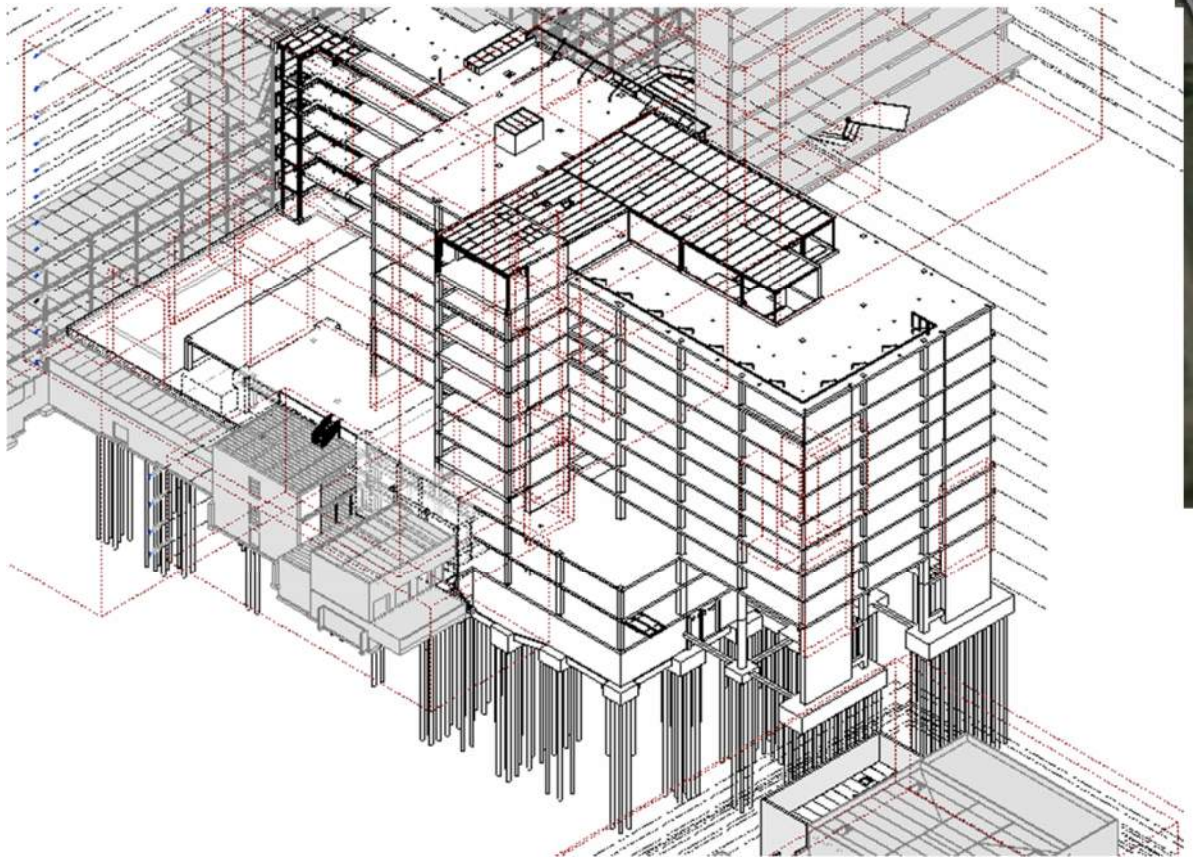




PRESBYTERIAN DOWNTOWN TOWER

DEKKER
PERICH
SABATINI

ARCHITECTURE
DESIGN
INSPIRATION



Structural/Architectural: Dekker/Perich/Sabatini

Mechanical/Electrical/Piping: Bridgers and Paxton

Civil: Bohannan Huston Inc

Structural Peer Reviewer: Pangolin Structural engineers and ICC

STRUCTURAL TEAM

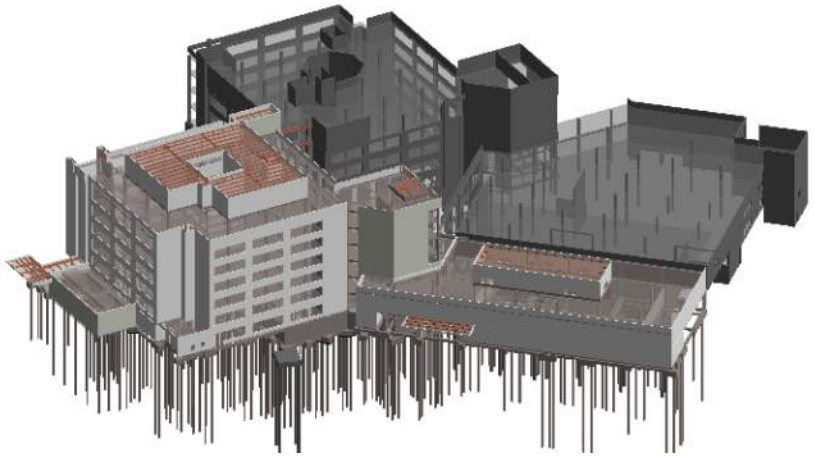
- **ME:** SEOR/OVERALL QA/DETAILING/OVERALL PM
- **JEFF ROSENBERG:** TOWER SLABS/COLUMNS/FOUNDATIONS/SHEAR WALLS/DETAILING/PENTHOUSE-CONNECTOR LINK/ QA
- **TREVOR SELF:** TOWER SLABS/BEAMS/LATERAL/ DETAILING OF STRUCTURAL COMPONENTS NOT PART OF LATERAL SYSTEM/EXISTING BUILDING STRENGTHENING
- **CRIS MONTALVO :** ENERGY CENTER/PENTHOUSE/LPILE/IRREGULARITY ANALYSIS/DIAPHRAGM ANALYSIS
- **JAME ALEXANDER:** CONNECTOR LINK/IRREGULARITY ANALYSIS/DRIFT ANALYSIS/LIGHT GAGE DESIGN/COLLECTOR/ DIAPHRAGM ANALYSIS
- **BEN COSTALES:** DETAILING/3D MODELING/CONSTRUCTION DOCUMENT DEVELOPMENT
- **DAVE VASQUEZ:** FINAL QA
- **CHUCK HANSON:** QA REVIEW/ASSISTANCE WITH PM







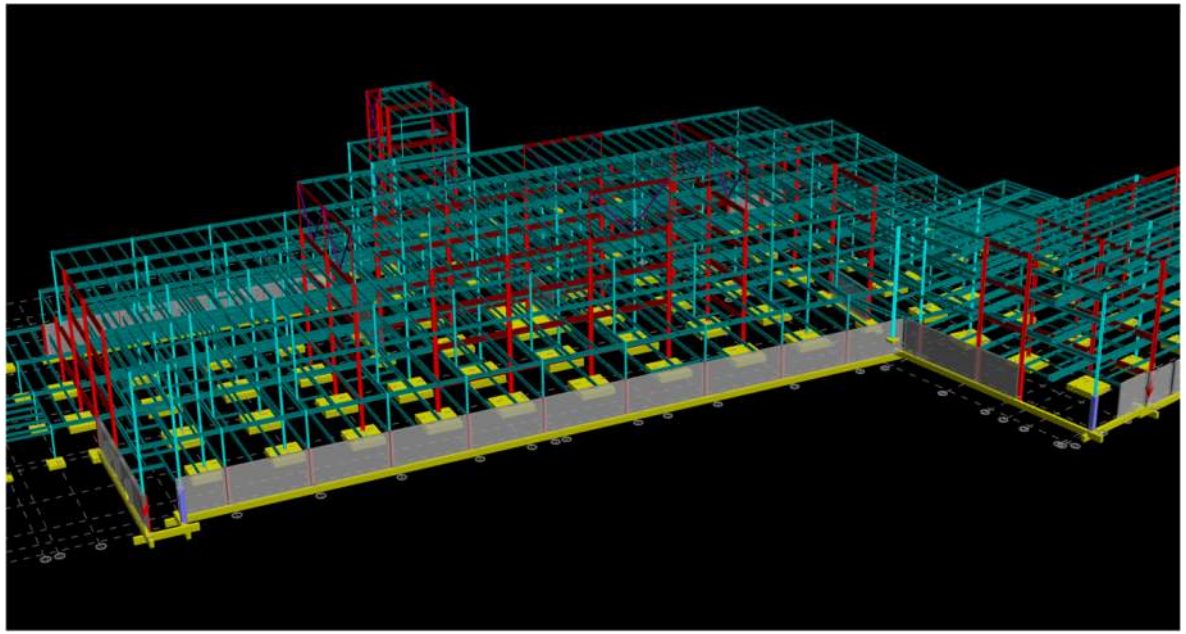
RUST MEDICAL CENTER






PRESBYTERIAN
Rust Medical Center
CANCER CENTER

SANTA FE MEDICAL CENTER

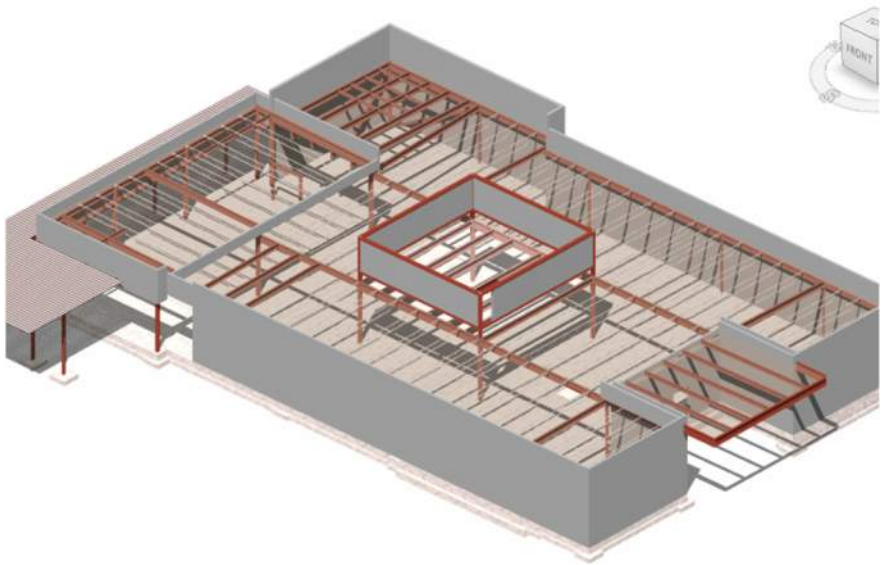








ESPANOLA HOSPITAL EXPANSION







24/7 EMERGENCY CARE







PRESBYTERIAN CLINICS





NEW CONSTRUCTION (~320,000 SQFT)

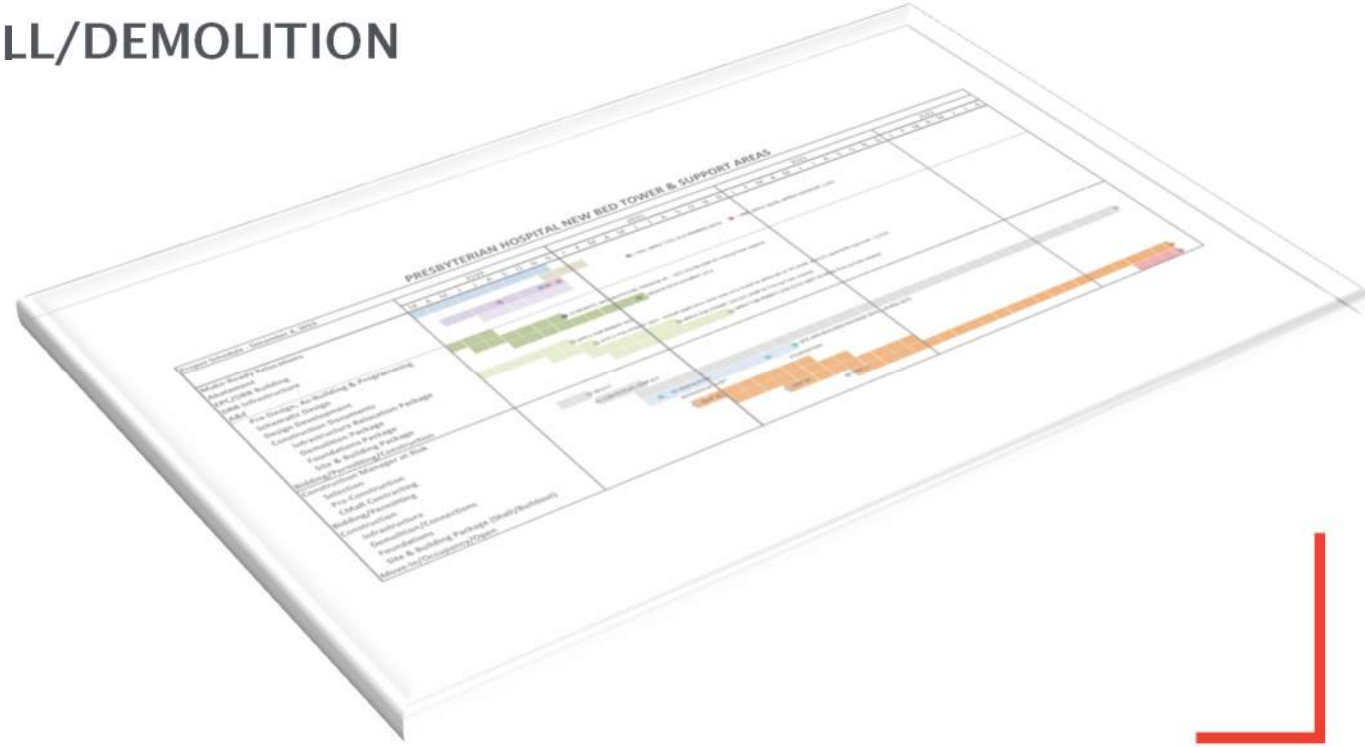
- 11 STORY BED TOWER/D&T (CONCRETE – SPECIAL REINFORCED CONCRETE SHEAR WALL)
- 1 STORY PENTHOUSE (STEEL FRAMED)
- 2 STORY INDEPENDENT CONNECTOR LINK (STEEL FRAMED – SMF WUF)
- 6 STORY ATTACHED BRIDGE (STEEEL FRAMED – SMF WUF)
- CENTRAL PLANT EXPANSION (SPECIAL REINFORCED MASONRY SHEAR WALLS)

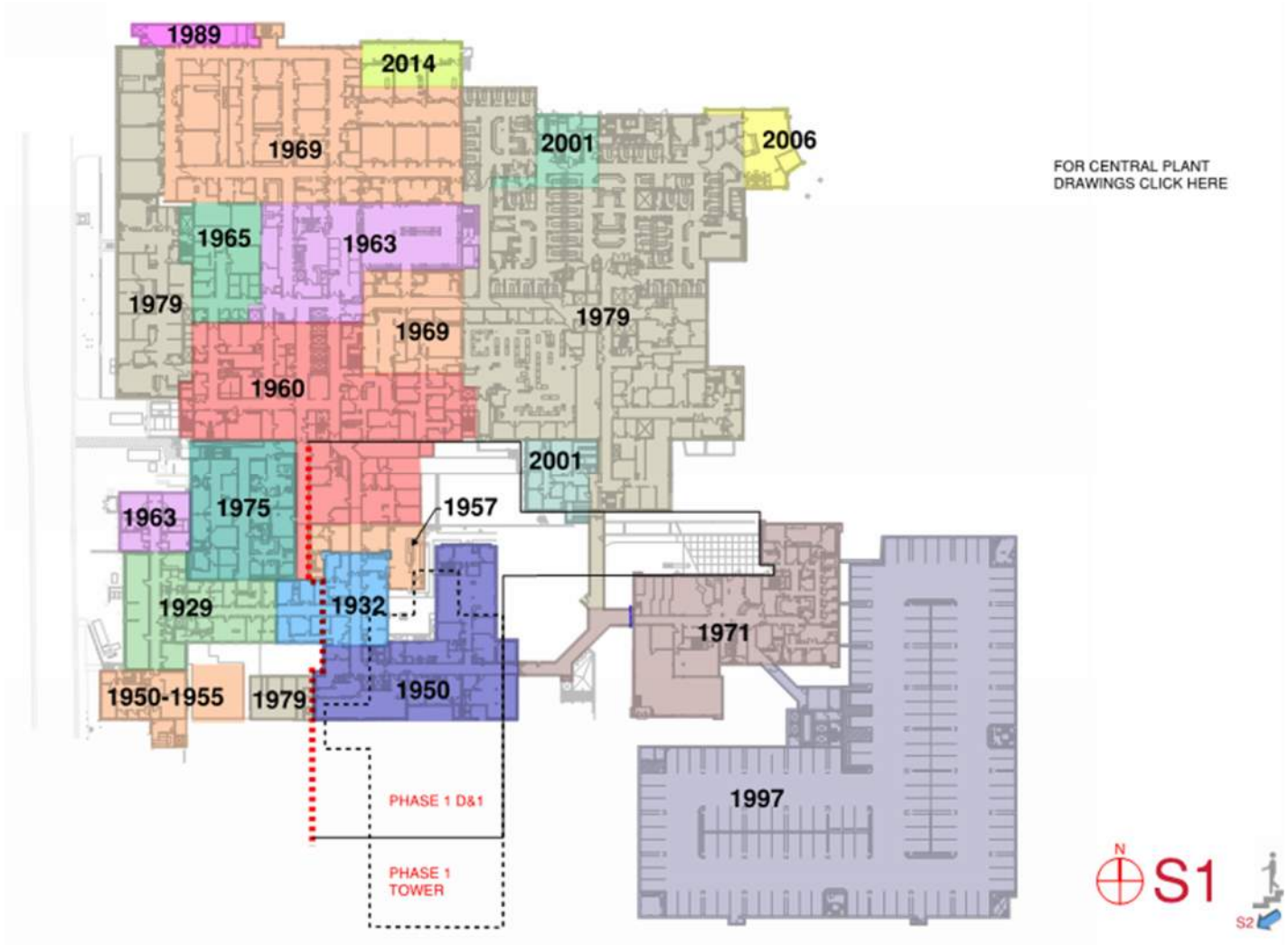
MODIFICATIONS TO EXISTING

- STRUCTURAL STABILIZATION TO 3-STORY 1932 BUILDING
- STRUCTURAL STABILIZATION TO 1960 REMAINING CORRIDOR
- MODIFICATIONS TO 6 OTHER EXISTING BUILDINGS

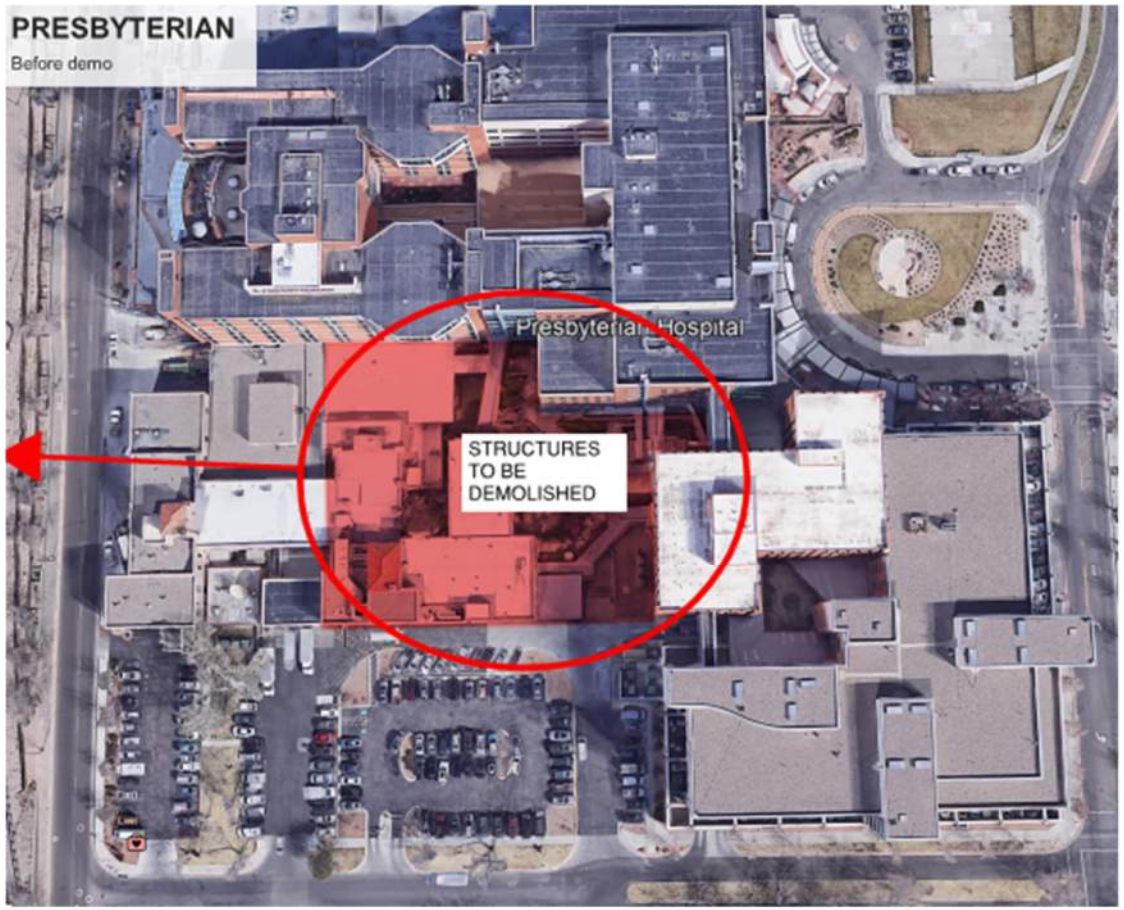
TIMELINE

- JANURARY 2019: PLANNING
  - RESOURCE/BUDGET/SCHEDULE
- JULY 2019: CMAR WAS SELECTED
- SEPTEMBER TO DECEMBER 2019: PRELIMINARY STRUCTURAL PEER REVIEW/PRELIMINARY STRUCTURAL SYSTEM STUDIES
- OCTOBER 2019: PRELIMINARY DEMOLITION PACKAGE
- DECEMBER 2019: SYSTEM SELECTION, DESIGN STARTS
- MARCH 15, 2020- FOUNDATION PERMIT PACKAGE
- JUNE 9, 2020 – FINAL BUILDING SHELL/DEMOLITION PACKAGE



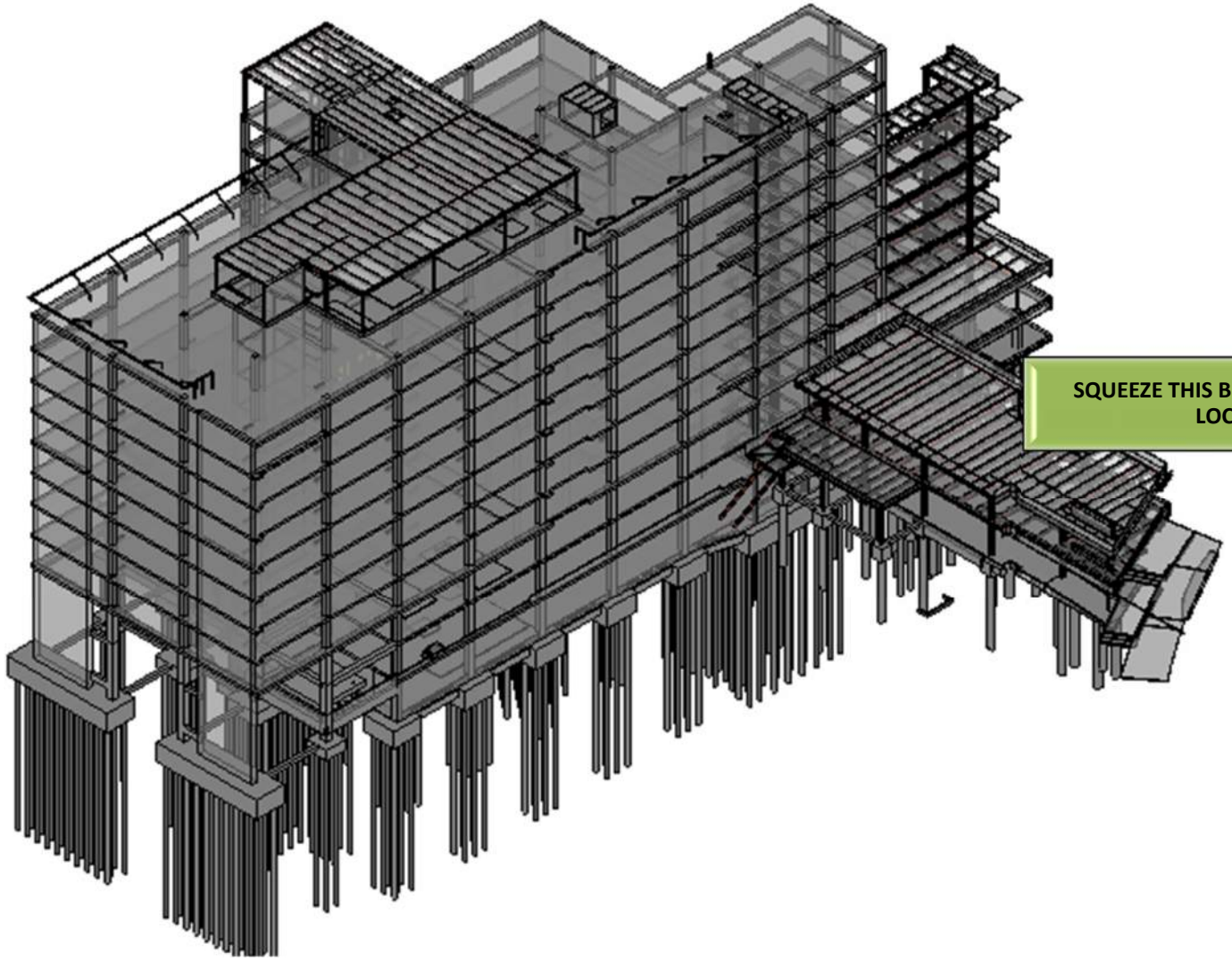

1989
2014
1969
2001
2006
1965
1963
1979
1969
1979
1960
2001
1963
1975
1957
1929
1932
1971
1950-1955
1979
1950
1997
PHASE 1 D&1
PHASE 1
TOWER
FOR CENTRAL PLANT
DRAWINGS CLICK HERE
N
S1
S2



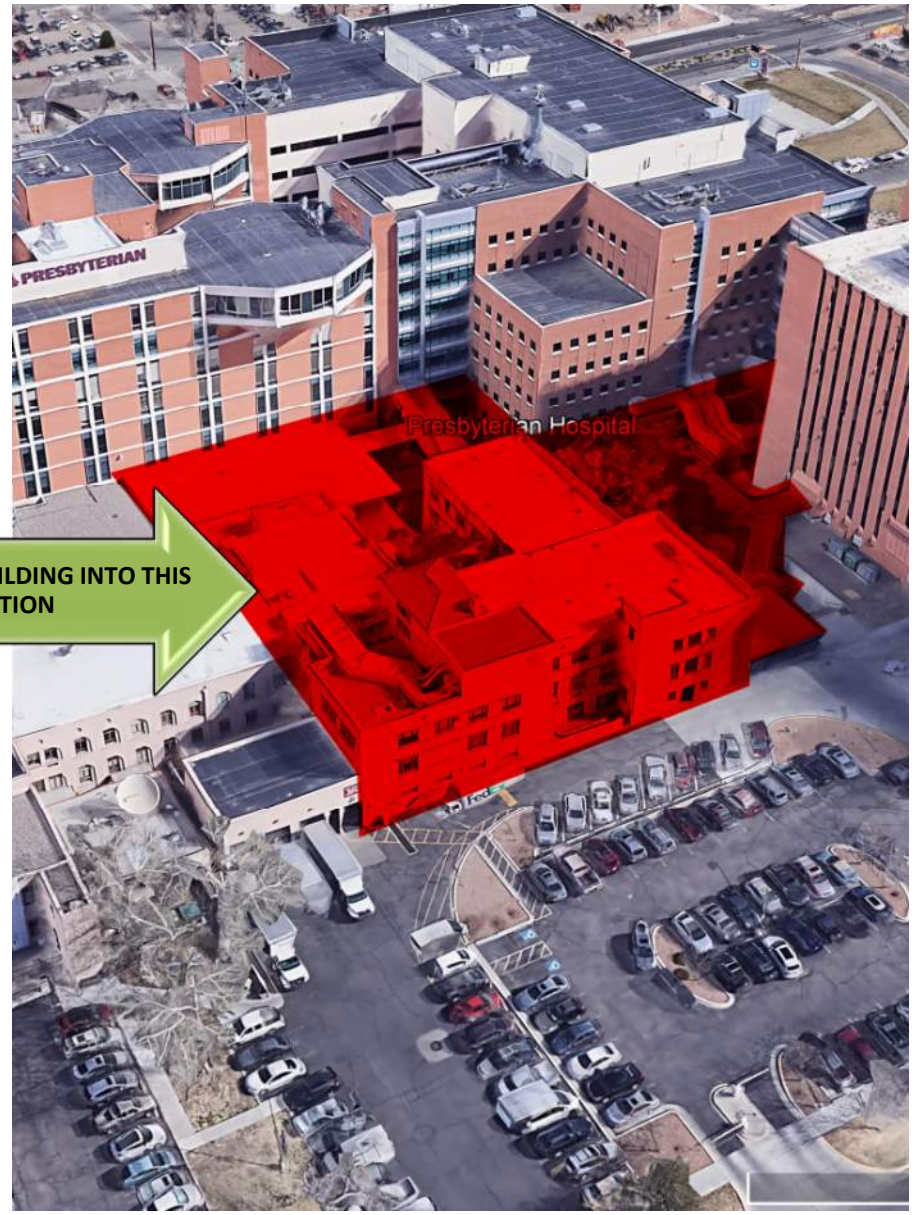


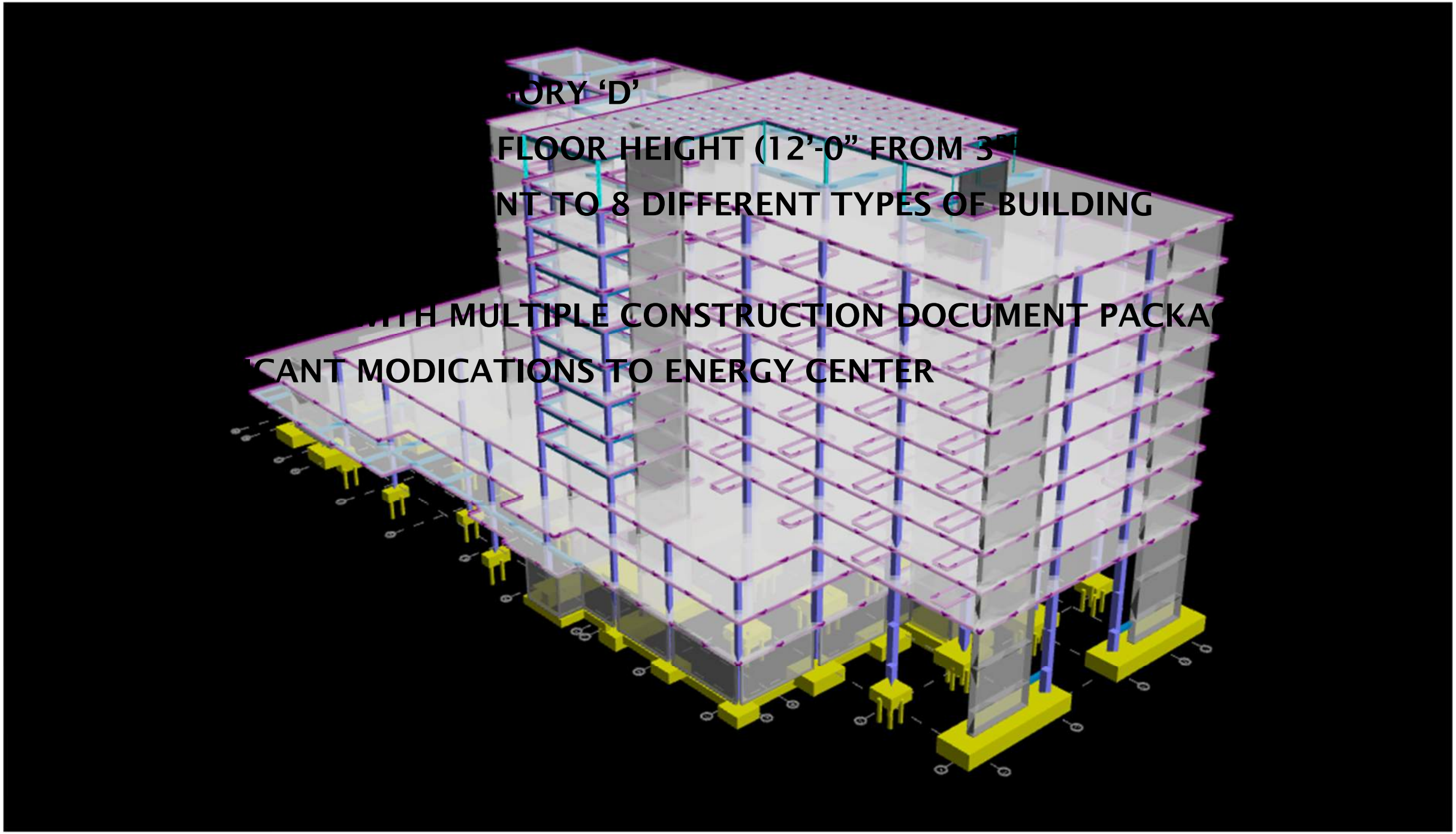
SATELLITE IMAGES:
GOOGLE MAPS

155’ FROM BASEMENT TO TOP OF PENTHOUSE

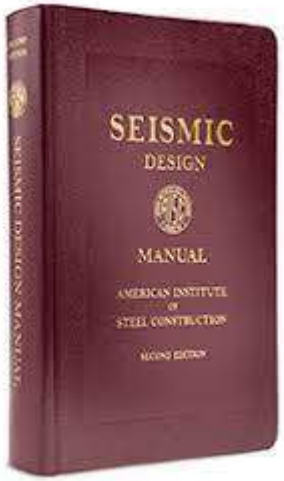


SQUEEZE THIS BUILDING INTO THIS LOCATION



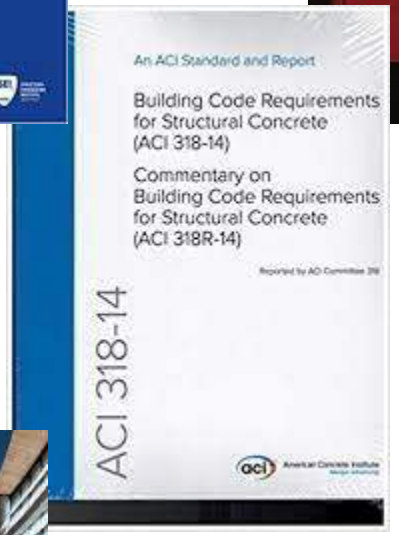

ORY 'D'
FLOOR HEIGHT (12'-0" FROM 3
NT TO 8 DIFFERENT TYPES OF BUILDING
ITH MULTIPLE CONSTRUCTION DOCUMENT PACKA
CANT MODICATIONS TO ENERGY CENTER

