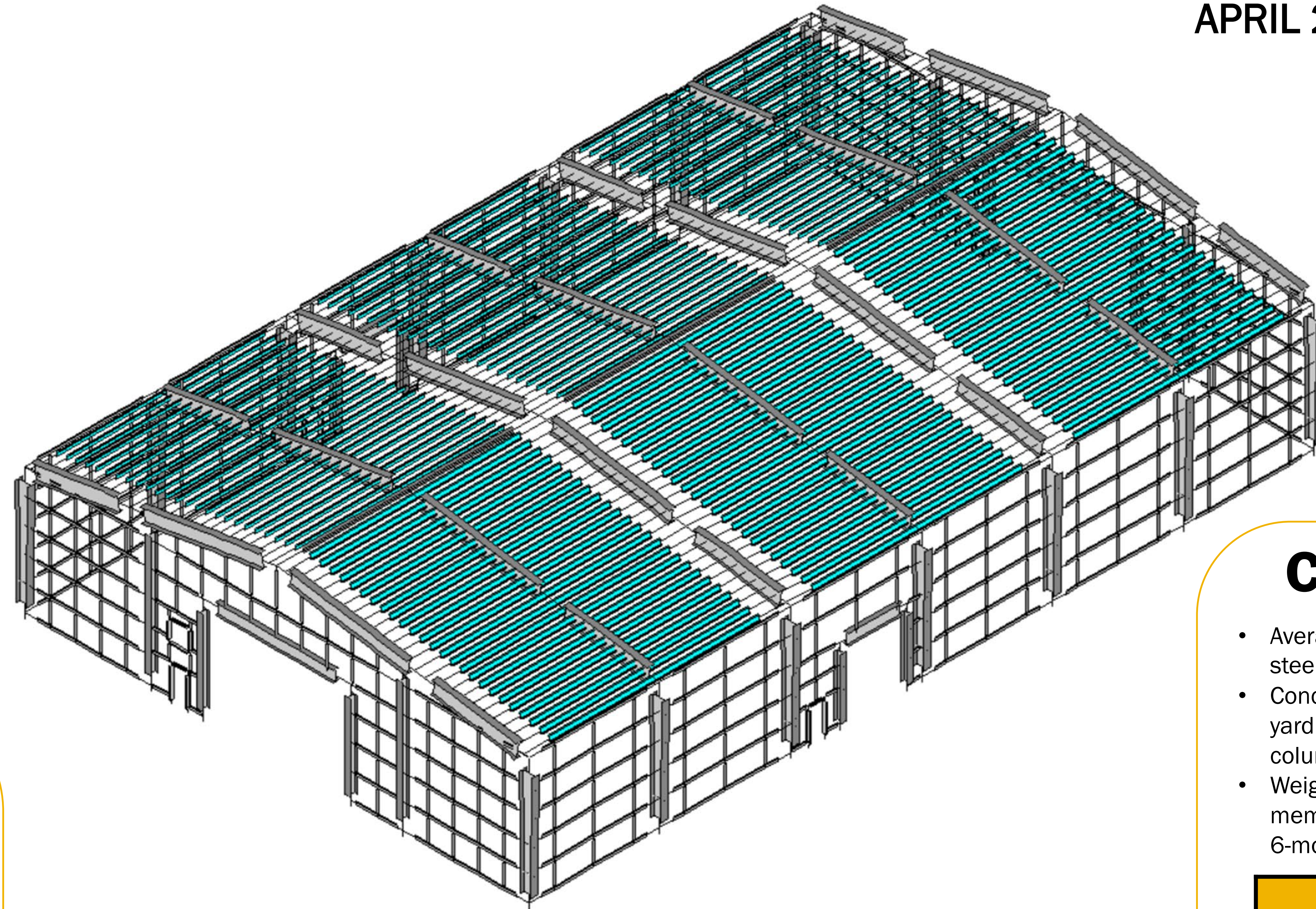
