



Harvard Museum of Comparative Zoology

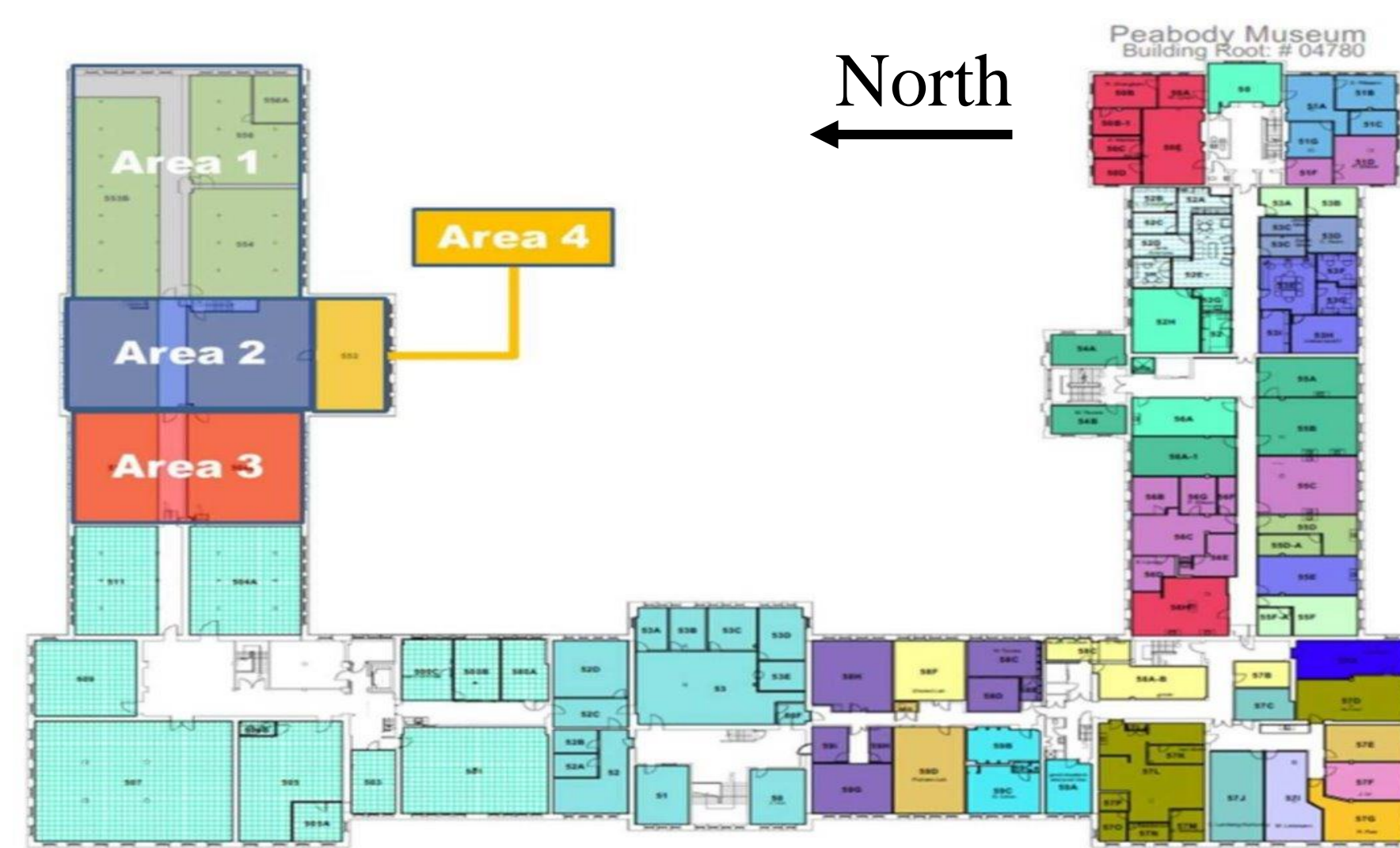
Caleb Chinburg, Connor Deming, Payton Maddaloni, Susan Strickland

