only be modelled when exceeding a tolerance of (+/-30mm) as it can affect the performance of the model.
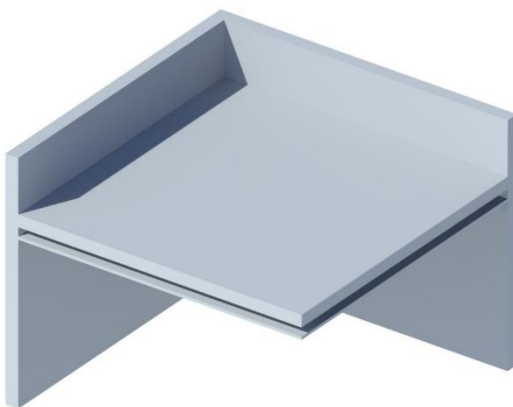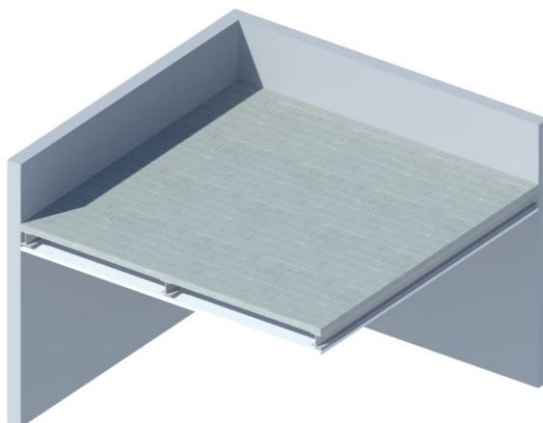
Floors & Ceilings
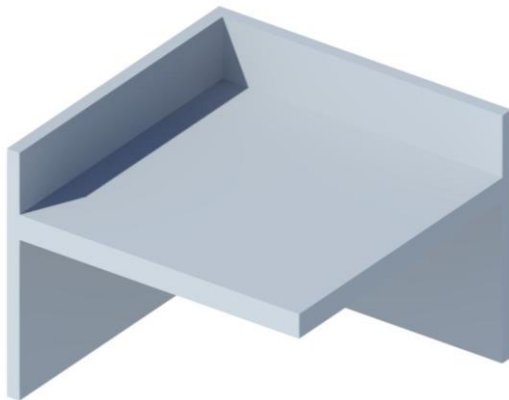
LOD 1

Overall thickness of a floor and the ceiling below will be shown as one slab. Slopes and falls will generally not be shown.

LOD 2

Floors and ceilings will be shown as separate elements and correct overall thicknesses will be given to them where it has been possible to identify. Slopes and falls will generally not be shown unless they exceed a tolerance of (+/- 30mm) as it can affect the overall performance of the model. Hatches will be shown as generic in place families.

LOD 3

Floors and ceilings will be shown as separate elements with correct overall thicknesses. This includes an accurate floor structure when it has been possible to identify. Slopes and falls will generally not be shown unless they exceed a tolerance of (+/- 30mm) as it can affect the overall performance of the model. Surface finishes will also be added. Hatches will be shown as generic in place families.
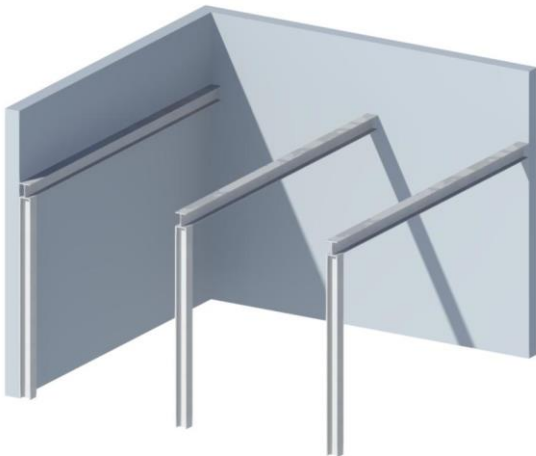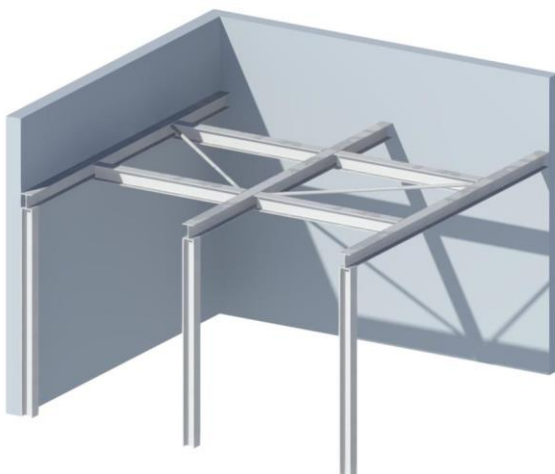
Structural Elements
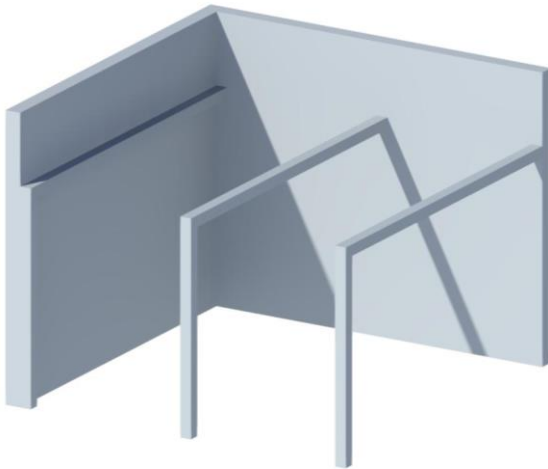
LOD 1