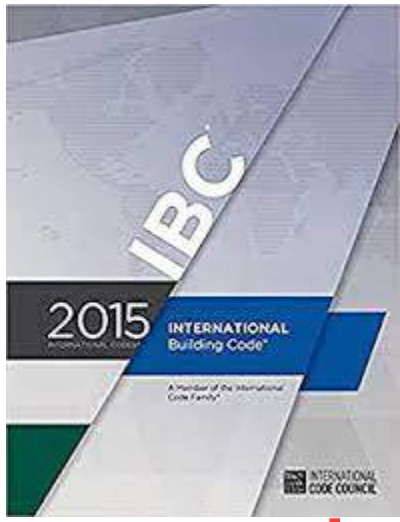
- DESIGNED UNDER IBC/IEBC 2015
  - -REFERENCED STANDARDS
    - -ASCE 7-10
    - -AISC 360/341
    - -AISC 358
    - -ACI 318-14
    - -ACI 530-13
- RISK CATEGORY IV
- SITE CLASS D (SHEAR WAVE VELOCITY)
- SEISMIC DESIGN CATEGORY "D" – HIGH SEISMIC
- FGI 2018 VIBRATION CRITERIA (STATE OF NM)
- UNIFORM ADMINISTRATIVE CODE (COA)
  - WIND SPEED 125 MPH (PER COA)

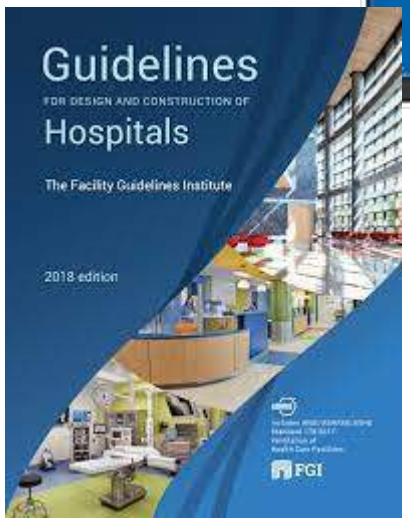


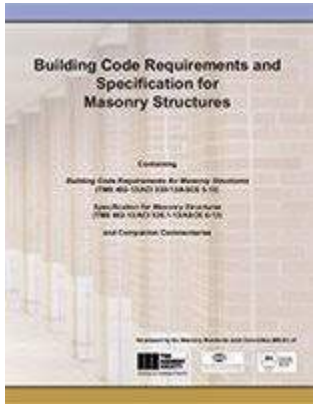


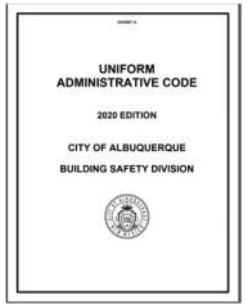








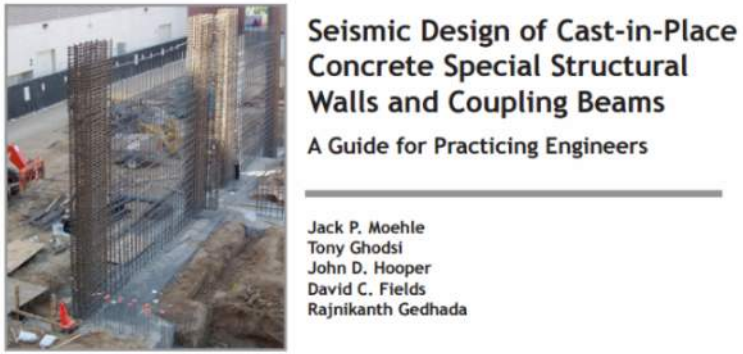


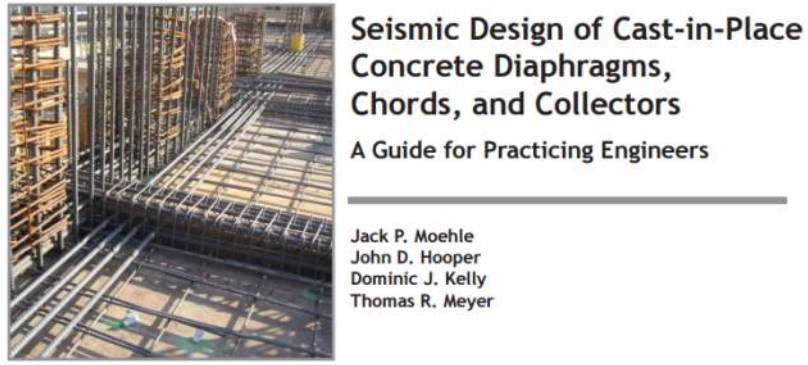


HIGHLIGHTED RESOURCES

- ACI 224 CONTROL OF CRACKING
- ACI 209 PREDICTION OF CREEP
- ACI 207 GUIDE TO MASS CONCRETE
- ACI 435 CONTROL OF DEFLECTION





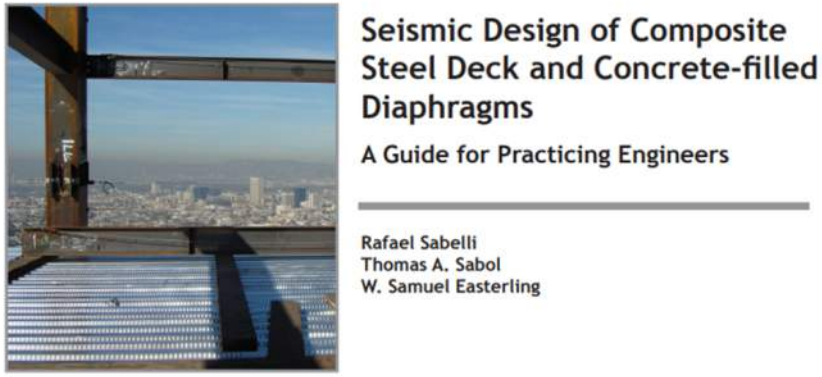


ADDITIONAL REFERENCES







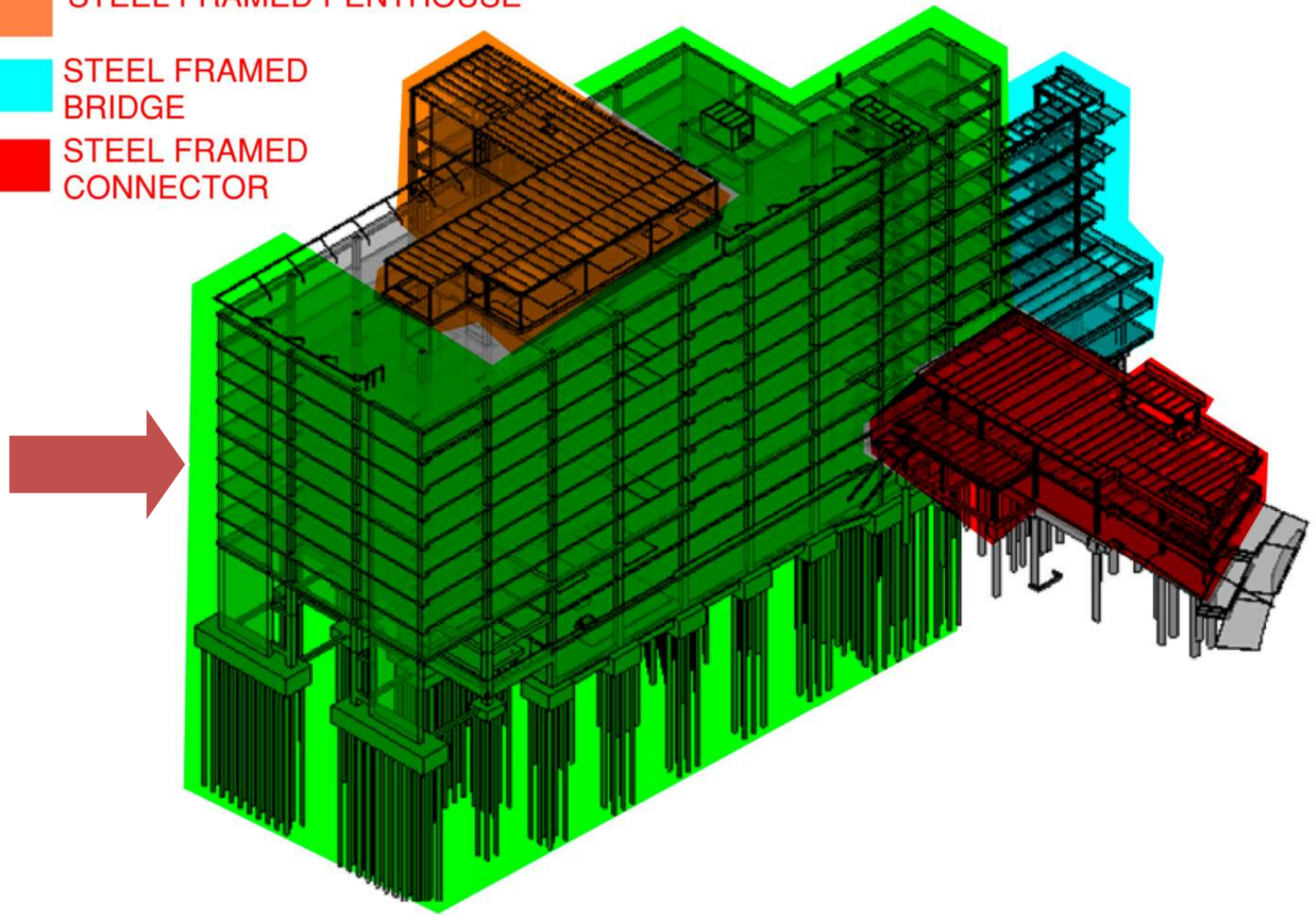


CONCRETE TOWER

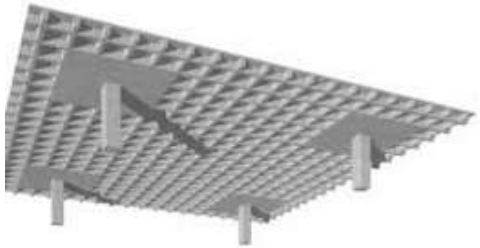
STEEL FRAMED PENTHOUSE

STEEL FRAMED BRIDGE

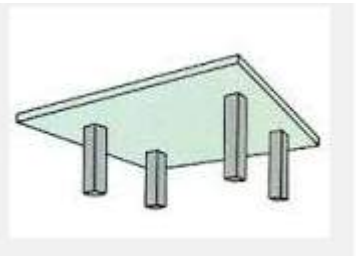
STEEL FRAMED CONNECTOR



TOWER STRUCTURAL SYSTEM SELECTION







STUDIED 7 SYSTEMS:

- STRUCTURAL STEEL COMPOSITE SLAB
- WAFFLE SLAB
- VOIDED SLAB
- BONDED POST TENSIONED FLAT SLAB
- UNBONDED POST TENSIONED FLAT SLAB
- ONE WAY PAN JOIST WITH PT GIRDERS
- FLAT MILD REINFORCED TWO-WAY SLAB
  - WITH AND WITHOUT DROP CAPITALS

FINAL DECISION

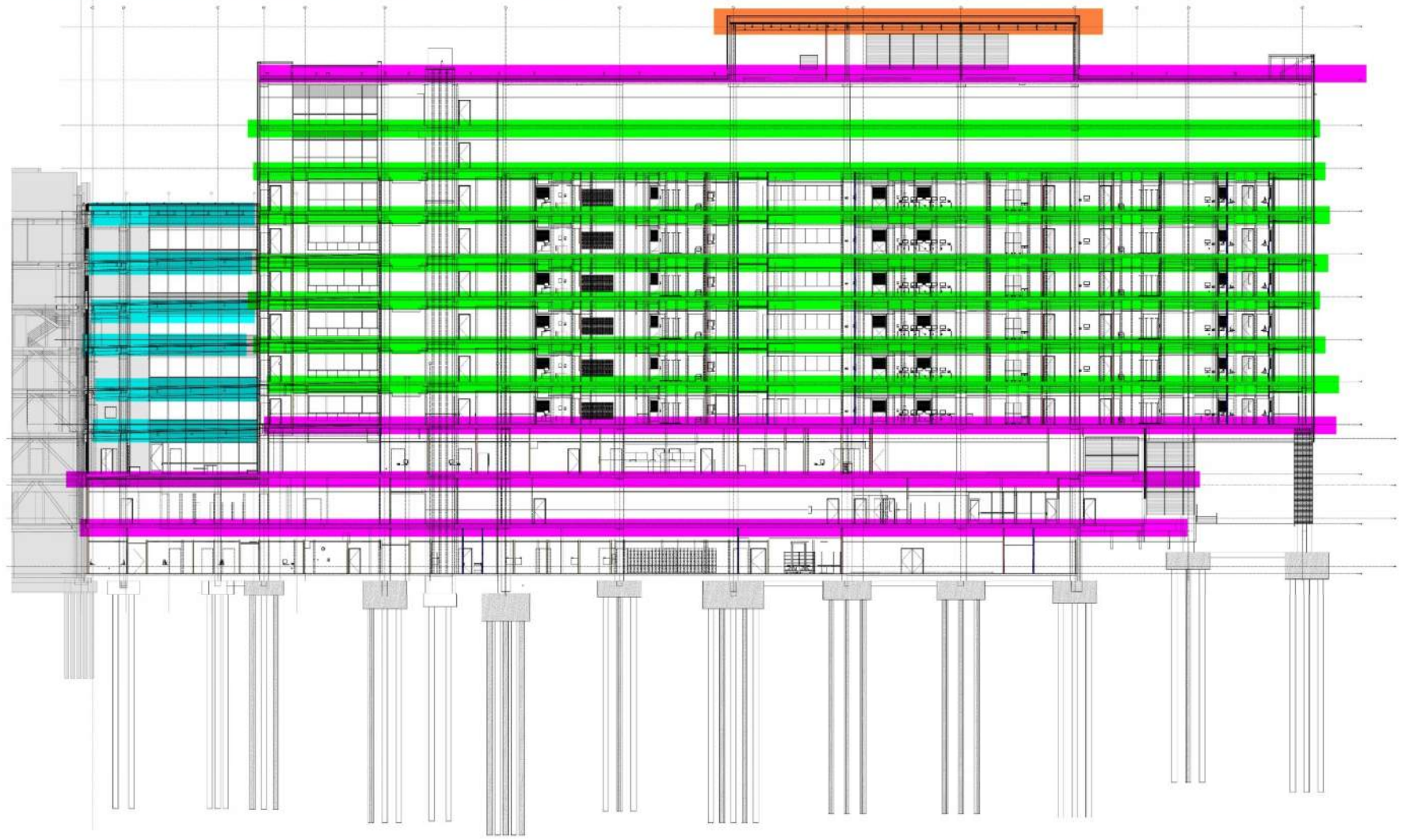
- 14” FLAT TWO-WAY SLAB WITH CAMBER 3 LOWER LEVELS AND ROOF
- 12” POST TENSIONED FLAT SLAB ALL OTHER LEVELS

STEEL FRAMED SLOPING BRIDGE

12" UNBONDED POST TENSIONED SLABS

14" MILD REINFORCED TWO WAY SLAB

STEEL FRAMED PENTHOUSE

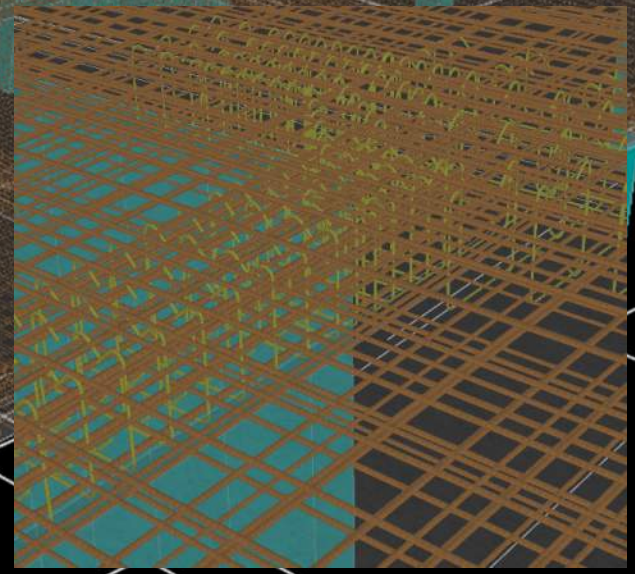


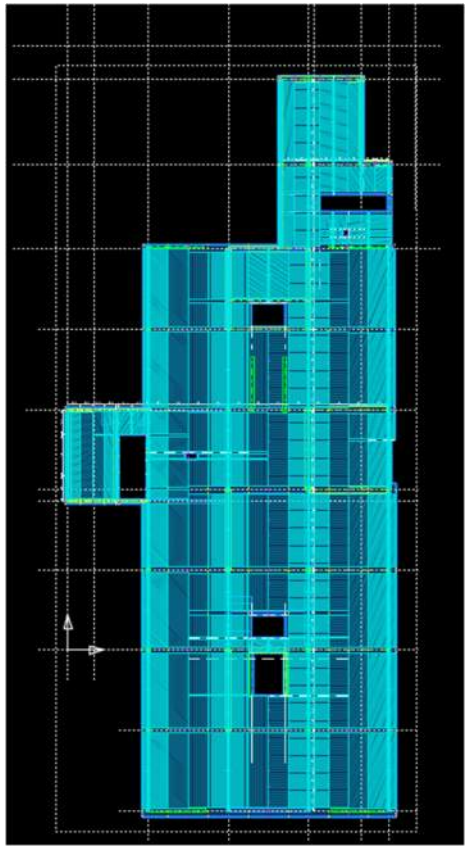
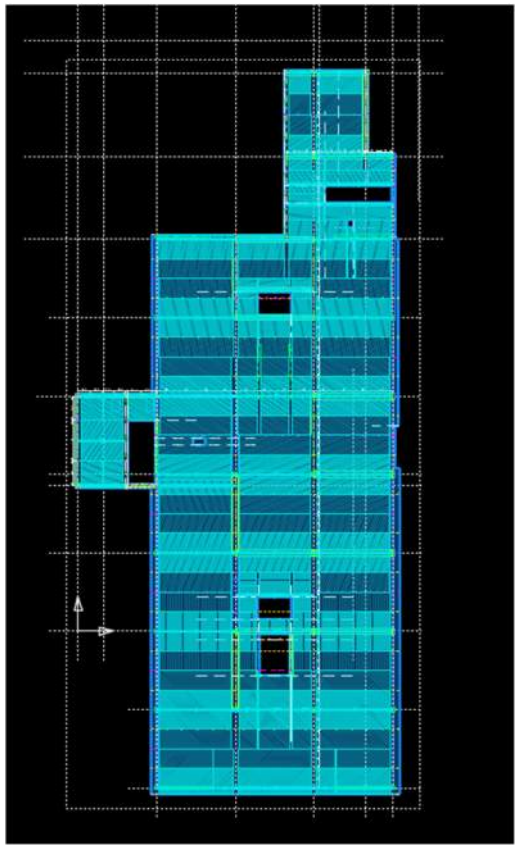
BEAM DEPTH

LONGITUDINAL REBAR AREA AND STIRRUPS
G..ITED DURING THESE DISCUSSIONS

FINAL DECISION BY JAYNES/DPS:

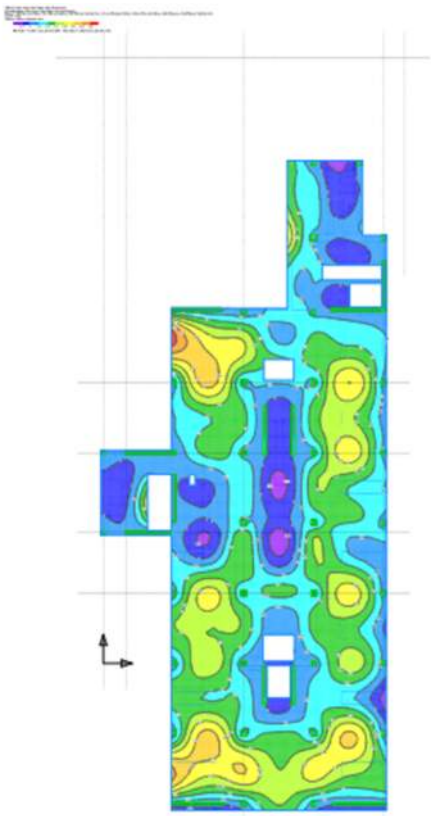
USE 18” D... BEAMS TYPICALLY, UNLESS DEEPER IS REQ.




CONCRETE FLOOR ANALYSIS

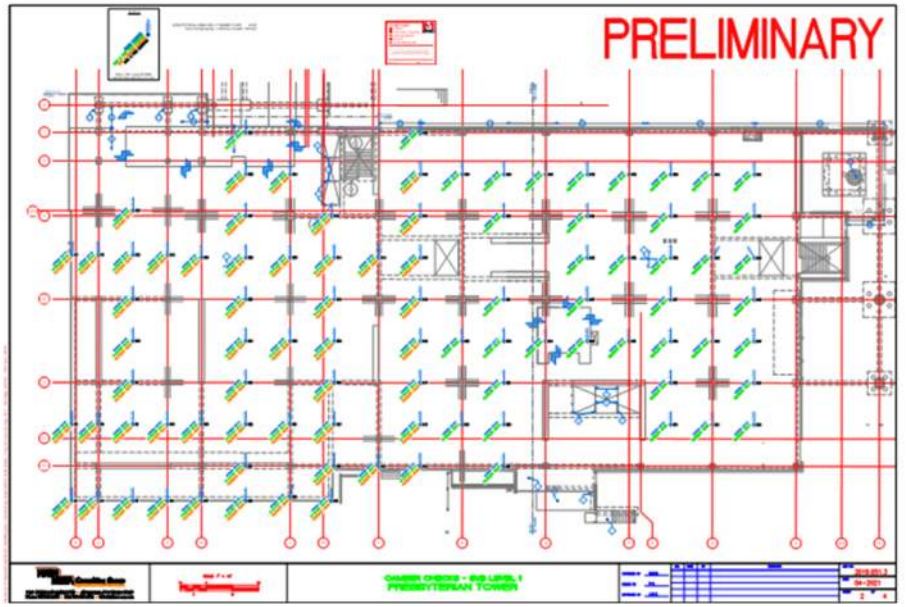






LONG TERM DEFLECTIONS TIME HISTORY

SLAB SURVEY



EACH LEVEL IS TO BE SURVEYED:

1. TOP OF FORM TO ENSURE CAMBER WAS OBTAINED
2. TOP OF FINISHED CONCRETE TO ENSURE CAMBER WAS OBTAINED
3. TOP OF CONCRETE AFTER FORM WAS RELEASED
4. TOP OF CONCRETE ABOUT 1 MONTH TO 2 MONTHS OUT
5. VARIOUS SPOT CHECKS

VIBRATION

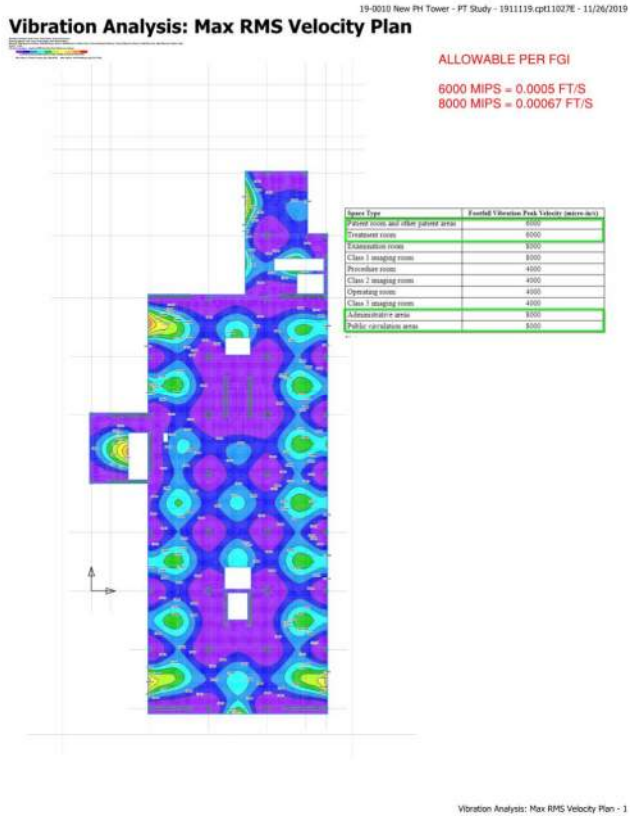


Table 1.2-8: Maximum Limits on Floor Vibration Caused by Footfalls in Hospitals

Space Type	Footfall Vibration Peak Velocity (micro-in/s)
Patient room and other patient areas	6000
Treatment room	6000
Examination room	8000
Class 1 imaging room	8000
Procedure room	4000
Class 2 imaging room	4000
Operating room	4000
Class 3 imaging room	4000
Administrative areas	8000
Public circulation areas	8000

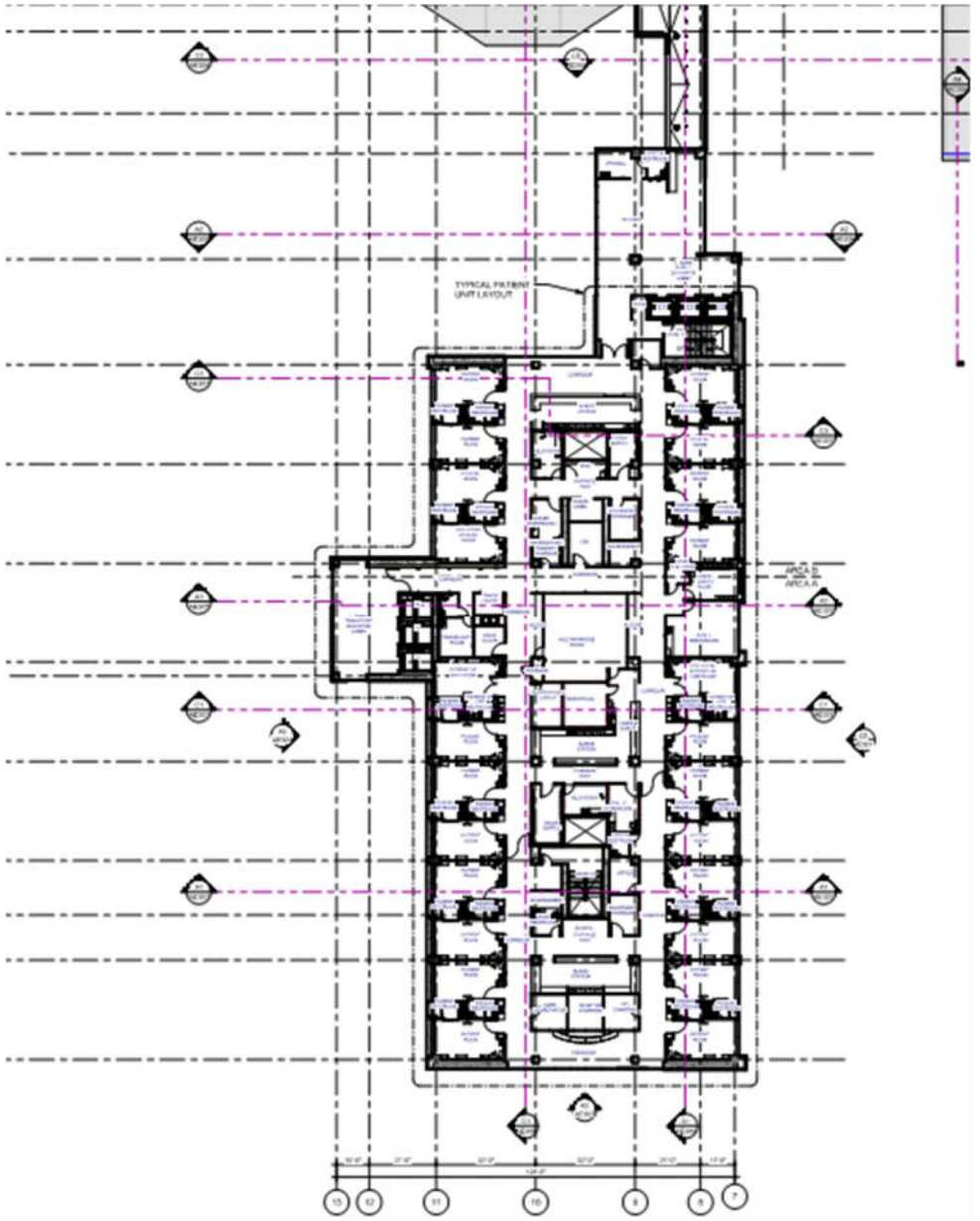
Notes

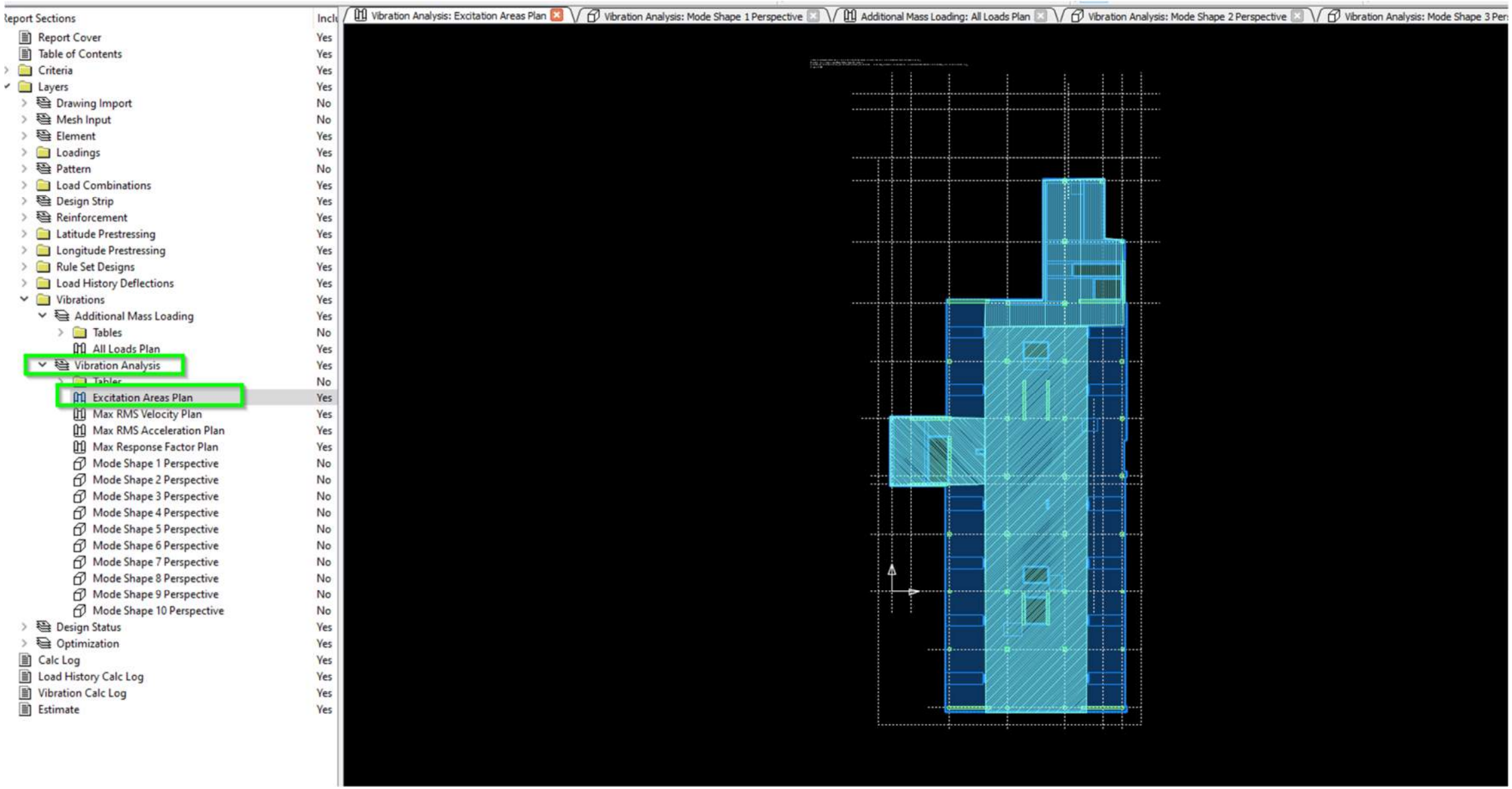
1. Higher vibration criteria are less stringent and vice versa.

