ENGINEERING COMPANY OF CENTRAL AMERICA
Consulting – Engineering – Supervision – BIM Services
Industrial Plants – Buildings – Infrastructure

April 2016

NEWSLETTER

BUILDING INFORMATION MODELING (BIM) STANDARDS: IDENTIFYING THE ADEQUATE AMOUNT OF REGULATION FOR EACH CLIENT

Introduction

The present article provides an overview of the broad variety of international BIM guidelines and standards for several countries and clients. Existing British BIM standards will be particularly described. The requirement of standards adapted to client's needs will also be discussed, leading to the advantages of either using an existing standard, adapt one to a specific project, or create a fully customized BIM rule.

What is BIM and what are the client's advantages?

A BIM process involves both generation and management of digital representations of the physical and functional characteristics of a facility. This leads to improved accuracy and reduced design changes before and during construction. Clients gain overall knowledge of the building design long BEFORE the construction begins, and can review and improve the digital version of the finished building.

In BIM, all objects (e.g. walls) and their attached pieces (e.g. doors) are connected with each other to ease design changes. These lead to faster redesign and price estimation processes not only for the designers, but also for the contractors and project owners since all the information is collected in one Model.

The Level of Information (LOI - non-graphical Data, e.g. flow rates, cost per meter, fire rating, used material or lifetime of a designed piece) and the Level of Detail (LOD – graphical information) are defined by the british Standards, both included in the Level of model Detail (also defined as LOD) and described from 1 (low) to 7 (high).

The American Institute of Architects (AIA) Standard defines the Level of Development (LOD-US definition) in the BIM form G202, from LOD 100 to LOD 500. A definition conversion of the UK and US definitons is shown in Figure 1.

Overview of international standards

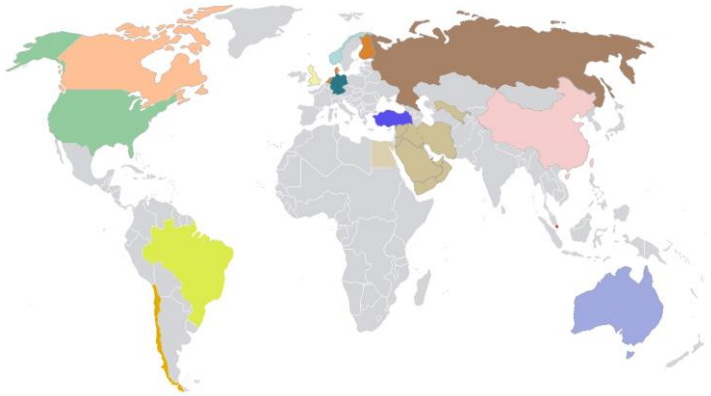
An extensive variety of standards and guidelines is available in most BIM experienced countries, as shown in Figure 1. Big customers (e.g. the US Army with "USACE BIM Primer") or construction sectors (e.g. "NORWEGIAN HOME BUILDERS BIM MANUAL") even have their own standards, as well as public standards for their countries.

The United States made a comprehensive variety of standards, such as "NBIMS-US V3" from the National Institute of Building Sciences.

Australia created the "NATSPEC NATIONAL BIM GUIDE" to be accompanied by the "PROJECT BIM BRIEF", guiding through the partly customization of the national BIM GUIDE for project fit, while stating: *"The BIM Guide is not intended to be a one-size-fits-all document."*

Chile made BIM mandatory in January 2016 for publicly funded projects. The ministry of health joined the national BIM group and established a first guideline in 2015, though a national standard is yet to develop.

Turkey uses BIM mostly for visualization and preliminary designs, and has not yet developed their own standard [1]. Canada adapted standards built on the existing UK standards, before evolving their own "AEC (CAN) BIM PROTOCOL" in 2014.



UK convention LOD (PAS 1192-2:2013)	US convention LOD (AIA standard)
LOD 1	-
LOD 2	LOD 100
LOD 3	LOD 200
LOD 4	LOD 300
LOD 5	LOD 400
LOD 6	LOD 500
LOD 7	-

Figure 1: Overview of important internationally existing BIM standards and guides

[1] Current Situation of Building Information Modeling in the Turkish AEC Industry, Fatih Topac, 2014.

Germany created a guide and released a step-by-step plan in late 2015 to make BIM mandatory for infrastructure projects by 2020, with pilot projects for on field experience and lessons learned. The "SINGAPORE BIM GUIDE" made requirements for new buildings above 5.000 m^2.