All main structural elements such as columns and beams will be modelled with generic profiles that represent the overall geometry of each element. Structural elements located above false ceilings and therefore obstructed from view will likely not be modelled unless they are made visible prior to us collecting data. No finishes will be added. Columns and beams will be placed on grid lines when possible.

LOD 2

All main structural elements such as columns and beams will be modelled with correct profiles. Structural elements located above false ceilings and therefore obstructed from view will likely not be modelled unless they are made visible prior to us collecting data. Materials will be identified where possible. Columns and beams will be placed on grid lines when possible.


LOD 3

All main structural elements such as columns and beams will be modelled with correct profiles. Ties beams, braces and trusses will also be shown. Structural elements located above false ceilings and therefore obstructed from view will likely not be modelled unless they are made visible prior to us collecting data. Materials will be identified where possible. Columns and beams will be placed on grid lines when possible.
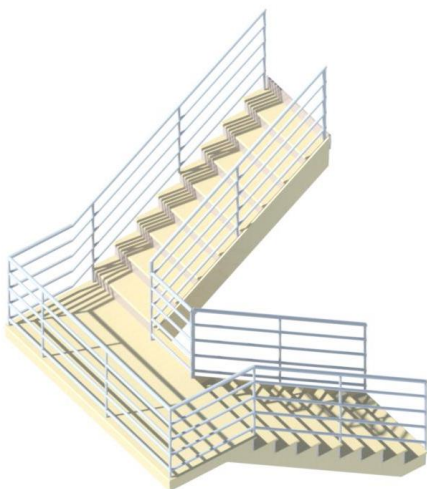
Stairs & Ramps
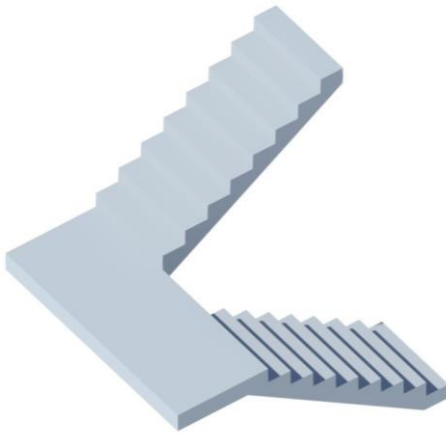
LOD 1

All stairs & ramps will be modelled as monolithic stairs with correct riser heights, tread depths, structural depths, and widths. Risers will be placed accurately where possible however risers in straight runs will be evenly spaced across the overall length of the run. No handrails or finishes will be added.

LOD 2

All stairs & ramps will be modelled as monolithic stairs with correct riser heights, tread depths, structural depths, and widths. Risers will be placed accurately where possible however risers in straight runs will be evenly spaced across the overall length of the run. Basic handrails will be added. No finishes will be added.

LOD 3

All stairs & ramps will be modelled as monolithic or open steel or timber where relevant with correct riser heights, tread depths, structural depths, and widths. Risers will be placed accurately where possible however risers in straight runs will be evenly spaced across the overall length of the run. Stingers and supports will also be shown. Accurate handrails will be added. Finishes will be added.

Roofs

LOD 1

Roofs will be modelled as a footprint with defined slopes where possible but may also be modelled by footprint or with modified sub elements. An overall thickness will be shown with no joists.

