

## What Information Do You Need to Build?

Interestingly, this question is being answered different ways by innovative teams who are pushing the boundaries of what it means to be a builder. Being cognizant of available, better technologies and understanding that the need for a builder doesn't necessarily have to be complex, you can develop elegant solutions that get to the core of what construction can be. For example, there are fewer limitations in file size or computing power for a designer's vision to be virtually represented to the smallest detail. BIM platforms—such as M-SIX's Veo, which significantly reduces model size yet retains intelligence, as well as the use of cloud environments or VDI/VDE infrastructure—make the limitations associated with the local desktop or laptop a thing of the past.

The ability to link components to information is now readily available in modeling and analysis platforms alike. Systems such as InterSpec's e-SPECS that connect specification data to model data provide the opportunity to get to necessary installation information. You've seen how models are being used for estimating and integrated scheduling with Navisworks and Vico. You've seen subcontractors begin to leverage the granularity in models to achieve tremendous efficiency gains (such as the Rex Moore case study). In-field activities are connecting to models via tools such as BIM 360 Glue and mobile applications. Vendors have opened up the APIs for modeling and analysis tools, further facilitating improvement through plug-in development, custom integrations, and other improvements to bridge information gaps.

So how will all of this available technology create change for design and construction teams to work together to virtually build a model so that the physical representation to follow is completely understood? This is the real challenge at hand and in many cases the elephant in the room. I'm not proposing that this will be easy to accomplish, or that there is a clearly defined roadmap to follow. Groups like Fiatech (Figure 5.36) are doing great work to explore the potential opportunities and how they can impact the project life cycle. You must challenge industry norms and have the dedication to question and understand what BIM could be.

## Model Redlining Exercise

Using the model for construction is a worthwhile endeavor. In the following exercises you'll explore some of the ways models can be leveraged as an effective means of creating a more dynamic and meaningful dialogue.

The next exercise will focus on using Navisworks as an in-field construction administration tool. Navisworks provides construction staff with a means of defining what is to be built and checking against the existing conditions in the field. Best practices for handling issue coordination should be developed before construction begins. You should get input from the superintendent and field engineer, who are the ones most connected to the project and on the jobsite the majority of the time, and then determine workflows from there.

