AUTODESK **UNIVERSITY** 2015

ES10077

CREATING PRECAST SHOP DRAWINGS IN REVIT

Jordan Watkins (Primary Speaker) - PTAC Consulting Engineers/EDGE^Revit
Shannon Cooper (Assistant/Co-speaker) - PTAC Consulting Engineers/EDGE^Revit

Learning Objectives

- Learn how to use assemblies to create shop drawings.
- Learn how to use Revit schedules to create the necessary material counts.
- Learn how to effectively use view templates to create desirable shop drawings.
- Learn how to use Revit to obtain weights, volumes, and dimensions necessary for shop tickets.

Description

In this class you will learn how to create the shop drawings necessary for the precast/prestressed concrete industry in an effective and well-presented manner. These shop drawings will have all of the information necessary for production, including piece weights, lengths, volumes, and counts, as well as the necessary reinforcement and embedded elements within each piece. This class will walk you through the unique process of utilizing assemblies and schedules within Revit to achieve a desirable shop ticket. Finally, this class will show you how to use view templates to maintain the drafting integrity required for precast shop drawings.

Jordan Watkins is a structural engineer in the Pensacola, Florida, area. He specializes in the design of precast/prestressed concrete structures. He graduated from Auburn University with a bachelor's of civil engineering in 2012. For the past 3 years he has been overseeing the implementation of Revit software as the primary 3D modeling software for his company. In order to make Revit software more efficient for them, the company has been developing a set of tools and plug-ins that can be used by the precast concrete industry specifically.

Shannon Cooper is a Draftsman in the Pensacola, Florida, area. He has 10 years of experience in the precast/prestressed concrete detailing industry. Shannon is a key component in the software development at his company. He has been tasked with overseeing the training of custom software for clients.

Learn How To Use Assemblies To Create Shop Drawings (OFTB):

About Assemblies

The Assemblies category of Revit elements supports construction workflows by letting you identify, classify, quantify, and document unique element combinations in the model. You can combine any number of model elements to create an assembly, which can then be edited, tagged, scheduled, and filtered. Each unique assembly is listed as a type in the Project Browser, from where instances of that type can be placed in the drawing either by dragging or by using the Create Instance option on the context menu. You can select an assembly type in the Project Browser or an instance of that type in the drawing area and generate one or more types of isolated views of the assembly as well as parts lists, material takeoffs, and sheets. Assembly views are listed in the Project Browser, from where they can be easily dragged onto project or assembly sheet views as needed.

How are assembly types differentiated?

Each time you create a unique assembly, a new assembly type is added to the Project Browser. A new assembly type will also be added if you edit an instance of an existing assembly type such that it becomes unique. In cases where the new or edited assembly exactly matches an existing assembly type, it is added to the model as an instance of that type.

For Revit to recognize assemblies as matching, they must meet the following criteria:

- They must have the same value for the Naming Category property.
- They must include the same number of elements of the same categories and types with the same values for properties that affect geometry.
- Corresponding elements must occupy the same positions within each assembly.

  For example, two shearwall assemblies are created separately, using structural framing as the naming category. If each consists of the same type of plate at the same position in the shearwall of the same type and dimensions, then Revit detects a match, and both assemblies are instances of the same assembly type.

Which elements can be included in assemblies?

Most model elements (walls, floors, roofs, family instances, parts, and so on) can be included in assemblies. The following elements cannot be included:

- Annotations and detail items
- Assemblies and elements that are already part of another assembly
- Complex structures (trusses, beam systems, curtain systems, curtain walls, stacked walls)
- Elements in different design options
- Groups
- Imports
- Images
- Links or elements in a link
- Masses

- MEP-specific elements (ducts, pipes, conduits, cable trays and fittings, HVAC zones)
- Model lines
- Railings that have a continuous top rail or handrail defined in the railing type properties
- Reinforcement Fabric Sheets
- Rooms
- Stairs created by components (stairs created by sketch can be included)
- Structural loads, load cases, and internal loads

Create an assembly:

Select the elements first:

1. In the drawing area, select the elements you want to include in the assembly.
2. Click Modify | <element type> tab ➤ Create panel ➤ (Create Assembly).
3. In the New Assembly dialog, if the assembly is unique, you can edit the default Type Name value, which is auto-generated by appending a sequential number to the last assembly type name assigned in the specified naming category.

   If the assembly includes elements from different categories, you can select a different value for Naming Category, and if the assembly is still unique, you can edit the type name. Click OK to finish creating the assembly and add the new assembly type to the Project Browser.
   If a matching assembly exists, the Type Name is read-only, and clicking OK creates another instance of that assembly type. However, if the new assembly includes elements from different categories, you can select a different value for Naming Category. If changing the naming category results in a unique assembly, you can edit the type name if desired, and then click OK to add the new assembly type to the Project Browser.

Select the tool first:

1. Click Modify tab ➤ Create panel ➤ (Create Assembly).
   The Add/Remove toolbar displays with Add selected by default.
2. In the drawing area, select the elements you want to include in the assembly.
3. Click Finish to exit edit mode.
4. In the New Assembly dialog, if the assembly is unique, you can edit the default Type Name value, which is auto-generated by appending a sequential number to the last assembly type name assigned in the specified naming category.

   If the assembly includes elements from different categories, you can select a different value for Naming Category, and if the assembly is still unique, you can edit the type name. Click OK to finish creating the assembly and add the new assembly type to the Project Browser. If a matching assembly exists, the Type Name is read-only, and clicking OK creates another instance of that assembly type.

However, if the new assembly includes elements from different categories, you can select a different value for Naming Category. If changing the naming category results in a unique assembly, you can edit the type name if desired, and then click OK to add the new assembly type to the Project Browser.