LOD 2

Roofs will be modelled as a footprint with defined slopes where possible but may also be modelled by footprint or with modified sub elements. A correct thickness of the roofs structure will be shown including key roof joists. Finishes will be added upon request.
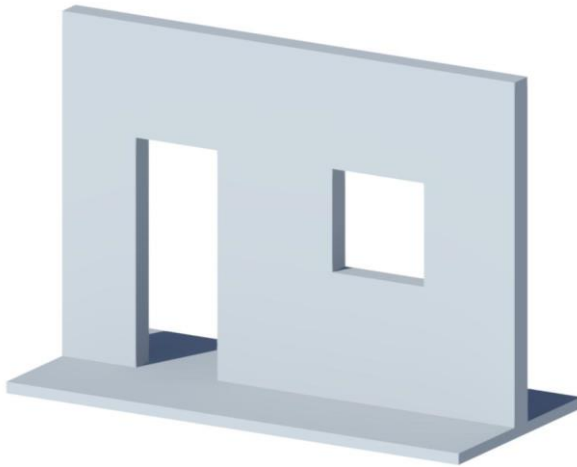

LOD 3

Roofs will be modelled as a footprint with defined slopes where possible but may also be modelled by footprint or with modified sub elements. A correct thickness of the roofs structure will be shown including all roof joists, braces and supports. Soffits and fascia's will also be shown. Finishes will be added.
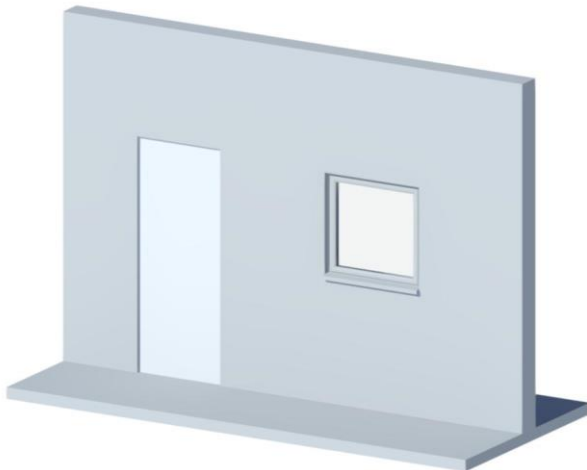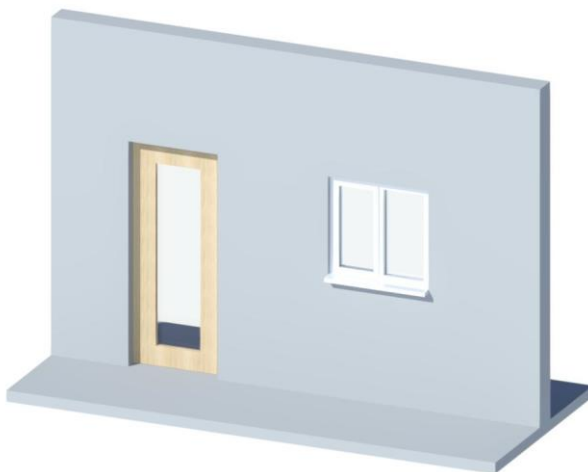
Windows & Doors

LOD 1

Windows and doors will be modelled to the correct size as openings.

LOD 2

Windows and doors will be modelled to the correct size and depth within the wall as generic families, showing the swing direction with no finishes.
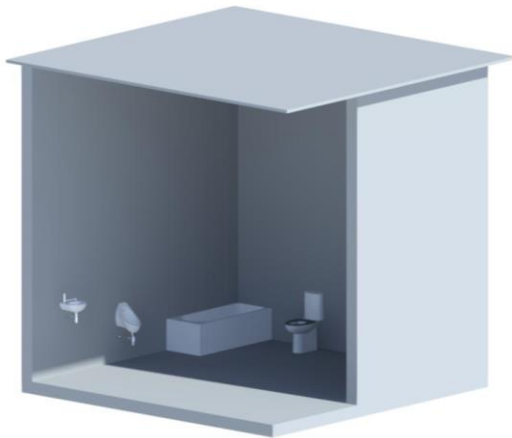
LOD 3

