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Cutting Building Envelope Chaos: Going Beyond the Skin to the Structural Skeleton

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Learning Objectives

1. Discover how fabricators will use combinations of software such as Revit and Inventor for the curtain wall systems
2. Discover how teams specify LOD to facilitate building-enclosure review meetings with the enclosure review consultants
3. Learn key points for steel and enclosure detailers on building enclosure review
4. Discover best practices for model management for building-enclosure review systems, and learn about key directions in a BIM execution plan

Description

   This course will present inventive techniques and methods, using Building Information Modeling (BIM) for the review of the building envelope. A key focus of the presentation will be the highlighting of how structural systems interact with the enclosure system. It will focus on topics such as the Level of Development (LOD) of architectural models and structural design models and how these progress into fabrication-level models for the building envelope in products such as Inventor software and Revit Architecture software with the structural system, interacting with products such as Revit Structure software and Advance Steel software. Key areas of this will be looking at localized high-level-of-development models around transitions of buildings, and will show how systems are brought together and used in a building-enclosure review meeting, as well as the importance of integrating both structure and building envelope as holistic systems as part of the review process.

Software used for curtain wall review

Revit is often used as the foundation for modeling the frame for curtain walls and the supporting structure. For coordination at a high level of detail, Autodesk Inventor is often used for creating models with detailed mullions. Advance Steel is a software package from Autodesk that is being adopted by many detailers in the US. Advance steel can import main structural members from Revit and use the members for detailing. Inventor object can also be imported into Advance Steel for objects such as mullions, equipment, and special objects. It may become necessary for the mullions and curtain wall to be modeled to a high level of detail for coordination with other objects.
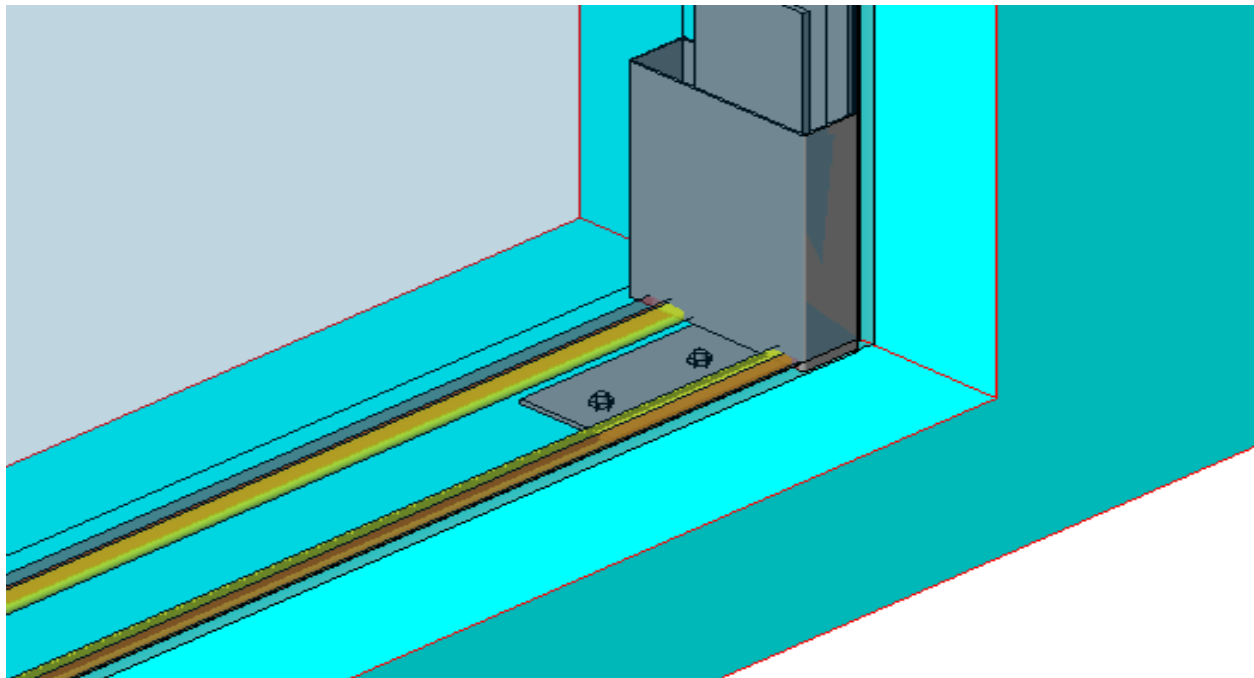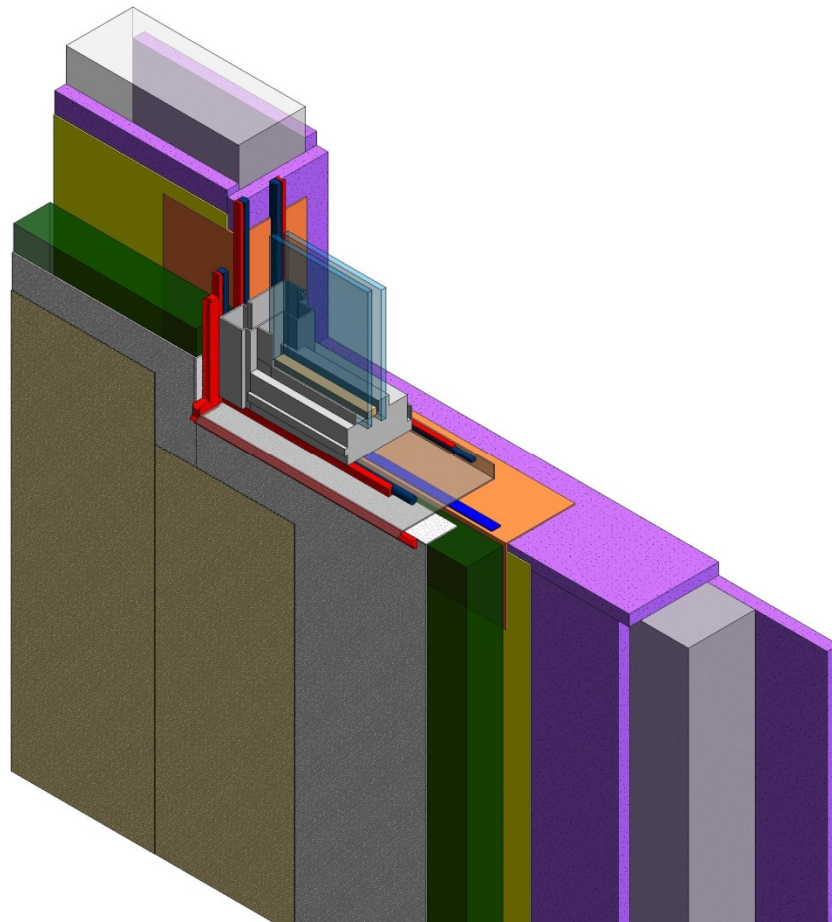

