Jefferson Barracks Building 29

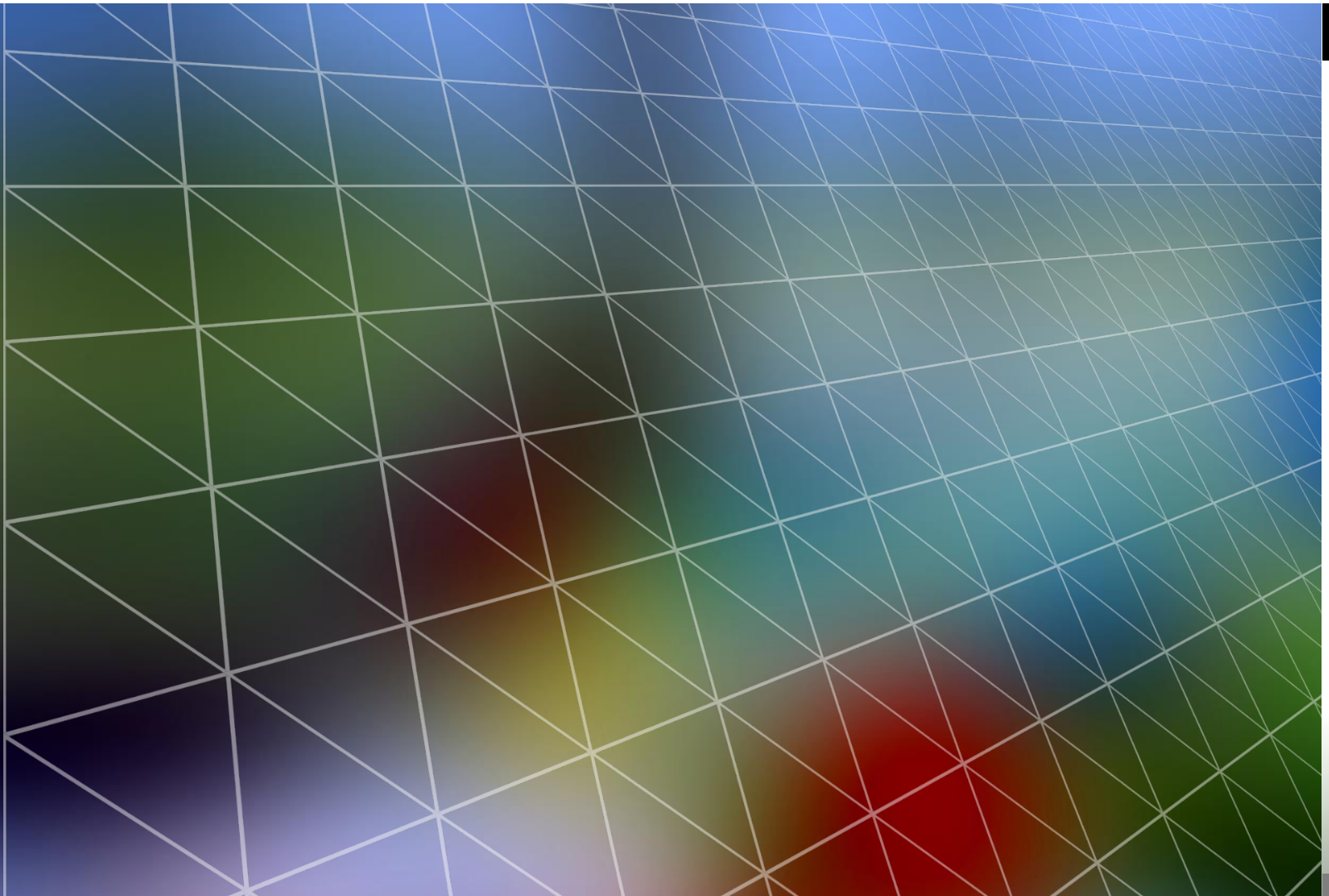
ATFP

Historic

Progressive Collapse

Seismic

Mead & Hunt



Jefferson Barracks Building 29

David Cockrum

AIA Learning Objectives

- Describe the historic significance and features of the Jefferson Barracks Building 29 structure.
- Identify the seismic deficiencies of the structure.
- Explain how progressive collapse and ATFP requirements complicated the design.
- Discuss the design solutions used to mitigate these issues.
- Identify additional challenges discovered during construction.

Historic

- Old
- Historic

Historic

Constructed in 1898 as Cavalry Barracks

Renovate to modern standards

Historic


Character Defining Features
Stately
Ventilators
Porches
Arches
District

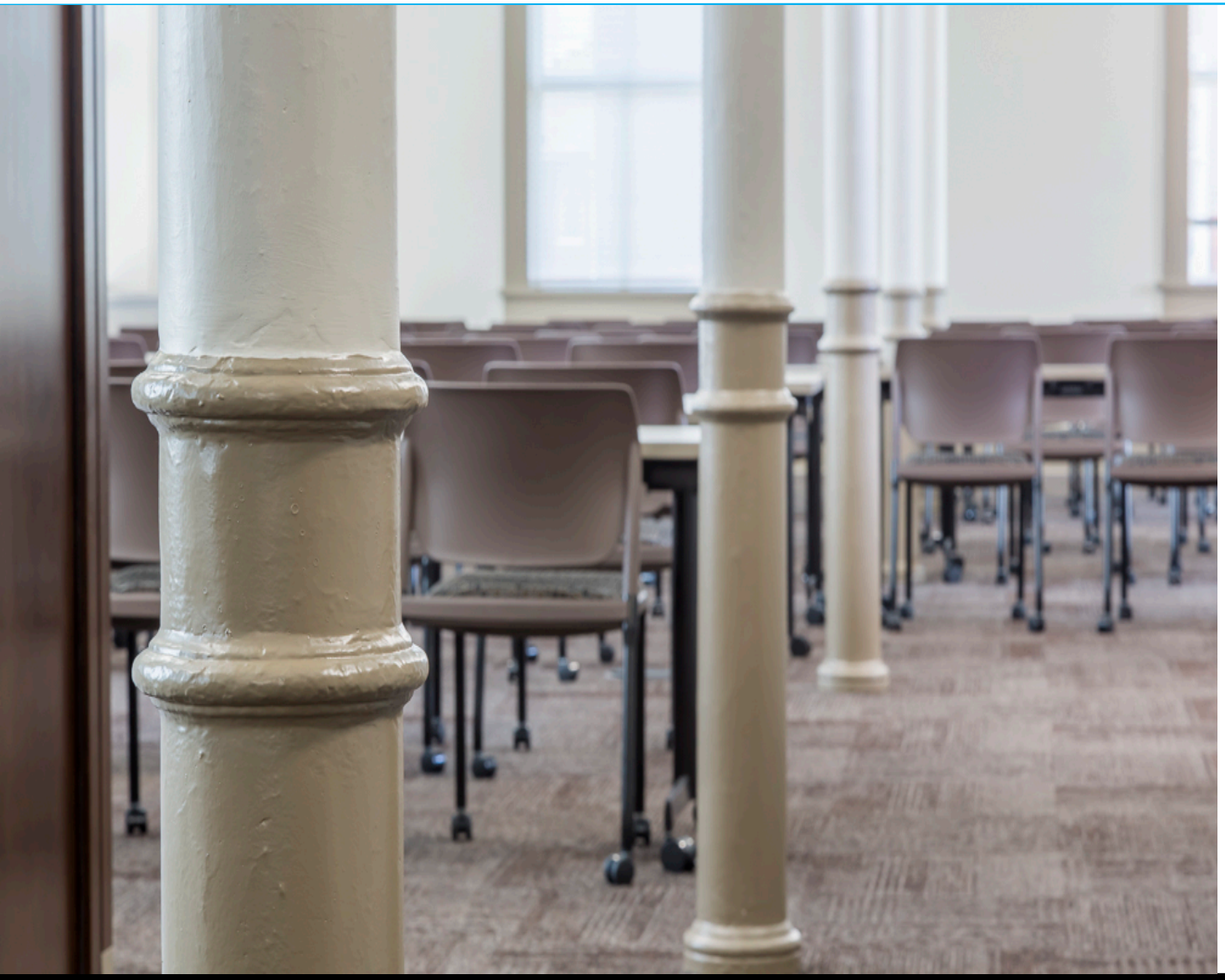
Historic

- 3 and 4 wythe brick
- Massive construction
- Majestic

Historic

- Limestone watertable
- Limestone foundation walls
- Arched windows
- Chimneys
- Pilasters