Windows and doors will be modelled to the correct size and depth within the wall as families with accurate fenestration, showing the swing direction and finishes.
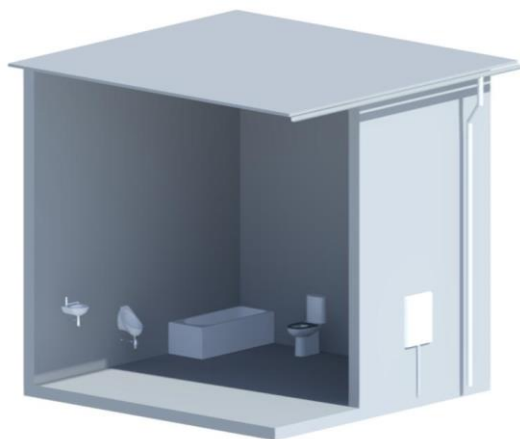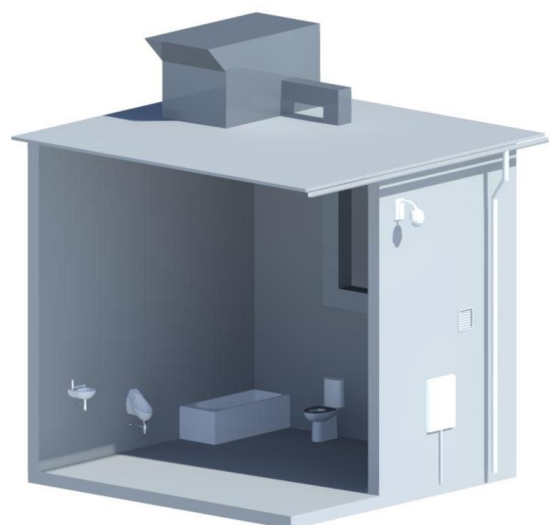
Services

LOD 1

Sanitary fittings will be shown as generic families. This includes sinks, water closets, urinals, baths, and showers. Including vanity units and kitchen units modelled as generic masses with no finishes.

LOD 2

Sanitary fittings will be shown as generic families. This includes sinks, water closets, urinals, baths, and showers. Including vanity units and kitchen units modelled accurately as in place families with no finishes. Service entry points, gutters, rainwater pipes, soil vent pipes, tanks, boilers and ACU's will also be shown.


LOD 3

Sanitary fittings will be shown as generic families. This includes sinks, water closets, urinals, baths, and showers. Including vanity units and kitchen units modelled accurately as in place families with no finishes. Service entry points, gutters, rainwater pipes, soil vent pipes, tanks, boilers, ACU's, vents and any other external services such as alarms, lights, cameras etc will also be shown. Main MEP plant will be modelled as generic in-place models and main ducting will also be shown.
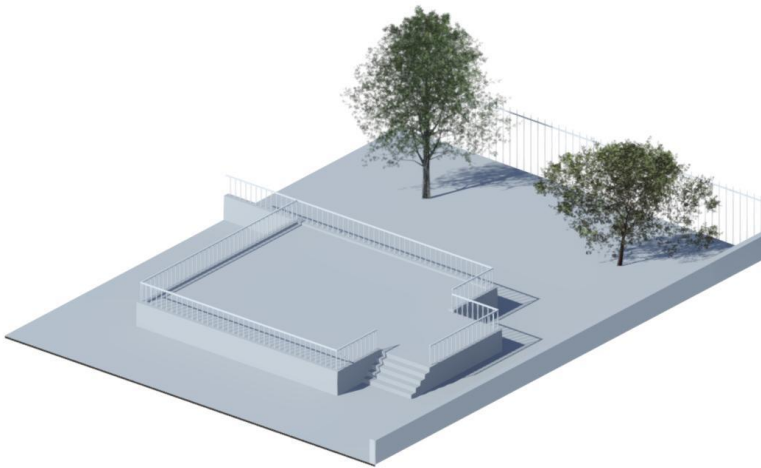
Topography
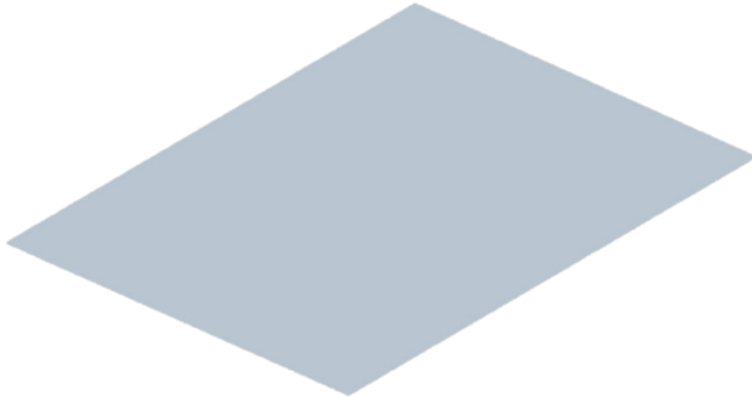
LOD 1

Basic topographic surface will be created using contours. If a full building model has not been requested all buildings on site will be modelled to either LOD 0 or LOD 1.

LOD 2

Topographic surface will be created using points to give an accurate representation of the land. Steps, walls, kerbs, fences, and trees will also be shown. No finishes will be added. If a full building model has not been requested all buildings on site will be modelled to either LOD 0 or LOD 1.


