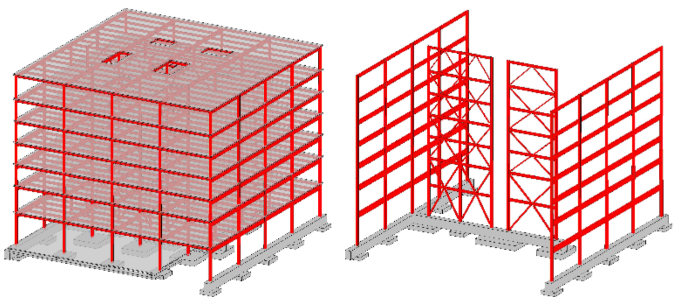
NIST GCR 21-917-48v2A



Seismic Design of Archetype Steel Buildings in Central and Eastern United States

Volume 2A – 7-story Healthcare Building in Long Island, New York Building Designs

Applied Technology Council

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Seismic Design of Archetype Steel Buildings in Central and Eastern United States Volume 2A – 7-story Healthcare Building in Long Island, New York

Prepared for
U.S. Department of Commerce
Engineering Laboratory
National Institute of Standards and Technology
Gaithersburg, MD 20899-8600

By
Applied Technology Council
201 Redwood Shores Parkway, Suite 240
Redwood City, CA 94065

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NIST GCR 21-917-48v2A

Participants

National Institute of Standards and Technology

John (Jay) Harris III, Research Structural Engineer
Earthquake Engineering Group, Materials and Structural Systems Division, Engineering Laboratory
www.NEHRP.gov

Applied Technology Council

201 Redwood Shores Parkway, Suite 240
Redwood City, California 94065
www.ATCouncil.org

Program Management

Jon A. Heintz (Program Manager)
Ayse Hortacsu (Associate Program Manager)

Project Technical Committee

Donald Scott (Project Director)
John Hutton
Adrian Persaud

Project Review Panel

Ramon Gilsanz
Larry Griffis
Emily Guglielmo
Eric Hines
Erik A. Madsen

Working Group

Steve Antilla
McKell Bowen
Jared Dragovich
Hai Lin
Chris Putman
Cameron Prince
Gavin Rinaldo

Preface

Seismic design codes in the United States have evolved since first introduced in 1925; however, they are primarily based on the knowledge of performance requirements for buildings located in high seismicity regions of the United States, such as the West Coast. These model codes are extrapolated for use in areas with moderate seismicity, such as the Central and Eastern United States (CEUS), where member sizes of the lateral-force-resisting systems may be governed by wind requirements. There is a need to understand the seismic performance of buildings when the controlling design load is from wind effects.

In September 2018, the Applied Technology Council (ATC) commenced a task order project under National Institute of Standards and Technology (NIST) Contract SB1341-13-CQ-0009 to develop designs for archetype steel buildings to facilitate future research in understanding the seismic performance of buildings when the controlling design load is from wind. For this purpose, three archetype steel buildings were designed in accordance with older building codes and current building codes for specific locations within the CEUS. This document is one of three volumes presenting design of suites of buildings. Representative structural calculations are provided as supplemental documentation in NIST GCR 21-917-48v2B.

The designs presented were developed by design firms PCS Structural Solutions of Seattle, Washington and Uzun + Case of Atlanta, Georgia. The Project Technical Committee, consisting of Don Scott, John Hutton, and Adrian Persaud monitored and guided the technical efforts of the Project Working Groups, which included Steve Antilla, Jared Dragovich, Hai Lin, Chris Putman, Cameron Prince, and Gavin Rinaldo. Project Working Group member McKell Bowen led the development of two of the three designs presented. The Project Review Panel, consisting of Melissa Burton (ATC Board Contact), C.B. Crouse, Ramon Gilsanz, Larry Griffis, Emily Guglielmo, Eric Hines, and Erik Madsen provided technical advice and consultation over the duration of the work. The names and affiliations of all who contributed to this report are provided in the list of Project Participants.

ATC also gratefully acknowledges Jay Harris (Contracting Officer's Representative) for his input and guidance throughout the project development process. ATC staff member Justin Moresco and Ginevra Rojahn provided project management support and report production services, respectively.

Ayse Hortacsu	Jon Heintz
Associate Program Manager	Program Manager

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Building 2 Overview

The objective of this project was to develop designs for archetype steel buildings to facilitate future research in understanding the seismic performance of buildings when the controlling design load is from wind. For this purpose, three buildings were designed in accordance with previous editions of the building codes and current building codes for specific locations within Central and Eastern United States (CEUS). This volume documents designs for Building 2, a 7-story healthcare facility located in Long Island, New York; designs for Buildings 1 and 3 are documented in NIST GCR 21-917-48 Volumes 1 and 3, respectively.

I.1 Building Selection Criteria

Three buildings were selected for design to support the investigation of the relationship between wind-controlled and seismic-controlled design, as well as the effect of seismic detailing. Each building was selected to be in a moderate- to high-seismic region of CEUS with high design wind loads, with different building configurations (height and footprint), and occupancies. For each building, a different lateral-force-resisting system (LFRS) is used in orthogonal directions: a moment frame system in one direction and a braced frame system in the other.

Building designs include the structural framing systems necessary to resist gravity and environmental (wind) and natural hazard (earthquake) lateral loads consistent with those commonly used in the CEUS at the designated benchmark year. Designs include gravity loads and associated performance criteria consistent with the design use and occupancy identified for the building, and include allowances for interior finishes, mechanical and electrical equipment, and façade. Elevators or stairwells are not included, and nonstructural building systems are not designed as part of this project. Floor systems are assumed to be metal deck with concrete infill slabs and roof systems are selected to be appropriate for the building system. The buildings were designed to the minimum requirements of the building code in effect for the time period of the design.

A total of 16 designs were developed, comprising variation of geographic location, occupancy, height, applicable design code, Risk Category, and Seismic Design Category. Table I-1 presents a summary of designs documented in each of the three Volumes.

In addition, one building (Building 2 documented in this volume) was also evaluated using performance-based seismic design principles specified in ASCE/SEI 41-17 (2017b), for an Immediate Occupancy performance objective. The evaluation is described in the next Chapter.

Table I-1 Summary of Designs Documented in NIST GCR 21-917-48

Parameters	Volume 1	Volume 2	Volume 3
Location	Savannah, GA	Long Island, NY	St. Louis, MO
Occupancy	Office	Healthcare	Education
Height	12-story	7-story	3-story
Overall Plan Dimensions	190 ft × 120 ft	124 ft × 129 ft	148 ft × 76 ft
Design Code (old)[a]	1988 SBC	1987 NBC	1987 NBC
Design Code (current)[a]	2018 IBC	2018 IBC	2018 IBC
Performance-based Design		ASCE/SEI 41-17	
Risk Category	II, III	III, IV	II, III
Seismic Design Category	C, D	B, C, D	C, D
Number of Designs	5	6	5

[a] Design code designations are discussed in the next section.

Figures I-1 through I-3 present schematic designs for each of the three buildings.

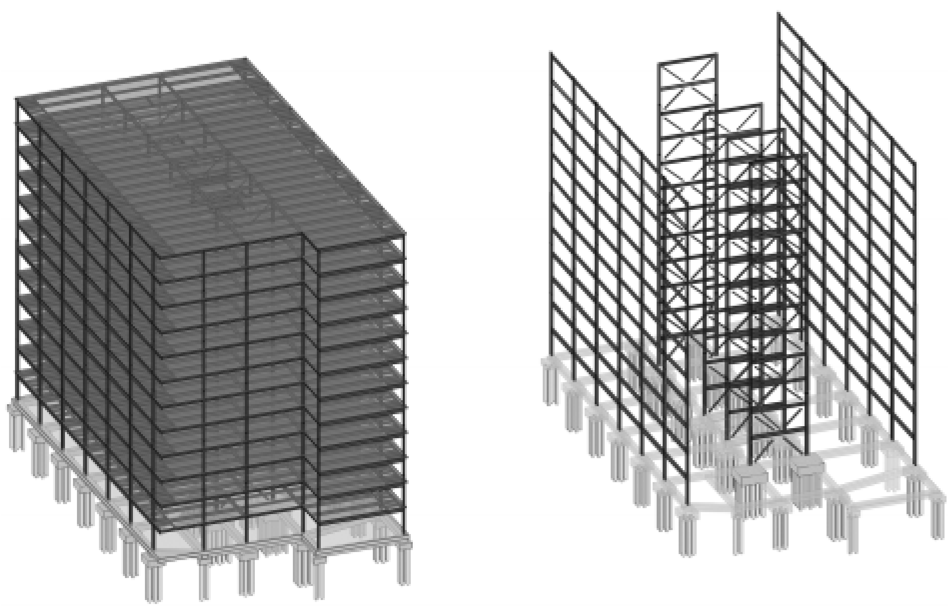


Figure I-1 Schematic for Building 1.

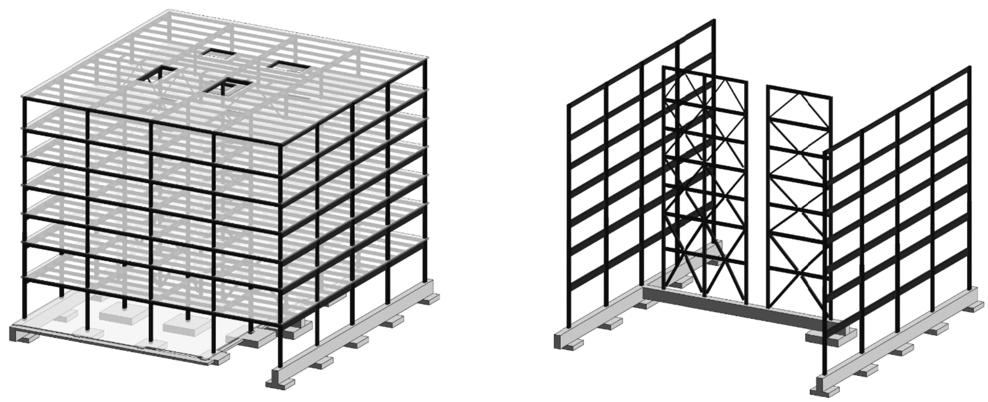


Figure I-2 Schematic for Building 2 (this volume).

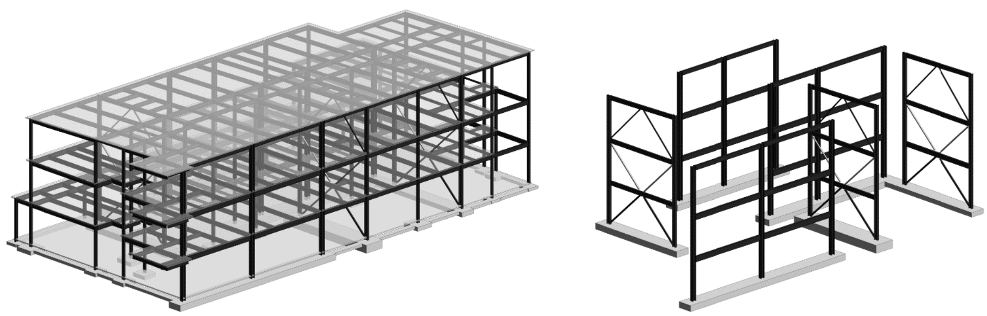


Figure I-3 Schematic for Building 3.

I.2 Design Codes

To provide designs that are defined by varying Risk Categories, the edition of the national design codes to be used for the "older" buildings were evaluated to reference the ANSI A58.1 – 1982, *American National Standard, Minimum Design Loads for Building and Other Structures* (ANSI, 1982) as this was the first standard in the United States to introduce Importance Factors, which are based upon the use of the building, into the design of buildings. Current building codes now define these Importance Factors as Risk Category Factors.

In the 1980s there were three regional building codes utilized in the United States, the *Standard Building Code* (SBC) used in the Southeast, the *National Building Code* (NBC) used in the Northeast and Midwest, and the *Uniform Building Code* (UBC) used in the West. ANSI A58.1 – 1982 was first referenced by the national building codes in the 1988 edition of the SBC developed by the Southern Building Code Congress International, Inc., and the 1987 NBC developed by the Building Officials and Code Administrators, Inc.

The "current" versions of the designs satisfy the requirements of the 2018 *International Building Code* (IBC) developed by the International Code Council and used throughout the United States.

Based upon the selection of the editions of the overall building codes, the appropriate editions of the material design standards were determined. The material standards used for the designs are as follows.

1987 National Building Code (NBC)

- American Institute of Steel Construction (AISC), *Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings*, 1978 Edition
- American Concrete Institute (ACI) – *318-83: ACI Building Code Requirements for Structural Concrete*, (ACI 318-83)

1988 Standard Building Code (SBC) – not applicable to Building 2

- AISC *Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings*, 1978 Edition
- ACI *318-83: ACI Building Code Requirements for Structural Concrete*, (ACI 318-83)

2018 International Building Code (IBC)

- *Minimum Design Loads and Associated Criteria for Building and Other Structures*, 2016 Edition (ASCE/SEI 7-16)
- AISC, *Specification for Structural Steel Buildings*, (ANSI/AISC 360-16)
- ACI *318-14: Building Code Requirements for Structural Concrete and Commentary*, (ACI 318-14)

I.3 Building 2 Design Cases

This volume documents the designs for Building 2, a 7-story healthcare facility located in Long Island, New York, illustrated in Figure I-2. Six design cases were developed for this building.

A. 1987 NBC, "Risk Category III, Seismic Design Category B" Equivalent

B. 2018 IBC, Risk Category III, Seismic Design Category B

C. 1987 NBC, "Risk Category IV, Seismic Design Category B" Equivalent

D. 2018 IBC, Risk Category IV, Seismic Design Category B

E. 2018 IBC, Risk Category IV, Seismic Design Category D

F. 2018 IBC, Risk Category IV, Seismic Design Category C

As noted previously, the 1980s editions of the building codes did not use the term Risk Category, but based the selection of the required "Importance Factor" on the specified Use or Occupancy of the facility. In the current editions of the building codes the "Importance Factor" is based upon the "Risk Category" of the facility.

Therefore, the term "Equivalent" found in Designs A and C listed above is used to distinguish which Importance Factor was used in seismic design, 1.25 or 1.5, and relate it to the current code language.

Performance-based seismic evaluation of Design Case C in accordance with ASCE/SEI 41-17 provisions is described in the next Chapter.

I.4 Variations in Gravity Framing Design

The primary reason for developing designs with building codes from both 1980s and current building codes was to demonstrate the difference in detailing requirements for the LFRS. However, there are also other requirements of the building codes that contribute significantly to the differences in designs.

The occupancy and framing layout are identical for each of the individual archetype building designs. The differences in gravity designs are a result of changes in code provisions, material strengths, and engineering practice between the 1980s and 2018. The differences described below primarily lead to reductions in weight and depth of the structural members for the 2018 IBC design with respect to the 1980s SBC and NBC designs for the gravity system.

I.4.1 ASD vs. LRFD Design

The design philosophy changed from Allowable Stress Design (ASD) in the 1988 SBC and the 1987 NBC to Load and Resistance Factor Design (LRFD) in the 2018 IBC. All things being equal, ASD commonly leads to heavier or deeper member sizes when compared to the LRFD methodology. This was observed to be true for the designs completed for this project.

I.4.2 Live Load Reduction

For this building, the standard live load reduction provisions are identical for the 1987 NBC and the 2018 IBC and therefore have no effect on the design.

I.4.3 Material Strengths

There was a significant change in the material strengths of commonly available wide flange steel between the 1980s and 2018. ASTM A36 strength steel with F_y = 36 ksi was the most commonly available steel in 1980s and was therefore used for the 1980s designs. Whereas today ASTM A992 grade 50, F_y = 50 ksi, steel is commonly available and was used for the 2018 IBC designs. This increase in strength has the general effect of reducing the overall structural material weight.

I.4.4 Engineering Practice – Serviceability

In 1980s, it was not common practice to design buildings explicitly for vibration criteria, whereas it is today, particularly in a Healthcare Facility, as Building 2 is designed for this use. Therefore, vibration criteria were considered for the 2018 IBC designs but not for the 1980s designs. The change in engineering practice between the 1980s and today was driven by necessity, as higher steel strengths and more economical design methodologies, i.e., LRFD, resulted in lighter member designs.

I.5 Variations in Lateral-Force-Resisting System Design

The LFRS design, both for moment frames and braced frames, is significantly different between the design methodologies and requirements of the 1987 NBC and 2018 IBC. First, the applied lateral loading was found to be similar among the six designs, whether it was controlled by seismic or wind forces. The NBC uses regional seismic zones and does not consider the response of the building's lateral system, while the IBC uses site specific values and incorporate the responses of the lateral system, including the natural frequency of the building. The wind force calculation is not vastly different between the codes, with the two discernable differences being the basic wind speeds and the applied importance factors. In the NBC, the basic wind speed is based upon the fastest-mile measurement, which results in a design value of 90 mph. The basic wind speed from the IBC, depending on the risk category, is an ultimate wind speed of 125 mph for a Risk Category III facility and 129 mph for a Risk Category IV facility, based upon a 3-second gust measurement. It should be noted that the difference in the basic wind speeds for the different classification of facilities is because the Importance Factor has been incorporated in the basic wind speed maps in the current codes. In addition, the wind pressures in the NBC are increased using the square of the importance factor, 1.07, but is still found to be less conservative than the pressures calculated using the IBC where the importance factor has been incorporated into the basic wind speed maps.

In the NBC designs (Design Cases A and B), seismic forces controlled for both the braced frame and moment frame designs. In IBC designs for braced frame types, "Ordinary" with a response modification factor, R, of 3-1/4, or "Special" with an R of 6, designs are controlled by the code specified seismic forces. For moment frame types, "Ordinary" with an R of 3-1/2, and "Special" with and R of 8, are controlled by the code specified wind forces. It was found that for these different frame types, member designs are controlled by varying design requirements. Braced frames were controlled by the strength of the braces, columns, beams, and moment frames were controlled by the drift limitation of the applicable code: The NBC drift limits are more restrictive than the current IBC limits. The NBC only allows the lateral deflection to equal 0.5% of the height of the floor while the IBC allows 1.5% and 1.0% of the floor height depending on the Risk Category. The NBC drift limitations resulted in the required member sizes to be heavier to achieve the required system stiffness and require the base connection to be a fixed instead of pinned to meet the required design limits.

For the fourth IBC design (Design Case F), both the braced frames and the moment frames are designed using "Steel Systems Not Specifically Detailed for Seismic Resistance" with an *R* of 3.0. Both the braced frames and moment frames were controlled by the code specified seismic force. Similar to the braced frames and moment frames for the other five designs, the braces, beams and columns were strength-controlled for the braced frames and the beams and columns were drift-controlled for the moment frame systems.

The greatest differences within the lateral systems for Building 2 can be observed in the detailing requirements between the NBC and the IBC. The NBC detailing requirements are limited to transferring the applied lateral load to the lateral resisting elements. In contrast, the IBC, has many intricate detailing requirements to achieve energy dissipation for each LFRS. These detailing requirements do not apply to the fourth IBC design, where the members and connections are detailed to resist the applied force, similar to the NBC designs. In addition, the IBC has member seismic compaction requirements for earthquake loading, that dictate the minimum size of members depending on the level of ductility required for the LFRS. The NBC has minimum compaction requirements that only apply to members that are part of a Special moment frame.

Further, it is noted that it is the preference in New York to utilize bolted moment frame connections instead of the welded connections used throughout the rest of the country, and only W14x shapes for column members, where on the West Coast deeper/lighter shapes are utilized for moment frame columns. Also, for the lower seismic design categories on the East Coast of the United States, it is prevalent to use an *R* of 3.0 to determine seismic loading so that member selection and detailing of connections are not subject to seismic detailing requirements. These types of systems are not typically utilized on the West Coast of the United States.

I.6 Comparison of Building 2 Designs

The focus of this project and the designs is the steel structure and thus the foundation systems used are representative for the geographic region of the country that the buildings are in; however, the foundation systems are not fully designed and detailed. The primary observation of the effect the various requirements have on the design of the building structure can be made from the steel tonnage calculated for each of the designs, as shown in Table I-2 below.

Table I-2 Steel Tonnage for Building 2 Designs

Design Case (Code Year, Risk Category, Seismic Design Category)	Steel (tons)
Design A (1987 NBC, "RC III, SDC B" Equivalent)	811 tons
Design B (2018 IBC, RC III, SDC B)	767 tons
Design C (1987 NBC, "RC IV, SDC B" Equivalent)	856 tons
Design D (2018 IBC, RC IV, SDC B)	781 tons
Design E (2018 IBC, RC IV, SDC D)	849 tons
Design F (2018 IBC, RC IV, SDC C with *R* = 3.0)	848 tons

Overall, a decrease of approximately 10% of total lateral-force-resisting system steel tonnage was observed between NBC and IBC designs. The reduction is not as drastic as anticipated due to the local New York standards requiring use of W14x or shallower columns that in turn greatly increase the weight of the moment frame columns.

It is observed that buildings designed to current codes are expected to have higher seismic performance than buildings constructed in the 1980s; however, they are being constructed at a much higher cost. Although this cost increase is not evident in the total steel tonnages, it is mostly associated with the additional detailing and fabrication costs associated with reaching the code required level of ductility within the lateral systems. The difference in detailing criteria is also evident when comparing Design Case D and F that share all the same criteria except for the response factor, *R*, and the detailing requirements.

I.7 Report Organization

This report provides the necessary context for researchers utilizing the building designs developed on this project. The next chapter summarizes performance-based seismic evaluation results for on design case. List of references and project participants are provided in the next section.

The remainder of the report includes applicable codes, snow loads, seismic loading criteria, wind loading criteria, description of gravity design, description of lateral design, and structural drawings for the following design cases:

- Design Case A: 1987 NBC "Risk Category III, Seismic Design Category B" Equivalent
- Design Case B: 2018 IBC Risk Category III, Seismic Design Category B
- Design Case C: 1987 NBC "Risk Category IV, Seismic Design Category B" Equivalent

- Design Case D: 2018 IBC Risk Category IV, Seismic Design Category B
- Design Case E: 2018 IBC Risk Category IV, Seismic Design Category D
- Design Case F: 2018 IBC Risk Category IV, Seismic Design Category C

Representative structural calculations and ground motion selection summary are provided as supporting documentation in NIST GCR 21-917-48v2B.

Designs for Buildings 1 and 3 are documented in NIST GCR 21-917-48 Volumes 1 and 3, respectively.

Performance-Based Seismic Evaluation

This chapter summarizes the seismic performance-based evaluation of Building 2 designed for 1987 NBC, "Risk Category IV" "Seismic Design Category B" equivalent (Design Case C) described in the previous chapter in accordance with the provisions of ASCE/SEI 41-17 (ASCE, 2017b).

II.1 Design Case C Summary

This Healthcare Facility is a 7-story structure located on Long Island, New York (40.6471 Latitude, -73.5642 Longitude). The building is approximately square in plan with typical plan dimensions of 124ft × 129ft, and a roof height of approximately 99ft above the adjacent grade.

Lateral-Force-Resisting System

The complete lateral-force-resisting system (LFRS) consists of reinforced slab on metal deck diaphragms, 2-story X steel concentric braced frames (BF) in the north-south direction, steel moment frames (MF) in the east-west direction, and all attachments between these elements and the foundation.

The plan layout of the LFRS is 'H' shaped with moment resisting frames taking east-west lateral loads and located on the north and south sides of the structure. The braced frames resist the north-south lateral loads and are located at approximately the centerline of the building. See Figure II-1 for orientation of the LFRS.

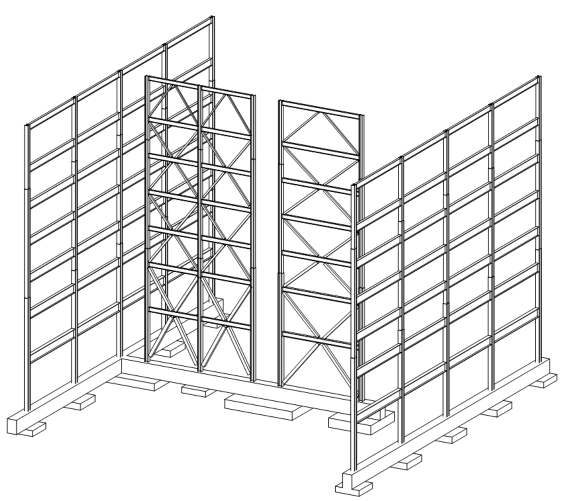


Figure II-1 3D view (SW Corner) of LFRS.

Under the 1987 National Building Code (NBC), the structure would be classified as 'Braced Frame' and 'Space Frame' systems. The horizontal force factor '*K*' is 1.0 for braced frames (as defined in the NBC, which are similar to steel ordinary concentrically braced frames per ASCE/SEI 7-16 (ASCE, 2017a)) and 0.67 for 'special' space frames (as defined in the NBC, which are similar to ordinary moment frames per ASCE/SEI 7-16). The NBC code level base shear for this building has been approximated to be 962 kips in the north-south direction and 645 kips in the east-west direction.

Foundation support is provided by reinforced concrete spread footings interconnected by reinforced concrete grade beams.

Gravity Force Resisting System

The gravity force resisting system is comprised of normal weight concrete slab on metal deck with composite steel beams and steel columns. Columns are supported on concrete spread footings.

The design of this structure is intended to satisfy the requirements of the NBC for a "Risk Category IV" equivalent structure as defined by the 2018 International Building Code (IBC). The design of the lateral-force-resisting system (LFRS) was performed per the Distribution of Lateral Forces requirements as outlined in Section 1113.5 of the NBC. Specific material design was in accordance with American Concrete Institute (ACI) 318-83 (ref) and American Institute of Steel Construction (AISC) Design, Fabrication and Erection of Structural Steel for Buildings, 1978.

II.2 Performance Objectives for Structural Performance Assessment

Overall Building Performance

The assessment of the LFRS is performed using the Nonlinear Dynamic Procedure (NDP) per ASCE/SEI 41-17 Section 7.4.4. Modeling and acceptance criteria were determined using ASCE/SEI 41-17 and PEER/ATC (2010). Acceptance criteria were selected consistent with achieving a Life Safety (LS) level of performance for the Maximum Considered Earthquake/Basic Safety Earthquake (MCE/BSE-2N) level of shaking and an Immediate Occupancy (IO) level of performance for the Design Basis Earthquake (DBE/BSE-1N) level of shaking using Nonlinear Time History Analysis (NLTHA).

Structural Component Performance

Inelastic deformation will be permitted in members/components where inelastic behavior is anticipated. These members are referred to as "Deformation-Controlled" members. Based on full scale testing for the lateral systems (moment frames and braced frames) used in this building, there are not many conditions where reliable inelastic deformation capacity is anticipated as the failure mechanisms are generally brittle (NIST, 2010). However, inelastic behavior may occur in the following:

- Moment frame columns - Flexure outside of the panel zone and at ground level
    - The permissible plastic rotation demands are governed by ASCE/SEI 41-17. Full scale testing of the partially restrained moment connections indicated that the vast majority of column yielding took place at the base of the columns (SAC, 2000a).
- Moment frame beam connections - Flexural actions at beam ends
    - The permissible plastic rotation demands are governed by ASCE/SEI 41-17.
- Moment frame panel zones - Shear actions
    - The plastic rotation demands predicted by analysis will be monitored and compared to the permissible plastic rotation prescribed by ASCE/SEI 41-17.
- Braced frame braces - Axial deformations
    - The permissible plastic deformation demands are governed by ASCE/SEI 41-17.

"Force-controlled" members are anticipated to have strength decay while inelastic. Under gravity loading failure of these members may have structural stability concerns. Force-controlled actions may occur but are not expected to control the design of the following, as stated in SAC (2000a):

- Moment frame columns - Axial compression/tension
    - Fundamentally remain elastic
- Braced frame columns - Axial compression/tension
    - Fundamentally remain elastic
- Braced frame beams - Axial compression/tension and flexure
    - Fundamentally remain elastic

Foundations are not being analyzed within this project and will be treated as simple constraints fixed at base of moment frame columns and pinned at base of braced frame columns.

II.3 Criteria

Material Definitions

- Concrete:
  - Slabs on steel deck: $f_c' = 3{,}000$ psi (Nominal)
  - $f_{ce}' = f_c' \times 1.50$ (ASCE 41-17 Table 10-1)
- Concrete Reinforcement:
  - Rebar: $F_y = 60$ ksi (Nominal)
- Structural Steel - Wide Flange columns, wide Flange beams, other steel, unless noted otherwise:
  - ASTM A36 (ASCE 41-17 Table 9-1)
    - Group 1: $F_y = 44$ ksi (Nominal), $F_u = 66$ ksi (Nominal)
    - Group 2: $F_y = 41$ ksi (Nominal), $F_u = 59$ ksi (Nominal)
    - Group 3: $F_y = 39$ ksi (Nominal), $F_u = 60$ ksi (Nominal)
    - Group 4: $F_y = 37$ ksi (Nominal), $F_u = 62$ ksi (Nominal)
- Structural Steel -Tubes, Rectangular:
  - ASTM A500 Gr. B (ASCE 41-17 Table 9-1)
    - $F_y = 50$ ksi (Nominal), $F_u = 62$ ksi (Nominal)
- Factors to Translate Lower-Bound to Expected-Strength Properties - Yield Strength (ASCE 41-17 Table 9-3):
  - ASTM A36 All Groups: $F_{ye} = F_y \times 1.10$
  - ASTM A500 Gr. B: $F_{ye} = F_y \times 1.20$
- Factors to Translate Lower-Bound to Expected-Strength Properties - Tensile Strength (ASCE 41-17 Table 9-3):
  - ASTM A36 All Groups: $F_{ue} = F_u \times 1.10$
  - ASTM A500 Gr. B: $F_{ue} = F_u \times 1.20$

Material strengths will be at expected strength level within the analysis model and the strengths for all of the force-controlled actions will be checked against lower-bound strengths per ASCE 41-17 Section 7.5.3.2.3.

Knowledge Factor

  - $\kappa = 1.00$ (ASCE 41-17 Table 6-1)

Component action capacity is calculated per ASCE/SEI 41-17 Table 7-7.

II.4 Ground Motions

Selected ground motions are summarized in Table II-1. More information about the selection is provided in NIST GCR 21-917-48v2B, *Supplementary Documentation*.

Table II-1 Selected Ground Motion Summary

Name, Location	Date	Magnitude	Fault Type	Station	R_{rup} (km)	RSN	V_s^{30} (m/s)
Southern Calif, CA	1952	6.00	Strike Slip	San Luis Obispo	73	17	493.50
Livermore-01, CA	1980	5.80	Strike Slip	Fremont – Mission San Jose	36	213	367.57
Westmorland, CA	1981	5.90	Strike Slip	Superstition Mtn Camera	19	318	362.38
Chalfant Valley-01, CA	1986	5.77	Strike Slip	Lake Crowley – Shehorn Res	24	546	456.83
Borrego Mtn, CA	1968	6.63	Strike Slip	San Onofre – So Cal Edison	129	40	442.88
Bam Iran, Iran	1999	6.20	Strike Slip	TCU033	114	1846	423.40
Chi-Chi Taiwan-04, Taiwan	2003	6.60	Strike Slip	Golbaf	105	4045	441.84
Tottori Japan, Japan	2000	6.61	Strike Slip	SMN014	170	6373	385.91
Darfield New Zealand, New Zealand	2010	7.00	Strike Slip	OA MS	175	6945	437.72
Kocaeli Turkey, Turkey	1999	7.51	Strike Slip	Tekirdag	165	1172	521.76
Herctor Mine, CA	1999	7.13	Strike Slip	Castaic – Old Ridge Route	205	1775	450.28

II.5 Analysis Procedures and Acceptance Criteria

Nonlinear Dynamic Procedure

Component Gravity Loads and Load Combinations

$$Q_G = Q_D + Q_L + Q_S \qquad \text{(ASCE/SEI 41-17 Equation 7-3)}$$

Application of Ground Motions to the Structural Model

Mean demands from the 11 pairs of ground motion records per (ASCE/SEI 7-16 Section 16.2.4)

Acceptance Criteria for Force-Controlled Actions

$$\gamma\chi(Q_{UF} - Q_G) + Q_G \leq Q_{CL} \qquad \text{(ASCE/SEI 41-17 Equation 7-38)}$$

Demand/Capacity Checks Force-Controlled Actions

Mean demands from the NLTHA are used and amplified (ASCE/SEI 41-17 Section 7.5.3.2.3). A Demand/Capacity less than 1.0 indicates acceptable performance.

Demand/Capacity Checks Deformation-Controlled Actions

Mean demands from the NLTHA are used. A Demand/Capacity less than 1.0 indicates acceptable performance. Capacities are indicated in the acceptance criteria per Table II-3 and Table II-4.

Modeling Parameters and Acceptance Criteria for Deformation Controlled Actions

- Moment Frames:
  - Beam and Column - Flexure Action per ASCE/SEI 41-17 Table 9-7.1.
  - Partially Restrained Moment Connections - Flexure Action (Top and Bottom Clip Angle)
  - Backbone curves and acceptance criteria per ASCE/SEI 41-17 Table 9-7.2. Backbone hysteretic behavior to be calibrated with full size testing data per SAC (2000a).
- Braced Frames
  - Column - Flexure Action per ASCE/SEI 41-17 Table 9-7.1.
  - Brace - Axial Action backbone curves and acceptance criteria per ASCE/SEI 41-17 Table 9-8.

Nonlinear Time History Analysis Models and Assumptions

Moment Frames

See Figure II-2 below.

Moment frame beams and columns are modeled using the Frame Compound Component in Perform3D nonlinear analysis software (CSI, 2021).

The beam compound component is a ‘lumped plasticity’ element consisting of elastic elements with concentrated plastic hinges at each end per PEER/ATC (2010). See Figure II-3. These are made up of multiple individual components:

- Elastic beam elements are used within the clip angle connection zone outside of the column on each end and the balance of the beam span outside the plastic hinge.
- Inelastic behavior is modeled using a plastic hinge located at end of clip angle connection. The clip angle connection is reinforcing the beam flange; therefore, the hinge location will be at the center of the connection plate at a minimum per PEER/ATC (2010) and FEMA (2000b). Partially restrained moment-resisting connections are modeled using an elastic-perfectly-plastic nonlinear spring at each end.

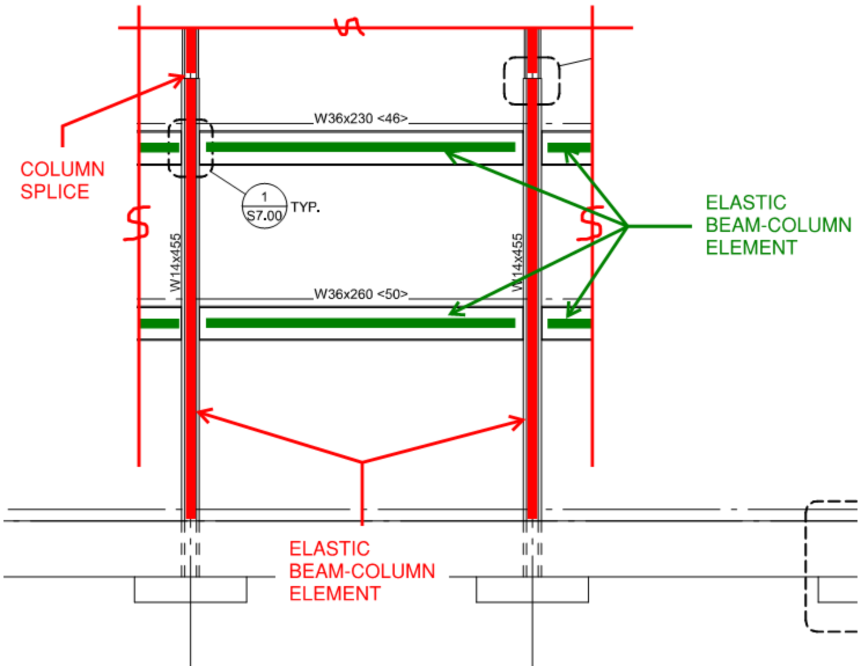


Figure II-2 Moment frame nonlinear time history analysis approach.

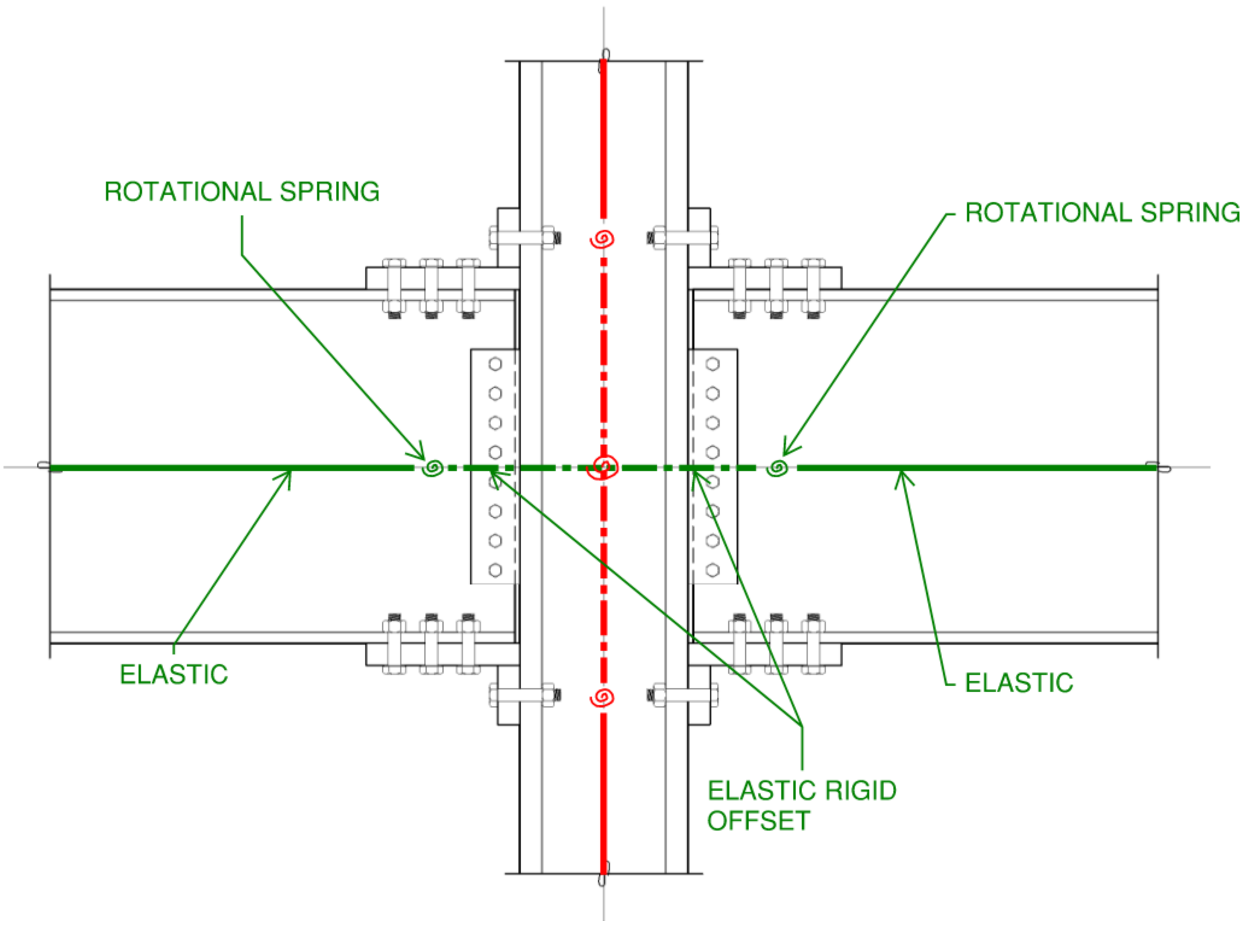


Figure II-3 Moment frame beam nonlinear analysis approach.

Plastic rotations of flexible partially restrained connections per FEMA (2000c) are monitored in the analysis and calibrated to match observed behavior from testing of similar connections per SAC (2000b).

The column compound component is also a lumped plasticity element made up of elastic elements with concentrated plastic hinges. See Figure II-4. These are comprised of multiple individual components:

- Elastic column elements are used between moment frame panel zones.
- Inelastic behavior is captured using plastic hinges located at the center of the clip angle connection. The column flange is reinforced by the connection; therefore, the hinge will be located at the center of the connection plate at a minimum per PEER/ATC (2010) and FEMA (2000b). Full scale testing has shown that yielding mostly occurs at the base of the columns, but this will be monitored to verify that the columns remain elastic (Sen et al., 2019).
- Plastic rotation caused by shear within the panel zones will be modeled with a concentrated hinge located at the work point of the beams and column.

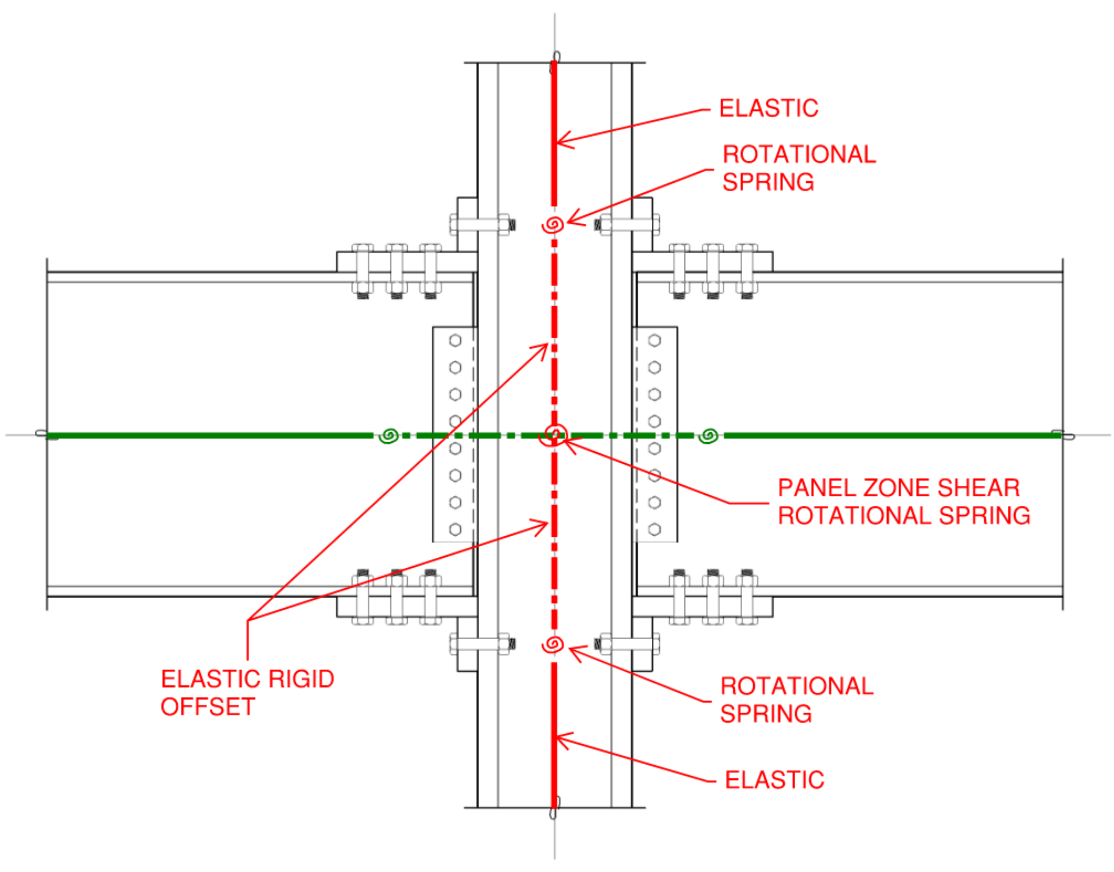


Figure II-4 Moment frame column nonlinear analysis approach.

Plastic hinge rotations are monitored in the analysis and compared to the acceptance criteria. Backbone curves and acceptance criteria for the rotational hinges are determined from ASCE/SEI 41-17 Table 9-7.1.

Braced Frames

See Figure II-5.

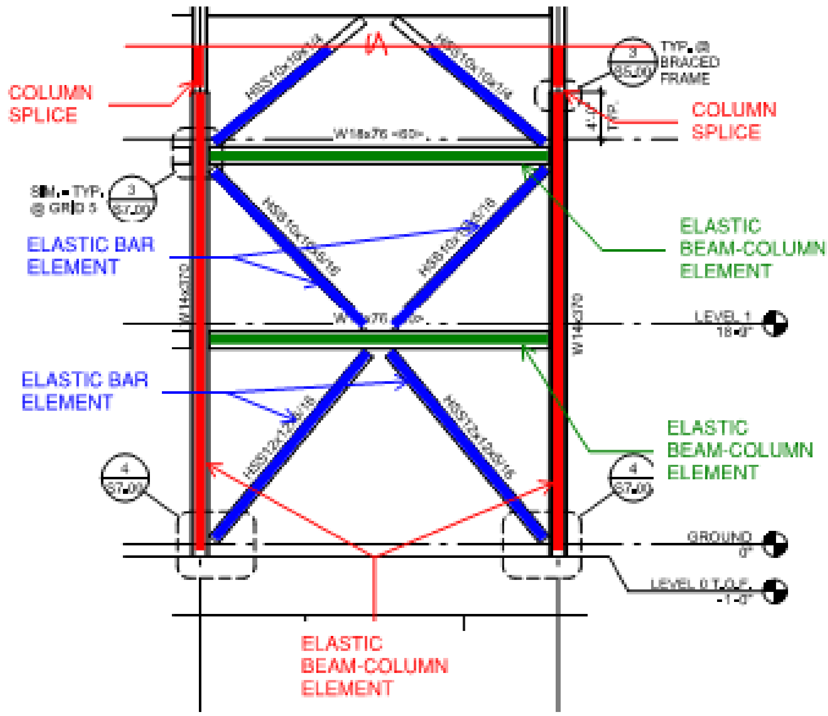


Figure II-5 Braced frame nonlinear analysis approach.

Braced frame braces are modeled using the Bar Compound Component in Perform3D. See Figure II-6 below for the simplified modeling approach.

The brace compound component is a bar element made up of multiple components:

- Elastic bar element is used for the balance of the brace.
- Plastic axial deformation hinges are located at the midspan of the brace per ASCE/SEI 41-17 Section 9.5.2.2.2.3.
- Moment release at end of brace

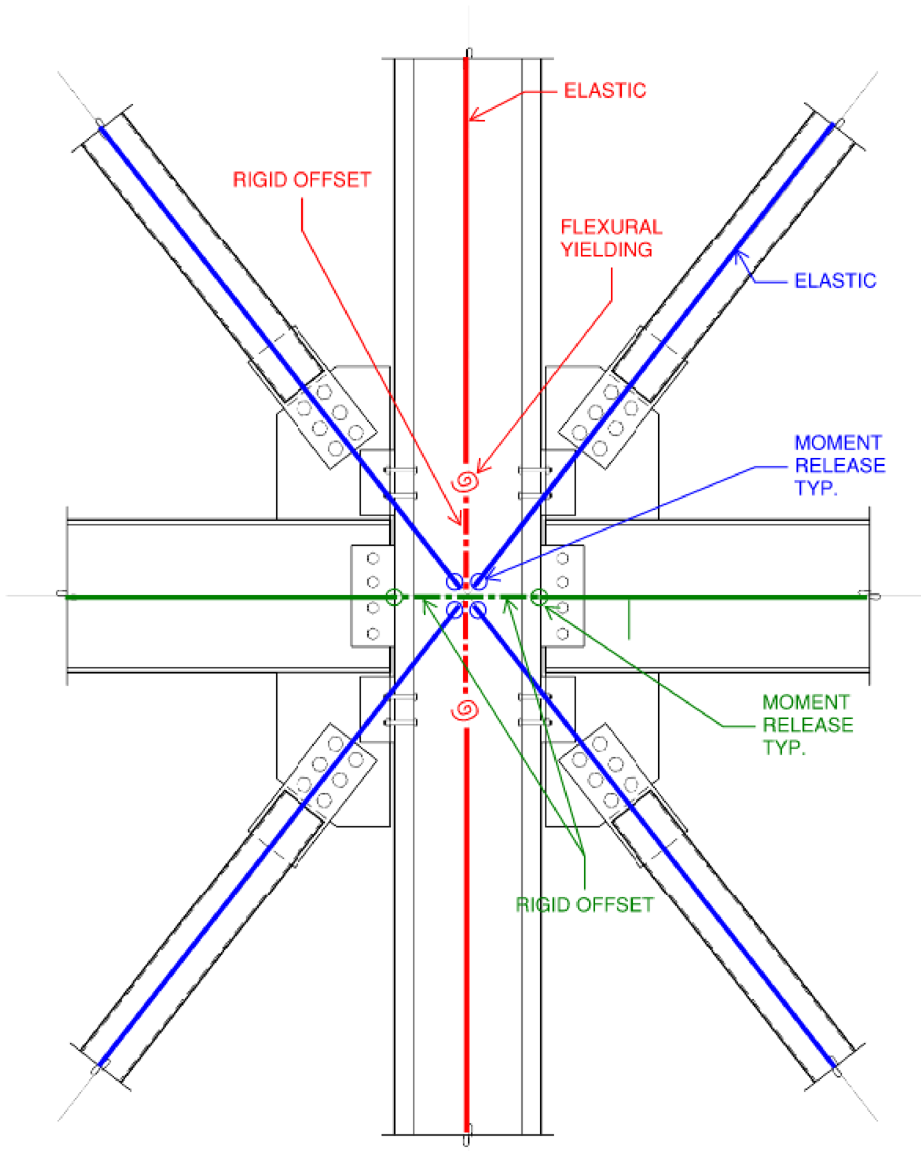


Figure II-6 Braced frame brace simplified nonlinear analysis approach.

Strains and Deformations are monitored in the model and compared to the acceptance criteria.

Braced frame beams and columns are modeled using the Frame Compound Component in Perform3D; see Figure II-7.

The beam and mid-story beam compound component:

- Elastic beam elements are used for the balance of the beam span with pinned end moment releases at beam ends.

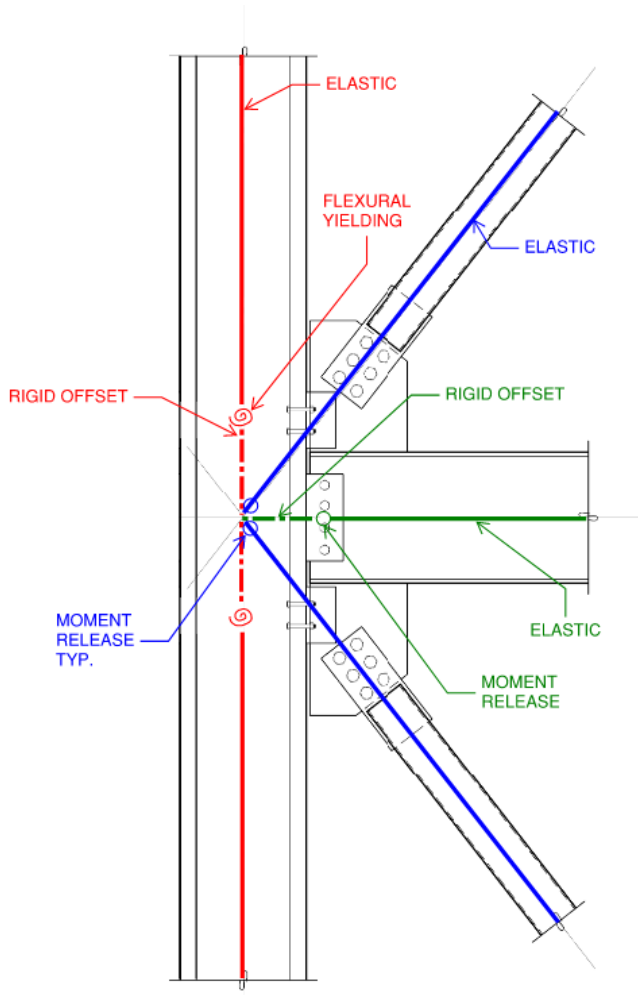


Figure II-7 Braced frame beam nonlinear analysis approach.

The column compound component is made up of elastic elements with rigid offsets at the panel zone. Column splices are assumed continuous, and the foundation connection will be pinned.

The diaphragms are assumed rigid. Translational and rotational mass are assigned to the center of mass. The center of mass has been offset away from the calculated location and away from the center of rigidity by 5% of the building width in each direction to account for accidental eccentricity per ASCE/SEI 41-17 Section 7.2.3.2.1.2. P-Delta effects are accounted for in the model using the P-Delta analysis option in Perform3D and through a 'leaning column' located at the approximate center of mass and will capture the gravity loads and masses from all of the gravity framing. Tributary gravity loads and mass will be assigned to the moment frames. Rayleigh damping of 3% is used for analysis.

Table II-2 summarizes ASCE/SEI 41-17 acceptance criteria for Life Safety at MCE_R/BSE-2N.

Table II-2 Acceptance Criteria for Life Safety at BSE-2N

Element	Action Type	Classification	Expected Behavior	Acceptance Limit for Nonlinear Behavior
MF Story Drift	N.A.	N.A.	N.A.	0.015 ASCE41-17 Table 17-9
MF Beam	Flexure	Displacement Controlled	Nonlinear	$9\theta_y$
	Shear	Force Controlled	Elastic	N.A.
MF Column (Compression)	Flexure	Displacement Controlled	Nonlinear	$0.75(0.8(1-P_G/P_{ye})^{2.2}(0.1L/r_y+0.8h/t_w)^{-1}-0.0035)$
	Shear	Force Controlled	Elastic	N.A.
	Axial	Force Controlled	Elastic	N.A.
MF Column (Tension)	Flexure	Displacement Controlled	Nonlinear	$9\theta_y$
	Shear	Force Controlled	Elastic	N.A.
	Axial	Force Controlled	Elastic	N.A.
MF Column Panel Zone	Shear	Displacement Controlled	Nonlinear	$\lvert P\rvert/P_{ye}<0.4{:}12\gamma_y$, $\lvert P_y\rvert/P_{ye}\geq 0.4{:}20(1-\lvert P\rvert/P_{ye})\gamma_y$
MF PR Connection	Flexure	Displacement Controlled	Nonlinear	Limit State 1→ 0.030 Limit State 2→ 0.010 Limit State 3→ 0.020 Limit State 4→ 0.035
BF Story Drift	N.A.	N.A.	N.A.	N.A.
BF Beam	Flexure	Displacement Controlled	Elastic	N.A.
	Shear	Force Controlled	Elastic	N.A.
BF Column (Compression)	Flexure	Displacement Controlled	Elastic	N.A.
	Shear	Force Controlled	Elastic	N.A.
	Axial	Force Controlled	Elastic	N.A.
BF Column (Tension)	Flexure	Displacement Controlled	Elastic	N.A.
	Shear	Force Controlled	Elastic	N.A.
	Axial	Force Controlled	Elastic	N.A.
BF Brace (Compression)	Axial	Displacement Controlled	Nonlinear	$7\Delta_c$
BF Brace (Tension)	Axial	Displacement Controlled	Nonlinear	$8\Delta_T$

Table II-3 summarizes the ASCE/SEI 41-17 acceptance criteria for Immediate Occupancy at DBE_R/BSE-1N.

Table II-3 Acceptance Criteria for Immediate Occupancy at BSE-1N

Element	Action Type	Classification	Expected Behavior	Acceptance Limit for Nonlinear Behavior
MF Story Drift	N.A.	N.A.	N.A.	0.015 ASCE 41-17 Table 17-9
MF Beam	Flexure Shear	Displacement Controlled Force Controlled	Nonlinear Elastic	$2.25\theta_y$ N.A.
MF Column (Compression)	Flexure Shear Axial	Displacement Controlled Force Controlled Force Controlled	Nonlinear Elastic Elastic	$0.5(0.8(1-P_G/P_{ye})^{2.2}(0.1L/r_y+0.8h/t_w)^{-1}-0.0035)$ N.A. N.A.
MF Column (Tension)	Flexure Shear Axial	Displacement Controlled Force Controlled Force Controlled	Nonlinear Elastic Elastic	$2.25\theta_y$ N.A. N.A.
MF Column Panel Zone	Shear	Displacement Controlled	Nonlinear	$\lvert P\rvert/P_{ye}<0.4{:}1\gamma_y$, $\lvert P_y\rvert/P_{ye}>0.4{:}5/3(1-\lvert P\rvert/P_{ye})\gamma_y$
MF PR Connection	Flexure	Displacement Controlled	Nonlinear	Limit State 1→ 0.008 Limit State 2→ 0.003 Limit State 3→ 0.005 Limit State 4→ 0.010
BF Story Drift	N.A.	N.A.	N.A.	N.A.
BF Beam	Flexure Shear	Displacement Controlled Force Controlled	Elastic Elastic	N.A. N.A.
BF Column (Compression)	Flexure Shear Axial	Displacement Controlled Force Controlled Force Controlled	Elastic Elastic Elastic	N.A. N.A. N.A.
BF Column (Tension)	Flexure Shear Axial	Displacement Controlled Force Controlled Force Controlled	Elastic Elastic Elastic	N.A. N.A. N.A.
BF Brace (Compression)	Axial	Displacement Controlled	Nonlinear	$0.5\Delta_c$
BF Brace (Tension)	Axial	Displacement Controlled	Nonlinear	$0.5\Delta_T$

II.6 Level of Seismicity

To determine Level of Seismicity as outlined in ASCE/SEI 41-17 Section 2.5, a site class was assumed to be ‘D-default’, Risk Category IV providing the following for the project site location:

- $S_{DS} = 0.261$g
- $S_{D1} = 0.088$g

Per ASCE/SEI 41-17 Table 2-4 the Level of Seismicity is ‘Low.’ More information is provided in NIST GCR 21-917-48V2B, *Supplementary Documentation.*

II.7 Summary of Results and Discussion

This section summarizes the results of the NLTHA performance assessment for Building 2 (Healthcare Facility) archetype steel building aimed at achieving Life Safety (LS) performance at the MCE seismic event and Immediate Occupancy (IO) at the DBE seismic event.

100% mass participation was achieved within the first twenty mode shapes of the structure during the analysis. The first two mode shapes were translational in each of the major directions, with a torsional mode shape at the third mode with at a total mass participation just over 85% in these first three modes.

The results of the NLTHA indicate that there is little nonlinear behavior within the LFRS for either the MCE or DBE level ground motion load cases. This is evident when the energy balance plots are reviewed for any of the ground motion records. See Figure II-8 for an example plot. The level of seismicity, local construction standard practices, and NBC requirements give a scenario where there are low seismic forces, compact frame columns, and a very stiff LFRS to meet the NBC drift requirements. For both MCE and DBE cases, there were no components that exceeded the performance objective limit states. See Figure II-11 for an example plot of the worst-case condition for the MCE level ground motion and LS limit state. Therefore, it appears the structure meets the performance objectives for both conditions.

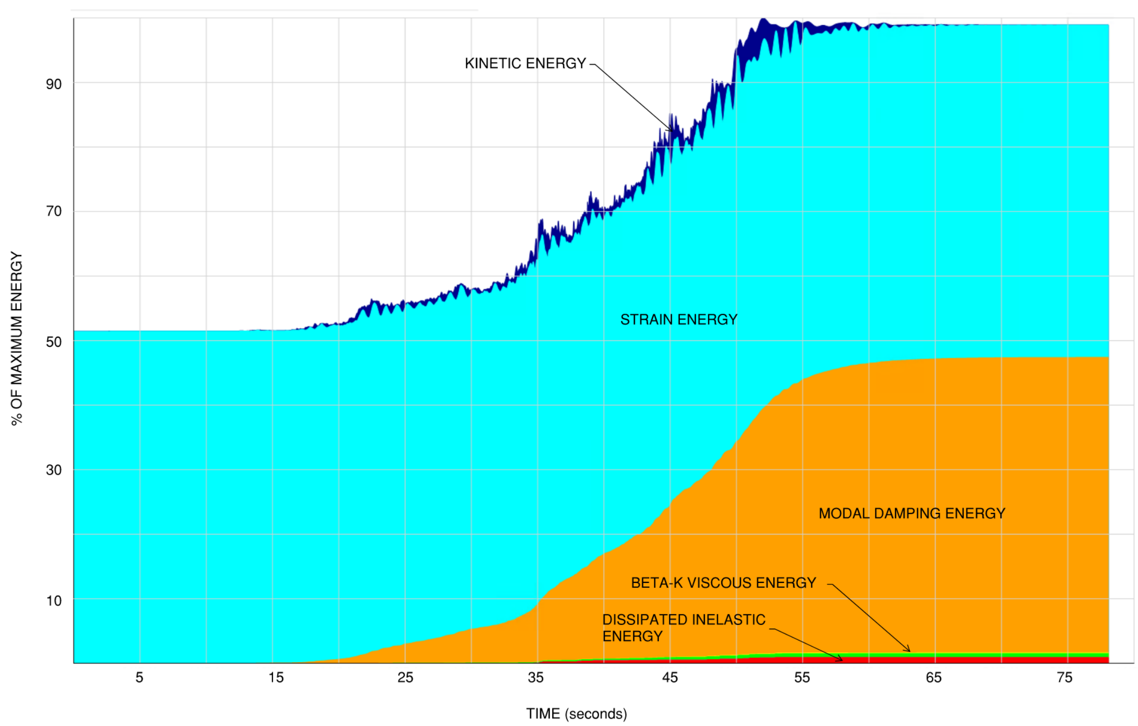


Figure II-8 Kocaeli energy plot.

Level of Seismicity

Figure II-9 presents representative base shears from 1987 NBC, 2018 IBC, NLTHA DBE, and NLTHA MCE. Figure II-10 presents a summary of the base shears for the eleven ground motion records. The estimated seismic forces designed for in the 1987 NBC are the highest, and the average of DBE records is very similar to the 2018 IBC design requirements. It should be noted that the 2018 IBC Design Case E had to assume a soil Site Class E in order to achieve the desired Seismic Design Category D, whereas the Site Class determined for the ASCE/SEI 41 evaluation ground motion selection was Site Class D with a $v_s = 760$ m/s.

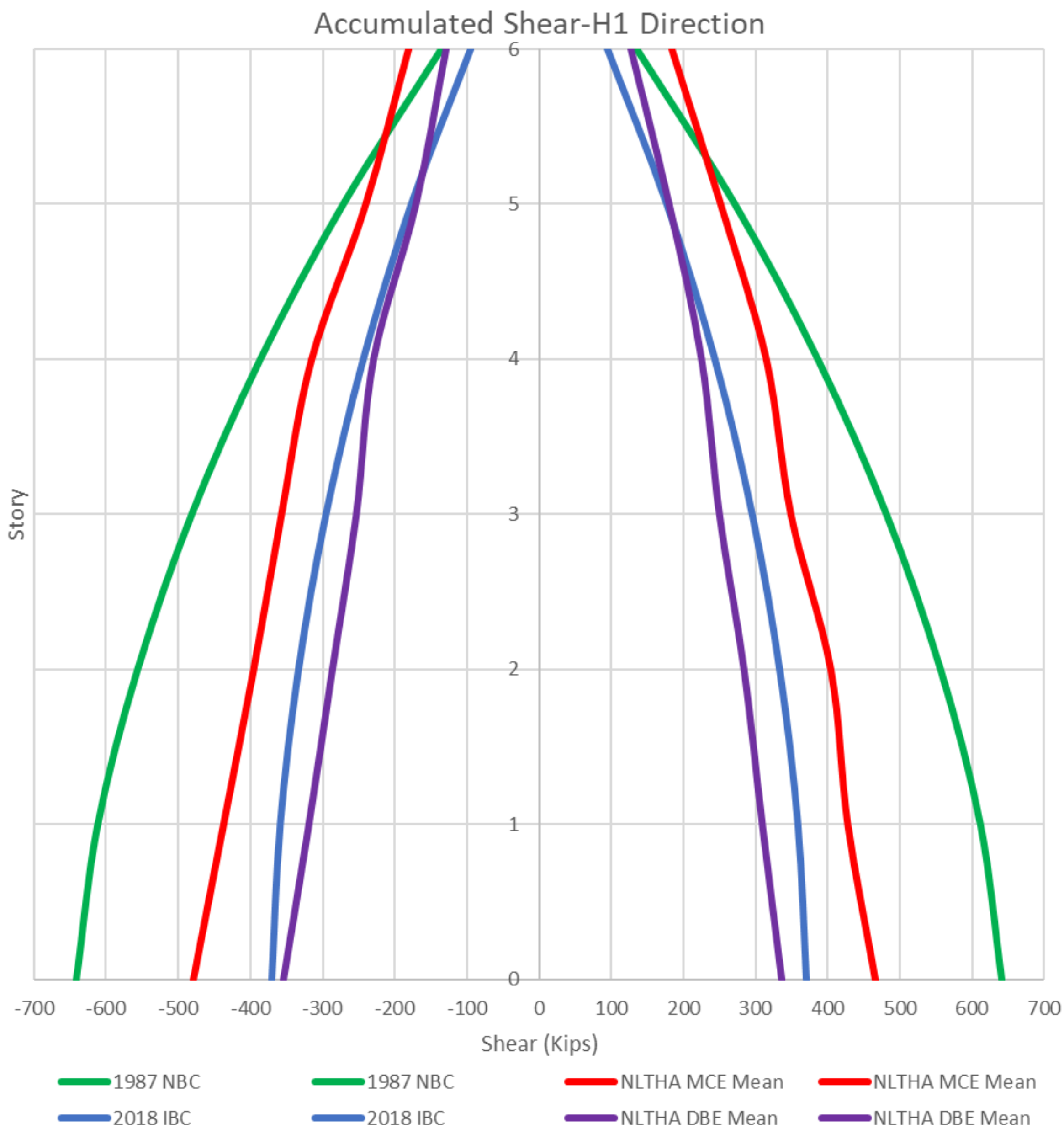


Figure II-9 Accumulated shear-H1 direction.

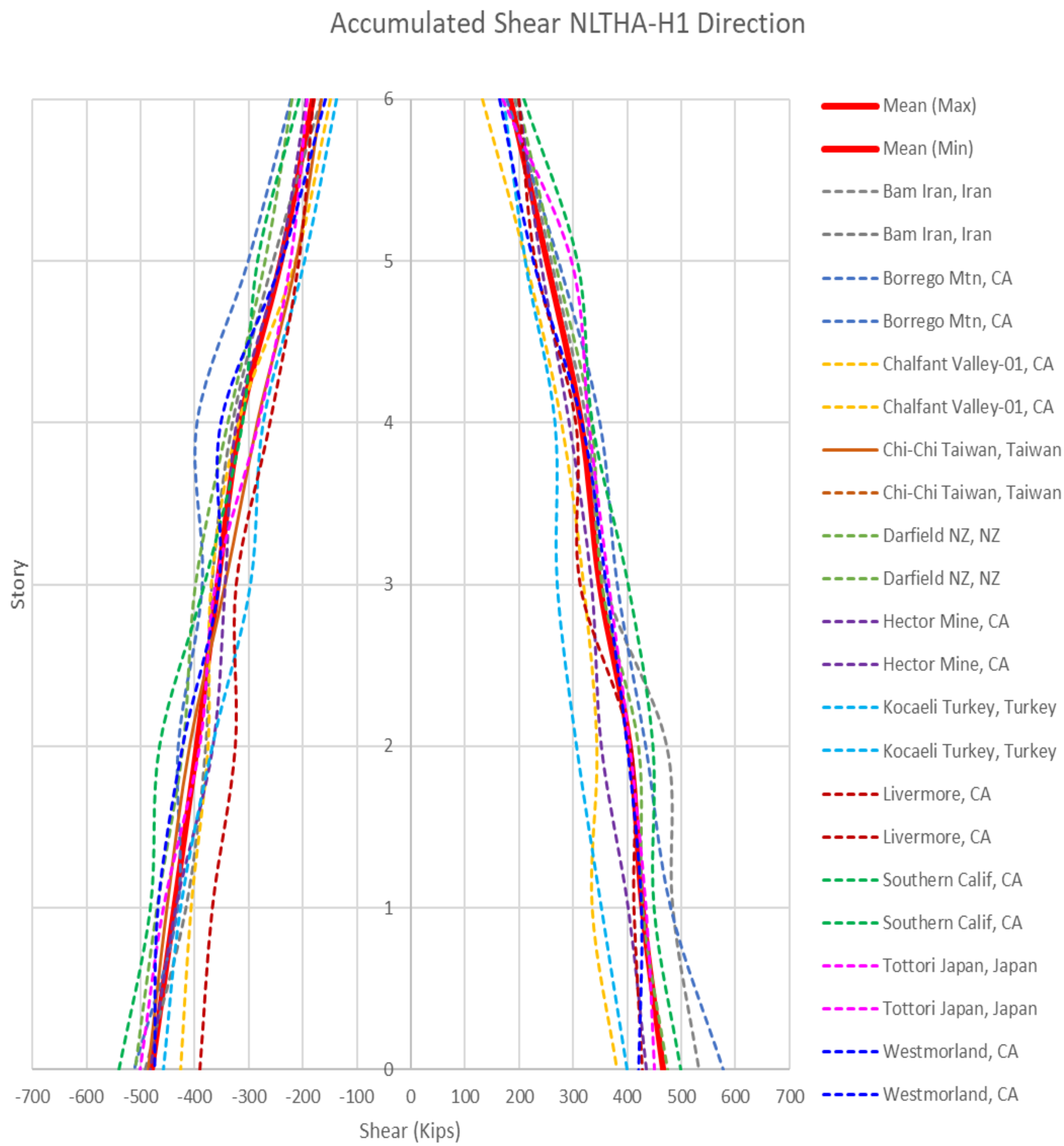


Figure II-10 Accumulated MCE Ground Motion shear NLTHA-H1 direction.

Local Construction Practices

The standard construction practices in New York required the use of W14x column sizes for the moment frame and braced frame columns. This differs from the standard of practice on the West Coast of the United States where deeper/lighter sections would be utilized. This requirement reduced the likelihood of panel zone and column yielding/deformations by having higher volumes of steel and increased compactness. See Figure II-11 for summary of Limit State Results for moment frame panel zones.

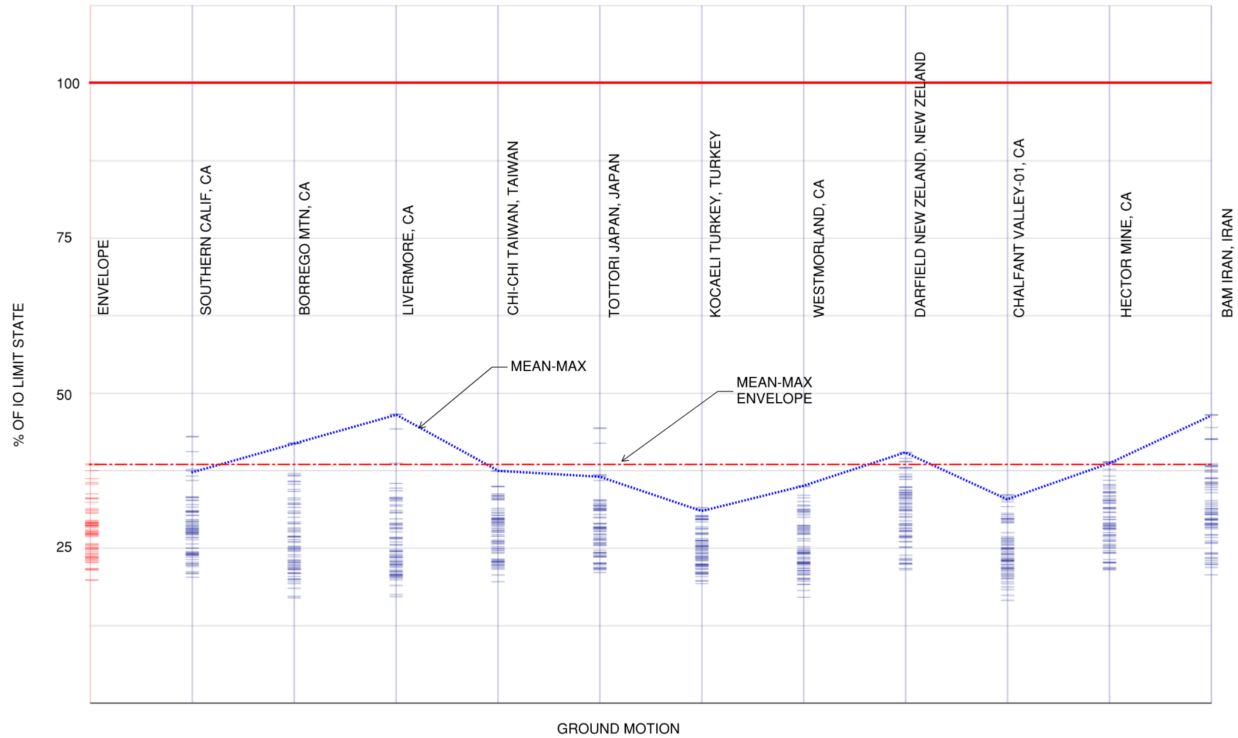


Figure II-11 LS Limit state results for moment frame panel zones.

1987 National Building Code Drift Requirements

The drift requirements set in 1987 NBC are restrictive when compared to current code. The NBC only allowed the lateral deflection to equal 0.5% of the height of the floor while the IBC allows for 1.0% of the floor height. The NBC drift limitations resulted in the member sizes to be heavier to achieve the required system stiffness and also led to the base connection of the moment frames required to be fixed into the foundation grade beam. This increase in system stiffness is observed with the computed deflections of the NLTHA model results when subjected to the MCE and DBE ground motion records. See Table II-4 for a summary of the roof drifts.

Table II-4 Roof Drifts

Roof Drift Maximum		
Design	*H1 (in)*	*H2 (in)*
1987 NBC	3.12	2.42
2018 IBC	2.83	1.85
DBE	1.07	0.88
MCE	1.54	1.26

References

ACI, 1983a, *318-83: ACI Building Code Requirements for Structural Concrete*, ACI 318-83, American Concrete Institute, Farmington Hills, Michigan.

ACI, 1983b, *ACI 318-14: Building Code Requirements for Structural Concrete and Commentary*, American Concrete Institute, Farmington Hills, Michigan.

AISC, 1978, *Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings*, 1978 Edition, American Institute of Steel Construction, Chicago, Illinois.

AISC, 2016, *Specification for Structural Steel Buildings*, ANSI/AISC 360-16, American Institute of Steel Construction, Chicago, Illinois.

ANSI, 1982, *American National Standard, Minimum Design Loads for Buildings and Other Structures*, American National Standards Institute, New York, New York.

ASCE, 2017a, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*, ASCE/SEI 7-16, Structural Engineering Institute of American Society of Civil Engineers, Reston, Virginia.

ASCE, 2017b, *Seismic Evaluation and Retrofit of Existing Buildings*, ASCE/SEI 41-17, Structural Engineering Institute of American Society of Civil Engineers, Reston, Virginia.

BOCA, 1987, *The BOCA National Building Code/1987*, Tenth Edition, NBC 1987 Building Officials and Code Administrators International, Inc., Country Club Hills, Illinois.

CSI, 2021, *Perform3D*, Computers and Structures, Inc., Walnut Creek, California.

FEMA, 2000b, *State of the Art Report on Connection Performance*, FEMA 355D, prepared by the SAC Joint Venture, a partnership of the Structural Engineers Association of California (SEAOC), Applied Technology Council (ATC), and California Universities for Research in Earthquake Engineering (CUREE), for the Federal Emergency Management Agency, Washington, D.C.

FEMA, 2000c, *Prestandard and Commentary for the Seismic Rehabilitation of Buildings*, FEMA 356, prepared by the American Society of Civil Engineers for the Federal Emergency Management Agency, Washington, D.C.

ICC, 2018, *International Building Code,* 2018 IBC, International Code Council, Washington, D.C.

NIST, 2010, *NEHRP Seismic Design Technical Brief No. 4: Nonlinear Structural Analysis for Seismic Design, A Guide for Practicing Engineers*, NIST GCR 10-917-5, prepared by the NEHRP Consultants Joint Venture, a partnership of the Applied Technology Council and the Consortium of Universities for Research in Earthquake Engineering for the National Institute of Standards and Technology, Gaithersburg, Maryland.

FEMA, 2000a, *Recommended Seismic Design Criteria for New Steel Moment Frame Buildings*, FEMA 350, prepared by the SAC Joint Venture, a partnership of the Structural Engineers Association of California (SEAOC), Applied Technology Council (ATC), and California Universities for Research in Earthquake Engineering (CUREE), for the Federal Emergency Management Agency, Washington, D.C.

PEER/ATC, 2010, *Modeling and Acceptance Criteria for Seismic Design and Analysis of Tall Buildings*, PEER/ATC 72-1, prepared by the Pacific Earthquake Engineering Research Center (PEER) and Applied Technology Council (ATC), Redwood City, California.

SAC, 2000a, *Seismic Performance of 3 and 9 Story Partially Restrained Moment Frame Buildings*, Report No. SAC/BD-99/16, prepared by Maison, B., Kasai, K., for SAC Joint Venture, a partnership of the Structural Engineers Association of California (SEAOC), Applied Technology Council (ATC), and California Universities for Research in Earthquake Engineering (CUREE).

SAC, 2000b, *Effects of Partially Restrained Connection Stiffness and Strength on Frame Seismic Performance*, Report No. SAC/BD-99/17, prepared by Maison, B., Kasai, K., Mayangarum, A., for SAC Joint Venture, a partnership of the Structural Engineers Association of California (SEAOC), Applied Technology Council (ATC), and California Universities for Research in Earthquake Engineering (CUREE).

SBC, 1988, *Standard Building Code 1988 Edition*, SBC 1988, Southern Building Code Congress International, Inc., Birmingham, Alabama.

Sen, A., Roeder, C., Lehman, D., Berman, J., 2019, "Nonlinear modeling of concentrically braced frames," *Journal of Constructional Steel Research*, Vol. 157, pp. 103-120.

Project Participants

National Institute of Standards and Technology

John (Jay) L. Harris III
Engineering Laboratory (MS8604)
National Institute of Standards and Technology
100 Bureau Drive
Gaithersburg, Maryland 20899

Applied Technology Council

Jon A. Heintz (Program Manager)
Applied Technology Council
201 Redwood Shores Parkway, Suite 240
Redwood City, California 94065

Ayse Hortacsu (Associate Program Manager)
Applied Technology Council
201 Redwood Shores Parkway, Suite 240
Redwood City, California 94065

Project Technical Committee

Donald Scott (Project Director)
PCS Structural Solutions
Waterfront Place
1011 Western Avenue, Suite 810
Seattle, Washington 98104

John Hutton
Uzun + Case, LLC
1230 Peachtree Street NE
Suite 2500
Atlanta, Georgia 30309

Adrian Persaud
Uzun + Case, LLC
1230 Peachtree Street NE
Suite 2500
Atlanta, Georgia 30309

Project Review Panel

Melissa Burton (ATC Board Contact)
Arup
121 Bloor Street East
Toronto, Ontario M4W 1A9
Canada

C.B. Crouse
P.O. Box 2703
Woodinville, Washington 98072

Ramon Gilsanz
Gilsanz Murray Steficek LLP
129 W 27th St. 5th Floor
New York, New York 10001

Larry Griffis
Walter P Moore
221 W 6th Street Suite 800
Austin, Texas 78701

Emily Guglielmo
Martin/Martin Consulting Engineers
700 Larkspur Landing Cir. #155
Larkspur, California 94939

Eric Hines
Hines + Partners, LLC
31 Hillside Avenue
Medford, Massachusetts 02155

Erik A. Madsen
Madsen Consulting Engineering, PLLC
26 Broadway, 3rd Floor
New York New York 10004

Working Group Members

Steve Antilla
PCS Structural Solutions
Waterfront Place
1011 Western Avenue, Suite 810
Seattle, Washington 98104

McKell Bowen
PCS Structural Solutions
Waterfront Place
1011 Western Avenue, Suite 810
Seattle, Washington 98104

Jared Dragovich
PCS Structural Solutions
Waterfront Place
1011 Western Avenue, Suite 810
Seattle, Washington 98104

Hai Lin
PCS Structural Solutions
Waterfront Place
1011 Western Avenue, Suite 810
Seattle, Washington 98104

Cameron Prince
Uzun + Case, LLC
1230 Peachtree Street NE
Suite 2500
Atlanta, Georgia 30309

Chris Putman
Uzun + Case, LLC
1230 Peachtree Street NE
Suite 2500
Atlanta, Georgia 30309

Gavin Rinaldo
1230 Peachtree Street NE
Suite 2500
Atlanta, Georgia 30309

Design Case A

1987 NBC
"Risk Category III"
"Seismic Design Category B"

A.1 Gravity Design

The 7-story healthcare facility is a steel framed building with 3" metal deck and 4-1/2" of concrete topping providing a total slab thickness of 7-1/2", not including the structural steel framing. This decking was chosen to provide the required 2-hour fire rating that is typical for healthcare facilities. The columns and beams are ASTM A36 steel wide flange members and were designed using allowable stress procedures in accordance with AISC *Steel Construction Manual* 8^{th} edition. The deflection was limited to the NBC prescribed limits of $L/360$ for applied live loads and $L/240$ for applied total loads.

The calculated total dead load applied was 95 psf and 20 psf partition load at the floors and a dead load of 100 psf at the roof. The increase of dead load at the roof is attributed to the theoretical mechanical units typically placed on the roof structure. The live loads chosen for the floors and roof were provided by Section 1103 of 1987 NBC. It should be noted that the 40 psf roof live loads controlled the design over the calculated snow load per Section 1111.0 of 1987 NBC.

A.2 Lateral Design

There are two separate lateral-load-resisting-systems for this building, a steel braced frame system for the lateral load resistance in the North/South direction and a steel special moment frame system for the lateral load resistance in the East/West direction. The applied wind and seismic loads were determined using Sections 1112.0 and 1113.0 respectively from 1987 NBC. In each case the seismic force controlled the design, most likely due to the increased dead load caused by the 7-1/2" total slab depth at each story. In both directions the eccentric loading, both calculated and required accidental, was included in determining the applied frame forces at each level.

The braced frames have a two-story X-configuration and utilize ASTM A500 Gr. B tube steel braces. The relative stiffness between the braced frames were designed to be similar, to efficiently distribute the applied load at each diaphragm to allow for overall efficiency of the brace, beam, and column sizes of the braced frame system.

Given that the global stiffness of the braced frame system is high, the frames were strength controlled. At the foundations, the anchorage was designed to resist the uplift force due to overturning and the shear lugs were designed to transfer the applied shear forces to the foundations.

The moment frames have been designed using bolted moment connections. This type of connection is chosen because this is the preferred method of moment frame construction in the New York City area. It was permissible to use special moment frames with a response modification factor $K = 0.67$ because we were able to meet the member thickness requirements listed in the NBC Section 1113.0 and Chapter 5 of AISC 8th edition. The design of the moment frame was controlled by the 0.5% drift limit provided in the NBC. In order to meet this requirement, the columns are designed with a fixed connection at the foundation. The size of the columns at the lower levels, and the beams at the first and second level had to increase in size as well.

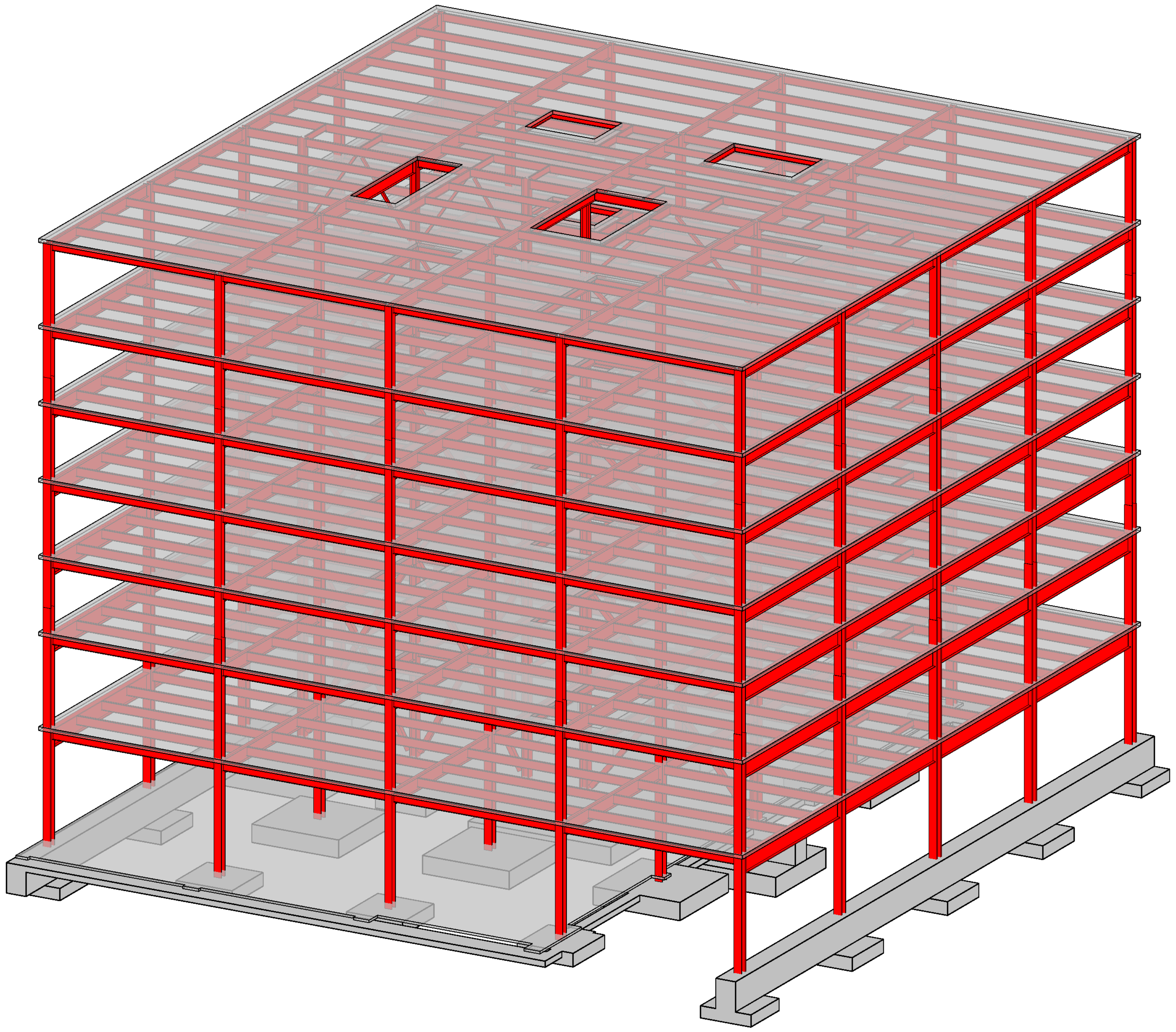
A.3 Steel Tonnage

Total steel tonnage for this design case is calculated as 811 tons.

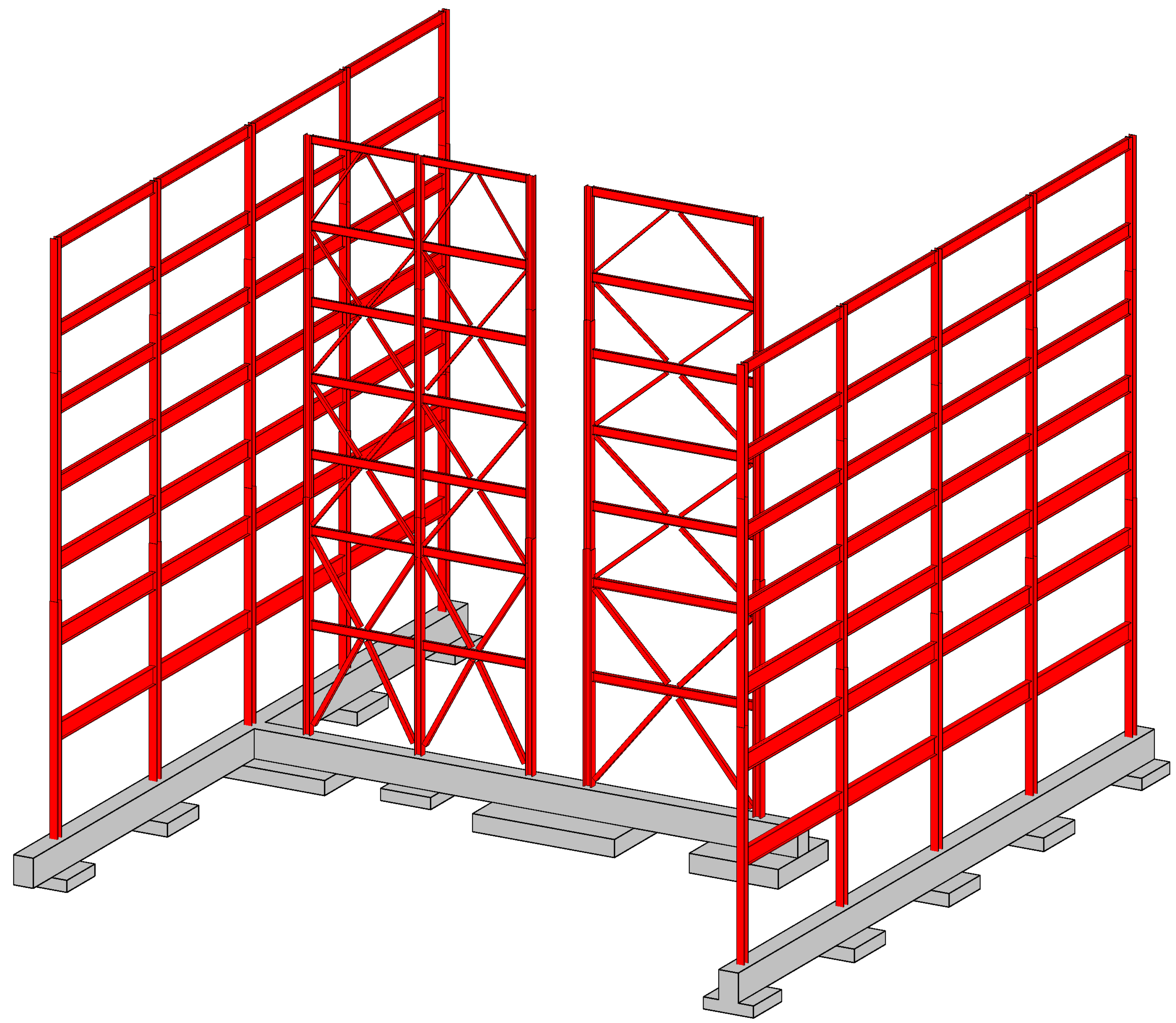
A.4 Structural Drawings

Structural drawings for Design Case A are provided on the following pages.

HEALTHCARE FACILITY - LONG ISLAND, NEW YORK
DESIGN A - 1987 NBC WITH EQUIVALENT RISK CATEGORY III



OVERALL FRAMING 3D VIEW



LATERAL FORCE RESISTING SYSTEM 3D VIEW

DESIGN A: 1987 NBC "RISK CATEGORY III" EQUIVALENT	
HEALTHCARE FACILITY, LONG ISLAND, NEW YORK	
ITEM	QUANTITY
WF COLUMNS (Fy = 36 KSI)	100 TONS
WF GIRDERS AND JOISTS (Fy = 36 KSI)	379 TONS
MOMENT FRAME WF COLUMNS (Fy = 36 KSI)	155 TONS
MOMENT FRAME WF BEAMS (Fy = 36 KSI)	116 TONS
BRACED FRAME WF COLUMNS (Fy = 36 KSI)	42 TONS
BRACED FRAME WF BEAMS (Fy = 36 KSI)	13 TONS
HSS BRACES (Fy = 46 KSI)	6 TONS
TOTAL	811 TONS

1. STEEL QUANTITIES DO NOT INCLUDE MISCELLANEOUS STEEL, CUT WASTE STEEL, STAIRS, TYPICAL STEEL FRAMING CONNECTIONS, ETC.

DRAWING INDEX

CONSULTANTS

National Institute of Standards and Technology

Applied Technology Council

Structural Solutions

PROJECT

HEALTHCARE FACILITY

LONG ISLAND, NEW YORK
PCS STRUCTURAL SOLUTIONS
DESIGN A
1987 NBC WITH EQUIVALENT RISK CATEGORY III

This publication is available free of charge from: https://doi.org/10.6028/NIST.GCR.21-917-48v2A

DRAWINGS

30 SEPTEMBER, 2021

Job Number	19-051
Checked	JAD
Approved	DRS

TITLE

COVER SHEET

SHEET NUMBER

S0.00

GENERAL NOTES

STANDARDS

THE DESIGN AND MATERIALS SHALL CONFORM TO THE 1987 NATIONAL BUILDING CODE (NBC) AS AMENDED AND ADOPTED BY THE LOCAL BUILDING OFFICIAL OR APPLICABLE JURISDICTION.

STRUCTURAL DRAWINGS

PRIMARY STRUCTURAL ELEMENTS ARE DIMENSIONED ON STRUCTURAL PLANS AND DETAILS AND OVERALL LAYOUT OF STRUCTURAL PORTION OF WORK. STRUCTURAL DETAILS SHOW DIMENSIONAL RELATIONSHIPS TO CONTROL DIMENSIONS DEFINED BY DRAWINGS.

PROJECT LOCATION

LONG ISLAND, NEW YORK

40.6471 LATITUDE, -73.5642 LONGITUDE

DESIGN CRITERIA

VERTICAL LOADS

AREA	DESIGN DEAD LOAD	LIVE LOAD (2)	PARTITION LOAD	CONCENTRATED LOADS
OPERATING ROOMS	95 PSF	60 PSF	20 PSF	1000#
PRIVATE ROOMS	95 PSF	40 PSF	20 PSF	1000#
CORRIDORS ABOVE 1ST FLOOR	95 PSF	80 PSF	20 PSF	1000#
ROOF	100 PSF	40 PSF (1)	-	-

(1) DRIFT AND UNBALANCED SNOW LOAD PER NBC, 1987, CHAPTER 4.
(2) LIVE LOAD REDUCTION NOT PERMITTED EXCEPT AS NOTED IN NBC 1987, SECTION 1115.0.

SNOW:

Pg = 35 PSF = GROUND SNOW LOAD
Pf = CeIPg = FLAT ROOF SNOW LOAD = 29.4 PSF
Ps = CsPf = SLOPED ROOF SNOW LOAD
I = 1.2, Ce = 0.7

LATERAL FORCES

LATERAL FORCES ARE TRANSMITTED BY DIAPHRAGM ACTION OF ROOF AND FLOORS TO BRACED FRAME/MOMENT FRAME. LOADS ARE THEN TRANSFERRED TO FOUNDATION BY BRACED FRAME/MOMENT FRAME ACTION WHERE ULTIMATE DISPLACEMENT IS RESISTED BY PASSIVE PRESSURE OF EARTH AND/OR SLIDING FRICTION. OVERTURNING IS RESISTED BY DEAD LOAD OF THE STRUCTURE.

WIND:

THE BUILDING MEETS THE CRITERIA PER NBC 1987 SECTION 1112.0.

- EXPOSURE CATEGORY = B
- BASIC WIND SPEED, V = 90 MPH
- EQUIVALENT RISK CATEGORY PER TABLE 1.5-1 = III
- PRESSURE COEFFICIENT (ENCLOSED) = 0.8, -0.5
- WIND IMPORTANCE FACTOR I_W = 1.07
- DESIGN WIND BASE SHEAR = 390 KIPS

SEISMIC: (NBC 1987) V = ZIKCSW

Z = 3/8
SEISMIC IMPORTANCE FACTOR, I = 1.25
EQUIVALENT RISK CATEGORY OF BUILDING PER TABLE 1113.1 = III
k = 1.0 AT BRACED FRAME, k= 0.67 AT MOMENT FRAME
W = EFFECTIVE SEISMIC WEIGHT OF BUILDING = 12180 KIPS
ANALYSIS PROCEDURE USED = EQUIVALENT LATERAL FORCE PROCEDURE
CS = 0.14
DESIGN BRACE FRAME BASE SHEAR V = 805 KIPS
DESIGN MOMENT FRAME BASE SHEAR V = 535 KIPS

FOUNDATION DESIGN CRITERIA

SOIL BEARING PRESSURE: 6000 PSF (ASSUMED)

ACTIVE PRESSURE - RESTRAINED: 50 PCF +14H SEISMIC SURCHARGE (ASSUMED)
ACTIVE PRESSURE - UNRESTRAINED: 35 PCF +6H SEISMIC SURCHARGE (ASSUMED)
PASSIVE RESISTANCE: 200 PCF (INCLUDES F.O.S. ≥ 1.5) (ASSUMED)
COEFFICIENT OF FRICTION: .35 (INCLUDES F.O.S. ≥ 1.5) (ASSUMED)
*1/3 INCREASE ALLOWED FOR SEISMIC OR WIND LOADING

CONCRETE

CAST-IN-PLACE CONCRETE

ITEM	DESIGN f'c (PSI) (AT 28 DAYS U.N.O.)
FOUNDATIONS	3000
SLABS ON GRADE AND SLABS ON METAL DECK	4000

REINFORCING STEEL

ASTM A615, GRADE 60 TYPICAL UNLESS NOTED OTHERWISE.

WELDED WIRE REINFORCEMENT SHALL CONFORM TO ASTM A185. LAP ONE FULL MESH ON SIDES AND ENDS BUT NOT LESS THAN 8 INCHES. WELDED WIRE REINFORCING SHALL BE SUPPORTED TO WITHSTAND CONCRETE PLACEMENT. PULLING OF MESH INTO PLACE AFTER PLACEMENT IS NOT ALLOWED.

REINFORCING SPLICE AND DEVELOPMENT LENGTH SCHEDULE, Fy=40 KSI (UNLESS NOTED OTHERWISE)

BAR SIZE	MINIMUM LAP SPLICE LENGTHS ("Ls")	MINIMUM DEVELOPMENT LENGTHS ("Ld")
#3	1'-6"	1'-3"
#4	2'-0"	1'-7"
#5	2'-7"	2'-0"
#6	3'-1"	2'-4"
#7	4'-6"	3'-6"
#8	5'-2"	3'-11"
#9	5'-10"	4'-6"
#10	6'-6"	5'-0"
#11	7'-3"	5'-7"

STRUCTURAL STEEL

MATERIAL PROPERTIES

WIDE FLANGE SECTIONS: ASTM A36 (Fy = 36 KSI)

OTHER SHAPES AND PLATES: ASTM A36 (Fy = 36 KSI)

HOLLOW STRUCTURAL SECTIONS: RECTANGULAR & SQUARE - ASTM A500 GRADE B (Fy = 46 KSI)

MACHINE BOLTS (M.B.): ASTM A307

HIGH-STRENGTH BOLTS: A325-ASTM F1852, A490-ASTM F2280

ANCHOR BOLTS (A.B.): ASTM A490, GRADE 36, UNLESS OTHERWISE NOTED

GENERAL REQUIREMENTS

HEADED STUDS: SHALL BE "S3L SHEAR CONNECTORS" FOR STUDS 3/4" DIAMETER AND LARGER AS MANUFACTURED BY NELSON STUD WELDING, INC. OR PRE-APPROVED EQUAL AND SHALL CONFORM TO AWS D1.1.

COMPOSITE FLOOR DECK: SHALL CONTAIN THE MINIMUM PROPERTIES SHOWN ON THE STRUCTURAL DRAWINGS. THE FLOOR UNITS SHALL BE FORMED FROM STEEL SHEETS CONFORMING TO ASTM A653, AND GALVANIZED PER ASTM A924.

ABBREVIATION LIST

@	AT	HORIZ.	HORIZONTAL
A.B.	ANCHOR BOLT	HSS	HOLLOW STRUCTURAL SECTION
ADD'L	ADDITIONAL	HT	HEIGHT
ALT.	ALTERNATE	INT.	INTERIOR
BLD'G	BUILDING	JT	JOINT
BM	BEAM	L	ANGLE
B.O.F.	BOTTOM OF FOOTING	L.F.R.S.	LATERAL FORCE-RESISTING SYSTEM
BOT.	BOTTOM	L.L.	LIVE LOAD
BRG	BEARING	LLH	LONG LEG HORIZONTAL
BTWN	BETWEEN	LLV	LONG LEG VERTICAL
(C=)	CAMBER	LOC.	LOCATION
CANT.	CANTILEVER	MAX.	MAXIMUM
C.J.	CONTROL/CONSTRUCTION JOINT	M.B.	MACHINE BOLT
CL	CENTERLINE	MFR	MANUFACTURER
CLR.	CLEARANCE	MIN.	MINIMUM
COL.	COLUMN	MISC.	MISCELLANEOUS
CONC.	CONCRETE	MTL	METAL
CONN.	CONNECTION	N.F.	NEAR FACE
CONST.	CONSTRUCTION	N.S.	NEAR SIDE
CONT.	CONTINUOUS	NTS	NOT TO SCALE
COORD.	COORDINATE	O.C.	ON CENTER
C.P.	COMPLETE PENETRATION	OPN'G	OPENING
CTR'D	CENTERED	OPP.	OPPOSITE
C.Y.	CUBIC YARD	PERP.	PERPENDICULAR
DBL.	DOUBLE	PL.	PLATE
DIA. OR ø	DIAMETER	P.P.	PARTIAL PENETRATION
DIAG.	DIAGONAL	P.S.F.	POUNDS PER SQUARE FOOT
DIM.	DIMENSION	REINF.	REINFORCING
D.L.	DEAD LOAD	REQ'D	REQUIRED
DWG	DRAWING	SCHED.	SCHEDULE
DWL	DOWEL	SIM.	SIMILAR
EA.	EACH	S.O.G.	SLAB ON GRADE
E.F.	EACH FACE	SQ.	SQUARE
EL.	ELEVATION	STD	STANDARD
ENGR.	ENGINEER	STIFF.	STIFFENER
EQ.	EQUAL	STL	STEEL
E.W.	EACH WAY	STRUCT.	STRUCTURAL
EXP.	EXPANSION	T&B	TOP & BOTTOM
EXT.	EXTERIOR	THR'D	THREADED
FDN	FOUNDATION	T.O.F.	TOP OF FOOTING
F.F.	FAR FACE	T.O.S.	TOP OF STEEL
FLR	FLOOR	TYP.	TYPICAL
FRM'G	FRAMING	U.N.O.	UNLESS NOTED OTHERWISE
F.S.	FAR SIDE	VERT.	VERTICAL
FTG	FOOTING	W/	WITH
GA.	GAGE/GAUGE	W.P.	WORK POINT
GALV.	GALVANIZED	WT	WEIGHT
GR.	GRADE	W.W.R.	WELDED WIRE REINFORCING

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DRAWINGS
30 SEPTEMBER, 2021

Job Number	19-051
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Approved	Approver

TITLE
GENERAL NOTES

SHEET NUMBER
S0.01

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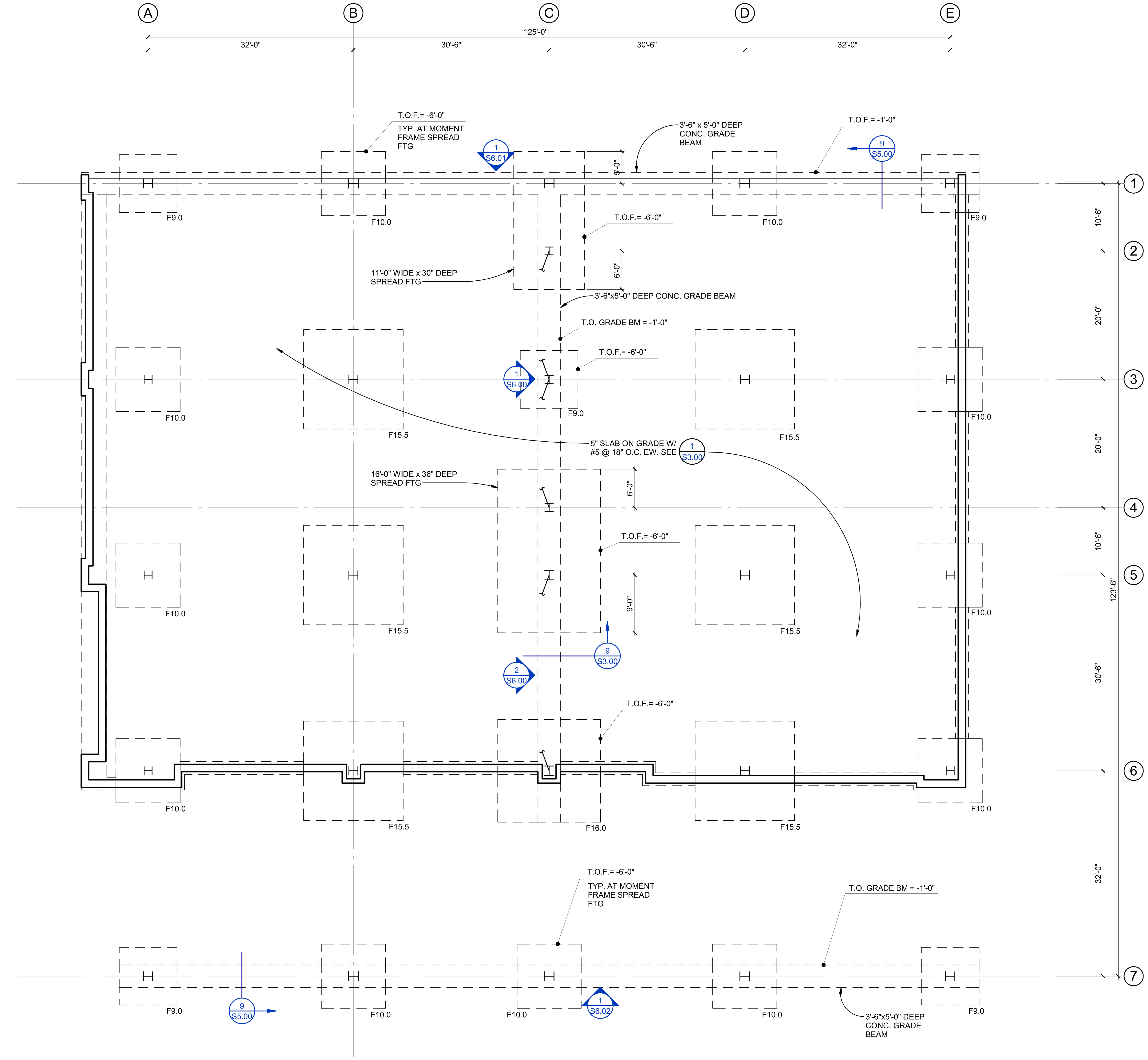

1 S2.00 FOUNDATION AND GRADE LEVEL FRAMING PLAN

1/8" = 1'-0"

FOUNDATION NOTES

1. INDICATES EXTERIOR WALL.
2. INDICATES CONTINUOUS CONCRETE WALL FOOTING. FOR TYPICAL FOOTING AND FOUNDATION WALL DETAILS SEE SHEET S3.00. FOOTING WIDTH ("W") = 2'-0" UNLESS NOTED OTHERWISE ON PLAN. CENTER FOOTINGS ON CONCRETE STEM WALL.
3. "F_" INDICATES CONCRETE SPREAD FOOTING. FOR SCHEDULE SEE 5/S3.00.
4. X X.XX INDICATES BRACED FRAME. FOR ELEVATIONS, BRACE SIZES AND DETAIL CALLOUTS SEE SHEET S6.00.
5. INDICATES STEEL COLUMNS ORIGINATING AT FOUNDATION LEVEL. ALL COLUMNS ARE CONTINUOUS TO ROOF UNLESS NOTED OTHERWISE. FOR TYPICAL ANCHOR ROD/BOLT DETAIL SEE 7/S3.00. FOR COLUMN SCHEDULE SEE S4.00.
6. FOR TYPICAL FOUNDATION AND CONCRETE SLAB-ON-GRADE DETAILS SEE SHEET S3.00.
7. TOP OF FOOTING ELEVATIONS = -1'-0" UNLESS NOTED OTHERWISE ON PLANS AND DETAILS.
8. X X.XX INDICATES MOMENT FRAME. FOR ELEVATIONS, MEMBER SIZES AND DETAIL CALLOUTS SEE SHEETS S6.01 AND S6.02.

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TITLE

FOUNDATION AND GRADE LEVEL FRAMING PLAN

SHEET NUMBER

S2.00

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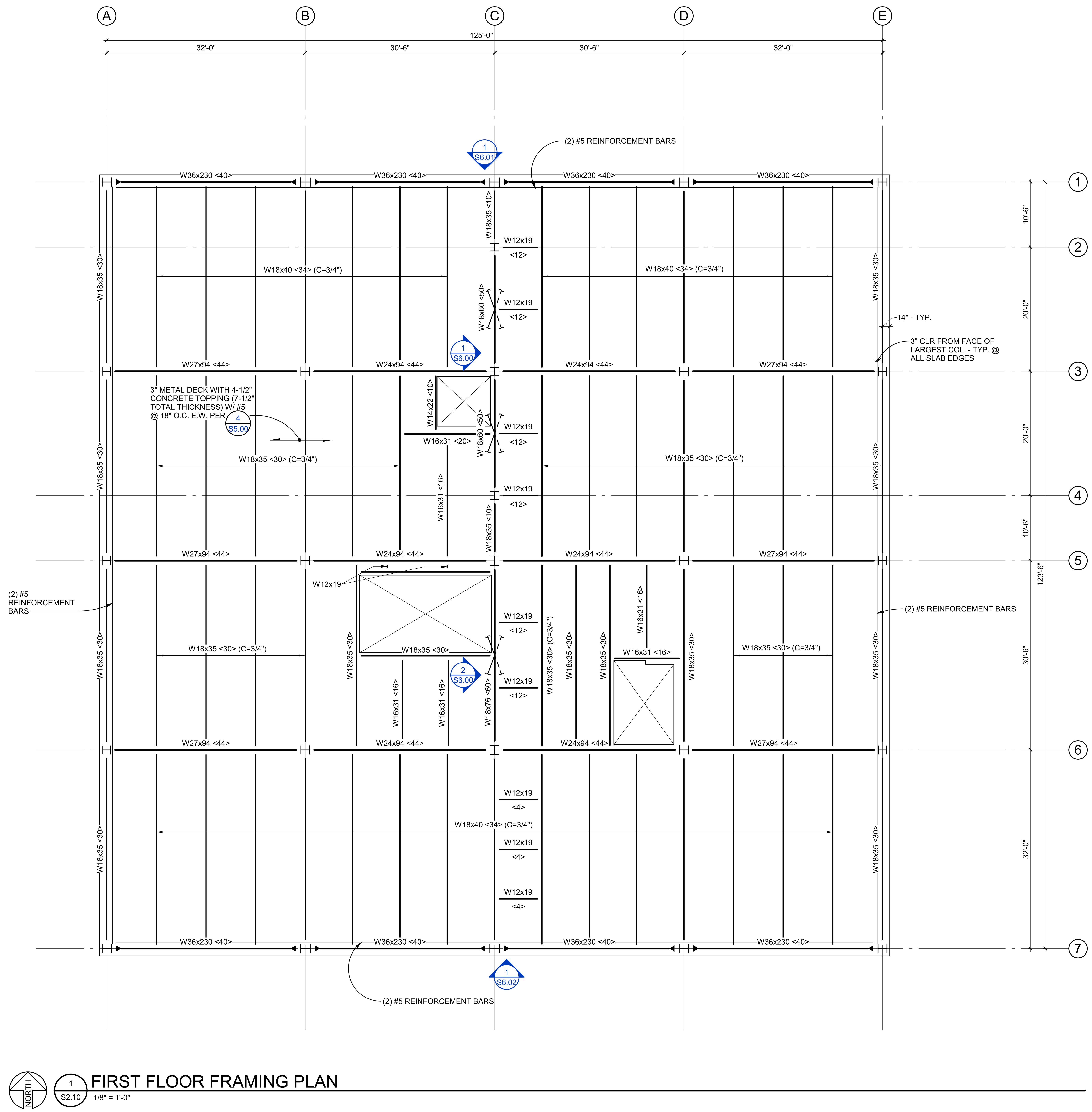


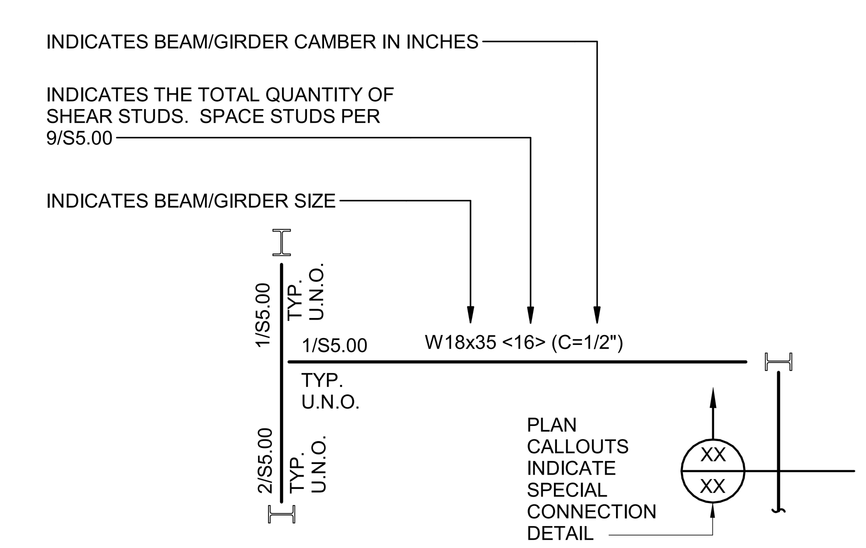
1
S2.10

FIRST FLOOR FRAMING PLAN

1/8" = 1'-0"

FLOOR FRAMING NOTES

1. INDICATES BRACED FRAME. FOR ELEVATIONS, BRACE SIZES AND DETAIL CALLOUTS SEE SHEET S6.00. ALL BEAMS THAT ARE PART OF A BRACED FRAME SHALL BE CONSIDERED "COLLECTOR" BEAMS.
2. SEE FOUNDATION NOTES FOR EXTERIOR STUD WALL REQUIREMENTS.
3. INDICATES STEEL COLUMN, SEE S4.00 FOR STEEL COLUMN SCHEDULE.
4. INDICATES PENETRATION IN FLOOR STRUCTURE. FOR TYPICAL REINFORCING AROUND OPENINGS SEE 5/S5.00.
5. FOR TYPICAL COMPOSITE BEAM AND METAL DECK DETAILS SEE SHEET S5.00.
6. INDICATES DIRECTION OF SPAN FOR METAL DECK.
7. FOR TYPICAL STEEL CONNECTION DETAILS SEE SHEET S5.00. SEE BRACED FRAME ELEVATIONS FOR CONNECTION CALLOUTS. ALL MEMBERS AND CONNECTIONS THAT ARE PART OF A BRACED FRAME SHALL BE CONSIDERED PART OF THE LATERAL-FORCE RESISTING SYSTEM.



8. STEEL MEMBERS ARE EQUALLY SPACED BETWEEN DIMENSION POINTS UNLESS NOTED OTHERWISE.
9. INDICATES MOMENT FRAME. FOR ELEVATIONS AND DETAIL CALLOUT SEE SHEET S6.00. ASSOCIATED MEMBERS AND CONNECTIONS ARE PART OF THE LATERAL-FORCE RESISTING SYSTEM.