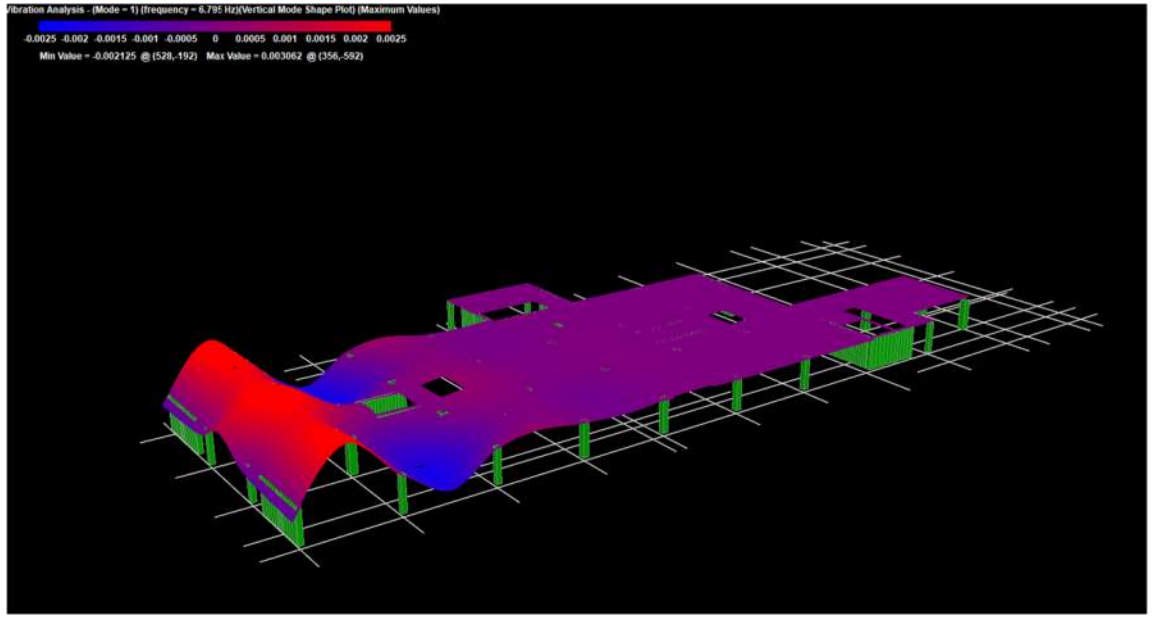
2. The vibration criteria in this table do not apply to renovation projects unless new equipment being installed has more stringent vibration limits.

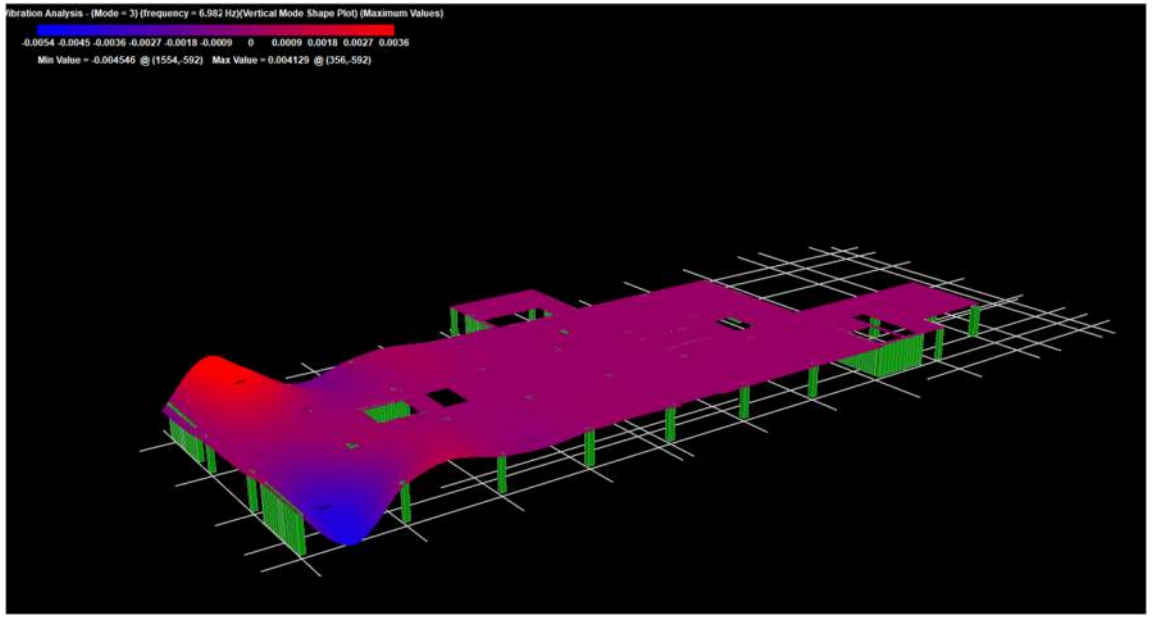
3. The vibration criteria in this table do not apply to mobile/transportable medical units.

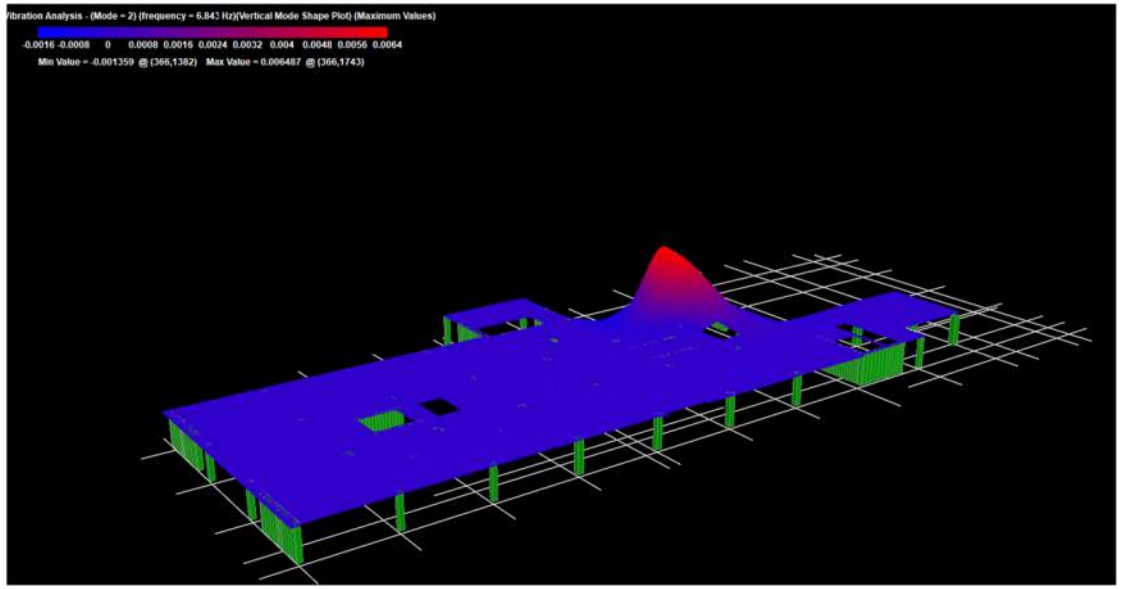
ARCHITECTURAL FLOOR PLAN

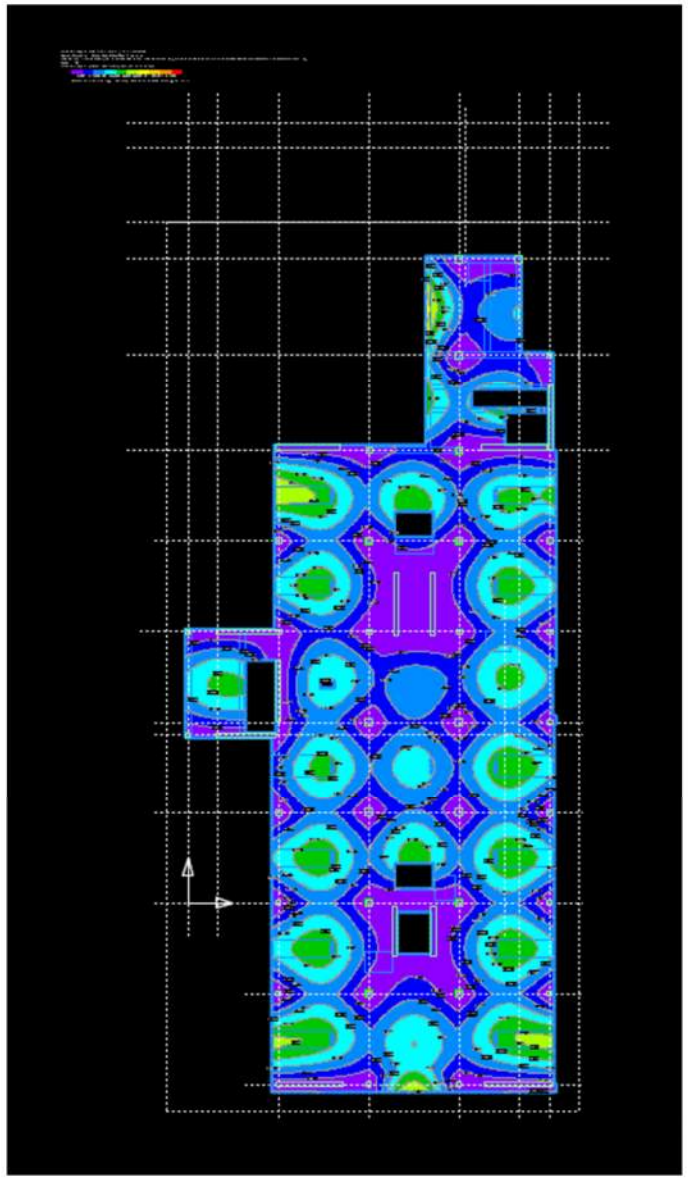


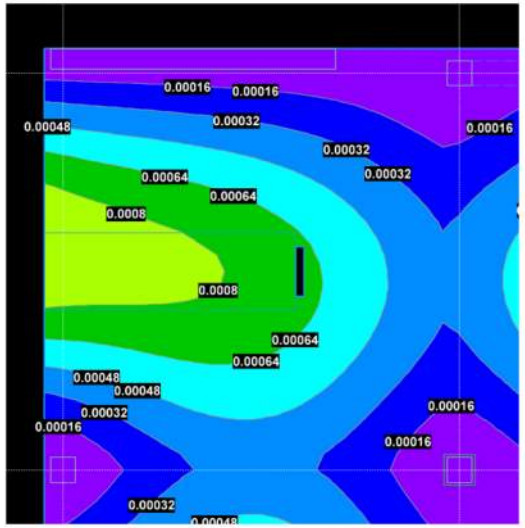

Report Sections
Incl
Report Cover Yes
Table of Contents Yes
Criteria Yes
Layers Yes
Drawing Import No
Mesh Input No
Element Yes
Loadings Yes
Pattern No
Load Combinations Yes
Design Strip Yes
Reinforcement Yes
Latitude Prestressing Yes
Longitude Prestressing Yes
Rule Set Designs Yes
Load History Deflections Yes
Vibrations Yes
Additional Mass Loading Yes
Tables No
All Loads Plan Yes
Vibration Analysis Yes
Tables No
Excitation Areas Plan Yes
Max RMS Velocity Plan Yes
Max RMS Acceleration Plan Yes
Max Response Factor Plan Yes
Mode Shape 1 Perspective No
Mode Shape 2 Perspective No
Mode Shape 3 Perspective No
Mode Shape 4 Perspective No
Mode Shape 5 Perspective No
Mode Shape 6 Perspective No
Mode Shape 7 Perspective No
Mode Shape 8 Perspective No
Mode Shape 9 Perspective No
Mode Shape 10 Perspective No
Design Status Yes
Optimization Yes
Calc Log Yes
Load History Calc Log Yes
Vibration Calc Log Yes
Estimate Yes
Vibration Analysis: Excitation Areas Plan
Vibration Analysis: Mode Shape 1 Perspective
Additional Mass Loading: All Loads Plan
Vibration Analysis: Mode Shape 2 Perspective
Vibration Analysis: Mode Shape 3 Per


Vibration Analysis - (Mode = 1) (frequency = 6.795 Hz)(Vertical Mode Shape Plot) (Maximum Values)
-0.0025 -0.002 -0.0015 -0.001 -0.0005 0 0.0005 0.001 0.0015 0.002 0.0025
Min Value = -0.002125 @ (528,-192) Max Value = 0.003062 @ (356,-592)


Vibration Analysis - (Mode = 3) (frequency = 6.982 Hz)(Vertical Mode Shape Plot) (Maximum Values)
-0.0054 -0.0045 -0.0036 -0.0027 -0.0018 -0.0009 0 0.0009 0.0018 0.0027 0.0036
Min Value = -0.004546 @ (1554,-592) Max Value = 0.004129 @ (356,-592)


Vibration Analysis - (Mode = 2) (frequency = 6.843 Hz)(Vertical Mode Shape Plot) (Maximum Values)
-0.0016 -0.0008 0 0.0008 0.0016 0.0024 0.0032 0.004 0.0048 0.0056 0.0064
Min Value = -0.001359 @ (366,1382) Max Value = 0.006487 @ (366,1743)




0.00016
0.00016
0.00048
0.00032
0.00016
0.00032
0.00032
0.00064
0.00064
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0.00064
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0.00032
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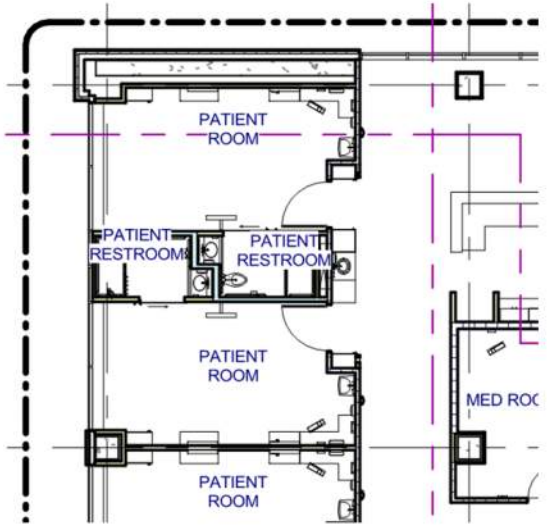
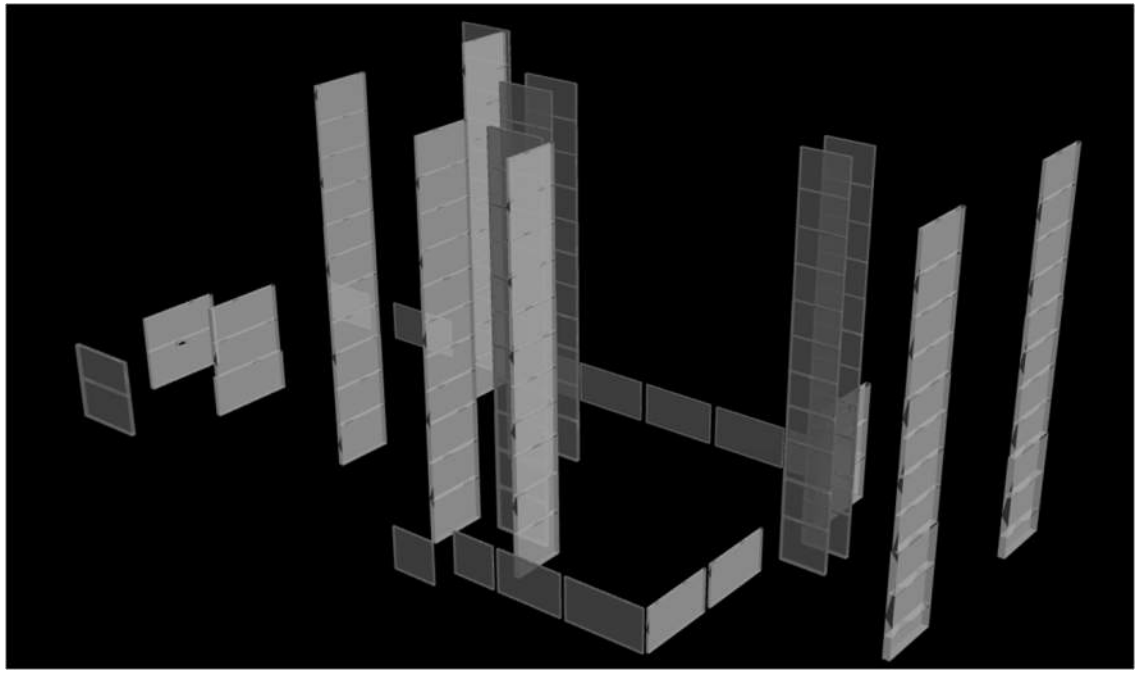
0.00016
0.00032


PATIENT ROOM
PATIENT RESTROOM
PATIENT RESTROOM
PATIENT ROOM
MED ROC
PATIENT ROOM

LATERAL SYSTEM SELECTION

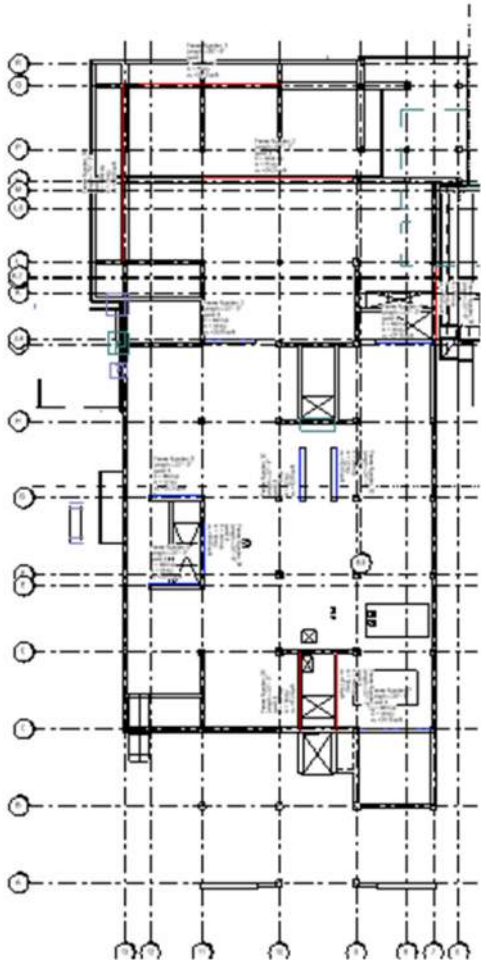


STUDIED 3 SYSTEMS:

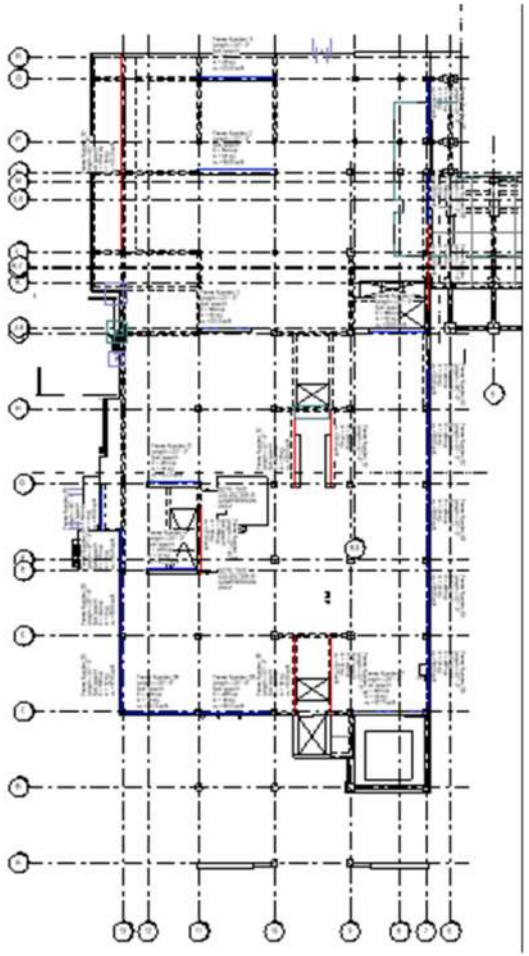
- SPECIAL CONCRETE SHEAR WALL
- SPECIAL CONCRETE MOMENT FRAME
- DUAL SYSTEM
  - INTERMEDIATE REINFORCED CONCRETE MOMENT FRAMES W/ SPECIAL REINFORCED CONCRETE SHEAR WALLS

FINAL DECISION

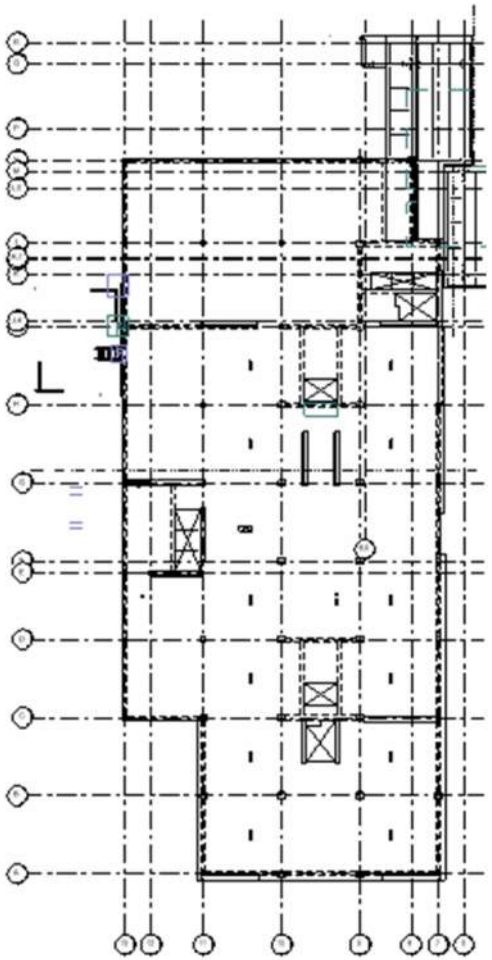
- SPECIAL CONCRETE SHEAR WALL (DUE TO LOW FLOOR TO FLOOR)



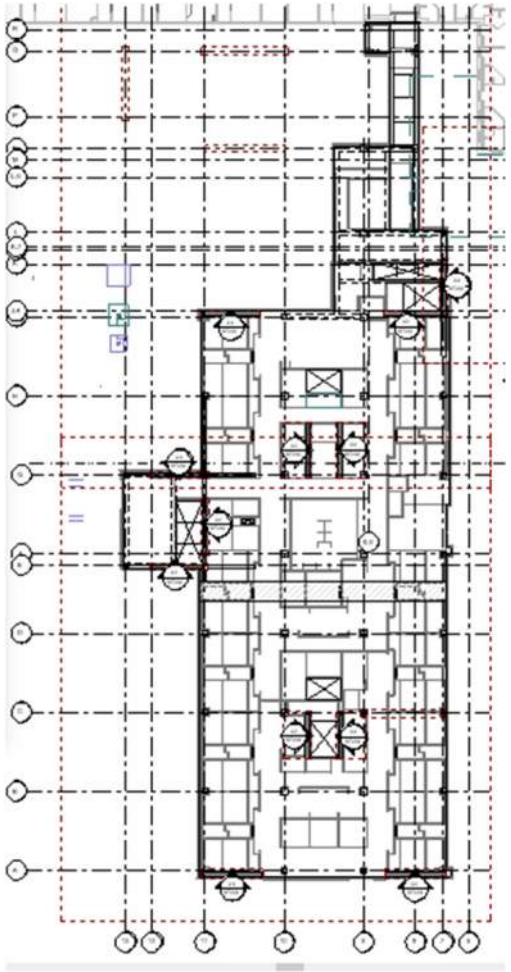
SUB 1



LEVEL 1



LEVEL 3



LEVEL 4 - 11

LATERAL DESIGN – STARTING POINT

SHEAR WALL LAYOUT:

- WELL DISTRIBUTED THROUGHOUT PLAN
- WALLS POSITIONED SUCH THAT THE COR ~ COM

WALL PORPORTIONING

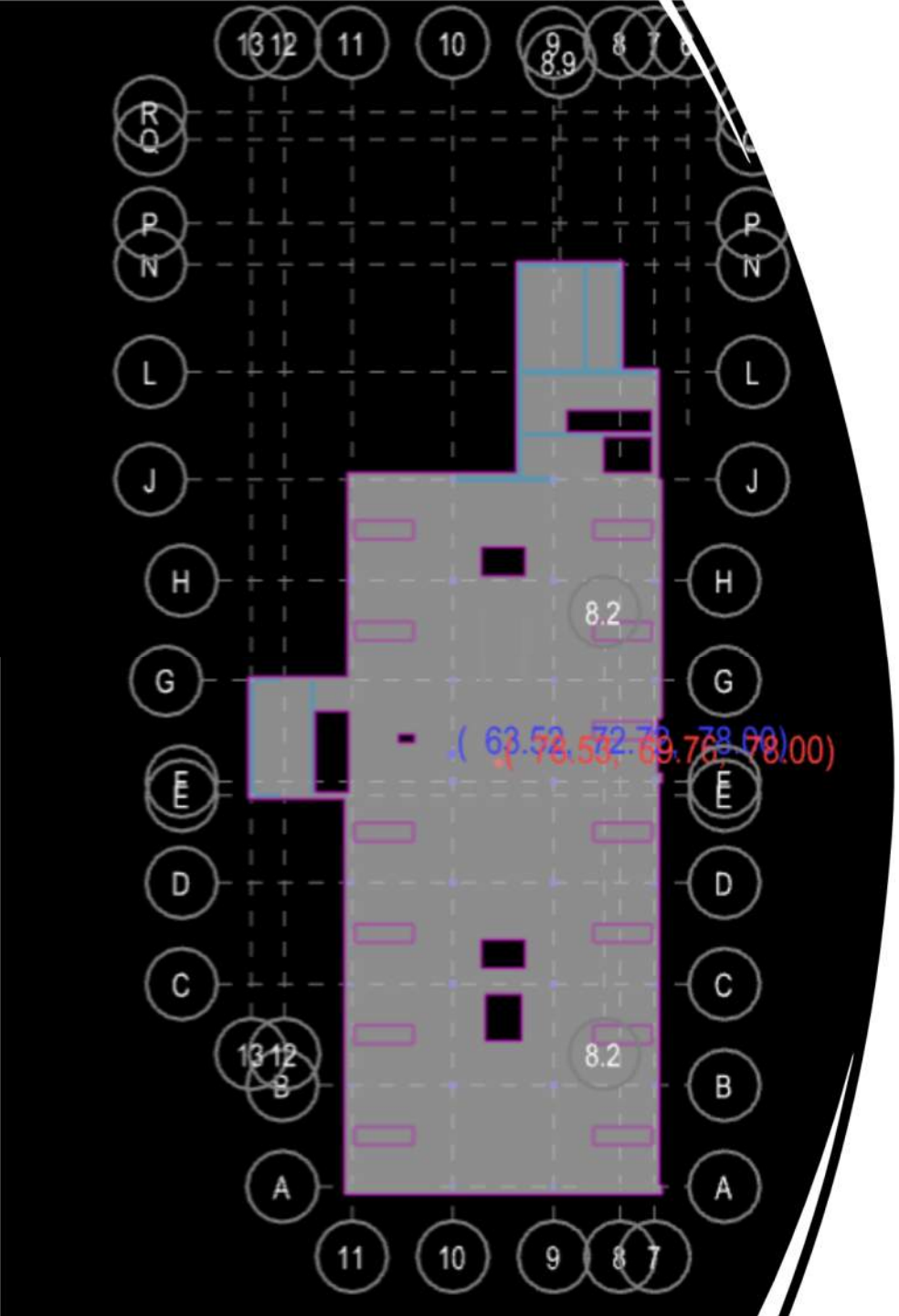
- INITIAL STRUCTURAL WALL SIZING TYPICALLY CONSIDERS BUILDING SEISMIC BASE SHEAR VERSUS WALL DESIGN SHEAR STRENGTH

WALL THICKNESS

- IF YOU ANTICIPATE BOUNDARY ELEMENTS, WALLS SHALL BE MINIMUM OF 12” THICK.
- IF YOU ANTICIPATE COUPLING BEAMS, WALLS SHALL BE A MINIMUM OF 16” THICK

IRREGULARTIES

- ELIMINATE (AS MUCH AS POSSIBLE), INSTEAD OF DESIGNING FOR IRREGULARITIES



ASCE SECTION 12.9 RESPONSE SPECTRUM ANALYSIS



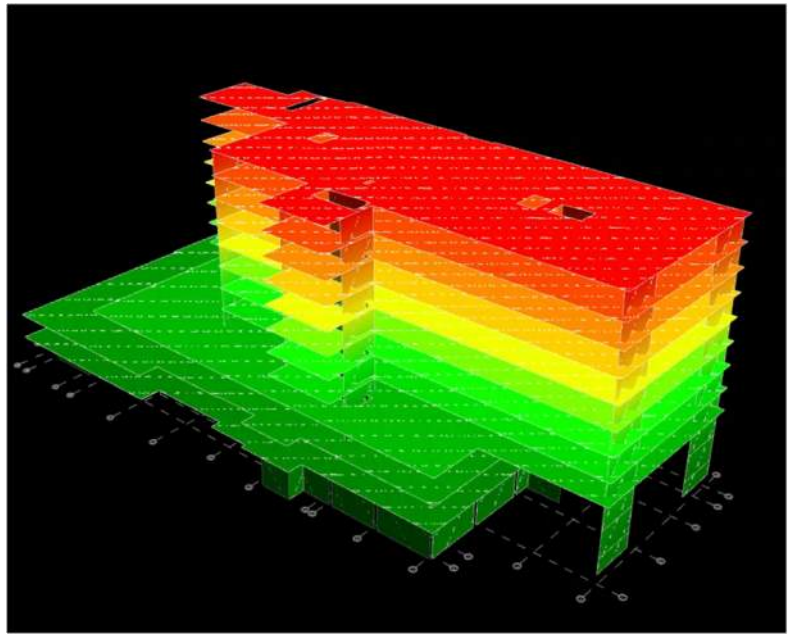
MODE SHAPES

- IDEALLY, A STRUCTURE IS DESIGNED WHERE THE FIRST TWO MODES ARE CLEARLY UNCOUPLED, AND THE TORSIONAL MODES OCCUR AT SHORTER PERIODS THAN THE RELATIVE TRANSLATIONAL MODES.

