



ARCH 2431 BUILDING TECHNOLOGY III

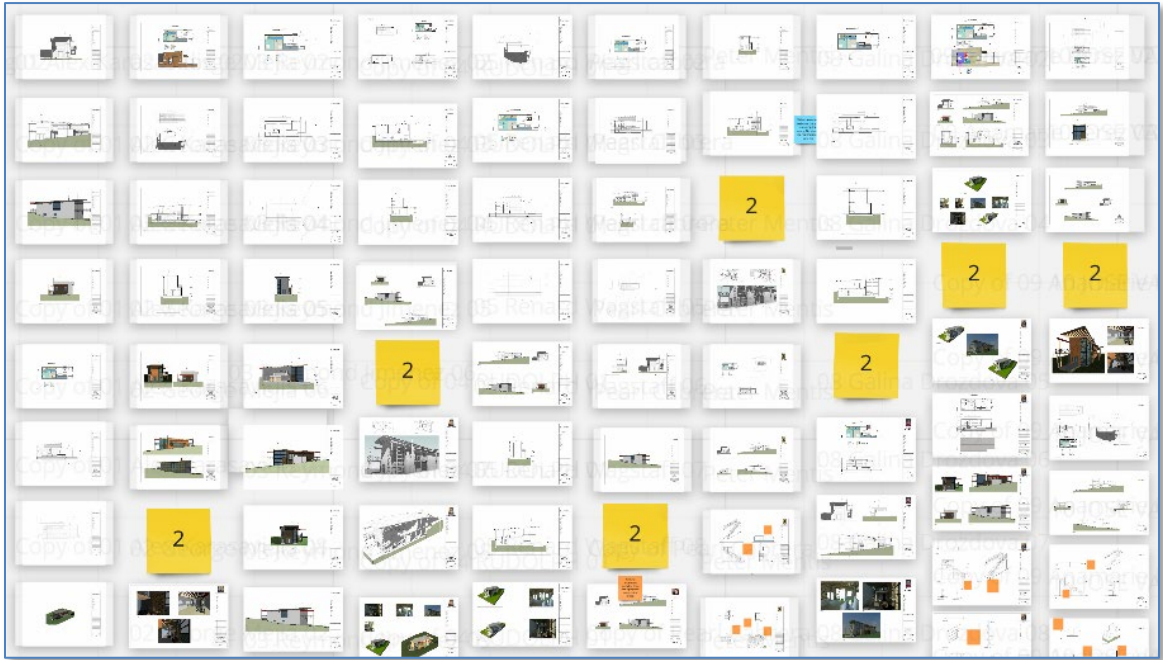
STUDIO ASSIGNMENT: STEEL CONNECTIONS

Overview:

This studio assignment will introduce you to both standard steel components used for beams and columns and to the modeling of Revit parametric families. All of the semesters Studio Assignments combined, represent 30% of your final grade. We will review Wide Flange Sections, High Strength Steel (HSS) Circular and Square Columns as well as methods of connecting these components in construction. We will build a small assembly that includes three columns with concrete footings and beams. To this we will add column base plates, concrete footings, fins and connection splice plates and diagonal bracing. We will format groups of 4 related views (plan, elevation, section and isometric) at various scales to describe the different parts of the assembly. To this we will add descriptive annotation (notes/leaders & dimensions) as well as materials designations and cross hatchings to all views. We will start this assignment with a new Revit file.

Our printed work will be reviewed in a series of class pinups using **Miro.com** or live pinup on the wall.

