

BIM for Subcontractors: Cladding Case Study: Rhino + Grasshopper to Revit

Varla Cladding decided on Grasshopper and Rhino for BIM modelling. The software lends itself to sculptural and organic surfacing and repeated items such as panels and tiles. Furthermore, any number of information tags can be exported with each piece of the jigsaw, via a BIM export system called Geometry Gym, written by Jon Mirtschin.

Geometry for The Derby Innovation Centre was exported in an IFC format, that enabled all subcontractors to view the cladding buildup in the software they were using. The Revit flavour could have been exported too, and along with more geometry, such as fixings and shingle horizontal welts. However, this information was considered too data heavy for the main model, even on a healthy hardware platform Revit would have struggled. Varla, therefore, created 'lightweight extruded' panels, mullions and shingles around the model to minimise file size. (Sculptural cladding is often a very data heavy field and an 'Item Mapping' population process needed to be used, to reduce size). This representational modelling was used to develop production criteria, and to adhere to the Architects artistic intent through defining production constraints early on.

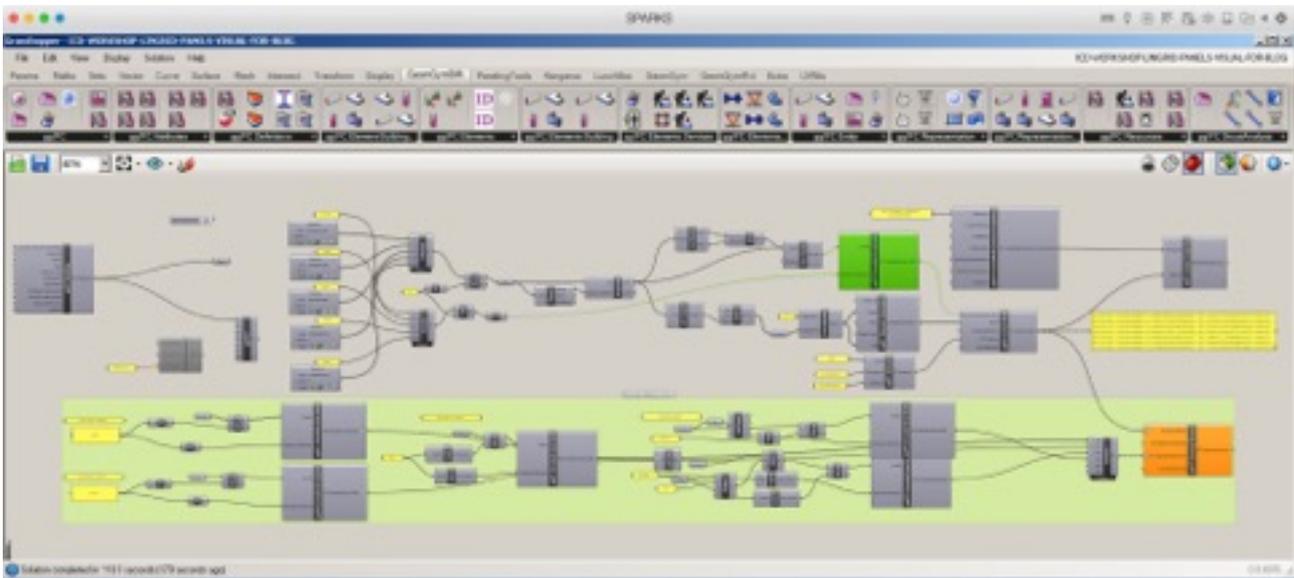
The use of specialised external software for specialised aspects of design in construction, is still a requirement in the building industry, and Revit is not a totally integrated system as of yet. Finite element analysis or structural calculation software for example, must often be used to complete the cycle, i.e. old STUCAD, ARUP GSA or AUTODESK ROBOT are common place and will persist as peripherals to a main central model for some time. The use of Revit as a federation environment and as the shared clash detection environment is very effective though, and it draws the components together for us to create sectional drawings from the assembly, for design, production or construction. Could the Architects central model be used to create the construction drawings though? This would bring the control main contractors desire, no? The external plugins that require an external workflow can then evolve, with all their strengths and persist as plugins to the main model.

Using Rhino for the cladding has meant the parametrics that extruded, cut, numbered and tagged each panel with BIM data, stay within Rhino and Grasshopper, and do not migrate over into Revit. Which is wise as it couldn't handle all that currently. The sculptural surface modelling stays clean for production and can then be used for accurate direct manufacturing after approval.