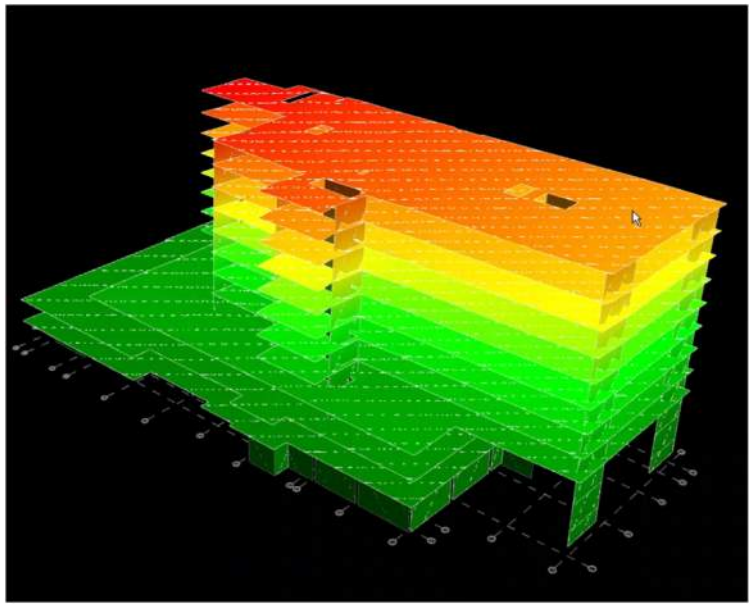
- **THUS THE FIRST TWO BUILDING MODES SHOULD BE TRANSLATIONAL, THE THIRD IS TORSIONAL, THE FOURTH AND FIFTH ARE TRANSLATIONAL, THE SIXTH IS TORSIONAL, AND SO ON. ALSO IT IS NICE IF 80% OF THE MASS PARTICIPATION OCCURS IN THE FIRST THREE BUILDING MODES**

MODE SHAPES

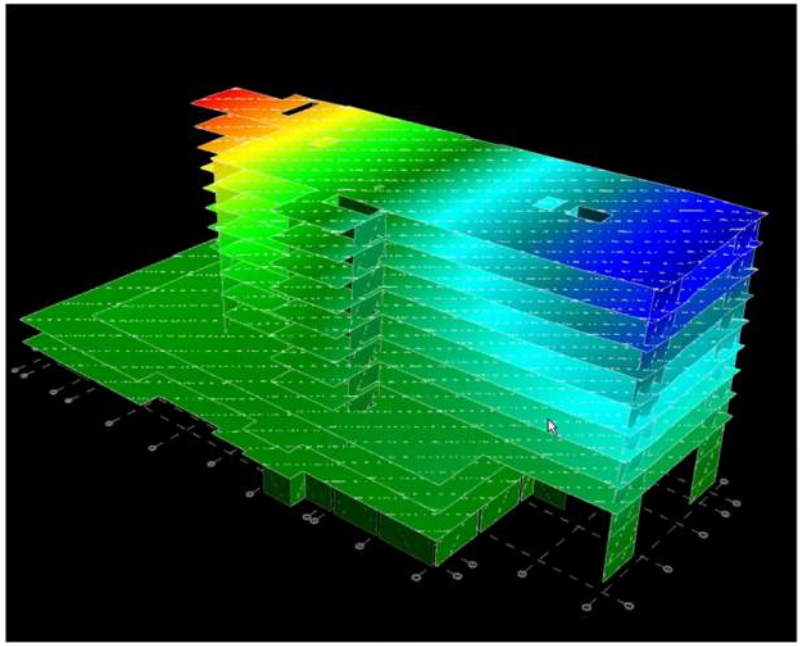
- UNFORTUNATELY, IT IS EASY TO DEFINE WHAT IS NICE, THE MORE DIFFICULT QUESTION IS WHAT IS TOO BAD? AS MODES BEGIN TO COUPLE, AS MASS PARTICIPATION MOVES INTO HIGHER MODES, AND AS TORSIONAL BUILDING MODES OCCUR AT LONGER PERIODS, WE GENERALLY EXPECT THE OVERALL PERFORMANCE OF THE STRUCTURE TO BE DECREASED.



Mode 1



Mode 2



Mode 3

Periods and Modes

12	-9.8789	2.8464	-402.1653
13	-24.2715	-10.2218	-271.0867
14	1.3980	-2.1020	-119.9261
15	6.5279	-4.0740	-232.9644

MODAL DIRECTION FACTORS:

Mode	X-Dir	Y-Dir	Rotation
1	0.02	99.97	0.01
2	99.02	0.02	0.95
3	0.98	0.01	99.01
4	0.02	99.95	0.03
5	97.97	0.02	2.01
6	3.27	0.11	96.63
7	0.67	98.65	0.68
8	86.08	1.16	12.76
9	26.57	1.52	71.92
10	2.72	90.19	7.09
11	66.72	7.25	26.03
12	18.57	4.53	76.90

SPECIAL BOUNDARY ELEMENTS

2 METHODS

- METHOD 1 PREFERRED METHOD (ACI 318-14 18.10.6.2)

$$c \geq \frac{\ell_w}{600\left(1.5\delta_u / h_w\right)} \qquad (18.10.6.2)$$

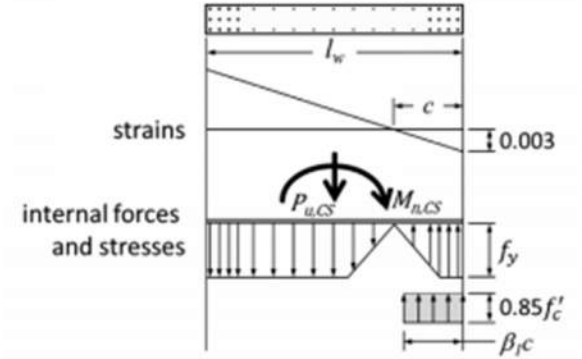


Figure 5-4 – Calculation of neutral axis depth c.

Image: Seismic Design of Cast-in-Place Concrete Special Structural Walls and Coupling Beams by NIST (2013, March)

  - C= LARGEST NEUTRAL AXIS CALCULATED FOR FACTORED AXIAL MOMENT/ITERATIVE OR DEPTH OF N.A. TO EXTREME COMPRESSIVE FIBER
  - ASSUMED REINFORCEMENT STRAIN

- METHOD 2 BASED UPON NOMINAL STRESS (ACI 318-14 18.10.6.3)
  - SPECIAL BOUNDARY ELEMENTS ARE REQUIRED AT AN EDGE IF NOMINAL STRESS EXCEEDS 0.2F C’.

SPECIAL BOUNDARY ELEMENTS

BOUNDARY ELEMENTS

METHOD 1 ASSUMES

THAT THE INELASTIC

DRIFT IS DUE ENTIRELY

TO CURVATURE

∅u CENTERED ON WALL

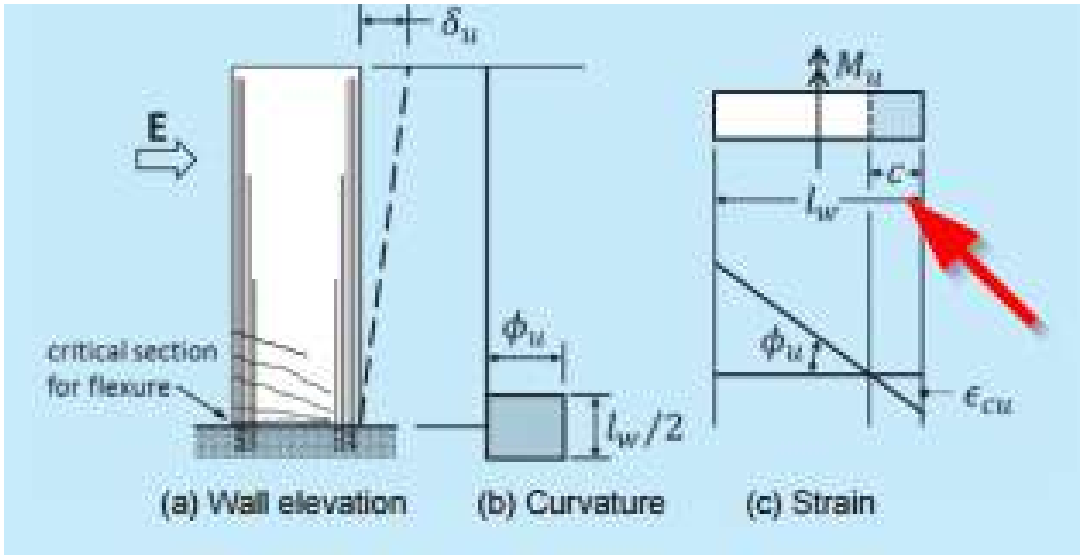


Image: Seismic Design of Cast-in-Place Concrete Special Structural Walls and Coupling Beams by NIST (2013, March)

$$c \geq \frac{\ell_w}{600\left(1.5\delta_u / h_w\right)} \qquad (18.10.6.2)$$

CRITICAL SECTION WITH PLASTIC HINGE LENGTH = LW/2. IF C

EXCEEDS THE VALUE ABOVE, CONFINEMENT IS <u>REQUIRED.</u>

SPECIAL BOUNDARY ELEMENTS *(METHOD 1 REQUIREMENTS)*

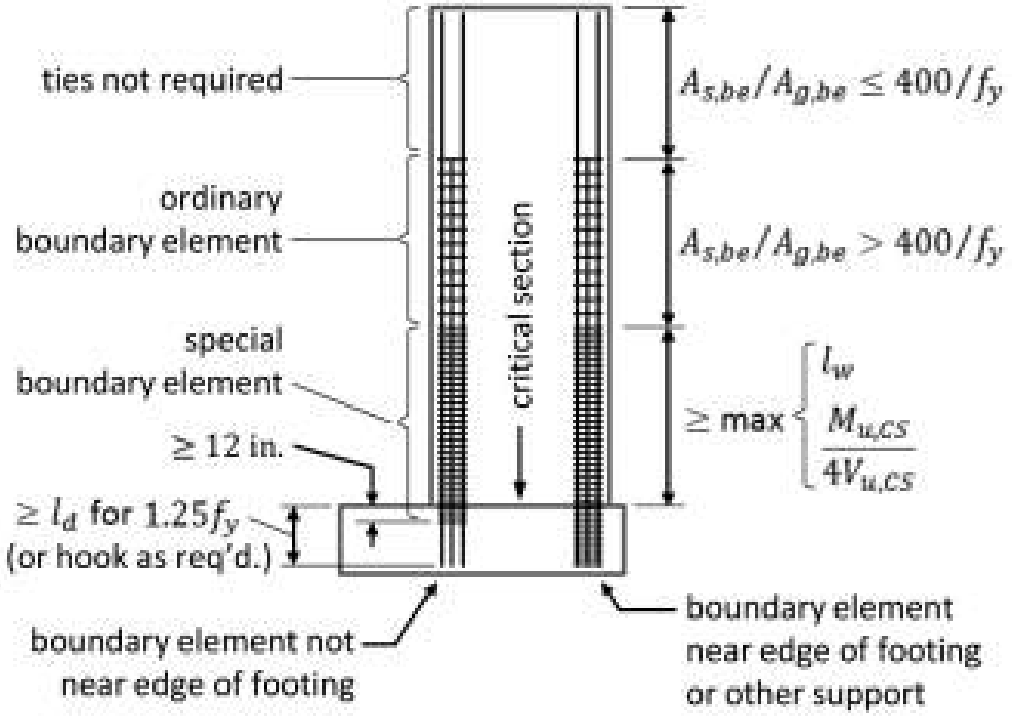
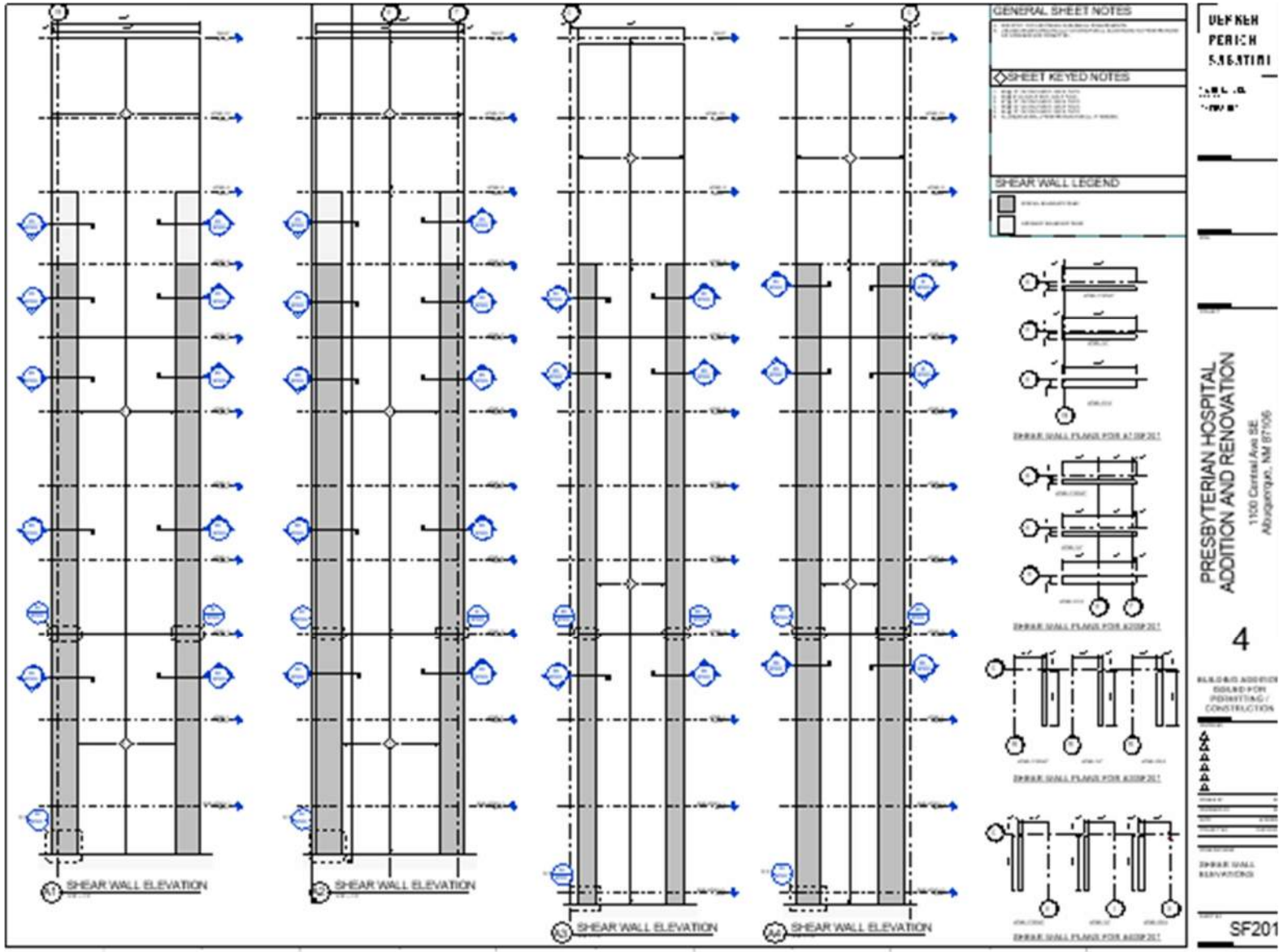


Figure 5-5 – Boundary element extensions for walls designed by Method I, for critical section at foundation interface. For ordinary and special boundary element details, see Figure 5-3.

Figure 5.5: Seismic Design of Cast-in-Place Concrete Special Structural Walls and Coupling Beams by NIST (2013, March)


GENERAL SHEET NOTES
SHEET KEYED NOTES
SHEAR WALL LEGEND
SHEAR WALL ELEVATION
SHEAR WALL ELEVATION
SHEAR WALL ELEVATION
SHEAR WALL ELEVATION
PRESBYTERIAN HOSPITAL
ADDITION AND RENOVATION
1100 Central Ave SE
Albuquerque, NM 87106
4
SF201

SPECIAL REINFORCED CONCRETE SHEAR WALL DETAILING

NONE OF THE SHEAR WALLS AT THE TOWER HAD LARGE PENETRATIONS

- THEREFORE, NO COUPLING BEAMS WERE REQUIRED

- HOWEVER, SPECIAL BOUNDARY ELEMENTS WERE REQUIRED AT MOSTS WALLS









SPECIAL REINFORCED CONCRETE SHEAR WALL DETAILING

TRY TO STEER ARCHITECTS AWAY FROM LARGE PENETRATIONS IN SHEAR WALLS

- IF YOU CAN….



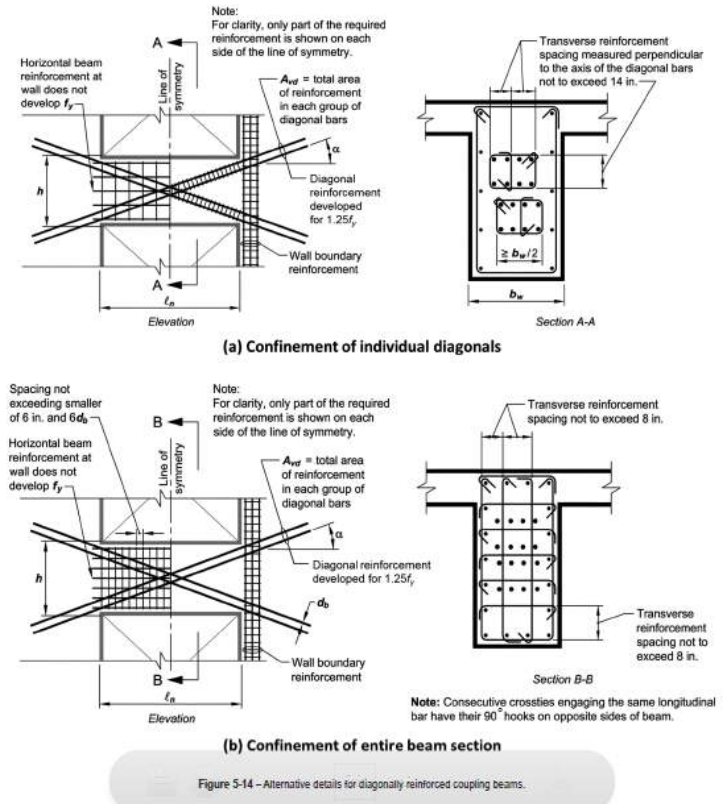


Image: Seismic Design of Cast-in-Place Concrete Special Structural Walls and Coupling Beams by NIST (2013, March)

COUPLING BEAMS

IF YOU NEED TO DESIGN A COUPLING BEAM, MAKE SURE IT IS PERMITTED AND THE DETAILING WORKS.

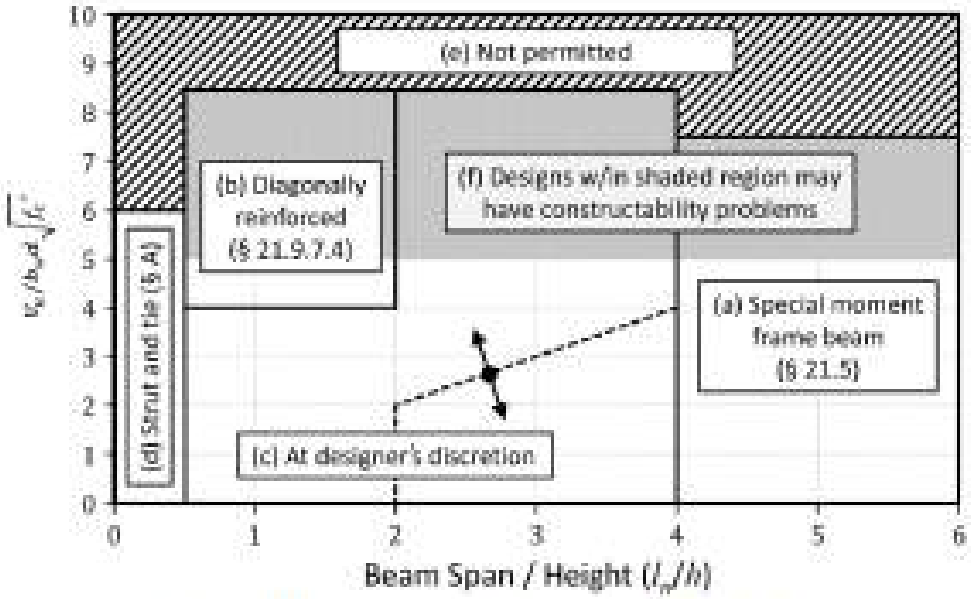


Figure 5-11 – Seismic coupling beam design space.

Figure 5.11: Seismic Design of Cast-in-Place Concrete Special Structural Walls and Coupling Beams by NIST (2013, March)

BOUNDARY ELEMENT DETAILING



TWO TYPES: ORIDINARY AND SPECIAL

- **SPECIAL** ARE REQUIRED WHEN COMBINED SEISMIC AND GRAVITY LOADING RESULTS IN HIGH COMPRESSIVE DEMANDS AT EDGE.
- **ORDINARY** ARE REQUIRED WHEN THE COMPRESSIVE DEMANDS ARE LOWER

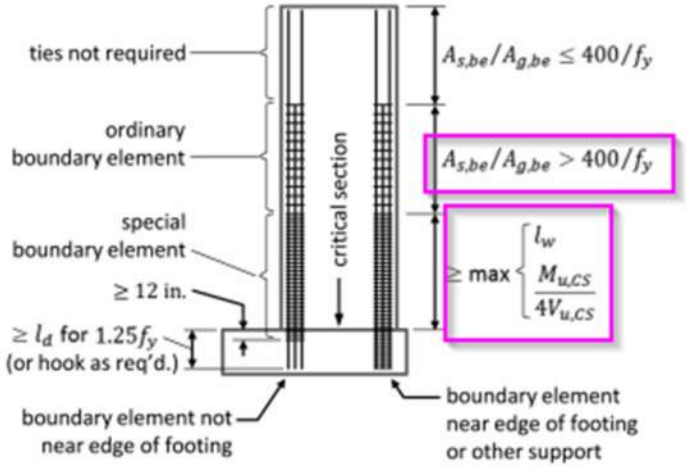
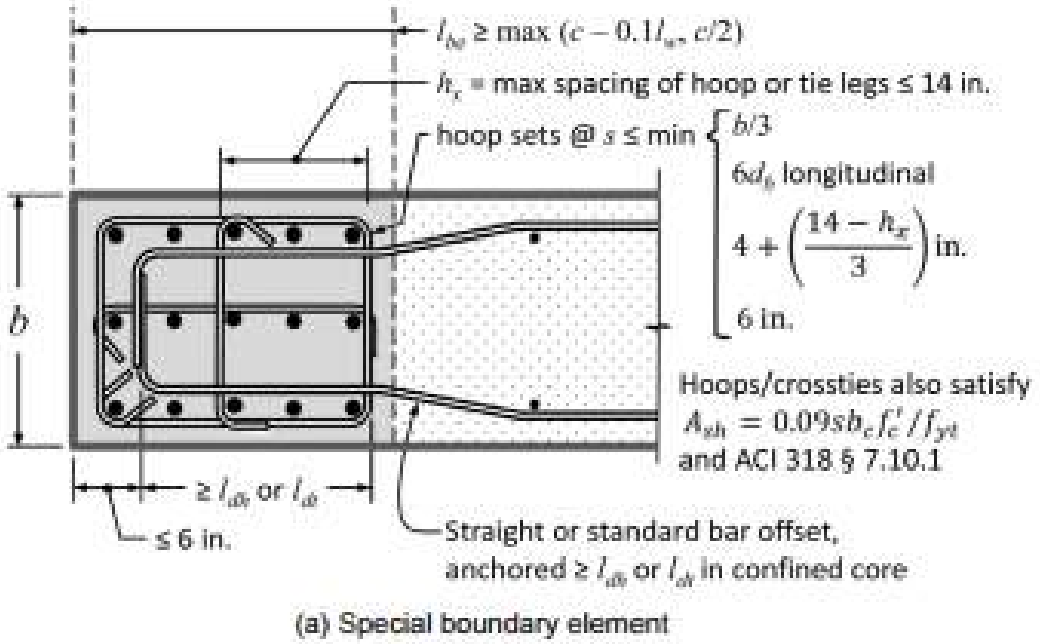


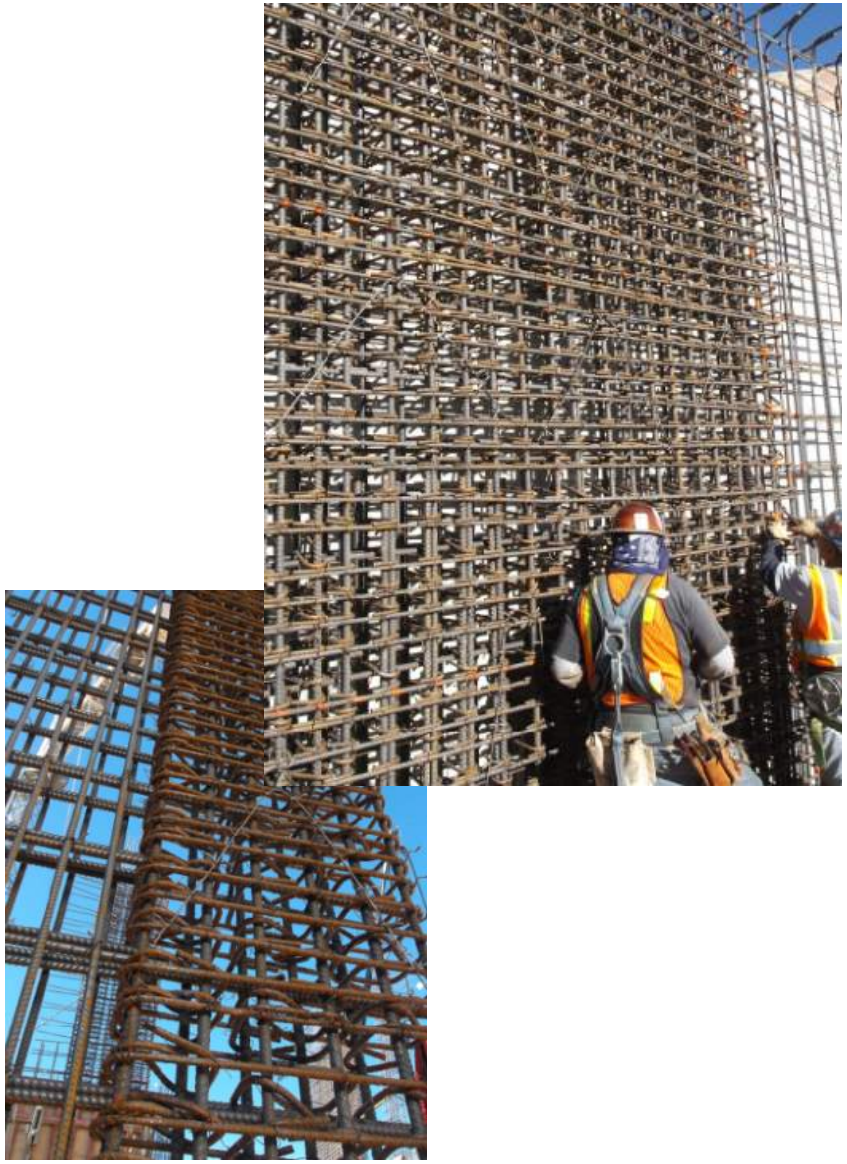
Figure 5-5 – Boundary element extensions for walls designed by Method I, for critical section at foundation interface. For ordinary and special boundary element details, see Figure 5-3.

SPECIAL BOUNDARY ELEMENT

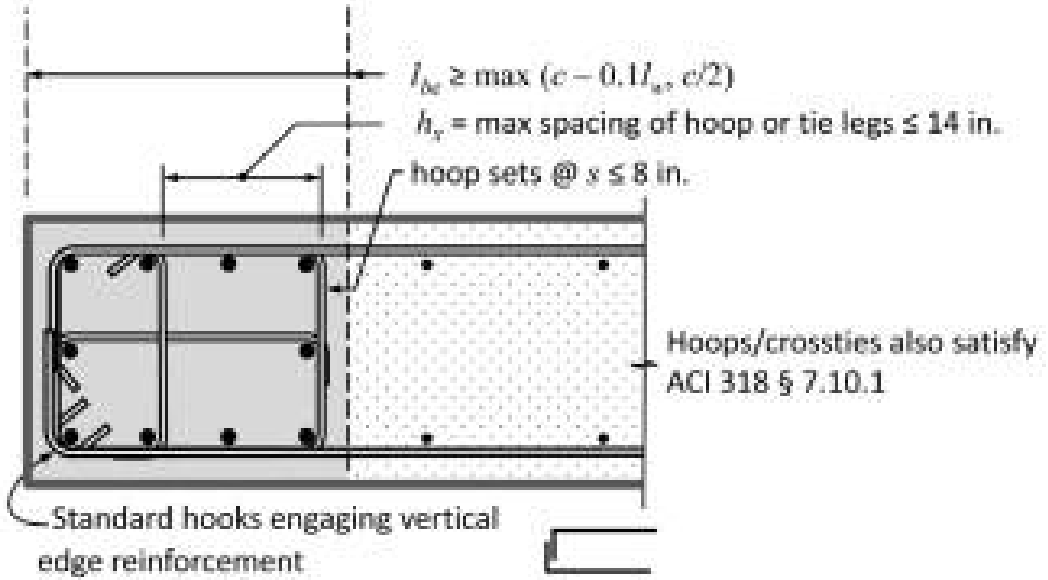


(a) Special boundary element

Figure 5.3: Seismic Design of Cast-in-Place Concrete Special Structural Walls and Coupling Beams by NIST (2013, March)



ORDINARY BOUNDARY ELEMENT



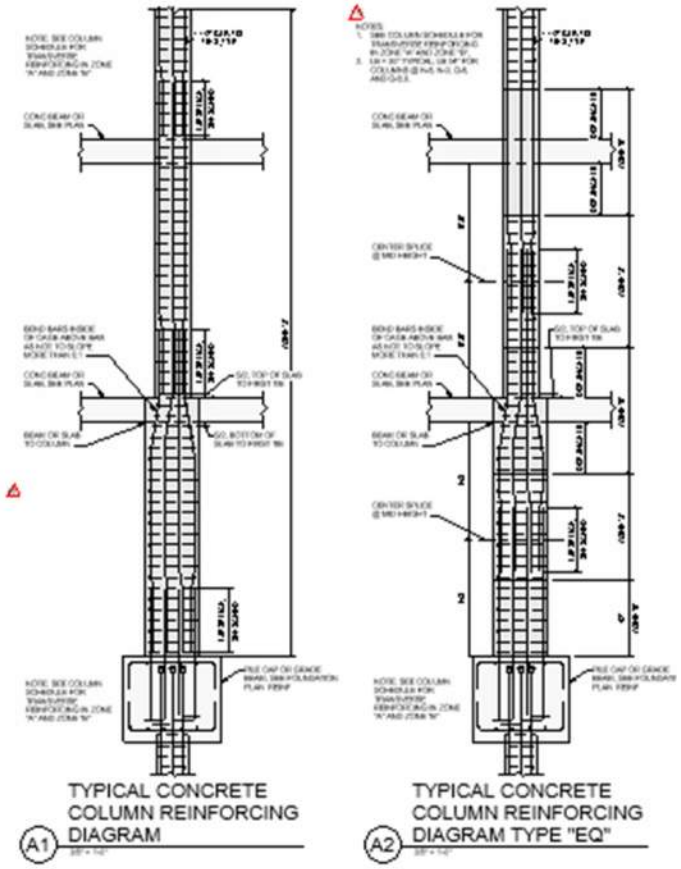
(b) Ordinary boundary element where $\rho_{be} > 400/f_y$



Image: Seismic Design of Cast-in-Place Concrete Special Structural Walls and Coupling Beams by NIST (2013, March)

MEMBERS NOT DESIGNATED AS PART OF THE SEISMIC FORCE RESISTING SYSTEM

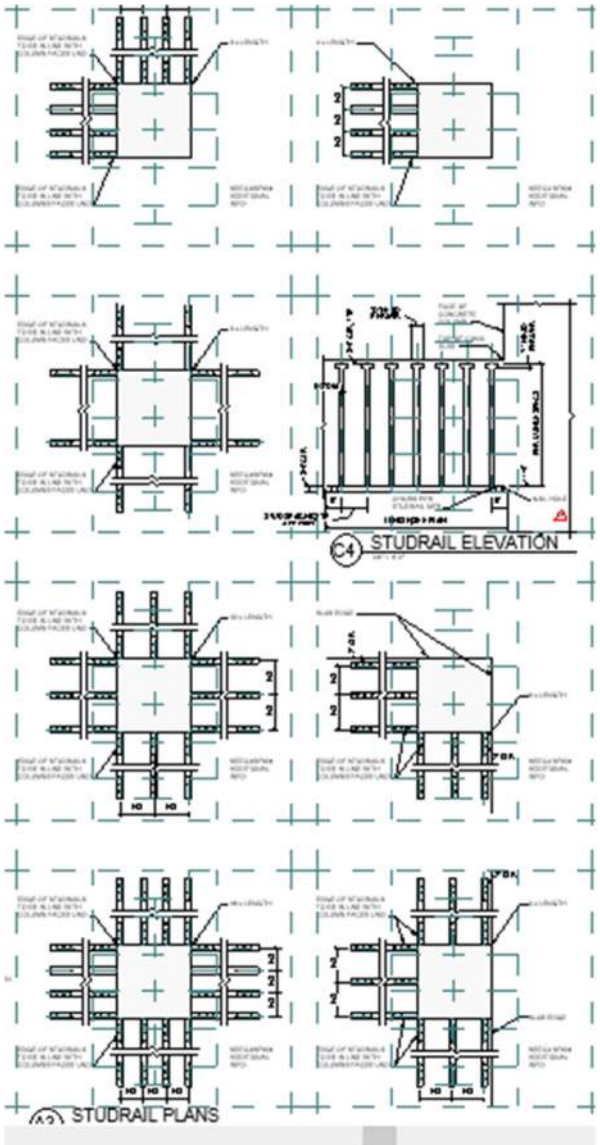
18.14.3.1 Cast-in-place beams and columns shall be detailed in accordance with 18.14.3.2 or 18.14.3.3 depending on the magnitude of moments and shears induced in those members when subjected to the design displacement δ_u. If effects of δ_u are not explicitly checked, the provisions of 18.14.3.3 shall be satisfied.