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FIRST FLOOR FRAMING PLAN

SHEET NUMBER

S2.10

FOR FRAMING NOTES SEE S2.10

SECOND FLOOR FRAMING PLAN

1/8" = 1'-0"

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SECOND FLOOR FRAMING PLAN

SHEET NUMBER

S2.20

FOR FRAMING NOTES SEE S2.10

THIRD FLOOR FRAMING PLAN

1/8" = 1'-0"

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TITLE
THIRD FLOOR FRAMING PLAN

SHEET NUMBER
S2.30

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FOR FRAMING NOTES SEE S2.10

NORTH

1
S2.40

FOURTH FLOOR FRAMING PLAN

1/8" = 1'-0"

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FOURTH FLOOR FRAMING PLAN

SHEET NUMBER

S2.40

FOR FRAMING NOTES SEE S2.10

NORTH

FIFTH FLOOR FRAMING PLAN

1 / S2.50

1/8" = 1'-0"

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TITLE

FIFTH FLOOR FRAMING PLAN

SHEET NUMBER

S2.50

FOR FRAMING NOTES SEE S2.10

SIXTH FLOOR FRAMING PLAN

1/8" = 1'-0"

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TITLE

SIXTH FLOOR FRAMING PLAN

SHEET NUMBER

S2.60

FOR FRAMING NOTES SEE S2.10

NORTH

1 S2.70 ROOF FRAMING PLAN

1/8" = 1'-0"

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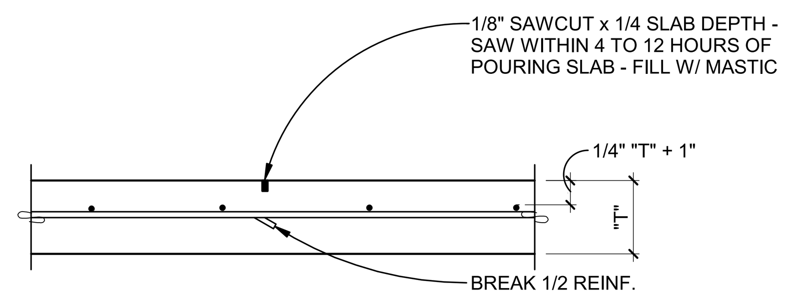
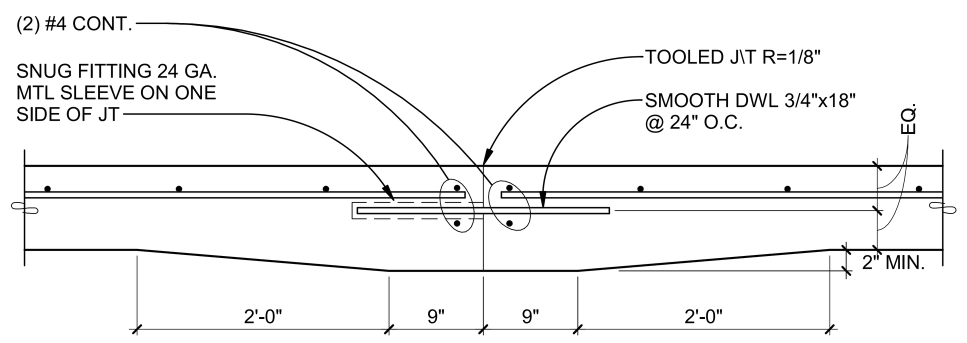
ROOF FRAMING PLAN

SHEET NUMBER

S2.70

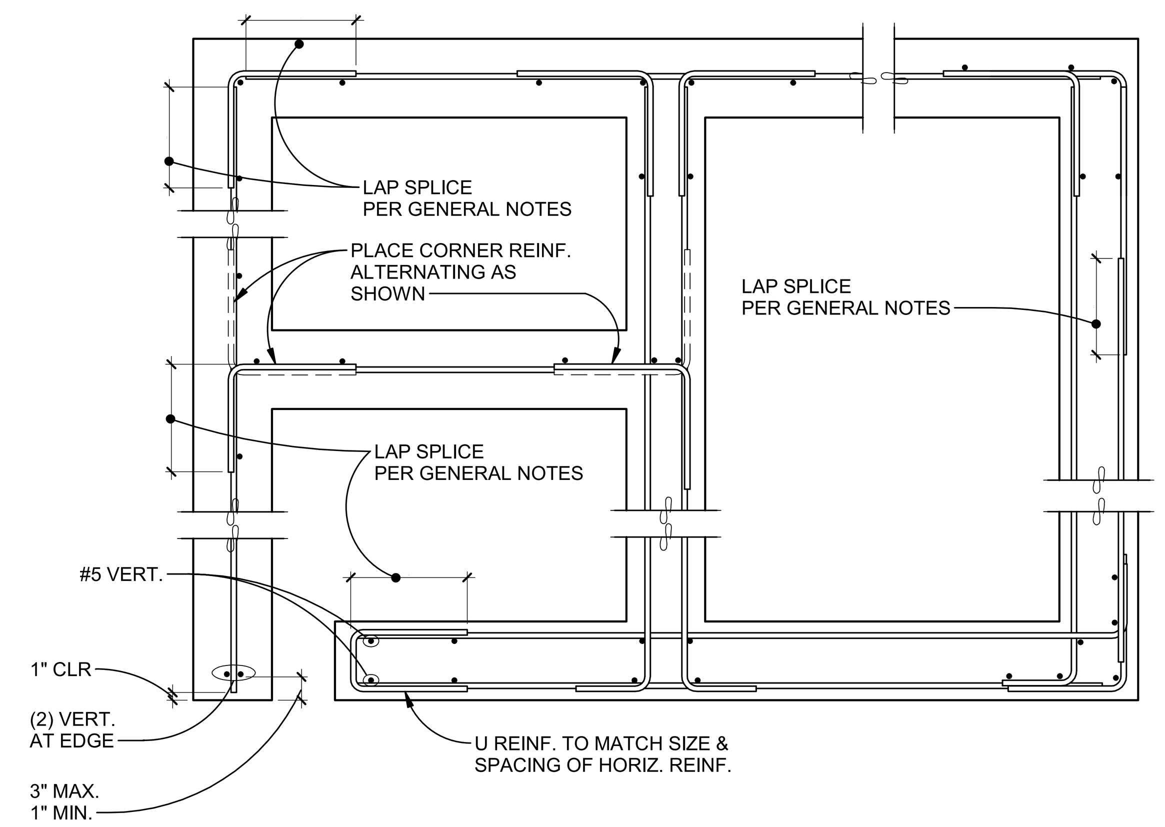


TYPICAL CONTROL JOINT FOR SLAB ON GRADE



TYPICAL CONSTRUCTION JOINT FOR SLAB ON GRADE

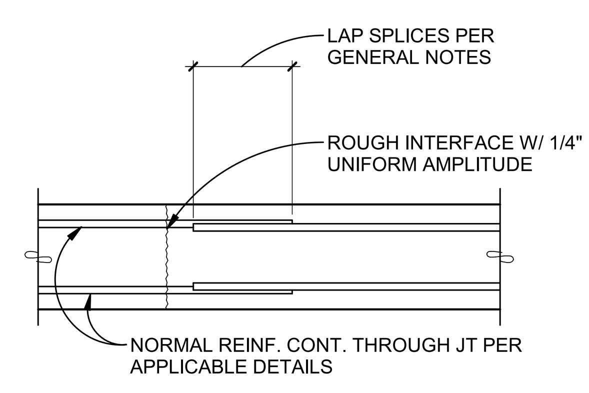
1 SECTION
S3.00 NO SCALE



NOTES:
1. VERTICAL REINFORCEMENT SHOWN IS ADDITIONAL IF NORMAL STEM WALL REINFORCEMENT IS NOT IN PROPER LOCATION.
2. CORNER REINFORCEMENT IS SAME SIZE AND SPACING AS HORIZONTAL REINFORCEMENT.
3. STANDARD HOOK MAY BE SUBSTITUTED FOR CORNER REINFORCEMENT. SEE NOTE #5.
4. REINFORCEMENT AT ALL CORNERS, ENDS, AND INTERSECTIONS OF WALLS SHALL BE PLACED IN ACCORDANCE WITH APPROPRIATE DETAIL SHOWN.
5. USE STANDARD HOOK FOR EMBEDMENT LESS THAN 24" PAST FACE OF WALL.

TYPICAL REINFORCEMENT PLACEMENT FOR CAST IN PLACE CONCRETE WALLS AND STEM WALLS

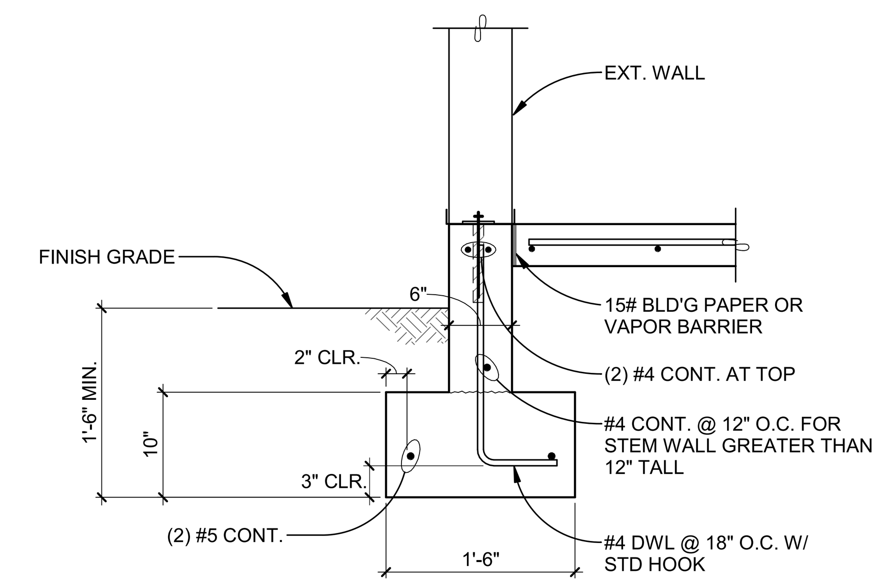
2 SECTION
S3.00 NO SCALE



TYPICAL AT CONCRETE FOOTINGS

TYPICAL FOR CAST IN PLACE CONCRETE WALLS, GRADE BEAMS AND FOOTINGS

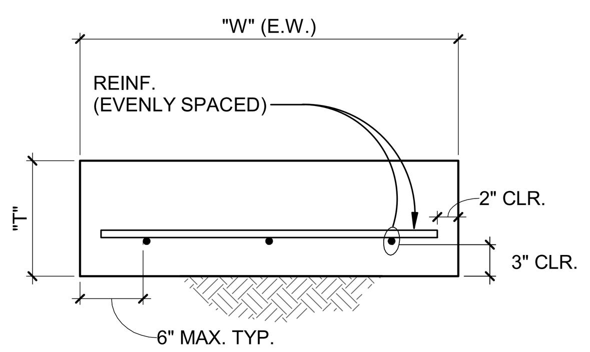
3 SECTION
S3.00 NO SCALE



TYPICAL FOUNDATION AT EXTERIOR WALL

4 SECTION
S3.00 NO SCALE

MARK	DIMENSIONS	
	"W"	"T"
F9.0	9'-0"	24"
F10.0	10'-0"	27"
F15.5	15'-6"	36"
F16.0	16'-0"	39"

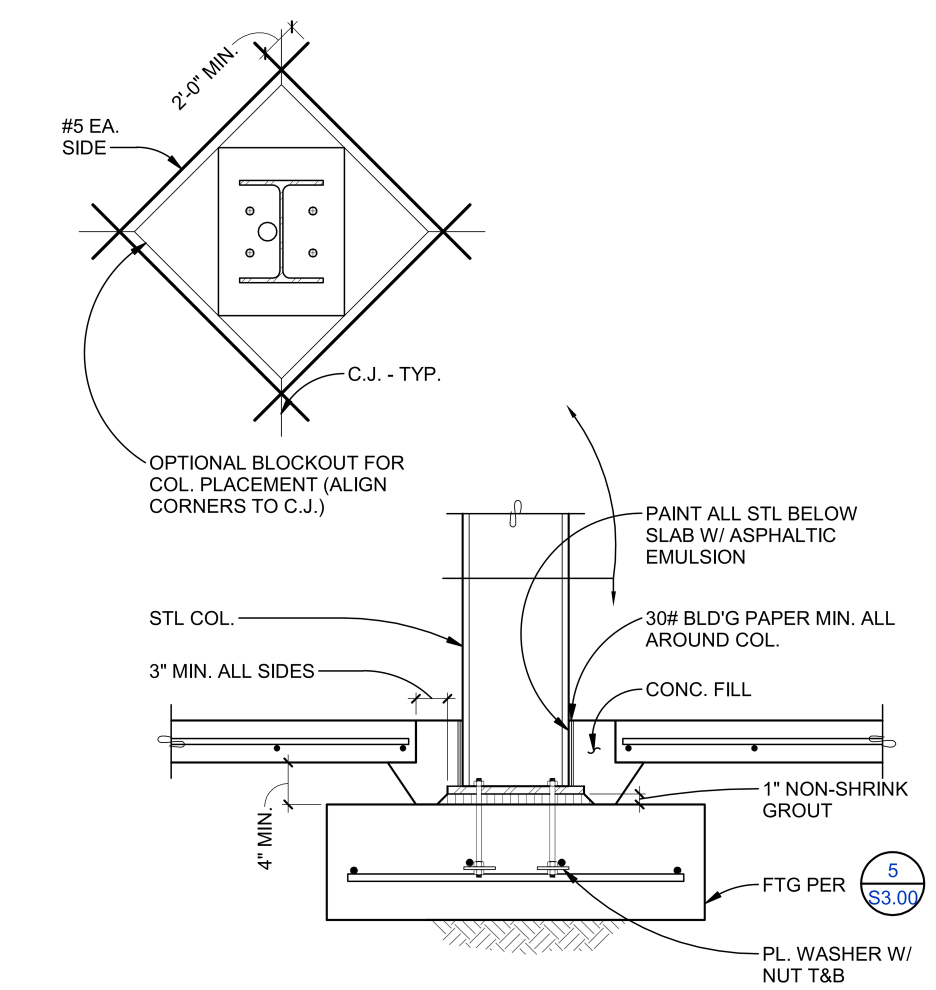


SECTION

NOTES:
1. CENTER ALL FOOTINGS ON COLUMN ABOVE EXCEPT AS SHOWN OTHERWISE.
2. FOOTINGS SHALL BEAR ON UNDISTURBED OR COMPACTED MATERIAL PER GENERAL NOTES. DESIGN BEARING PRESSURE IS 6000 POUNDS PER SQUARE FOOT.

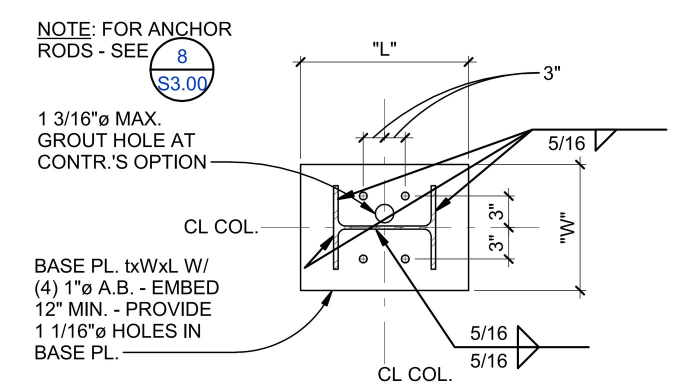
TYPICAL CONCRETE SPREAD FOOTING

5 SECTION
S3.00 NO SCALE



TYPICAL STEEL COLUMN AT SPREAD FOOTING

6 SECTION
S3.00 NO SCALE

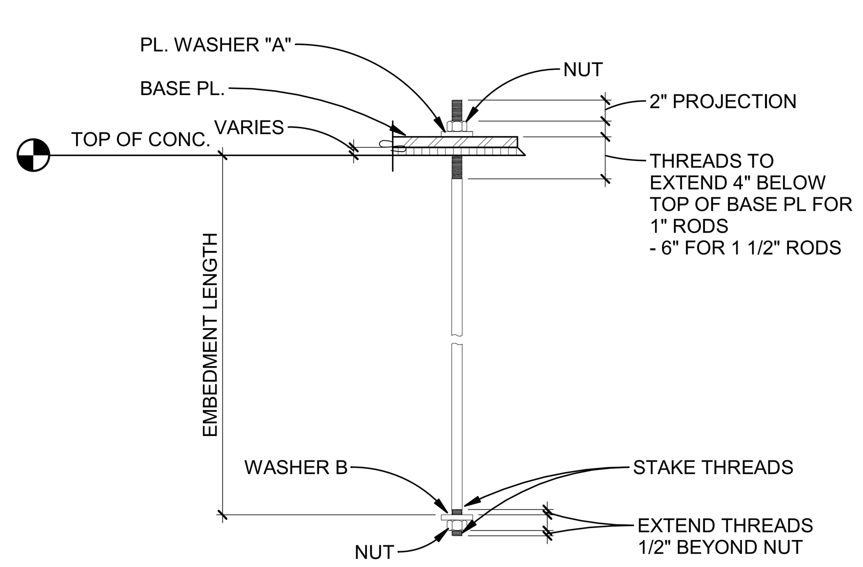


WIDE FLANGE

COLUMN SIZE	"W" (IN.)	"L" (IN.)	"t" (IN.)
W14x145	20	18	1-3/4
W14x283	22	22	2-1/2

TYPICAL MOMENT FRAME COLUMN BASE PLATE

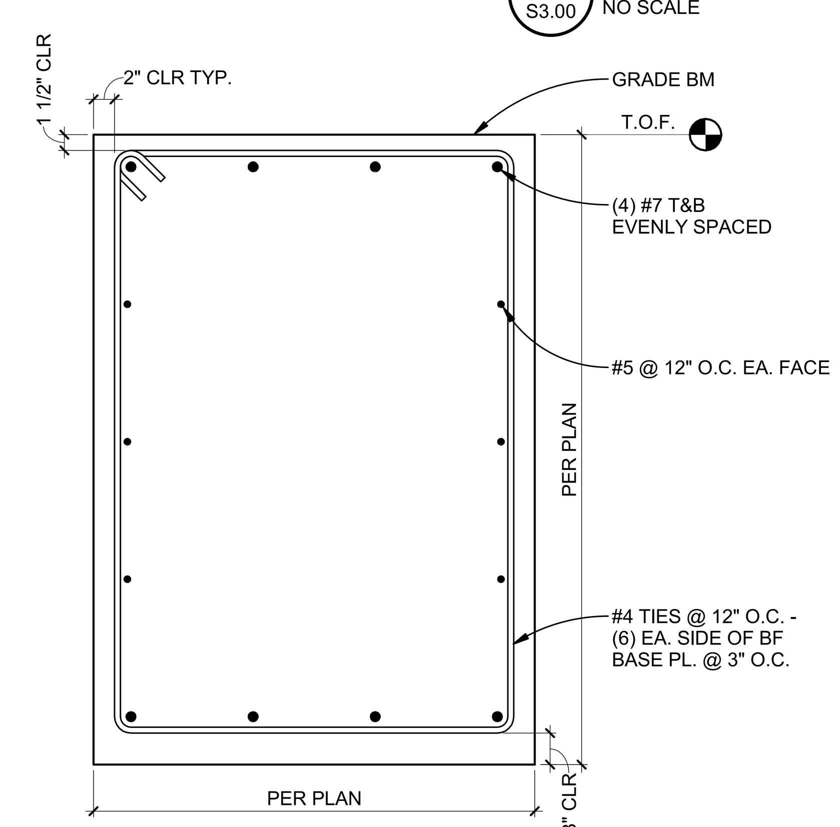
7 DETAIL
S3.00 NO SCALE



ANCHOR ROD		WASHER		NUT
SIZE	MATERIAL	TYPE	SIZE	
1"ø	A490	A	PL. 1/2"x3"x0'-3" W/ 1 1/16"ø HOLE CTR'D	A563 GRADE A HEAVY HEX
		B	ASTM A36 CARBON FLAT WASHER	

TYPICAL ANCHOR ROD/BOLT DETAIL

8 DETAIL
S3.00 NO SCALE



9 DETAIL
S3.00 NO SCALE

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TITLE
FOUNDATION DETAILS

SHEET NUMBER
S3.00

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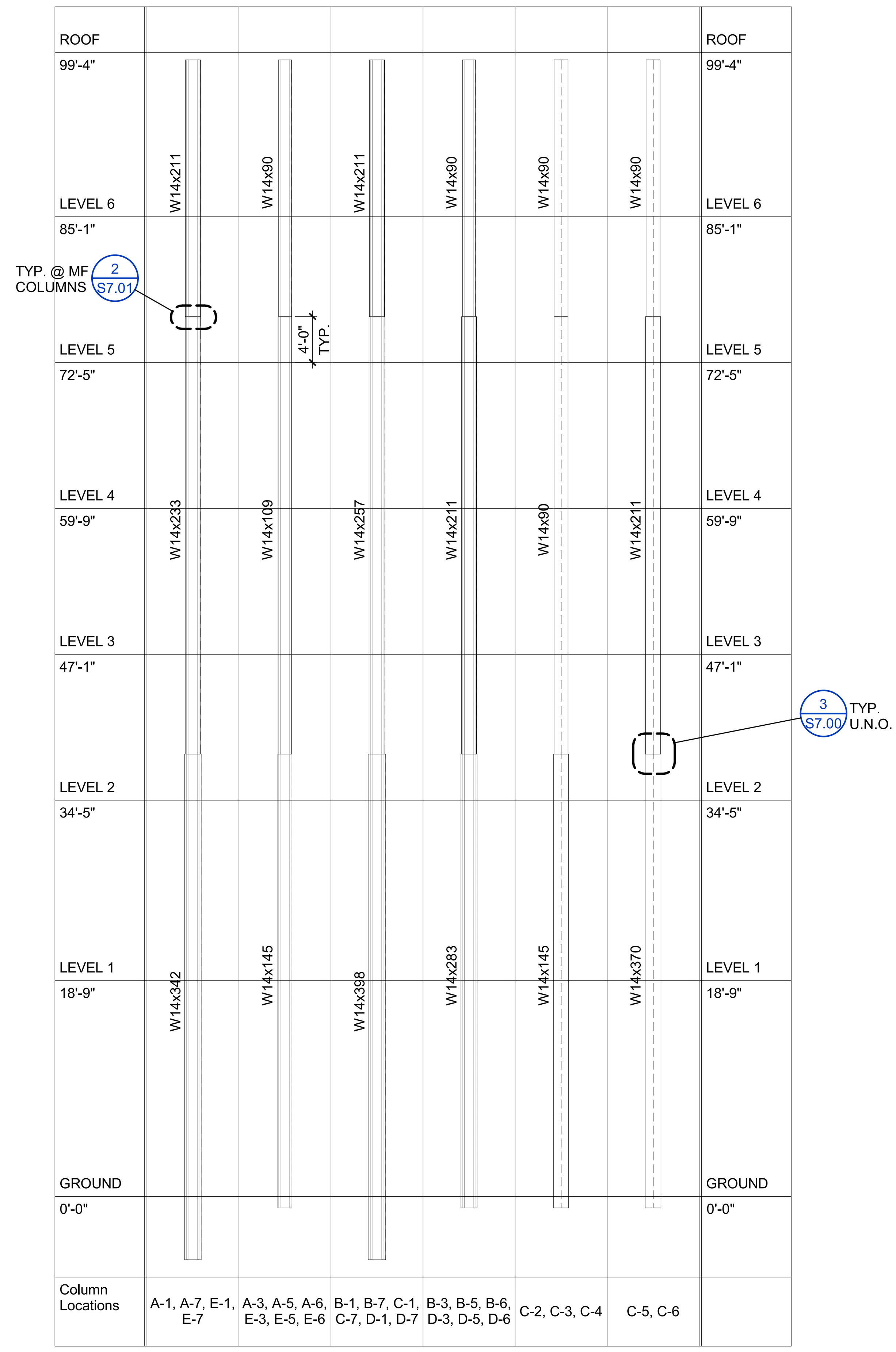

1
S4.00
COLUMN SCHEDULE
1/8" = 1'-0"

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HEALTHCARE FACILITY
LONG ISLAND, NEW YORK
PCS STRUCTURAL SOLUTIONS
DESIGN A
1987 NBC WITH EQUIVALENT RISK CATEGORY III

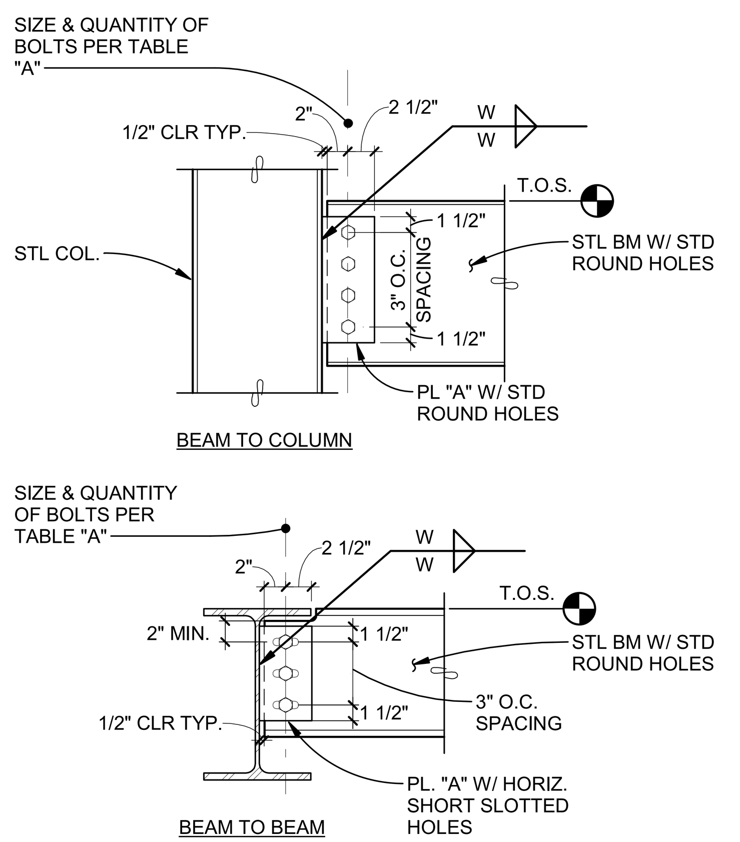
This publication is available free of charge from: https://doi.org/10.6028/NIST.GCR.21-917-48v2A

DRAWINGS
30 SEPTEMBER, 2021

Job Number	19-051
Checked	Checker
Approved	Approver

TITLE
COLUMN SCHEDULE

SHEET NUMBER
S4.00



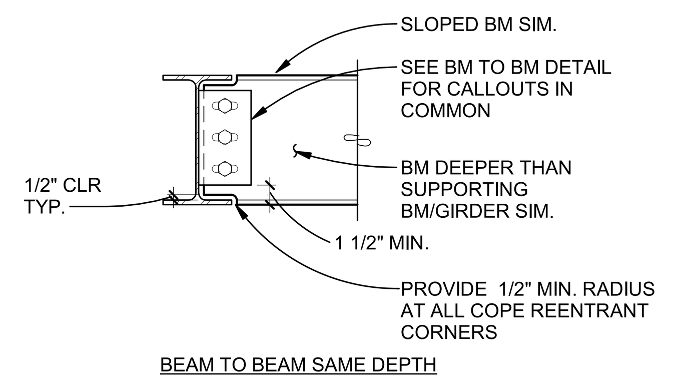
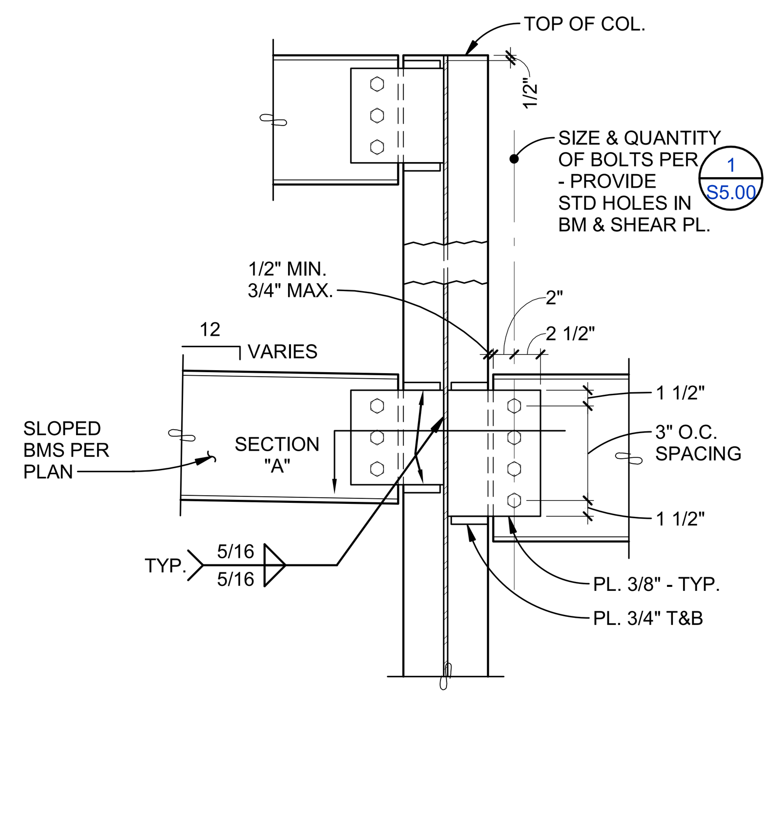


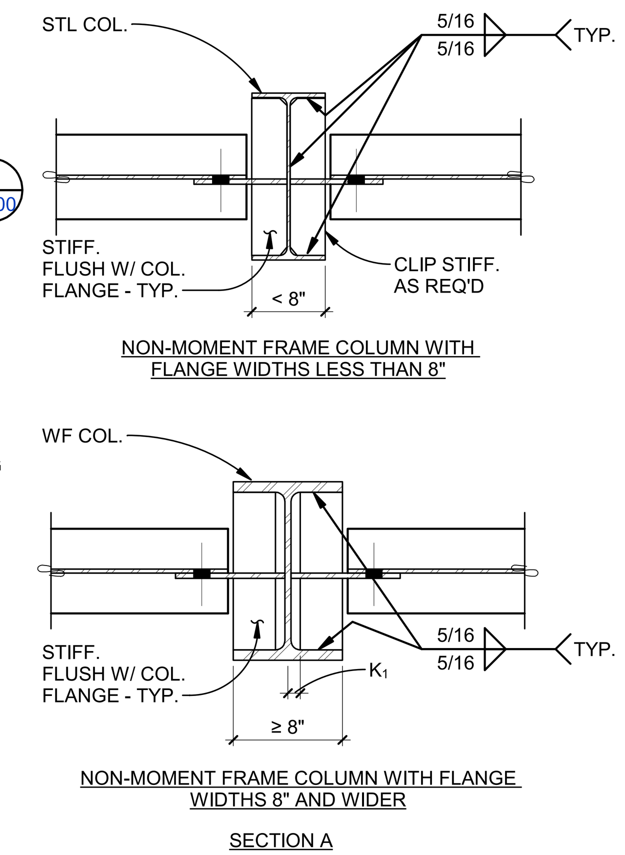
TABLE A

SUPPORTED BEAM SIZE	QUANTITY OF 7/8"ø A325N BOLTS	SHEAR PLATE THICKNESS "A"	WELD "W" NOTE 1.
W10	2	3/8"	5/16"
W12, W14	3	3/8"	5/16"
W16, W18	4	3/8"	5/16"
W21	5	3/8"	5/16"
W24	6	3/8"	5/16"
W27	7	3/8"	5/16"
W30	7	3/8"	5/16"
W33	8	3/8"	5/16"

TYPICAL STEEL DETAIL

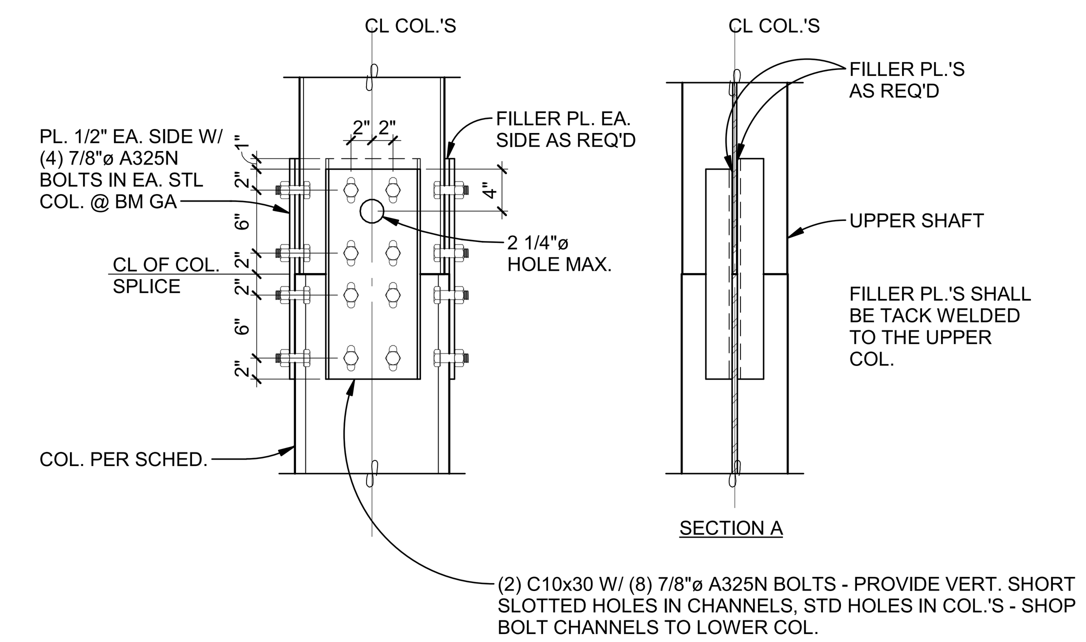
1 DETAIL
S5.00 NO SCALE





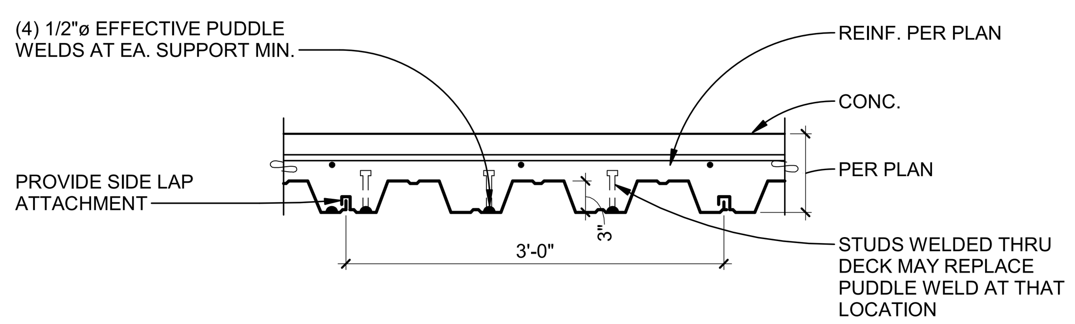
TYPICAL BEAM/COLUMN FRAMING INTO WEB

2 DETAIL
S5.00 NO SCALE



TYPICAL COLUMN SPLICE

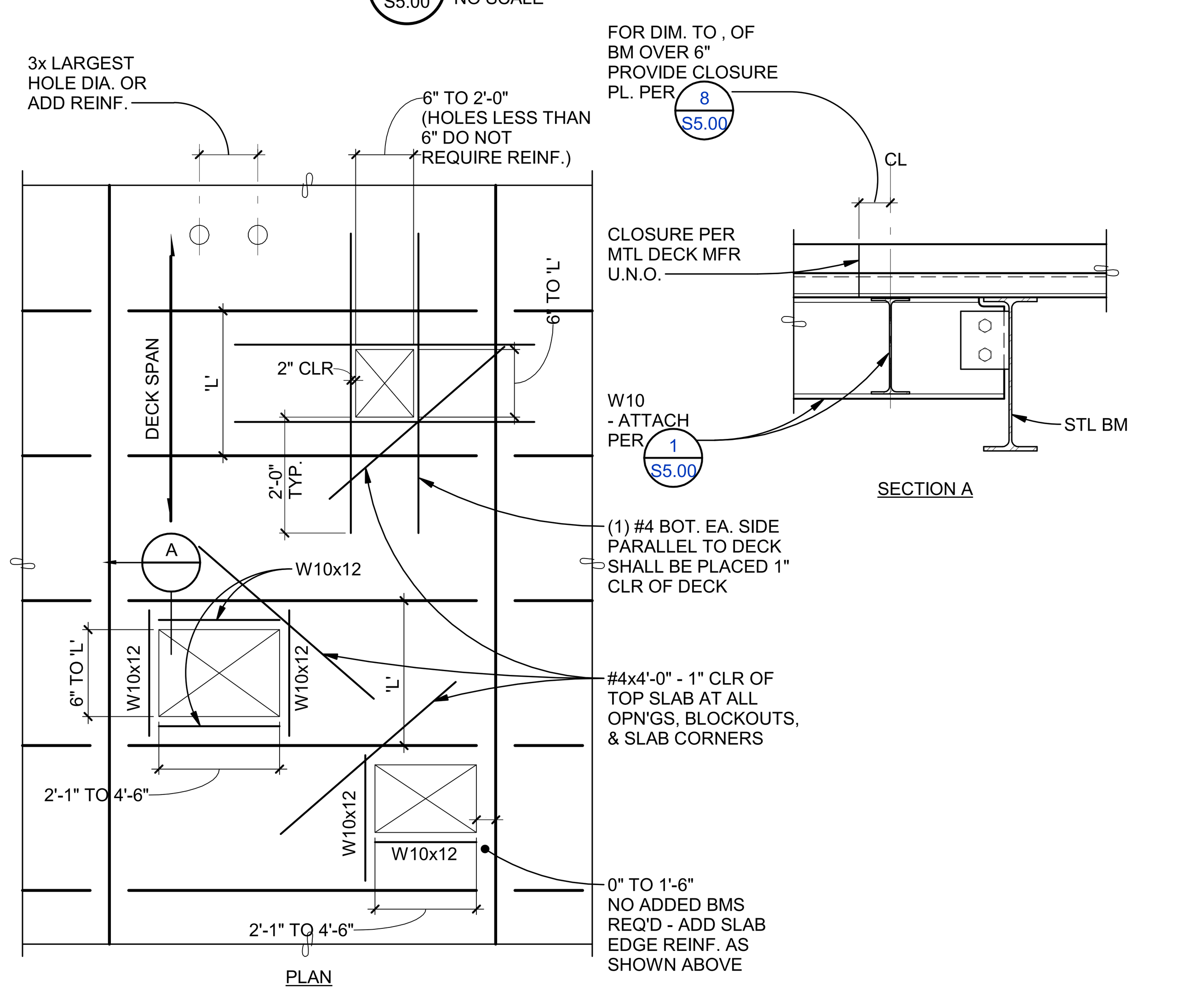
3 DETAIL
S5.00 NO SCALE



NOTES:
1. (2) SPAN MINIMUM, (3) SPAN PREFERRED.
2. AT SUPPORTS PARALLEL TO CORRUGATIONS, PROVIDE PUDDLE WELDS @ 24" O.C. MAXIMUM.

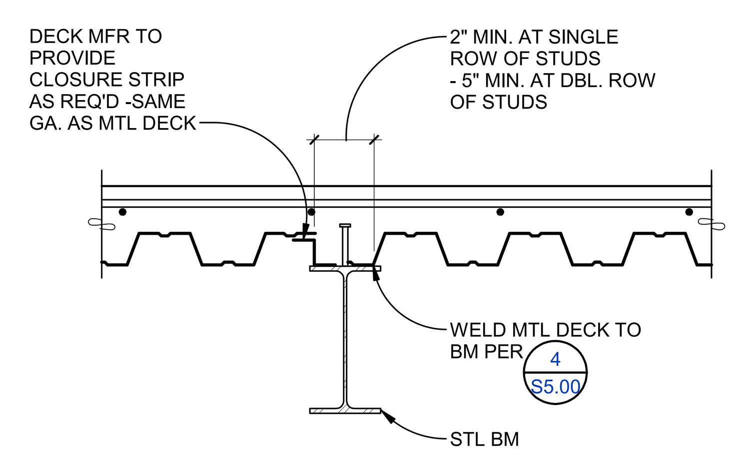
TYPICAL COMPOSITE FLOOR DECK

4 DETAIL
S5.00 NO SCALE



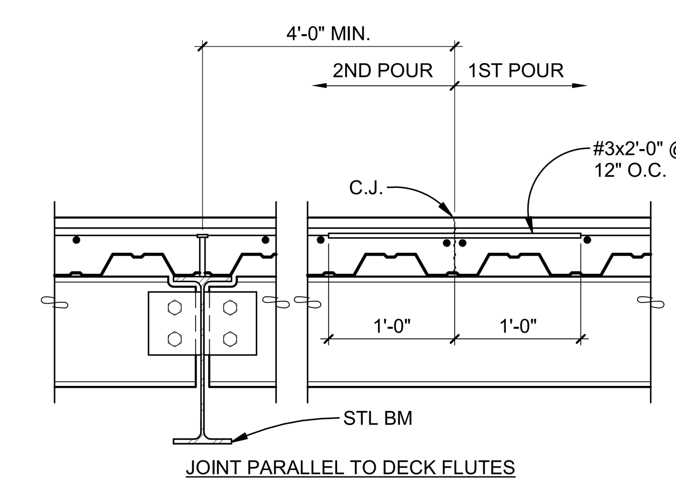
TYPICAL FLOOR PENETRATION REINFORCEMENT

5 DETAIL
S5.00 NO SCALE

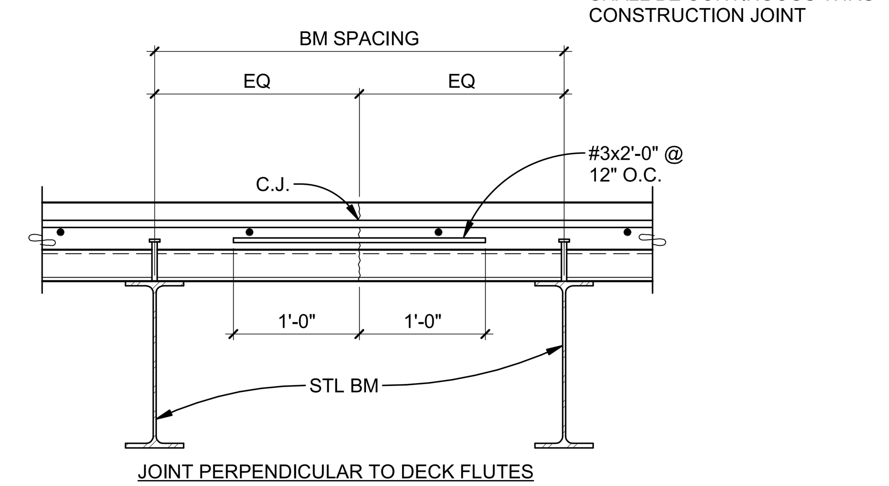


TYPICAL AT METAL DECK PARALLEL TO BEAM

6 SECTION
S5.00 NO SCALE

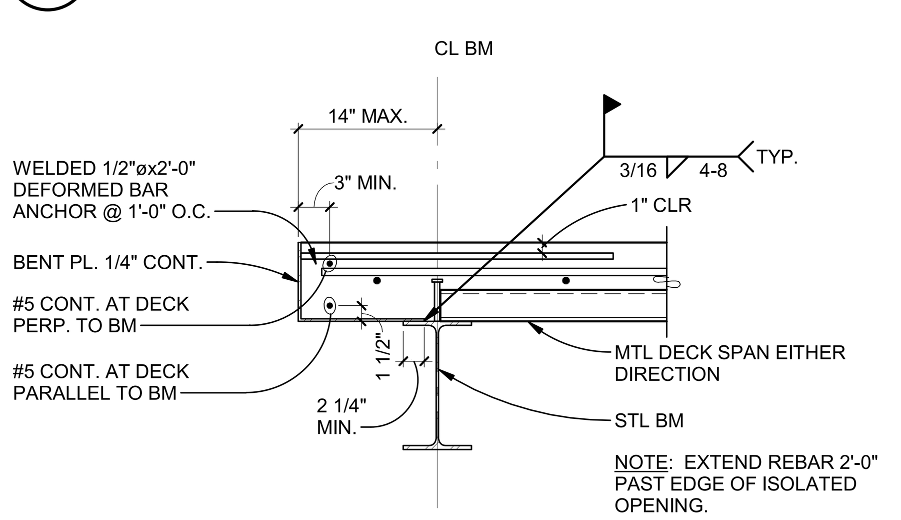


NOTE: ALL REINFORCEMENT SHALL BE CONTINUOUS THRU CONSTRUCTION JOINT



TYPICAL COMPOSITE DECK CONSTRUCTION JOINT

7 SECTION
S5.00 1" = 1'-0"

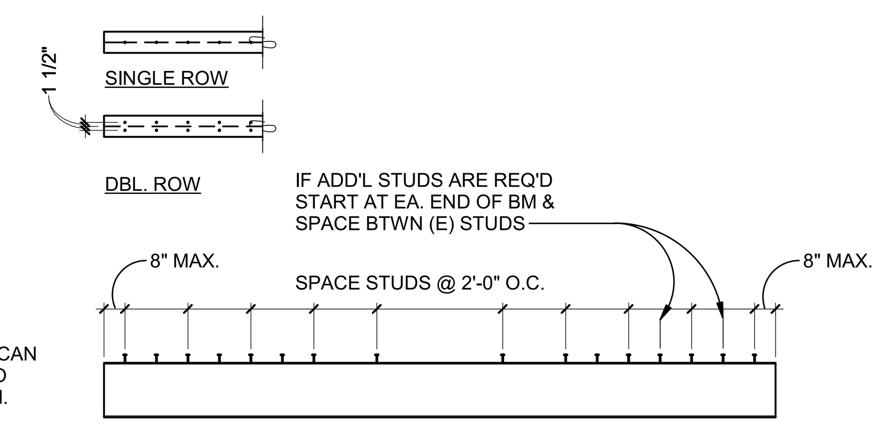


NOTE: EXTEND REBAR 2'-0" PAST EDGE OF ISOLATED OPENING.

TYPICAL SLAB EDGE CONDITION - OVER 6" OVERHANG

8 SECTION
S5.00 NO SCALE

NOTES:
1. LOCATE STUDS AT CENTER OF BEAM FLANGE.
2. STUDS ARE 3/4"ø x 4 1/2" LONG AFTER WELDING.
3. SEE FRAMING PLANS FOR NUMBER OF STUDS.
4. ALL BEAMS WITH STUDS ARE COMPOSITE STEEL BEAMS.
5. PROVIDE A DOUBLE ROW OF STUDS AT BEAMS WHERE THE REQUIRED NUMBER OF STUDS EXCEEDS THE NUMBER THAT CAN FIT IN A SINGLE ROW AT 6" ON CENTER AT DECK PARALLEL TO BEAM OR 12" ON CENTER AT DECK PERPENDICULAR TO BEAM.



TYPICAL COMPOSITE BEAM DETAIL

9 DETAIL
S5.00 NO SCALE

9/27/2021 8:34:34 AM
C:_Revit Models\BUILDING 2 - ATC BLDG 2 NBC 1987 SDC B RC3 v2020 (Central)_dhome@pcs-structural.com.rvt

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TITLE
STEEL DETAILS

SHEET NUMBER
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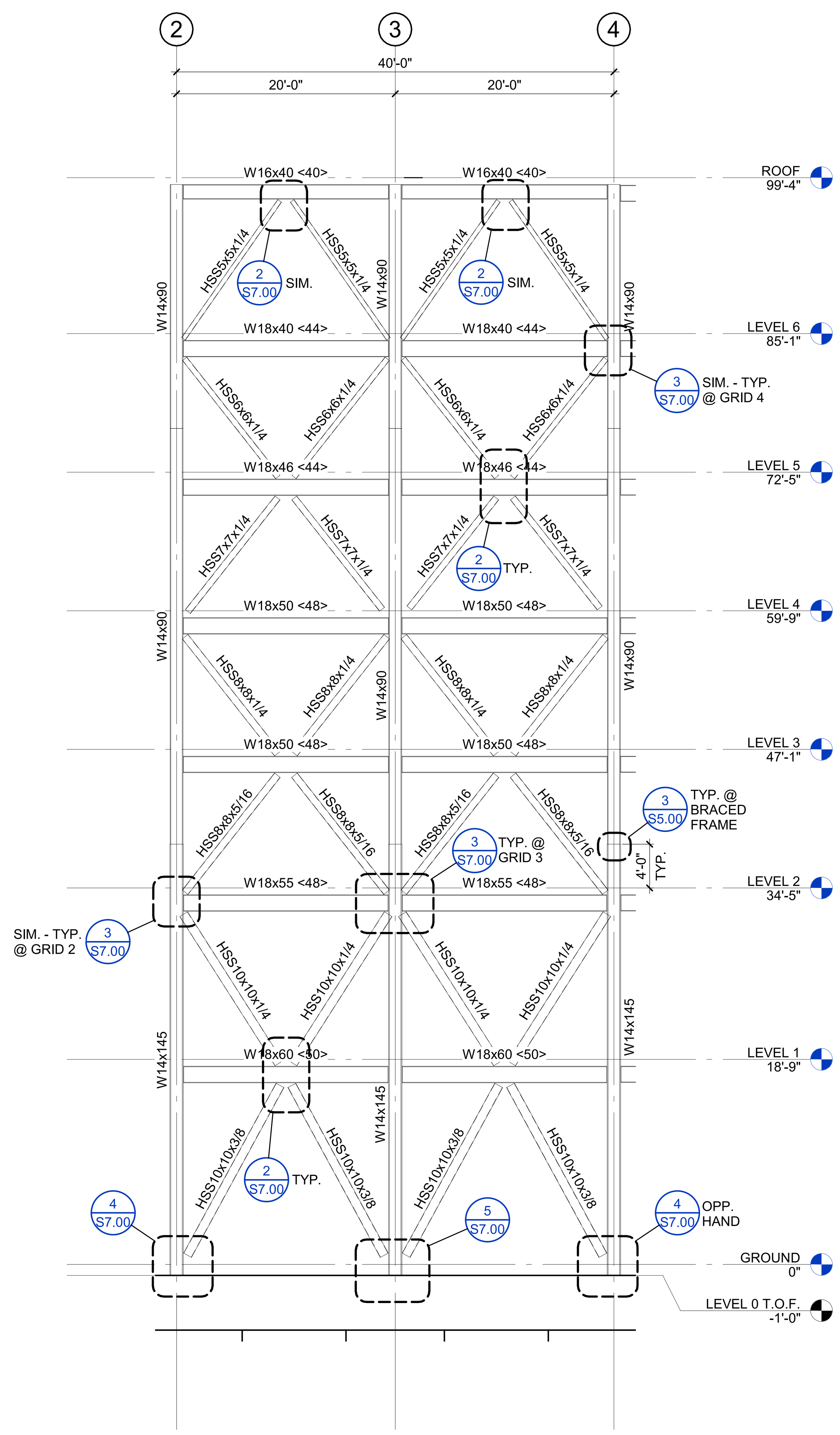
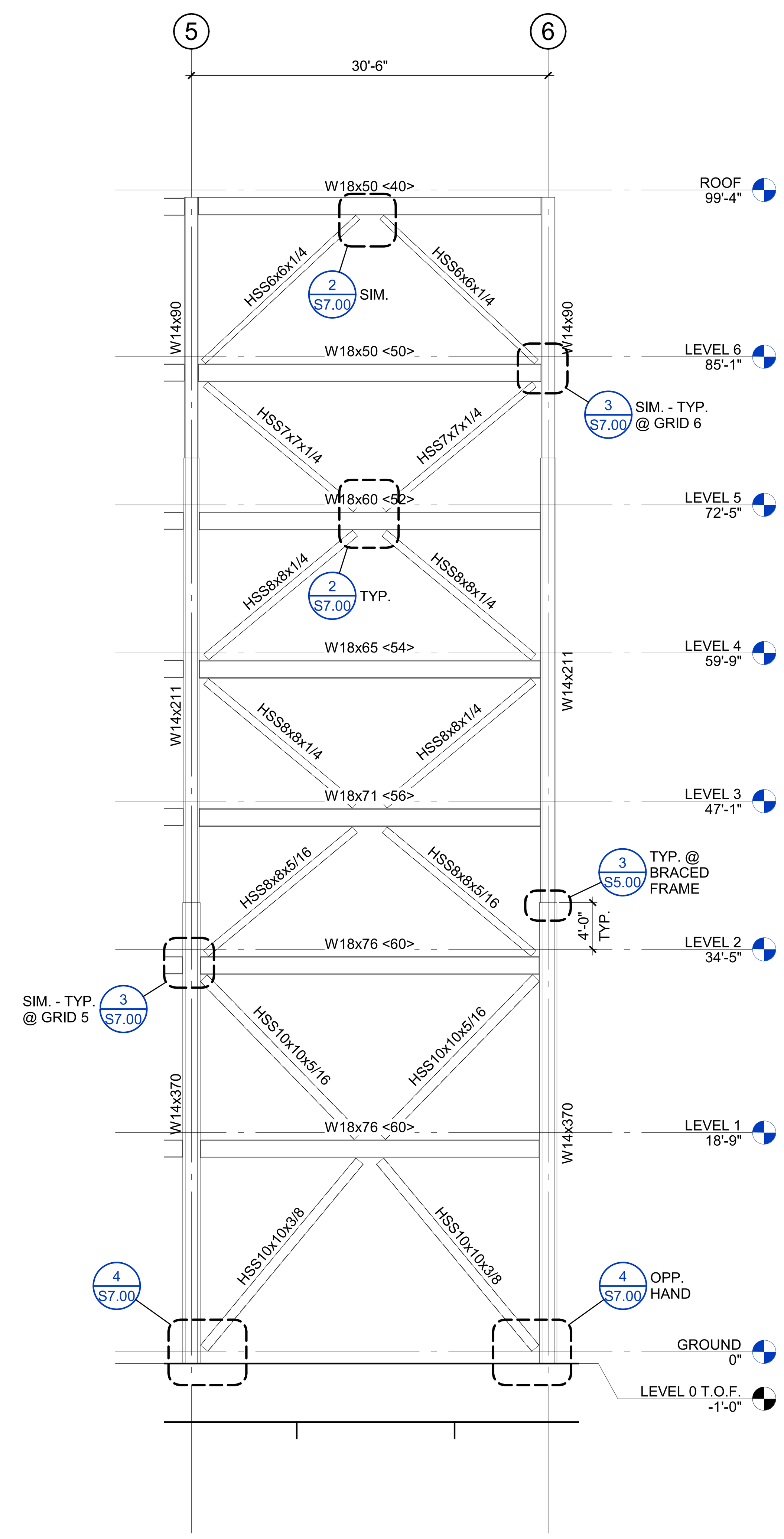


1 S6.00 BRACED FRAME ELEVATION
1/8" = 1'-0"



2 S6.00 BRACED FRAME ELEVATION
1/8" = 1'-0"

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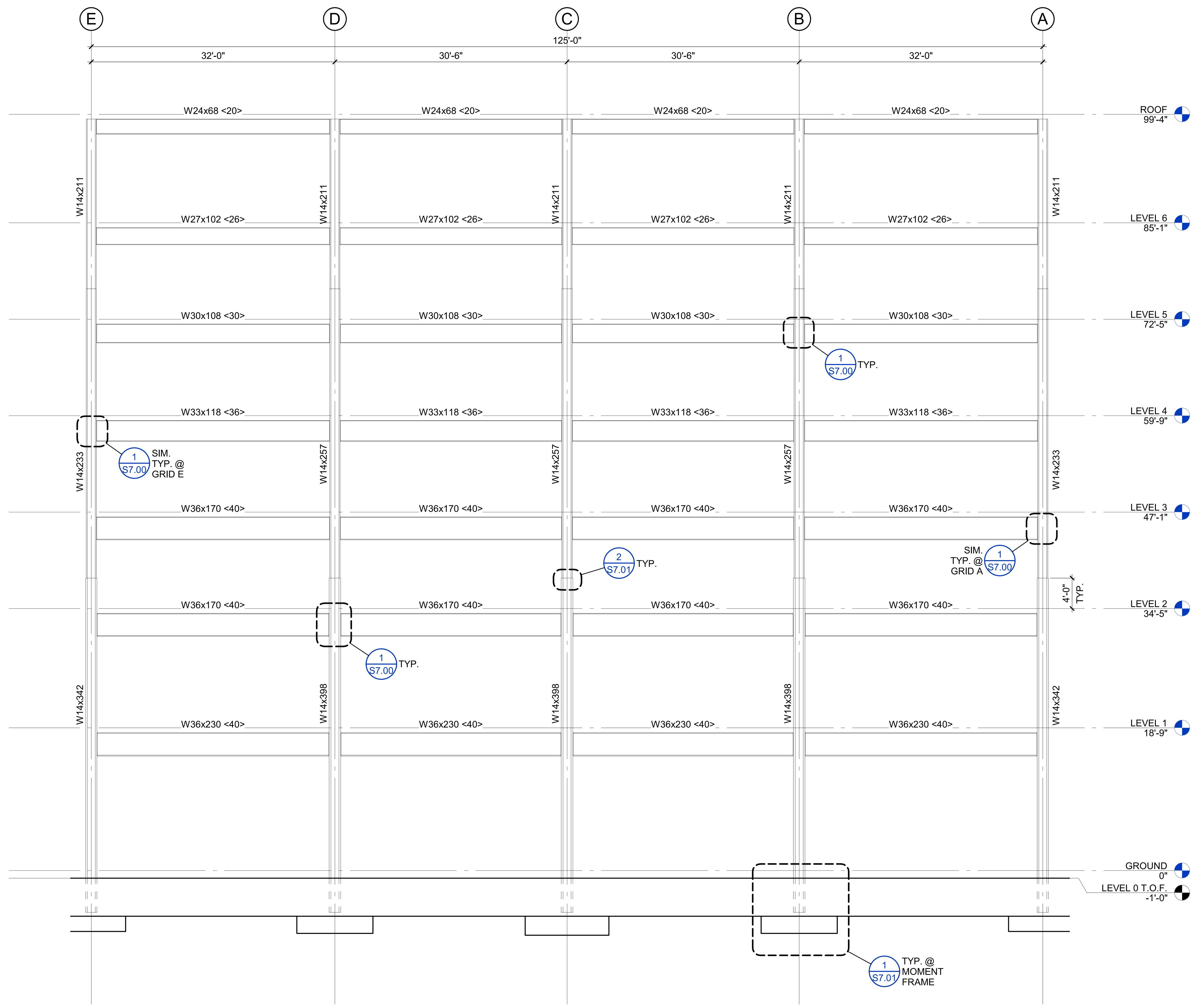
TITLE
BRACED FRAME ELEVATIONS

SHEET NUMBER
S6.00



1 S6.01 MOMENT FRAME ELEVATION
1/8" = 1'-0"

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TITLE
MOMENT FRAME ELEVATION

SHEET NUMBER
S6.01

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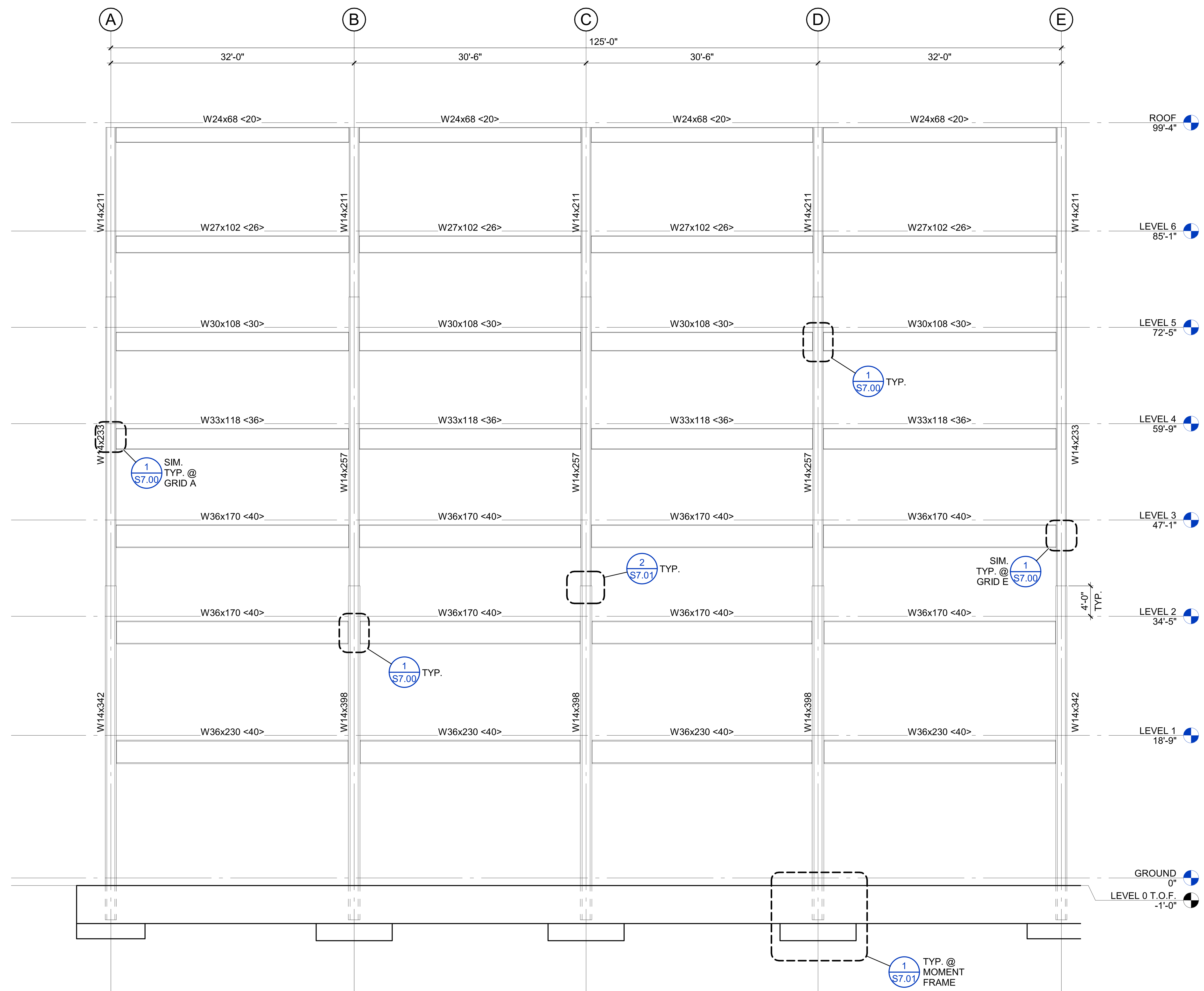

1 S6.02 MOMENT FRAME ELEVATION
1/8" = 1'-0"

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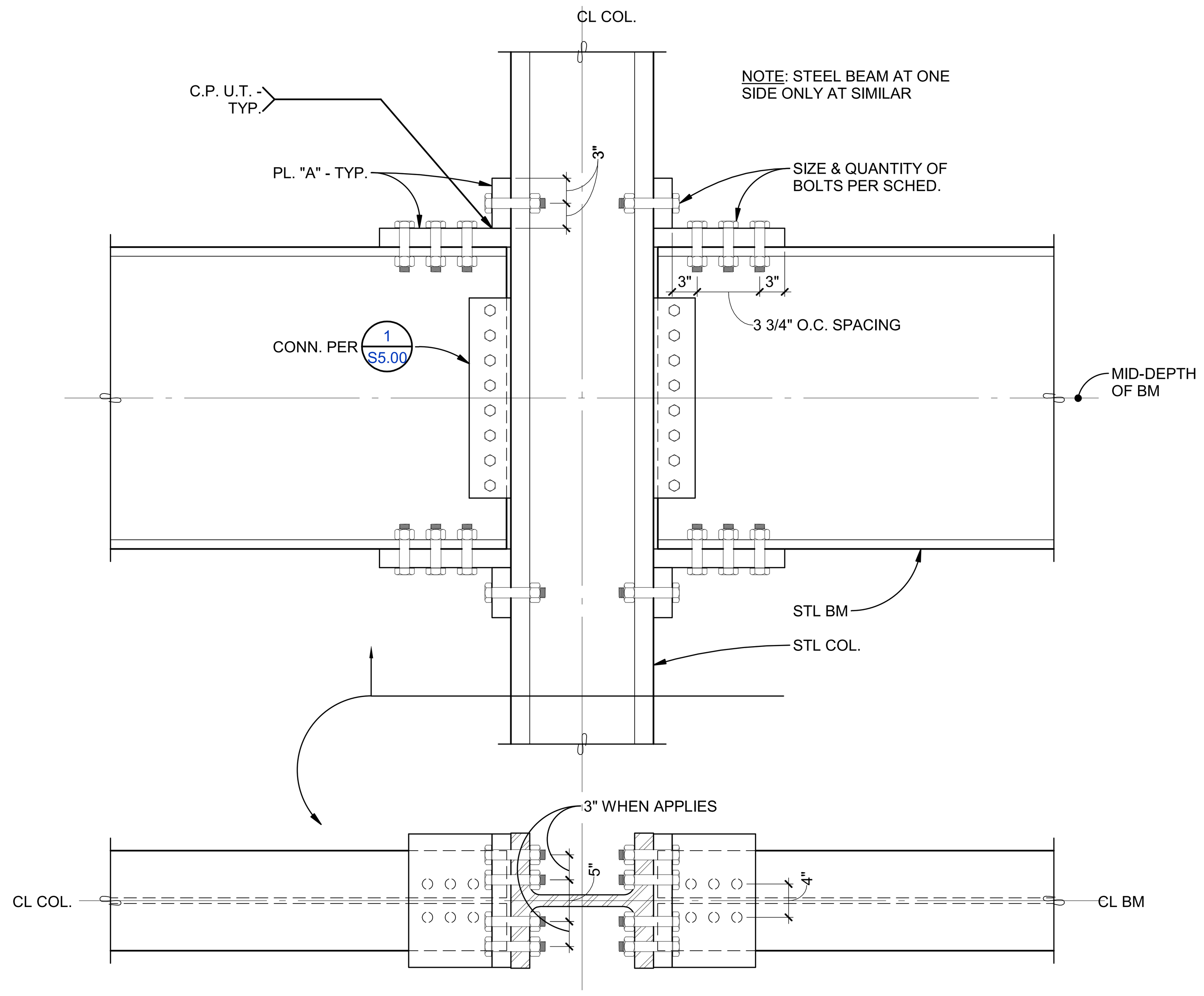
TITLE
MOMENT FRAME ELEVATION

SHEET NUMBER
S6.02

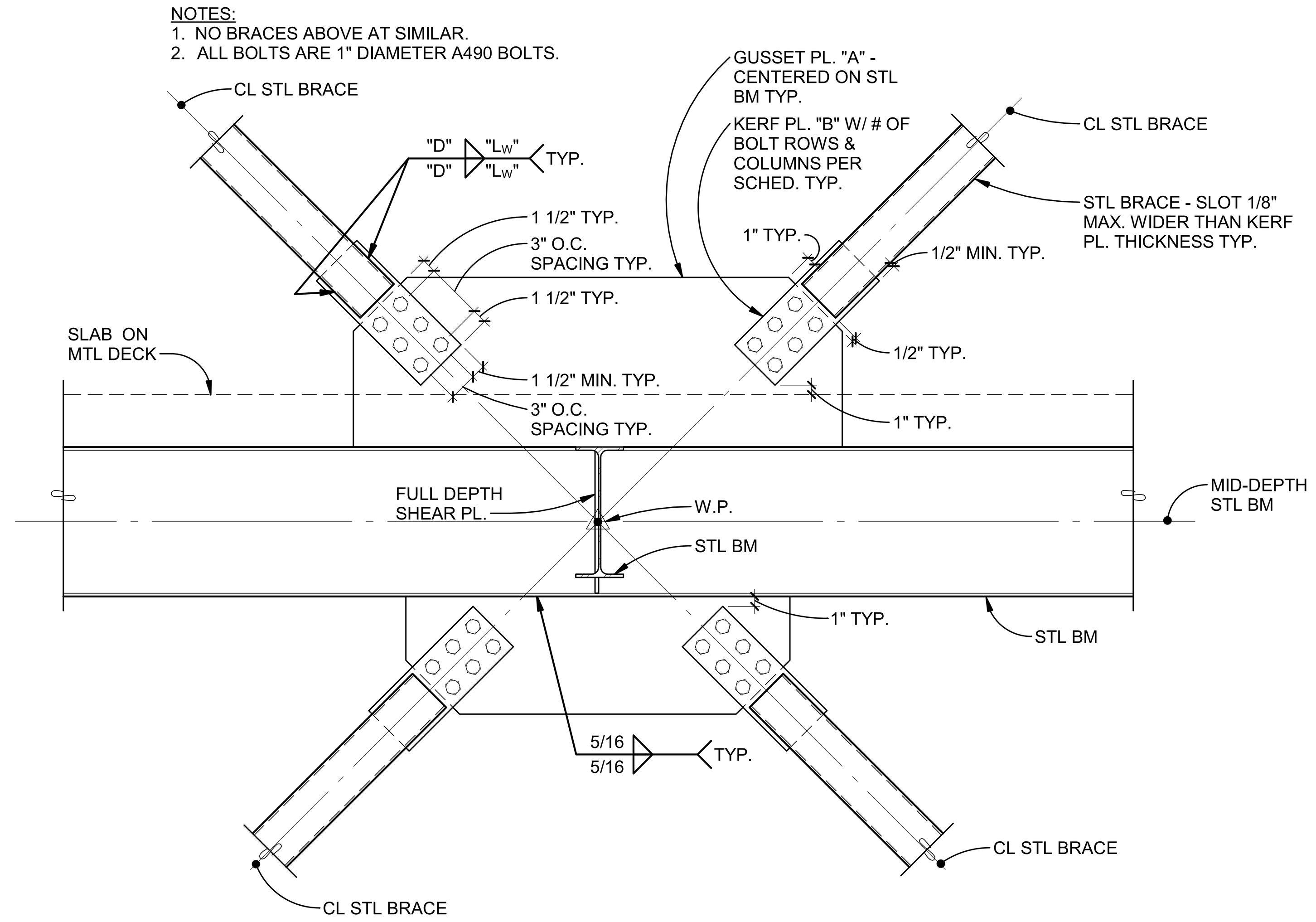
MOMENT FRAME CONNECTION SCHEDULE			
STEEL BEAM SIZE	PLATE "A" SIZE	QUANTITY OF 1 1/4"ø A490X BOLTS FROM PLATE TO COLUMN	QUANTITY OF 1 1/4"ø A490X BOLTS FROM PLATE TO BEAM
W36	2 1/4"x16"	4	8
W33	2"x15 3/4"	4	4
W30 & W27	2"x15 3/4"	4	4
W24	1 1/2"x14"	2	4



1 S7.00 DETAIL
NO SCALE

BRACED FRAME CONNECTION SCHEDULE						
STEEL BRACE SIZE	GUSSET PLATE "A" THICKNESS	WELD SIZE "D"	LENGTH OF WELD "LW"	KERF PL. "B" THICKNESS	NUMBER OF A490 BOLT COLUMNS	NUMBER OF A490 BOLT ROWS
HSS5x5	1/2"	1/4"	6"	1/2"	2	2
HSS6x6	3/4"	5/16"	6"	3/4"	2	2
HSS7x7	1"	5/16"	8"	1"	2	2
HSS8x8	1 1/4"	7/16"	9"	1 1/4"	3	3
HSS10x10	1 1/2"	1/2"	12"	1 1/2"	3	3

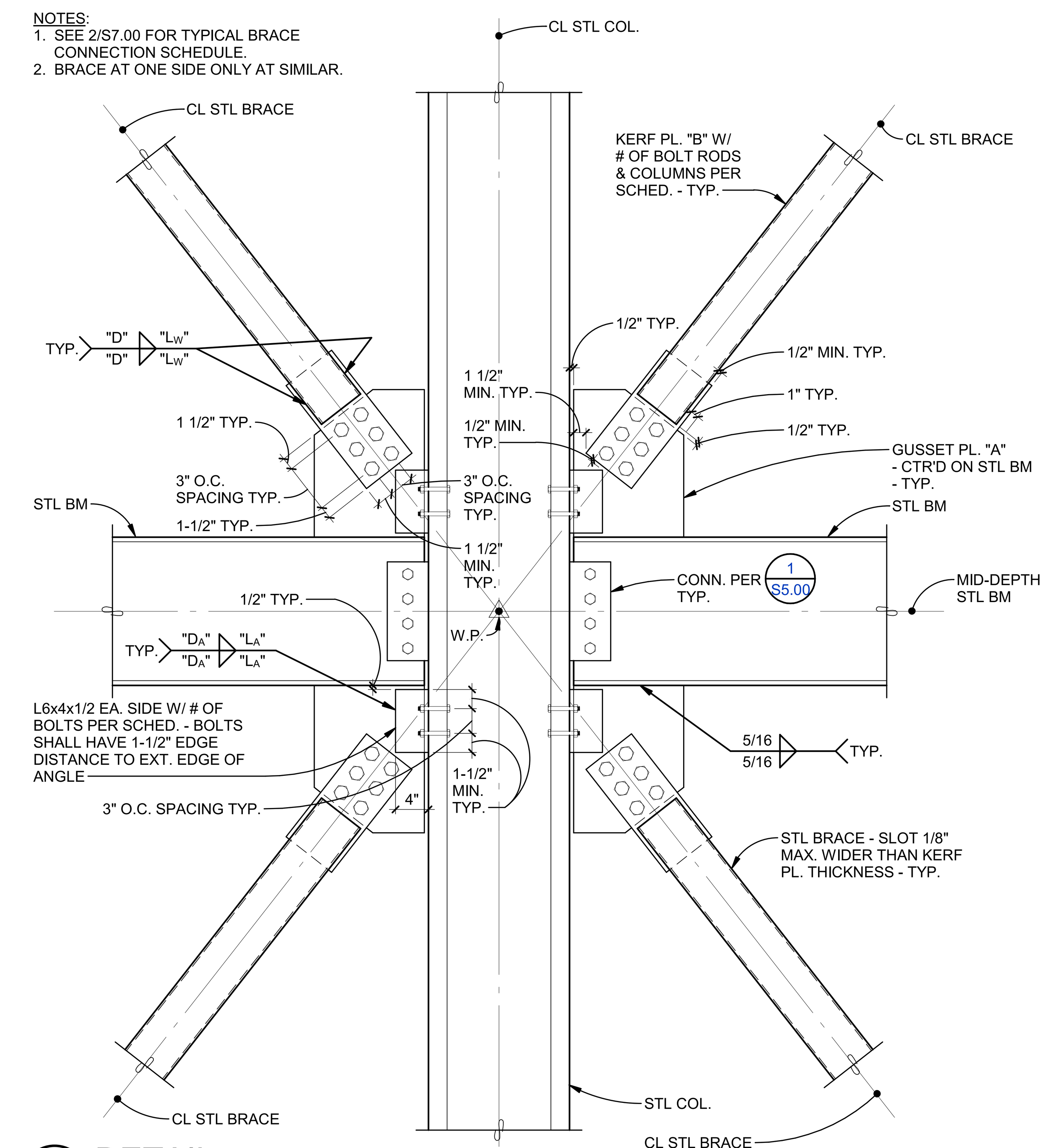
NOTES:
1. NO BRACES ABOVE AT SIMILAR.
2. ALL BOLTS ARE 1" DIAMETER A490 BOLTS.



2 S7.00 DETAIL
NO SCALE

BRACED FRAME CONNECTION SCHEDULE			
STEEL BRACE SIZE	WELD SIZE "DA"	MINIMUM WELD LENGTH "LA"	NUMBER OF 1"ø A490 BOLTS
HSS5x5	5/16"	6"	1
HSS6x6	5/16"	9 1/2"	2
HSS7x7	5/16"	12"	3
HSS8x8	5/16"	20"	5
HSS10x10	7/16"	24"	8

NOTES:
1. SEE 2/S7.00 FOR TYPICAL BRACE CONNECTION SCHEDULE.
2. BRACE AT ONE SIDE ONLY AT SIMILAR.



3 S7.00 DETAIL
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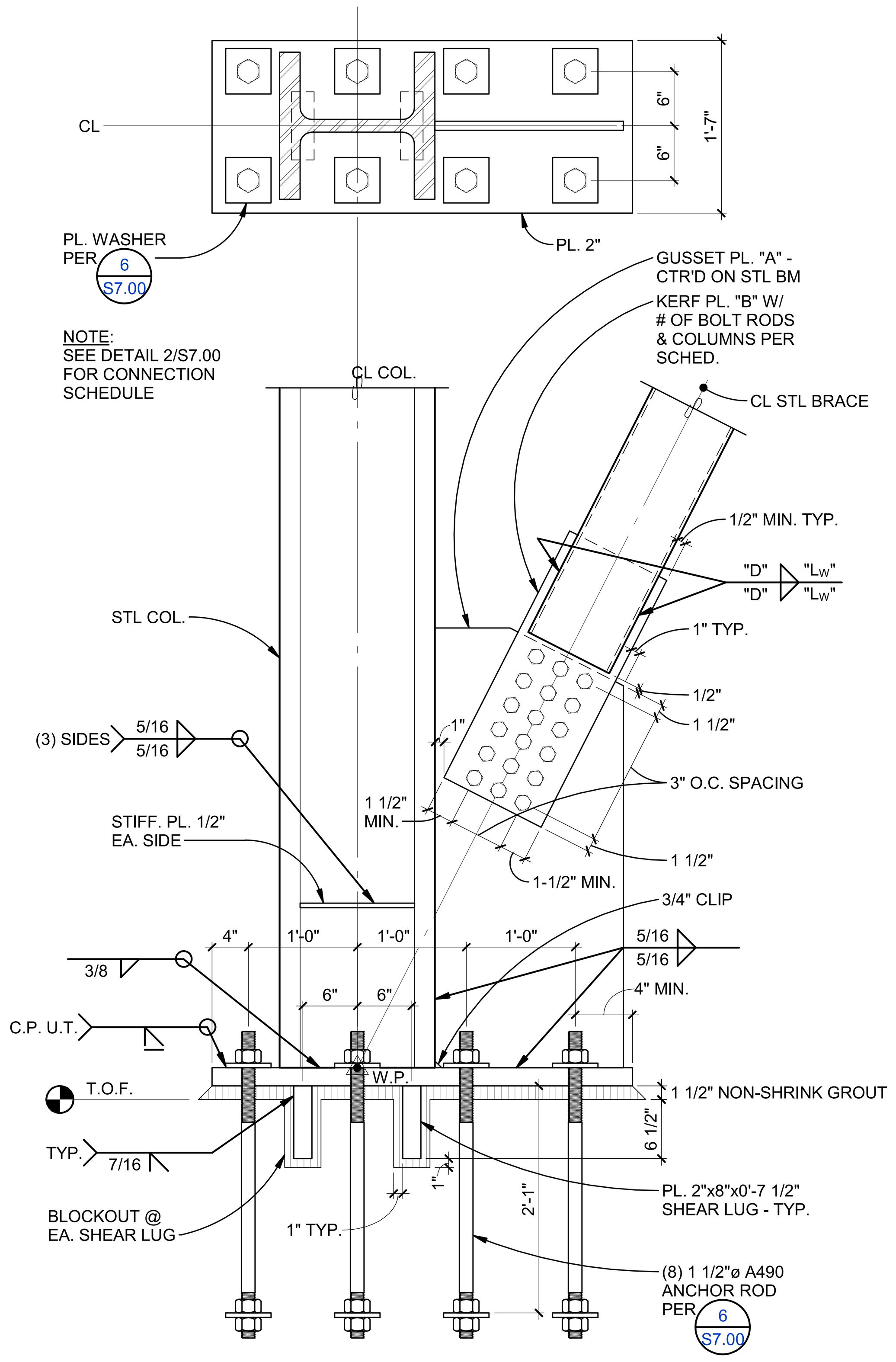

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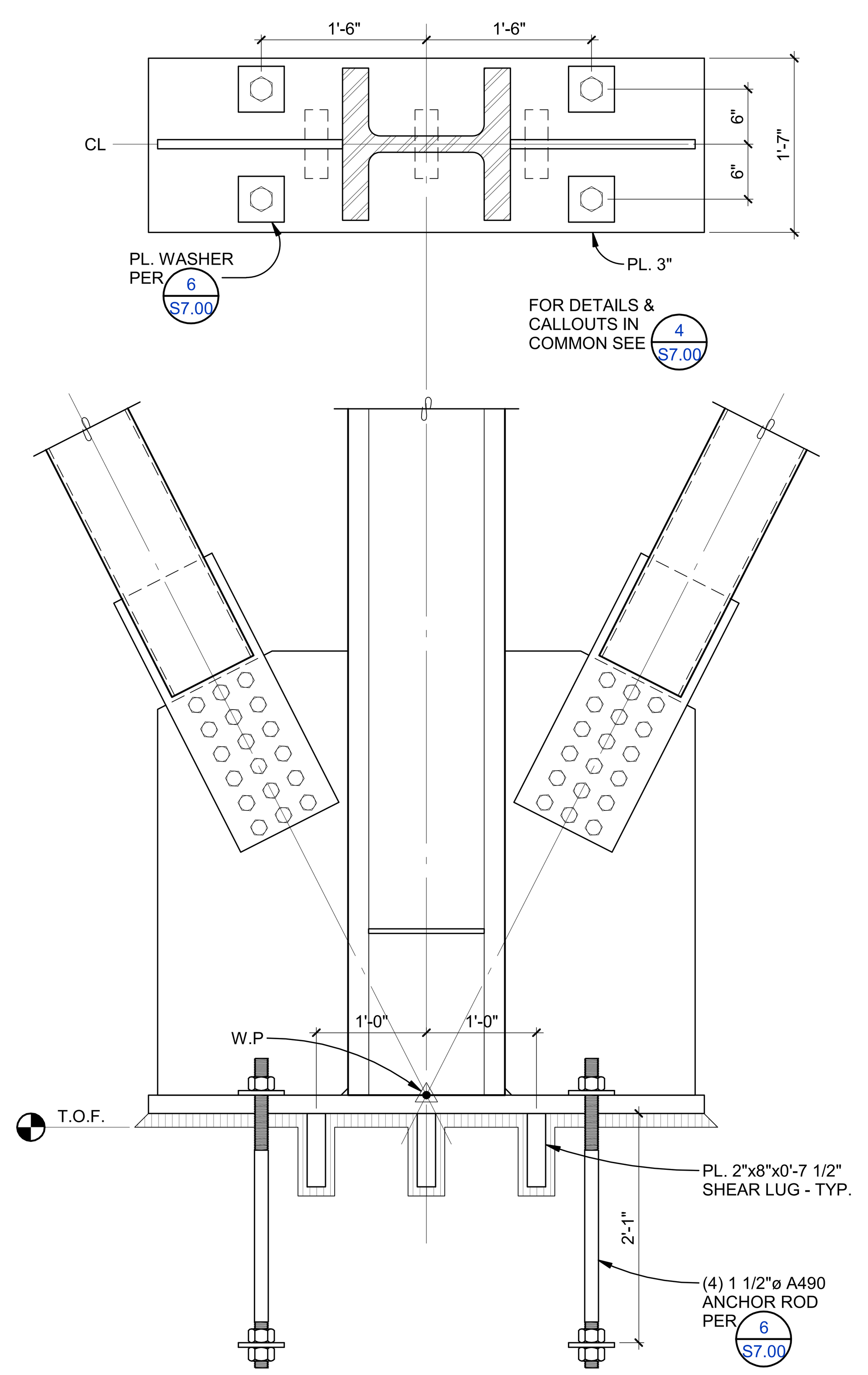
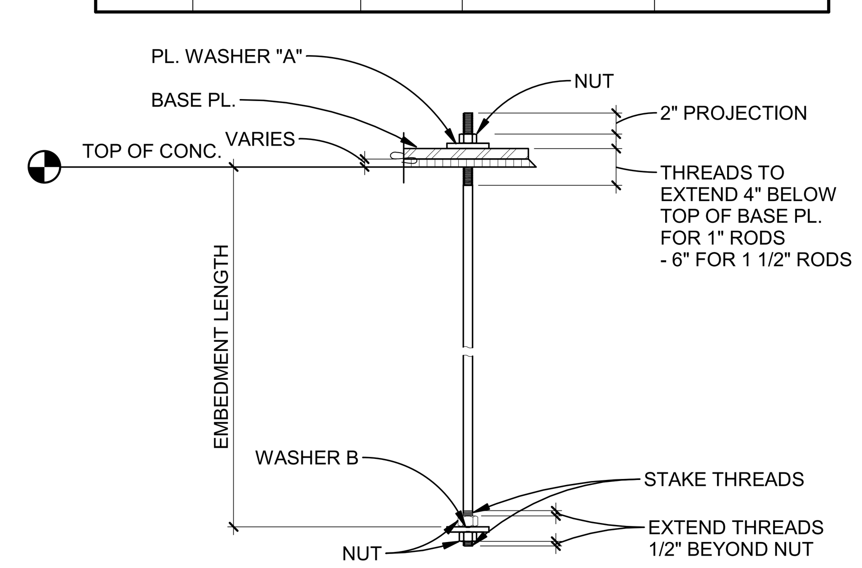


5 S7.00 SECTION
NO SCALE

ANCHOR ROD		WASHER		NUT
SIZE	MATERIAL	TYPE	SIZE	
1 1/2"ø	A490 GRADE 36	A	PL. 1/2"x5"x0'-5" W/ 1 7/8"ø HOLE CENTERED	A563 GRADE A HEAVY HEX
		B	ASTM A529 CARBON FLAT WASHER	



TYPICAL ANCHOR ROD/BOLT DETAIL

6 S7.00 SECTION
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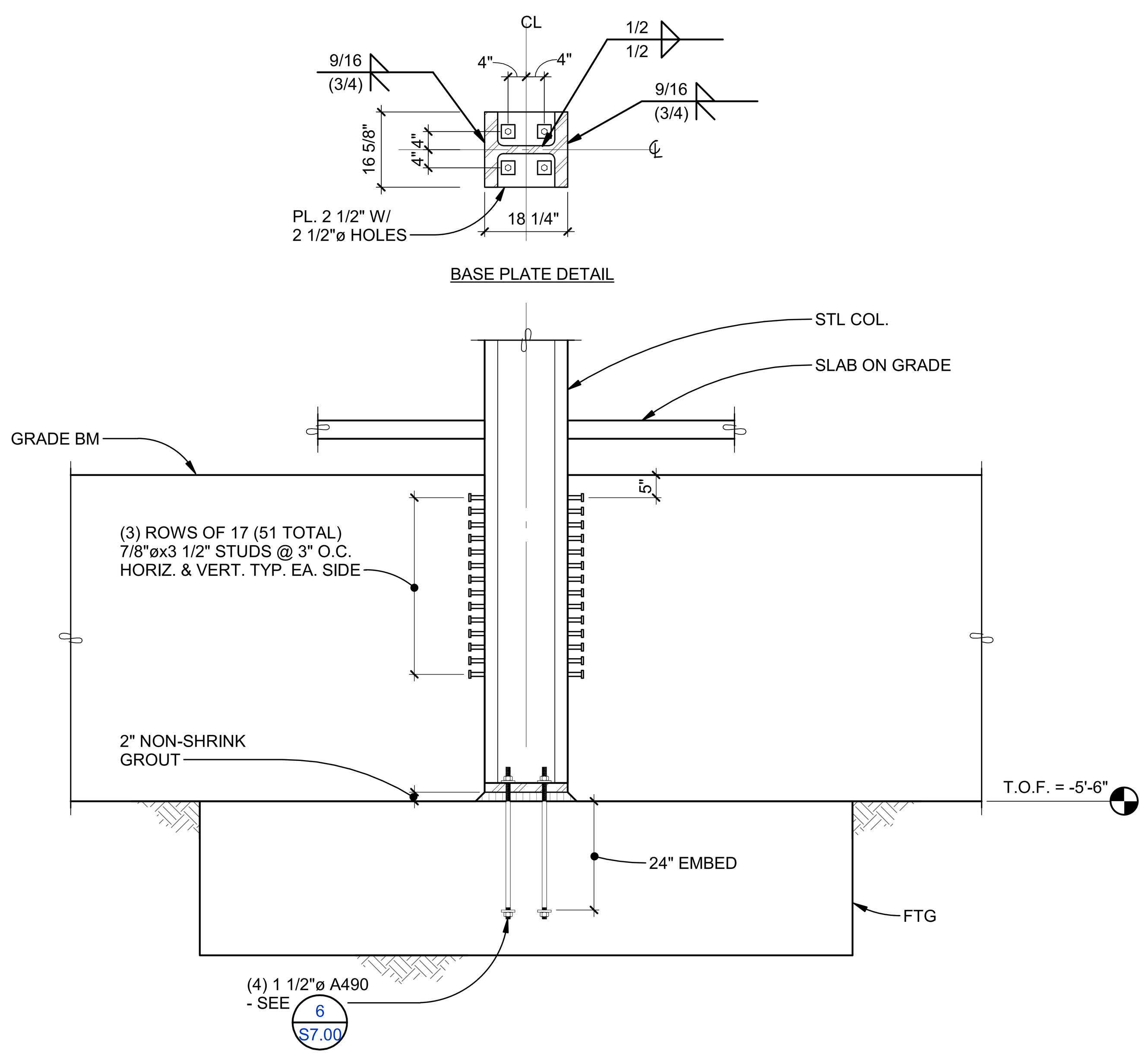

1 S7.01 SECTION
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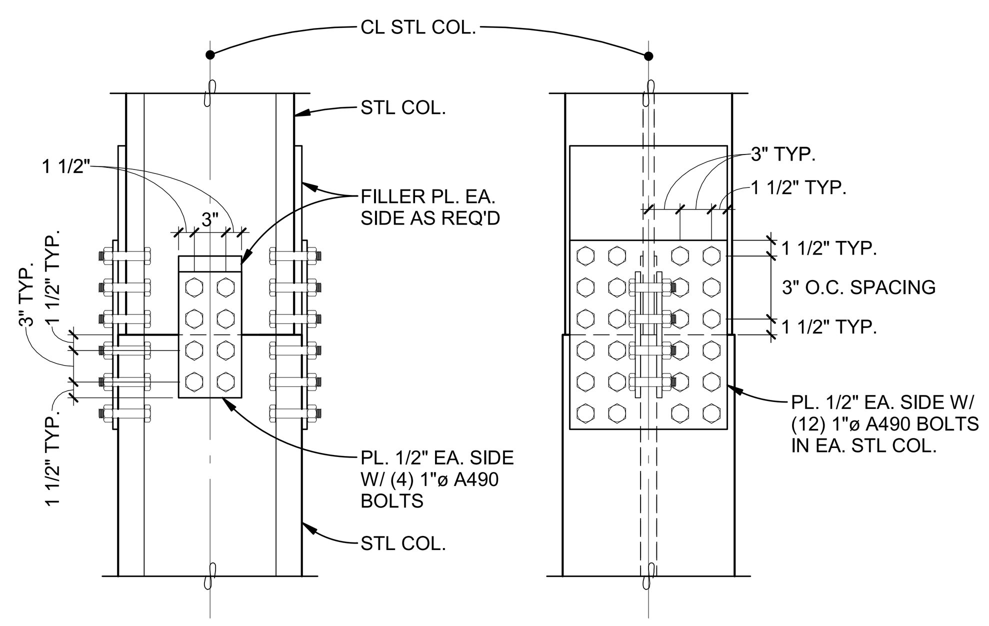

2 S7.01 DETAIL
NO SCALE

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Approved	Approver

TITLE
FRAME DETAILS

SHEET NUMBER
S7.01

Design Case B

2018 IBC
Risk Category III
Seismic Design Category B

B.1 Gravity Design

The 7-story healthcare facility is a steel framed building with 3” metal deck and 4-1/2” of concrete topping providing a total slab depth of 7-1/2”, not including the structural steel framing. This decking was chosen to provide the required 2-hour fire rating that is typical for healthcare facilities. The columns and beams are ASTM A992 steel wide flange members and were designed using Load Resistance Factor Design (LRFD) procedures in accordance with AISC *Steel Construction Manual* 15th edition. The deflection was limited to 2018 IBC prescribed limits of $L/480$ for applied floor live loads, $L/360$ for applied floor total loads, $L/360$ for applied roof live loads, and $L/240$ for applied roof total loads.

The calculated total dead load applied was 95 psf at the floors and 100 psf at the roof. The increase of dead load at the roof is attributed to the theoretical mechanical units that are typically placed on the roof structure. The live loads chosen for the floors and roof were provided in accordance with 2018 IBC Table 1607.1. It should be noted that the 40 psf roof live loads controlled the design over the calculated snow load per Chapter 7 of ASCE/SEI 7-16.

B.2 Lateral Design

There were two separate lateral-load-resisting systems for this building, a steel concentric braced frame system for lateral load resistance in the North/South direction and a steel moment frame system for lateral load resistance in the East/West direction. The applied wind and seismic loads were determined using Chapters 27 and 12 respectively from ASCE/SEI 7-16. In the North/South direction the code level seismic force controlled the design, while in the East/West direction the code specified wind force controlled the design. In both directions the eccentric loading, both calculated and required accidental, is included in determining the applied frame forces at each level.

The braced frames have a two-story X configuration and utilize ASTM A500 Gr. C HSS steel braces. The braces are designed to maintain the same area of steel at floors where the upper and lower braces meet at the intersecting floor/roof beam to help

mitigate the forces that are applied to that beam. This is important to be efficient in the size of our braced framed beams and the overall tonnage of the building. The KISS method was used for force distribution analysis of the connection designs. At the foundations, the anchorage was designed to resist the minimum of the uplift force due to overturning with an applied Ω_o or the expected brace strength. The shear lugs were designed to resist the minimum of the applied shear forces with an applied Ω_o or the expected brace strength.

The moment frames have been designed using bolted moment connections. This type of connection was chosen because this is the preferred method of moment frame construction in the New York City area. The design of the moment frame was controlled by the H/400 drift limit during a 50-year windstorm, or a wind speed of 90 mph. In order to meet this requirement without fixing the base of the columns, the column sizes were increased at the lower levels and the beams at the first and second level were increased in size over what is required for strength. The design of all the connections is required by the AISC *Seismic Manual* to resist moment and reaction due to the expected flexural strength of the beam.

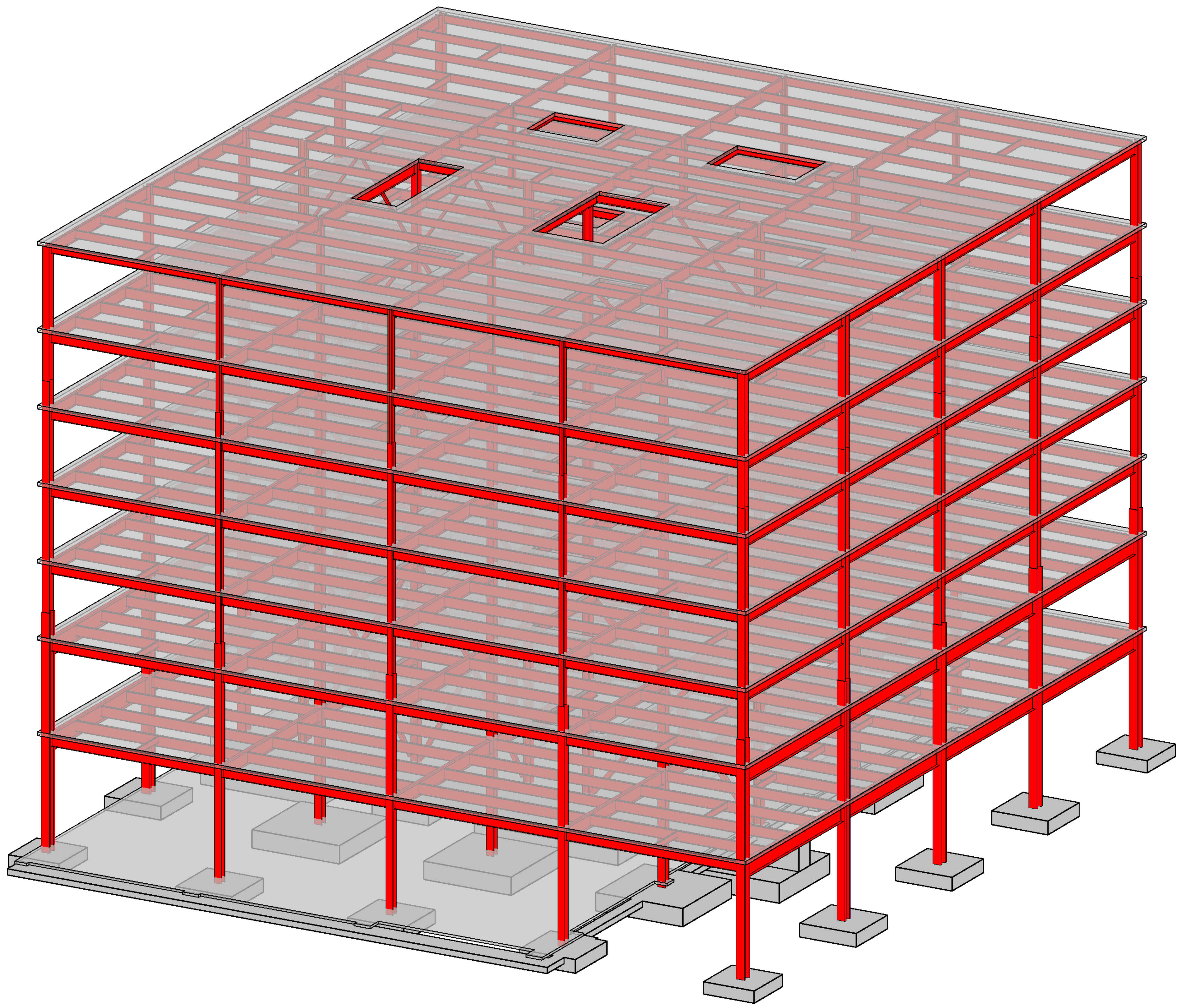
B.3 Steel Tonnage

Total steel tonnage for this design case is calculated as 767 tons.

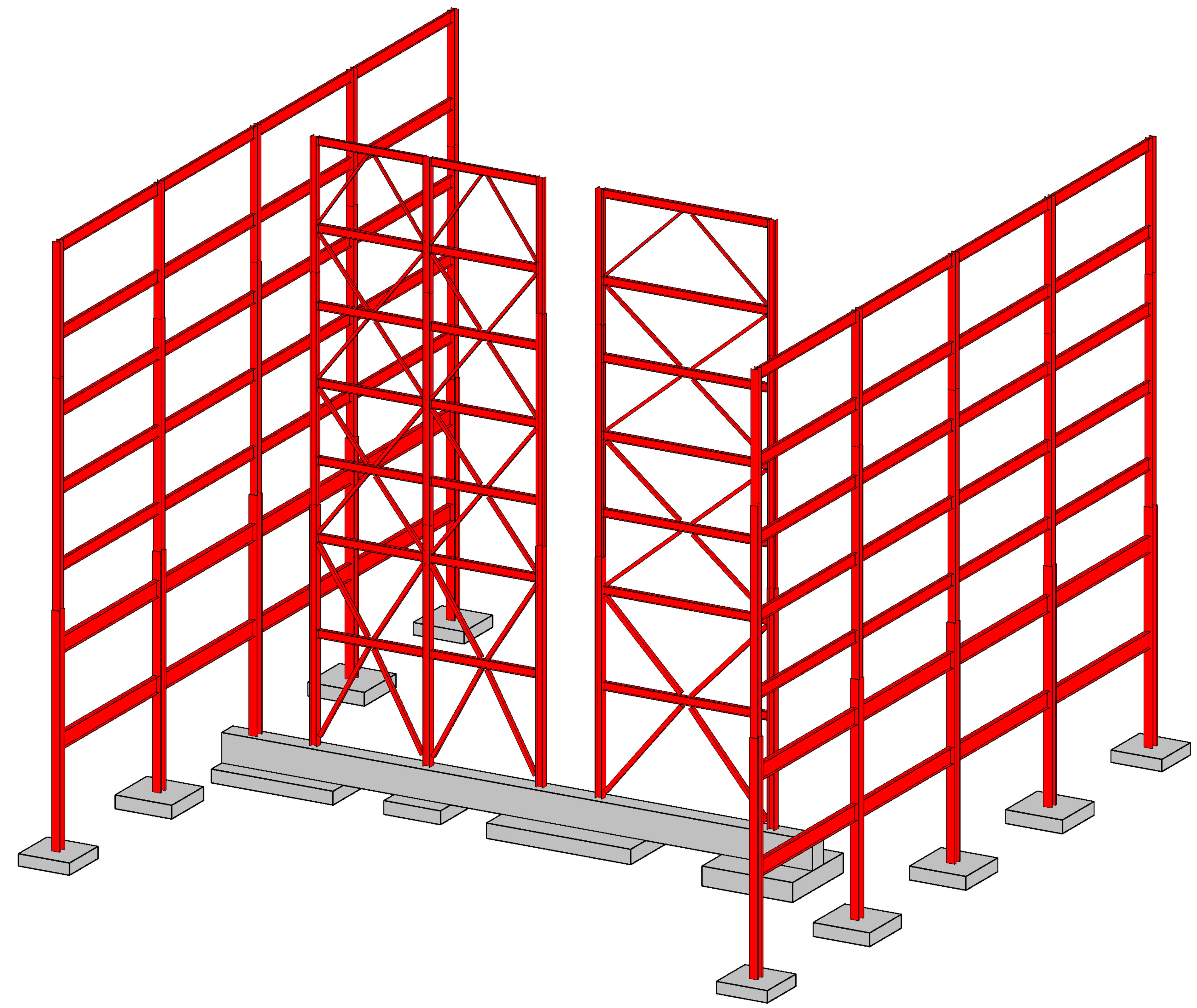
B.4 Structural Drawings

Structural drawings for Design Case B are provided on the following pages.

HEALTHCARE FACILITY - LONG ISLAND, NEW YORK
DESIGN B - 2018 IBC RISK CATEGORY III



OVERALL FRAMING 3D VIEW



LATERAL FORCE RESISTING SYSTEM 3D VIEW

DESIGN B: 2018 IBC "RISK CATEGORY III"	
HEALTHCARE FACILITY, LONG ISLAND, NEW YORK	
ITEM	QUANTITY
WF COLUMNS (Fy = 50 KSI)	57 TONS
WF GIRDERS AND JOISTS (Fy = 50 KSI)	403 TONS
MOMENT FRAME WF COLUMNS (Fy = 50 KSI)	177 TONS
MOMENT FRAME WF BEAMS (Fy = 50 KSI)	69 TONS
BRACED FRAME WF COLUMNS (Fy = 50 KSI)	31 TONS
BRACED FRAME WF BEAMS (Fy = 50 KSI)	16 TONS
HSS BRACES (Fy = 50 KSI)	14 TONS
TOTAL	767 TONS

1. STEEL QUANTITIES DO NOT INCLUDE MISCELLANEOUS STEEL, CUT WASTE STEEL, STAIRS, TYPICAL STEEL FRAMING CONNECTIONS, ETC.
2. ON PLANS " ▶ " INDICATES GRAVITY MOMENT CONNECTION WITH (CJP) WELDS AT FLANGES.

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Approved DRS

TITLE

COVER SHEET

SHEET NUMBER

S0.00

GENERAL NOTES

STANDARDS
THE DESIGN AND MATERIALS SHALL CONFORM TO THE 2018 INTERNATIONAL BUILDING CODE (IBC) AS AMENDED AND ADOPTED BY THE LOCAL BUILDING OFFICIAL OR APPLICABLE JURISDICTION.

STRUCTURAL DRAWINGS PRIMARY STRUCTURAL ELEMENTS ARE DIMENSIONED ON STRUCTURAL PLANS AND DETAILS AND OVERALL LAYOUT OF STRUCTURAL PORTION OF WORK.

PROJECT LOCATION

LONG ISLAND, NEW YORK

40.6471 LATITUDE, -73.5672 LONGITUDE

DESIGN CRITERIA

VERTICAL LOADS

AREA	DESIGN DEAD LOAD	LIVE LOAD (2)	PARTITION LOAD	CONCENTRATED LOADS
OPERATING ROOMS	95 PSF	60 PSF	15 PSF	1000#
PRIVATE ROOMS	95 PSF	40 PSF	15 PSF	1000#
CORRIDORS ABOVE 1ST FLOOR	95 PSF	80 PSF	15 PSF	1000#
ROOF	100 PSF	40 PSF	-	-

(1) DRIFT AND UNBALANCED SNOW LOAD PER ASCE 7-16, CHAPTER 7.
(2) LIVE LOADS EXCEPT SNOW LOADS ARE REDUCED PER IBC SECTION 1607.11.

SNOW: (MINIMUM ROOF SNOW LOAD = 25 PSF)

Pg = 20 PSF = GROUND SNOW LOAD
Pf = 0.7CeCtIsPg = FLAT ROOF SNOW LOAD
Ps = CsPf = SLOPED ROOF SNOW LOAD
Is = 1.10 Ce = 1.0, Ct = 1.0, Cs = VARIES

VIBRATION DESIGN CRITERIA:

VIBRATION CONSIDERATIONS WERE DESIGNED PER THE RECOMMENDATIONS IN THE GUIDELINES FOR DESIGN AND CONSTRUCTION OF HOSPITALS AND OUTPATIENT FACILITIES. FOR PATIENT ROOM FLOORS A VIBRATION VELOCITY LIMIT OF 6,000 MICRO INCHES PER SECOND WAS EVALUATED AT A WALKING SPEED OF 75 STEPS PER MINUTE.

LATERAL FORCES

LATERAL FORCES ARE TRANSMITTED BY DIAPHRAGM ACTION OF ROOF AND FLOORS TO BRACED FRAME/MOMENT FRAME. LOADS ARE THEN TRANSFERRED TO FOUNDATION BY BRACED FRAME/MOMENT FRAME ACTION WHERE ULTIMATE DISPLACEMENT IS RESISTED BY PASSIVE PRESSURE OF EARTH AND/OR SLIDING FRICTION. OVERTURNING IS RESISTED BY DEAD LOAD OF THE STRUCTURE.

WIND:

THE BUILDING MEETS THE CRITERIA TO USE THE "ENCLOSED, PARTIALLY ENCLOSED, AND OPEN BUILDING OF ALL HEIGHTS PROCEDURE" PER ASCE 7-16.

- EXPOSURE CATEGORY = B
- BASIC WIND SPEED, (3 SEC. GUST), V_{ULT} = 131 MPH; V_{ASD} = 93 MPH
- RISK CATEGORY PER IBC TABLE 1604.5 = III
- TOPOGRAPHIC FACTOR K_{ZT} = 1.0
- INTERNAL PRESSURE COEFFICIENT (ENCLOSED) = ± 0.18
- DESIGN WIND BASE SHEAR = 448 KIPS
- SEE THE FOLLOWING SCHEDULES FOR COMPONENTS AND CLADDING WIND PRESSURES

ROOF SURFACES [1]						
EFFECTIVE WIND AREA	POSITIVE PRESSURES (PSF)			NEGATIVE PRESSURES (PSF)		
	ZONE [2]					
	1	2	3	1	2	3
10 SF	17.8	17.8	17.8	-58.4	-91.8	-125.2
20 SF	17.8	17.4	16.9	-56.1	-88.1	-119.7
50 SF	17.8	17.0	15.6	-53.7	-84.5	-115.3
100 SF	17.8	16.7	14.6	-51.4	-80.7	-110.0

WALL SURFACES AND ROOF OVERHANGS [1]				
EFFECTIVE WIND AREA	POSITIVE PRESSURE (PSF)		NEGATIVE PRESSURE (PSF)	
	ZONE [2]			
	4	5	4	5
10 SF	43.7	43.7	-47.3	-73.3
20 SF	41.9	40.6	-45.0	-69.6
50 SF	40.2	36.7	-41.6	-64.5
100 SF	38.4	33.2	-38.9	-60.1
500 SF	34.9	26.2	-33.2	-51.3

1. VALUES SHOWN IN TABLE ARE GROSS ULTIMATE WIND PRESSURES.
2. ZONES ARE AS DEFINED BY TABLE 30.6-2 IN ASCE 7-16.

SEISMIC: (ASCE 7-16) V = CsW

WHERE $Cs = \frac{S_{DS}}{\left(\frac{R}{Ie}\right)}$; WITH

$Cs\ MINIMUM = 0.044\, S_{DS} I_E \geq 0.01$

OR

$Cs\ MINIMUM = \frac{0.5S_1}{\frac{R}{Ie}}$ FOR $S_1 > 0.6g$

$Cs\ MAXIMUM = \frac{S_{D1}}{T\left(\frac{R}{Ie}\right)}$ FOR $T \leq T_L$

OR

$Cs\ MAXIMUM = \frac{S_{D1}T_L}{T^2\left(\frac{R}{Ie}\right)}$ FOR $T > T_L$

SEISMIC IMPORTANCE FACTOR, Ie = 1.25
RISK CATEGORY OF BUILDING PER IBC TABLE 1604.5 = III
SPECTRAL RESPONSE ACCELERATIONS S_S = 0.245 & S_1 = 0.055
SITE CLASS PER TABLE 20.3-1 = D
DESIGN SPECTRAL RESPONSE ACCELERATIONS S_{DS} = 0.261 & S_{D1} = 0.088
SEISMIC DESIGN CATEGORY = B
W = EFFECTIVE SEISMIC WEIGHT OF BUILDING = 11410 KIPS
ANALYSIS PROCEDURE USED = EQUIVALENT LATERAL FORCE PROCEDURE
RESPONSE MODIFICATION FACTOR PER TABLE 12.2-1, R = 3.5 AT ORDINARY STEEL MOMENT FRAMES, 3.25 AT SPECIAL CONCENTRIC STEEL BRACED FRAMES
Cs = 0.093 AT MOMENT FRAMES, 0.10 AT BRACED FRAMES
Cs max = .028 AT MOMENT FRAMES, .054 AT BRACED FRAMES
DESIGN BASE SHEAR V = 315 KIPS AT MOMENT FRAMES, 617 KIPS AT BRACED FRAMES

FOUNDATION DESIGN CRITERIA

SOIL BEARING PRESSURE: 6000 PSF (ASSUMED)*

ACTIVE PRESSURE - RESTRAINED: 50 PCF +14H SEISMIC SURCHARGE (ASSUMED)
ACTIVE PRESSURE - UNRESTRAINED: 35 PCF +6H SEISMIC SURCHARGE (ASSUMED)
PASSIVE RESISTANCE: 200 PCF (INCLUDES F.O.S. ≥ 1.5) (ASSUMED)
COEFFICIENT OF FRICTION: .35 (INCLUDES F.O.S. ≥ 1.5) (ASSUMED)
*1/3 INCREASE ALLOWED FOR SEISMIC OR WIND LOADING

CONCRETE

ITEM	DESIGN f'c (PSI) (AT 28 DAYS U.N.O.)
SLABS ON GRADE - UNO	4000
FOUNDATIONS - UNO	3000
STEM WALLS AND OTHER WALLS - UNO	4000
ELEVATED DECKS, TOPPING SLABS, AND SLABS ON METAL	5000

REINFORCING STEEL

REINFORCING STEEL SHALL CONFORM TO:

ASTM A615, GRADE 60 TYPICAL UNLESS NOTED OTHERWISE.

REINFORCING SPLICE AND DEVELOPMENT LENGTH SCHEDULE, Fy=60 KSI (UNLESS NOTED OTHERWISE)		
BAR SIZE	MINIMUM LAP SPLICE LENGTHS ("Ls")	MINIMUM DEVELOPMENT LENGTHS ("Ld")
#3	1'-6"	1'-3"
#4	2'-0"	1'-7"
#5	2'-7"	2'-0"
#6	3'-1"	2'-4"
#7	4'-6"	3'-6"
#8	5'-2"	3'-11"
#9	5'-10"	4'-6"
#10	6'-6"	5'-0"

STRUCTURAL STEEL

MATERIAL PROPERTIES

WIDE FLANGE SECTIONS: ASTM A992 (Fy = 50 KSI)

OTHER SHAPES AND PLATES: ASTM A36 (Fy = 36 KSI) TYP. U.N.O.; ASTM A572 (Fy = 50 KSI) WHERE INDICATED

HOLLOW STRUCTURAL SECTIONS: RECTANGULAR & SQUARE - ASTM A500, GRADE C (Fy = 50 KSI)

MACHINE BOLTS (M.B.): ASTM A307, GRADE A

HIGH-STRENGTH BOLTS: A325-ASTM F1852, A490-ASTM F2280

ANCHOR BOLTS (A.B.): ASTM F1554, GRADE 36, UNLESS OTHERWISE NOTED, ASTM F1554, GRADE 105 WHERE INDICATED.

WIDE FLANGE STRUCTURAL MEMBERS WHICH ARE ASTM A6 GROUP 3 SHAPES WITH FLANGE THICKNESS 1-1/2" THICK AND THICKER, AND ALL ASTM A6 GROUP 4 AND 5 SHAPES AND PLATE THAT IS 1-1/2" THICK OR THICKER SHALL HAVE A CHARPY V-NOTCH (CVN) TOUGHNESS OF 20 FT-LBS @ 70 DEG F.

GENERAL REQUIREMENTS

HIGH-STRENGTH BOLTS: ALL A325 HIGH-STRENGTH BOLTS (HSB) SHALL BE ASTM F3125, GRADE F1852, UNLESS OTHERWISE DESIGNATED AS A490. ALL HSB DESIGNATED AS A490 SHALL BE ASTM F3125, GRADE F2280. ALL HSB SHALL BE BY "LEJEUNE BOLT COMPANY" OR PRE-APPROVED EQUAL AND SHALL BE INSTALLED PER SECTION 8.2 OF THE "SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH STRENGTH BOLTS", AUGUST 2014 BY THE RESEARCH COUNCIL ON STRUCTURAL CONNECTIONS (RCSC SPECIFICATION). ALL BOLT HOLES SHALL BE STANDARD ROUND HOLES UNLESS NOTED OTHERWISE. THE FAYING SURFACES OF ALL PLIES WITHIN THE GRIP OF SLIP-CRITICAL BOLTS (A325SC OR A490SC) SHALL MEET THE REQUIREMENTS FOR A CLASS A SURFACE PER SECTION 3.2 OF THE RCSC SPECIFICATION.

HEADED STUDS: SHALL BE "S3L SHEAR CONNECTORS" FOR STUDS 3/4" DIAMETER AND LARGER AS MANUFACTURED BY NELSON STUD WELDING, INC. OR PRE-APPROVED EQUAL AND SHALL CONFORM TO AWS D1.1.

COMPOSITE FLOOR DECK: SHALL CONTAIN THE MINIMUM PROPERTIES SHOWN ON THE STRUCTURAL DRAWINGS AND SHALL BE "FORMLOK" AS MANUFACTURED BY VERCO MANUFACTURING CO., "W COMPOSITE" AS MANUFACTURED BY ASC STEEL DECK, "EPICORE" AS MANUFACTURED BY EPIC METALS, OR PRE-APPROVED EQUAL. THE FLOOR UNITS SHALL BE FORMED FROM STEEL SHEETS CONFORMING TO ASTM A653, AND GALVANIZED PER ASTM A924.

ABBREVIATION LIST			
@	AT	HSS	HOLLOW STRUCTURAL SECTION
A.B.	ANCHOR BOLT	HT	HEIGHT
ADD'L	ADDITIONAL	INT.	INTERIOR
ALT.	ALTERNATE	JST	JOIST
BLD'G	BUILDING	JT	JOINT
BM	BEAM	L	ANGLE
B.O.F.	BOTTOM OF FOOTING	L.F.R.S.	LATERAL FORCE-RESISTING SYSTEM
BOT.	BOTTOM	L.L.	LIVE LOAD
BRG	BEARING	LLH	LONG LEG HORIZONTAL
BTWN	BETWEEN	LLV	LONG LEG VERTICAL
(C=)	CAMBER	LOC.	LOCATION
CANT.	CANTILEVER	MAX.	MAXIMUM
C.J.	CONTROL/CONSTRUCTION JOINT	M.B.	MACHINE BOLT
CL	CENTERLINE	MFR	MANUFACTURER
CLR.	CLEARANCE	MIN.	MINIMUM
COL.	COLUMN	MISC.	MISCELLANEOUS
CONC.	CONCRETE	MTL	METAL
CONN.	CONNECTION	N.F.	NEAR FACE
CONST.	CONSTRUCTION	N.S.	NEAR SIDE
CONT.	CONTINUOUS	NTS	NOT TO SCALE
COORD.	COORDINATE	O.C.	ON CENTER
C.P.	COMPLETE PENETRATION	OPN'G	OPENING
CTR'D	CENTERED	OPP.	OPPOSITE
C.Y.	CUBIC YARD	PERP.	PERPENDICULAR
DBL.	DOUBLE	PL	PLATE
DCW	DEMAND CRITICAL WELD	P.P.	PARTIAL PENETRATION
DIA. OR ø	DIAMETER	P.S.F.	POUNDS PER SQUARE FOOT
DIAG.	DIAGONAL	REINF.	REINFORCING
DIM.	DIMENSION	REQ'D	REQUIRED
D.L.	DEAD LOAD	SCHED.	SCHEDULE
DWG	DRAWING	SIM.	SIMILAR
DWL	DOWEL	S.O.G.	SLAB ON GRADE
EA.	EACH	SQ.	SQUARE
E.F.	EACH FACE	STD	STANDARD
EL.	ELEVATION	STIFF.	STIFFENER
ENGR.	ENGINEER	STL	STEEL
EQ.	EQUAL	STRUCT.	STRUCTURAL
E.W.	EACH WAY	T&B	TOP & BOTTOM
EXP.	EXPANSION	THR'D	THREADED
EXT.	EXTERIOR	T.O.F.	TOP OF FOOTING
FDN	FOUNDATION	T.O.S.	TOP OF STEEL
F.F.	FAR FACE	TYP.	TYPICAL
FLR	FLOOR	U.N.O.	UNLESS NOTED OTHERWISE
FRM'G	FRAMING	U.T.	ULTRASONIC TESTED
F.S.	FAR SIDE	VERT.	VERTICAL
FTG	FOOTING	W/	WITH
GA.	GAGE/GAUGE	W.P.	WORK POINT
GALV.	GALVANIZED	WT	WEIGHT
GR.	GRADE	W.W.R.	WELDED WIRE REINFORCING
HORIZ.	HORIZONTAL		

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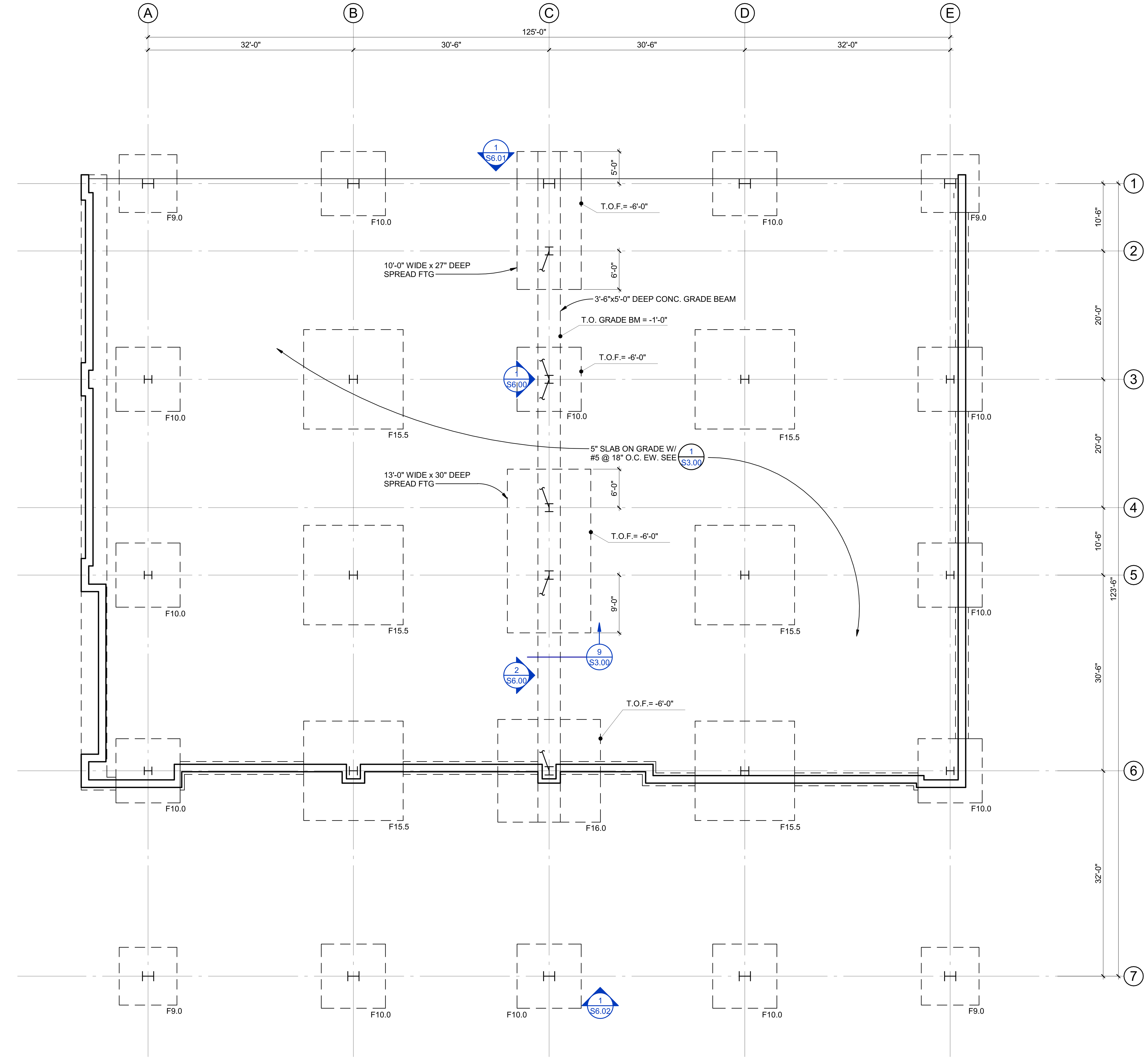
TITLE
GENERAL NOTES

SHEET NUMBER
S0.01



NORTH

1
S2.00

FOUNDATION AND GRADE LEVEL FRAMING PLAN

1/8" = 1'-0"

FOUNDATION NOTES

1. INDICATES EXTERIOR WALL.
2. INDICATES CONTINUOUS CONCRETE WALL FOOTING. FOR TYPICAL FOOTING AND FOUNDATION WALL DETAILS SEE SHEET S3.00. FOOTING WIDTH ("W") = 2'-0" UNLESS NOTED OTHERWISE ON PLAN. CENTER FOOTINGS ON CONCRETE STEM WALL.
3. "F_" INDICATES CONCRETE SPREAD FOOTING. FOR SCHEDULE SEE 5/S3.00.
4. X X.XX INDICATES BRACED FRAME. FOR ELEVATIONS, BRACE SIZES AND DETAIL CALLOUTS SEE SHEET S6.00.
5. INDICATES STEEL COLUMNS ORIGINATING AT FOUNDATION LEVEL. ALL COLUMNS ARE CONTINUOUS TO ROOF UNLESS NOTED OTHERWISE. FOR TYPICAL ANCHOR ROD/BOLT DETAIL SEE 7/S3.00. FOR COLUMN SCHEDULE SEE S4.00.
6. FOR TYPICAL FOUNDATION AND CONCRETE SLAB-ON-GRADE DETAILS SEE SHEET S3.00.
7. TOP OF FOOTING ELEVATIONS = -1'-0" UNLESS NOTED OTHERWISE ON PLANS AND DETAILS.
8. X X.XX INDICATES MOMENT FRAME. FOR ELEVATIONS, MEMBER SIZES AND DETAIL CALLOUTS SEE SHEETS S6.01 AND S6.02.

