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Self-Certification Training – Structural Peer Review

Krista Blidy

Structural Plans Engineer

Presentation by: John-Jozef "JJ" Proczka

Self-Certification

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What does it mean to self-certify a set of drawings?

- IBC 107.3. The self-certified professional with your help is performing the legal requirement to examine the documents for code compliance

Auditing?

- 10% chance of all projects that don't require an automatic audit will be audited
- Auditing is just a plan review, with points assigned based on code violations
- One point per code section
- Points are cumulative from all disciplines – assigned to the self-cert professional per project – not peer reviewer
- Automatic audits don't need a structural peer review – BUT it's a really good idea to get one

Structural Codes

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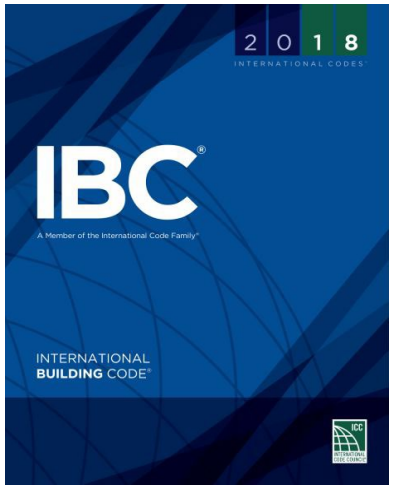
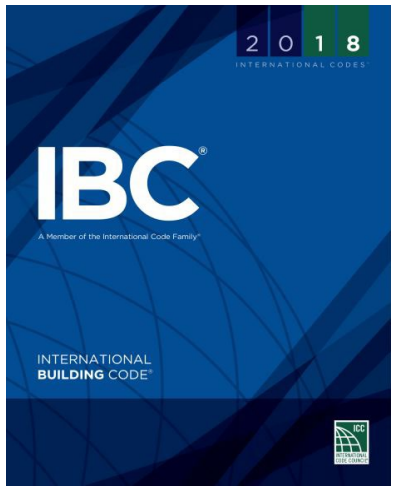
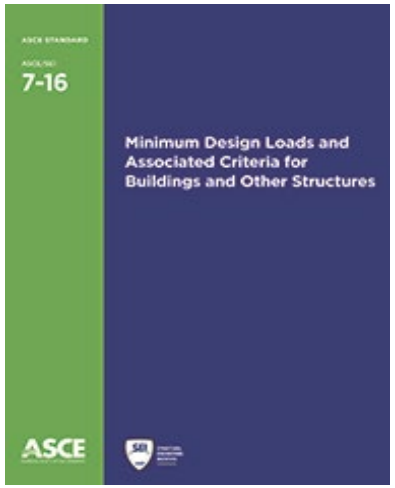
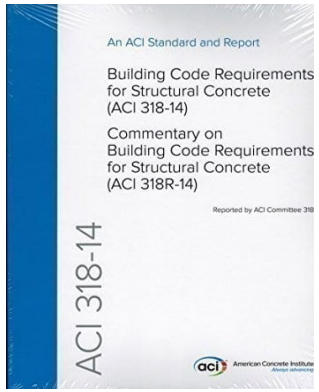
Admin and Scope → **Load** → **Material Specific Resistance**

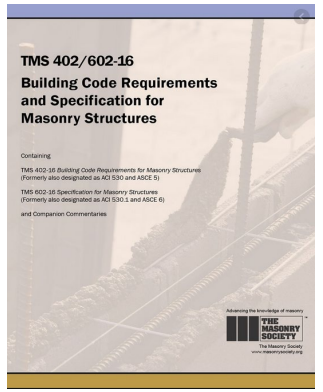


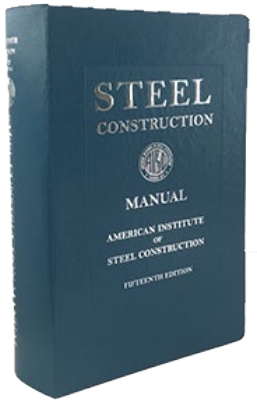
We will mostly only be covering admin and loading items in this presentation



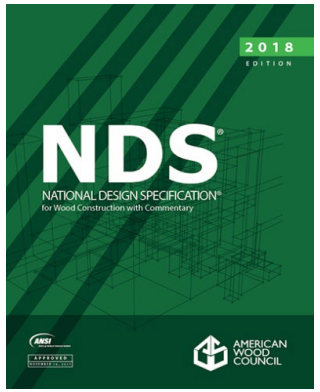








*Probably AISI S240



Complete Construction Documents

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Structural Drawings

- ✓ General Structural Notes
- ✓ Foundation Plan
- ✓ Floor Framing Plan
- ✓ Roof Framing Plan
- ✓ Structural Details

Supporting Documents

- ✓ Structural Calculations
- ✓ Geotechnical Report
- ✓ Geotechnical Special Inspection Certificate
- ✓ Structural Special Inspection Certificate
- ✓ Structural Observation Certificate

General Structural Notes Contents

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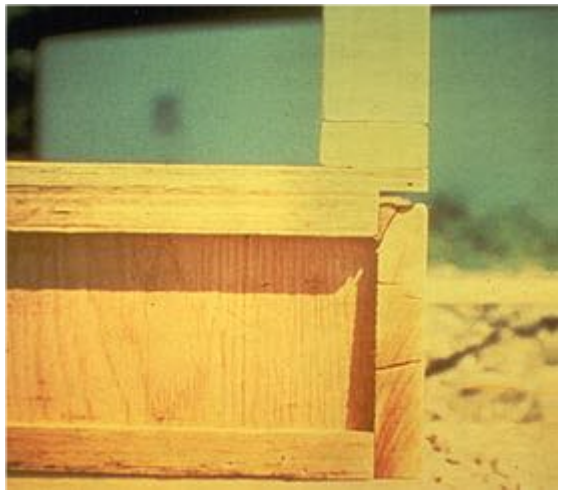
- Governing Building Code
- Design Live Loads
- Roof Rain Intensity – Important in Arizona.
- Wind Design Data (All of it. Read the section)
- Earthquake Design Data (All of it. Read the section)
- Geotechnical Report Number and Date
  - for minor projects without a geotechnical report see the Phoenix amendment to 1803.2
- Soil Bearing Values
- Statement of special inspections
- Statement of Structural Observations
- Deferred Submittals list and required Phoenix Planning and Development note
- Material Specifications
  - Rebar cover with respect to required fire ratings. It can govern.
- Make sure the notes actually apply to this project



Frequently Confused Structural Options

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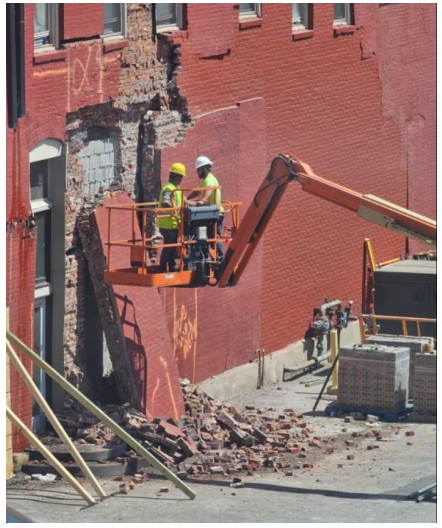
Deferred Submitals

- Identified before a permit is issued, but
- Performed and submitted after a permit is issued

Delegated Designs

- Design task given to another designer, can be performed before a permit is issued.



Deferred Submittals

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LIMITED ITEMS CAN BE DEFERRED

- See the Phoenix deferred submittal policy document https://www.phoenix.gov/pddsite/Documents/TRT/dsd_trt_pdf_00469B.pdf

Do not defer:

- Stairs
- Guards (Guardrails)
- Structural Connections

Deferred Submittals

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The construction permit drawings should:

- Identify all deferred design items,
- Specify the design loads for the deferred items,
- Lay out the deferred items within the construction,
- Detail the supports for the deferred items – including allowed reactions to structure

Each deferred submittal is required to be reviewed and approved by the design team including peer reviewer before they get to the field for construction (or to the office for an office review).

Delegated Designs

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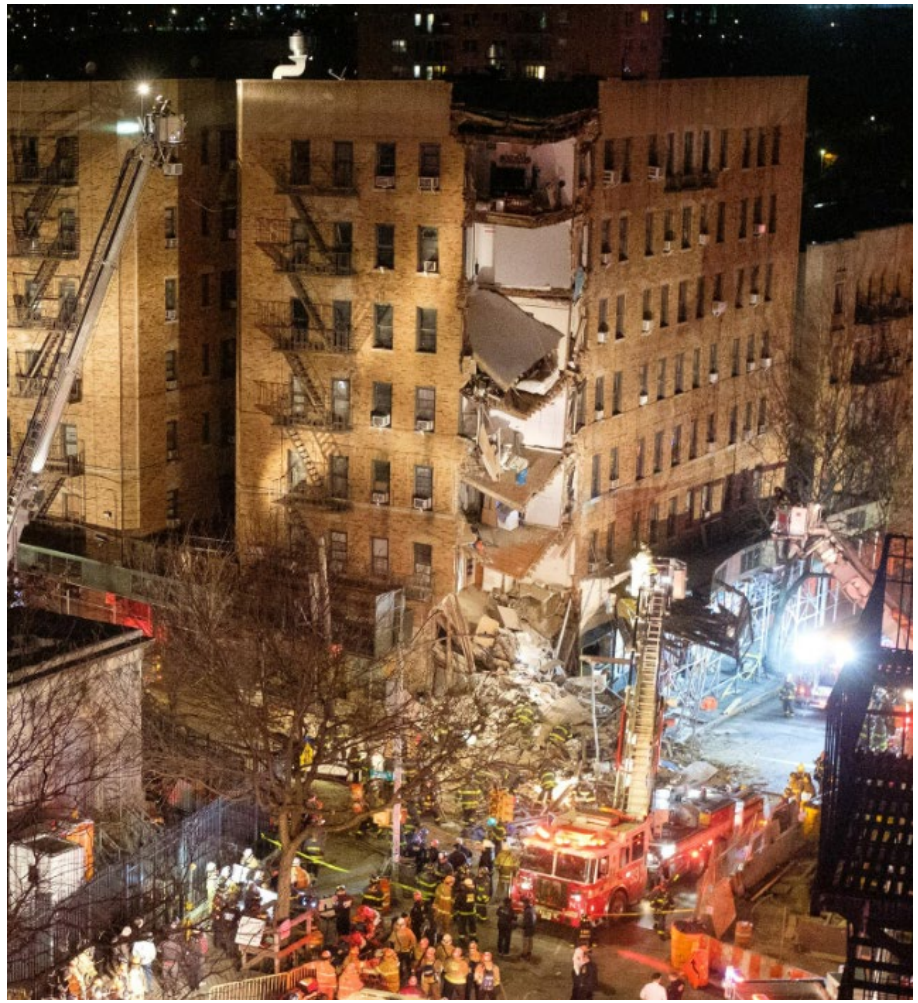
Any portion of the structural design may be delegated to another qualified licensed engineer by the engineer of record.

Delegated Design drawings need to be regular design drawings and are not shop drawings!



Delegated Designs

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The engineer of record is responsible for coordinating each delegated design, and shall provide:

- The design loads required for the delegated design,
- The design for the supports of the delegated design,
- The review and coordination of the delegated design.

Delegated Design drawings need to be regular design drawings and are not shop drawings!

Metal Buildings and Precast Concrete

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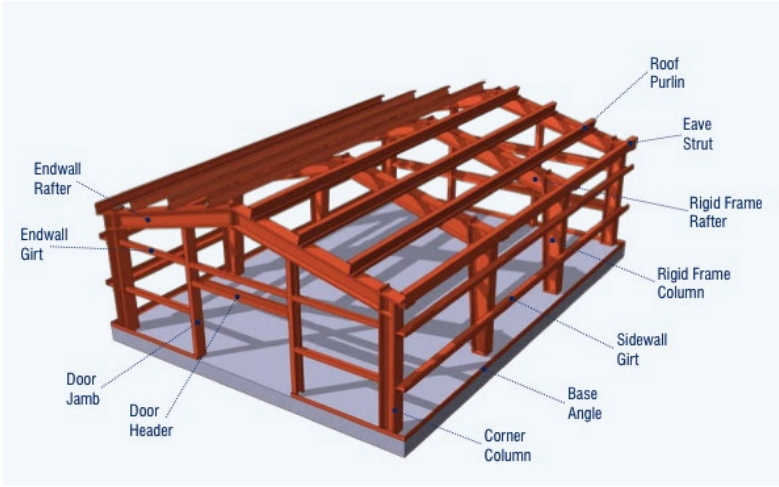
Metal Buildings and Precast Concrete Structures are an example of something that may be delegated design performed before a permit is issued



Check:

- Are the drawings sealed with an ARIZONA seal?
- Are the drawings labelled “FOR CONSTRUCTION”?
- Do the drawings appear complete? Notes, Plans, Details – including the moment frame connections?
- Do the drawings look like this project?

Loads and Common Issues

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Live Loads:

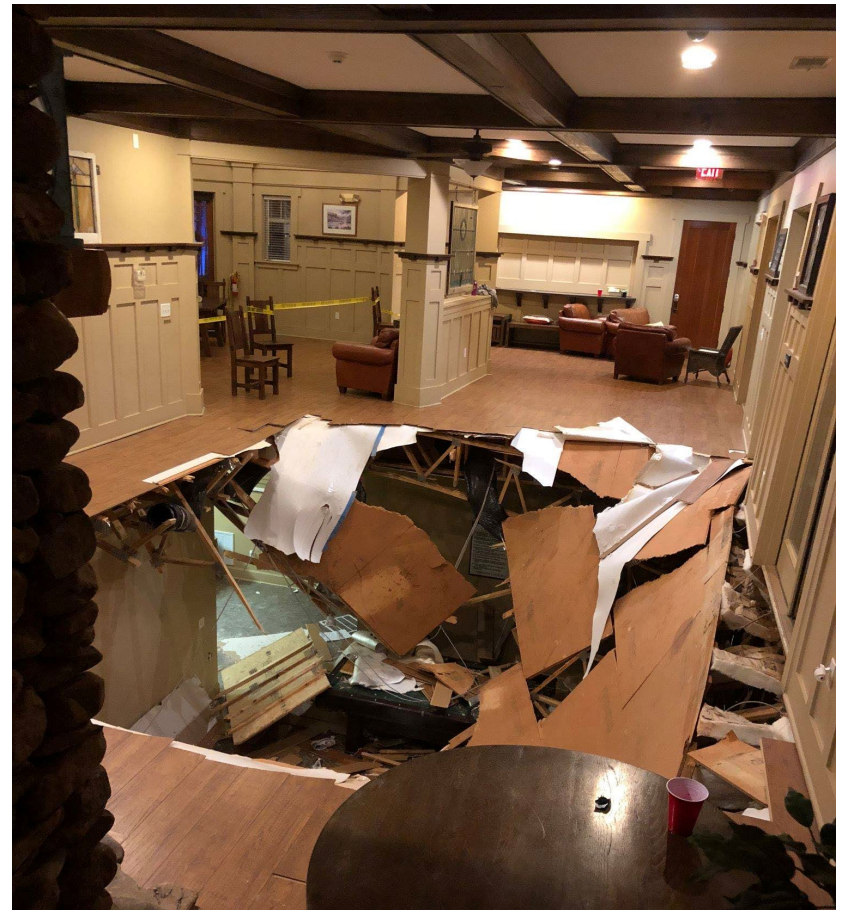
- Too low in assembly areas and corridors that serve them. IBC Table 1607.1.
- Live loads over 50 psf are posted in a conspicuous location. IBC 106.1

Dead Loads:

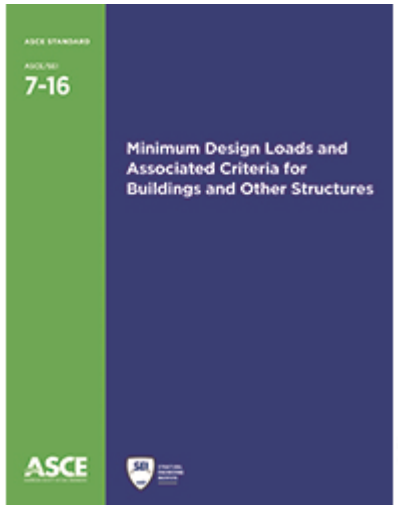
- Not coordinated with actual finishes and construction shown on architectural drawings.
    - Frequent mismatch between roof covering and number of layers of gypsum wallboard.

Wind Loads:

- Exposure Category B chosen arbitrarily over Exposure Category C resulting in approximately 30% missing wind load.
- Missing parapet and overhang wind loads
- Partially enclosed buildings aren't designed for increased internal pressures
- Analysis does not consider wind uplift in column foundations.