Department of Civil and Environmental Engineering, University of New Hampshire, Durham, NH 03824



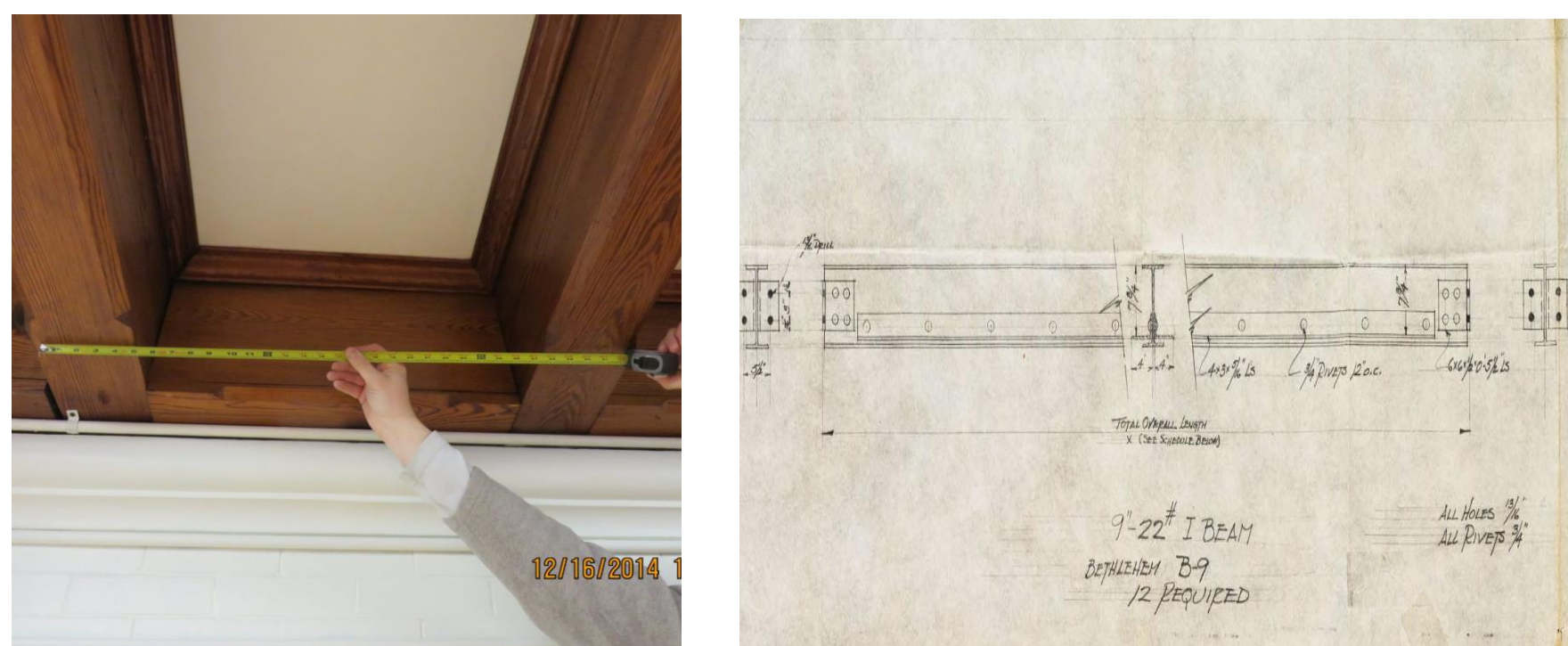
Background

- The Harvard Museum of Comparative Zoology was constructed over different periods of time throughout the 19th and early 20th century
- Each area possesses a different structural system with varied materials that reflect the period in which they were constructed
- The client has concerns regarding load capacity for storage of materials on the fifth floor of the museum
- Information on Areas 1 through 4 (shown below) was provided