FIGURE 1: IMAGE OF DETAIL NEEDED FOR REVIEW

FIGURE 2: EXAMPLE OF ALL FEATURES NEEDED FOR CURTAIN WALL REVIEW

LOD

LOD is important for creating and defining an industry standards for the information included in a 3D model. Different trades are required to work together to coordinate the design and construction of a building. It is necessary for all parties involved to understand the information provided in the models of other trades to identify relevant information during coordination. For example, it is necessary for louvers above ceiling to have clearance from lights, steel, HVAC and Cold Form metal studs. Proposed descriptions to form an industry standard of what should be included for each Level of Development can be found in the BIM Forum LOD Specification. Information can be found at the BIM Forum Web site:

https://bimforum.org/lod/

FIGURE 3: LOD MANUAL

Coordination and review

This presentation discusses a coordinated project for a Century Link data center. In this project, the steel deflected half-an-inch between bays from loading. A large metal panel system was designed for the skin of the building with openings for a long span of louvers and glass windows. An issue was discovered on the project concerning the designed connection between the structure and the metal panel system. Concerns were raised about a possibility of the Metal Panels "Oil Canning" as the steel deflected. A solution was proposed by Will Ikerd to address this issue. The proposed solution was to add a large HSS beam to the structure spanning between columns. This would prevent the metal panels from deflecting with the floor.
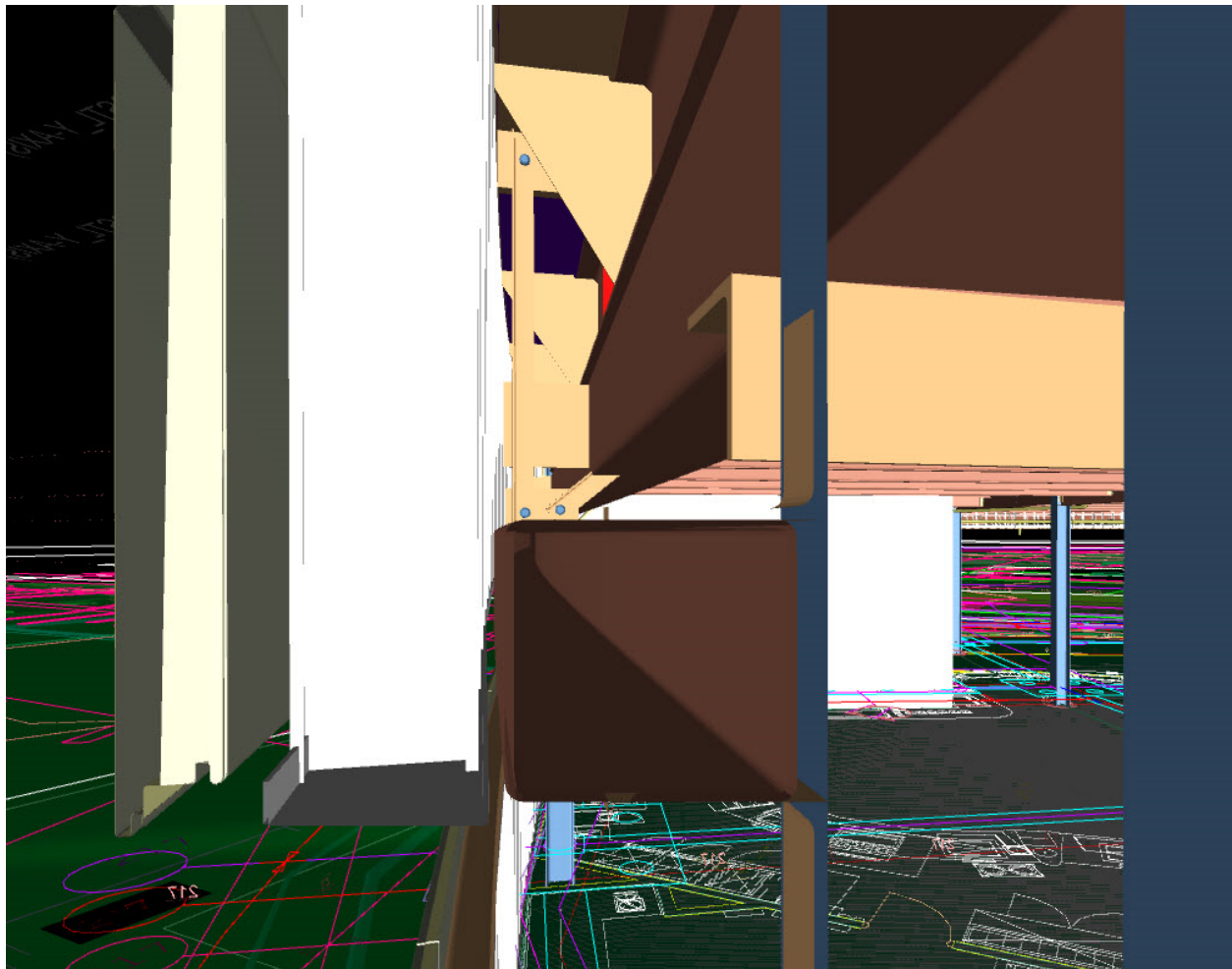
FIGURE 4: EXAMPLE OF ENCLOSURES REVIEW

