



This Month:

## **Constructing Model Audits**

Welcome to **INFOCUS**, C3 Consulting Solutions' Monthly Newsletter. This month, we look at model audits and how they can best be constructed.

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### **“What should a Model Audit consist of?”**

Is a question that many BIM Managers and Model Managers ask at some point. Unfortunately, it's a poor question. It's a premature question.

*“What does the Model need to achieve?”* Is the key question, and the answer will not be a single sentence.

Furthermore, what is the primary purpose of the model? Is it to communicate design intent? Is it to simulate the construction process? Is it to perform quantity take-offs?

While the ability to achieve all of the above may have been touted under the umbrella term 'Building Information Modelling', this hasn't in truth been realised yet.

#### **Primary Purpose of Model**

The purpose of a designer's Building Information Model is to communicate design information. To this end, such a model could be referred to, as a Design Information Model, or DIM for short (no jokes please). This design is not always the way a building will be constructed on site. While all manner of queries can be applied against the model, in practice, these results are only as accurate as the model itself (remember: Garbage In = Garbage Out). Often, these are indicative only.

#### **Project Phase / Level of Development**

Moreover, within this primary purpose, are design phases. Each can be aligned with certain levels of detail or resolution of the design. In the case of Design-Bid-Build, these phases may include:

1. Concept Design
2. Schematic Design
3. Developed Design (aka Design Development)
4. Contract Documentation

In other methods of project delivery, the phases may vary, but regardless, the point remains that different things are required of the model at different stages. In the U.S., the AIA has acknowledged this (in the context of BIM) by publishing documents such as [E202-2008: Building Information Modelling Protocol Exhibit](#), which can help project teams establish Levels of Development (LODs) for building element required against each project phase.

If assembled for construction simulation purposes, the model could be referred to as a Construction Information Model, or CIM. Given that this model is supposed to accurately represent the building – i.e. constructed in a virtual environment, this should also suffice quantity take-off purposes.

In assembling the criteria against which a model may be measured, it is these phases of a project that must be acknowledged in addition to the primary purpose; whatever that may be (whether the model is a DIM or CIM).

There are many reasons why a design model and construction model are separate, but these are a subject for another time.

### **Audit Subject**

Let's consider reasons *why* a model audit is conducted.

Typically, this is to determine the extent to which a model satisfies various criteria. If a model is to compare, or 'perform' well in such an exercise, the project modellers should have a clear understanding of these criteria from the time they start work on the model.

For instance, let's firstly identify subject areas that may be cause for an audit. While there may well be others, some ideas include:

- The building's energy use
- The integrity of the model (geometric/parametric/information/assembly)
- The consistency of the documentation standards employed
- What is modelled versus what is drafted
- The consistency and appropriate use of the components used within the project
- Compliance with modelling standards (usually borne of 'best practices')
- The performance of the model file (which indicates the ability to carry out work in the file)

The word 'integrity' is a broad term, and should be assessed a little more closely. In the brief list above, four types of integrity have been cited.

- *Geometric* integrity would refer to the accuracy of the model elements, and the degree to which the geometry can be relied upon. It also covers physical coordination issues between disciplines.
- *Parametric* integrity would focus on the parameters or properties of elements within the model, and how they perform their intended functions, and how they may interact with adjacent or related elements.

- *Information* integrity refers to the non-graphic data, ensuring that it can be organised and queried with consistent, reliable results. For example, keynote values of elements for referencing/scheduling purposes must be assigned thoroughly and consistently. This may require ongoing efforts to ensure the integrity of this information.
- Integrity of *assembly* would be focused toward the construction techniques demonstrated within the model, ensuring that what is communicated by the model reflects good technical design and resolution of detail.

### **Contextual/Peripheral Issues**

There are contextual items to consider, too. For example, who is the intended recipient of the information, and in what form must it be provided?

What is the skill/experience level of the team members (internally/externally) with respect to the BIM approach, and to their profession? There will be a need to differentiate between technical and industry knowledge lacking – is something the case because the user doesn't know their trade, or doesn't know something that is specific to the software?

The expectations of performance within a model audit on an inexperienced team (or office) would usually be less than those placed on a more experienced team.

Have there been other issues impacting on the virtual design or virtual construction processes? If so, what is the nature of their impact? Political, personal, economic, even environmental issues can have enormous influence on a project in positive or negative ways.

For example, a change of client or site can radically change a project, particularly if construction has not been commenced. Changes to the design team can, but (ideally) should not have a serious impact, except for the better.

The net result of all this may ultimately (and eventually) be a series of audits for a series of purposes.

### **Approach**

Once the model audit criteria has been established (for one or many audits), the manner in which the audit is taken is also important.

Model audits should be used in the pursuit of ongoing improvement and of excellence. Information gleaned from them should be used constructively, and will help determine what issues are most in need of attention re training. Communication of those areas identified as requiring more attention can be used to make improvements retrospectively or in advance of future projects.

Model audits should not be conducted as witch hunts, looking for guilty parties or scapegoats for perceived failures. And yet, that does not mean that they can't be used to hold individuals or entire teams to account, provided that the criteria are established early and clearly. Such circumstances are more easily handled by progressive audits rather than waiting until something drastic occurs that cannot be ignored (white elephants...).

If, at some level, the audit includes consultation with the project team, this may yield

further insight into the project's progress. It can be extremely rewarding to arrange for team members to contribute to the improvement process, by offering feedback on what they understand to be positive and negative aspects of a project. Subject to project pressures, this *can* have a risk of deteriorating into a blame-fest. However, if it is well-managed, and if the team and its collective objectives are well established at the project's outset, this can be a tremendously worthwhile exercise. This highlights even further the value in sound strategic planning at, or prior to project commencement.

## Summary

A model audit must begin by establishing:

1. Primary Purpose of Model – DIM or CIM (or other)
2. Project phase and Level of Development applicable
3. Audit subject
4. Contextual/Peripheral Issues

It must also be conducted in a way that creates and helps maintain forward progress.

If this is carried out well (this process in itself this can be an area for ongoing improvement), a model audit can be employed as a useful tool to achieve valuable ongoing and cyclical improvement of processes and deliverables. Those who make the time and stick with the commitment will inevitably yield the benefits.

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