

## Challenge exercise

### Add circulation and create a sheet

Using the provided Revit models, **07\_RESEARCH BUILDING\_STRUCTURAL.rvt**, and **RESEARCH BUILDING\_ARCHITECTURAL.rvt**, complete this challenge covering skills that you learned in the course. By using the linked architectural model as a guide, create a shaft opening. Once the opening is complete, modify the framing on each floor to support the new opening.

#### Complete the required activities:

- On the ground floor, in Visibility Graphics, make sure the architectural model is turned on. This allows you to see the CMU shaft wall that is penetrating through the core of your structure. Ensure that the discipline is set to coordination. This ensures that you have all the architectural elements turned on and you won't miss any important architectural elements that need to be accommodated for.
- Create a shaft opening. A shaft opening is essentially a 3D void that can set to level constraints. Any floors, ceilings or roofs that cross through the opening are cut at the perimeter specified. Constrain the opening from the ground floor to the roof. Create an opening annotation.
- On Level 1, model UB305x165X40 beams 153 mm from the outside face of the CMU wall. This will allow you to frame the beam system to these beams. It also provides the steel decking installer a proper method to secure the edges of the decking around the opening.
- Edit the beam system to allow the beams within the bay to be modified. Do not remove the beam system to do this. Simply unpin each beam and frame it into the new UB305 beams you added at a 153 mm offset from the framing. Once you are finished, pin the beams back.
- Remove the existing beam systems in that bay, on each level except for the roof. Copy the beam system on the first floor to the Windows clipboard. Paste and align the new beam systems to each level. This provides consistency on each floor.
- Create a detail sheet with a callout of the first floor framing bay, a cropped 3D view, a section and a framing connection detail at the shaft opening. By creating a construction document, you are showing how your design is going to be built. This gives contractors enough information to price the project as well as produce shop drawings.

**Success Criteria:**

- **Model consistency:** The opening is to the outside of the CMU walls. The beams are modeled 153 mm from the face of the block. All the framing members within the beam system are properly framed into the wide flange beams added to the perimeter of the opening.
- **Annotated elements:** All the new framing is tagged and labeled appropriately. All callouts and sections are placed in a manner that does not obscure important information. Each level is exactly the same.
- **Concise construction documents:** An enlarged floor plan of the first floor opening bay is placed on the sheet fully annotated and labeled. A large-scale section with a callout for a connection detail is placed on the sheet and clearly identified. A cropped 3D view is placed on the sheet at the largest scale possible.

**What to Submit:**

- **Revit model file (.RVT)** – The full model with the shaft opening present, and the circulation bay properly framed.

## Grading Rubric

	Advanced	Proficient	Basic	Emerging
<b>Displaying architectural elements crucial to your design</b>	The architectural model is displayed. In the view properties, the discipline is set to Coordination.	The architectural model is displayed. In the properties, the discipline is set to Structural.	The architectural model is displayed. In the properties, the discipline is set to Architectural.	The architectural model is not displayed.
<b>Creating the shaft opening</b>	The shaft opening is to the outside of the CMU walls. There is an X to denote the opening in the drawings. The base constraint is set to Ground Floor, the top constraint is set to Roof.	The shaft opening is to the inside of the CMU walls. There is not an X to denote the opening in the drawings. The base constraint is set to Ground Floor, the top constraint is set to Roof.	The shaft opening is to the inside of the CMU walls. There is not an X to denote the opening in the drawings. The base constraint is set to Ground Floor, the top constraint is disconnected	The opening is only set to the ground floor and has no symbolic lines.
<b>Modeling the penetration framing</b>	The Detail Level is set to Fine to make sure the 153 mm is a proper offset. The beams are framed into the adjacent beams in the beam system. All the beams are added.	The Detail Level is set to coarse. All the beams are added.	The beams are added but the ends are not framed into the existing beams in the beam system.	No beams or only one beam has been added without the ends framed into the adjacent beams.
<b>Modifying the beam system</b>	The beams in the beam system are properly framed into the new beams outside the opening. All beams are properly annotated, and the graphic display is showing an offset.	The beams in the beam system are properly framed into the new beams outside the opening. All beams are properly annotated.	Some beams are extending through the shaft opening while others are properly framed.	The beams have not been modified to accommodate for the opening,
<b>Remove the existing beam systems and copy paste the new framing</b>	The beam systems have been deleted from each level and the shaft opening is clearly seen. The new beams are in place on each level and are fully annotated.	The beam systems have been deleted from each level and the shaft opening is clearly seen. The new beams are in place on each level but	The beam systems have clearly been modified individually on each level.	The new beams have not been copied and pasted.

		are not fully annotated.		
<b>Creating a drawing sheet</b>	A sheet labeled S-502 SHAFT OPENING DETAILS has been created. A large-scale callout, a section, a connection, and a 3D cropped view has been added. The sheet is fully annotated, and each view is clearly displayed.	A sheet labeled S-502 SHAFT OPENING DETAILS has been created. A large-scale callout, a section, a connection, and a 3D cropped view has been added. Some of the views are at a small scale.	A sheet has been made but the views are at a very small scale and are overlapping. The sheet is not named.	No sheets have been created.