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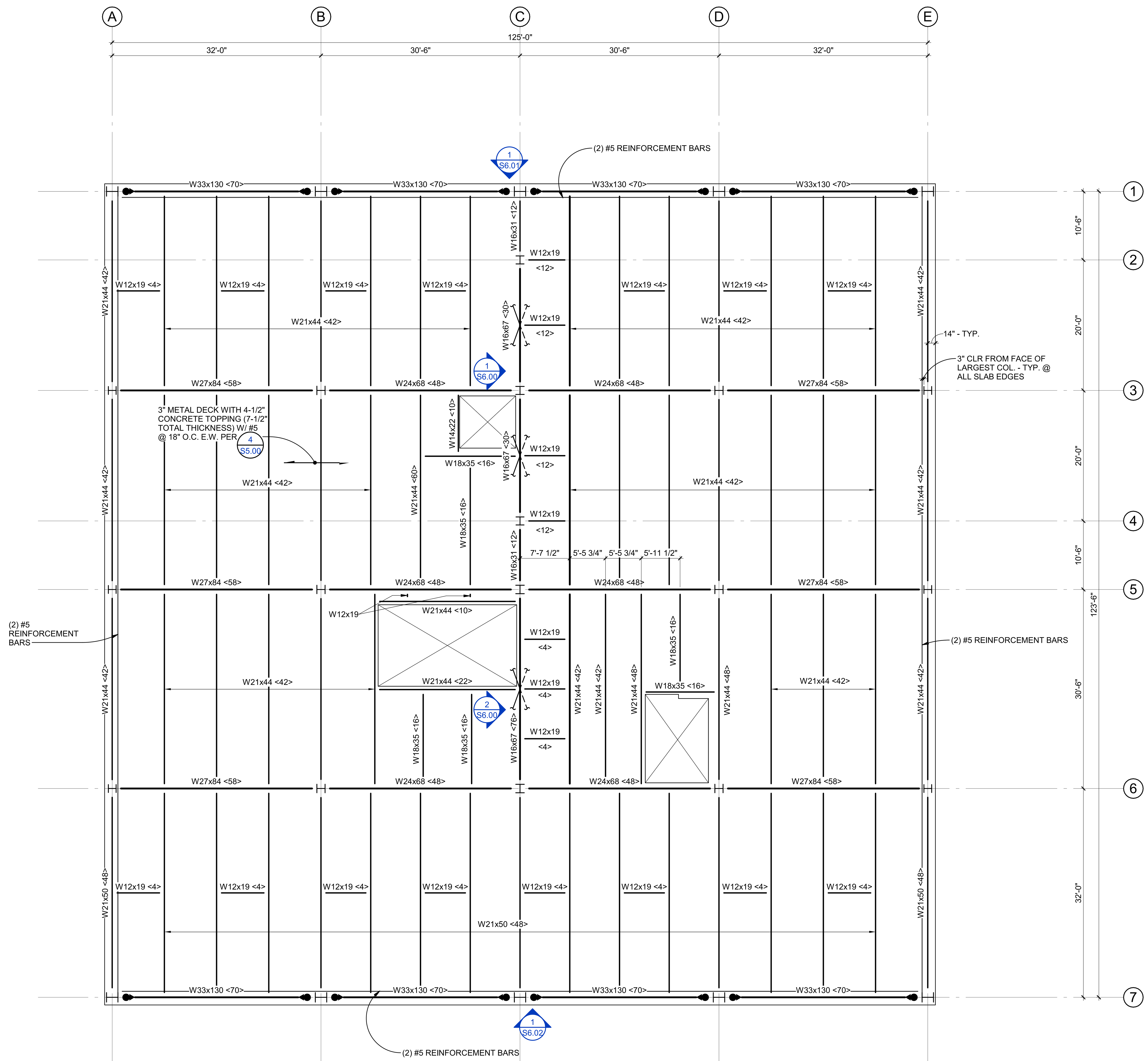
TITLE

FOUNDATION AND GRADE LEVEL FRAMING PLAN

SHEET NUMBER

S2.00



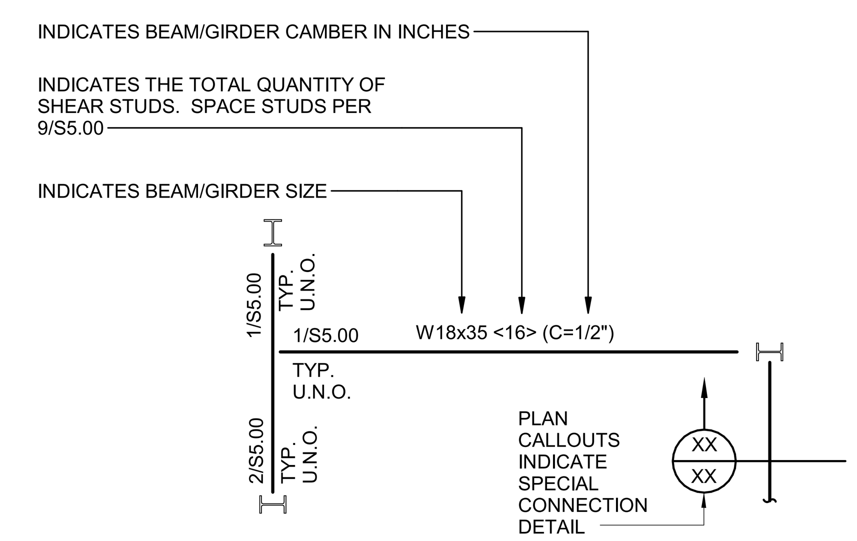
FIRST FLOOR FRAMING PLAN

1/S2.10 — 1/8" = 1'-0"

NORTH

FLOOR FRAMING NOTES

1. INDICATES BRACED FRAME. FOR ELEVATIONS, BRACE SIZES AND DETAIL CALLOUTS SEE SHEET S6.00. ALL BEAMS THAT ARE PART OF A BRACED FRAME SHALL BE CONSIDERED "COLLECTOR" BEAMS.
2. INDICATES STEEL COLUMN, SEE S4.00 FOR STEEL COLUMN SCHEDULE.
3. INDICATES PENETRATION IN FLOOR STRUCTURE. FOR TYPICAL REINFORCING AROUND OPENINGS SEE 5/S5.00.
4. FOR TYPICAL COMPOSITE BEAM AND METAL DECK DETAILS SEE SHEET S5.00.
5. INDICATES DIRECTION OF SPAN FOR METAL DECK.
6. FOR TYPICAL STEEL CONNECTION DETAILS SEE SHEET S5.00. SEE BRACED FRAME ELEVATIONS FOR CONNECTION CALLOUTS. ALL MEMBERS AND CONNECTIONS THAT ARE PART OF A BRACED FRAME SHALL BE CONSIDERED PART OF THE LATERAL-FORCE RESISTING SYSTEM.



7. STEEL MEMBERS ARE EQUALLY SPACED BETWEEN DIMENSION POINTS UNLESS NOTED OTHERWISE.
8. INDICATES MOMENT FRAME. FOR ELEVATIONS AND DETAIL CALLOUT SEE SHEETS S6.01 AND S6.02. ASSOCIATED MEMBERS AND CONNECTIONS ARE PART OF THE LATERAL-FORCE RESISTING SYSTEM.

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FIRST FLOOR FRAMING PLAN

SHEET NUMBER

S2.10

9/27/2021 9:32:16 AM
C:_Revit Models\BUILDING 2 - ATC BLDG 2 IBC 2018 SDC B RC3 v2020 (Central)_dhorne@pcs-structural.com.rvt

FOR FRAMING NOTES SEE S2.10

SECOND FLOOR FRAMING PLAN

1/8" = 1'-0"

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TITLE
SECOND FLOOR FRAMING PLAN

SHEET NUMBER
S2.20

FOR FRAMING NOTES SEE S2.10

THIRD FLOOR FRAMING PLAN

1/8" = 1'-0"

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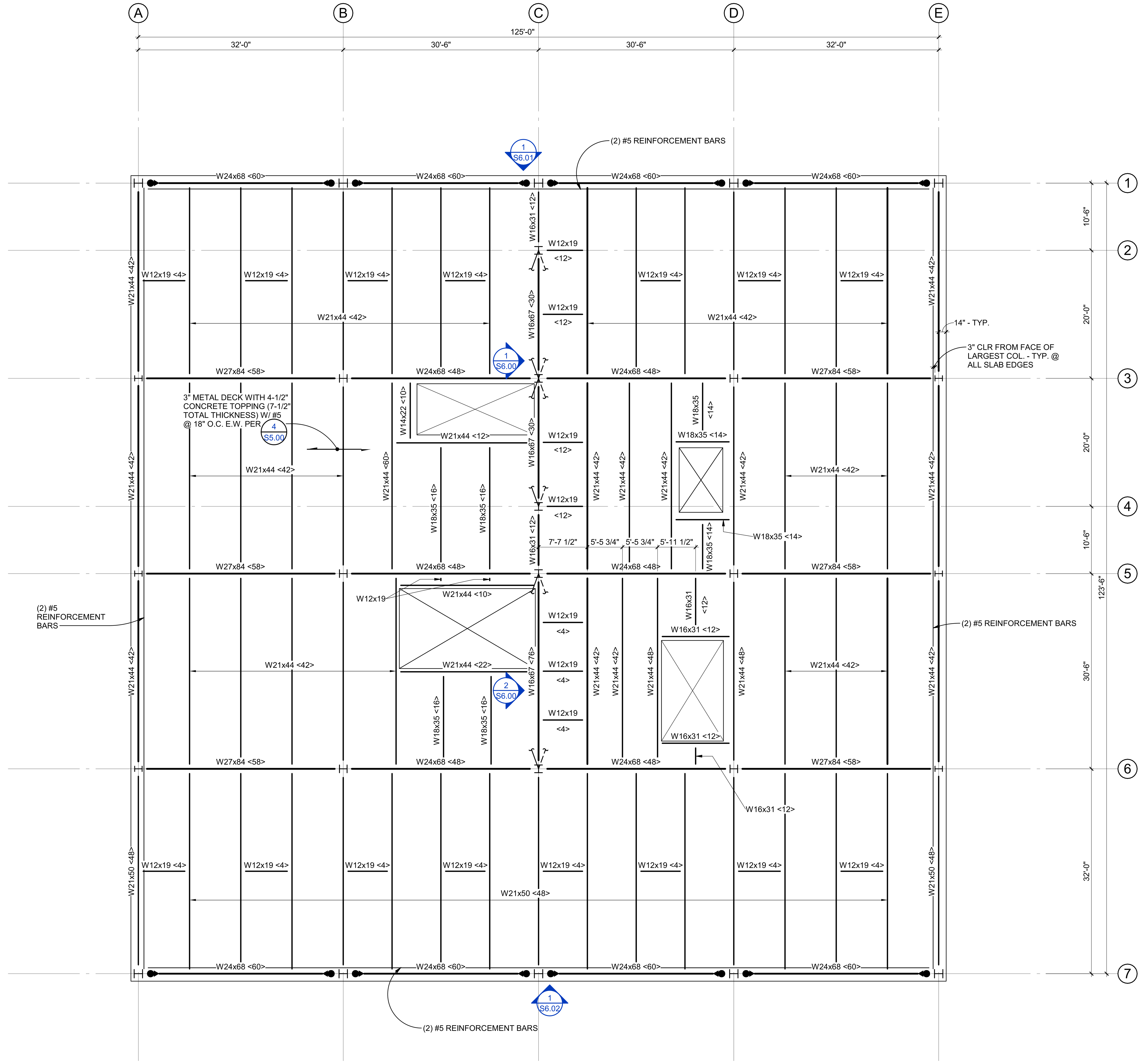
THIRD FLOOR FRAMING PLAN

SHEET NUMBER

S2.30



FOR FRAMING NOTES SEE S2.10

NORTH

1
S2.40

FOURTH FLOOR FRAMING PLAN

1/8" = 1'-0"

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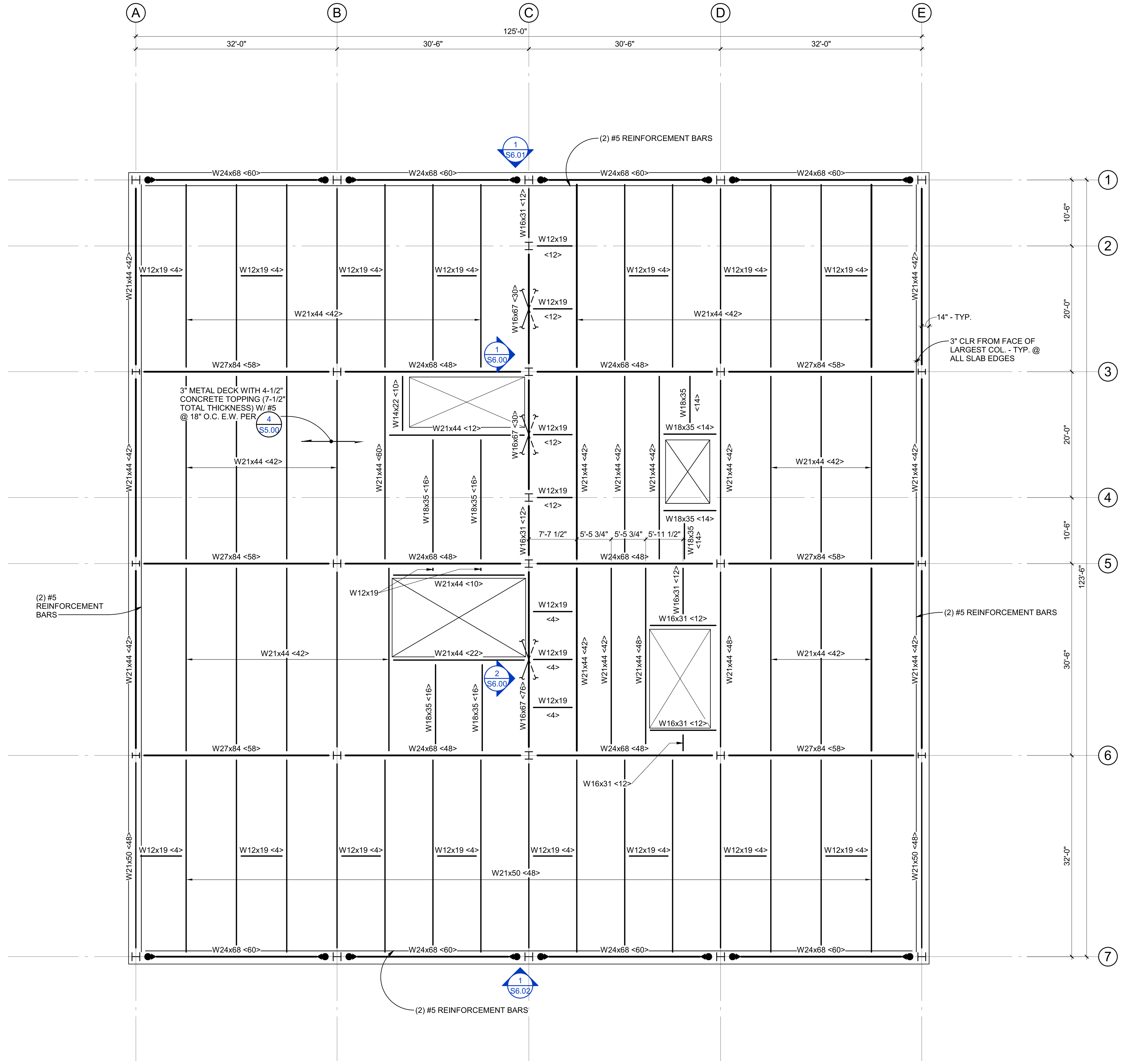
FOURTH FLOOR FRAMING PLAN

SHEET NUMBER

S2.40



FOR FRAMING NOTES SEE S2.10

NORTH

1 S2.50 FIFTH FLOOR FRAMING PLAN

1/8" = 1'-0"

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FIFTH FLOOR FRAMING PLAN

SHEET NUMBER

S2.50

FOR FRAMING NOTES SEE S2.10

NORTH

1
S2.60

SIXTH FLOOR FRAMING PLAN

1/8" = 1'-0"

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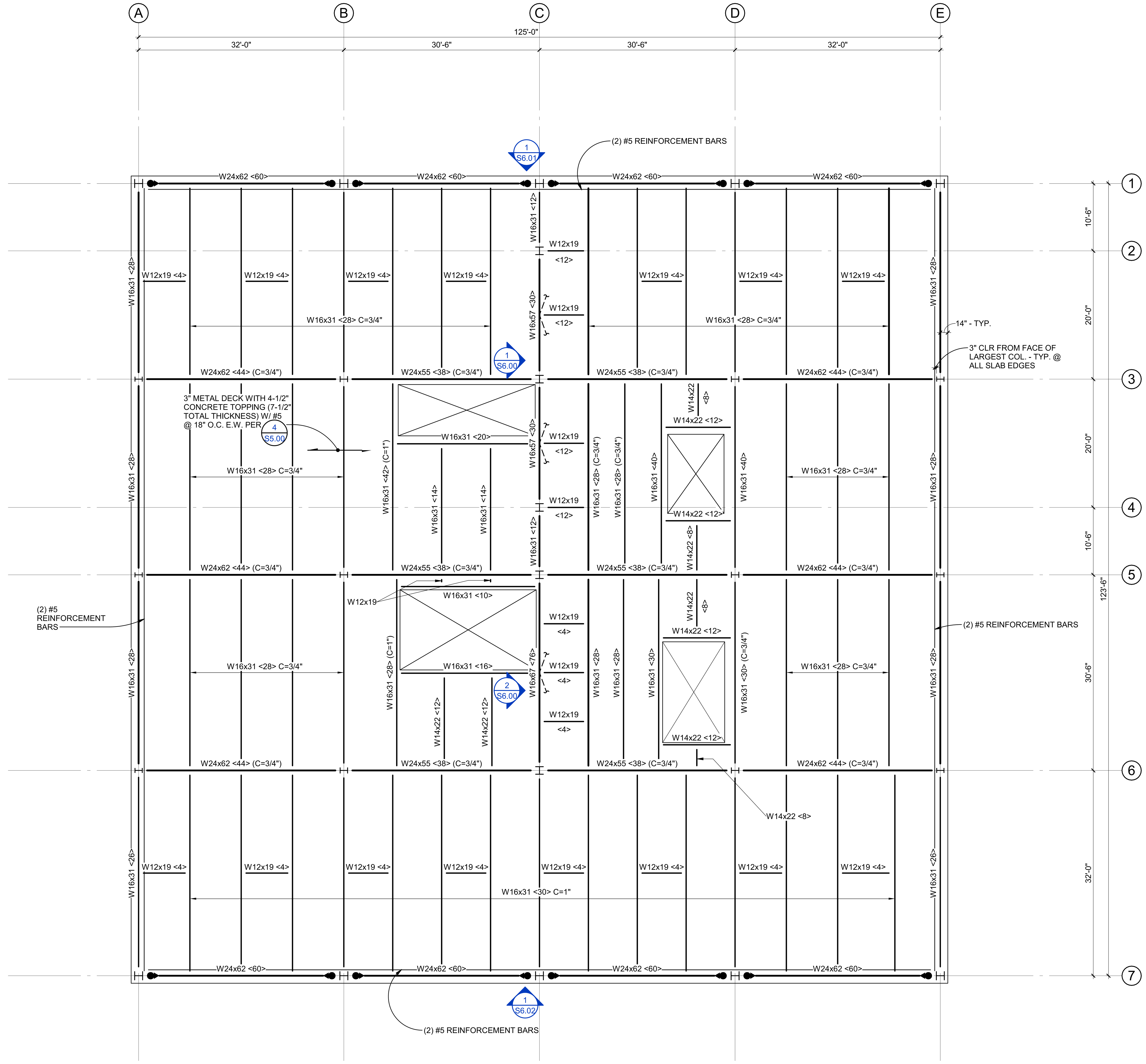
SIXTH FLOOR FRAMING PLAN

SHEET NUMBER

S2.60



FOR FRAMING NOTES SEE S2.10

NORTH

1 S2.70 ROOF FRAMING PLAN

1/8" = 1'-0"

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ROOF FRAMING PLAN

SHEET NUMBER

S2.70

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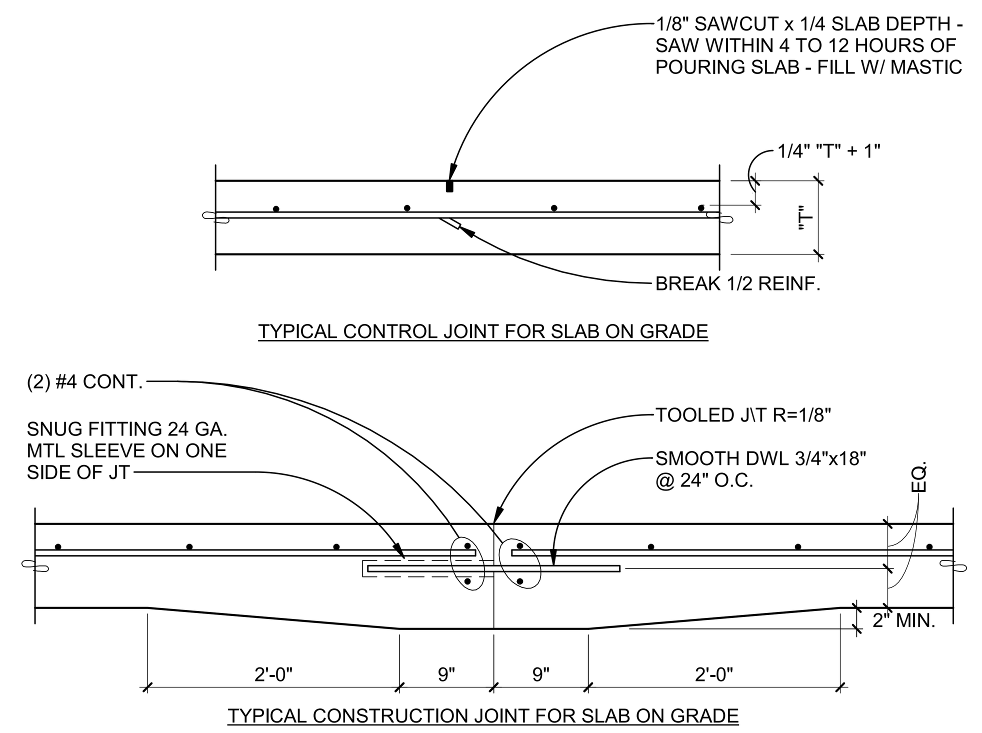
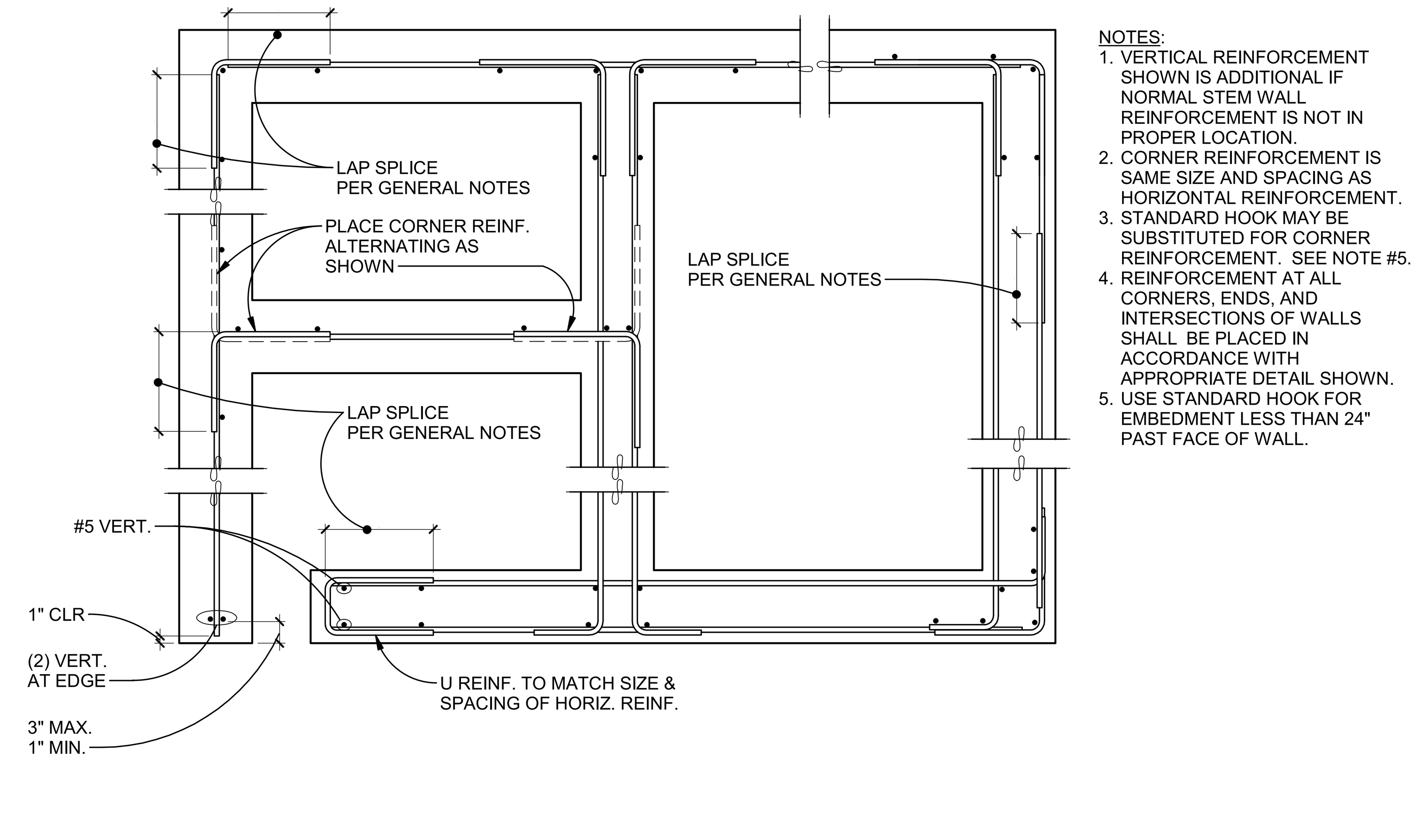


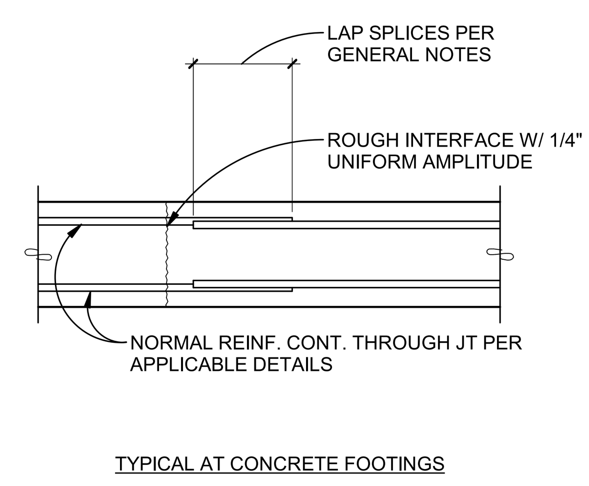
1 S3.00 SECTION
NO SCALE



NOTES:
1. VERTICAL REINFORCEMENT SHOWN IS ADDITIONAL IF NORMAL STEM WALL REINFORCEMENT IS NOT IN PROPER LOCATION.
2. CORNER REINFORCEMENT IS SAME SIZE AND SPACING AS HORIZONTAL REINFORCEMENT.
3. STANDARD HOOK MAY BE SUBSTITUTED FOR CORNER REINFORCEMENT. SEE NOTE #5.
4. REINFORCEMENT AT ALL CORNERS, ENDS, AND INTERSECTIONS OF WALLS SHALL BE PLACED IN ACCORDANCE WITH APPROPRIATE DETAIL SHOWN.
5. USE STANDARD HOOK FOR EMBEDMENT LESS THAN 24" PAST FACE OF WALL.

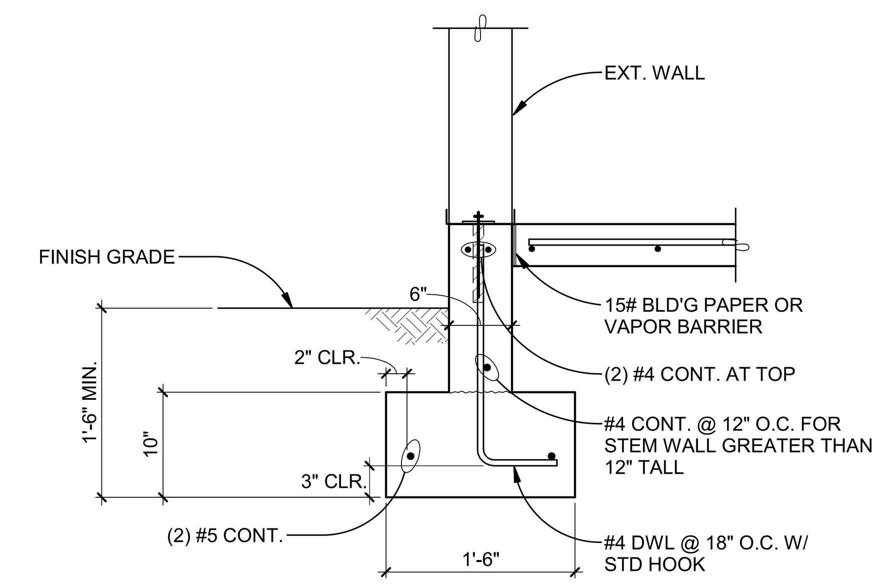
TYPICAL REINFORCEMENT PLACEMENT FOR CAST IN PLACE CONCRETE WALLS AND STEM WALLS

2 S3.00 SECTION
NO SCALE



TYPICAL FOR CAST IN PLACE CONCRETE WALLS, GRADE BEAMS AND FOOTINGS

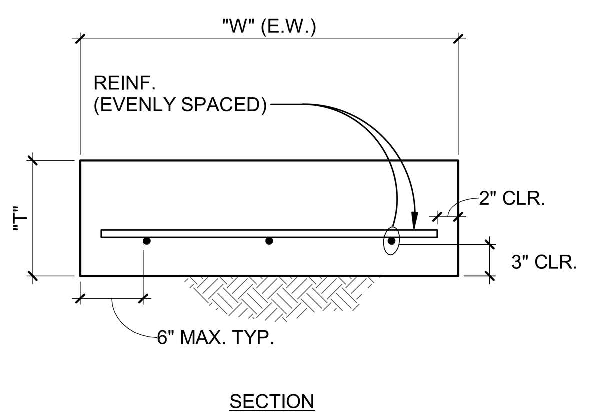
3 S3.00 SECTION
NO SCALE



TYPICAL FOUNDATION AT EXTERIOR WALL

4 S3.00 SECTION
NO SCALE

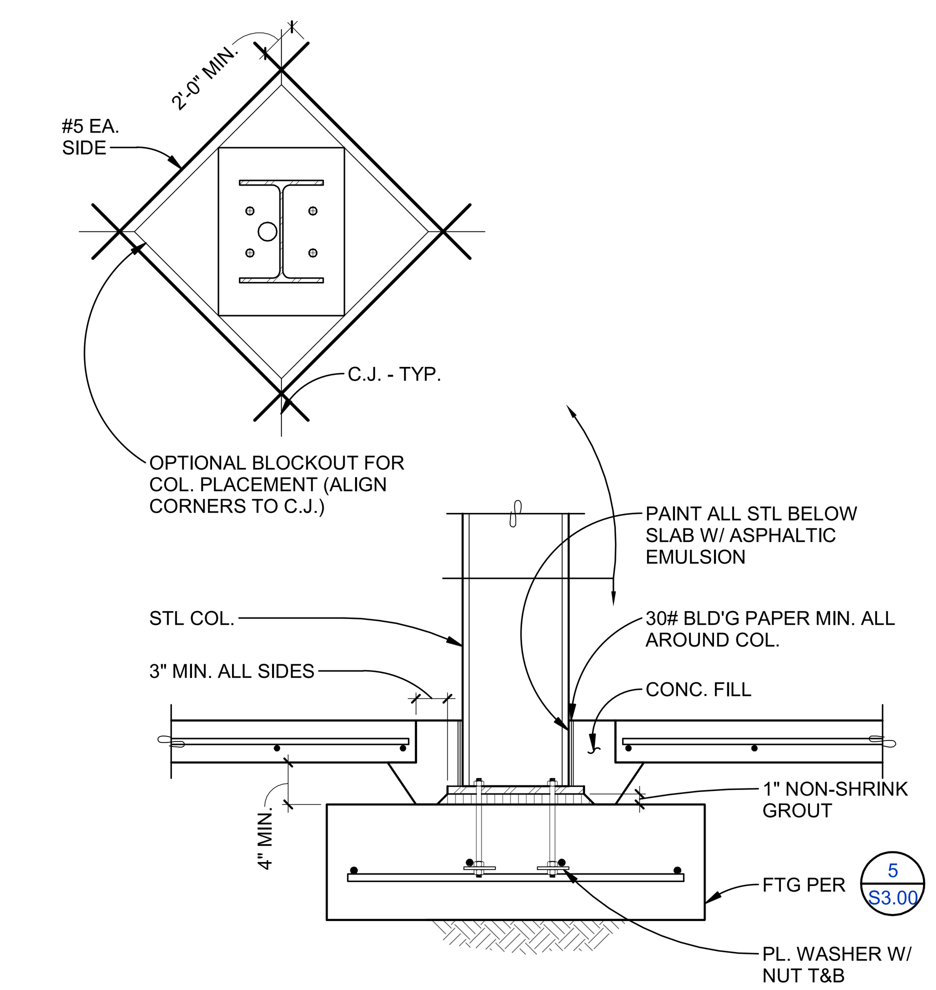
MARK	DIMENSIONS	
	"W"	"T"
F9.0	9'-0"	24"
F10.0	10'-0"	27"
F15.5	15'-6"	36"
F16.0	16'-0"	39"



NOTES:
1. CENTER ALL FOOTINGS ON COLUMN ABOVE EXCEPT AS SHOWN OTHERWISE.
2. FOOTINGS SHALL BEAR ON UNDISTURBED OR COMPACTED MATERIAL PER GENERAL NOTES. DESIGN BEARING PRESSURE IS 6000 POUNDS PER SQUARE FOOT.

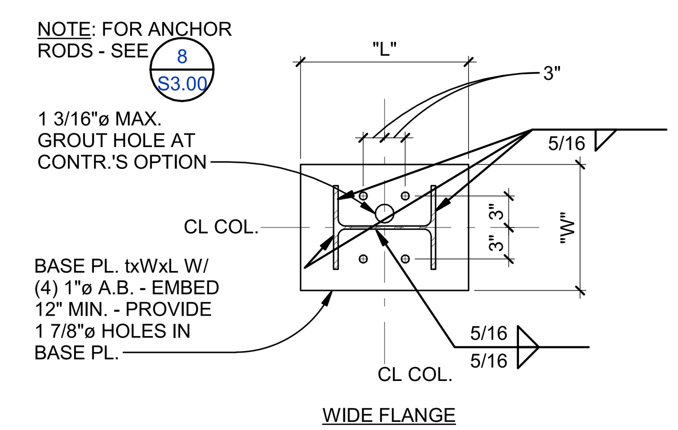
TYPICAL CONCRETE SPREAD FOOTING

5 S3.00 SECTION
NO SCALE



TYPICAL STEEL COLUMN AT SPREAD FOOTING

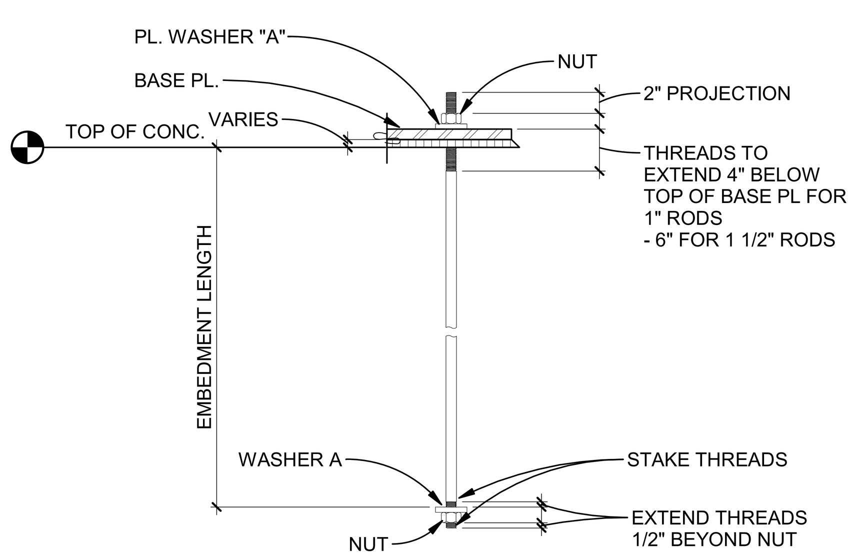
6 S3.00 SECTION
NO SCALE



COLUMN SIZE	"W" (IN.)	"L" (IN.)	"t" (IN.)
W14x99	18 1/4	18 3/4	1 1/2
W14x145, W14x159	20 3/4	22 3/4	2

TYPICAL COLUMN BASE PLATE

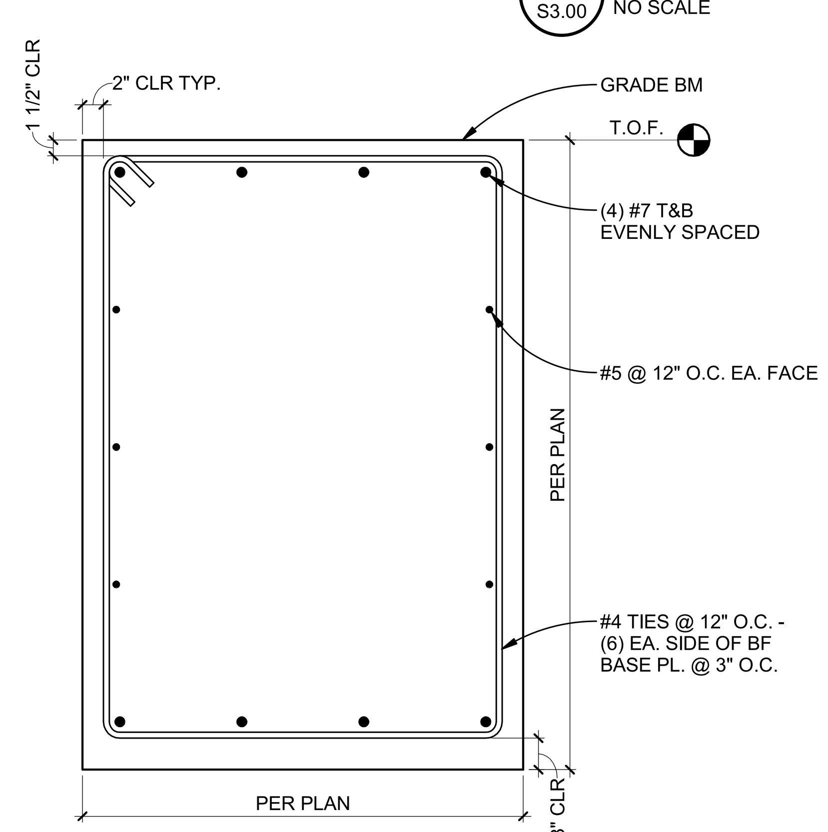
7 S3.00 DETAIL
NO SCALE



ANCHOR ROD		WASHER		NUT
SIZE	MATERIAL	TYPE	SIZE	
1"ø	F1554 GRADE 105	A	PL. 1/2"x3"x0'-3" W/ 1 1/16"ø HOLE CTR'D	A563 GRADE A HEAVY HEX

TYPICAL ANCHOR ROD/BOLT DETAIL

8 S3.00 DETAIL
NO SCALE



9 S3.00 DETAIL
NO SCALE

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PROJECT
HEALTHCARE FACILITY
LONG ISLAND, NEW YORK
PCS STRUCTURAL SOLUTIONS
DESIGN B
2018 IBC WITH RISK CATEGORY III

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DRAWINGS
30 SEPTEMBER, 2021

Job Number	19-051
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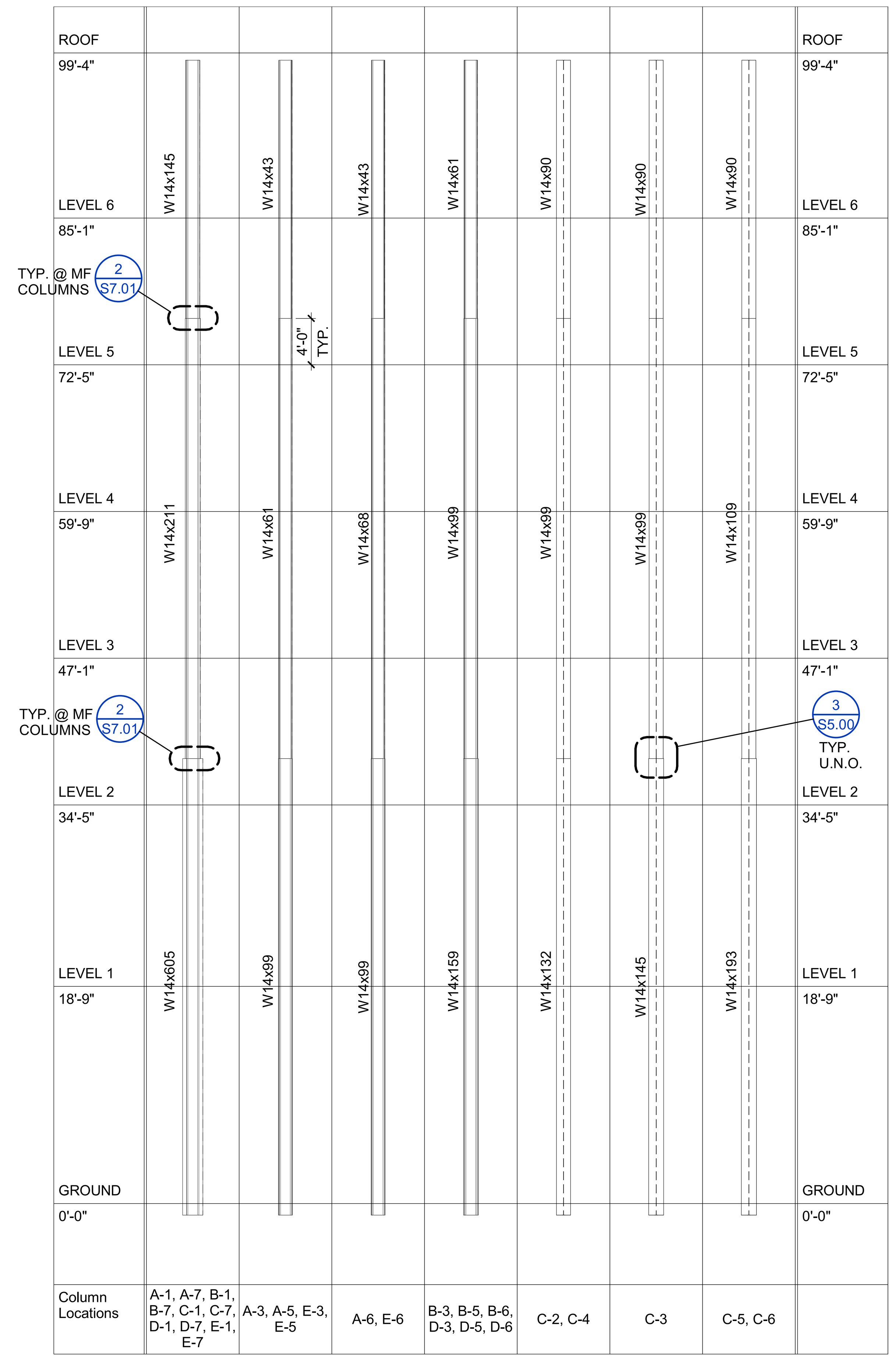
Approved	Approver

TITLE
FOUNDATION DETAILS

SHEET NUMBER
S3.00



1
S4.00
COLUMN SCHEDULE
NO SCALE

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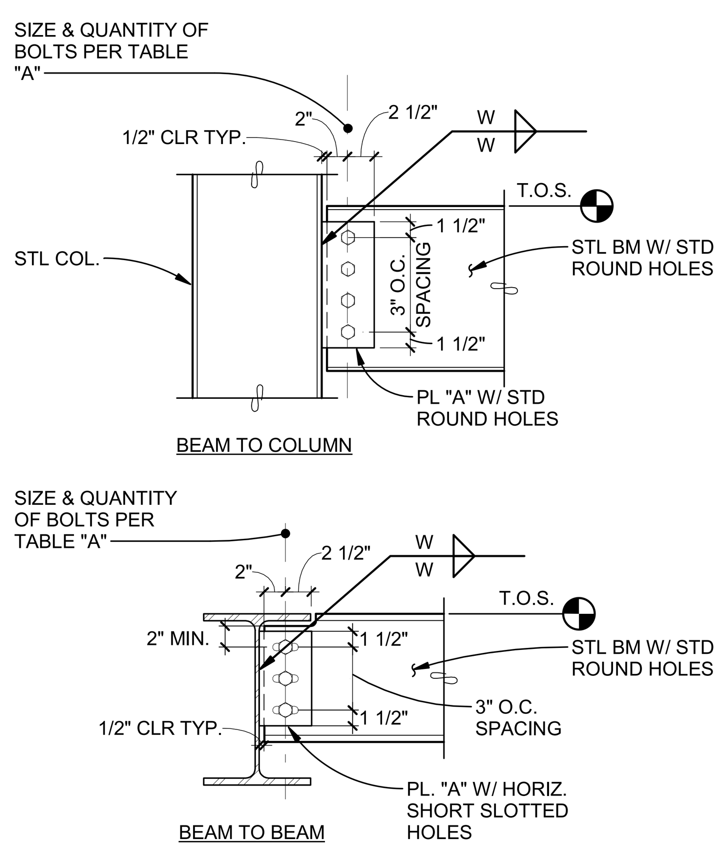


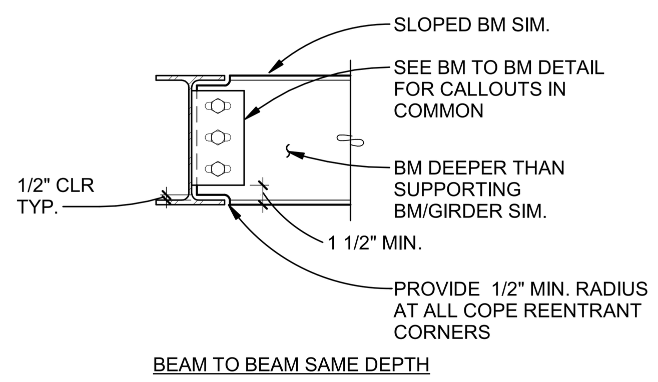


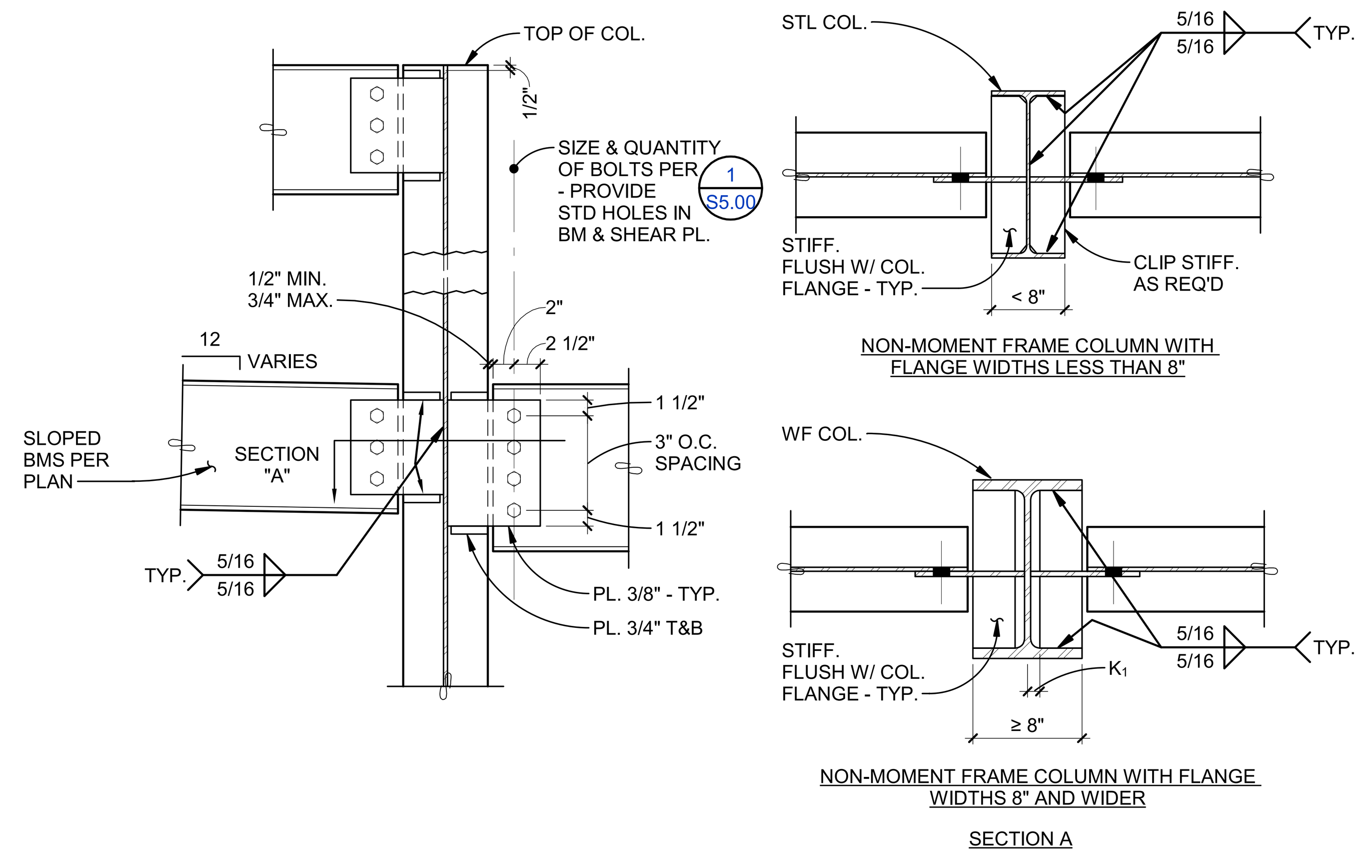
TABLE A

SUPPORTED BEAM SIZE	QUANTITY OF 7/8"ø A325N BOLTS	SHEAR PLATE THICKNESS "A"	WELD "W" NOTE 1.
W12, W14	3	3/8"	5/16"
W16, W18	4	3/8"	5/16"
W21	5	3/8"	5/16"
W24	6	3/8"	5/16"
W27	7	3/8"	5/16"
W30	7	3/8"	5/16"
W33	8	3/8"	5/16"

TYPICAL STEEL DETAIL

1 S5.00 DETAIL

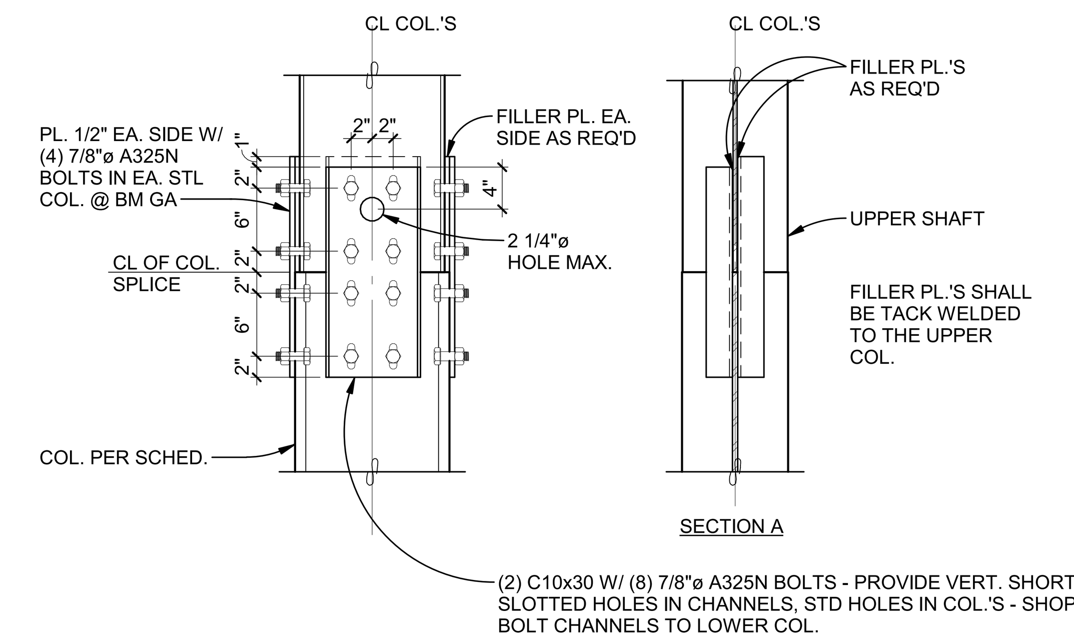
NO SCALE



TYPICAL BEAM/COLUMN FRAMING INTO WEB

2 S5.00 DETAIL

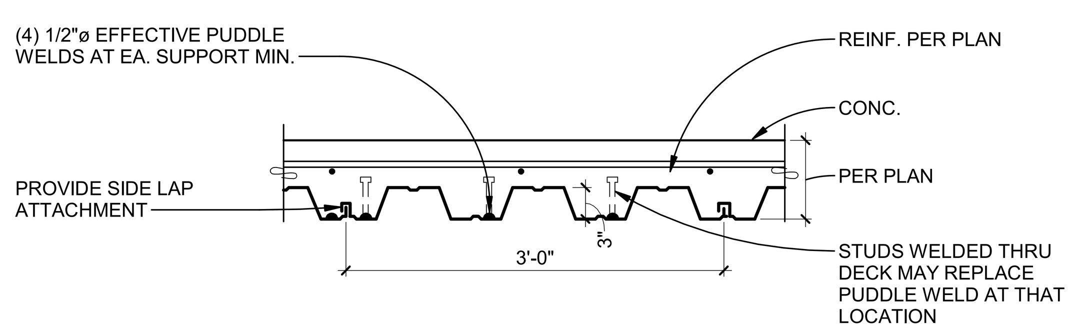
NO SCALE



TYPICAL COLUMN SPLICE

3 S5.00 DETAIL

NO SCALE

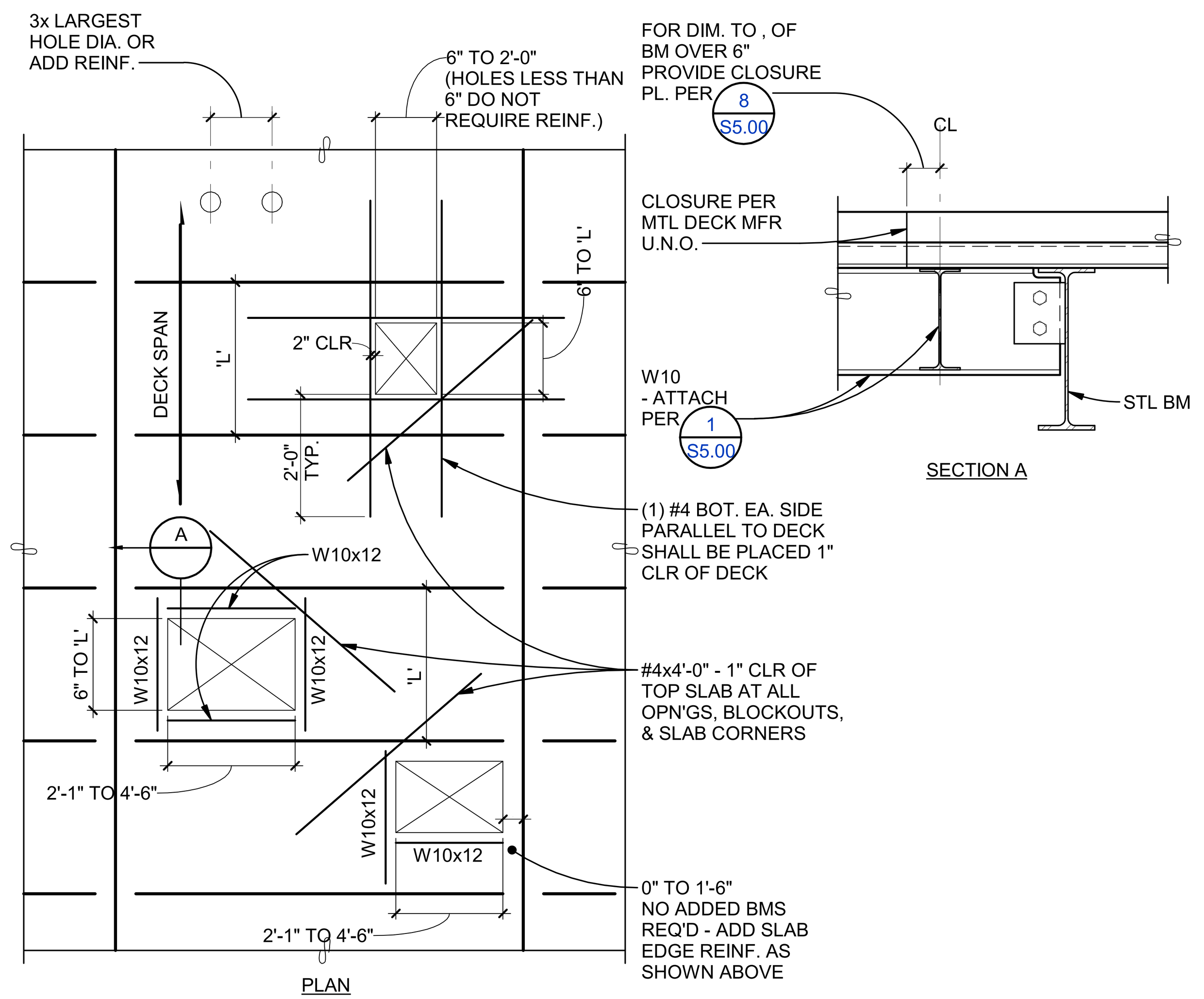


NOTES:
1. (2) SPAN MINIMUM, (3) SPAN PREFERRED.
2. AT SUPPORTS PARALLEL TO CORRUGATIONS, PROVIDE PUDDLE WELDS @ 24" O.C. MAXIMUM.

TYPICAL COMPOSITE FLOOR DECK

4 S5.00 DETAIL

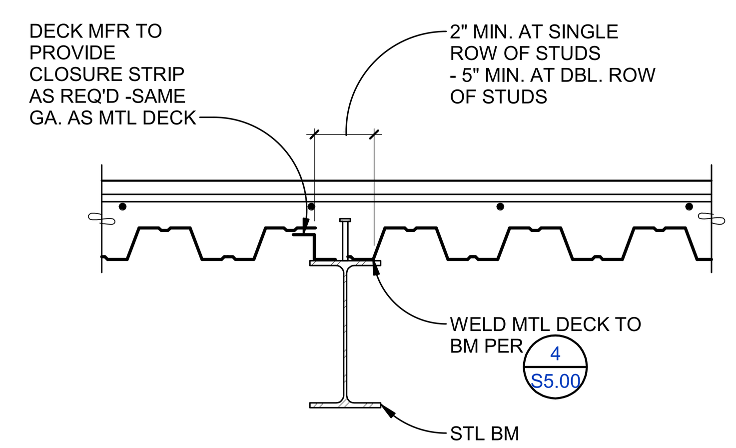
NO SCALE



TYPICAL FLOOR PENETRATION REINFORCEMENT

5 S5.00 DETAIL

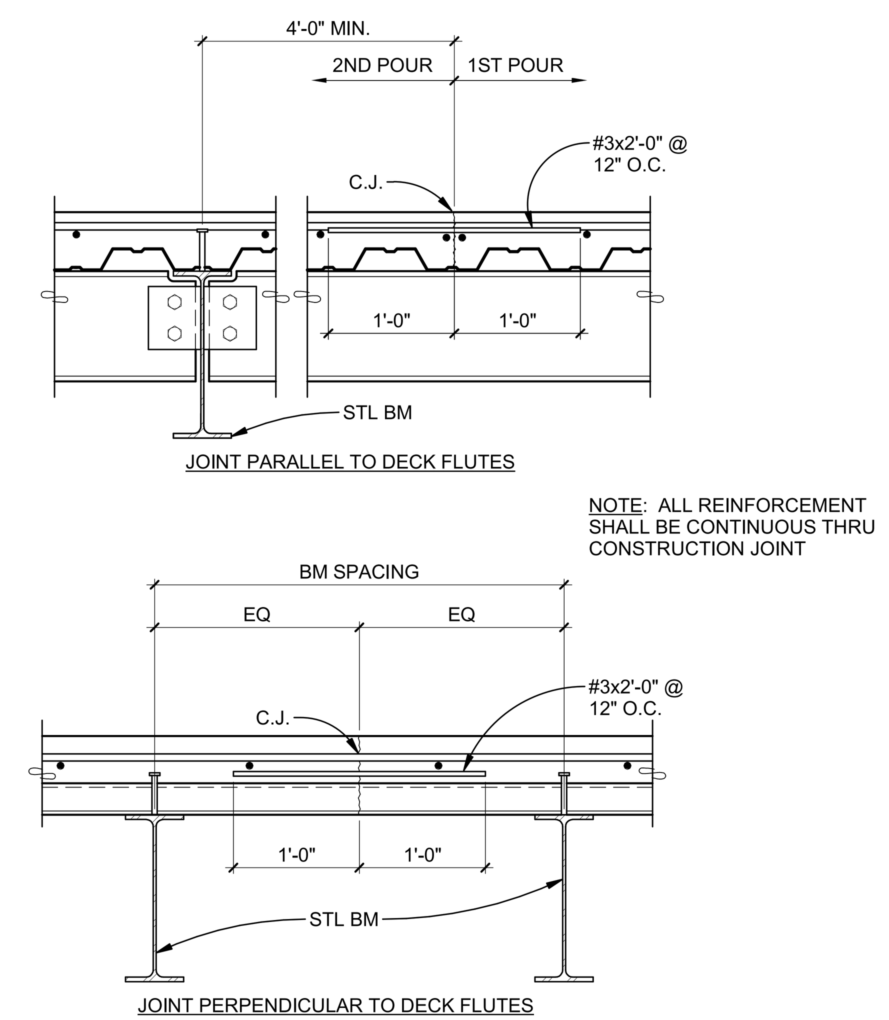
NO SCALE



TYPICAL AT METAL DECK PARALLEL TO BEAM

6 S5.00 SECTION

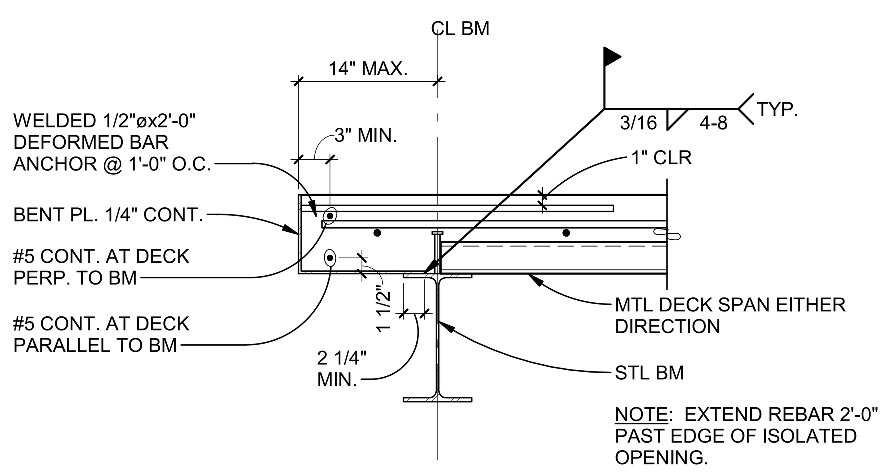
NO SCALE



TYPICAL COMPOSITE DECK CONSTRUCTION JOINT

7 S5.00 SECTION

1" = 1'-0"

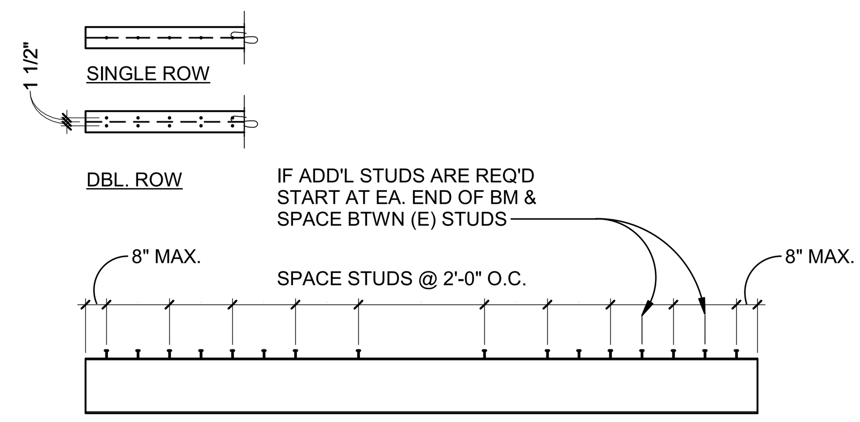


TYPICAL SLAB EDGE CONDITION - OVER 6" OVERHANG

8 S5.00 SECTION

NO SCALE

NOTES:
1. LOCATE STUDS AT CENTER OF BEAM FLANGE.
2. STUDS ARE 3/4"ø x 4 1/2" LONG AFTER WELDING.
3. SEE FRAMING PLANS FOR NUMBER OF STUDS.
4. ALL BEAMS WITH STUDS ARE COMPOSITE STEEL BEAMS.
5. PROVIDE A DOUBLE ROW OF STUDS AT BEAMS WHERE THE REQUIRED NUMBER OF STUDS EXCEEDS THE NUMBER THAT CAN FIT IN A SINGLE ROW AT 6" ON CENTER AT DECK PARALLEL TO BEAM OR 12" ON CENTER AT DECK PERPENDICULAR TO BEAM. STUDS SHOULD BE LOCATED IN DECK FLUTES PER AISC STRONG POSITION.



TYPICAL COMPOSITE BEAM DETAIL

9 S5.00 DETAIL

NO SCALE

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STEEL DETAILS

SHEET NUMBER
S5.00

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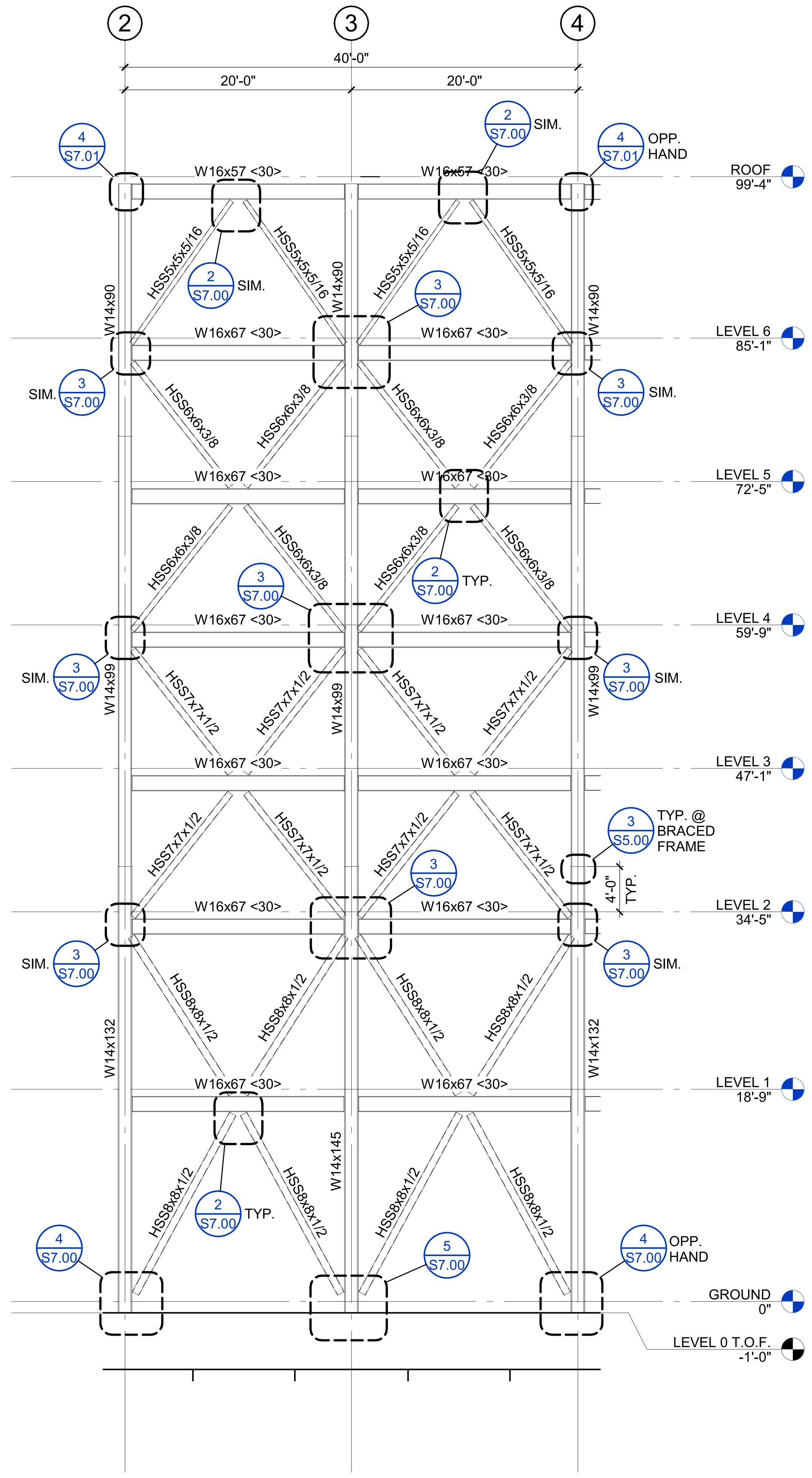
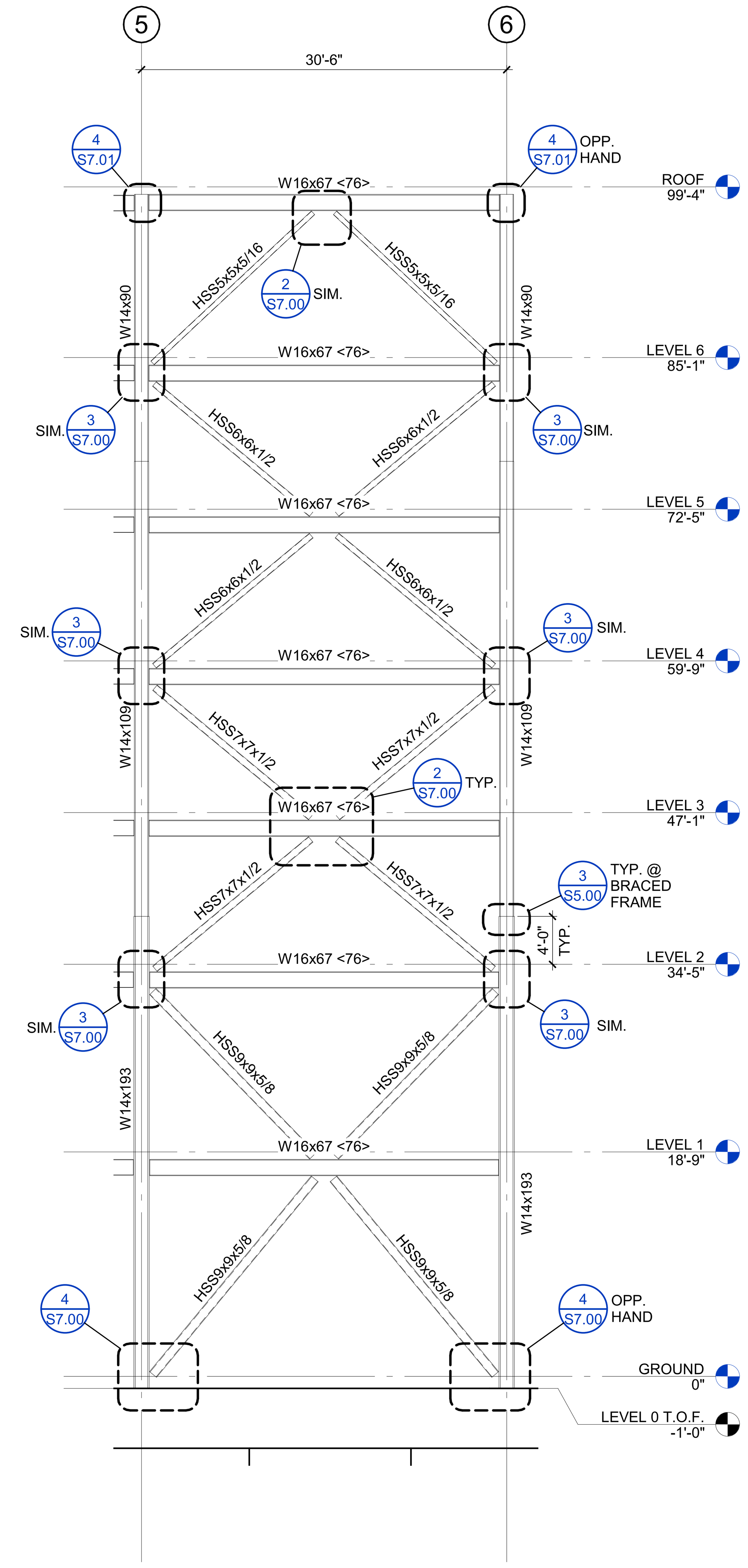


1 S6.00 BRACED FRAME ELEVATION

1/8" = 1'-0"



2 S6.00 BRACED FRAME ELEVATION

1/8" = 1'-0"

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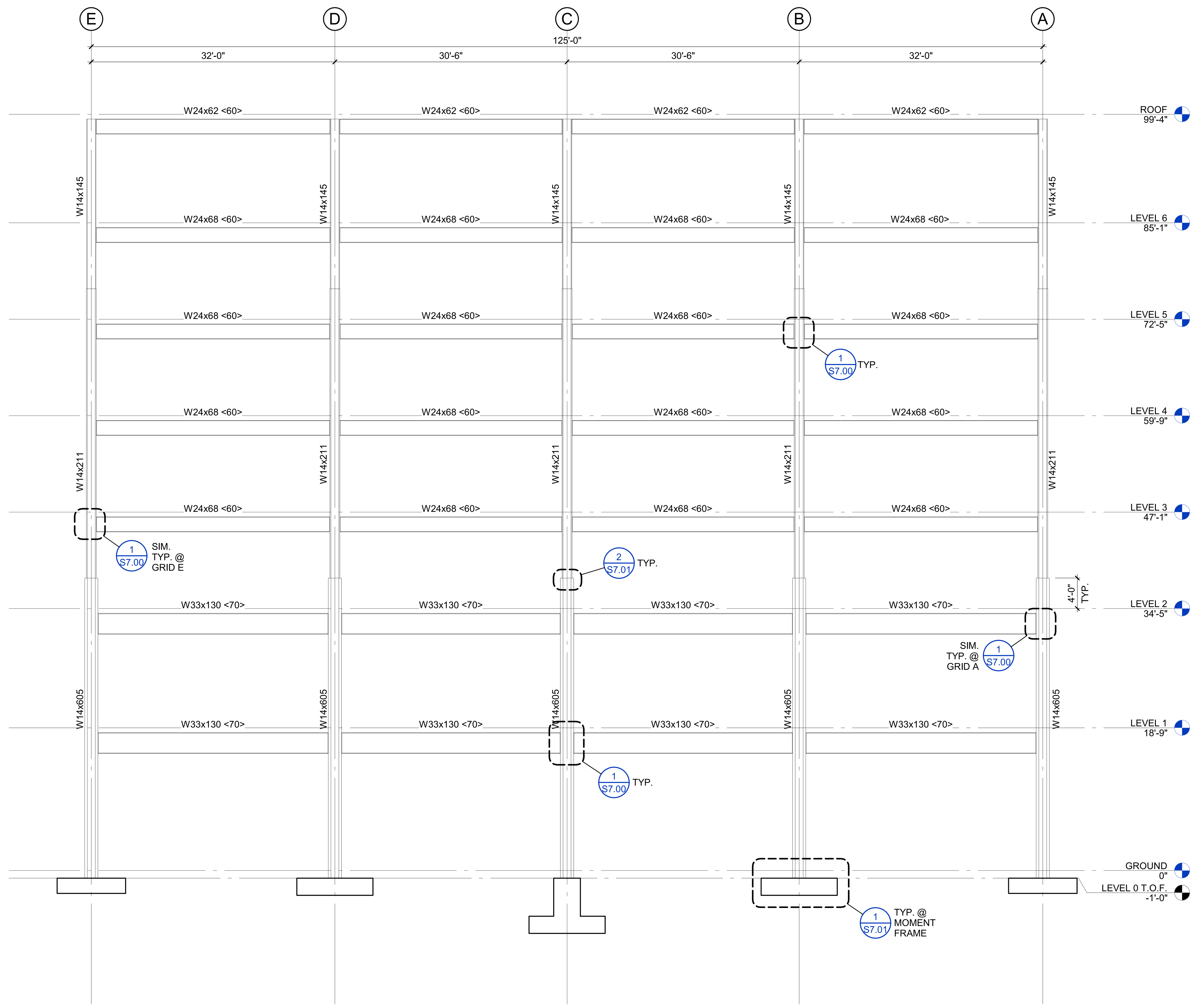
TITLE

BRACED FRAME ELEVATIONS

SHEET NUMBER

S6.00



1
S6.01
MOMENT FRAME ELEVATION
1/8" = 1'-0"

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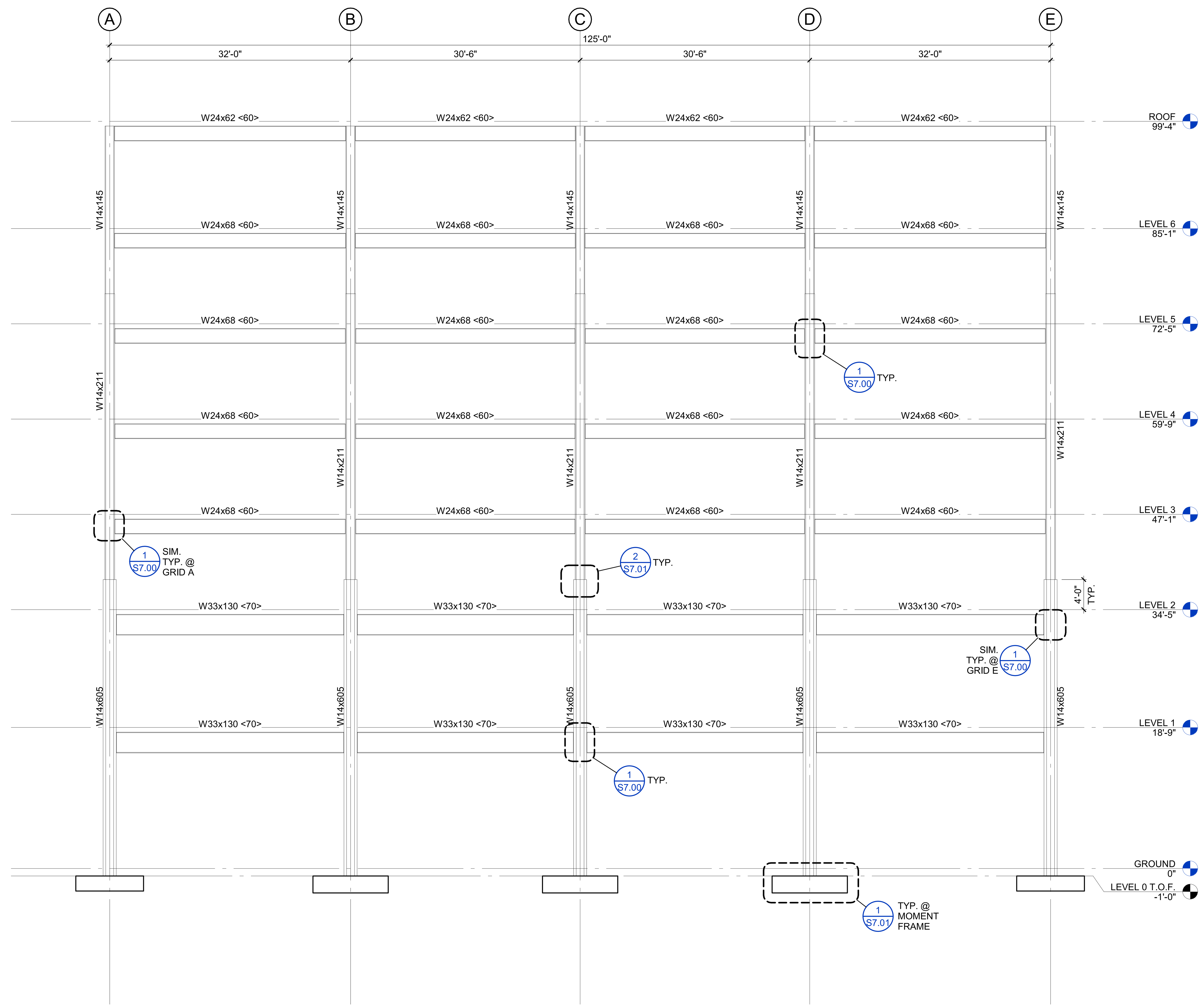
TITLE
MOMENT FRAME ELEVATION

SHEET NUMBER
S6.01



1 S6.02 MOMENT FRAME ELEVATION

1/8" = 1'-0"

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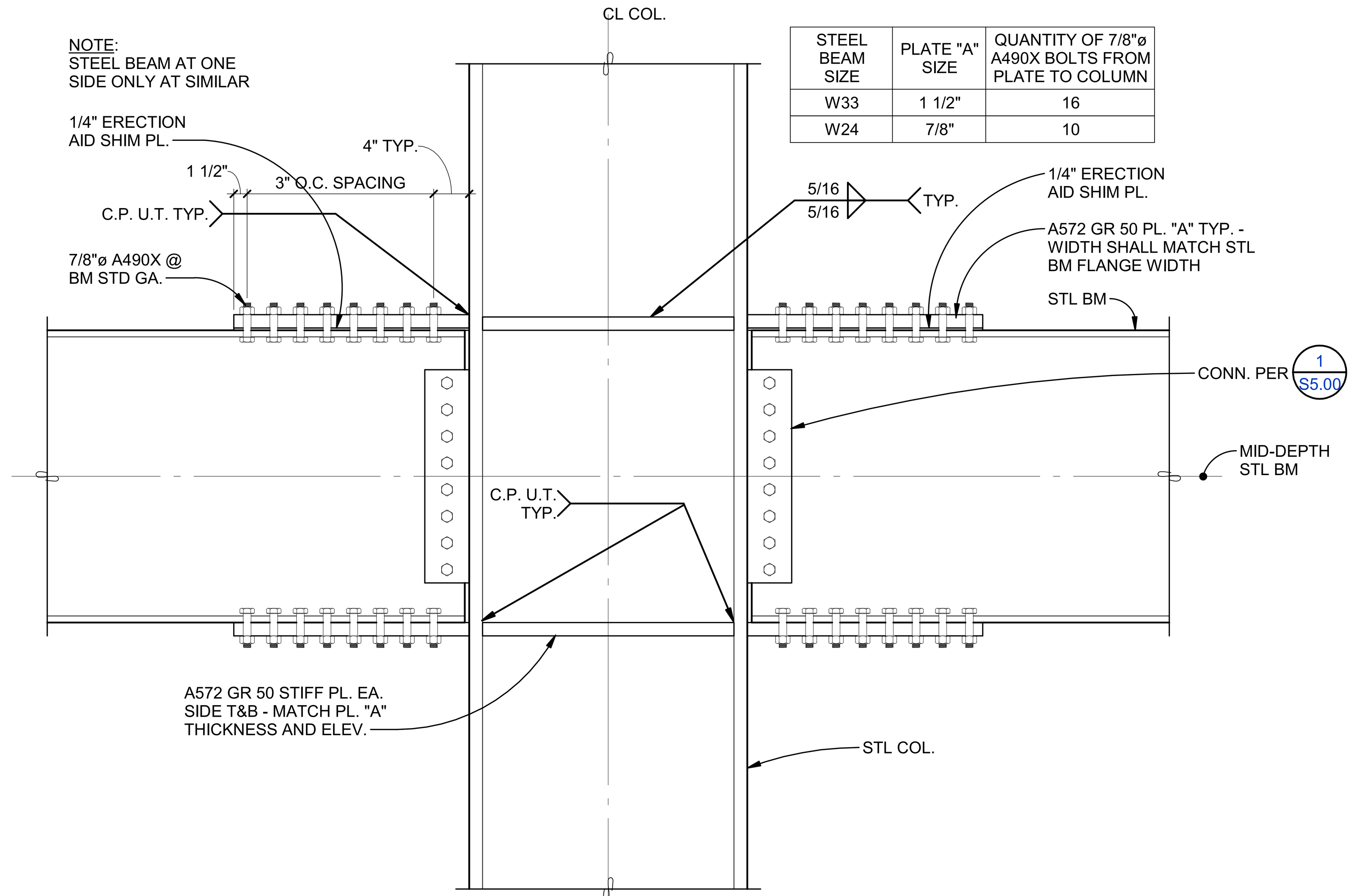
MOMENT FRAME ELEVATION

SHEET NUMBER

S6.02

STEEL BEAM SIZE	PLATE "A" SIZE	QUANTITY OF 7/8"ø A490X BOLTS FROM PLATE TO COLUMN
W33	1 1/2"	16
W24	7/8"	10

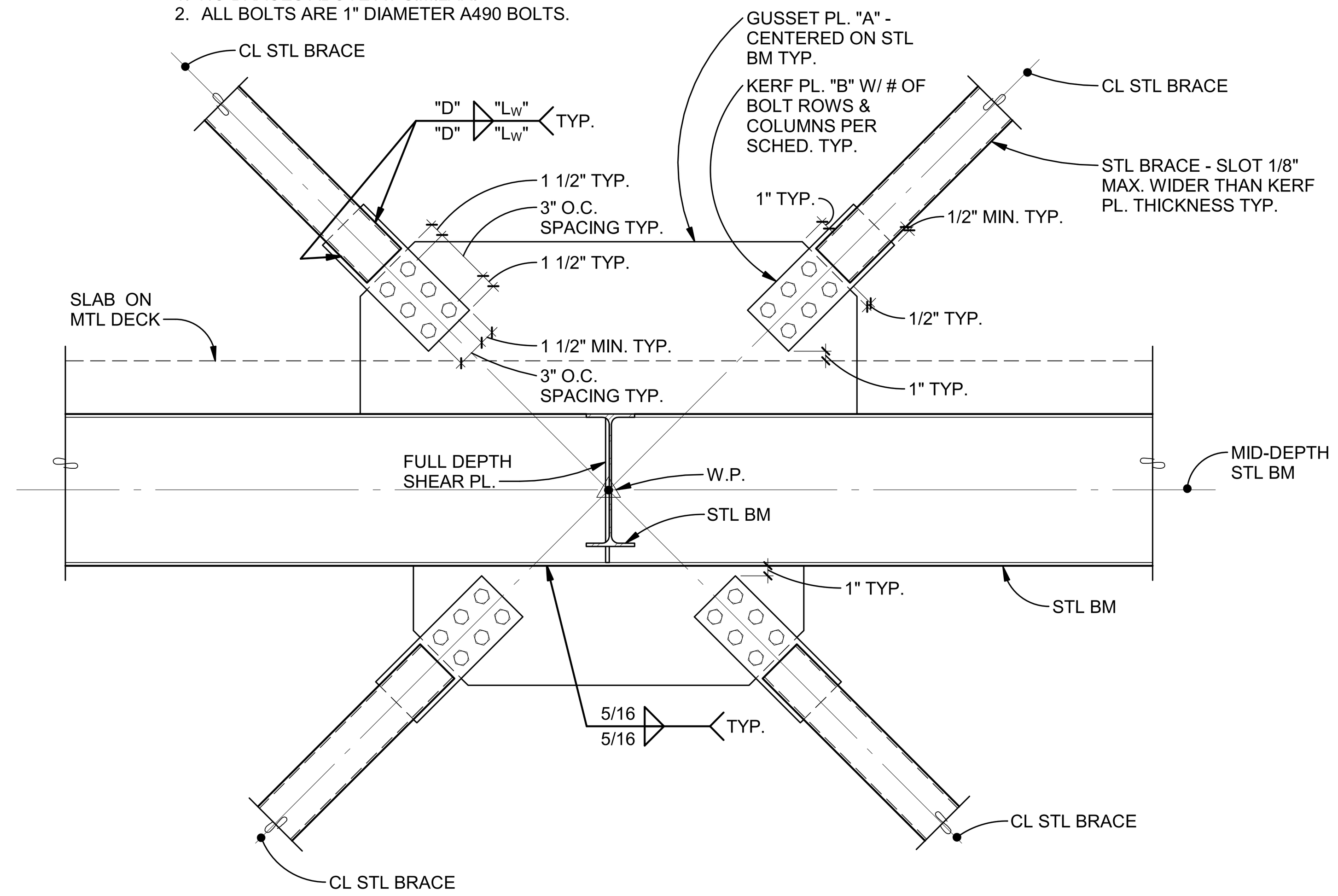
NOTE:
STEEL BEAM AT ONE SIDE ONLY AT SIMILAR



1 S7.00 DETAIL
NO SCALE

BRACED FRAME CONNECTION SCHEDULE						
STEEL BRACE SIZE	GUSSET PLATE "A" THICKNESS	WELD SIZE "D"	LENGTH OF WELD "L_W"	KERF PL. "B" THICKNESS	NUMBER OF A490 BOLT COLUMNS	NUMBER OF A490 BOLT ROWS
HSS5x5	5/8"	1/4"	10"	5/8"	2	2
HSS6x6	1 1/4"	5/16"	10"	1 1/4"	2	3
HSS7x7	1 1/2"	5/16"	13"	1 1/2"	3	3
HSS8x8	1 3/4"	5/16"	16"	1 3/4"	3	4
HSS9x9	2"	3/8"	17"	2"	3	5

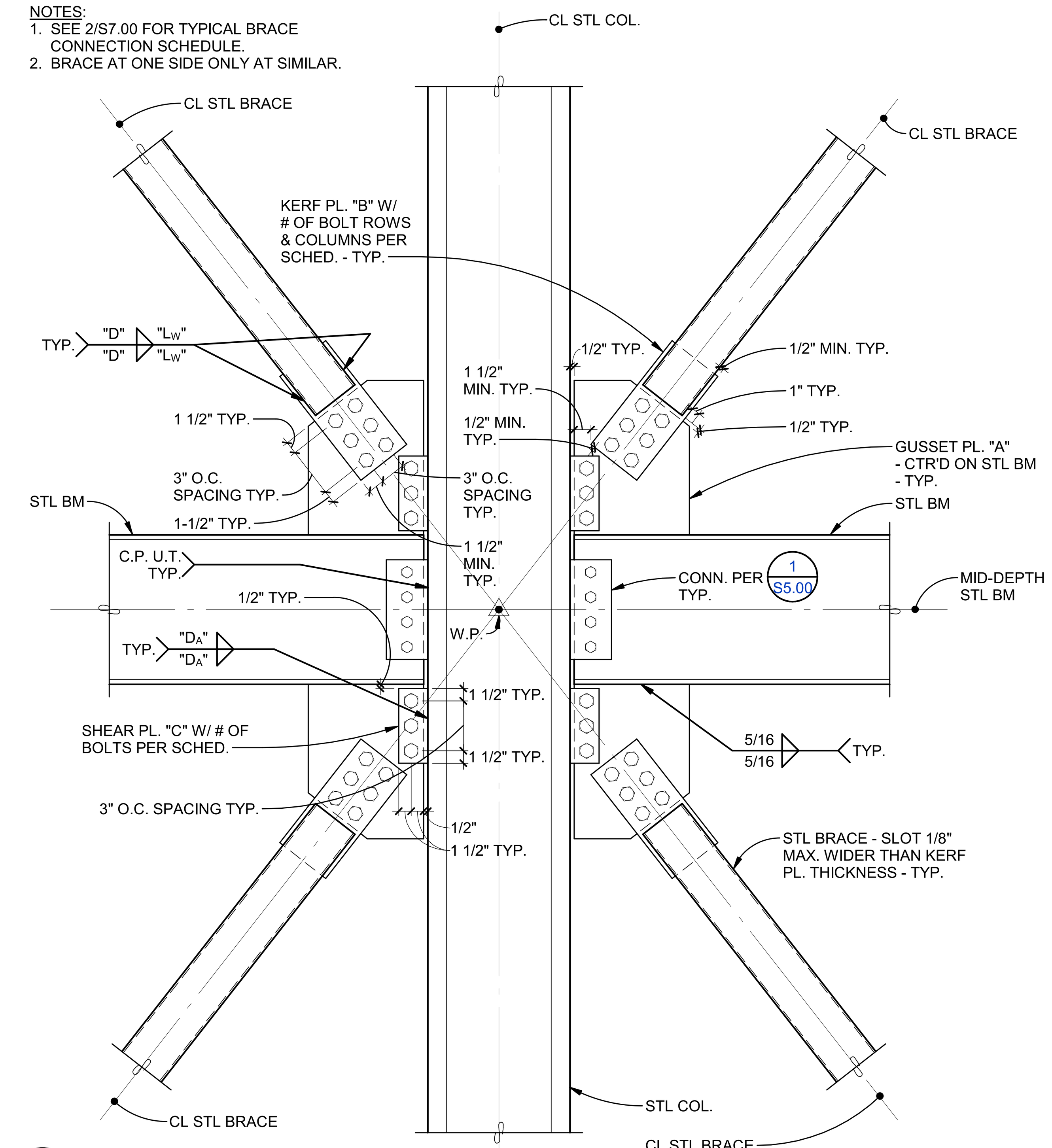
NOTES:
1. NO BRACES ABOVE AT SIMILAR.
2. ALL BOLTS ARE 1" DIAMETER A490 BOLTS.



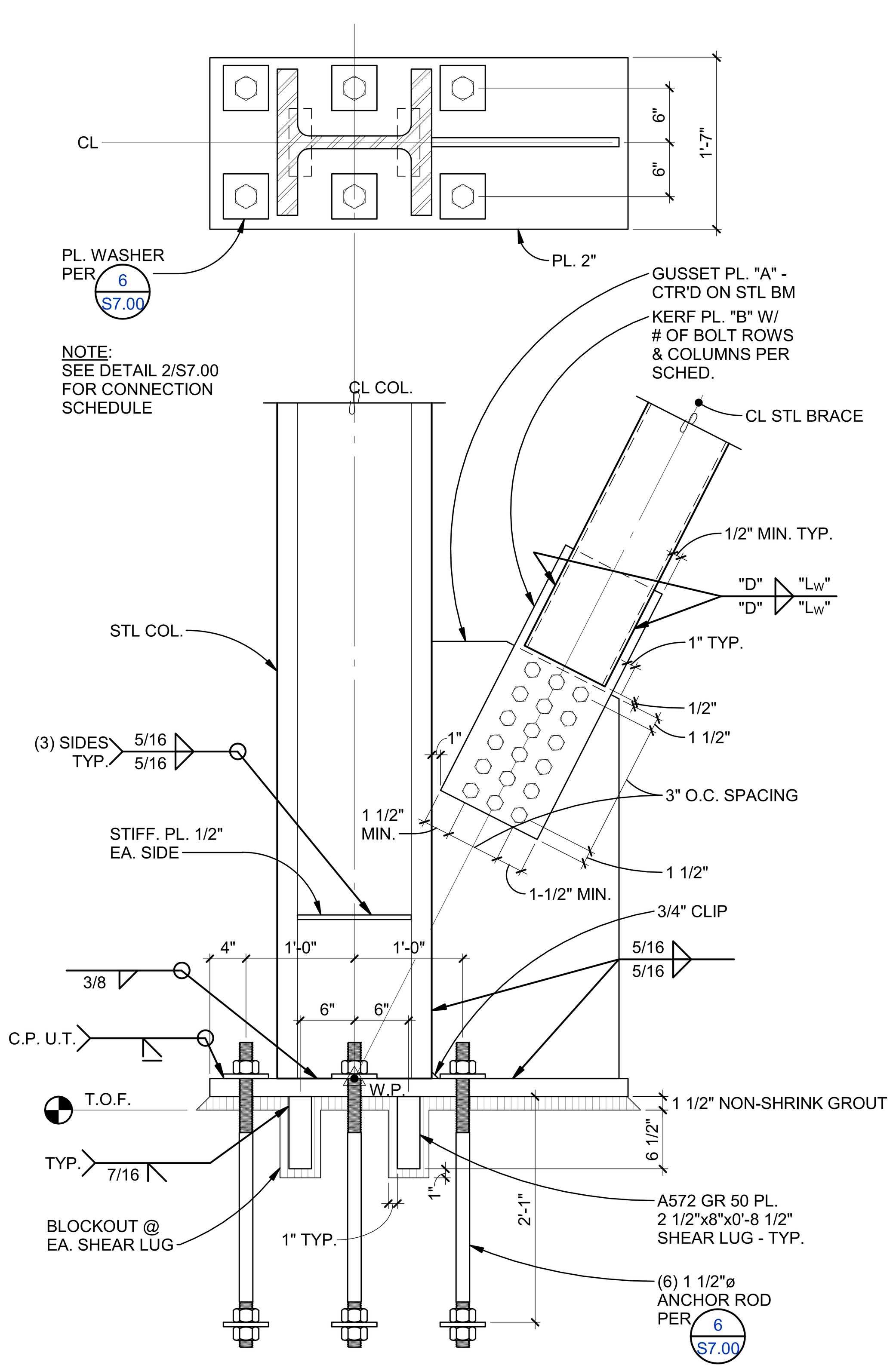
2 S7.00 DETAIL
NO SCALE

BRACED FRAME CONNECTION SCHEDULE			
STEEL BRACE SIZE	WELD SIZE "D_A"	SHEAR PLATE "C" THICKNESS	NUMBER OF 1"ø A490 BOLTS
HSS5x5	1/4"	1/2"	2
HSS6x6	1/4"	1/2"	3
HSS7x7	1/4"	3/4"	5
HSS8x8	1/4"	3/4"	7
HSS9x9	5/16"	3/4"	8

NOTES:
1. SEE 2/S7.00 FOR TYPICAL BRACE CONNECTION SCHEDULE.
2. BRACE AT ONE SIDE ONLY AT SIMILAR.



3 S7.00 DETAIL
NO SCALE



4 S7.00 DETAIL
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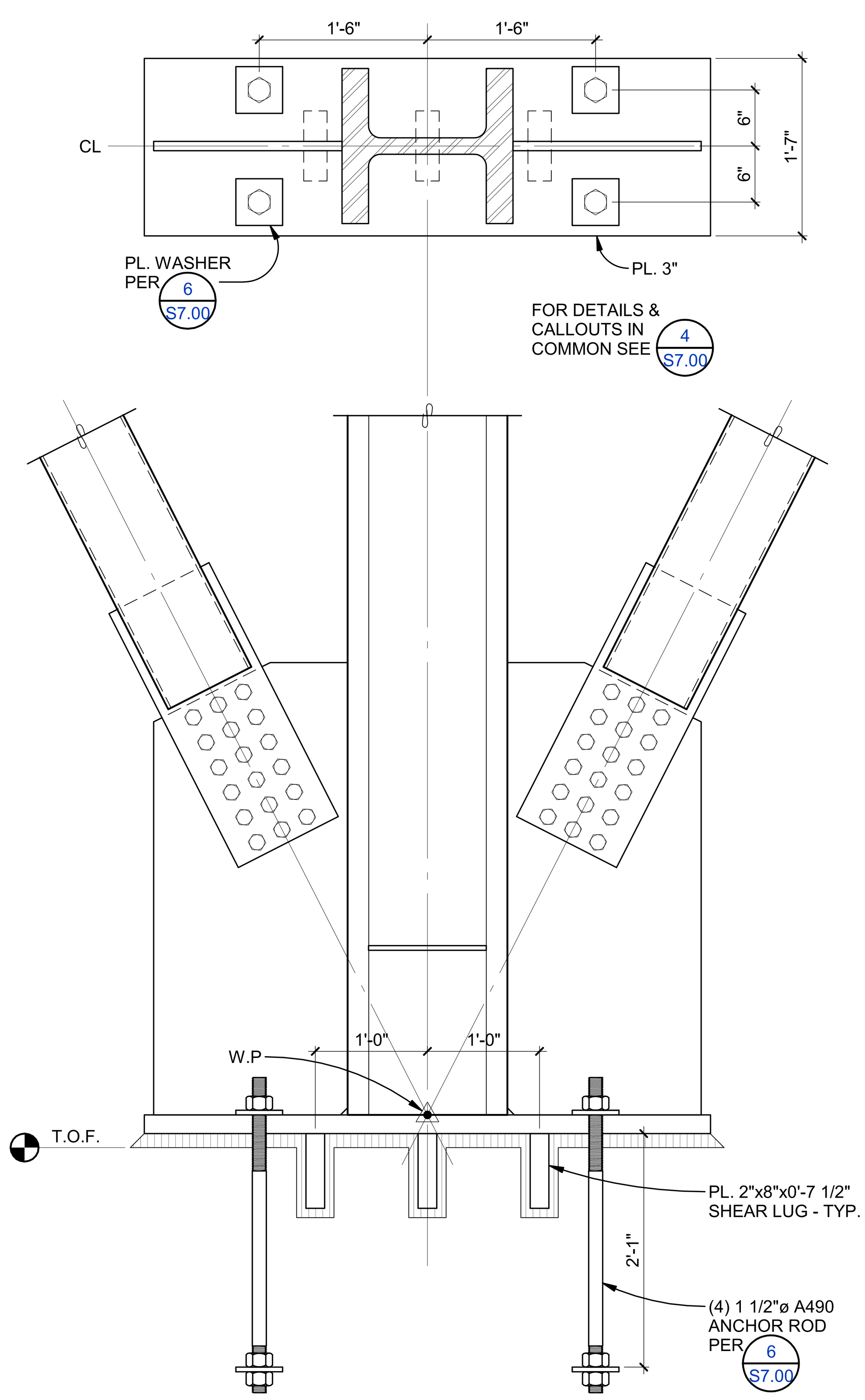
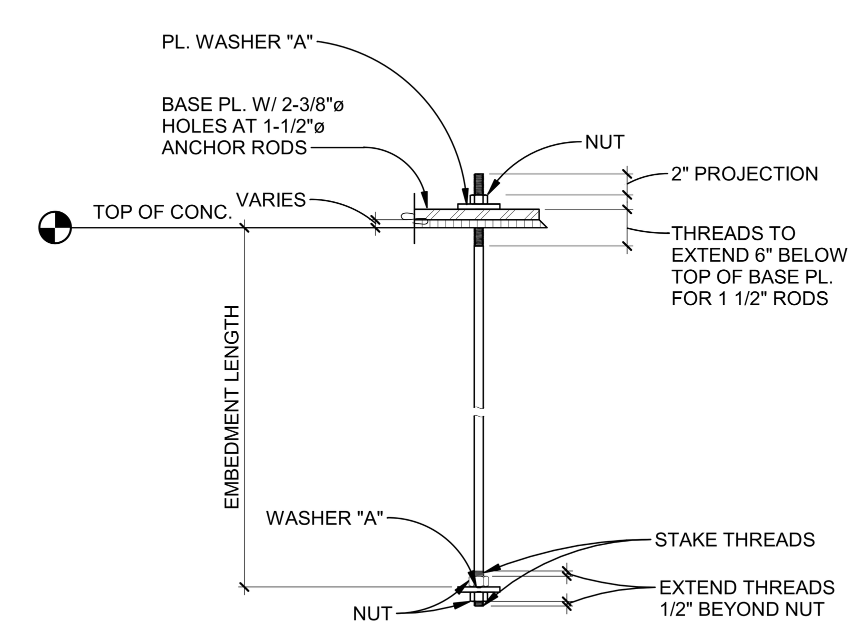


5 S7.00 SECTION
NO SCALE

ANCHOR ROD		WASHER		NUT
SIZE	MATERIAL	TYPE	SIZE	
1 1/2"ø	F1554 GRADE 105	A	PL. 1/2"x5"x0'-5" W/ 1 7/8"ø HOLE CENTERED	A563 GRADE A HEAVY HEX



TYPICAL ANCHOR ROD/BOLT DETAIL

6 S7.00 SECTION
NO SCALE

9/27/2021 9:32:54 AM
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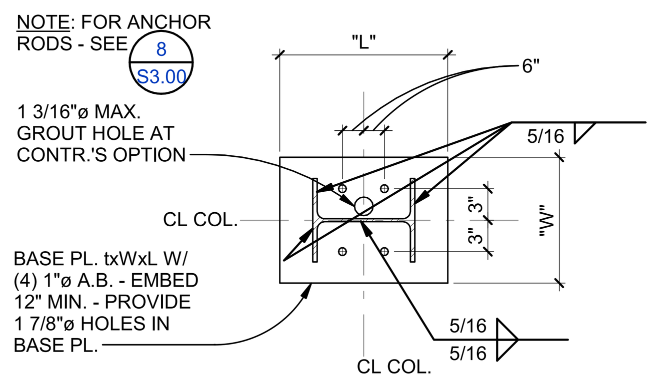
FRAME DETAILS

SHEET NUMBER
S7.00

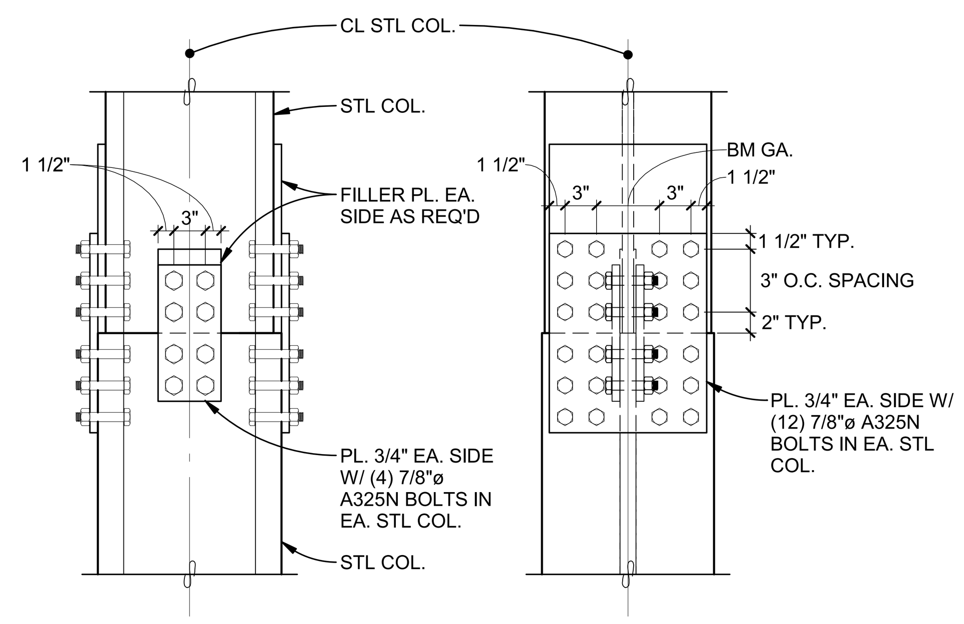


WIDE FLANGE

COLUMN SIZE	"W" (IN.)	"L" (IN.)	"t" (IN.)
W30x	19	34	2

TYPICAL COLUMN BASE PLATE

1 S7.01 SECTION
NO SCALE



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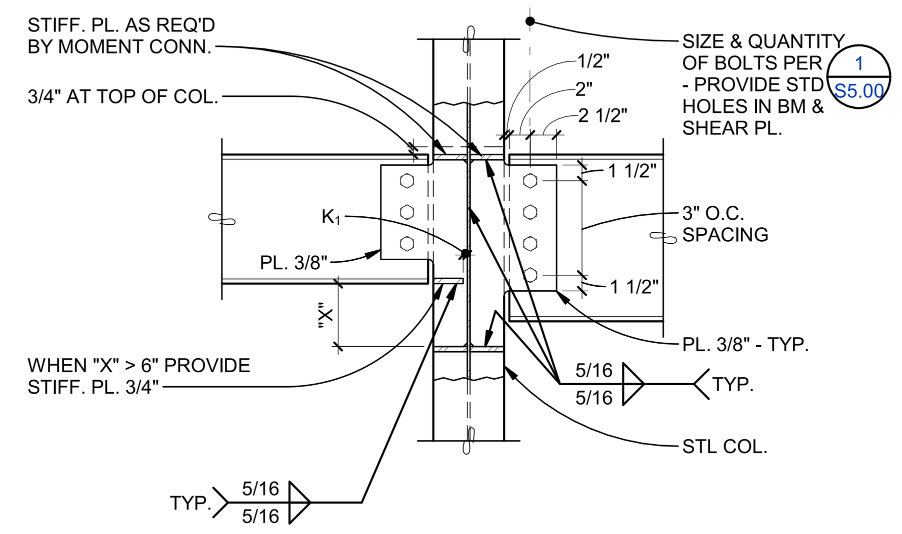
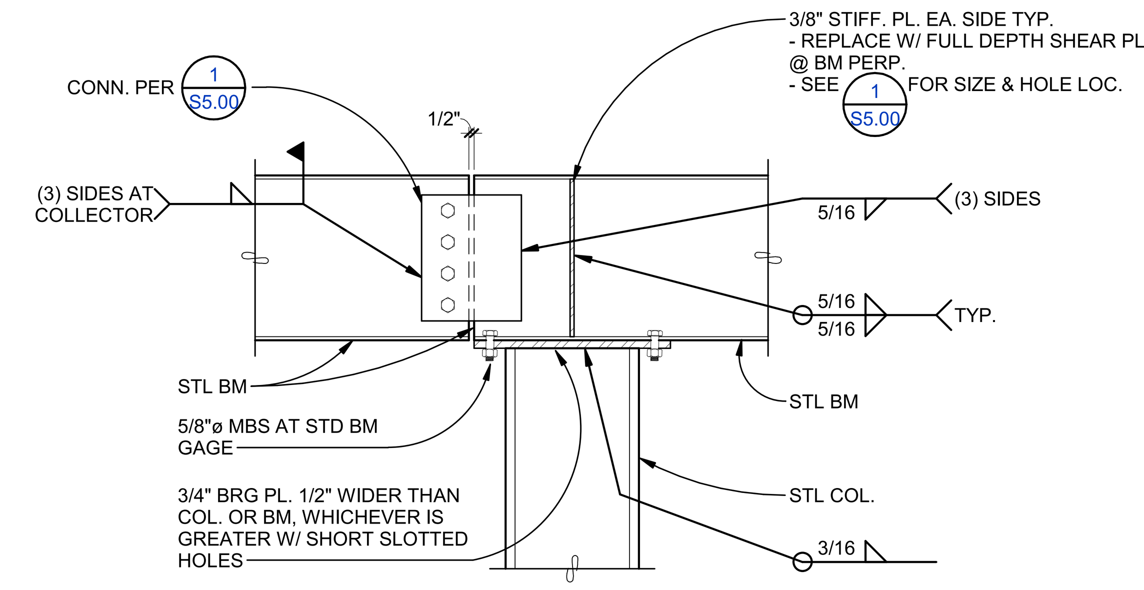


TYPICAL BEAM TO COLUMN WEB CONNECTION WITH ADJACENT MOMENT CONNECTION

3 S7.01 DETAIL
NO SCALE



4 S7.01 DETAIL
NO SCALE

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FRAME DETAILS

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Design Case C

1987 NBC
"Risk Category IV"
"Seismic Design Category B"

C.1 Gravity Design

The 7-story healthcare facility is a steel framed building with 3" metal deck and 4-1/2" of concrete topping providing a total slab thickness of 7-1/2", not including the structural steel framing. This decking was chosen to provide the required 2-hour fire rating that is typical for healthcare facilities. The columns and beams are ASTM A36 steel wide flange members and were designed using allowable stress procedures in accordance with AISC *Steel Construction Manual* 8th edition. The deflection was limited to the NBC prescribed limits of $L/360$ for applied live loads and $L/240$ for applied total loads.

The calculated total dead load applied was 95 psf and 20 psf partition load at the floors and a dead load of 100 psf at the roof. The increase of dead load at the roof is attributed to the theoretical mechanical units typically placed on the roof structure. The live loads chosen for the floors and roof were provided by Section 1103 of 1987 NBC. It should be noted that the 40 psf roof live loads controlled the design over the calculated snow load per Section 1111.0 of 1987 NBC.

C.2 Lateral Design

There are two separate lateral-load-resisting systems for this building, a steel braced frame system for the lateral load resistance in the North/South direction and a steel special moment frame system for the lateral load resistance in the East/West direction. The applied wind and seismic loads were determined using Sections 1112.0 and 1113.0 respectively from the NBC. In each case the seismic force controlled the design, most likely due to the increased dead load caused by the 7-1/2" total slab depth at each story. In both directions the eccentric loading, both calculated and required accidental, was included in determining the applied frame forces at each level.

The braced frames have a two-story X configuration and utilize ASTM A500 Gr. B tube steel braces. The relative stiffness between the braced frames were designed to be similar, to efficiently distribute the applied load at each diaphragm to allow for overall efficiency of the brace, beam, and column sizes of the braced frame system.

Given that the global stiffness of the braced frame system is high, the frames were strength controlled. At the foundations, the anchorage was designed to resist the uplift force due to overturning and the shear lugs were designed to transfer the applied shear forces to the foundations.

The moment frames have been designed using bolted moment connections. This type of connection was chosen because this is the preferred method of moment frame construction in the New York City area. It was permissible to use special moment frames with a response modification factor $K = 0.67$ because we were able to meet the member thickness requirements listed in the NBC Section 1113.0 and Chapter 5 of AISC 8th edition. The design of the moment frame was controlled by the 0.5% drift limit provided in the NBC. In order to meet this requirement, the columns were designed with a fixed connection at the foundation. The size of the columns at the lower levels, and the beams at the first and second level had to increase in size as well.