Key practices for review

It is highly suggested to have a weekly review for coordination of the building. For the Century Link data center project, weekly meetings were held mid-week. These meetings were split into two meetings. One of the meetings was for the enclosures of the building and another for the interior of the building for electoral and MEP. The coordination meetings should be hosted by the GC of the project and attended by the relevant trades for each meeting. Each meeting was kept short, about one hour long, to not intrude into the daily schedule of the involved parties. A representative from the Architect, Structural Engineer, and MEP Engineer were also present in the meetings to communicate design intent. A clash detection matrix was used for coordinate the models between the different trades. Screen capture was used on the project to quickly demonstrate clashes and show which trades were involved in each item. Models containing objects at LOD 350 or greater were required for the project from all trades. This allowed for coordination with small but important items such as connection joints, electrical

conduit, and plates. All trades were required to provide a model showing the accurate placement of the items to be installed. Despite the added cost the coordination modeling, many issues were found before installation and saved money in the long run by reducing delays in schedule. When hosting a coordination meeting, notes should be recorded for each meeting. Action items for tasks and responsibilities and items discussed should be recorded. Clashes found during model review must be recorded in the meeting minutes and submitted as RFIs after the meeting.
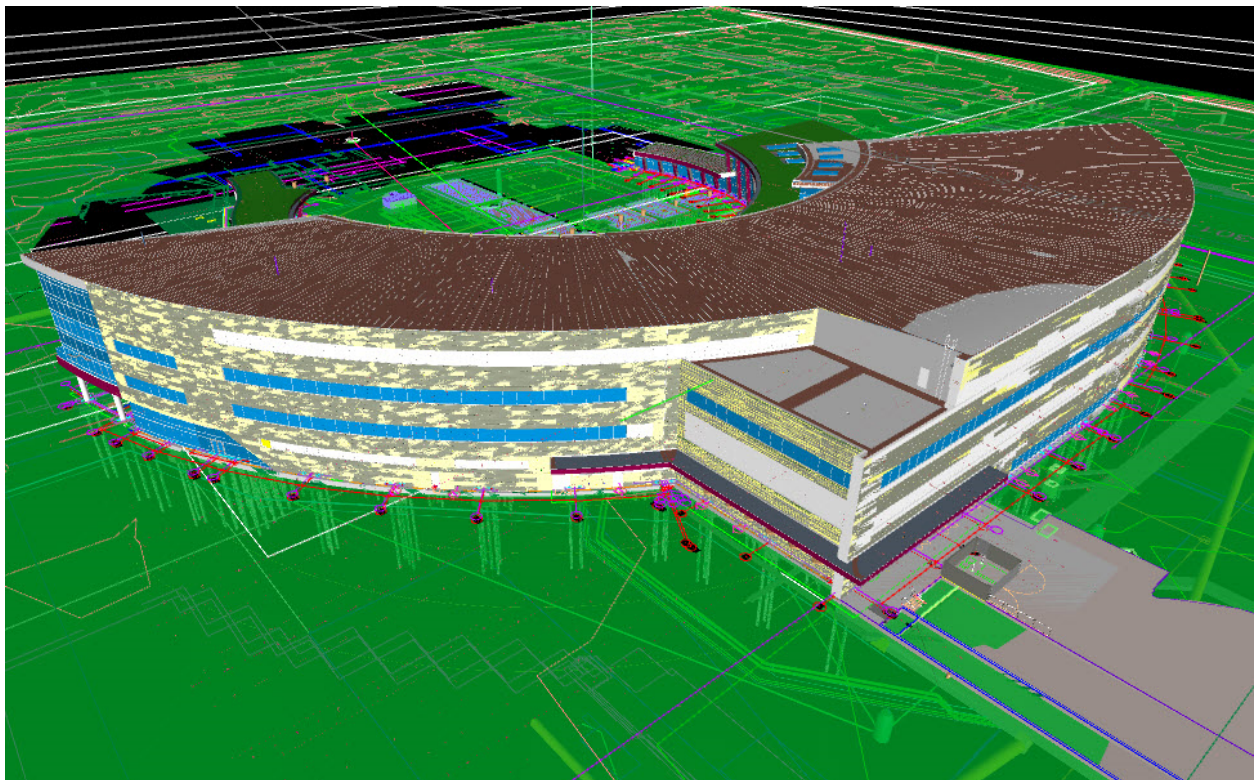

FIGURE 5: VIEW OF CENTURY LINK PROJECT.