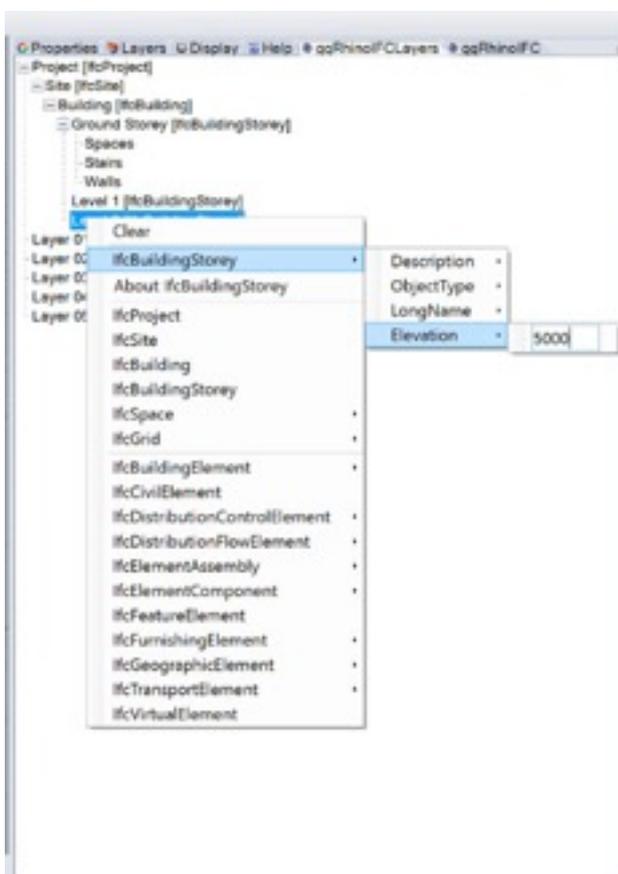
Designers comments:

It would seem that using Construction drawings from the main model would make BIM work more manageable for subcontractors?? The signing, authorising and approving for construction, as a shared responsibility, could create more time to orchestrate design and production, and is the goal for contractors to match construction programmes across the site and subcontractors in the future? No? The central model can receive IFCs from several orbital BIM packages, and create federated drawings, if the 3D formatting is good that is. Why not create all the subcontractors construction drawings from there, giving consistency across the field? (It could be a political / legal reason - but this I feel would work best in terms of workflow?)

The Software can export B spline Nurbs Surfaces with editable Knots, and hierarchical families details directly into Revit or as IFC 4, using visual programming, which in Rhino and Grasshopper are currently the most powerful parametric / semi parametric surface modelling tools for sculptural design, production and construction in the trade.

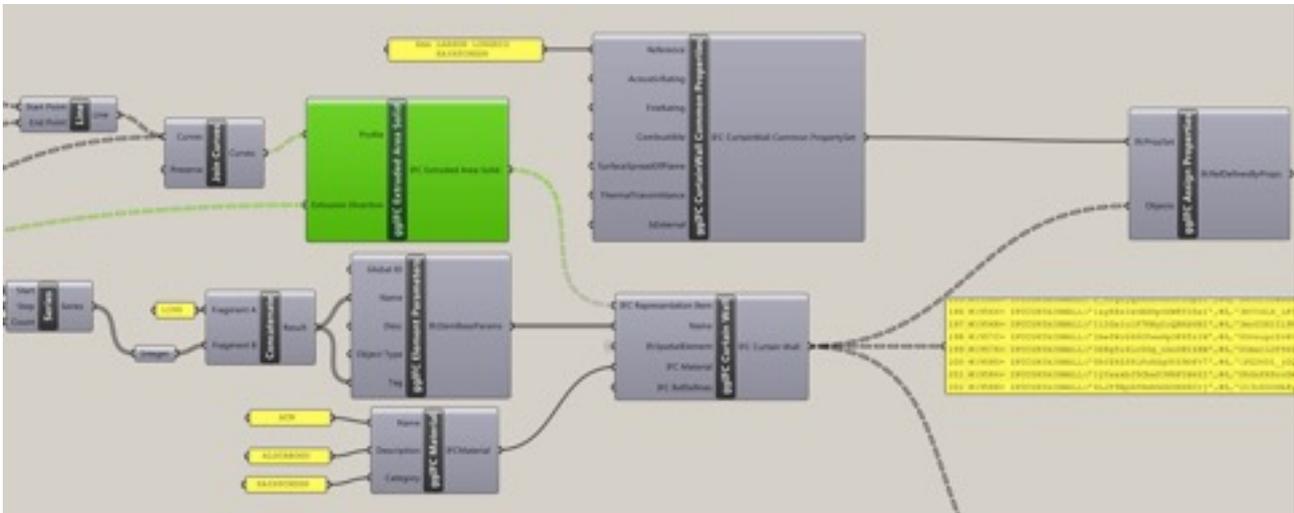


The tags required for analysis or maintenance can be added with Geometry Gym through Grasshopper as above, and now through a better interface within Rhino, as illustrated in the hierarchical modelling interface Jon has introduced below. By which in both instances we can reposition the overall model geo-spatially (If required), creating a more bespoke Building Information Modelling system, that is, with a hybrid approach for bespoke design.



Derby Innovation Centre - Level 2 BIM Project. FEA Architects.

The screen grabs from Grasshopper show the visual programming for the LINGRID panels provided by Ash and Lacy, with the resultant light weight extruded parts - before cutouts are applied, in green, in the 3D image posted above.



The software update, out this year, will enable the layering systems to be used from within Rhino, as the hierarchical modelling and export platform to Revit and IFC. (See Image of Hierarchical layering system taken from a Skype Chat with Jon Mirtschin Dec 2015, which shows seamless integration of IFC into Revit, and that extends to Rhino for the Mac!)

The curves on this geometrical and prismatic portioned building, were dealt with through Rhino. Which was backed up with Grasshopper and Geometry gym. The tools used were well tested on this project, for use in more complex and organic curved buildings in the future. The tools provided can aid partial and hybrid use of BIM for subcontractors to utilise only part or all of the BIM CAD integration and parametric tools, for use in altering and adjusting a buildings external form, right up until construction.