

WHITE BEAR LAKE HS RENOVATIONS AND ADDITIONS

MNSEA Presentation

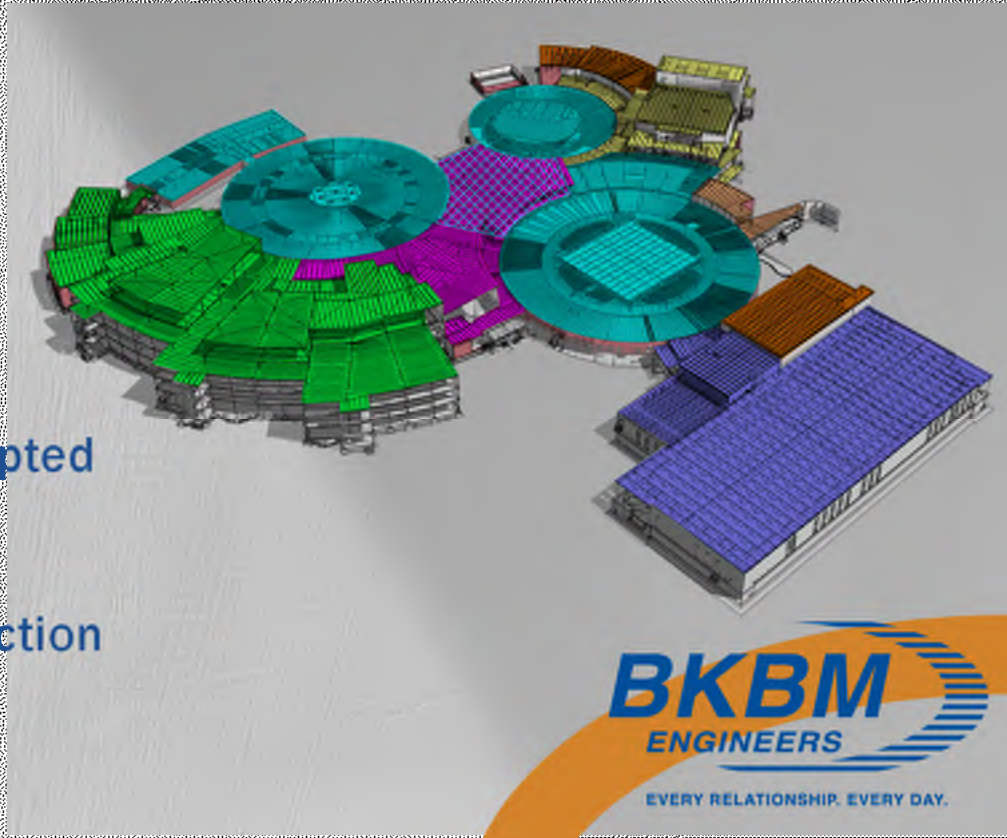
May 10, 2022

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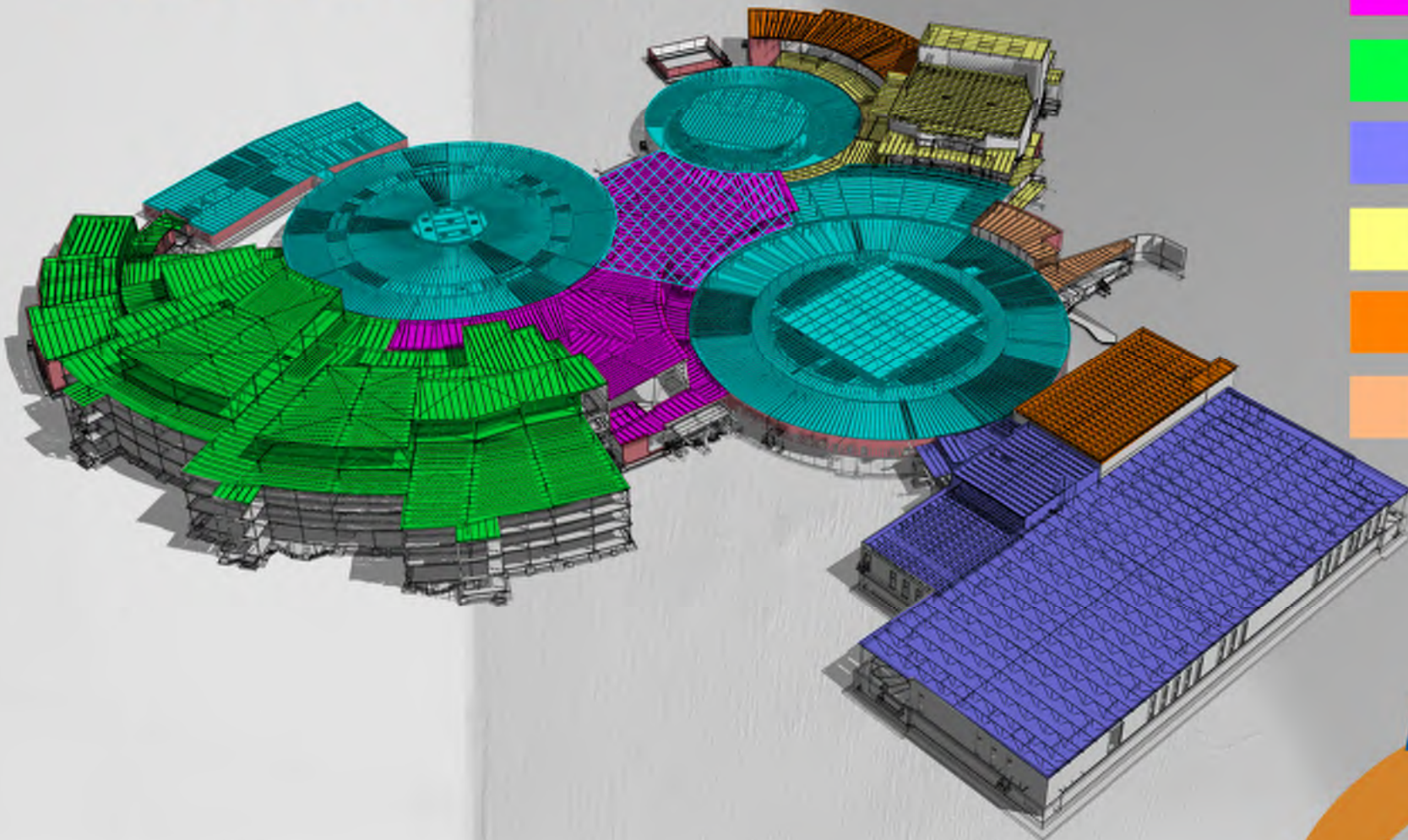
EVERY RELATIONSHIP. EVERY DAY.