LOD 3

Topographic surface will be created using points to give an accurate representation of the land. Changes of surface will be shown. Steps, walls, kerbs, fences, and trees will be shown as well as all street furniture and other fixed features. Finishes will be added. . If a full building model has not been requested all buildings on site will be modelled to either LOD 0 or LOD 1.
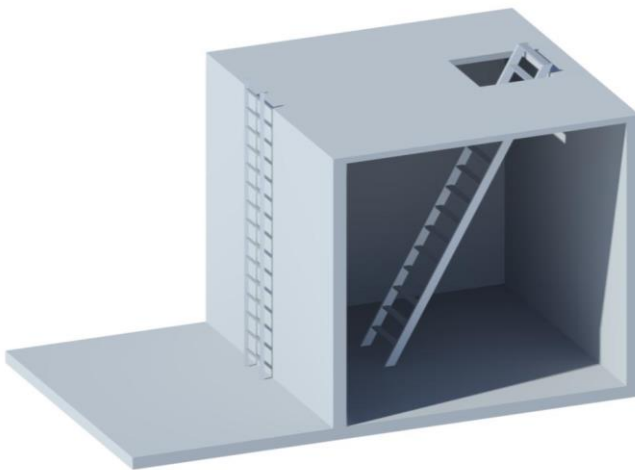
Curtain Walls
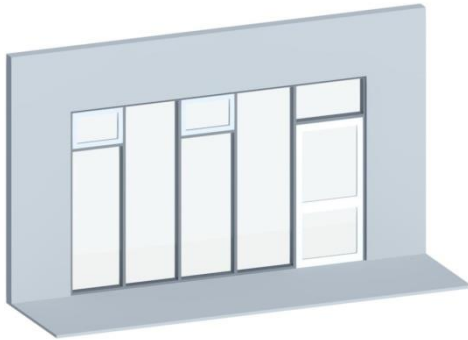
Curtain walls will be modelled to include accurate mullion positions and sizes. The location line will be placed so the glass sits in the correct position. Glass panels will be replaced accordingly by spandrel panels, doors or windows that accurately represent the feature of the curtain wall.

Ladders

LOD 2

Ladders will be shown as generic in place families without handrails and cages. No finishes will be added.
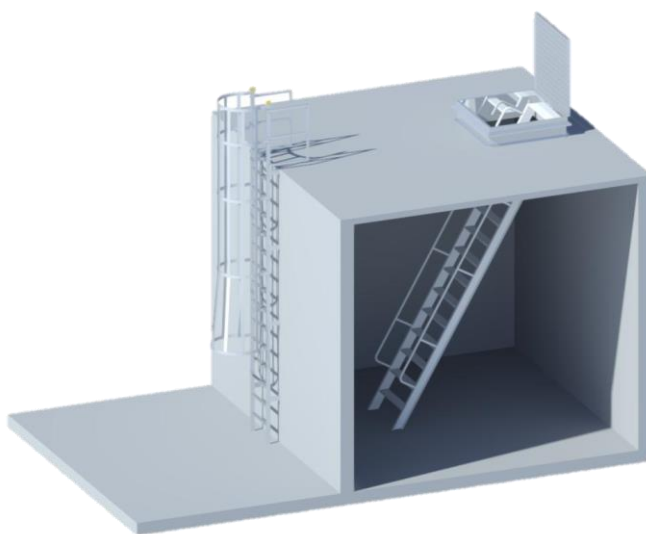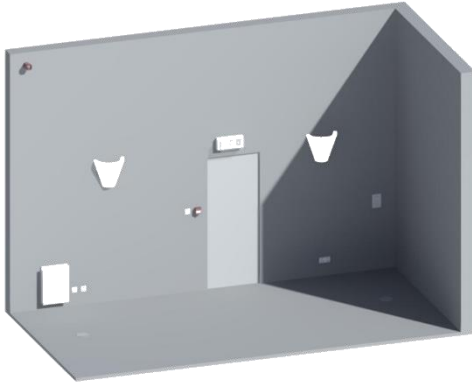

LOD 3

Ladders will be shown as generic in place families with handrails and cages. Finishes will be added.
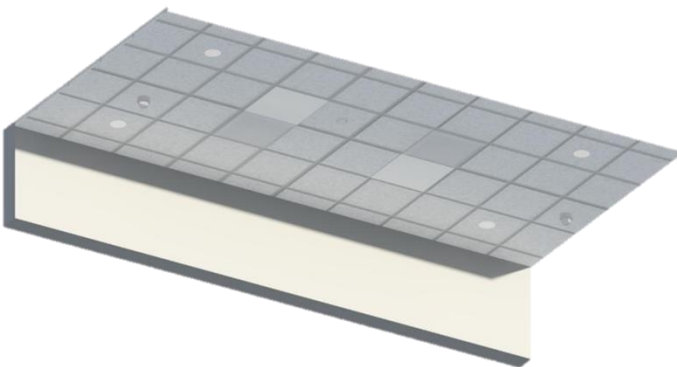
Additional Features

Internal Services

We can include all internal services or a select group based on a project's specific needs. We would liaise with the client to ensure the appropriate level of detail is achieved. All services will be shown as in-place families that give an accurate representation of each service.