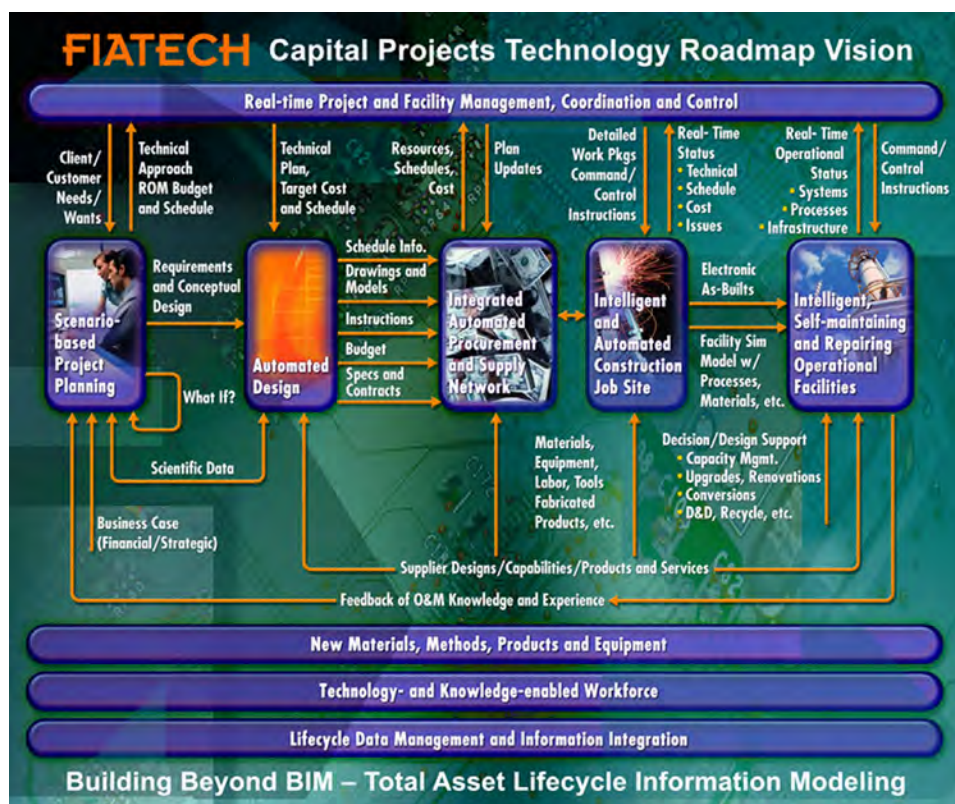


Figure 5.36 Fiatech's model roadmap vision

In Navisworks, these are the three tools used for commenting:

**Comments** These are associated with clashes, saved views, selections sets, tasks, and animations.

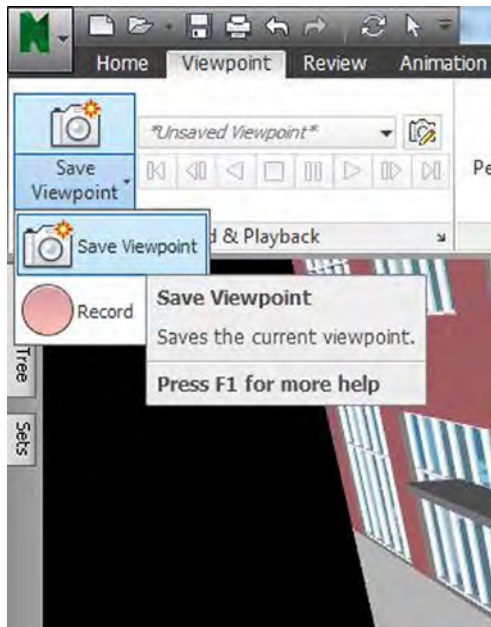
**Redlining** This is annotation that can be added over a viewpoint.

**Redline Tags** These are tags used for recording issues during a review, and they combine the functionality of comments, redlines, and viewpoints.

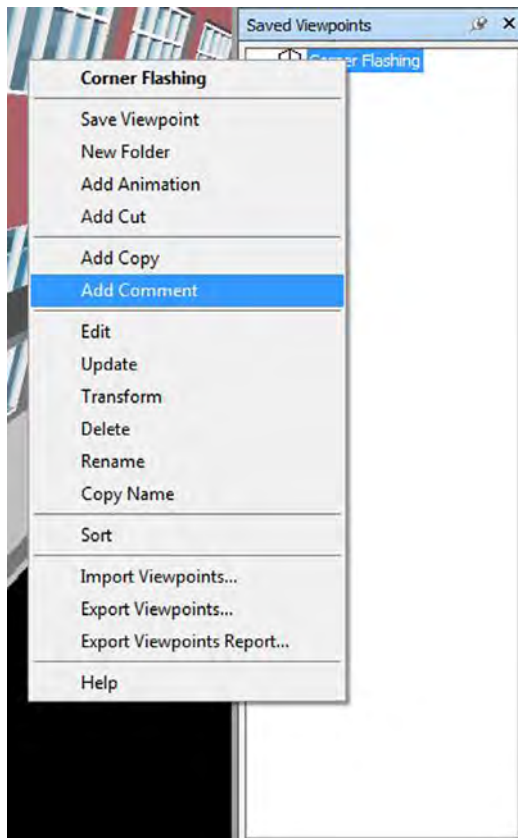
### Comments

For this example, you will use the Comments tool:

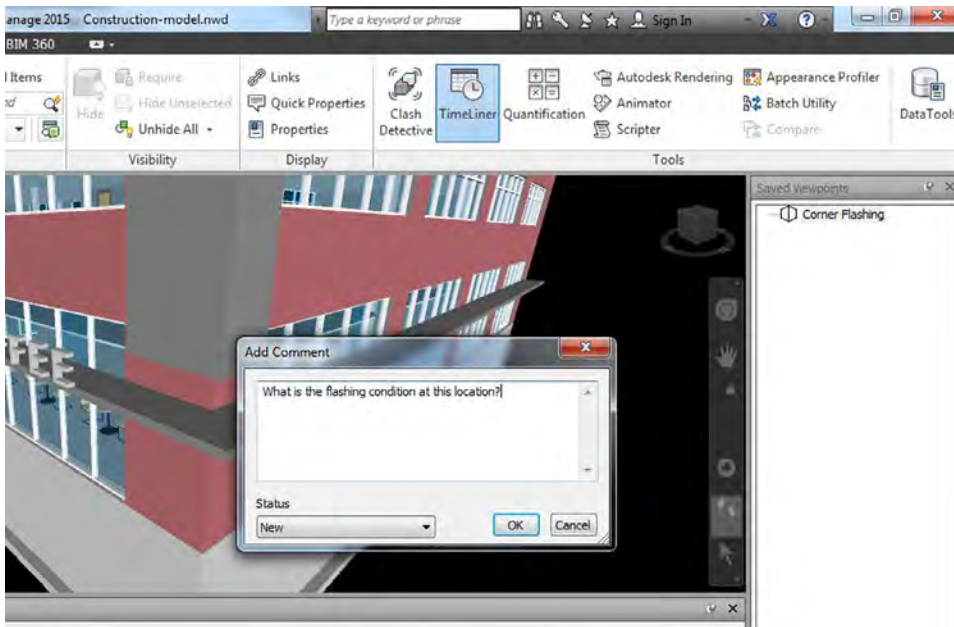
1. Open the Navisworks file `Construction-model.nwd`, and select a view you want to use.
2. Save the viewpoint by selecting Viewpoint ⇄ Saved Viewpoint ⇄ Save Viewpoint (Figure 5.37).
3. In the Saved Viewpoints tab, name the viewpoint **Corner Flashing**.
4. Right-click on the newly created viewpoint and select **Add Comment** (Figure 5.38).
5. In the Add Comment dialog box, type a comment or question you have, leave Status set to **New**, and click **OK** (Figure 5.39).



**Figure 5.37** Saving a viewpoint



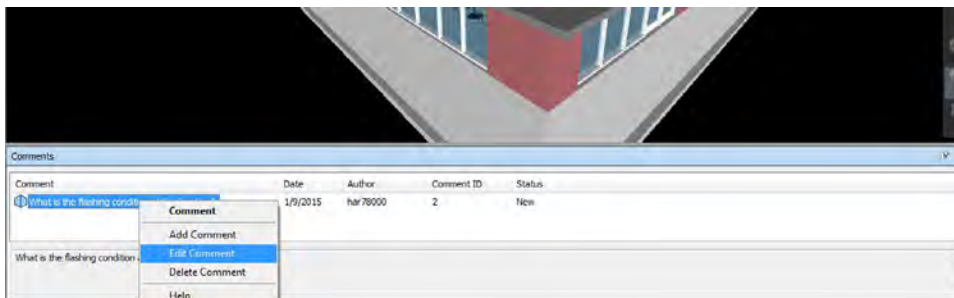
**Figure 5.38** Adding a comment to the composite file



**Figure 5.39** Saving the comment

You will notice that your new comment appears in the comment area, and it has tracked the author, the date, and time it was created, as well as its current status. Comments may also be found under the Review tab for reference. To edit the status of a comment:

1. Right-click the comment.
2. Select Edit Comment (Figure 5.40).

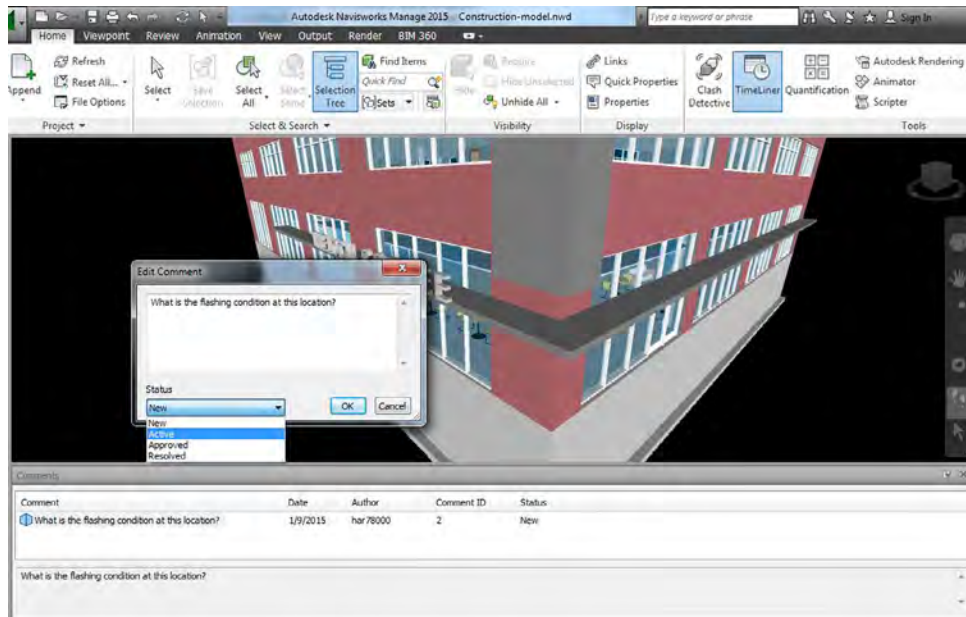


**Figure 5.40** Editing an existing comment

This opens the Edit Comment dialog box.

3. Answer the question and change the status of the comment.

Figure 5.41 shows the status changing from New to Active.



**Figure 5.41** Comments on the model create related views and can be tracked and logged just like sheet comments.

Commenting alone is useful if you are looking to internally go through a model review or model issues in an organized manner. Usually comments are combined with redlining tools and other information to add more clarity to issues. Additionally, you can create folders using the Saved Viewpoints tab to better organize your comments and status of each revision. Just right-click in the window and select New Folder. Rename the folder to what you'd like and then drag and drop viewpoints into the folders. Next you'll add redlines to the model, using the redlining tool.

## Redlining

Next you'll create a redline in Navisworks:

1. Using the same view from the previous exercise, open the Review tab, click the Draw tool, and choose the Cloud option (Figure 5.42). Other redline shape options include Ellipse, Freehand, Line, Line String, and Arrow.
2. With the Cloud option selected, make multiple clicks, circling the area you want to call out, to generate the cloud shape (Figure 5.43).