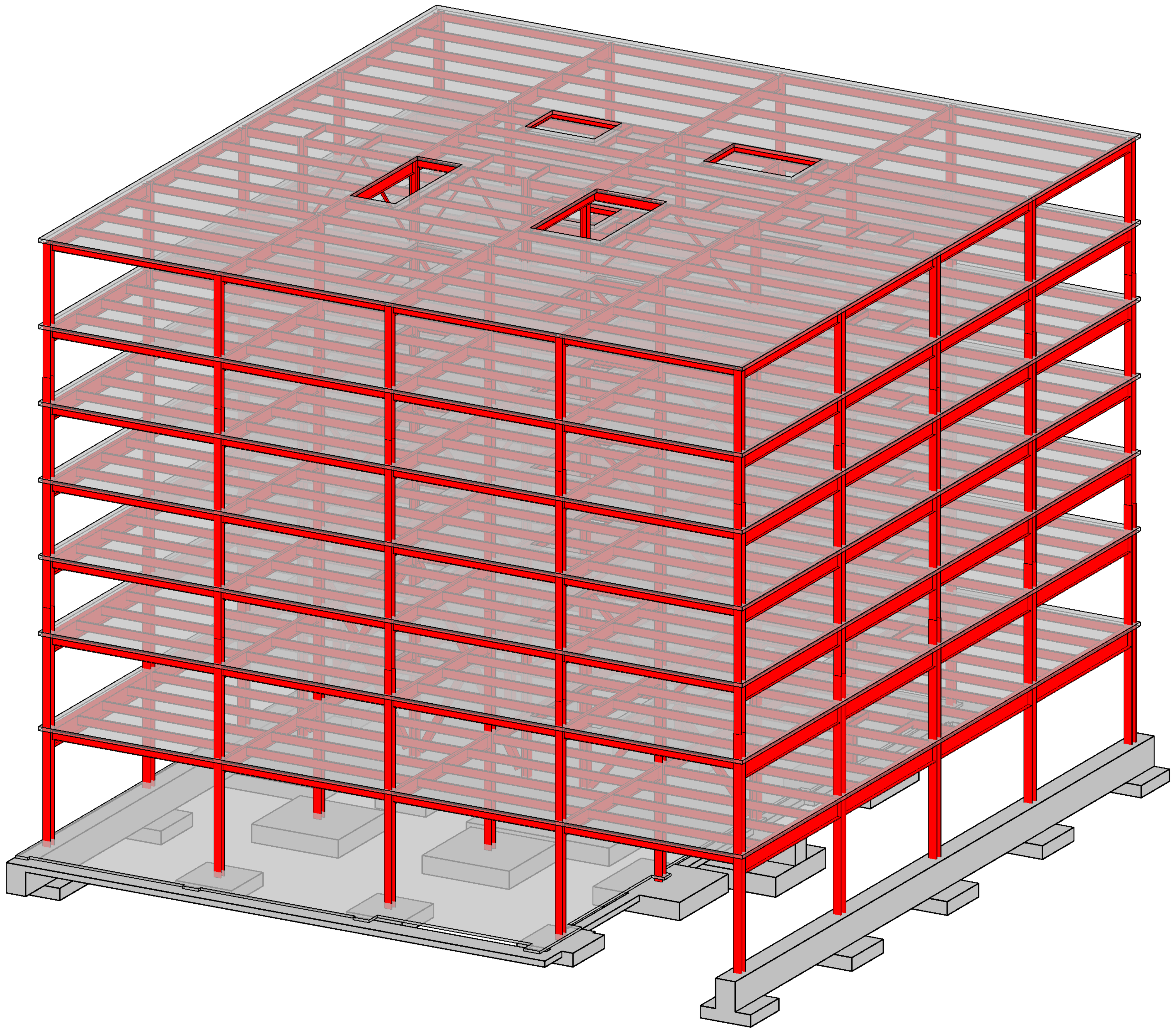
C.3 Steel Tonnage

Total steel tonnage for this design case is calculated as 856 tons.

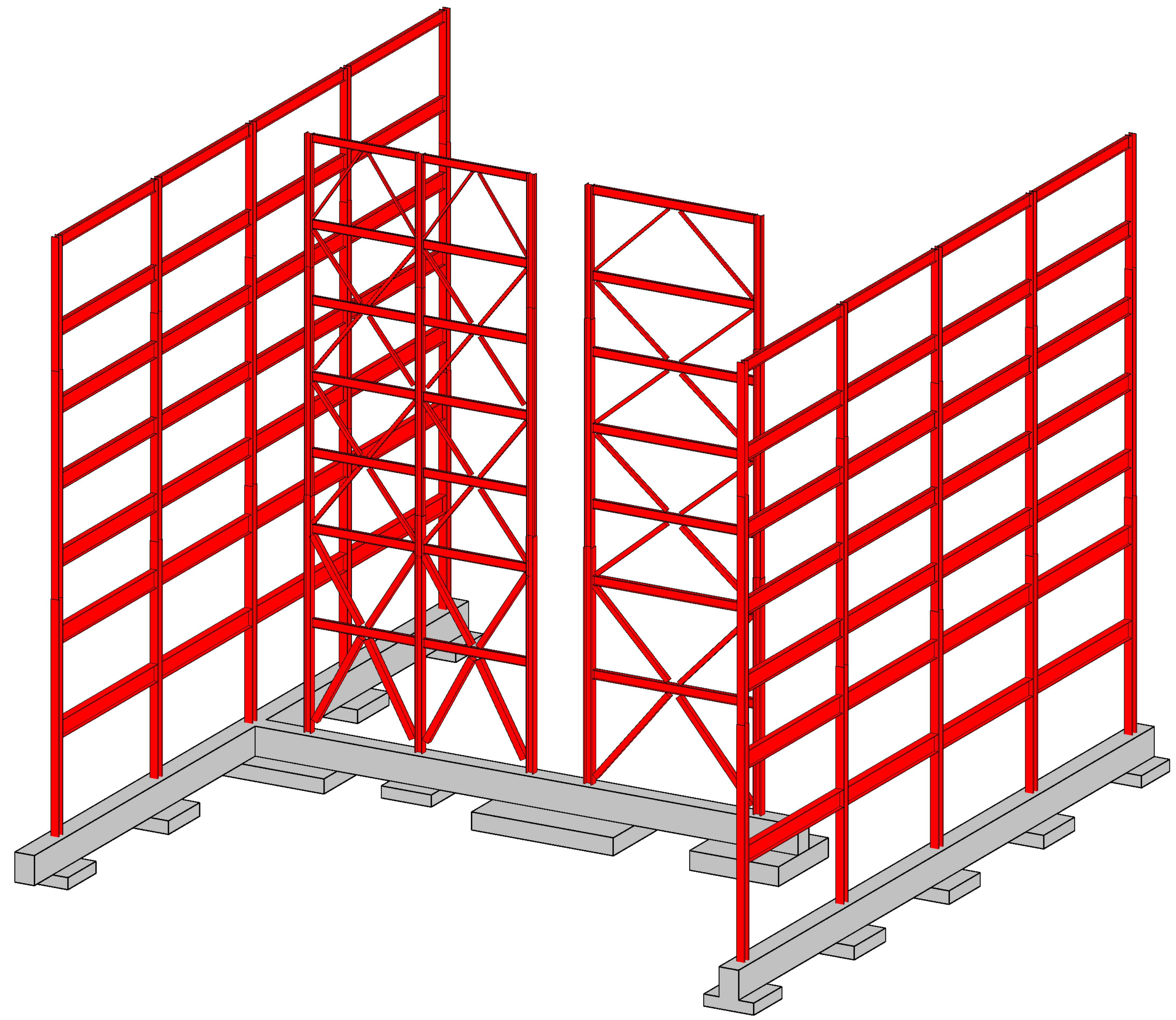
C.4 Structural Drawings

Structural drawings for Design Case C are provided on the following pages.

HEALTHCARE FACILITY - LONG ISLAND, NEW YORK
DESIGN C - 1987 NBC WITH EQUIVALENT RISK CATEGORY IV



OVERALL FRAMING 3D VIEW



LATERAL FORCE RESISTING SYSTEM 3D VIEW

DESIGN C: 1987 NBC "RISK CATEGORY IV" EQUIVALENT	
HEALTHCARE FACILITY, LONG ISLAND, NEW YORK	
ITEM	QUANTITY
WF COLUMNS (Fy = 36 KSI)	108 TONS
WF GIRDERS AND JOISTS (Fy = 36 KSI)	378 TONS
MOMENT FRAME WF COLUMNS (Fy = 36 KSI)	178 TONS
MOMENT FRAME WF BEAMS (Fy = 36 KSI)	131 TONS
BRACED FRAME WF COLUMNS (Fy = 36 KSI)	42 TONS
BRACED FRAME WF BEAMS (Fy = 36 KSI)	13 TONS
HSS BRACES (Fy = 46 KSI)	6 TONS
TOTAL	856 TONS

1. STEEL QUANTITIES DO NOT INCLUDE MISCELLANEOUS STEEL, CUT WASTE STEEL, STAIRS, TYPICAL STEEL FRAMING CONNECTIONS, ETC.

DRAWING INDEX

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TITLE
COVER SHEET

SHEET NUMBER
S0.00

GENERAL NOTES

STANDARDS
THE DESIGN AND MATERIALS SHALL CONFORM TO THE 1987 NATIONAL BUILDING CODE (NBC) AS AMENDED AND ADOPTED BY THE LOCAL BUILDING OFFICIAL OR APPLICABLE JURISDICTION.

STRUCTURAL DRAWINGS

PRIMARY STRUCTURAL ELEMENTS ARE DIMENSIONED ON STRUCTURAL PLANS AND DETAILS AND OVERALL LAYOUT OF STRUCTURAL PORTION OF WORK. STRUCTURAL DETAILS SHOW DIMENSIONAL RELATIONSHIPS TO CONTROL DIMENSIONS DEFINED BY DRAWINGS.

PROJECT LOCATION

LONG ISLAND, NEW YORK

40.6471 LATITUDE, -73.5642 LONGITUDE

DESIGN CRITERIA

VERTICAL LOADS

AREA	DESIGN DEAD LOAD	LIVE LOAD (2)	PARTITION LOAD	CONCENTRATED LOADS
OPERATING ROOMS	95 PSF	60 PSF	20 PSF	1000#
PRIVATE ROOMS	95 PSF	40 PSF	20 PSF	1000#
CORRIDORS ABOVE 1ST FLOOR	95 PSF	80 PSF	20 PSF	1000#
ROOF	100 PSF	40 PSF (1)	-	-

(1) DRIFT AND UNBALANCED SNOW LOAD PER NBC, 1987, CHAPTER 4.
(2) LIVE LOAD REDUCTION NOT PERMITTED EXCEPT AS NOTED IN NBC 1987, SECTION 1115.0.

SNOW:

Pg = 35 PSF = GROUND SNOW LOAD
Pf = CeI Pg = FLAT ROOF SNOW LOAD = 29.4 PSF
Ps = CsPf = SLOPED ROOF SNOW LOAD
I = 1.2, Ce = 0.7

LATERAL FORCES

LATERAL FORCES ARE TRANSMITTED BY DIAPHRAGM ACTION OF ROOF AND FLOORS TO BRACED FRAME/MOMENT FRAME. LOADS ARE THEN TRANSFERRED TO FOUNDATION BY BRACED FRAME/MOMENT FRAME ACTION WHERE ULTIMATE DISPLACEMENT IS RESISTED BY PASSIVE PRESSURE OF EARTH AND/OR SLIDING FRICTION. OVERTURNING IS RESISTED BY DEAD LOAD OF THE STRUCTURE.

WIND:

THE BUILDING MEETS THE CRITERIA PER NBC 1987 SECTION 1112.0.

- EXPOSURE CATEGORY = B
- BASIC WIND SPEED, V = 90 MPH
- EQUIVALENT RISK CATEGORY PER TABLE 1.5-1 = IV
- PRESSURE COEFFICIENT (ENCLOSED) = 0.8, -0.5
- WIND IMPORTANCE FACTOR I_W = 1.07
- DESIGN WIND BASE SHEAR = 390 KIPS

SEISMIC: (NBC 1987) V = ZIkCSW

Z = 3/8
SEISMIC IMPORTANCE FACTOR, I = 1.50
EQUIVALENT RISK CATEGORY OF BUILDING PER TABLE 1113.1 = IV
k = 1.0 AT BRACED FRAME, k= 0.67 AT MOMENT FRAME
W = EFFECTIVE SEISMIC WEIGHT OF BUILDING = 12180 KIPS
ANALYSIS PROCEDURE USED = EQUIVALENT LATERAL FORCE PROCEDURE
CS = 0.14
DESIGN BRACE FRAME BASE SHEAR V = 962 KIPS
DESIGN MOMENT FRAME BASE SHEAR V = 645 KIPS

FOUNDATION DESIGN CRITERIA

SOIL BEARING PRESSURE: 6000 PSF (ASSUMED)

ACTIVE PRESSURE - RESTRAINED: 50 PCF +14H SEISMIC SURCHARGE (ASSUMED)
ACTIVE PRESSURE - UNRESTRAINED: 35 PCF +6H SEISMIC SURCHARGE (ASSUMED)
PASSIVE RESISTANCE: 200 PCF (INCLUDES F.O.S. ≥ 1.5) (ASSUMED)
COEFFICIENT OF FRICTION: .35 (INCLUDES F.O.S. ≥ 1.5) (ASSUMED)
*1/3 INCREASE ALLOWED FOR SEISMIC OR WIND LOADING

CONCRETE

CAST-IN-PLACE CONCRETE

ITEM	DESIGN f'c (PSI) (AT 28 DAYS U.N.O.)
FOUNDATIONS	3000
SLABS ON GRADE AND SLABS ON METAL DECK	4000

REINFORCING STEEL

ASTM A615, GRADE 60 TYPICAL UNLESS NOTED OTHERWISE.

WELDED WIRE REINFORCEMENT SHALL CONFORM TO ASTM A185. LAP ONE FULL MESH ON SIDES AND ENDS BUT NOT LESS THAN 8 INCHES. WELDED WIRE REINFORCING SHALL BE SUPPORTED TO WITHSTAND CONCRETE PLACEMENT. PULLING OF MESH INTO PLACE AFTER PLACEMENT IS NOT ALLOWED.

REINFORCING SPLICE AND DEVELOPMENT LENGTH SCHEDULE, Fy=40 KSI (UNLESS NOTED OTHERWISE)

BAR SIZE	MINIMUM LAP SPLICE LENGTHS ("Ls")	MINIMUM DEVELOPMENT LENGTHS ("Ld")
#3	1'-6"	1'-3"
#4	2'-0"	1'-7"
#5	2'-7"	2'-0"
#6	3'-1"	2'-4"
#7	4'-6"	3'-6"
#8	5'-2"	3'-11"
#9	5'-10"	4'-6"
#10	6'-6"	5'-0"
#11	7'-3"	5'-7"

STRUCTURAL STEEL

MATERIAL PROPERTIES

WIDE FLANGE SECTIONS: ASTM A36 (Fy = 36 KSI)

OTHER SHAPES AND PLATES: ASTM A36 (Fy = 36 KSI)

HOLLOW STRUCTURAL SECTIONS: RECTANGULAR & SQUARE - ASTM A500 GRADE B (Fy = 46 KSI)

MACHINE BOLTS (M.B.): ASTM A307

HIGH-STRENGTH BOLTS: A325-ASTM F1852, A490-ASTM F2280

ANCHOR BOLTS (A.B.): ASTM A490, GRADE 36, UNLESS OTHERWISE NOTED

GENERAL REQUIREMENTS

HEADED STUDS: SHALL BE "S3L SHEAR CONNECTORS" FOR STUDS 3/4" DIAMETER AND LARGER AS MANUFACTURED BY NELSON STUD WELDING, INC. OR PRE-APPROVED EQUAL AND SHALL CONFORM TO AWS D1.1.

COMPOSITE FLOOR DECK: SHALL CONTAIN THE MINIMUM PROPERTIES SHOWN ON THE STRUCTURAL DRAWINGS. THE FLOOR UNITS SHALL BE FORMED FROM STEEL SHEETS CONFORMING TO ASTM A653, AND GALVANIZED PER ASTM A924.

ABBREVIATION LIST			
@	AT	HORIZ.	HORIZONTAL
A.B.	ANCHOR BOLT	HSS	HOLLOW STRUCTURAL SECTION
ADD'L	ADDITIONAL	HT	HEIGHT
ALT.	ALTERNATE	INT.	INTERIOR
BLD'G	BUILDING	JT	JOINT
BM	BEAM	L	ANGLE
B.O.F.	BOTTOM OF FOOTING	L.F.R.S.	LATERAL FORCE-RESISTING SYSTEM
BOT.	BOTTOM	L.L.	LIVE LOAD
BRG	BEARING	LLH	LONG LEG HORIZONTAL
BTWN	BETWEEN	LLV	LONG LEG VERTICAL
(C=)	CAMBER	LOC.	LOCATION
CANT.	CANTILEVER	MAX.	MAXIMUM
C.J.	CONTROL/CONSTRUCTION JOINT	M.B.	MACHINE BOLT
CL	CENTERLINE	MFR	MANUFACTURER
CLR.	CLEARANCE	MIN.	MINIMUM
COL.	COLUMN	MISC.	MISCELLANEOUS
CONC.	CONCRETE	MTL	METAL
CONN.	CONNECTION	N.F.	NEAR FACE
CONST.	CONSTRUCTION	N.S.	NEAR SIDE
CONT.	CONTINUOUS	NTS	NOT TO SCALE
COORD.	COORDINATE	O.C.	ON CENTER
C.P.	COMPLETE PENETRATION	OPN'G	OPENING
CTR'D	CENTERED	OPP.	OPPOSITE
C.Y.	CUBIC YARD	PERP.	PERPENDICULAR
DBL.	DOUBLE	PL.	PLATE
DIA. OR ø	DIAMETER	P.P.	PARTIAL PENETRATION
DIAG.	DIAGONAL	P.S.F.	POUNDS PER SQUARE FOOT
DIM.	DIMENSION	REINF.	REINFORCING
D.L.	DEAD LOAD	REQ'D	REQUIRED
DWG	DRAWING	SCHED.	SCHEDULE
DWL	DOWEL	SIM.	SIMILAR
EA.	EACH	S.O.G.	SLAB ON GRADE
E.F.	EACH FACE	SQ.	SQUARE
EL.	ELEVATION	STD	STANDARD
ENGR.	ENGINEER	STIFF.	STIFFENER
EQ.	EQUAL	STL	STEEL
E.W.	EACH WAY	STRUCT.	STRUCTURAL
EXP.	EXPANSION	T&B	TOP & BOTTOM
EXT.	EXTERIOR	THR'D	THREADED
FDN	FOUNDATION	T.O.F.	TOP OF FOOTING
F.F.	FAR FACE	T.O.S.	TOP OF STEEL
FLR	FLOOR	TYP.	TYPICAL
FRM'G	FRAMING	U.N.O.	UNLESS NOTED OTHERWISE
F.S.	FAR SIDE	VERT.	VERTICAL
FTG	FOOTING	W/	WITH
GA.	GAGE/GAUGE	W.P.	WORK POINT
GALV.	GALVANIZED	WT	WEIGHT
GR.	GRADE	W.W.R.	WELDED WIRE REINFORCING

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GENERAL NOTES

SHEET NUMBER
S0.01

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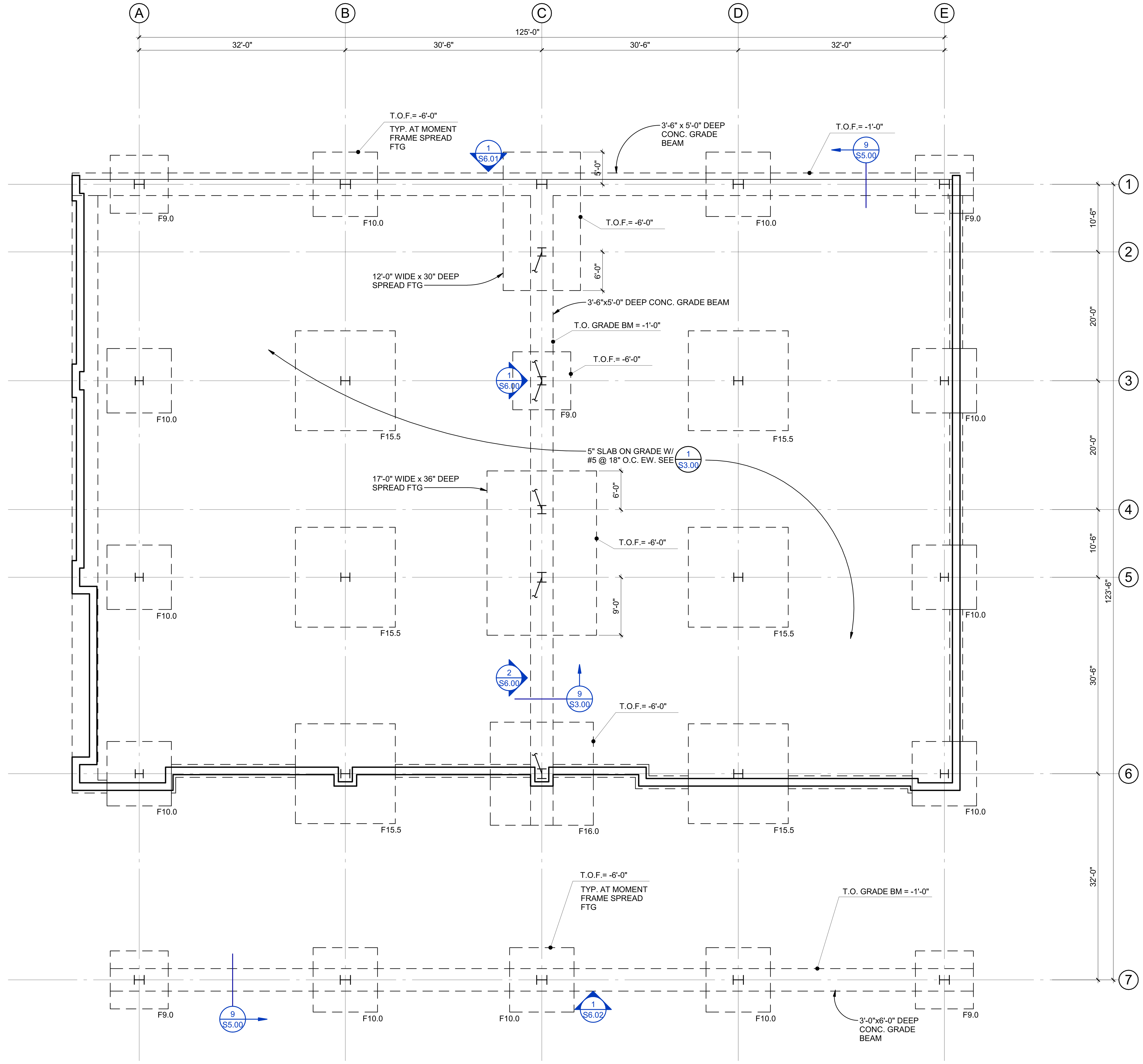

FOUNDATION AND GRADE LEVEL FRAMING PLAN

1 S2.00 1/8" = 1'-0"

NORTH

FOUNDATION NOTES

1. INDICATES EXTERIOR WALL.

2. INDICATES CONTINUOUS CONCRETE WALL FOOTING. FOR TYPICAL FOOTING AND FOUNDATION WALL DETAILS SEE SHEET S3.00. FOOTING WIDTH ("W") = 2'-0" UNLESS NOTED OTHERWISE ON PLAN. CENTER FOOTINGS ON CONCRETE STEM WALL.

3. "F_" INDICATES CONCRETE SPREAD FOOTING. FOR SCHEDULE SEE 5/S3.00.

4. X X.XX INDICATES BRACED FRAME. FOR ELEVATIONS, BRACE SIZES AND DETAIL CALLOUTS SEE SHEET S6.00.

5. INDICATES STEEL COLUMNS ORIGINATING AT FOUNDATION LEVEL. ALL COLUMNS ARE CONTINUOUS TO ROOF UNLESS NOTED OTHERWISE. FOR TYPICAL ANCHOR ROD/BOLT DETAIL SEE 7/S3.00. FOR COLUMN SCHEDULE SEE S4.00.

6. FOR TYPICAL FOUNDATION AND CONCRETE SLAB-ON-GRADE DETAILS SEE SHEET S3.00.

7. TOP OF FOOTING ELEVATIONS = -1'-0" UNLESS NOTED OTHERWISE ON PLANS AND DETAILS.

8. X X.XX INDICATES MOMENT FRAME. FOR ELEVATIONS, MEMBER SIZES AND DETAIL CALLOUTS SEE SHEETS S6.01 AND S6.02.

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TITLE
FOUNDATION AND GRADE LEVEL FRAMING PLAN

SHEET NUMBER
S2.00

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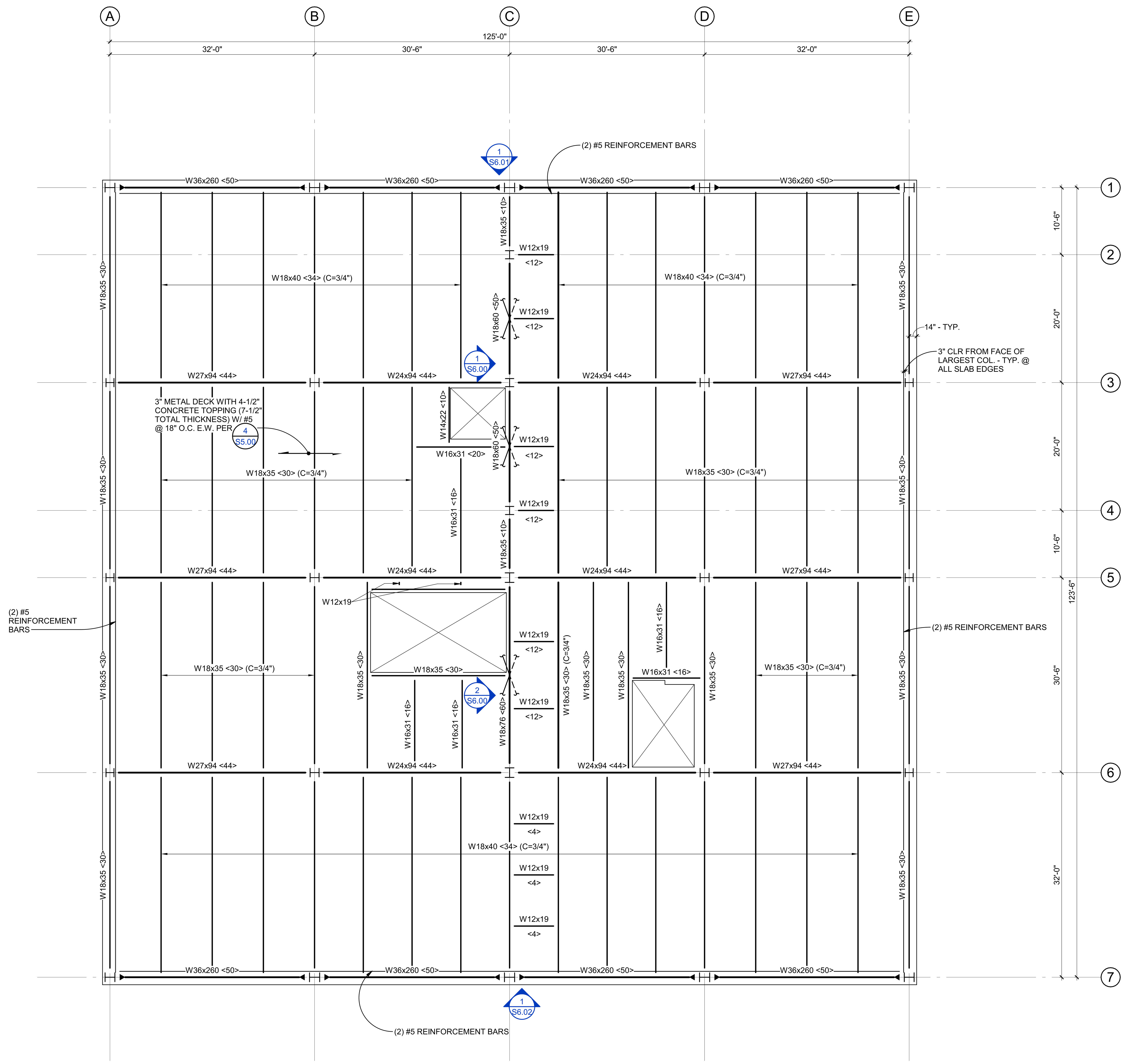
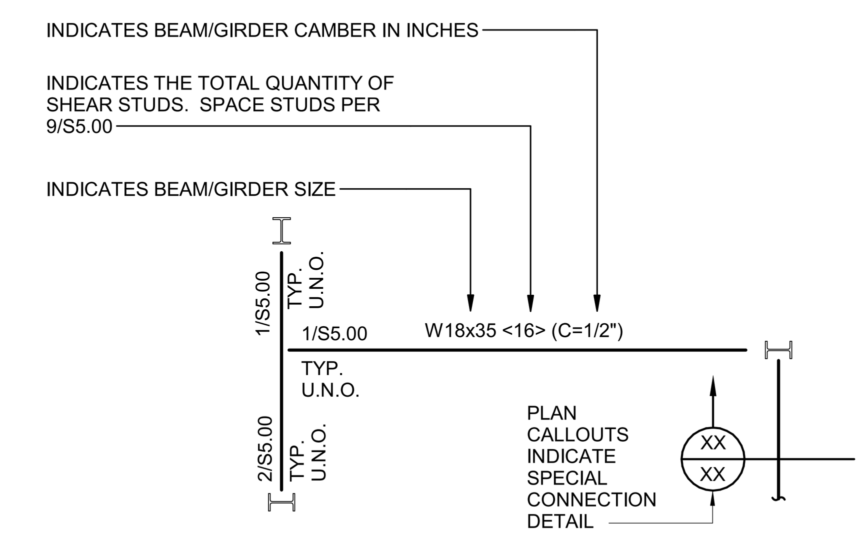


1 S2.10 FIRST FLOOR FRAMING PLAN
1/8" = 1'-0"

NORTH

FLOOR FRAMING NOTES

1. INDICATES BRACED FRAME. FOR ELEVATIONS, BRACE SIZES AND DETAIL CALLOUTS SEE SHEET S6.00. ALL BEAMS THAT ARE PART OF A BRACED FRAME SHALL BE CONSIDERED "COLLECTOR" BEAMS.
2. SEE FOUNDATION NOTES FOR EXTERIOR STUD WALL REQUIREMENTS.
3. INDICATES STEEL COLUMN, SEE S4.00 FOR STEEL COLUMN SCHEDULE.
4. INDICATES PENETRATION IN FLOOR STRUCTURE. FOR TYPICAL REINFORCING AROUND OPENINGS SEE 5/S5.00.
5. FOR TYPICAL COMPOSITE BEAM AND METAL DECK DETAILS SEE SHEET S5.00.
6. INDICATES DIRECTION OF SPAN FOR METAL DECK.
7. FOR TYPICAL STEEL CONNECTION DETAILS SEE SHEET S5.00. SEE BRACED FRAME ELEVATIONS FOR CONNECTION CALLOUTS. ALL MEMBERS AND CONNECTIONS THAT ARE PART OF A BRACED FRAME SHALL BE CONSIDERED PART OF THE LATERAL-FORCE RESISTING SYSTEM.



8. STEEL MEMBERS ARE EQUALLY SPACED BETWEEN DIMENSION POINTS UNLESS NOTED OTHERWISE.
9. INDICATES MOMENT FRAME. FOR ELEVATIONS AND DETAIL CALLOUT SEE SHEET S6.00. ASSOCIATED MEMBERS AND CONNECTIONS ARE PART OF THE LATERAL-FORCE RESISTING SYSTEM.

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FIRST FLOOR FRAMING PLAN

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FOR FRAMING NOTES SEE S2.10

SECOND FLOOR FRAMING PLAN

1 / S2.20

1/8" = 1'-0"

NORTH

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SECOND FLOOR FRAMING PLAN

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S2.20

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FOR FRAMING NOTES SEE S2.10

1 S2.30 THIRD FLOOR FRAMING PLAN

1/8" = 1'-0"

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THIRD FLOOR FRAMING PLAN

SHEET NUMBER

S2.30

FOR FRAMING NOTES SEE S2.10

NORTH

1 / S2.40 FOURTH FLOOR FRAMING PLAN

1/8" = 1'-0"

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TITLE

FOURTH FLOOR FRAMING PLAN

SHEET NUMBER

S2.40

FOR FRAMING NOTES SEE S2.10

NORTH

1 S2.50 FIFTH FLOOR FRAMING PLAN

1/8" = 1'-0"

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FIFTH FLOOR FRAMING PLAN

SHEET NUMBER

S2.50

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FOR FRAMING NOTES SEE S2.10

NORTH

1 S2.60 SIXTH FLOOR FRAMING PLAN

1/8" = 1'-0"

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SIXTH FLOOR FRAMING PLAN

SHEET NUMBER

S2.60

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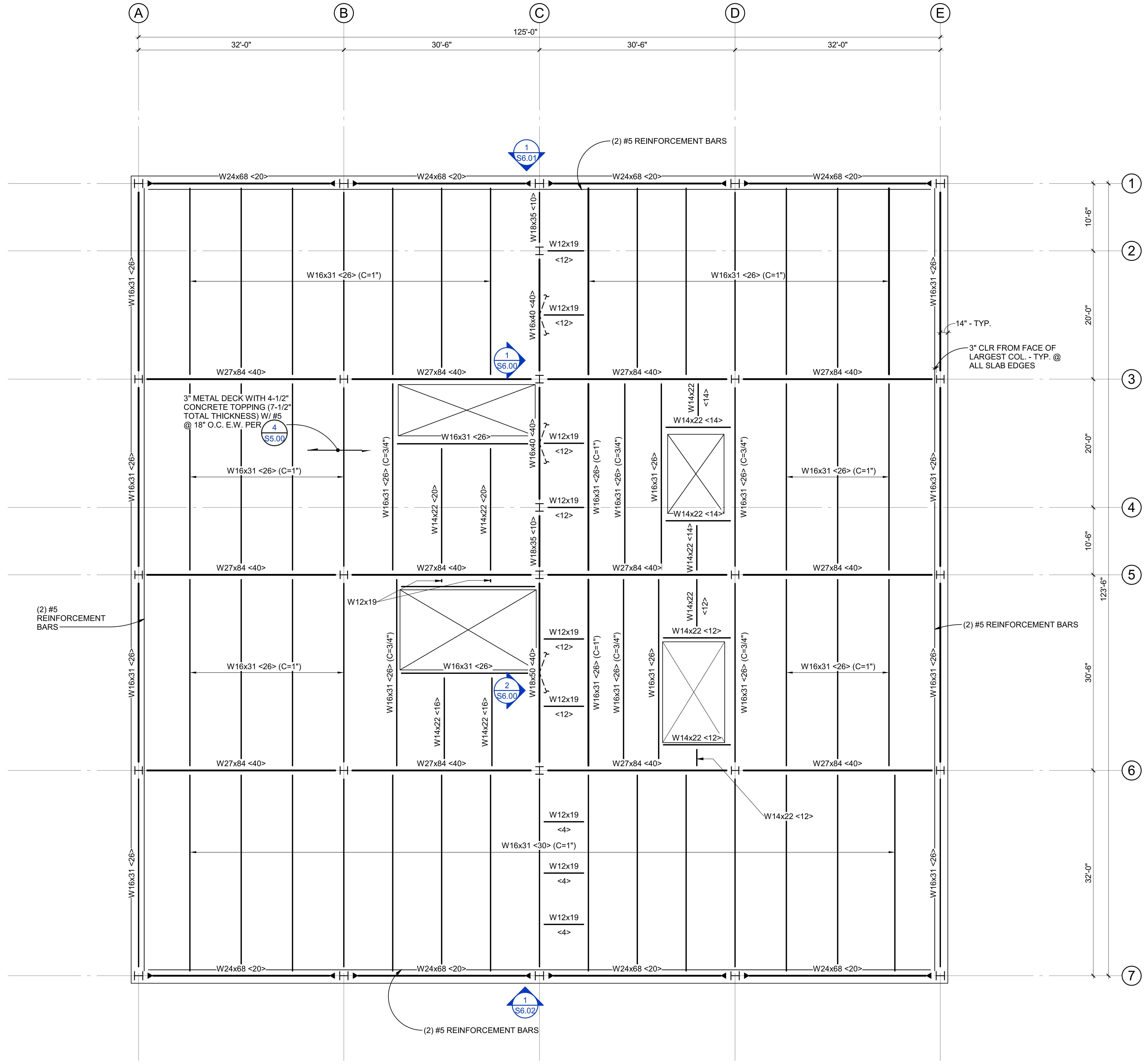

FOR FRAMING NOTES SEE S2.10

NORTH

1 S2.70 ROOF FRAMING PLAN

1/8" = 1'-0"

nehrp

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ROOF FRAMING PLAN

SHEET NUMBER

S2.70

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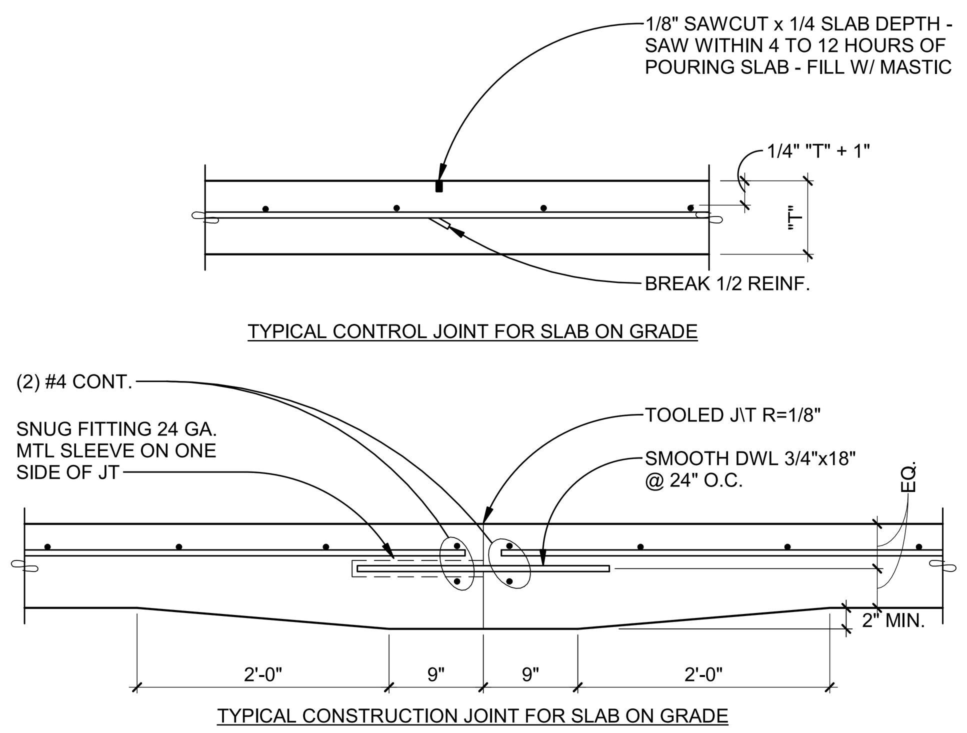
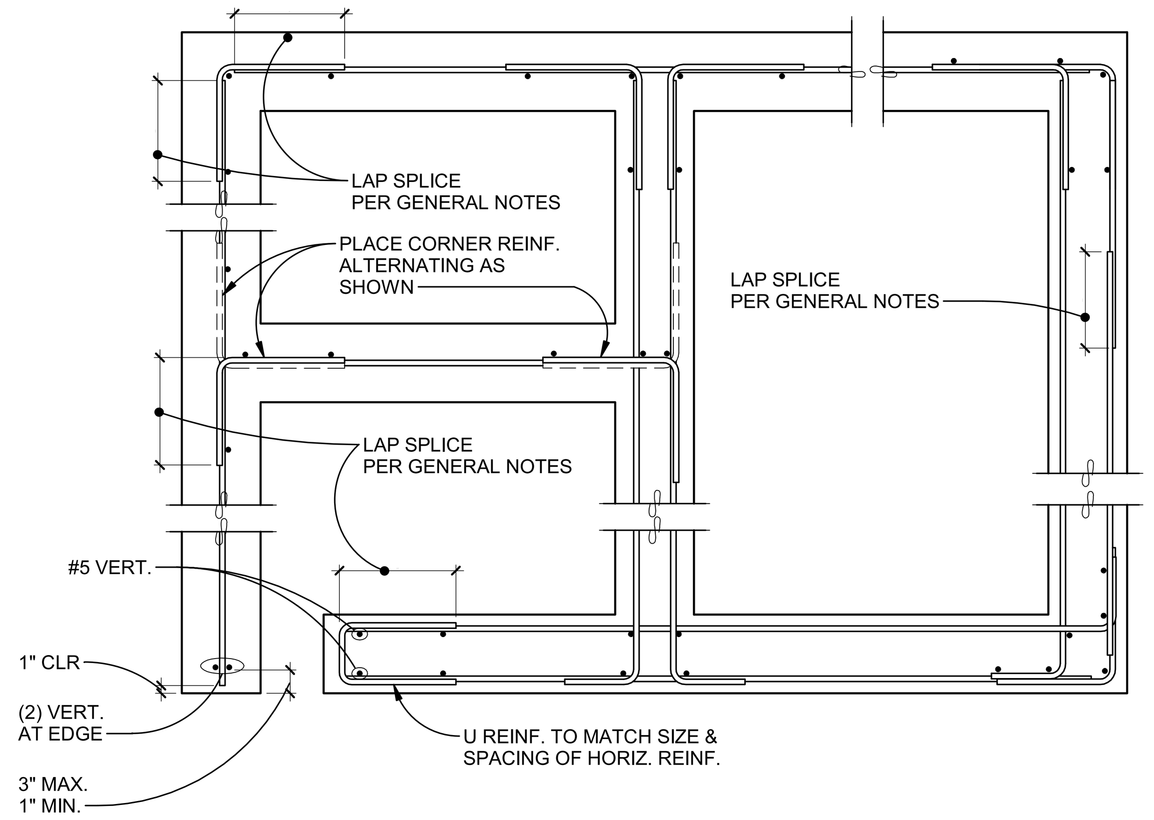


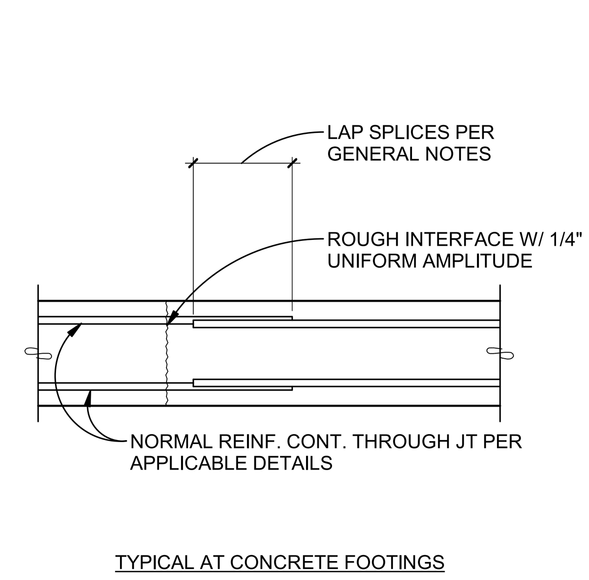
1 SECTION
S3.00 NO SCALE



NOTES:
1. VERTICAL REINFORCEMENT SHOWN IS ADDITIONAL IF NORMAL STEM WALL REINFORCEMENT IS NOT IN PROPER LOCATION.
2. CORNER REINFORCEMENT IS SAME SIZE AND SPACING AS HORIZONTAL REINFORCEMENT.
3. STANDARD HOOK MAY BE SUBSTITUTED FOR CORNER REINFORCEMENT. SEE NOTE #5.
4. REINFORCEMENT AT ALL CORNERS, ENDS, AND INTERSECTIONS OF WALLS SHALL BE PLACED IN ACCORDANCE WITH APPROPRIATE DETAIL SHOWN.
5. USE STANDARD HOOK FOR EMBEDMENT LESS THAN 24" PAST FACE OF WALL.

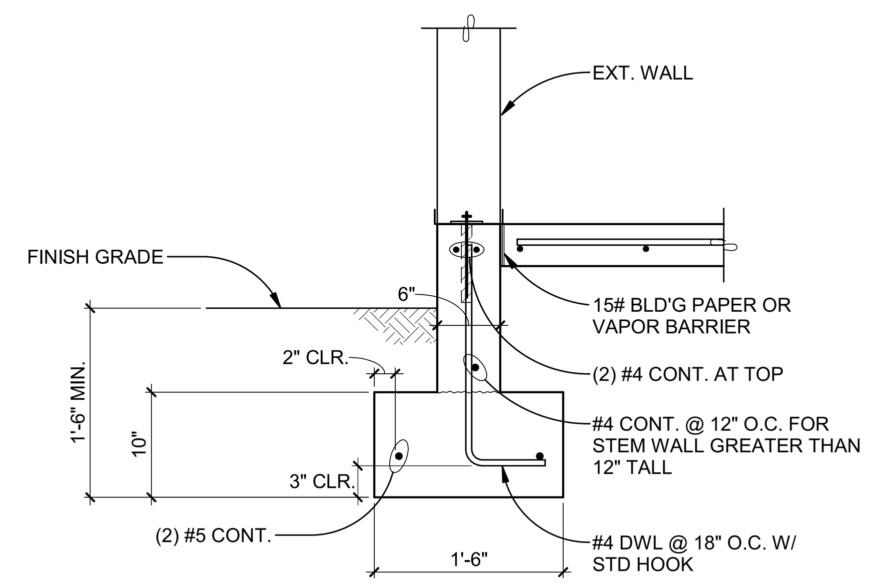
TYPICAL REINFORCEMENT PLACEMENT FOR CAST IN PLACE CONCRETE WALLS AND STEM WALLS

2 SECTION
S3.00 NO SCALE



TYPICAL FOR CAST IN PLACE CONCRETE WALLS, GRADE BEAMS AND FOOTINGS

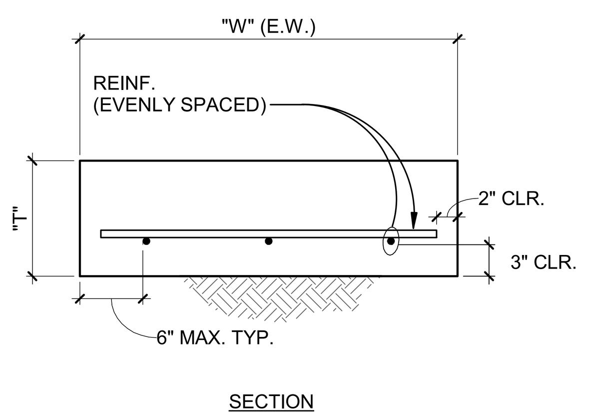
3 SECTION
S3.00 NO SCALE



TYPICAL FOUNDATION AT EXTERIOR WALL

4 SECTION
S3.00 NO SCALE

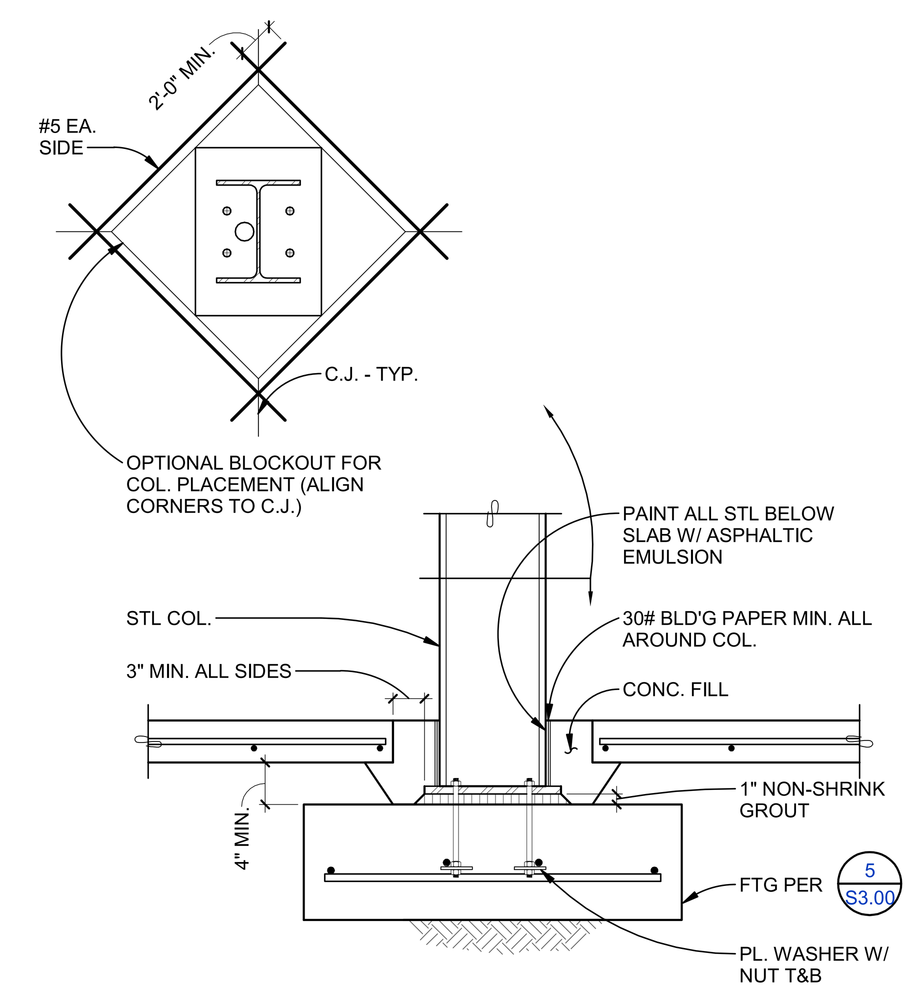
MARK	DIMENSIONS	
	"W"	"T"
F9.0	9'-0"	24"
F10.0	10'-0"	27"
F15.5	15'-6"	36"
F16.0	16'-0"	39"



NOTES:
1. CENTER ALL FOOTINGS ON COLUMN ABOVE EXCEPT AS SHOWN OTHERWISE.
2. FOOTINGS SHALL BEAR ON UNDISTURBED OR COMPACTED MATERIAL PER GENERAL NOTES. DESIGN BEARING PRESSURE IS 6000 POUNDS PER SQUARE FOOT.

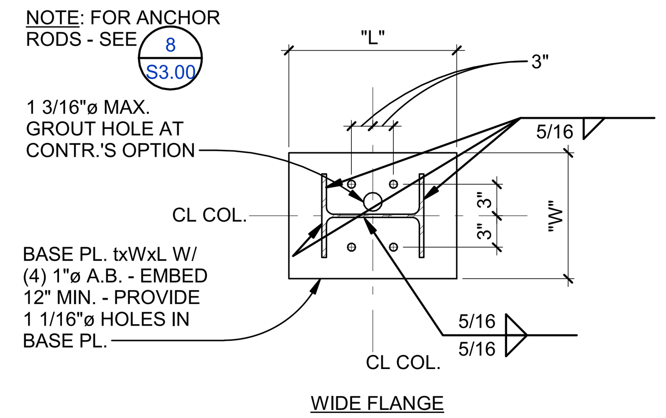
TYPICAL CONCRETE SPREAD FOOTING

5 SECTION
S3.00 NO SCALE



TYPICAL STEEL COLUMN AT SPREAD FOOTING

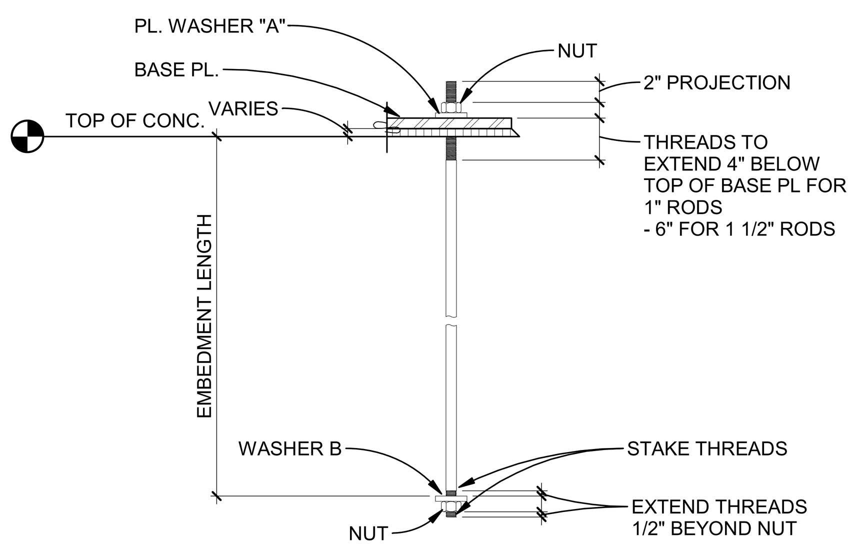
6 SECTION
S3.00 NO SCALE



COLUMN SIZE	"W" (IN.)	"L" (IN.)	"t" (IN.)
W14x145	20	18	1-3/4
W14x283	22	22	2-1/2

TYPICAL MOMENT FRAME COLUMN BASE PLATE

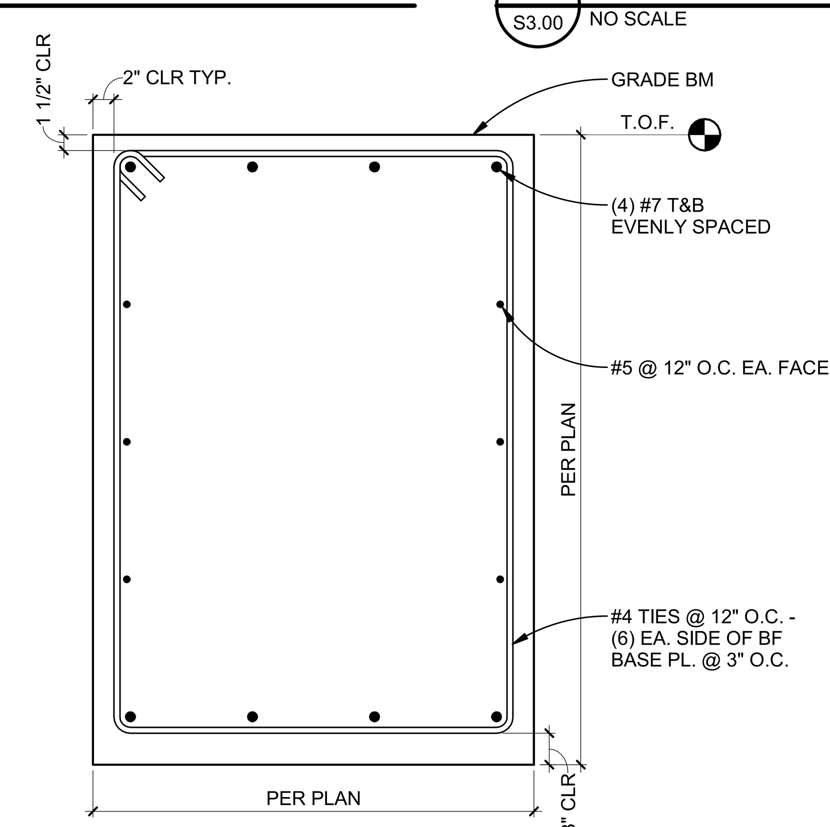
7 DETAIL
S3.00 NO SCALE



ANCHOR ROD		WASHER		NUT
SIZE	MATERIAL	TYPE	SIZE	
1"ø	A490	A	PL. 1/2"x3"x0'-3" W/ 1 1/16"ø HOLE CTR'D	A563 GRADE A HEAVY HEX
		B	ASTM A36 CARBON FLAT WASHER	

TYPICAL ANCHOR ROD/BOLT DETAIL

8 DETAIL
S3.00 NO SCALE



9 DETAIL
S3.00 NO SCALE

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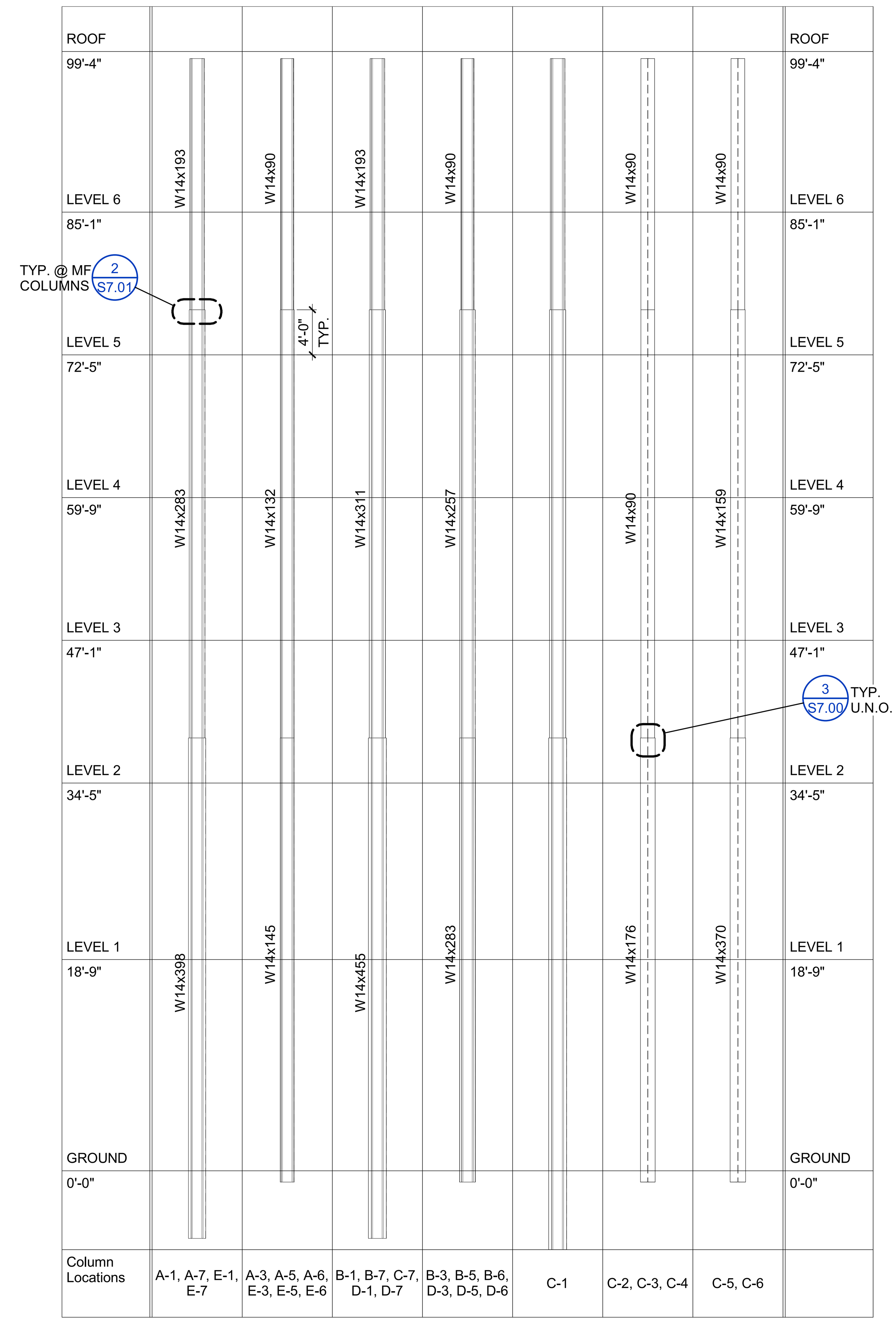
FOUNDATION DETAILS

SHEET NUMBER
S3.00



1
S4.00
COLUMN SCHEDULE
NO SCALE

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COLUMN SCHEDULE

SHEET NUMBER
S4.00

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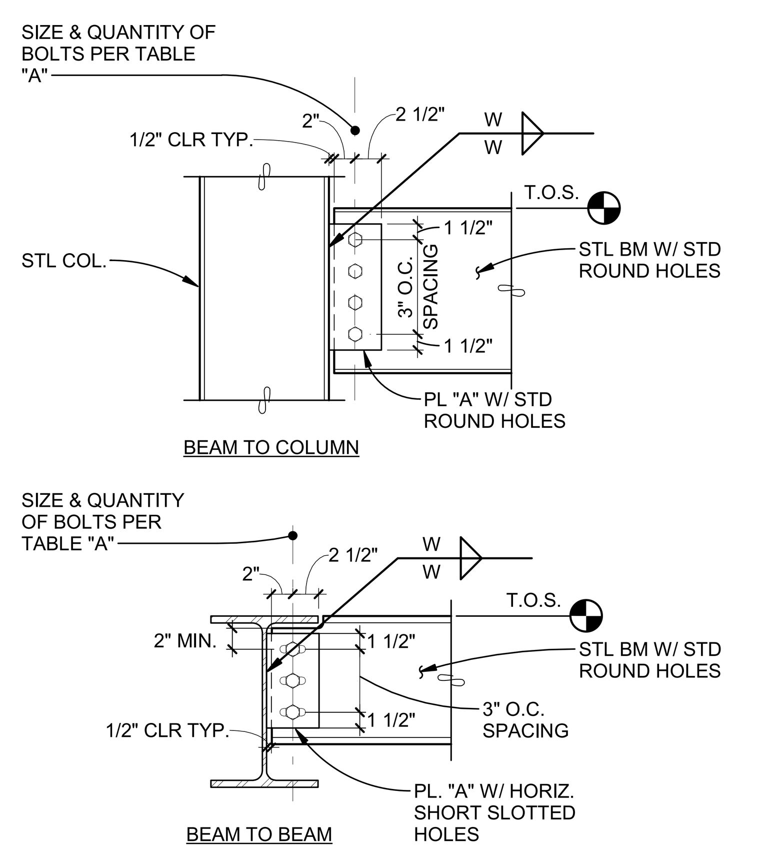


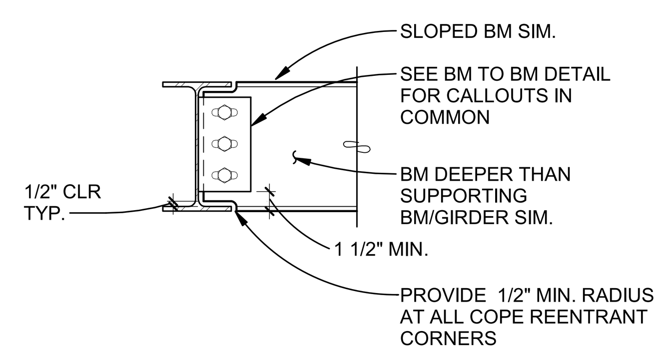
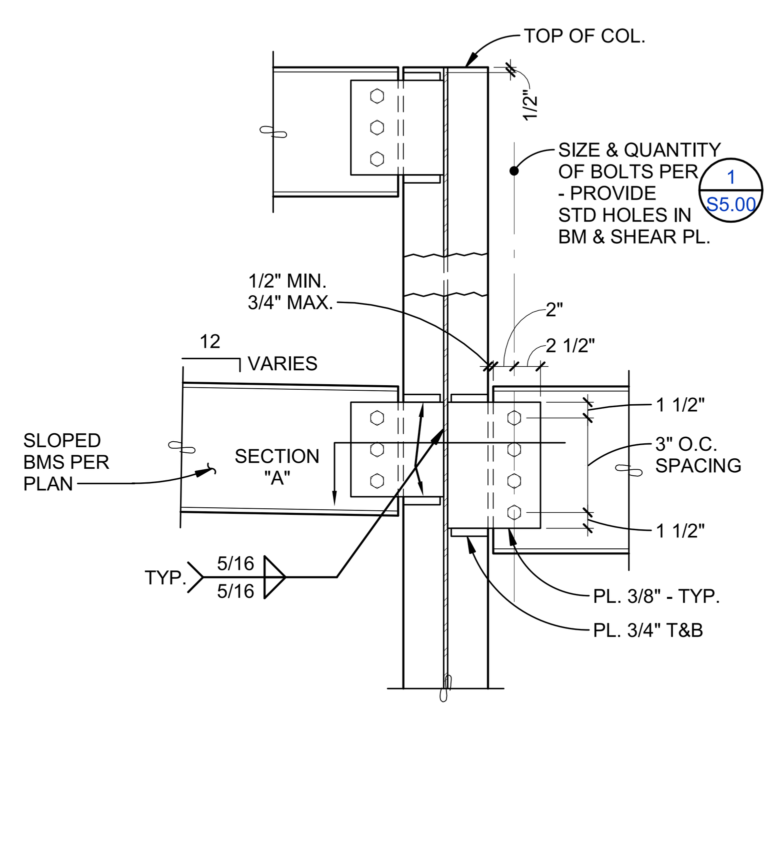


TABLE A			
SUPPORTED BEAM SIZE	QUANTITY OF 7/8"ø A325N BOLTS	SHEAR PLATE THICKNESS "A"	WELD "W" NOTE 1.
W10	2	3/8"	5/16"
W12, W14	3	3/8"	5/16"
W16, W18	4	3/8"	5/16"
W21	5	3/8"	5/16"
W24	6	3/8"	5/16"
W27	7	3/8"	5/16"
W30	7	3/8"	5/16"
W33	8	3/8"	5/16"

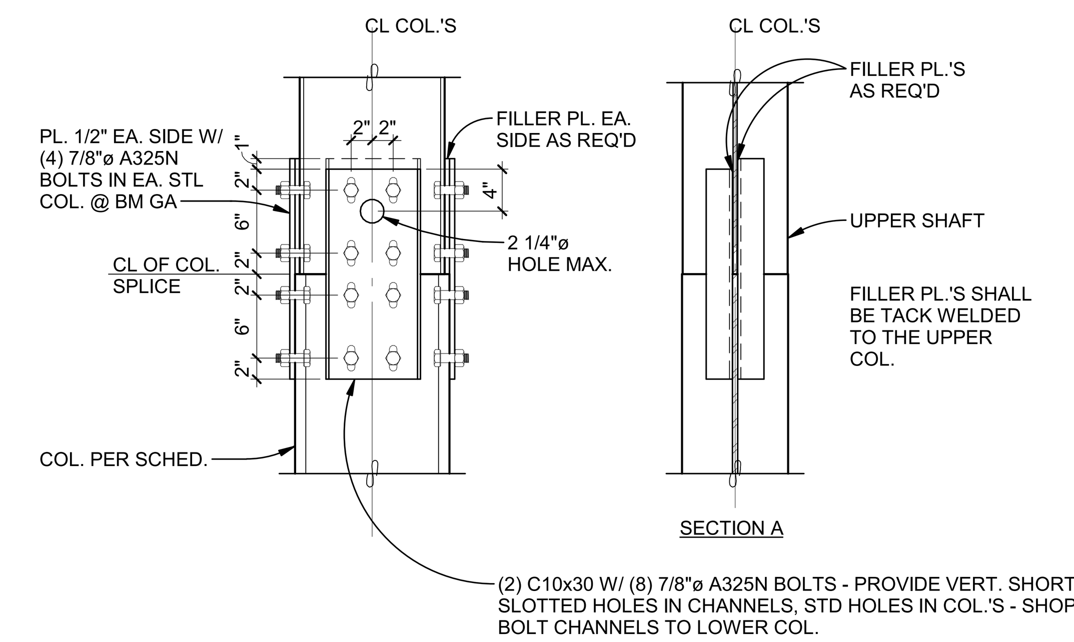
TYPICAL STEEL DETAIL

1 S5.00 DETAIL
NO SCALE



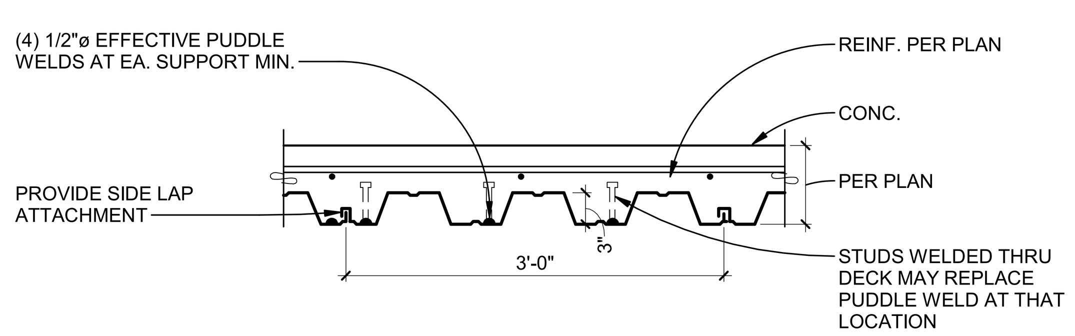
TYPICAL BEAM/COLUMN FRAMING INTO WEB

2 S5.00 DETAIL
NO SCALE



TYPICAL COLUMN SPLICE

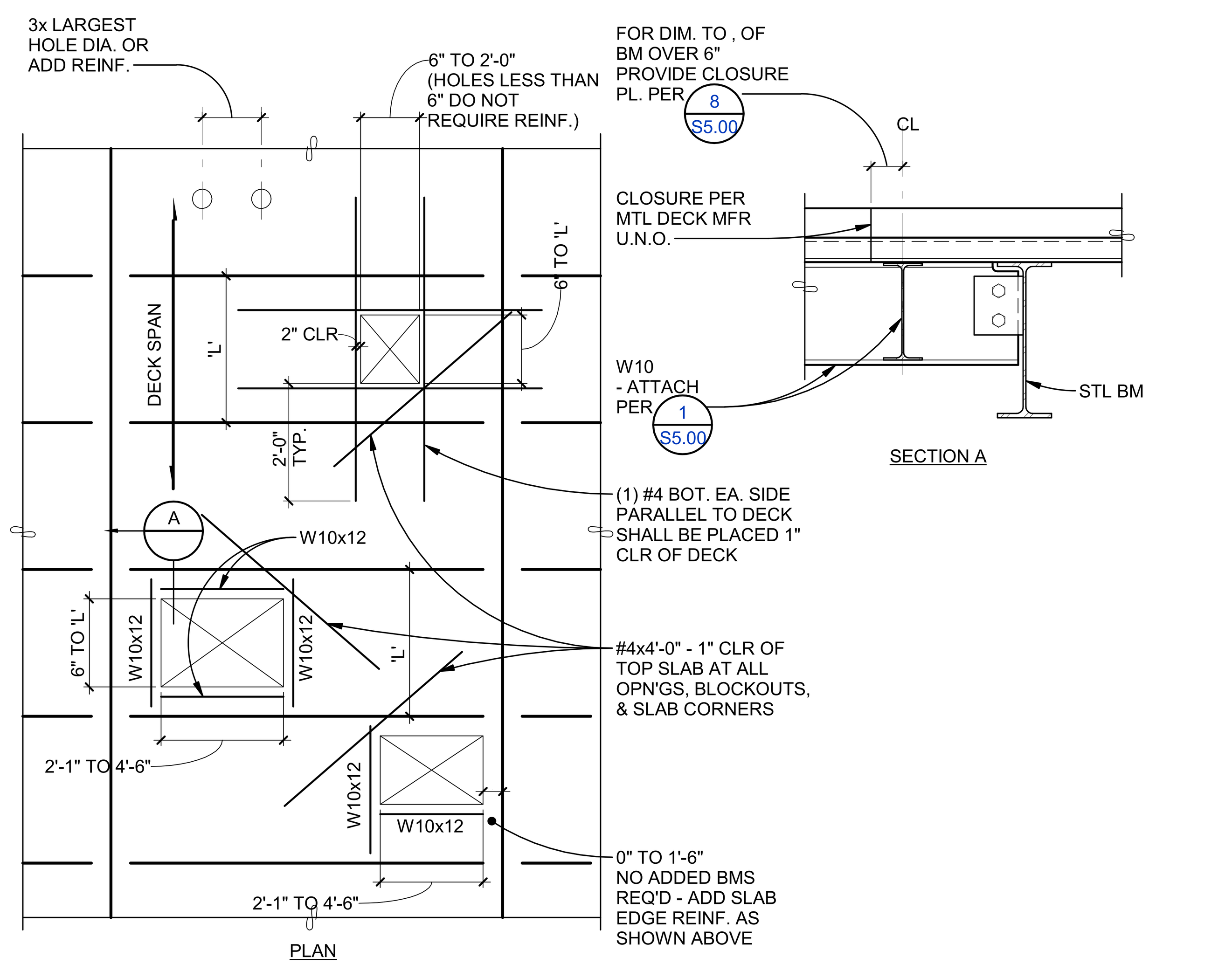
3 S5.00 DETAIL
NO SCALE



NOTES:
1. (2) SPAN MINIMUM, (3) SPAN PREFERRED.
2. AT SUPPORTS PARALLEL TO CORRUGATIONS, PROVIDE PUDDLE WELDS @ 24" O.C. MAXIMUM.

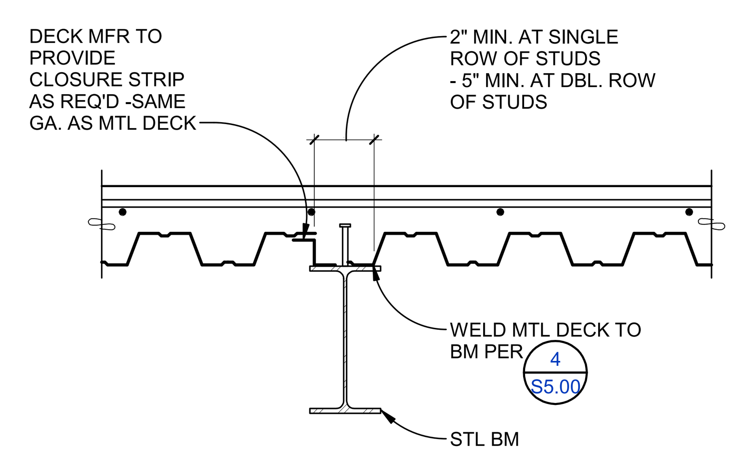
TYPICAL COMPOSITE FLOOR DECK

4 S5.00 DETAIL
NO SCALE



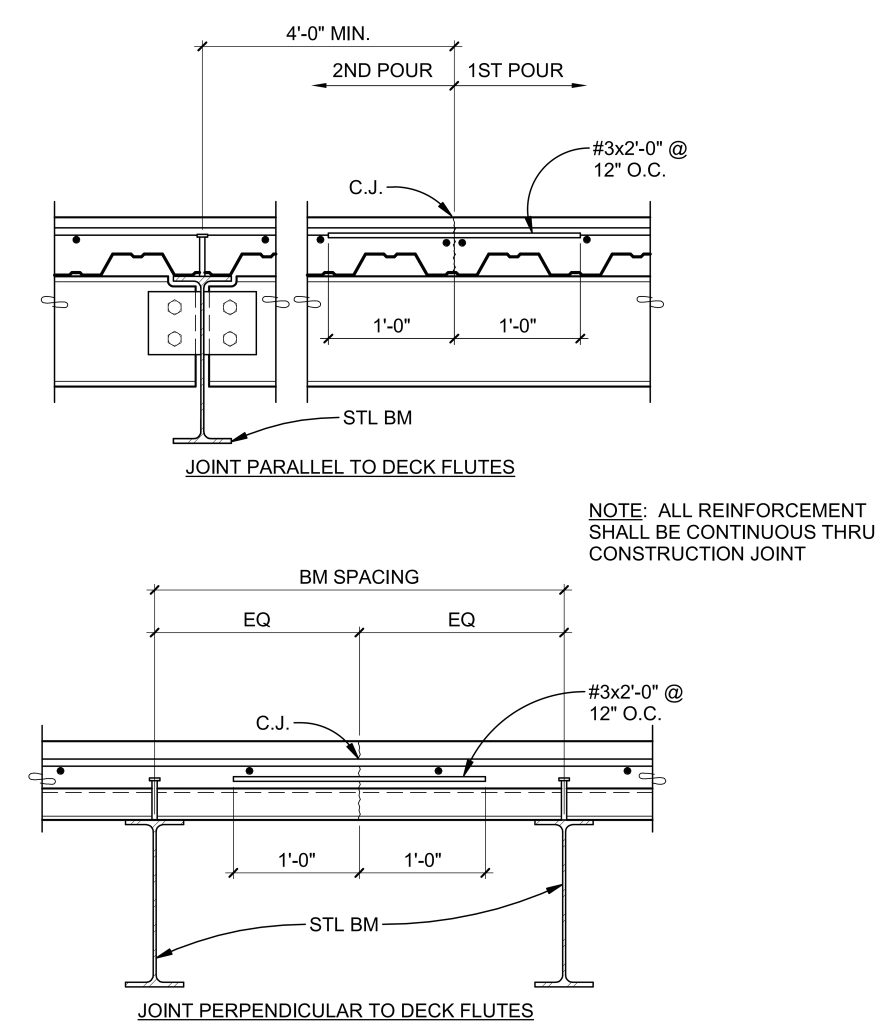
TYPICAL FLOOR PENETRATION REINFORCEMENT

5 S5.00 DETAIL
NO SCALE



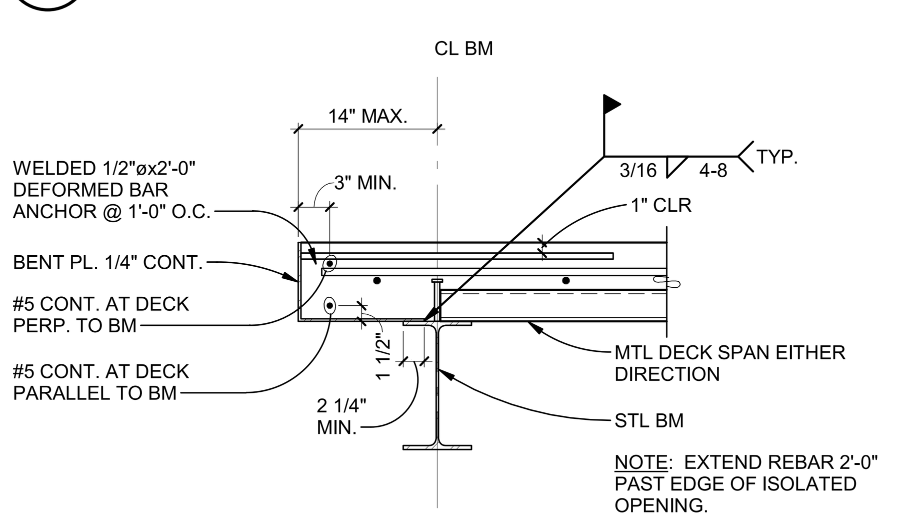
TYPICAL AT METAL DECK PARALLEL TO BEAM

6 S5.00 SECTION
NO SCALE



TYPICAL COMPOSITE DECK CONSTRUCTION JOINT

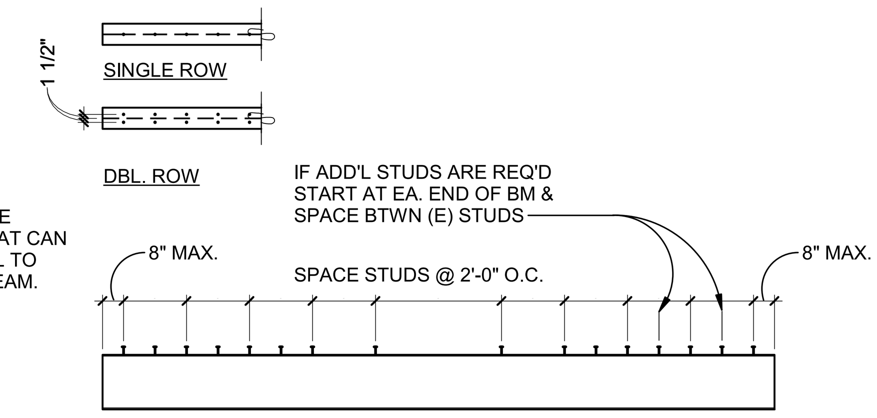
7 S5.00 SECTION
1" = 1'-0"



TYPICAL SLAB EDGE CONDITION - OVER 6" OVERHANG

8 S5.00 SECTION
NO SCALE

NOTES:
1. LOCATE STUDS AT CENTER OF BEAM FLANGE.
2. STUDS ARE 3/4"ø x 4 1/2" LONG AFTER WELDING.
3. SEE FRAMING PLANS FOR NUMBER OF STUDS.
4. ALL BEAMS WITH STUDS ARE COMPOSITE STEEL BEAMS.
5. PROVIDE A DOUBLE ROW OF STUDS AT BEAMS WHERE THE REQUIRED NUMBER OF STUDS EXCEEDS THE NUMBER THAT CAN FIT IN A SINGLE ROW AT 6" ON CENTER AT DECK PARALLEL TO BEAM OR 12" ON CENTER AT DECK PERPENDICULAR TO BEAM.



TYPICAL COMPOSITE BEAM DETAIL

9 S5.00 DETAIL
NO SCALE

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DESIGN C
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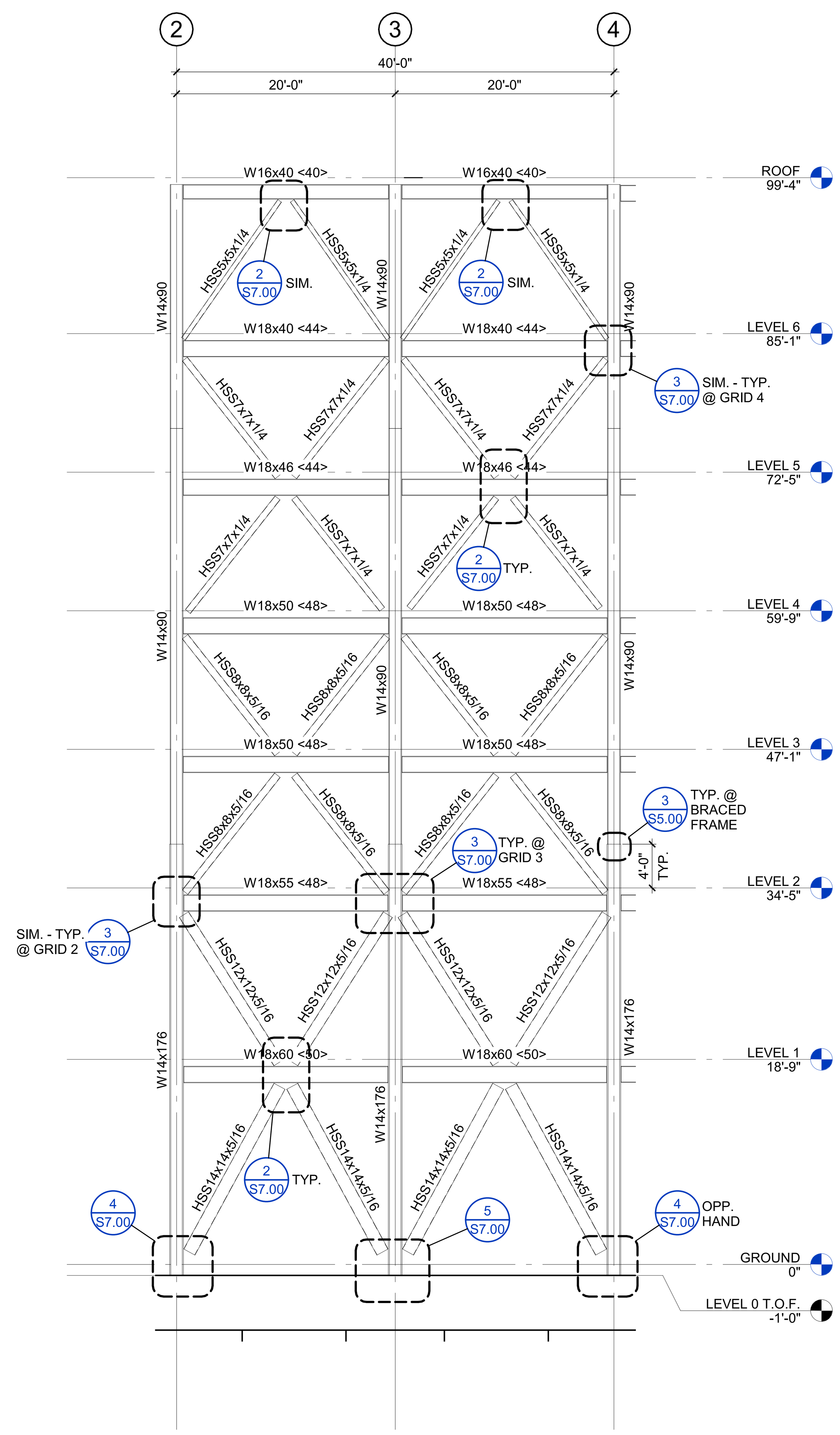
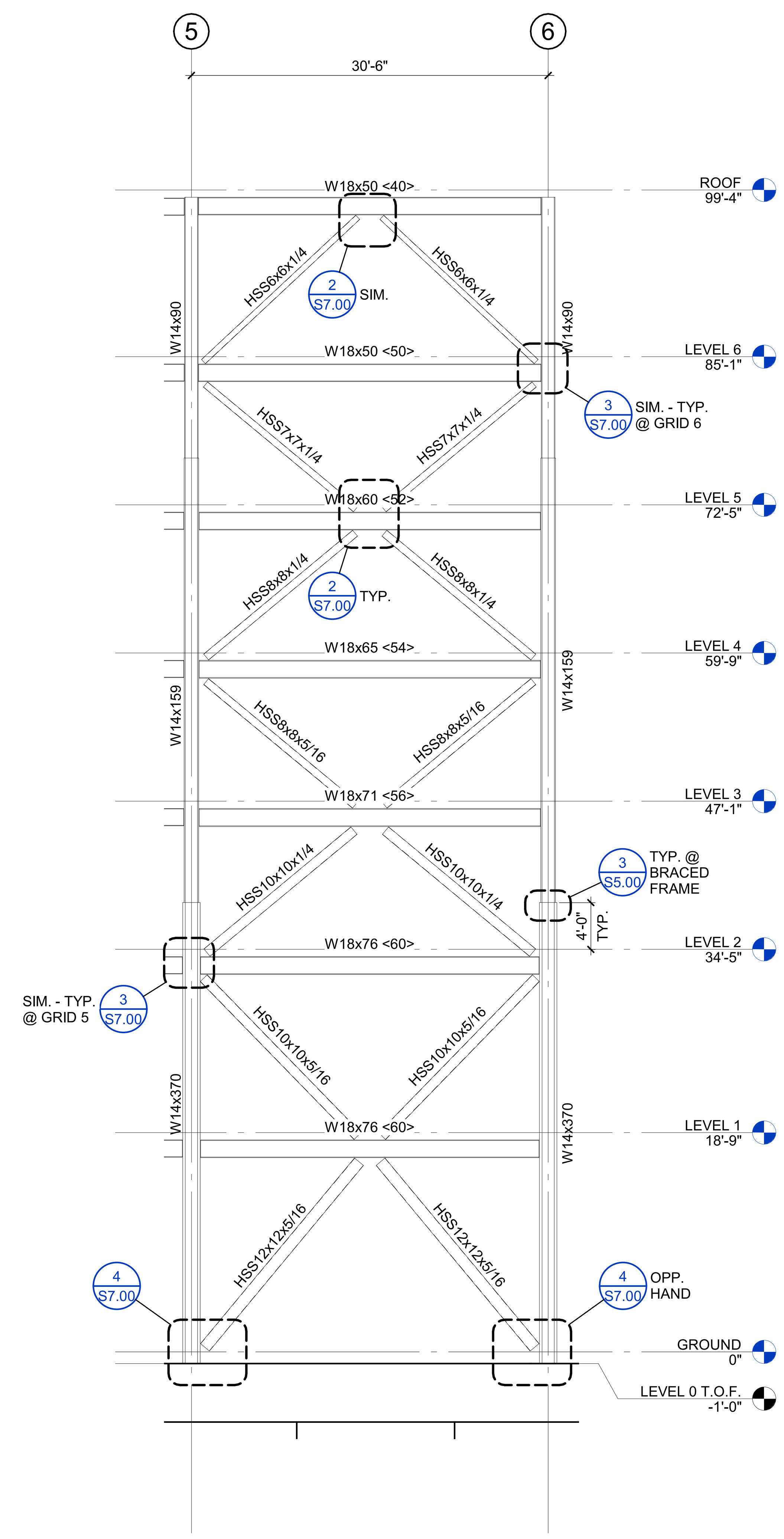
TITLE
STEEL DETAILS

SHEET NUMBER
S5.00



1 S6.00 BRACED FRAME ELEVATION
1/8" = 1'-0"



2 S6.00 BRACED FRAME ELEVATION
1/8" = 1'-0"

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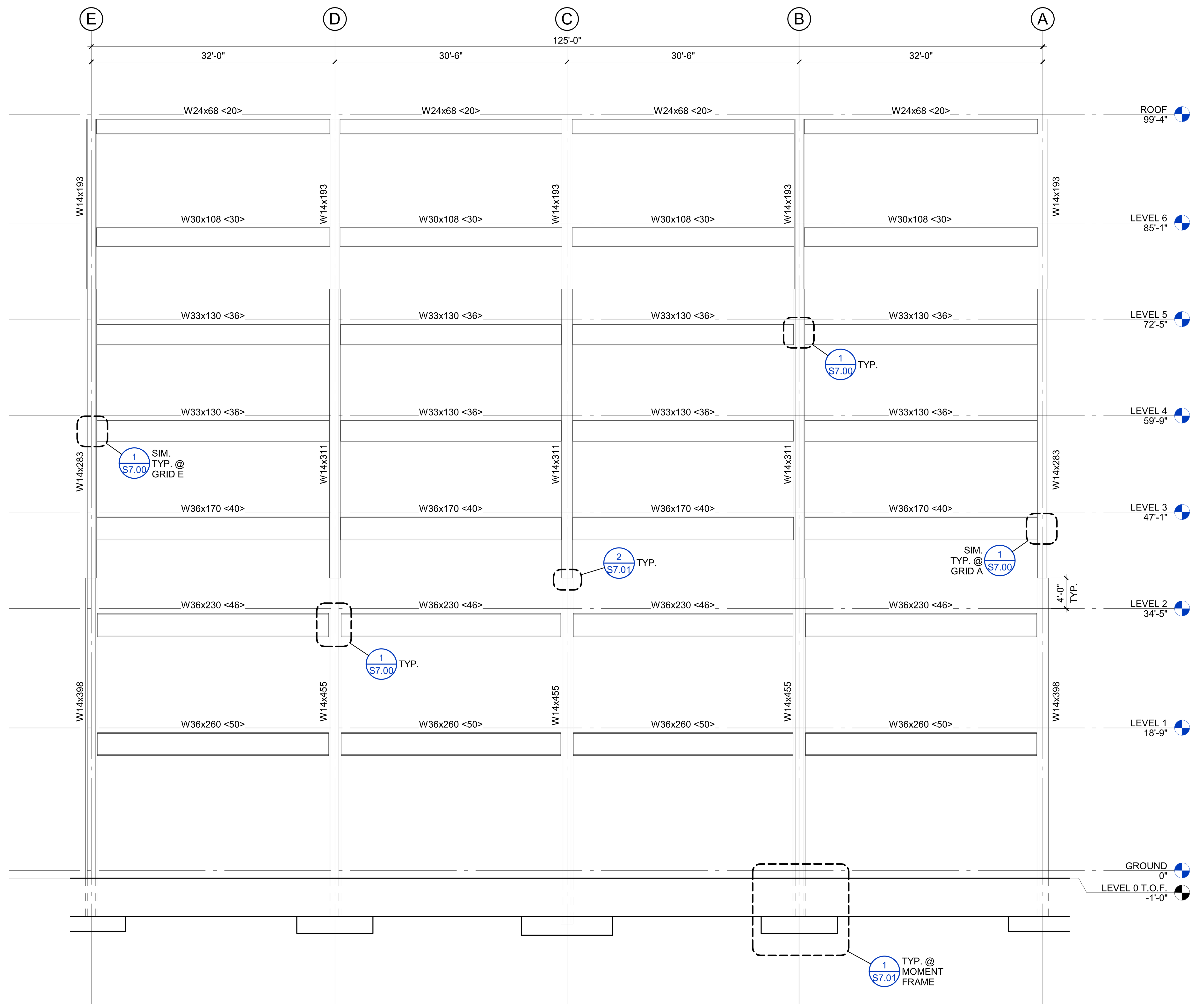
TITLE
BRACED FRAME ELEVATIONS

SHEET NUMBER
S6.00



1 S6.01 MOMENT FRAME ELEVATION

1/8" = 1'-0"

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TITLE

MOMENT FRAME ELEVATIONS

SHEET NUMBER

S6.01

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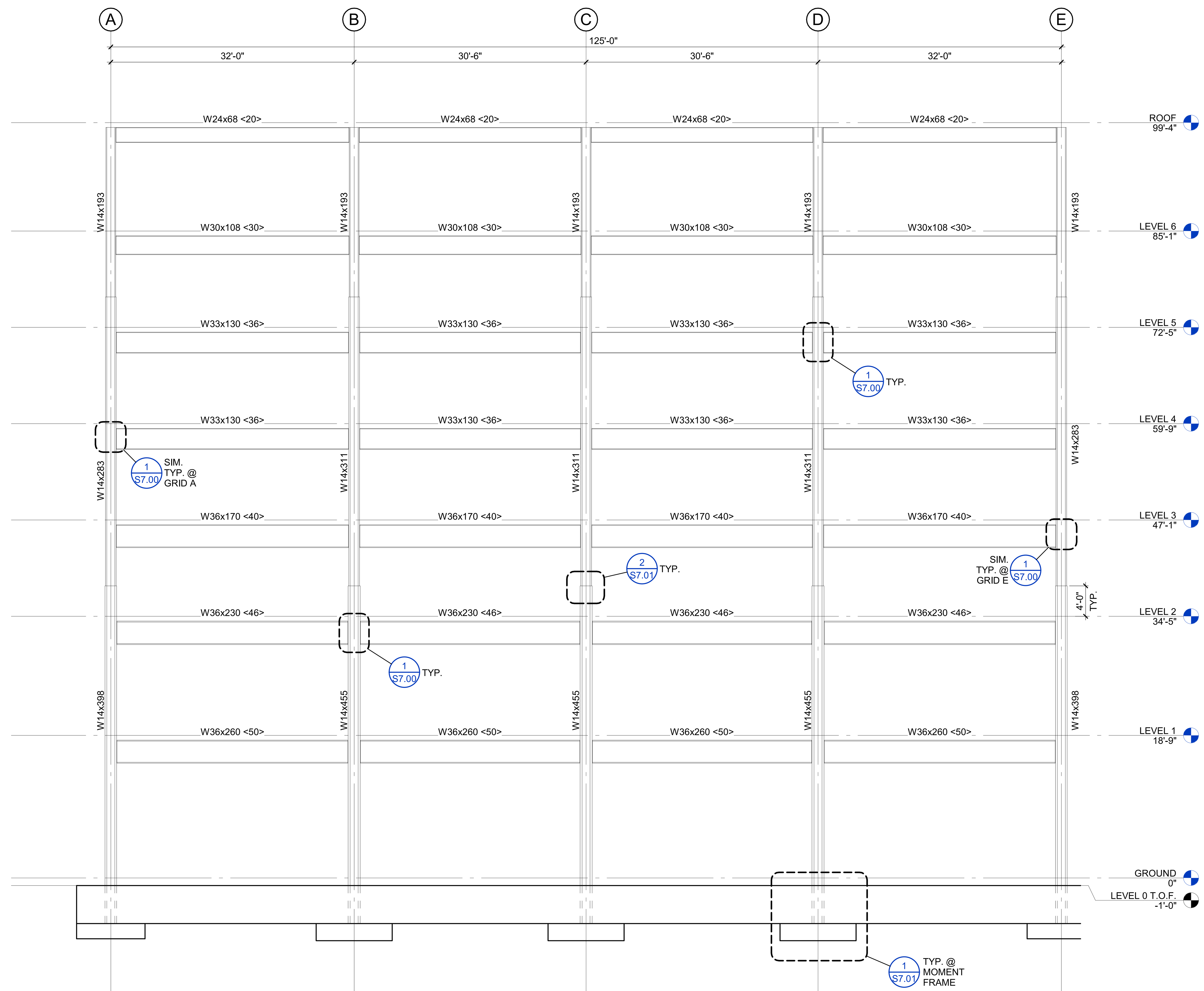

1 S6.02 MOMENT FRAME ELEVATION

1/8" = 1'-0"

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TITLE

MOMENT FRAME ELEVATIONS

SHEET NUMBER

S6.02

9/27/2021 8:49:51 AM

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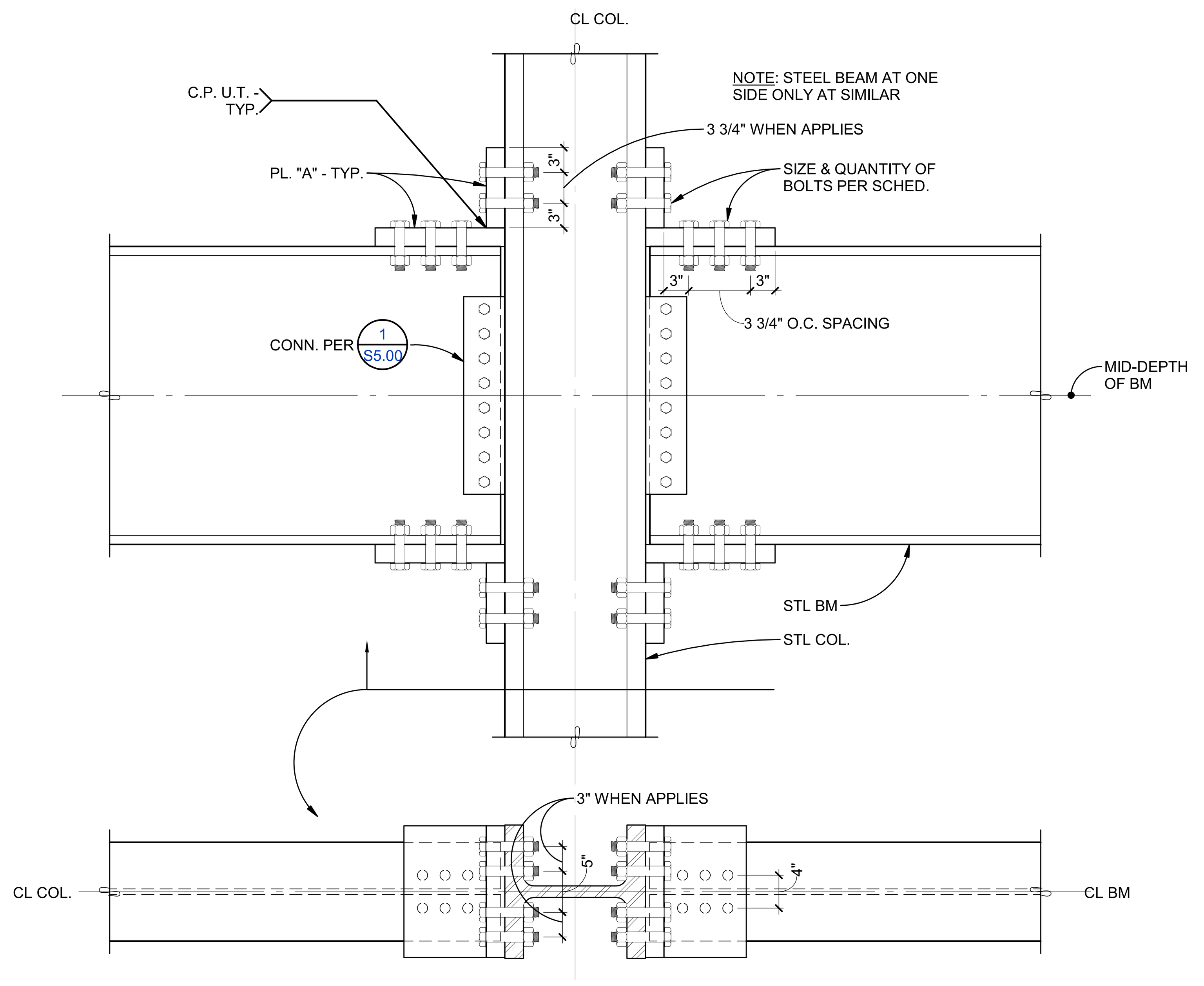
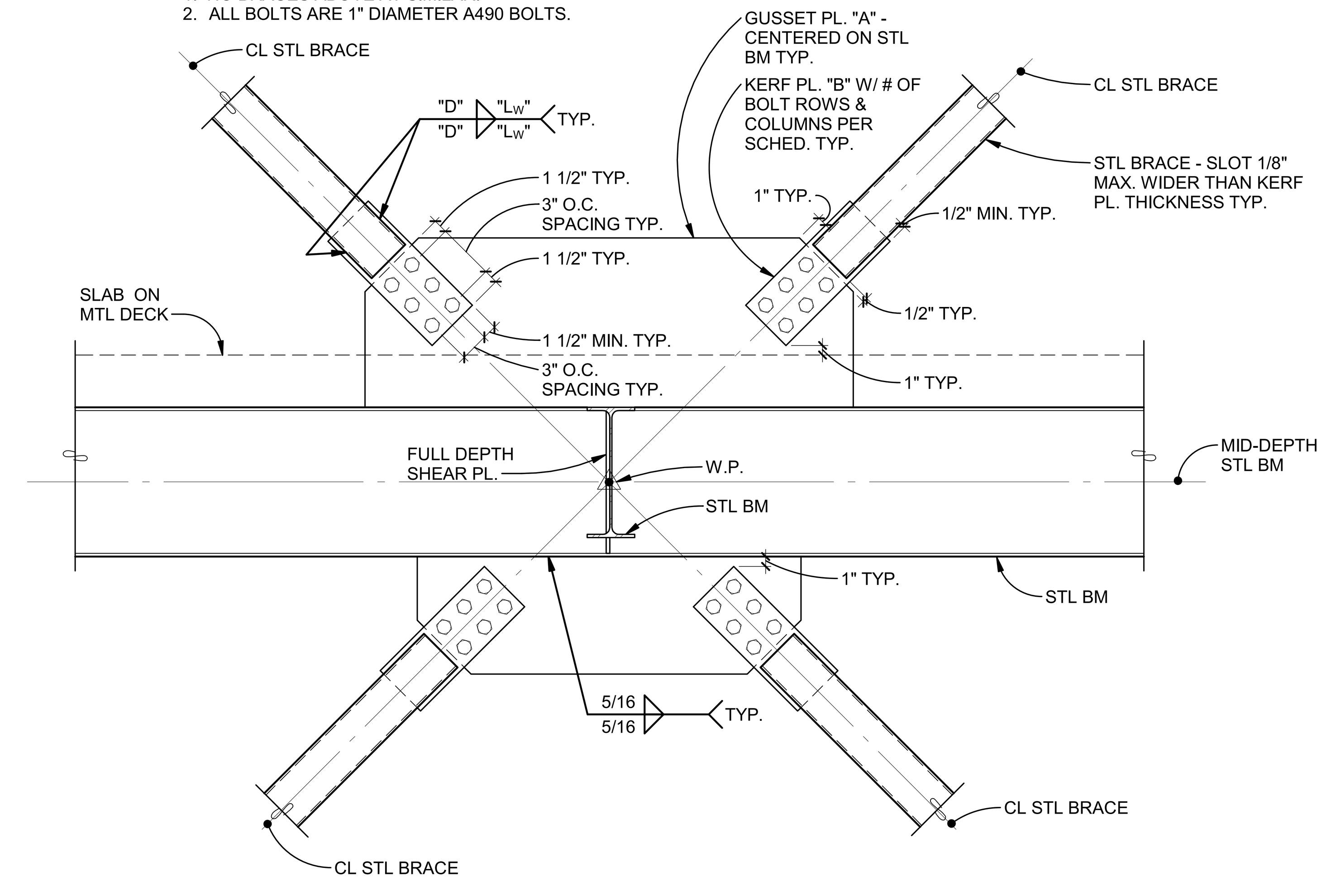
MOMENT FRAME CONNECTION SCHEDULE			
STEEL BEAM SIZE	PLATE "A" SIZE	QUANTITY OF 1 1/4"ø A490X BOLTS FROM PLATE TO COLUMN	QUANTITY OF 1 1/4"ø A490X BOLTS FROM PLATE TO BEAM
W36	3 1/2"x16"	8	8
W33	2"x15 3/4"	4	4
W30	1 3/4"x15 1/2"	4	4
W24	1 1/2"x14"	2	4



1 S7.00 DETAIL
NO SCALE

BRACED FRAME CONNECTION SCHEDULE						
STEEL BRACE SIZE	GUSSET PLATE "A" THICKNESS	WELD SIZE "D"	LENGTH OF WELD "L_W"	KERF PL. "B" THICKNESS	NUMBER OF A490 BOLT COLUMNS	NUMBER OF A490 BOLT ROWS
HSS5x5	1/2"	5/16"	5"	1/2"	2	2
HSS6x6	3/4"	5/16"	6"	3/4"	2	3
HSS7x7	1"	5/16"	9"	1"	2	4
HSS8x8	1 1/4"	7/16"	10"	1 1/4"	3	4
HSS10x10	1 1/4"	1/2"	12"	1 1/4"	3	6
HSS12x12	1 1/2"	1/2"	13"	1 1/2"	3	6
HSS14x14	1 1/2"	5/8"	12"	1 1/2"	3	7

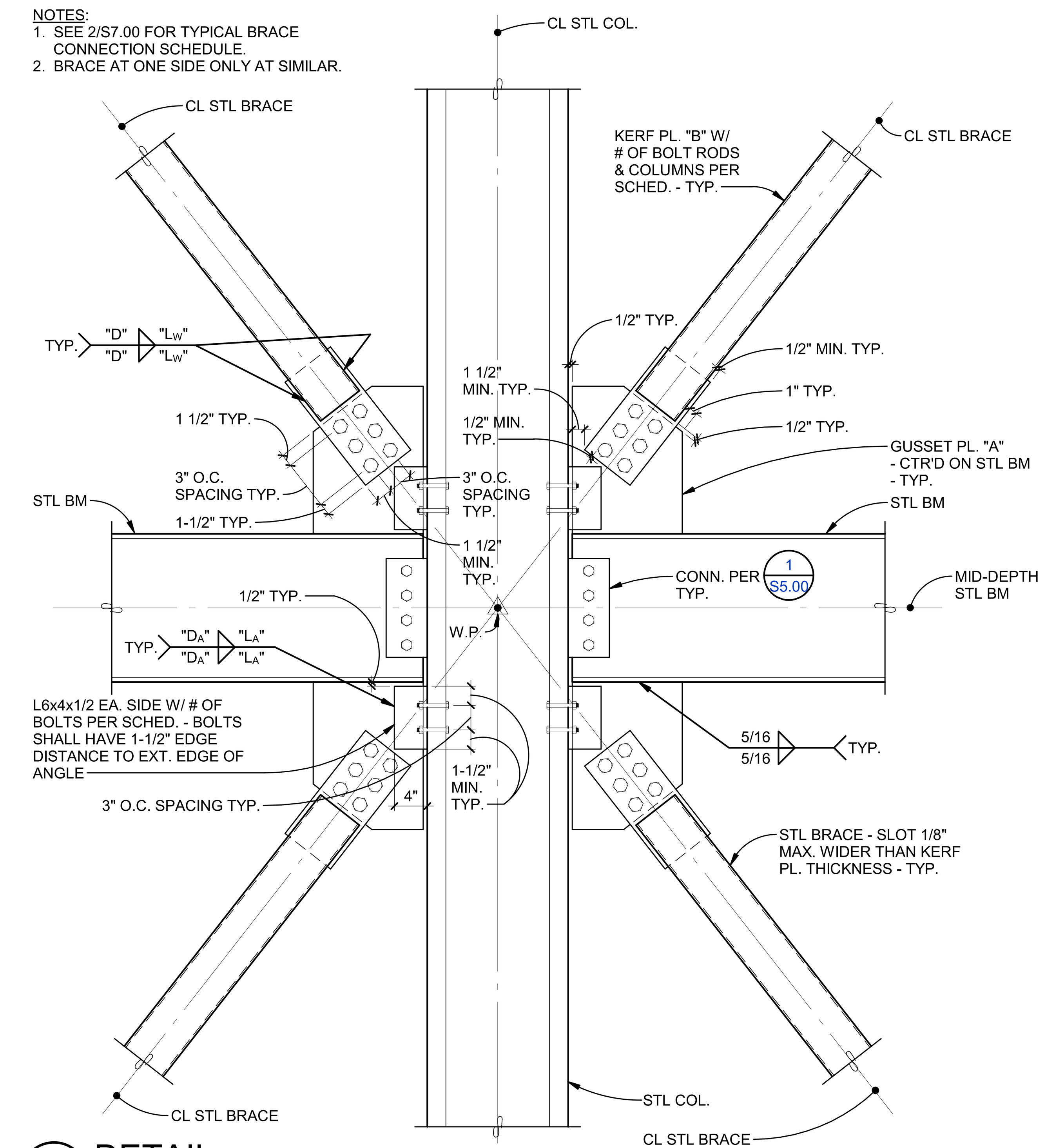
NOTES:
1. NO BRACES ABOVE AT SIMILAR.
2. ALL BOLTS ARE 1" DIAMETER A490 BOLTS.



2 S7.00 DETAIL
NO SCALE

BRACED FRAME CONNECTION SCHEDULE			
STEEL BRACE SIZE	WELD SIZE "D_A"	MINIMUM WELD LENGTH "L_A"	NUMBER OF 1"ø A490 BOLTS
HSS5x5	5/16"	6 1/2"	2
HSS6x6	5/16"	9 1/2"	2
HSS7x7	5/16"	14"	3
HSS8x8	5/16"	22"	5
HSS10x10	7/16"	24"	8
HSS12x12	7/16"	24"	8
HSS14x14	1/2"	27"	9

NOTES:
1. SEE 2/S7.00 FOR TYPICAL BRACE CONNECTION SCHEDULE.
2. BRACE AT ONE SIDE ONLY AT SIMILAR.



3 S7.00 DETAIL
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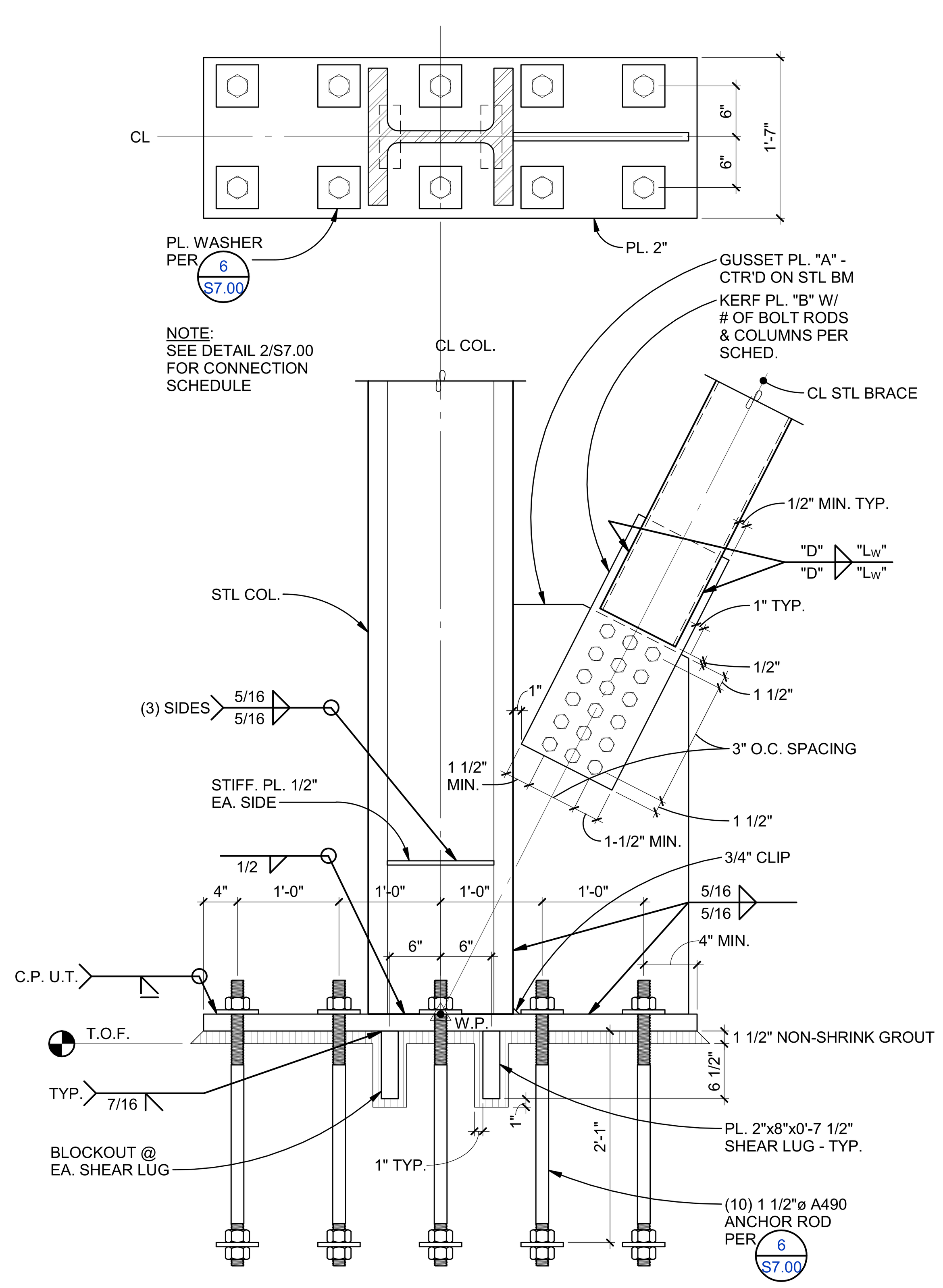

4 S7.00 DETAIL
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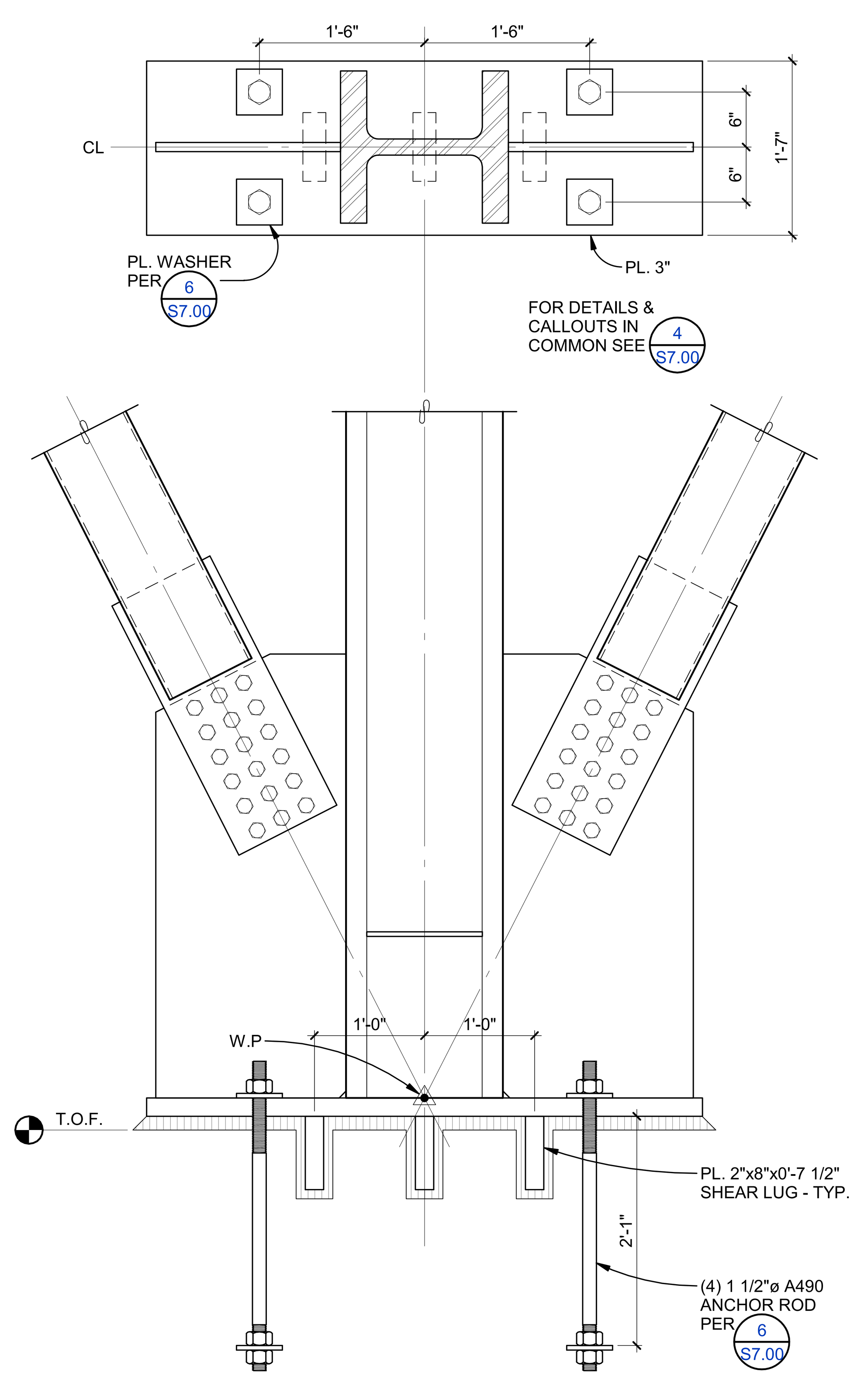
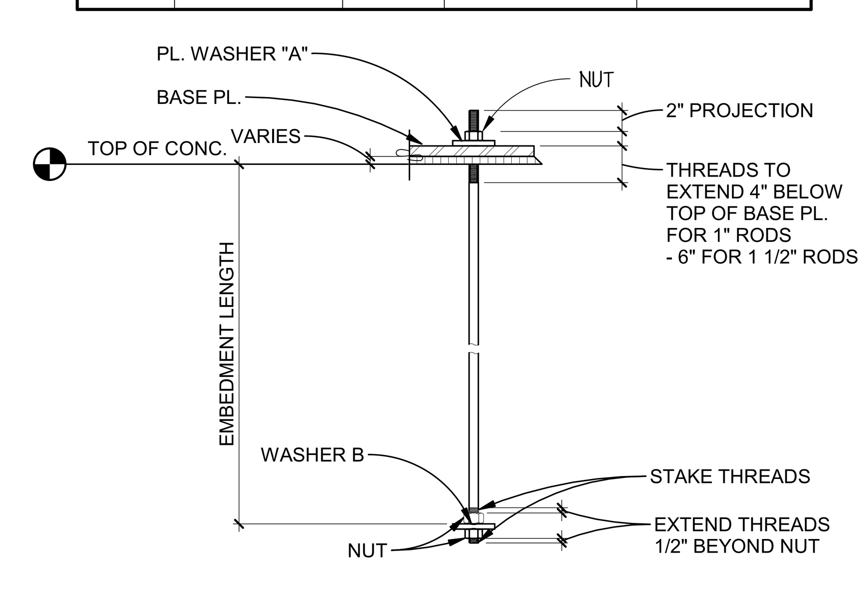


5 S7.00 SECTION
NO SCALE

ANCHOR ROD		WASHER		NUT
SIZE	MATERIAL	TYPE	SIZE	
1 1/2"ø	A490 GRADE 36	A	PL. 1/2"x5"x0'-5" W/ 1 7/8"ø HOLE CENTERED	A563 GRADE A HEAVY HEX
		B	ASTM A529 CARBON FLAT WASHER	



TYPICAL ANCHOR ROD/BOLT DETAIL
6 S7.00 SECTION
NO SCALE

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DRAWINGS
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TITLE
FRAME DETAILS

SHEET NUMBER
S7.00

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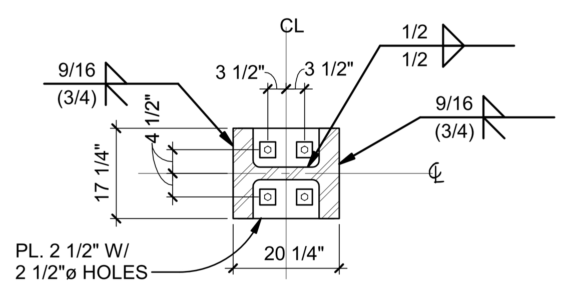
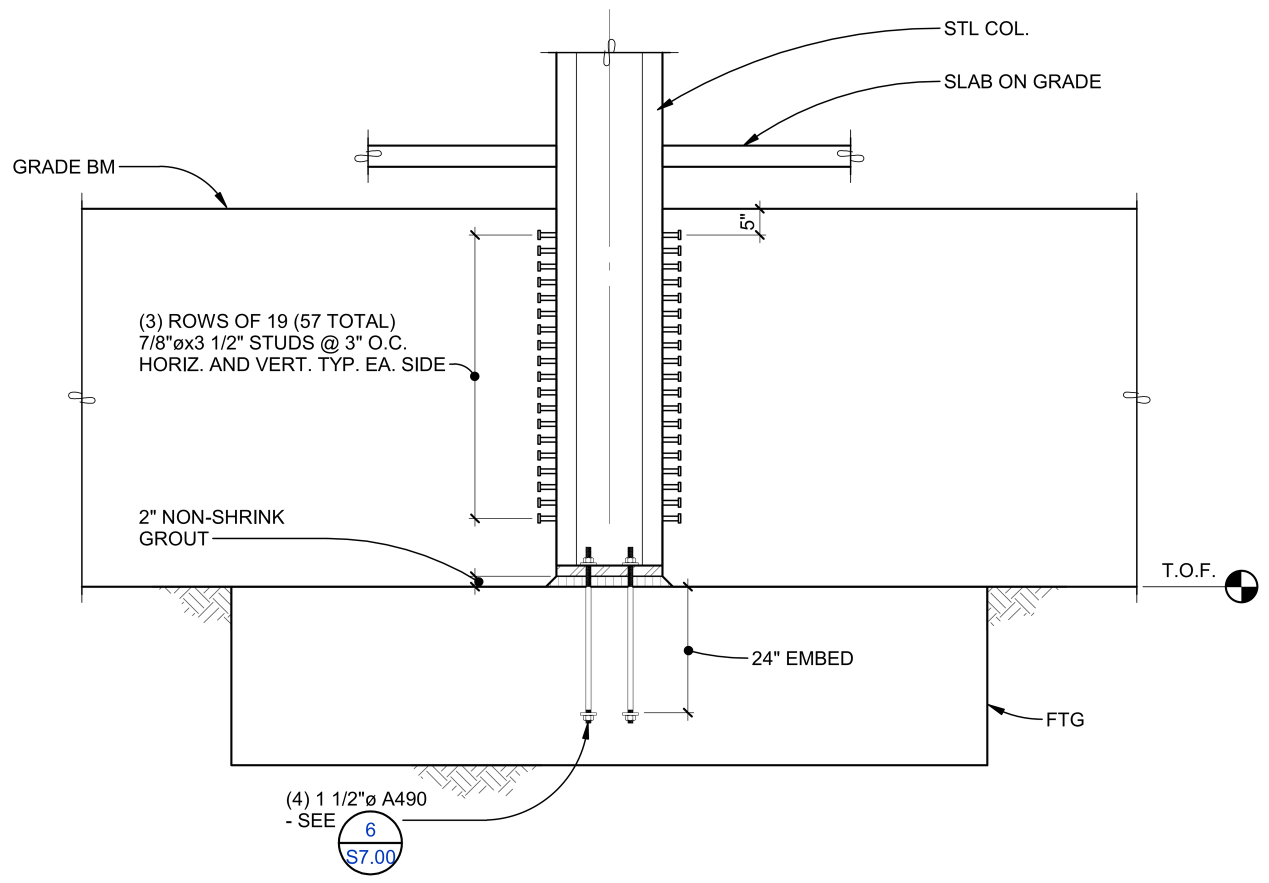
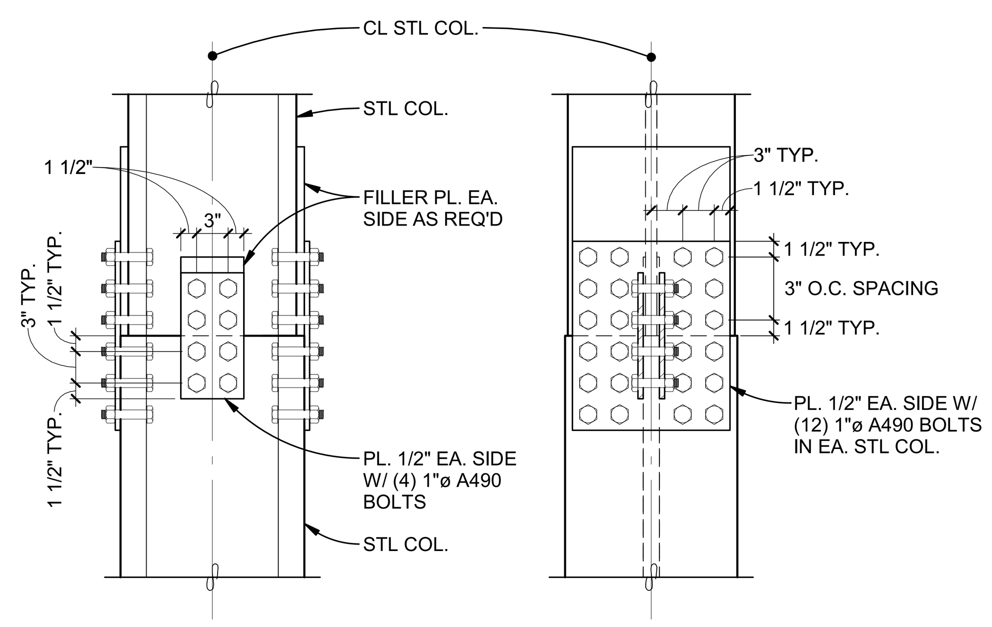


BASE PLATE DETAIL



1 SECTION
S7.01 NO SCALE



2 SECTION
S7.01 NO SCALE

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FRAME DETAILS

SHEET NUMBER
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Design Case D

2018 IBC
Risk Category IV
Seismic Design Category B

D.1 Gravity Design

The 7-story healthcare facility is a steel framed building with 3" metal deck and 4-1/2" of concrete topping providing a total slab depth of 7-1/2", not including the structural steel framing. This decking was chosen to provide the required 2-hour fire rating that is typical for healthcare facilities. The columns and beams are ASTM A992 steel wide flange members and were designed using Load Resistance Factor Design (LRFD) procedures in accordance with AISC *Steel Construction Manual* 15th edition. The deflection was limited to 2018 IBC prescribed limits of $L/480$ for applied floor live loads, $L/360$ for applied floor total loads, $L/360$ for applied roof live loads, and $L/240$ for applied roof total loads.