Ceiling Plans

We can include all ceiling services or a select group based on a project's specific needs. We would liaise with the client to ensure the appropriate level of detail is achieved. All services will be shown as in-place families that give an accurate representation of each service. Where appropriate the ceiling tile grid will be shown accurately.
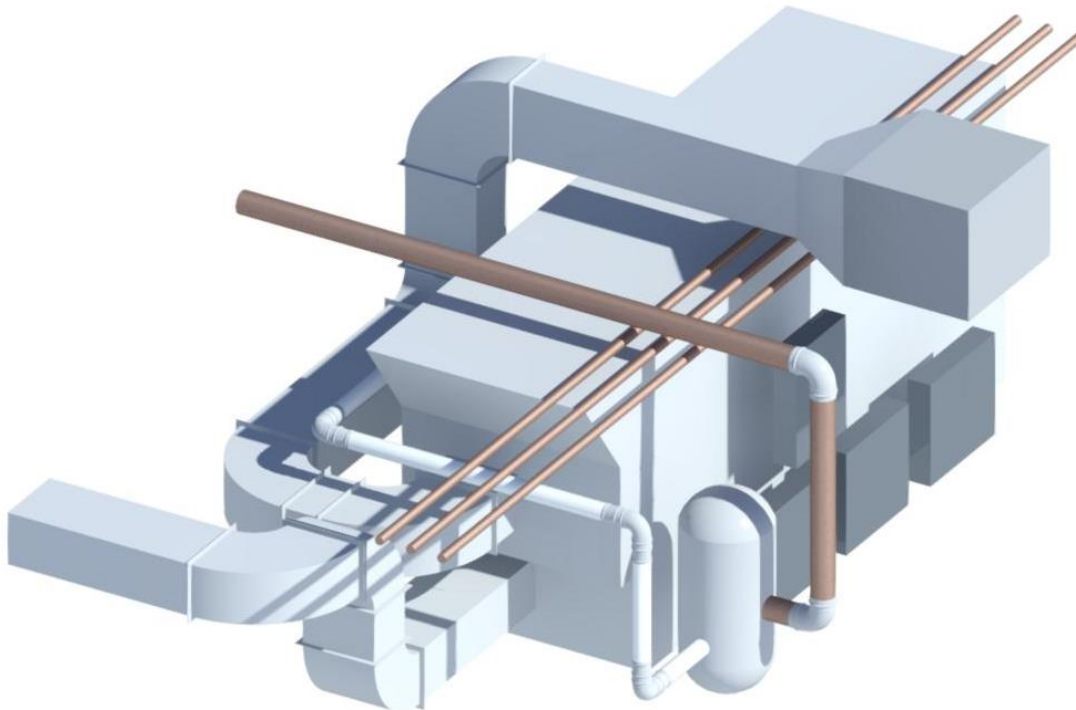
Furniture
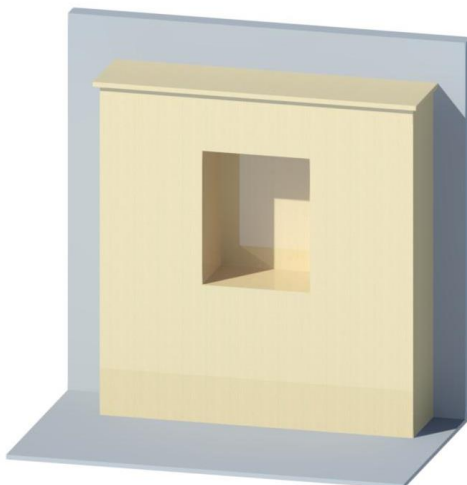
Furniture will be modelled as in-place families. Finishes will be added or not added based on the overall LOD of the model.

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MEP

Mechanical, Electrical & Plumbing

MEP can be modelled as an additional extra.

This would include all ducting will be modelled using the ducting tool within Revit.

Pipe work with a diameter of 60mm or more will be modelled using the pipe tools within Revit.

All electrical equipment such a switch gear, junction boxes, sensor boxes, electrical cupboards will be shown as generic in-place models.

Tanks, boilers, and other plumbing fixtures would be shown as generic in place models. All plant including mechanical equipment and air terminals will be shown as generic in-place models.

Lighting, Sockets, switches, and other devices will be shown as in places families.

As standard be would not model cables trays or conduits but this can be included if essential to the project, however this can prove a costly addition to MEP. Loose and temporary fittings would not be modelled.