PROJECT INFORMATION

- Upon completion, among the largest high schools in MN
- \$150M project construction cost
- 285,000 sqft of renovations
- 375,000 sqft of new construction
- Design: Jan 2020 – April 2021
 - Nearly all WFH
 - New MN Building Code, ICC 500 adopted
- Construction June 2021-Fall 2024
 - School remains open during construction



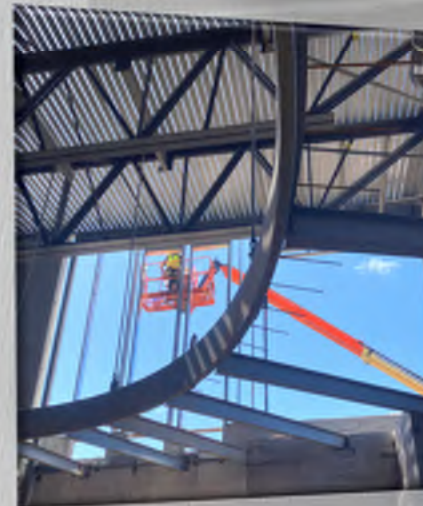
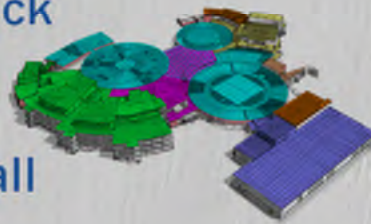
PROJECT INTRODUCTION



- EXISTING
- COMMONS
- CLASSROOMS
- ATHELETICS
- AUDITORIUM, ETC.
- STORM SHELTERS
- RECEIVING

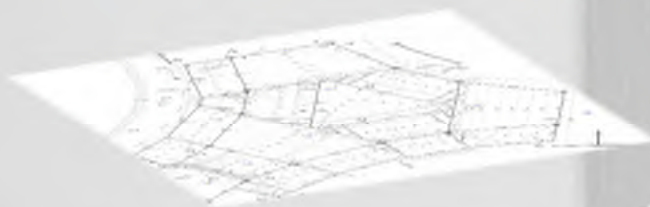
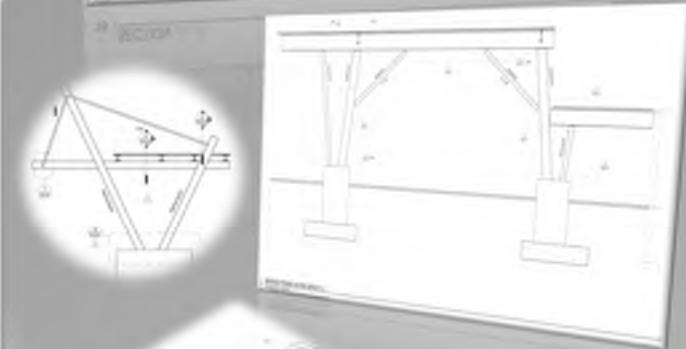
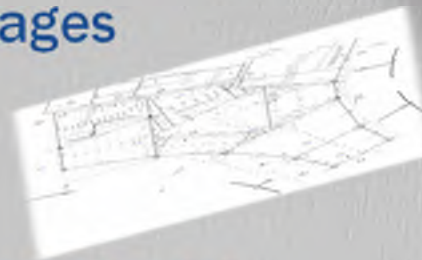
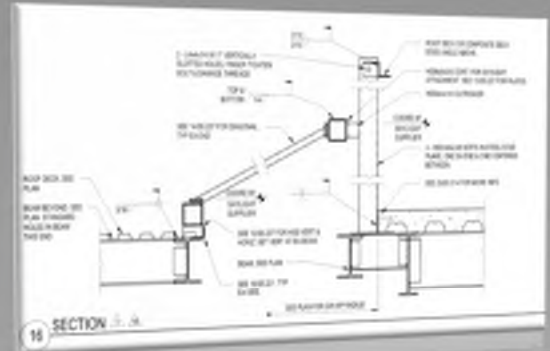
NOTEWORTHY FEATURES

- Classroom tower
 - Long span floors (45')
 - Curves, angles, undulating brick support
- Athletics
 - 128' long span joists
 - Hanging running track
- Auditorium
 - Staying under 50' tall
- Existing
 - Column removal at 100' trusses
 - Concrete strengthening



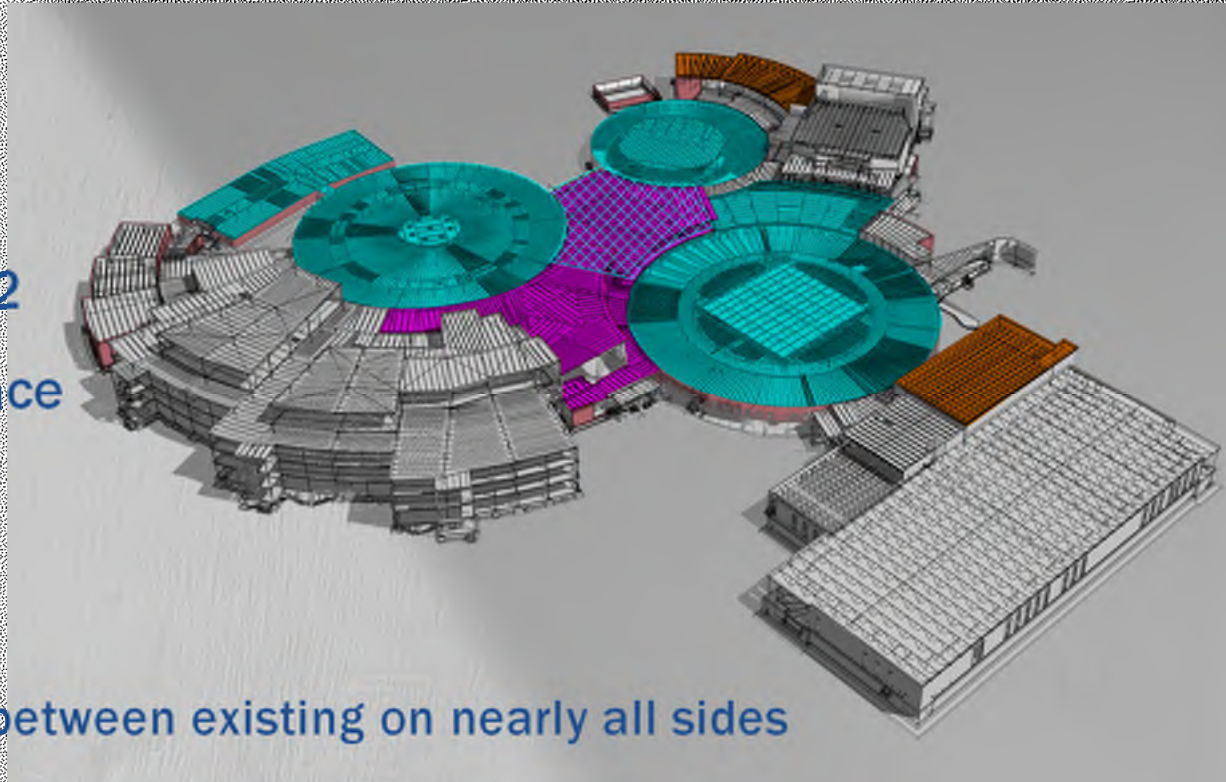
NOTEWORTHY FEATURES

- Modeled entire existing (and new) structure
- Drawing set: 100 pages
 - 66 plan sheets
 - 427 Details
 - Approximately 80 “standards”
- 51 Elevations for frames



