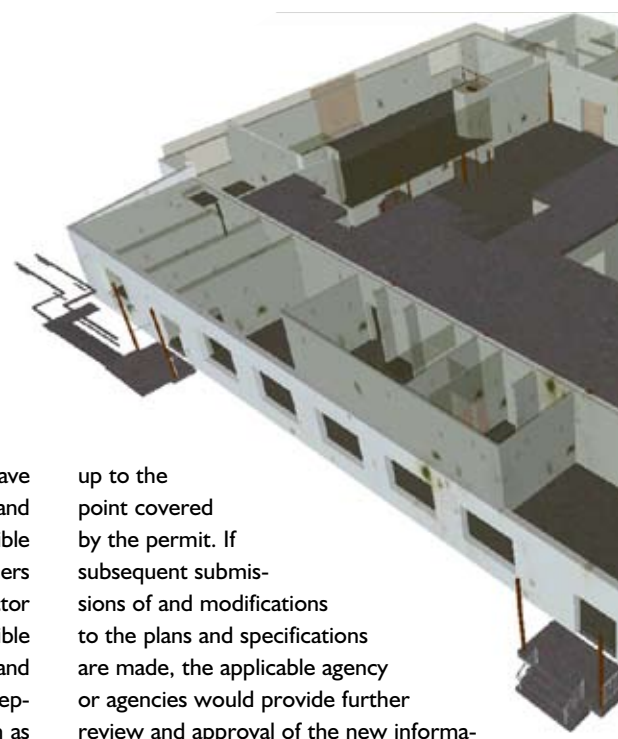# The BIM Balancing Act: Tilt the Scales in Your Favor

SMARTcodes

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ABSTRACT

The International Code Council's SMARTcodes project team is building a platform to support automated code checking of building plans for compliance with the International Codes and federal, state and local amendments to those codes. The team is also creating a process that will allow other building-related criteria to be presented as SMARTcodes. To date, the Code Council debuted an auto code checking demonstration of the 2006 International Energy Conservation Code (IECC) SMARTcode, and is working on the egress and accessibility provisions of the International Building Code.

INTRODUCTION

Building regulations have existed for centuries. In recent years, new and existing structures have had to respond to population growth; address issues such as energy, the environment and enhanced public safety; and foster application of new technology. In parallel, building regulations (codes, standards, rules and other criteria) that guide their design, construction, commissioning, operation and use; as well as the processes to apply and verify compliance with those criteria; have also needed to respond. The evolution of information technology, which has been comparatively rapid in a short period of time, is helping to provide a solution to such challenges. The availability of building information modeling, e-permitting and other new information technology (IT) makes it possible to complete existing processes in less time and affords the opportunity to develop and apply new processes, such as software-generated, automated code checking.

PURPOSE

The purpose of this article is to provide an overview of building regulations and new IT that is relevant to their application.

EXPECTED OUTCOME

The expected outcome is to show how the building regulatory process can change in the future, based on the availability of new IT and a building information model (BIM).

OVERVIEW OF BUILDING REGULATIONS

Federal, state and local government have varying degrees of authority to adopt and enforce building regulations. The responsible agencies can represent government owners or they can have authority over private sector construction. In either case, the responsible agency usually adopts codes, standards and other provisions that, once assembled, represent a body of governing criteria known as building construction regulations. In the past, agencies were prone to develop their own unique criteria but, over time, many have moved to adopt model codes, standards and other documents developed in the voluntary sector, and then amended those documents to address conditions considered unique by the adopting agency. Most building regulations at the federal, state and local level are based on the International Codes developed by the International Code Council, as well as a number of private sector standards adopted by reference within the codes. These model codes and standards are updated on a regular basis and, as new issues arise, new codes and standards are developed to address them. To stay in track with the model code development cycle, most building regulations are updated every three years. These building regulations are available in print form, in pdf on CD, or accessed on the web. In some cases, they are searchable for specific key words or concepts. In all cases, when applying new IT such as BIM, the work to be done to determine compliance requires that one must still access and apply the building regulations "by hand".

OVERVIEW OF THE BUILDING REGULATORY PROCESS

Once adopted, there are varying processes employed to implement and administer the building regulations. In most cases, this involves a design firm preparing plans and specifications, which are then submitted with a permit application to the applicable agency or agencies by the owner/developer or their representative. Once approved, the agency issues a permit and construction begins up to the point covered by the permit. If subsequent submissions of and modifications to the plans and specifications are made, the applicable agency or agencies would provide further review and approval of the new information. This process is enjoying significant application of IT for communications and information transmittal.

CODE CHECKING TODAY

Currently, the majority of building departments conduct plan reviews manually because building designs are submitted by hand on paper or electronically in 2D. Similarly, designers and builders rely on hard or "plastic" versions of the building regulations to ensure projects comply with applicable requirements. All of the effort to verify compliance is based on human intervention, with the exception of some specialty programs that can process hand-entered data and provide an assessment of compliance for certain aspects of the building that must be read and interpreted by hand. In most cases, the process established by the applicable agency may vary based on a number of factors, most notably the size and complexity of the project. In some cases, owners or their agents will hire expediters to channel a project through the process and agencies may offer an expedited process as an option. In many such cases, additional manpower and expense are involved, something an owner/developer may count as cost effective when they consider the return on investment (ROI) on the project if the timeframe from inception to occupancy can be shortened.