MEMBERS NOT DESIGNATED AS PART OF THE SEISMIC FORCE RESISTING SYSTEM



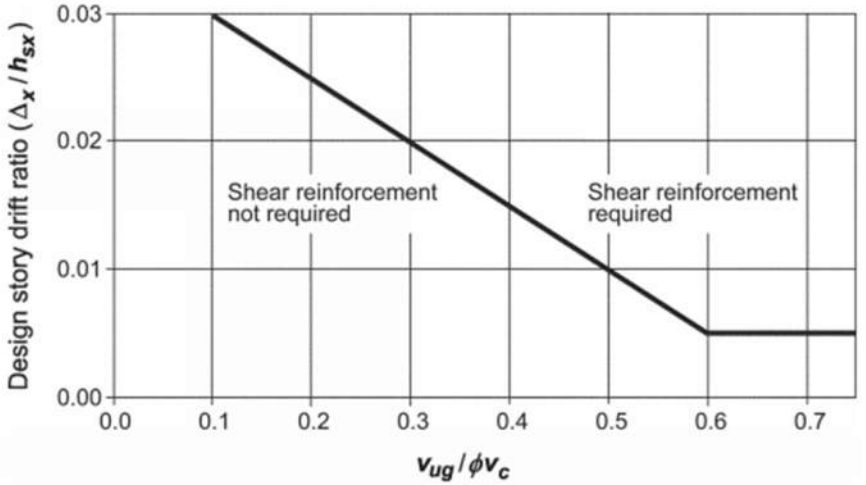
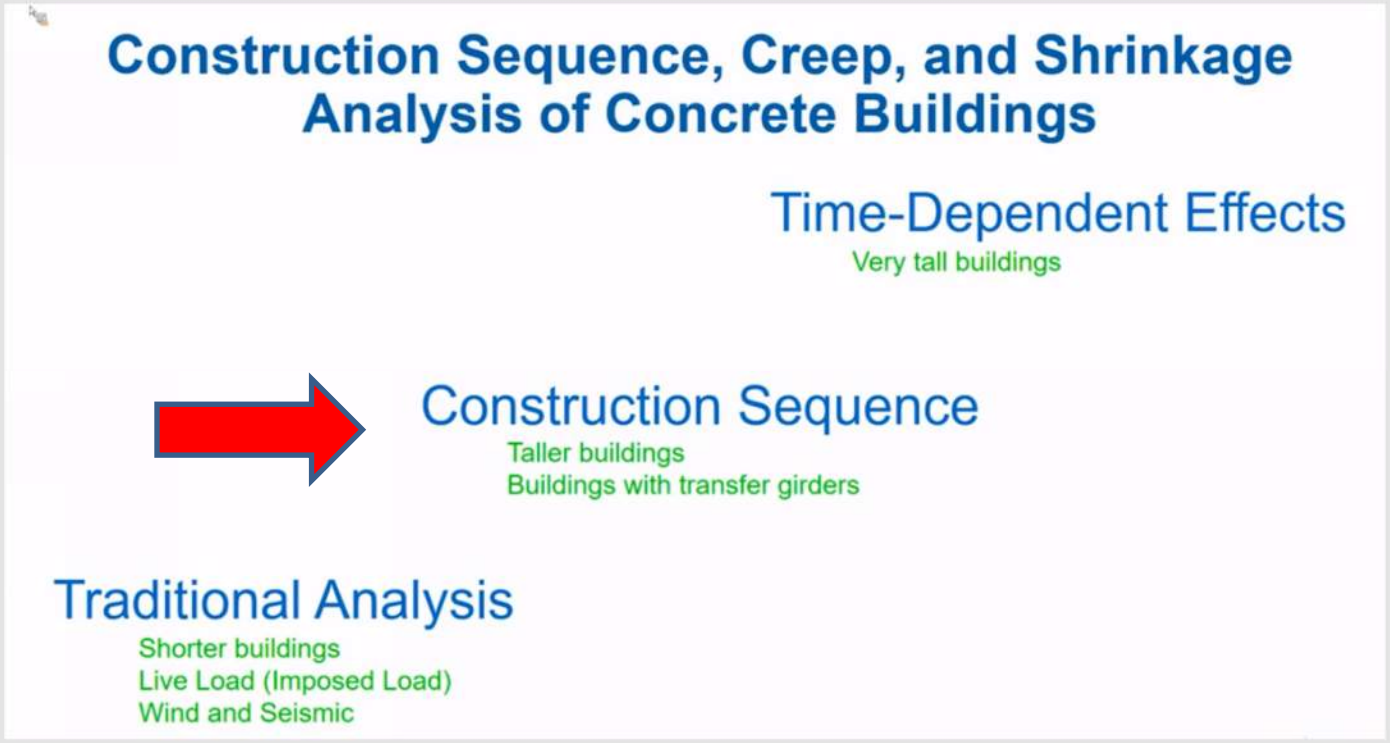


Fig. R18.14.5.1—Illustration of the criterion of 18.14.5.1.



CONSTRUCTION STAGE ANALYSIS



CONCRETE STRUCTURES MAY EXHIBIT DIFFERENTIAL AXIAL SHORTENING DURING CONSTRUCTION AND THIS MIGHT INDUCE ADDITIONAL MOMENTS

CONSTRUCTION STAGE ANALYSIS

Stage and Duration

Stages | Duration

Number of Stories/Stage: 1

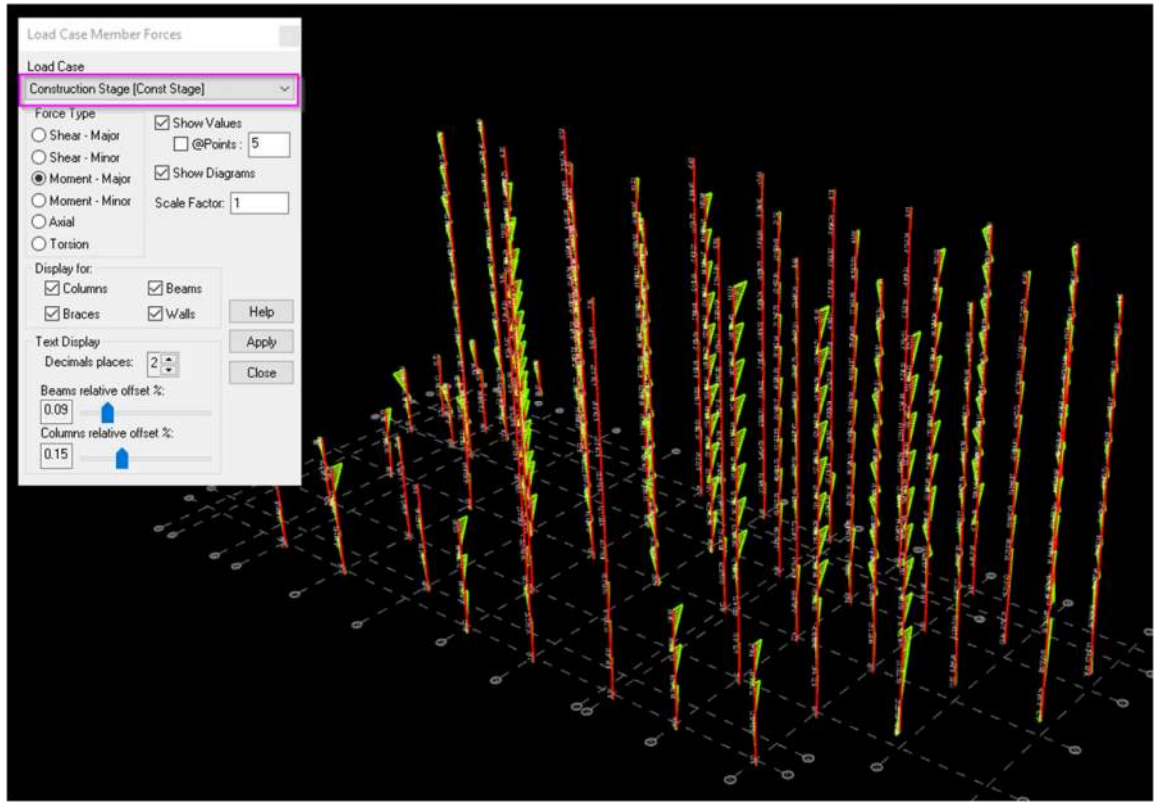
Generate Stages

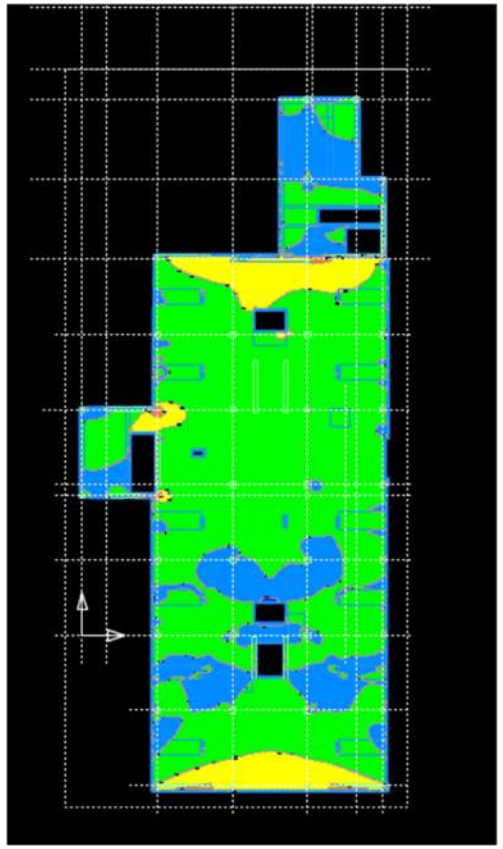
OK

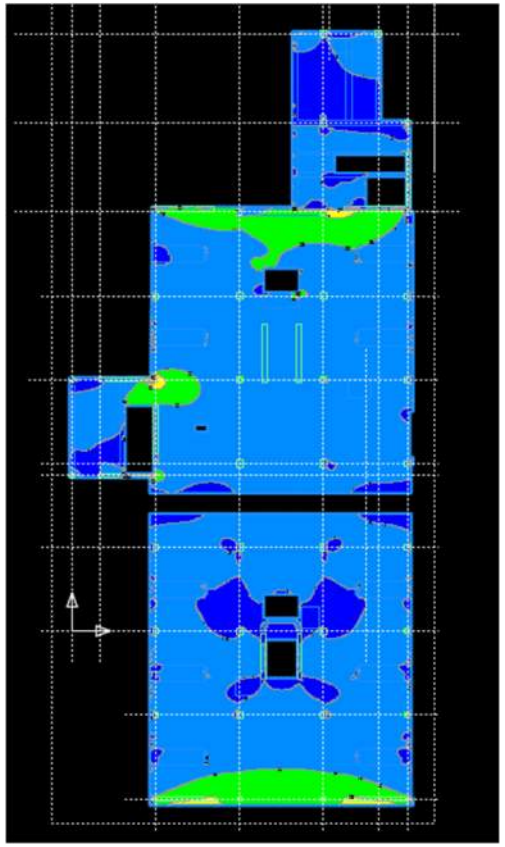
Cancel

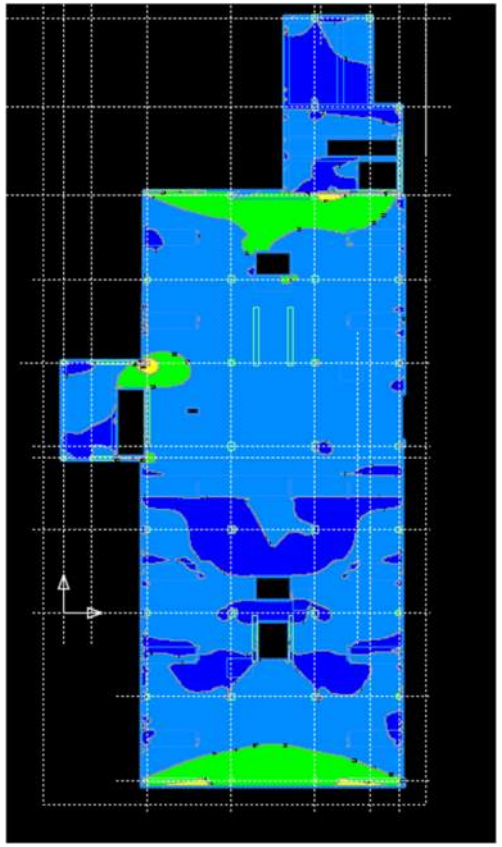
Help

Story	Diaph. #	Stage #
Pent House	1	12
Roof	1	11
Level 10	1	10
Level 9	1	9
Level 8	1	8
Level 7	1	7
Level 6	1	6
Level 5	1	5
Level 4	1	4
Level 3	1	3
Level 1	1	2
Sub Level 1	1	1









SLAB SHRINKAGE

CFA

Concrete Frame Associates, LLC
551 Norfolk Street • Suite 100 • Aurora, CO 80011
303-341-5035 • Fax 303-341-5034

NOTE PAD

Date 04-13-2021
Project No.
Sheet ____ of ____

Project PRESBYTERIAN HOSPITAL-TOWER Subject POUR STRIP

LVL. 6

6B POUR = DAY 40

6C POUR = DAY 47

LVL. 5

5B POUR = DAY 20

RELEASE ALL SHORING LOAD AND INSTALL RESHORES BEFORE POURING ABOVE.

POUR SAME DAY

5C POUR = DAY 27

RELEASE ALL SHORING LOAD AND INSTALL RESHORES BEFORE POURING ABOVE AND BEFORE STRIPPING POUR STRIP BELOW.

- CURE DAYS 28, 29, 30
- STRIP/RESHORE DAYS 31-39

LVL. 4

POUR STRIP

4B POUR = DAY 0

POUR = DAY 27

4C POUR = DAY 7

RELEASE ALL SHORING LOAD AND INSTALL RESHORES BEFORE POURING ABOVE.

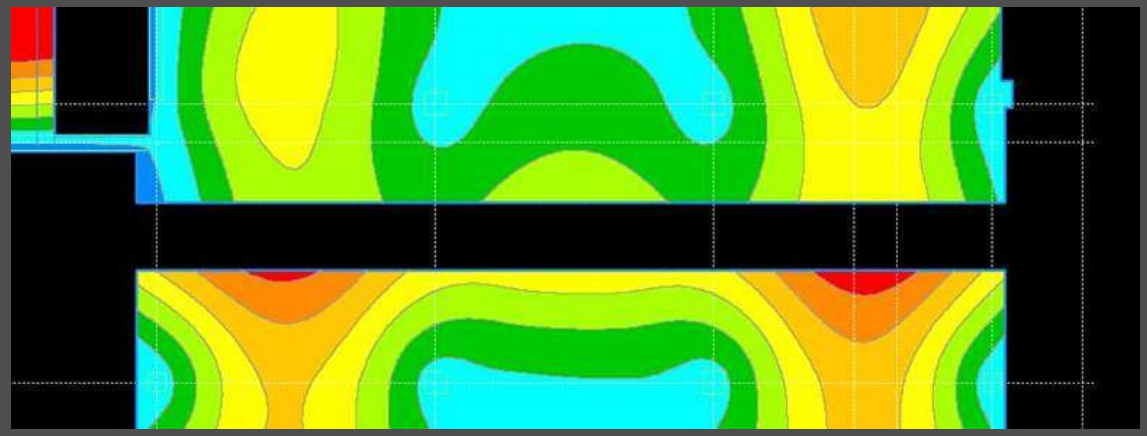
DAY 27
− DAY 7
20 DAYS
+ 4 WEEKEND DAYS (MIN.)
= 24 DAYS (MIN.)

RELEASE ALL SHORING LOAD AND INSTALL RESHORES BEFORE POURING ABOVE.

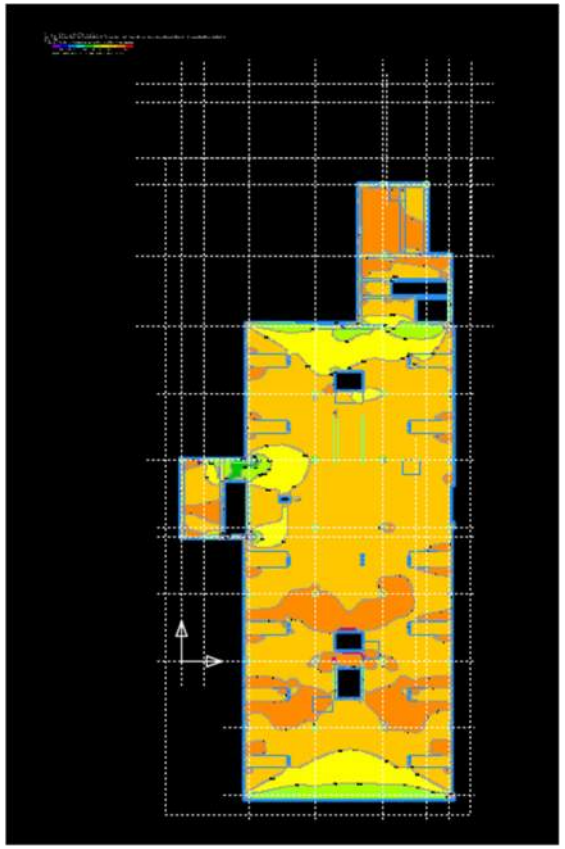
POUR STRIP —
CURE DAYS 28, 29, 30
STRIP/RESHORE DAYS 31-39
(BEFORE LVL. 6B POUR)

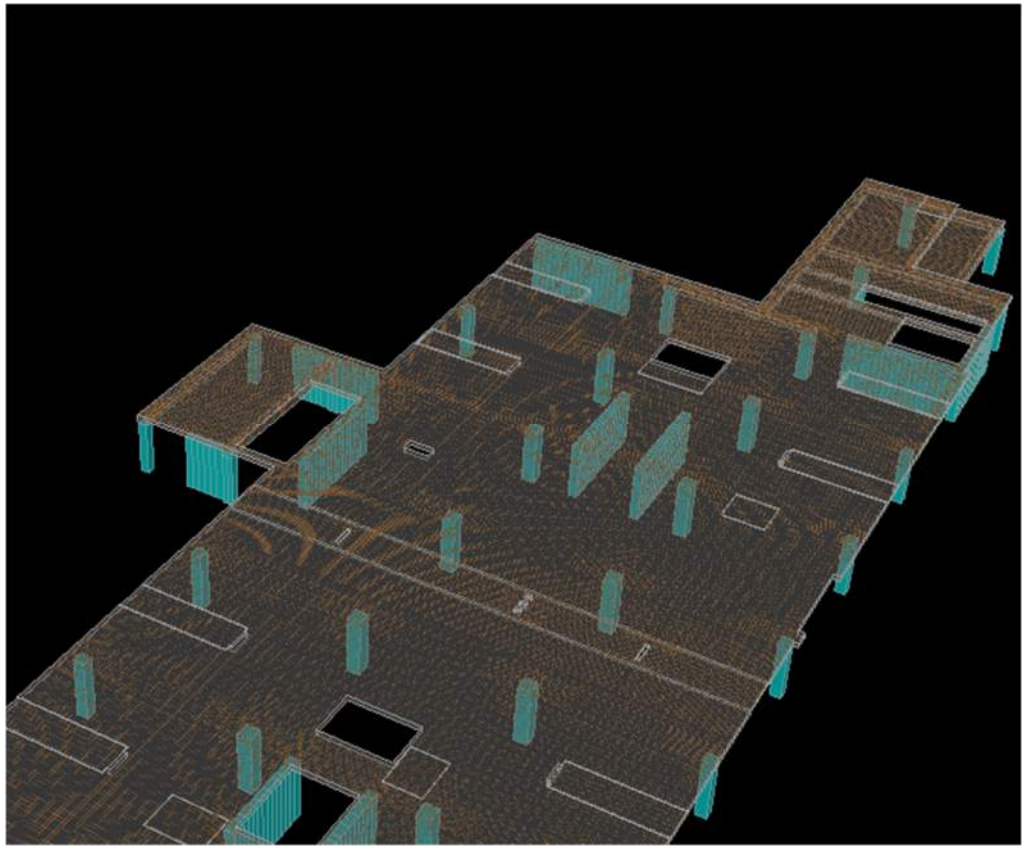
LVL. 3

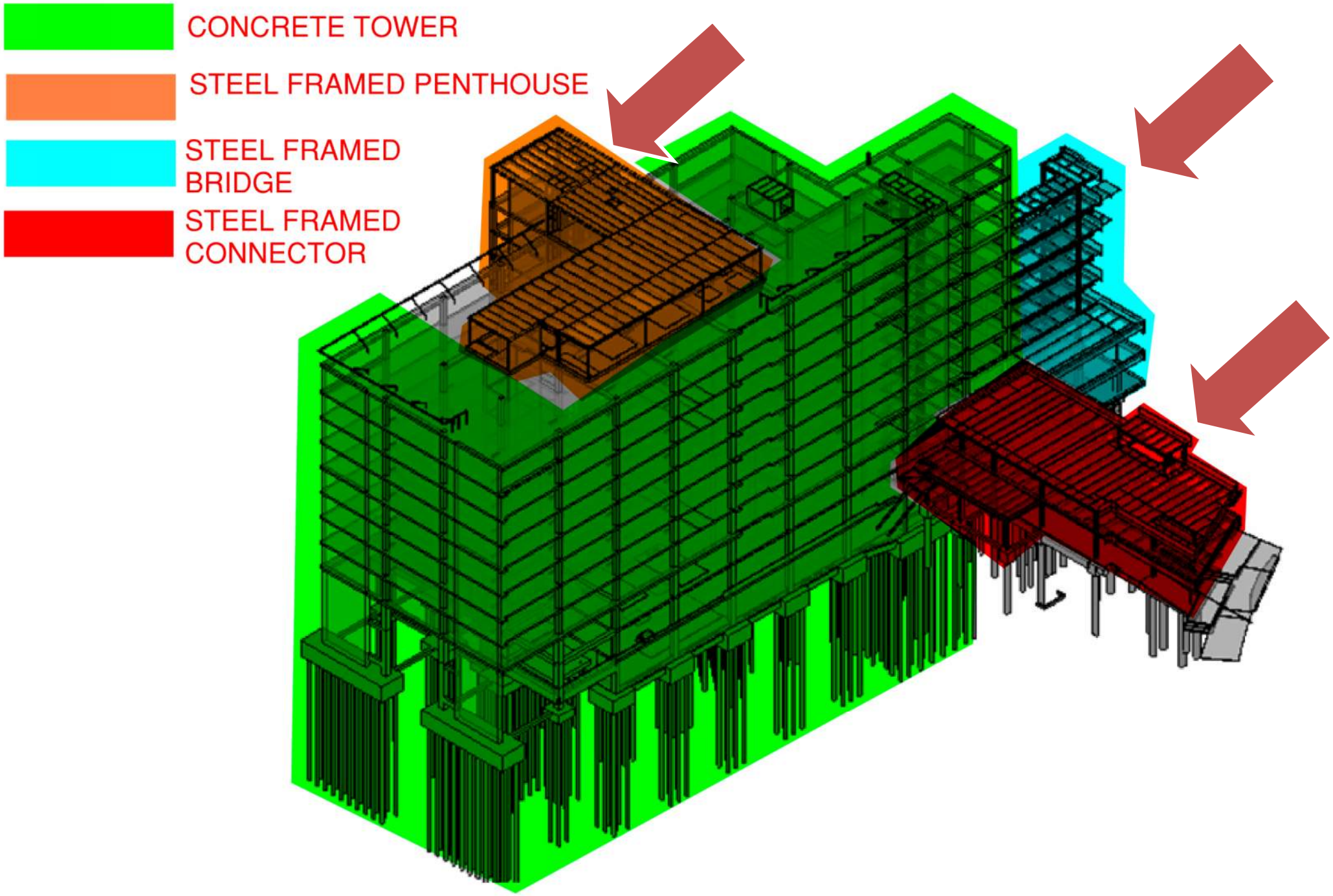
FULLY STRIPPED & RESHORED BEFORE LVL. 4 POURED ABOVE.



TEMPERATURE

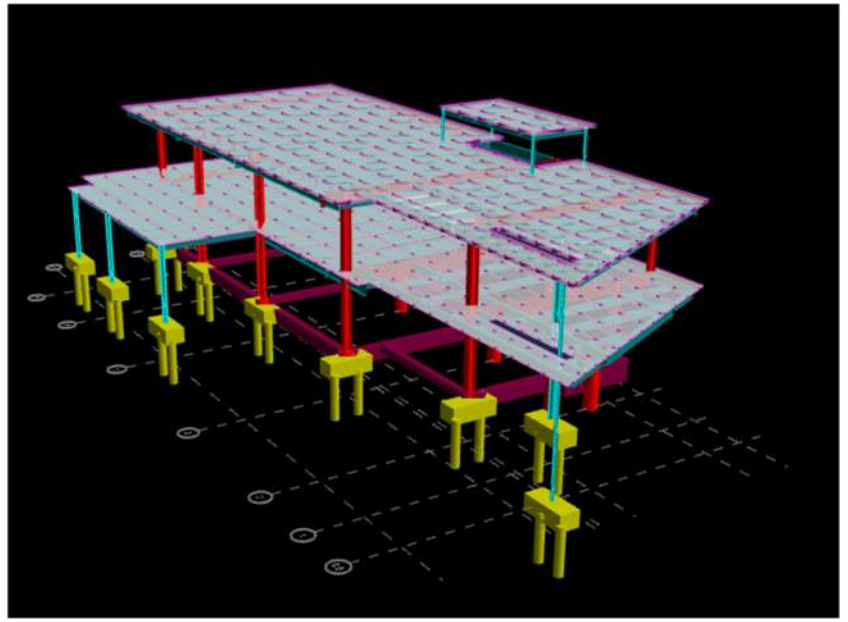


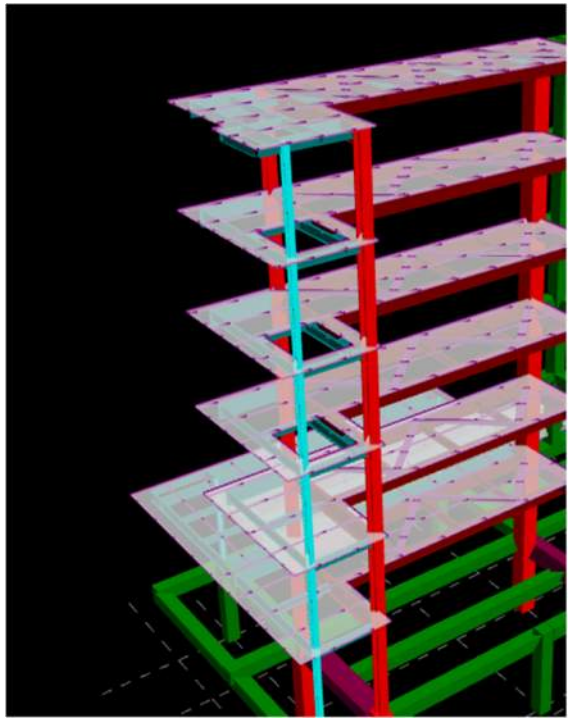



CONCRETE TOWER
STEEL FRAMED PENTHOUSE
STEEL FRAMED BRIDGE
STEEL FRAMED CONNECTOR

CONNECTOR LINK/BRIDGE FRAMING

- **GRAVITY SYSTEM**
  - **HORIZONTAL**
    - COMPOSITE STEEL BEAMS
    - CAMBERED
    - NW CONCRETE OVER STEEL COMPOSITE DECK
      - 4.5” OVER THE FLUTES
    - WIDE FLANGE COLUMNS





CONNECTOR LINK LATERAL FRAMING

- **LATERAL SYSTEM OPTIONS**
  - SPECIAL CONCENTRIC BRACED FRAMES (SCBF)
  - BUCKLING RESTRAINED BRACED FRAME (BRBF)
  - ECCENTRIC BRACED FRAME (EBF)
  - SPECIAL MOMENT FRAME (SMF)

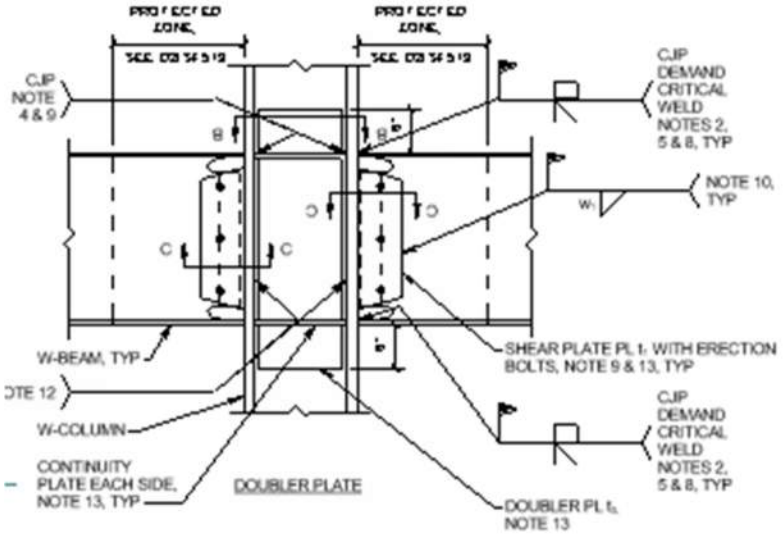


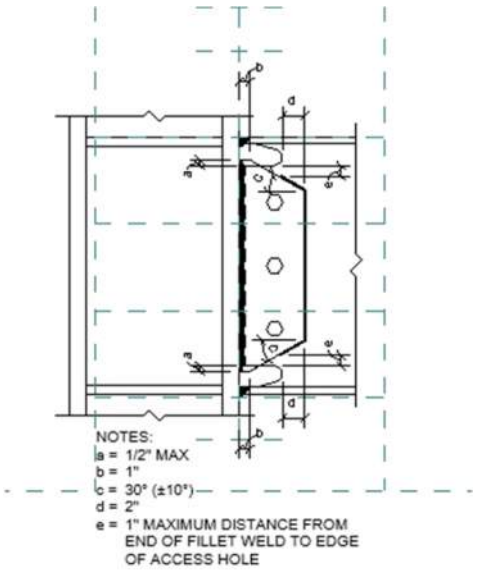


BRBF – RUST MEDICAL CENTER

DUCTILE CONNECTIONS

- **SMF CONNECTION OPTIONS (PREQUALIFIED UNDER AISC 358)**
  - REDUCED BEAM SECTION
  - BOLTED STIFFENED/UNSTIFFENED EXTEND END PLATE
  - BOLTED FLANGE PLATES
  - WELDED UNREINFORCED FLANGE – WUF
  - KAISER BOLTED
  - SIDEPLATE (HSS OR WF)
  - CONXTECH (HSS)
    - HSS OR BU CO





MOMENT FRAME REQUIREMENTS

	SMF (R=8, C_d=5.5)	IMF (R=4.5, C_d=4)	OMF (R=3.5, C_d=3)
Demand Critical Welds	X	X	X
Protected Zone	X	X	
Seismically Compact Sections	X		
Compact Sections	X	X	
Strong-Column Weak-Beam	X		
Lateral Bracing of Beams	X	X	

BENEFITS OF A DUCTILE SYSTEM



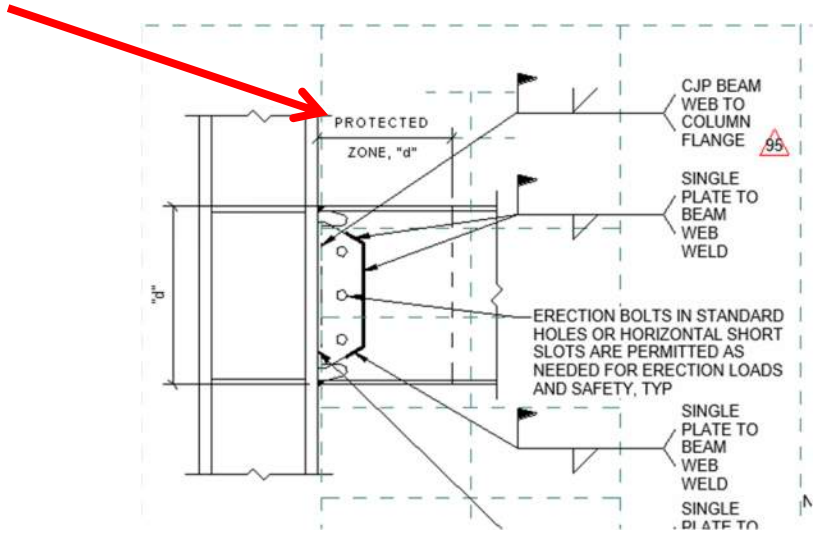
Figure 2-7 - Typical local buckling of beam flanges and web in zone of plastic hinging at high levels of inelastic rotation.