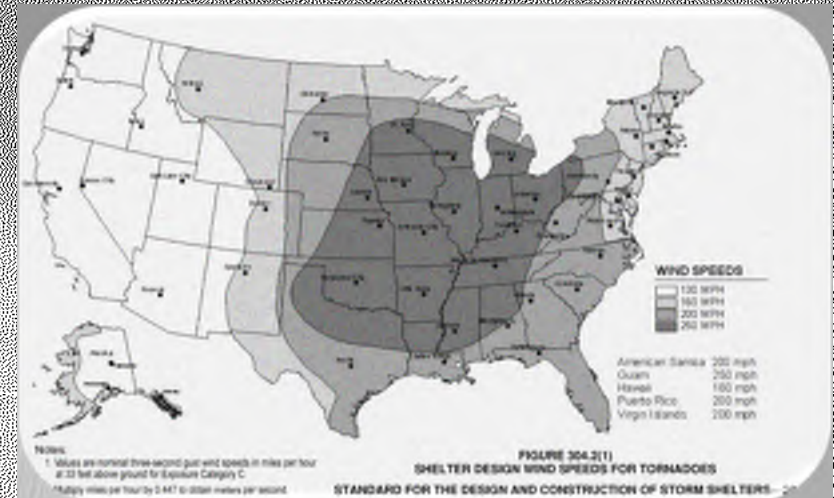
TOPICS TODAY

- ICC 500 storm shelter x2
- Elaborate commons space
 - Stepped roofs
 - Slanted columns
 - Long cantilevers
 - Radiused walls, nestled between existing on nearly all sides
- Addressing member capacities in existing building



ICC 500 STORM (TORNADO) SHELTERS

- 100 psf roof live load
- 250 mph ultimate wind speed
- $GC_{pi} = \pm 0.55$ (Partially Enclosed)
- $K_d = 1.0$ (typically 0.85)
- Exposure “C” regardless of host building exposure category
- Structurally separated from “host building” or determine “breakaway load”
- Impact/missile debris requirements



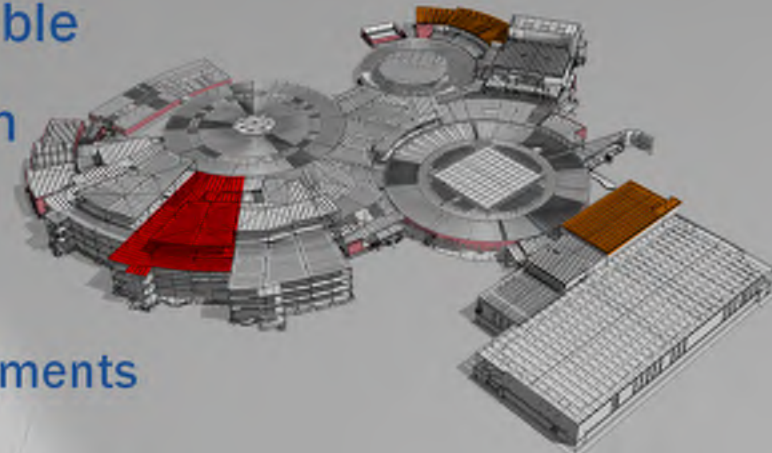
ICC 500 STORM (TORNADO) SHELTERS

- 5 square feet per standing/seated occupant – 501.1.1
- Usable square footage considerations – 501.1.2
 - Increase by 50% with “concentrated furnishings or fixed seating”
 - Increase by 35% with “unconcentrated furnishings or fixed seating”
 - Increase by 15% with “areas of open plan furnishings...”
- “Lay down, rollover and collapse hazards...” – 305.3
- Minimum 2-hour fire barrier around perimeter – 601.1
- Support systems remain online for 2+ hours – 701.1