Wind Exposure Category



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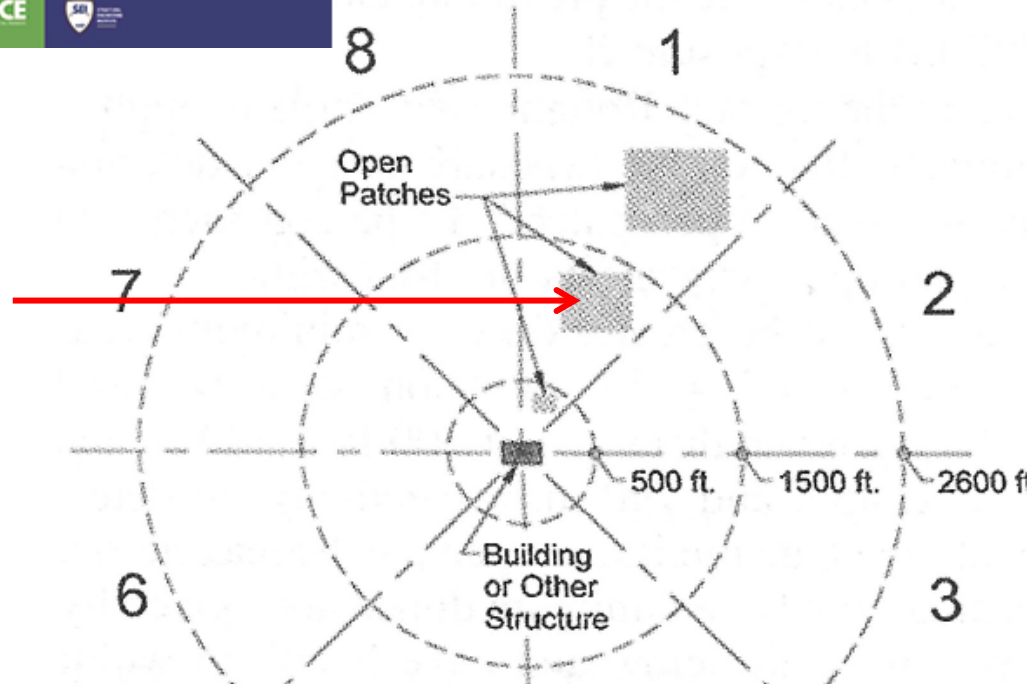
- Frequently *Exposure Category* B being used in inappropriate locations, resulting in less safe buildings.

- What ASCE 7 says:
  - For each wind direction the *Exposure Category* is to be determined by the worst case 45° sector.
  - *Surface Roughness* describes one quadrant considering open patches contribution.
  - *Exposure Category* describes the worst of the *Surface Roughness* in the two quadrants over the required distance from the structure.

- Many areas of Phoenix that are not developed are *Surface Roughness* C.

- Where *Exposure Category* B is used it is best to perform an analysis of the percent of open patches to confirm.



North direction Exposure Category is determined by worst case of quadrants 8 and 1

Wind Exposure Category Cont.

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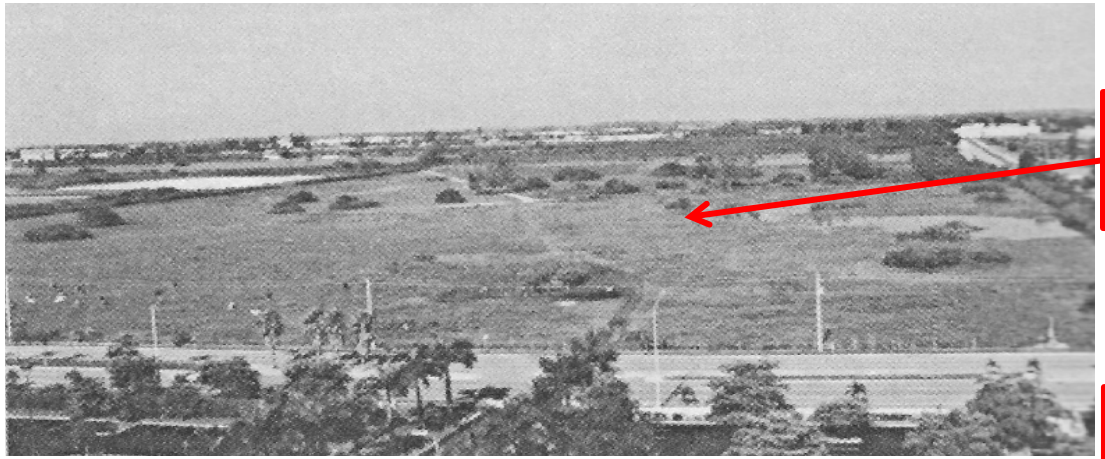
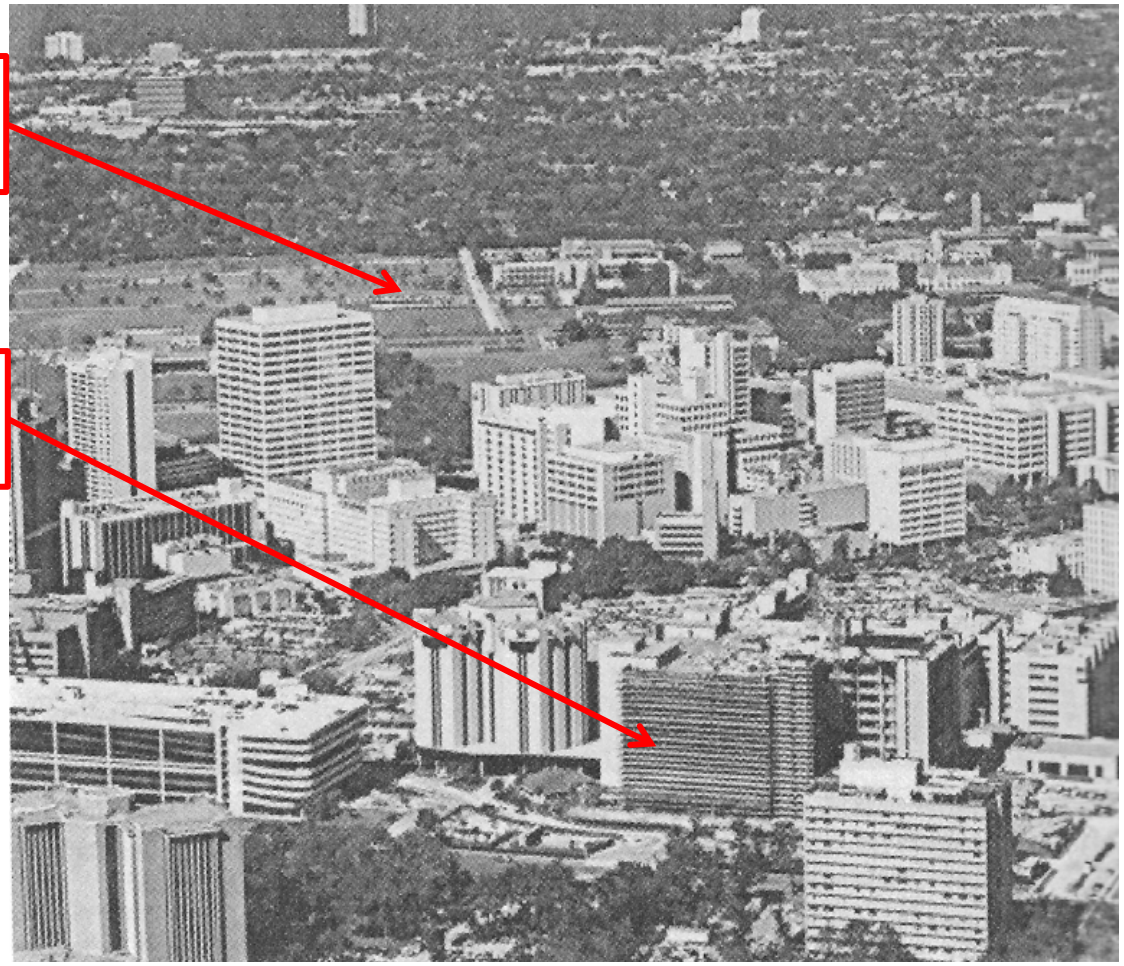
Surface Roughness B: Urban and suburban areas with numerous, closely spaced obstructions that have the size of single-family dwellings or larger



Roughness C

Roughness B



Surface Roughness C: Open terrain with scattered obstructions that have heights generally less than 30 feet.

Wind Exposure Category Cont.

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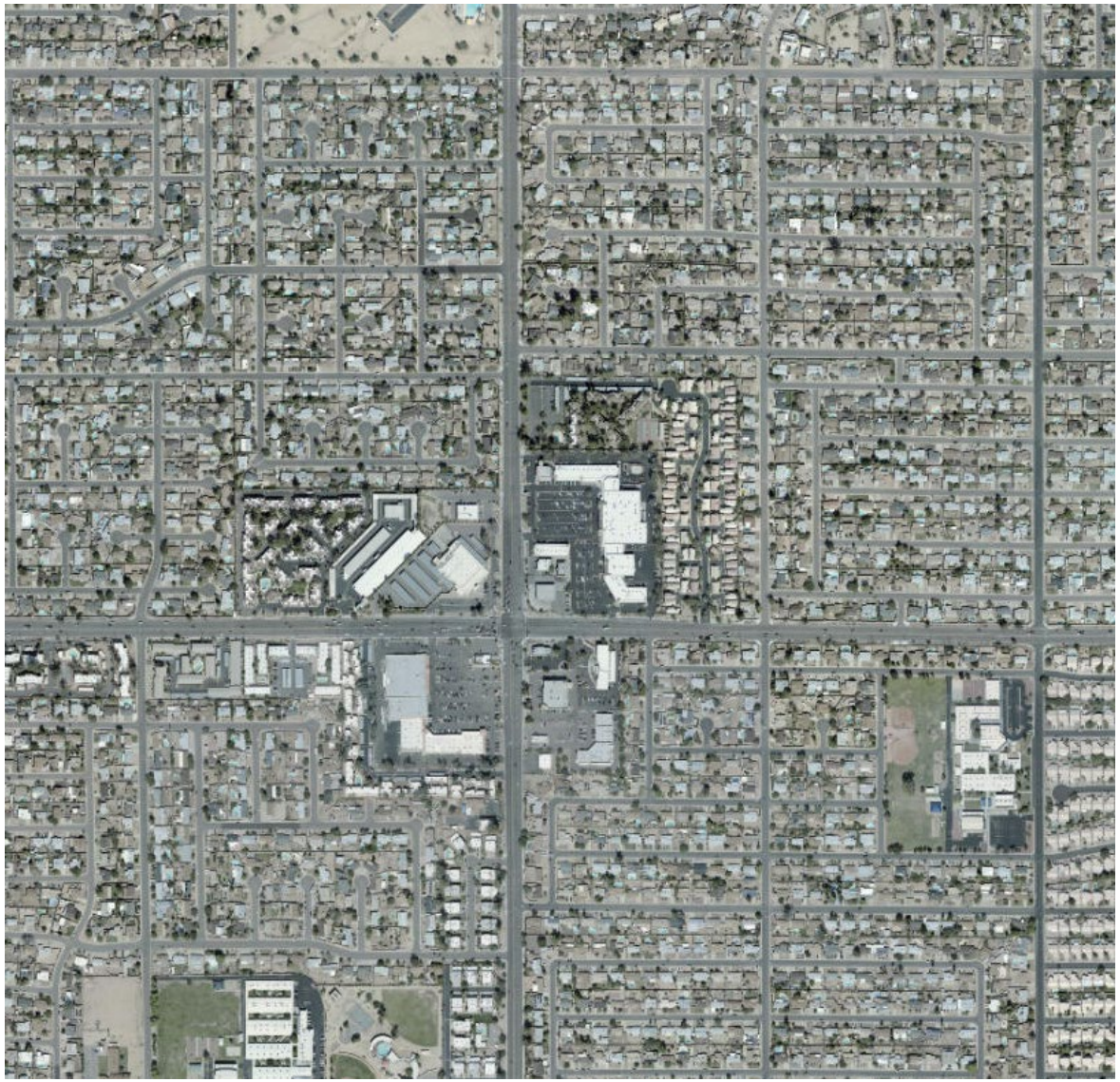

Phoenix is *Surface Roughness* C where not developed!

Wind on Parapets and Overhangs

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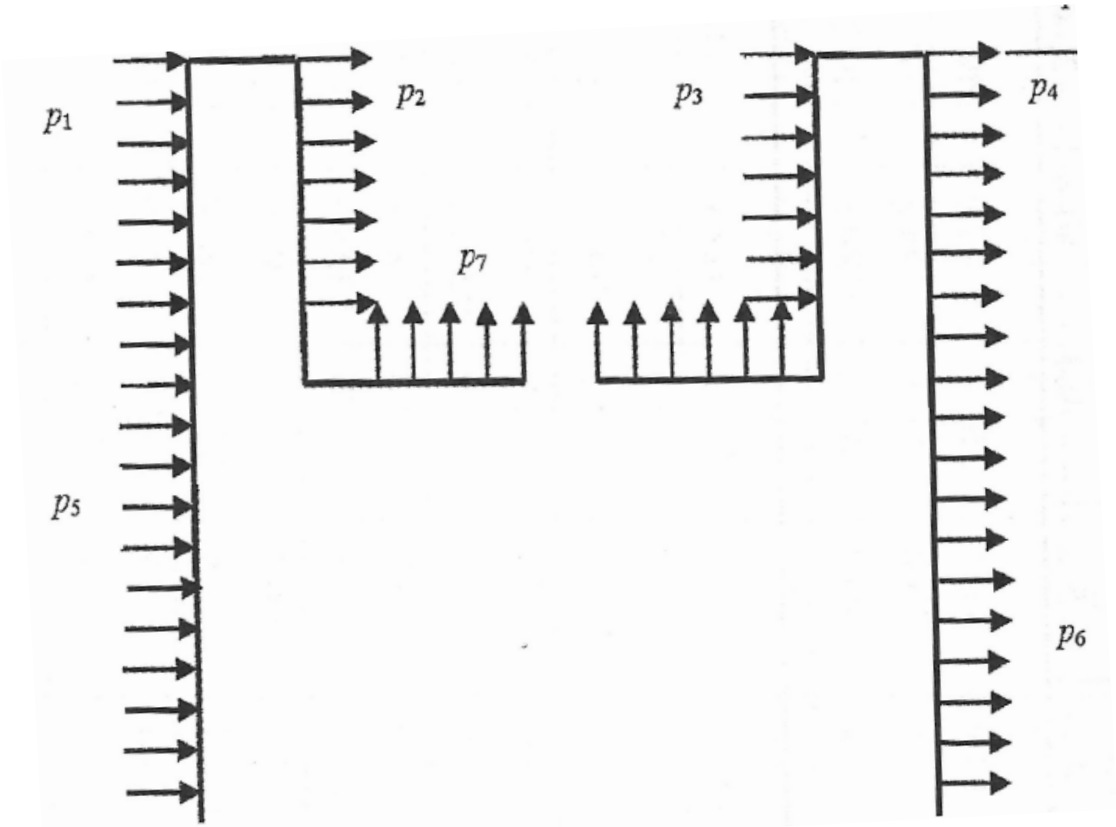
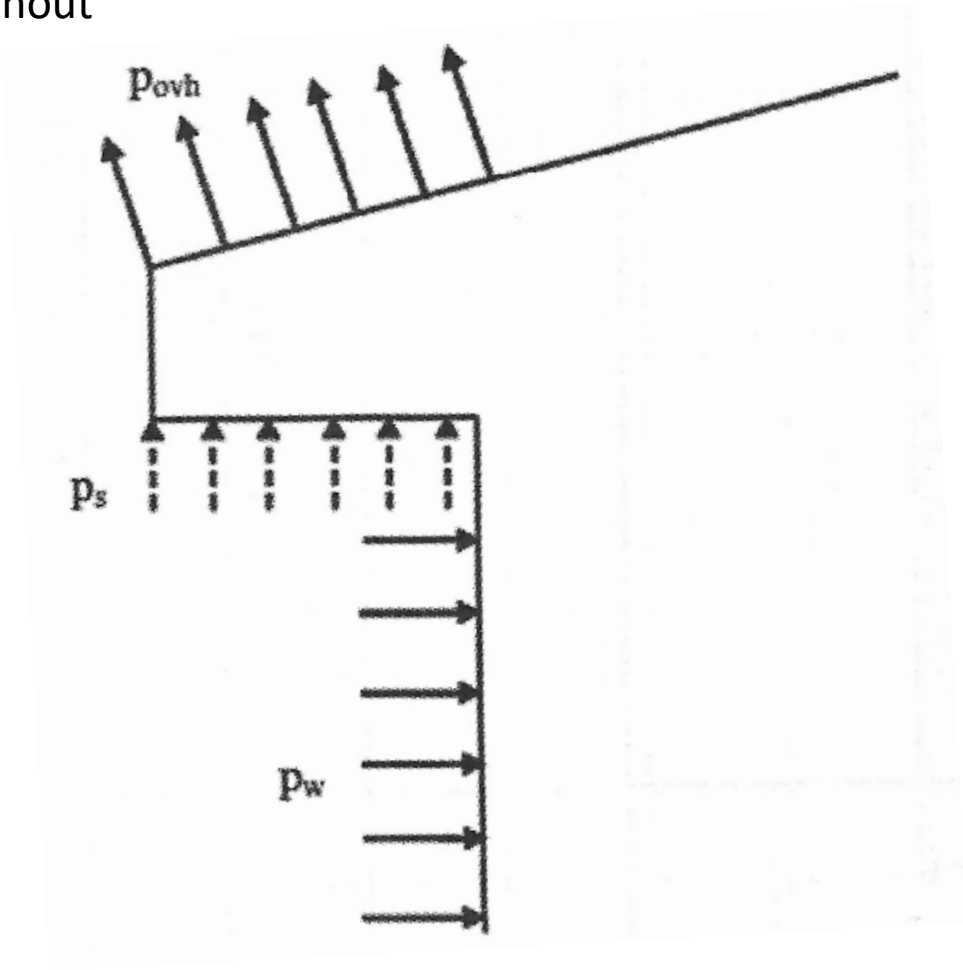
•Parapets and overhangs have high wind loads as the wind pushes on one side while it pulls on the other side.