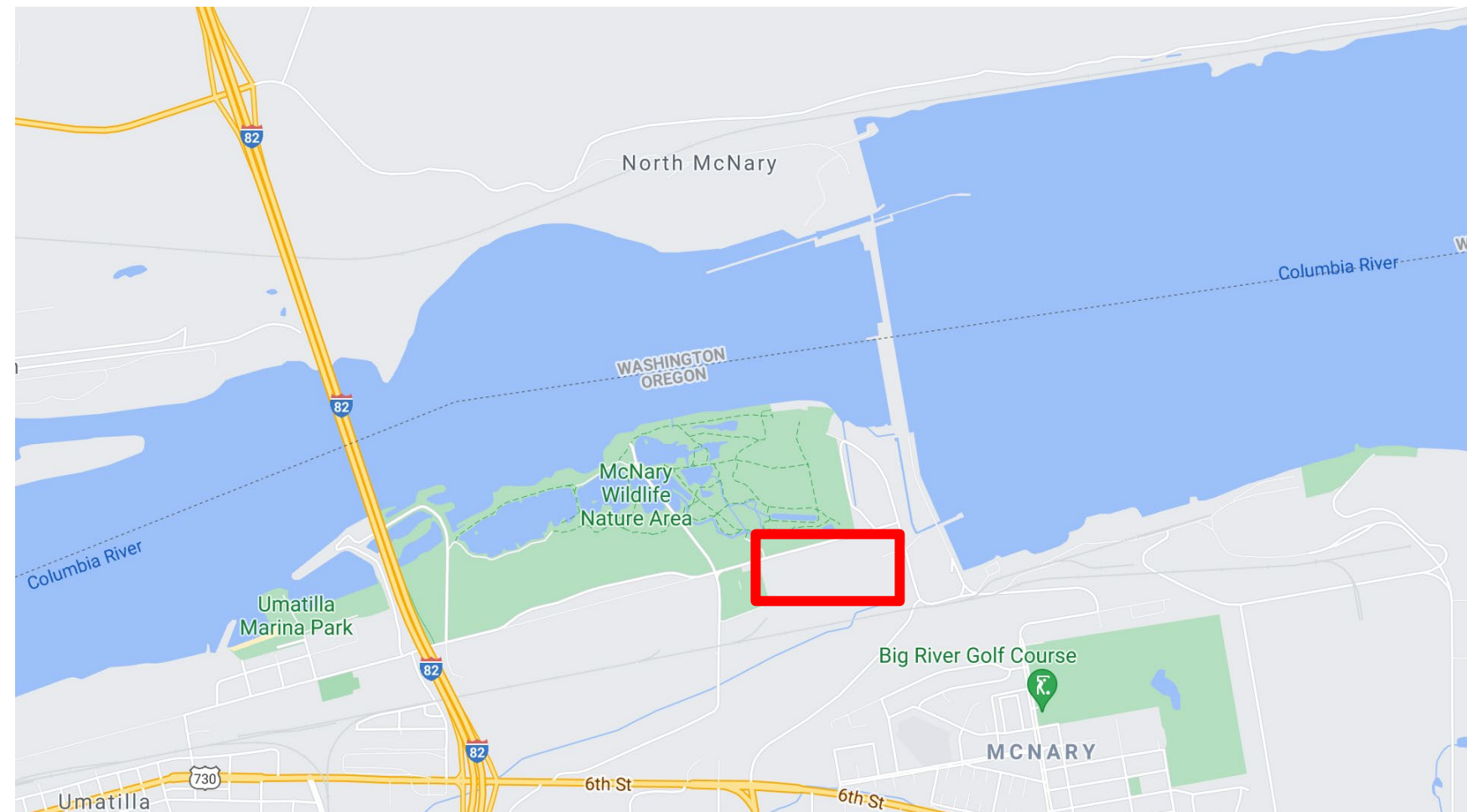