PHOTO: NEHRP SEISMIC DESIGN GUIDE TECH 2

- R=8 SYSTEM RESPONSE MODIFICATION COEFFICIENT
- IMPLIES INITIATION OF INELASTIC BEHAVIOR WITH AN INTENSITY OF 1/8 OF THE DESIGN EARTHQUAKE.
- THE LOWER THE R, THE HIGHER THE SEISMIC DEMAND
- DUCTILITY!!!! THESE FRAMES ARE EXPECTED TO BEHAVE IN A DUCTILE MANNER.

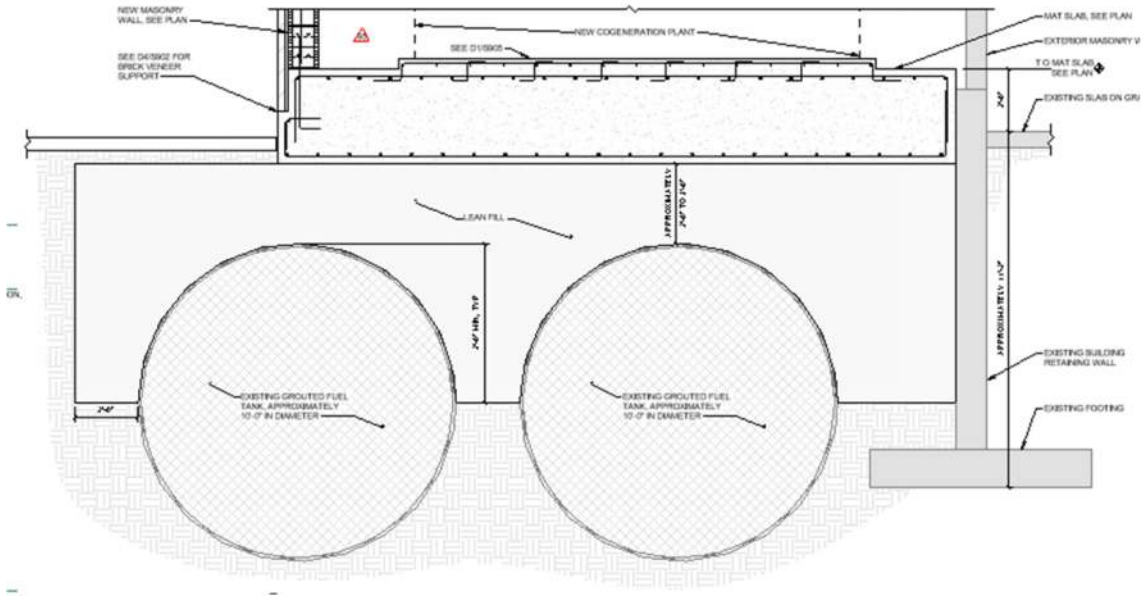
DETAILS FOR DUCTILE BEHAVIOR

- LATERAL SYSTEM CONT.
  - PROTECTED ZONE (REGION SUBJECT TO INELASTIC STRAINING)
    - THE PROTECTED ZONE IS IMMEDIATELY AROUND THE PLASTIC HINGING REGION.
  - DEMAND CRITICAL WELDS FOR INCREASED QUALITY/TOUGHNESS
  - SEISMICALLY COMPACT SECTIONS
  - PANEL ZONE OF BEAM TO COLUMN CONNECTIONS

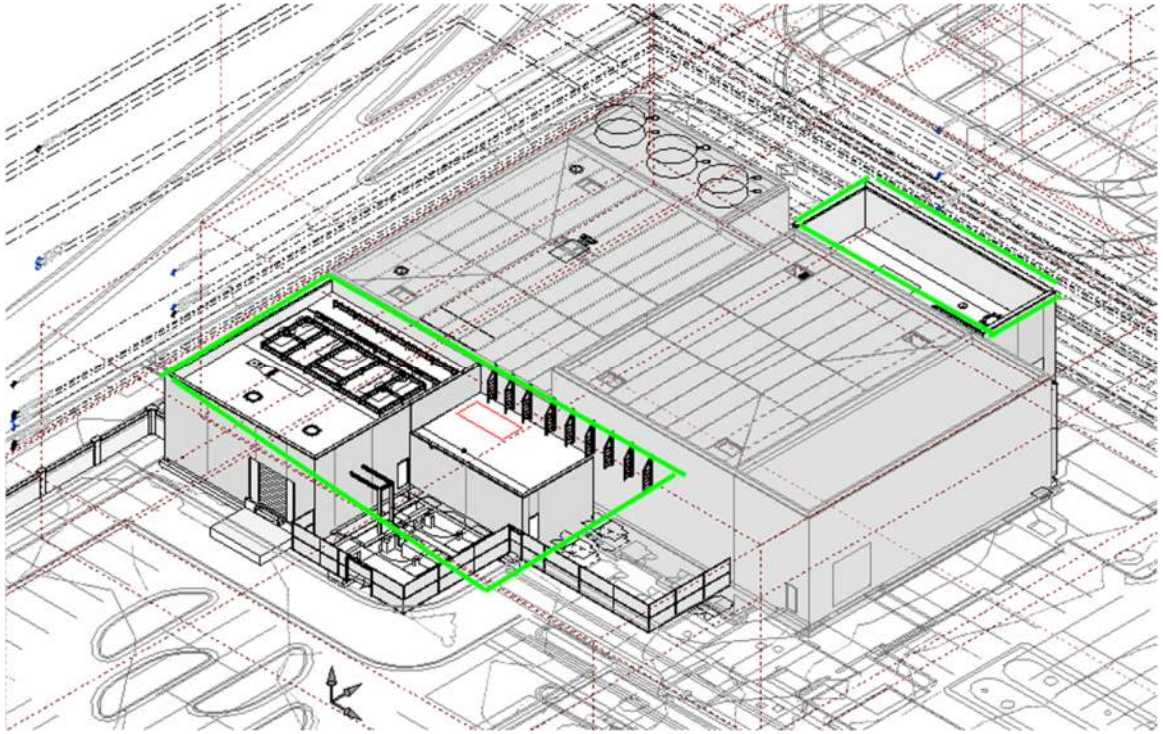


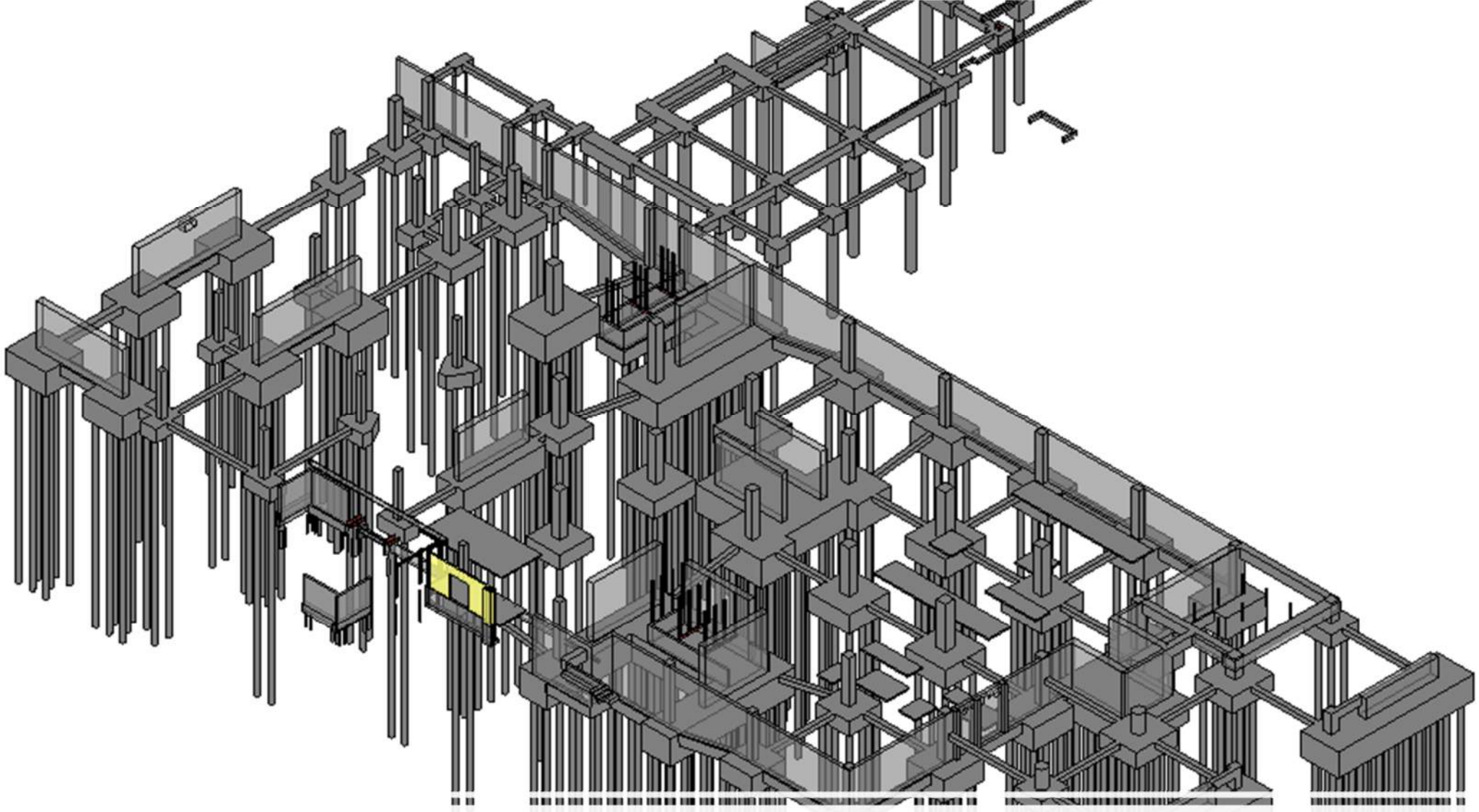


ENERGY CENTER EXPANSION









FOUNDATION DESIGN

AUGERCAST PILES

400 KIP PILES

300 KIP PILES

NEARLY 500 PILES





COMPRESSION PILE LOAD TESTING PER ASTM D1143 PROCEDURE A

Design Capacity	Length	Max Test Load
300 kips	50 ft	600 kips
400 kips	70 ft	800 kips

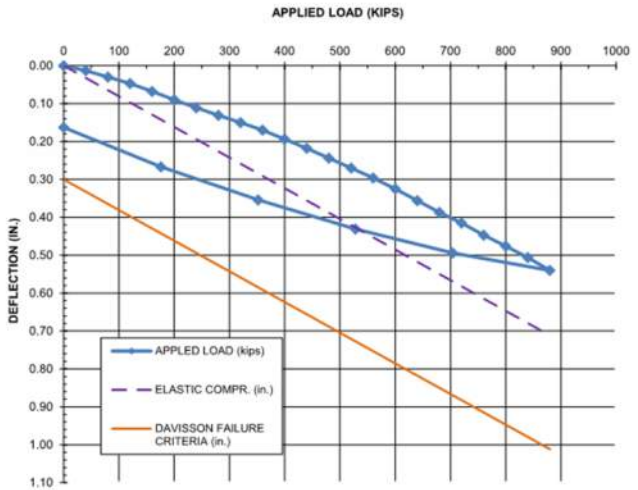
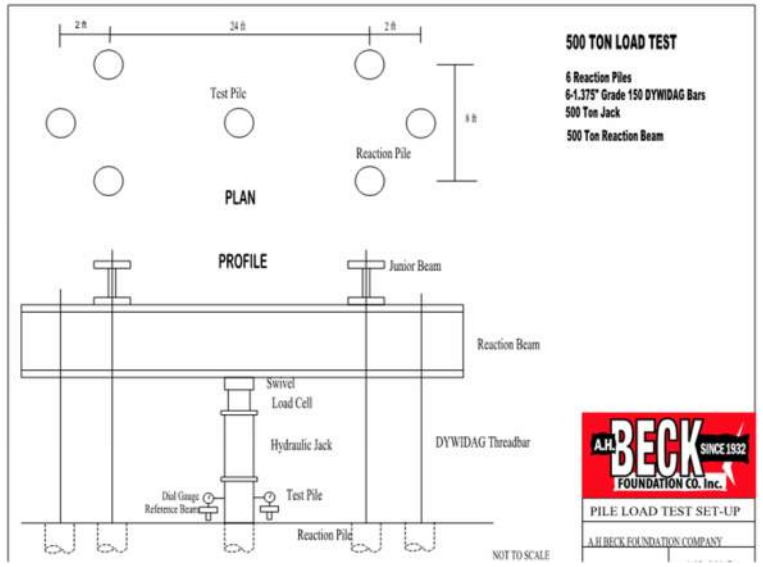


Figure 2. Test Pile 1 Compression Test Load-Deflection Plot of Results

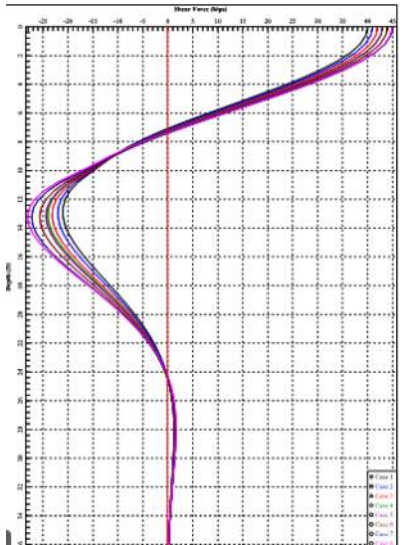


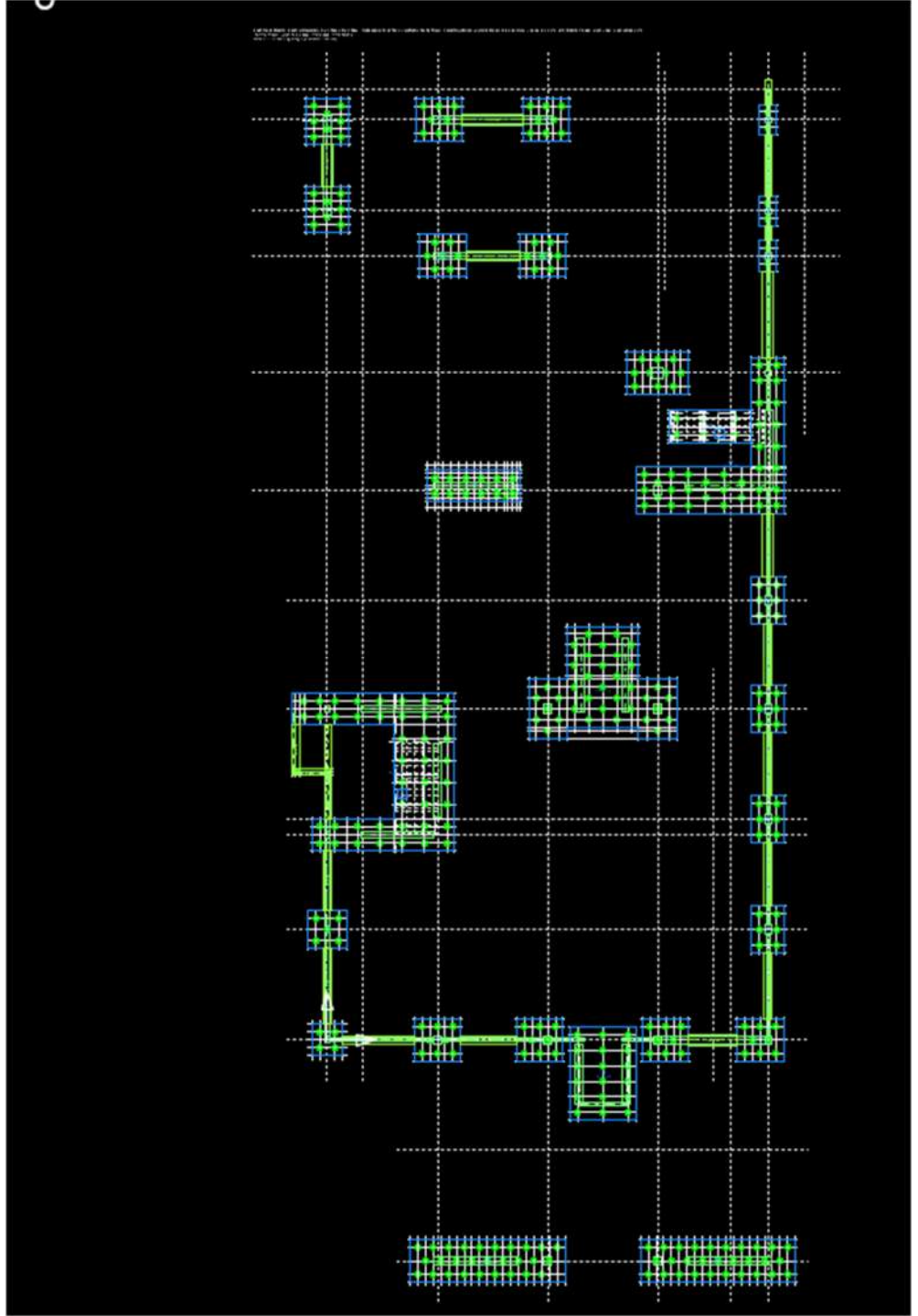
FOUNDATION DESIGN

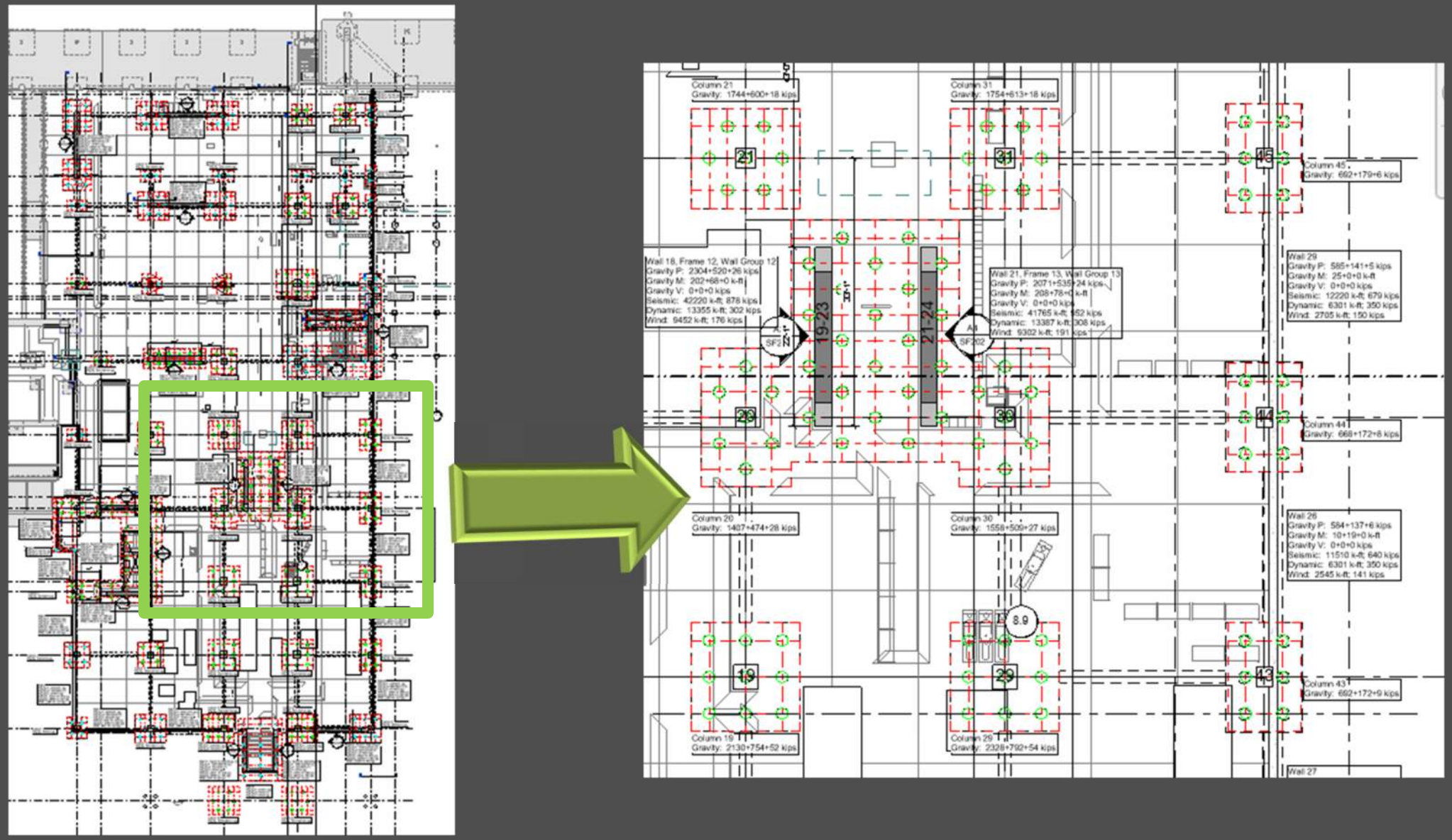
AUGER CAST PILES

- INFORMATION FROM BECK WAS USED TO DESIGN THE PIERS FOR TENSION/COMPRESSION.
- LATERAL WAS EVALUATED USING LPILE IN CONJUNCTION WITH THE GEOTECHNICAL ENG.
- RAM FOUNDATION/STRUT TIE WAS UTILIZED FOR PIER CAP DESIGN
- RAM CONCEPT WAS

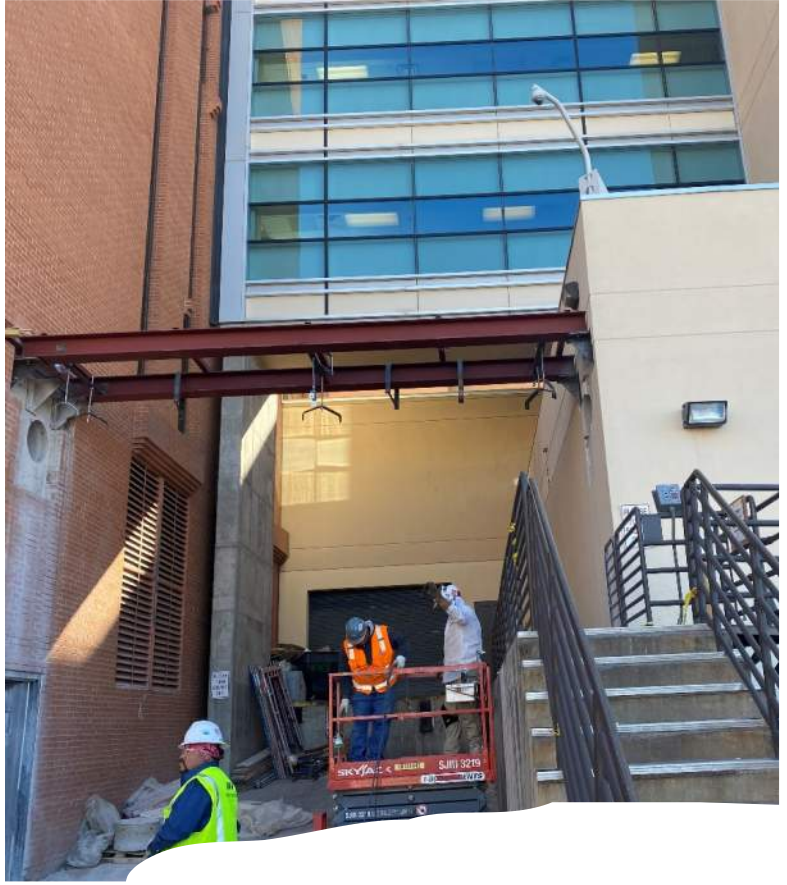
  USED FOR LARGE CAPS






Column 21
Gravity: 1744+600+18 kips
Column 31
Gravity: 1754+613+18 kips
Column 45
Gravity: 692+179+6 kips
Wall 18, Frame 12, Wall Group 12
Gravity P: 2304+520+26 kips
Gravity M: 202+68+0 k-ft
Gravity V: 0+0+0 kips
Seismic: 42220 k-ft; 878 kips
Dynamic: 13355 k-ft; 302 kips
Wind: 9452 k-ft; 176 kips
Wall 21, Frame 13, Wall Group 13
Gravity P: 2071+535+24 kips
Gravity M: 208+78+0 k-ft
Gravity V: 0+0+0 kips
Seismic: 41765 k-ft; 952 kips
Dynamic: 13387 k-ft; 308 kips
Wind: 9302 k-ft; 191 kips
Wall 29
Gravity P: 585+141+5 kips
Gravity M: 25+0+0 k-ft
Gravity V: 0+0+0 kips
Seismic: 12220 k-ft; 679 kips
Dynamic: 6301 k-ft; 350 kips
Wind: 2705 k-ft; 150 kips
Column 44
Gravity: 668+172+8 kips
Column 20
Gravity: 1407+474+28 kips
Column 30
Gravity: 1558+509+27 kips
Wall 26
Gravity P: 584+137+6 kips
Gravity M: 10+19+0 k-ft
Gravity V: 0+0+0 kips
Seismic: 11510 k-ft; 640 kips
Dynamic: 6301 k-ft; 350 kips
Wind: 2545 k-ft; 141 kips
Column 43
Gravity: 692+172+9 kips
Column 19
Gravity: 2130+754+52 kips
Column 29
Gravity: 2328+792+54 kips
Wall 27
19-23
21-24
SF201
SF202
8.9