•Buildings with parapets have much higher wind load than those without





Wind on Partially Enclosed Bldgs

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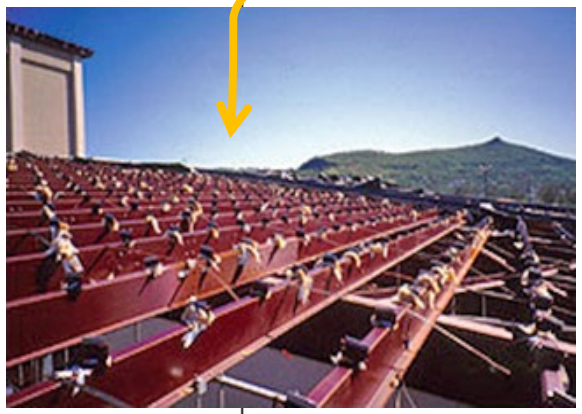
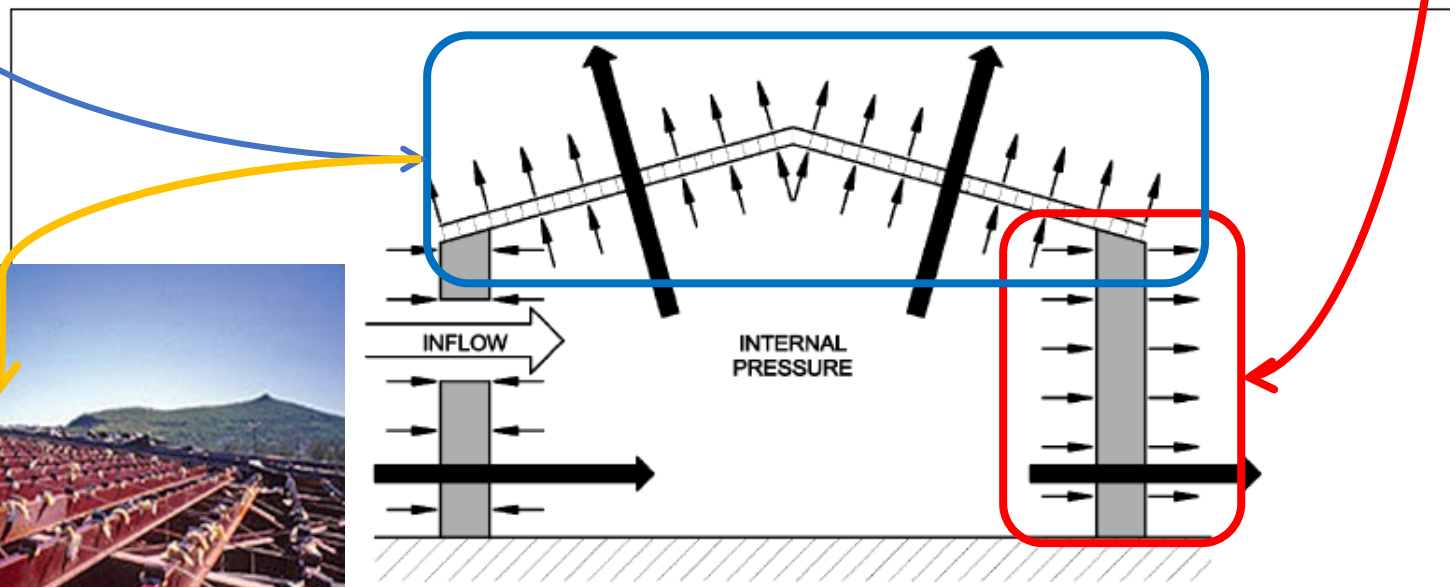
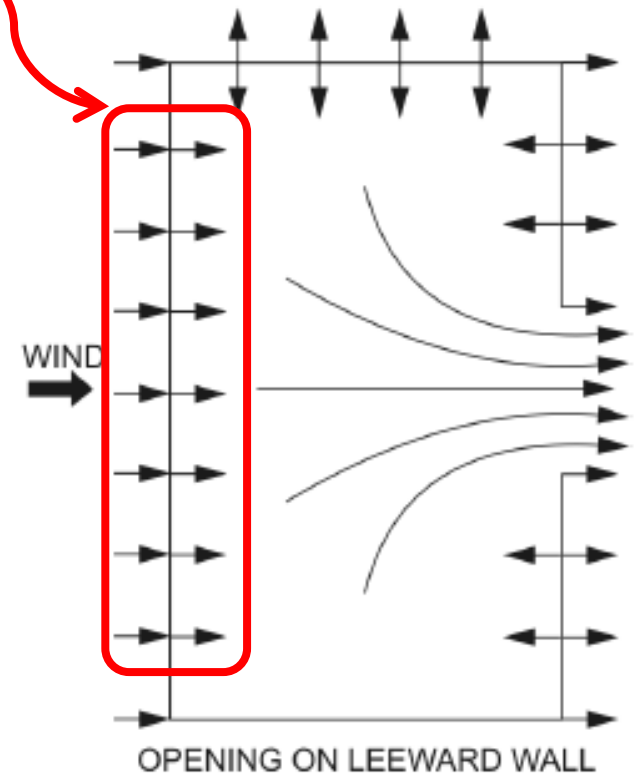
- Partially enclosed buildings have much higher internal pressures
- This results in higher forces on the individual wall components
- Requirements for wind loads on doors and exterior windows in IBC 1709.5… yes doors and windows are actually regulated





Commentary Figure 1609.2
EFFECTS OF OPENINGS IN THE BUILDING ENVELOPE



Commentary Figure 1609.1(2)
OPENING IN EXTERIOR WALL OF BUILDING

Wind Wall Anchorage

Do walls need wind anchorage to diaphragms like they do for seismic loads?

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(a) After hurricane Michael (b) Before hurricane Michael (Nov 2017)

Figure 17: Jinks Middle School (Panama City) gym destroyed by Hurricane Michael (source: WMBB). (a) Post-storm imagery documenting failure of end wall adjacent to parking lot (yellow dashed boxes) and tennis court (red dashed boxes). Roof at the tennis court side (blue dash boxes) is completely peeled back. (b) Multiple views of building before Hurricane Michael from Google StreetView (captured Nov 2017). Each damaged element in (a) is boxed using the same colors but solid line in (b).

Is your dead load larger than your wind load by the time you reach the sill plate?

Common Load Issues Continued

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Earthquake Loads:

- Soil site class C chosen arbitrarily resulting in approximately 20% missing earthquake load
  - Sometimes dramatically large missing load if resulting Seismic Design Category is A instead of B.
  - IBC allows us to assume site class D
- Structure separation for earthquake pounding is not provided

Earthquake Building Pounding

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- Building pounding occurs when two adjacent buildings collide.
- Earthquakes cause pounding when adjacent building have little or no separation.
- Can be extremely severe if impact takes place between floor levels
- Phoenix is lucky that it's earthquake chances and motion are low, but they are not zero
- Only way to design for pounding is with separation.

Common Load Issues Continued

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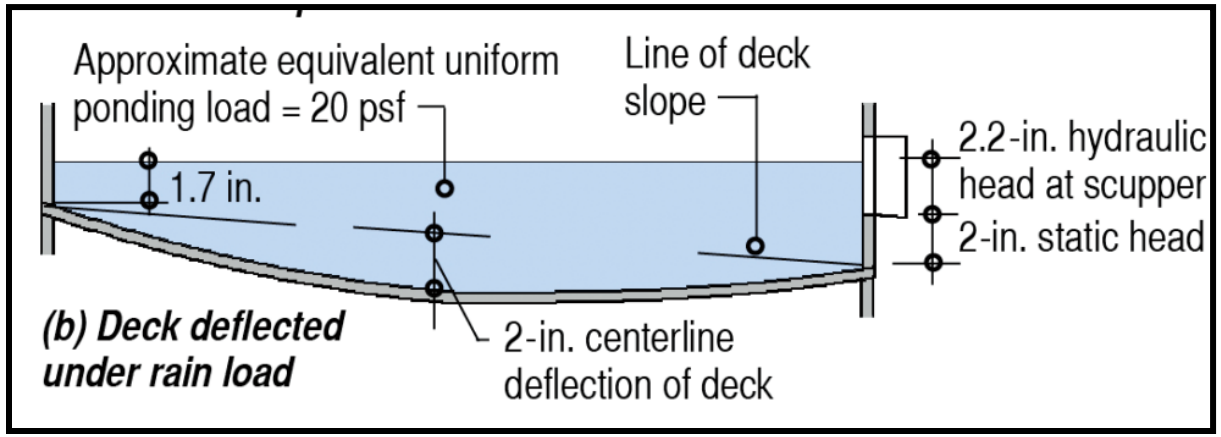
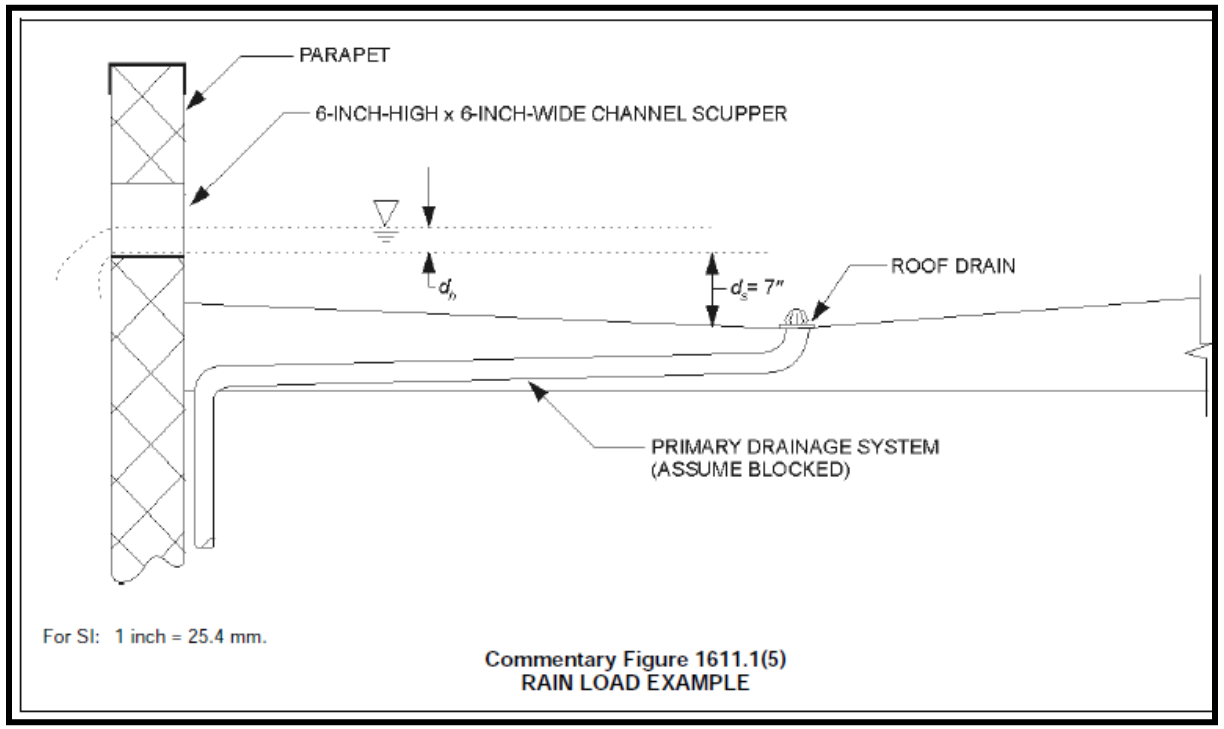
Rain Loads:

- Rain loading based on mechanical and architectural drawings
- Rain ponding potential ignored or incorrectly checked only with strength and not stiffness.
  - ASCE 7-16 updated its definitions of susceptible bays to clarify where its required to check.
  - From 2007 to 2017 rain load building damage losses in Texas and Arizona were nearly equal to snow load losses in New England

Roof Rain Load and Ponding





Commentary Figure 1611.1(5)
RAIN LOAD EXAMPLE

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- Rain causes mild pond
- Roof deflects
- More water ponds
- Roof deflections more
- Continues until failure or equilibrium from stiffness

Foundation Plan

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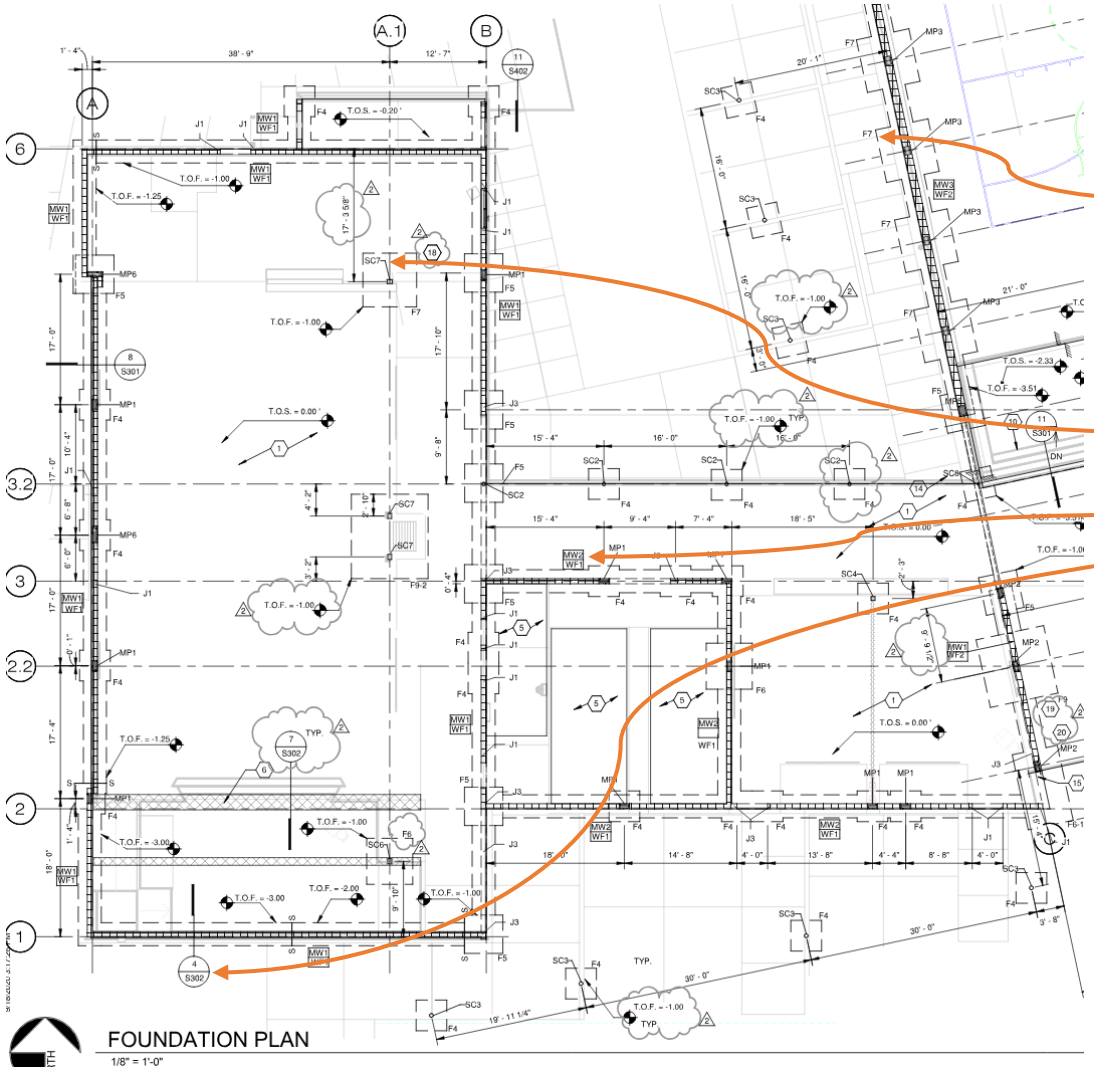
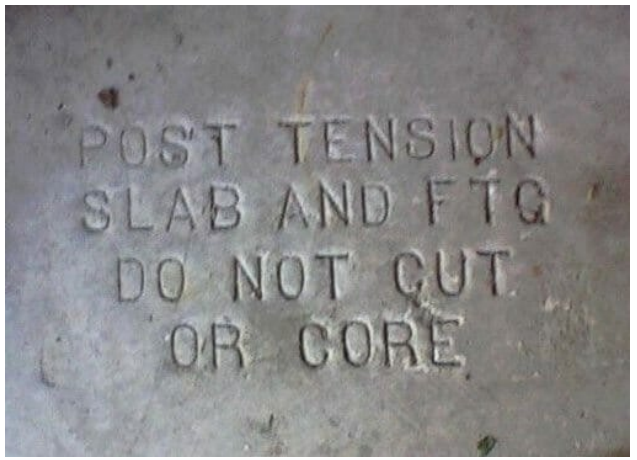


Contents:

- Foundation sizes
- Rebar size and spacing
- Column sizes
- Wall sizes



- Shear Walls / Braced Frames / Moment Frames Identified
- Cut Details
- PT slabs stamped per IBC Amended 1907.2