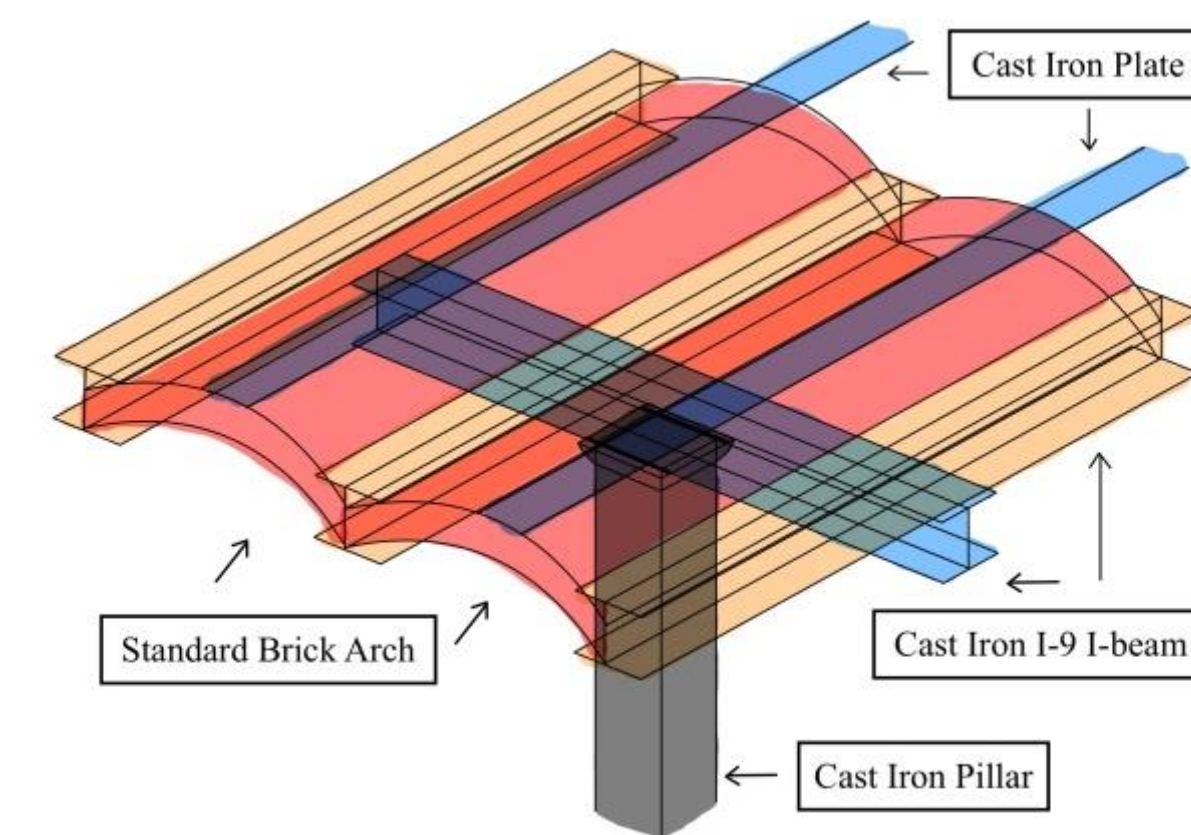
Initial Area Analysis

- A virtual site tour was given, including limited pictures of all four areas
- Original design plans were provided for some areas
- Dimensions were taken from footnotes and scaled from plans and images