Create Assembly Views and Sheets:

You can create assembly views and assembly sheets for an assembly type. These drawings are always associated with a particular instance of the type, and only one instance of a type can have assembly views.

If that instance of the assembly is deleted from the project (or disassembled), all associated assembly views are deleted as well. If necessary, you can change the instance the views are associated with using the Acquire Views tool.

Aside from annotations, assembly detail views contain only those elements that make up the assembly instance. You can add annotations to an assembly view, rotate it, and edit the assembly itself by adding or removing elements.

You specify the particular views you want and other parameters in the Create Assembly Views dialog, which you can access in either of the following ways:

- Select an instance of the assembly type in a project view, and then click Modify | Assemblies tab ➤ Assembly panel ➤  Create Views.

  Note: The Create Views option is not available if assembly views already exist for a different instance of the same type.

- Select an assembly type in the Project Browser, right-click, and click Create Assembly Views. In this case, the views will be associated with the assembly instance that was created first, and the Create Views tool will not be available for other instances selected in a project view.

In the Create Assembly Views dialog, you select the types of views you want, select the desired scale, and (if Sheet is selected) specify title block information. When you click OK, the views are added to the Assemblies category in the Project Browser under the assembly type name. The settings you specified in the Create Assembly Views dialog will be the default settings the next time you open this dialog for this project.
Note: The 6 different elevations available in the Create Assembly Views dialog (Top, Bottom, Left, Right, Front, Back) represent the views from each side of a conceptual box enclosing the assembly. Each pair of opposite sides of the box is parallel to one of the 3 orientation planes of the assembly origin, which you can edit to change the orientation of the assembly in relation to the project orientation. See Work with an Assembly.

Assembly views always remain associated with the assembly instance for which they were created. If an edit to an assembly instance causes the instance to change from one assembly type to another, any assembly views belonging to the edited instance will be listed under the project browser node for the new assembly type. If the type you changed to already has assembly views, an error message informs you that one set of views will be deleted.

If you create additional section views within an assembly view, they inherit the assembly view's relationship to the assembly instance.

To place an assembly view on a sheet

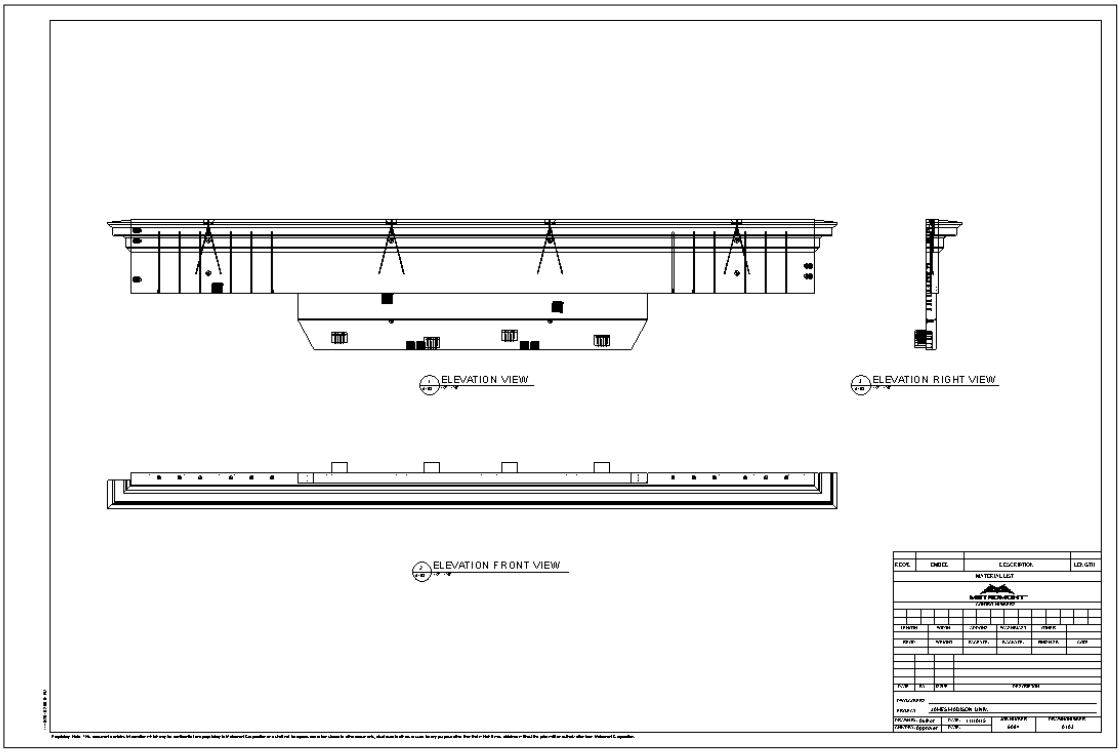
1. In the Project Browser, under Assemblies, expand the node for the assembly type, and double-click the name of the sheet.
2. Drag the desired detail view from the Project Browser onto the open sheet view, and release the mouse button to display an outline of the detail view.
3. Move the cursor to position the outline as desired, then click to place the view on the sheet. To change the orientation of the assembly within the view, you need to open that assembly view, select the crop region, and use the rotate tool on the modify panel.

   Note: You can also place drafting views and other kinds of project views on assembly sheets.