Floor Framing Plan

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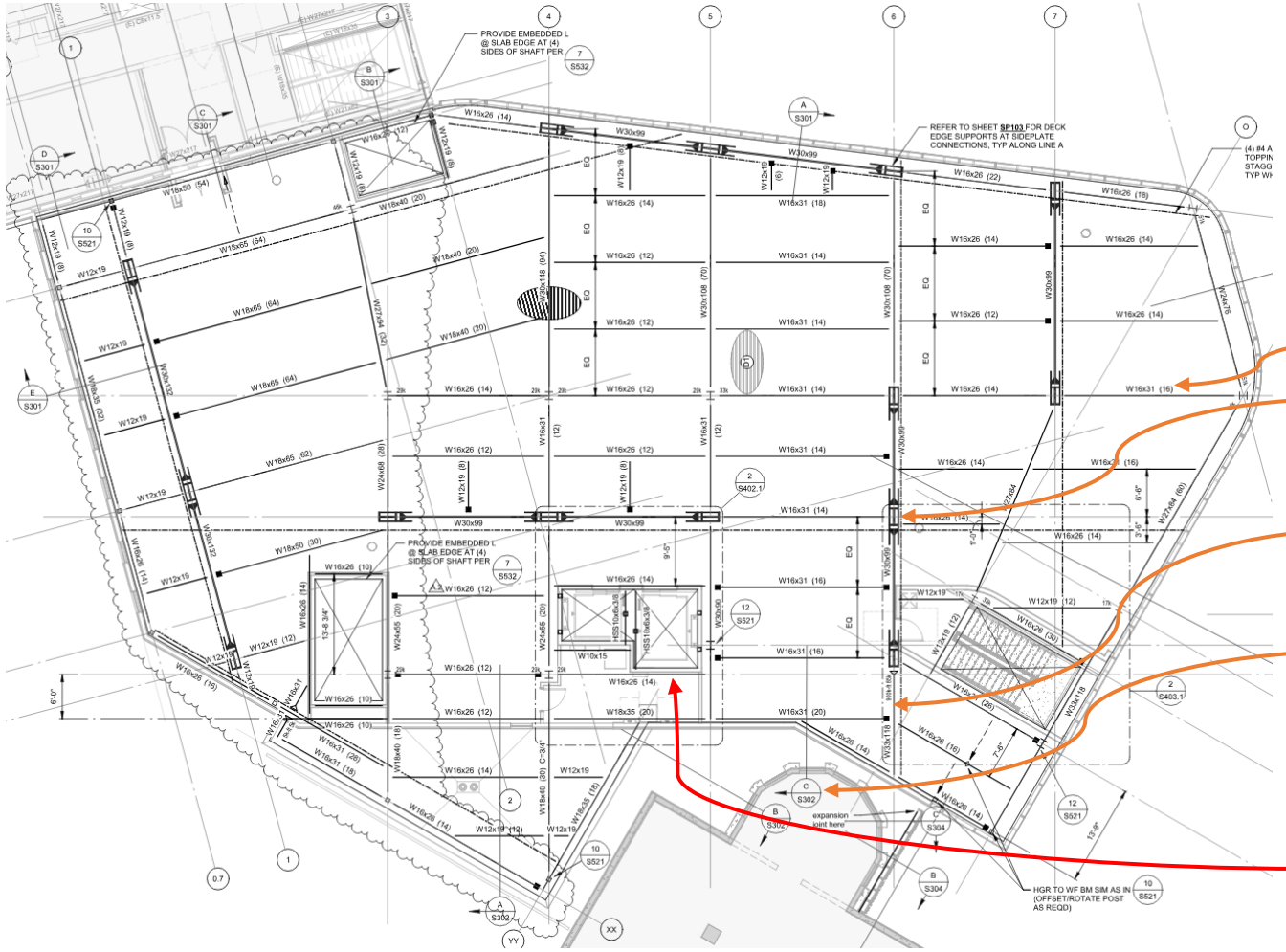

Contents:

- Column size changes
- Repetitive framing sizes
- Beam sizes
- Shear Walls / Braced Frames / Moment Frames Identified
- Diaphragm Collectors
- Diaphragm Chords
- Cut Details
- Connection Details
- Remember to check architectural fire rated wall locations!

Roof Framing Plan

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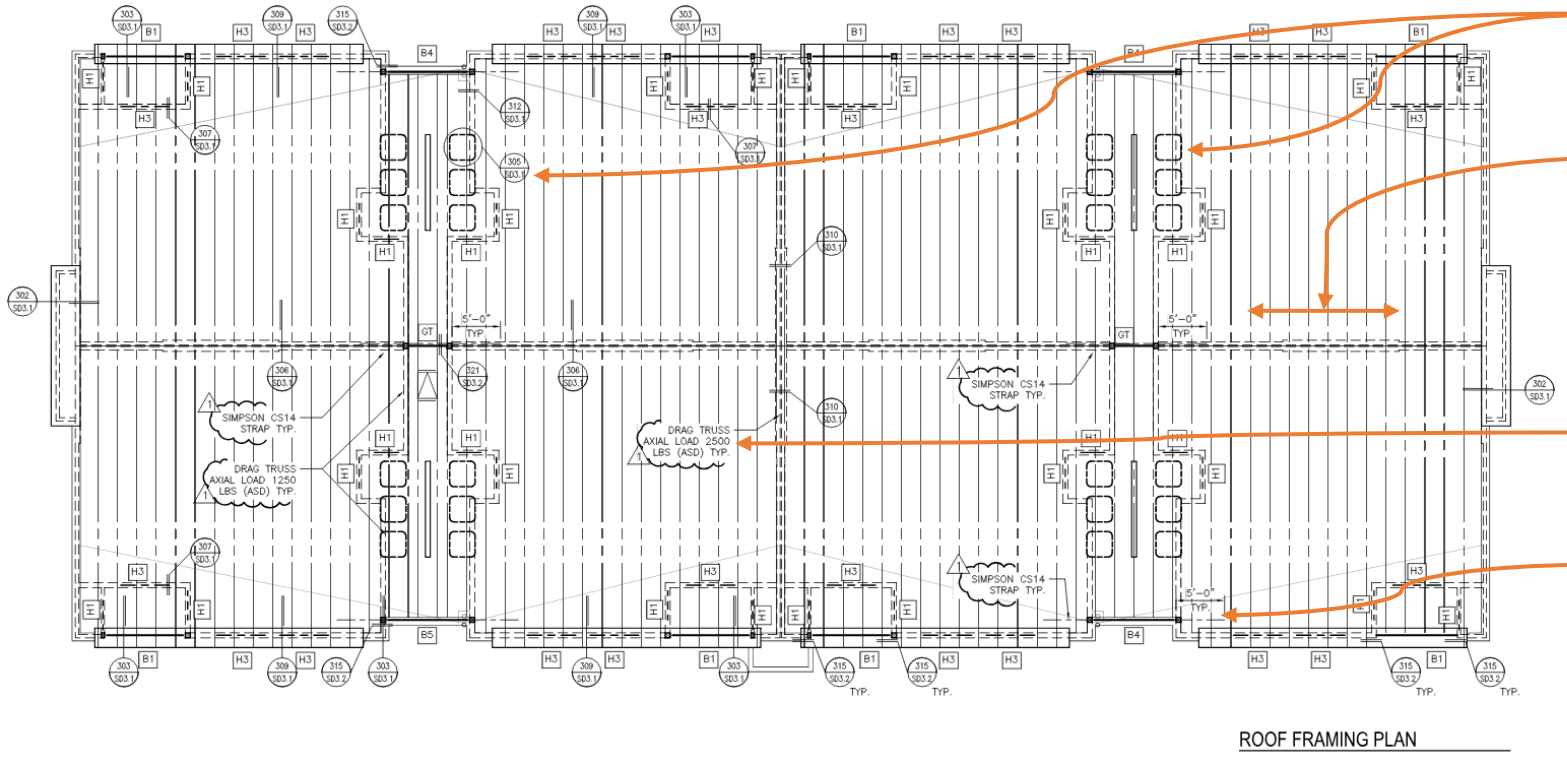

Check Contents:

- Rooftop Unit Weights are shown
- Repetitive framing sizes
- Beam sizes
- Diaphragm collectors
- Diaphragm chords
- Roofs with parapets have roof drains

Roof Framing Plan

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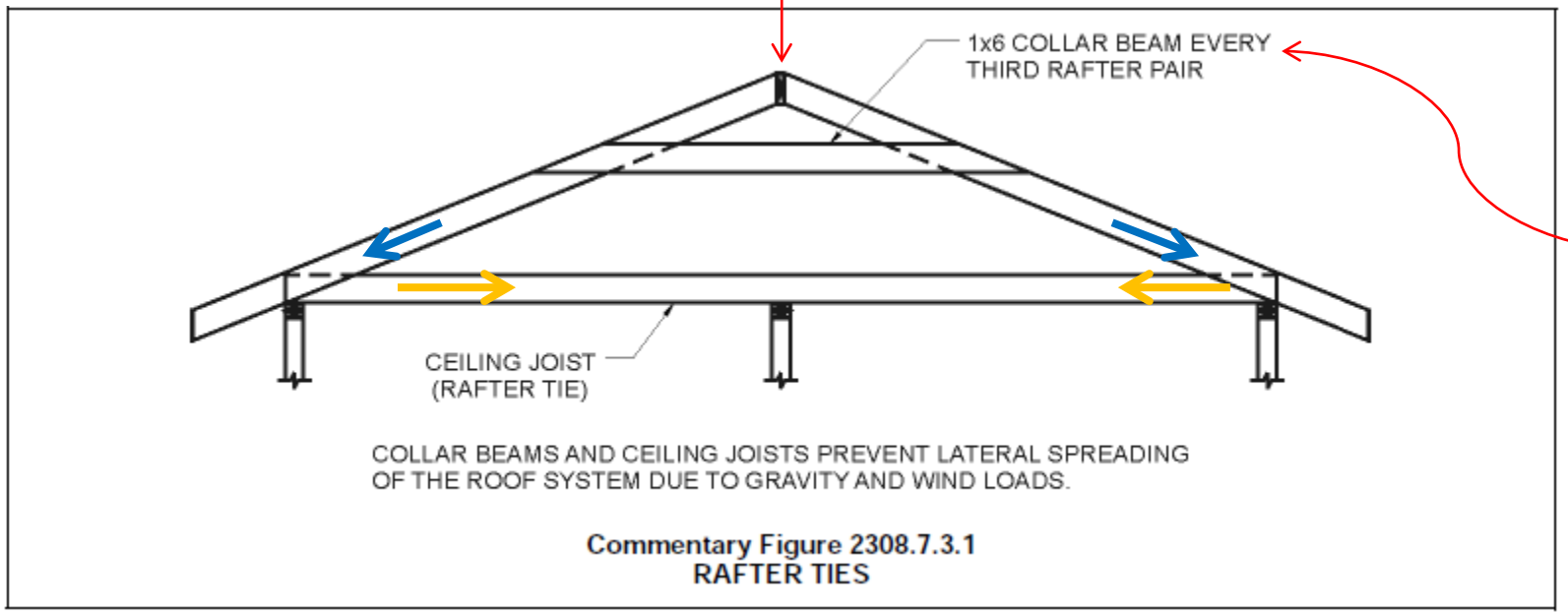
IRC and Conventional Roof Construction IBC 2308

- Ceiling joists are an integral part of the construction
- They resist the thrust outwards on the walls as there is no beam at the top of the ridge

Ridge board versus a ridge beam

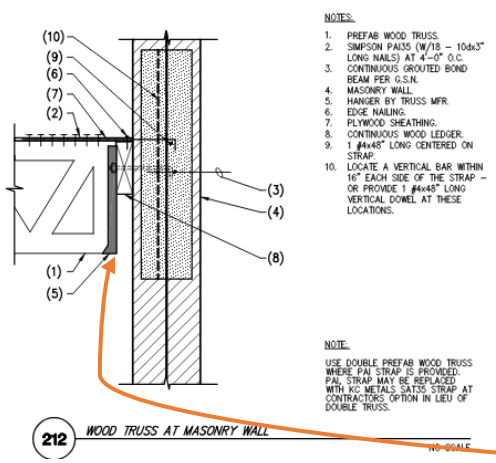


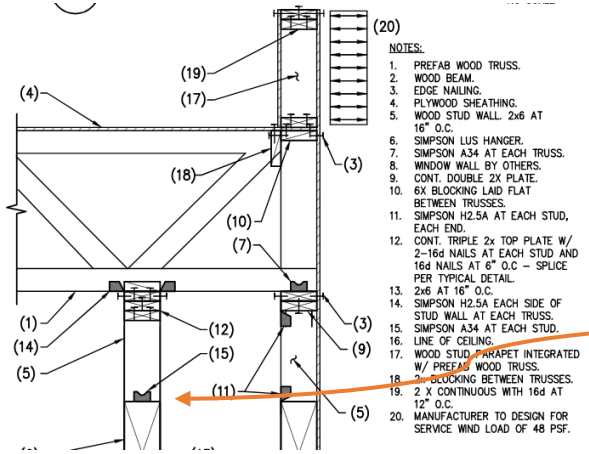
COLLAR BEAMS AND CEILING JOISTS PREVENT LATERAL SPREADING OF THE ROOF SYSTEM DUE TO GRAVITY AND WIND LOADS.

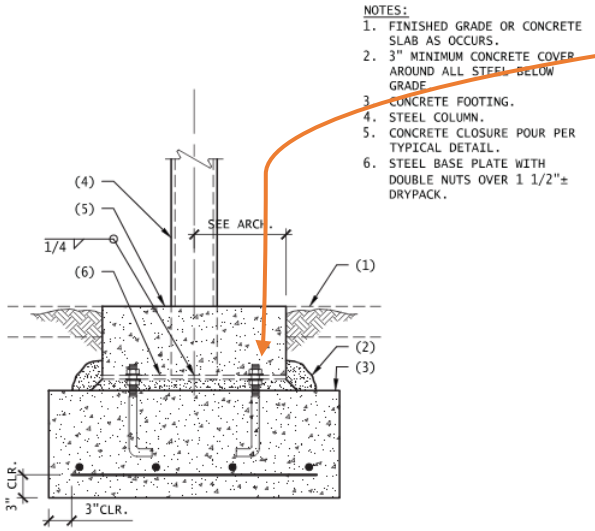
Commentary Figure 2308.7.3.1
RAFTER TIES

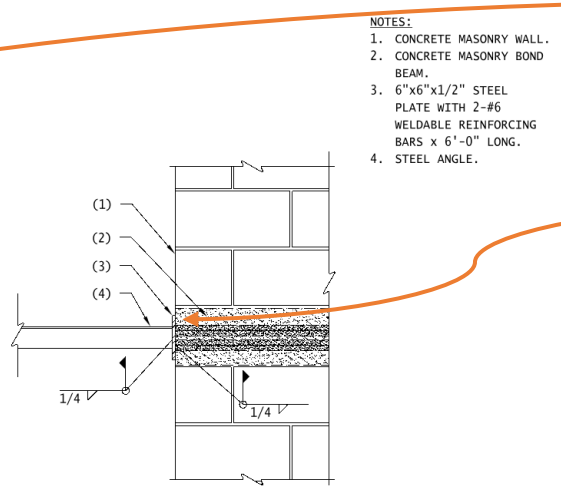
These things are for wind uplift

Details









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Check Contents:

- Beam to column connections
- Repetitive framing to beam connections
- Repetitive framing to wall connections
- Foundation to column connections
- Foundation to wall connections
- Window and Door opening details
- Diaphragm to shear wall connections
- Shear wall chords and holdowns
- Diaphragm continuity at corridors

Wall Framing and Details

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- Perforated and FTAO Shear Walls
  - Design shown in calculations
- Concrete Tilt Panels – show jambs, point loads, and reinforcement
- Fire protection - Clarification of Primary and Secondary Framing Members (704.3 and 704.4)
  - Columns vs Light-Frame Columns
- Know which structural framing members must be rated per Table 601 and 602.

Nailing for Shear Walls and Diaphragms

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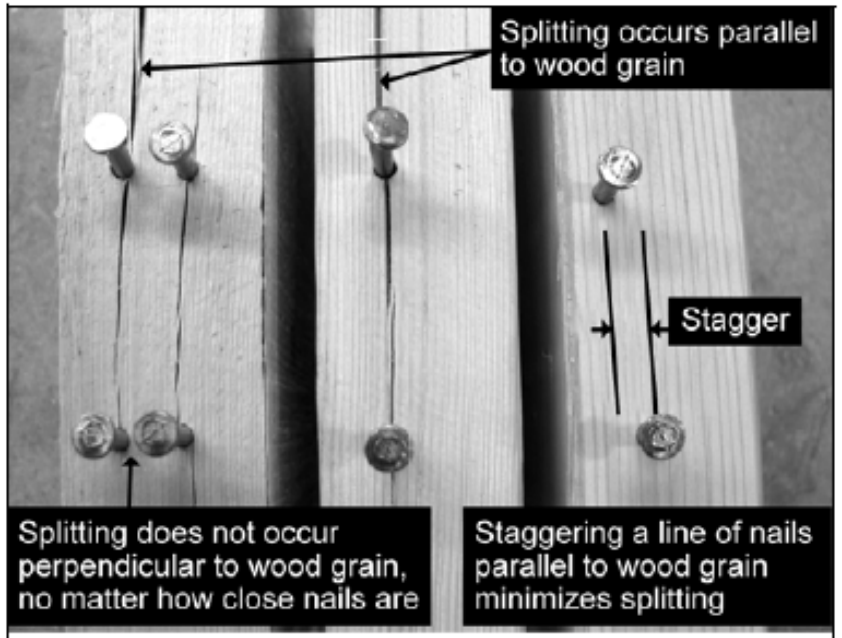
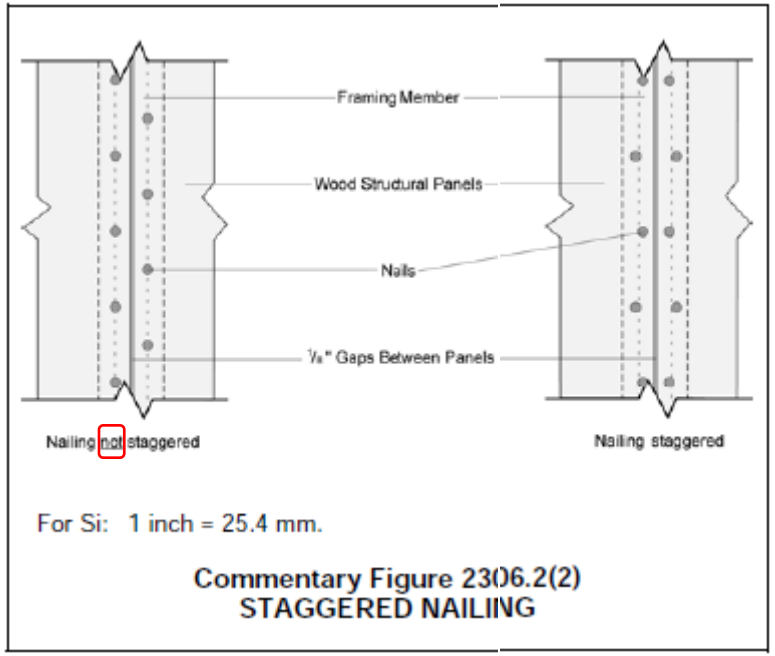
- Common misconception for staggered nailing in diaphragm and shear wall panel edges



Commentary Figure 2306.2(1)
HOW WOOD SPLITS AND
HOW STAGGERING MINIMIZES SPLITTING



Commentary Figure 2306.2(2)
STAGGERED NAILING

Wood Shrinkage

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IBC 2304.3.3 Shrinkage effects on wood framing over three stories

Shrinkage almost exclusively takes place perpendicular to the grain for wood, not longitudinally.