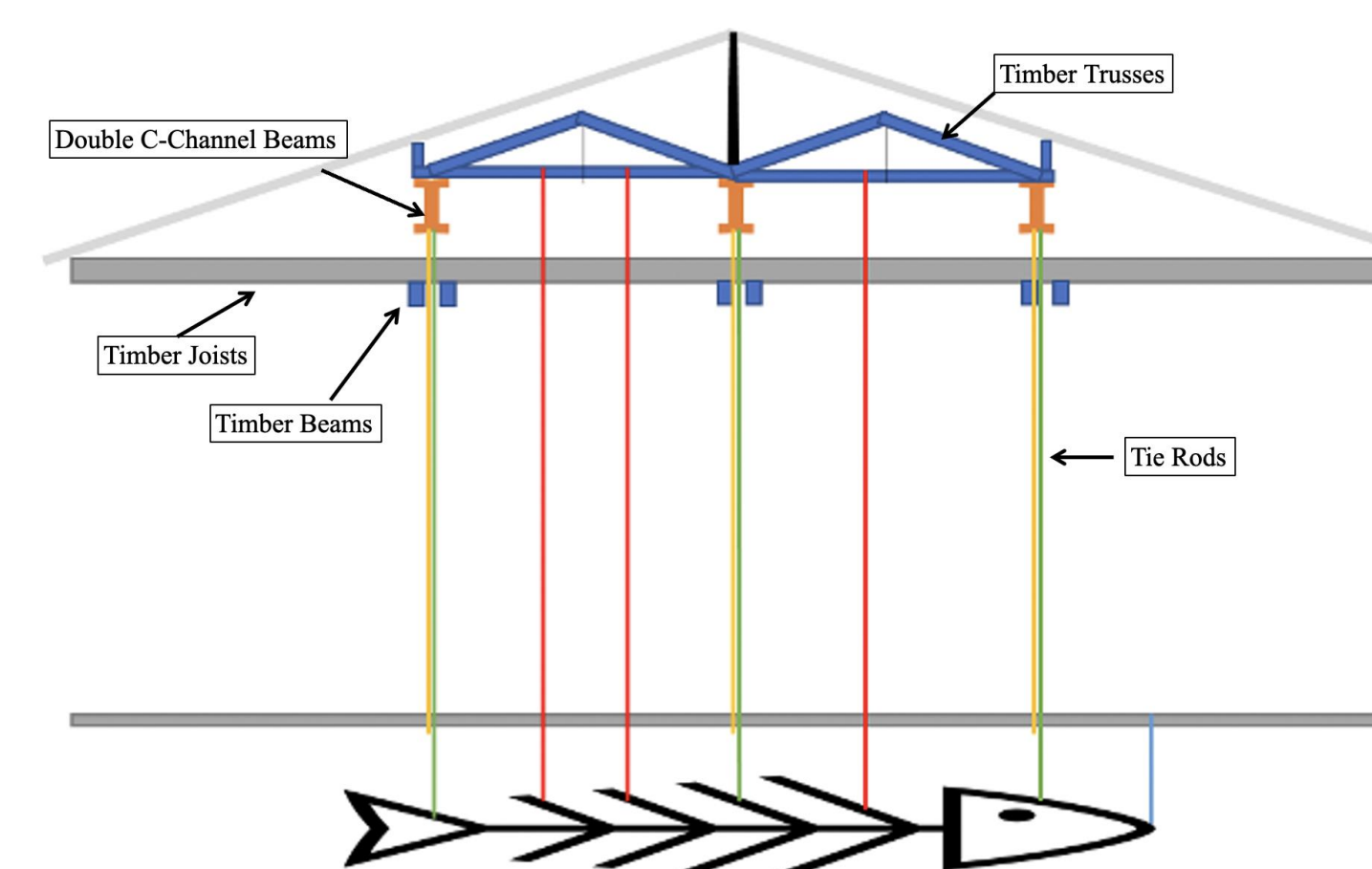
Area 1

- Fifth floor is supported by two different support systems
- North half is supported by a timber frame system
- South half is supported by a combination of brick archways and steel beams