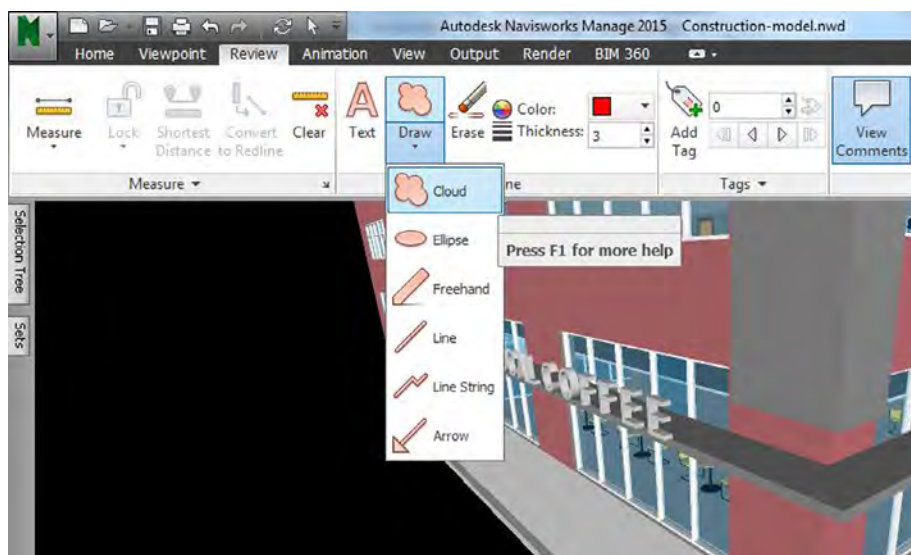


Figure 5.42 Opening the redlining tool

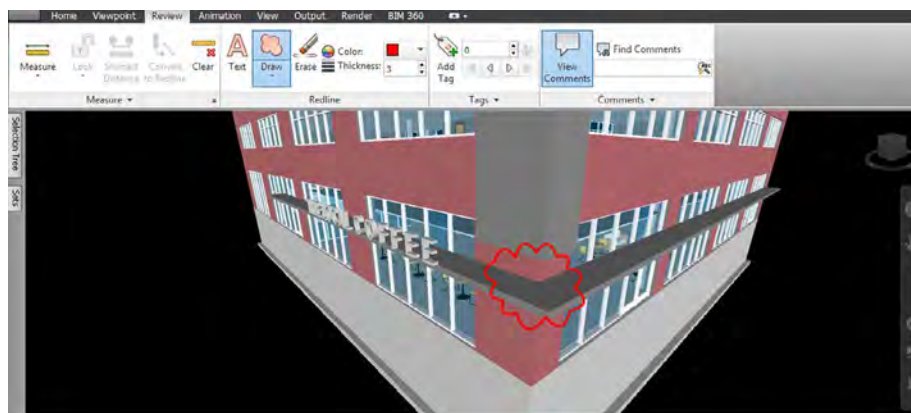


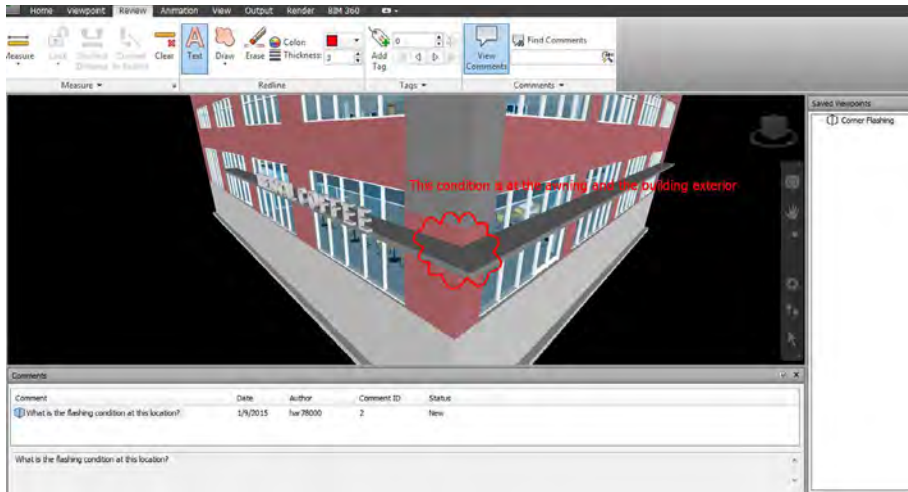
Figure 5.43 Creating the redline cloud shape

**Note:** You can edit the thickness before using the redline tools. In the Redline window, select the Thickness drop-down and adjust as needed. The default is 3".



3. Once your shape is created, select the Text tool next to the Draw tool and click to close the cloud you just created.
4. In the Enter Redline Text field, type a comment and click OK (Figure 5.44).

Notice that the text entered shows up on the view but doesn't appear in the Comments window. This is because redlining is view specific. A more common revision method in Navisworks is the use of a redline tag.