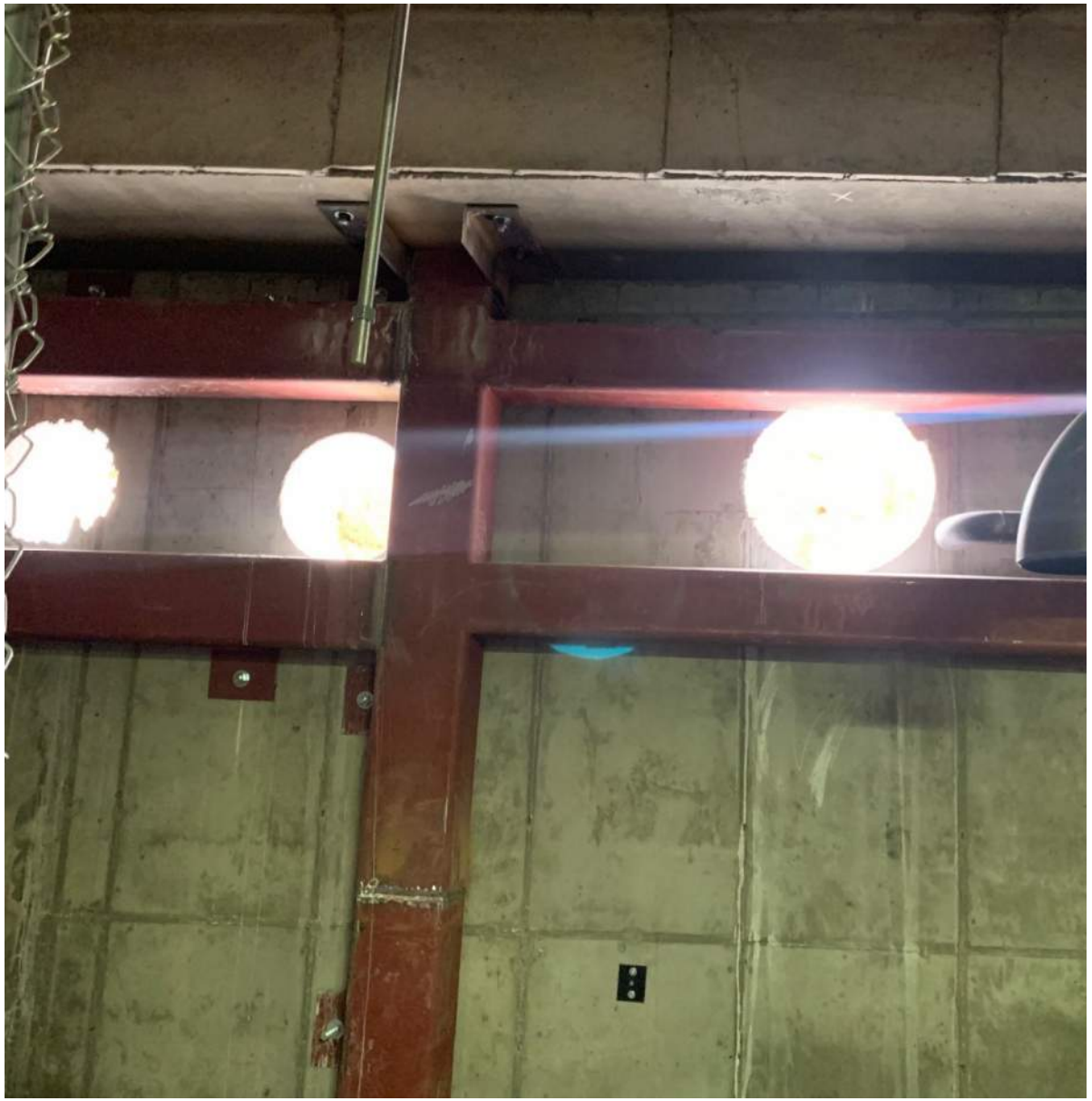






MAKE READY


PRESBYTERIAN







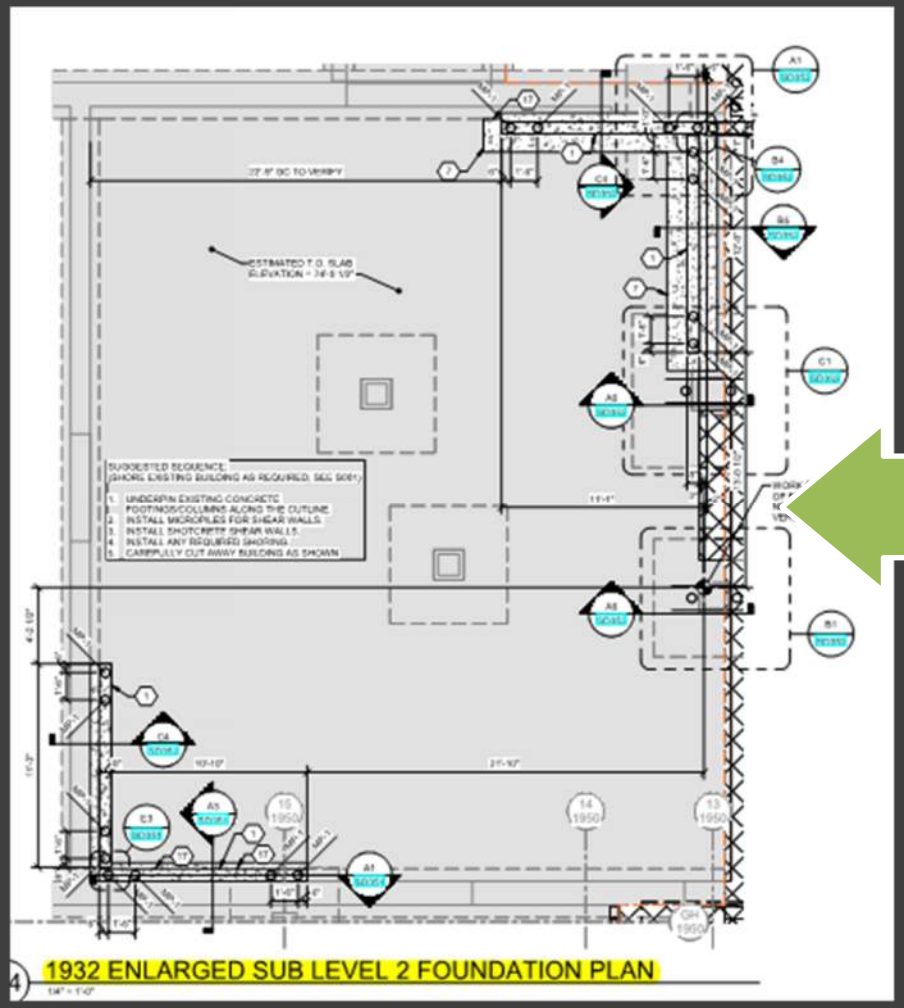


DEMOLITION



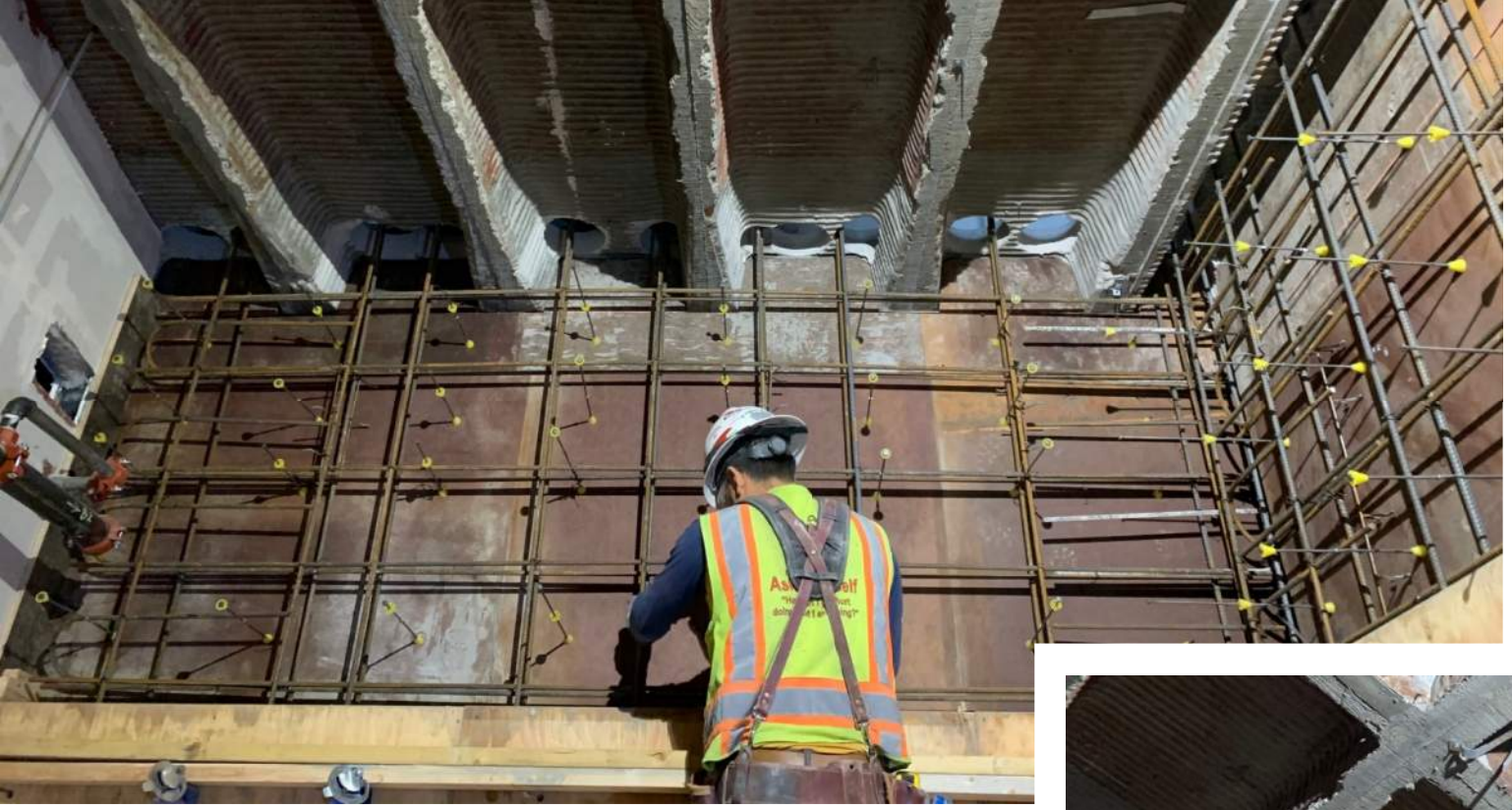

RESBYTERIAN


PRESBYTERIAN
DEERE





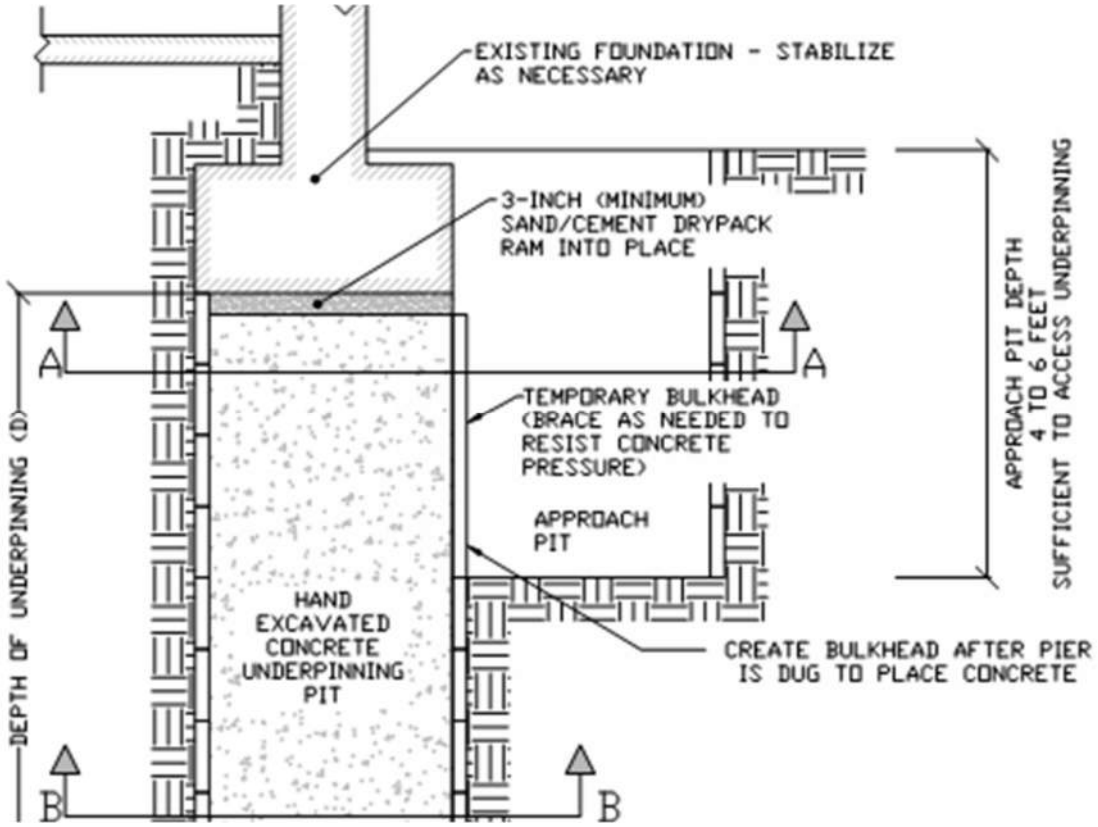
BUILDING STABILIZATION



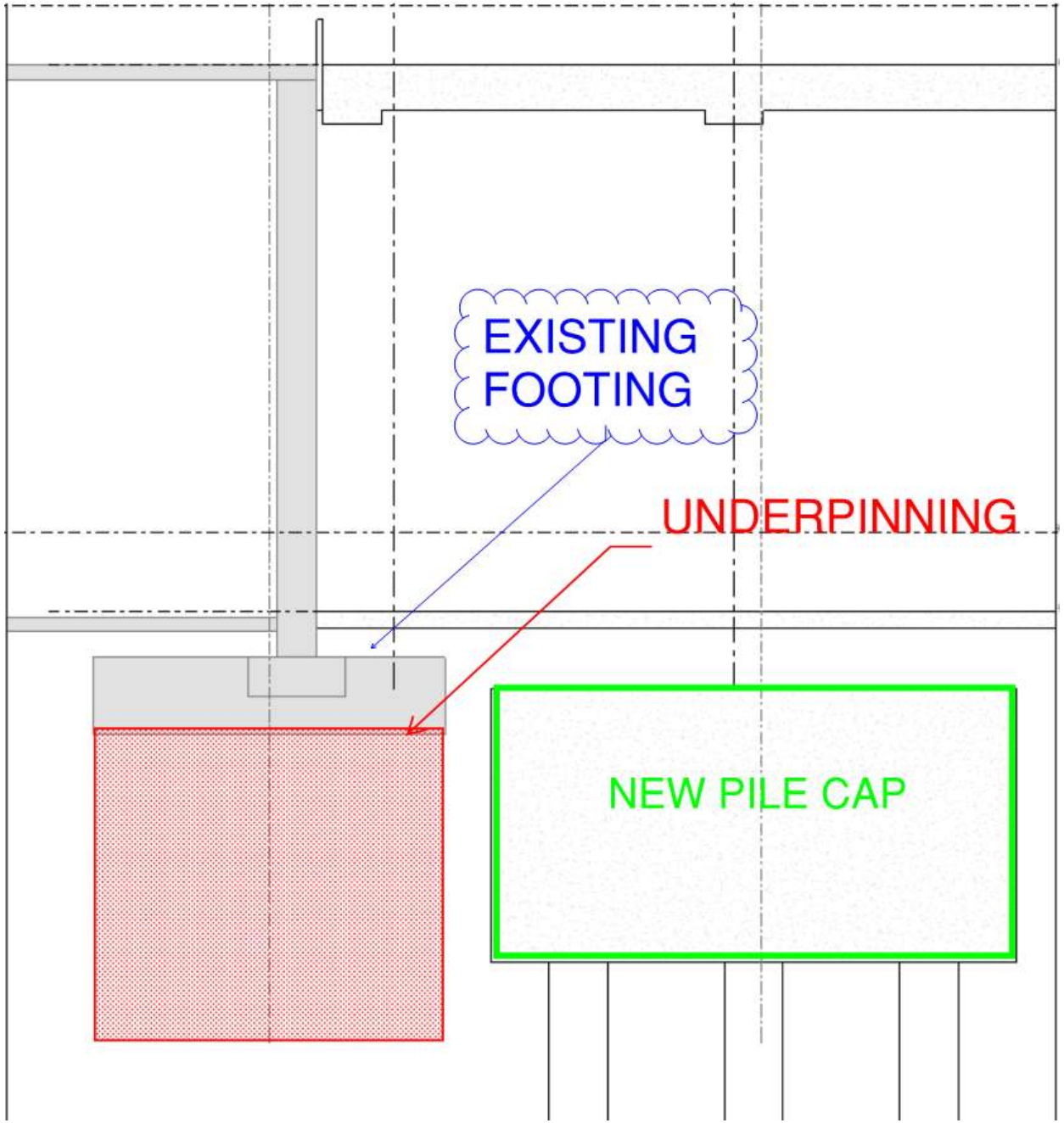




UNDERPINNING



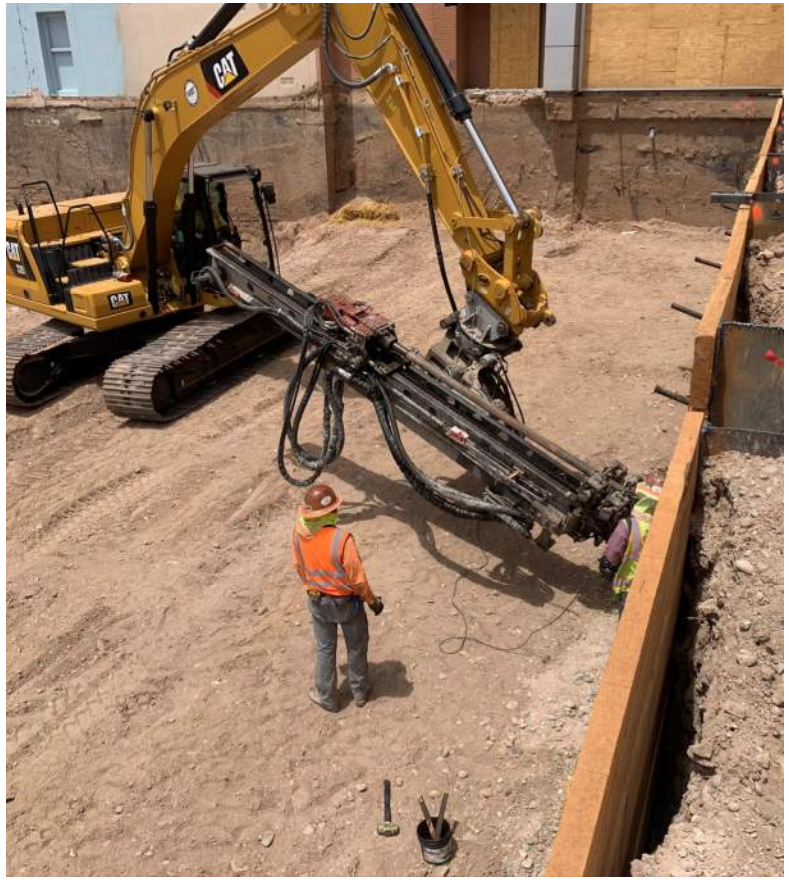


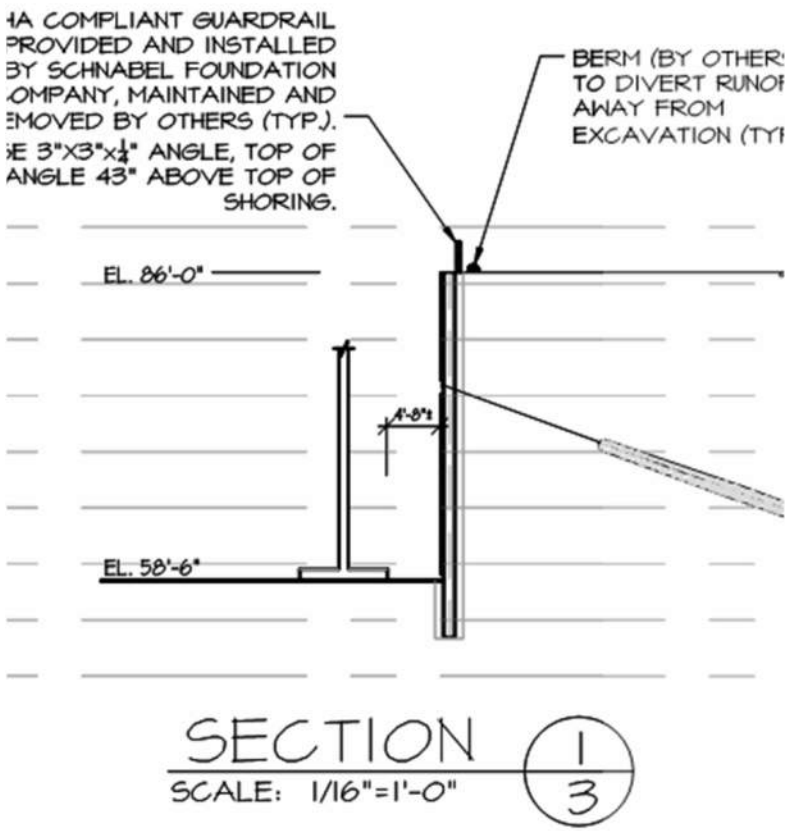

EXISTING
FOOTING
UNDERPINNING
NEW PILE CAP





SOIL NAIL SHORING





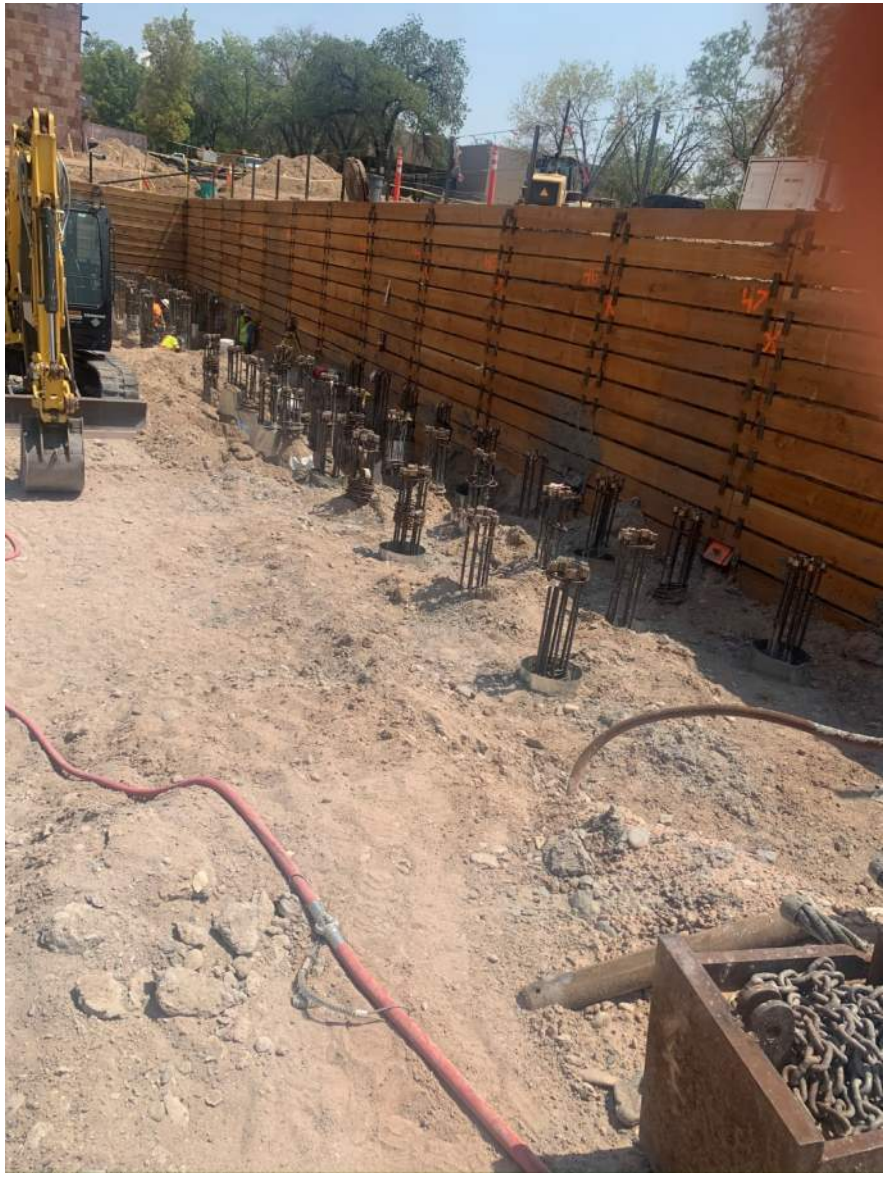


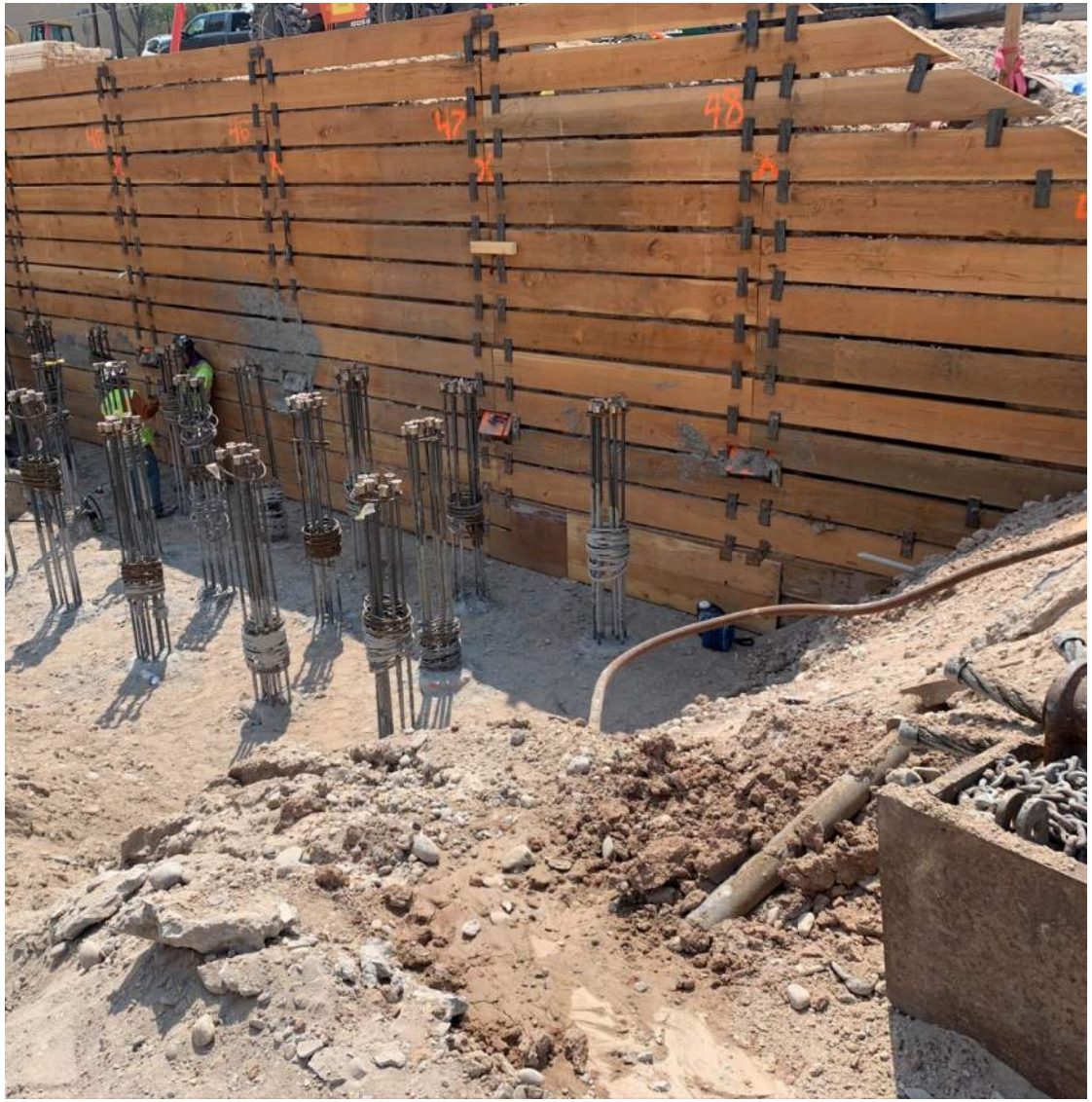
AUGERCAST PILE REBAR







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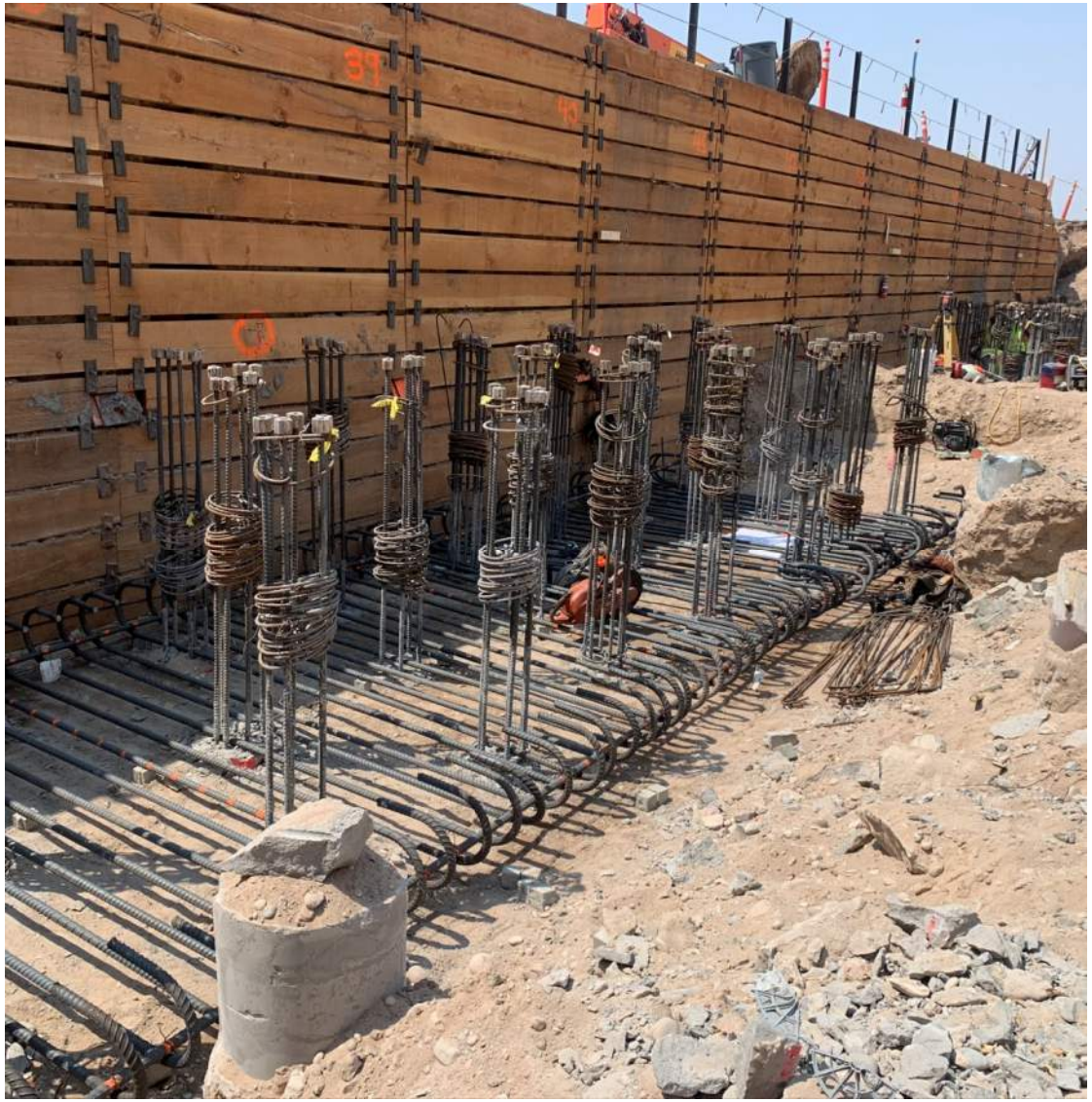
48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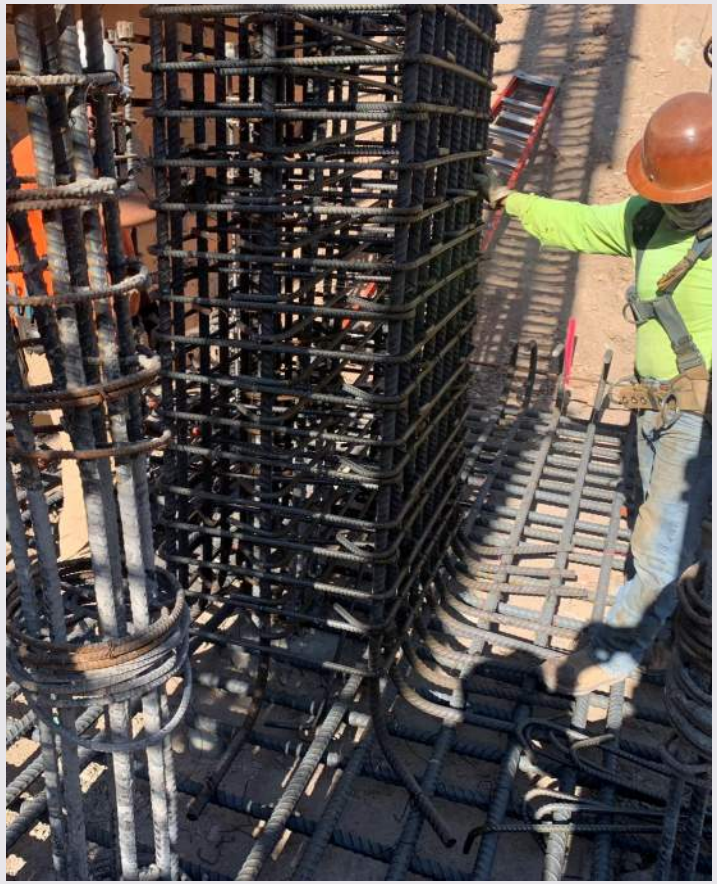
PILE CAP REBAR





ONE OF THE LARGER PILE CAPS

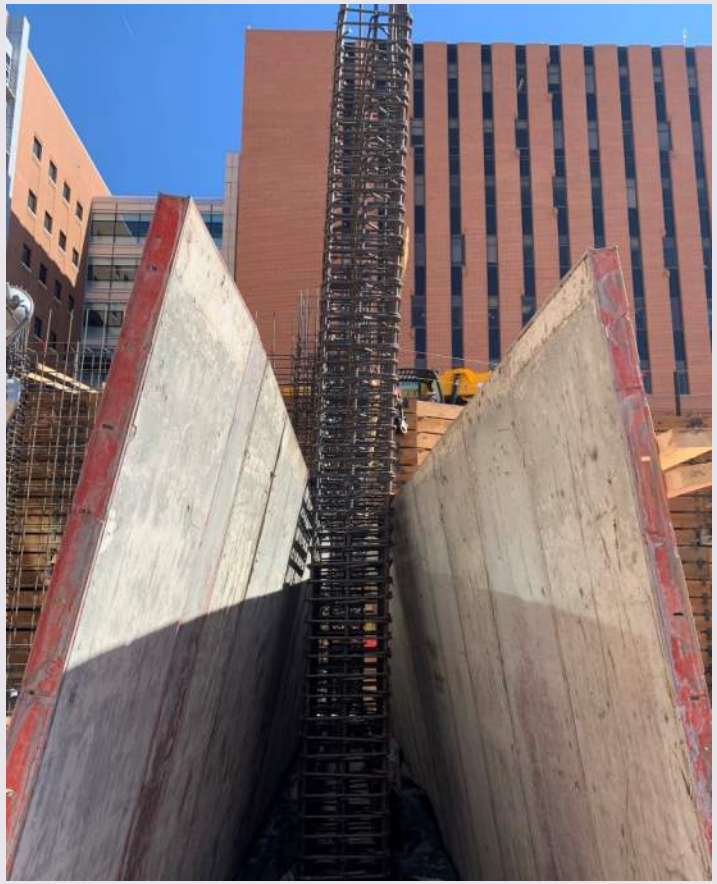


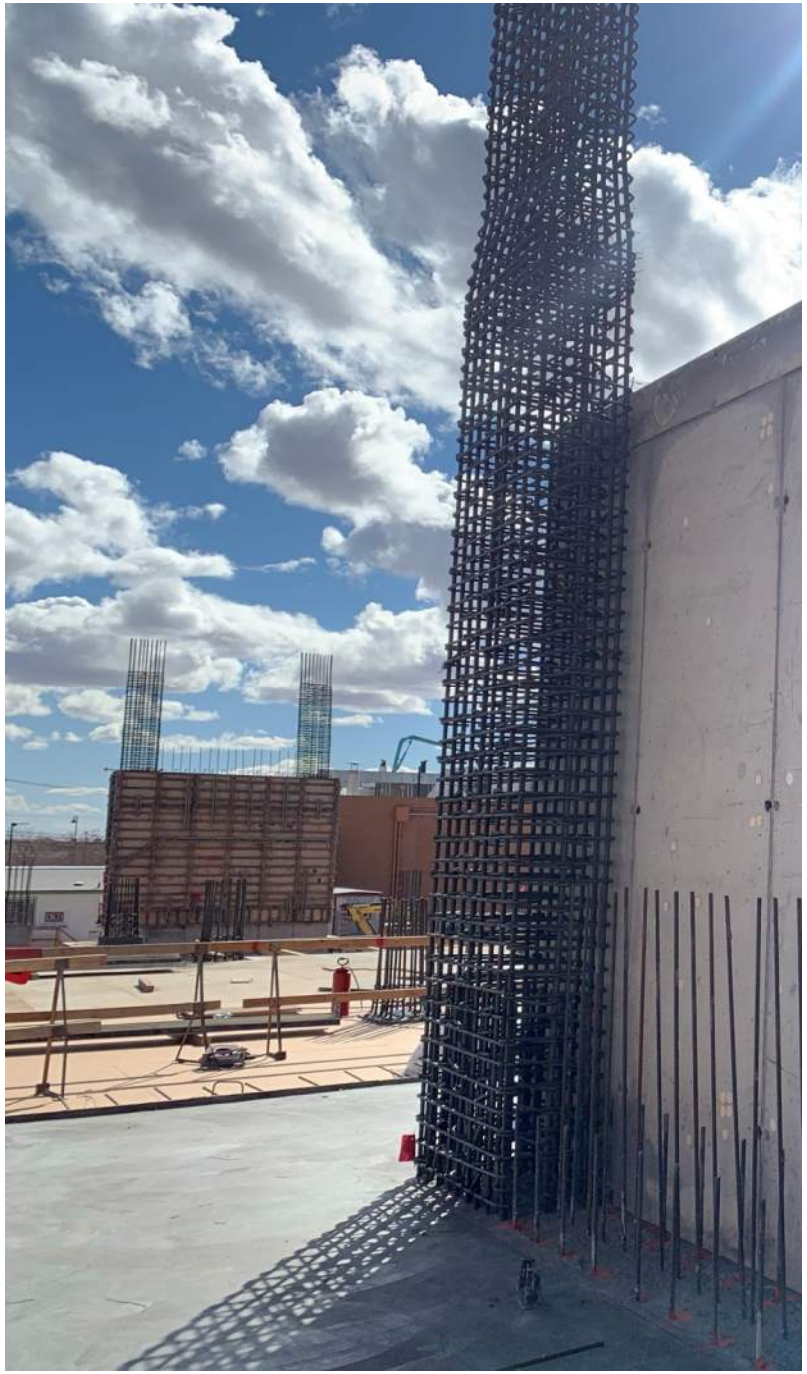
Thickest pile cap = 8’-0”