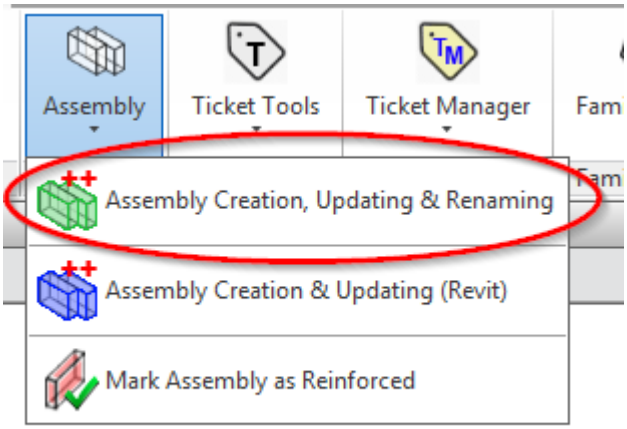
   After views have been placed on a sheet, you can expand the sheet's node in the Project Browser to see the list of views.

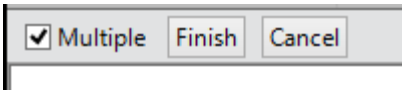
If you want to place the same view on more than one sheet for the same assembly, right-click the view name in the Project Browser, and click Duplicate View. For more information, see Duplicate a Detail View. Note that assembly views can also be placed on normal (non-assembly) sheets.

Example:



Instead of using out of the box (OOTB) Revit assembly creation you can use the Edge^R "Assembly Creation, Updating, & Renaming" tool.





Programmed Result of Tool:

This tool will create an assembly out of selected structural framing members incorporating all necessary hardware.

Steps to perform tool operation:

- The user can preselect a structural framing member (or multiple members) and the tool will perform its operations on each of the selected structural framing members one after the other until all have been processed.
    - User clicks the "Assembly Creation, Updating, & Renaming" icon.
    - If no structural framing members have been preselected, the user selects the structural framing members to perform the assembly operation upon.
    - Once the assembly has been created, the user must review the created assembly to verify that all desired elements have been added and not omitted due to modeling issues or unforeseen conditions not picked up by the tool.

Learn How To Use Revit Schedules To Create The Necessary Material Counts:

About Schedules

Display lists of any type of element in a project.

A schedule is a tabular display of information, extracted from the properties of the elements in a project. A schedule can list every instance of the type of element you are scheduling, or it can collapse multiple instances onto a single row, based on the schedule's grouping criteria.

Examples:

<PRODUCT SCHEDULE - FCA>

A	B	C	D	E	F	G	H
MARK	CONTROL	REQ'D	THICKNESS	HEIGHT	LENGTH	VOLUME	WEIGHT
FCA001	616	1	8"	5' - 11"	59' - 0"	8.4 CY	34,128
FCA002	617	1	8"	5' - 11"	59' - 0"	8.4 CY	34,128
FCA002	618	1	8"	5' - 11"	59' - 0"	8.4 CY	34,128
FCA003	619	1	8"	5' - 11"	59' - 0"	8.4 CY	34,128
FCA003	620	1	8"	5' - 11"	59' - 0"	8.4 CY	34,128
FCA005	621	1	8"	5' - 11"	59' - 0"	8.4 CY	34,128
FCA006	622	1	8"	5' - 11"	59' - 0"	8.4 CY	34,128
FCA006	623	1	8"	5' - 11"	59' - 0"	8.4 CY	34,128
FCA006	624	1	8"	5' - 11"	59' - 0"	8.4 CY	34,128
FCA006	625	1	8"	5' - 11"	59' - 0"	8.4 CY	34,128
FCA004	628	1	8"	5' - 11"	24' - 3"	3.5 CY	14,044
TOTAL: 11		11				87.7 CY	

<GROUT SCHEDULE>

A	B
GROUT	VOLUME
ERICO HY10L LENTON CEMENTITOUS GROUT	1.84 CF
84	1.84 CF
FLOWABLE GROUT	29.30 CF
476	29.30 CF
NON-METALLIC NON-SHRINK GROUT	204.63 CF
185	204.63 CF
SAND CEMENT GROUT	4.14 CF
52	4.14 CF

You can create a schedule at any point in the design process. As you make changes to the project that affect the schedule, it automatically updates to reflect those changes. You can add a schedule to a drawing sheet.

You can export a schedule to another software program, such as a spreadsheet program.

Schedule Updates

All schedules update automatically when you modify the project. For example, if you change the length of a precast wall panel, the length updates in wall panel schedule accordingly.

When you change the properties of building components in the project, the associated schedule updates automatically.

For example, you could select a plate in the project and change its identity information. The parts list schedule would reflect the change to the identity information.

Types of Schedules

You can create several types of schedules:

- Schedules (or Quantities)
- Key Schedules
- Material Takeoffs
- Annotation Schedules (or Note Blocks)
- Revision Schedules
- View Lists
- Drawing Lists
- Panel Schedules
- Graphical Column Schedules

Formatting Schedules

You have several choices available for formatting the look of the schedule. You can

- Specify the order and type of properties to display.
- Create totals
- Create your own custom properties, which you can then include in the schedule
- Apply phases to a schedule
- Set conditions to apply background color to cells in the schedule in order to verify design parameters are met.

Schedule Tips

- Mouse-wheel scrolling is available in schedule views. Move the mouse wheel to scroll vertically. Hold Shift and move the wheel to scroll horizontally.
- You can select an element in a non-schedule view from a schedule view. This works best if you are tiling windows. (To tile windows, click View tab ➤ Windows panel ➤ Tile.) To view an element in a non-schedule view, click in the element's cell in the schedule, and then click Modify Schedule/Quantities tab ➤ Schedule panel ➤ Highlight in Model. The Show Elements in View dialog displays. You can continue to click Show in this dialog to open other views that show the element.

Create a Schedule or Quantity

When needed, add a list of building element components to your project.

1. Click View tab ➤ Create panel ➤ Schedules drop-down ➤ Schedule/Quantities.
2. In the New Schedule dialog, select a component from the category list. A default name appears in the Name text box, which you can change as necessary.
3. Select Schedule building components.