Historic



- Cast-iron columns
  - Weak in shear and tension
  - Good in compression

Historic

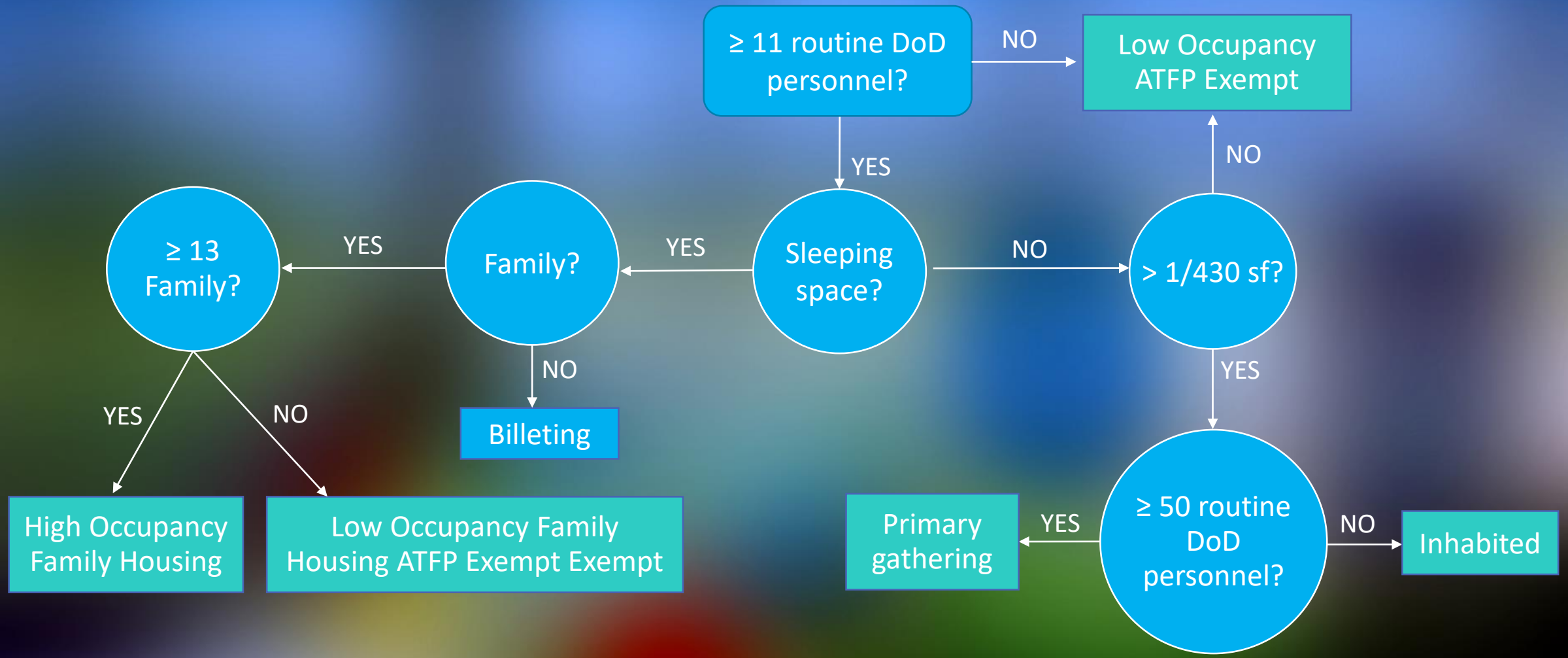
- Arched windows
- Custom blast connection at top for ATFP windows

Anti-Terrorism Force-Protection

ATFP - Intent

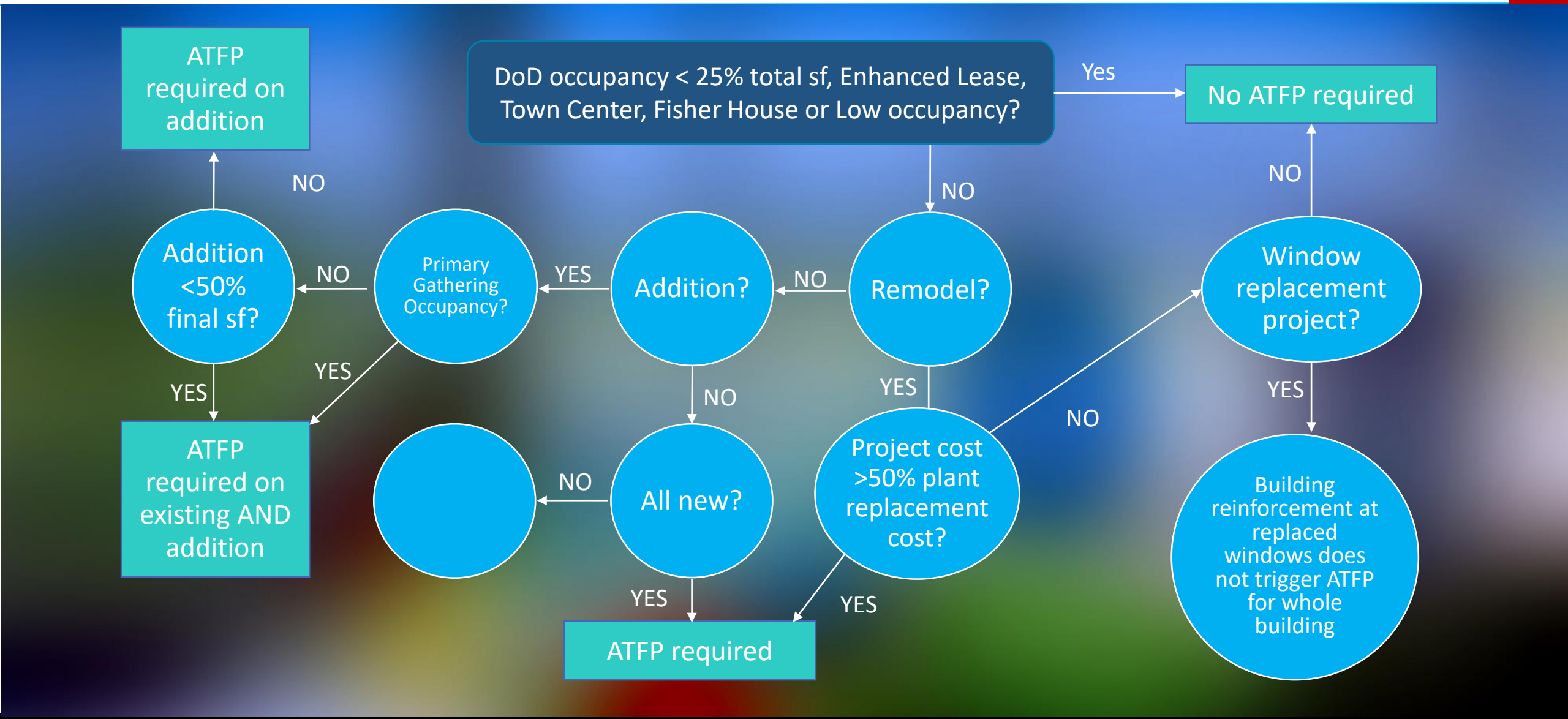
- UFC 04-010-01: “MINIMIZE MASS CASUALTIES” stated 11 times
- Protection against all potential threats is cost prohibitive.