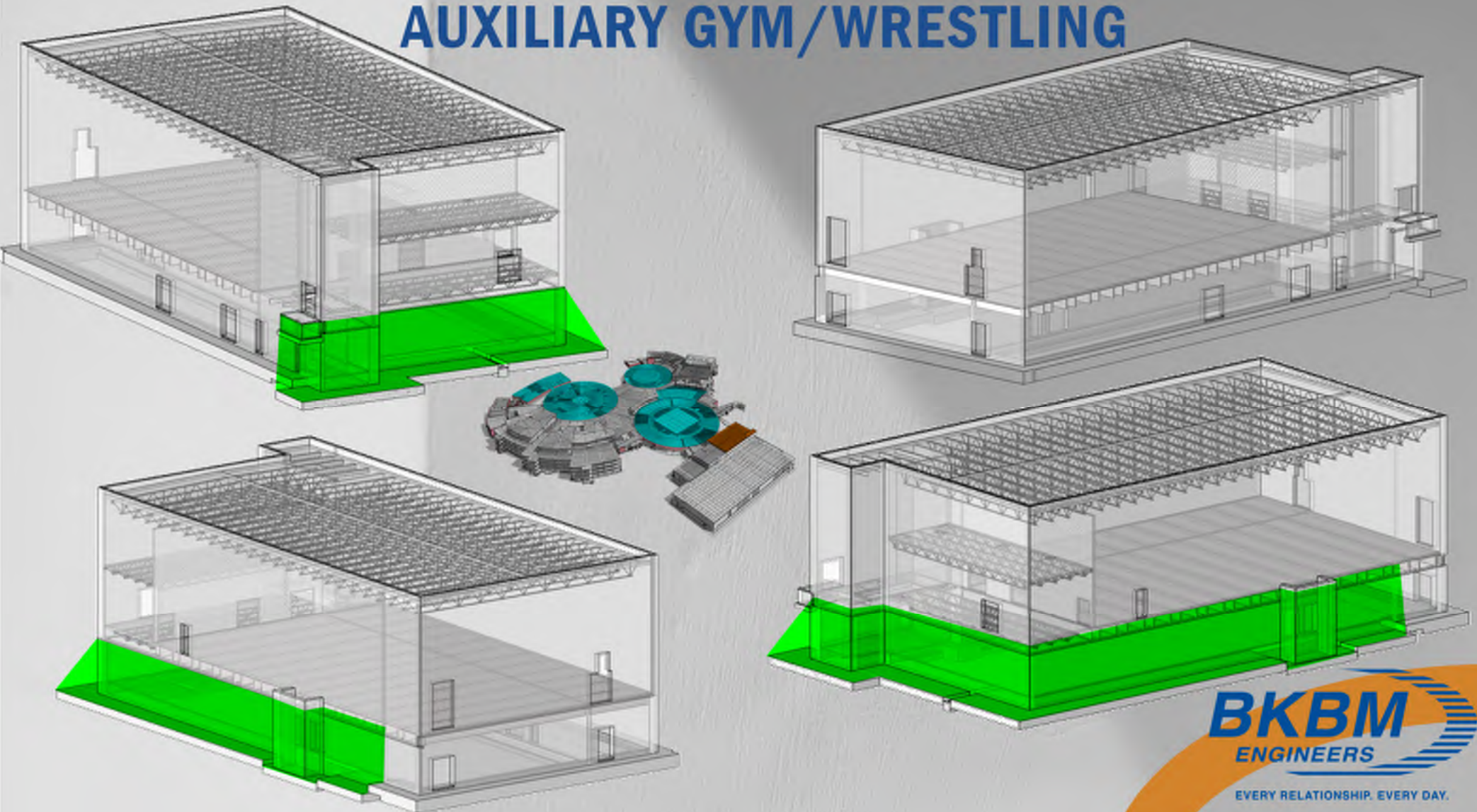


ICC 500 STORM SHELTER – LOCATION?

- All agreed conversion of existing not feasible
- Structural vote: 3-story classroom addition
 - Reduced span of walls for out-of-plane load
 - Increased dead load for sliding/overturning
 - Plenty of opportunities for interior lateral elements
- Everyone else's vote: **Gymnasium**
 - ...and band/orchestra area
 - Ease of servicing
 - Minimum amount of "excess" square footage

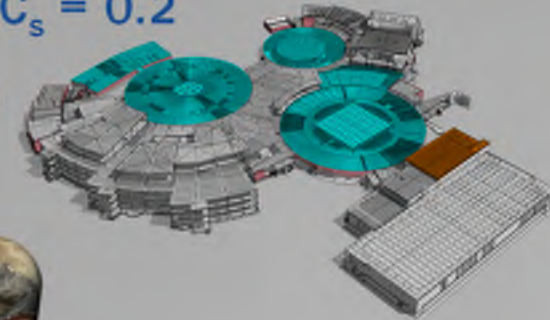


AUXILIARY GYM/WRESTLING

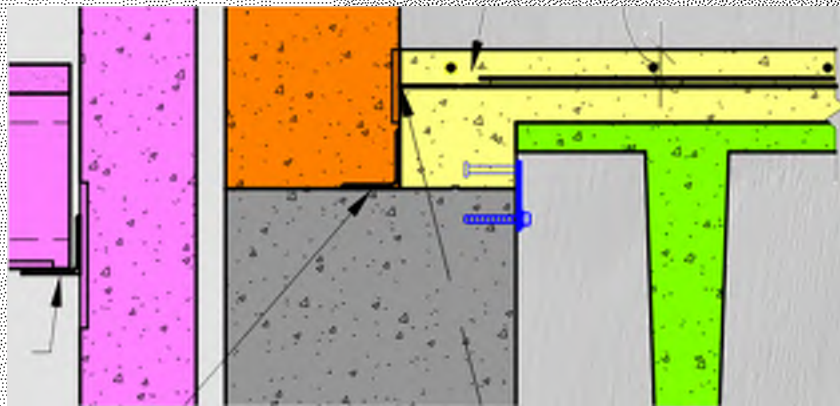
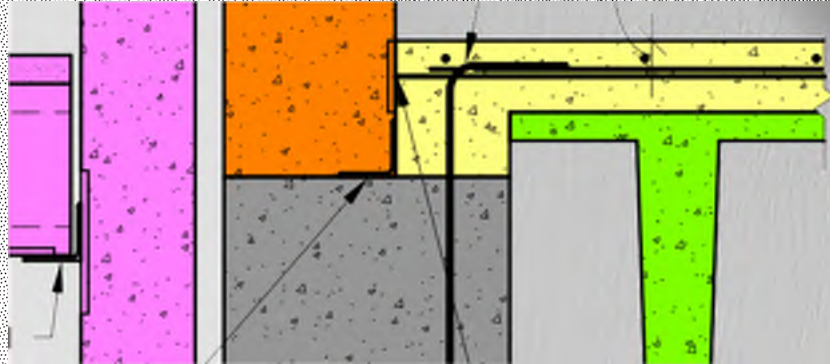
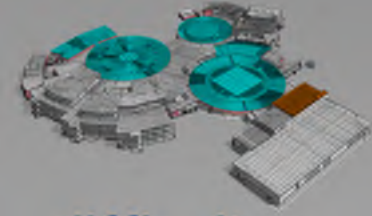


AUXILIARY GYM/WRESTLING

- Foundations reinforced to function as grade beams for overturning
- Reinforced concrete slabs at each level for diaphragm
- Base shear over 1,000 kips (strength) in N-S direction
 - Equivalent to >20% of total DL of structure – consider $C_s = 0.2$
- Helical piles installed at 10° batter (sliding, uplift)