   Note: Do not select Schedule keys.
4. Specify the phase.
5. Click OK.
6. In the Schedule Properties dialog, specify the schedule properties.
7. Click OK.

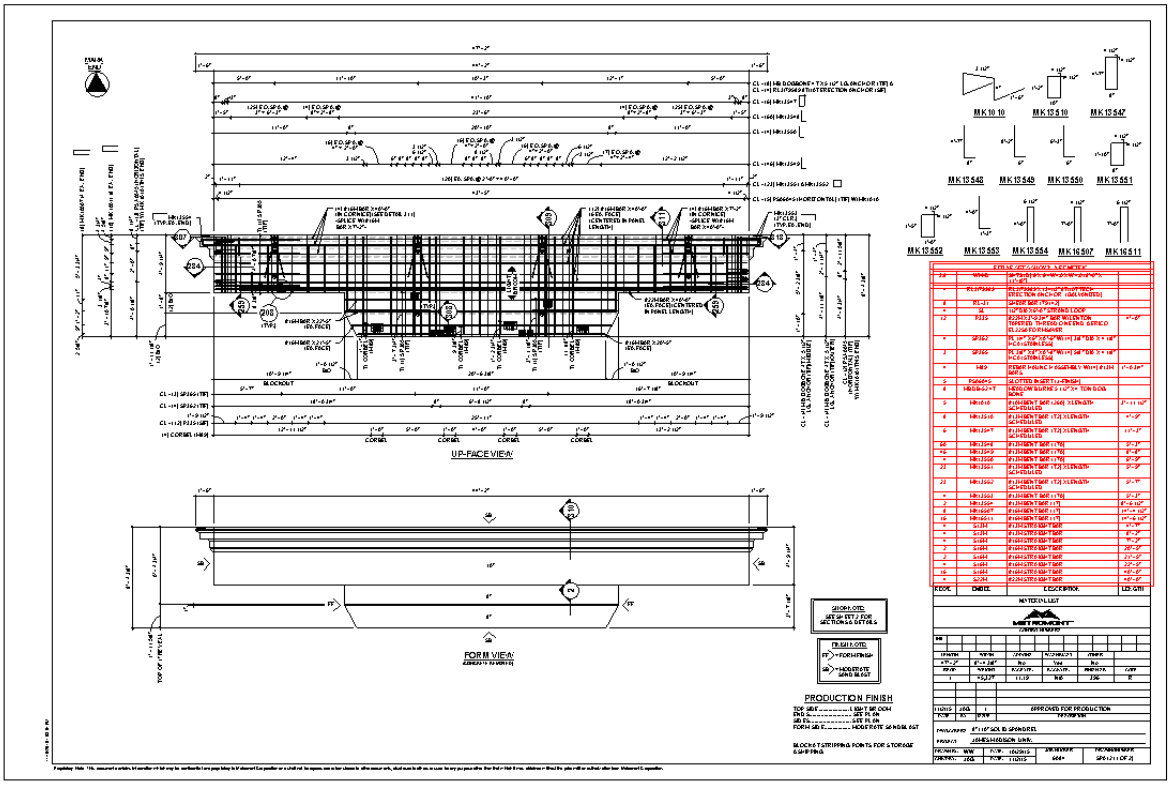
   Multi-category schedules can only include loadable families. When you select shared parameters, categories which do not have the chosen shared parameters will be unable to be selected.

Add a Schedule to a Sheet

Placing schedules on sheets adds to the information content of the documentation set.

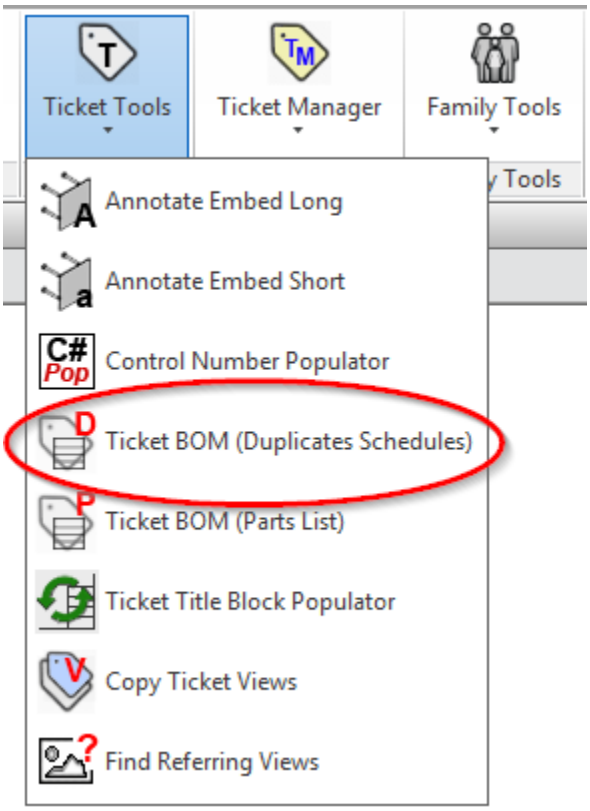
1. In a project, open the sheet to which you want to add a schedule.
2. In the Project Browser, under Schedules/Quantities, select the schedule, and drag it onto the sheet in the drawing area. Release the mouse button when the cursor is over the sheet.

   Revit displays a preview of the schedule at the cursor.
3. Move the schedule to the desired location, and click to place it on the sheet.



You can modify the schedule after placing it on the sheet. In the sheet view, right-click the schedule, and click Edit Schedule. The schedule view displays. You can now edit the cells of the schedule. You can also rotate the schedule on the sheet.