- **Pinup #1** – Create a new Revit project, model the Revit Families and complete the sheet layout (Sheet SC-01)
 - **Model** 4 grid lines, 3 columns & 4 beams
 - **Layout** one (1) sheet (22 x 34) with views. (Plan & 2 Elevations at 1/4" scale) 2 isometrics & 1 perspective
 - **Plot & Post** your sheet in Miro
- **Pinup #2** – Add/modify Revit Families and re-plot your first sheet
 - **Model** baseplates for each of the three columns with holes for connection to a concrete footing.
 - **Plot & Post** your sheet (SC-01) in Miro
- **Pinup #3** – Add the concrete footing and create a second sheet with details
 - **Model** the concrete footing assembly and the concrete slab.
 - **Layout** your sheet (SC-01) and create a second sheet (SC-01) with footing connection details –
 - add 4 coordinated views of the footing (plan, elevation, section at 3/4" scale & isometric)
 - add 4 additional coordinated views of a bolt connection at 1 1/2" scale
 - add annotation as needed (notes/leaders & dimensions) and materials designations
 - **Plot & Post** both sheets in Miro
- **Pinup #4** – Add fins and splice plates – add a joist with a notch
 - **Model** fins and splice plates and align them in the drawing. Add a joist with a notched top.
 - **Layout** your sheets (SC-01 & SC-02) showing changes- add new details. Add new sheets as needed.
 - add 4 coordinated views a typical fins and splice plate (3/4" scale)
 - add 4 coordinated views of the notched joist (3/4" scale)
 - add annotation as needed (notes/leaders & dimensions) and materials designations
 - **Plot & Post** additional sheets as needed and post all sheets in Miro
- **Pinup #5** – Add diagonal bracing
 - **Model** diagonal bracing and connection plates.
 - **Layout** your sheets again showing the changes- add new details as necessary.
 - add 4 coordinated views showing the diagonal bracing (3/4" or 1 1/2" scale)
 - add additional views to sheets as needed
 - add annotation as needed (notes/leaders & dimensions) and materials designations
 - **Plot & Post** all sheets in Miro for final review



Sample Miro.com Pinup Board

Grading & Rubric:

- **Grading:** Pinups # 1, #2, #3 & #4 will be given a preliminary grades (A/B/C/D). Pinup #5 will be given a final grade and will count most toward your overall semester grade.
- **Rubric:** Assignments will be graded on the following criteria. Additional criteria may be given during discussions.
 - Completeness of submission & deadlines. Proper file name, sheet name/number and format of titleblock
 - Good sheet layout & appropriate views. Coordinated sets of four (4) views are best. (Plan, two Elevations or an Elevation & Section and an Isometric). Scales for the group of four typically match.
 - Annotation & appropriate scale of views. Use a scale that clearly represents the information and allows for proper annotation to be added including, hatch patterns, detail items, notes/leaders & dimensions.
 - Formatting and organization – Are the sheets laid out well, organized and numbered properly? Do views align, is there limited wasted (white) space? Are detail views numbered sequentially?
 - Level of detail – Do the studies show enough to explain the construction? This requires that drawings exist at multiple scales ($\frac{1}{2}''$ or $\frac{3}{4}''$) with a second set of callout details at larger scales. (1 $\frac{1}{2}''$, 3'' or 6'')
 - Demonstration of the mastery of the Revit software. Good control over views, proper organization of project browser, creation and organization of sheets with title blocks, proper printing to PDF, etc.
 - Oral Presentation – Students ability to describe what has been drawn.

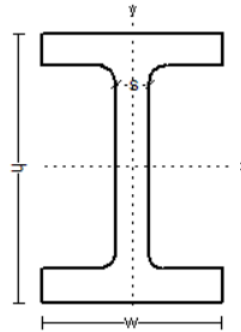
Archive Submission:

- In addition to class Miro pinup boards, each student will need to post the completed final assignment in blackboard. For this submission, you must combine the individual PDF files into a single PDF and then upload this to the proper directory in blackboard. You must also include your Revit file. All of your Revit family files are embedded in your main project file and should not be uploaded as part of this submission.
- Failure to submit the archive file on a timely basis may lower your grade.
 - **Pinup #5** – Final pinup of steel connections assembly

Reference Materials:

American Wide Flange Beams - W Beam

Dimensions of American Wide Flange Beams ASTM A6 - Imperial units



Properties in imperial units of American Wide Flange Beams according ASTM A6 are indicated below.