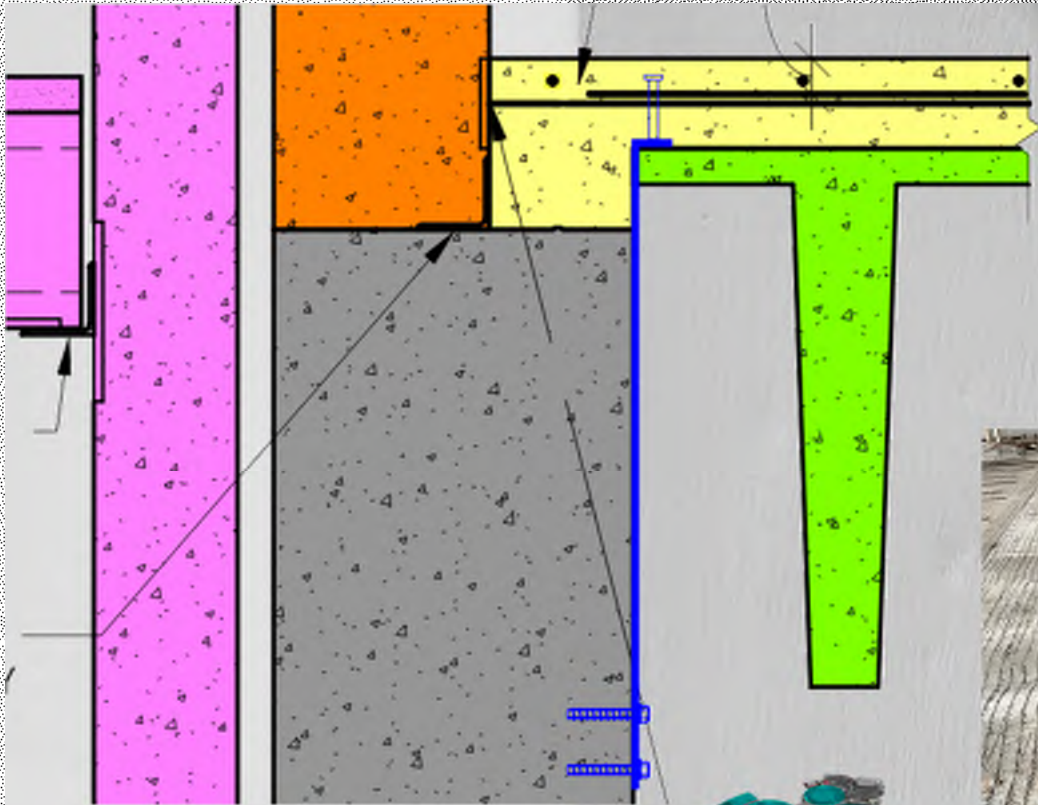
AUXILIARY GYM/WRESTLING



- Field fixes would be difficult, if not impossible
- Contractor failed to install dowels
- Failed to implement first field fix in time



AUXILIARY GYM/WRESTLING

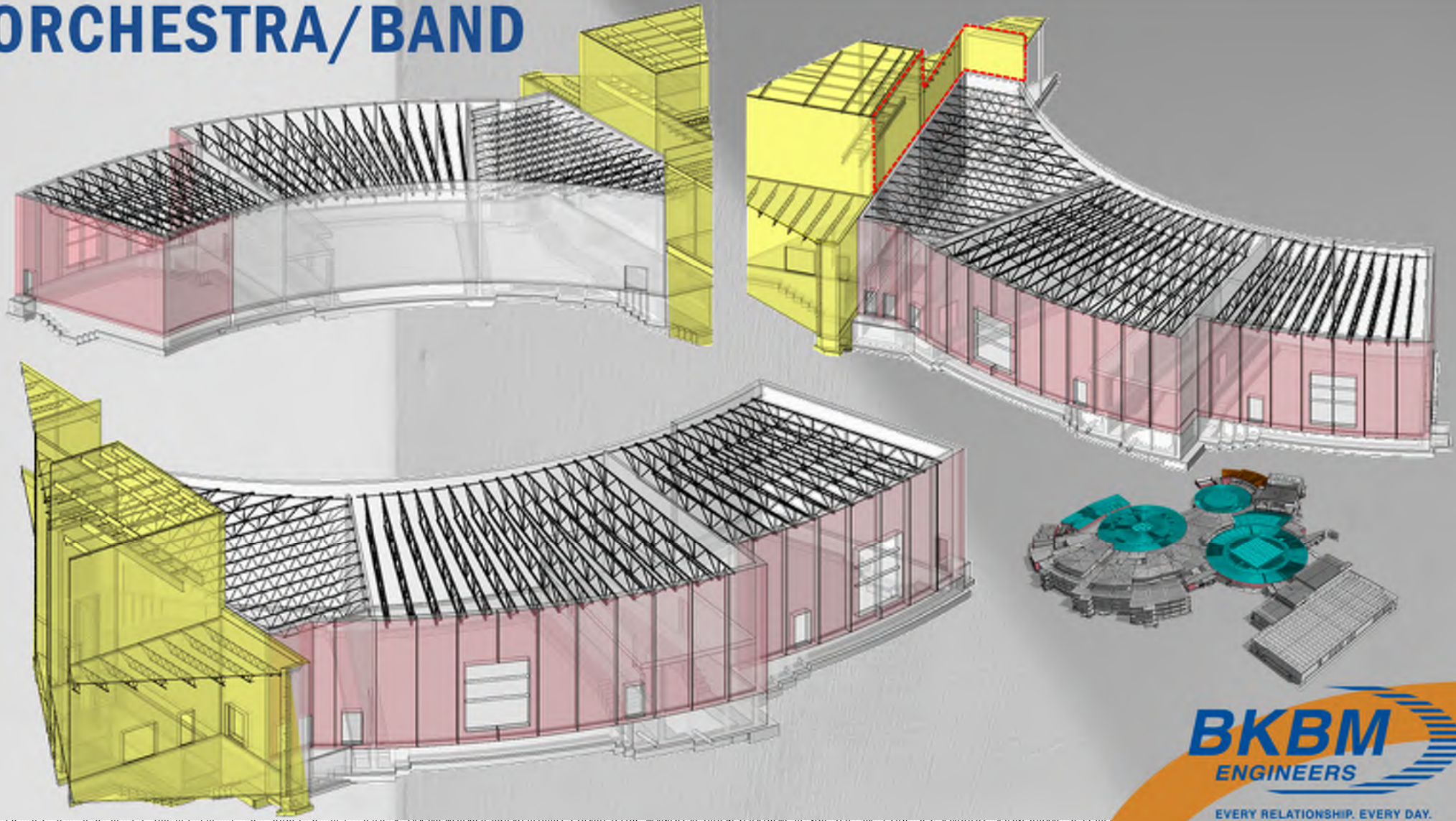


- 5/8" x 46" Plate
- 8'-0" long, cont.
- 900#/plate

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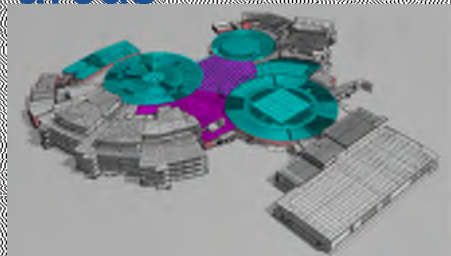
ORCHESTRA/BAND



COMMONS SPACE



- Meant to resemble sailboats at dock with masts at list
- Angles, curves, and glass
- Wedged between existing circular areas