ATFP – Occupancy Triggers

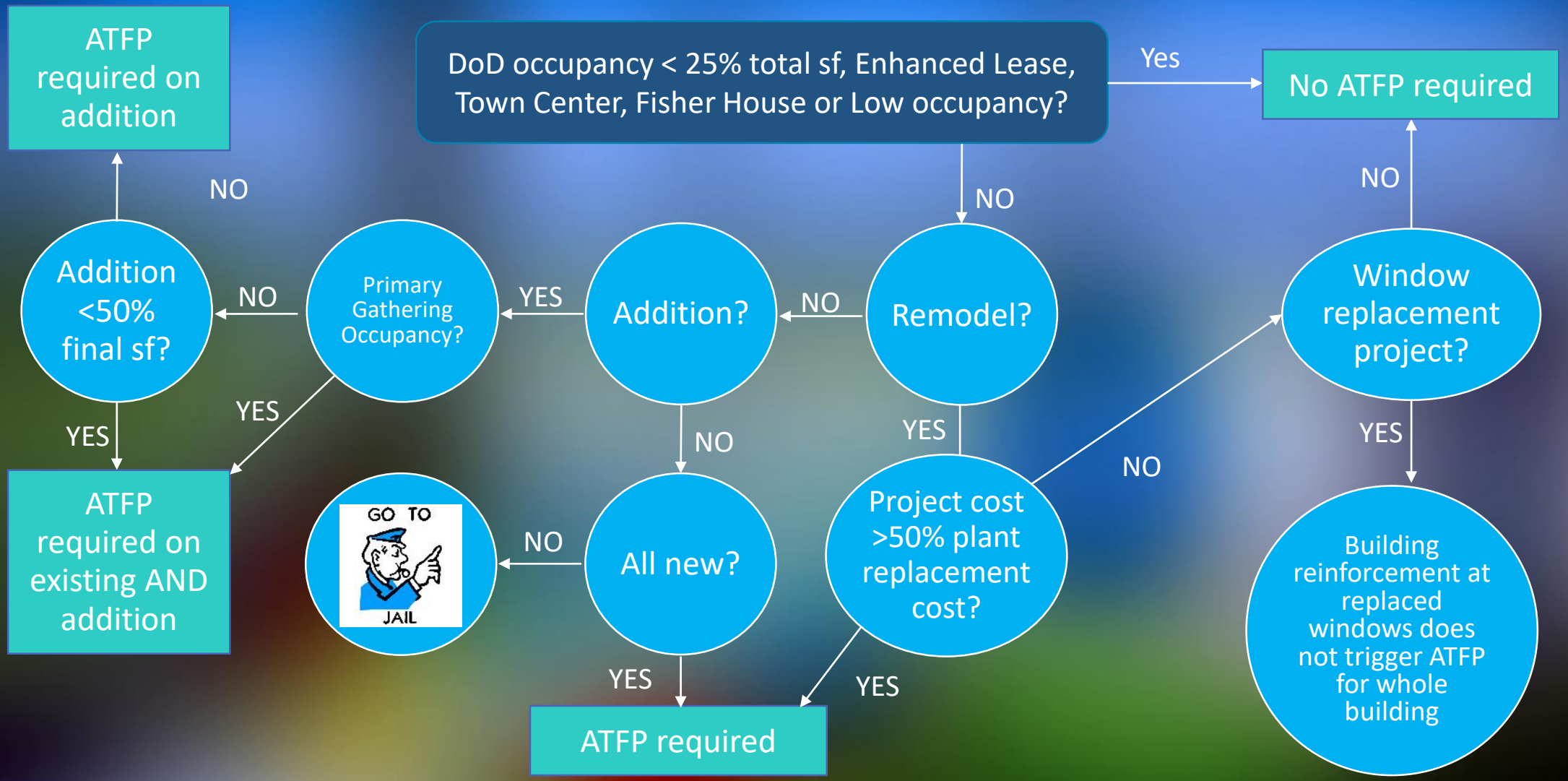


ATFP – Occupancy, B29

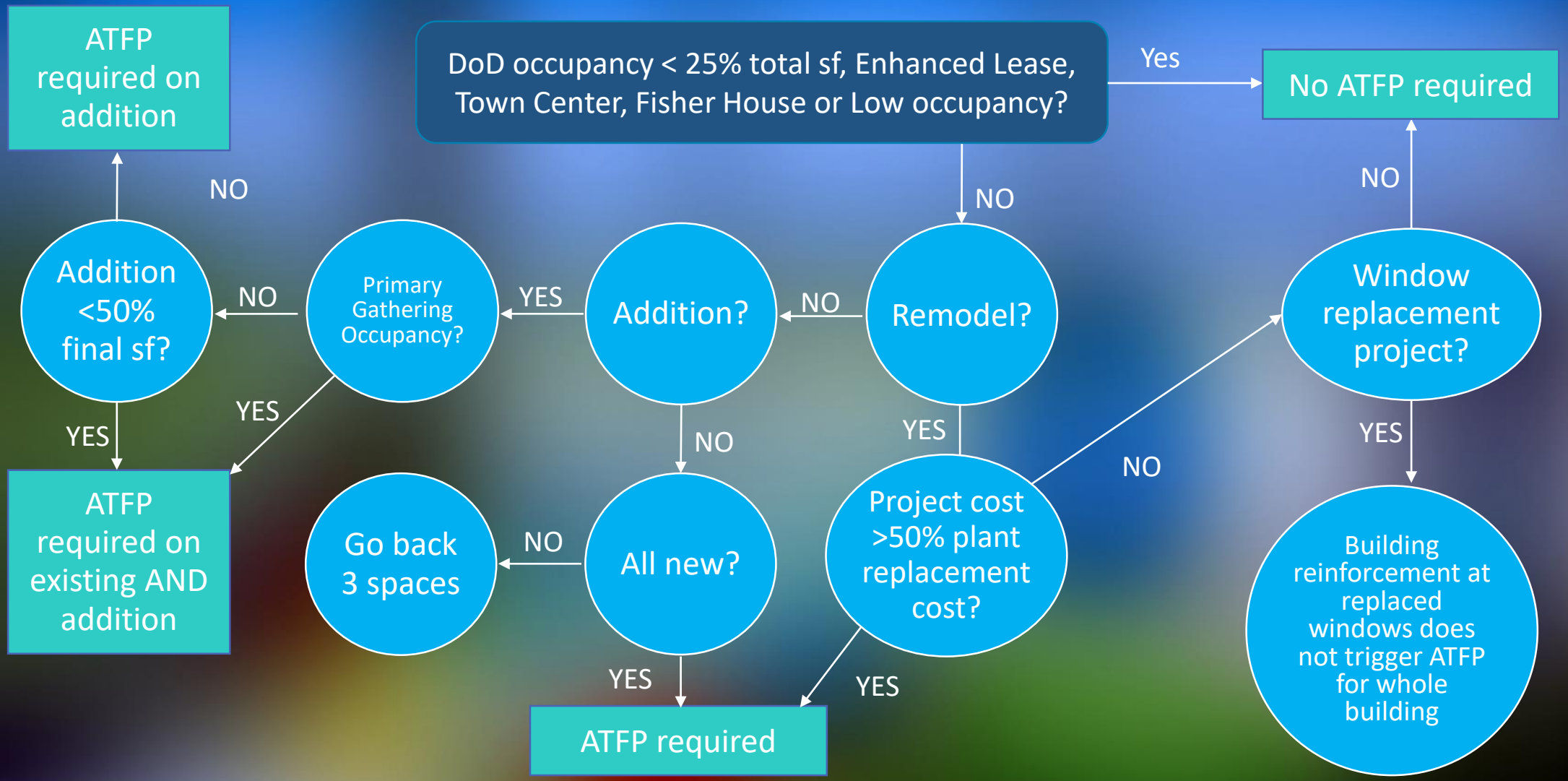
ATFP – Project Triggers



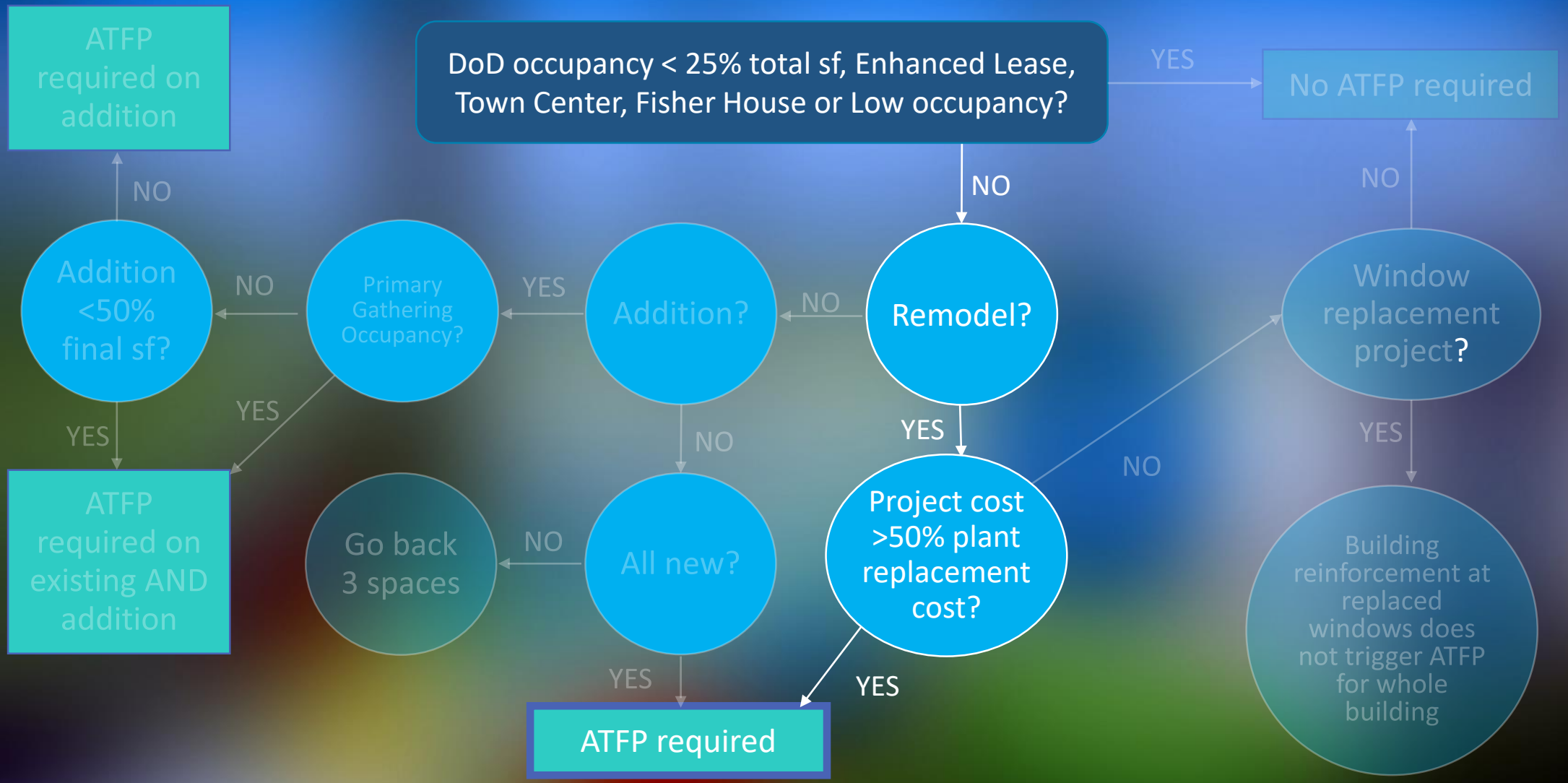
ATFP – Project Triggers



ATFP – Project Triggers



ATFP – Project Triggers, B29



ATFP - Triggers

- Three stories in front, four on back; progressive collapse required
- What is a story?
  - Human occupancy
    - Eggress
    - Lights
    - ventilation