- American Wide Flange Beams according ASTM A6 - Metric units

For the Column use W 24 x 162 and for the Beam use @ 21 x 62

Designation	Dimensions						Static Parameters			
	Depth h (in)	Width w (in)	Web Thickness t _w (in)	Flange Thickness t _f (in)	Sectional Area (in ²)	Weight (lb/ft)	I _x (in ⁴)	I _y (in ⁴)	W _x (in ³)	W _y (in ³)
W 27 x 178	27.8	14.09	0.725	1.190	52.3	178	6990	555	502	78.8
W 27 x 161	27.6	14.02	0.660	1.080	47.4	161	6280	497	455	70.9
W 27 x 146	27.4	14	0.605	0.975	42.9	146	5630	443	411	63.5
W 27 x 114	27.3	10.07	0.570	0.930	33.5	114	4090	159	299	31.5
W 27 x 102	27.1	10.02	0.515	0.830	30.0	102	3620	139	267	27.8
W 27 x 94	26.9	10	0.490	0.745	27.7	94	3270	124	243	24.8
W 27 x 84	26.7	9.96	0.460	0.640	24.8	84	2850	106	213	21.2
W 24 x 162	25	13	0.705	1.220	47.7	162	5170	443	414	68.4
W 24 x 146	24.7	12.9	0.650	1.090	43.0	146	4580	391	371	60.5
W 24 x 131	24.5	12.9	0.605	0.960	38.5	131	4020	340	329	53.0
W 24 x 117	24.3	12.8	0.55	0.850	34.4	117	3540	297	291	46.5
W 24 x 104	24.1	12.75	0.500	0.750	30.6	104	3100	259	258	40.7
W 24 x 94	24.1	9.07	0.515	0.875	27.7	94	2700	109	222	24.0
W 24 x 84	24.1	9.02	0.470	0.770	24.7	84	2370	94.4	196	20.9
W 24 x 76	23.9	9	0.440	0.680	22.4	76	2100	82.5	176	18.4
W 24 x 68	23.7	8.97	0.415	0.585	20.1	68	1830	70.4	154	15.7
W 24 x 62	23.7	7.04	0.430	0.590	18.2	62	1550	34.5	131	9.8
W 24 x 55	23.6	7.01	0.395	0.505	16.2	55	1350	29.1	114	8.3
W 21 x 147	22.1	12.51	0.720	1.150	43.2	147	3630	376	329	60.1
W 21 x 132	21.8	12.44	0.650	1.035	38.8	132	3220	333	295	53.5
W 21 x 122	21.7	12.39	0.600	0.960	35.9	122	2960	305	273	49.2
W 21 x 111	21.5	12.34	0.550	0.875	32.7	111	2670	274	249	44.5
W 21 x 101	21.4	12.29	0.500	0.800	29.8	101	2420	248	227	40.3
W 21 x 93	21.6	8.42	0.580	0.930	27.3	93	2070	92.9	192	22.1
W 21 x 83	21.4	8.36	0.515	0.835	24.3	83	1830	81.4	171	19.5
W 21 x 73	21.2	8.3	0.455	0.740	21.5	73	1600	70.6	151	17.0
W 21 x 68	21.1	8.27	0.430	0.685	20.0	68	1480	64.7	140	15.7
W 21 x 62	21	8.24	0.400	0.615	18.3	62	1330	57.5	127	13.9
W 21 x 57	21.1	6.56	0.405	0.650	16.7	57	1170	30.6	111	9.4
W 21 x 50	20.8	6.53	0.380	0.535	14.7	50	984	24.9	94.5	7.6
W 21 x 44	20.7	6.5	0.350	0.450	13.0	44	843	20.7	81.6	6.4

Sources of Information:

- https://www.engineeringtoolbox.com/american-wide-flange-steel-beams-d_1319.html
- Additional Reference for steel components: <http://products.anssteel.com/category/steel/>