

Appendix I

Case Study 1

In a case where building information modeling could have prevented some problems, let's take a look at an example from Office Building 4601 at Marshall Space Flight Center. Simply put, there was a clash between components in the infrastructure of the ceiling located in the penthouse of the building that was not detected during the design phase of the project. In the structural plans, the designs called for certain bar joists to run the length of the ceiling and be bridged together to keep the framework rigid. The mechanical plans called for a required ductwork, and these clashed with the bracing during the construction of the project. During the design phase, the structural engineers and designers did not take the depth of the ductwork into consideration once the ductwork was installed, and the bridging could not be installed due to the dimension conflict. The only way the joists could be braced correctly was if they were braced around the ductwork instead of as shown on the drawings. To correct this problem, additional engineering, construction modification, and costs were required to install braces instead of bridging.



Figure 10. Building 4601

This is a prime example of how building information modeling can help prevent problems. This issue in particular was a simple miscommunication that ended up costing more money and delayed project completion. The way building information modeling can help prevent this is through component clash detection. In your BIM model, elements are highlighted or the user is indicated if they clash with other parts of the model. Below are some pictures of the infrastructure in Building 4601 as explained in this study (note the congestion of components), along with an example of what a clash may look like in a BIM model.



Figure 11. Building 4601 Infrastructure



Figure 12. Building 4601 Infrastructure

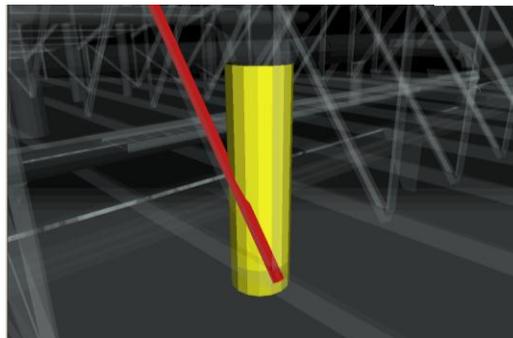


Figure 13. BIM Clash Example

Appendix II

Case Study 2

Two good examples of successful BIM users include the Corp. of Engineers and the US Coast Guard. The Corp. of Engineers has just recently been utilizing BIM technologies, and the MSFC building information modeling research team was able to explore the processes that the Corp. utilizes in Huntsville. With all of the construction that takes place throughout the Army, headquarters established what are known as Centers of Standardization, or COS. The purpose of these centers is to design, construct, and maintain standardized facilities which can be used over and over again. Some examples of these types of facilities include child development centers, fitness centers, and fire stations. BIM technologies, Bentley Products being their software of choice, have simplified the process of these projects for many reasons, but the most notable being the fact that they are standardized and can base every project off of a model that is similar to the project in design. Some other benefits include resolving conflicts, having a model present to allow visualization during construction, allows for cost verification, providing COS contractors with a starting point, and the models can be used for managing and maintenance of the facility. The Army has become so successful with BIM because of the way they go about business. They established what they call a “BIM Pit” to gain productivity and efficiency in their projects. The pit is just a room dedicated to the models that will be used in the project. With no walls between work spaces, designers and engineers can communicate with each other easily to produce a more organized model. This helps keep everyone involved and prevents any troubles that may occur.

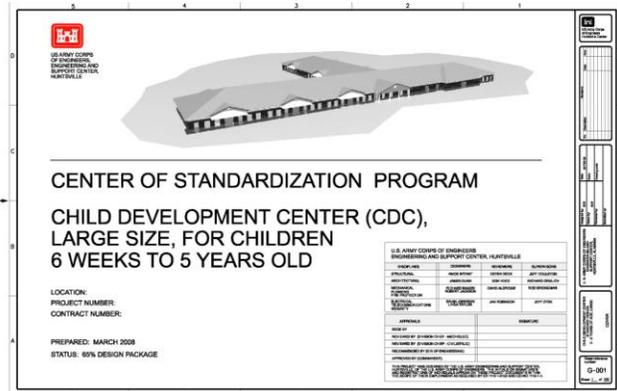


Figure 14. COS Project

The US Coast Guard has also utilized BIM to keep their procedures organized. Using BIM, the USCG was able to render over 33 million square feet of facilities, including in high detail using Graphisoft ArchiCAD. These include over 8,000 facilities spread over 65,000 acres of land, 1,400 small boats, and around 240 aircraft. With these models, the Coast Guard is now able to manage their facilities, produce more efficient planning and mission documents, and automate several experimental processes such as blast threats on buildings. The USCG was so successful in modeling their facilities in the fact that they did not over-detail their models.



Figure 15. Coast Guard BIM Model