Scenario sprinkler lines to roof: (3) 2x10s platform framed and (12) 2x top plates or sills.

Assume Kiln Dried (KD) wood is specified (because you don't like getting sued from green wood at 30%). Moisture content = 19%.

S = (3 x 9.25"+ 12 x 1.5") x (19%-6%) x 0.002
S = 1.19 inches from foundation to roof plate
If balloon framed then = 0.47 inches.
Mixed wood and masonry/concrete structures.

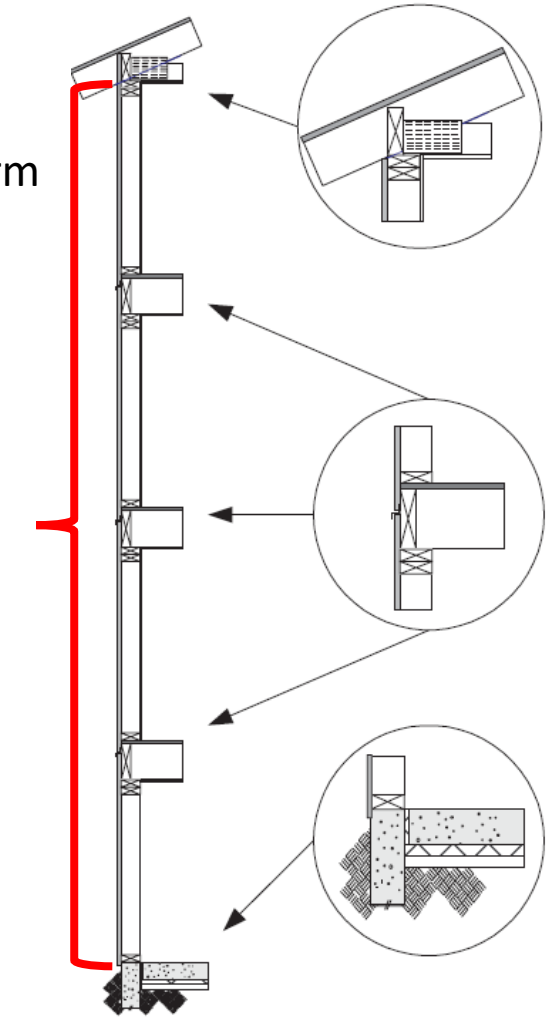

Table 1. Average Outdoor and Indoor EMC

Location	Average Outdoor EMC (%)	Average Indoor EMC (%)
Los Angeles, CA	10	9
San Diego, CA	12	10
Twentynine Palms, CA	6	6
San Francisco Bay Area	13	9
Sacramento Valley (CA)	11	8
N. Coast Red. (CA)	14	9
Sierra Nevada (CA)	11	7
San Joaquin Valley (CA)	11	8
Phoenix/Tucson, AZ	7	6

$S = D \times M \times C$ Where S = Shrinkage, inches
D = Dimension, inches
M = Change in moisture content, percent
C = Shrinkage coefficient, 0.0020 for Western softwood species

Lateral Load Detailing

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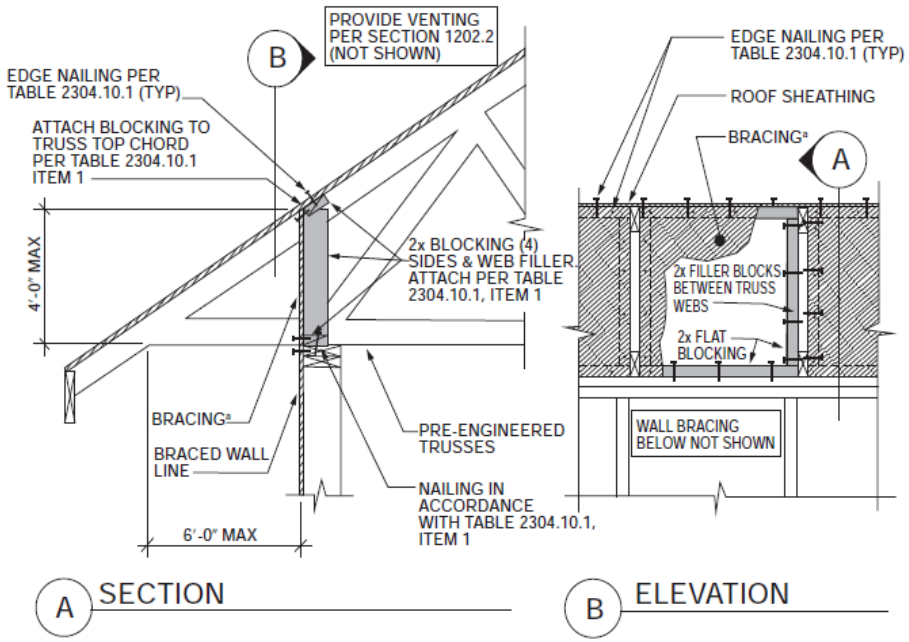
- Loads in the roof and floor diaphragms have a path to reach the shear walls

- Large openings in diaphragms and shear walls have reinforcement



a. Methods of bracing shall be as described in Table 2308.6.3(1) DWB, WSP, SFB, GB, PBS, PCP or HPS.

)4.8 mm.

FIGURE 2308.6.7.2(2)
BRACED WALL PANEL TOP PLATE CONNECTION

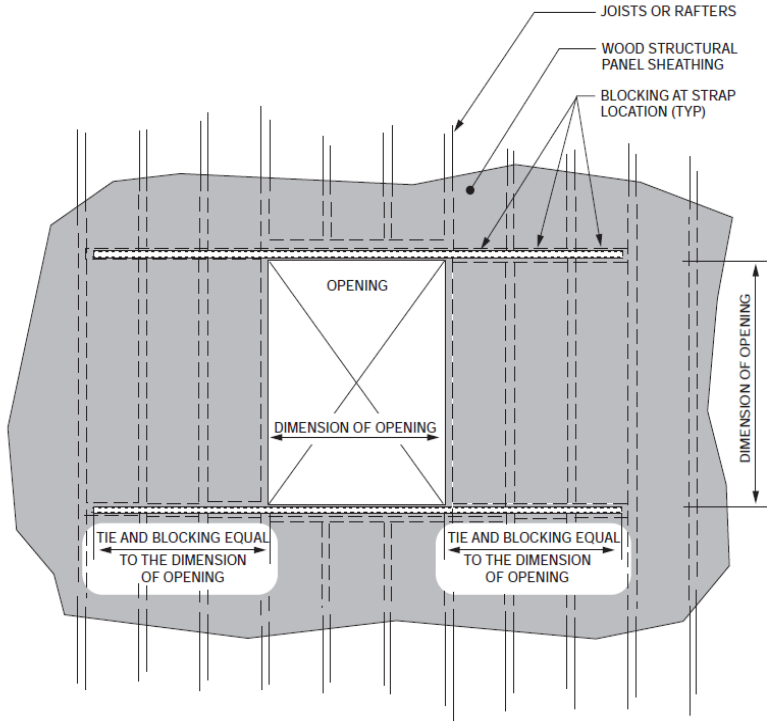


FIGURE 2308.4.4.1(1)
OPENINGS IN FLOOR AND ROOF DIAPHRAGMS

Lateral Load Detailing

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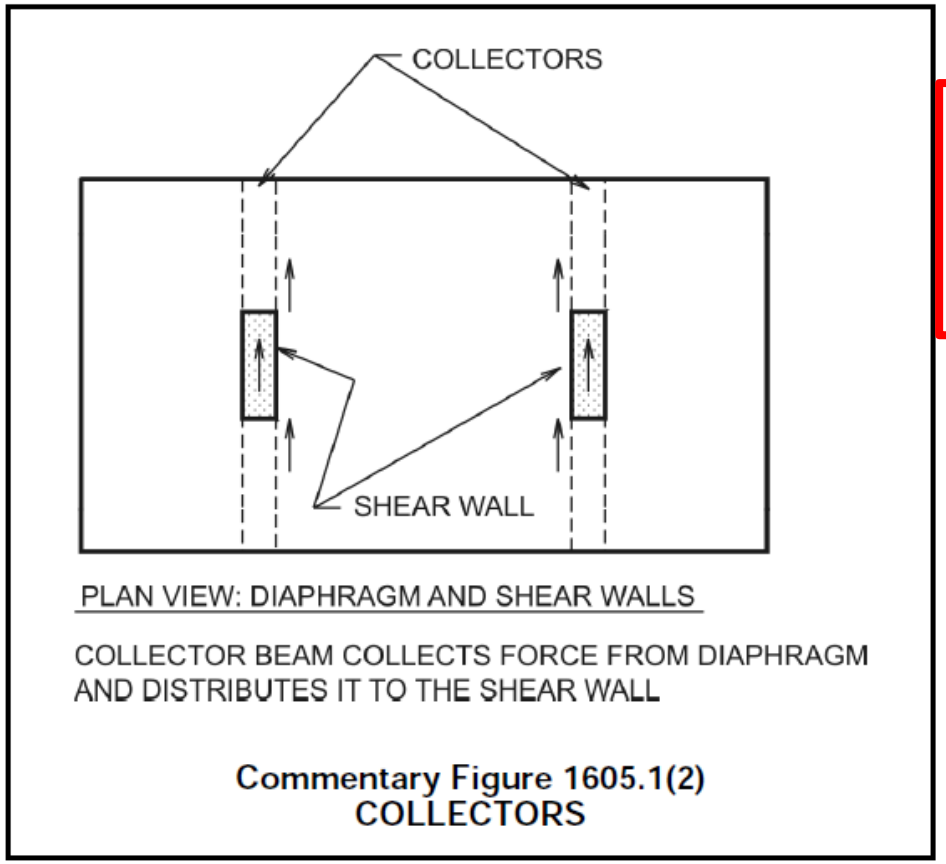
- Diaphragms have collectors provided so force can reach a shear wall

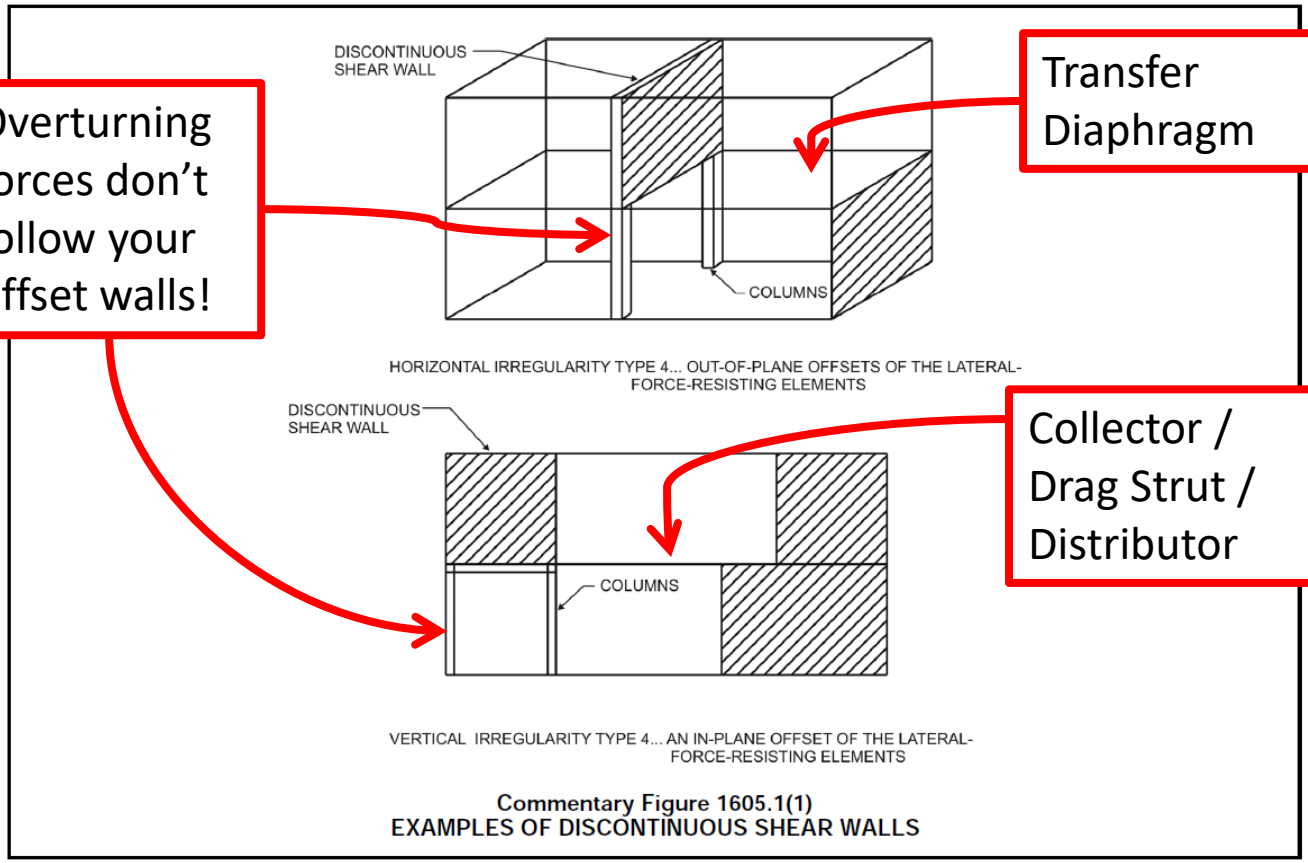
•Discontinuous shear walls have adequate detailing to transfer forces. This can get very complicated if you offset walls.



Overturning forces don't follow your offset walls!

Transfer Diaphragm

Collector / Drag Strut / Distributor



Calculations

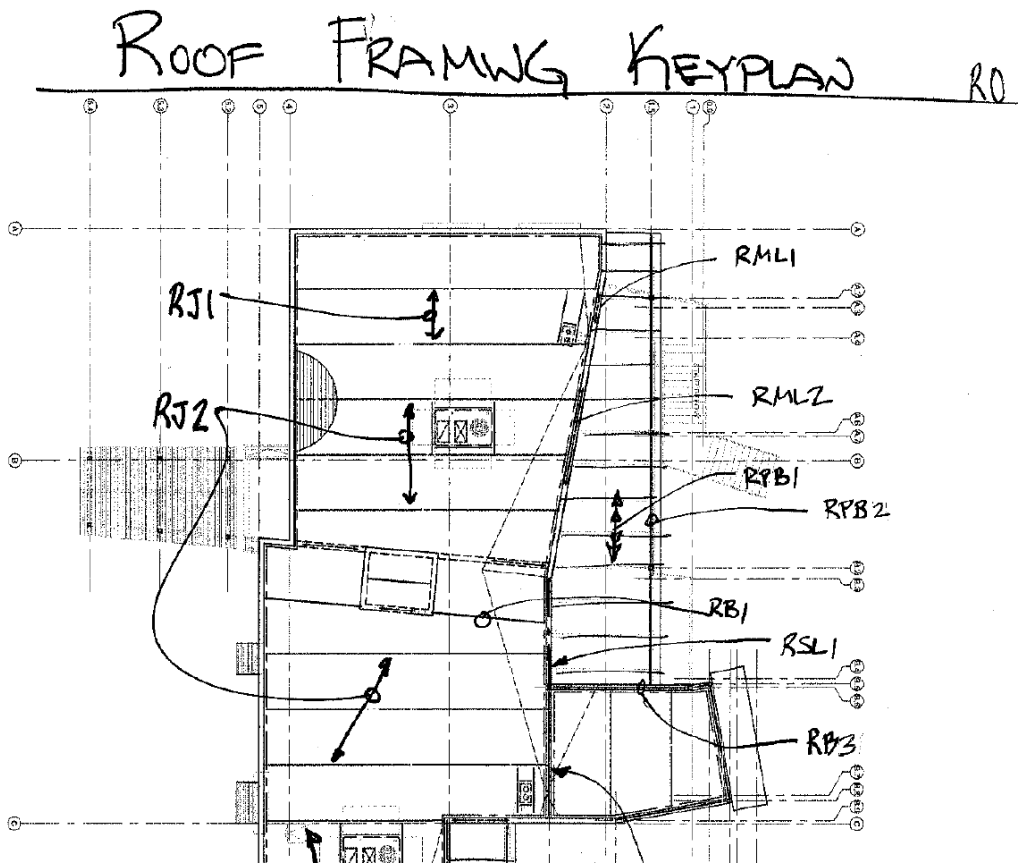
Data matches the GSN's

- Wind exposure
- Seismic data
- Soils data

Sketches of framing plans (keyed plans)

Summaries for input and output

Hand calculations to validate design input loads, connection details, etc.