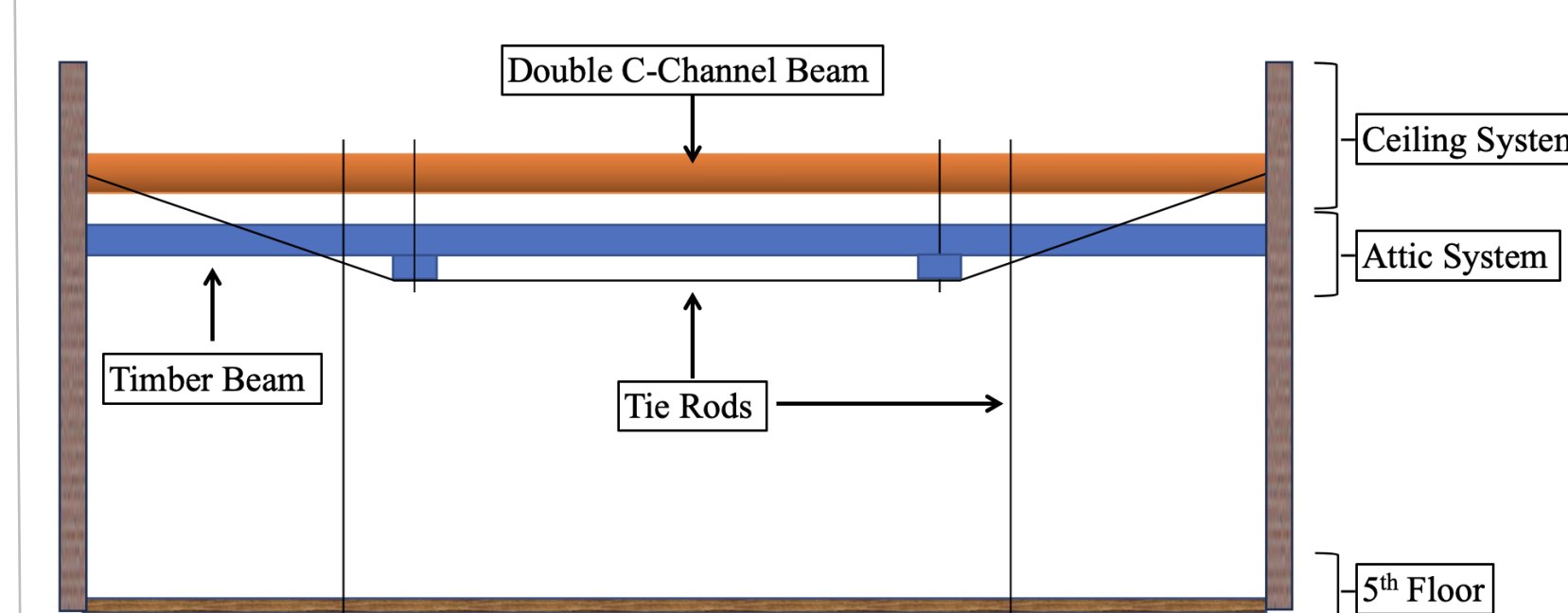
Area 2

- Fifth floor is hung from the attic with tie rods
- Double C-Channels in the attic support the floor and ceiling members
- A wooden truss system in the attic space serves to support whales that hang under the fifth floor