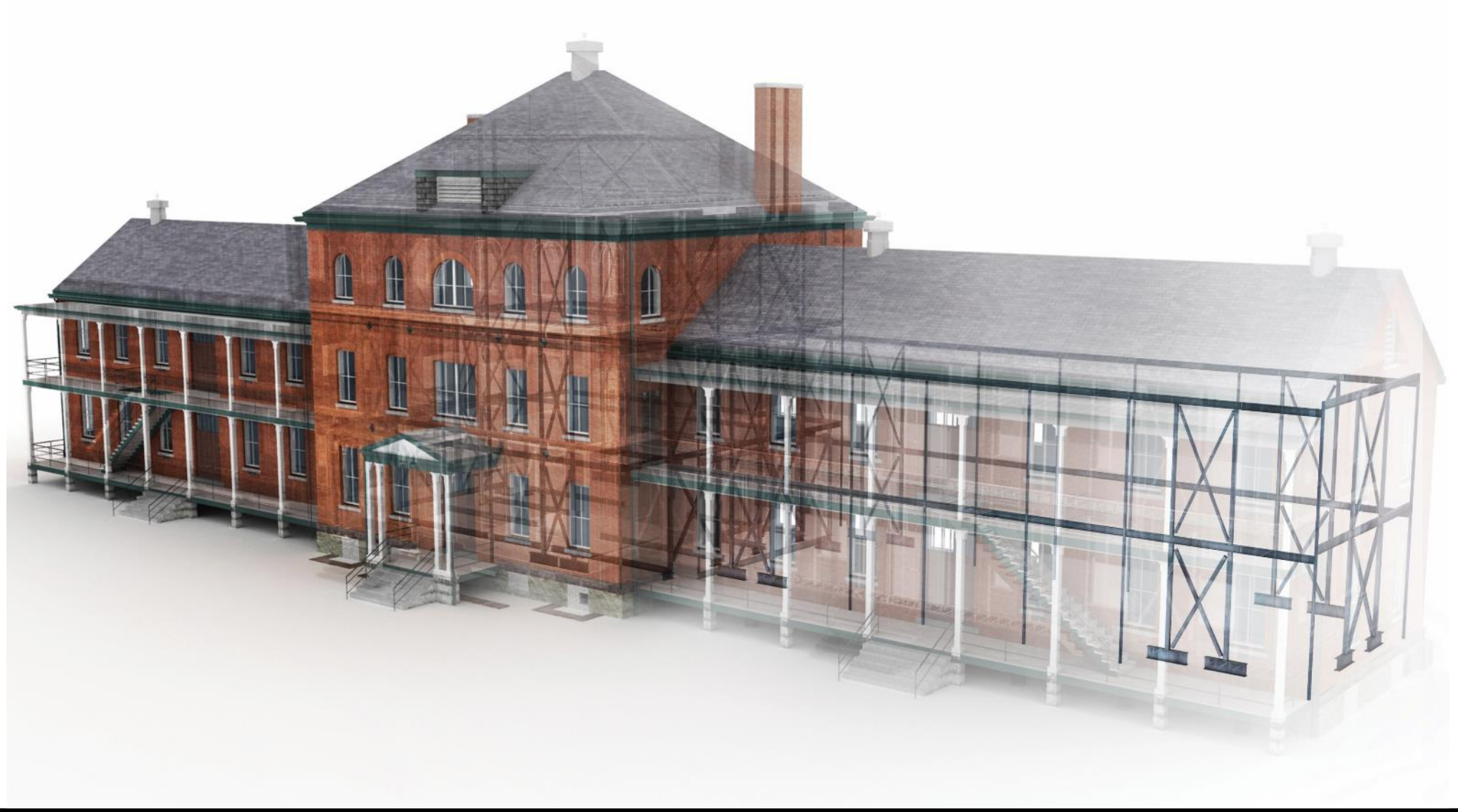
Seismic

Seismic - Analysis of Existing Structures

- UFC 3-310-04 Seismic Engineering
  - Seismic Design Category C 50% trigger
  - Seismic Design Category D 30% trigger
  - Trigger invokes RP8
- RP8 directs to ASCE 41
- ASCE41-13
  - Reduced earthquake & Analyze, modify, analyze, modify…
  - Collapse Prevention