Special Topics:
(TRT) Technical Documents

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- Alternative materials and design
  https://www.phoenix.gov/pddsite/Documents/TRT/dsd_trt_pdf_00284B.pdf
- Code modification guidelines
  https://www.phoenix.gov/pddsite/Documents/TRT/dsd_trt_pdf_00889.pdf
- Slabs on ground as foundations
  https://www.phoenix.gov/pddsite/Documents/TRT/dsd_trt_pdf_00282.pdf
- Post-tensioned concrete
  https://www.phoenix.gov/pddsite/Documents/TRT/dsd_trt_pdf_00200.pdf
- Soil presumptive loads and special inspection
  https://www.phoenix.gov/pddsite/Documents/TRT/dsd_trt_pdf_00878.pdf
- Storage racking systems
  https://www.phoenix.gov/pddsite/Documents/TRT/dsd_trt_pdf_00701.pdf
- Compacted Aggregate Piers
  https://www.phoenix.gov/pddsite/Documents/TRT/dsd_trt_pdf_00223.pdf
- And much more – these are some but not all of the structural ones.

Straps worked!...
For what they were attached to.

Special Topics: Elevator Support

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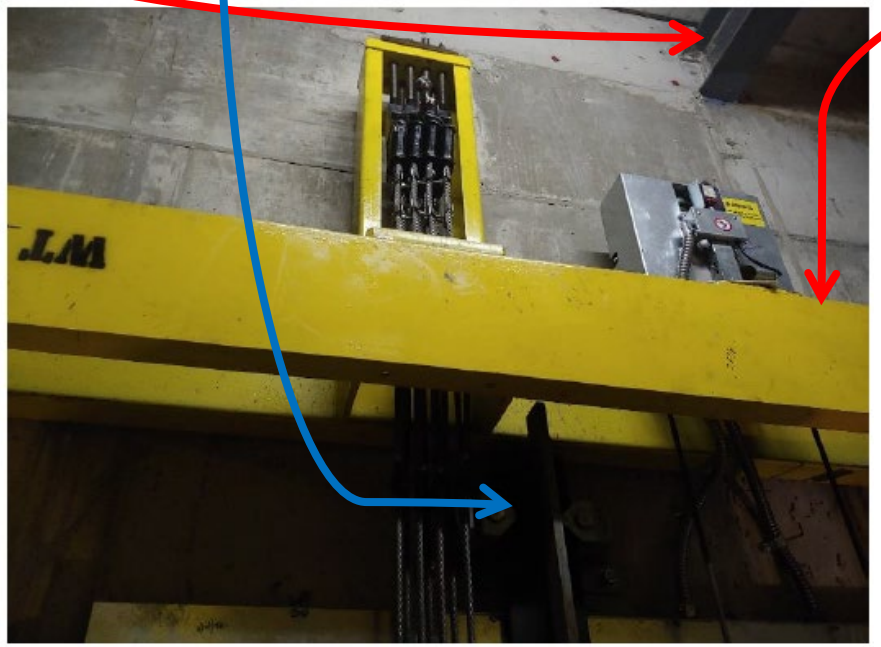
- Hoistway beams are only for construction and maintenance
- The guide rails infrequently take the loading of the elevators
- Elevators supported inside hoistways deliver their load to "elevator machine beams"



Picture 1: One of two sides supporting the elevator weight. The opposite side supports the drive motor and counterweight. Notice the hoist beam above. Elevators weight has traditionally been supported by the equipment and anchorages in elevator equipment rooms, above a hoistway, but these rooms are no longer common.

- Counterweights typically weigh 1.4 times the weight of the elevator

- Did you design your walls for this? Have columns for this? What happens at non-bearing walls?

- Add'l info in June 2014 structure magazine article

Picture 2: The same "dead" side that holds the side of the cables that do not move. This beam installed by the elevator manufacturer is supported by the hoistway wall. It is doubted this load was communicated to the building designer. This hoistway consists of both masonry and concrete walls.

Special Topics:
Approved Steel Fabricators

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In lieu of special inspections for fabricators

The City administers the program and maintains a list: https://www.phoenix.gov/pdd/topics-a-to-z/steel-fabricators

Probably expanded past steel soon. Lists exist for wood truss fabricators as well through the Maricopa Association of Governments (MAG).

Figure H-13 Collapsed unreinforced masonry classroom wall in the U.S. Virgin Islands during Hurricane Marilyn in 1995 (FEMA, 2010a).

Special Topics: Post-Tensioned Concrete Slab

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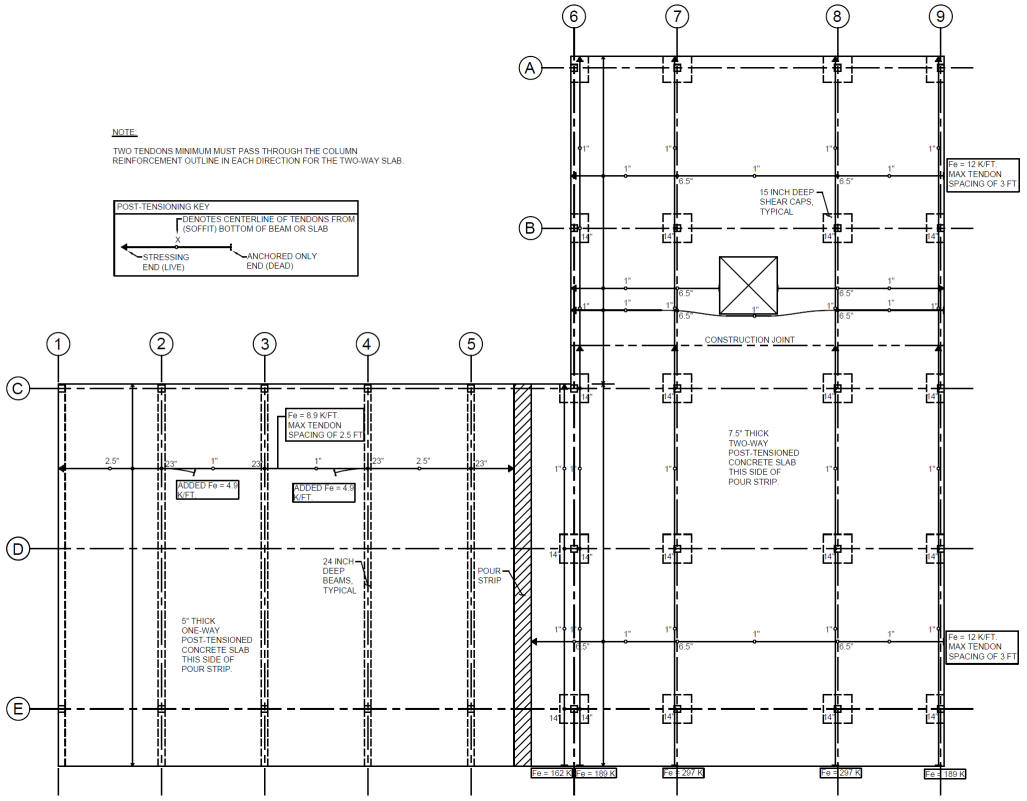
Post-Tensioned Concrete Slabs

- PT Slabs are typically designed by the E.O.R. using standard design procedures and typical material parameters
- The construction drawings must show the tendon layout and specify the design assumptions and material parameters used
- The design is calculated and has supporting calculations
- Contractor submits sealed adjusted tendon placement drawings and calculations to E.O.R., using specific tested tendon properties, to meet the original E.O.R. design.
- Alternatively, the PT slabs can be given to a specialty engineer to design prior to issuance of a permit with drawings coordinated with the E.O.R.



Special Topics: Alternatives

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- The provisions of IBC Section 104.11 allow you to build anything in a manner that isn't specifically prescribed by the codes when accepted as equal by the building official.
- The usual way this is accomplished is via code/evaluation/research reports.
- Historically - two big players writing research reports, now more agencies are doing so.
- Not all accredited agencies are equally good at this.
- Ask City staff if faced with an unfamiliar agency.

UES

ES ICC EVALUATION SERVICE

QAI

intertek
Total Quality. Assured.

UL Evaluation Report

DrJ

Special Topics:
Compacted Aggregate Piers

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- There are two companies selling compacted aggregate piers.
- Accepted by Phoenix as soil improvement with stipulations. See TRT 00223.
- Secret sauce is causing lateral/confining stress to build up.

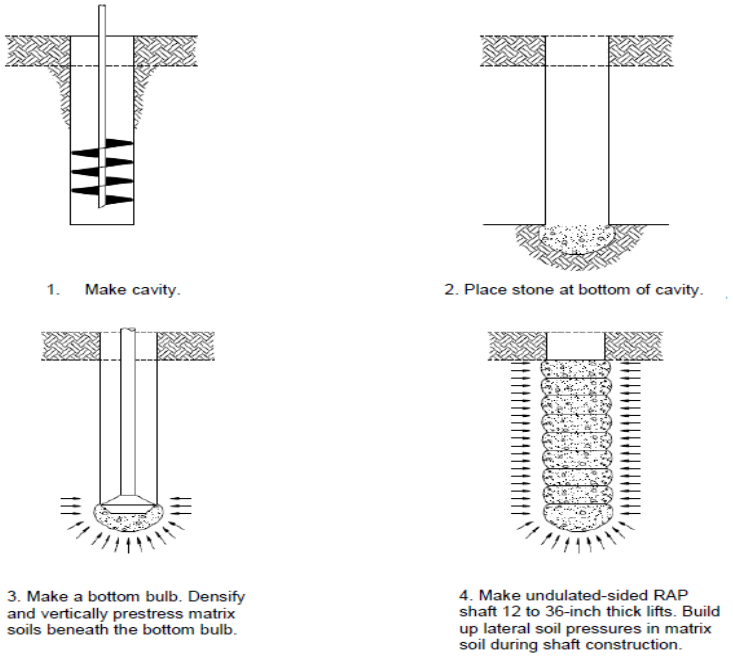

FIGURE 1—RAP CONSTRUCTION PROCESS USING THE GEOPIER SYSTEM

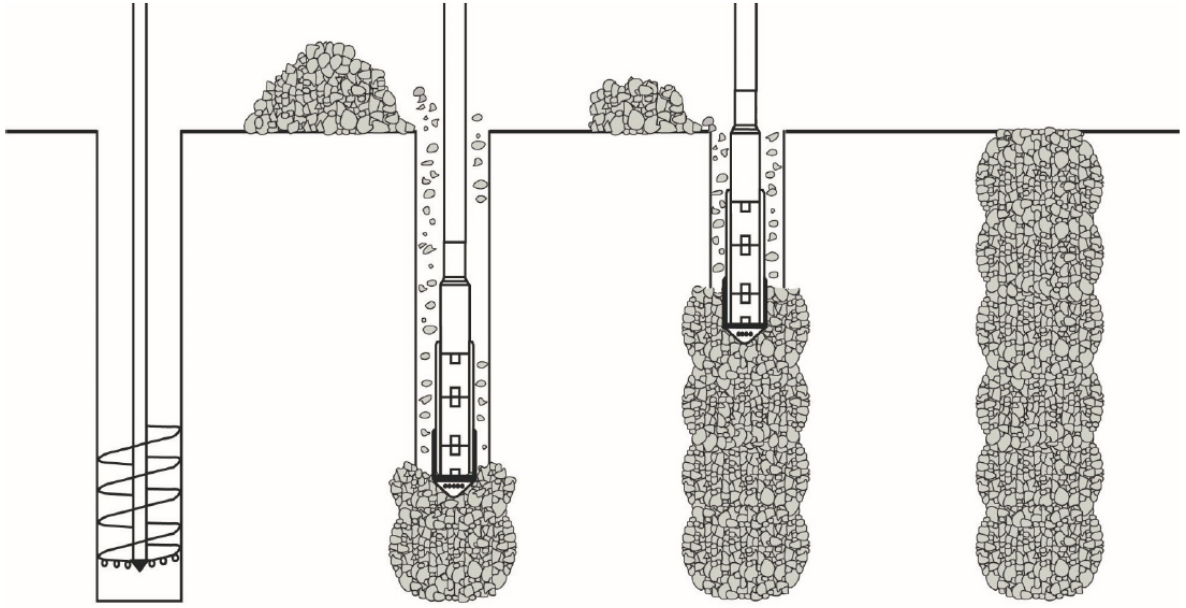

FIGURE 1—TOP-FEED VIBRO PIER CONSTRUCTION SEQUENCE

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Coordination

- Check the architectural drawings for compatibility with the structural drawings

Overlapping Information with Architectural Details

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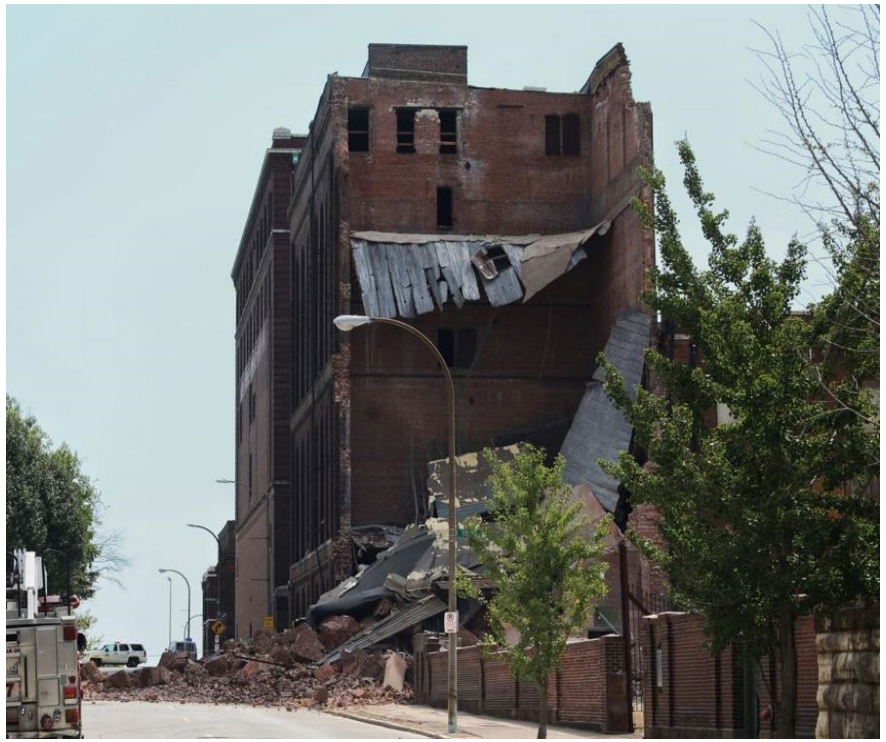
Become familiar with Chapter 6 and Chapter 7

Table 601 – Fire Resistance Rating requirements for Building Elements

- Know the construction type
- When elements are rated, they need to match the architectural and UL details



Type I and Type II buildings

– all materials non-combustible

•No wood. No epoxy in gravity load path*

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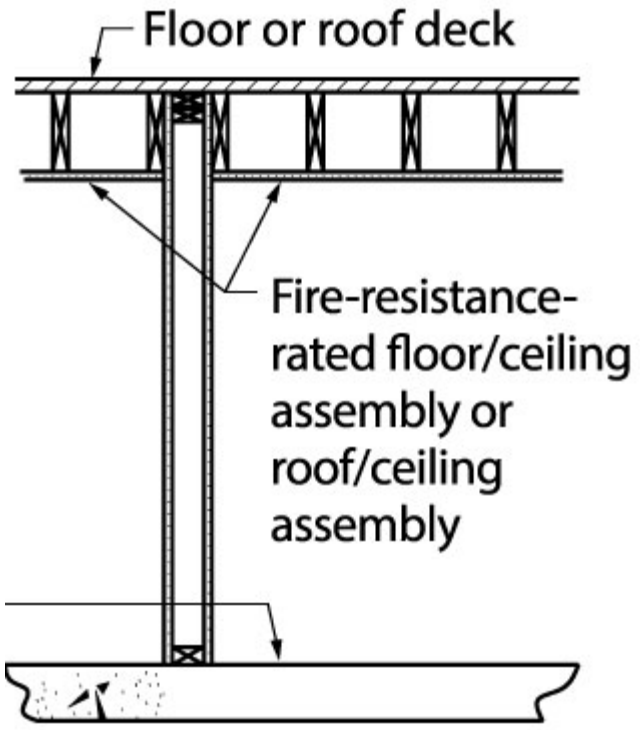
Type III buildings – exterior walls non-combustible

- Is FRTW non-combustible?
  - NO, but there are some applications where it can be used where non-combustible is usually required.



Type IV buildings – heavy timber

Type V buildings – any materials permitted by the code

- Remember just because a building is type VB does not mean there is no rating (fire walls, fire barriers, etc).

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IBC 706 Fire walls – structural independence (Section 706.2)

706.2 Structural stability.
Fire walls shall have sufficient structural stability under fire conditions to allow collapse of construction on either side without collapse of the wall for the duration of time indicated by the required fire-resistance rating or shall be constructed as double fire walls in accordance with NFPA 221.