Instead of using out of the box (OOTB) Revit to create a schedule you can use the Edge^R "Ticket BOM Duplicate Schedules" tool.



Programmed Result of Tool:

This tool will automatically generate the necessary schedules based on manufacturer standard and format/filter the schedules properly.

Steps to perform tool operation:

- The user selects the tool, then is prompted for location of the first parts list to be added to the sheet view.
    - User clicks the "Ticket BOM (Duplicates Schedules)" icon.
    - User clicks to provide the location of the individual parts list.

Learn How To Effectively Use View Templates To Create Desirable Shop Drawings:

About View Templates

A view template is a collection of view properties, such as view scale, discipline, detail level, and visibility settings. A view template is a “snap shot” in time of the visibility graphics interface.

Use view templates to apply standard settings to views. View templates can help to ensure adherence to office standards and achieve consistency across construction document sets.

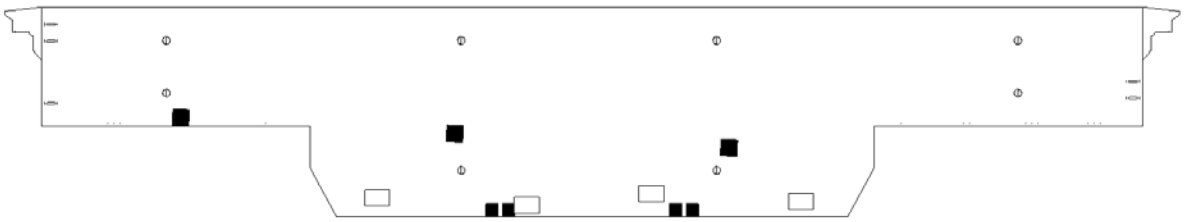
Before creating view templates, first think about how you use views. For each type of view (floor plan, elevation, section, 3D view, and so on), what styles do you use? For example, for precast you may use many styles of floor plan views, such as rebar on or off, top in form or bottom in form plates, lifting and handling.

You can create a view template for each style to control settings for the visibility/graphics overrides of categories, view scales, detail levels, graphic display options, and more.

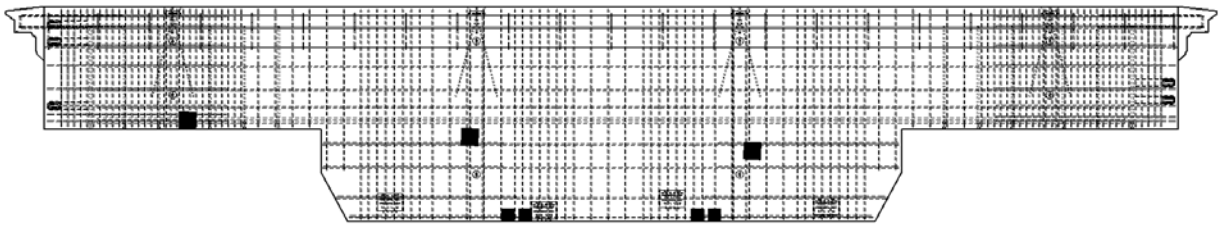
Examples

The following examples show a plan view without a view template applied then a plan view with a view template applied. You can create a view template for each style with predefined visibility and graphics settings.

Without view template applied:



With view template applied:



You can use view templates to control views in the following ways:

- **Apply** properties from a view template to a view. Later changes to the view template do not affect the view.
- **Assign** a view template to a view, creating a link between the template and the view. Later changes to the view template are automatically applied to any linked views.

View templates can be transferred from one project to another.

Create a View Template

You can create a view template by duplicating an existing view template and making necessary modifications.

You can also create a view template from a project view or directly from the Graphic Display Options dialog.

To create a view template based on an existing view template

1. Click View tab ➤ Graphics panel ➤ View Templates drop-down ➤ Manage View Templates.
2. In the View Templates dialog, under View Templates, use the Discipline filter and the View type filter to limit the list of view templates.

   Templates for each view type contain different sets of view properties. Select the appropriate view type for the template you are creating.
3. In the Names list, select the view template to use as a starting point for the new template.
4. Click  (Duplicate).
5. In the New View Template dialog, enter a name for the template, and click OK.
6. Modify view template property values as needed.

   The Include option allows you to select the properties that will be included in the view template. Clear the Include option to remove properties from the template. For properties that you do not include in the view template, you do not need to specify a value. These view properties will not be overridden when you apply the view template.
7. Click OK.

To create a view template based on the settings of a project view

1. In the Project Browser, select the view from which you want to create the view template.
2. Click View tab ➤ Graphics panel ➤ View Templates drop-down ➤ Create Template from Current View, or right-click and select Create View Template From View.

3. In the New View Template dialog, enter a name for the template, and click OK.

   The View Templates dialog displays.

4. Modify view template property values as needed.

   The Include option allows you to select the properties that will be included in the view template. Clear the Include option to remove properties. For properties that you do not include in the view template, you do not need to specify a value. These view properties will not be overridden when you apply the view template.

5. Click OK.

Apply a View Template

When you apply a view template to a view, the view template properties affect the view immediately. However, later changes to the view template do not affect the view.

To create a link between the template and the view so that later changes to the view template are automatically applied to linked views, assign the view template to the view.

1. In the Project Browser, select the view or views to which you want to apply a view template.

   Note: Use the CTRL key to select multiple views in the Project Browser.

2. Click View tab ➤ Graphics panel ➤ View Templates drop-down ➤ Apply Template Properties to Current View, or right-click and select Apply View Template.

3. In the Apply View Template dialog, under View Templates, use the Discipline filter and the View type filter to limit the list of view templates.