The calculated total dead load applied was 95 psf at the floors and 100 psf at the roof. The increase of dead load at the roof is attributed to the theoretical mechanical units that are typically placed on the roof structure. The live loads chosen for the floors and roof were provided in accordance with 2018 IBC Table 1607.1. It should be noted that the 40 psf roof live loads controlled the design over the calculated snow load per Chapter 7 of ASCE/SEI 7-16.

D.2 Lateral Design

There were two separate lateral-force-resisting systems for this building, a steel concentric braced frame system for the lateral load resistance in the North/South direction and a steel moment frame system for the lateral load resistance in the East/West direction. The applied wind and seismic loads were determined using Chapters 27 and 12 respectively from ASCE/SEI 7-16. In the North/South direction the code level seismic force controlled the design, while in the East/West direction the code specified wind force controlled the design. In both directions the eccentric loading, both calculated and required accidental, is included in determining the applied frame forces at each level.

The braced frames have a two-story X configuration and utilize ASTM A500 Gr. C HSS steel braces. The braces are designed to maintain the same area of steel at floors where the upper and lower braces meet at the intersecting floor/roof beam to help

mitigate the forces that are applied to that beam. This is important to be efficient in the size of our braced framed beams and the overall tonnage of the building. The KISS method was used for force distribution analysis of the connection designs. At the foundations, the anchorage was designed to resist the minimum of the uplift force due to overturning with an applied Ω_o or the expected brace strength. The shear lugs were designed to resist the minimum of the applied shear forces with an applied Ω_o or the expected brace strength.

The moment frames have been designed using bolted moment connections. This type of connection was chosen because this is the preferred method of moment frame construction in the New York City area. The design of the moment frame was controlled by the H/400 drift limit during a 50-year windstorm, or a wind speed of 90 mph. In order to meet this requirement without fixing the base of the columns, the column sizes were increased at the lower levels and the beams at the first and second level were increased in size over what is required for strength. The design of all the connections is required by the AISC *Seismic Manual* to resist moment and reaction due to the expected flexural strength of the beam.

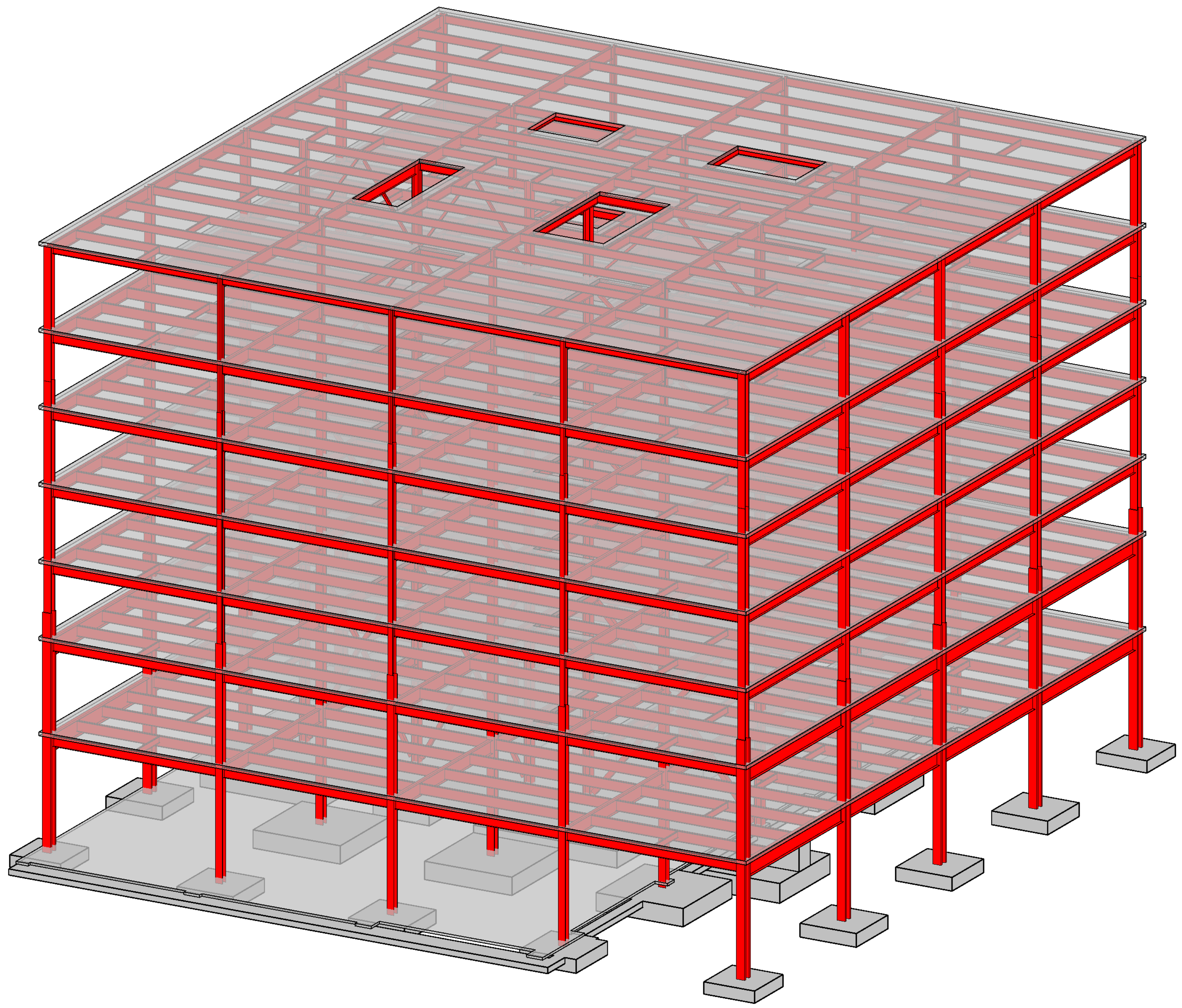
D.3 Steel Tonnage

Total steel tonnage for this design case is calculated as 781 tons.

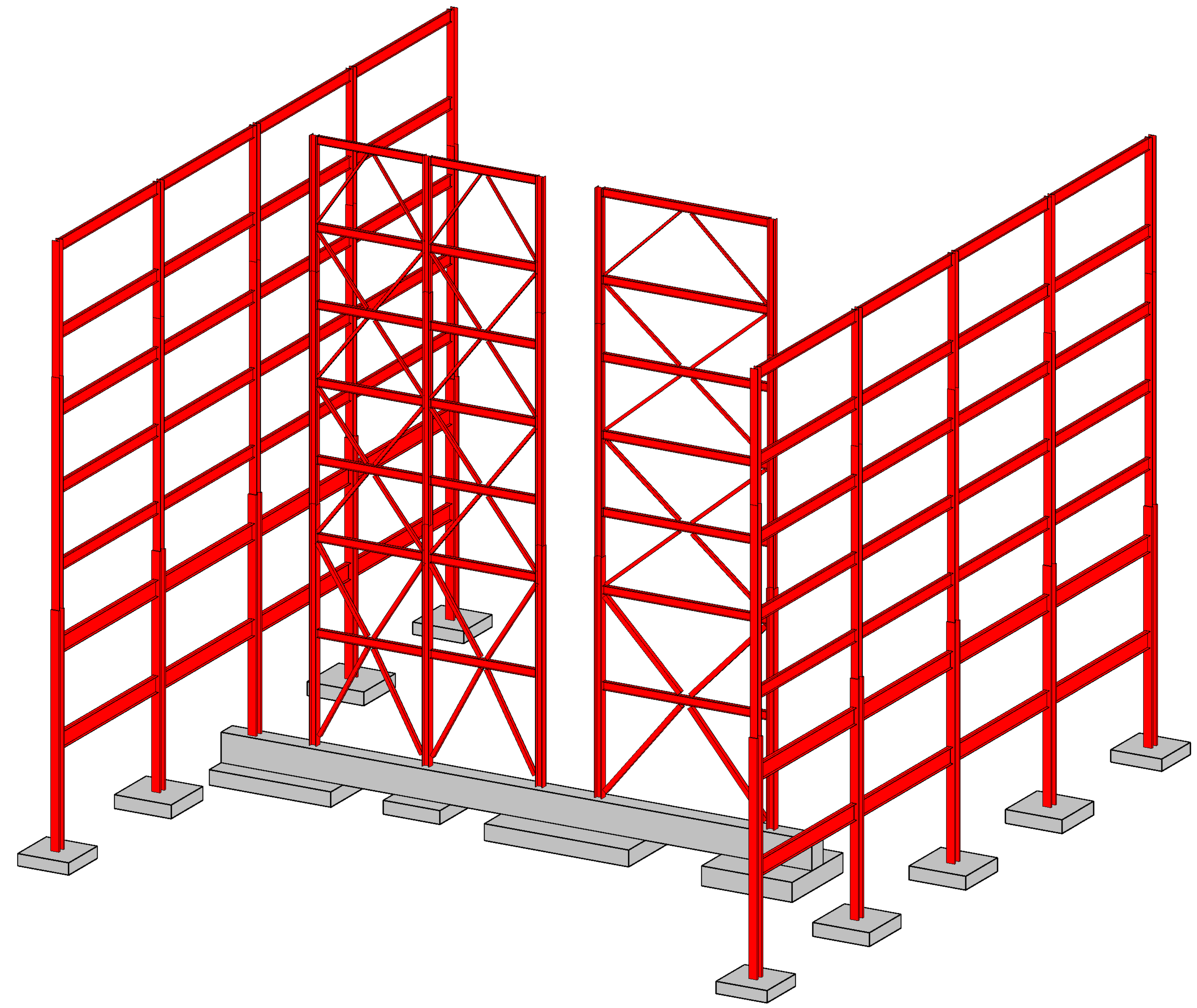
D.4 Structural Drawings

Structural drawings for Design Case D are provided on the following pages.

HEALTHCARE FACILITY - LONG ISLAND, NEW YORK
DESIGN D - 2018 IBC RISK CATEGORY IV



OVERALL FRAMING 3D VIEW



LATERAL FORCE RESISTING SYSTEM 3D VIEW

DESIGN D: 2018 IBC "RISK CATEGORY IV"	
HEALTHCARE FACILITY, LONG ISLAND, NEW YORK	
ITEM	QUANTITY
WF COLUMNS (Fy = 50 KSI)	57 TONS
WF GIRDERS AND JOISTS (Fy = 50 KSI)	403 TONS
MOMENT FRAME WF COLUMNS (Fy = 50 KSI)	189 TONS
MOMENT FRAME WF BEAMS (Fy = 50 KSI)	69 TONS
BRACED FRAME WF COLUMNS (Fy = 50 KSI)	32 TONS
BRACED FRAME WF BEAMS (Fy = 50 KSI)	16 TONS
HSS BRACES (Fy = 50 KSI)	15 TONS
TOTAL	781 TONS

1. STEEL QUANTITIES DO NOT INCLUDE MISCELLANEOUS STEEL, CUT WASTE STEEL, STAIRS, TYPICAL STEEL FRAMING CONNECTIONS, ETC.
2. ON PLANS " ▶ " INDICATES GRAVITY MOMENT CONNECTION WITH (CJP) WELDS AT FLANGES.

DRAWING INDEX

SHEET NUMBER	SHEET DESCRIPTION
S0.00	COVER SHEET
S0.01	GENERAL NOTES
S2.00	FOUNDATION AND GRADE LEVEL FRAMING PLAN
S2.10	FIRST FLOOR FRAMING PLAN
S2.20	SECOND FLOOR FRAMING PLAN
S2.30	THIRD FLOOR FRAMING PLAN
S2.40	FOURTH FLOOR FRAMING PLAN
S2.50	FIFTH FLOOR FRAMING PLAN
S2.60	SIXTH FLOOR FRAMING PLAN
S2.70	ROOF FRAMING PLAN
S3.00	FOUNDATION DETAILS
S4.00	COLUMN SCHEDULE
S5.00	STEEL DETAILS
S6.00	BRACED FRAME ELEVATIONS
S6.01	MOMENT FRAME ELEVATION
S6.02	MOMENT FRAME ELEVATION
S7.00	FRAME DETAILS
S7.01	FRAME DETAILS
Grand total: 18	

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DRAWINGS

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TITLE

COVER SHEET

SHEET NUMBER

S0.00

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GENERAL NOTES

STANDARDS
THE DESIGN AND MATERIALS SHALL CONFORM TO THE 2018 INTERNATIONAL BUILDING CODE (IBC) AS AMENDED AND ADOPTED BY THE LOCAL BUILDING OFFICIAL OR APPLICABLE JURISDICTION.

STRUCTURAL DRAWINGS PRIMARY STRUCTURAL ELEMENTS ARE DIMENSIONED ON STRUCTURAL PLANS AND DETAILS AND OVERALL LAYOUT OF STRUCTURAL PORTION OF WORK.

PROJECT LOCATION

LONG ISLAND, NEW YORK

40.6471 LATITUDE, -73.5642 LONGITUDE

DESIGN CRITERIA

VERTICAL LOADS

AREA	DESIGN DEAD LOAD	LIVE LOAD (2)	PARTITION LOAD	CONCENTRATED LOADS
OPERATING ROOMS	95 PSF	60 PSF	15 PSF	1000#
PRIVATE ROOMS	95 PSF	40 PSF	15 PSF	1000#
CORRIDORS ABOVE 1ST FLOOR	95 PSF	80 PSF	15 PSF	1000#
ROOF	100 PSF	40 PSF	-	-

(1) DRIFT AND UNBALANCED SNOW LOAD PER ASCE 7-16, CHAPTER 7.
(2) LIVE LOADS EXCEPT SNOW LOADS ARE REDUCED PER IBC SECTION 1607.11.

SNOW: (MINIMUM ROOF SNOW LOAD = 25 PSF)

Pg = 20 PSF = GROUND SNOW LOAD
Pf = 0.7CeCtIsPg = FLAT ROOF SNOW LOAD
Ps = CsPf = SLOPED ROOF SNOW LOAD
Is = 1.10 Ce = 1.0, Ct = 1.0, Cs = VARIES

VIBRATION DESIGN CRITERIA:

VIBRATION CONSIDERATIONS WERE DESIGNED PER THE RECOMMENDATIONS IN THE GUIDELINES FOR DESIGN AND CONSTRUCTION OF HOSPITALS AND OUTPATIENT FACILITIES. FOR PATIENT ROOM FLOORS A VIBRATION VELOCITY LIMIT OF 6,000 MICRO INCHES PER SECOND WAS EVALUATED AT A WALKING SPEED OF 75 STEPS PER MINUTE.

LATERAL FORCES

LATERAL FORCES ARE TRANSMITTED BY DIAPHRAGM ACTION OF ROOF AND FLOORS TO BRACED FRAME/MOMENT FRAME. LOADS ARE THEN TRANSFERRED TO FOUNDATION BY BRACED FRAME/MOMENT FRAME ACTION WHERE ULTIMATE DISPLACEMENT IS RESISTED BY PASSIVE PRESSURE OF EARTH AND/OR SLIDING FRICTION. OVERTURNING IS RESISTED BY DEAD LOAD OF THE STRUCTURE.

WIND:

THE BUILDING MEETS THE CRITERIA TO USE THE "ENCLOSED, PARTIALLY ENCLOSED, AND OPEN BUILDING OF ALL HEIGHTS PROCEDURE" PER ASCE 7-16.

- EXPOSURE CATEGORY = B
- BASIC WIND SPEED, (3 SEC. GUST), V_{ULT} = 137 MPH; V_{ASD} = 99 MPH
- RISK CATEGORY PER IBC TABLE 1604.5 = IV
- TOPOGRAPHIC FACTOR K_{ZT} = 1.0
- INTERNAL PRESSURE COEFFICIENT (ENCLOSED) = ± 0.18
- DESIGN WIND BASE SHEAR = 477 KIPS
- SEE THE FOLLOWING SCHEDULES FOR COMPONENTS AND CLADDING WIND PRESSURES

ROOF SURFACES [1]						
EFFECTIVE WIND AREA	POSITIVE PRESSURES (PSF)			NEGATIVE PRESSURES (PSF)		
	ZONE [2]					
	1	2	3	1	2	3
10 SF	19.6	19.6	19.6	-64.7	-101.6	-138.6
20 SF	19.6	19.3	18.6	-62.1	-97.6	-133.0
50 SF	19.6	18.8	17.3	-59.6	-93.5	-127.0
100 SF	19.6	18.5	16.1	-57.0	-89.4	-121.8

WALL SURFACES AND ROOF OVERHANGS [1]				
EFFECTIVE WIND AREA	POSITIVE PRESSURE (PSF)		NEGATIVE PRESSURE (PSF)	
	ZONE [2]			
	4	5	4	5
10 SF	48.4	48.4	-52.4	-81.2
20 SF	46.5	45.0	-49.9	-77.1
50 SF	44.4	40.6	-46.2	-71.5
100 SF	42.5	36.8	-43.0	-66.5
500 SF	38.7	29.0	-36.8	-56.8

1. VALUES SHOWN IN TABLE ARE GROSS ULTIMATE WIND PRESSURES.
2. ZONES ARE AS DEFINED BY TABLE 30.6-2 IN ASCE 7-16.

SEISMIC: (ASCE 7-16) V = CsW

WHERE $Cs = \dfrac{S_{DS}}{\left(\frac{R}{Ie}\right)}$; WITH

$Cs\ MINIMUM = 0.044\, S_{DS} I_E \geq 0.01$
OR
$Cs\ MINIMUM = \dfrac{0.5S_1}{\frac{R}{Ie}}$ FOR $S_1 > 0.6g$

$Cs\ MAXIMUM = \dfrac{S_{D1}}{T\left(\frac{R}{Ie}\right)}$ FOR $T \leq T_L$
OR
$Cs\ MAXIMUM = \dfrac{S_{D1}T_L}{T^2\left(\frac{R}{Ie}\right)}$ FOR $T > T_L$

SEISMIC IMPORTANCE FACTOR, Ie = 1.50
RISK CATEGORY OF BUILDING PER IBC TABLE 1604.5 = IV
SPECTRAL RESPONSE ACCELERATIONS S_S = 0.245 & S_1 = 0.055
SITE CLASS PER TABLE 20.3-1 = D
DESIGN SPECTRAL RESPONSE ACCELERATIONS S_{DS} = 0.261 & S_{D1} = 0.088
SEISMIC DESIGN CATEGORY = B
W = EFFECTIVE SEISMIC WEIGHT OF BUILDING = 11410 KIPS
ANALYSIS PROCEDURE USED = EQUIVALENT LATERAL FORCE PROCEDURE
RESPONSE MODIFICATION FACTOR PER TABLE 12.2-1, R = 3.5 AT ORDINARY STEEL MOMENT FRAMES, 3.25 AT ORDINARY CONCENTRIC BRACED FRAMES
Cs = 0.11 AT MOMENT FRAMES, 0.12 AT BRACED FRAMES
Cs max = 0.033 AT MOMENT FRAMES, 0.07 AT BRACED FRAMES
DESIGN BASE SHEAR V = 375 KIPS AT MOMENT FRAMES, 800 KIPS AT BRACED FRAMES

FOUNDATION DESIGN CRITERIA

SOIL BEARING PRESSURE: 6000 PSF (ASSUMED)*

ACTIVE PRESSURE - RESTRAINED: 50 PCF +14H SEISMIC SURCHARGE (ASSUMED)
ACTIVE PRESSURE - UNRESTRAINED: 35 PCF +6H SEISMIC SURCHARGE (ASSUMED)
PASSIVE RESISTANCE: 200 PCF (INCLUDES F.O.S. ≥ 1.5) (ASSUMED)
COEFFICIENT OF FRICTION: .35 (INCLUDES F.O.S. ≥ 1.5) (ASSUMED)
*1/3 INCREASE ALLOWED FOR SEISMIC OR WIND LOADING

CONCRETE

ITEM	DESIGN f'c (PSI) (AT 28 DAYS U.N.O.)
SLABS ON GRADE - UNO	4000
FOUNDATIONS - UNO	3000
STEM WALLS AND OTHER WALLS - UNO	4000
ELEVATED DECKS, TOPPING SLABS, AND SLABS ON METAL	5000

REINFORCING STEEL

REINFORCING STEEL SHALL CONFORM TO:

ASTM A615, GRADE 60 TYPICAL UNLESS NOTED OTHERWISE.

REINFORCING SPLICE AND DEVELOPMENT LENGTH SCHEDULE, Fy=60 KSI (UNLESS NOTED OTHERWISE)		
BAR SIZE	MINIMUM LAP SPLICE LENGTHS ("Ls")	MINIMUM DEVELOPMENT LENGTHS ("Ld")
#3	1'-6"	1'-3"
#4	2'-0"	1'-7"
#5	2'-7"	2'-0"
#6	3'-1"	2'-4"
#7	4'-6"	3'-6"
#8	5'-2"	3'-11"
#9	5'-10"	4'-6"
#10	6'-6"	5'-0"

STRUCTURAL STEEL

MATERIAL PROPERTIES

WIDE FLANGE SECTIONS: ASTM A992 (Fy = 50 KSI)

OTHER SHAPES AND PLATES: ASTM A36 (Fy = 36 KSI) TYP. U.N.O.; ASTM A572 (Fy = 50 KSI) WHERE INDICATED

HOLLOW STRUCTURAL SECTIONS: RECTANGULAR & SQUARE - ASTM A500, GRADE C (Fy = 50 KSI)

MACHINE BOLTS (M.B.): ASTM A307, GRADE A

HIGH-STRENGTH BOLTS: A325-ASTM F1852, A490-ASTM F2280

ANCHOR BOLTS (A.B.): ASTM F1554, GRADE 36, UNLESS OTHERWISE NOTED, ASTM F1554, GRADE 105 WHERE INDICATED.

WIDE FLANGE STRUCTURAL MEMBERS WHICH ARE ASTM A6 GROUP 3 SHAPES WITH FLANGE THICKNESS 1-1/2" THICK AND THICKER, AND ALL ASTM A6 GROUP 4 AND 5 SHAPES AND PLATE THAT IS 1-1/2" THICK OR THICKER SHALL HAVE A CHARPY V-NOTCH (CVN) TOUGHNESS OF 20 FT-LBS @ 70 DEG F.

GENERAL REQUIREMENTS

HIGH-STRENGTH BOLTS: ALL A325 HIGH-STRENGTH BOLTS (HSB) SHALL BE ASTM F3125, GRADE F1852, UNLESS OTHERWISE DESIGNATED AS A490. ALL HSB DESIGNATED AS A490 SHALL BE ASTM F3125, GRADE F2280. ALL HSB SHALL BE BY "LEJEUNE BOLT COMPANY" OR PRE-APPROVED EQUAL AND SHALL BE INSTALLED PER SECTION 8.2 OF THE "SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH STRENGTH BOLTS", AUGUST 2014 BY THE RESEARCH COUNCIL ON STRUCTURAL CONNECTIONS (RCSC SPECIFICATION). ALL BOLT HOLES SHALL BE STANDARD ROUND HOLES UNLESS NOTED OTHERWISE. THE FAYING SURFACES OF ALL PLIES WITHIN THE GRIP OF SLIP-CRITICAL BOLTS (A325SC OR A490SC) SHALL MEET THE REQUIREMENTS FOR A CLASS A SURFACE PER SECTION 3.2 OF THE RCSC SPECIFICATION.

HEADED STUDS: SHALL BE "S3L SHEAR CONNECTORS" FOR STUDS 3/4" DIAMETER AND LARGER AS MANUFACTURED BY NELSON STUD WELDING, INC. OR PRE-APPROVED EQUAL AND SHALL CONFORM TO AWS D1.1.

COMPOSITE FLOOR DECK: SHALL CONTAIN THE MINIMUM PROPERTIES SHOWN ON THE STRUCTURAL DRAWINGS AND SHALL BE "FORMLOK" AS MANUFACTURED BY VERCO MANUFACTURING CO., "W COMPOSITE" AS MANUFACTURED BY ASC STEEL DECK, "EPICORE" AS MANUFACTURED BY EPIC METALS, OR PRE-APPROVED EQUAL. THE FLOOR UNITS SHALL BE FORMED FROM STEEL SHEETS CONFORMING TO ASTM A653, AND GALVANIZED PER ASTM A924.

ABBREVIATION LIST			
@	AT	HSS	HOLLOW STRUCTURAL SECTION
A.B.	ANCHOR BOLT	HT	HEIGHT
ADD'L	ADDITIONAL	INT.	INTERIOR
ALT.	ALTERNATE	JST	JOIST
BLD'G	BUILDING	JT	JOINT
BM	BEAM	L	ANGLE
B.O.F.	BOTTOM OF FOOTING	L.F.R.S.	LATERAL FORCE-RESISTING SYSTEM
BOT.	BOTTOM	L.L.	LIVE LOAD
BRG	BEARING	LLH	LONG LEG HORIZONTAL
BTWN	BETWEEN	LLV	LONG LEG VERTICAL
(C=)	CAMBER	LOC.	LOCATION
CANT.	CANTILEVER	MAX.	MAXIMUM
C.J.	CONTROL/CONSTRUCTION JOINT	M.B.	MACHINE BOLT
CL	CENTERLINE	MFR	MANUFACTURER
CLR.	CLEARANCE	MIN.	MINIMUM
COL.	COLUMN	MISC.	MISCELLANEOUS
CONC.	CONCRETE	MTL	METAL
CONN.	CONNECTION	N.F.	NEAR FACE
CONST.	CONSTRUCTION	N.S.	NEAR SIDE
CONT.	CONTINUOUS	NTS	NOT TO SCALE
COORD.	COORDINATE	O.C.	ON CENTER
C.P.	COMPLETE PENETRATION	OPN'G	OPENING
CTR'D	CENTERED	OPP.	OPPOSITE
C.Y.	CUBIC YARD	PERP.	PERPENDICULAR
DBL.	DOUBLE	PL	PLATE
DCW	DEMAND CRITICAL WELD	P.P.	PARTIAL PENETRATION
DIA. OR ø	DIAMETER	P.S.F.	POUNDS PER SQUARE FOOT
DIAG.	DIAGONAL	REINF.	REINFORCING
DIM.	DIMENSION	REQ'D	REQUIRED
D.L.	DEAD LOAD	SCHED.	SCHEDULE
DWG	DRAWING	SIM.	SIMILAR
DWL	DOWEL	S.O.G.	SLAB ON GRADE
EA.	EACH	SQ.	SQUARE
E.F.	EACH FACE	STD	STANDARD
EL.	ELEVATION	STIFF.	STIFFENER
ENGR.	ENGINEER	STL	STEEL
EQ.	EQUAL	STRUCT.	STRUCTURAL
E.W.	EACH WAY	T&B	TOP & BOTTOM
EXP.	EXPANSION	THR'D	THREADED
EXT.	EXTERIOR	T.O.F.	TOP OF FOOTING
FDN	FOUNDATION	T.O.S.	TOP OF STEEL
F.F.	FAR FACE	TYP.	TYPICAL
FLR	FLOOR	U.N.O.	UNLESS NOTED OTHERWISE
FRM'G	FRAMING	U.T.	ULTRASONIC TESTED
F.S.	FAR SIDE	VERT.	VERTICAL
FTG	FOOTING	W/	WITH
GA.	GAGE/GAUGE	W.P.	WORK POINT
GALV.	GALVANIZED	WT	WEIGHT
GR.	GRADE	W.W.R.	WELDED WIRE REINFORCING
HORIZ.	HORIZONTAL		

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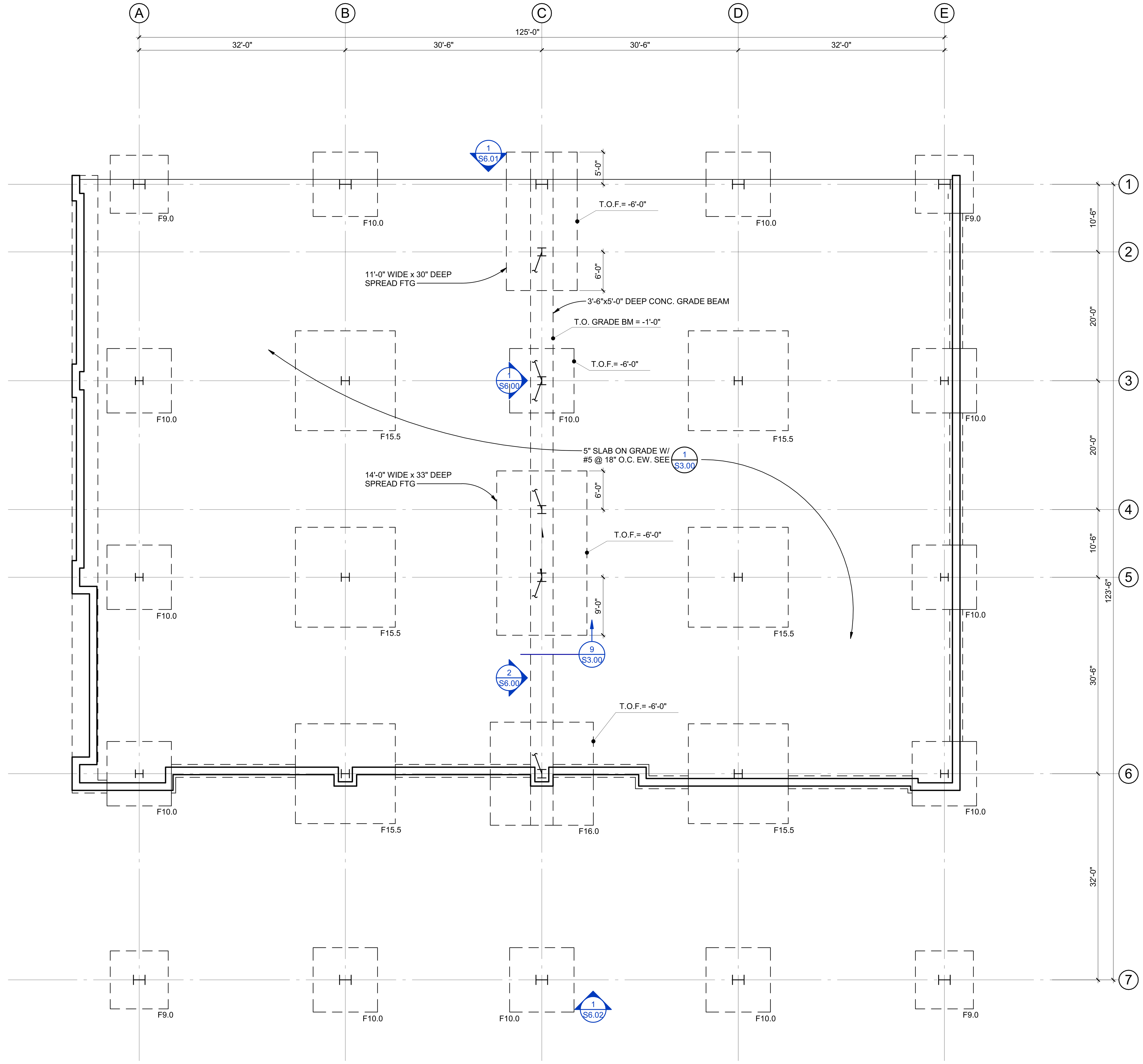
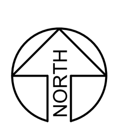
30 SEPTEMBER, 2021

Job Number	19-051
Checked	Checker
Approved	Approver

TITLE
GENERAL NOTES

SHEET NUMBER
S0.01




1 S2.00 FOUNDATION AND GRADE LEVEL FRAMING PLAN
1/8" = 1'-0"

FOUNDATION NOTES

1. INDICATES EXTERIOR WALL.
2. INDICATES CONTINUOUS CONCRETE WALL FOOTING. FOR TYPICAL FOOTING AND FOUNDATION WALL DETAILS SEE SHEET S3.00. FOOTING WIDTH ("W") = 2'-0" UNLESS NOTED OTHERWISE ON PLAN. CENTER FOOTINGS ON CONCRETE STEM WALL.
3. "F_" INDICATES CONCRETE SPREAD FOOTING. FOR SCHEDULE SEE 5/S3.00.
4. INDICATES BRACED FRAME. FOR ELEVATIONS, BRACE SIZES AND DETAIL CALLOUTS SEE SHEET S6.00.
5. INDICATES STEEL COLUMNS ORIGINATING AT FOUNDATION LEVEL. ALL COLUMNS ARE CONTINUOUS TO ROOF UNLESS NOTED OTHERWISE. FOR TYPICAL ANCHOR ROD/BOLT DETAIL SEE 7/S3.00. FOR COLUMN SCHEDULE SEE S4.00.
6. FOR TYPICAL FOUNDATION AND CONCRETE SLAB-ON-GRADE DETAILS SEE SHEET S3.00.
7. TOP OF FOOTING ELEVATIONS = -1'-0" UNLESS NOTED OTHERWISE ON PLANS AND DETAILS.
8. INDICATES MOMENT FRAME. FOR ELEVATIONS, MEMBER SIZES AND DETAIL CALLOUTS SEE SHEETS S6.01 AND S6.02.

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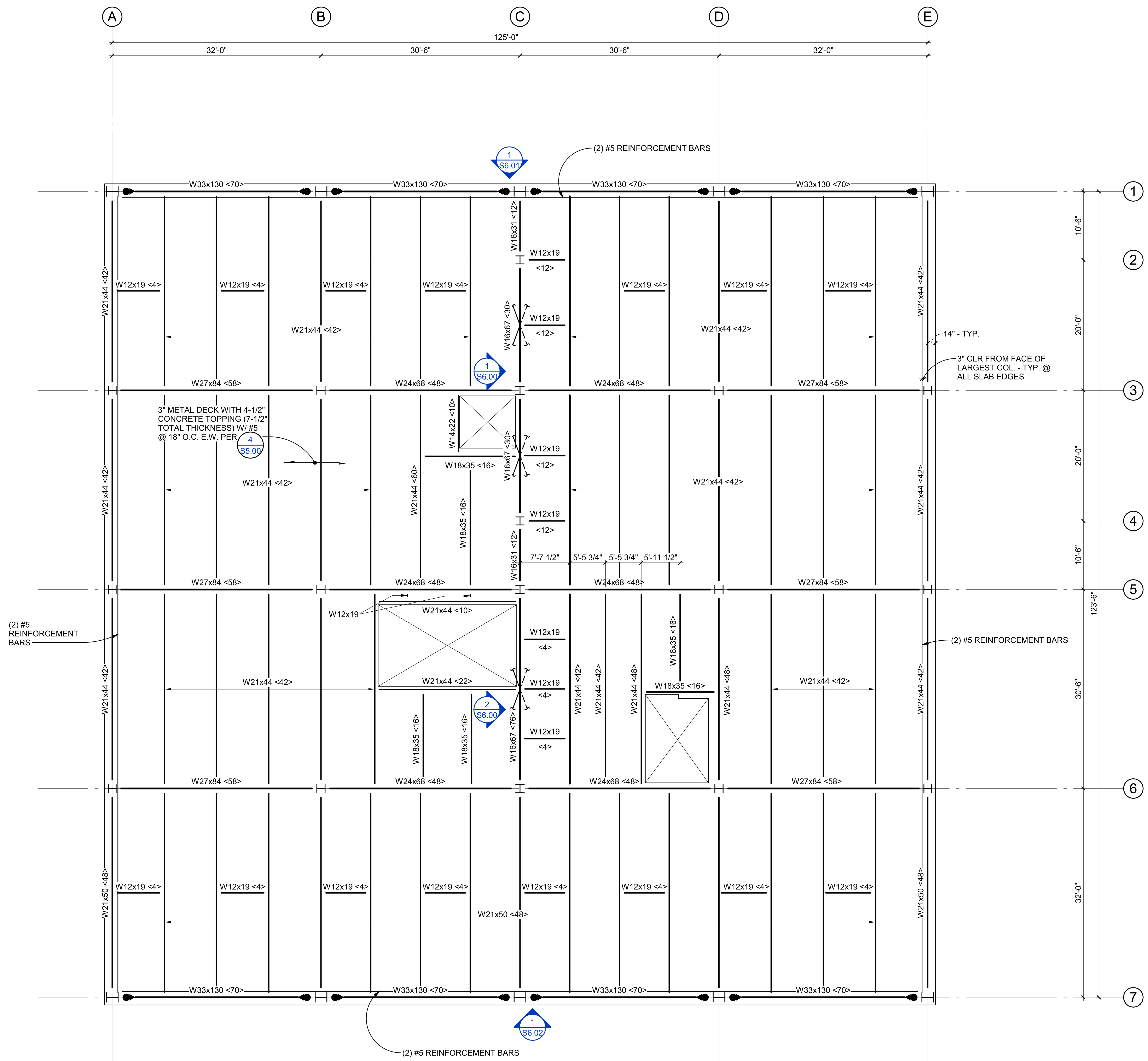
TITLE
FOUNDATION AND GRADE LEVEL FRAMING PLAN

SHEET NUMBER
S2.00

9/27/2021 9:37:17 AM
C:_Revit Models\BUILDING 2 - ATC BLDG 2 IBC 2018 SDC B RC4 v2020 (Central)_dhome@pcs-structural.com.rvt



1 S2.10 FIRST FLOOR FRAMING PLAN

1/8" = 1'-0"

FLOOR FRAMING NOTES

1. INDICATES BRACED FRAME. FOR ELEVATIONS, BRACE SIZES AND DETAIL CALLOUTS SEE SHEET S6.00. ALL BEAMS THAT ARE PART OF A BRACED FRAME SHALL BE CONSIDERED "COLLECTOR" BEAMS.
2. INDICATES STEEL COLUMN, SEE S4.00 FOR STEEL COLUMN SCHEDULE.
3. INDICATES PENETRATION IN FLOOR STRUCTURE. FOR TYPICAL REINFORCING AROUND OPENINGS SEE 5/S5.00.
4. FOR TYPICAL COMPOSITE BEAM AND METAL DECK DETAILS SEE SHEET S5.00.
5. INDICATES DIRECTION OF SPAN FOR METAL DECK.
6. FOR TYPICAL STEEL CONNECTION DETAILS SEE SHEET S5.00. SEE BRACED FRAME ELEVATIONS FOR CONNECTION CALLOUTS. ALL MEMBERS AND CONNECTIONS THAT ARE PART OF A BRACED FRAME SHALL BE CONSIDERED PART OF THE LATERAL-FORCE RESISTING SYSTEM.

INDICATES BEAM/GIRDER CAMBER IN INCHES

INDICATES THE TOTAL QUANTITY OF SHEAR STUDS. SPACE STUDS PER 9/S5.00

INDICATES BEAM/GIRDER SIZE

W18x35 <16> (C=1/2")

1/S5.00 TYP. U.N.O.

1/S5.00 TYP. U.N.O.

2/S5.00 TYP. U.N.O.

PLAN CALLOUTS INDICATE SPECIAL CONNECTION DETAIL XX XX

7. STEEL MEMBERS ARE EQUALLY SPACED BETWEEN DIMENSION POINTS UNLESS NOTED OTHERWISE.
8. INDICATES MOMENT FRAME. FOR ELEVATIONS AND DETAIL CALLOUT SEE SHEETS S6.01 AND S6.02. ASSOCIATED MEMBERS AND CONNECTIONS ARE PART OF THE LATERAL-FORCE RESISTING SYSTEM.

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FIRST FLOOR FRAMING PLAN

SHEET NUMBER

S2.10

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FOR FRAMING NOTES SEE S2.10

NORTH

1 S2.20 SECOND FLOOR FRAMING PLAN

1/8" = 1'-0"

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TITLE

SECOND FLOOR FRAMING PLAN

SHEET NUMBER

S2.20

FOR FRAMING NOTES SEE S2.10

NORTH

1 S2.30 THIRD FLOOR FRAMING PLAN

1/8" = 1'-0"

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THIRD FLOOR FRAMING PLAN

SHEET NUMBER

S2.30

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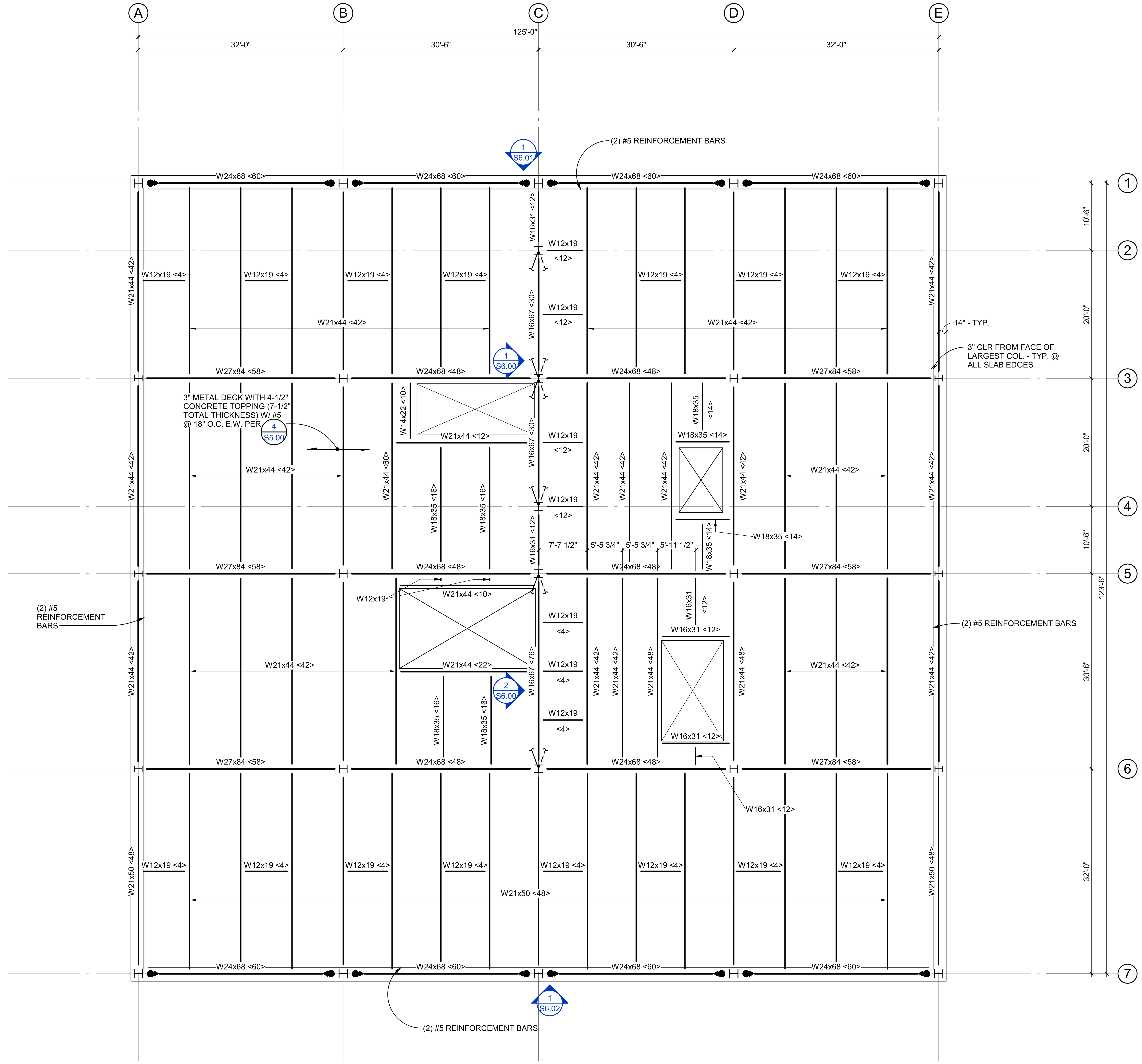

FOR FRAMING NOTES SEE S2.10

NORTH

1
S2.40

FOURTH FLOOR FRAMING PLAN

1/8" = 1'-0"

9/27/2021 9:37:31 AM

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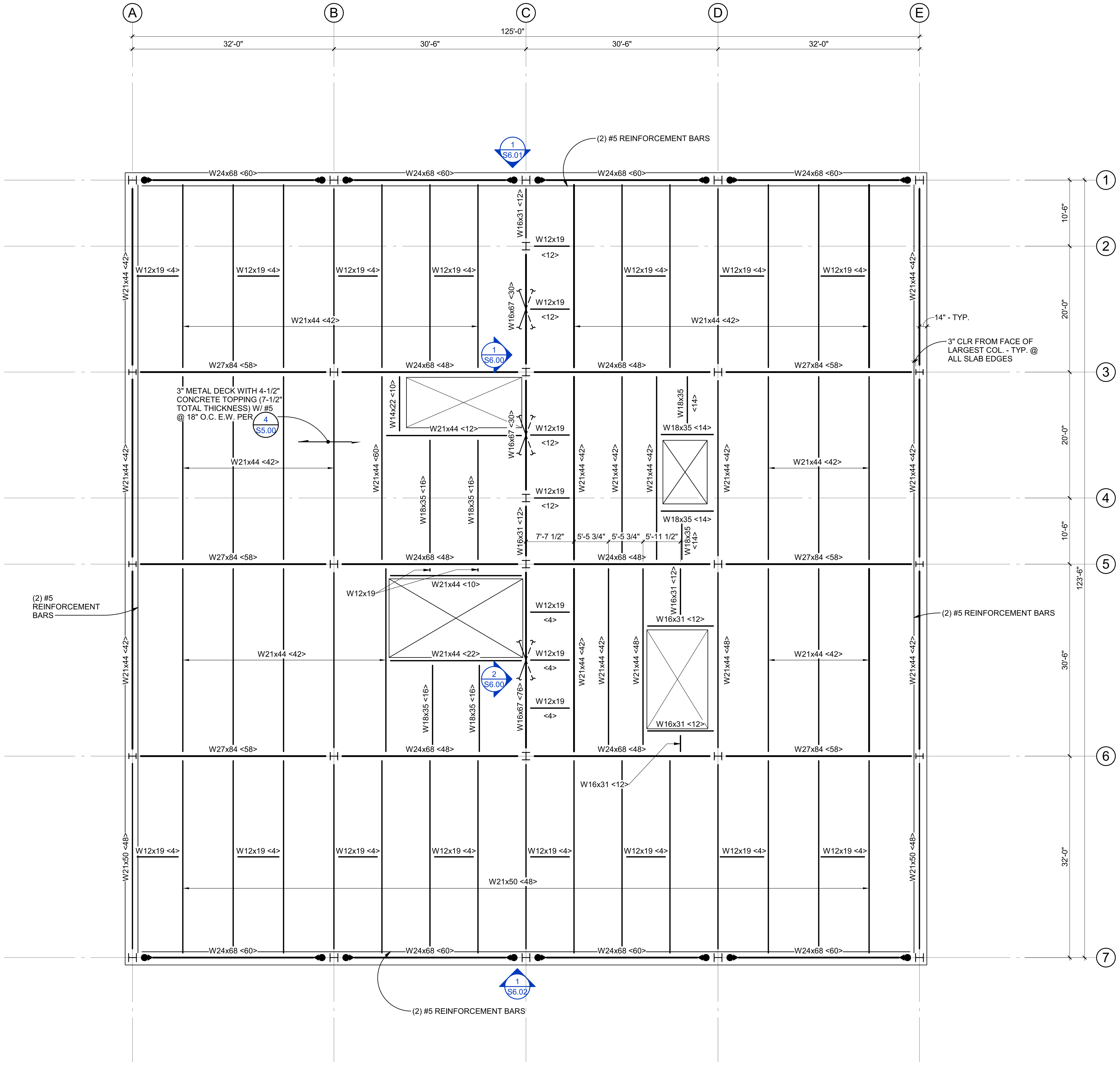
FOURTH FLOOR FRAMING PLAN

SHEET NUMBER
S2.40



FOR FRAMING NOTES SEE S2.10

NORTH

1 / S2.50 FIFTH FLOOR FRAMING PLAN

1/8" = 1'-0"

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FIFTH FLOOR FRAMING PLAN

SHEET NUMBER

S2.50

FOR FRAMING NOTES SEE S2.10

NORTH

1 S2.60 SIXTH FLOOR FRAMING PLAN

1/8" = 1'-0"

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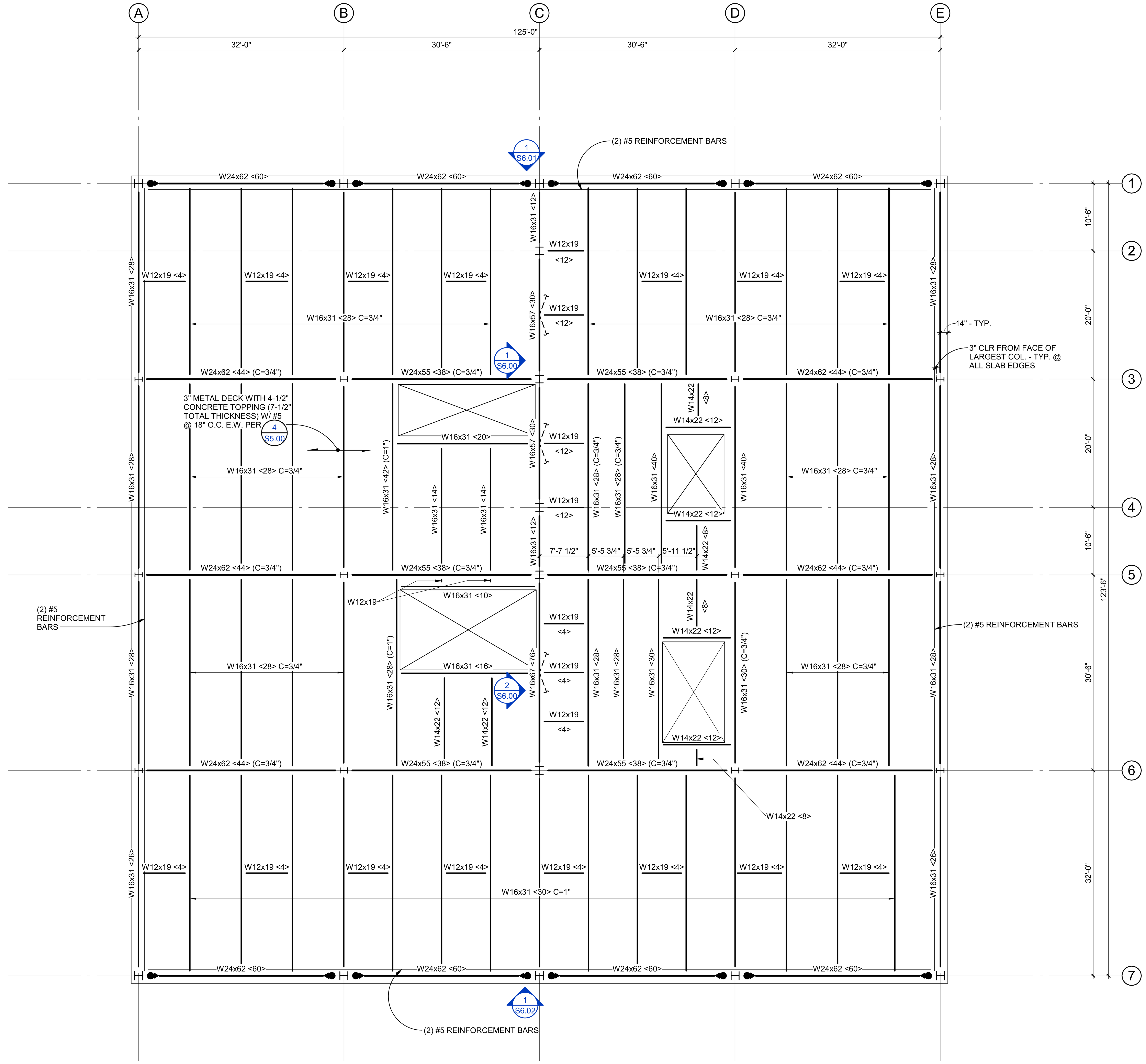
TITLE

SIXTH FLOOR FRAMING PLAN

SHEET NUMBER

S2.60



FOR FRAMING NOTES SEE S2.10

NORTH

1 S2.70 ROOF FRAMING PLAN

1/8" = 1'-0"

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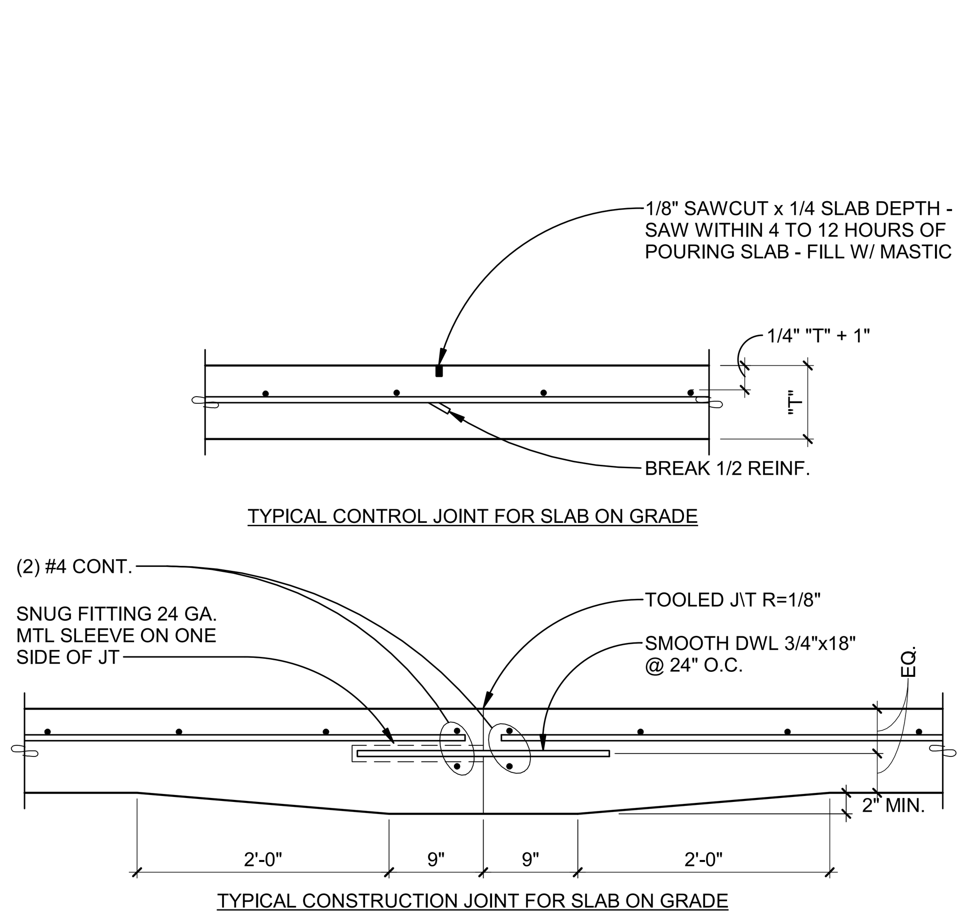
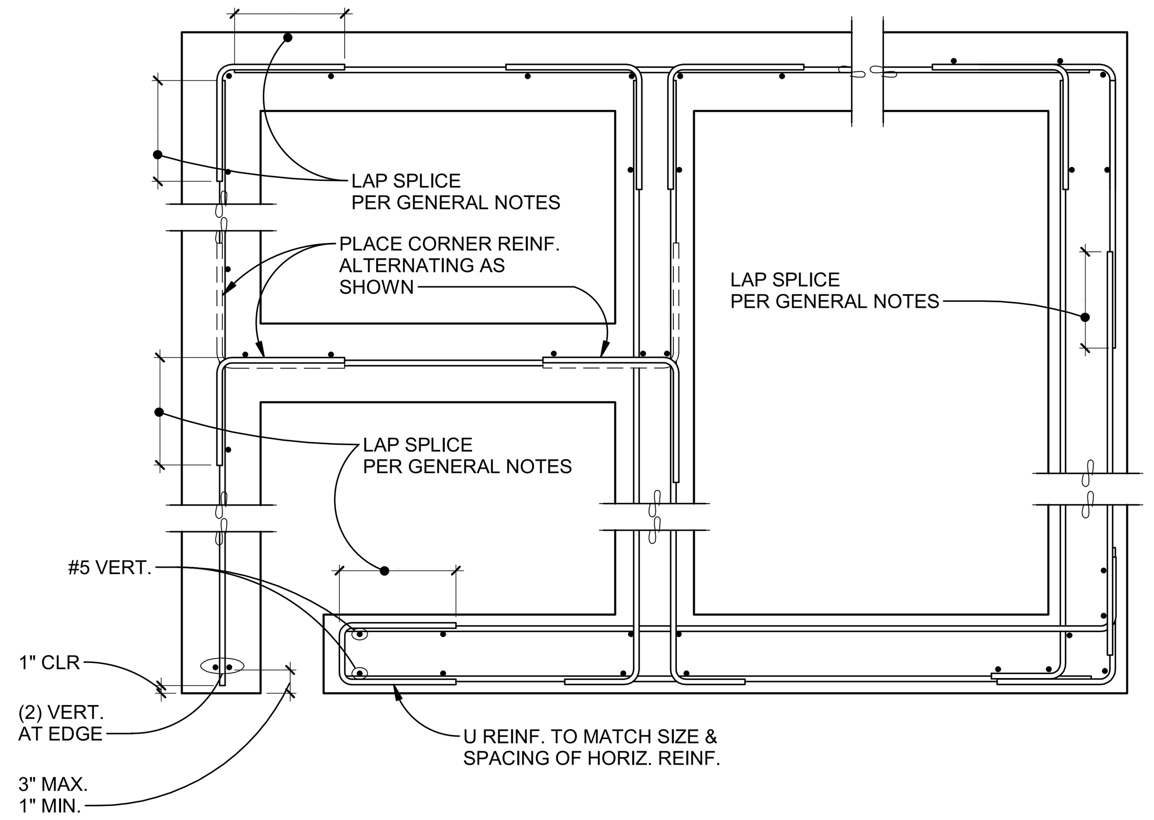
ROOF FRAMING PLAN

SHEET NUMBER

S2.70



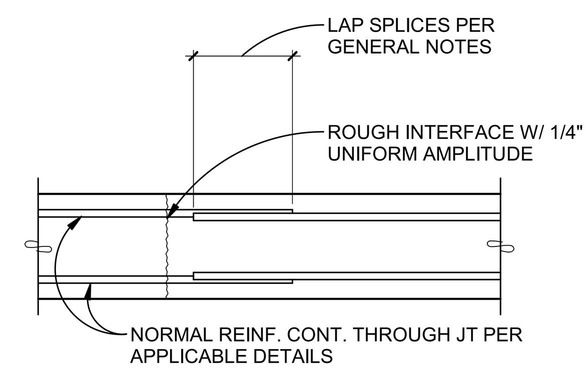
1 SECTION
S3.00 NO SCALE



NOTES:
1. VERTICAL REINFORCEMENT SHOWN IS ADDITIONAL IF NORMAL STEM WALL REINFORCEMENT IS NOT IN PROPER LOCATION.
2. CORNER REINFORCEMENT IS SAME SIZE AND SPACING AS HORIZONTAL REINFORCEMENT.
3. STANDARD HOOK MAY BE SUBSTITUTED FOR CORNER REINFORCEMENT. SEE NOTE #5.
4. REINFORCEMENT AT ALL CORNERS, ENDS, AND INTERSECTIONS OF WALLS SHALL BE PLACED IN ACCORDANCE WITH APPROPRIATE DETAIL SHOWN.
5. USE STANDARD HOOK FOR EMBEDMENT LESS THAN 24" PAST FACE OF WALL.

TYPICAL REINFORCEMENT PLACEMENT FOR CAST IN PLACE CONCRETE WALLS AND STEM WALLS

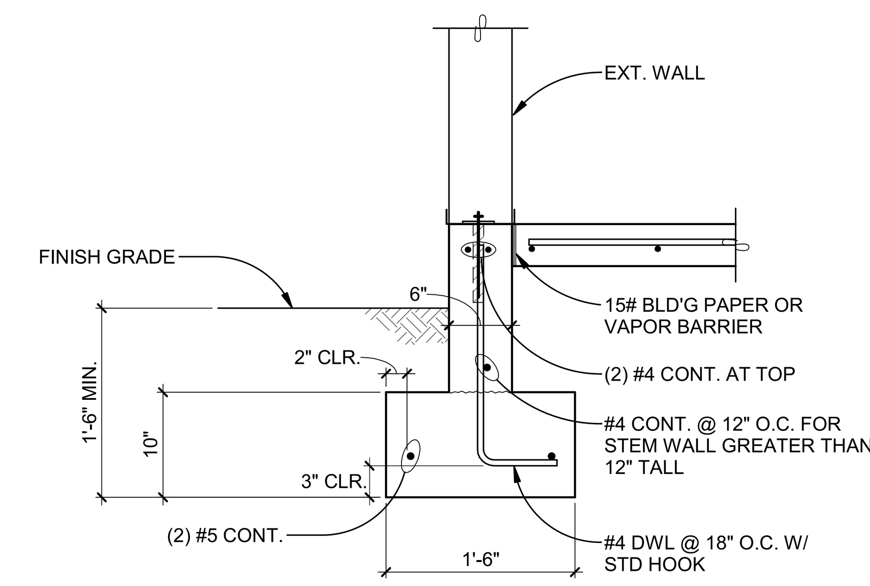
2 SECTION
S3.00 NO SCALE



TYPICAL AT CONCRETE FOOTINGS

TYPICAL FOR CAST IN PLACE CONCRETE WALLS, GRADE BEAMS AND FOOTINGS

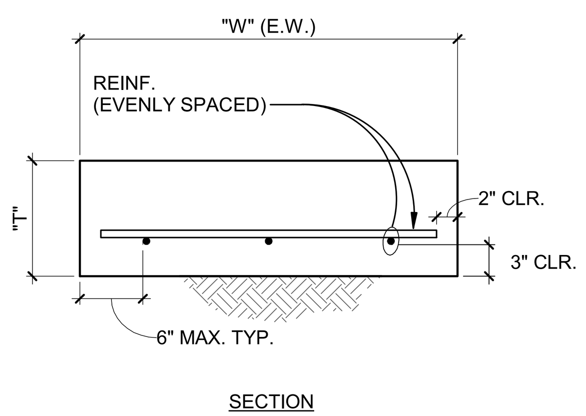
3 SECTION
S3.00 NO SCALE



TYPICAL FOUNDATION AT EXTERIOR WALL

4 SECTION
S3.00 NO SCALE

MARK	DIMENSIONS	
	"W"	"T"
F9.0	9'-0"	24"
F10.0	10'-0"	27"
F15.5	15'-6"	36"
F16.0	16'-0"	39"

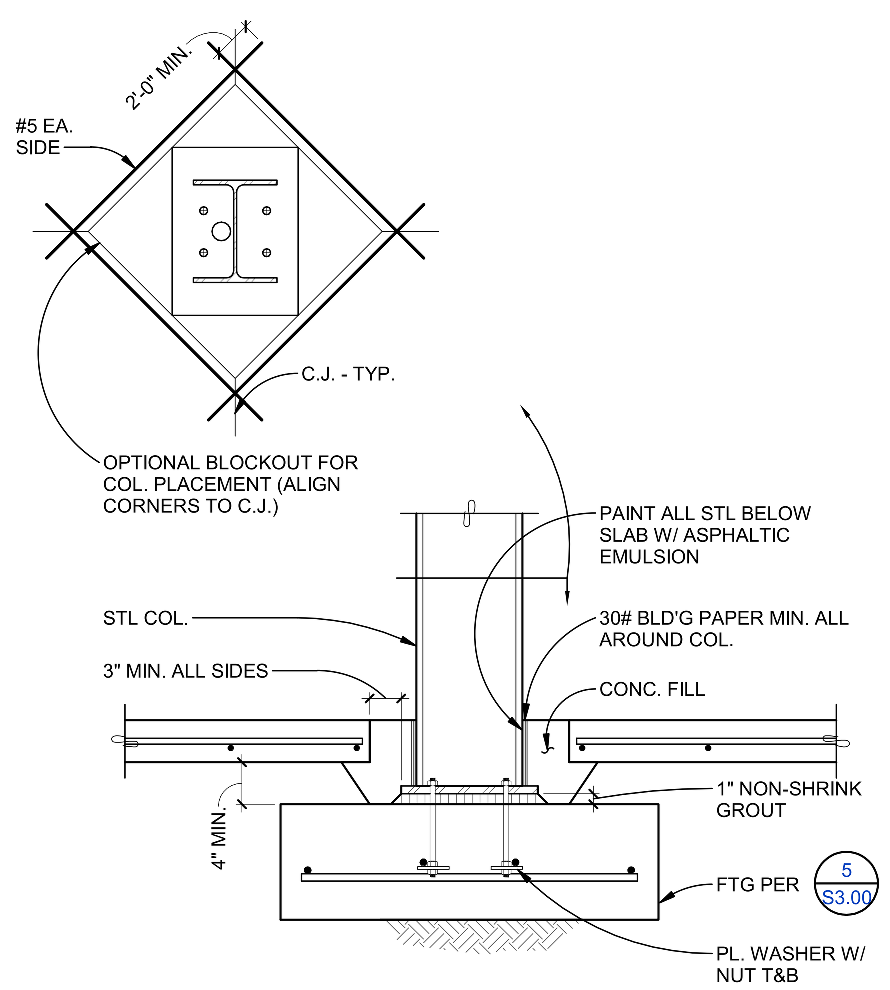


SECTION

NOTES:
1. CENTER ALL FOOTINGS ON COLUMN ABOVE EXCEPT AS SHOWN OTHERWISE.
2. FOOTINGS SHALL BEAR ON UNDISTURBED OR COMPACTED MATERIAL PER GENERAL NOTES. DESIGN BEARING PRESSURE IS 6000 POUNDS PER SQUARE FOOT.

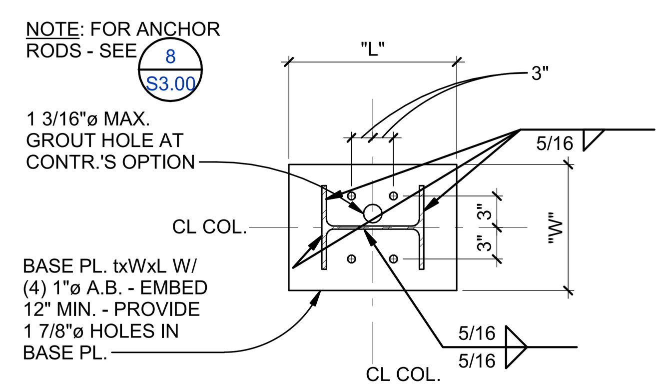
TYPICAL CONCRETE SPREAD FOOTING

5 SECTION
S3.00 NO SCALE



TYPICAL STEEL COLUMN AT SPREAD FOOTING

6 SECTION
S3.00 NO SCALE

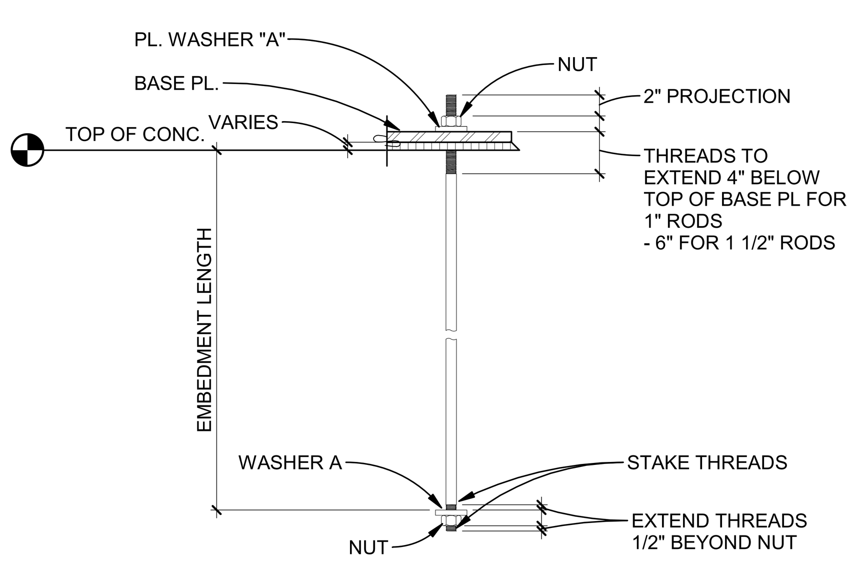


WIDE FLANGE

COLUMN SIZE	"W" (IN.)	"L" (IN.)	"t" (IN.)
W14x99	18 1/4	18 3/4	1 1/2
W14x132, W14x159	20 3/4	22 3/4	2

TYPICAL COLUMN BASE PLATE

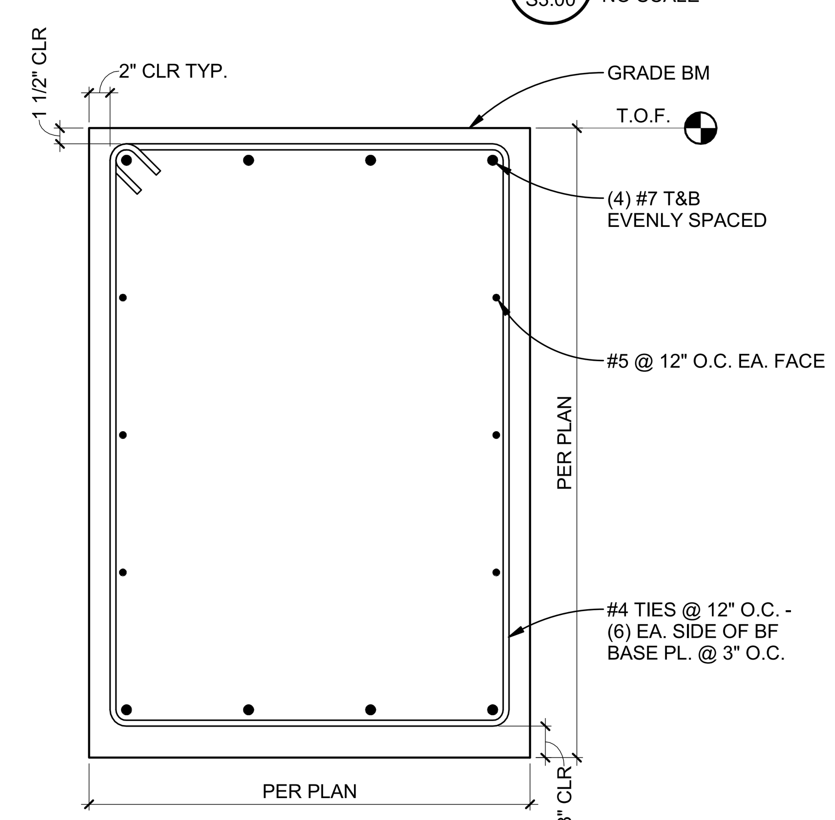
7 DETAIL
S3.00 NO SCALE



ANCHOR ROD		WASHER		NUT
SIZE	MATERIAL	TYPE	SIZE	
1"ø	F1554 GRADE 105	A	PL. 1/2"x3"x0'-3" W/ 1 1/16"ø HOLE CTR'D	A563 GRADE A HEAVY HEX

TYPICAL ANCHOR ROD/BOLT DETAIL

8 DETAIL
S3.00 NO SCALE



9 DETAIL
S3.00 NO SCALE

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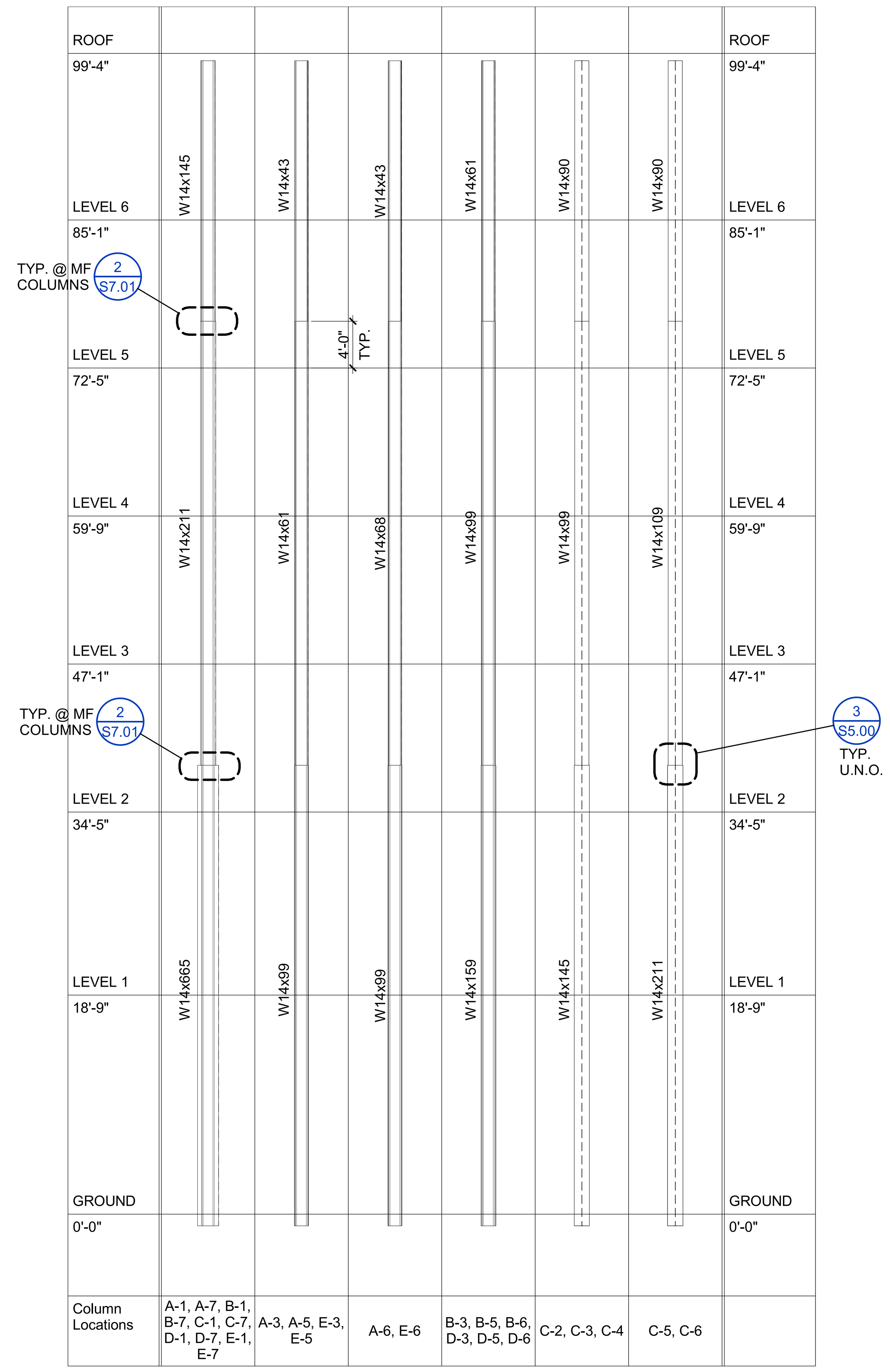
TITLE
FOUNDATION DETAILS

SHEET NUMBER
S3.00



1
S4.00
COLUMN SCHEDULE
NO SCALE

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TITLE
COLUMN SCHEDULE

SHEET NUMBER
S4.00

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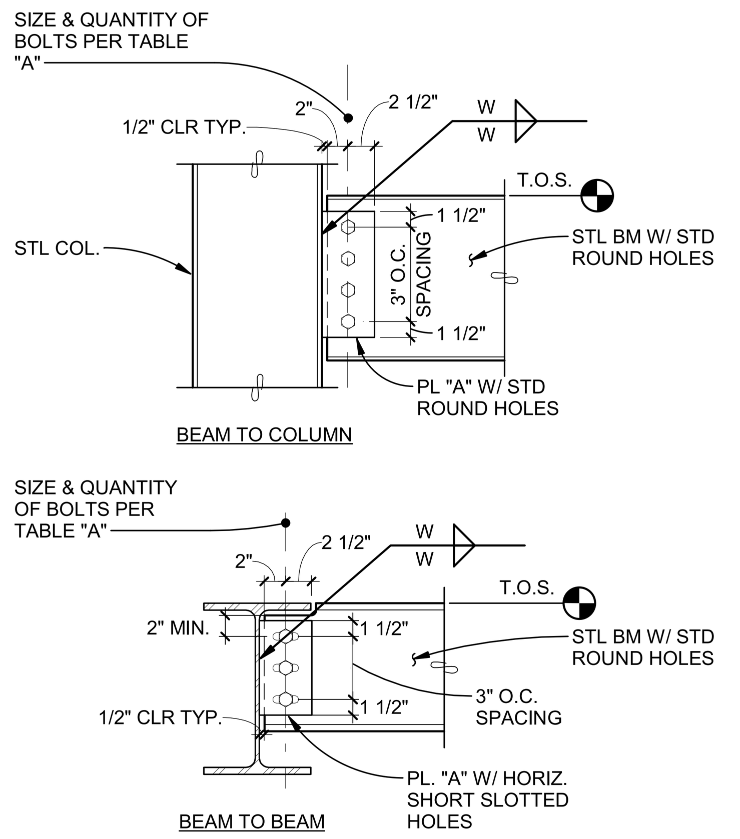


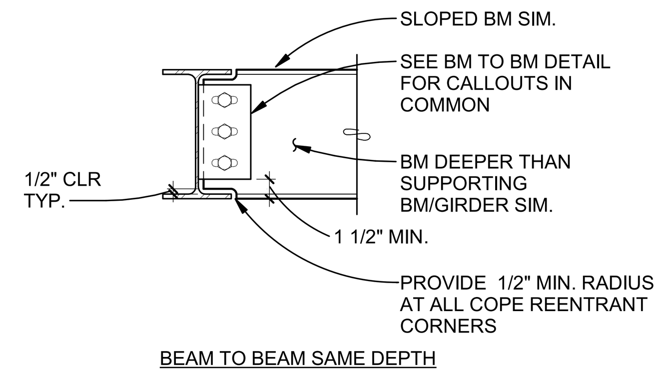
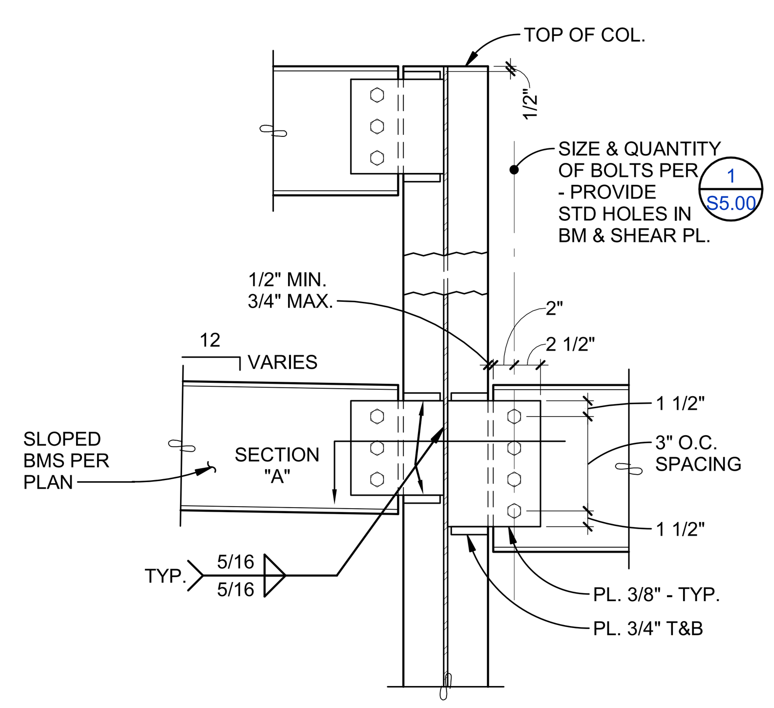


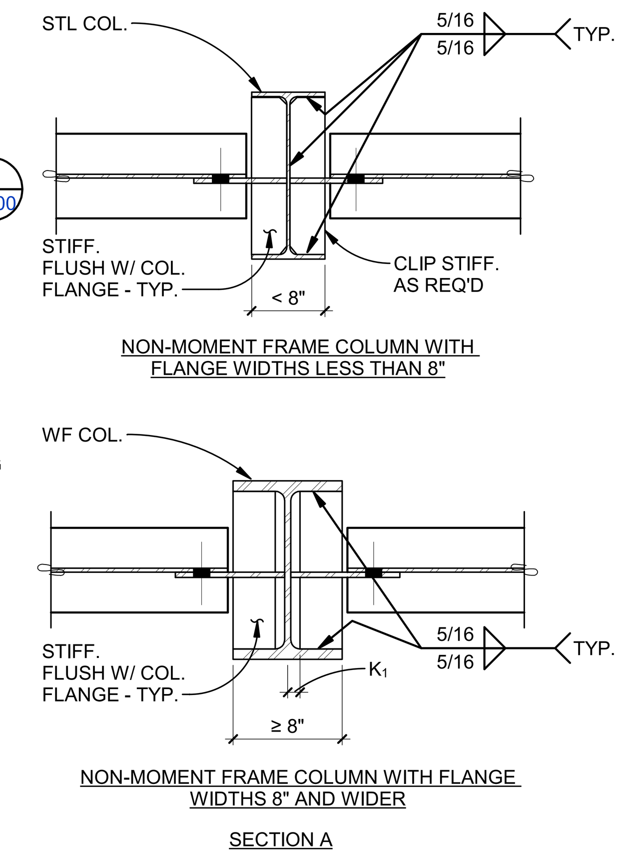
TABLE A

SUPPORTED BEAM SIZE	QUANTITY OF 7/8"ø A325N BOLTS	SHEAR PLATE THICKNESS "A"	WELD "W" NOTE 1.
W12, W14	3	3/8"	5/16"
W16, W18	4	3/8"	5/16"
W21	5	3/8"	5/16"
W24	6	3/8"	5/16"
W27	7	3/8"	5/16"
W30	7	3/8"	5/16"
W33	8	3/8"	5/16"

TYPICAL STEEL DETAIL

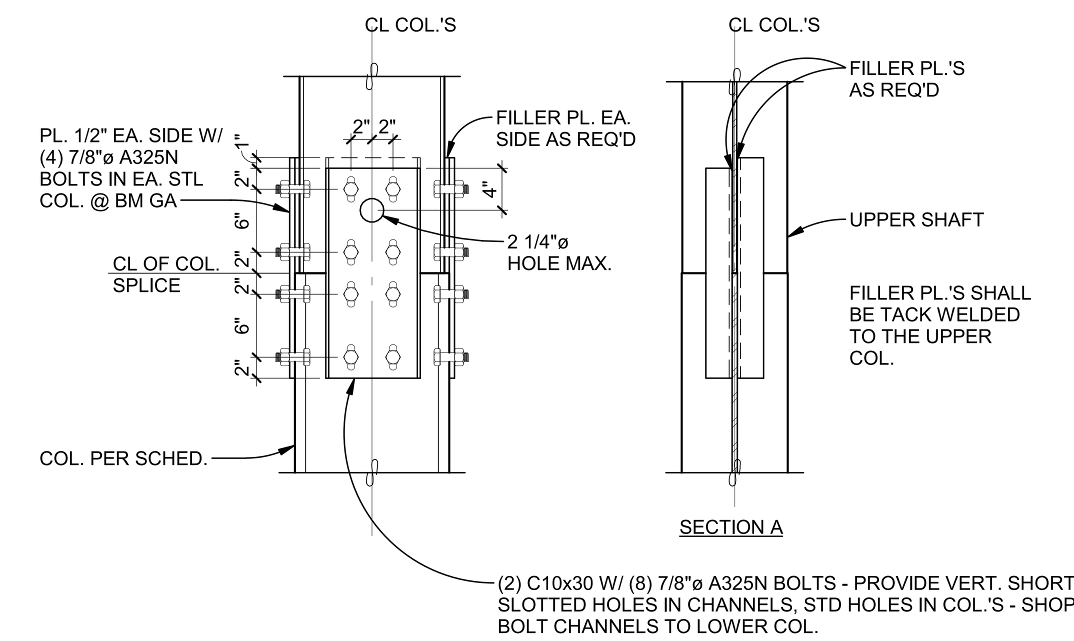
1 S5.00 DETAIL
NO SCALE





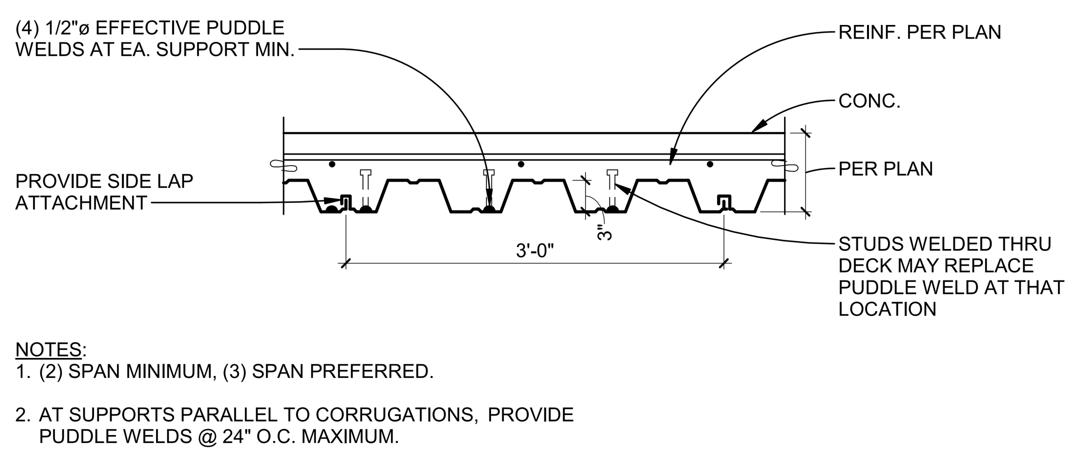
TYPICAL BEAM/COLUMN FRAMING INTO WEB

2 S5.00 DETAIL
NO SCALE



TYPICAL COLUMN SPLICE

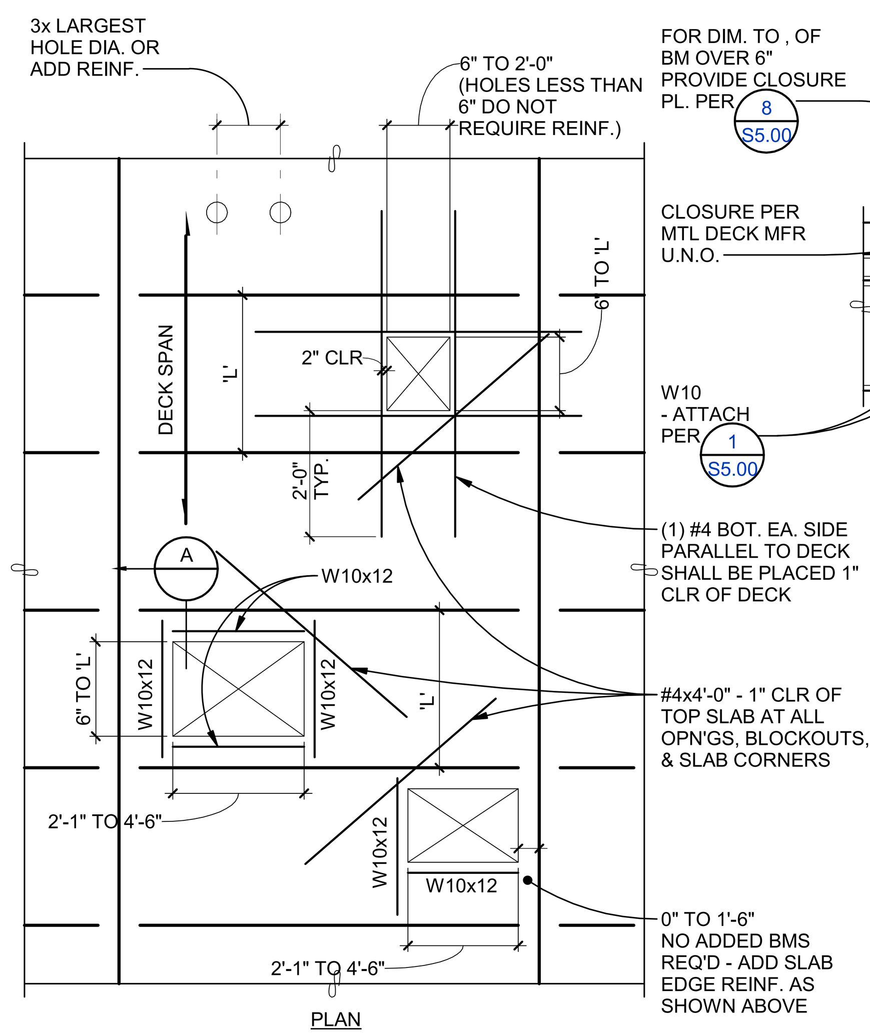
3 S5.00 DETAIL
NO SCALE

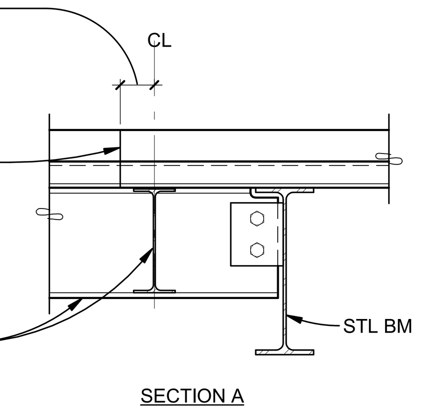


NOTES:
1. (2) SPAN MINIMUM, (3) SPAN PREFERRED.
2. AT SUPPORTS PARALLEL TO CORRUGATIONS, PROVIDE PUDDLE WELDS @ 24" O.C. MAXIMUM.

TYPICAL COMPOSITE FLOOR DECK

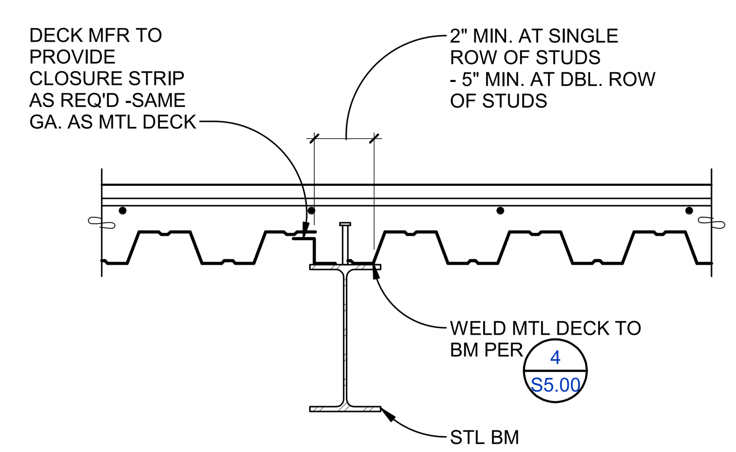
4 S5.00 DETAIL
NO SCALE





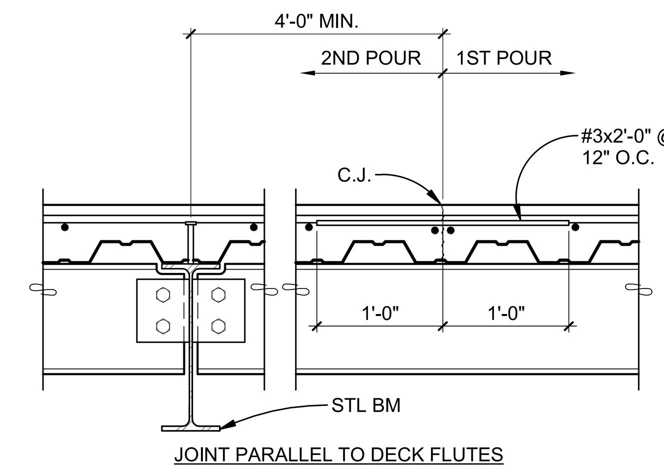
TYPICAL FLOOR PENETRATION REINFORCEMENT

5 S5.00 DETAIL
NO SCALE

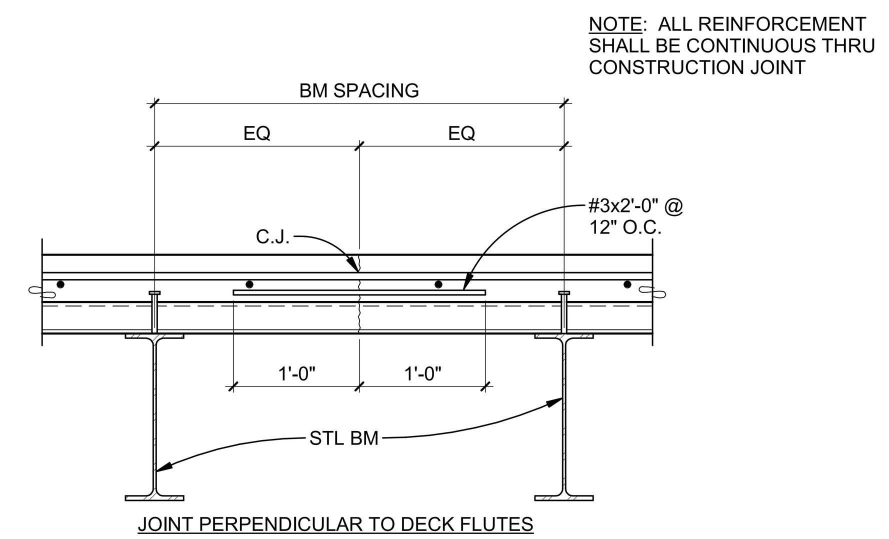


TYPICAL AT METAL DECK PARALLEL TO BEAM

6 S5.00 SECTION
NO SCALE

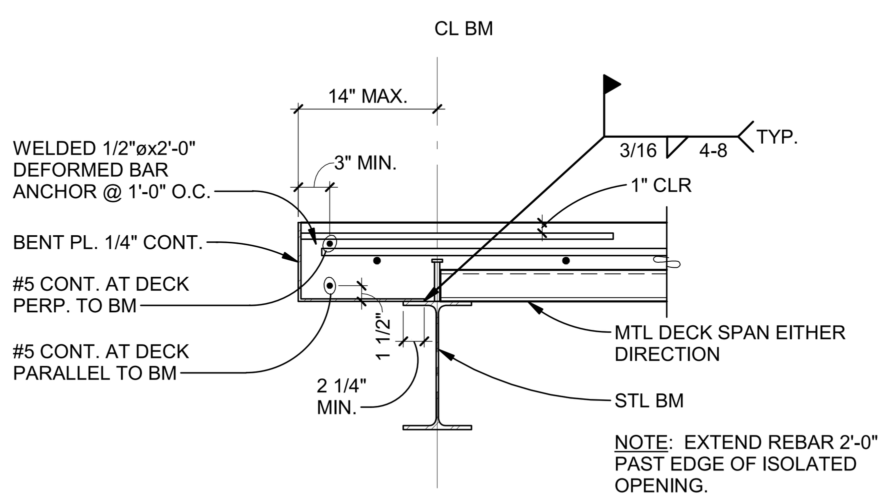


NOTE: ALL REINFORCEMENT SHALL BE CONTINUOUS THRU CONSTRUCTION JOINT



TYPICAL COMPOSITE DECK CONSTRUCTION JOINT

7 S5.00 SECTION
1" = 1'-0"

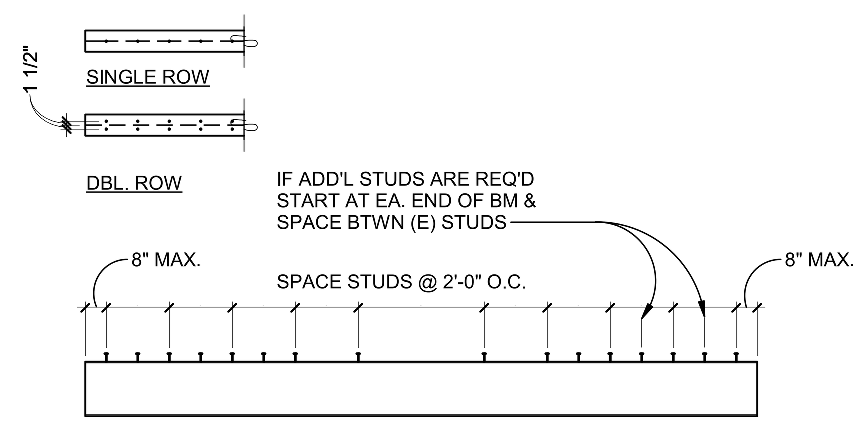


NOTE: EXTEND REBAR 2'-0" PAST EDGE OF ISOLATED OPENING.

TYPICAL SLAB EDGE CONDITION - OVER 6" OVERHANG

8 S5.00 SECTION
NO SCALE

NOTES:
1. LOCATE STUDS AT CENTER OF BEAM FLANGE.
2. STUDS ARE 3/4"ø x 4 1/2" LONG AFTER WELDING.
3. SEE FRAMING PLANS FOR NUMBER OF STUDS.
4. ALL BEAMS WITH STUDS ARE COMPOSITE STEEL BEAMS.
5. PROVIDE A DOUBLE ROW OF STUDS AT BEAMS WHERE THE REQUIRED NUMBER OF STUDS EXCEEDS THE NUMBER THAT CAN FIT IN A SINGLE ROW AT 6" ON CENTER AT DECK PARALLEL TO BEAM OR 12" ON CENTER AT DECK PERPENDICULAR TO BEAM. STUDS SHOULD BE LOCATED IN DECK FLUTES PER AISC STRONG POSITION.



TYPICAL COMPOSITE BEAM DETAIL

9 S5.00 DETAIL
NO SCALE

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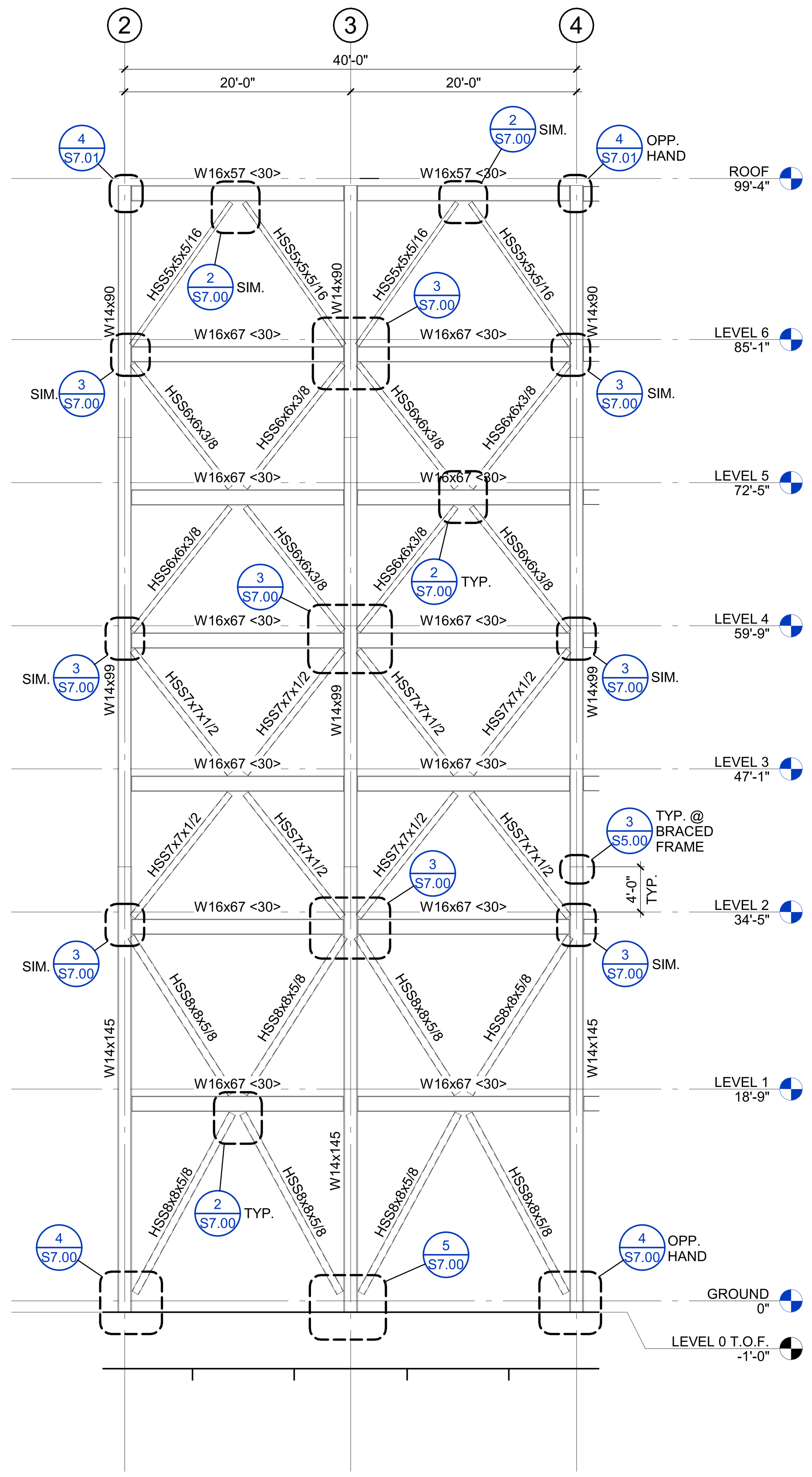
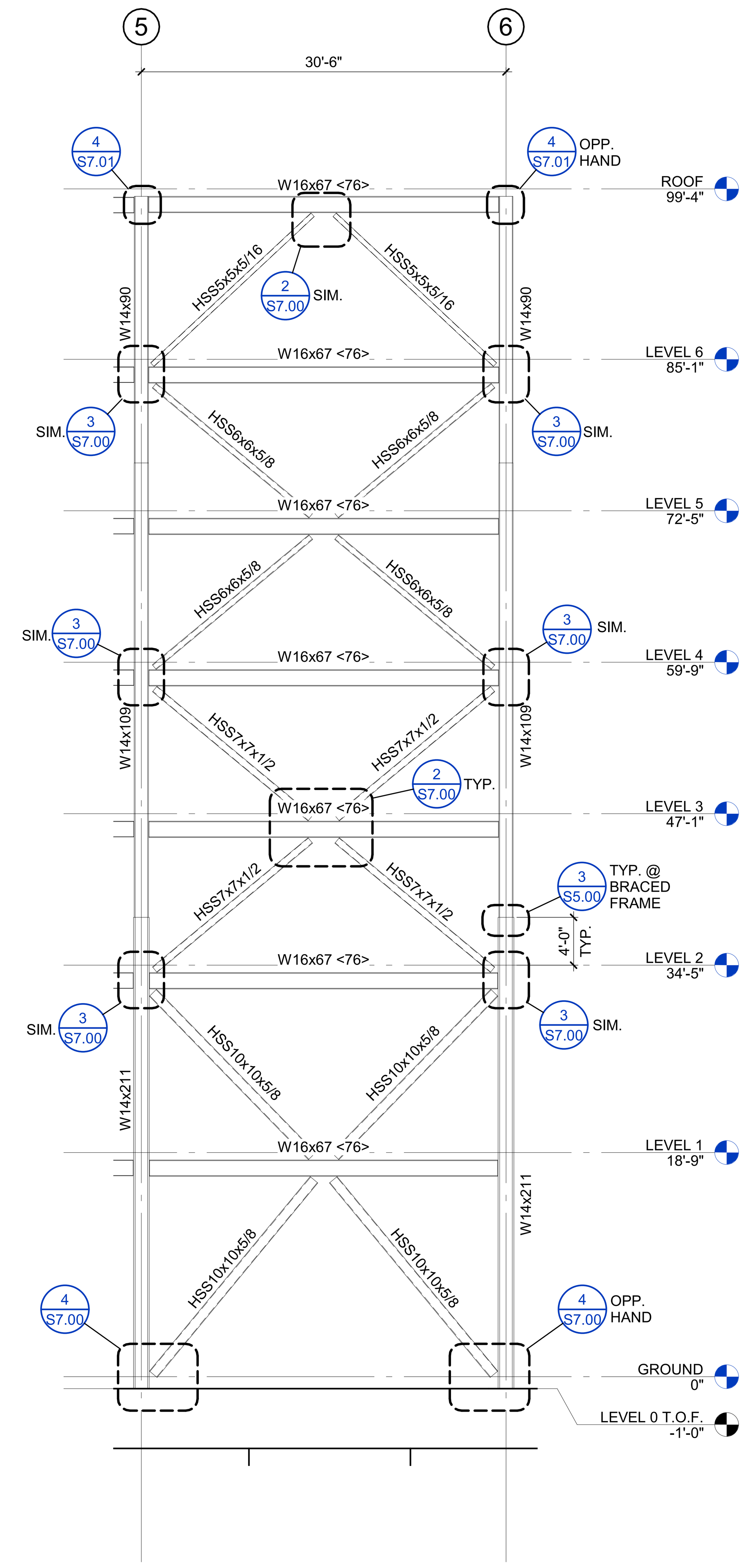
TITLE
STEEL DETAILS

SHEET NUMBER
S5.00



1
S6.00
BRACED FRAME ELEVATION
1/8" = 1'-0"



2
S6.00
BRACED FRAME ELEVATION
1/8" = 1'-0"

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TITLE
BRACED FRAME ELEVATIONS

SHEET NUMBER
S6.00

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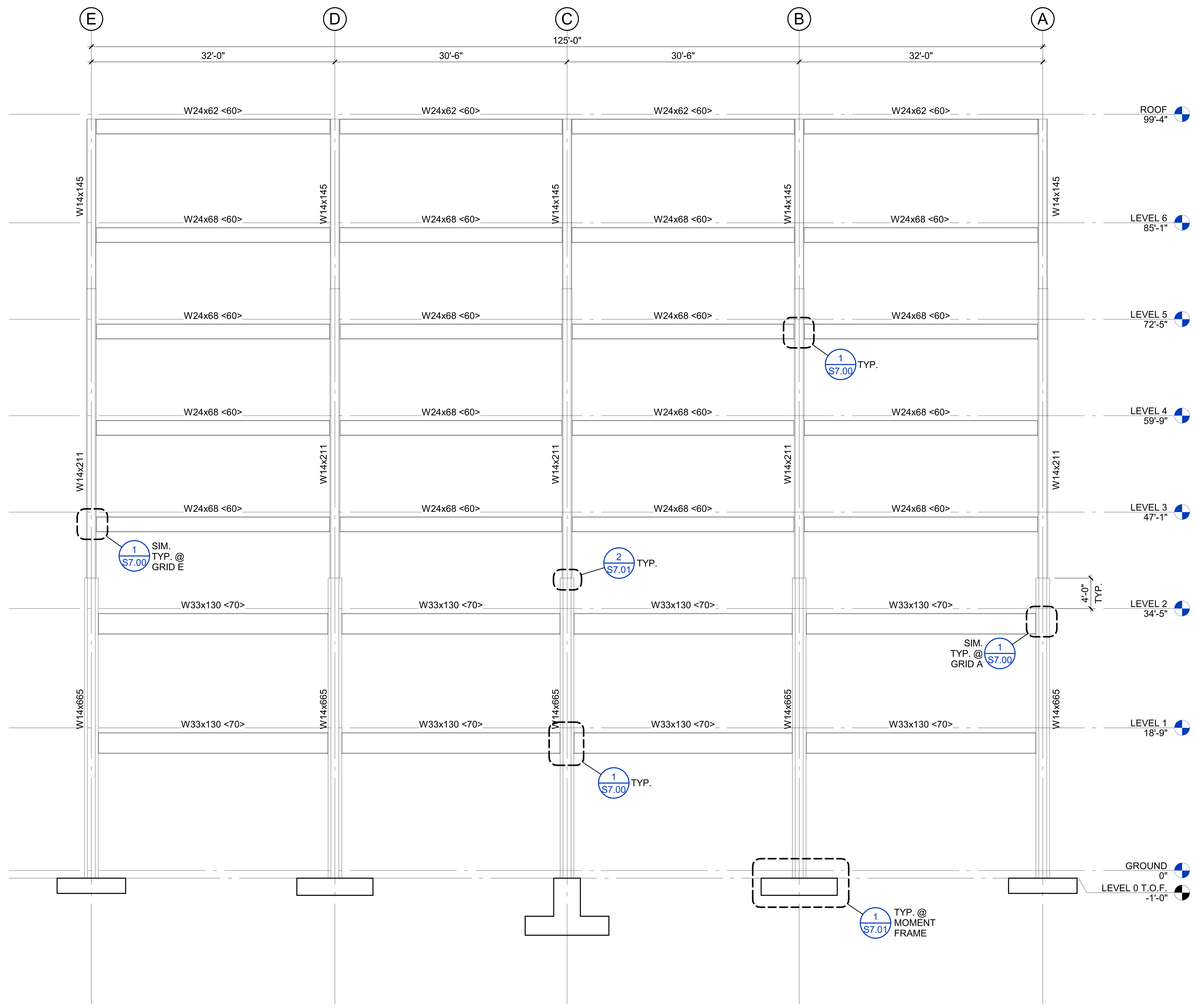

1 S6.01 MOMENT FRAME ELEVATION
1/8" = 1'-0"

nehrp

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TITLE
MOMENT FRAME ELEVATION

SHEET NUMBER
S6.01

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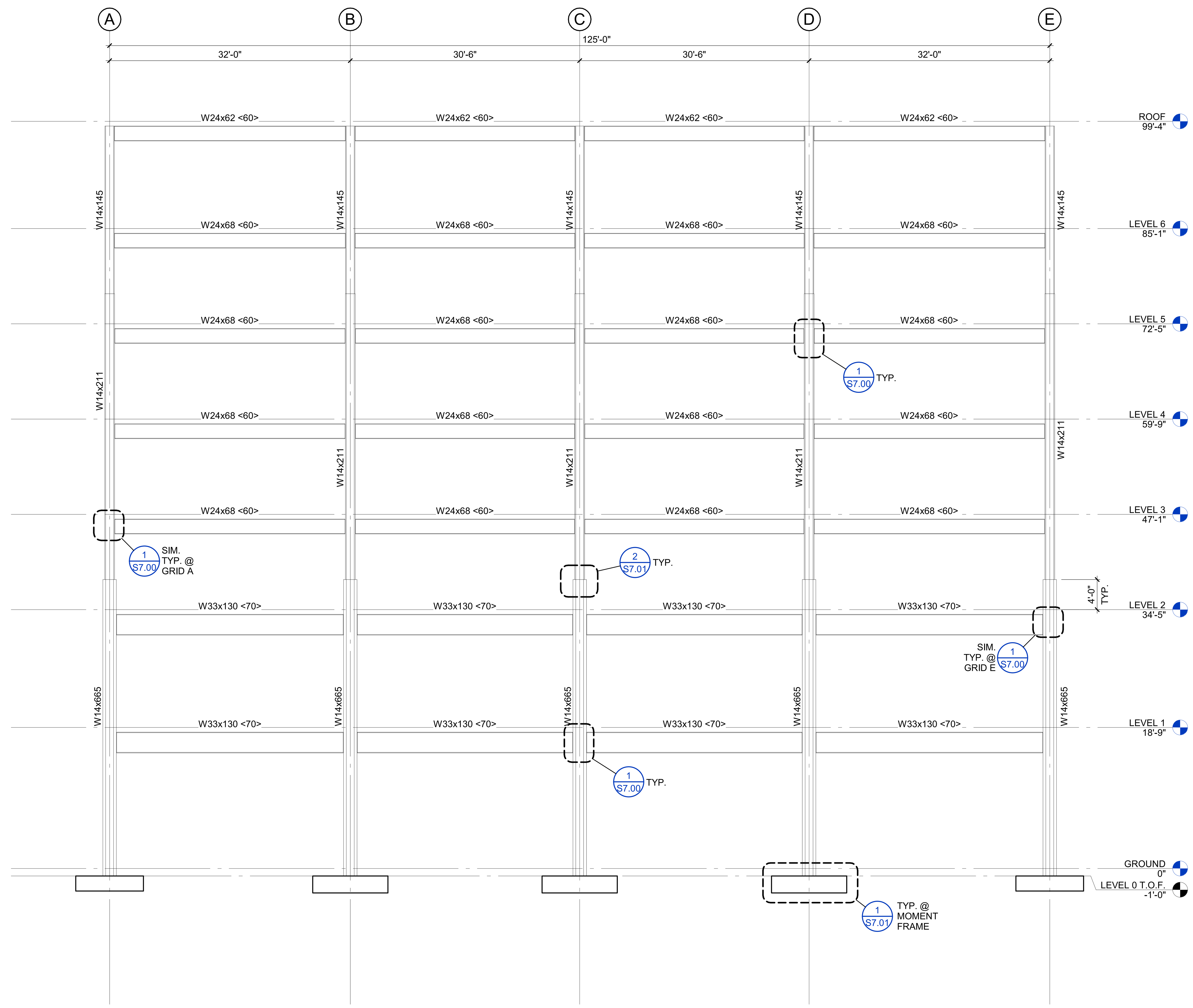

1 S6.02 MOMENT FRAME ELEVATION
1/8" = 1'-0"

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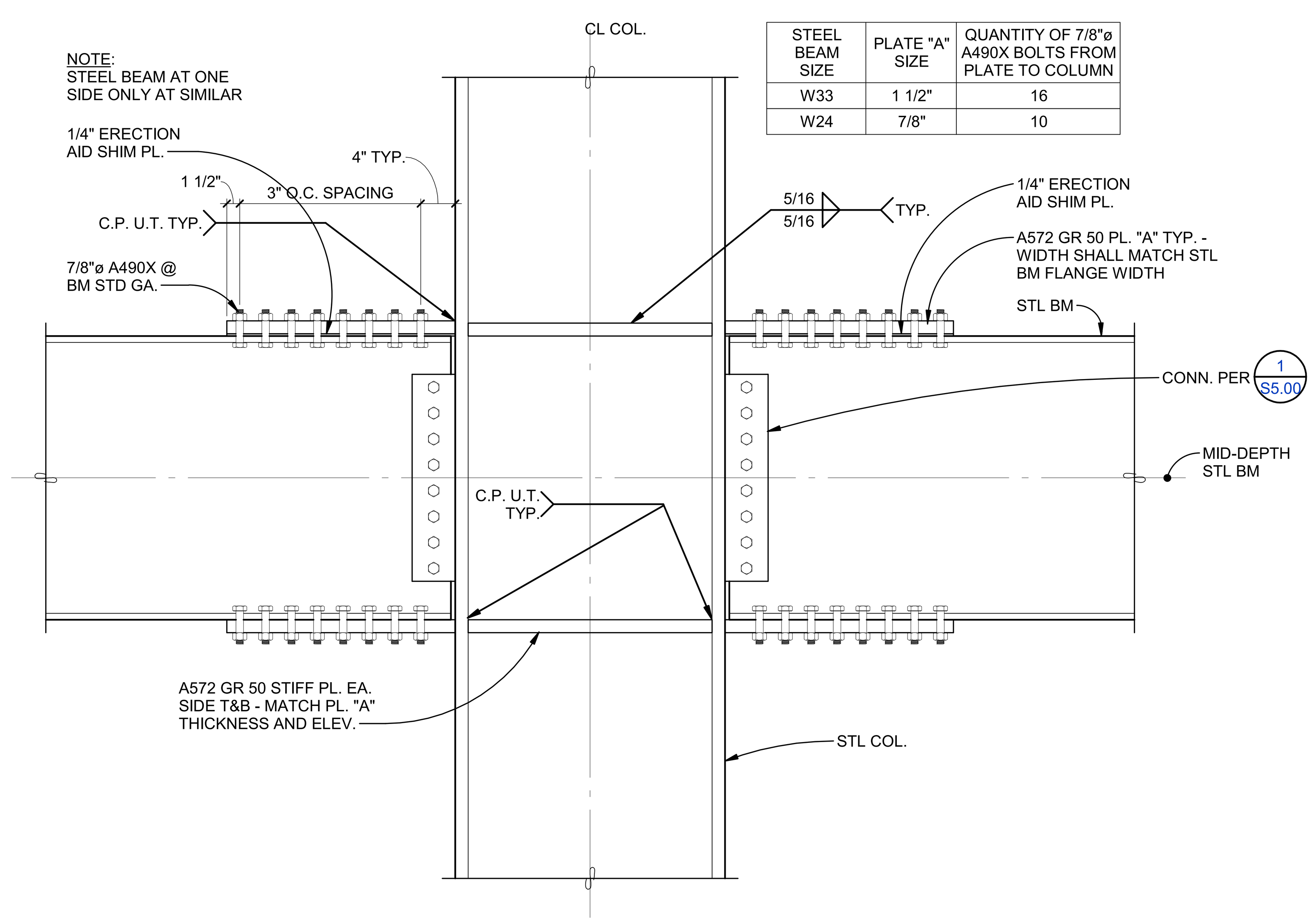
TITLE
MOMENT FRAME ELEVATION

SHEET NUMBER
S6.02

9/27/2021 11:05:00 AM

NOTE:
STEEL BEAM AT ONE SIDE ONLY AT SIMILAR

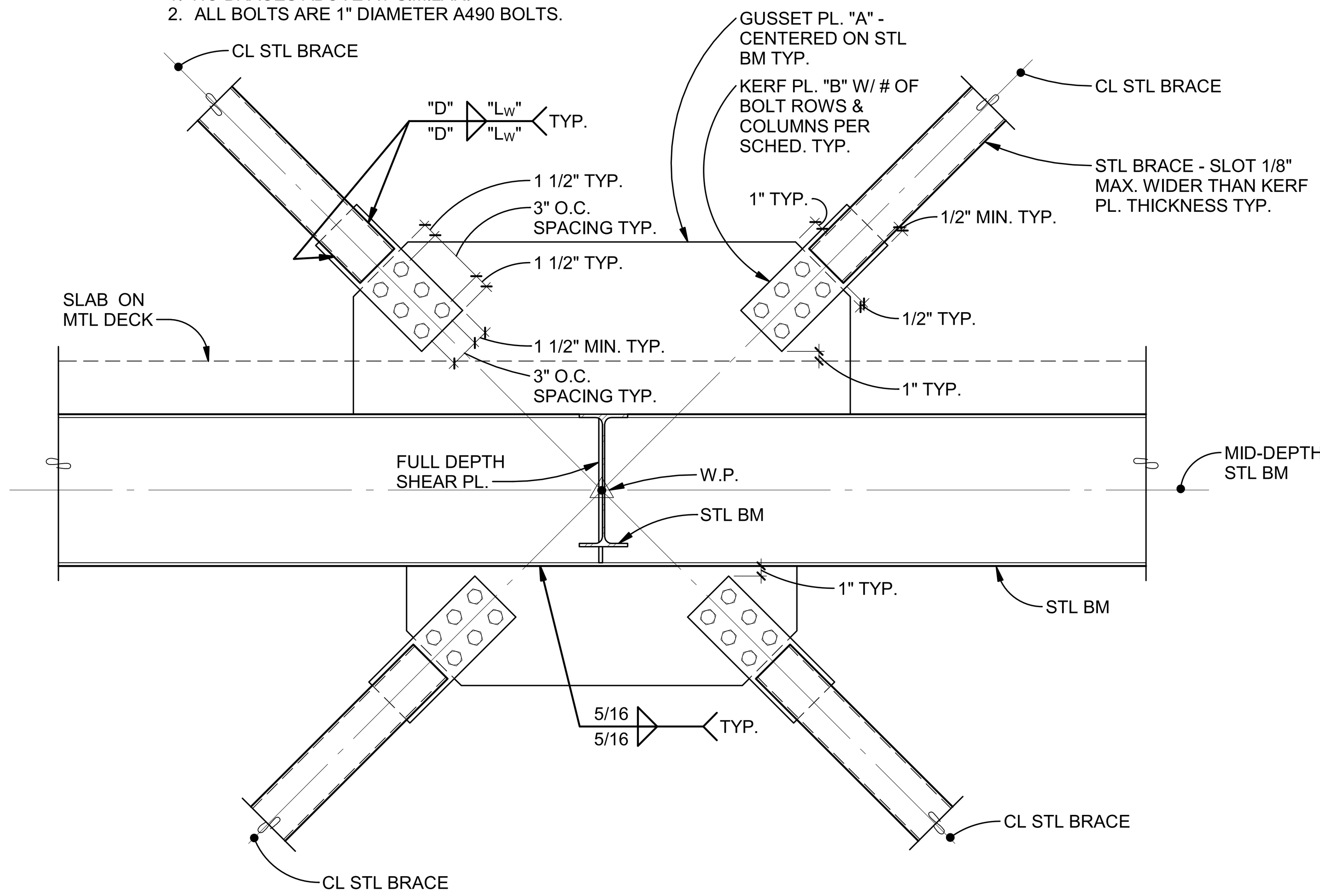
STEEL BEAM SIZE	PLATE "A" SIZE	QUANTITY OF 7/8"ø A490X BOLTS FROM PLATE TO COLUMN
W33	1 1/2"	16
W24	7/8"	10



1 DETAIL
S7.00 NO SCALE

BRACED FRAME CONNECTION SCHEDULE						
STEEL BRACE SIZE	GUSSET PLATE "A" THICKNESS	WELD SIZE "D"	LENGTH OF WELD "L_W"	KERF PL. "B" THICKNESS	NUMBER OF A490 BOLT COLUMNS	NUMBER OF A490 BOLT ROWS
HSS5x5	5/8"	5/16"	8"	5/8"	2	2
HSS6x6	1 1/4"	5/16"	11"	1 1/4"	2	4
HSS7x7	1 1/4"	5/16"	12"	1 1/2"	3	4
HSS8x8	1 3/4"	3/8"	17"	1 3/4"	3	5
HSS10x10	1 3/4"	7/16"	20"	1 3/4"	4	5

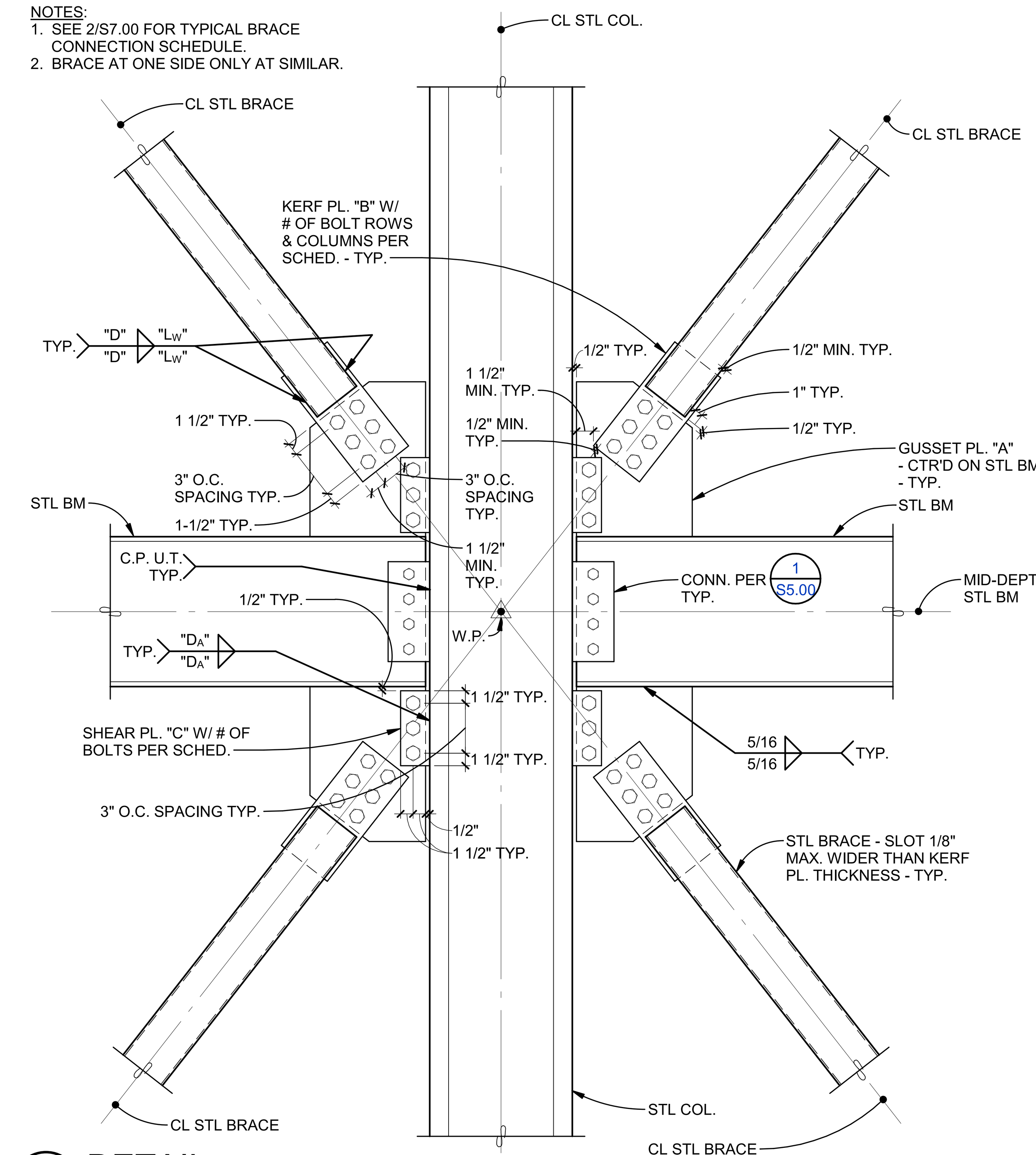
NOTES:
1. NO BRACES ABOVE AT SIMILAR.
2. ALL BOLTS ARE 1" DIAMETER A490 BOLTS.