Overlapping Information with Architectural Details

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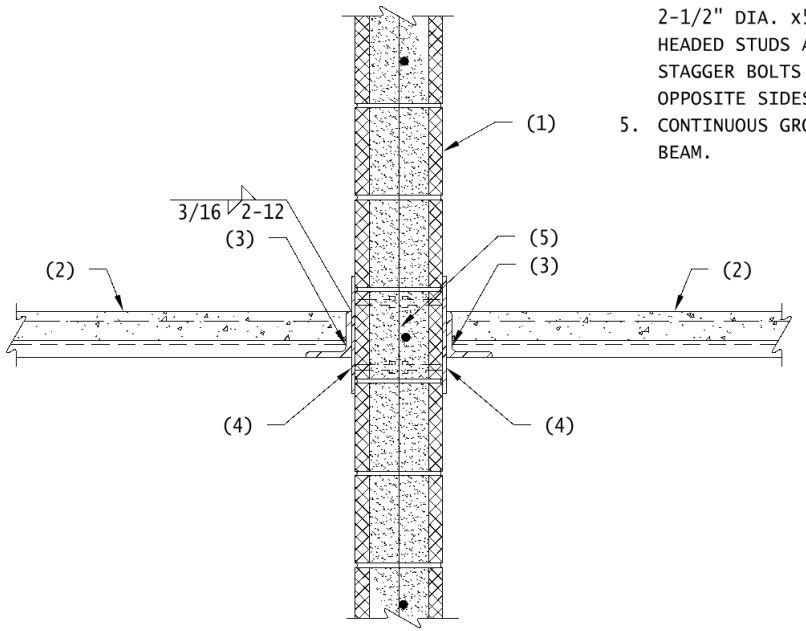
Can this detail be used at a fire wall?

3. L4x4x1/4 CONTINUOUS LEDGER ANGLE.
4. 1/4"x4"x0'-9" STEEL PLATE AT 4'-0" O.C. WITH 2-1/2" DIA. x5" LONG HEADED STUDS AT 6" O.C. STAGGER BOLTS ON OPPOSITE SIDES OF WALL.
5. CONTINUOUS GROUTED BOND BEAM.



Compare with this detail

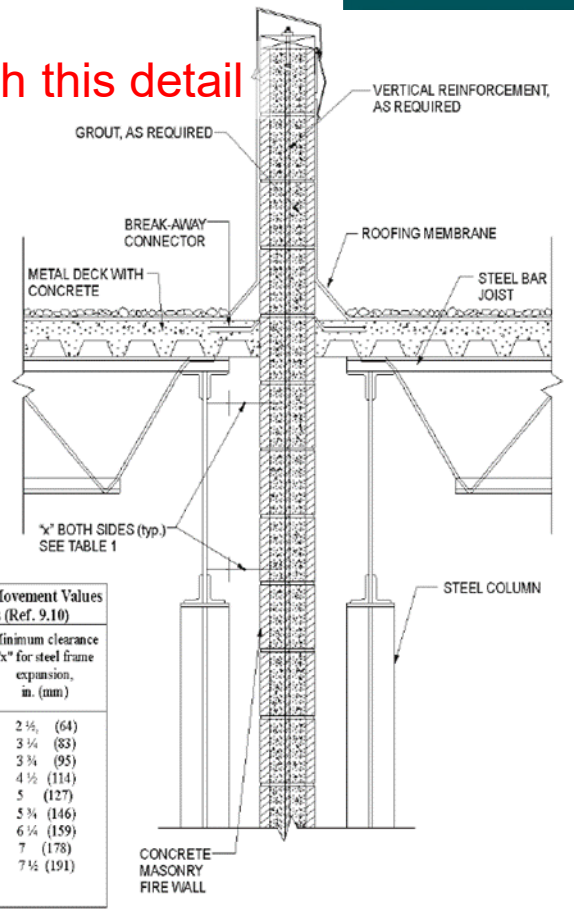


Table 1 — Thermal Movement Values for Steel Frames (Ref. 9.10)

Length of bay perpendicular to fire wall ft (m)	Minimum clearance "x" for steel frame expansion, in. (mm)
20 (6.10)	2 ½ (64)
25 (7.62)	3 ¼ (83)
30 (9.14)	3 ¾ (95)
35 (10.67)	4 ½ (114)
40 (12.19)	5 (127)
45 (13.72)	5 ¾ (146)
50 (15.24)	6 ¼ (159)
55 (16.76)	7 (178)
	7 ½ (191)

Who is responsible for Fire Wall Structural Stability? - IBC 706.2

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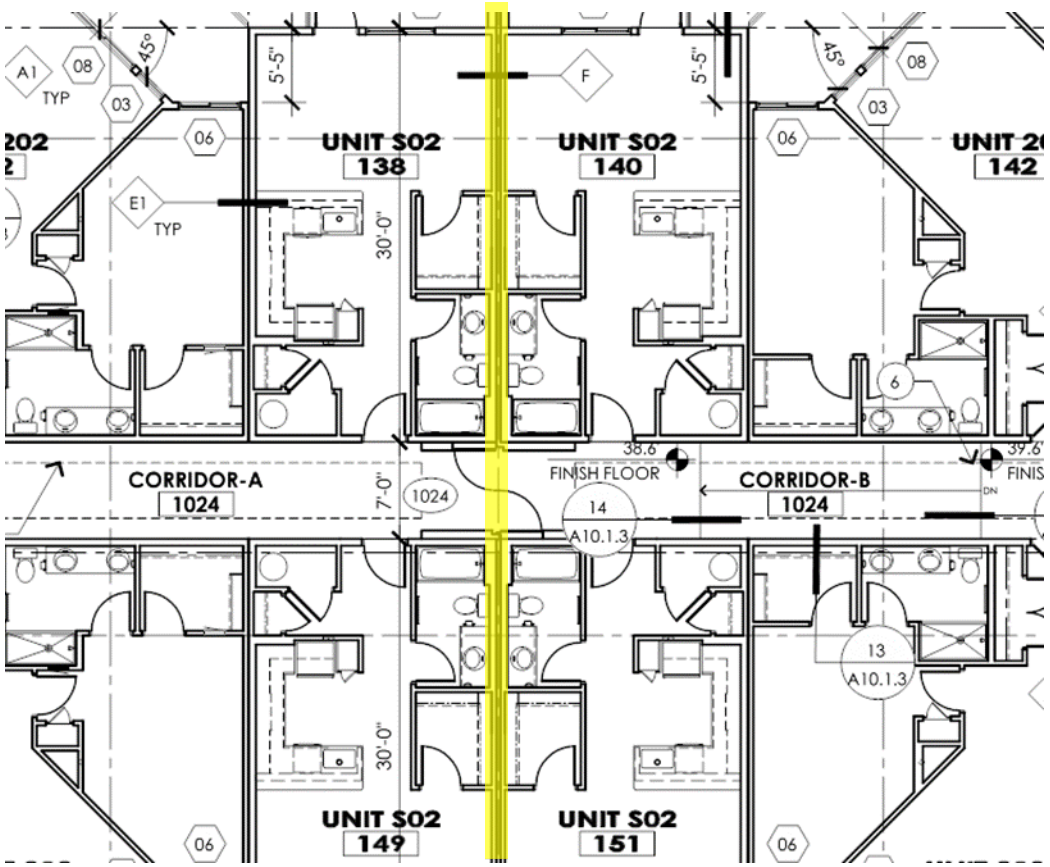

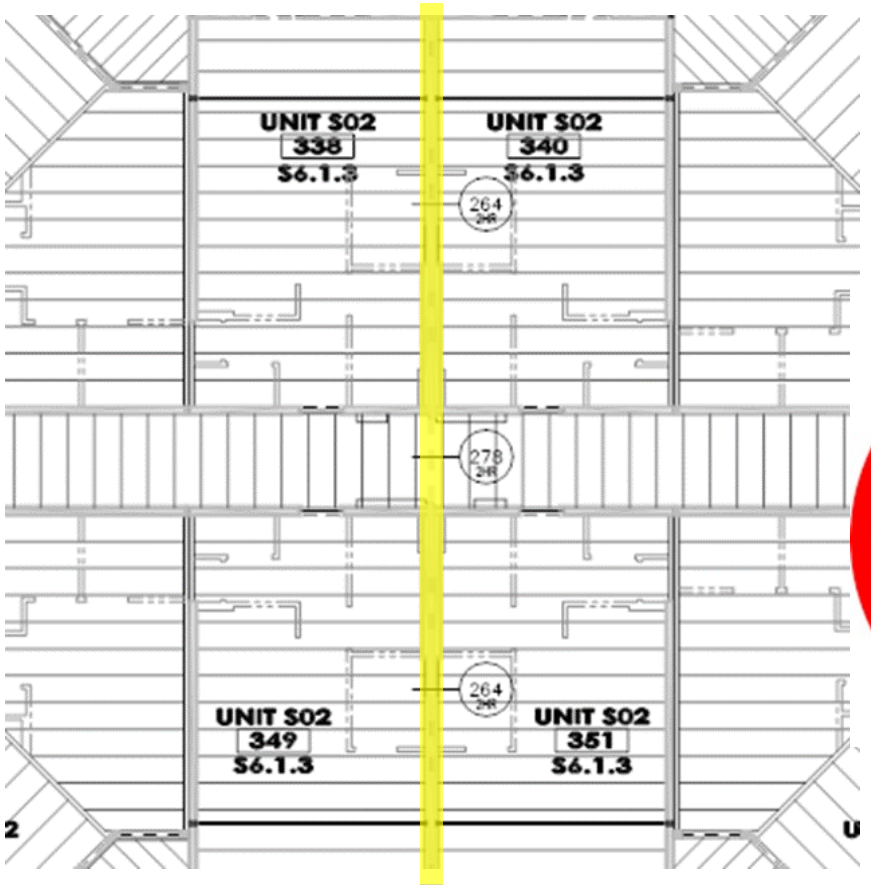

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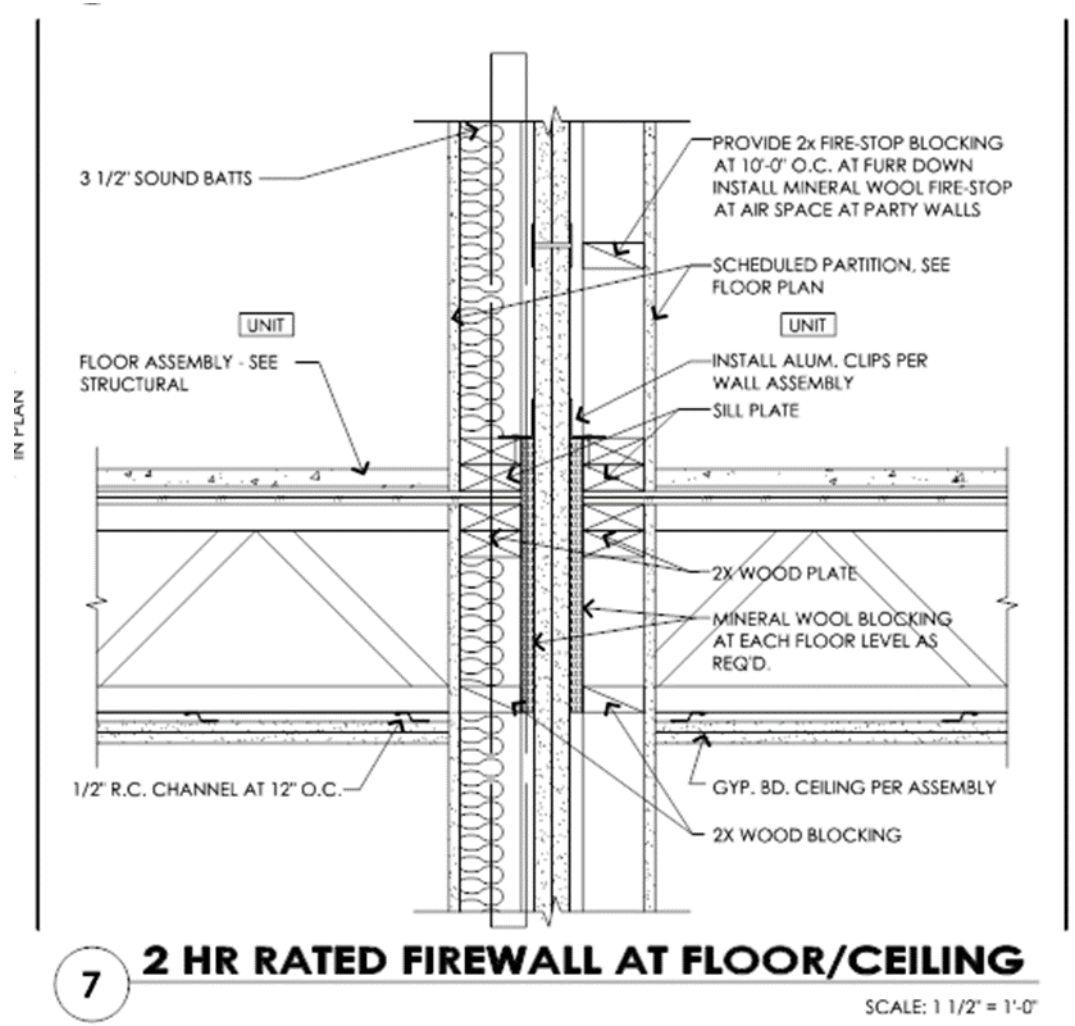
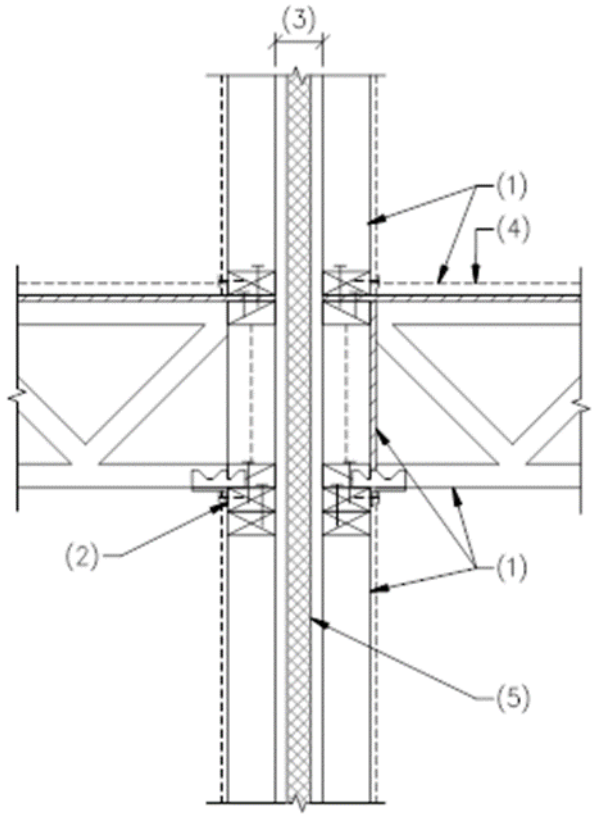


7 **2 HR RATED FIREWALL AT FLOOR/CEILING**

SCALE: 1 1/2" = 1'-0"



NOTES:

1. UNIT STUD WALL AND FLOOR FRAMING PER DETAIL 201.
2. CONTINUOUS 2X DOUBLE TOP PLATE WITH 16d AT 12" O.C.
3. GAP PER ARCH'L.
4. TOPPING PER PLAN.
5. 2 HOUR RATED ASSEMBLY PER ARCH'L.

NOTE:
A. DETAIL SYMMETRICAL ABOUT GAP.
B. AT SHEAR WALLS, PLATE AND SHEAR PANEL NAIL SPACING PER SHEAR WALL SCHEDULE.

