SPECIFICATIONS AND GEOMETRY IN BIM
(ICIS Project #2, Sub-Project #1)
2015-04-02

EXECUTIVE SUMMARY

The goal of this report is to identify types of information that can or may exist in a BIM, which BIM data should best reside in the geometry model and which should best reside in the specification.

The resulting guidelines should result in a minimum of duplication between the two environments, yet enable computers to monitor the activity and notify users of changes.

DEFINITIONS

BIM:
Building Element:
Geometry Model:
Object:
Required Property:
Specification: [from Definition of a Specification ICIS paper]
Specification Model:
Type Object:

INTRODUCTION

History - Coordination

History of the construction process has shown that coordinating drawings with specifications has always been a challenge. The introduction of BIM software tools shows great promise enabling computers to help humans coordinate information in the geometry and specification documents. However, since it is possible (even necessary) to carry the same property values in both environments, this report seeks to minimize the duplication by standardizing on where certain types of information should exist.

Assumptions

First, this report is prepared based on the assumption that the relationship between the geometric model and the specification is that of a federated model. Put another way, it could be said that the total project requirements are made up of requirements documented in the geometric model, and those contained in the specification model. In a properly-coordinated federated model, individual properties which may (or be required to) appear in both environments shall be equal.

Objective

This report will analyze types of information that need to be stored, and offer recommendations on whether the information is most appropriately stored in the geometry model or the specification model.   The approach selected should apply regardless of country, classification, or software used.

ROLE OF THE SPECIFICATION

Experts who model BIM objects, but who are not involved in the specifications industry, often conclude that specifications are little more than required properties that can be stored with the geometric entity they describe. This may be true in isolated cases, but the following roles will illustrate that geometric models are totally inadequate to carry the information normally contained in the specification.

The specification identifies temporary entities. (temporary fencing, concrete formwork, etc)

The specification, by obligating a desired level of quality from the builder, fulfils the critical role of managing risk – for the building owner, design consultants, and even for the builder.

PROJECT PHASES

During the evolution of a construction project, BIM models may evolve from 'desired' state (reflecting owner requirements), to a 'required' state (expressed in contract documents), to a 'record' state (what was actually installed).

Normally the evolution of a building model could represent various levels of detail, and the information contained may be 'desired', 'required', or 'actual' depending on the project phase.

GEOMETRY MODEL DATA

The 'geometry' model (or CAD model) can be thought of as the virtual representation of the 'existence' of a building and its various components.

Geometry models typically are constructed of building 'elements', starting from the fundamental elements (foundation, structure, service systems, etc) to highly detailed designed elements (layered walls, doors, pumps, etc).

Fundamentally, geometry models by themselves provide the following minimum amount of data:
- The 'existence' of a building element,
- The 'quantity' and dimensions of a building element (how large, or how many of an element exists),

- The 'orientation' (special direction), for example, whether an element is deemed "external" or "internal" can be derived from the geometry model.

It can be equally useful to identify what geometry models might NOT model:
- Building components with micro-geometry (vapour barrier, paint),
- Properties of materials (most geometric software label elements with the name of material, but further detail is uncommon).

While modern geometry model software enable many more properties to be added, any properties beyond the minimum described above 'may' also be included in the specification model.

SPECIFICATION MODEL DATA

There exists model data which is normally contained entirely within the specification. Expressed simply, any property value which may be deemed contractually mandatory for the builder to fulfil should be included in the specification model.

- Temporary entities: Entities which do not exist in the final building structure (and thus, not normally modelled in the geometry).

- The specification identifies components not normally modelled in geometry (eg. Fasteners, insect screens, sealant, etc)

- The specification identifies administrative requirements not associated with the modelled building (that is, it models process requirements).

Since specifications deal with 'types' of things (Type Objects); knowing the quantity of instances of an object in a BIM model is of lesser significance (excepting in countries where 'costing' is included in the specification process). Having said this, often 'schedules' are added to specifications for the purpose of contributing additional required properties to each object.

The specification should carry references to objects which exist in the geometry model; this is necessary in order to ensure that the specified objects still exist (have not been deleted), and is still relevant (has not been changed in a way that requires a specification change).

COMMON MODEL DATA

Common model data is defined as data which must, or could, exist in both the geometry model and the specification model.

At minimum, the only data that is mandatory in both geometry and specification environments is an object's existence and its name. Since specifications deal in 'types', many specifications only require that an object exist once in order to determine whether clauses about such an object are required. The existence of two or more of the same 'type' of entity has no impact on the specification.

Given that many BIM software are designed to 'consume' property values for calculations (cost calculations and energy calculations, for example), it follows that any properties useful for those activities could be included in both the geometry model and the specification.

One example of properties which would NOT be included in the specification model are select complex element properties, or properties that describe 'assemblies'.   For example, in North America specifications commonly describe the quality of materials, but not assemblies (such as walls).