SHEAR WALL REBAR AND FORMWORK



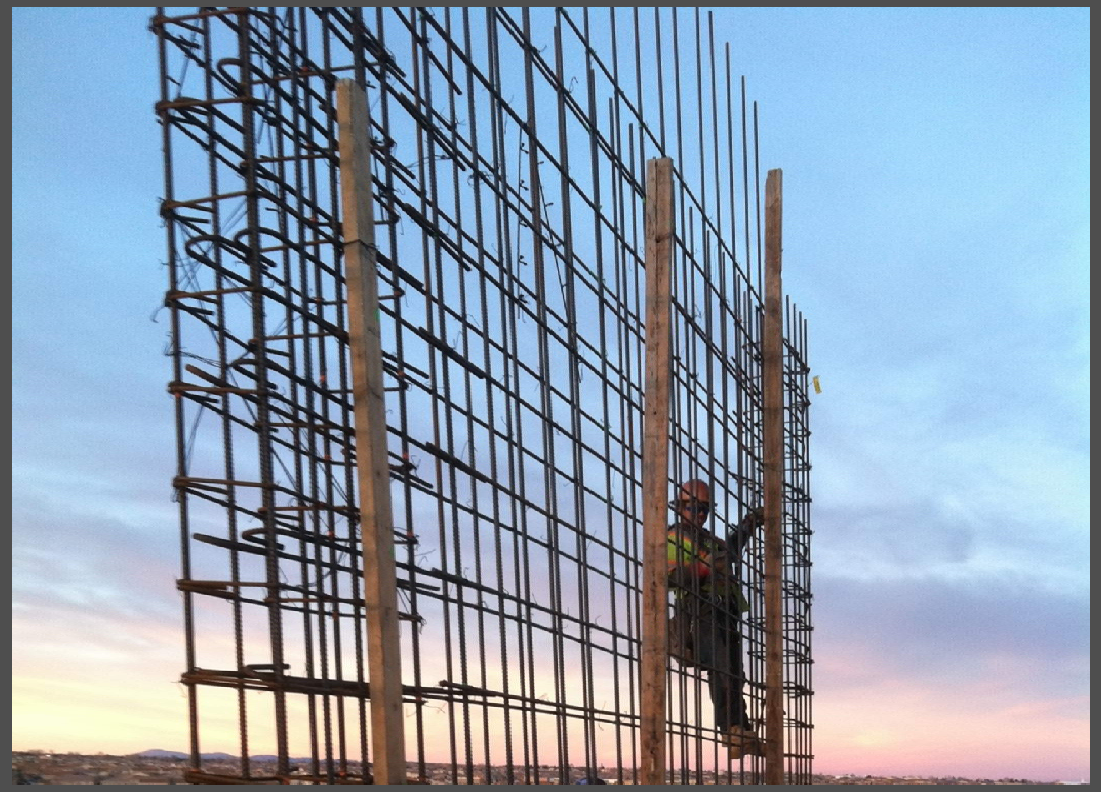




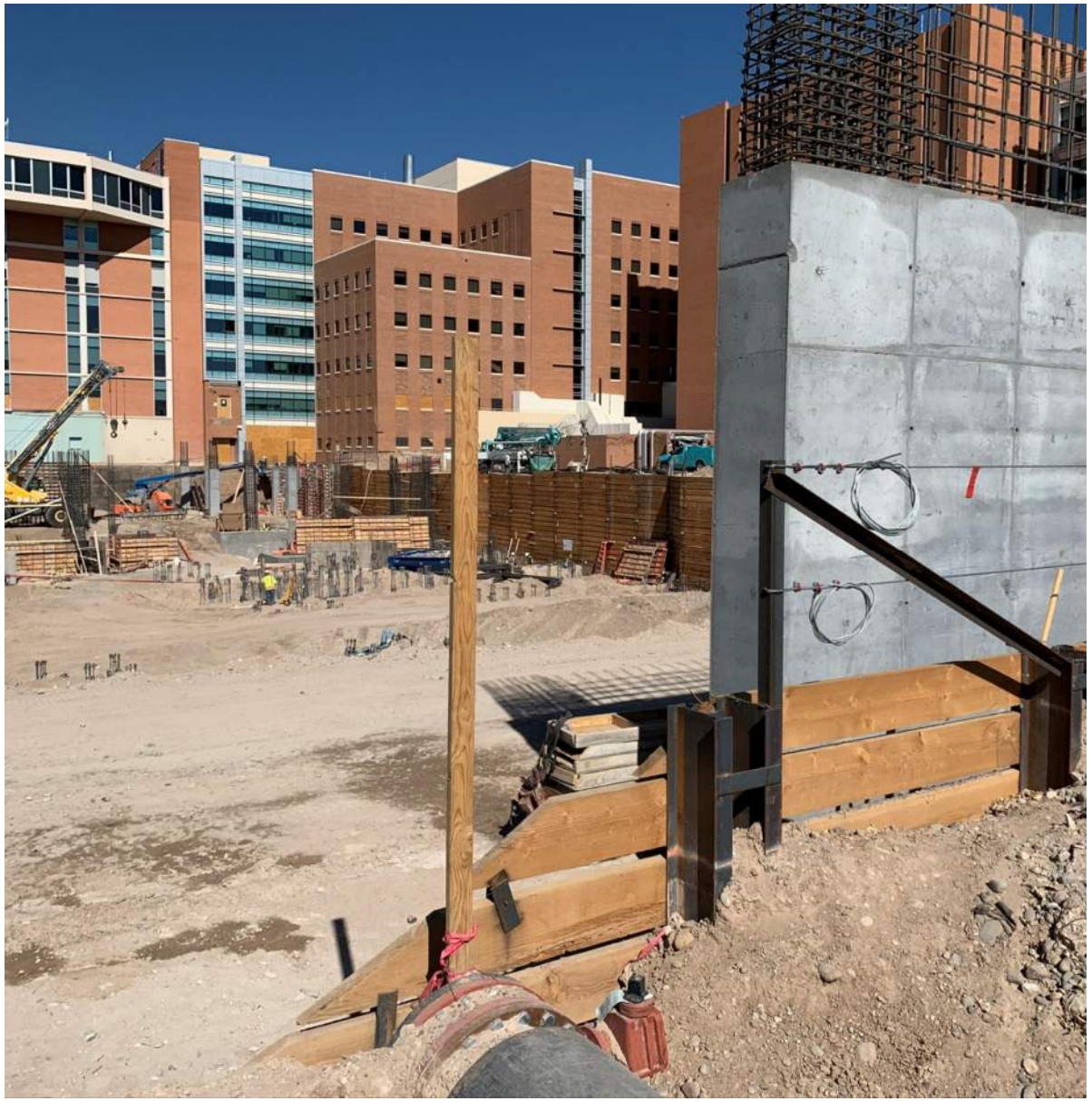

JLG LIFT
YANMAR















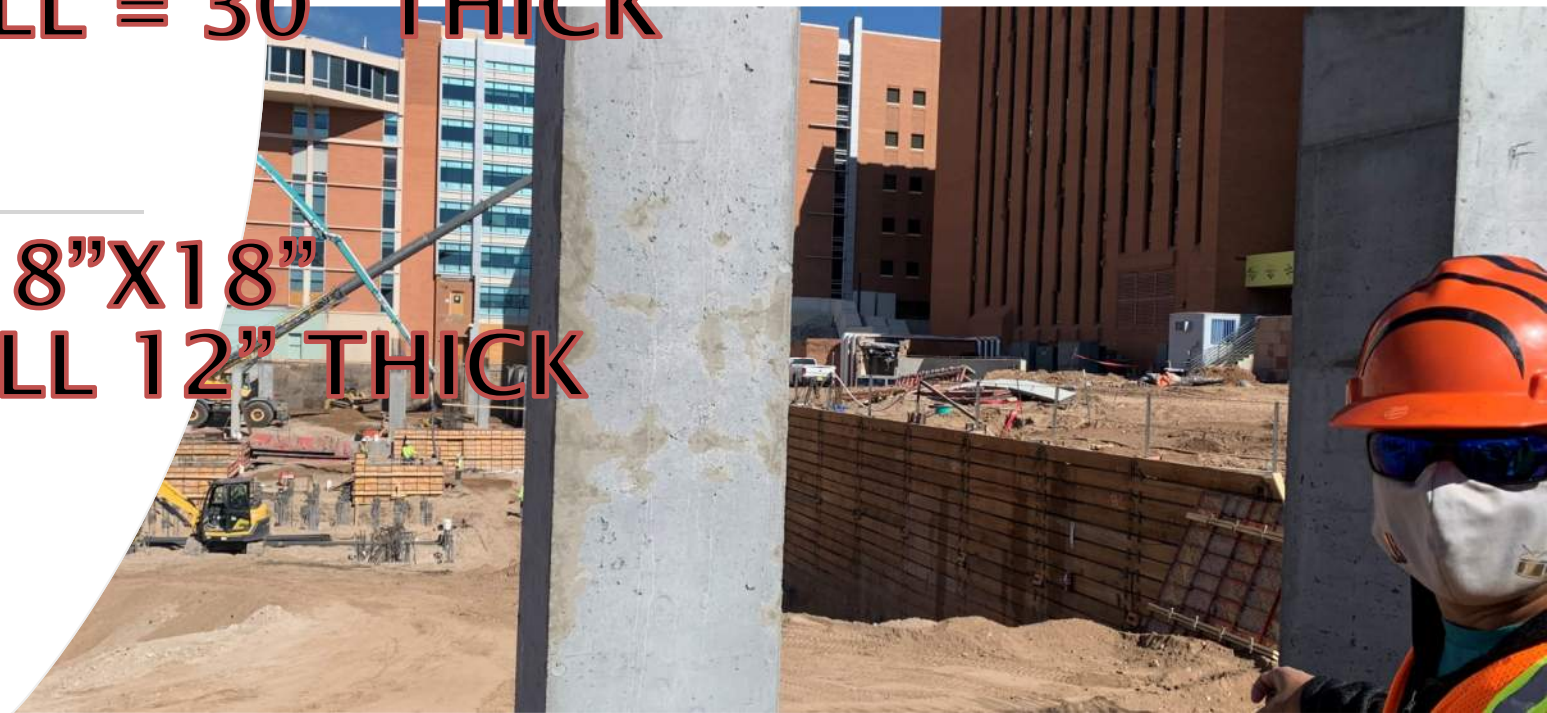
MAXIMUM COLUMN LOAD ~ 4,000, 000 LBS

LARGEST COLUMN 36”x36”
8000 PSI CONCRETE

THICKEST SHEAR WALL = 30“ THICK
6000 PSI CONCRETE

SMALLEST COLUMN 18”X18”
THINNEST SHEAR WALL 12” THICK



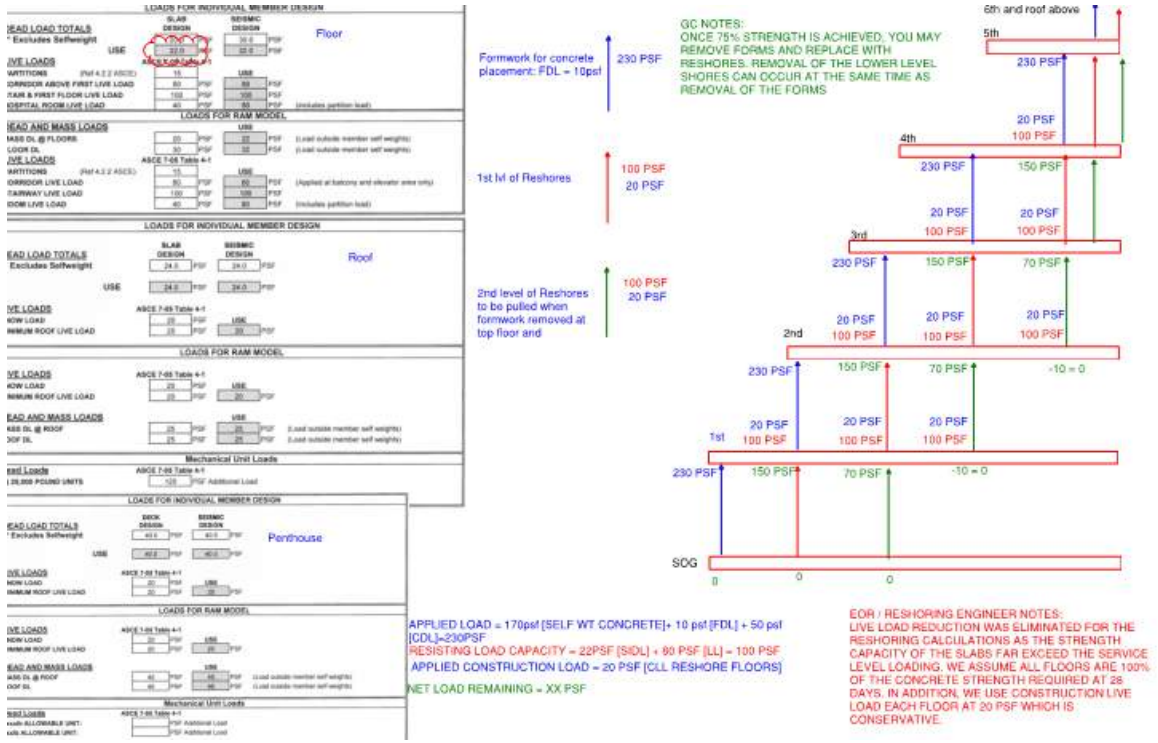




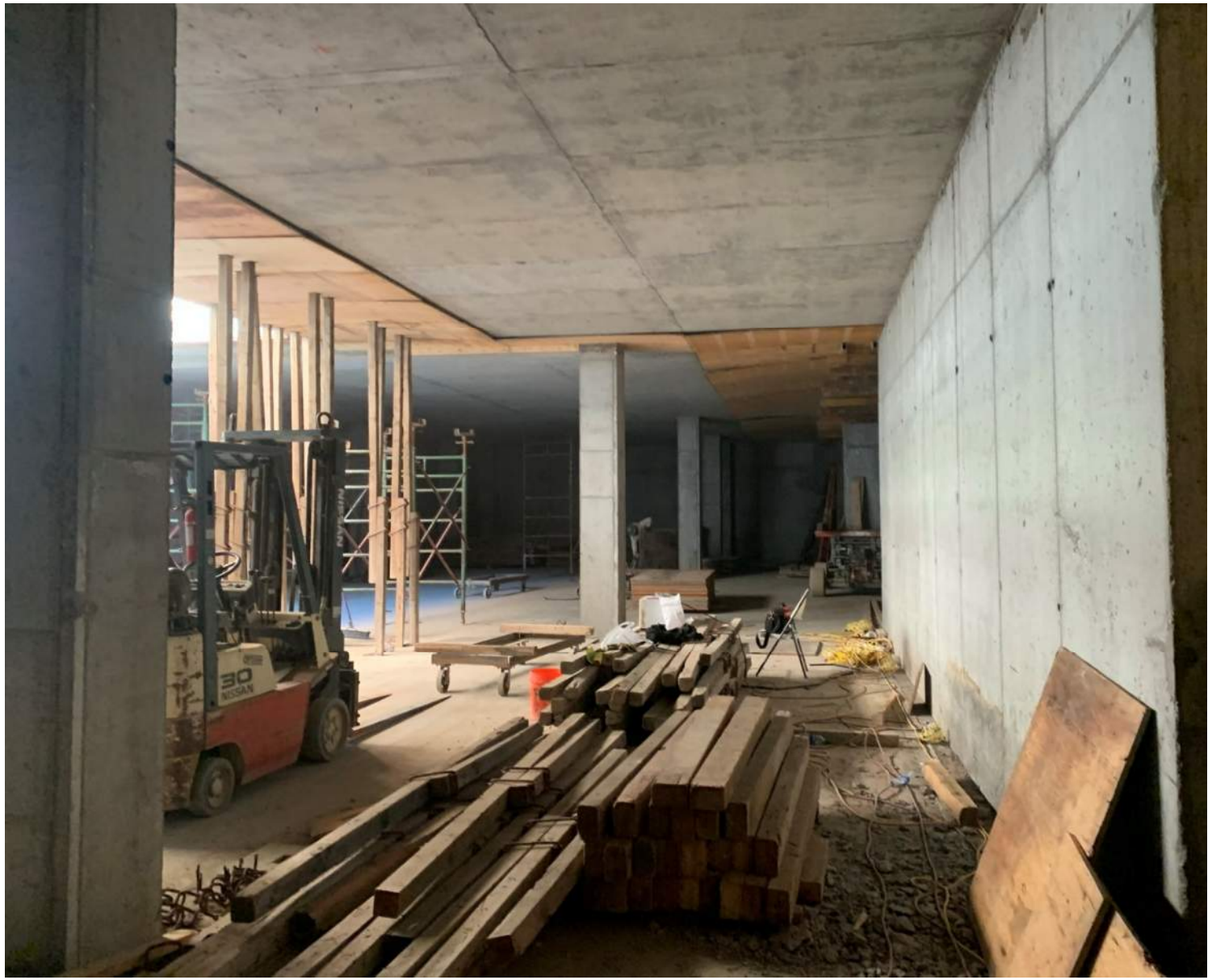


ELEVATED SLAB FORMWORK

FORMWORK – By Others



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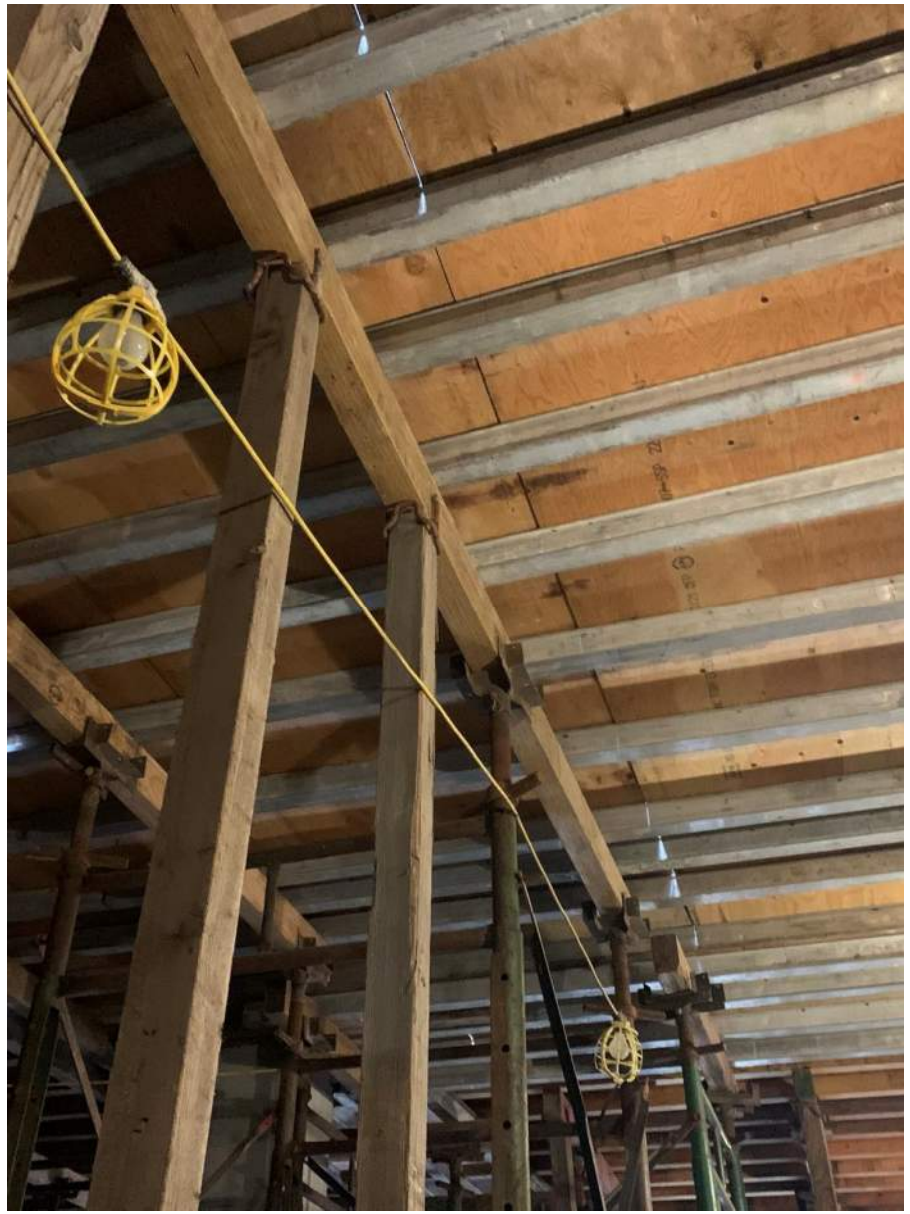
NISSAN



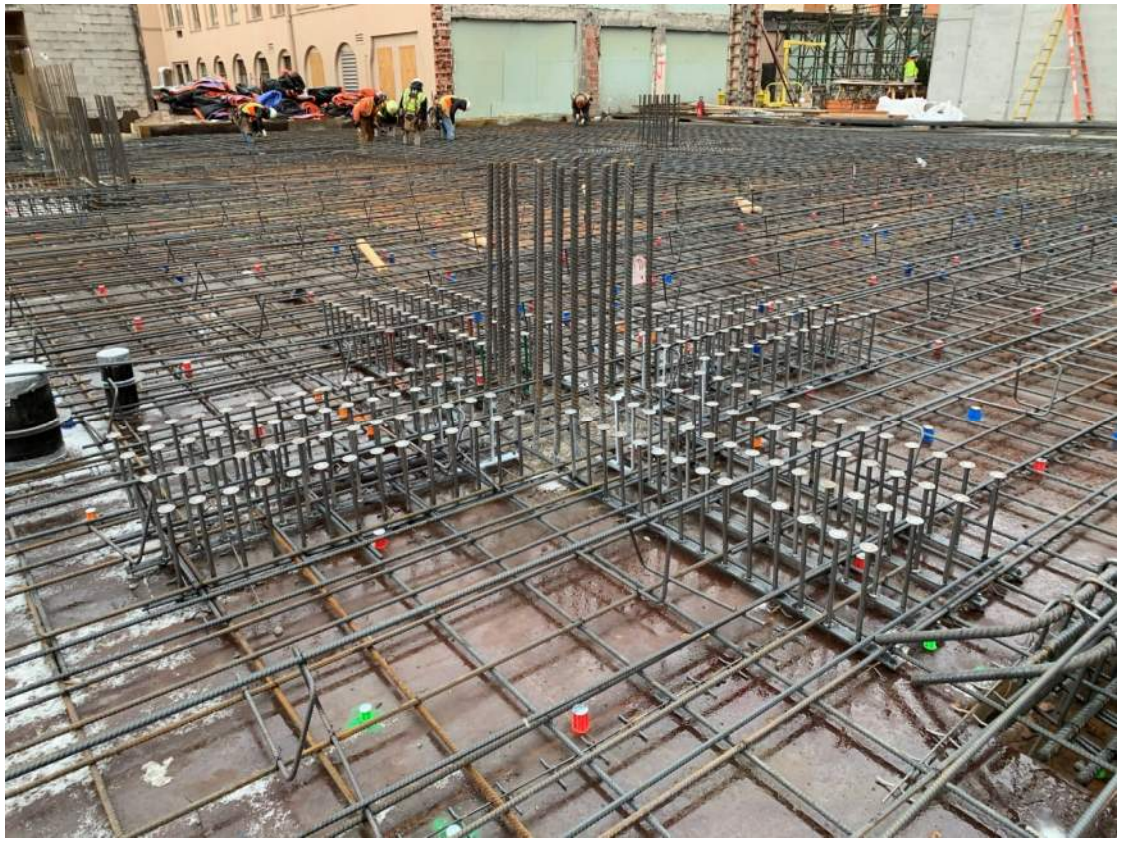








ELEVATED SLAB REBAR



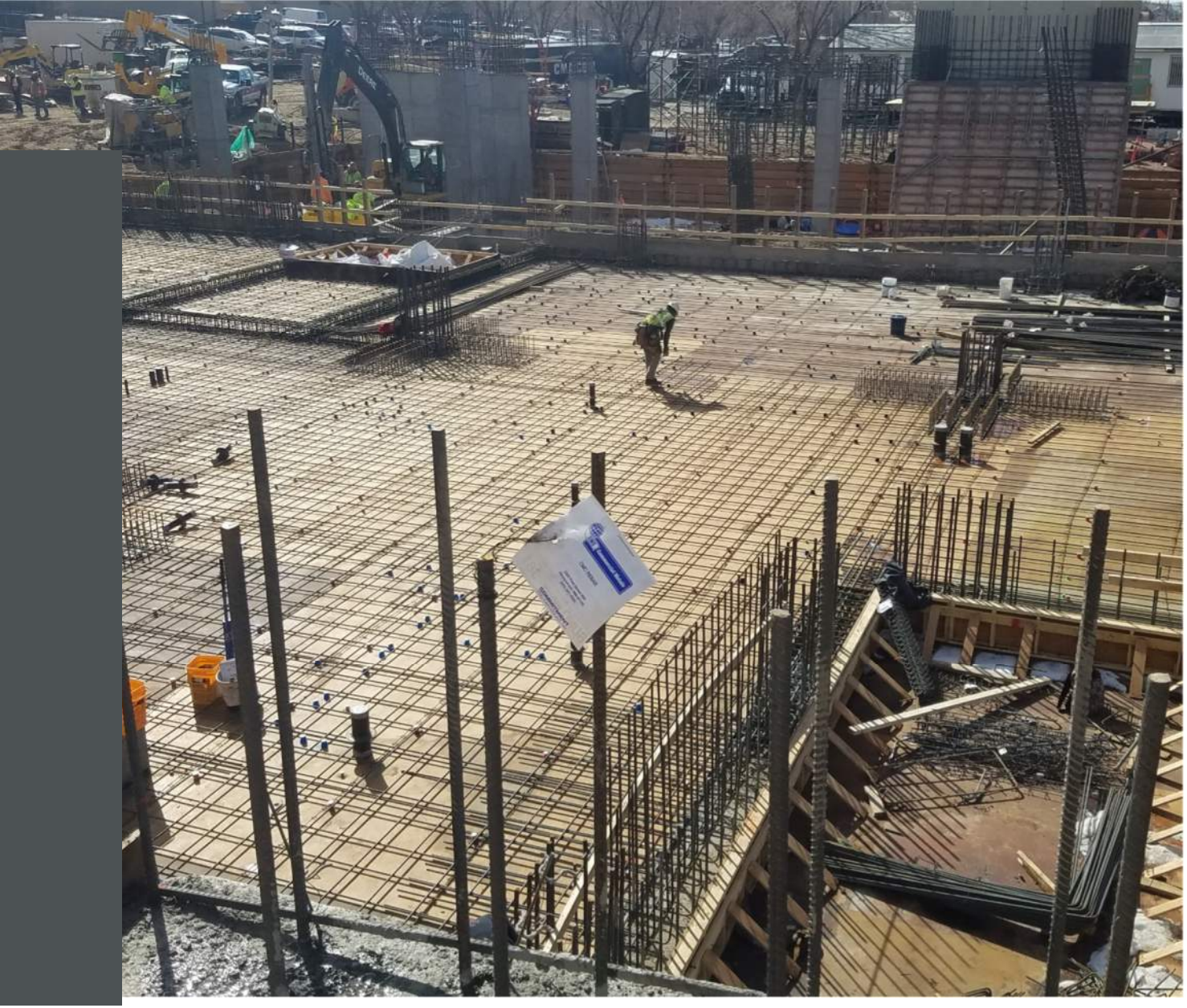




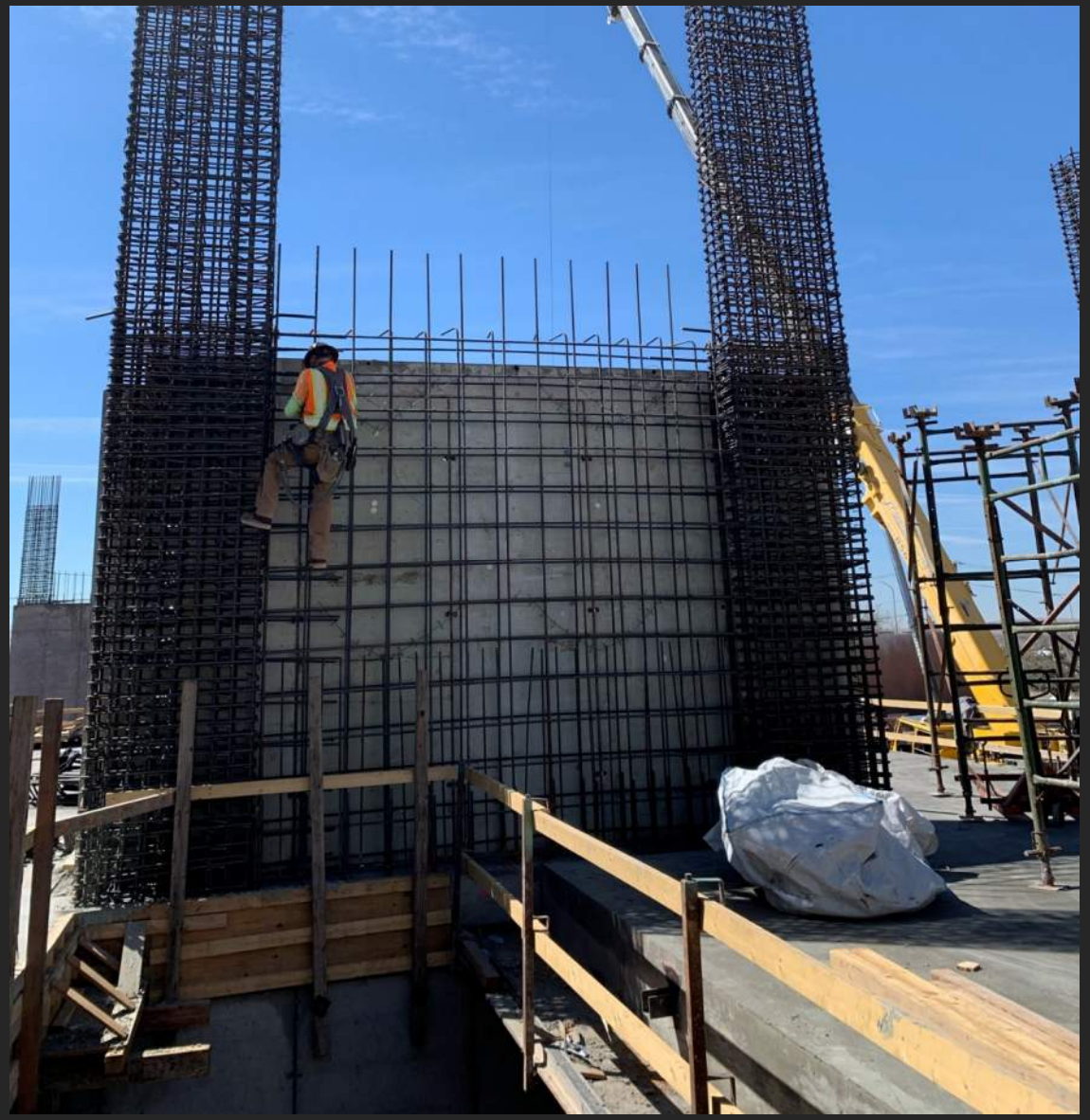















2-17-20
YANMAR
JCB