4. In the Names list, select the view template to apply.

   You can use the view properties of another project view as a view template. To do this, select Show Views and select the view name in the list.

5. Click OK.

The properties of the view template are applied to the selected views. Notice that this action does not change the value of the View Template property for each view on the Properties palette.

Apply a View Template to All Views on a Sheet

You can apply a view template to all views on a sheet to ensure adherence to office standards and achieve consistency across construction document sets.

When you apply a view template to views on a sheet, the view template properties are applied to the views that are currently included on the sheet. However, the view template is not assigned to those views, so later changes to the view template do not affect the views.

Example

You want to make sure that all views on the sheet use the same view scale. Create a view template (named View Scale Template) that defines only the view scale. After placing views on the sheet, apply the View Scale Template. All of those views now display using the same scale.

Note: If any of the views has an assigned view template that defines the scale, that view's scale will not change according to the View Scale Template. The View Scale Template settings apply only to view settings that are not already defined by assigned templates.

To apply a view template to all views on a sheet

1. In the Project Browser, right-click a sheet view name, and click Apply View Template to All Views.
2. In the Apply View Template dialog, under View Templates, use the Discipline filter and the View type filter to limit the list of view templates.
3. In the Names list, select the view template to apply.

   You can use the view properties of another project view as a view template. To do this, select Show Views and select the view name in the list.
4. Click OK.
5. If any view in the sheet has an assigned view template, a message asks if you want to partially apply the selected template to the views.

   Click yes to apply properties from the selected view template that are not controlled by an assigned view template.
   Click No to exit the message and return to the Apply View Template dialog without applying the view template properties.

Learn How To Use Revit To Obtain Weights, Volumes, and Dimensions Necessary For Shop Tickets:

Material Takeoff Schedules

Show more detail about the assembly of a component with lists of sub-components or materials.

Material takeoff schedules list the sub-components or materials of any Revit family. Material takeoff schedules have all the functionality and characteristics of other schedule views, but they allow you to show more detail about the assembly of a component. Any material that is placed in a component within Revit can be scheduled. This is how we can achieve accurate weights in Revit for shop tickets.

<PRODUCT SCHEDULE - FCA>					
A	B	C	D	E	F
MARK	THICKNESS	HEIGHT	LENGTH	VOLUME	WEIGHT
FCA001	8"	5' - 11"	59' - 0"	8.4 CY	34,128
FCA002	8"	5' - 11"	59' - 0"	8.4 CY	34,128
FCA002	8"	5' - 11"	59' - 0"	8.4 CY	34,128
FCA003	8"	5' - 11"	59' - 0"	8.4 CY	34,128
FCA003	8"	5' - 11"	59' - 0"	8.4 CY	34,128
FCA005	8"	5' - 11"	59' - 0"	8.4 CY	34,128
FCA006	8"	5' - 11"	59' - 0"	8.4 CY	34,128
FCA006	8"	5' - 11"	59' - 0"	8.4 CY	34,128
FCA006	8"	5' - 11"	59' - 0"	8.4 CY	34,128
FCA006	8"	5' - 11"	59' - 0"	8.4 CY	34,128
FCA004	8"	5' - 11"	24' - 3"	3.5 CY	14,044
TOTAL: 11				87.7 CY	

Note: When Revit computes the volume of materials for individual layers within a wall, some approximations are made to maintain performance. Minor discrepancies might appear between the volumes visible in the model and those shown in the material takeoff schedule. These discrepancies tend to occur when you add a sweep or a reveal to a wall, or under certain join conditions.

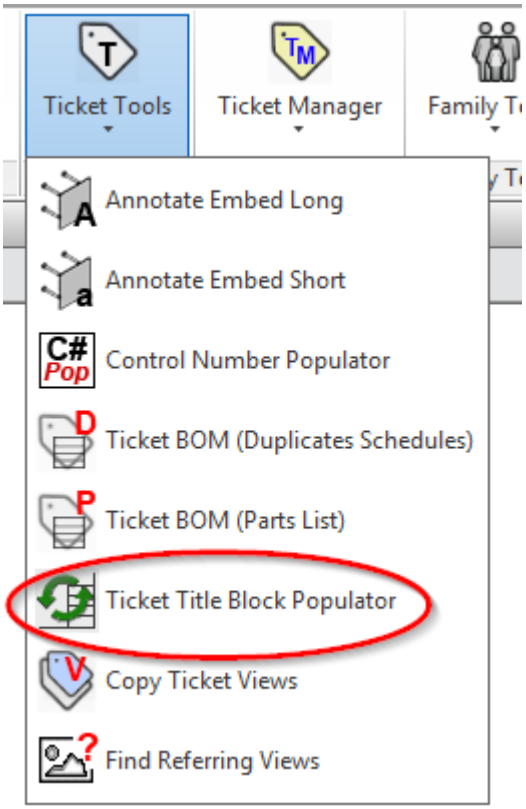
Create a Material Takeoff Schedule

Add a schedule that provides details such as what materials a project component will use.

1. Click View tab ➤ Create panel ➤ Schedules drop-down ➤ Material Takeoff.
2. In the New Material Takeoff dialog, click a category for the material takeoff schedule, and click OK.
3. In the Material Takeoff Properties dialog, for Available Fields, select the material attributes.
4. Optionally, sort and group, or format the schedule.
5. Click OK to create the material takeoff schedule.

The material takeoff schedule displays, and the view is listed in the Project Browser under Schedules/Quantities.

Instead of using out of the box (OOTB) Revit to create a schedule you can use the Edge^R "Ticket BOM Duplicate Schedules" tool.



