

Challenge exercise

Create a roof framing plan with bar joists

Using the provided Revit models, **04_RESEARCH BUILDING_STRUCTURAL.rvt**, and **RESEARCH BUILDING_ARCHITECTURAL.rvt**, complete this challenge using the skills you learned in the course. Create a roof framing plan that will allow a joist with a bearing seat of 64mm to bear on wide flange framing members allowing for a consistent top of steel plane.

Complete the required activities:

- In the roof framing plan, adjust the horizontal framing members to be set -64mm start and end. This will allow the joists to bear on the framing as opposed to framing directly into the wide flange beam. By doing this, you will maintain a consistent top of steel plane for the architectural roofing to be installed.
- Load the bar joist family **K-Series Bar Joist-Angle Web** types; **16K6**, **18K10** and **22K10**. These joists are used in conjunction with shorter or longer spans. The larger number joists will go in the larger bays.
- Add joists using the beam system command in each bay. The rule is that shorter span framing at a higher count in a framing bay will allow for less deflection and create a stronger diaphragm. For example, you are better off with 5 joists at 8,239 mm in length than 4 joists at 9,144mm.
- Always check your work in 3D. Adding bar joists in 3D like this may produce unexpected results. Go to a 3D view after you add the first bay of joists to make sure it is bearing on the beam as expected. Once you are done adding joists in all the bays, check your work again.
- Add a section to a single bay of joists, as well as a callout. This ensures you are relaying important information such as joist type, spacing and additional detail such as uplift bridging or stiffener angles.
- Create a roof framing sheet. 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:** There are no framing bays that have incorrectly offset members. All the joists are bearing on top of the framing as expected.
- **Annotated elements:** All the joist bays are annotated showing joist types at the correct on center spacing. These tags should be shown as a beam system tag.
- **Clear visual graphics:** The joists should show a symbolic offset from the framing members. All elements should display the proper lineweights. The created sheet should have no overlapping elements and each view should be at the right scale factor.

What to Submit:

- **Revit model file (.RVT)** – The full model with a complete roof framing plan. The sheet should be properly named, and all relevant views should be on the sheet.

Grading Rubric

	Advanced	Proficient	Basic	Emerging
Adjusting bearing beams	Both ends of all applicable beams are set to a -64mm offset and all joists are bearing directly on the framing.	Some beams were missed but the framing members are still bearing in the correct location.	Several beams are offset or at the wrong elevation.	None of the framing has been offset or is all offset at the wrong elevation.
Adding the correct framing	The applicable joist sizes are loaded into the model and are used appropriately in the different size bays.	The correct joists are loaded but are used inappropriately in different sized bays.	Only one joist type is loaded and used throughout.	The framing is simply wide flange beams copied from the floor below.
Using the beam system function	The beam system tool was used. All joists are spaced spanning the shortest direction with more beams. The 3D offset is at 64 mm, and all joists bear on the framing.	The beam system has been used, and the beams are spaced appropriately; however, the 3D extents have not been applied.	The beams are in the right spot, but the beam system has not been used.	The framing is simply wide flange beams copied from the floor below.
Verifying work	A named 3D view has been created focusing on a joist bay, illustrating attention is being paid to detail.	No named 3D view has been created; however, the systems are perfectly modeled.	No named 3D view has been created, and joists are misaligned.	No effort has been made to verify the roof framing.
Adding a section	A section has been created and named appropriately. The section has been dimensioned and annotated and is scaled properly.	A section has been created, but not named or dimensioned, but is scaled properly.	A section has been created but not scaled or annotated.	No section has been created.
Creating a drawing sheet	A sheet has been created called S-112 ROOF RAMING PLAN All views are added and are perfectly aligned and readable.	A sheet has been made but is not named. All views are on the sheet but are overlapping in some cases.	A sheet has been made but the views are at a very small scale and are overlapping. The sheet is not named.	No sheet has been created.