BACKGROUND

There is a need for a steel warehouse at the McNary Dam to allow temporary housing and maintenance of the dam turbines and their components. The focus of our project is to design the steel framed warehouse and its foundation.



AARON CROCKETT
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LOAD DETERMINATION

The first step in the design process is to determine the loads acting on the structure by utilizing the ASCE 7-16, the ATC Hazards tool, as well as information provided by the USACE.

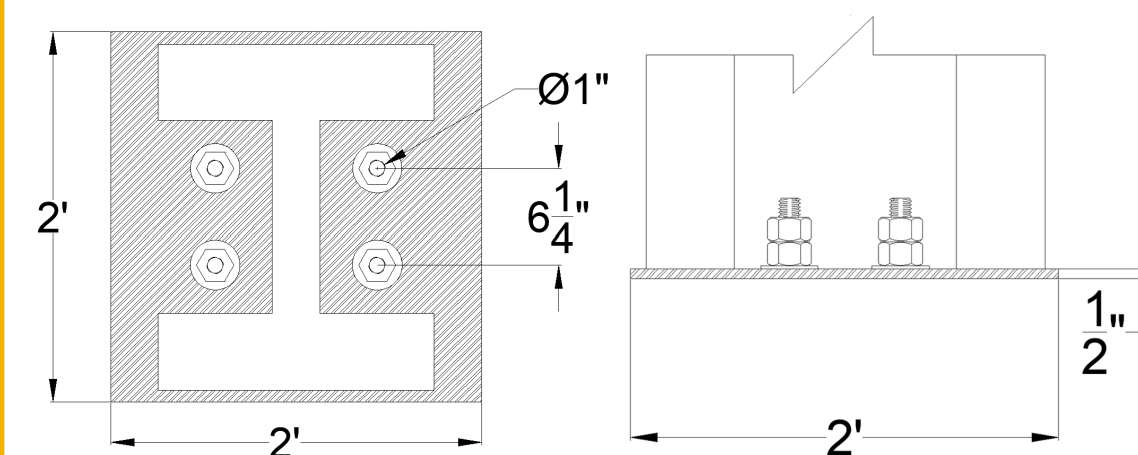
Load Type	Magnitude
Dead Load	931,000 pounds
Wind Load	30 – 80 pounds per square foot
Live Load	300 pounds
Snow Load	30 pounds per square foot

After determining the loads acting on the structure using the LRFD method, the most conservative load combination was chosen.

$$1.2 * D + W + L + 0.5 * S$$

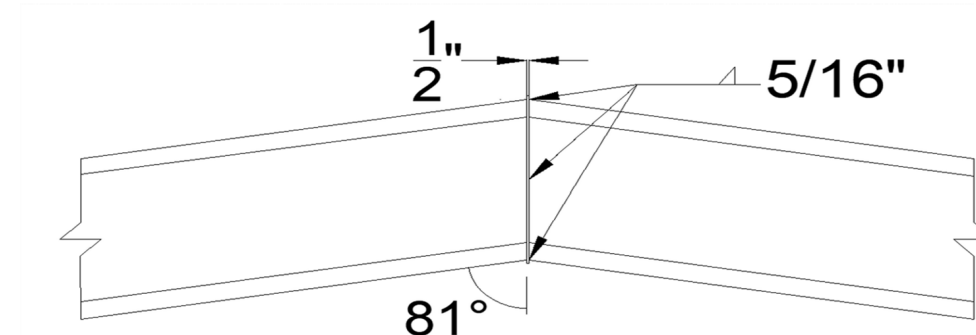
- D = Dead load**
 - Involves the steel members and any other permanent construction material
- W = Wind Load**
 - Varies based on location of the structure, the highest magnitude being at the corners and the lowest magnitude at the center of the roof
- L = Live Load**
 - Used to simulate the weight of construction workers and equipment on the structure
- S = Snow Load**
 - Represents the load due to snow accumulation on the roof

STEEL DESIGN



The columns are connected to the foundation by a bolted base plate, shown above in a top and side view.

- Top-down approach** to size the straight and tapered steel members as previous sections were completed
- Deflection < L/180 and <W/360**, for members and door framing respectively
- RISA 3D** to model the structure above



The rafters are connected at the apex of the structure by a series of 5/16" fillet welds shown above in a side view.