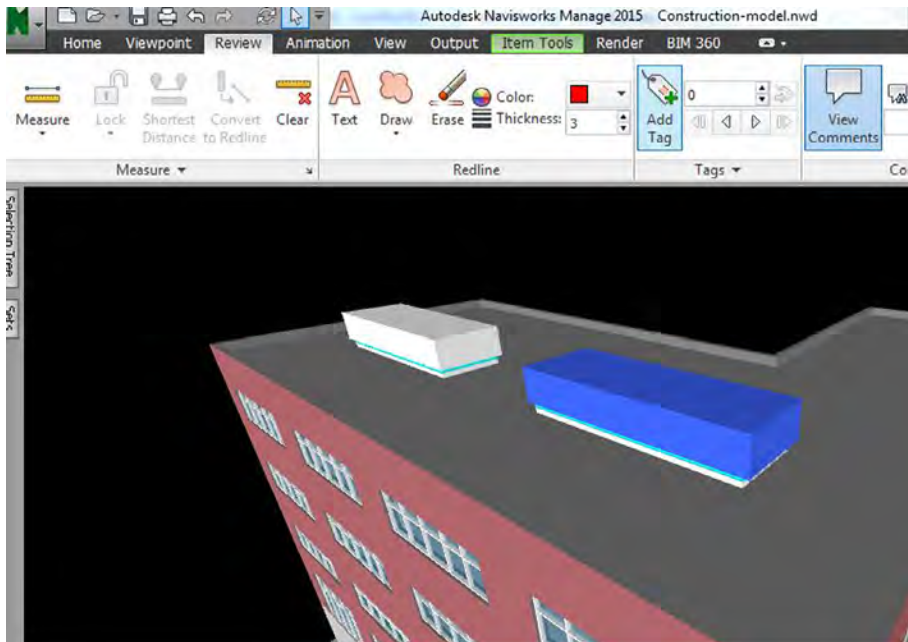


**Figure 5.44** Adding a comment to the redline

## Redline Tags

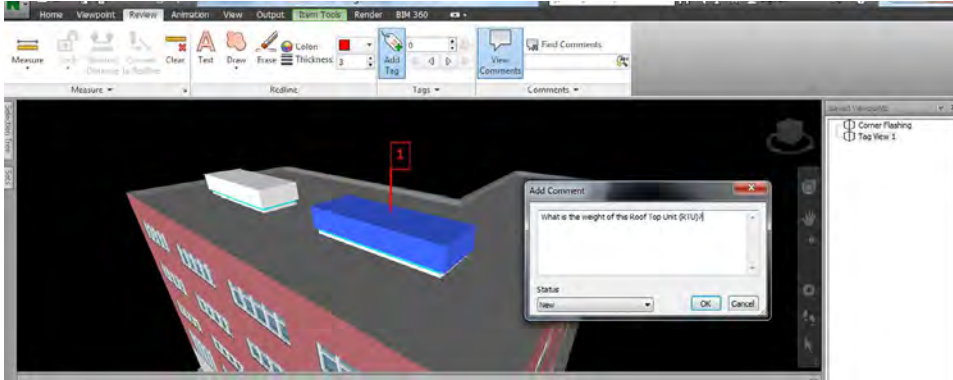
Redline tags are probably the most common means of marking up a Navisworks file. A tag automates view creation and lets you comment on anything in the model:

1. Rotate the current view in the Navisworks model to a new view, but don't save the viewpoint.
2. Select a model component.
3. Click Add Tag on the Review tab (Figure 5.45).