264 PREFAB WOOD TRUSS AT WOOD STUD WALL – 2 HOUR WALL

14–1326 NO SCALE

Overlapping Information with Architectural Details

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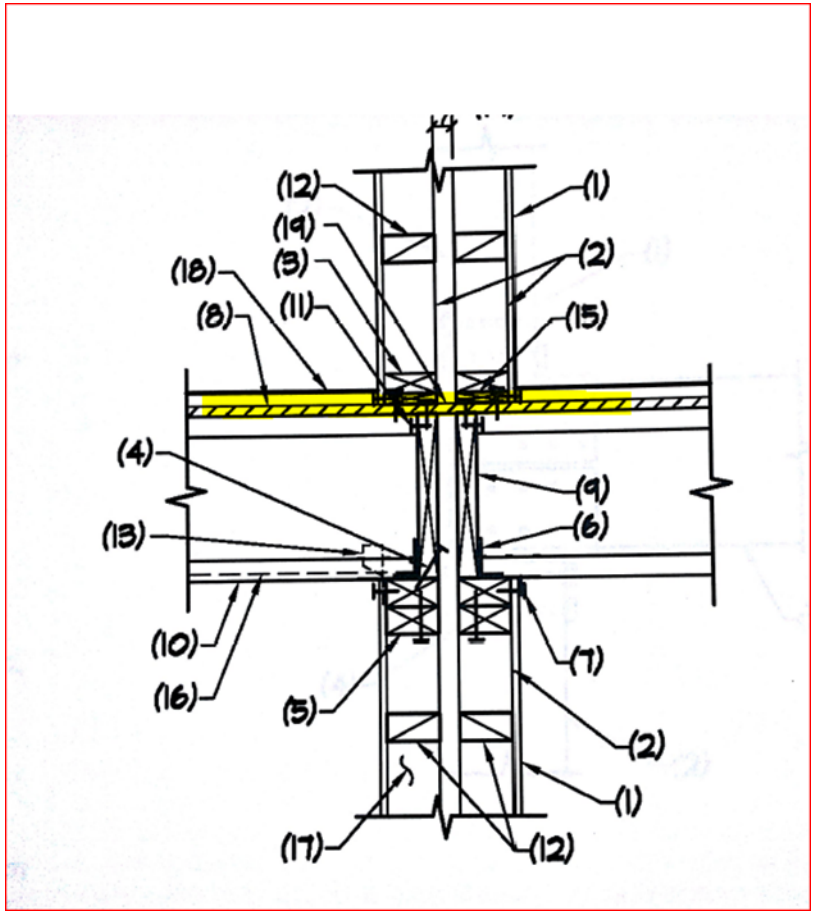

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IBC 706 Fire Walls

- Separate distinct buildings*
- Continuous from foundation to 30” above roof*

IBC 707 Fire Barriers – Usually shaft walls

- No Structural penetrations* (Section 707.7.1)
- Continuous to underside of floor or roof deck
- What supports it must also be rated

IBC 708 Fire Partitions

- Continuous to rated ceiling

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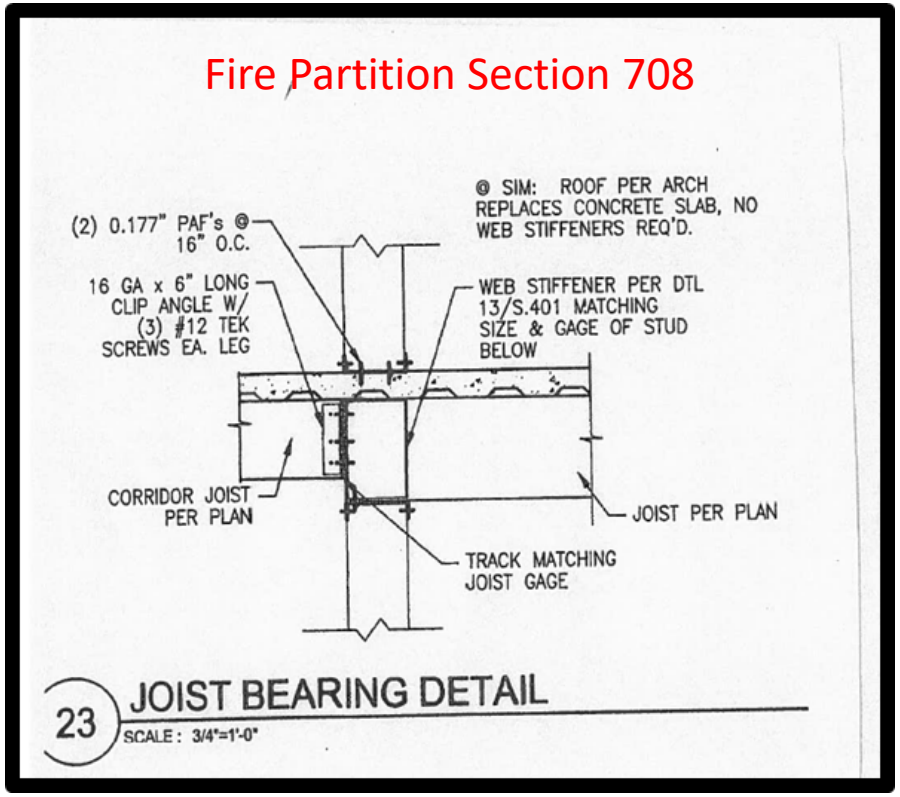
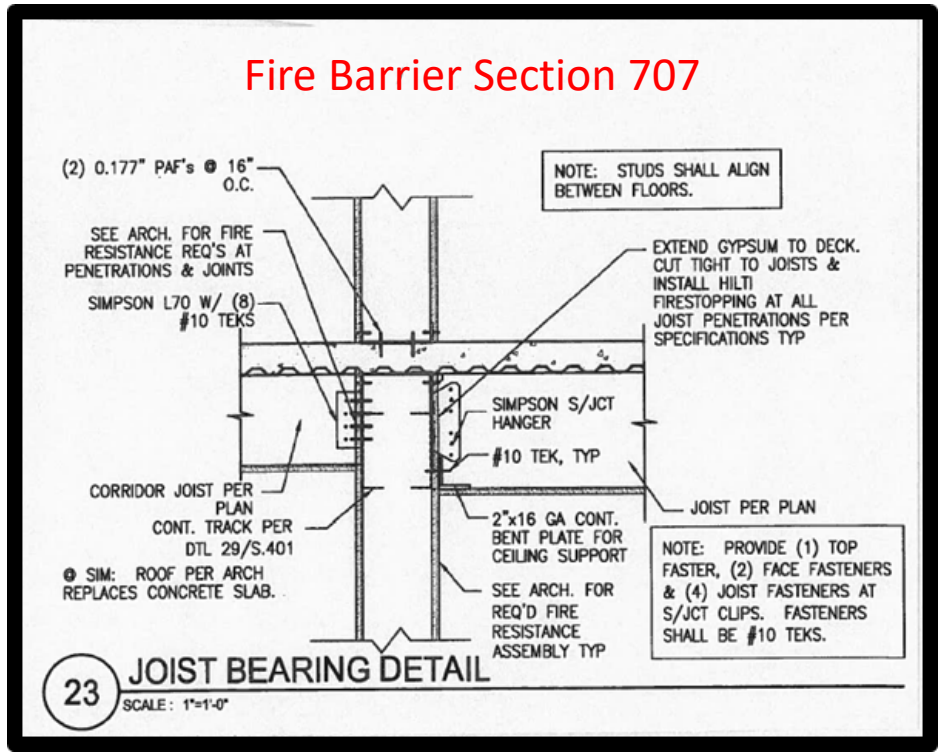
Which Detail Should You Use?

Fire Partition Section 708



Fire Barrier Section 707



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IBC 704.2, 704.3, 704.4 – individual protection of structural members

- Columns
  - Individual encasement protection*
- Primary structural frame other than columns (see Chapter 2 for definition)
  - Individual encasement protection if supporting more than 2 levels of structure
- Secondary members
  - Individual encasement or membrane protection

Overlapping Information with Architectural Details

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Part of Cedar Rapids building falls to the ground, damages vehicle

Published: Fri Jul 24 2020

Part of Cedar Rapids building falls to the ground, damages vehicle

Published: Fri Jul 24 2020

See IBC 1404.6 through 1404.10 for heavy veneer anchorage. Frequently links to TMS 402 and TMS 602.

Remodels and Alterations

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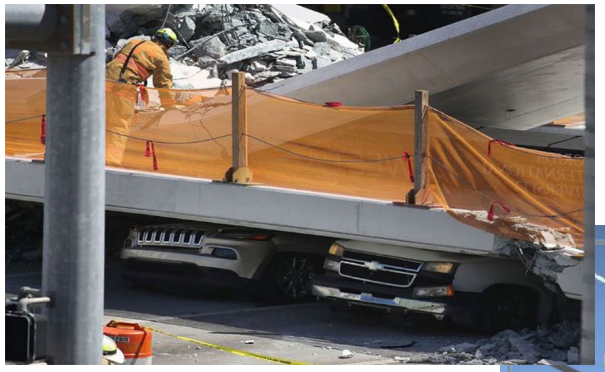
No more IBC Chapter 34. Must use IEBC.

- There are 3 methods. All disciplines must follow the same one. See chapter 3.
- Is the occupancy changing?
- Show what the existing structure is and how your changes are incorporated into it.
- You are not allowed to make a structure worse
- Usually have a 10% lateral demand to capacity ratio rule and 5% gravity demand to capacity ratio rule.*

FIU Bridge Collapse



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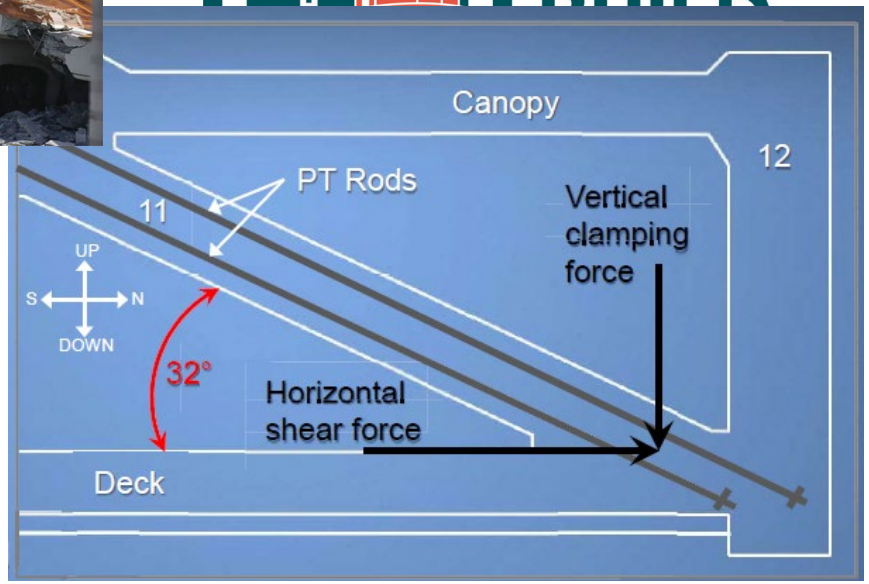
NTSB Executive Summary

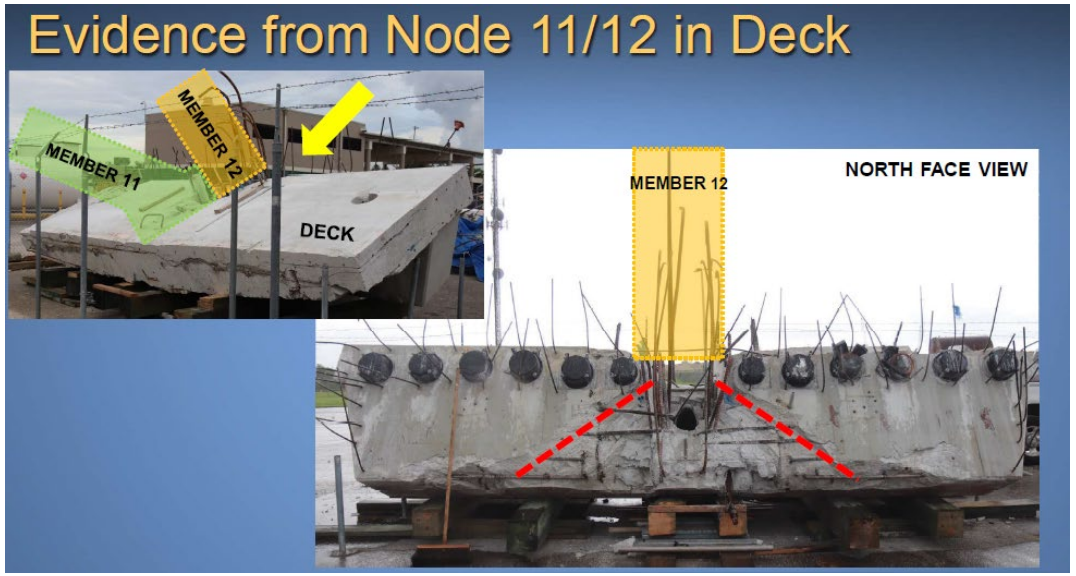
- "…collapse was the load and capacity calculation errors made by FIGG Bridge Engineers, Inc., (FIGG) in its design of the main span truss member 11/12 nodal region connection to the bridge deck."

- "…the demand for the node was nearly twice what the design team had calculated."

- "…the design team also overestimated the capacity of the node to resist shear (horizontal force) where the nodal region (11/12) connected to the bridge deck."

- The peer reviewer "…recognized that he should have examined the nodes and stages, he indicated that there was not enough budget or time to evaluate those factors."





Structural Checklist

City of Phoenix
PLANNING AND DEVELOPMENT DEPARTMENT

Plan Review Checklist
Structural

STRUCTURAL DRAWINGS

Sealed by either a structural or civil engineer registered in the State of Arizona.

1. **IBC 1603 General Structural Notes**
   - ☐ Design Dead Loads.
   - ☐ Design Live Loads.
   - ☐ IBC 106.1 and 1607.7.5 Live loads posted. – Storage – light and heavy, Parking Garages 1607.7.5
   - ☐ Wind Design Data-1603.1.4, ASCE 7-10, Chapter 6 (wind exposure category- type B, parapets, components and cladding).
   - ☐ IBC 1604.5 – Risk Category.
   - ☐ Seismic Design Data – 1603.1.5
   - ☐ Special Loads (if applicable) that are specified by the code.
   - ☐ IBC 107.3.4.1 Identify all Deferred Submittal Items such as joists, trusses, alternate stairs.
   - ☐ IBC 1705 Identify all Special Inspection and Structural Observation requirements.
   - ☐ Material Specifications (fire cover for concrete if applies, fire treated wood if applies, etc.)
   - ☐ IBC 2304.3.3 Shrinkage specs for wood framing over 3 stories.
   - ☐ Geotechnical Information, i.e. Soils Class, Allowable Bearing Pressure, Reference to Geotechnical.
   - ☐ Investigation Report or IBC Table 1806.2, other information pertaining to the design.

2. **Foundation Plan**
   - ☐ Indicate shear wall and hold down locations.
   - ☐ Include separate sheets for "mirrored" plans.
   - ☐ Footing bearing or top of footing elevations.
   - ☐ Anchor size and placements.
   - ☐ PT slabs stamped per IBC 1907.2. Note: This is a PHX amendment.
   - ☐ Plaza decks adjacent to high-rise buildings designed per IBC 1607.6 IF REQUIRED.

3. **Floor Framing Plan**
   - ☐ Indicate shear wall and hold down locations.
   - ☐ Include separate sheets for "mirrored" plans.
   - ☐ Framing floor layout and sizes.
   - ☐ Section and detail cuts.
   - ☐ Stairs and railings when required.

4. **Roof Framing Plan**
   - ☐ Framing roof layout and sizes- include loading and reactions for deferred elements per 107.3.4.2.
   - ☐ Section and detail cuts.
   - ☐ Mechanical loads shown and designed for per IBC 1607.12.
   - ☐ Roof slopes match architectural plans – ponding design per IBC 1611.2.
   - ☐ Drag elements at re-entrant corners and flexible diaphragms designed per ASCE 7-10.
   - ☐ Parapets are designed and detailed per ASCE 7-10.

5. **Wall Framing Information and Details**

6. **Structural Details**
   - ☐ General structural details, connection details and all cut structural details called out from structural.
   - ☐ Foundation / framing plans.

This publication can be made available in alternate formats (Braille, large print or digital media) upon request.
Contact Planning & Development at (602) 262-7811 voice or (602) 534-5500 TTY.

7. **Calculations**
   - ☐ One copy of Structural calculations that includes vertical and lateral structural analysis and sealed by the structural engineer of record.
   - ☐ Computer Calculations shall include design input load summary, output summary and explicit cross references to supplemental calculations as well as the plans.
   - ☐ Sketched detailed layout of Lateral Force Resistance System members.
   - ☐ Hand calculations to validate design input loads, output data, connection details, etc. (such as stair and railings.

8. **Geotechnical Investigation Report**
   - ☐ Provide one copy of soil report sealed by the geotechnical engineer of record or include site soil classification & allowable bearing and cite the source.

9. **Prefabricated Metal Building**
   - ☐ Provide separate manufacturer's construction drawings and calculations that are sealed by the structural engineer of record for the prefabricated metal building.

10. **Post-Tension Slab-on-Ground Plans**
    - ☐ Slab/beam geometry: length, width, thickness, overlapping regions based on simplified analysis for complex geometries, thickened sections if used, dimensions of turndowns.
    - ☐ Slab type per PTI guide- type I, II, III, or IV.
    - ☐ Minimum concrete strength at 28 days and minimum concrete strength at jacking.
    - ☐ Em, Ym, coefficient of subgrade friction, soil subgrade modulus.
    - ☐ Strand specifications; strand grade and diameter, clearances, drape if used.
    - ☐ Post tendons' jacking force, assumed losses, anchor set, edge distance to first strand, edge moisture variation. Plans shall graphically show all locations of strand tendons with dimensioned spacing requirements.
    - ☐ Mild reinforcing associated with stress concentrations (re-entrant corners, etc.)
    - ☐ Provide the following loading data in Post-Tension Slab-on-Ground calculation: concentrated loads from framing elements; posts and columns, fire places, heavy equipment, etc, and perimeter line loading.
    - ☐ Plans shall reference the correct vital soil report information for design: the company and their report number, allowable soil bearing capacities and at what depth and any compacted fill requirements in addition to items noted above. All calculations shall be based and coordinated with this soil report.
    - ☐ Strand elongation.
    - ☐ Post tension hardware supplier assumptions; i.e., proprietary data from supplier used in analysis assumptions.

11. **Remodels and Alterations**
    - ☐ Provide structural evaluation/calculations addressing code compliance.

12. **Special Inspections**
    - ☐ One copy of Special Structural Inspection Certificate and Special Geotechnical Inspection Certificate if applicable.

13. **Overlapping information with architectural details**
    - ☐ 705 – Fire walls – Structural independence.
    - ☐ 707 – Shaft walls – 707.7.1 no structural penetrations.
    - ☐ 704.2, 704.3 – Individual protection of structural members
    - ☐ 721 – Prescriptive and calculated fire resistance

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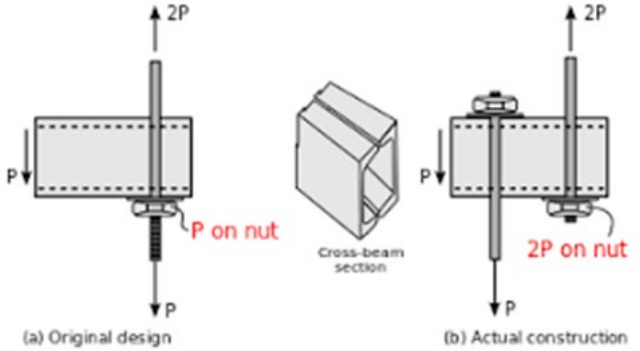
https://www.phoenix.gov/pddsite/Documents/TRT/dsd_trt_pdf_00706.pdf

Updated extensively soon!



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QUESTIONS?

Krista Blidy
Structural Plans Engineer
602-495-5354
Krista.blidy@phoenix.gov