2 DETAIL
S7.00 NO SCALE

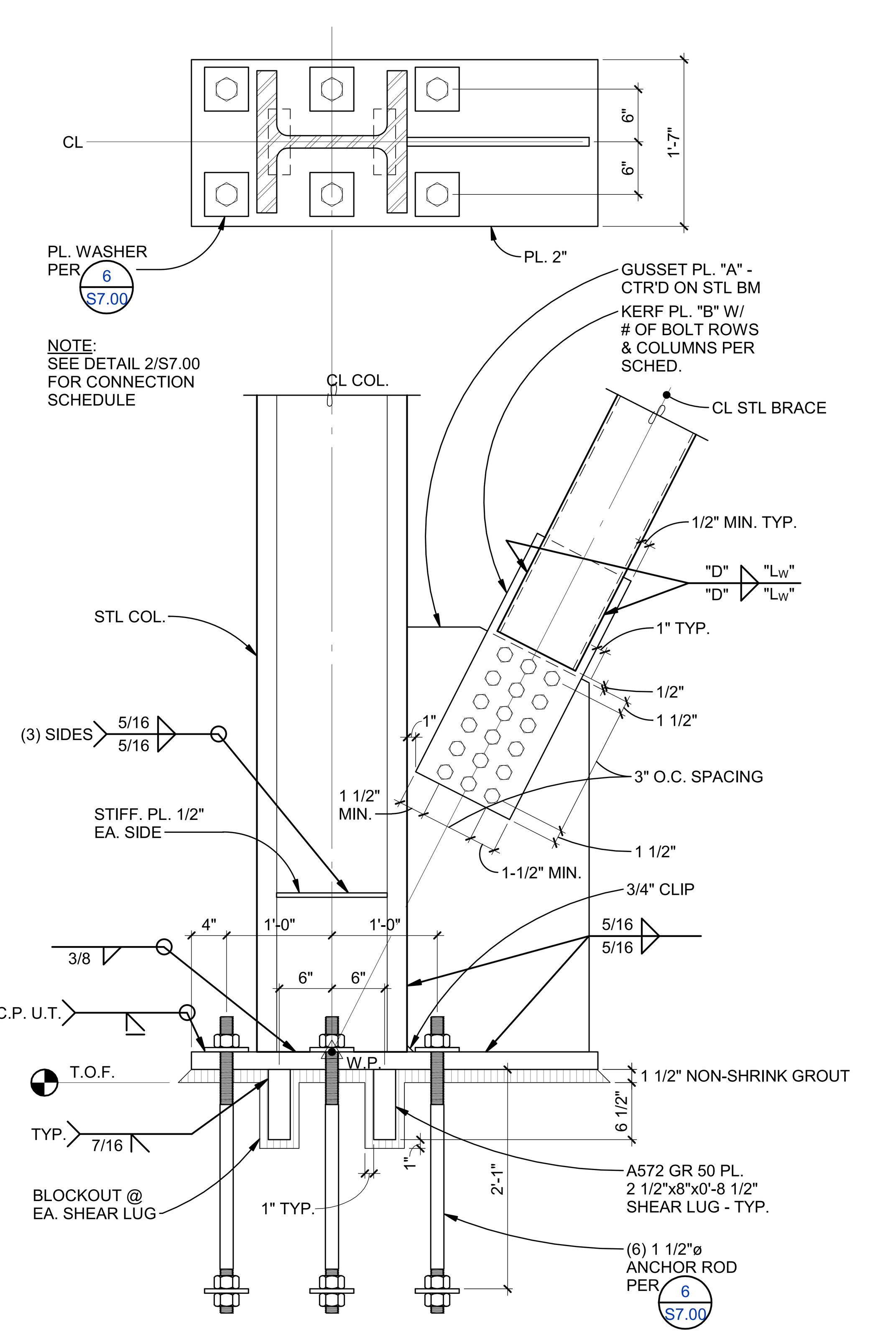
BRACED FRAME CONNECTION SCHEDULE			
STEEL BRACE SIZE	WELD SIZE "D_A"	SHEAR PLATE "C" THICKNESS	NUMBER OF 1"ø A490 BOLTS
HSS5x5	1/4"	1/2"	2
HSS6x6	1/4"	1/2"	4
HSS7x7	1/4"	3/4"	5
HSS8x8	1/4"	3/4"	10
HSS10x10	5/16"	3/4"	12

NOTES:
1. SEE 2/S7.00 FOR TYPICAL BRACE CONNECTION SCHEDULE.
2. BRACE AT ONE SIDE ONLY AT SIMILAR.

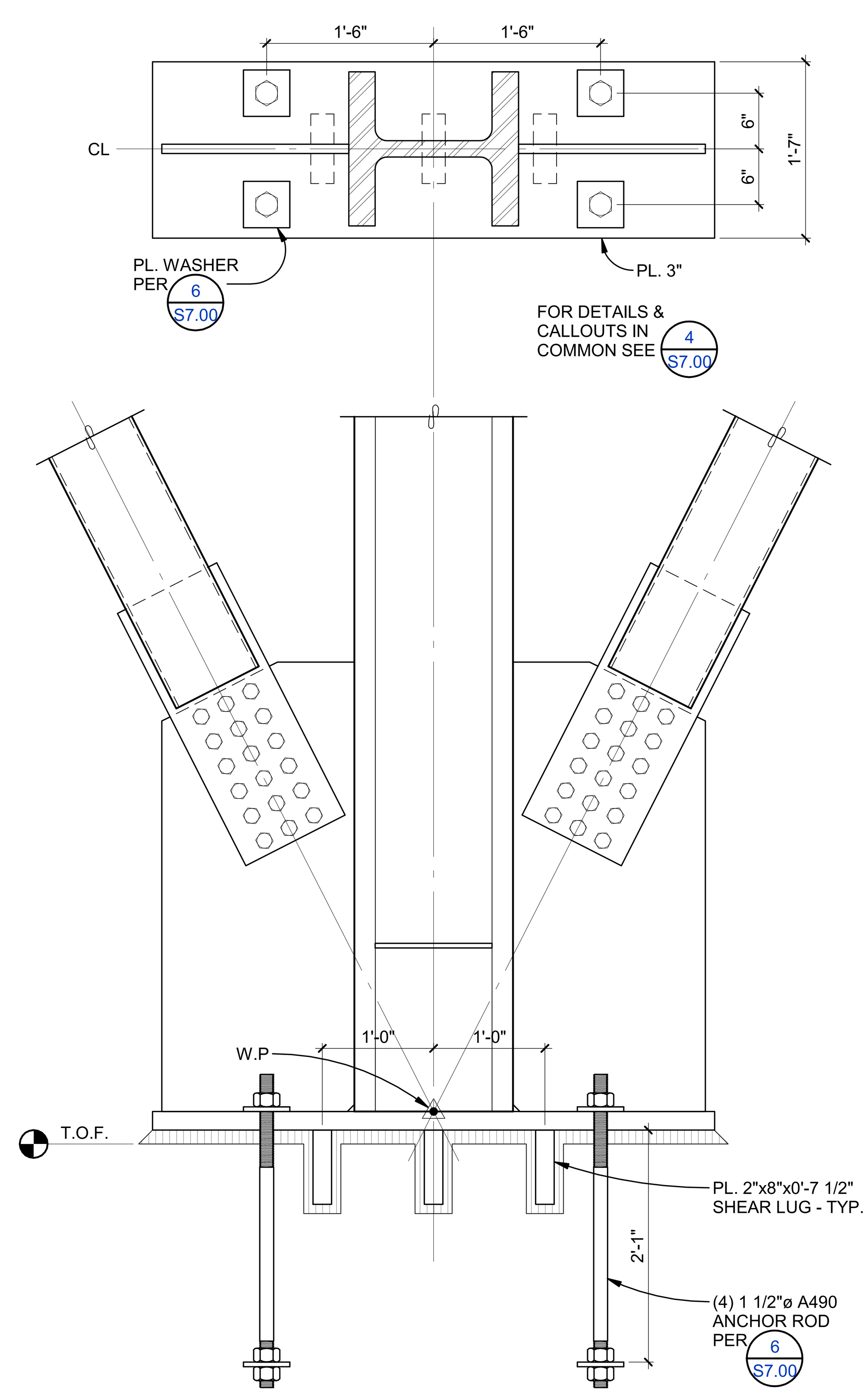


3 DETAIL
S7.00 NO SCALE

NOTE:
SEE DETAIL 2/S7.00 FOR CONNECTION SCHEDULE

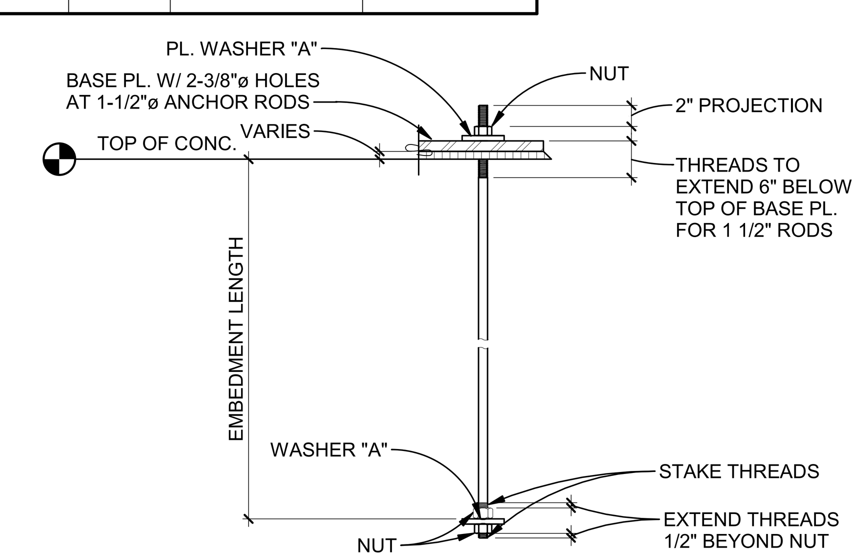


4 DETAIL
S7.00 NO SCALE



5 SECTION
S7.00 NO SCALE

ANCHOR ROD		WASHER		NUT
SIZE	MATERIAL	TYPE	SIZE	
1 1/2"ø	F1554 GRADE 105	A	PL. 1/2"x5"x0'-5" W/ 1 7/8"ø HOLE CENTERED	A563 GRADE A HEAVY HEX



TYPICAL ANCHOR ROD/BOLT DETAIL

6 SECTION
S7.00 NO SCALE

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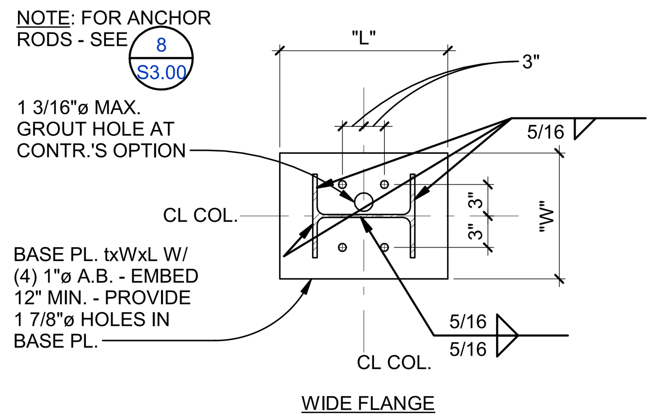
TITLE
FRAME DETAILS

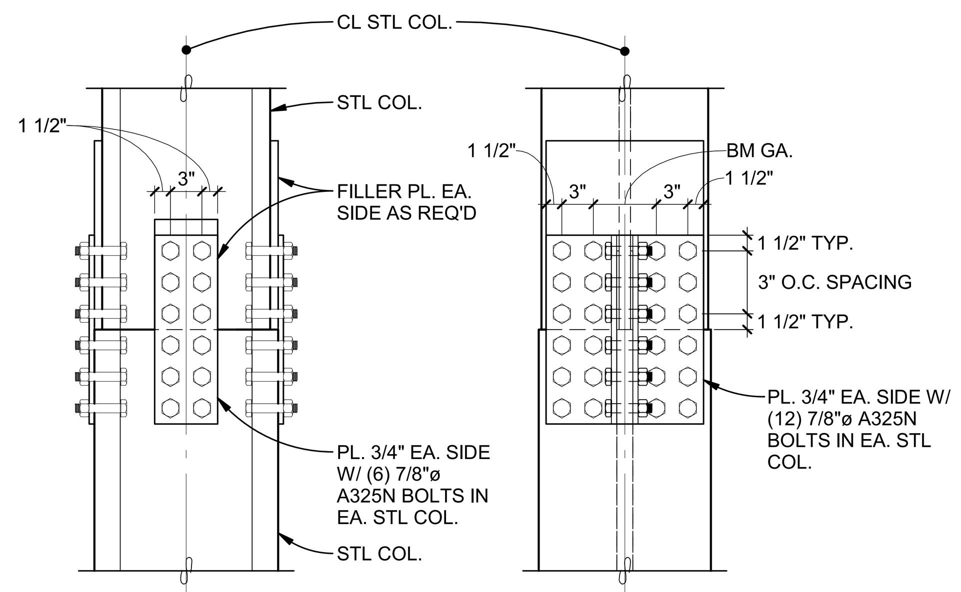
SHEET NUMBER
S7.00



COLUMN SIZE	"W" (IN.)	"L" (IN.)	"t" (IN.)
W30x	19	34	2

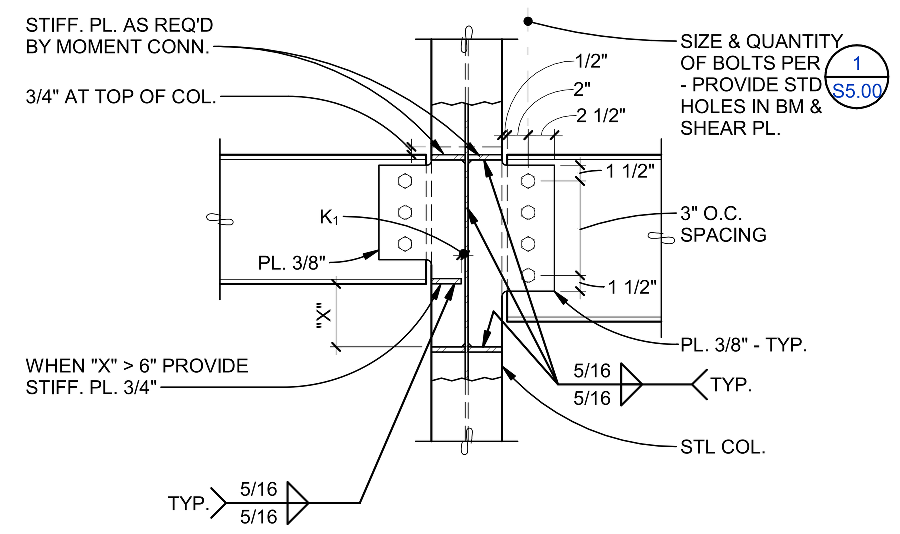
TYPICAL COLUMN BASE PLATE

1/S7.01 SECTION
NO SCALE



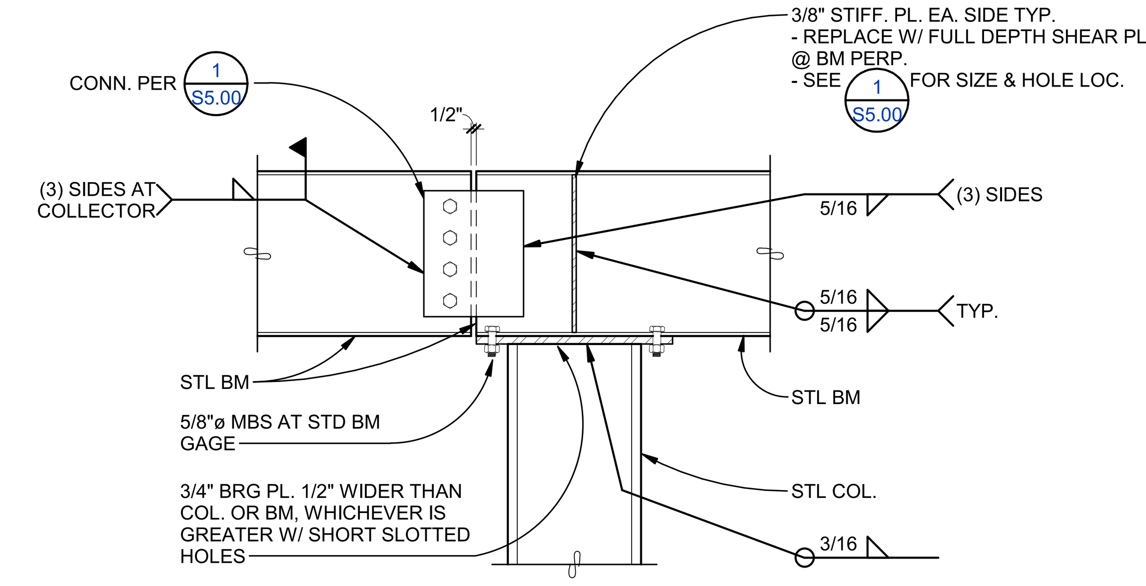
TYPICAL MOMENT FRAME COLUMN SPLICE

2/S7.01 SECTION
NO SCALE



TYPICAL BEAM TO COLUMN WEB CONNECTION WITH ADJACENT MOMENT CONNECTION

3/S7.01 DETAIL
NO SCALE



4/S7.01 DETAIL
NO SCALE

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Job Number	19-051
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TITLE
FRAME DETAILS

SHEET NUMBER
S7.01

Design Case E

2018 IBC
Risk Category IV
Seismic Design Category D

E.1 Gravity Design

The 7-story healthcare facility is a steel framed building with 3" metal deck and 4-1/2" of concrete topping providing a total slab depth of 7-1/2", not including the structural steel framing. This decking was chosen to provide the required 2-hour fire rating that is typical for healthcare facilities. The columns and beams are ASTM A992 steel wide flange members and were designed using Load Resistance Factor Design (LRFD) procedures in accordance with AISC *Steel Construction Manual* 15th edition. The deflection was limited to 2018 IBC prescribed limits of $L/480$ for applied floor live loads, $L/360$ for applied floor total loads, $L/360$ for applied roof live loads, and $L/240$ for applied roof total loads.

The calculated total dead load applied was 95 psf at the floors and 100 psf at the roof. The increase of dead load at the roof is attributed to the theoretical mechanical units that are typically placed on the roof structure. The live loads chosen for the floors and roof were provided in accordance with 2018 IBC Table 1607.1. It should be noted that the 40 psf roof live loads controlled the design over the calculated snow load per Chapter 7 of ASCE/SEI 7-16.

E.2 Lateral Design

There were two separate lateral-force-resisting systems for this building, a steel concentric braced frame system for the lateral load resistance in the North/South direction and a steel moment frame system for the lateral load resistance in the East/West direction. The applied wind and seismic loads were determined using Chapters 27 and 12 respectively from ASCE/SEI 7-16. In the North/South direction the code level seismic force controlled the design, while in the East/West direction the code specified wind force controlled the design. In both directions the eccentric loading, both calculated and required accidental, is included in determining the applied frame forces at each level.

The braced frames have a two-story X configuration and utilize ASTM A500 Gr. C HSS steel braces. The braces are designed to maintain the same area of steel at floors where the upper and lower braces meet at the intersecting floor/roof beam to help

mitigate the forces that are applied to that beam. This is important to be efficient in the size of our braced framed beams and the overall tonnage of the building. The KISS method was used for force distribution analysis of the connection designs. At the foundations, the anchorage was designed to resist the minimum of the uplift force due to overturning with an applied Ω_o or the expected brace strength. The shear lugs were designed to resist the minimum of the applied shear forces with an applied Ω_o or the expected brace strength.

The moment frames have been designed using bolted moment connections. These connections were chosen because this is the preferred method of moment frame construction in New York City. The design of the moment frame was controlled by the seismic drift limit of $0.1h$ and C_d.. To meet this requirement the column bases at the foundation needed to be designed and detailed for a fixed connection, this made it possible to reduce the size of the columns at the foundation and the beams at the first floor. The design of all the connections is required to resist moment and reaction due to the expected flexural strength of the beam.

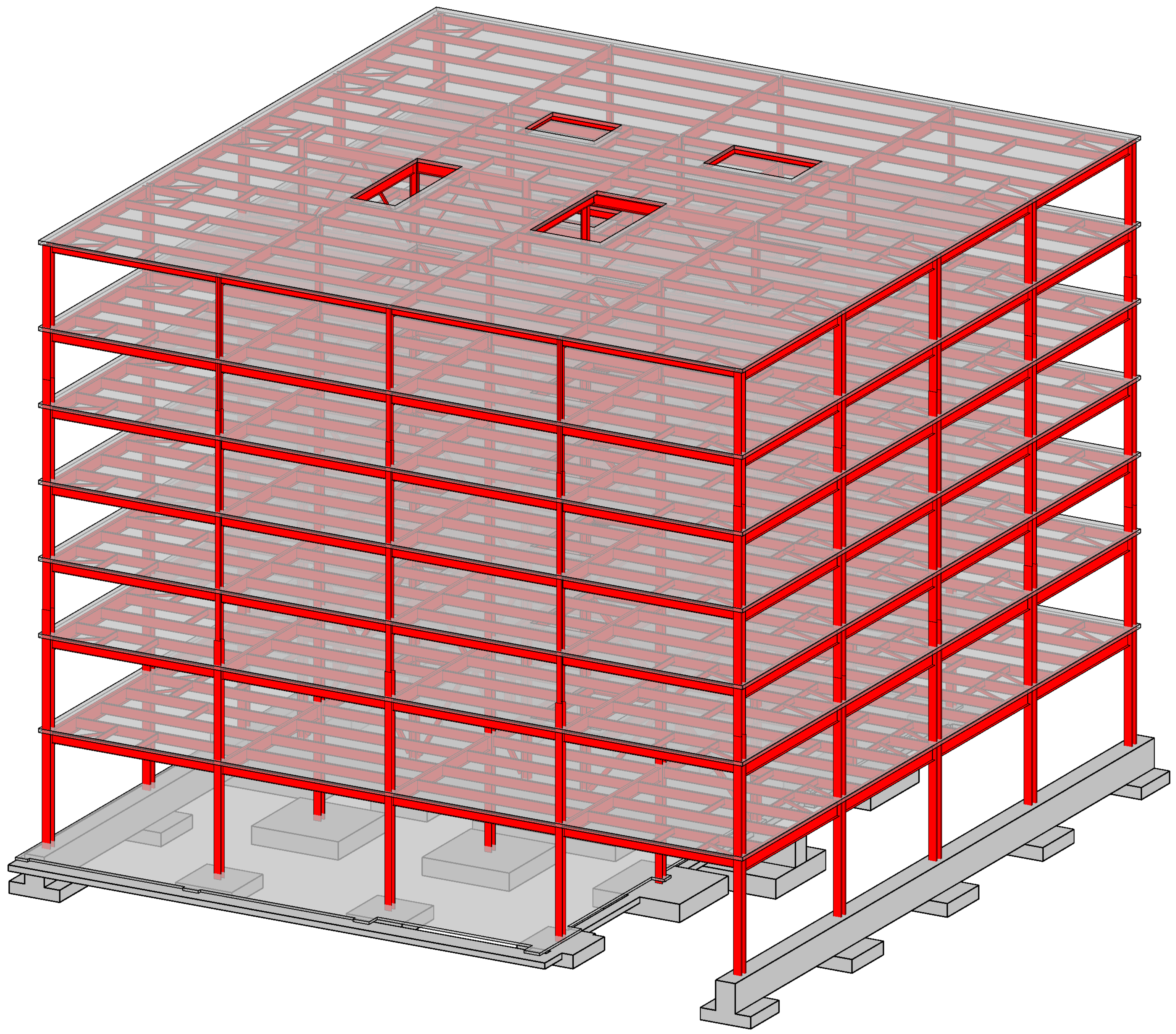
E.3 Steel Tonnage

Total steel tonnage for this design case is calculated as 849 tons.

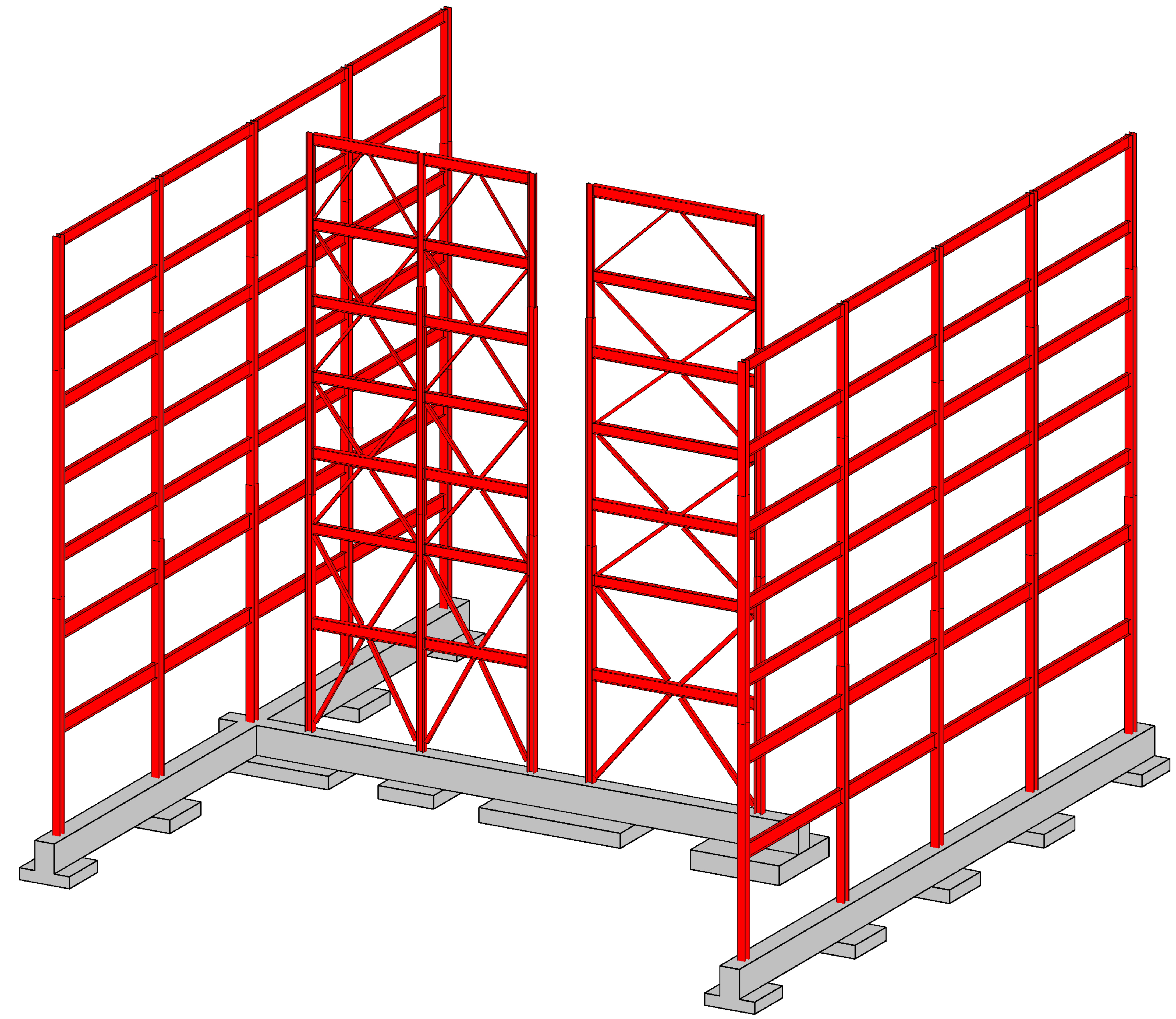
E.4 Structural Drawings

Structural drawings for Design Case E are provided on the following pages.

HEALTHCARE FACILITY - LONG ISLAND, NEW YORK
DESIGN E - 2018 IBC RISK CATEGORY IV



OVERALL FRAMING 3D VIEW



LATERAL FORCE RESISTING SYSTEM 3D VIEW

DESIGN E: 2018 IBC "RISK CATEGORY IV"	
HEALTHCARE FACILITY, LONG ISLAND, NEW YORK	
ITEM	QUANTITY
WF COLUMNS (Fy = 50 KSI)	56 TONS
WF GIRDERS AND JOISTS (Fy = 50 KSI)	404 TONS
MOMENT FRAME WF COLUMNS (Fy = 50 KSI)	225 TONS
MOMENT FRAME WF BEAMS (Fy = 50 KSI)	78 TONS
BRACED FRAME WF COLUMNS (Fy = 50 KSI)	34 TONS
BRACED FRAME WF BEAMS (Fy = 50 KSI)	37 TONS
HSS BRACES (Fy = 50 KSI)	15 TONS
TOTAL	849 TONS

1. STEEL QUANTITIES DO NOT INCLUDE MISCELLANEOUS STEEL, CUT WASTE STEEL, STAIRS, TYPICAL STEEL FRAMING CONNECTIONS, ETC.
2. ON PLANS " ▶ " INDICATES GRAVITY MOMENT CONNECTION WITH (CJP) WELDS AT FLANGES.

DRAWING INDEX

SHEET NUMBER	SHEET NAME
S0.00	COVER SHEET
S0.01	GENERAL NOTES
S2.00	FOUNDATION AND GRADE LEVEL FRAMING PLAN
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S2.20	SECOND FLOOR FRAMING PLAN
S2.30	THIRD FLOOR FRAMING PLAN
S2.40	FOURTH FLOOR FRAMING PLAN
S2.50	FIFTH FLOOR FRAMING PLAN
S2.60	SIXTH FLOOR FRAMING PLAN
S2.70	ROOF FRAMING PLAN
S3.00	FOUNDATION DETAILS
S4.00	COLUMN SCHEDULE
S5.00	STEEL DETAILS
S6.00	BRACED FRAME ELEVATIONS
S6.01	MOMENT FRAME ELEVATIONS
S6.02	MOMENT FRAME ELEVATIONS
S7.00	FRAME DETAILS
S7.01	FRAME DETAILS
S7.02	FRAME DETAILS
Grand total: 19	

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National Institute of Standards and Technology

Applied Technology Council

Structural Solutions

PROJECT

HEALTHCARE FACILITY

LONG ISLAND, NEW YORK
PCS STRUCTURAL SOLUTIONS
DESIGN E
2018 IBC WITH RISK CATEGORY IV

This publication is available free of charge from: https://doi.org/10.6028/NIST.GCR.21-917-48v2A

DRAWINGS

30 SEPTEMBER, 2021

Job Number	19-051
Checked	JAD
Approved	DRS

TITLE

COVER SHEET

SHEET NUMBER

S0.00

GENERAL NOTES

STANDARDS
THE DESIGN AND MATERIALS SHALL CONFORM TO THE 2018 INTERNATIONAL BUILDING CODE (IBC) AS AMENDED AND ADOPTED BY THE LOCAL BUILDING OFFICIAL OR APPLICABLE JURISDICTION.

STRUCTURAL DRAWINGS PRIMARY STRUCTURAL ELEMENTS ARE DIMENSIONED ON STRUCTURAL PLANS AND DETAILS AND OVERALL LAYOUT OF STRUCTURAL PORTION OF WORK.

PROJECT LOCATION

LONG ISLAND, NEW YORK

40.6471 LATITUDE, -73.5642 LONGITUDE

DESIGN CRITERIA

VERTICAL LOADS

AREA	DESIGN DEAD LOAD	LIVE LOAD (2)	PARTITION LOAD	CONCENTRATED LOADS
OPERATING ROOMS	95 PSF	60 PSF	15 PSF	1000#
PRIVATE ROOMS	95 PSF	40 PSF	15 PSF	1000#
CORRIDORS ABOVE 1ST FLOOR	95 PSF	80 PSF	15 PSF	1000#
ROOF	100 PSF	40 PSF	-	-

(1) DRIFT AND UNBALANCED SNOW LOAD PER ASCE 7-16, CHAPTER 7.
(2) LIVE LOADS EXCEPT SNOW LOADS ARE REDUCED PER IBC SECTION 1607.11.

SNOW: (MINIMUM ROOF SNOW LOAD = 25 PSF)

Pg = 20 PSF = GROUND SNOW LOAD
Pf = 0.7CeCtIsPg = FLAT ROOF SNOW LOAD
Ps = CsPf = SLOPED ROOF SNOW LOAD
Is = 1.10 Ce = 1.0, Ct = 1.0, Cs = VARIES

VIBRATION DESIGN CRITERIA:

VIBRATION CONSIDERATIONS WERE DESIGNED PER THE RECOMMENDATIONS IN THE GUIDELINES FOR DESIGN AND CONSTRUCTION OF HOSPITALS AND OUTPATIENT FACILITIES. FOR PATIENT ROOM FLOORS A VIBRATION VELOCITY LIMIT OF 6,000 MICRO INCHES PER SECOND WAS EVALUATED AT A WALKING SPEED OF 75 STEPS PER MINUTE.

LATERAL FORCES

LATERAL FORCES ARE TRANSMITTED BY DIAPHRAGM ACTION OF ROOF AND FLOORS TO BRACED FRAME/MOMENT FRAME. LOADS ARE THEN TRANSFERRED TO FOUNDATION BY BRACED FRAME/MOMENT FRAME ACTION WHERE ULTIMATE DISPLACEMENT IS RESISTED BY PASSIVE PRESSURE OF EARTH AND/OR SLIDING FRICTION. OVERTURNING IS RESISTED BY DEAD LOAD OF THE STRUCTURE.

WIND:

THE BUILDING MEETS THE CRITERIA TO USE THE "ENCLOSED, PARTIALLY ENCLOSED, AND OPEN BUILDING OF ALL HEIGHTS PROCEDURE" PER ASCE 7-16.

- EXPOSURE CATEGORY = B
- BASIC WIND SPEED, (3 SEC. GUST), V_{ULT} = 137 MPH; V_{ASD} = 99 MPH
- RISK CATEGORY PER IBC TABLE 1604.5 = IV
- TOPOGRAPHIC FACTOR K_{ZT} = 1.0
- INTERNAL PRESSURE COEFFICIENT (ENCLOSED) = ± 0.18
- DESIGN WIND BASE SHEAR = 477 KIPS
- SEE THE FOLLOWING SCHEDULES FOR COMPONENTS AND CLADDING WIND PRESSURES

ROOF SURFACES [1]						
EFFECTIVE WIND AREA	POSITIVE PRESSURES (PSF)			NEGATIVE PRESSURES (PSF)		
	ZONE [2]					
	1	2	3	1	2	3
10 SF	19.6	19.6	19.6	-64.7	-101.6	-138.6
20 SF	19.6	19.3	18.6	-62.1	-97.6	-133.0
50 SF	19.6	18.8	17.3	-59.6	-93.5	-127.0
100 SF	19.6	18.5	16.1	-57.0	-89.4	-121.8

WALL SURFACES AND ROOF OVERHANGS [1]				
EFFECTIVE WIND AREA	POSITIVE PRESSURE (PSF)		NEGATIVE PRESSURE (PSF)	
	ZONE [2]			
	4	5	4	5
10 SF	48.4	48.4	-52.4	-81.2
20 SF	46.5	45.0	-49.9	-77.1
50 SF	44.4	40.6	-46.2	-71.5
100 SF	42.5	36.8	-43.0	-66.5
500 SF	38.7	29.0	-36.8	-56.8

1. VALUES SHOWN IN TABLE ARE GROSS ULTIMATE WIND PRESSURES.
2. ZONES ARE AS DEFINED BY TABLE 30.6-2 IN ASCE 7-16.

SEISMIC: (ASCE 7-16) V = CsW

WHERE $C_s = \dfrac{S_{DS}}{\left(\frac{R}{I_e}\right)}$; WITH

C_s MINIMUM = 0.044 $S_{DS} I_E \geq 0.01$
OR
C_s MINIMUM = $\dfrac{0.5 S_1}{\frac{R}{I_e}}$ FOR $S_1 > 0.6g$

C_s MAXIMUM = $\dfrac{S_{D1}}{T\left(\frac{R}{I_e}\right)}$ FOR $T \leq T_L$
OR
C_s MAXIMUM = $\dfrac{S_{D1} T_L}{T^2 \left(\frac{R}{I_e}\right)}$ FOR $T > T_L$

SEISMIC IMPORTANCE FACTOR, I_e = 1.50
RISK CATEGORY OF BUILDING PER IBC TABLE 1604.5 = IV
SPECTRAL RESPONSE ACCELERATIONS S_S = 0.245 & S_1 = 0.055
SITE CLASS PER TABLE 20.3-1 = E
DESIGN SPECTRAL RESPONSE ACCELERATIONS S_{DS} = 0.391 & S_{D1} = 0.154
SEISMIC DESIGN CATEGORY = D
W = EFFECTIVE SEISMIC WEIGHT OF BUILDING = 11410 KIPS
ANALYSIS PROCEDURE USED = EQUIVALENT LATERAL FORCE PROCEDURE
RESPONSE MODIFICATION FACTOR PER TABLE 12.2-1, R = 8 AT SPECIAL STEEL MOMENT FRAMES, 6 AT SPECIAL CONCENTRIC BRACED FRAMES
Cs = 0.083 AT MOMENT FRAMES, 0.11 AT BRACED FRAMES
Cs max = 0.025 AT MOMENT FRAMES, 0.061 AT BRACED FRAMES
DESIGN BASE SHEAR V = 287 KIPS AT MOMENT FRAMES, 700 KIPS AT BRACED FRAMES

FOUNDATION DESIGN CRITERIA

SOIL BEARING PRESSURE: 6000 PSF (ASSUMED)*

ACTIVE PRESSURE - RESTRAINED: 50 PCF +14H SEISMIC SURCHARGE (ASSUMED)
ACTIVE PRESSURE - UNRESTRAINED: 35 PCF +6H SEISMIC SURCHARGE (ASSUMED)
PASSIVE RESISTANCE: 200 PCF (INCLUDES F.O.S. ≥ 1.5) (ASSUMED)
COEFFICIENT OF FRICTION: .35 (INCLUDES F.O.S. ≥ 1.5) (ASSUMED)
*1/3 INCREASE ALLOWED FOR SEISMIC OR WIND LOADING

CONCRETE

ITEM	DESIGN f'c (PSI) (AT 28 DAYS U.N.O.)
SLABS ON GRADE - UNO	4000
FOUNDATIONS - UNO	3000
STEM WALLS AND OTHER WALLS - UNO	4000
ELEVATED DECKS, TOPPING SLABS, AND SLABS ON METAL	5000

REINFORCING STEEL

REINFORCING STEEL SHALL CONFORM TO:

ASTM A615, GRADE 60 TYPICAL UNLESS NOTED OTHERWISE.

REINFORCING SPLICE AND DEVELOPMENT LENGTH SCHEDULE, Fy=60 KSI (UNLESS NOTED OTHERWISE)		
BAR SIZE	MINIMUM LAP SPLICE LENGTHS ("Ls")	MINIMUM DEVELOPMENT LENGTHS ("Ld")
#3	1'-6"	1'-3"
#4	2'-0"	1'-7"
#5	2'-7"	2'-0"
#6	3'-1"	2'-4"
#7	4'-6"	3'-6"
#8	5'-2"	3'-11"
#9	5'-10"	4'-6"
#10	6'-6"	5'-0"

STRUCTURAL STEEL

MATERIAL PROPERTIES

WIDE FLANGE SECTIONS: ASTM A992 (Fy = 50 KSI)

OTHER SHAPES AND PLATES: ASTM A36 (Fy = 36 KSI) TYP. U.N.O.; ASTM A572 (Fy = 50 KSI) WHERE INDICATED

HOLLOW STRUCTURAL SECTIONS: RECTANGULAR & SQUARE - ASTM A500, GRADE C (Fy = 50 KSI)

MACHINE BOLTS (M.B.): ASTM A307, GRADE A

HIGH-STRENGTH BOLTS: A325-ASTM F1852, A490-ASTM F2280

ANCHOR BOLTS (A.B.): ASTM F1554, GRADE 36, UNLESS OTHERWISE NOTED, ASTM F1554, GRADE 105 WHERE INDICATED.

WIDE FLANGE STRUCTURAL MEMBERS WHICH ARE ASTM A6 GROUP 3 SHAPES WITH FLANGE THICKNESS 1-1/2" THICK AND THICKER, AND ALL ASTM A6 GROUP 4 AND 5 SHAPES AND PLATE THAT IS 1-1/2" THICK OR THICKER SHALL HAVE A CHARPY V-NOTCH (CVN) TOUGHNESS OF 20 FT-LBS @ 70 DEG F.

GENERAL REQUIREMENTS

HIGH-STRENGTH BOLTS: ALL A325 HIGH-STRENGTH BOLTS (HSB) SHALL BE ASTM F3125, GRADE F1852, UNLESS OTHERWISE DESIGNATED AS A490. ALL HSB DESIGNATED AS A490 SHALL BE ASTM F3125, GRADE F2280. ALL HSB SHALL BE BY "LEJEUNE BOLT COMPANY" OR PRE-APPROVED EQUAL AND SHALL BE INSTALLED PER SECTION 8.2 OF THE "SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH STRENGTH BOLTS", AUGUST 2014 BY THE RESEARCH COUNCIL ON STRUCTURAL CONNECTIONS (RCSC SPECIFICATION). ALL BOLT HOLES SHALL BE STANDARD ROUND HOLES UNLESS NOTED OTHERWISE. THE FAYING SURFACES OF ALL PLIES WITHIN THE GRIP OF SLIP-CRITICAL BOLTS (A325SC OR A490SC) SHALL MEET THE REQUIREMENTS FOR A CLASS A SURFACE PER SECTION 3.2 OF THE RCSC SPECIFICATION.

HEADED STUDS: SHALL BE "S3L SHEAR CONNECTORS" FOR STUDS 3/4" DIAMETER AND LARGER AS MANUFACTURED BY NELSON STUD WELDING, INC. OR PRE-APPROVED EQUAL AND SHALL CONFORM TO AWS D1.1.

COMPOSITE FLOOR DECK: SHALL CONTAIN THE MINIMUM PROPERTIES SHOWN ON THE STRUCTURAL DRAWINGS AND SHALL BE "FORMLOK" AS MANUFACTURED BY VERCO MANUFACTURING CO., "W COMPOSITE" AS MANUFACTURED BY ASC STEEL DECK, "EPICORE" AS MANUFACTURED BY EPIC METALS, OR PRE-APPROVED EQUAL. THE FLOOR UNITS SHALL BE FORMED FROM STEEL SHEETS CONFORMING TO ASTM A653, AND GALVANIZED PER ASTM A924.

ABBREVIATION LIST			
@	AT	HSS	HOLLOW STRUCTURAL SECTION
A.B.	ANCHOR BOLT	HT	HEIGHT
ADD'L	ADDITIONAL	INT.	INTERIOR
ALT.	ALTERNATE	JST	JOIST
BLD'G	BUILDING	JT	JOINT
BM	BEAM	L	ANGLE
B.O.F.	BOTTOM OF FOOTING	L.F.R.S.	LATERAL FORCE-RESISTING SYSTEM
BOT.	BOTTOM	L.L.	LIVE LOAD
BRG	BEARING	LLH	LONG LEG HORIZONTAL
BTWN	BETWEEN	LLV	LONG LEG VERTICAL
(C=)	CAMBER	LOC.	LOCATION
CANT.	CANTILEVER	MAX.	MAXIMUM
C.J.	CONTROL/CONSTRUCTION JOINT	M.B.	MACHINE BOLT
CL	CENTERLINE	MFR	MANUFACTURER
CLR.	CLEARANCE	MIN.	MINIMUM
COL.	COLUMN	MISC.	MISCELLANEOUS
CONC.	CONCRETE	MTL	METAL
CONN.	CONNECTION	N.F.	NEAR FACE
CONST.	CONSTRUCTION	N.S.	NEAR SIDE
CONT.	CONTINUOUS	NTS	NOT TO SCALE
COORD.	COORDINATE	O.C.	ON CENTER
C.P.	COMPLETE PENETRATION	OPN'G	OPENING
CTR'D	CENTERED	OPP.	OPPOSITE
C.Y.	CUBIC YARD	PERP.	PERPENDICULAR
DBL.	DOUBLE	PL	PLATE
DCW	DEMAND CRITICAL WELD	P.P.	PARTIAL PENETRATION
DIA. OR ø	DIAMETER	P.S.F.	POUNDS PER SQUARE FOOT
DIAG.	DIAGONAL	REINF.	REINFORCING
DIM.	DIMENSION	REQ'D	REQUIRED
D.L.	DEAD LOAD	SCHED.	SCHEDULE
DWG	DRAWING	SIM.	SIMILAR
DWL	DOWEL	S.O.G.	SLAB ON GRADE
EA.	EACH	SQ.	SQUARE
E.F.	EACH FACE	STD	STANDARD
EL.	ELEVATION	STIFF.	STIFFENER
ENGR.	ENGINEER	STL	STEEL
EQ.	EQUAL	STRUCT.	STRUCTURAL
E.W.	EACH WAY	T&B	TOP & BOTTOM
EXP.	EXPANSION	THR'D	THREADED
EXT.	EXTERIOR	T.O.F.	TOP OF FOOTING
FDN	FOUNDATION	T.O.S.	TOP OF STEEL
F.F.	FAR FACE	TYP.	TYPICAL
FLR	FLOOR	U.N.O.	UNLESS NOTED OTHERWISE
FRM'G	FRAMING	U.T.	ULTRASONIC TESTED
F.S.	FAR SIDE	VERT.	VERTICAL
FTG	FOOTING	W/	WITH
GA.	GAGE/GAUGE	W.P.	WORK POINT
GALV.	GALVANIZED	WT	WEIGHT
GR.	GRADE	W.W.R.	WELDED WIRE REINFORCING
HORIZ.	HORIZONTAL		

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Approved	Approver

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GENERAL NOTES

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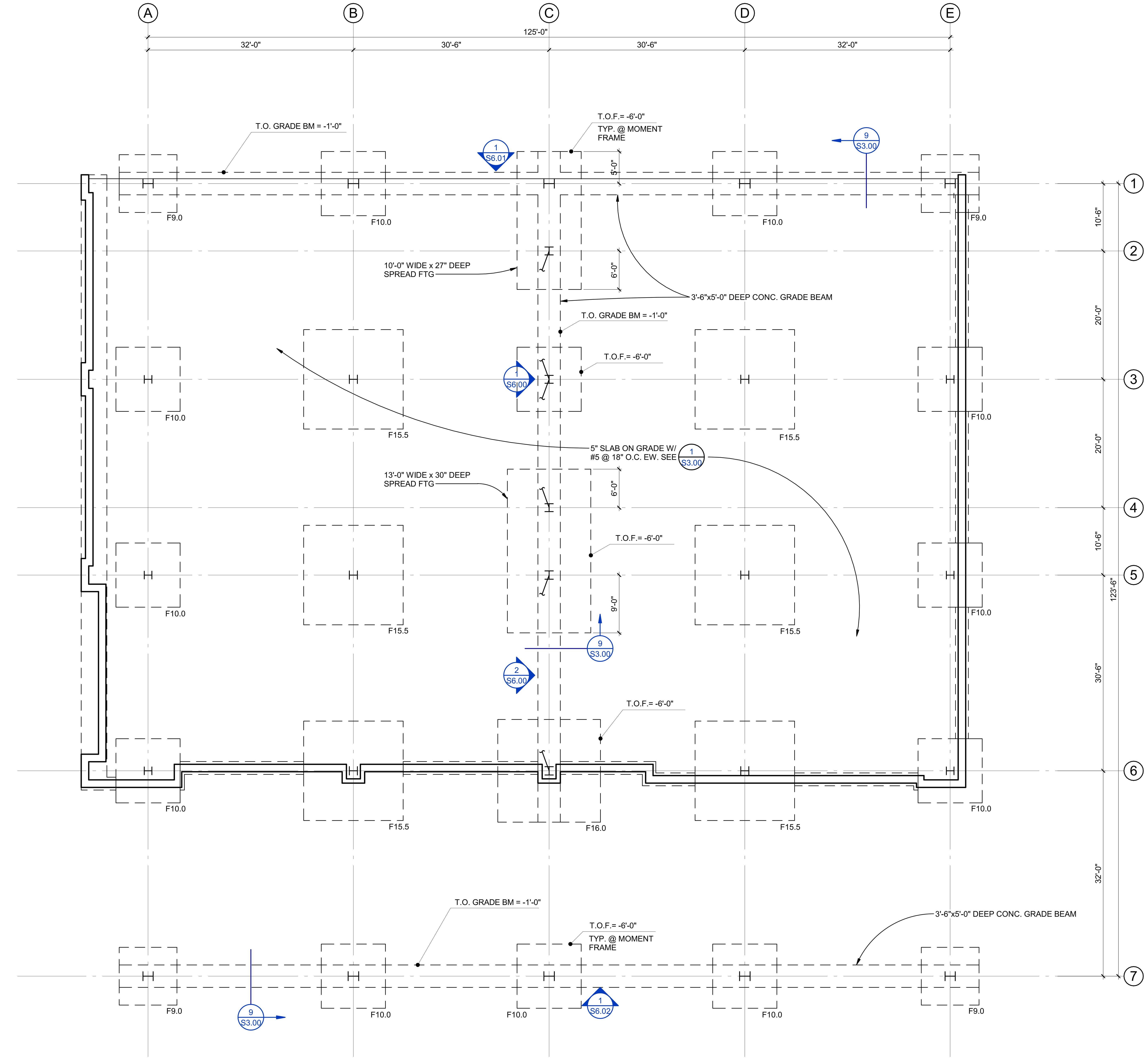

1
S2.00

FOUNDATION AND GRADE LEVEL FRAMING PLAN

1/8" = 1'-0"

FOUNDATION NOTES

1. INDICATES EXTERIOR WALL.
2. INDICATES CONTINUOUS CONCRETE WALL FOOTING. FOR TYPICAL FOOTING AND FOUNDATION WALL DETAILS SEE SHEET S3.00. FOOTING WIDTH ("W") = 2'-0" UNLESS NOTED OTHERWISE ON PLAN. CENTER FOOTINGS ON CONCRETE STEM WALL.
3. "F_" INDICATES CONCRETE SPREAD FOOTING. FOR SCHEDULE SEE 5/S3.00.
4. X X.XX INDICATES BRACED FRAME. FOR ELEVATIONS, BRACE SIZES AND DETAIL CALLOUTS SEE SHEET S6.00.
5. INDICATES STEEL COLUMNS ORIGINATING AT FOUNDATION LEVEL. ALL COLUMNS ARE CONTINUOUS TO ROOF UNLESS NOTED OTHERWISE. FOR TYPICAL ANCHOR ROD/BOLT DETAIL SEE 7/S3.00. FOR COLUMN SCHEDULE SEE S4.00.
6. FOR TYPICAL FOUNDATION AND CONCRETE SLAB-ON-GRADE DETAILS SEE SHEET S3.00.
7. TOP OF FOOTING ELEVATIONS = -1'-0" UNLESS NOTED OTHERWISE ON PLANS AND DETAILS.
8. X X.XX INDICATES MOMENT FRAME. FOR ELEVATIONS, MEMBER SIZES AND DETAIL CALLOUTS SEE SHEETS S6.01 AND S6.02.

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TITLE

FOUNDATION AND GRADE LEVEL FRAMING PLAN

SHEET NUMBER

S2.00

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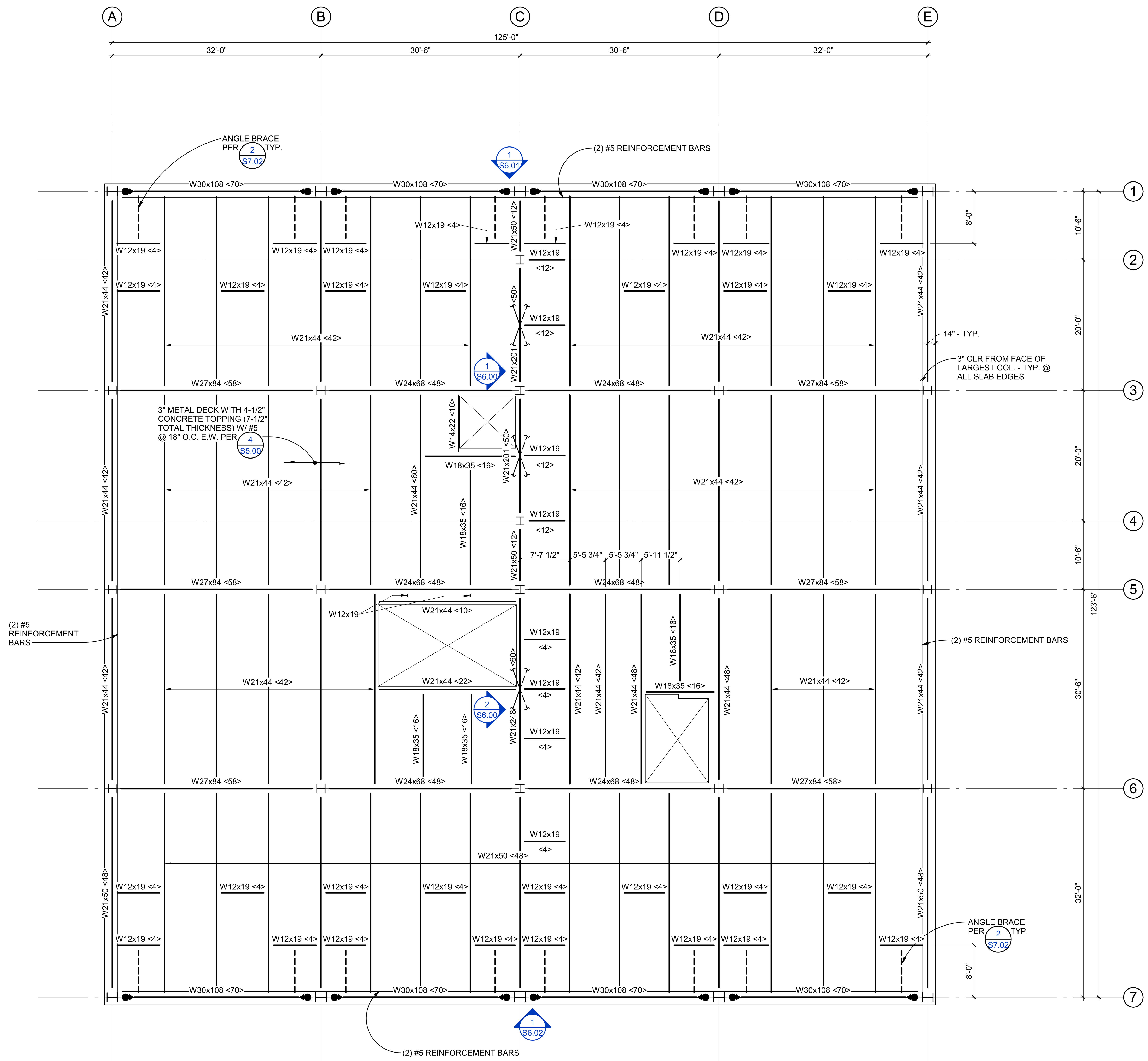


FIRST FLOOR FRAMING PLAN

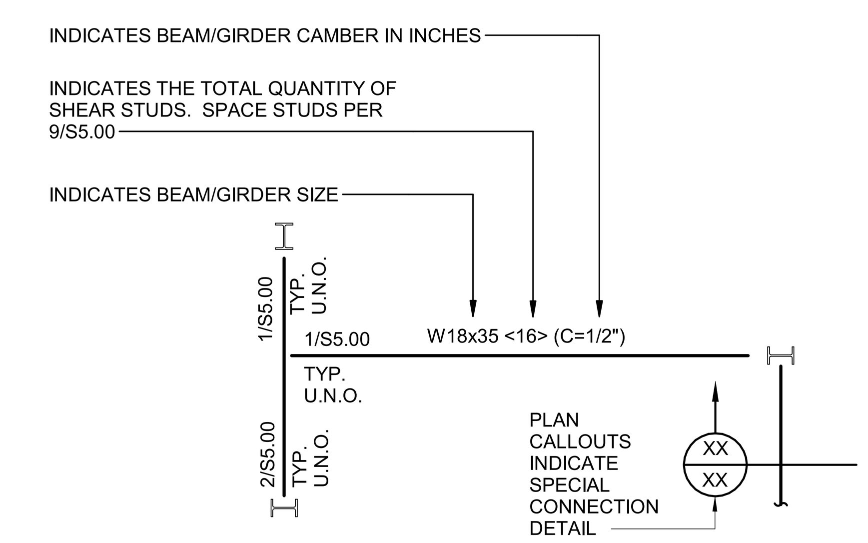
1/S2.10

1/8" = 1'-0"

NORTH

FLOOR FRAMING NOTES

1. INDICATES BRACED FRAME. FOR ELEVATIONS, BRACE SIZES AND DETAIL CALLOUTS SEE SHEET S6.00. ALL BEAMS THAT ARE PART OF A BRACED FRAME SHALL BE CONSIDERED "COLLECTOR" BEAMS.
2. INDICATES STEEL COLUMN, SEE S4.00 FOR STEEL COLUMN SCHEDULE.
3. INDICATES PENETRATION IN FLOOR STRUCTURE. FOR TYPICAL REINFORCING AROUND OPENINGS SEE 5/S5.00.
4. FOR TYPICAL COMPOSITE BEAM AND METAL DECK DETAILS SEE SHEET S5.00.
5. INDICATES DIRECTION OF SPAN FOR METAL DECK.
6. FOR TYPICAL STEEL CONNECTION DETAILS SEE SHEET S5.00. SEE BRACED FRAME ELEVATIONS FOR CONNECTION CALLOUTS. ALL MEMBERS AND CONNECTIONS THAT ARE PART OF A BRACED FRAME SHALL BE CONSIDERED PART OF THE LATERAL-FORCE RESISTING SYSTEM.



7. STEEL MEMBERS ARE EQUALLY SPACED BETWEEN DIMENSION POINTS UNLESS NOTED OTHERWISE.
8. INDICATES MOMENT FRAME. FOR ELEVATIONS AND DETAIL CALLOUT SEE SHEETS S6.01 AND S6.02. ASSOCIATED MEMBERS AND CONNECTIONS ARE PART OF THE LATERAL-FORCE RESISTING SYSTEM.

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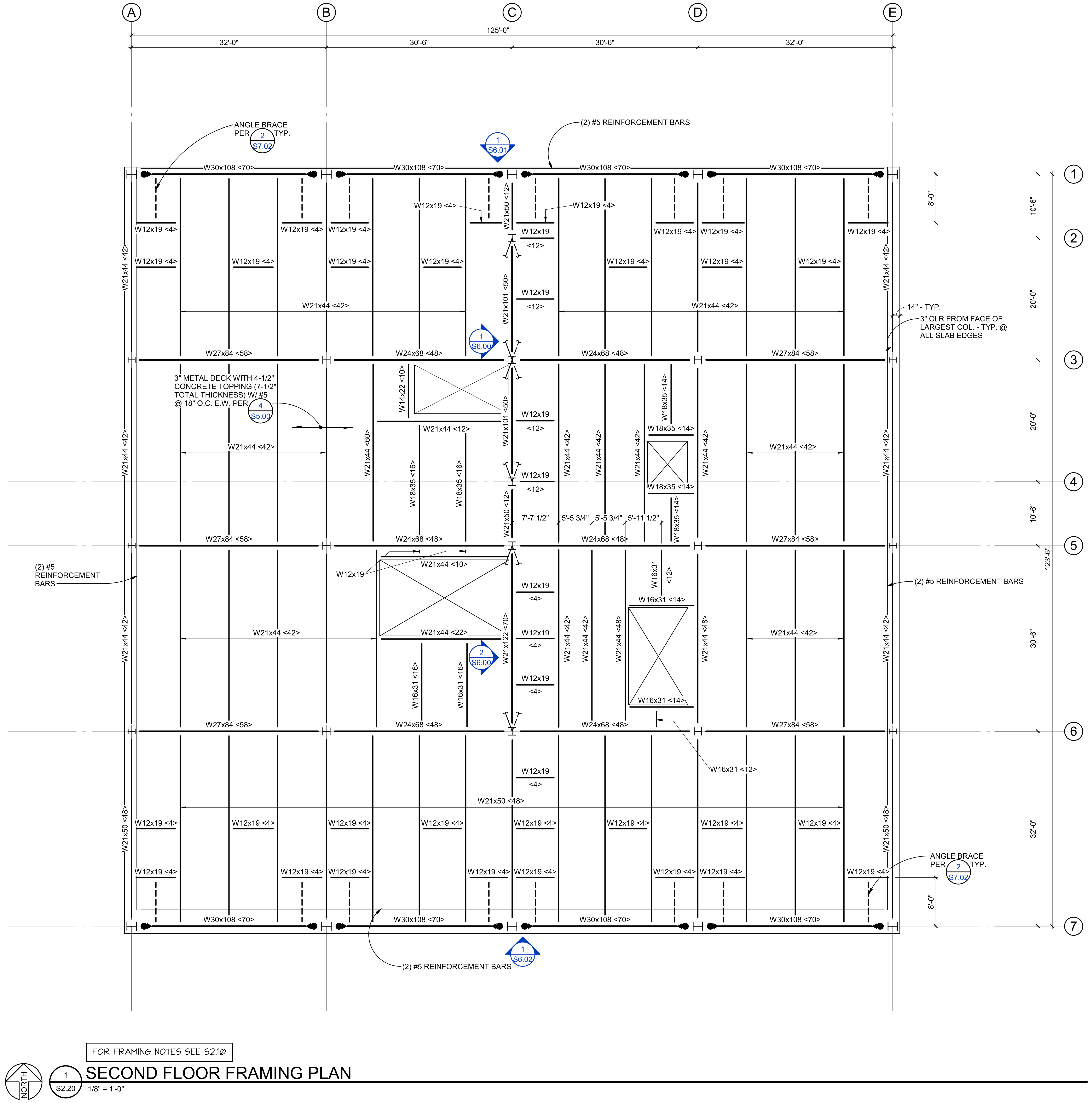
FIRST FLOOR FRAMING PLAN

SHEET NUMBER

S2.10



FOR FRAMING NOTES SEE S2.10

SECOND FLOOR FRAMING PLAN

1 S2.20

1/8" = 1'-0"

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SECOND FLOOR FRAMING PLAN

SHEET NUMBER

S2.20

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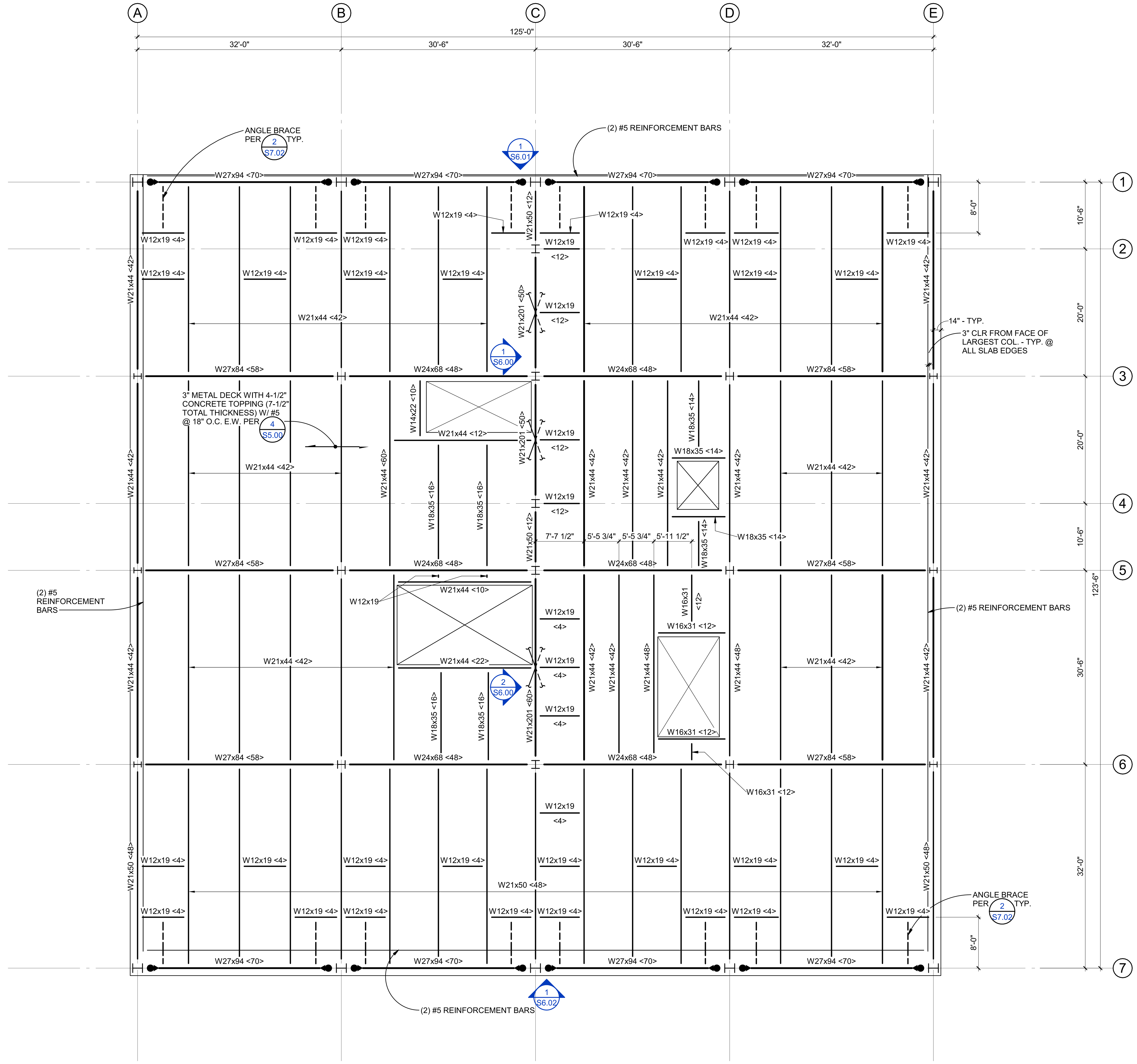

FOR FRAMING NOTES SEE S2.10

NORTH

1 S2.30 THIRD FLOOR FRAMING PLAN

1/8" = 1'-0"

nehrp

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THIRD FLOOR FRAMING PLAN

SHEET NUMBER

S2.30

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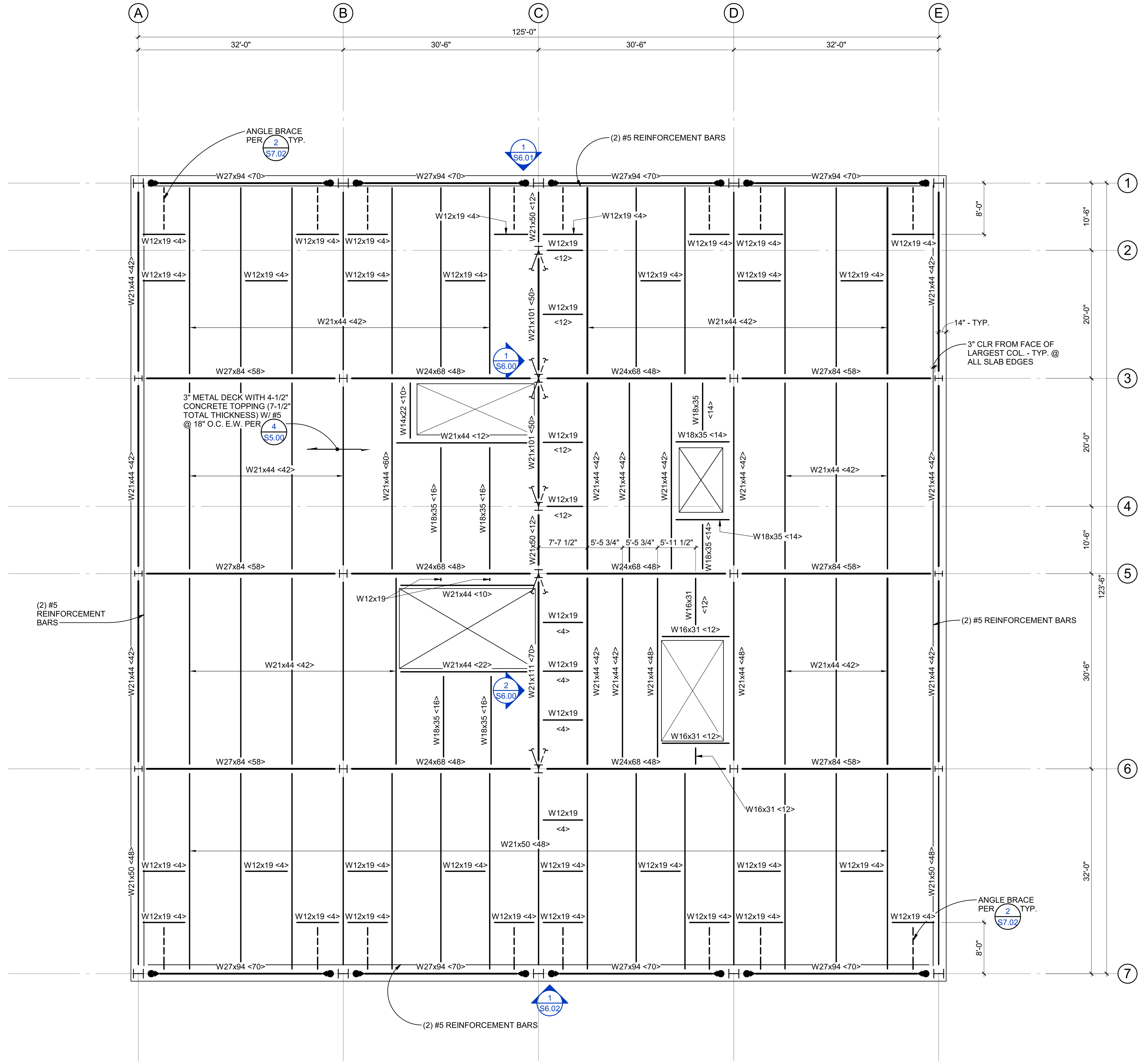

FOR FRAMING NOTES SEE S2.10

NORTH

1 S2.40 FOURTH FLOOR FRAMING PLAN

1/8" = 1'-0"

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FOURTH FLOOR FRAMING PLAN

SHEET NUMBER

S2.40

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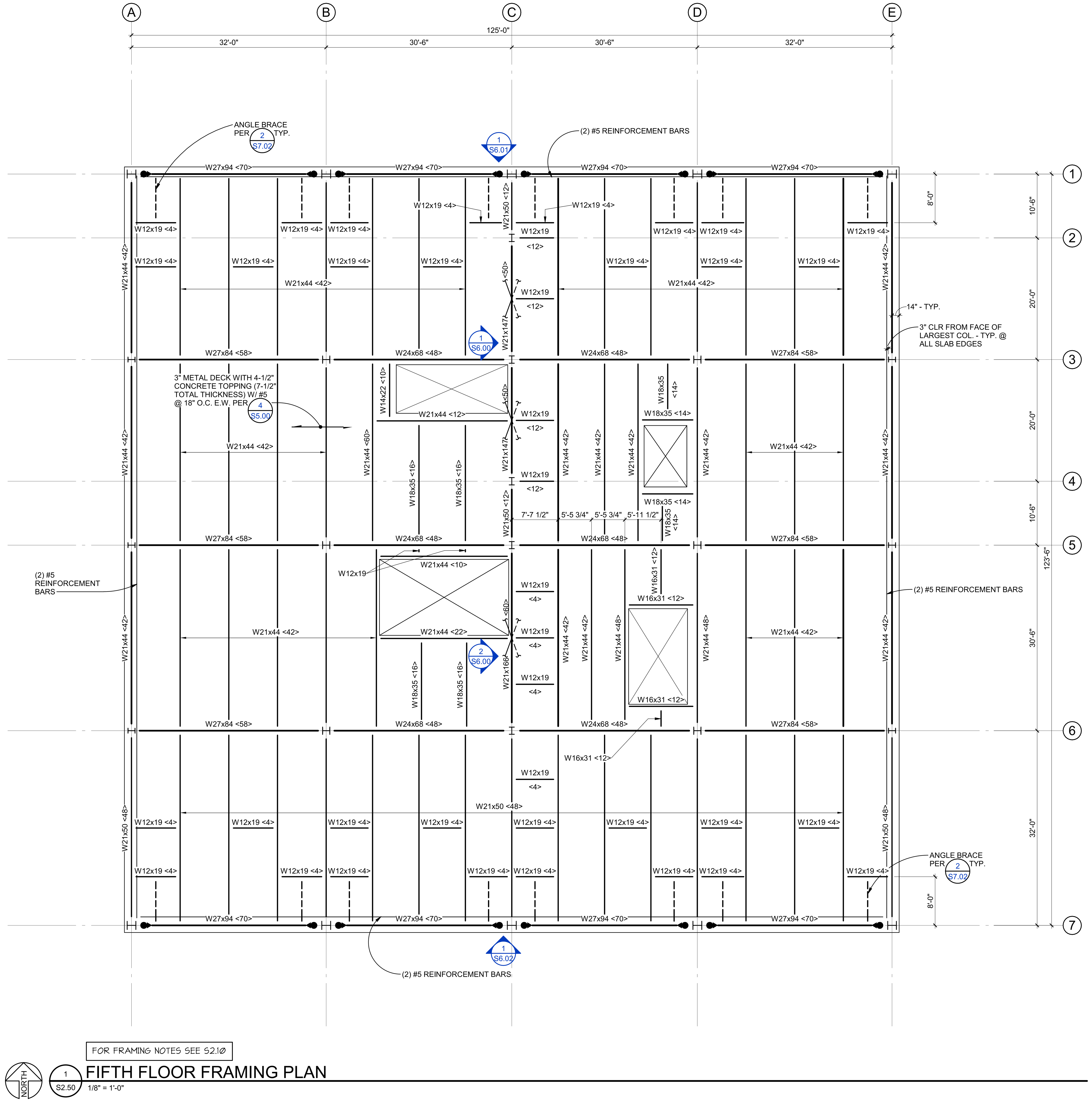

1 S2.50 FIFTH FLOOR FRAMING PLAN
1/8" = 1'-0"

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FIFTH FLOOR FRAMING PLAN

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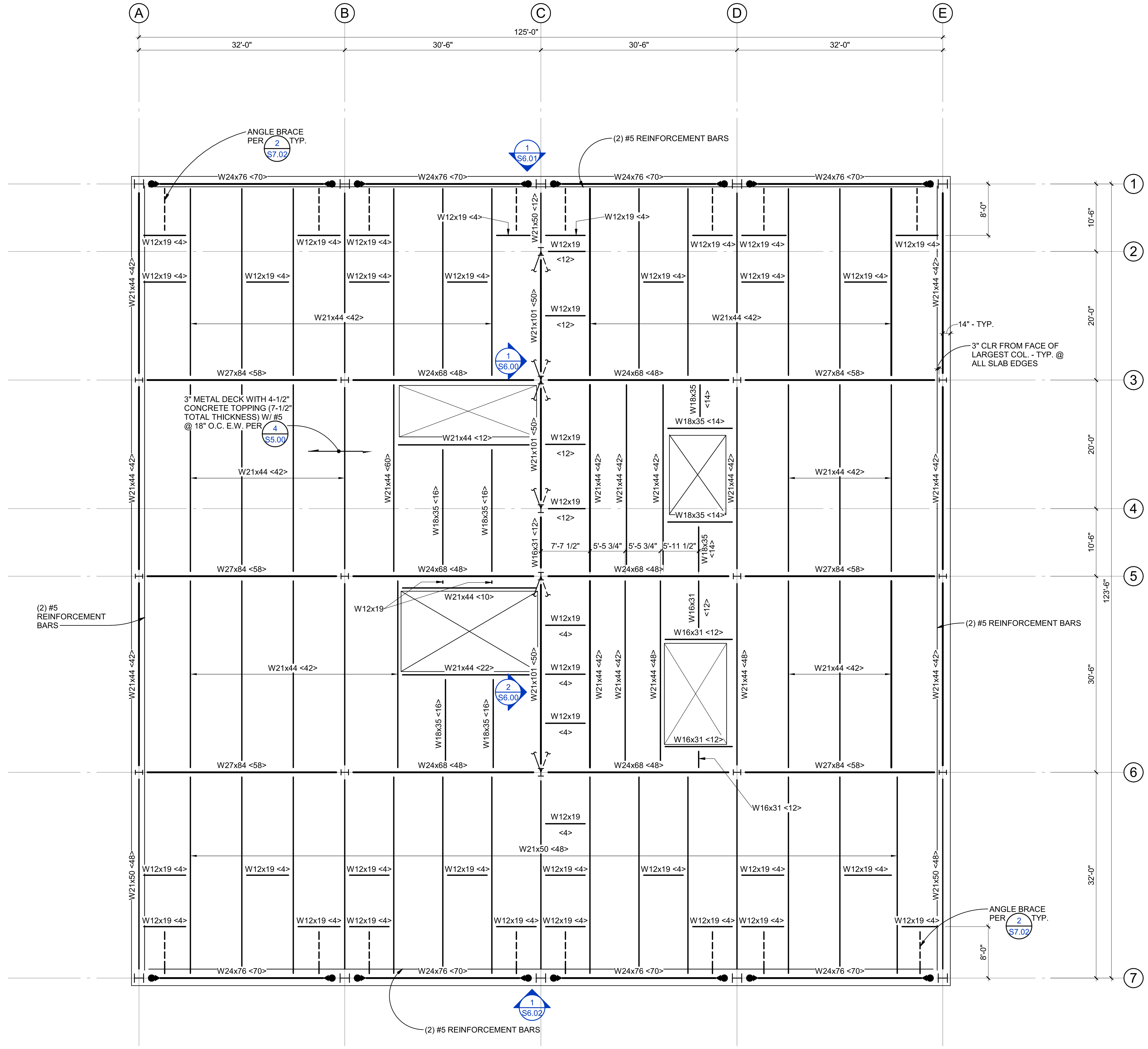

FOR FRAMING NOTES SEE S2.10

NORTH

1 S2.60 SIXTH FLOOR FRAMING PLAN

1/8" = 1'-0"

nehrp

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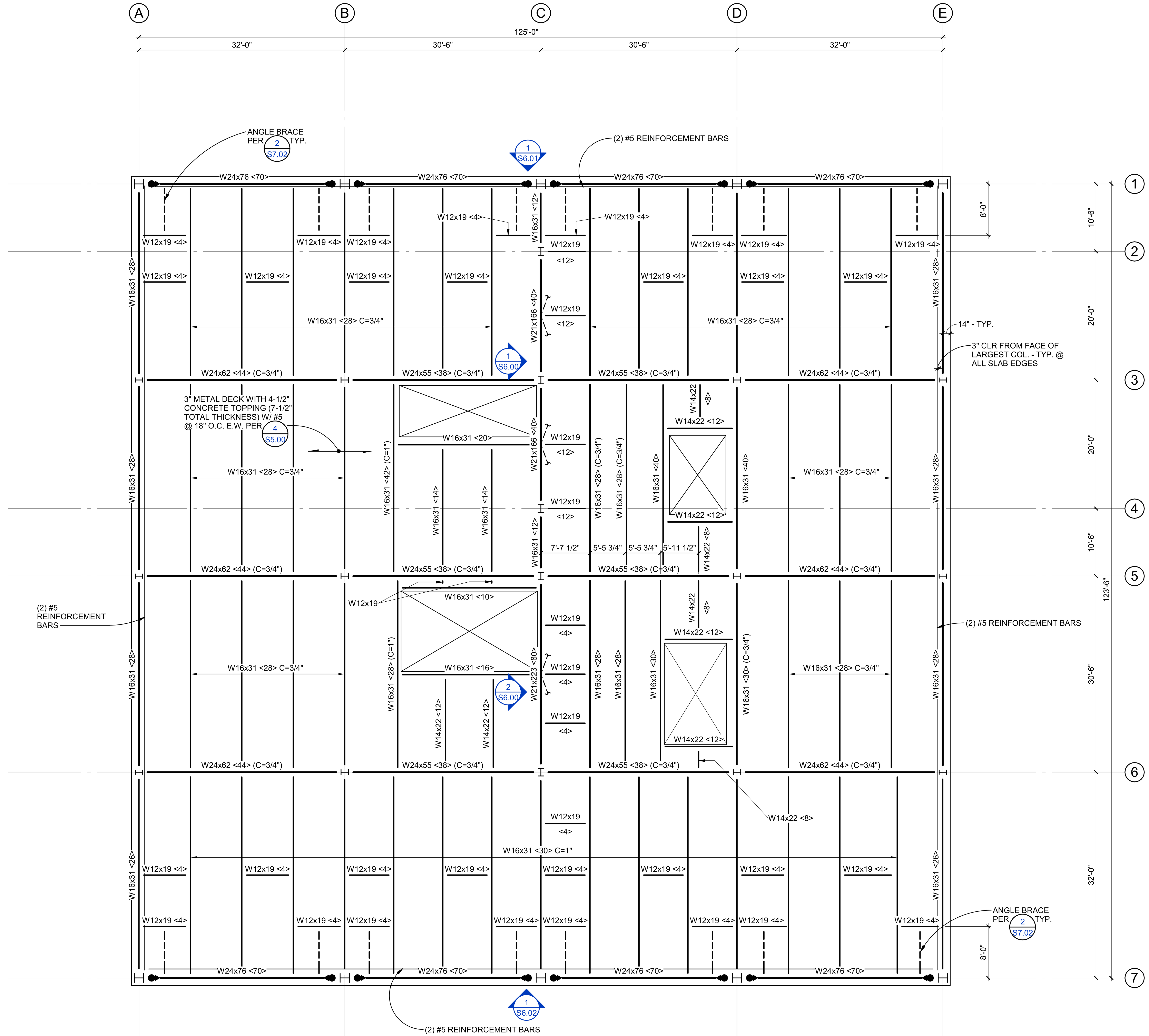
SIXTH FLOOR FRAMING PLAN

SHEET NUMBER

S2.60



FOR FRAMING NOTES SEE S2.10

1 S2.70 ROOF FRAMING PLAN

1/8" = 1'-0"

NORTH

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ROOF FRAMING PLAN

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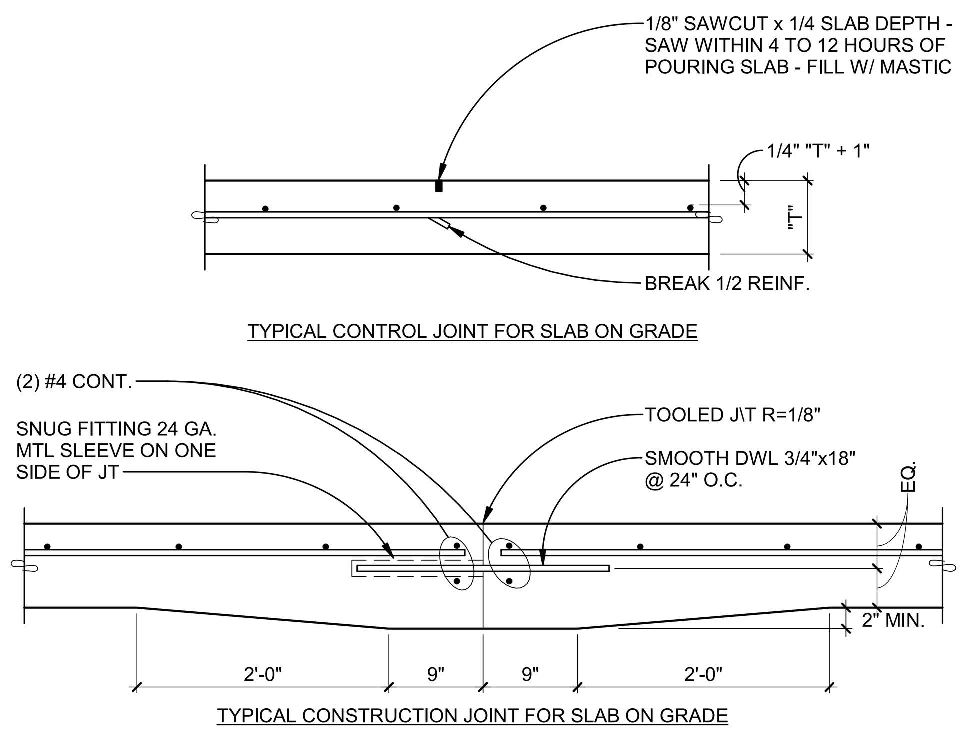
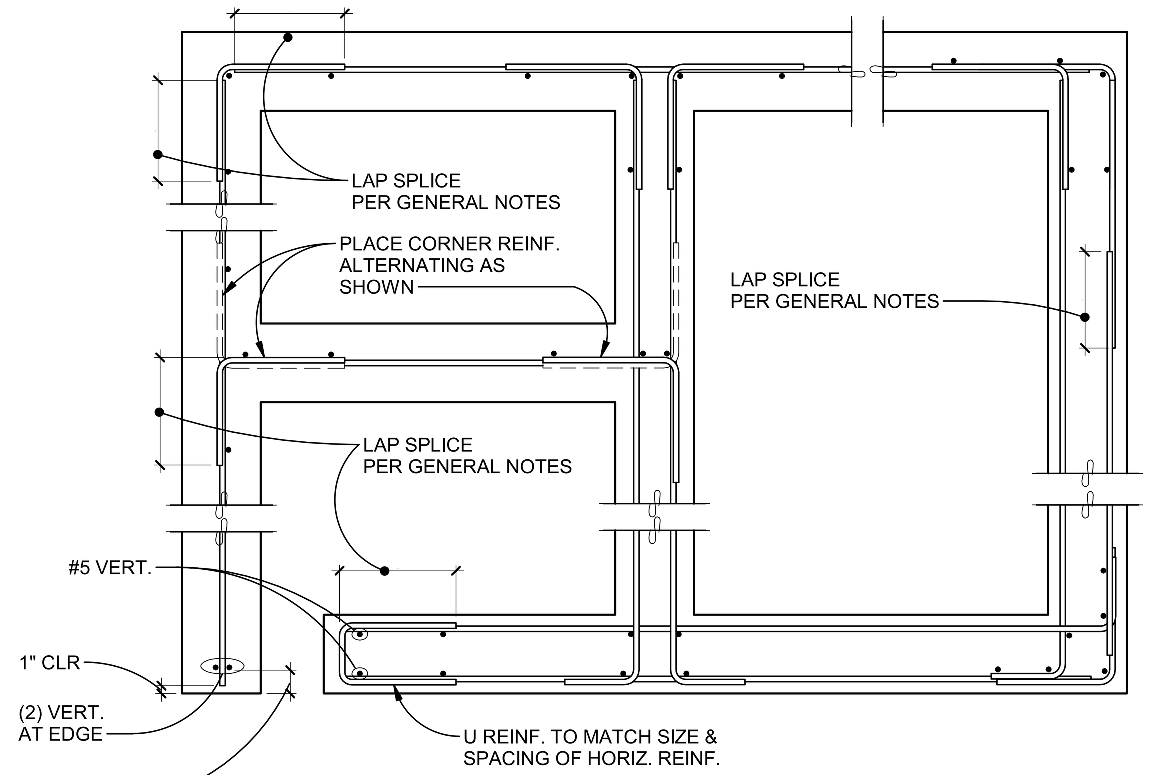


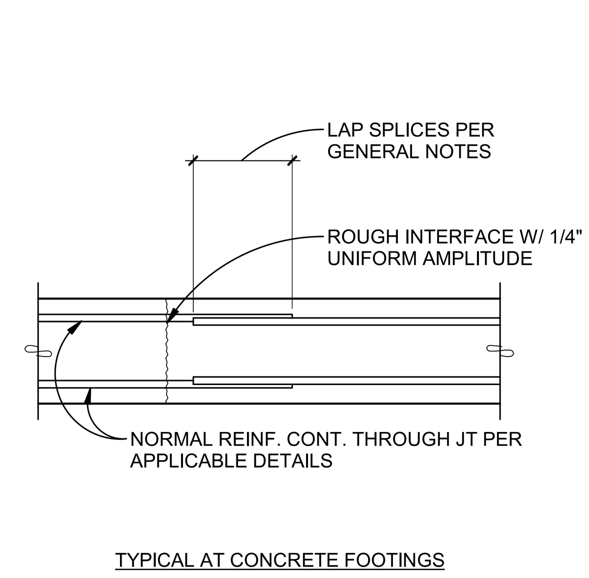
1 SECTION
S3.00 NO SCALE



NOTES:
1. VERTICAL REINFORCEMENT SHOWN IS ADDITIONAL IF NORMAL STEM WALL REINFORCEMENT IS NOT IN PROPER LOCATION.
2. CORNER REINFORCEMENT IS SAME SIZE AND SPACING AS HORIZONTAL REINFORCEMENT.
3. STANDARD HOOK MAY BE SUBSTITUTED FOR CORNER REINFORCEMENT. SEE NOTE #5.
4. REINFORCEMENT AT ALL CORNERS, ENDS, AND INTERSECTIONS OF WALLS SHALL BE PLACED IN ACCORDANCE WITH APPROPRIATE DETAIL SHOWN.
5. USE STANDARD HOOK FOR EMBEDMENT LESS THAN 24" PAST FACE OF WALL.

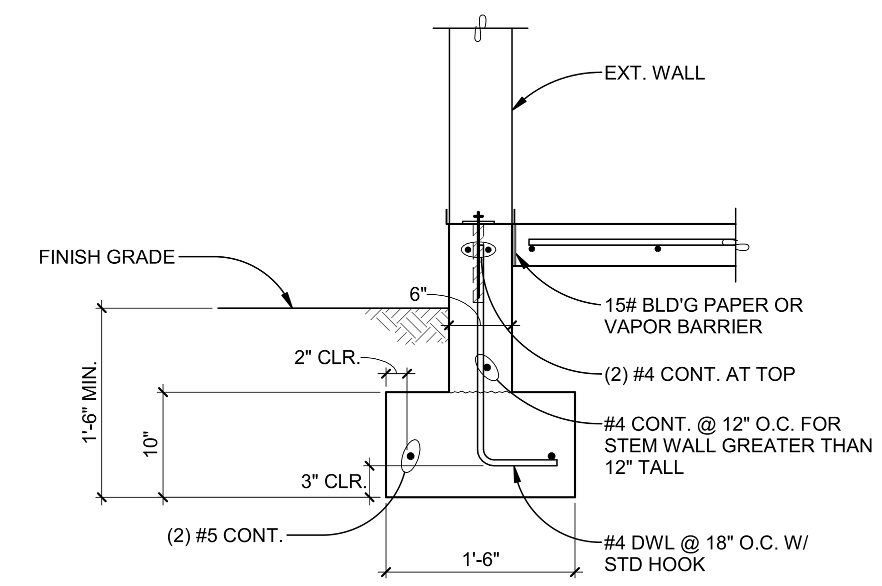
TYPICAL REINFORCEMENT PLACEMENT FOR CAST IN PLACE CONCRETE WALLS AND STEM WALLS

2 SECTION
S3.00 NO SCALE



TYPICAL FOR CAST IN PLACE CONCRETE WALLS, GRADE BEAMS AND FOOTINGS

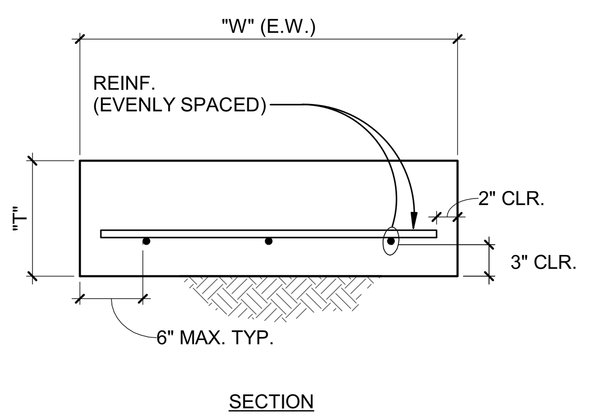
3 SECTION
S3.00 NO SCALE



TYPICAL FOUNDATION AT EXTERIOR WALL

4 SECTION
S3.00 NO SCALE

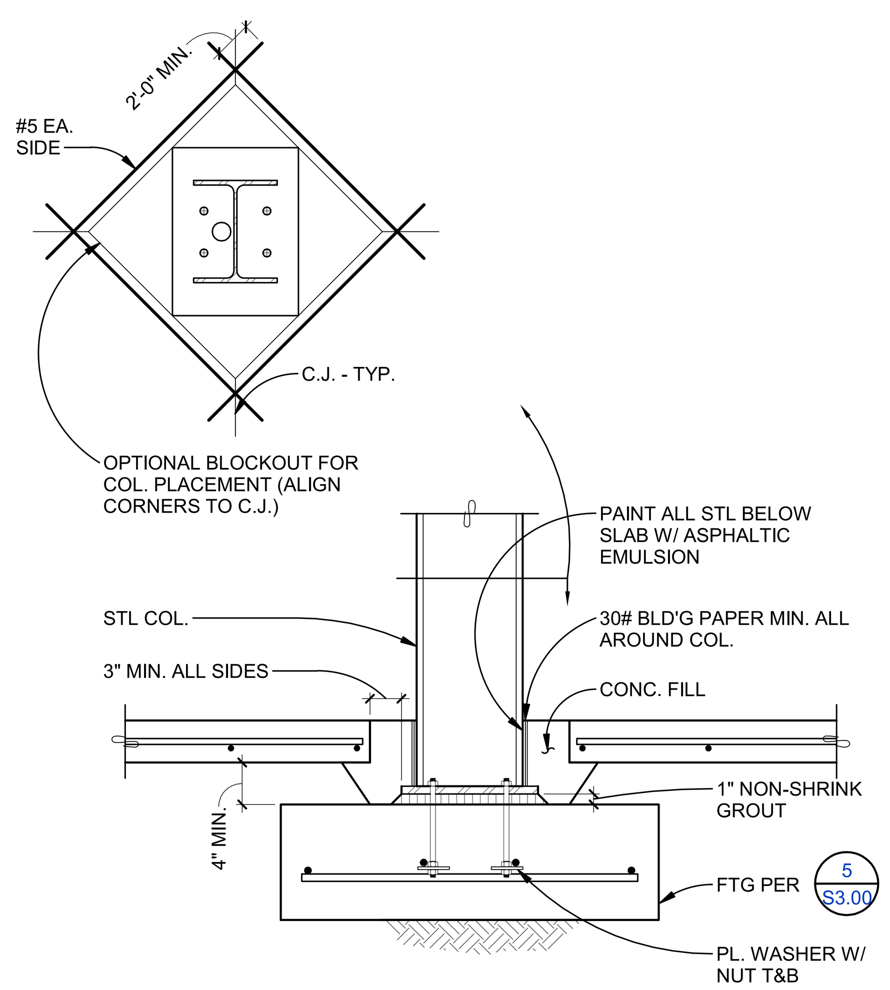
MARK	DIMENSIONS	
	"W"	"T"
F9.0	9'-0"	24"
F10.0	10'-0"	27"
F15.5	15'-6"	36"
F16.0	16'-0"	39"



NOTES:
1. CENTER ALL FOOTINGS ON COLUMN ABOVE EXCEPT AS SHOWN OTHERWISE.
2. FOOTINGS SHALL BEAR ON UNDISTURBED OR COMPACTED MATERIAL PER GENERAL NOTES. DESIGN BEARING PRESSURE IS 6000 POUNDS PER SQUARE FOOT.