**Figure 5.45** Adding a tag to model components

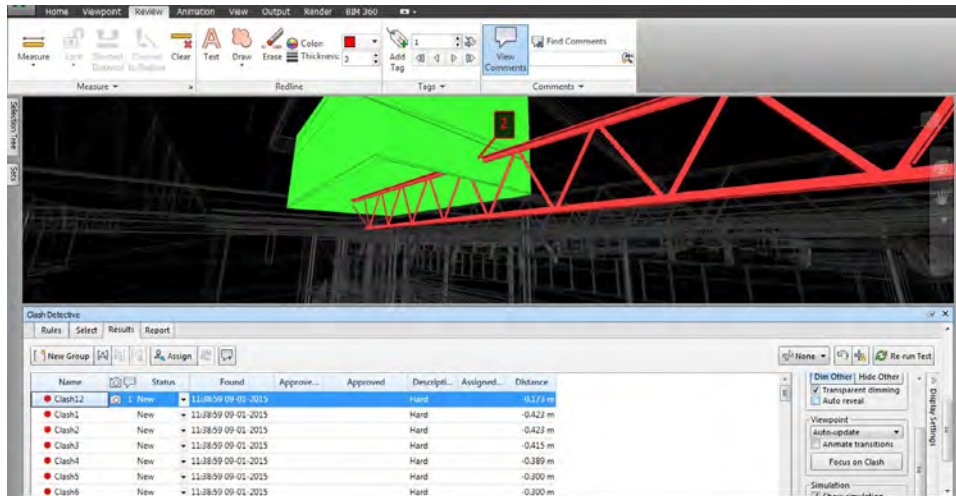
4. Click once where you want the tag leader to begin, and click again where you want the callout tag to end.
5. In the Add Comment dialog box, shown in Figure 5.46, insert a comment or question, and click OK.



**Figure 5.46** The Add Comment dialog box

You will now notice that there is a new comment in the Comments window as well as a new viewpoint called Tag View 1. You can rename it by right-clicking on the viewpoint and selecting Rename.

You can also create redline tags on clash reports by highlighting the clash in the report window, clicking the Tag tool, and associating a comment with it. If done correctly, it should have a red dot in the Comments window (Figure 5.47).



**Figure 5.47** Tag with comment added to a clash item

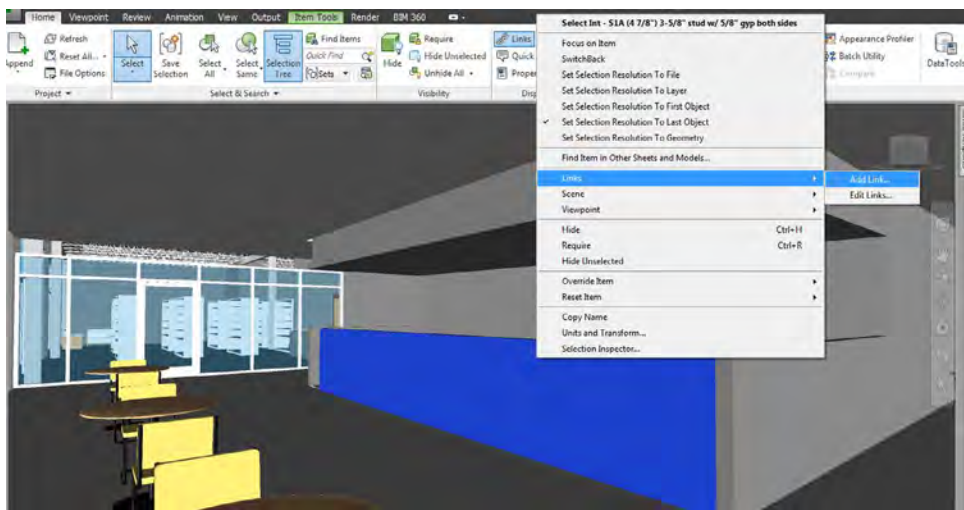
You can search the tags by choosing Review ⇌ View Comments and entering the search criteria for the tag you wish to find.



## Video Embedding Exercise

Something to think about when using BIM is the augmented layer of reality or connectivity to the physical components that can create value. In this exercise, you'll see how to add links to a model to show conditions in a structure that are placed within the 3D constraints of the model:

1. Open the Construction-model1.nwd file and navigate to a view where you want to put a link.
2. Select a model object using the Select tool from the Home tab, right-click on the object, and select Links ➔ Add Link (Figure 5.48).