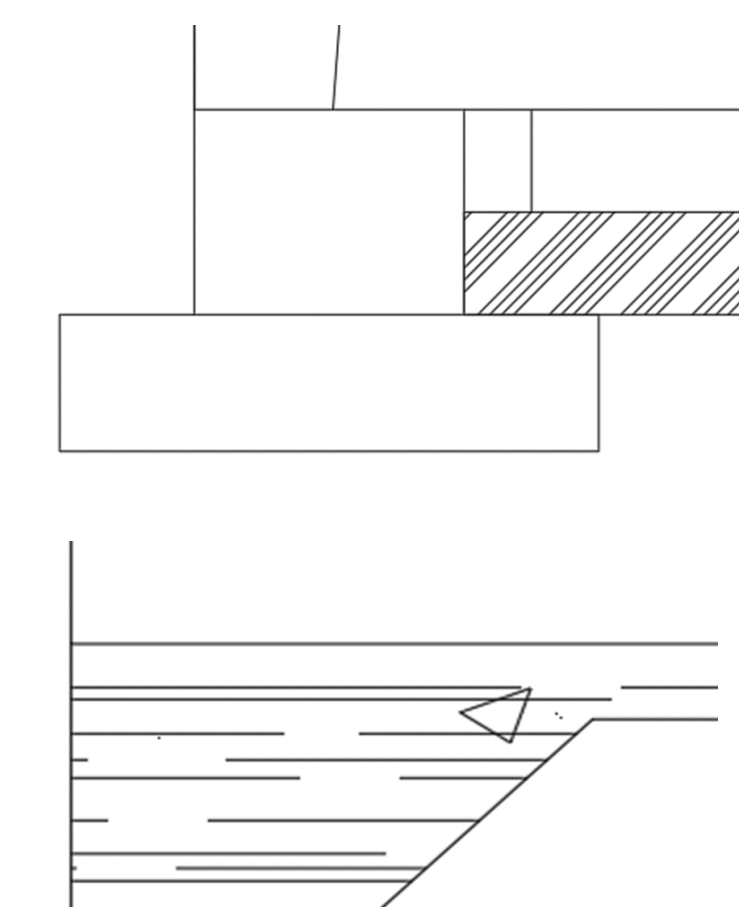
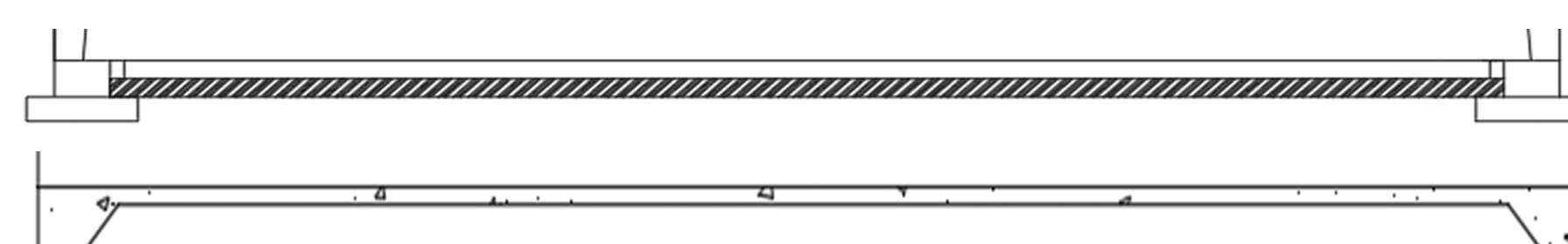
COST ANALYSIS

- Average cost of hot rolled and cold formed steel per ton
- Concrete costs were calculated by \$380/cubic yard for slabs and \$1030/cubic yard for columns
- Weighted average of paying each crew member \$48/hour on a 10-person crew over a 6-month construction period

Cost Type	Estimated Cost
Steel Components	\$545,000
Foundation Materials	\$516,000
Labor Costs	\$500,000
ESTIMATED TOTAL	\$1,561,000

FOUNDATION DESIGN

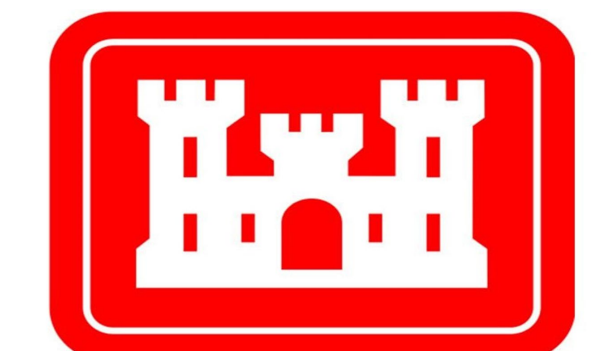
- Minimum required concrete compressive strength of 4,000 psi
- Reinforcing steel bars of sizes #4 and #5 throughout the foundation
- Two types of foundations
 - Tie-beam connection between the structure columns
 - Thickened haunch edge on the perimeter of the building
- 7.5-foot square footings under each column
- Concrete slabs will consist of doveled joints to limit stress fractures



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