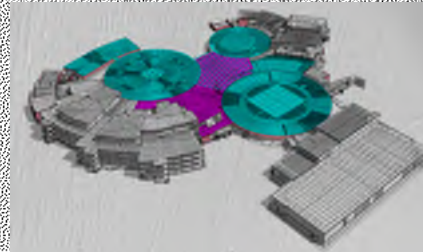
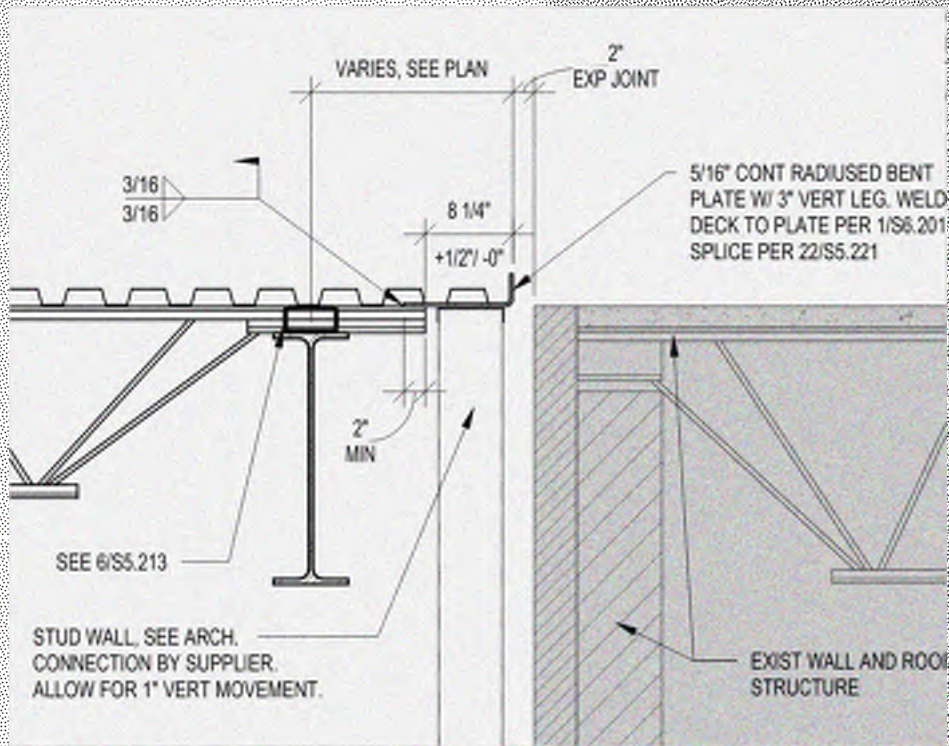


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COMMONS SPACE

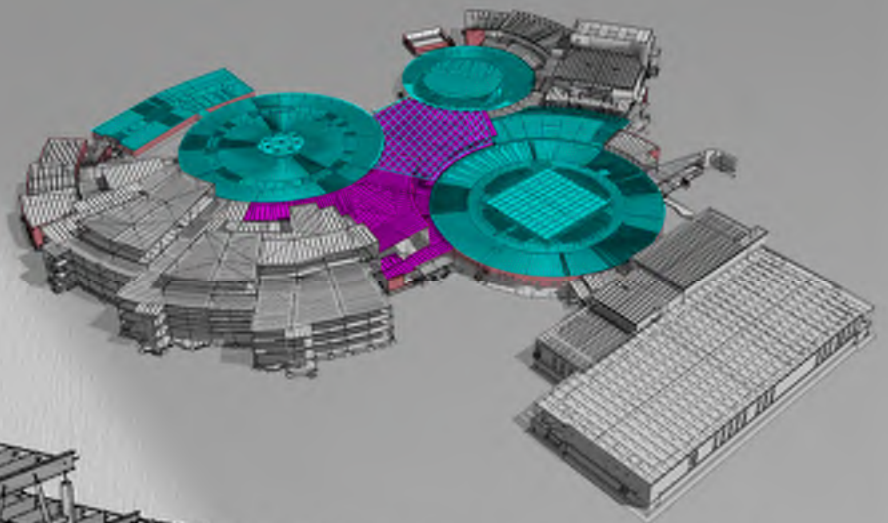
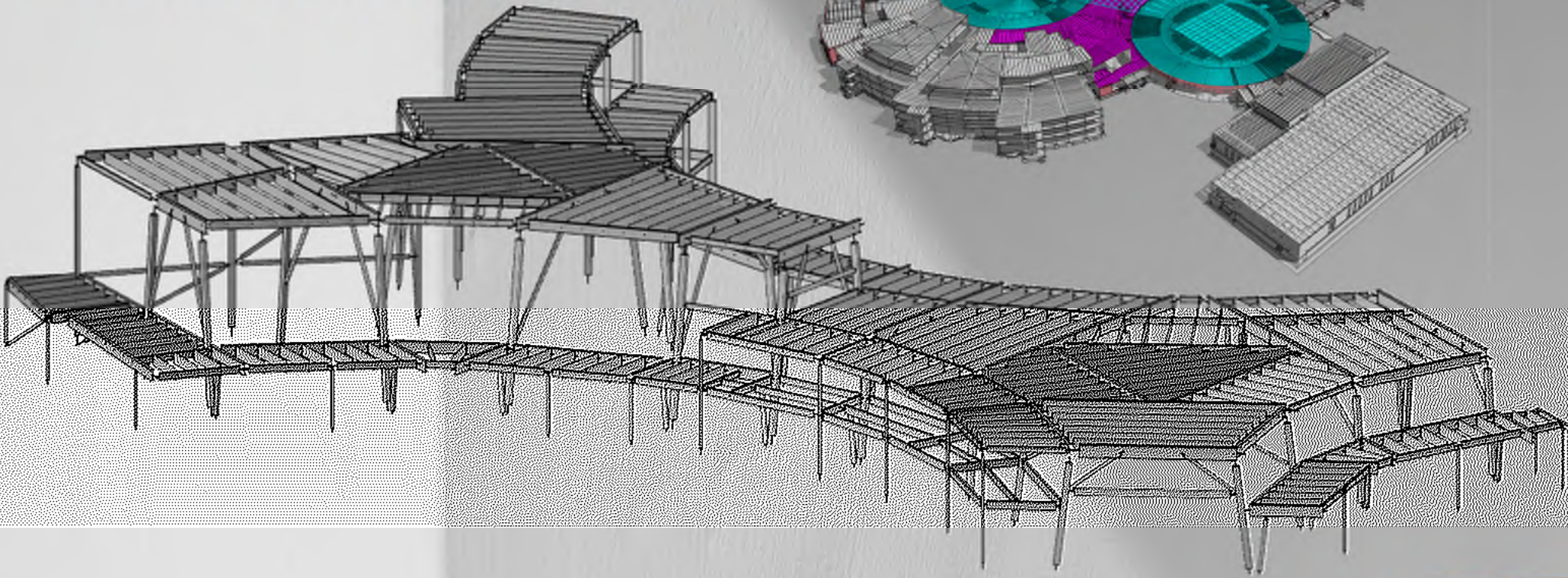
- Allowing for field tolerance was key