Service identification is generally not including however if information was provided this could be included within the model.

There are often certain limitations when surveying and collecting data for MEP elements within a building. We will always make our best efforts to provide a full model however these limitations should be considered.
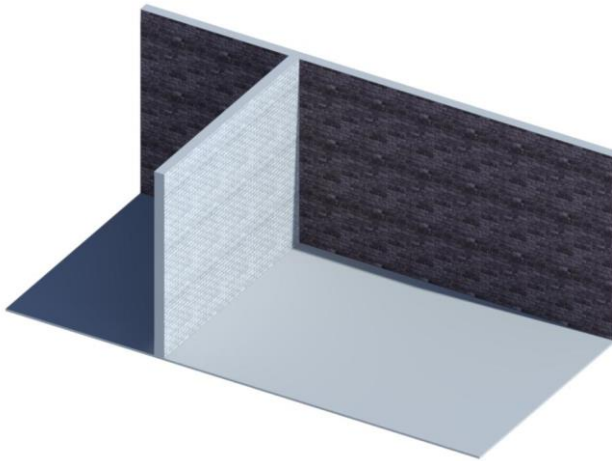
Additional Information

Approximations

| Family:	System Family: Basic Wall
Type:	TS_Wall_100mm(ApproximateThickness)

These will be kept to a minimum. The family type will be renamed to include (ApproximateThickness) or (ApproximateLocation) so that it stands out within the properties bar when selected.

Materials

Terrain will not assume the structural makeup of a wall. However, best efforts will be made to match the materials when applicable to the spec. Walls will still be left with a default material within the construction of the wall. If an external survey has been carried out to determine wall structures, then we can liaise with the external party to create structurally correct walls. Same applies for any other elements that would require a finish.
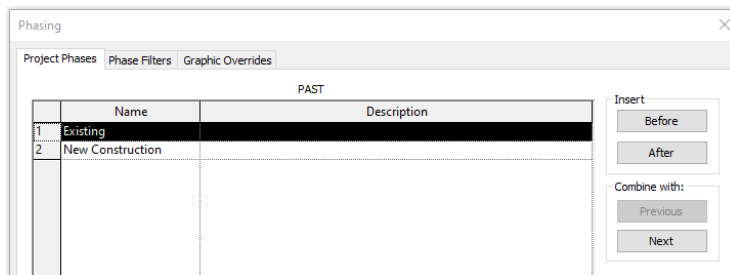
Visibility & Access
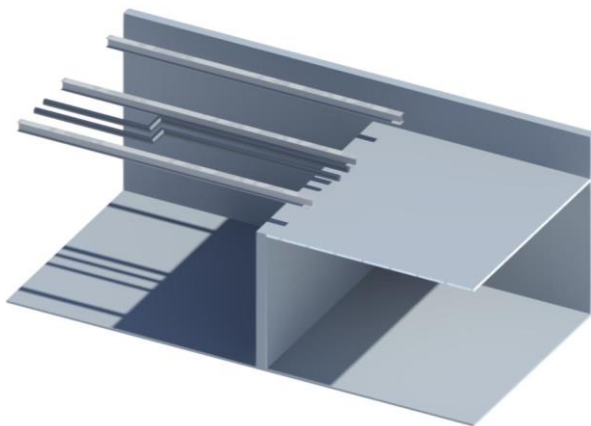
It is not up to Terrain Surveys to remove panelling or false ceiling tiles that may be covering up structural information or MEP. If this information is critical to a project, it will need to be removed prior to carrying out the survey. We do have the ability to scan up through ceiling tiles using extendable legs however this will only allow us to scan small amounts of information per scan and will add significant time to site work which can prove costly.
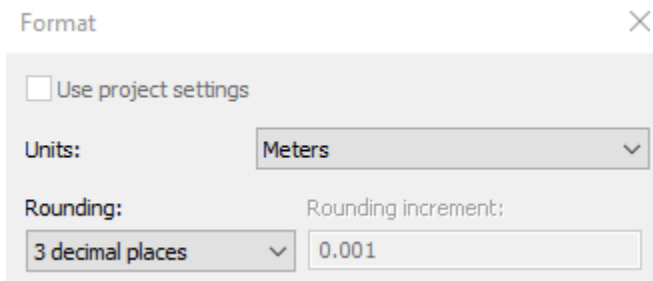
Phasing

Typically, Terrain will model all elements in Existing phase however this can be adjusted as per the client's request.