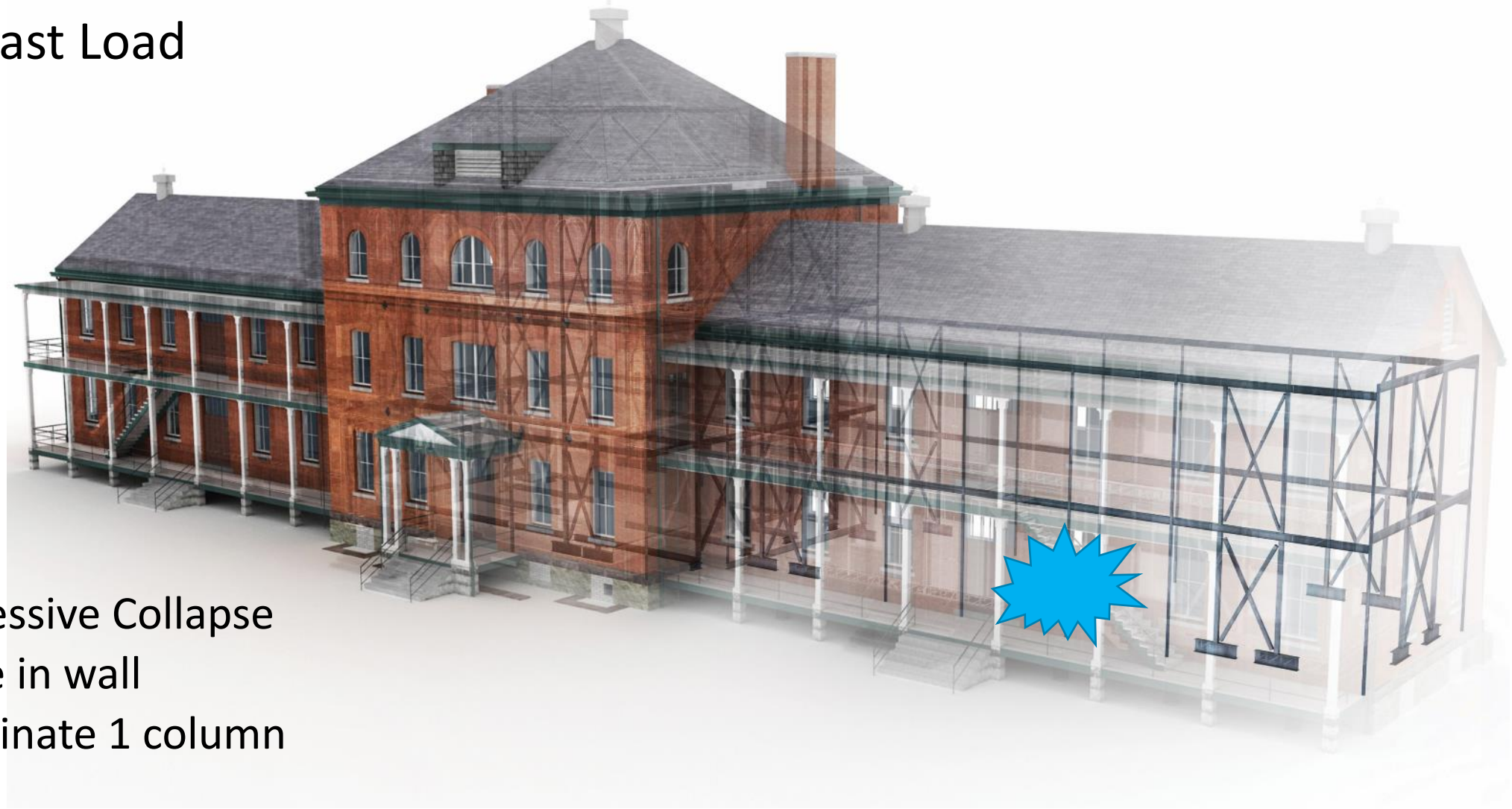
Retrofit

Retrofit - Endoskeleton



Retrofit - Endoskeleton

- Blast Load

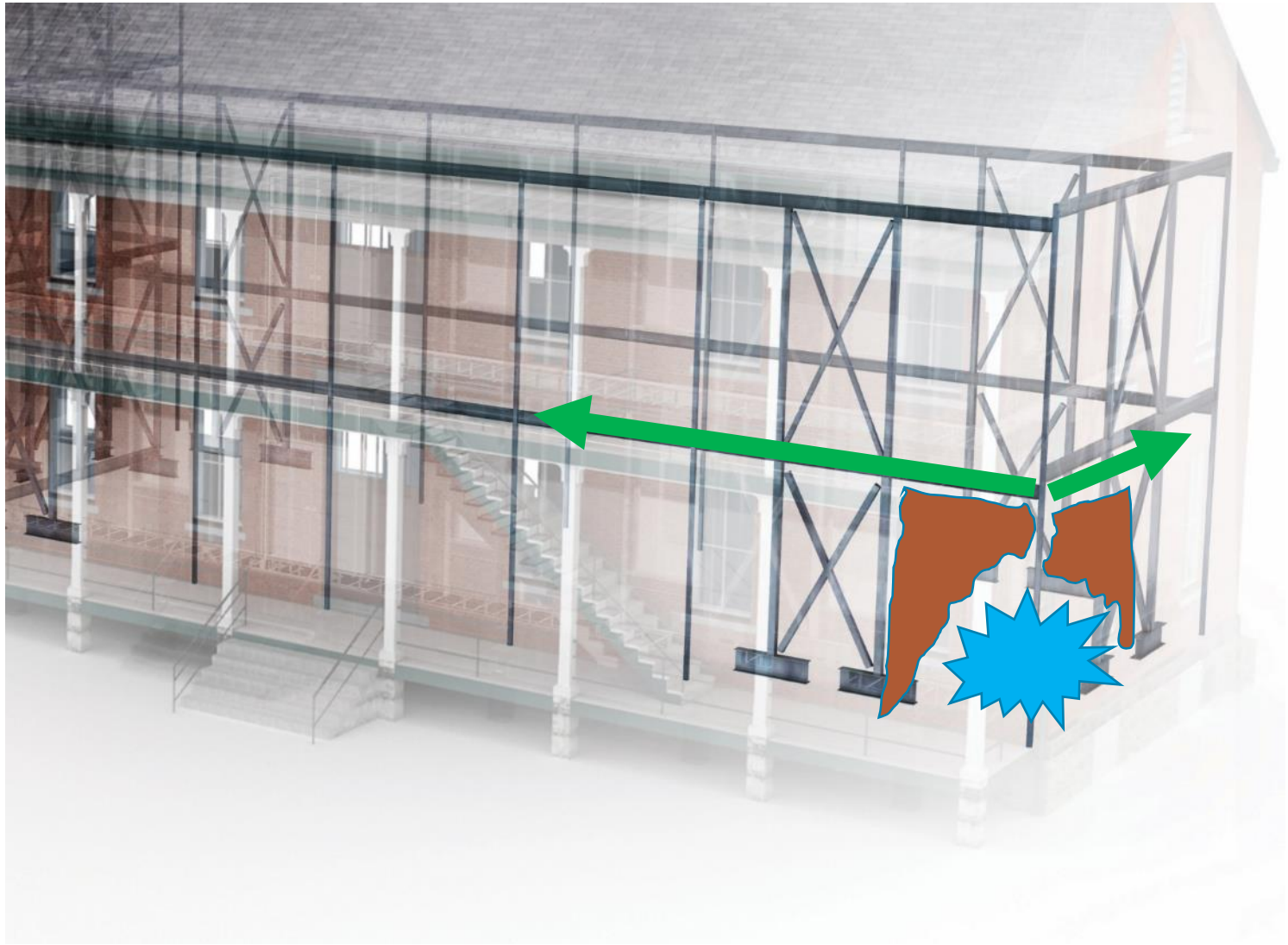


Progressive Collapse

- Hole in wall
- Eliminate 1 column

Retrofit - Endoskeleton

- Blast Load

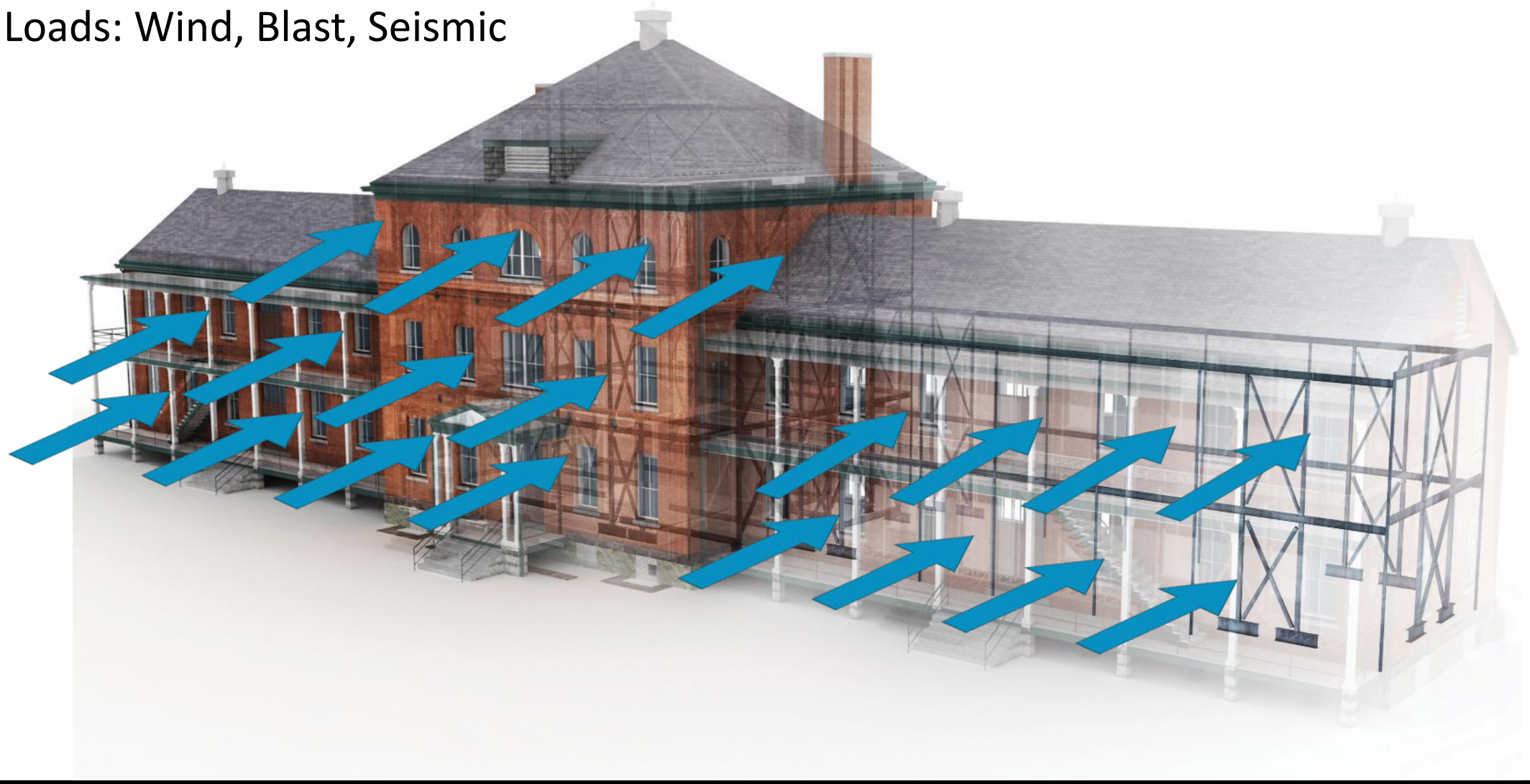


Progressive Collapse

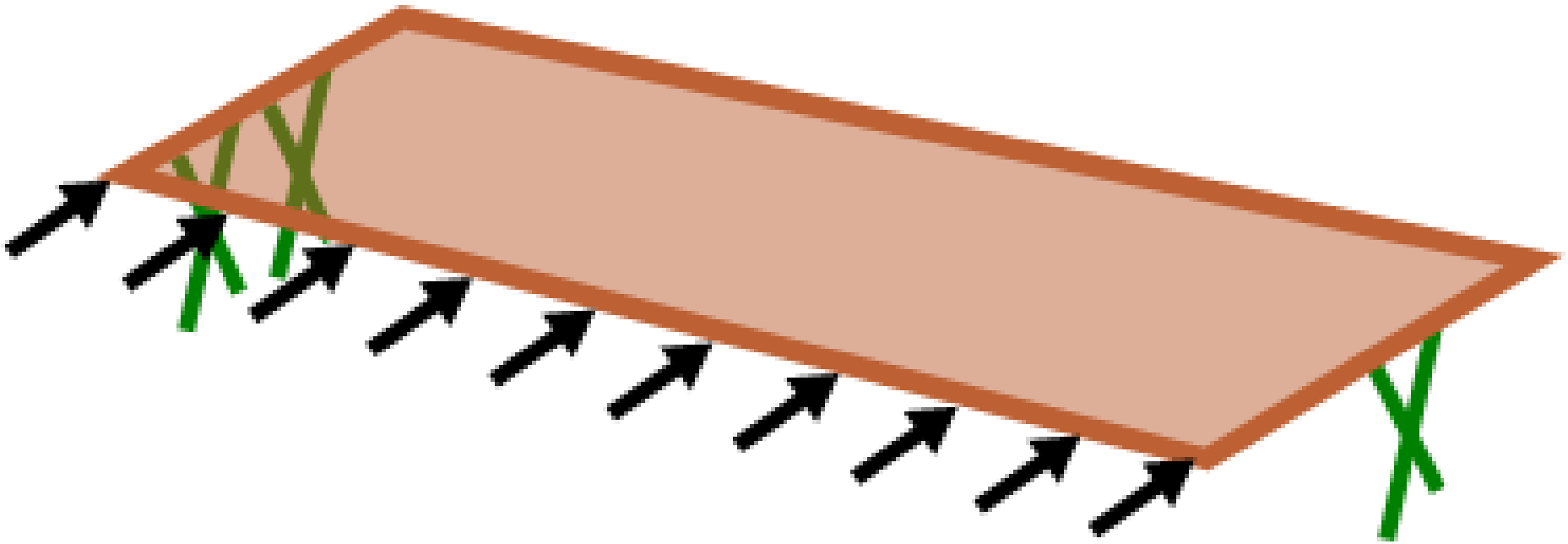
- Hole in wall
- Eliminate 1 column