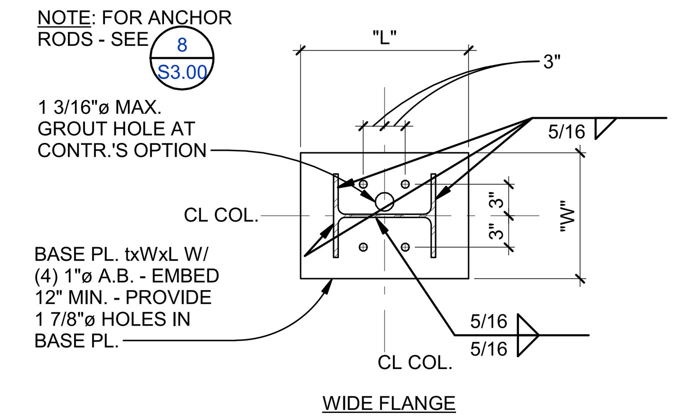
TYPICAL CONCRETE SPREAD FOOTING

5 SECTION
S3.00 NO SCALE



TYPICAL STEEL COLUMN AT SPREAD FOOTING

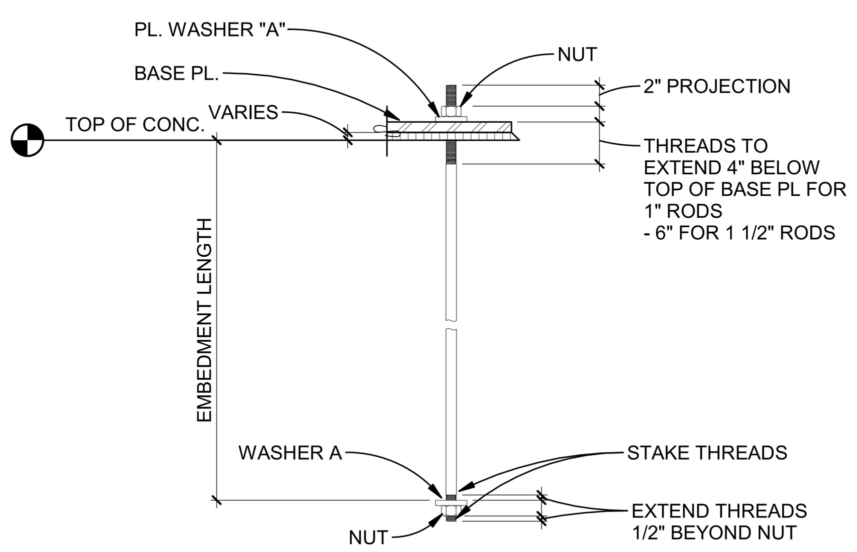
6 SECTION
S3.00 NO SCALE



COLUMN SIZE	"W" (IN.)	"L" (IN.)	"t" (IN.)
W14x99	18 1/4	18 3/4	1 1/2
W14x145, W14x159	20 3/4	22 3/4	2

TYPICAL COLUMN BASE PLATE

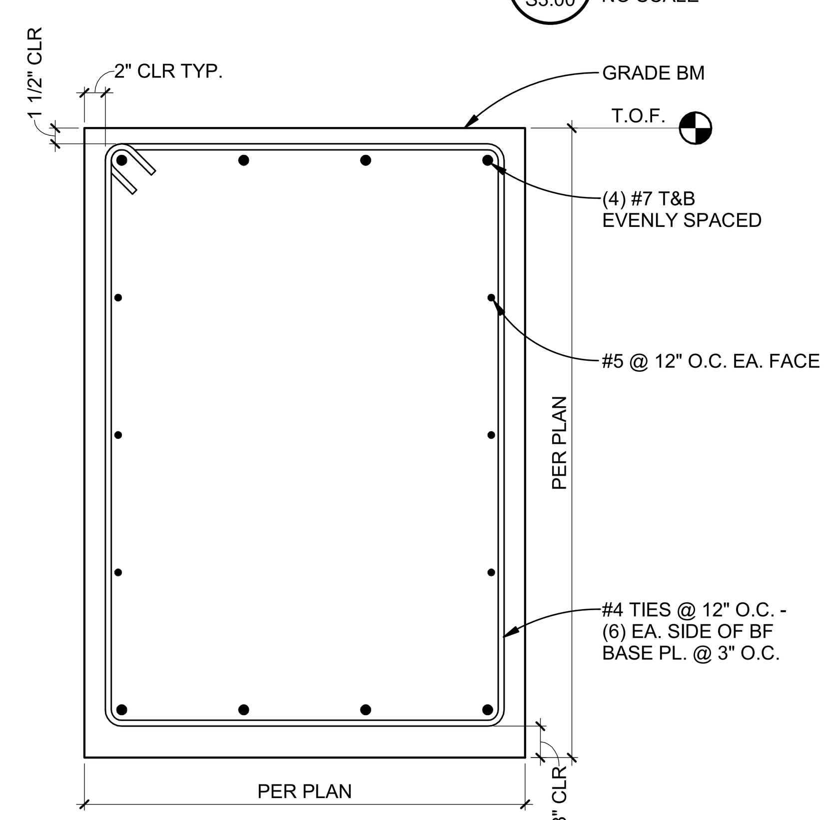
7 DETAIL
S3.00 NO SCALE



ANCHOR ROD		WASHER		NUT
SIZE	MATERIAL	TYPE	SIZE	
1"ø	F1554 GRADE 105	A	PL. 1/2"x3"x0'-3" W/ 1 1/16"ø HOLE CTR'D	A563 GRADE A HEAVY HEX

TYPICAL ANCHOR ROD/BOLT DETAIL

8 DETAIL
S3.00 NO SCALE



9 DETAIL
S3.00 NO SCALE

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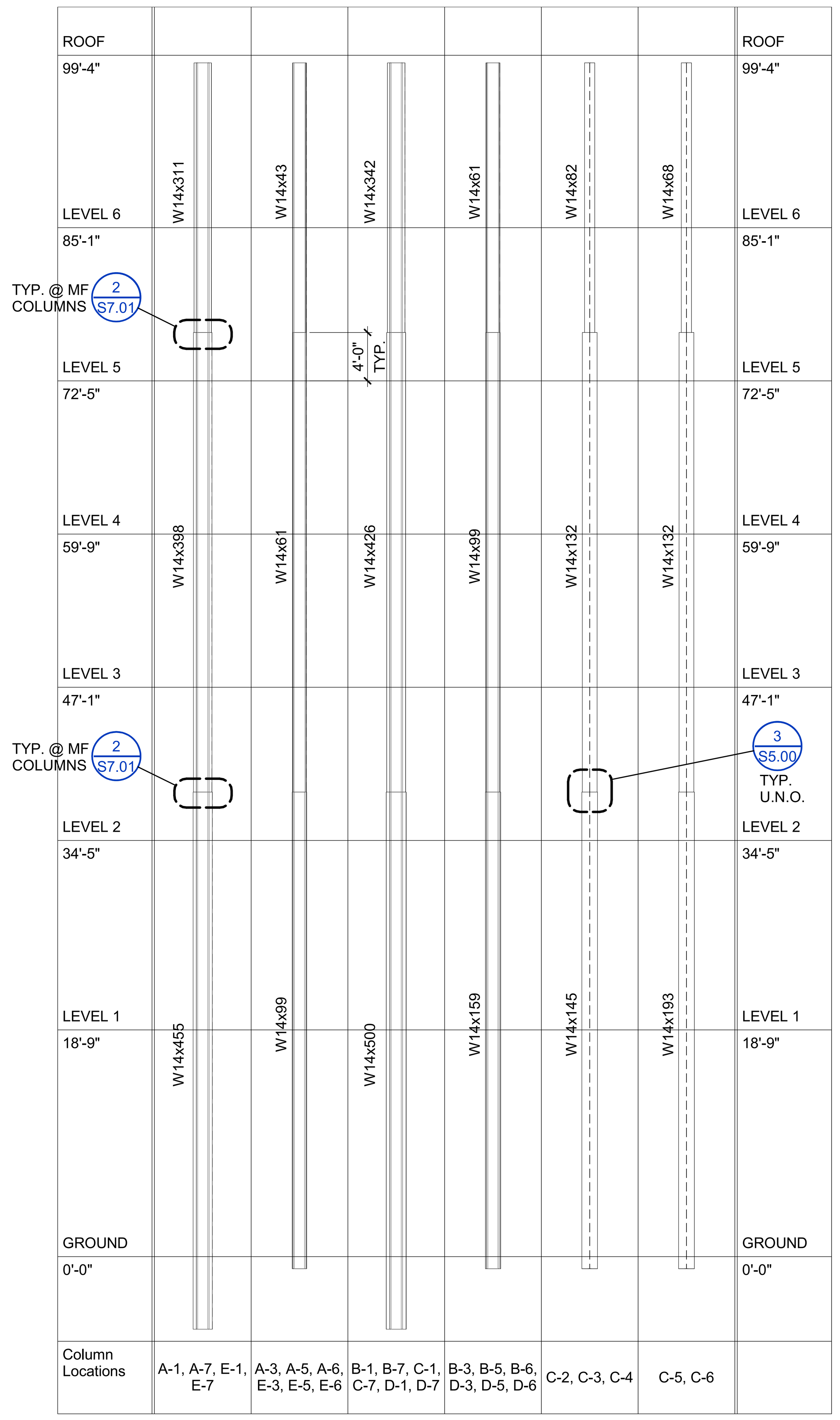
FOUNDATION DETAILS

SHEET NUMBER
S3.00



1 S4.00 COLUMN SCHEDULE

NO SCALE

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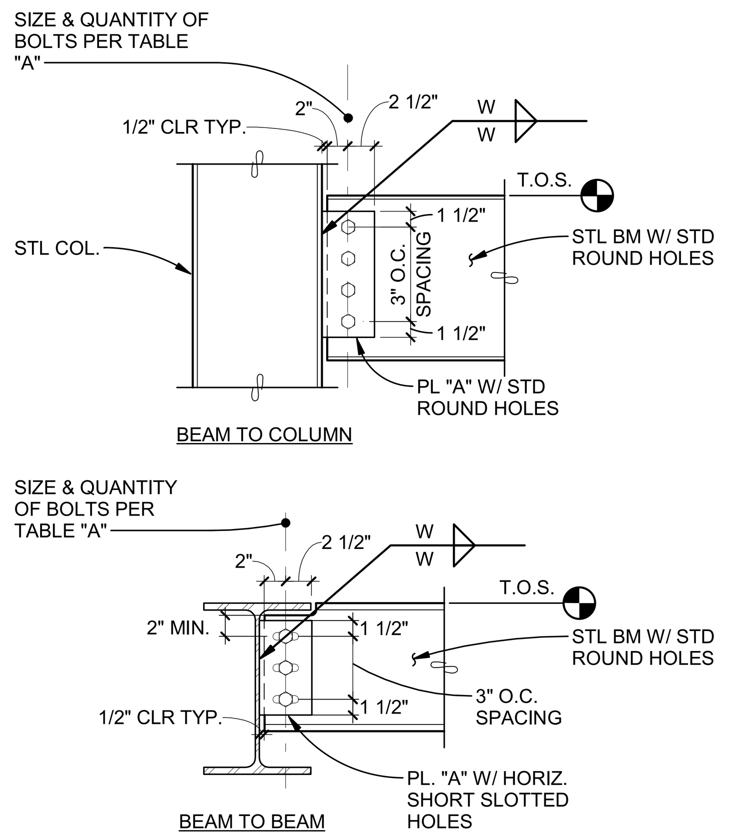
COLUMN SCHEDULE

SHEET NUMBER

S4.00

9/27/2021 9:48:21 AM



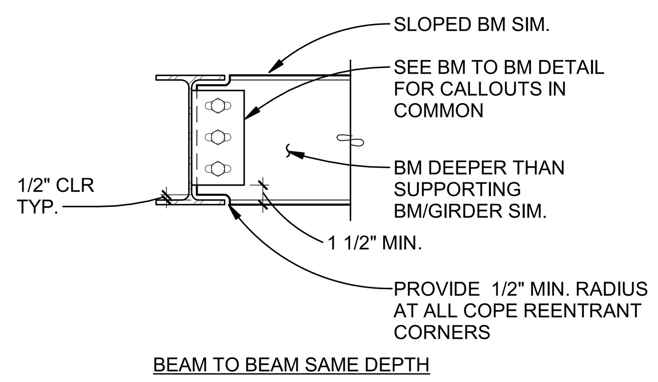
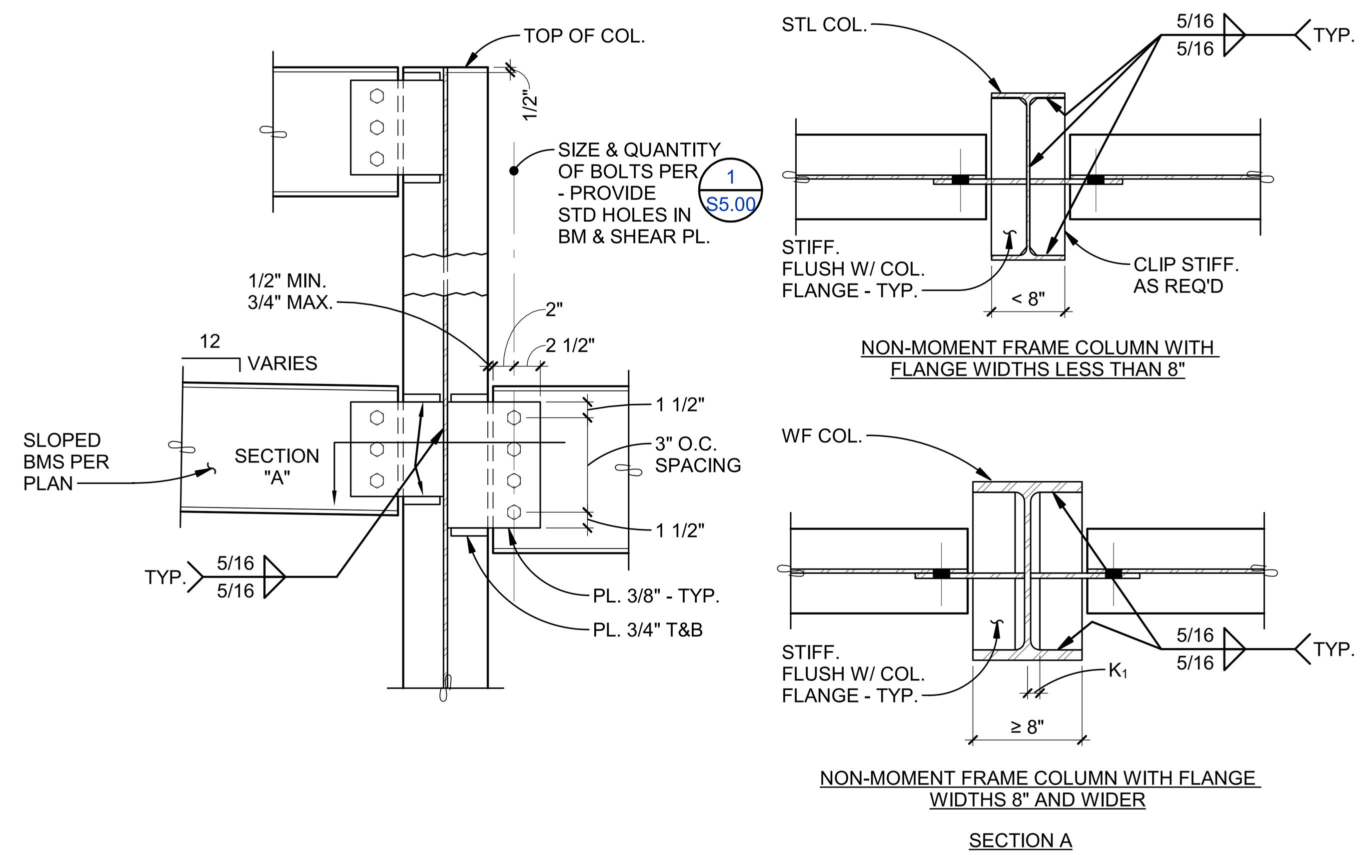


TABLE A

SUPPORTED BEAM SIZE	QUANTITY OF 7/8"ø A325N BOLTS	SHEAR PLATE THICKNESS "A"	WELD "W" NOTE 1.
W12, W14	3	3/8"	5/16"
W16, W18	4	3/8"	5/16"
W21	5	3/8"	5/16"
W24	6	3/8"	5/16"
W27	7	3/8"	5/16"
W30	7	3/8"	5/16"
W33	8	3/8"	5/16"

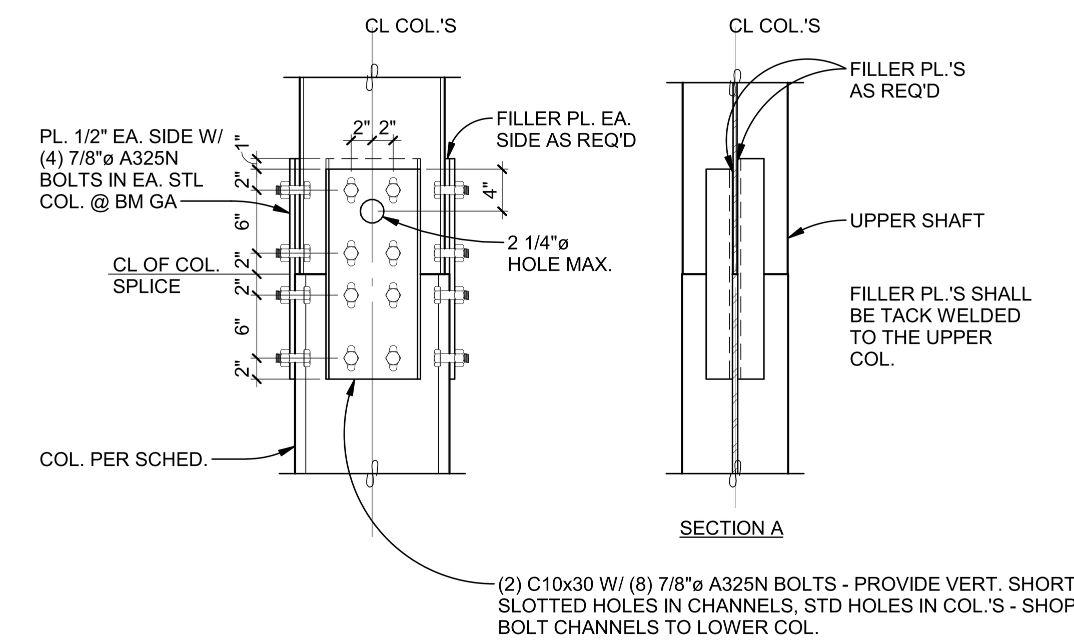
TYPICAL STEEL DETAIL

1 S5.00 DETAIL
NO SCALE



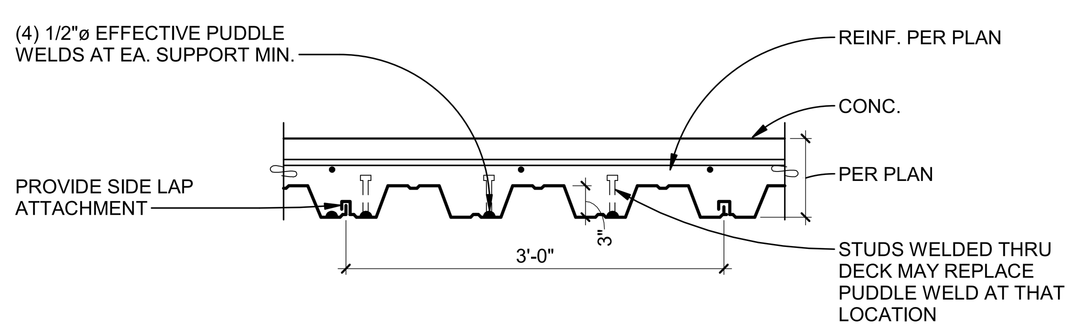
TYPICAL BEAM/COLUMN FRAMING INTO WEB

2 S5.00 DETAIL
NO SCALE



TYPICAL COLUMN SPLICE

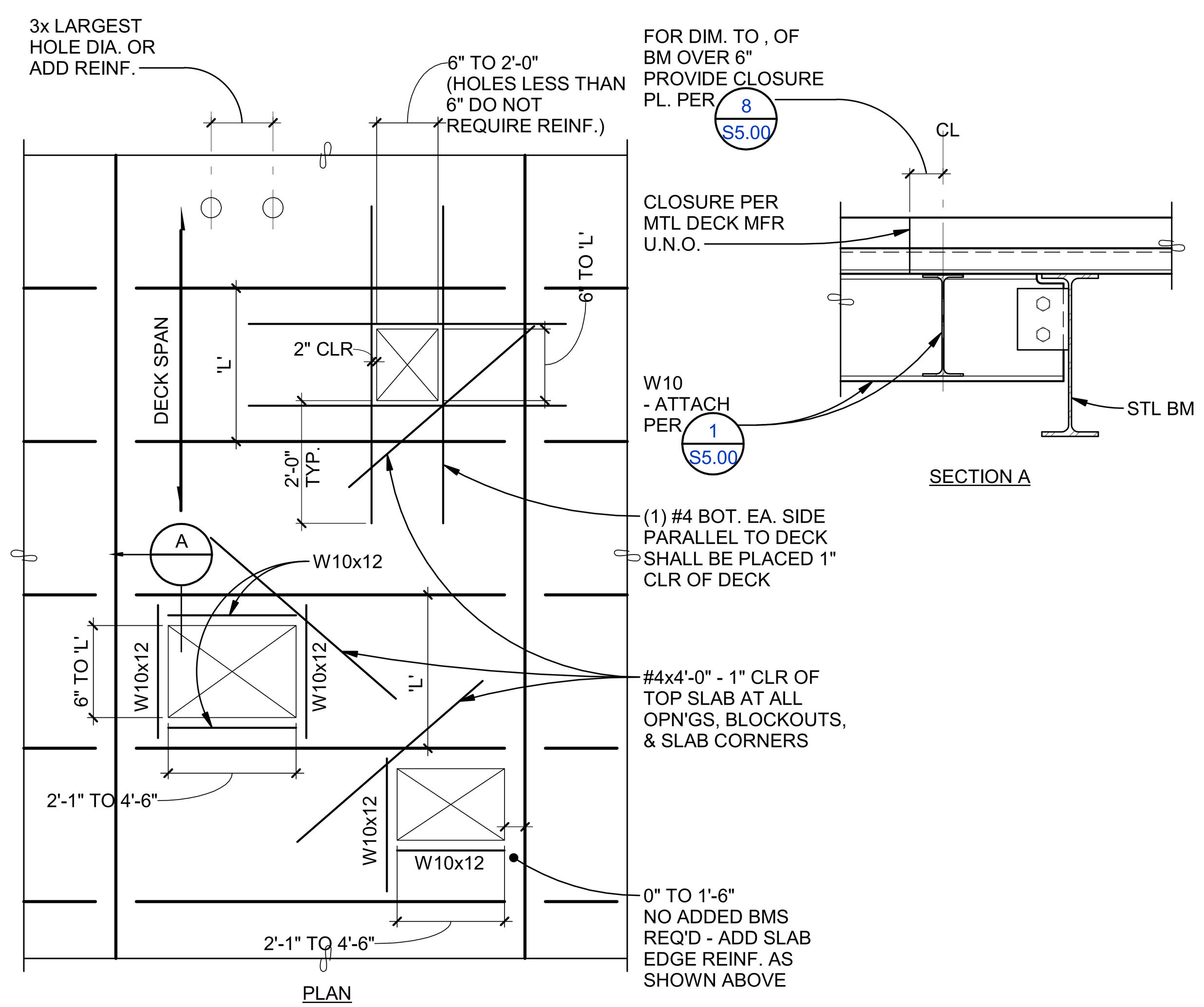
3 S5.00 DETAIL
NO SCALE



NOTES:
1. (2) SPAN MINIMUM, (3) SPAN PREFERRED.
2. AT SUPPORTS PARALLEL TO CORRUGATIONS, PROVIDE PUDDLE WELDS @ 24" O.C. MAXIMUM.

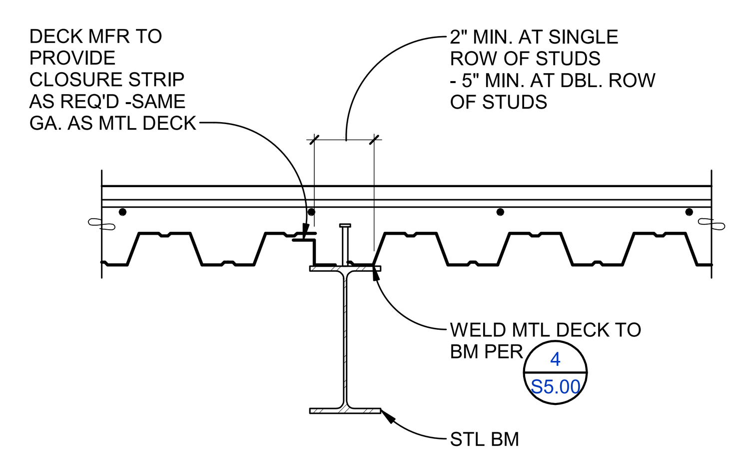
TYPICAL COMPOSITE FLOOR DECK

4 S5.00 DETAIL
NO SCALE



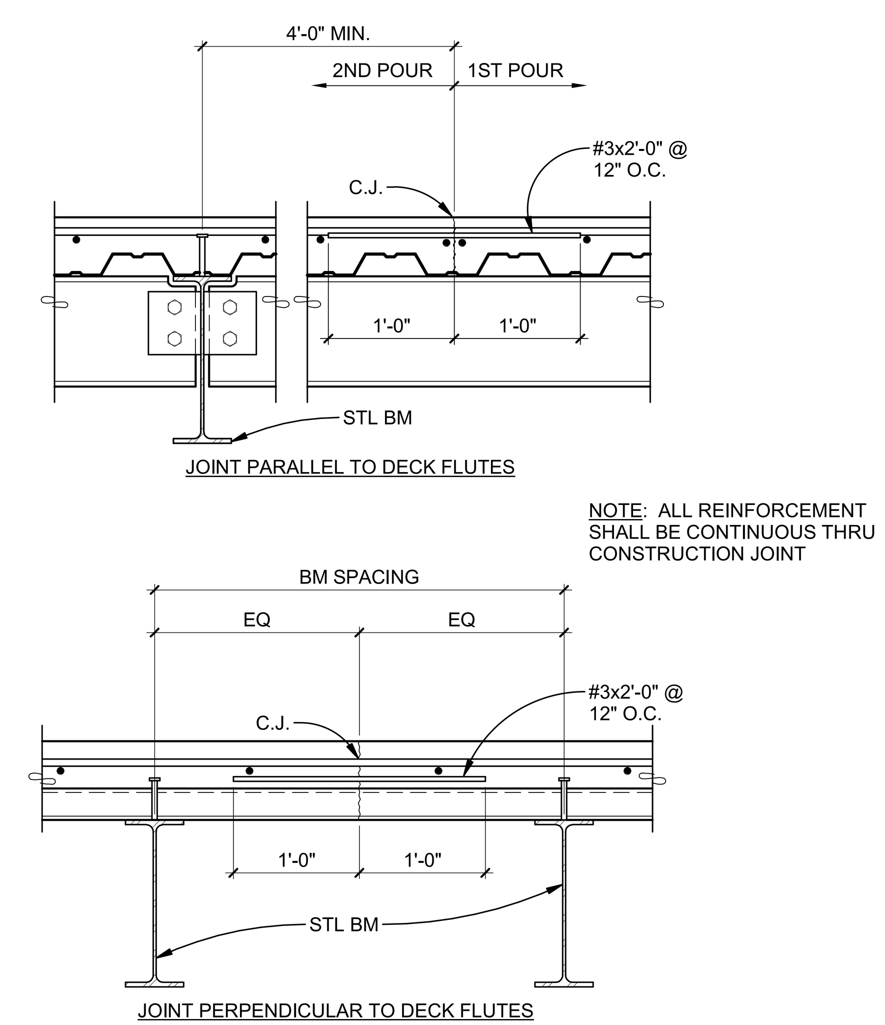
TYPICAL FLOOR PENETRATION REINFORCEMENT

5 S5.00 DETAIL
NO SCALE



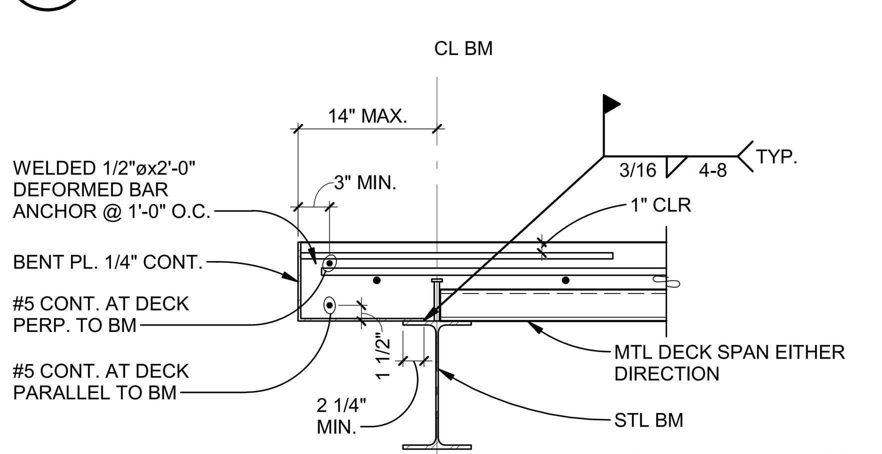
TYPICAL AT METAL DECK PARALLEL TO BEAM

6 S5.00 SECTION
NO SCALE



TYPICAL COMPOSITE DECK CONSTRUCTION JOINT

7 S5.00 SECTION
1" = 1'-0"

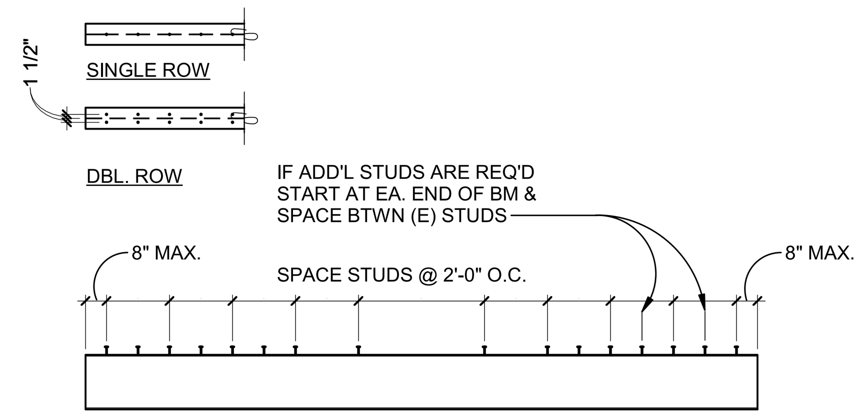


NOTE: EXTEND REBAR 2'-0" PAST EDGE OF ISOLATED OPENING.

TYPICAL SLAB EDGE CONDITION - OVER 6" OVERHANG

8 S5.00 SECTION
NO SCALE

NOTES:
1. LOCATE STUDS AT CENTER OF BEAM FLANGE.
2. STUDS ARE 3/4"ø x 4 1/2" LONG AFTER WELDING.
3. SEE FRAMING PLANS FOR NUMBER OF STUDS.
4. ALL BEAMS WITH STUDS ARE COMPOSITE STEEL BEAMS.
5. PROVIDE A DOUBLE ROW OF STUDS AT BEAMS WHERE THE REQUIRED NUMBER OF STUDS EXCEEDS THE NUMBER THAT CAN FIT IN A SINGLE ROW AT 6" ON CENTER AT DECK PARALLEL TO BEAM OR 12" ON CENTER AT DECK PERPENDICULAR TO BEAM. STUDS SHOULD BE LOCATED IN DECK FLUTES PER AISC STRONG POSITION.



TYPICAL COMPOSITE BEAM DETAIL

9 S5.00 DETAIL
NO SCALE

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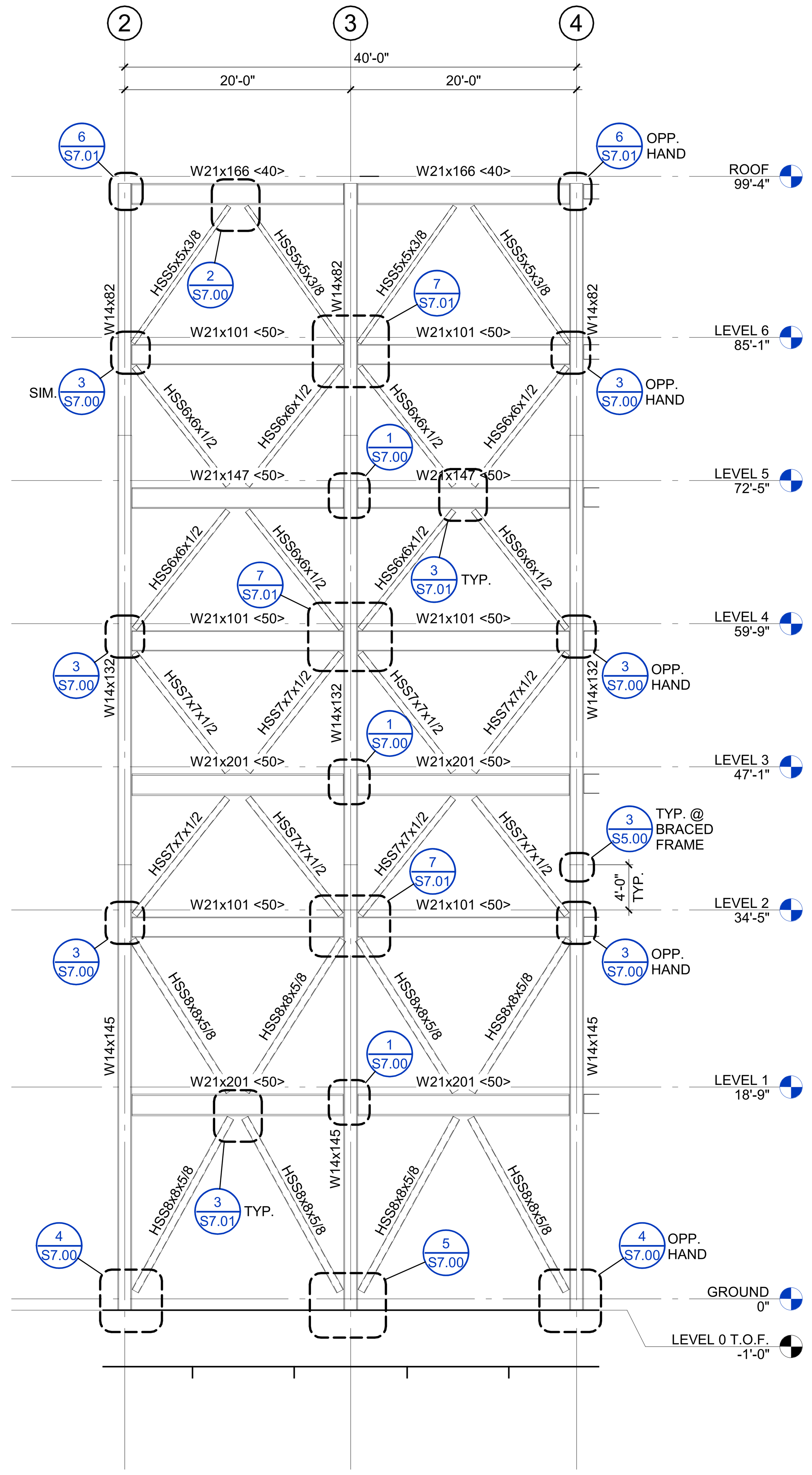
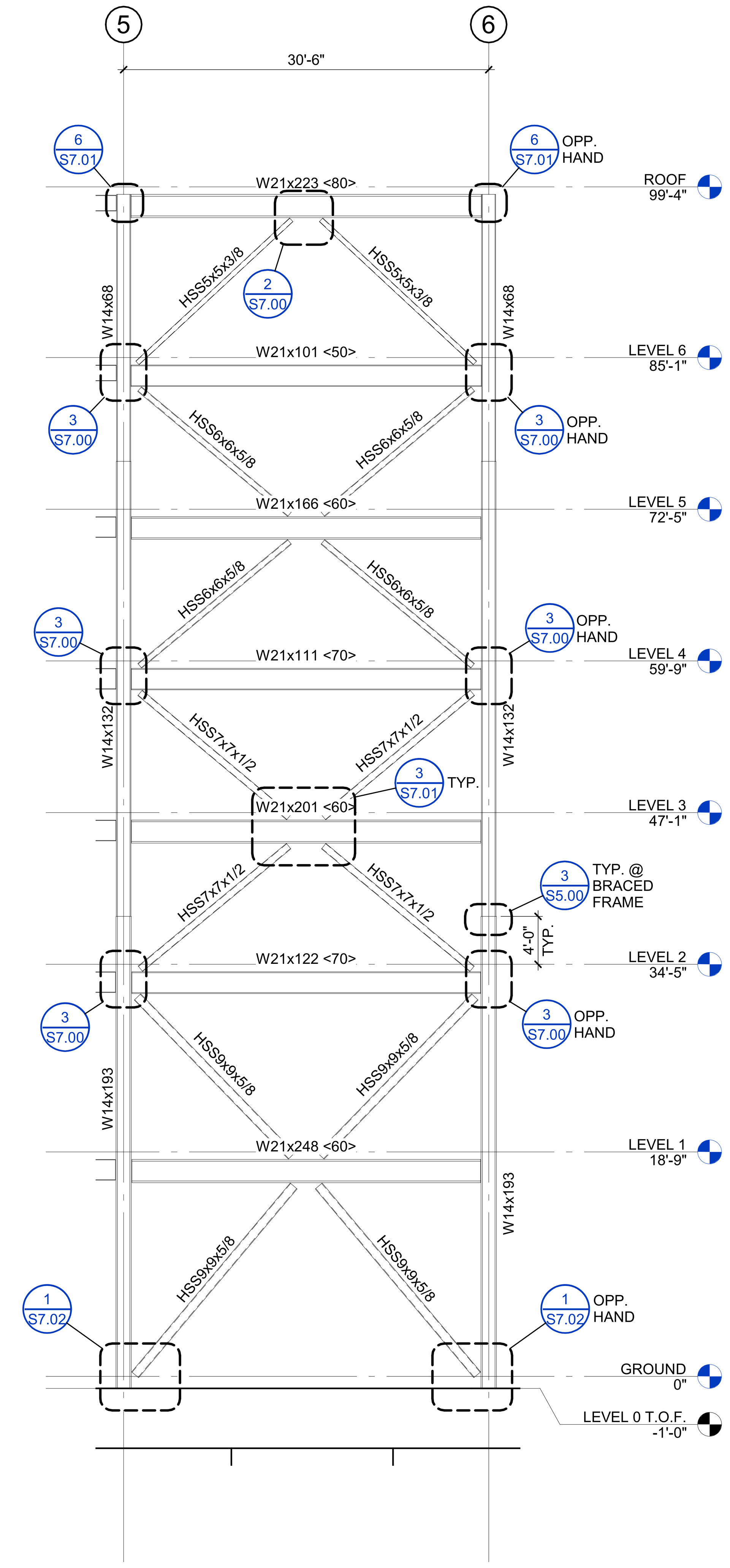


1 S6.00 BRACED FRAME ELEVATION
1/8" = 1'-0"



2 S6.00 BRACED FRAME ELEVATION
1/8" = 1'-0"

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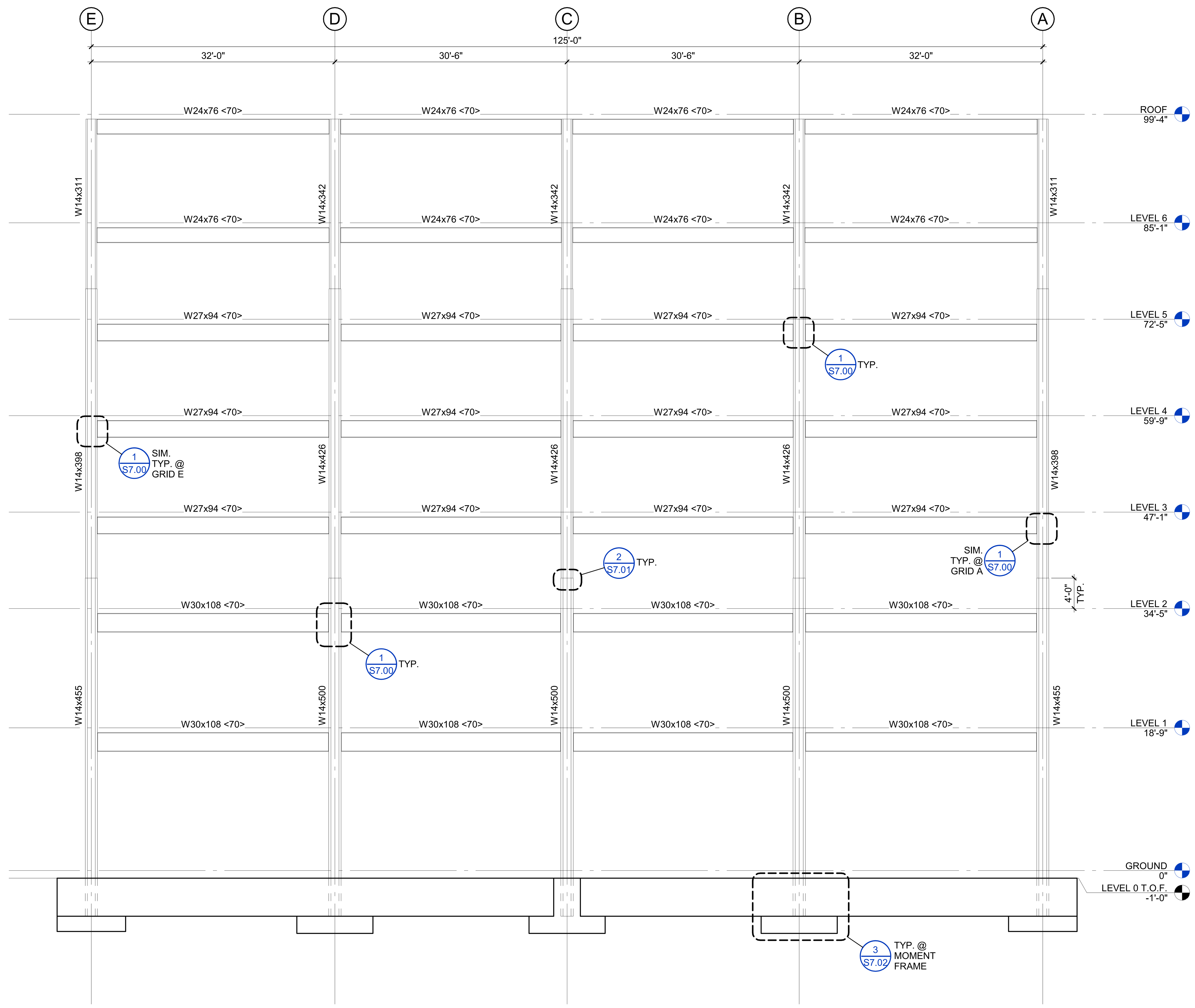
SHEET NUMBER
S6.00



1 S6.01 MOMENT FRAME ELEVATION
1/8" = 1'-0"

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MOMENT FRAME ELEVATIONS

SHEET NUMBER

S6.01

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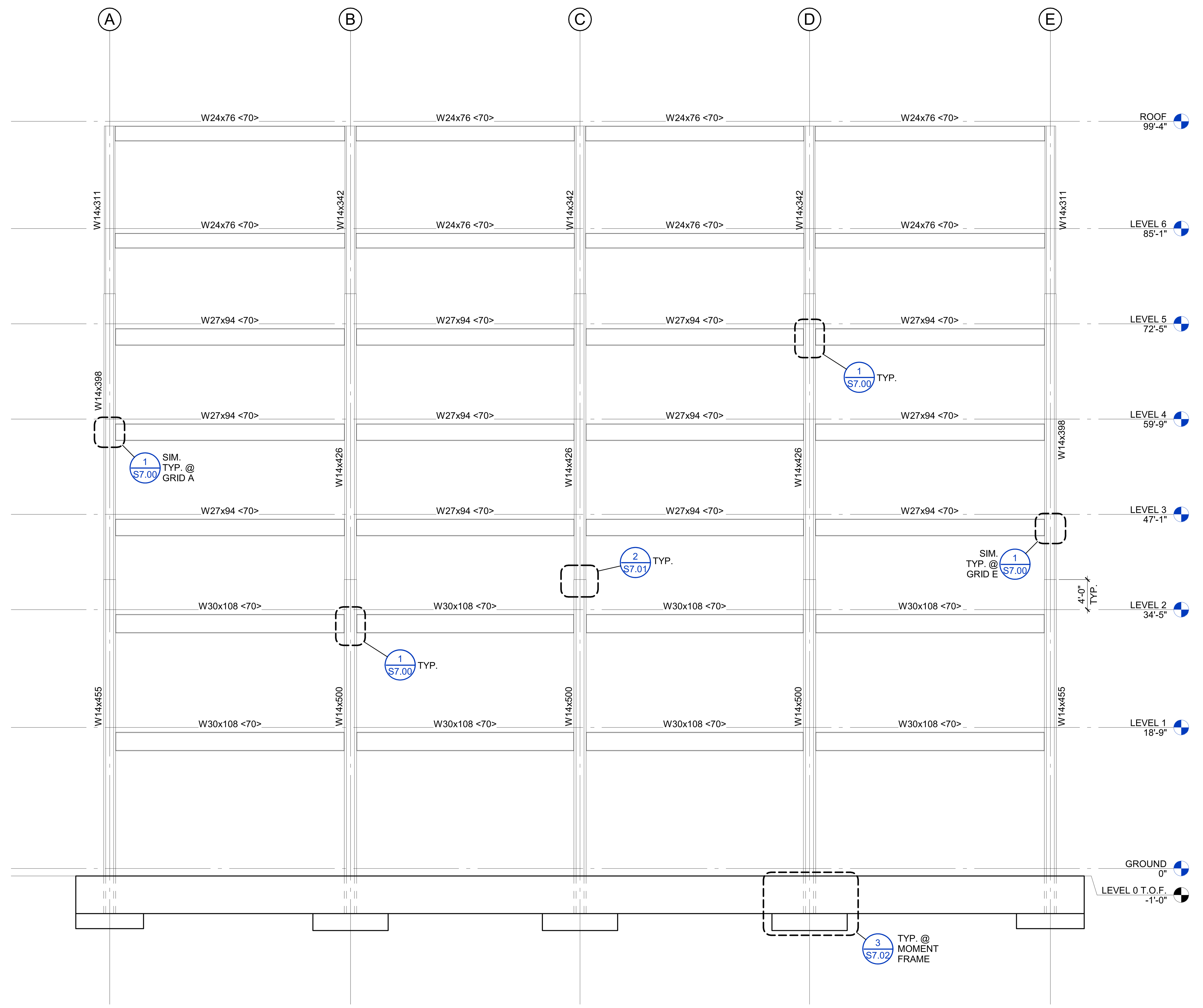

1 S6.02 MOMENT FRAME ELEVATION

1/8" = 1'-0"

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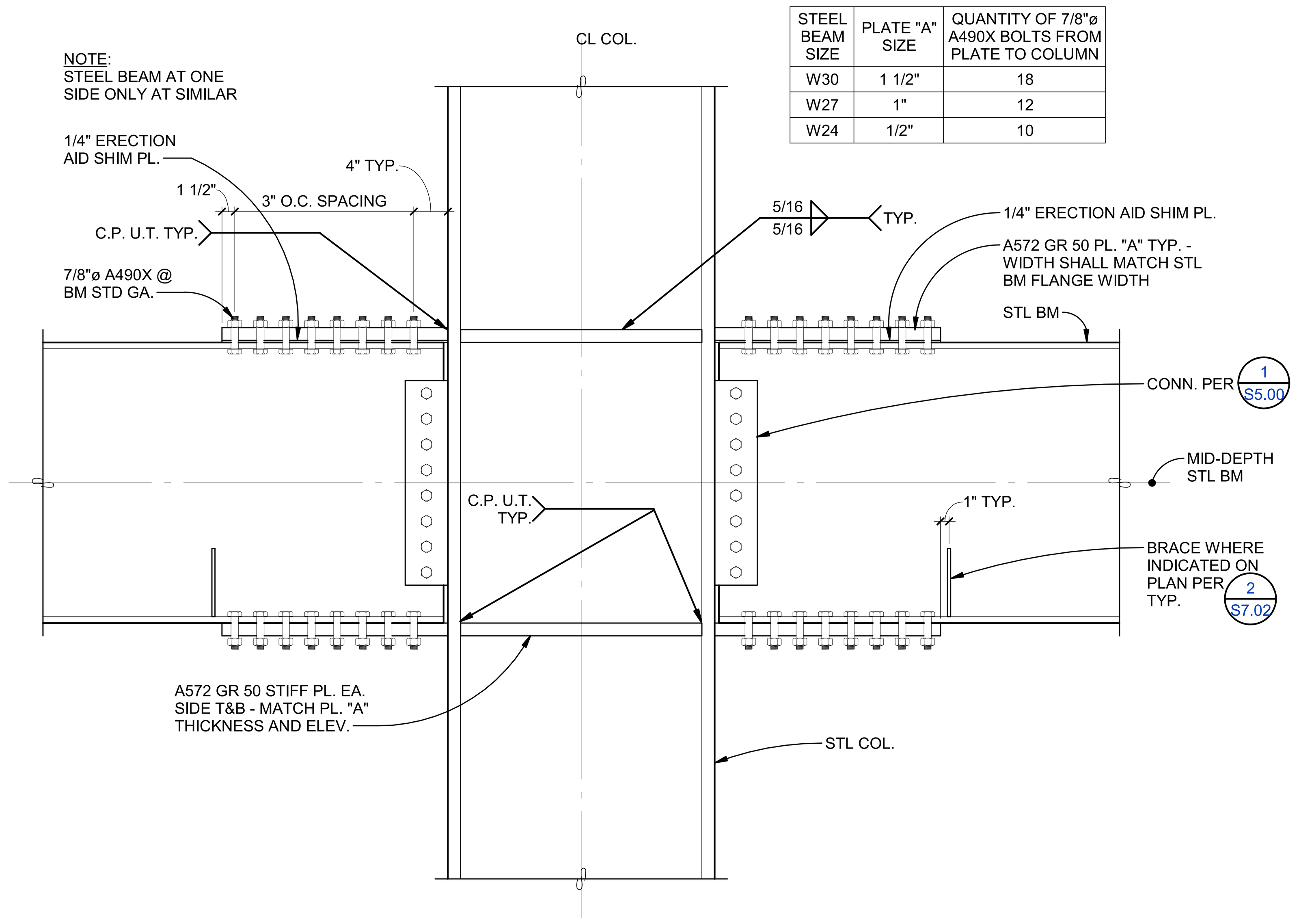
MOMENT FRAME ELEVATIONS

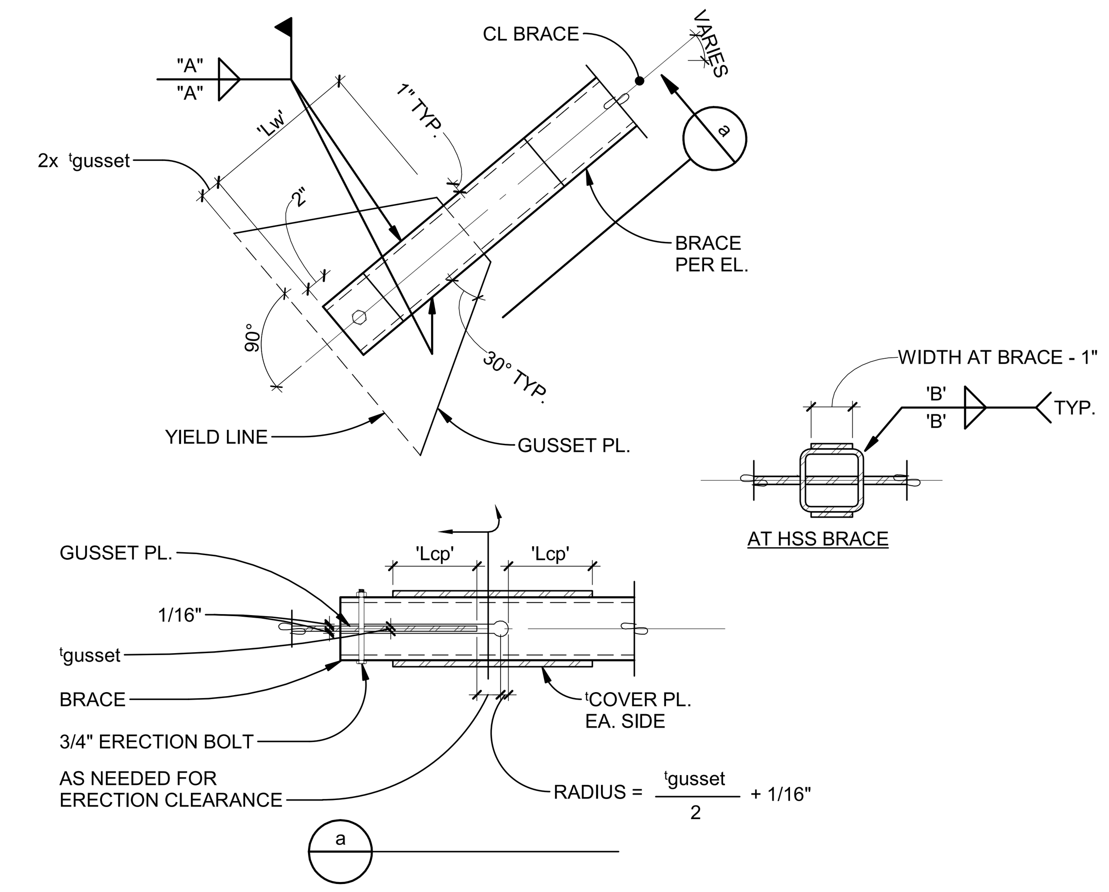
SHEET NUMBER

S6.02

STEEL BEAM SIZE	PLATE "A" SIZE	QUANTITY OF 7/8"ø A490X BOLTS FROM PLATE TO COLUMN
W30	1 1/2"	18
W27	1"	12
W24	1/2"	10



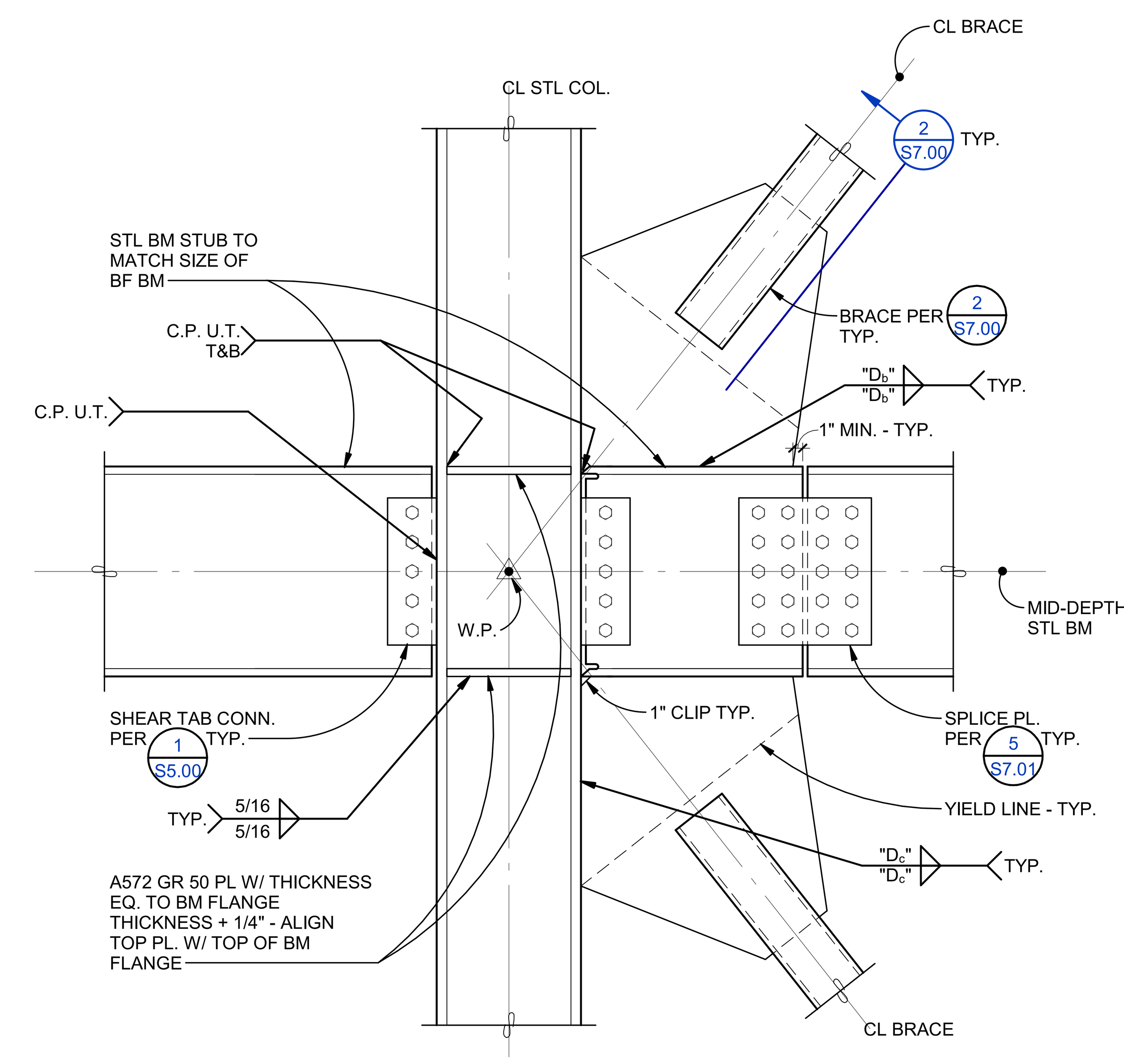
1 S7.00 DETAIL
NO SCALE



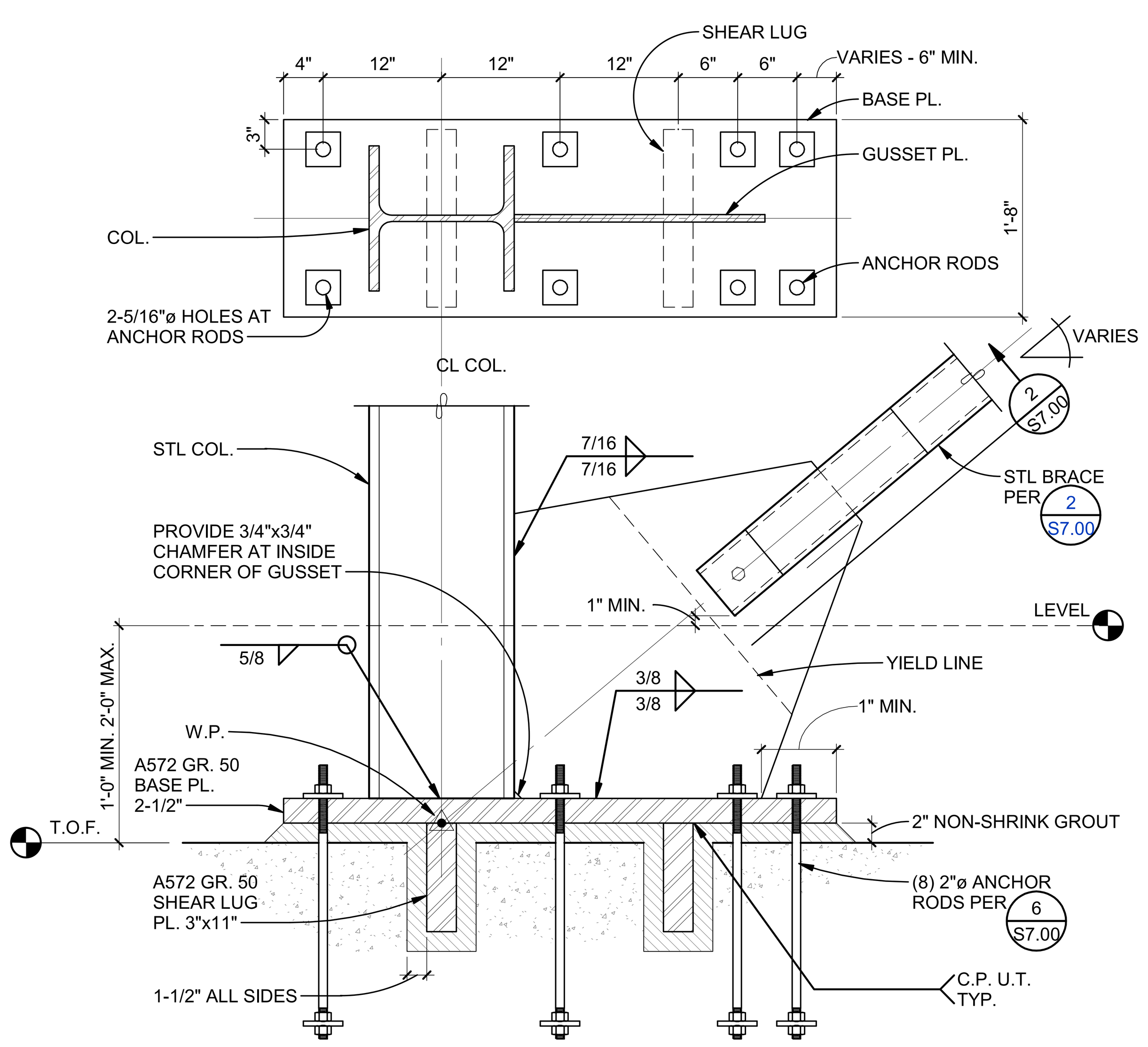
SCHEDULE								
BRACE SIZE	t_{gusset} (in)	"Lw" (in)	WELD 'A'	$t_{COVER\ PL.}$ (in)	'Lcp" (in)	WELD 'B'	"D_b"	"D_c"
HSS 5x5x3/8	3/4"	19"	5/16	3/8"	6"	5/16	7/16	1/2
HSS 6x6x1/2	7/8"	24"	5/16	1/2"	9"	3/8	1/2	1/2
HSS 6x6x5/8	1"	24"	3/8	1/2"	9"	3/8	9/16	9/16
HSS 7x7x1/2	1"	26"	3/8	1/2"	10"	3/8	9/16	9/16
HSS 8x8x5/8	1-1/4"	28"	7/16	1/2"	10"	7/16	9/16	5/8
HSS 9x9x5/8	1-1/2"	28"	1/2	5/8"	10"	1/2	7/8	7/8

PIPE BRACE TO GUSSET PLATE CONNECTION

2 S7.00 DETAIL
NO SCALE

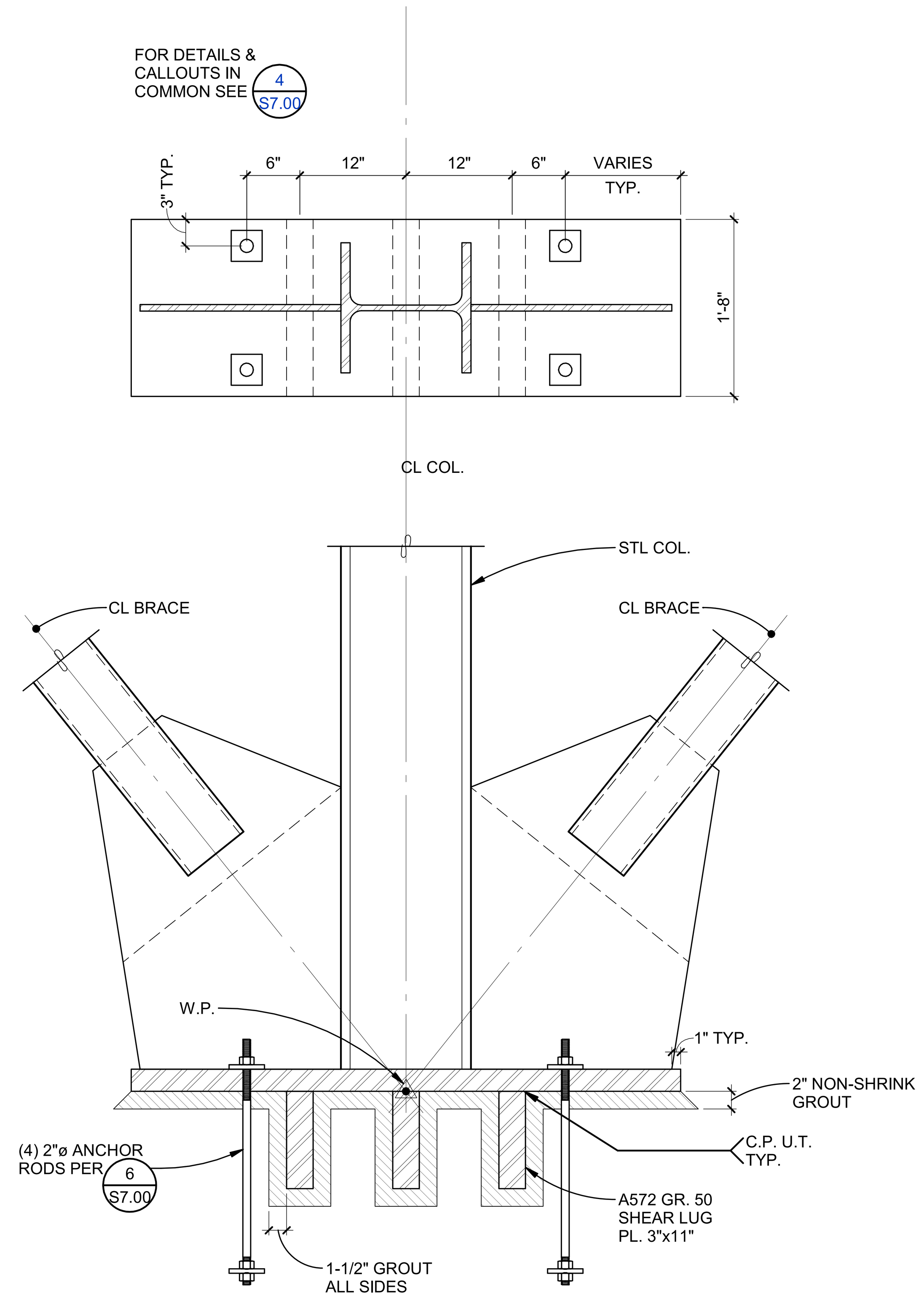


3 S7.00 DETAIL
NO SCALE



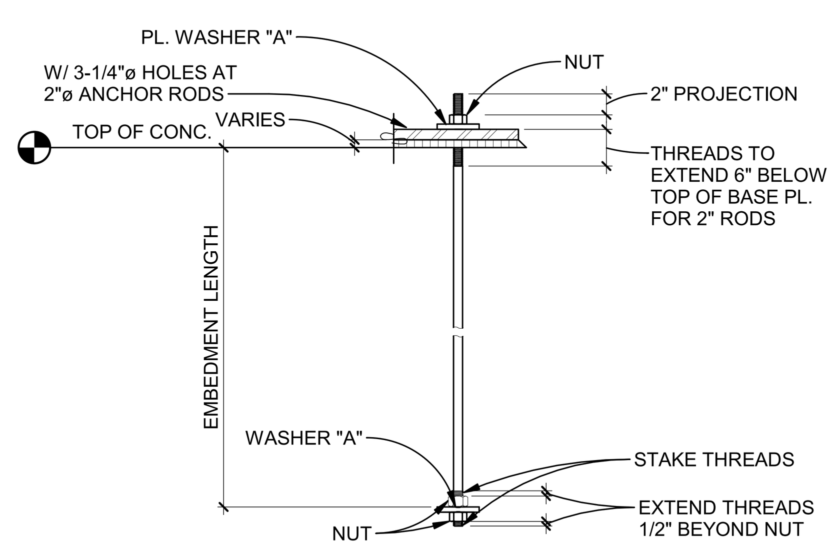
TYPICAL BASE PLATE AT BRACED FRAME

4 S7.00 SECTION
NO SCALE



5 S7.00 DETAIL
NO SCALE

ANCHOR ROD		WASHER		NUT
SIZE	MATERIAL	TYPE	SIZE	
2"ø	F1554 GRADE 105	A	PL. 3/4"x5"x0'-5" W/ 1 7/8"ø HOLE CENTERED	A563 GRADE A HEAVY HEX



TYPICAL ANCHOR ROD/BOLT DETAIL

6 S7.00 SECTION
NO SCALE

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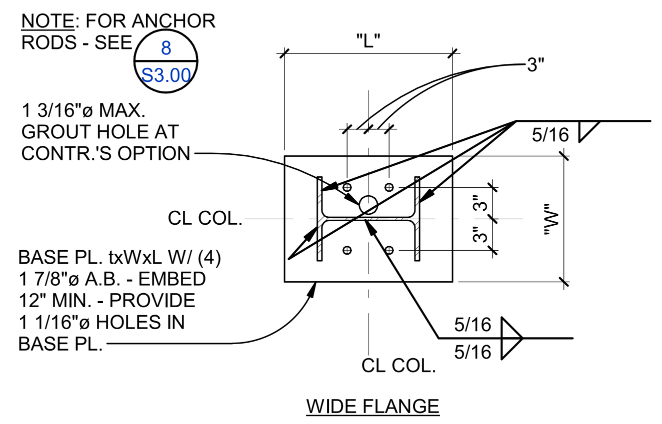
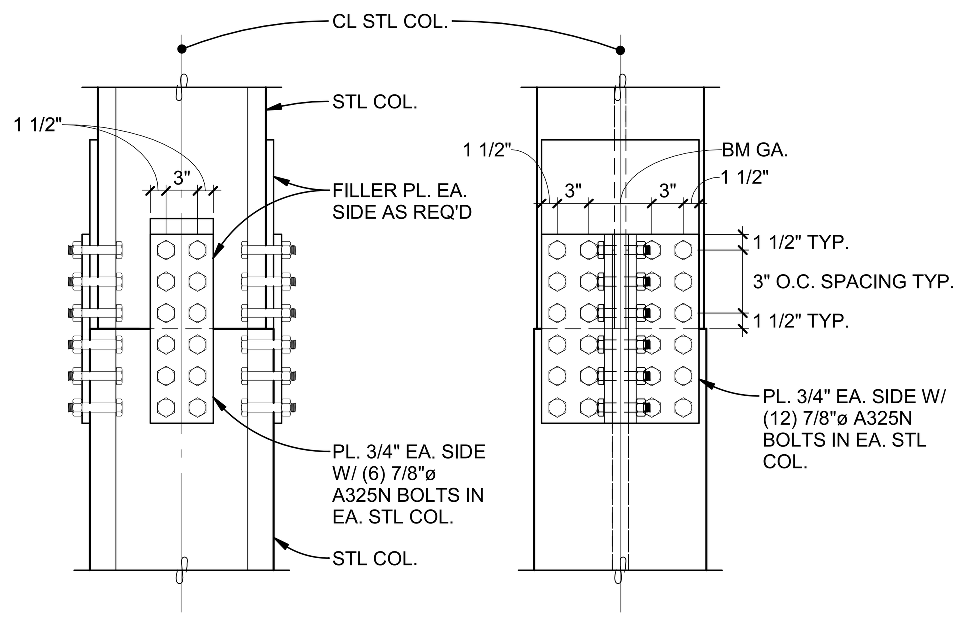


COLUMN SIZE	"W" (IN.)	"L" (IN.)	"t" (IN.)
W30x	19	34	2

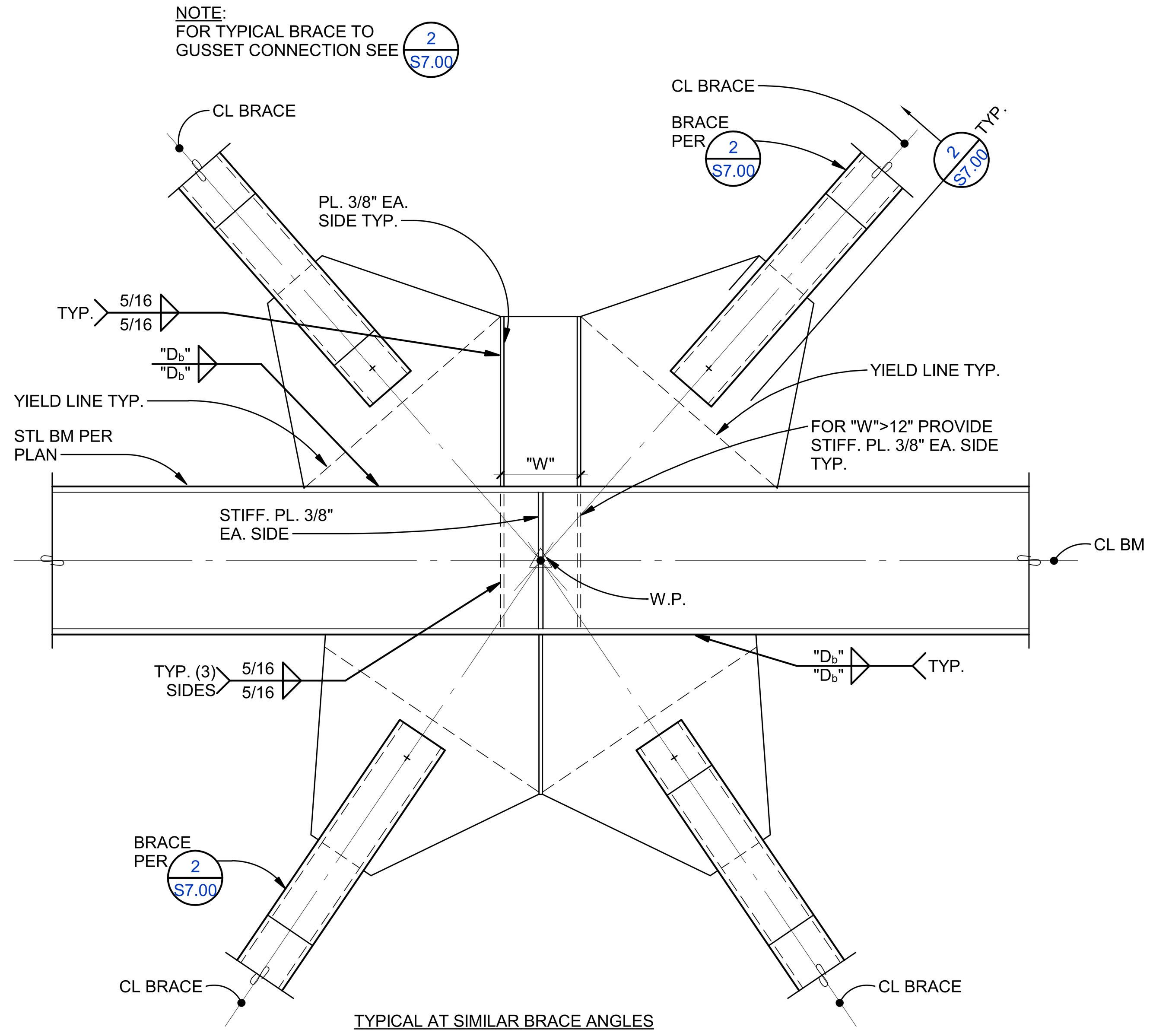
TYPICAL COLUMN BASE PLATE

1 S7.01 **SECTION**
NO SCALE



TYPICAL MOMENT FRAME COLUMN SPLICE

2 S7.01 **SECTION**
NO SCALE



3 S7.01 **SECTION**
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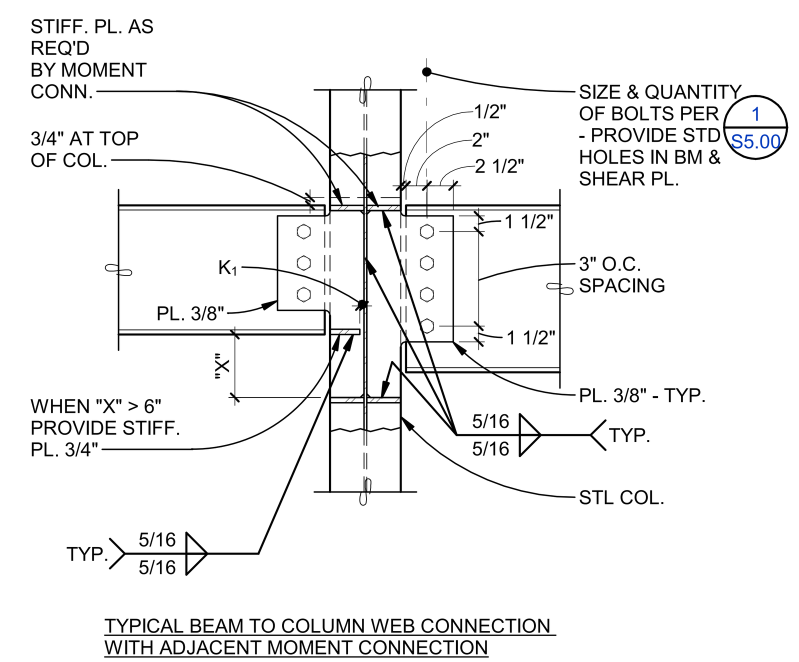
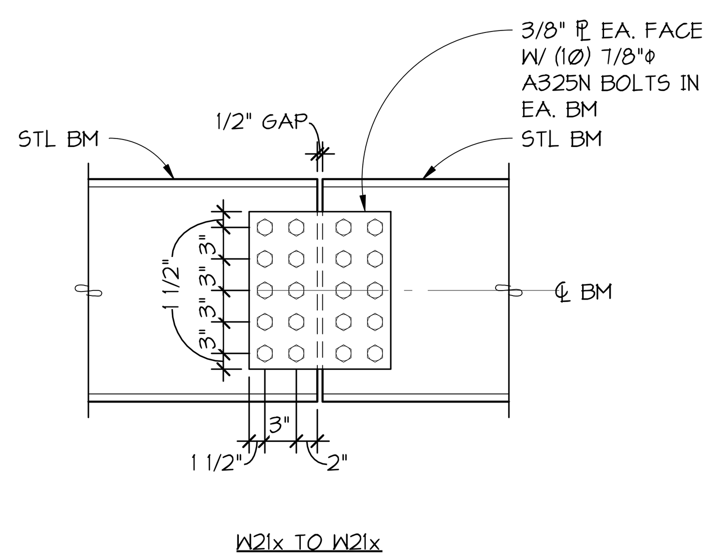
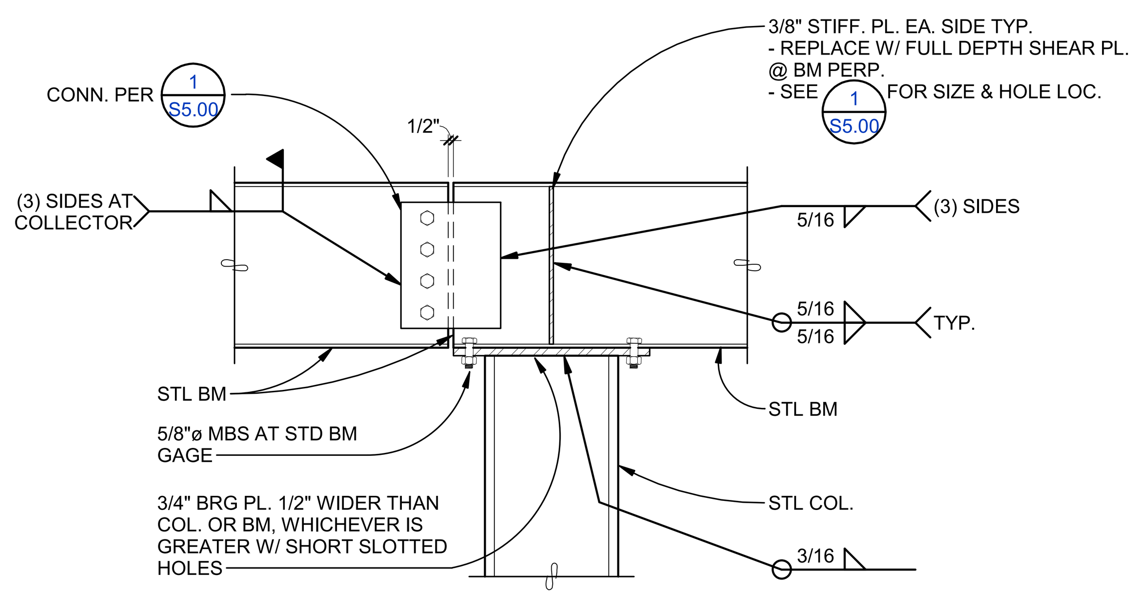


TYPICAL BEAM TO COLUMN WEB CONNECTION WITH ADJACENT MOMENT CONNECTION

4 S7.01 **DETAIL**
NO SCALE



5 S7.01 **DETAIL**
1" = 1'-0"



6 S7.01 **DETAIL**
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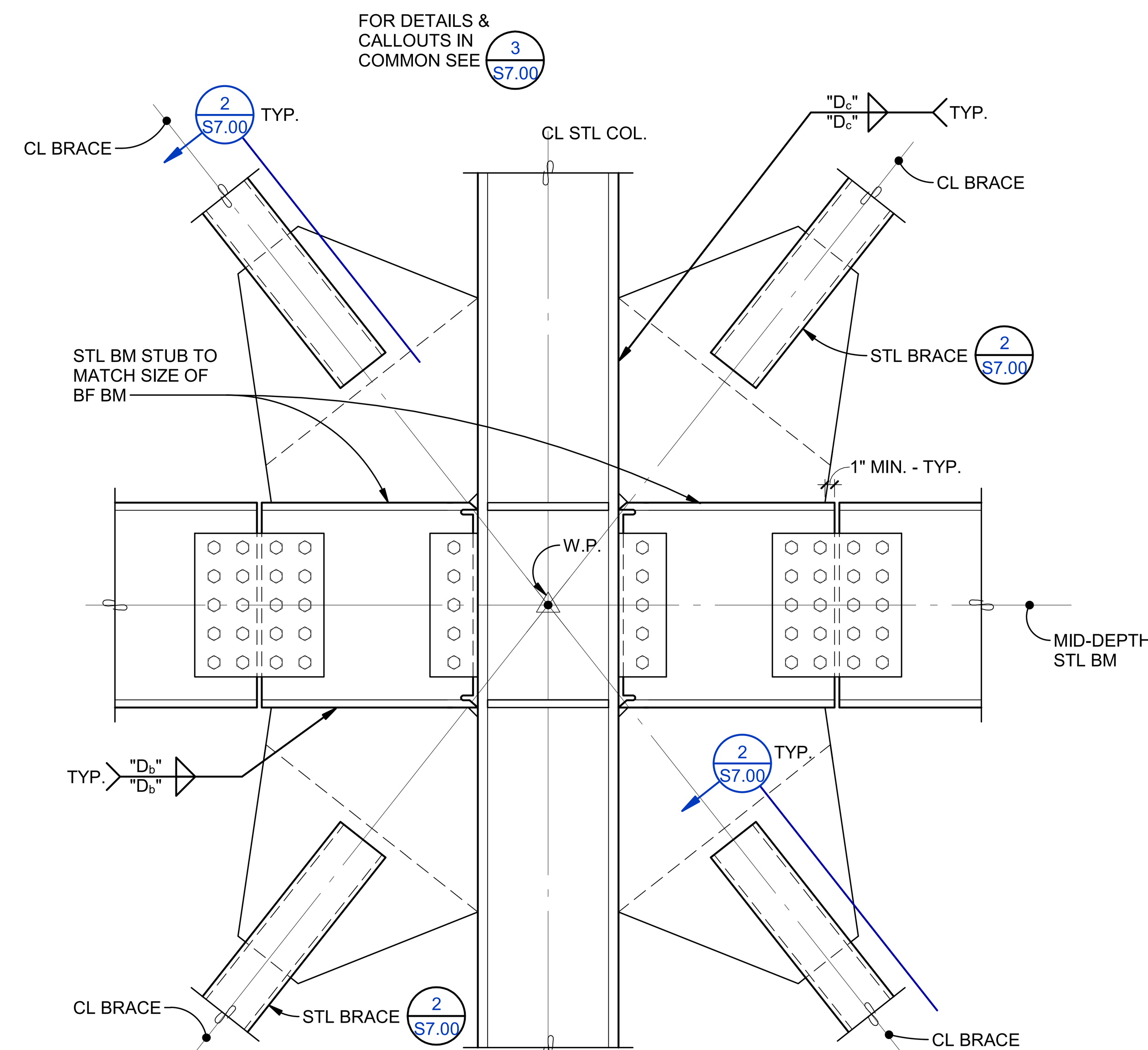

7 S7.01 **DETAIL**
NO SCALE

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FRAME DETAILS

SHEET NUMBER
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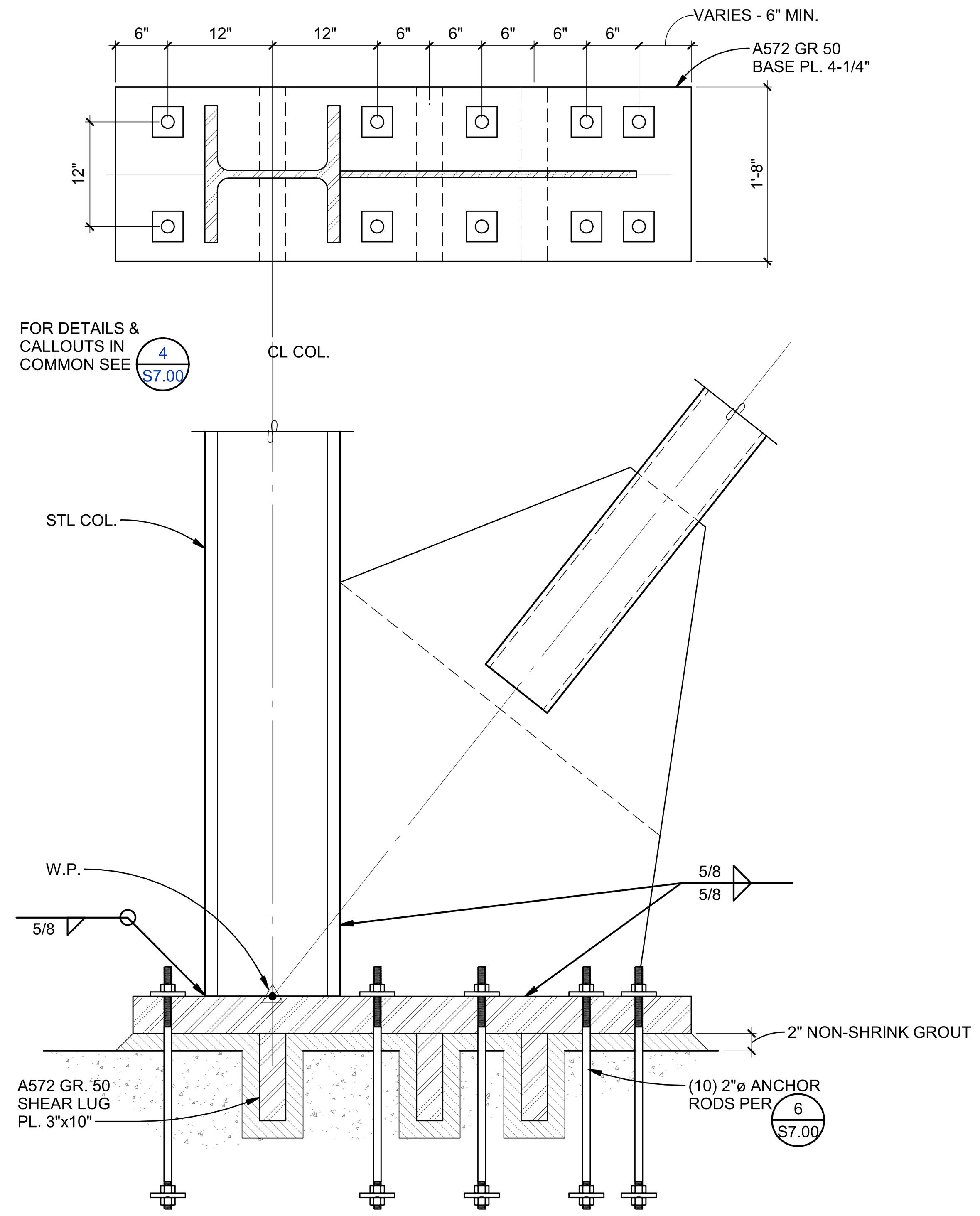
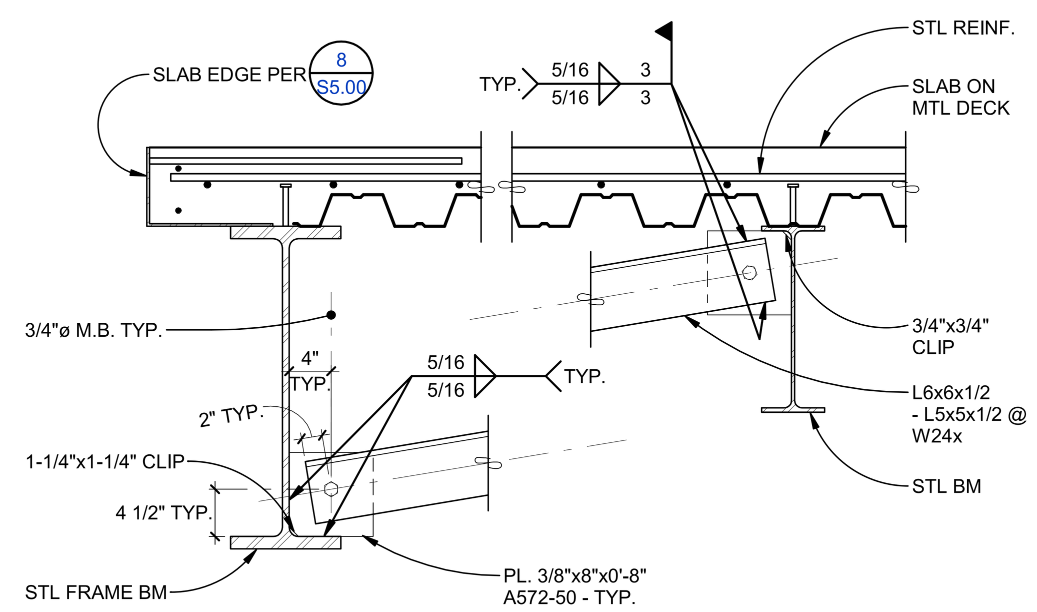
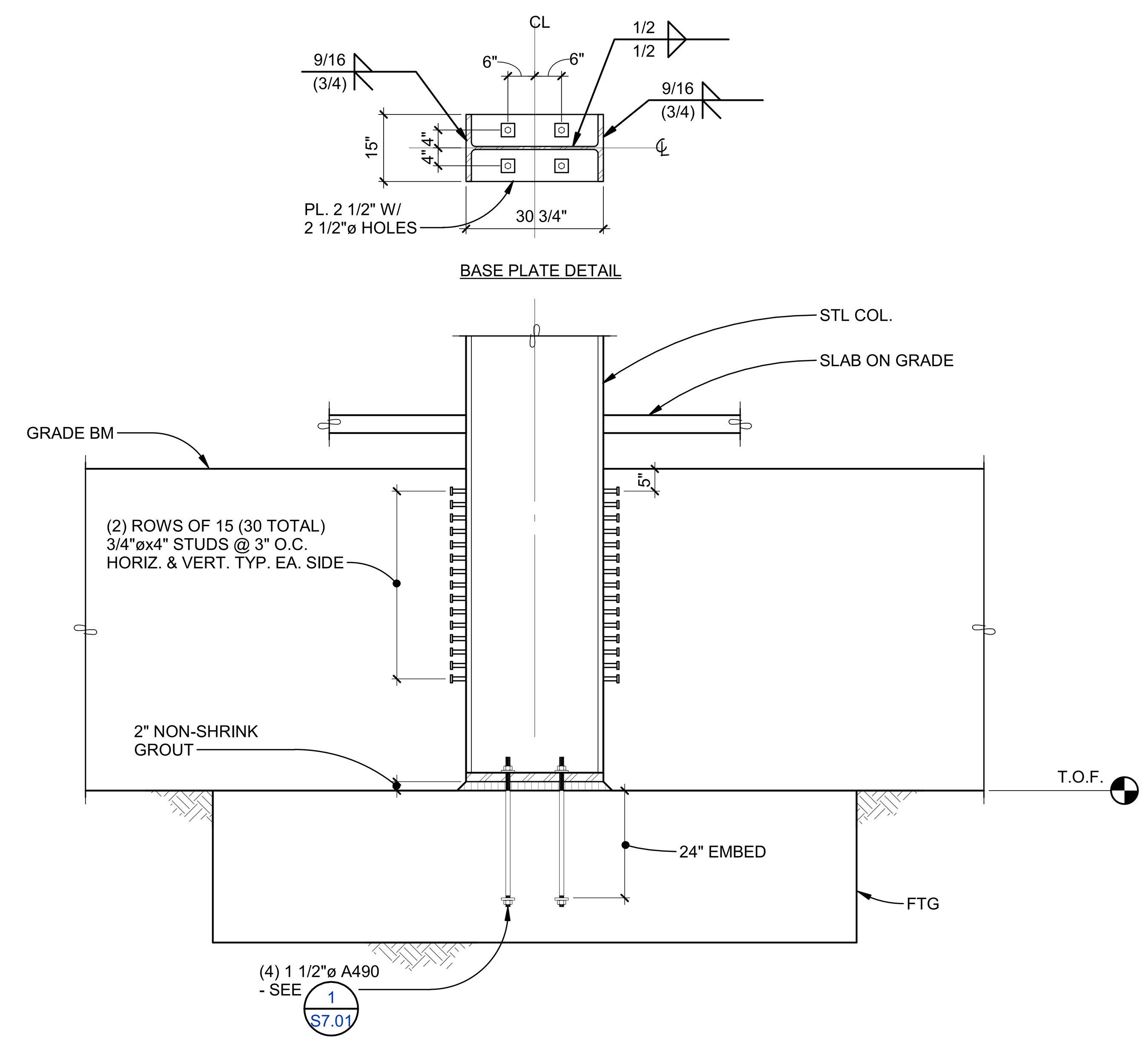


1 S7.02 DETAIL
NO SCALE

LATERAL CONNECTION LC2



2 S7.02 SECTION
1" = 1'-0"



3 S7.02 SECTION
1/2" = 1'-0"

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Approved	Approver

TITLE
FRAME DETAILS

SHEET NUMBER
S7.02

9/27/2021 9:48:50 AM
C:_Revit Models\BUILDING 2 - ATC BLDG 2 IBC 2018 SDC D RC4 v2020 (Central)_dhome@pcs-structural.com.rvt

Design Case F

2018 IBC
Risk Category IV
Seismic Design Category C

F.1 Gravity Design

The 7-story healthcare facility is a steel framed building with 3” metal deck and 4-1/2” of concrete topping providing a total slab depth of 7-1/2”, not including the structural steel framing. This decking was chosen to provide the required 2-hour fire rating that is typical for healthcare facilities. The columns and beams are ASTM A992 steel wide flange members and were designed using Load Resistance Factor Design (LRFD) procedures in accordance with AISC *Steel Construction Manual* 15th edition. The deflection was limited to 2018 IBC prescribed limits of *L*/480 for applied floor live loads, *L*/360 for applied floor total loads, *L*/360 for applied roof live loads, and *L*/240 for applied roof total loads.

The calculated total dead load applied was 95 psf at the floors and 100 psf at the roof. The increase of dead load at the roof is attributed to the theoretical mechanical units that are typically placed on the roof structure. The live loads chosen for the floors and roof were provided by 2018 IBC Table 1607.1. It should be noted that the 40 psf roof live load controlled the design over the calculated snow load per Chapter 7 of the ASCE/SEI 7-16.

F.2 Lateral Design

There were two separate lateral-force-resisting system designs for this project, a steel braced frame design for the lateral load resistance in the North/South direction and a steel moment frame design for the lateral load resistance in the East/West direction. Both systems utilize $R = 3.0$. The applied wind and seismic loads were determined using Chapters 27 and 12 respectively from the ASCE/SEI 7-16. The North/South design was seismic force controlled while the East/West design were wind force controlled. In both directions the eccentric loading, both calculated and required accidental, was included in determining the applied frame forces at each level.

The braced frames have a two-story X configuration and utilize ASTM A500 Gr. C tube steel braces. The braces are designed to resist the lateral forces applied to the members and no other considerations due to seismic detailing were included based upon the use of $R = 3.0$ parameters. At the foundations, the anchorage is designed to resist the uplift force due to overturning without and applied omega factor. The shear lugs are designed to resist the minimum of the applied shear forces without an applied omega factor.

The moment frames have been designed using bolted moment connections. These connections were chosen because this is the preferred method of moment frame construction in New York City. The design of the moment frame was controlled by the *L*/400 drift limit during a 50-year windstorm, or a wind speed of 90 mph. In order to meet this requirement without fixing the base of the columns, the column sizes were increased and the beams at the first and second level had to increase in size. The design of all the connections is required to resist moment and reaction due to the applied forces.

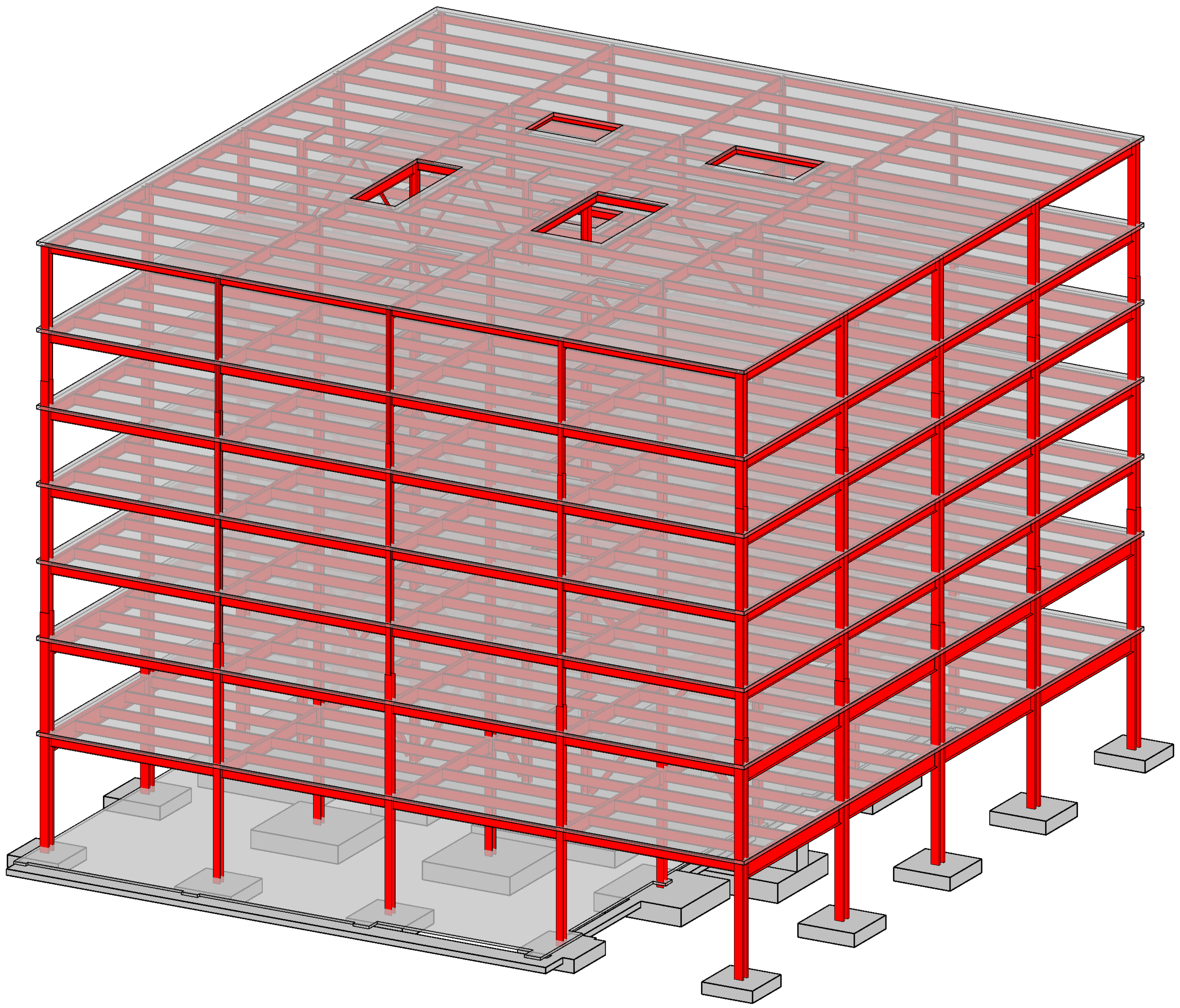
F.3 Steel Tonnage

Total steel tonnage for this design case is calculated as 848 tons.

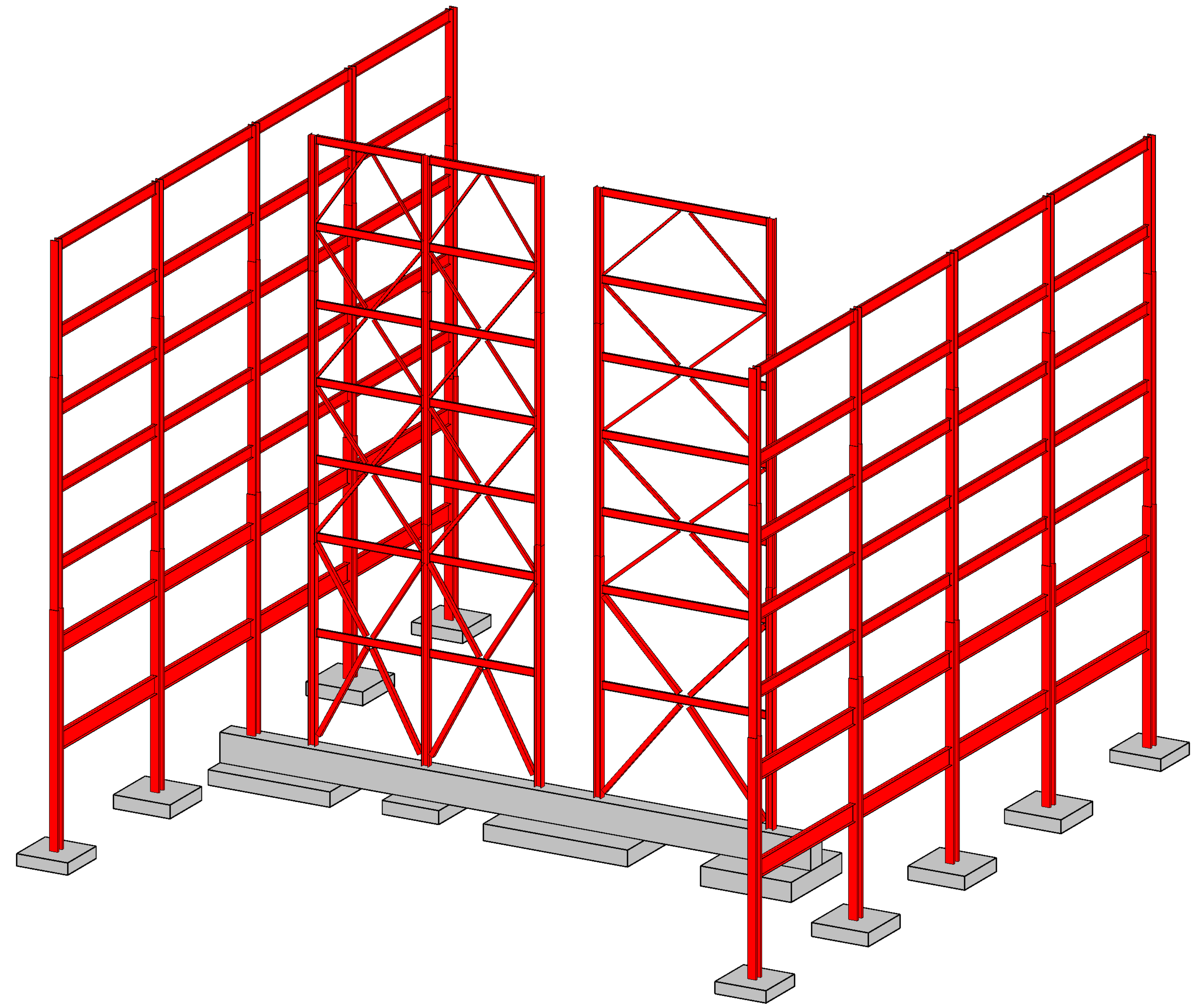
F.4 Structural Drawings

Structural drawings for Design Case F are provided on the following pages.

HEALTHCARE FACILITY - LONG ISLAND, NEW YORK
DESIGN F - 2018 IBC RISK CATEGORY IV



OVERALL FRAMING 3D VIEW



LATERAL FORCE RESISTING SYSTEM 3D VIEW

DESIGN F: 2018 IBC "RISK CATEGORY IV"	
HEALTHCARE FACILITY, LONG ISLAND, NEW YORK	
ITEM	QUANTITY
WF COLUMNS (Fy = 50 KSI)	57 TONS
WF GIRDERS AND JOISTS (Fy = 50 KSI)	403 TONS
MOMENT FRAME WF COLUMNS (Fy = 50 KSI)	268 TONS
MOMENT FRAME WF BEAMS (Fy = 50 KSI)	71 TONS
BRACED FRAME WF COLUMNS (Fy = 50 KSI)	27 TONS
BRACED FRAME WF BEAMS (Fy = 50 KSI)	8 TONS
HSS BRACES (Fy = 50 KSI)	14 TONS
TOTAL	848 TONS

1. STEEL QUANTITIES DO NOT INCLUDE MISCELLANEOUS STEEL, CUT WASTE STEEL, STAIRS, TYPICAL STEEL FRAMING CONNECTIONS, ETC.
2. ON PLANS " ▶ " INDICATES GRAVITY MOMENT CONNECTION WITH (CJP) WELDS AT FLANGES.

DRAWING INDEX

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PROJECT
HEALTHCARE FACILITY
LONG ISLAND, NEW YORK
PCS STRUCTURAL SOLUTIONS
DESIGN F
2018 IBC WITH RISK CATEGORY IV

This publication is available free of charge from: https://doi.org/10.6028/NIST.GCR.21-917-48v2A

DRAWINGS
30 SEPTEMBER, 2021

Job Number	19-051
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TITLE
COVER SHEET

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S0.00

GENERAL NOTES

STANDARDS
THE DESIGN AND MATERIALS SHALL CONFORM TO THE 2018 INTERNATIONAL BUILDING CODE (IBC) AS AMENDED AND ADOPTED BY THE LOCAL BUILDING OFFICIAL OR APPLICABLE JURISDICTION.

STRUCTURAL DRAWINGS PRIMARY STRUCTURAL ELEMENTS ARE DIMENSIONED ON STRUCTURAL PLANS AND DETAILS AND OVERALL LAYOUT OF STRUCTURAL PORTION OF WORK.

PROJECT LOCATION

LONG ISLAND, NEW YORK

40.6471 LATITUDE, -73.5642 LONGITUDE

DESIGN CRITERIA

VERTICAL LOADS

AREA	DESIGN DEAD LOAD	LIVE LOAD (2)	PARTITION LOAD	CONCENTRATED LOADS
OPERATING ROOMS	95 PSF	60 PSF	15 PSF	1000#
PRIVATE ROOMS	95 PSF	40 PSF	15 PSF	1000#
CORRIDORS ABOVE 1ST FLOOR	95 PSF	80 PSF	15 PSF	1000#
ROOF	100 PSF	40 PSF	-	-

(1) DRIFT AND UNBALANCED SNOW LOAD PER ASCE 7-16, CHAPTER 7.
(2) LIVE LOADS EXCEPT SNOW LOADS ARE REDUCED PER IBC SECTION 1607.11.

SNOW: (MINIMUM ROOF SNOW LOAD = 25 PSF)

Pg = 20 PSF = GROUND SNOW LOAD
Pf = 0.7CeCtIsPg = FLAT ROOF SNOW LOAD
Ps = CsPf = SLOPED ROOF SNOW LOAD
Is = 1.10 Ce = 1.0, Ct = 1.0, Cs = VARIES

VIBRATION DESIGN CRITERIA:

VIBRATION CONSIDERATIONS WERE DESIGNED PER THE RECOMMENDATIONS IN THE GUIDELINES FOR DESIGN AND CONSTRUCTION OF HOSPITALS AND OUTPATIENT FACILITIES. FOR PATIENT ROOM FLOORS A VIBRATION VELOCITY LIMIT OF 6,000 MICRO INCHES PER SECOND WAS EVALUATED AT A WALKING SPEED OF 75 STEPS PER MINUTE.

LATERAL FORCES

LATERAL FORCES ARE TRANSMITTED BY DIAPHRAGM ACTION OF ROOF AND FLOORS TO BRACED FRAME/MOMENT FRAME. LOADS ARE THEN TRANSFERRED TO FOUNDATION BY BRACED FRAME/MOMENT FRAME ACTION WHERE ULTIMATE DISPLACEMENT IS RESISTED BY PASSIVE PRESSURE OF EARTH AND/OR SLIDING FRICTION. OVERTURNING IS RESISTED BY DEAD LOAD OF THE STRUCTURE.

WIND:

THE BUILDING MEETS THE CRITERIA TO USE THE "ENCLOSED, PARTIALLY ENCLOSED, AND OPEN BUILDING OF ALL HEIGHTS PROCEDURE" PER ASCE 7-16.

- EXPOSURE CATEGORY = B
- BASIC WIND SPEED, (3 SEC. GUST), V_{ULT} = 137 MPH; V_{ASD} = 99 MPH
- RISK CATEGORY PER IBC TABLE 1604.5 = IV
- TOPOGRAPHIC FACTOR K_{ZT} = 1.0
- INTERNAL PRESSURE COEFFICIENT (ENCLOSED) = ± 0.18
- DESIGN WIND BASE SHEAR = 477 KIPS
- SEE THE FOLLOWING SCHEDULES FOR COMPONENTS AND CLADDING WIND PRESSURES

ROOF SURFACES [1]

EFFECTIVE WIND AREA	POSITIVE PRESSURES (PSF)			NEGATIVE PRESSURES (PSF)		
	ZONE [2]					
	1	2	3	1	2	3
10 SF	19.6	19.6	19.6	-64.7	-101.6	-138.6
20 SF	19.6	19.3	18.6	-62.1	-97.6	-133.0
50 SF	19.6	18.8	17.3	-59.6	-93.5	-127.0
100 SF	19.6	18.5	16.1	-57.0	-89.4	-121.8

WALL SURFACES AND ROOF OVERHANGS [1]

EFFECTIVE WIND AREA	POSITIVE PRESSURE (PSF)		NEGATIVE PRESSURE (PSF)	
	ZONE [2]			
	4	5	4	5
10 SF	48.4	48.4	-52.4	-81.2
20 SF	46.5	45.0	-49.9	-77.1
50 SF	44.4	40.6	-46.2	-71.5
100 SF	42.5	36.8	-43.0	-66.5
500 SF	38.7	29.0	-36.8	-56.8

1. VALUES SHOWN IN TABLE ARE GROSS ULTIMATE WIND PRESSURES.
2. ZONES ARE AS DEFINED BY TABLE 30.6-2 IN ASCE 7-16.

SEISMIC: (ASCE 7-16) V = CsW

WHERE $Cs = \frac{S_{DS}}{\left(\frac{R}{I_e}\right)}$; WITH

$Cs\ MINIMUM = 0.044\ S_{DS} I_E \geq 0.01$

OR

$Cs\ MINIMUM = \frac{0.5S_1}{\frac{R}{I_e}}$ FOR $S_1 > 0.6g$

$Cs\ MAXIMUM = \frac{S_{D1}}{T\left(\frac{R}{I_e}\right)}$ FOR $T \leq T_L$

OR

$Cs\ MAXIMUM = \frac{S_{D1}T_L}{T^2\left(\frac{R}{I_e}\right)}$ FOR $T > T_L$

SEISMIC IMPORTANCE FACTOR, I_e = 1.50
RISK CATEGORY OF BUILDING PER IBC TABLE 1604.5 = IV
SPECTRAL RESPONSE ACCELERATIONS S_S = 0.245 & S_1 = 0.055
SITE CLASS PER TABLE 20.3-1 = D
DESIGN SPECTRAL RESPONSE ACCELERATIONS S_{DS} = 0.261 & S_{D1} = 0.088
SEISMIC DESIGN CATEGORY = B
W = EFFECTIVE SEISMIC WEIGHT OF BUILDING = 11410 KIPS
ANALYSIS PROCEDURE USED = EQUIVALENT LATERAL FORCE PROCEDURE
RESPONSE MODIFICATION FACTOR PER TABLE 12.2-1, R = 3.0
Cs = 0.131
Cs max = 0.038 AT MOMENT FRAMES, 0.07 AT BRACED FRAMES
DESIGN BASE SHEAR V = 440 KIPS AT MOMENT FRAMES, 797 KIPS AT BRACED FRAMES

FOUNDATION DESIGN CRITERIA

SOIL BEARING PRESSURE: 6000 PSF (ASSUMED)*

ACTIVE PRESSURE - RESTRAINED: 50 PCF +14H SEISMIC SURCHARGE (ASSUMED)
ACTIVE PRESSURE - UNRESTRAINED: 35 PCF +6H SEISMIC SURCHARGE (ASSUMED)
PASSIVE RESISTANCE: 200 PCF (INCLUDES F.O.S. ≥ 1.5) (ASSUMED)
COEFFICIENT OF FRICTION: .35 (INCLUDES F.O.S. ≥ 1.5) (ASSUMED)
*1/3 INCREASE ALLOWED FOR SEISMIC OR WIND LOADING

CONCRETE

ITEM	DESIGN f'c (PSI) (AT 28 DAYS U.N.O.)
SLABS ON GRADE - UNO	4000
FOUNDATIONS - UNO	3000
STEM WALLS AND OTHER WALLS - UNO	4000
ELEVATED DECKS, TOPPING SLABS, AND SLABS ON METAL	5000

REINFORCING STEEL

REINFORCING STEEL SHALL CONFORM TO:

ASTM A615, GRADE 60 TYPICAL UNLESS NOTED OTHERWISE.

REINFORCING SPLICE AND DEVELOPMENT LENGTH SCHEDULE, Fy=60 KSI (UNLESS NOTED OTHERWISE)

BAR SIZE	MINIMUM LAP SPLICE LENGTHS ("Ls")	MINIMUM DEVELOPMENT LENGTHS ("Ld")
#3	1'-6"	1'-3"
#4	2'-0"	1'-7"
#5	2'-7"	2'-0"
#6	3'-1"	2'-4"
#7	4'-6"	3'-6"
#8	5'-2"	3'-11"
#9	5'-10"	4'-6"
#10	6'-6"	5'-0"

STRUCTURAL STEEL

MATERIAL PROPERTIES

WIDE FLANGE SECTIONS: ASTM A992 (Fy = 50 KSI)

OTHER SHAPES AND PLATES: ASTM A36 (Fy = 36 KSI) TYP. U.N.O.; ASTM A572 (Fy = 50 KSI) WHERE INDICATED

HOLLOW STRUCTURAL SECTIONS: RECTANGULAR & SQUARE - ASTM A500, GRADE C (Fy = 50 KSI)

MACHINE BOLTS (M.B.): ASTM A307, GRADE A

HIGH-STRENGTH BOLTS: A325-ASTM F1852, A490-ASTM F2280

ANCHOR BOLTS (A.B.): ASTM F1554, GRADE 36, UNLESS OTHERWISE NOTED, ASTM F1554, GRADE 105 WHERE INDICATED.

WIDE FLANGE STRUCTURAL MEMBERS WHICH ARE ASTM A6 GROUP 3 SHAPES WITH FLANGE THICKNESS 1-1/2" THICK AND THICKER, AND ALL ASTM A6 GROUP 4 AND 5 SHAPES AND PLATE THAT IS 1-1/2" THICK OR THICKER SHALL HAVE A CHARPY V-NOTCH (CVN) TOUGHNESS OF 20 FT-LBS @ 70 DEG F.

GENERAL REQUIREMENTS

HIGH-STRENGTH BOLTS: ALL A325 HIGH-STRENGTH BOLTS (HSB) SHALL BE ASTM F3125, GRADE F1852, UNLESS OTHERWISE DESIGNATED AS A490. ALL HSB DESIGNATED AS A490 SHALL BE ASTM F3125, GRADE F2280. ALL HSB SHALL BE BY "LEJEUNE BOLT COMPANY" OR PRE-APPROVED EQUAL AND SHALL BE INSTALLED PER SECTION 8.2 OF THE "SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH STRENGTH BOLTS", AUGUST 2014 BY THE RESEARCH COUNCIL ON STRUCTURAL CONNECTIONS (RCSC SPECIFICATION). ALL BOLT HOLES SHALL BE STANDARD ROUND HOLES UNLESS NOTED OTHERWISE. THE FAYING SURFACES OF ALL PLIES WITHIN THE GRIP OF SLIP-CRITICAL BOLTS (A325SC OR A490SC) SHALL MEET THE REQUIREMENTS FOR A CLASS A SURFACE PER SECTION 3.2 OF THE RCSC SPECIFICATION.

HEADED STUDS: SHALL BE "S3L SHEAR CONNECTORS" FOR STUDS 3/4" DIAMETER AND LARGER AS MANUFACTURED BY NELSON STUD WELDING, INC. OR PRE-APPROVED EQUAL AND SHALL CONFORM TO AWS D1.1.

COMPOSITE FLOOR DECK: SHALL CONTAIN THE MINIMUM PROPERTIES SHOWN ON THE STRUCTURAL DRAWINGS AND SHALL BE "FORMLOK" AS MANUFACTURED BY VERCO MANUFACTURING CO., "W COMPOSITE" AS MANUFACTURED BY ASC STEEL DECK, "EPICORE" AS MANUFACTURED BY EPIC METALS, OR PRE-APPROVED EQUAL. THE FLOOR UNITS SHALL BE FORMED FROM STEEL SHEETS CONFORMING TO ASTM A653, AND GALVANIZED PER ASTM A924.

ABBREVIATION LIST

@	AT	HSS	HOLLOW STRUCTURAL SECTION
A.B.	ANCHOR BOLT	HT	HEIGHT
ADD'L	ADDITIONAL	INT.	INTERIOR
ALT.	ALTERNATE	JST	JOIST
BLD'G	BUILDING	JT	JOINT
BM	BEAM	L	ANGLE
B.O.F.	BOTTOM OF FOOTING	L.F.R.S.	LATERAL FORCE-RESISTING SYSTEM
BOT.	BOTTOM	L.L.	LIVE LOAD
BRG	BEARING	LLH	LONG LEG HORIZONTAL
BTWN	BETWEEN	LLV	LONG LEG VERTICAL
(C=)	CAMBER	LOC.	LOCATION
CANT.	CANTILEVER	MAX.	MAXIMUM
C.J.	CONTROL/CONSTRUCTION JOINT	M.B.	MACHINE BOLT
CL	CENTERLINE	MFR	MANUFACTURER
CLR.	CLEARANCE	MIN.	MINIMUM
COL.	COLUMN	MISC.	MISCELLANEOUS
CONC.	CONCRETE	MTL	METAL
CONN.	CONNECTION	N.F.	NEAR FACE
CONST.	CONSTRUCTION	N.S.	NEAR SIDE
CONT.	CONTINUOUS	NTS	NOT TO SCALE
COORD.	COORDINATE	O.C.	ON CENTER
C.P.	COMPLETE PENETRATION	OPN'G	OPENING
CTR'D	CENTERED	OPP.	OPPOSITE
C.Y.	CUBIC YARD	PERP.	PERPENDICULAR
DBL.	DOUBLE	PL	PLATE
DCW	DEMAND CRITICAL WELD	P.P.	PARTIAL PENETRATION
DIA. OR ø	DIAMETER	P.S.F.	POUNDS PER SQUARE FOOT
DIAG.	DIAGONAL	REINF.	REINFORCING
DIM.	DIMENSION	REQ'D	REQUIRED
D.L.	DEAD LOAD	SCHED.	SCHEDULE
DWG	DRAWING	SIM.	SIMILAR
DWL	DOWEL	S.O.G.	SLAB ON GRADE
EA.	EACH	SQ.	SQUARE
E.F.	EACH FACE	STD	STANDARD
EL.	ELEVATION	STIFF.	STIFFENER
ENGR.	ENGINEER	STL	STEEL
EQ.	EQUAL	STRUCT.	STRUCTURAL
E.W.	EACH WAY	T&B	TOP & BOTTOM
EXP.	EXPANSION	THR'D	THREADED
EXT.	EXTERIOR	T.O.F.	TOP OF FOOTING
FDN	FOUNDATION	T.O.S.	TOP OF STEEL
F.F.	FAR FACE	TYP.	TYPICAL
FLR	FLOOR	U.N.O.	UNLESS NOTED OTHERWISE
FRM'G	FRAMING	U.T.	ULTRASONIC TESTED
F.S.	FAR SIDE	VERT.	VERTICAL
FTG	FOOTING	W/	WITH
GA.	GAGE/GAUGE	W.P.	WORK POINT
GALV.	GALVANIZED	WT	WEIGHT
GR.	GRADE	W.W.R.	WELDED WIRE REINFORCING
HORIZ.	HORIZONTAL		

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PCS STRUCTURAL SOLUTIONS
DESIGN F
2018 IBC WITH RISK CATEGORY IV

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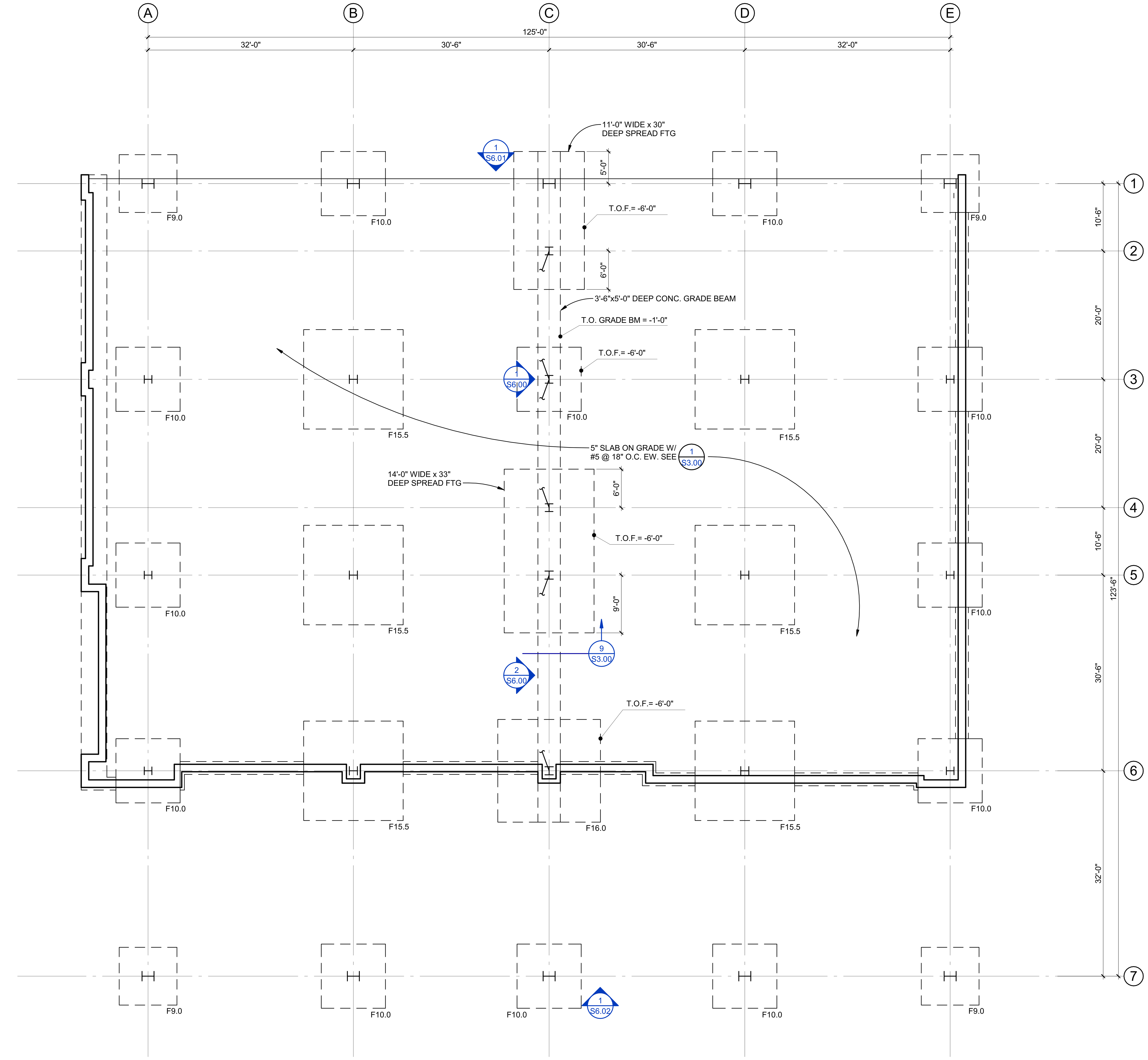
TITLE
GENERAL NOTES

SHEET NUMBER
S0.01



NORTH

1 S2.00 FOUNDATION AND GRADE LEVEL FRAMING PLAN

1/8" = 1'-0"

FOUNDATION NOTES

1. INDICATES EXTERIOR WALL.
2. INDICATES CONTINUOUS CONCRETE WALL FOOTING. FOR TYPICAL FOOTING AND FOUNDATION WALL DETAILS SEE SHEET S3.00. FOOTING WIDTH ("W") = 2'-0" UNLESS NOTED OTHERWISE ON PLAN. CENTER FOOTINGS ON CONCRETE STEM WALL.
3. "F_" INDICATES CONCRETE SPREAD FOOTING. FOR SCHEDULE SEE 5/S3.00.
4. INDICATES BRACED FRAME. FOR ELEVATIONS, BRACE SIZES AND DETAIL CALLOUTS SEE SHEET S6.00.
5. INDICATES STEEL COLUMNS ORIGINATING AT FOUNDATION LEVEL. ALL COLUMNS ARE CONTINUOUS TO ROOF UNLESS NOTED OTHERWISE. FOR TYPICAL ANCHOR ROD/BOLT DETAIL SEE 7/S3.00. FOR COLUMN SCHEDULE SEE S4.00.
6. FOR TYPICAL FOUNDATION AND CONCRETE SLAB-ON-GRADE DETAILS SEE SHEET S3.00.
7. TOP OF FOOTING ELEVATIONS = -1'-0" UNLESS NOTED OTHERWISE ON PLANS AND DETAILS.
8. INDICATES MOMENT FRAME. FOR ELEVATIONS, MEMBER SIZES AND DETAIL CALLOUTS SEE SHEETS S6.01 AND S6.02.