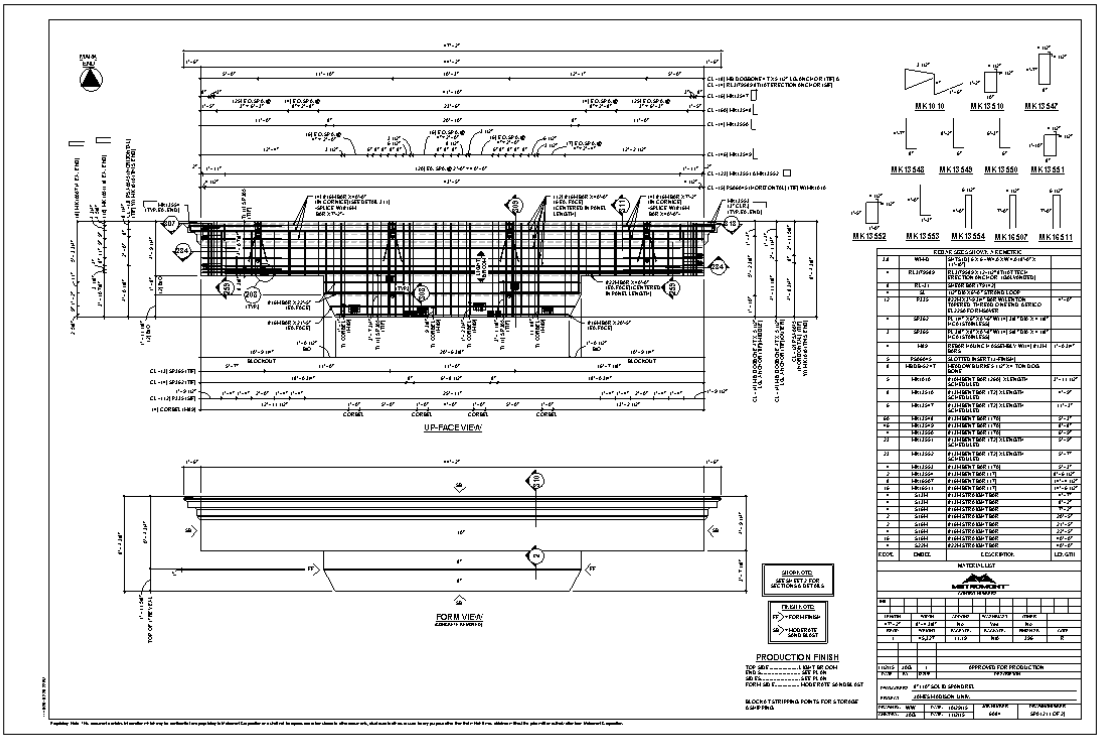
Programmed Result of Tool:

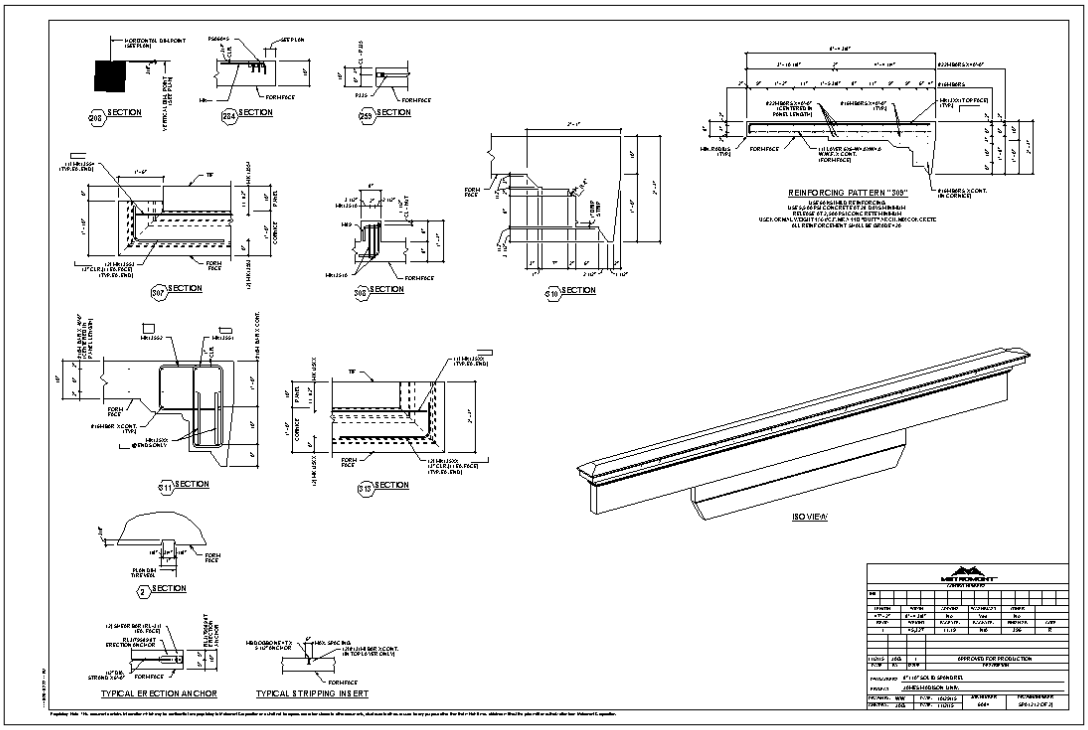
This tool will automatically add relevant information to a manufacturers title block.