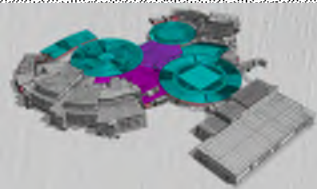
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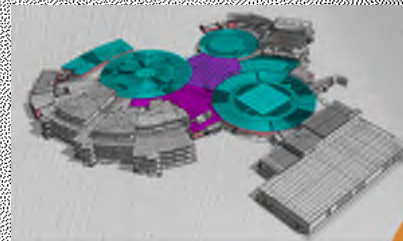
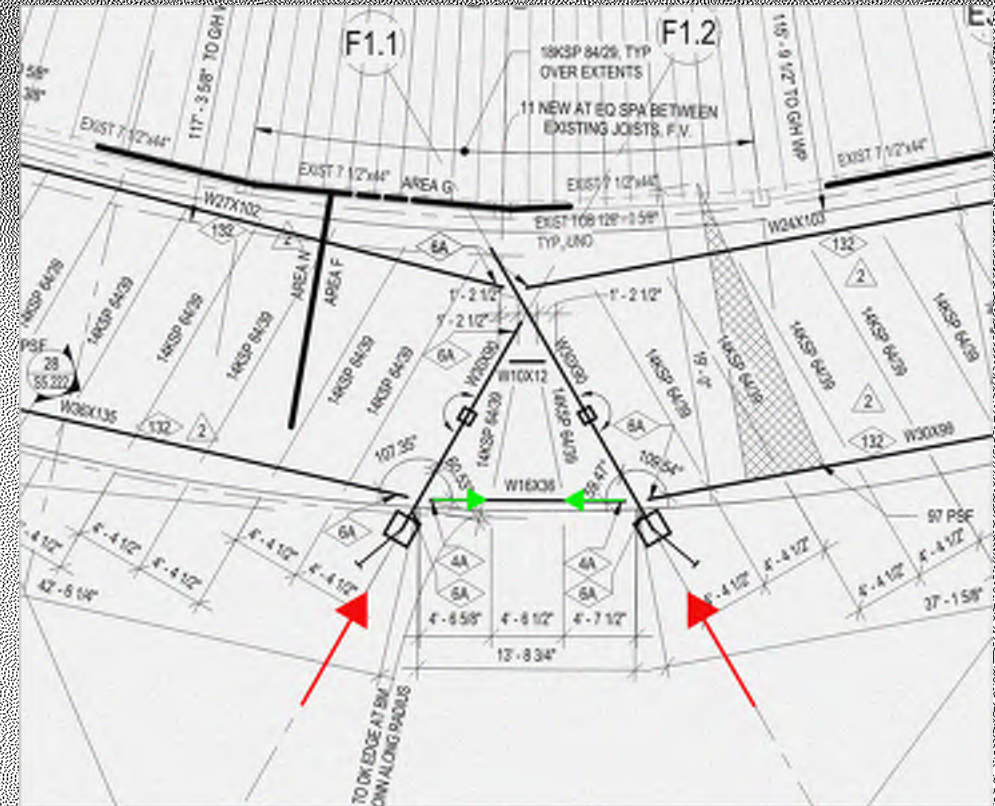
COMMONS SPACE