Units

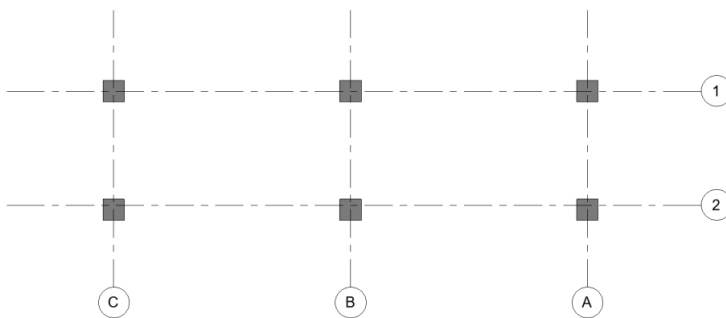As standard Terrain model are set to **Meters** so the project would be issued in meters unless requested otherwise by the client.

Grids

Grids will be used to aid modelling depending on the project. They can be removed as per a client's request. Clients can also provide grids for Terrain to add to a model however these are asked to be provided before modelling commences.

In-Place Families

In-place families will be kept to an absolute minimum. Loadable families will be used wherever possible.
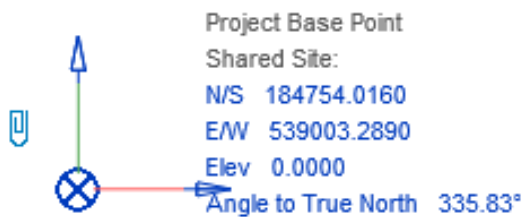
True North/ Project North
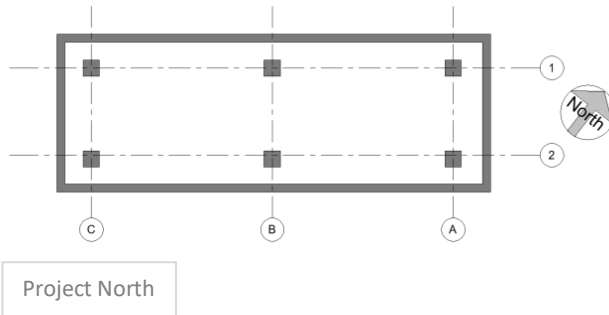
Project North

As standard a Project North will be set up. If a specific Project North is required, it would need to be specified before work commences.

Project Base Point

The Project Base Point will be set to a defined location, ideally one of our fixed stations from site and placed at a 0.00m Datum.
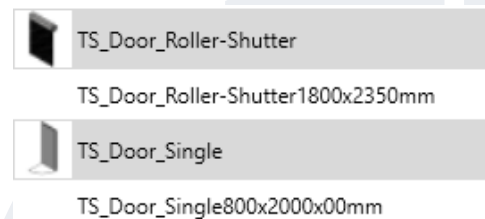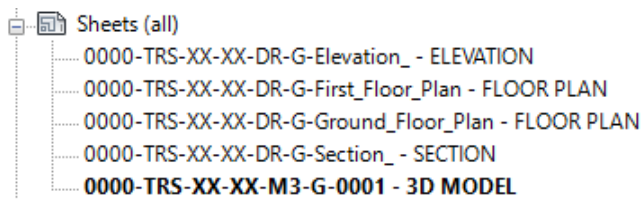
Naming Conventions

Terrain uses the **PS1192** naming convention for all models, sheets, components, and families.

For models and sheets this is as follows:

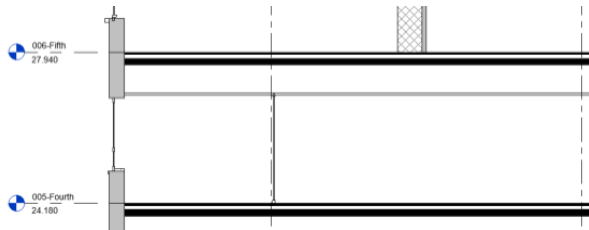**0000-TRS-XX-XX-M3-G-0001, 0000-TRS-XX-XX-DR-G-Elevation_A**

For components this is as follows:

TS_Component_Component-Information(WhereApplicable)Size(mm)

Reference Levels

Reference Levels (Floor Plans) will be named according to PS1192.

Example:

0000-TRS-XX-XX-DR-G-Ground_Floor_Plan

Software

Revit 2021 will be used as standard unless a previous version is stated prior to commencement. This is important information to clarify as models cannot be backdated to a previous version. 2019 is our other available version however it is preferred to use 2021 where possible.

Terrain Surveys is a user of **BIM Collaborate Pro** which means all our models are uploaded to the construction cloud and are available for docs, design collaboration, model coordination and any other features of the application that may aid the project.

We can export our models to a variety of other programs such as AutoCAD, SketchUp or PDF.

For more information, to get a quote or to look at the other services Terrain Surveys provides please visit **www.terrainsurveys.co.uk**