IDENTIFICATION OF INFORMATION EXCHANGES

Throughout this process there are a number of information exchanges. The required information is obtained from the building regulations which, in the past, was
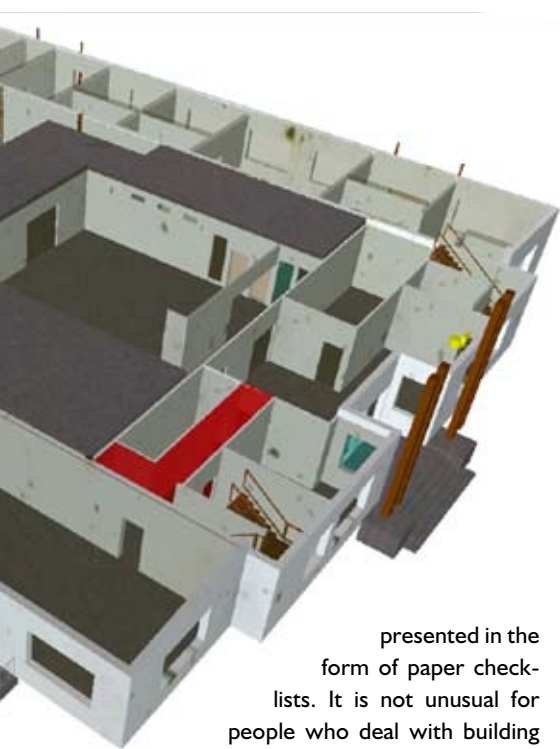
presented in the form of paper checklists. It is not unusual for people who deal with building regulations to have developed their own custom list of data needs over the years to address specific code issues and/or building types. In such instances, the information has "providers", "transmitters", "receivers", and "actors." Regulations that focus on properties of products would involve a manufacturer "provider," a specifier or designer "transmitter," an agency "receiver" and a plan reviewer "actor." Regulations that focus on dimensional issues such as egress, accessibility, height or area would likely involve the members of the design team, the owner and the regulatory authority. Though the needed information and the players in the exchange will still remain the same, IT can facilitate a more transparent process of exchange and software can actually exchange the information but software can also perform certain actions to apply and access the information.

HOW BIM CAN ADDRESS INFORMATION EXCHANGES AND BUILDING REGULATORY COMPLIANCE

Paralleling the information exchange process today, one can collect all regulatory-relevant -data, put the hard copy in a box and deliver it to the receivers and actors. Meanwhile, BIM can address the information exchange related to building regulations simply by providing a building where providers and transmitters can present project-relevant data and receivers and actors can review information. In addition, if software applies the information in the BIM, then numerous views of the building can be presented, facilitating building regulatory compliance checking by hand.

Where the building regulatory requirements are available in a format that software can understand and apply as a limiting rule set, then software can undertake the task of evaluating the BIM for conformance with building regulations. Automated code checking by software using SMARTcodes is one approach to putting building regulations and related content in a format that software can understand and apply to identify "clashes" between the information in the BIM and regulations. In simple terms, data are provided once, software acts on those data, and, in terms of a final outcome on regulatory compliance, if the results are positively reviewed, the plans can be approved.

BENEFITS FROM AUTO CODE CHECKING

In creating BIMs, designers can begin to automate a process of determining if the plans and specifications (building data) are complete and conform to building regulations. The personnel who currently handle that task can augment their efforts with software and be confident their submittal is complete and complies, and if the submittal is changed at any time, can be quickly rechecked. Imagine then submitting a BIM to the applicable building regulatory agency with a software-verified auto code check report that one is certain complies with the codes, who then applies the same software in conducting plan review and/or uses the report. Instead of waiting weeks or months for plan approval it is feasible to secure approval in a matter of days.

This expediting, which normally would require additional manpower and consequent expense is all handled by software. Think of the time, money and resources that could be saved by designers, contractors and code officials. More significantly, consider the economic value provided to owners and developers, who can go from plan submittal to a certificate of occupancy sooner, as well as more timely tax revenue received by local government.

Most importantly, the likelihood is that such plan reviews would be more thorough and save building departments manpower resources in plan review. Those gains could be applied to field inspections and ensuring that buildings constructed and occupied comply with the adopted criteria, with the end result being enhanced public safety. An added benefit is the resulting as-built BIM that would be accessible to fire, EMT, police and other officials in addressing natural and man-made disasters.

E-PERMITTING

As part of e-government initiatives, e-permitting has the potential to streamline and speed up the current permitting process. Dovetailing with automated code checking efforts, e-permitting would also allow for easier information sharing across agencies and departments, and more convenient access to permit status updates for the permit seeker. Upload the BIM to a server, let software do the checking and use the e-government portal for a virtual review session with the regulators prior to and during construction.

THE FUTURE

Instead of the potentially frustrating, time-consuming, paper-based process currently in place, BIM and IT hold the promise for change. The day of creating a BIM, getting instant feedback on regulatory compliance, e-submitting the BIM and receiving a plan approval and permit without ever leaving the office is coming. What can each one of us do over the next few years to help make this vision a reality?

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AEC3 XABIO: Automatic code compliance checking