Retrofit - Endoskeleton

- Loads: Wind, Blast, Seismic

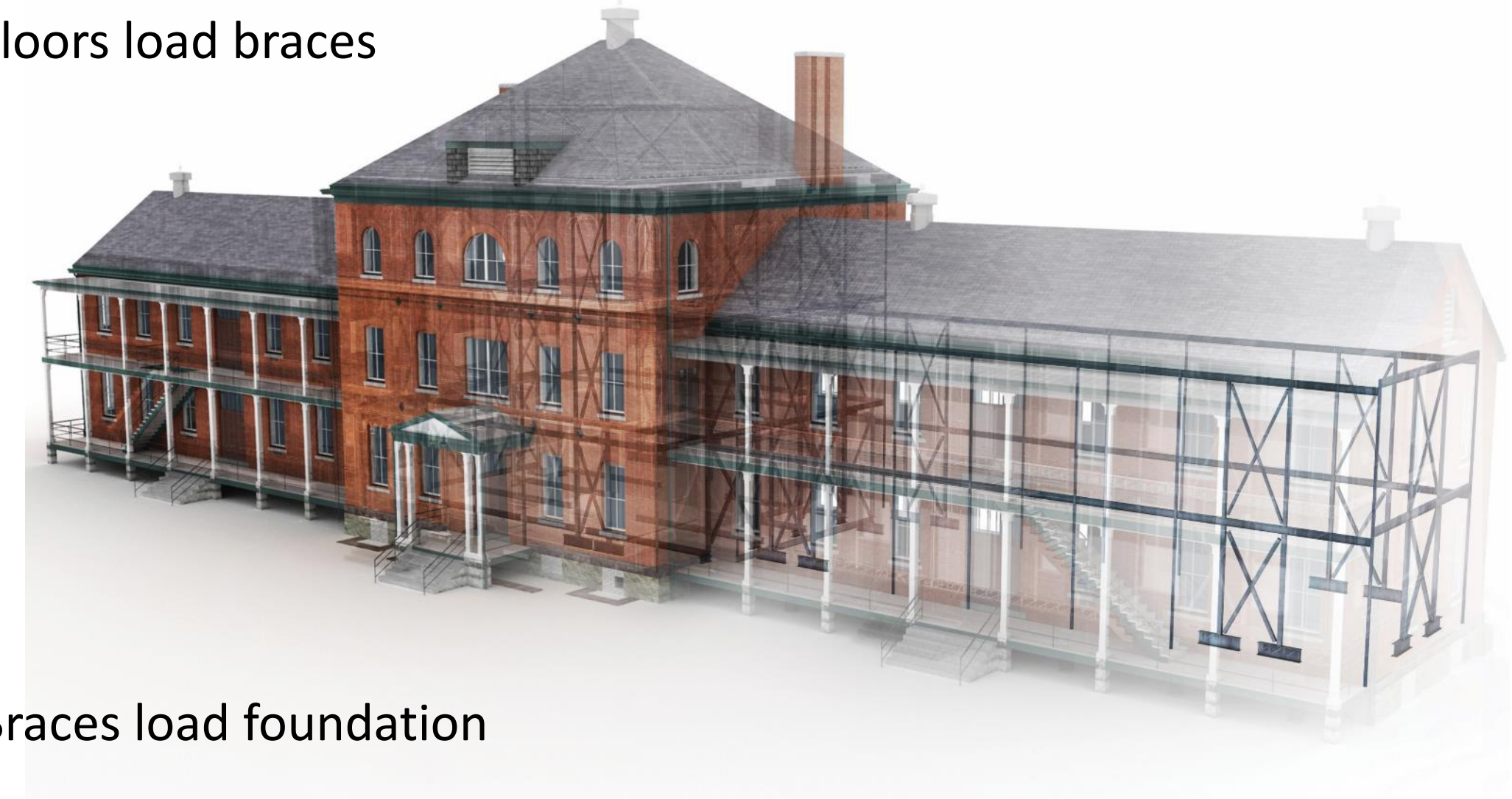


Retrofit



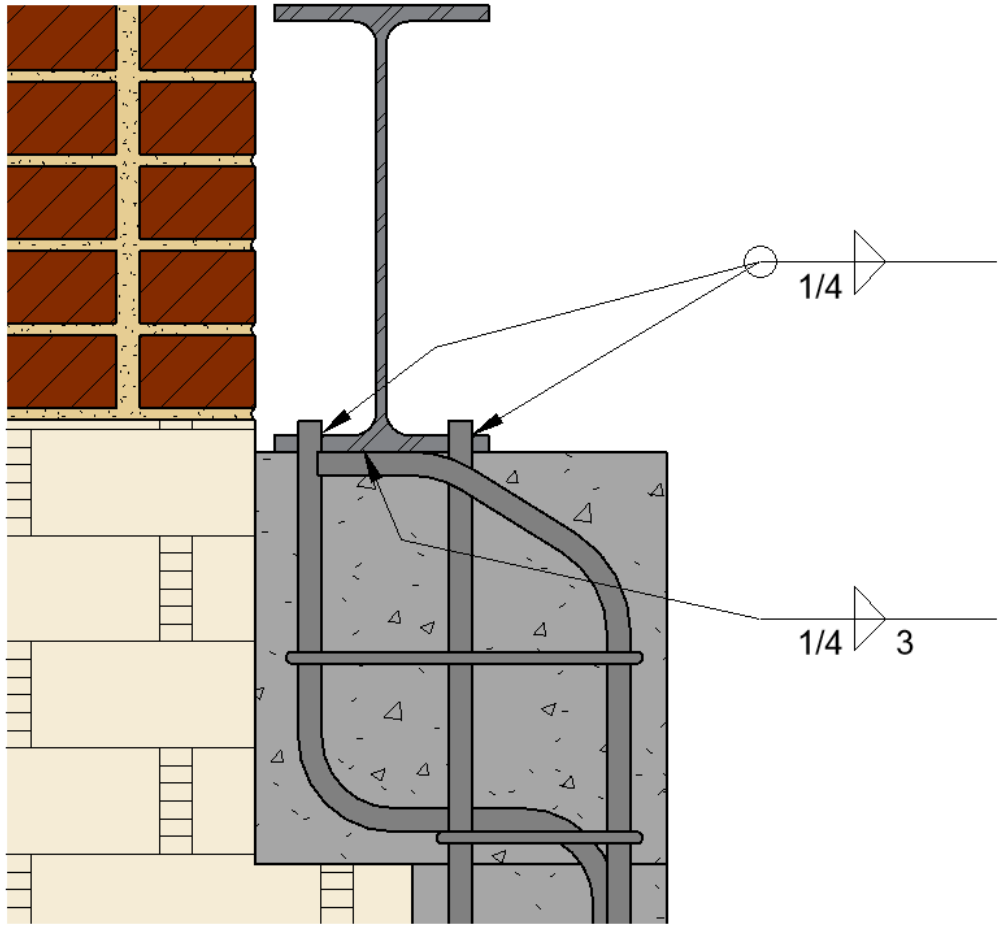
Retrofit - Endoskeleton

- Floors load braces

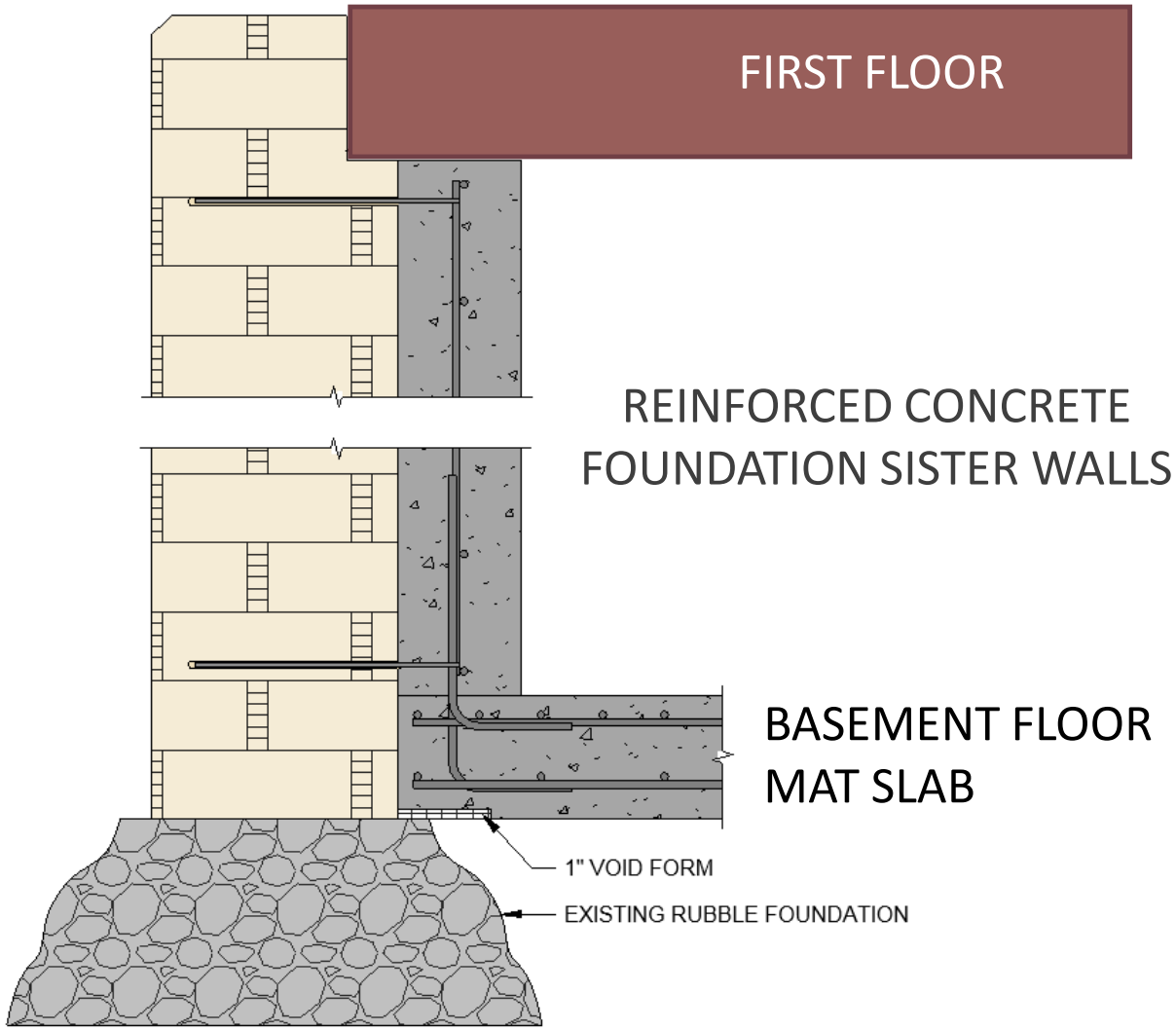


- Braces load foundation

Retrofit - Spreader Beams

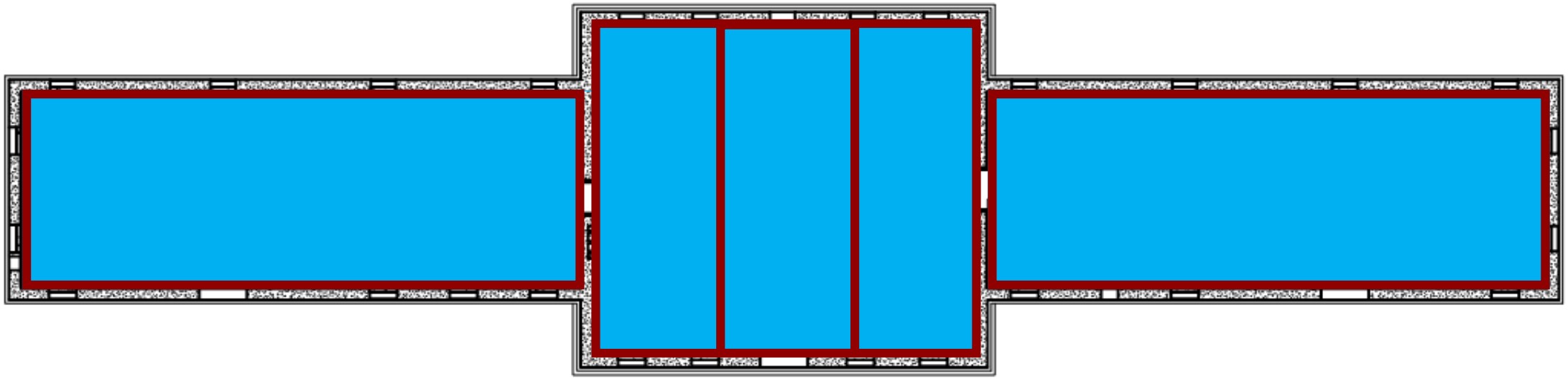


Retrofit - Foundation



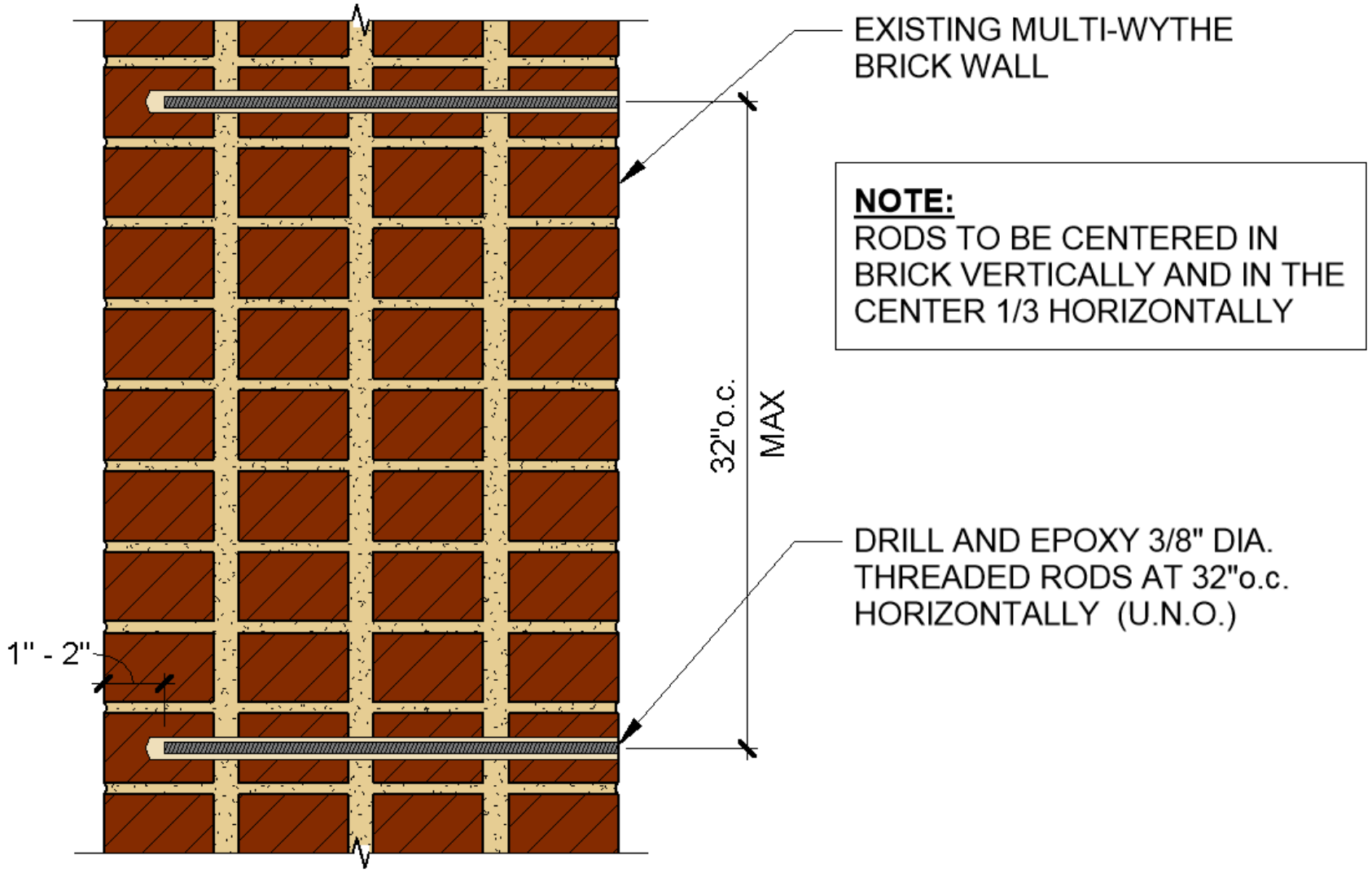