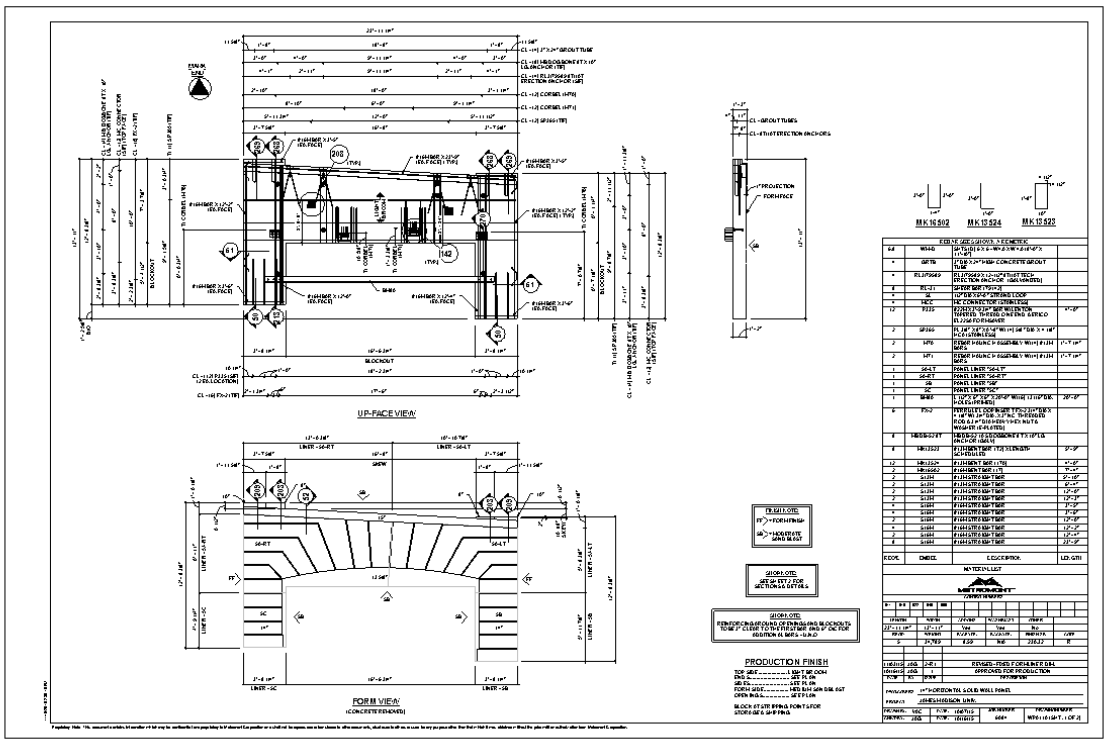
Steps to perform tool operation:

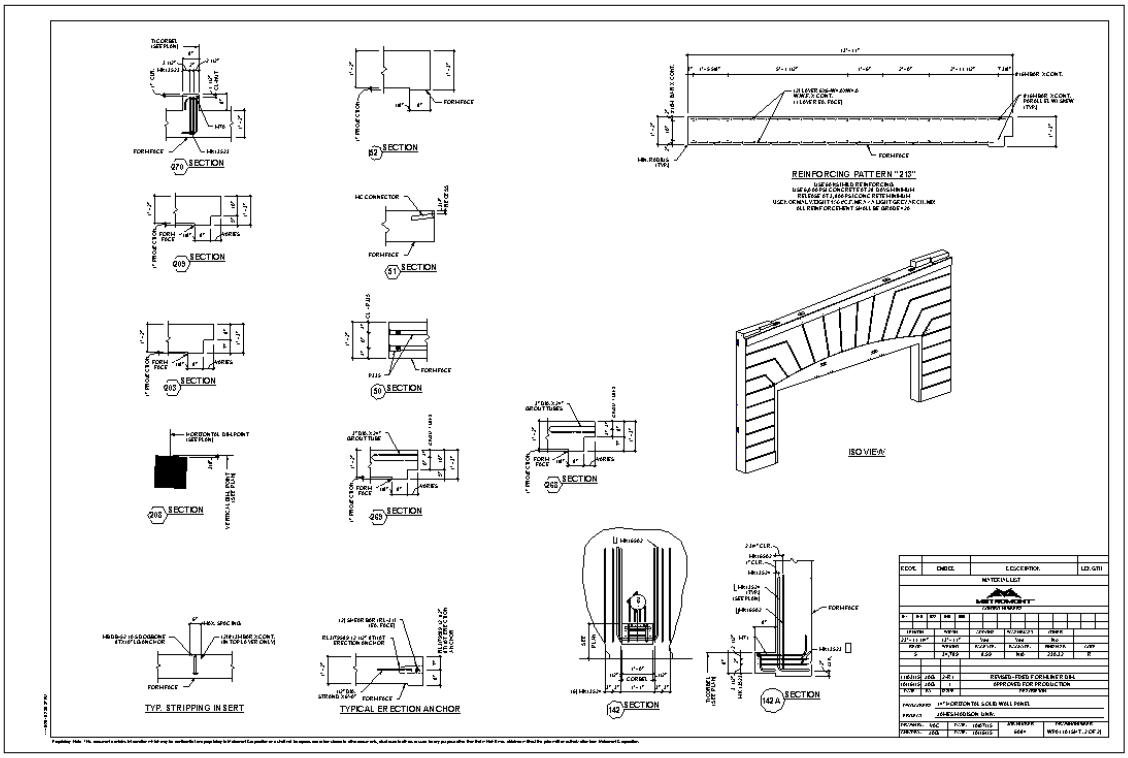
- The user selects the tool, then the tool automatically populates the title block with the appropriate information.
    - User clicks the "Ticket Title Block Populator" icon.

Below are two examples of completed Precast Shop Drawings:






UP-FACE VIEW
FORM VIEW
PRODUCTION FINISH
MATERIAL LIST


REINFORCING PATTERN "213"
ISO VIEW
TYP. STRIPPING INSERT
TYPICAL ERECTION ANCHOR
MATERIAL LIST