Netherlands, Denmark and Finland have already made BIM mandatory for publicly funded projects. The United Kingdom published further described standards being mandatory for public construction works from 2016 on.[2]

BIM standardization following the British standard BS/PAS 1192

The BIM standardization in the UK has received huge encouragement by the UK government during the last years, leading to a dense set of freely available BIM standards and latest application tools. The standard BS 1192:2007 describes general processes to enable consistent, structured, efficient and accurate information exchange, not exclusively for BIM.

The following PAS 1192-2:2014 defines BIM specific requirements for collaborative information management, differing BIM maturity Levels from 0 to 3. The standard offers details for the accomplishment of the BIM maturity level 2 at the delivery phase of construction projects.

The BIM process is described as follows, according to UK Standard:

1) The "Employers Information Requirements" are described by the employer, possibly through the "CIC BIM protocol".
2) The Bidder delivers a pre-contract BIM Execution Plan (BEP), including project goals, milestones, a Project Information Model (PIM) and the Project Implementation Plan (PIP).
3) The Post contract BEP includes the Master Information Delivery Plan (MIDP) showing responsibilities and due dates.
4) The PIM describes the planning process of shared models in a Common Data Environment (CDE).

Further standards describe the operational phase (PAS 1192-3), information exchange requirements (PAS 1192-4) and security minded-approaches (PAS 1192-5), leading to a holistic BIM usage.

Adapting the BIM process to each clients' needs

Each client has individual preconditions due to safety, data accessibility, storage and exchange, or even simple file naming regulations. A standardized business process is required in order for the functional pieces and process participants to work together efficiently, but the often high level of project uniqueness demands a customized BIM rule quite regularly. One core problem of construction projects is the lack of common agreements on the information exchange process.

public standards	adapting existing standards	fully customized regulations
- great knowledgebase	- individually adapted BIM process meets project needs, in consideration of the standards framework	- fully customizable BIM process to clients and projects needs
- BIM Investment and benefit during the whole buildings lifecycle	- focus on the whole life-cycle, except for customers exclusions	- focus on the desired project phases of the BIM process, e.g. design and construction
- public standards mostly remain achivable over the facilities lifetime.	- return on investment dependant on desired BIM depth	- return on investment customizable , possible in the constructions phase
- long-term Return on investment		

Figure 2: Advantages of the use of existing/customized BIM standards

Delivering customized shared knowledge resources as a reliable basis for decisions during the buildings life-cycle can provide long-term solutions, when accepted and implemented by all project participants.

Because every construction project is unique regarding the tasks, processes, and project members, it requires an adapted organizational structure besides adaption to the project needs. The necessary depth and type of BIM regulations as illustrated in Figure 2 demands skilled BIM power through in-house expertise or partners.

Experience at EC in BIM

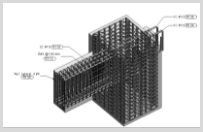
For over 15 years, EC has gathered a vast experience in 3D BIM modelling services and its management, resulting in over 750,000m^2 where different BIM services have been implemented in several types of facilities (steel making plants, power plants, data centers, hotels, offices and residential buildings, urbanization works, water treatment plants, among several others).

The BIM services that EC provides are performed according to the required BIM output and LOD to fulfill each customers' particular needs, starting from models with the main objective of obtaining a better understanding of the facilities, continuing with the detection and solving of clashes up to obtaining the shop drawings and bill of materials.

Concrete and Steel Structures:

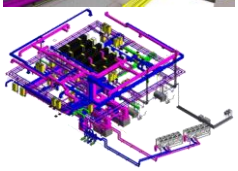
- Convert 2D drawings to 3D BIM geometrical model
- Workshop drawings
- Rebar schedules for concrete structures
- Assembly and parts drawings including production files (NC format) for steel structures

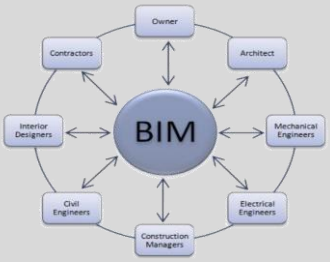




Mechanical, Electrical and Plumbing (MEP) Integration:

- Creation of the geometrical 3D model of the facility
- MEP Integration: HVAC, FPS, Electrical (LV) and Plumbing
- Clashes detection and solving
- "As built" documentation: Bill of Materials, Isometrics, Construction Drawings



BIM Management / Project Management Support:

- Multidisciplinary coordination of design products
- Common Data environment for data exchange
- 3D perspectives and walk through animations
- 3D Project Schedule tracking

To access EC's previous Newsletters, including a Newsletter presenting an overview of BIM general concepts please click here.

[2] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/61151/GCS-One-Year-On-Report-and-Action-Plan-Update-FINAL_0.pdf