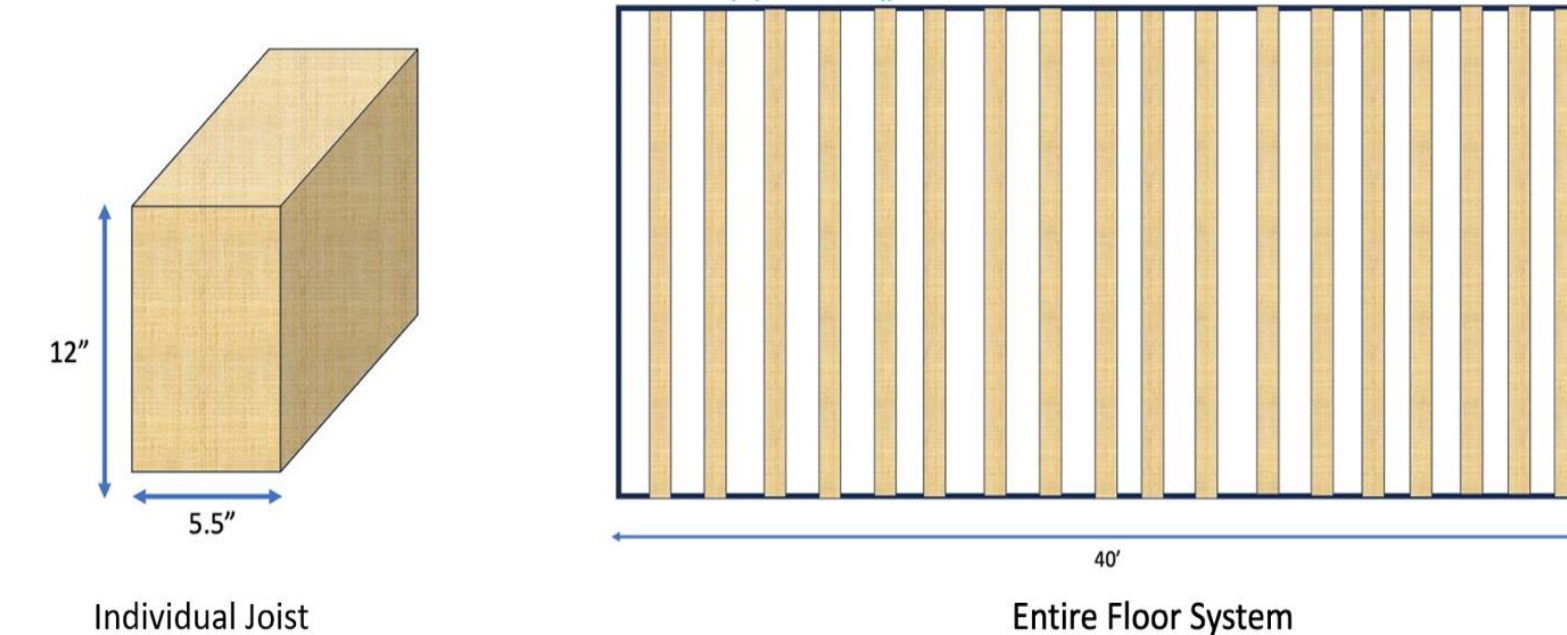
Area 3

- With limited plans and pictures available it was assumed that Area 3 has a similar structural system to Area 2
- There were no whales to account for in this area and therefore no attic truss system
- A load-bearing brick wall cuts this area in half, taking on some of the load from the fifth floor



Area 4

- Constructed with a simple span, timber joist system
- Using plans from Area 2 the width of the room was determined
- Timber floor system and dimensions were then calculated



Results

- Timber members were assumed to be Southern White Pine #2 Dense, based on historical research
- Other materials were assumed to be cast iron and wrought iron
- Calculations were performed to determine the additional available live load capacity that can be used for specimen and file storage
- Using hand calculations, each member was checked for their moment, shear, and deflection capacities to compare against the applied loads
- An attic floor live load was taken from IBC Code: #25 residential
- The loads applied to the system were split into dead loads and occupancy live loads, the remaining capacity was considered the additional available live load which can be used for storage

Area	Dead Load (psf)	Floor Live Load (psf)	Additional Available Load (psf)
One (North)	14	20	26
One (South)	56	20	34
Two	19	20	33
Three	19	20	33
Four	11	20	47

Conclusions

- After analyzing each of the areas, it was determined that there is additional capacity in each area
- The amount of additional capacity varied from 26 to 47 psf
- Depending on the additional capacity needs of the clients, some areas may need to have a retrofit designed to strengthen the system