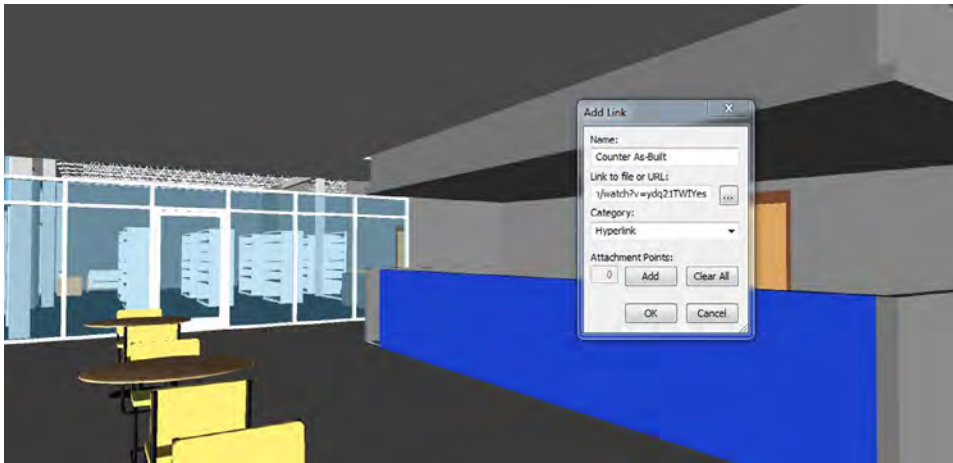
**Figure 5.48** Setting up the link

In the Add Link dialog box, give your new link a name, copy the link or file location you want to add, and paste it in the Link To File Or URL field. In this example, I'm using a link to a YouTube video: <https://www.youtube.com/watch?v=ydq21TWIYes>.



**Note:** Keep in mind that file links will require access to the same network or file location that you have. So if you want to share a model with other team members, it is usually best to link to information that is available through the Internet. You don't want to link to information that requires access to a secure network or FTP. When possible, provide access to tools such as Box.com, Egnyte, Dropbox, or other web enabled sharing platforms that utilize hyperlinks to files.

3. Leave Category set to Hyperlink (Figure 5.49). If you want to specify where the link icon is placed on the object, click Add under Attachment Points and select where on the object you want the link placed.



**Figure 5.49** Defining the type of link

4. Click OK. You may need to click the Links icon on the Home tab toward the middle of the icon bar (Figure 5.50).



**Figure 5.50** Links icon

Now if you navigate with your Select tool to where the link is located, it will act as a link to the file or URL you specified.

### The Links Tool

Contractors use the Links tool for an array of purposes. Some use links to file repositories where videos, photos, cut sheets, or other information about that object are stored. In this method, the link acts as a miniature website for each object.

Other uses include using links as a way of sending and answering questions about a project. If the project is nearing completion, some owners like to put all of the operations and maintenance information about equipment within the model in the link locations. This is a powerful tool that allows accurate model data to extend to other information outside of the model, which increases the usefulness of the model as a single reference point of information.

BIM software continues to evolve in the field of BIM as a useful means of providing construction information. Many construction managers have a fundamental understanding of the software and practices for how BIM can be applied in the field. I've shown just a few of the ways a model can be leveraged during construction. Whether it's conflict detection and resolution, or schedule sequencing, models work well when used in the fluid process of design and construction, because conditions consistently change.

From design to construction and even into operations, a model's variance is often significant. Although BIM aims to limit the negative variation of issues and conflicts, construction is a complicated process, and it is unrealistic to expect no surprises when construction begins. This is where the value of a flexible process and continued use of the model in the field can create significant value as a resource to analyze and collaborate on to arrive at solid solutions.

### The Virtual Job Trailer

So, how does BIM work in a job trailer, and what new technologies make the most sense? As the model migrates to the field, what technologies are needed to best support and enable its use? Although job trailers may never replace the corner conference room in the penthouse, there are some very useful tools that are being integrated on-site to assist site personnel in extending the life of a model and its effectiveness.

### The Conference Room

To start, let's talk about the job trailer as a conference room (Figure 5.51). The primary difference between traditional projects and BIM-enabled jobs is that the models require computers or tablets to view and access. That said, a job trailer for a BIM project will need to have the ability to display the model and views generated from the model in the trailer.