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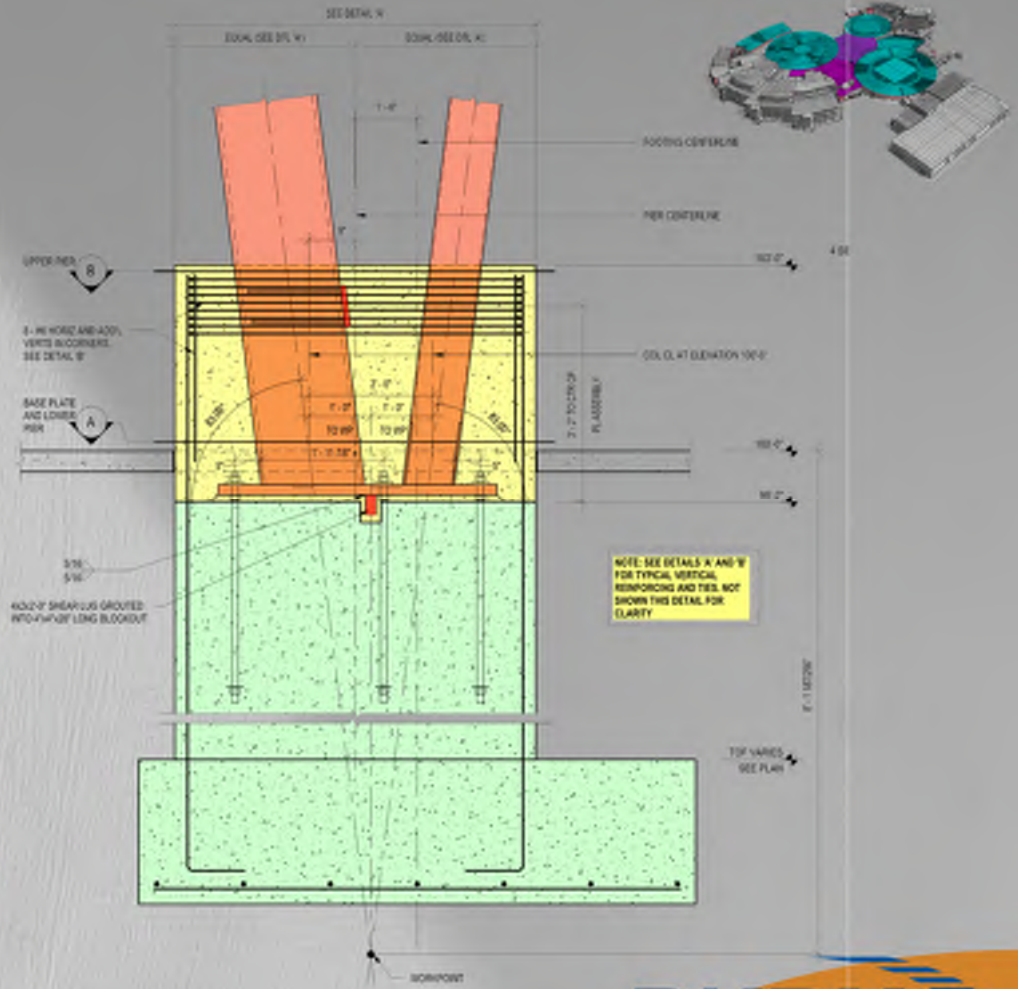
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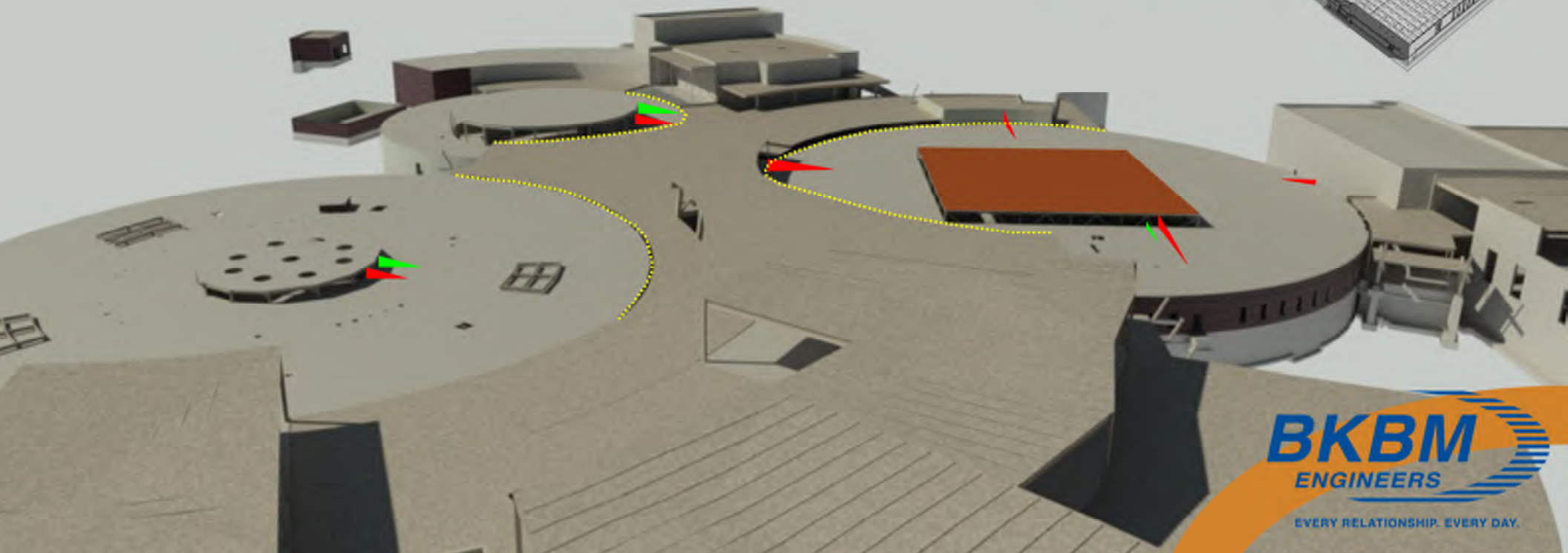
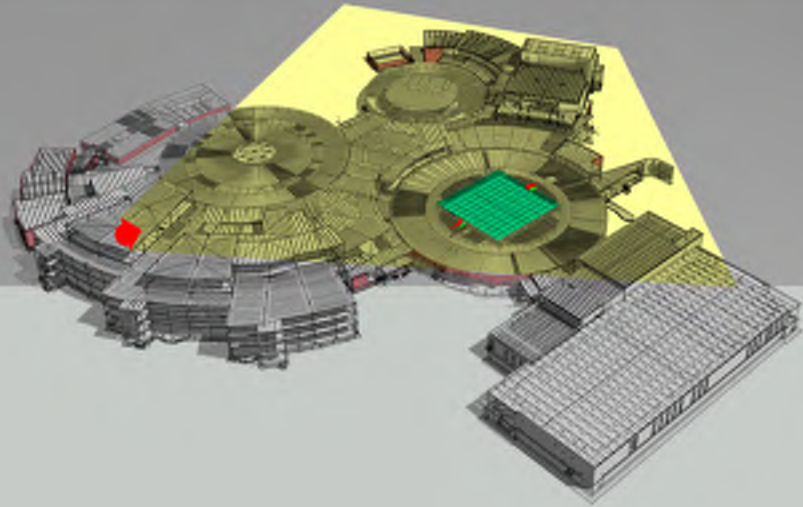
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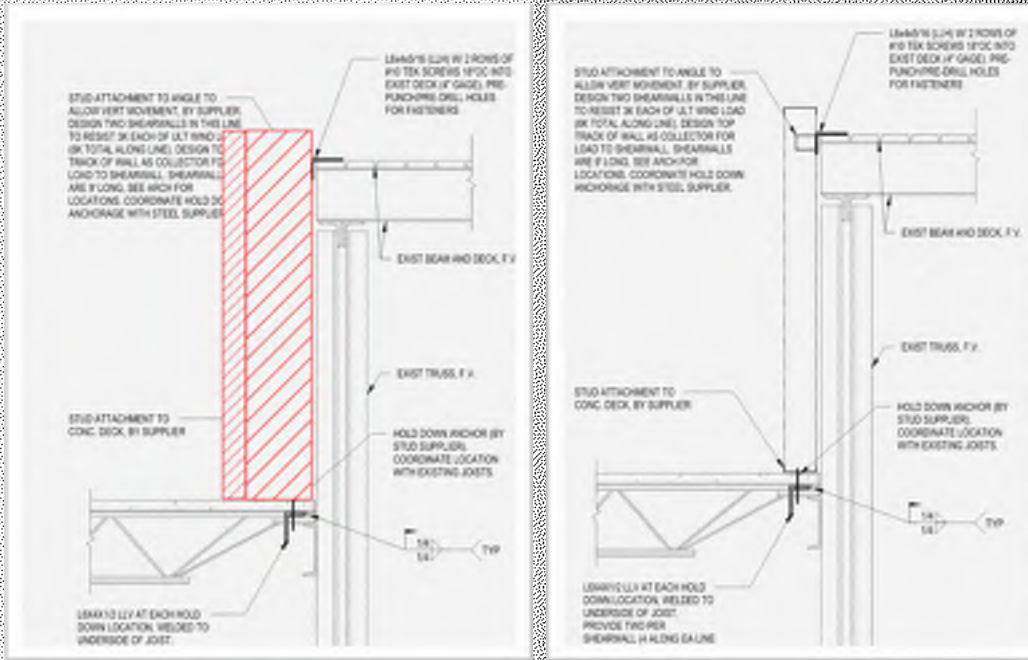
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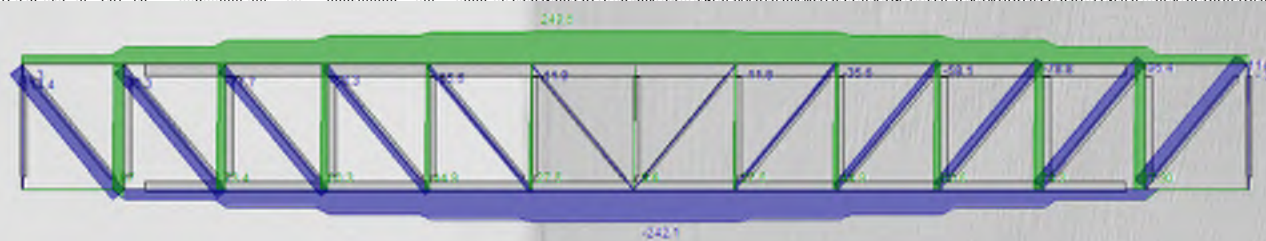
CHANGES IN SNOW DRIFTS



OFFSETTING ADDED SNOW LOAD



- Existing hi/low had CMU wall
- Replaced with steel stud
- Architect punched in openings
- Replaced DL with SL
- Forces in truss match original



QUESTIONS?

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