Retrofit - Foundation

REINFORCED CONCRETE FOUNDATION SISTER WALLS

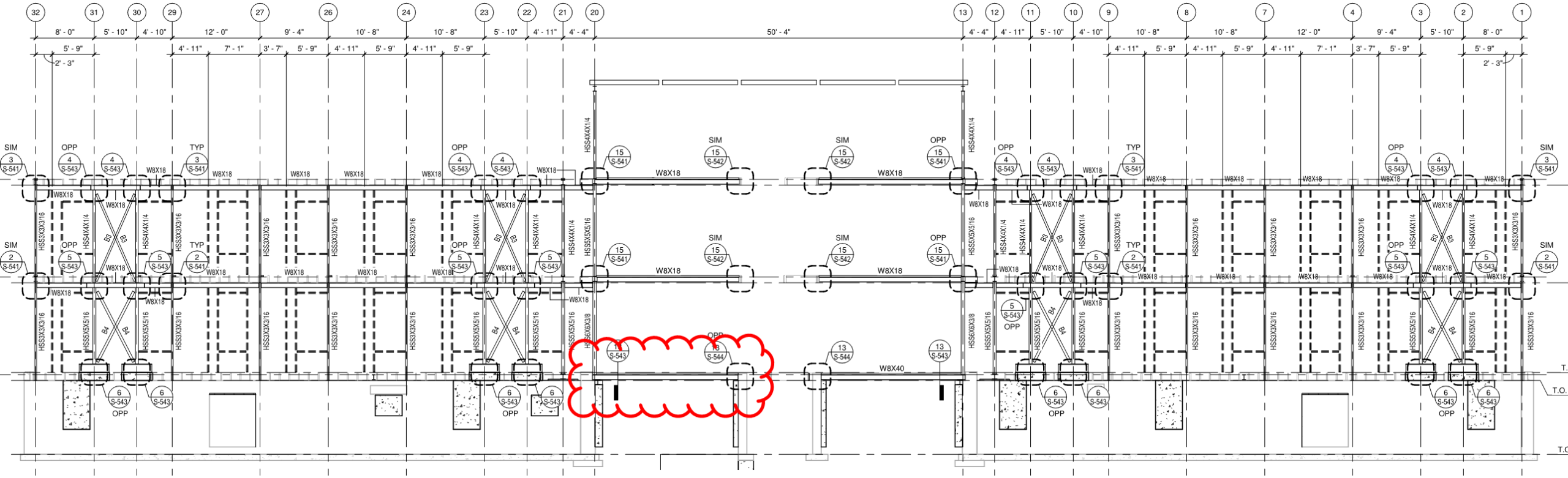


Retrofit - Foundation

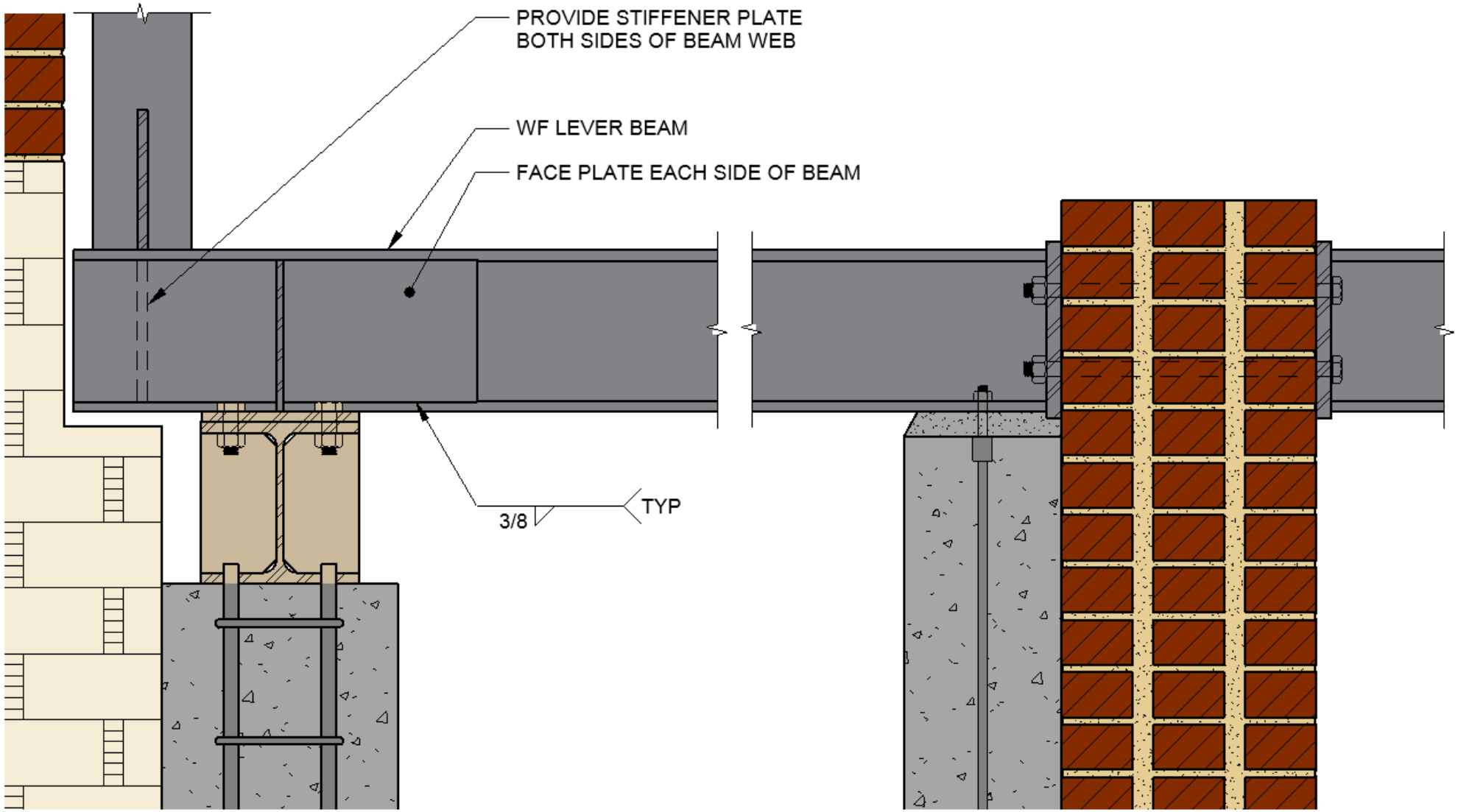
Retrofit - Brick Ties



Retrofit - Lever Beams



Retrofit - Lever Beams

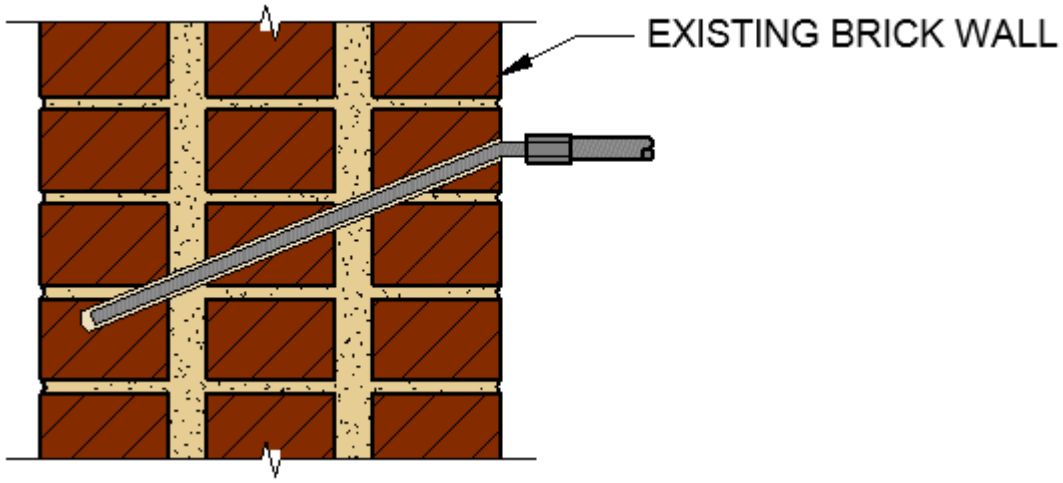


Retrofit - ATFP Windows

- 33 ft standoff
- Moderate blast load
- Massive walls
- Brittle walls