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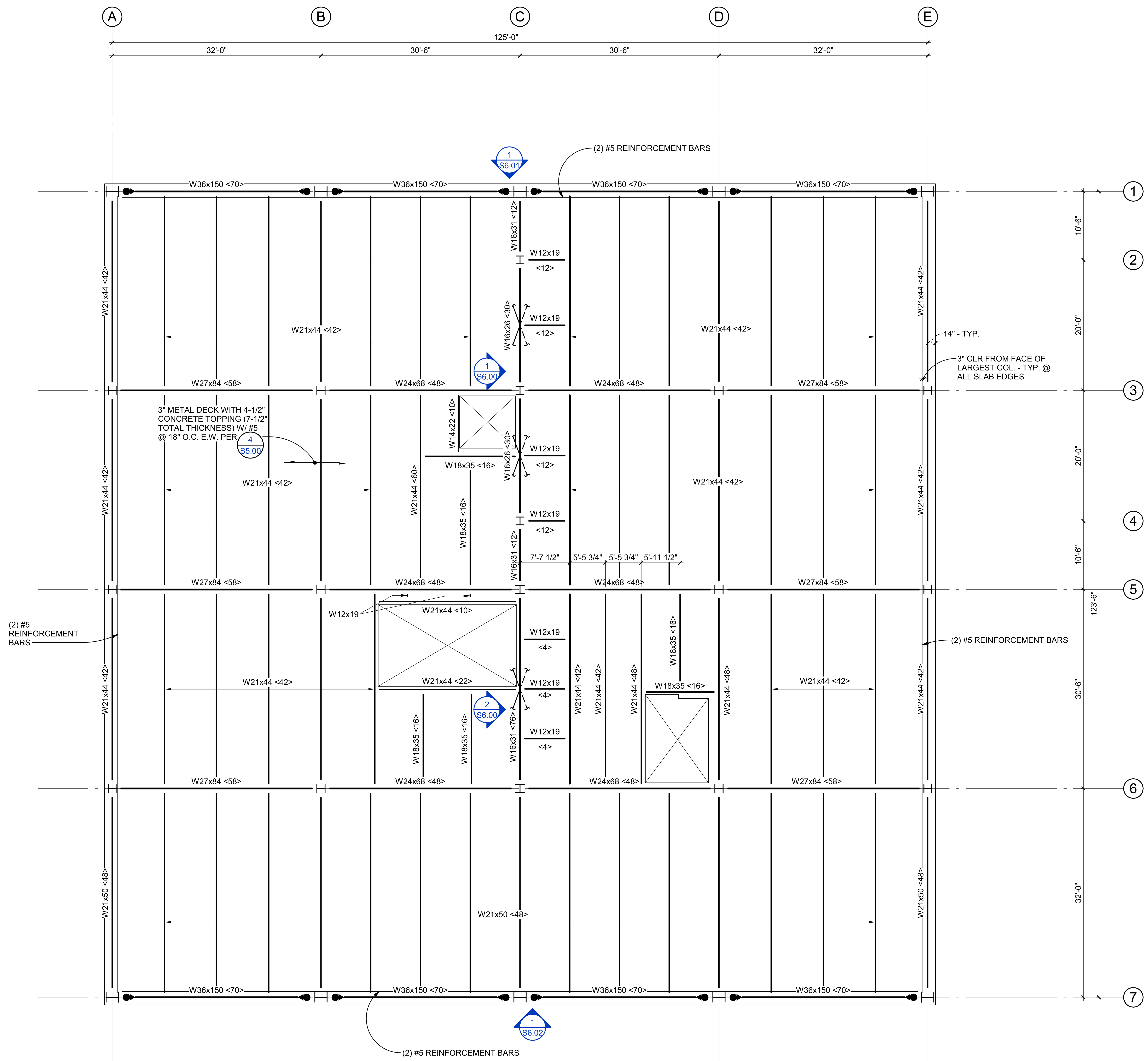
TITLE

FOUNDATION AND GRADE LEVEL FRAMING PLAN

SHEET NUMBER

S2.00

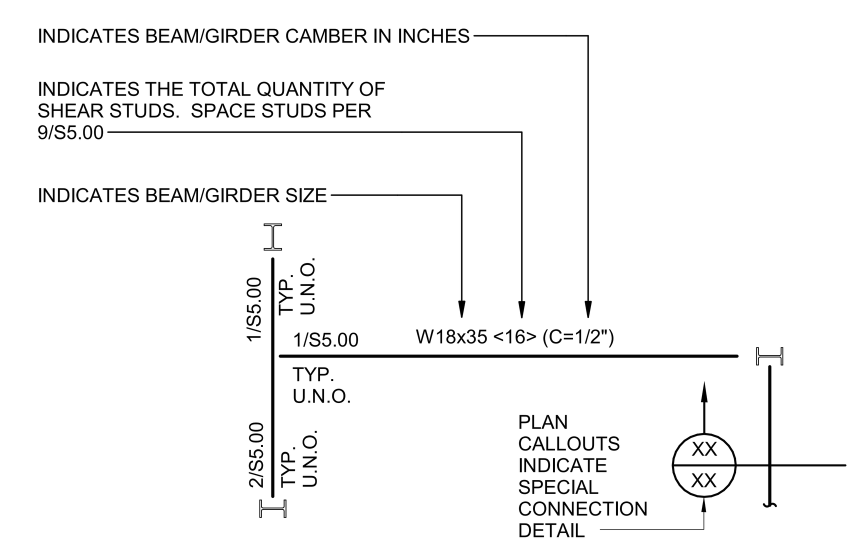


1 S2.10 FIRST FLOOR FRAMING PLAN
1/8" = 1'-0"

NORTH

FLOOR FRAMING NOTES

1. INDICATES BRACED FRAME. FOR ELEVATIONS, BRACE SIZES AND DETAIL CALLOUTS SEE SHEET S6.00. ALL BEAMS THAT ARE PART OF A BRACED FRAME SHALL BE CONSIDERED "COLLECTOR" BEAMS.
2. INDICATES STEEL COLUMN, SEE S4.00 FOR STEEL COLUMN SCHEDULE.
3. INDICATES PENETRATION IN FLOOR STRUCTURE. FOR TYPICAL REINFORCING AROUND OPENINGS SEE 5/S5.00.
4. FOR TYPICAL COMPOSITE BEAM AND METAL DECK DETAILS SEE SHEET S5.00.
5. INDICATES DIRECTION OF SPAN FOR METAL DECK.
6. FOR TYPICAL STEEL CONNECTION DETAILS SEE SHEET S5.00. SEE BRACED FRAME ELEVATIONS FOR CONNECTION CALLOUTS. ALL MEMBERS AND CONNECTIONS THAT ARE PART OF A BRACED FRAME SHALL BE CONSIDERED PART OF THE LATERAL-FORCE RESISTING SYSTEM.



7. STEEL MEMBERS ARE EQUALLY SPACED BETWEEN DIMENSION POINTS UNLESS NOTED OTHERWISE.
8. INDICATES MOMENT FRAME. FOR ELEVATIONS AND DETAIL CALLOUT SEE SHEETS S6.01 AND S6.02. ASSOCIATED MEMBERS AND CONNECTIONS ARE PART OF THE LATERAL-FORCE RESISTING SYSTEM.

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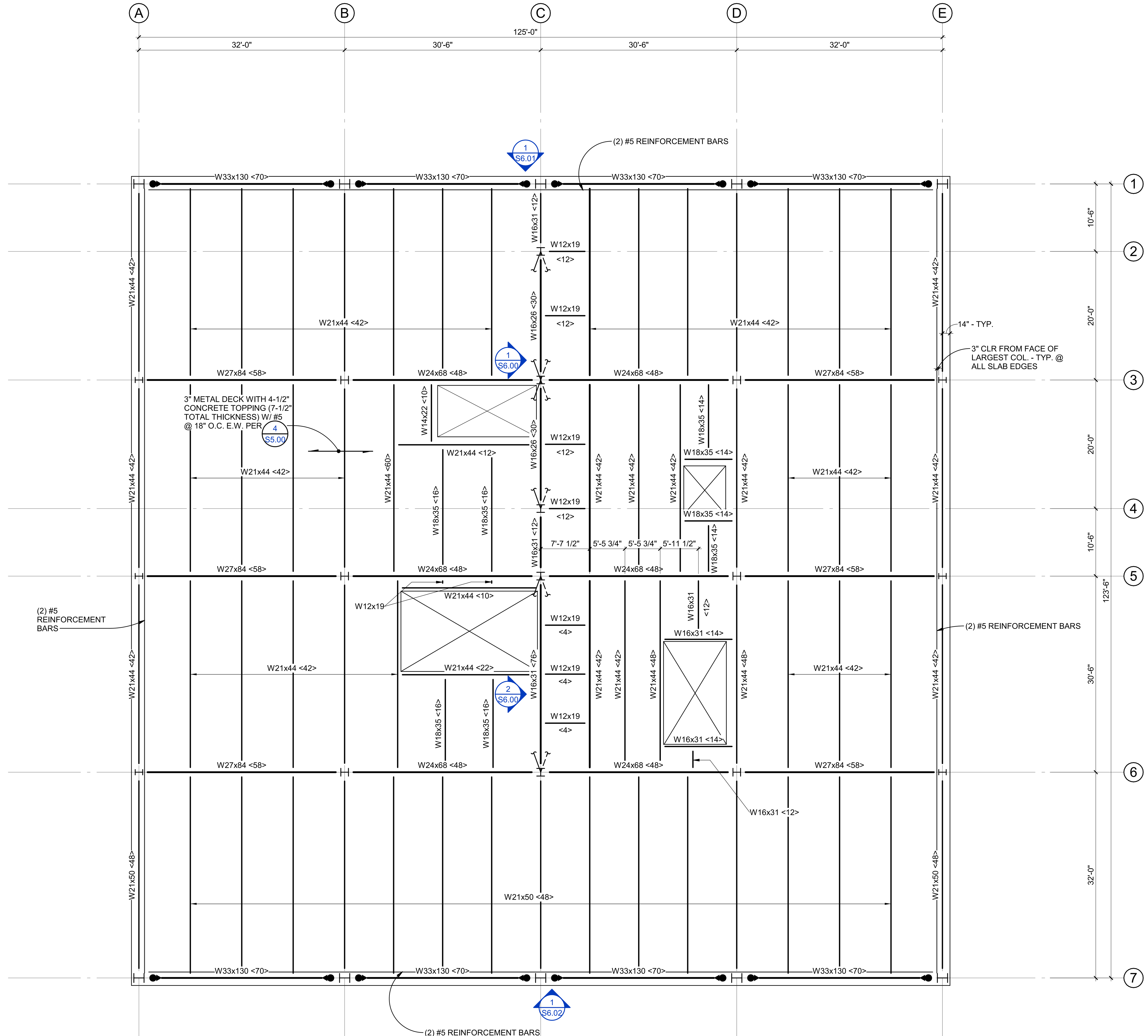
FIRST FLOOR FRAMING PLAN

SHEET NUMBER
S2.10



FOR FRAMING NOTES SEE S2.10

NORTH

1 S2.20 SECOND FLOOR FRAMING PLAN

1/8" = 1'-0"

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TITLE

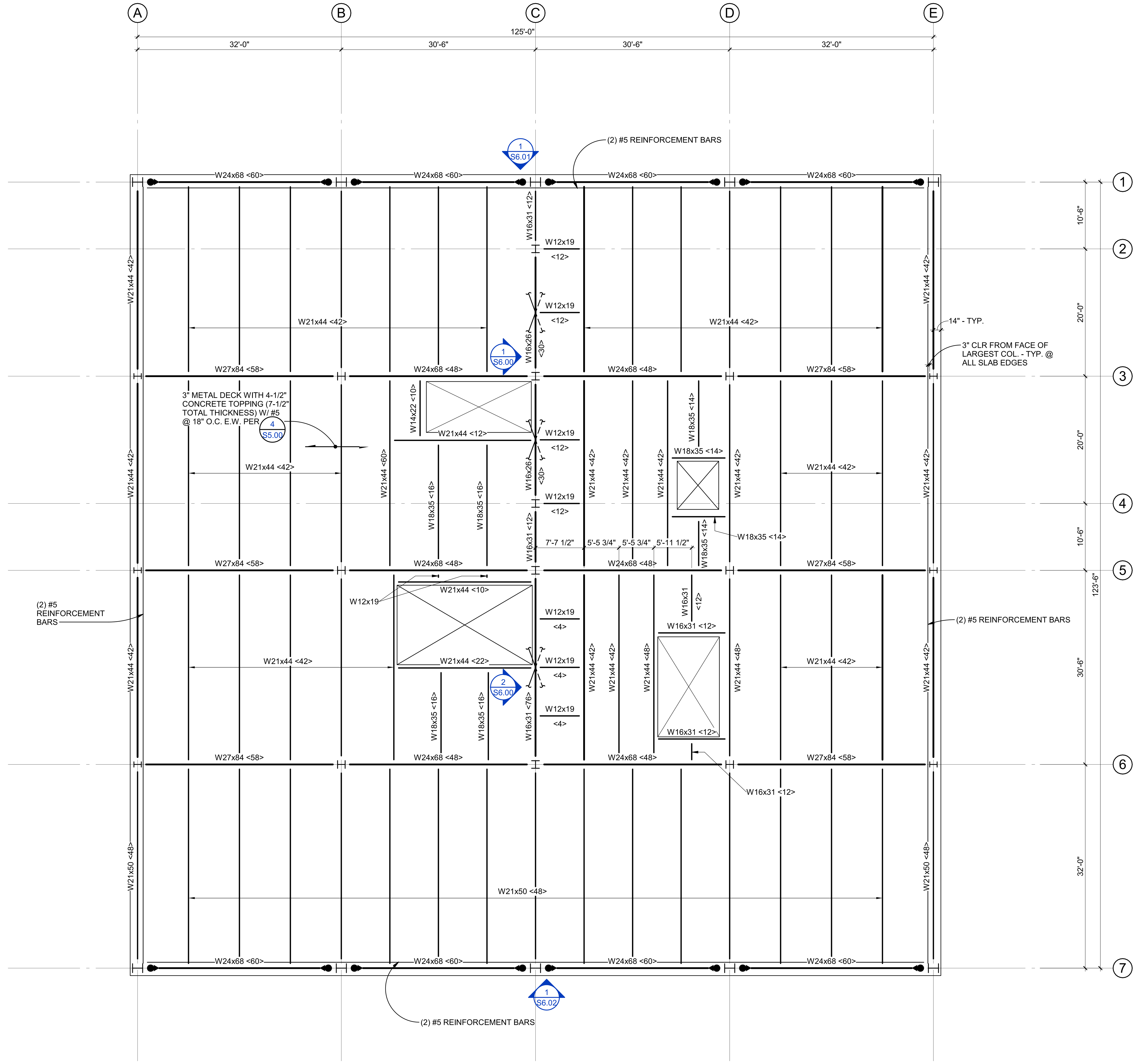
SECOND FLOOR FRAMING PLAN

SHEET NUMBER

S2.20

9/27/2021 9:22:52 AM

C:_Revit Models\BUILDING 2 - ATC BLDG 2 IBC 2018 RI-3 RC4 v2020 (Central)_dhorne@pcs-structural.com.rvt



FOR FRAMING NOTES SEE S2.10

NORTH

1 S2.30 THIRD FLOOR FRAMING PLAN
1/8" = 1'-0"

nehrp

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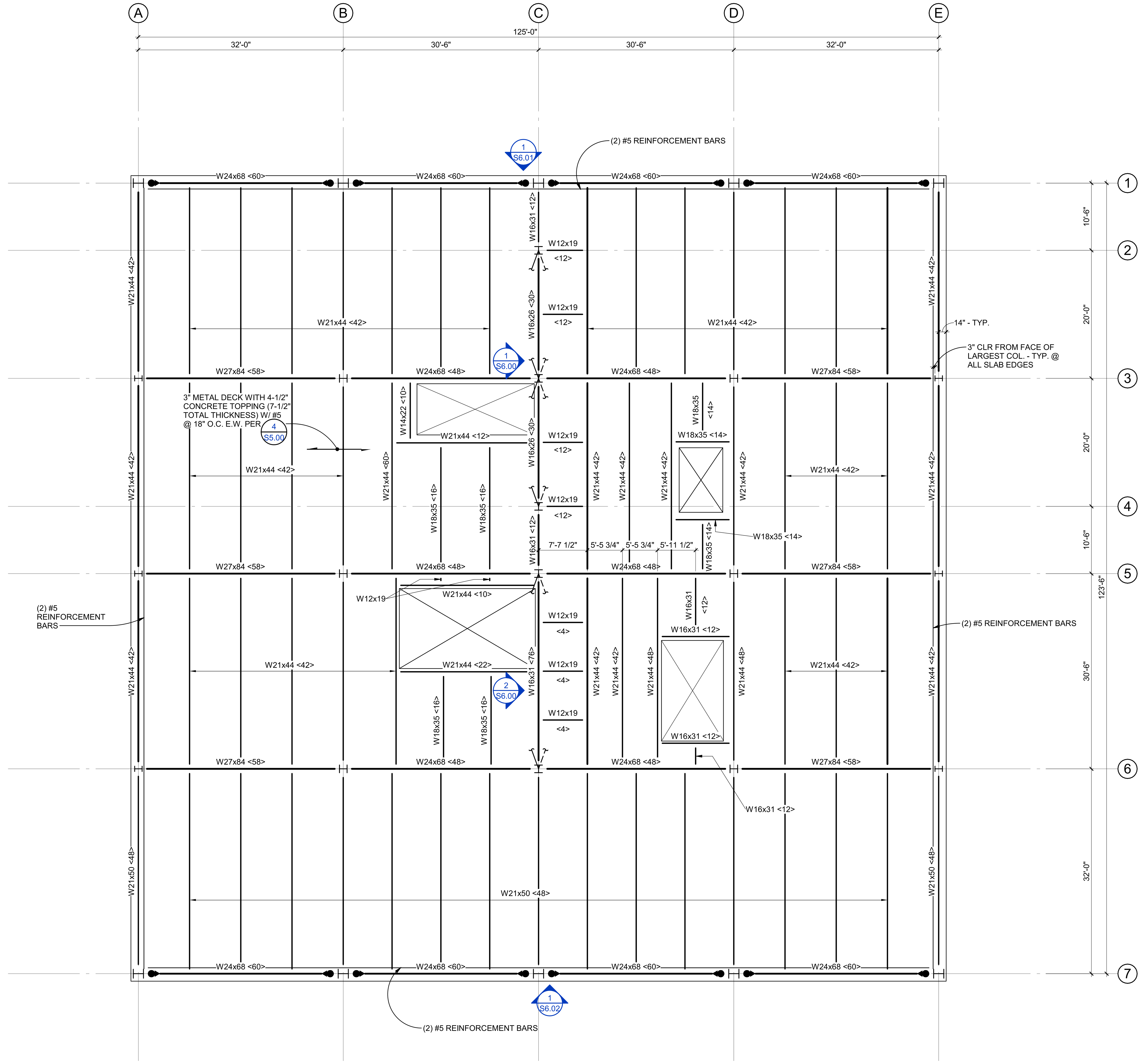
THIRD FLOOR FRAMING PLAN

SHEET NUMBER
S2.30



FOR FRAMING NOTES SEE S2.10

NORTH

1
S2.40

FOURTH FLOOR FRAMING PLAN

1/8" = 1'-0"

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DRAWINGS
30 SEPTEMBER, 2021

Job Number	19-051
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TITLE
FOURTH FLOOR FRAMING PLAN

SHEET NUMBER
S2.40

9/27/2021 9:22:59 AM
C:_Revit Models\BUILDING 2 - ATC BLDG 2 IBC 2018 RI-3 RC4 v2020 (Central)_dhorne@pcs-structural.com.rvt

FOR FRAMING NOTES SEE S2.10

NORTH

1
S2.50

FIFTH FLOOR FRAMING PLAN

1/8" = 1'-0"

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TITLE

FIFTH FLOOR FRAMING PLAN

SHEET NUMBER

S2.50

9/27/2021 9:23:03 AM
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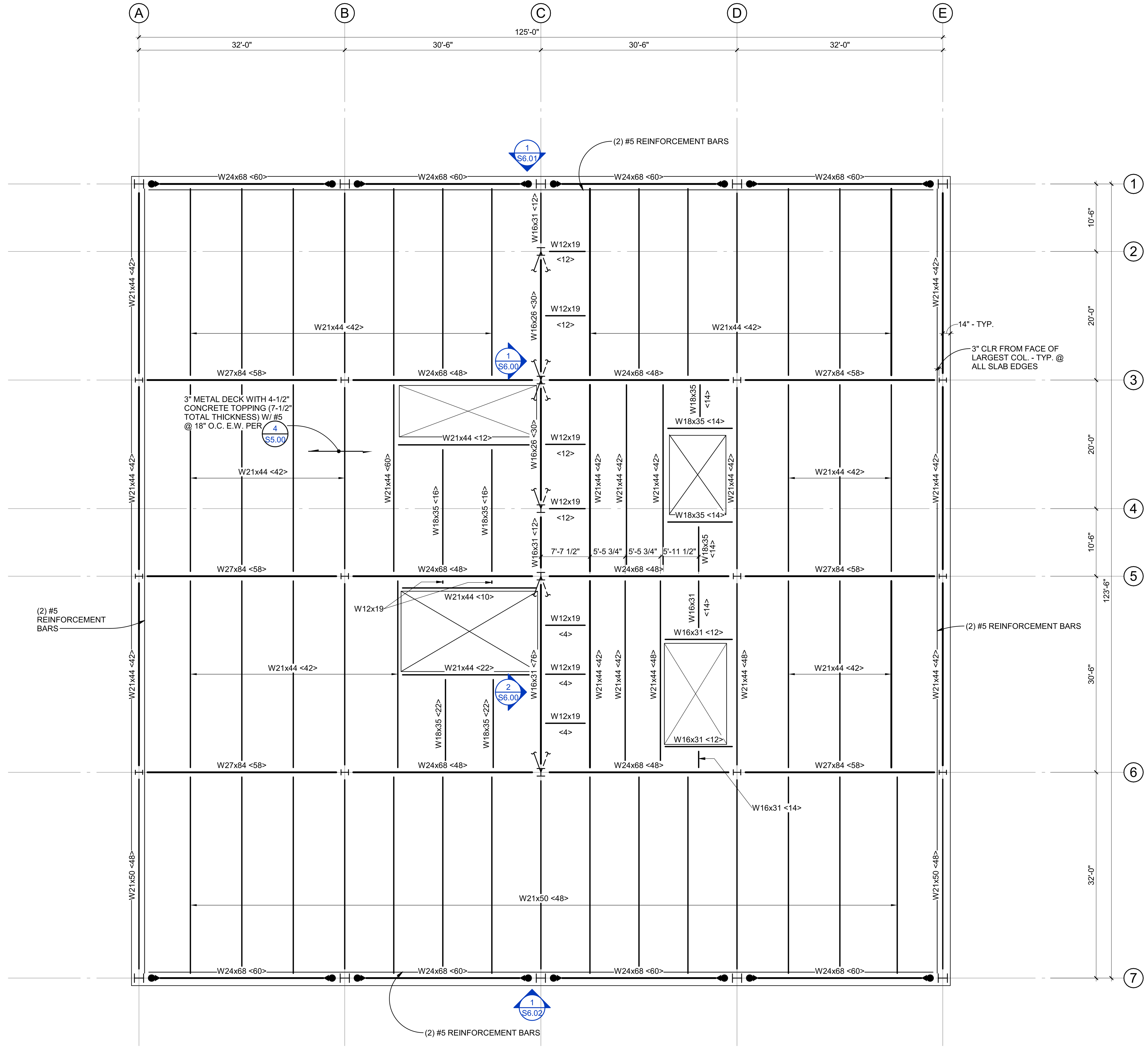

FOR FRAMING NOTES SEE S2.10

NORTH

1
S2.60

SIXTH FLOOR FRAMING PLAN

1/8" = 1'-0"

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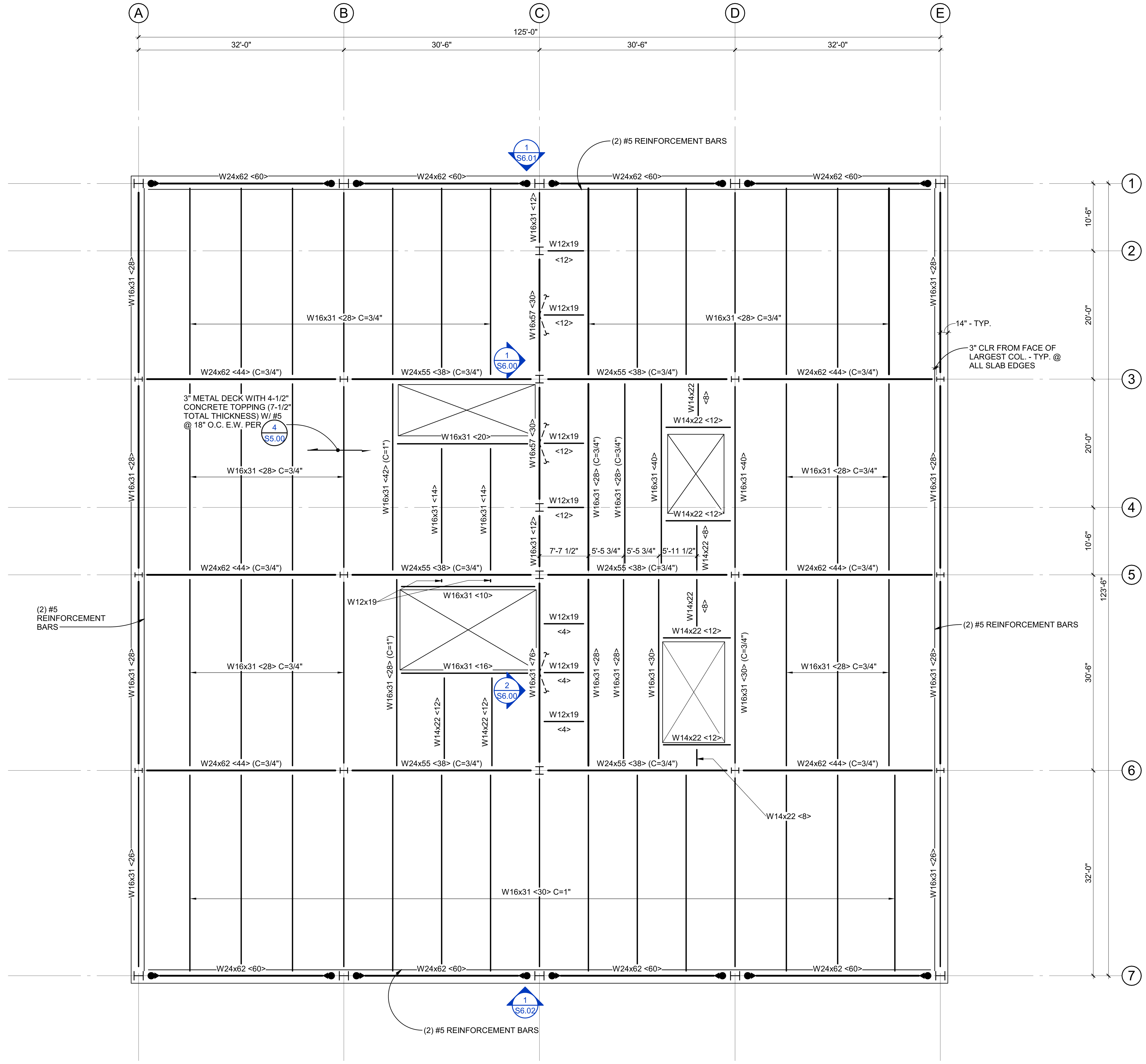
TITLE
SIXTH FLOOR FRAMING PLAN

SHEET NUMBER
S2.60



FOR FRAMING NOTES SEE S2.10

NORTH

1 S2.70 ROOF FRAMING PLAN

1/8" = 1'-0"

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ROOF FRAMING PLAN

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S2.70

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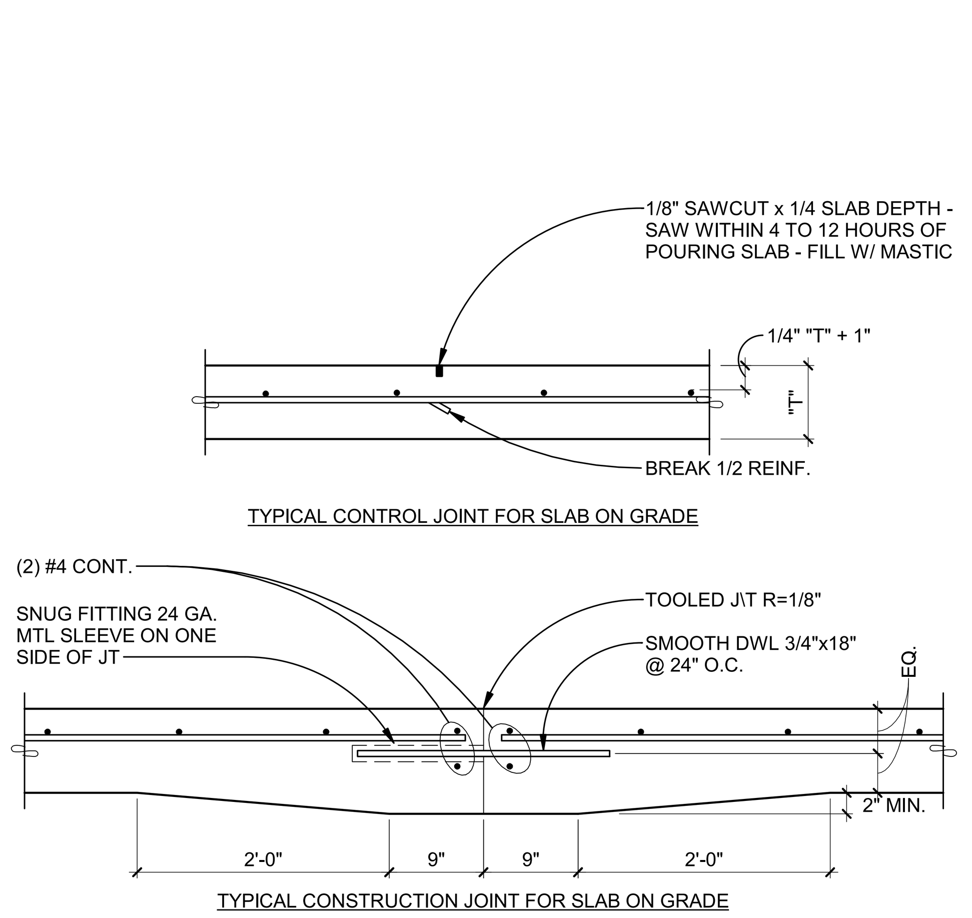

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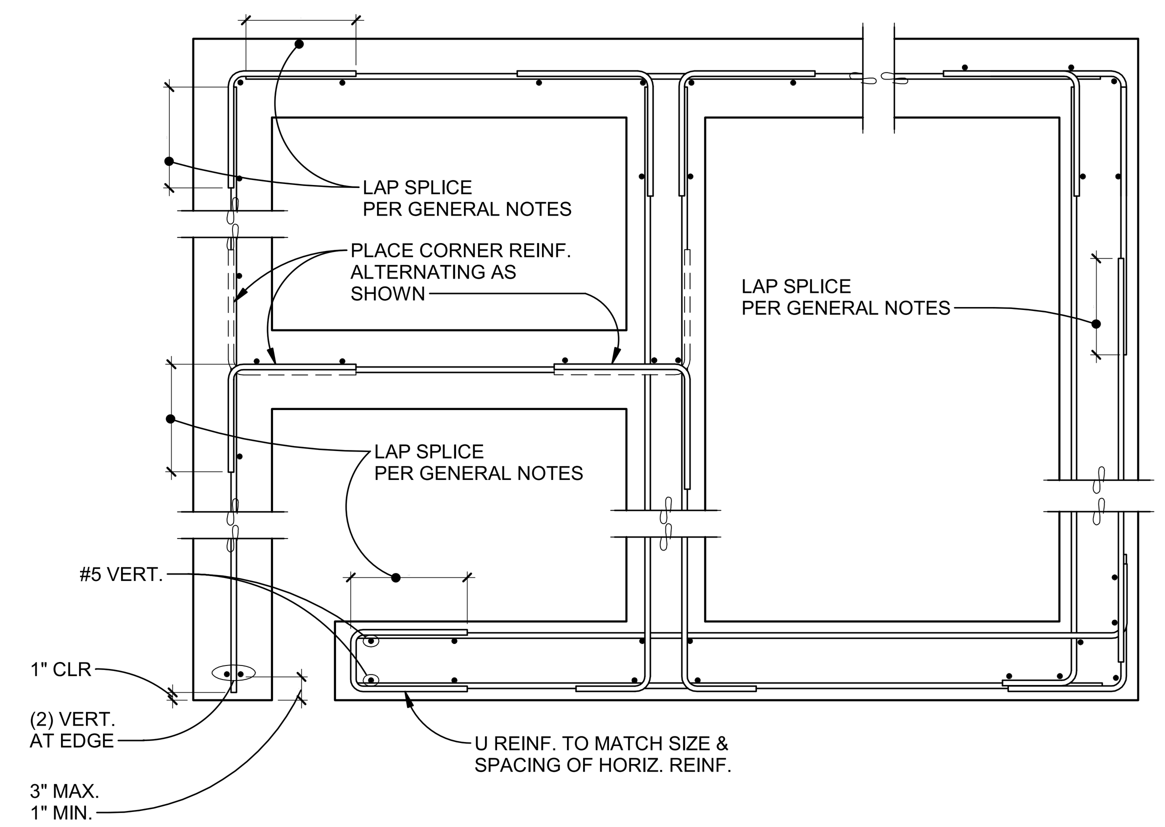
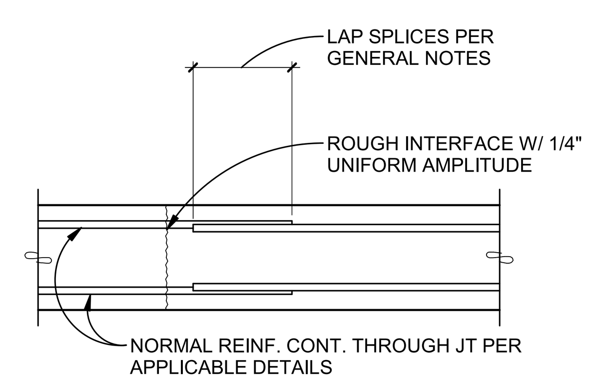


NOTES:
1. VERTICAL REINFORCEMENT SHOWN IS ADDITIONAL IF NORMAL STEM WALL REINFORCEMENT IS NOT IN PROPER LOCATION.
2. CORNER REINFORCEMENT IS SAME SIZE AND SPACING AS HORIZONTAL REINFORCEMENT.
3. STANDARD HOOK MAY BE SUBSTITUTED FOR CORNER REINFORCEMENT. SEE NOTE #5.
4. REINFORCEMENT AT ALL CORNERS, ENDS, AND INTERSECTIONS OF WALLS SHALL BE PLACED IN ACCORDANCE WITH APPROPRIATE DETAIL SHOWN.
5. USE STANDARD HOOK FOR EMBEDMENT LESS THAN 24" PAST FACE OF WALL.

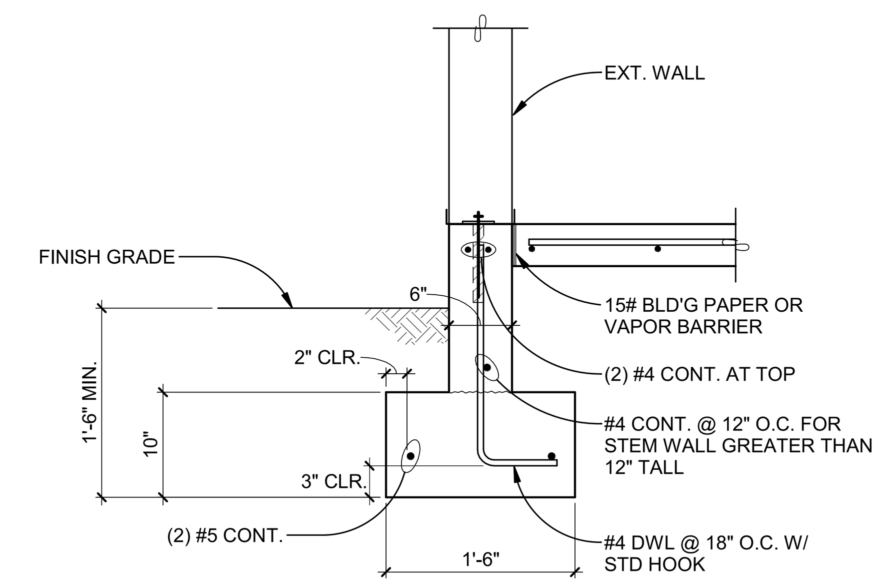
TYPICAL REINFORCEMENT PLACEMENT FOR CAST IN PLACE CONCRETE WALLS AND STEM WALLS

2 S3.00 SECTION
NO SCALE



TYPICAL FOR CAST IN PLACE CONCRETE WALLS, GRADE BEAMS AND FOOTINGS

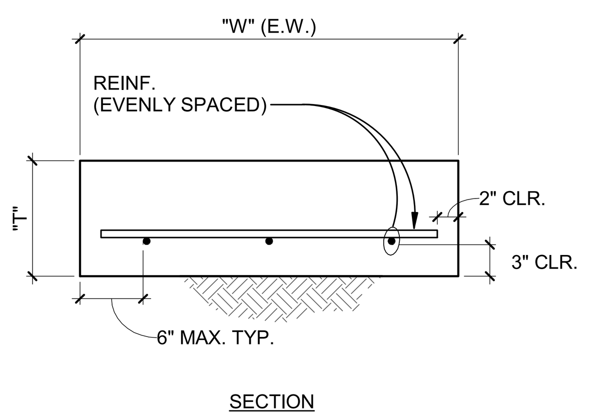
3 S3.00 SECTION
NO SCALE



TYPICAL FOUNDATION AT EXTERIOR WALL

4 S3.00 SECTION
NO SCALE

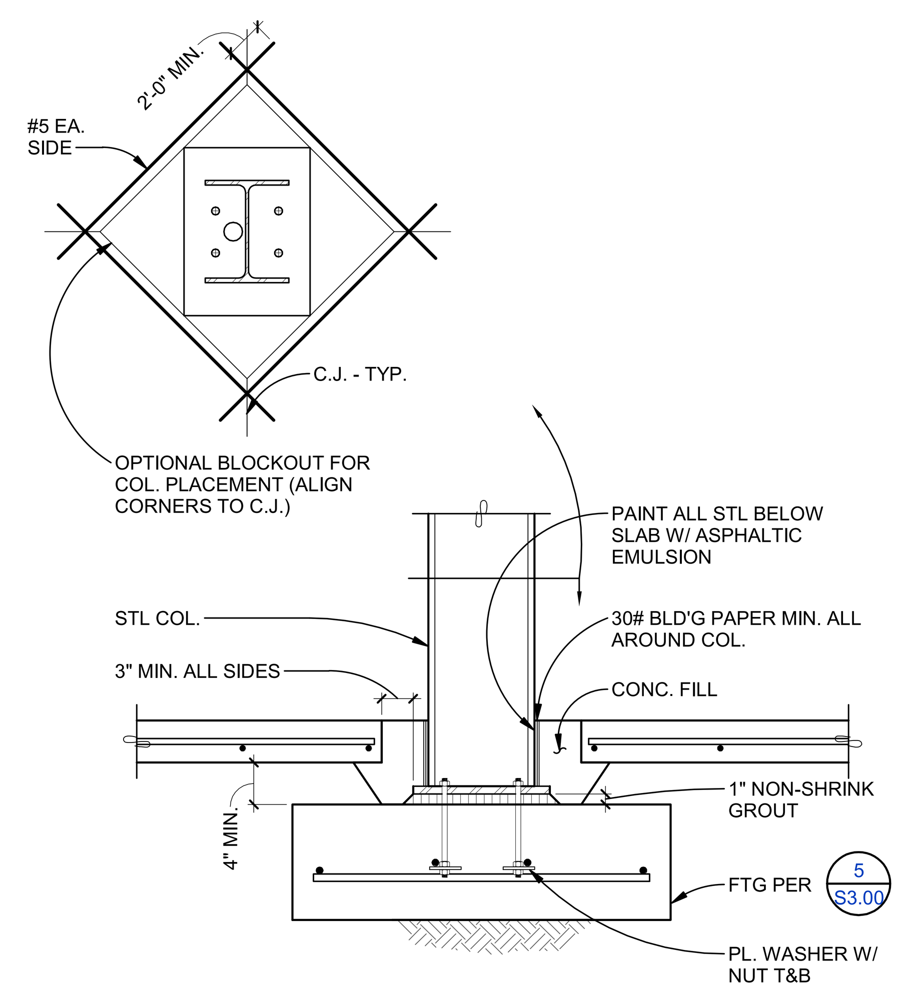
MARK	DIMENSIONS	
	"W"	"T"
F9.0	9'-0"	24"
F10.0	10'-0"	27"
F15.5	15'-6"	36"
F16.0	16'-0"	39"



NOTES:
1. CENTER ALL FOOTINGS ON COLUMN ABOVE EXCEPT AS SHOWN OTHERWISE.
2. FOOTINGS SHALL BEAR ON UNDISTURBED OR COMPACTED MATERIAL PER GENERAL NOTES. DESIGN BEARING PRESSURE IS 6000 POUNDS PER SQUARE FOOT.

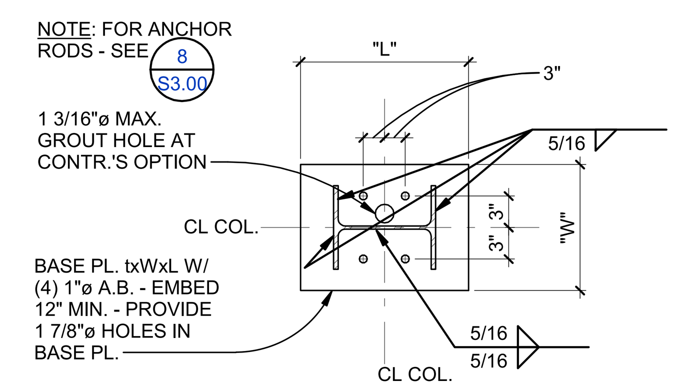
TYPICAL CONCRETE SPREAD FOOTING

5 S3.00 SECTION
NO SCALE



TYPICAL STEEL COLUMN AT SPREAD FOOTING

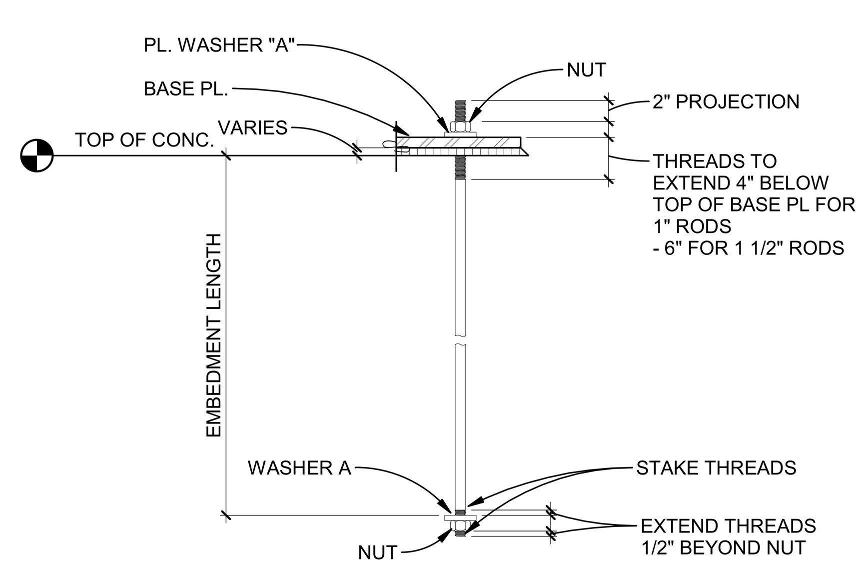
6 S3.00 SECTION
NO SCALE



COLUMN SIZE	"W" (IN.)	"L" (IN.)	"t" (IN.)
W14x99	18 1/4	18 3/4	1 1/2
W14x132, W14x159	20 3/4	22 3/4	2

TYPICAL COLUMN BASE PLATE

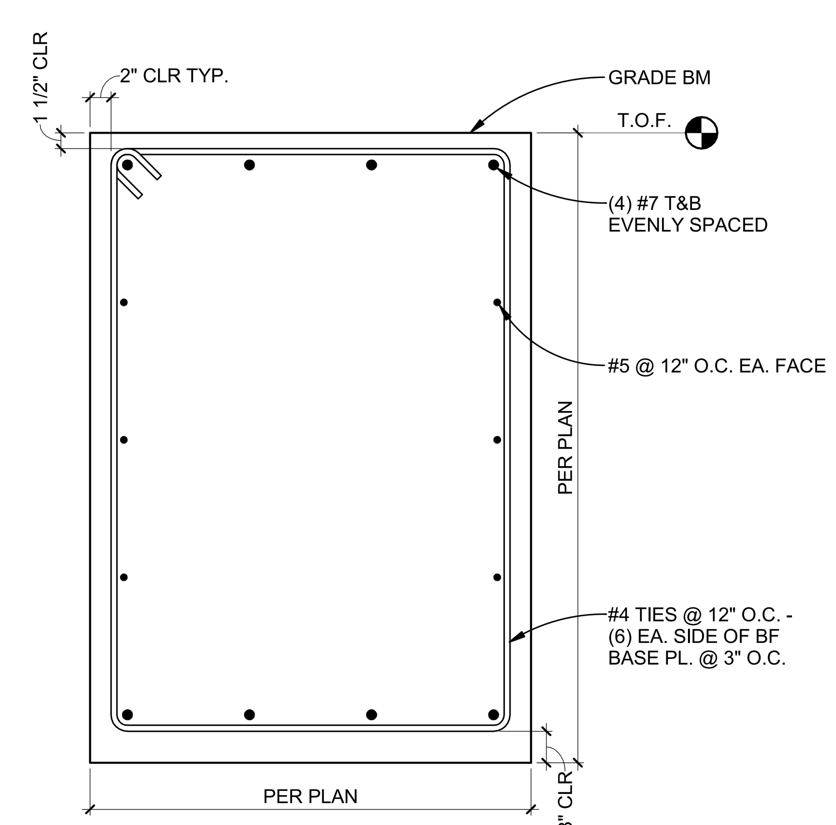
7 S3.00 DETAIL
NO SCALE



ANCHOR ROD		WASHER		NUT
SIZE	MATERIAL	TYPE	SIZE	
1"ø	F1554 GRADE 105	A	PL. 1/2"x3"x0'-3" W/ 1 1/16"ø HOLE CTR'D	A563 GRADE A HEAVY HEX

TYPICAL ANCHOR ROD/BOLT DETAIL

8 S3.00 DETAIL
NO SCALE



9 S3.00 DETAIL
NO SCALE

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TITLE
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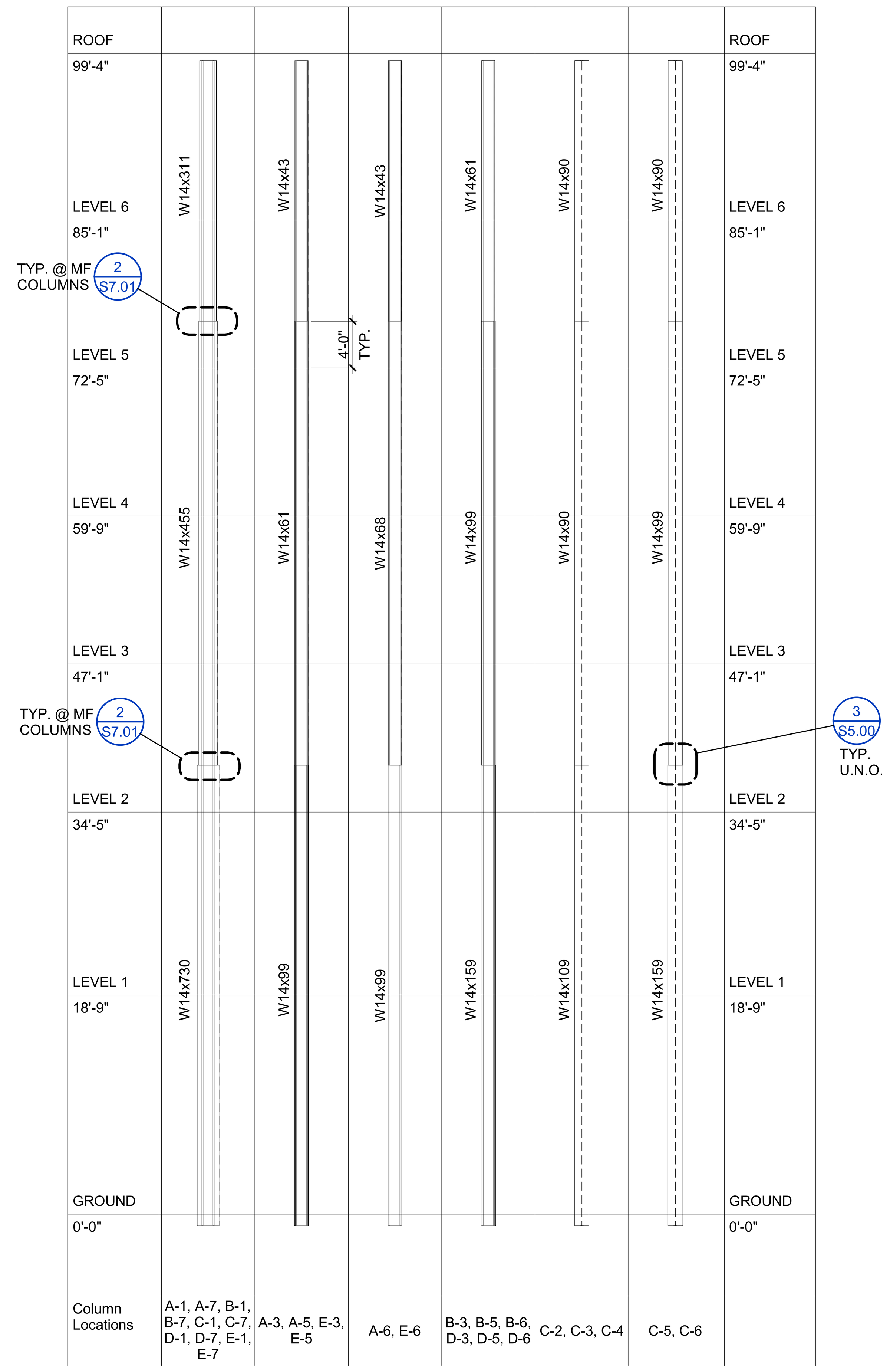

1
S4.00
COLUMN SCHEDULE
NO SCALE

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TITLE
COLUMN SCHEDULE

SHEET NUMBER
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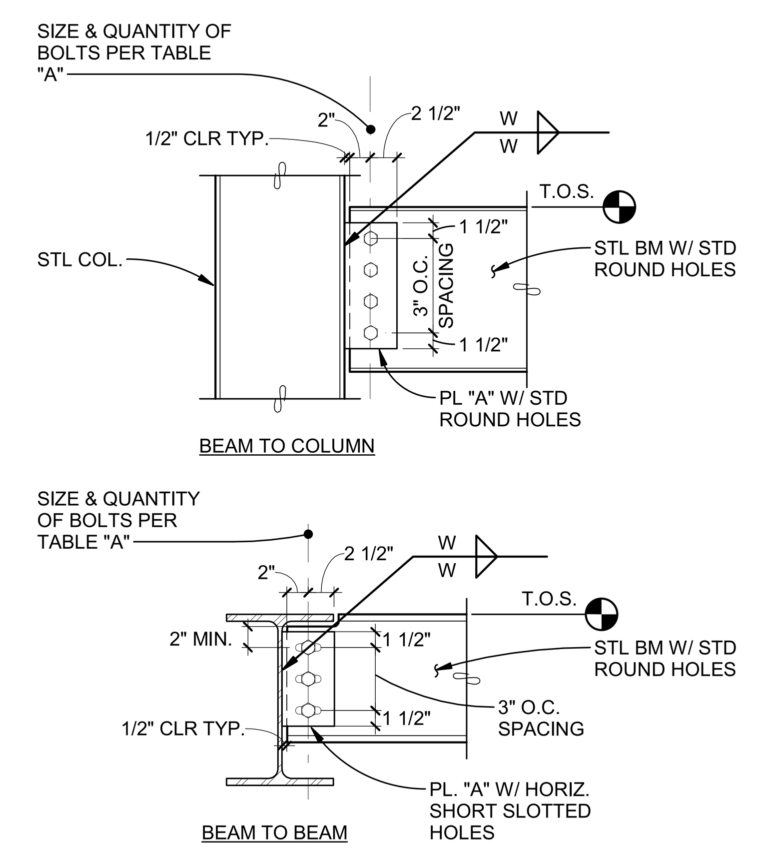


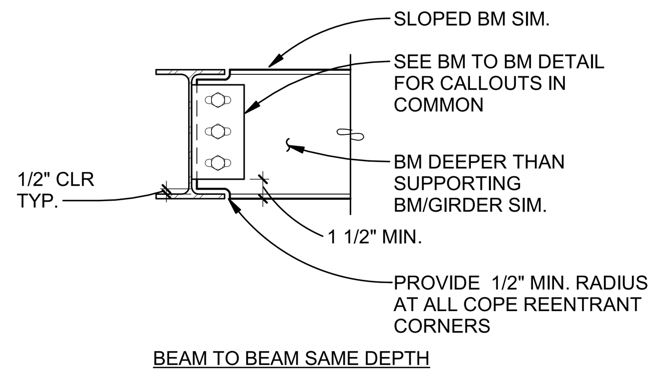
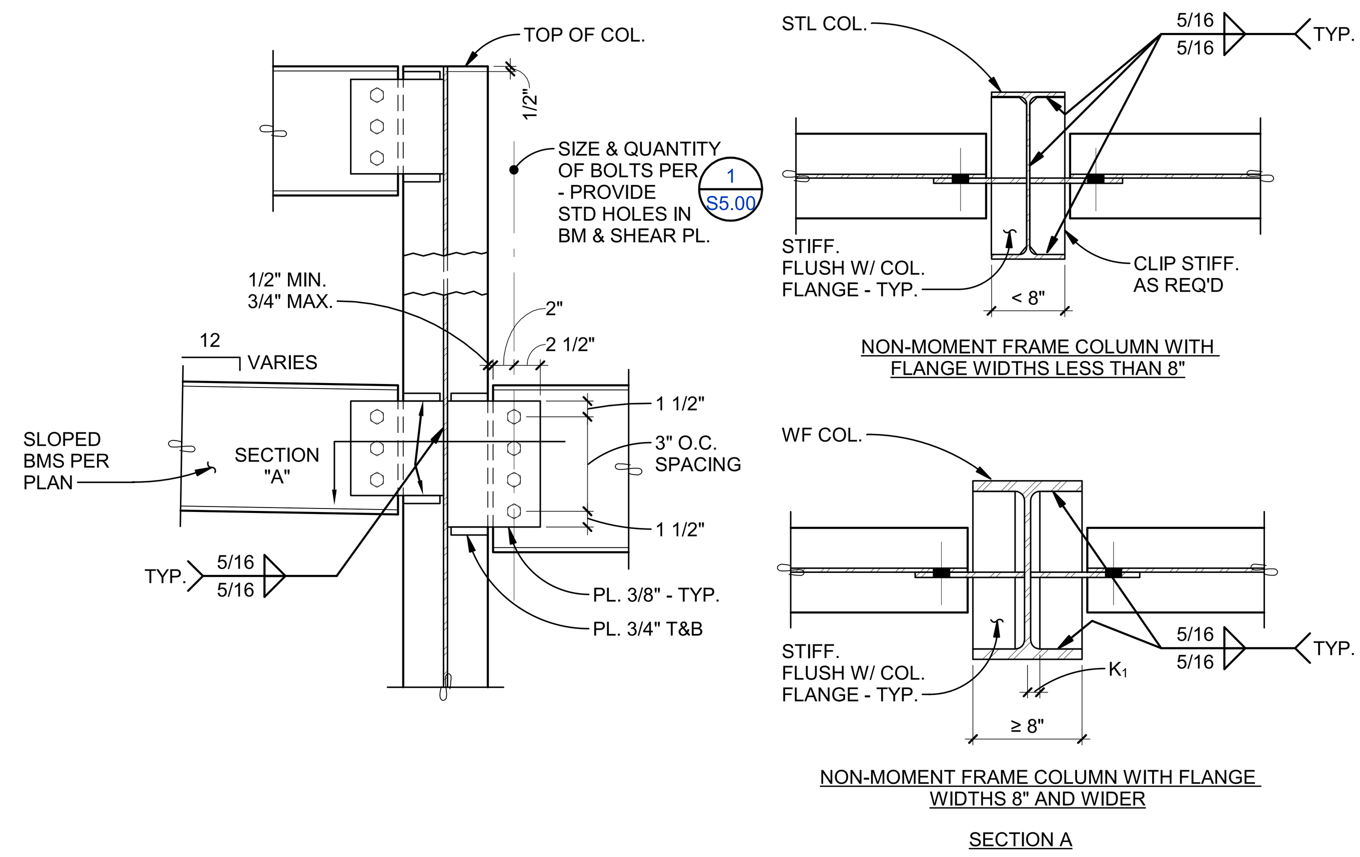


TABLE A

SUPPORTED BEAM SIZE	QUANTITY OF 7/8"ø A325N BOLTS	SHEAR PLATE THICKNESS "A"	WELD "W" NOTE 1.
W12, W14	3	3/8"	5/16"
W16, W18	4	3/8"	5/16"
W21	5	3/8"	5/16"
W24	6	3/8"	5/16"
W27	7	3/8"	5/16"
W30	7	3/8"	5/16"
W33	8	3/8"	5/16"

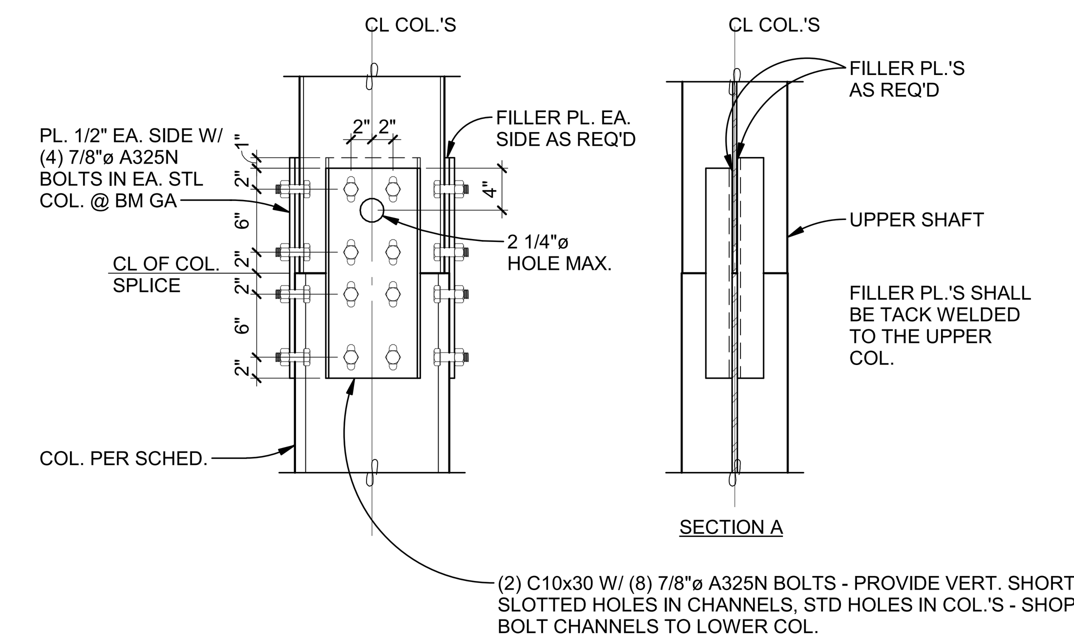
TYPICAL STEEL DETAIL

1 S5.00 DETAIL
NO SCALE



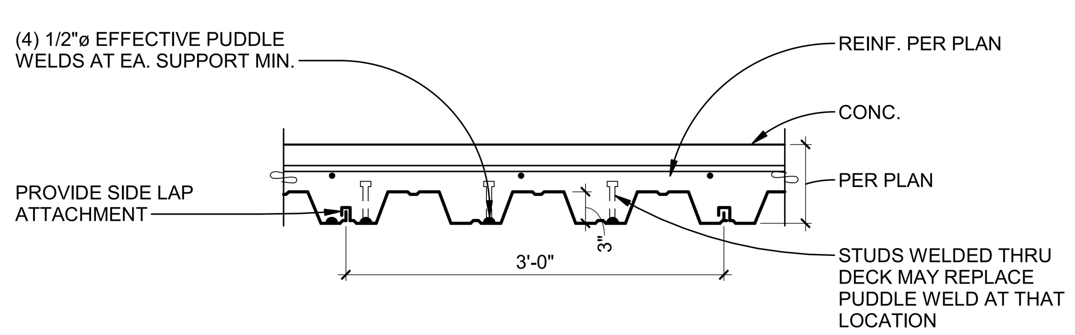
TYPICAL BEAM/COLUMN FRAMING INTO WEB

2 S5.00 DETAIL
NO SCALE



TYPICAL COLUMN SPLICE

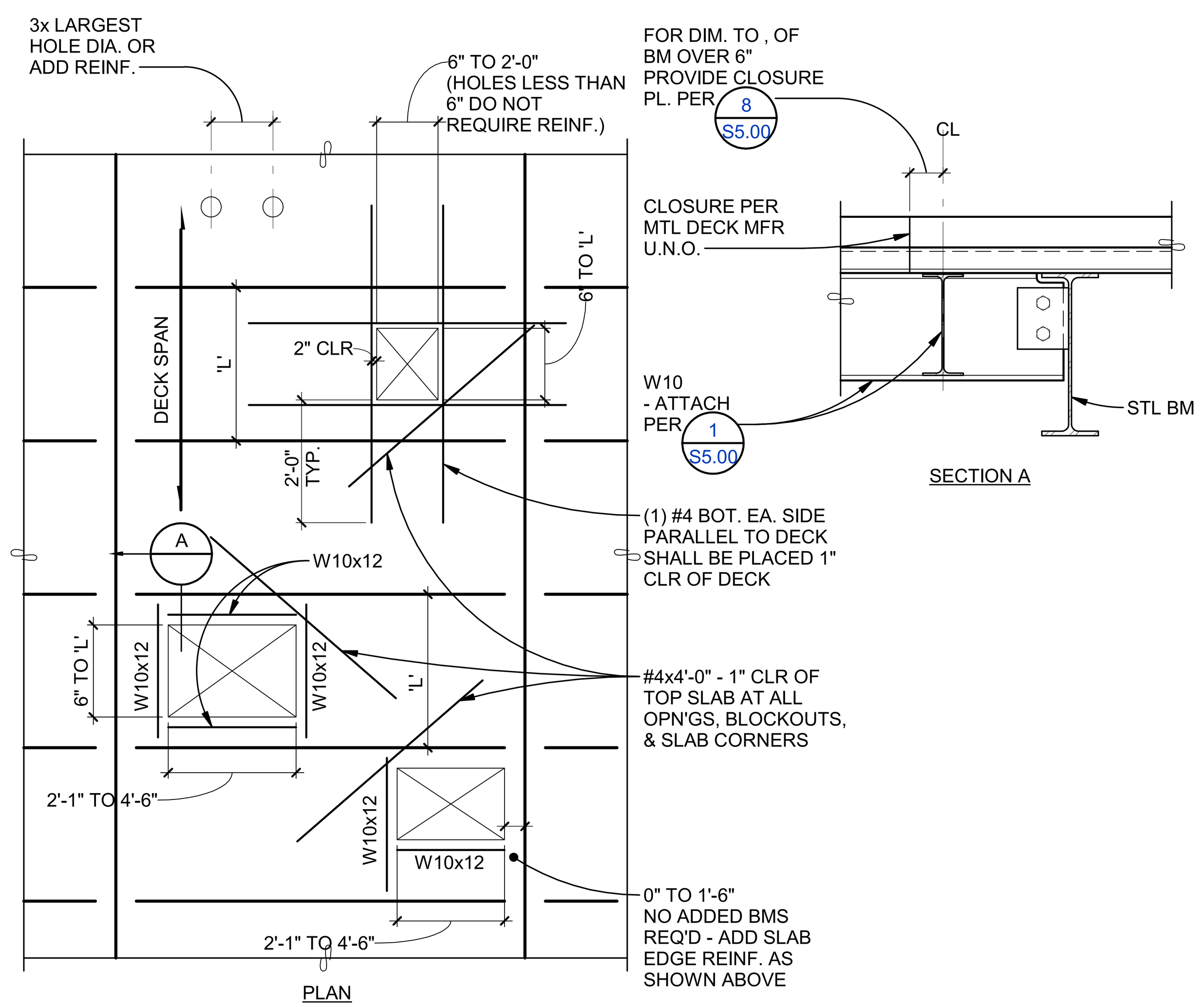
3 S5.00 DETAIL
NO SCALE



NOTES:
1. (2) SPAN MINIMUM, (3) SPAN PREFERRED.
2. AT SUPPORTS PARALLEL TO CORRUGATIONS, PROVIDE PUDDLE WELDS @ 24" O.C. MAXIMUM.

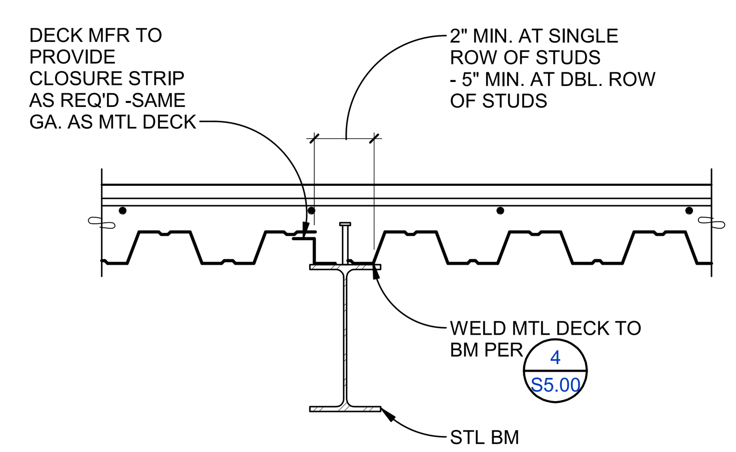
TYPICAL COMPOSITE FLOOR DECK

4 S5.00 DETAIL
NO SCALE



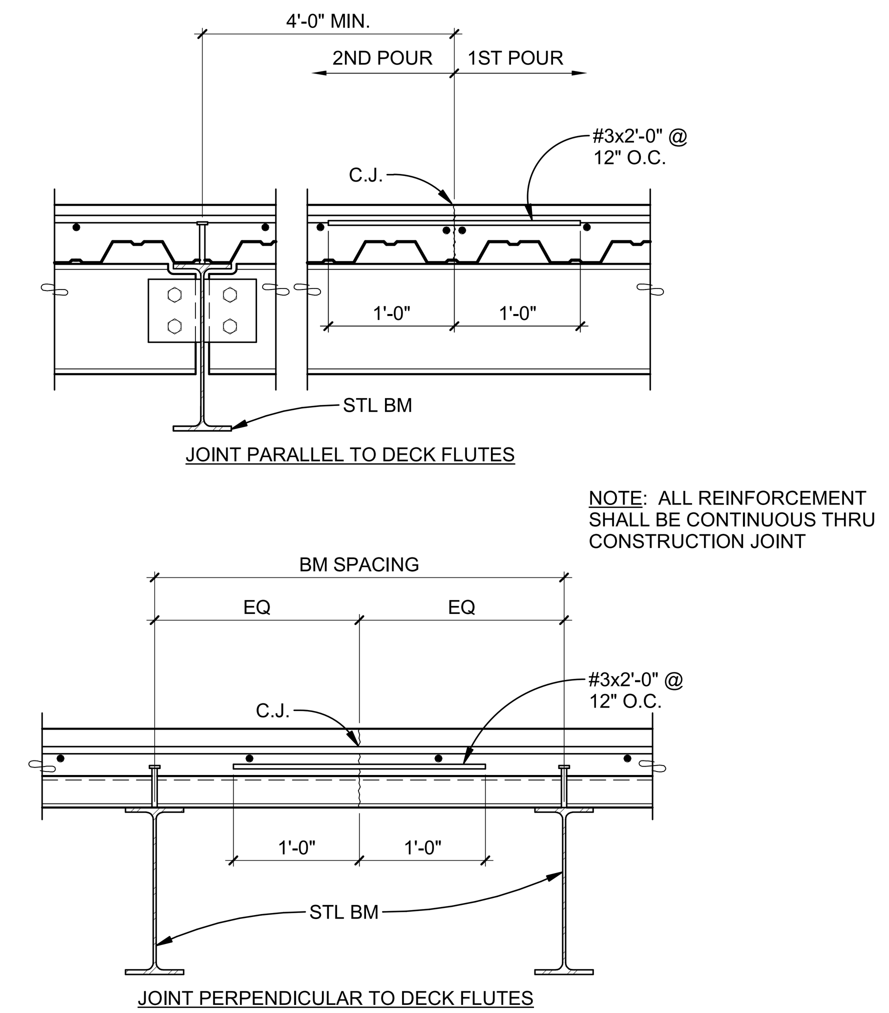
TYPICAL FLOOR PENETRATION REINFORCEMENT

5 S5.00 DETAIL
NO SCALE



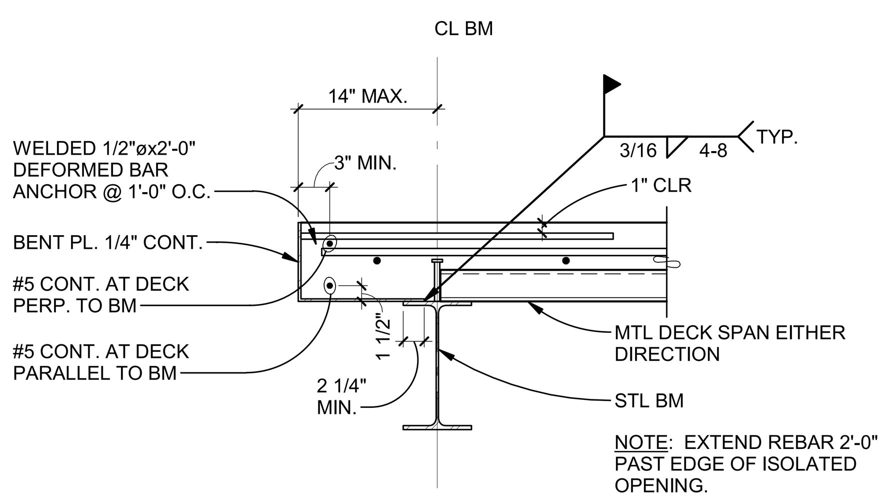
TYPICAL AT METAL DECK PARALLEL TO BEAM

6 S5.00 SECTION
NO SCALE



TYPICAL COMPOSITE DECK CONSTRUCTION JOINT

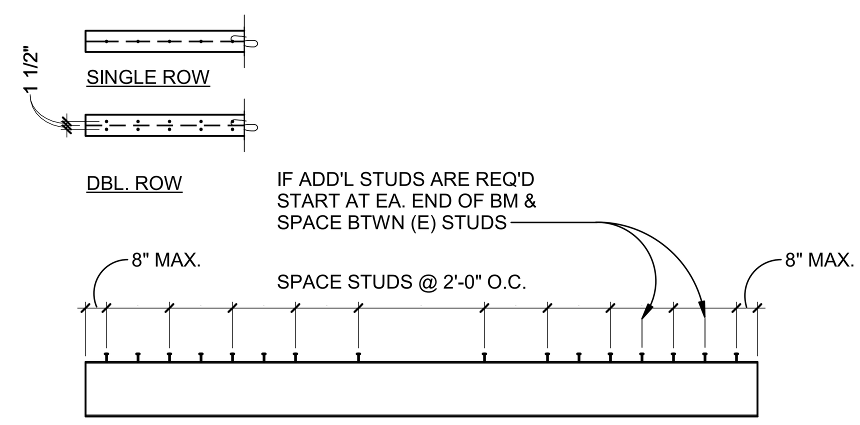
7 S5.00 SECTION
1" = 1'-0"



TYPICAL SLAB EDGE CONDITION - OVER 6" OVERHANG

8 S5.00 SECTION
NO SCALE

NOTES:
1. LOCATE STUDS AT CENTER OF BEAM FLANGE.
2. STUDS ARE 3/4"ø x 4 1/2" LONG AFTER WELDING.
3. SEE FRAMING PLANS FOR NUMBER OF STUDS.
4. ALL BEAMS WITH STUDS ARE COMPOSITE STEEL BEAMS.
5. PROVIDE A DOUBLE ROW OF STUDS AT BEAMS WHERE THE REQUIRED NUMBER OF STUDS EXCEEDS THE NUMBER THAT CAN FIT IN A SINGLE ROW AT 6" ON CENTER AT DECK PARALLEL TO BEAM OR 12" ON CENTER AT DECK PERPENDICULAR TO BEAM. STUDS SHOULD BE LOCATED IN DECK FLUTES PER AISC STRONG POSITION.



TYPICAL COMPOSITE BEAM DETAIL

9 S5.00 DETAIL
NO SCALE

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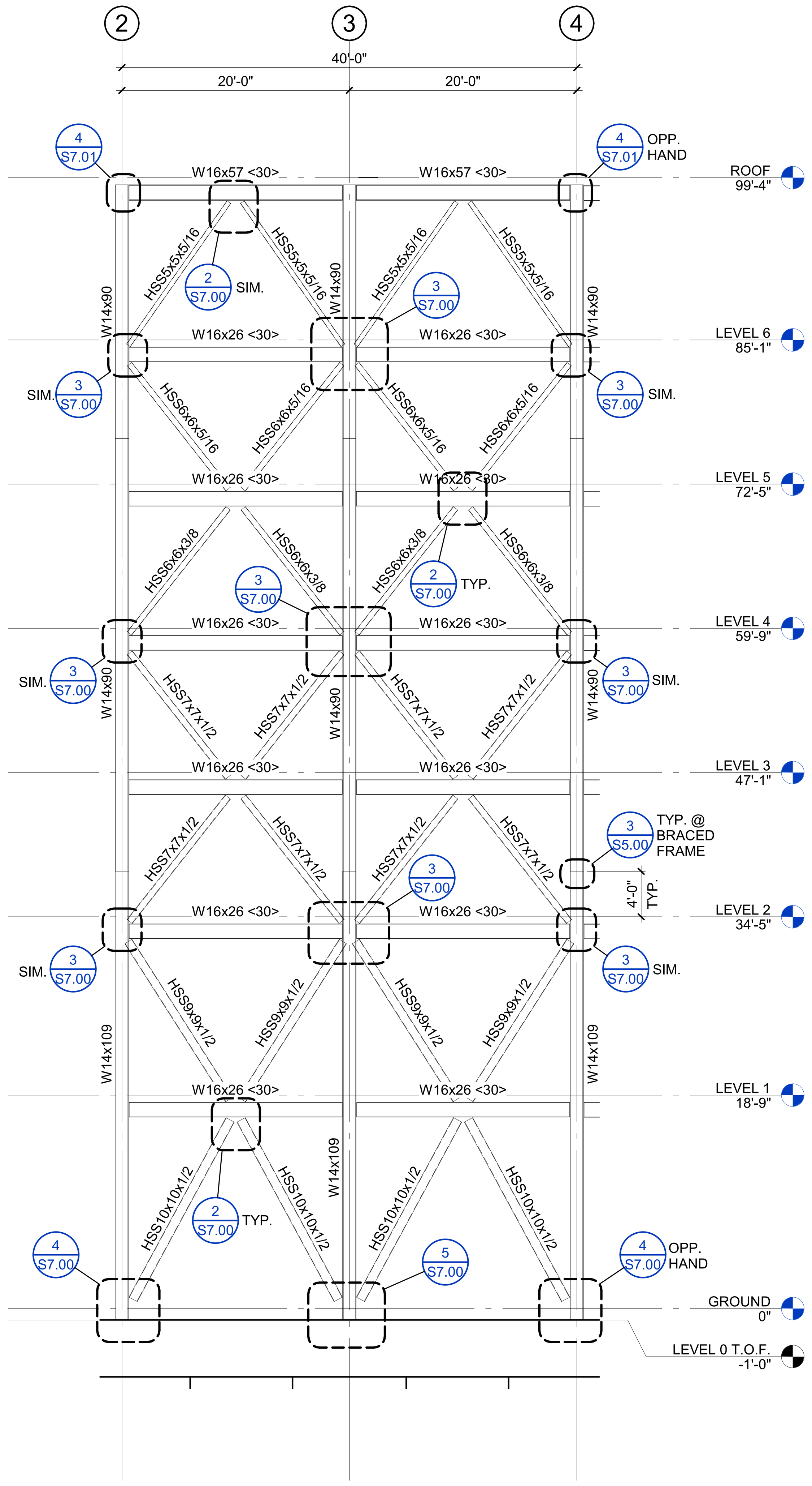
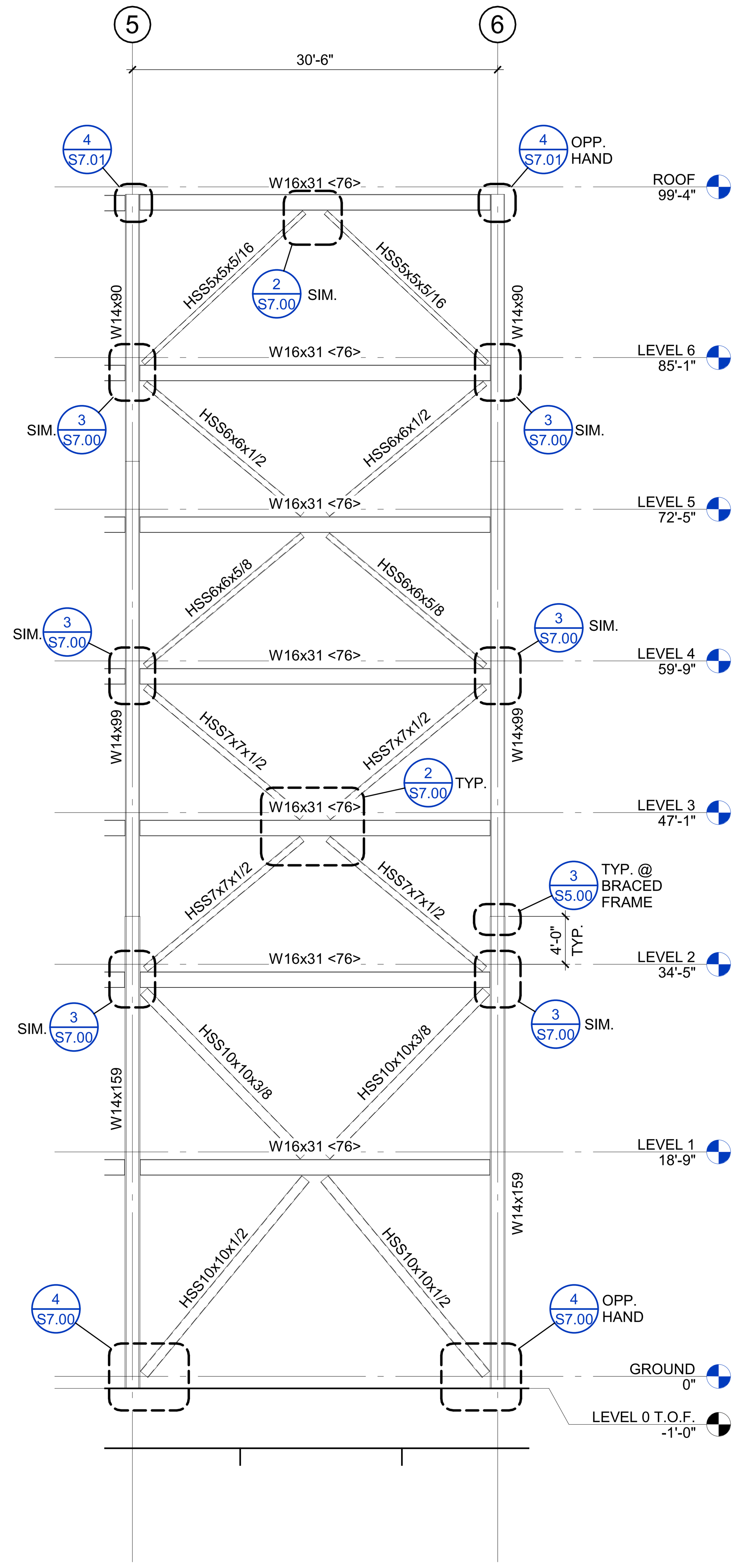
TITLE
STEEL DETAILS

SHEET NUMBER
S5.00



1
S6.00
BRACED FRAME ELEVATION
1/8" = 1'-0"



2
S6.00
BRACED FRAME ELEVATION
1/8" = 1'-0"

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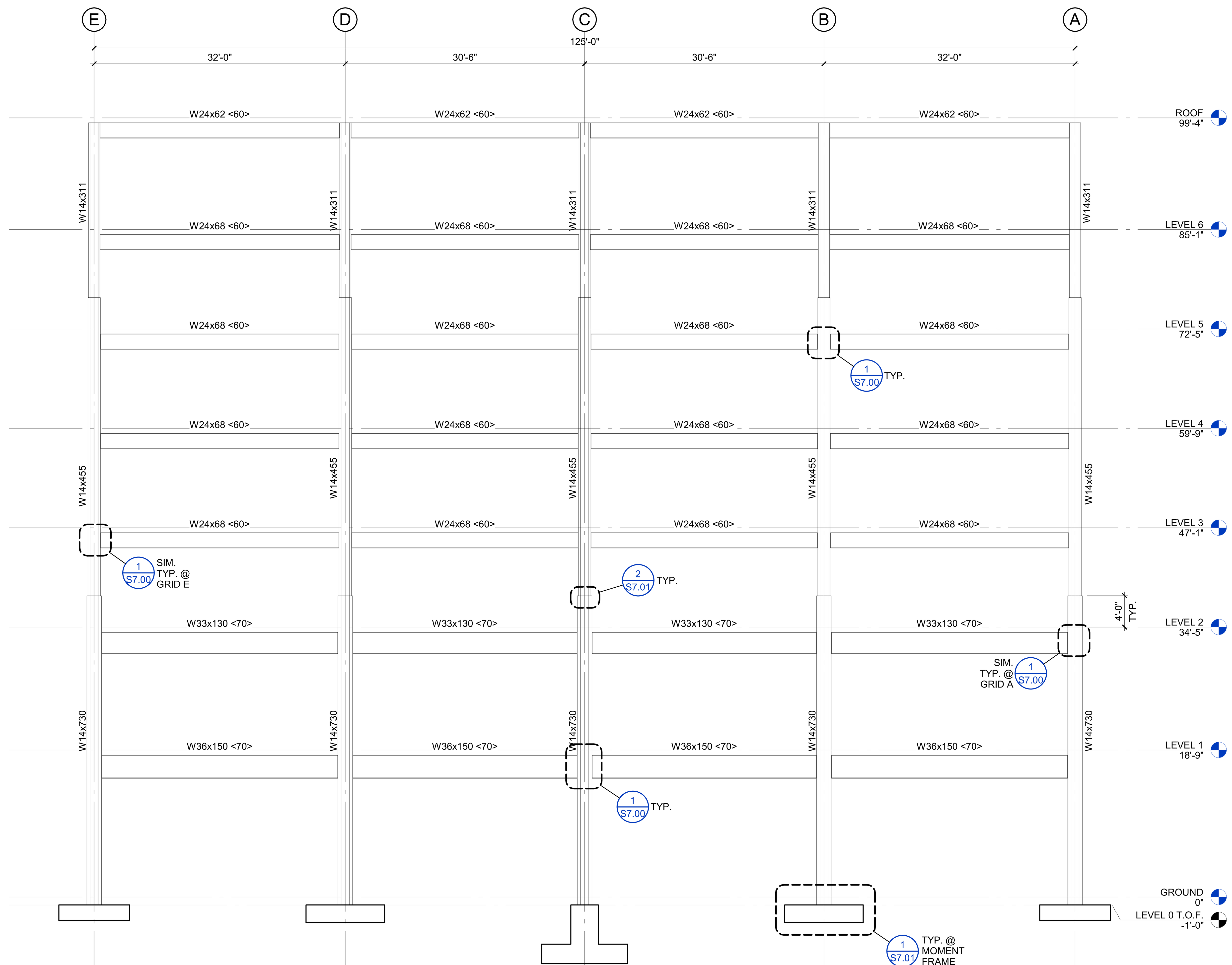
TITLE
BRACED FRAME ELEVATIONS

SHEET NUMBER
S6.00



1 S6.01 MOMENT FRAME ELEVATION
1/8" = 1'-0"

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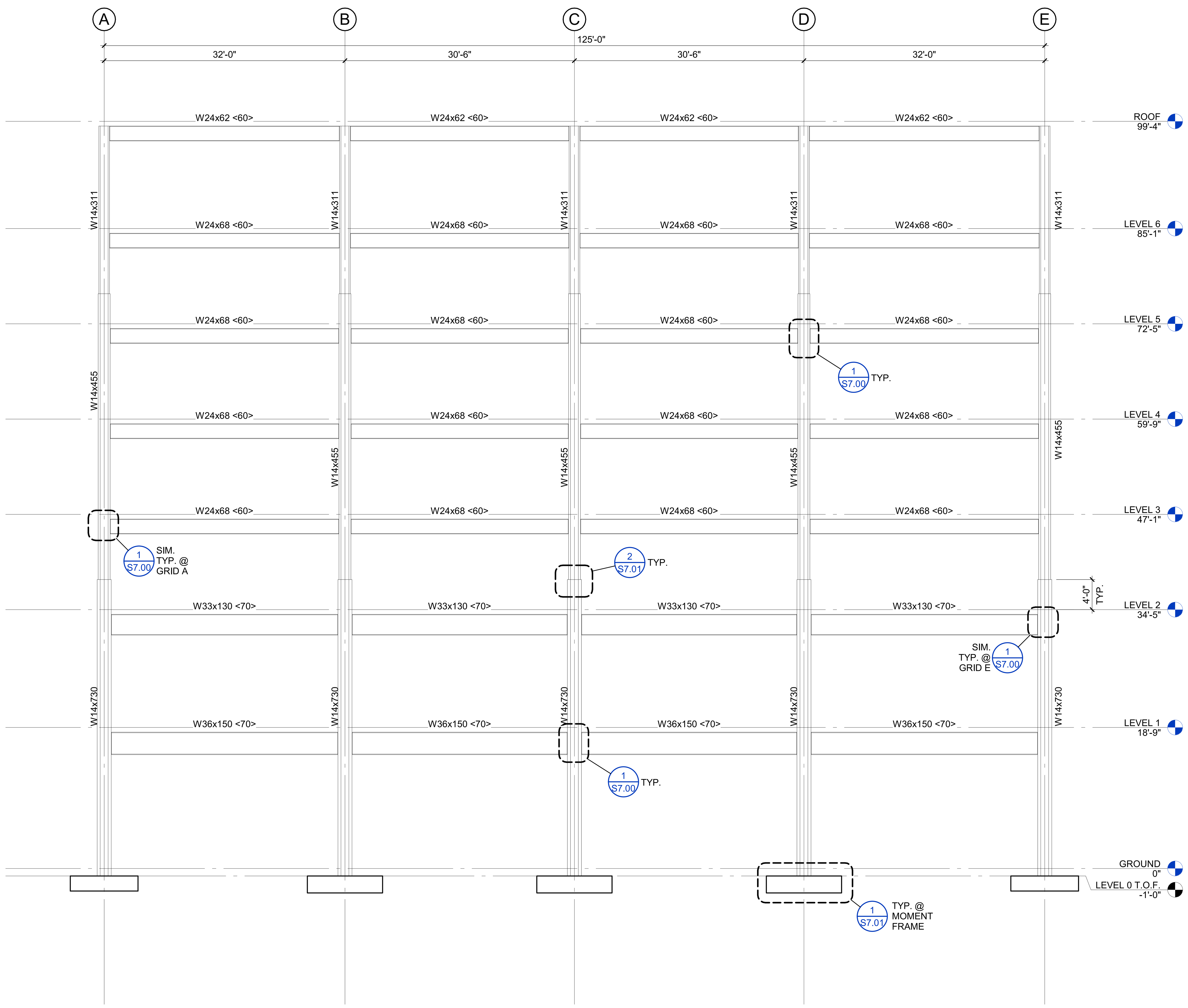
TITLE
MOMENT FRAME ELEVATION

SHEET NUMBER
S6.01



1 S6.02 MOMENT FRAME ELEVATION

1/8" = 1'-0"

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MOMENT FRAME ELEVATION

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S6.02

9/27/2021 11:00:41 AM

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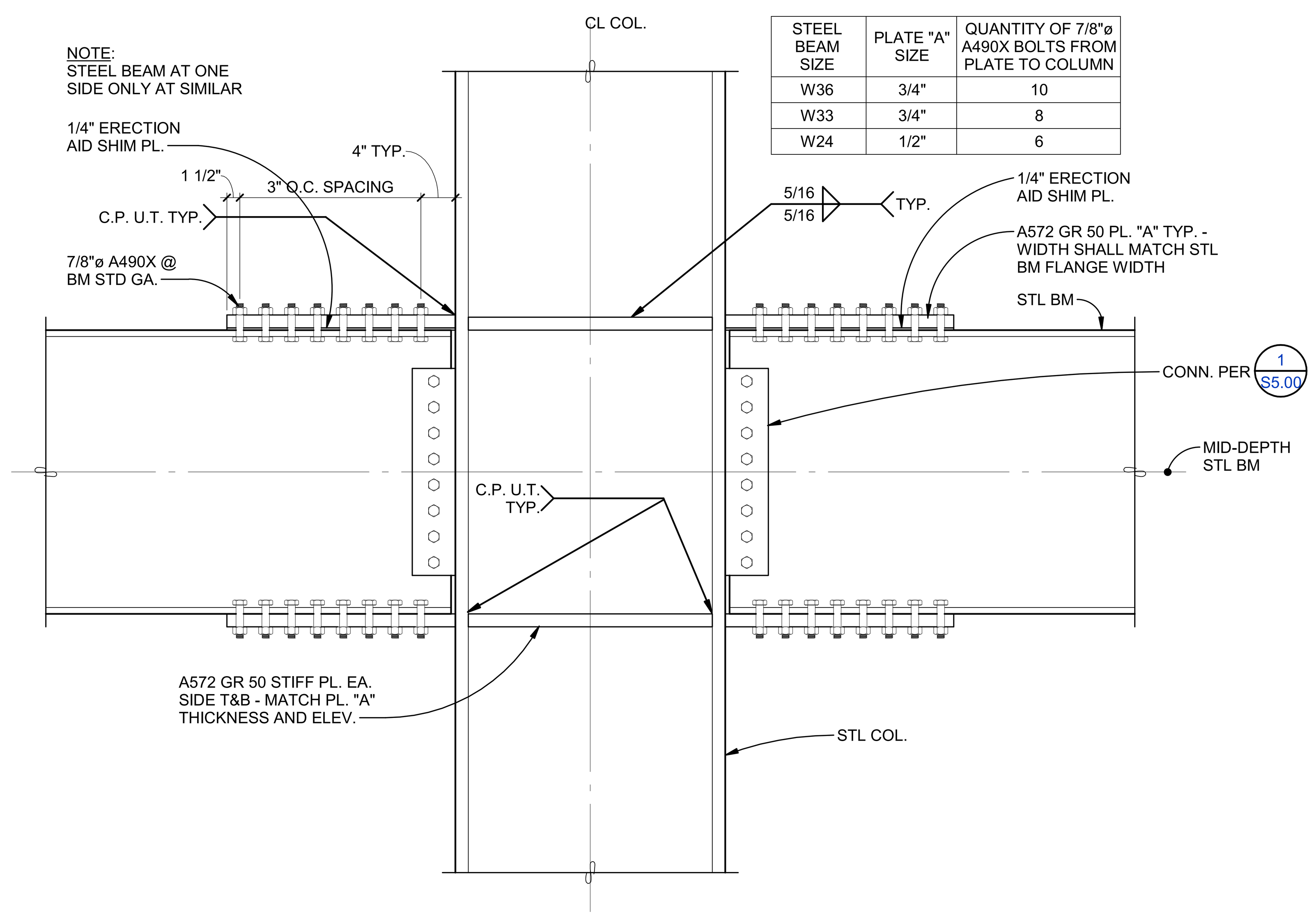
STEEL BEAM SIZE	PLATE "A" SIZE	QUANTITY OF 7/8"ø A490X BOLTS FROM PLATE TO COLUMN
W36	3/4"	10
W33	3/4"	8
W24	1/2"	6

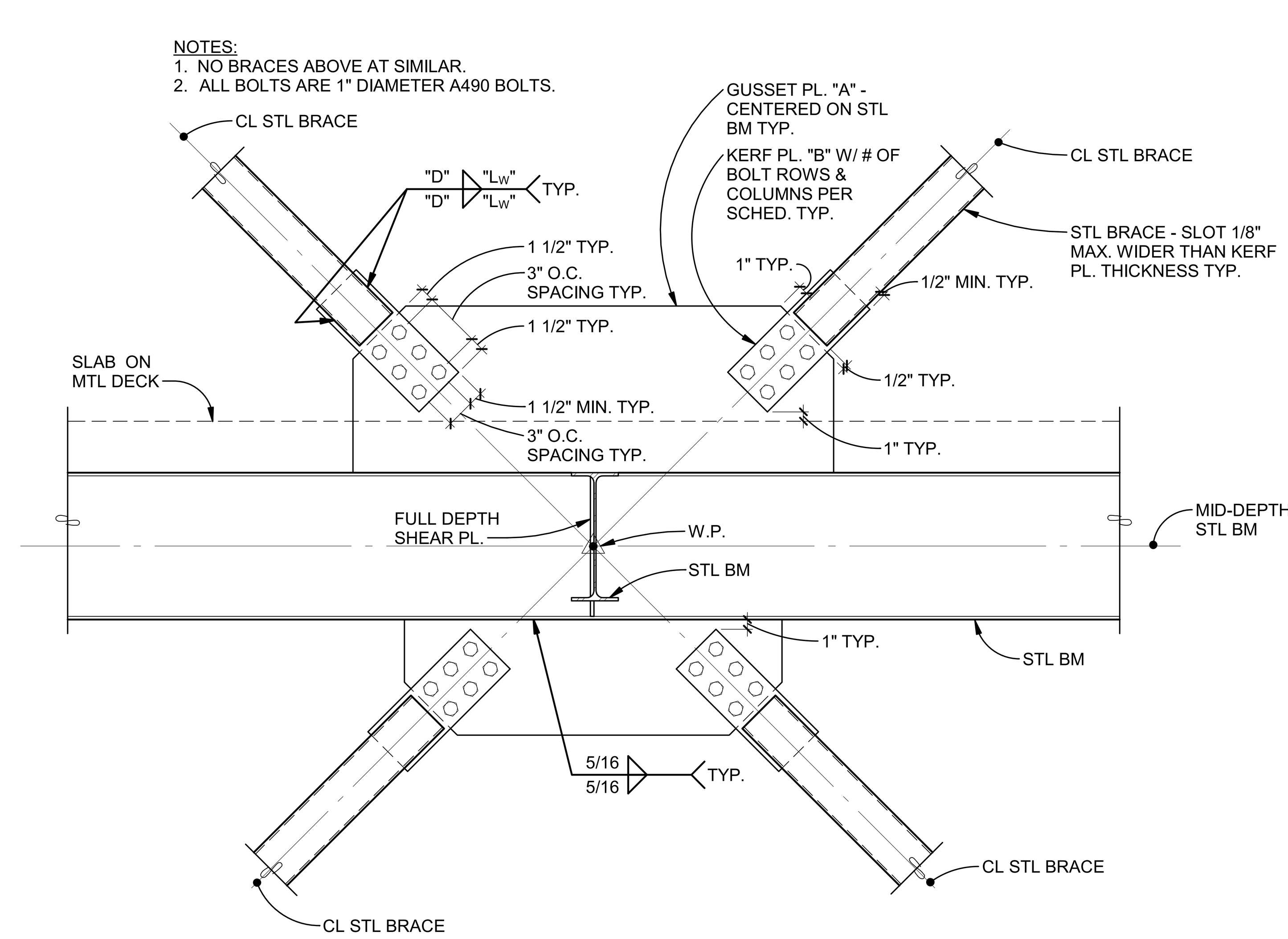


1 S7.00 DETAIL
NO SCALE

BRACED FRAME CONNECTION SCHEDULE

STEEL BRACE SIZE	GUSSET PLATE "A" THICKNESS	WELD SIZE "D"	LENGTH OF WELD "LW"	KERF PL. "B" THICKNESS	NUMBER OF A490 BOLT COLUMNS	NUMBER OF A490 BOLT ROWS
HSS5x5	1/2"	1/4"	8"	1/2"	2	2
HSS6x6	1"	1/4"	10"	1"	2	3
HSS7x7	1 1/4"	5/16"	12"	1 1/2"	2	4
HSS9x9 & HSS10x10	1 1/4"	5/16"	18"	1 1/2"	3	4

NOTES:
1. NO BRACES ABOVE AT SIMILAR.
2. ALL BOLTS ARE 1" DIAMETER A490 BOLTS.

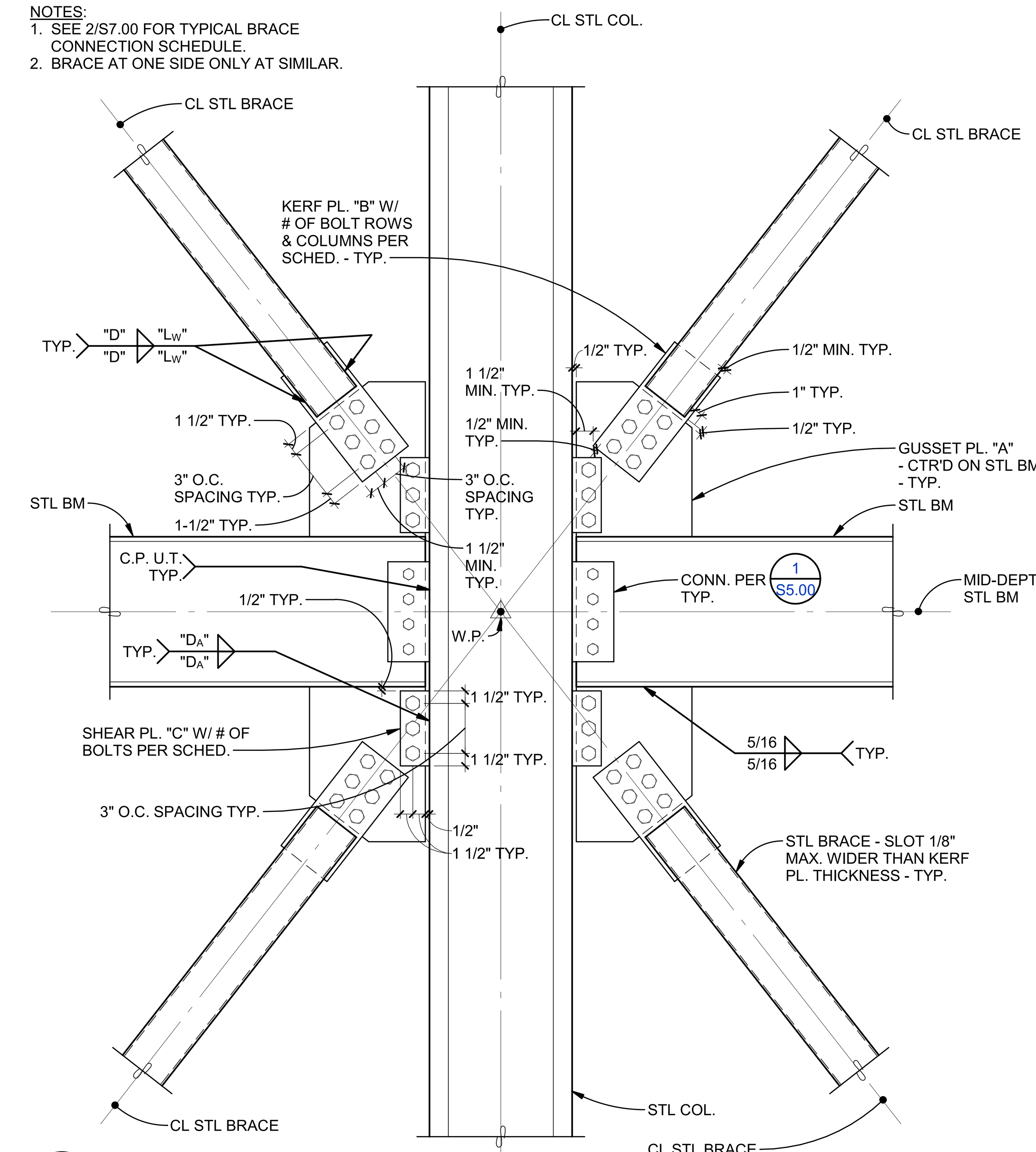


2 S7.00 DETAIL
NO SCALE

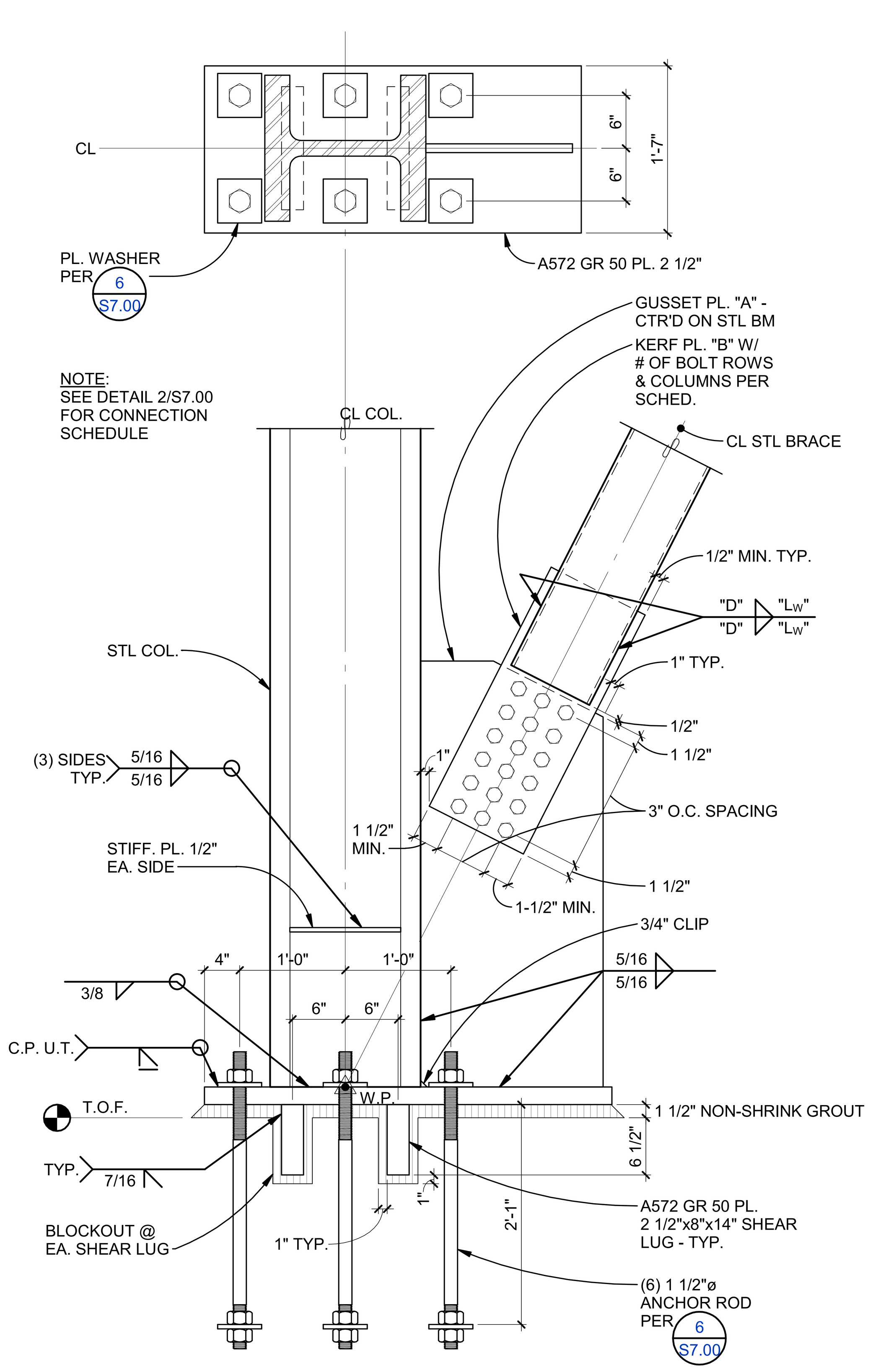
BRACED FRAME CONNECTION SCHEDULE

STEEL BRACE SIZE	WELD SIZE "DA"	SHEAR PLATE "C" THICKNESS	NUMBER OF 1"ø A490 BOLTS
HSS5x5	1/4"	1/2"	2
HSS6x6	1/4"	1/2"	3
HSS7x7	1/4"	3/4"	4
HSS9x9 AND HSS10x10	5/16"	1"	7

NOTES:
1. SEE 2/S7.00 FOR TYPICAL BRACE CONNECTION SCHEDULE.
2. BRACE AT ONE SIDE ONLY AT SIMILAR.



3 S7.00 DETAIL
NO SCALE



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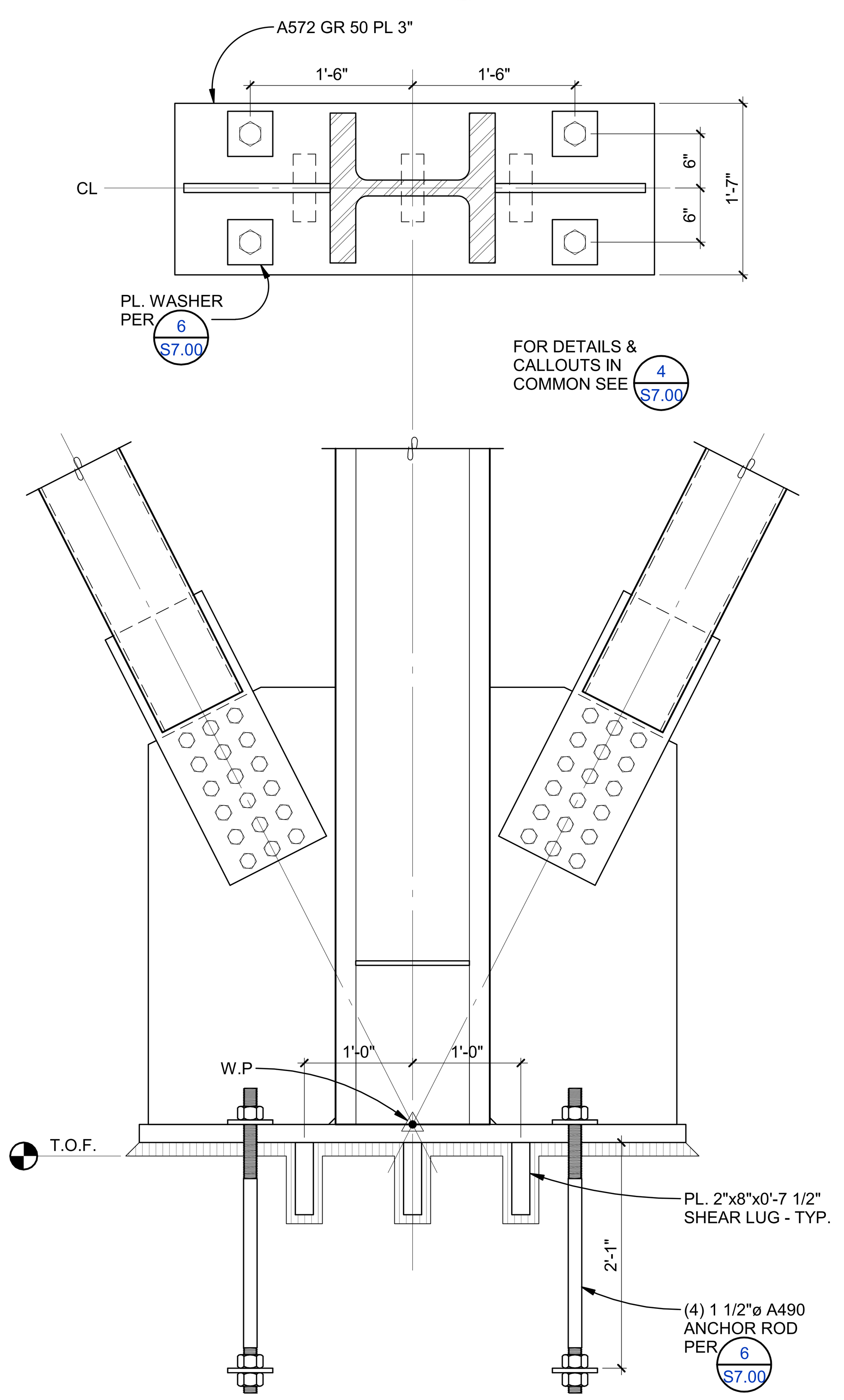
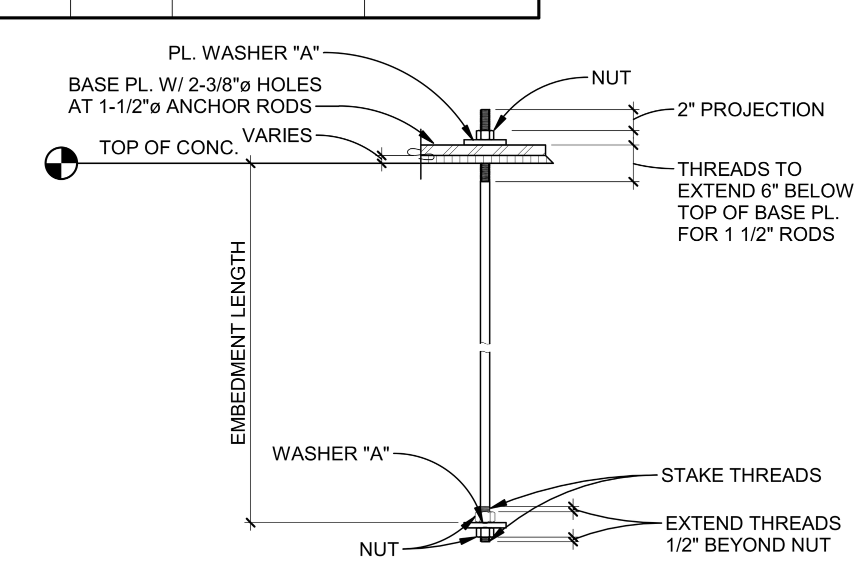


5 S7.00 SECTION
NO SCALE

ANCHOR ROD		WASHER		NUT
SIZE	MATERIAL	TYPE	SIZE	
1 1/2"ø	F1554 GRADE 105	A	PL. 1/2"x5"x0'-5" W/ 1 7/8"ø HOLE CENTERED	A563 GRADE A HEAVY HEX



TYPICAL ANCHOR ROD/BOLT DETAIL

6 S7.00 SECTION
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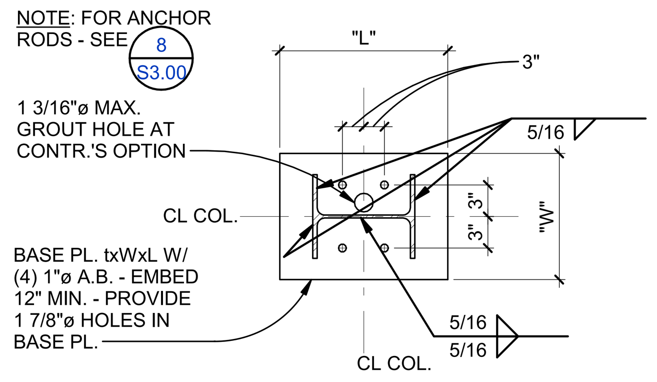
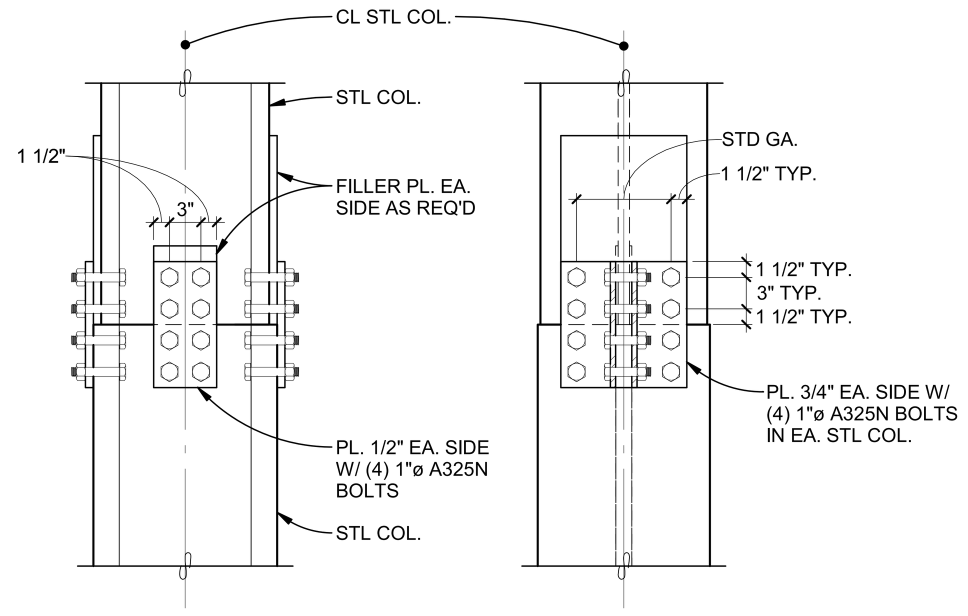


WIDE FLANGE

COLUMN SIZE	"W" (IN.)	"L" (IN.)	"t" (IN.)
W30x	19	34	2

TYPICAL COLUMN BASE PLATE

1 S7.01 SECTION
NO SCALE



2 S7.01 SECTION
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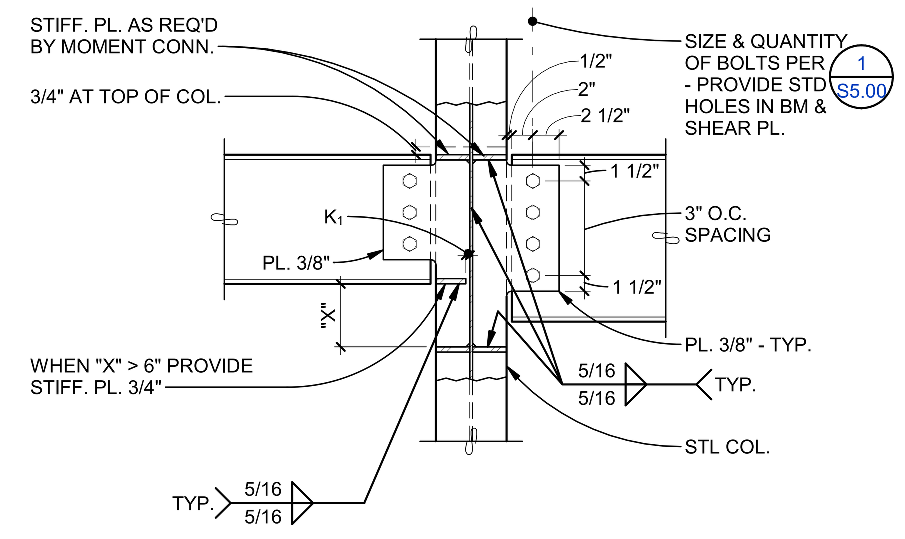
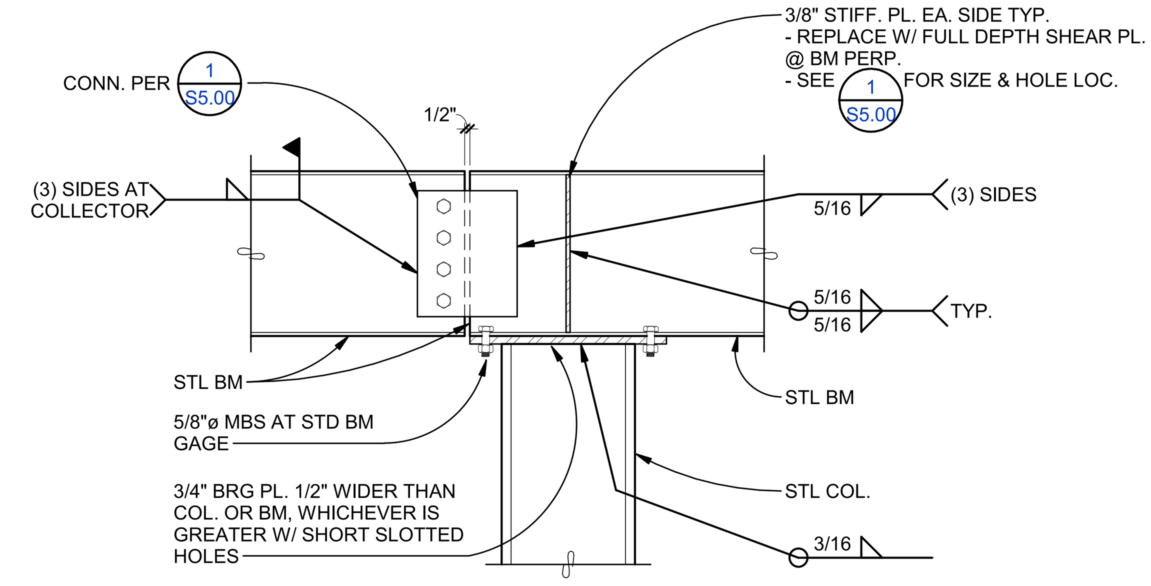


TYPICAL BEAM TO COLUMN WEB CONNECTION WITH ADJACENT MOMENT CONNECTION

3 S7.01 DETAIL
NO SCALE



4 S7.01 DETAIL
NO SCALE

CONSULTANTS

NIST National Institute of Standards and Technology

Applied Technology Council

PCS Structural Solutions

UZUN +CASE

PROJECT
HEALTHCARE FACILITY
LONG ISLAND, NEW YORK
PCS STRUCTURAL SOLUTIONS
DESIGN F
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DRAWINGS
30 SEPTEMBER, 2021

Job Number	19-051
Checked	Checker
Approved	Approver

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FRAME DETAILS

SHEET NUMBER
S7.01