- Reinforcing required, but light reinforcing ok

Retrofit - Wall Ties

Retrofit - Wall Ties



Retrofit - Roof Trusses

- Tension only rods
- Friction connections
- Unbraced top chord

Retrofit - Roof Trusses

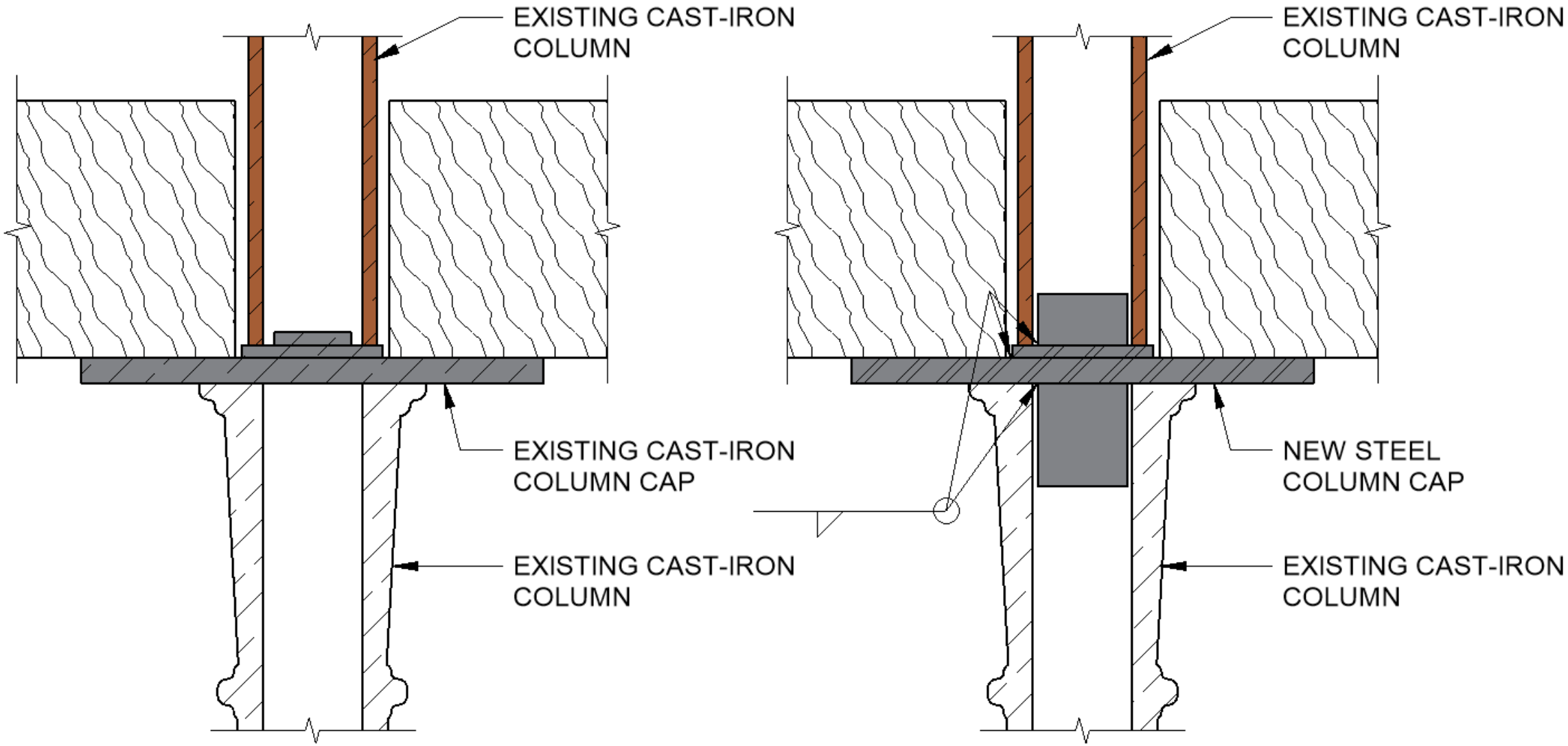
Construction Challenges

Construction - Interesting Header

Construction - Chimneys

Construction - Cast Iron Columns

Construction - Cast Iron Columns



THANK YOU