01000 GENERAL

1. The structure reflected on the drawings is structurally sound in its completed condition only. The design of any and all temporary shoring and bracing prior to the completed condition shall be the contractor's responsibility. The Structural Engineer of Record (EOR) shall not be responsible for the means, methods, techniques, sequences, procedures nor safety programs which are empolyed by the contractor to build the completed structure. Any deviations from the completed structure represented in the drawings must be submitted to the EOR for approval in writing.
2. The Contractor shall verify all conditions including exsisting structures (above and below grade) and shall notify of the EOR of any discrepancies. The Contractor shall perform all required field measurements.
3. The Sections and Details shown shall be considered to be typical for all similar conditions. The Contractor shall submit written Requests for Information for areas in question.
4. The Contractor shall submit shop drawings for each of the structural components shown on the drawings. Four copies of the shop drawings shall be submitted to the Architect for distribution.

03000 FOUNDATIONS:

1. The Contractor shall notify the Structural Engineer of Record (EOR) of any below grade structure which may affect the foundation performance.
2. Foundations shall bear on residual soils or engineered fill capable of supporting an allowable pressure of 3000 psf for column footings. Soils shall be stable, and any expansive, compressible, or shifting material shall be removed to ensure a stable moisture content.
3. Slabs on grade are designed for a modulus of subgrade reaction of 175 pci using a K = 30.
4. Refer to the project Geotechnical Report from Bunnell-Lammons Engineering, Inc. dated Sept. 12, 2014 for fill placement and compaction requirements required to obtain the above listed design parameters.

03300 CAST-IN-PLACE CONCRETE:

1. All concrete work and materials shall be in accordance with ACI 318 2008 and ACI 301.
2. Minimum Material Specifications:
   a. Portland Cement: ASTM C150, Type 1
   b. Fly Ash: ASTM C 618, Type F (limit to 20% of cementitious content)
   c. Maximum water/cementitious material ratio: 0.5.
   d. Course Aggregate: ASTM C33. Maximum Aggregate size to be 1" (#57).
   e. Water: Potable
      i. No water may be added at the site without consent of the engineer.
   f. Synthetic Micro fiber: Polypropylene microfiber such as Fiberstrand 100 by Euclid Chemical Company applied at a rate of one pound per cubic yard. Mix for a minimum of three minutes at maximum mixing speed to ensure proper distribution.
   g. Admixtures: Air-entraining, water-reducing, plasticizing, retarding, and other admixtures will be reviewed for consideration by the contractor.
3. Reinforcing Material Specifications:
   a. Reinforcing Bars: New billet bars; ASTM A615 Grade 60; deformed.
   b. Steel Wire: ASTM A82, plain
   c. Welded Wire Fabric: ASTM A182 Sheet stock only.
4. Related Material Specifications:
   a. Non-shrink grout for equipment foundations and column bases (as needed) at the Faraday Building.
      i. ASTM C 1107.
      ii. Compressive strength of 7000 psi at 28 days.
   b. Non-shrink grout for precast panel and column baseplate grouting:
      i. ASTM C 1107.
      ii. Compressive strength of 5000 psi at 28 days.
   c. Waterstops: premolded, bentonite type waterstop with 1inch by 3/4 inch profile such as Volclay Waterstop RX by Colloid Environmental Technologies, Inc.
5. Foundations:
   a. Foundations shall have a 28 day compressive strength of 3000 psi.
6. Foundation Walls.
   a. Foundation walls shall have a 28 day compressive strength of 4000 psi and shall have an air entraining admixture.
   b. Walls and slab edges, where permanently exposed to view, shall be free of honeycombing and shall be rubbed with a mixture of sand and cement to provide a uniform appearance in color and texture.
7. Slabs-on-grade:
   a. Interior slabs-on-grade shall have a 28 day compressive strength of 3000 psi and shall be fiber reinforced.
   b. Interior slabs to receive a hard steel trowel finish with overall Ff =35 and FL=25, and minimum local values of Ff = 24 and Fl = 17.
   c. Exterior slabs (under roof or floor) shall have air entraining admixture to provide 6% entrained air. Chamfer all exposed slab edge corners (3/4").
   d. Slabs shall be wet cured for a period of seven days. Maintain moisture by ponding, fogging, or by overlaying with polyethylene coated burlap, wetting as needed.
   e. Vapor barrier under slab shall be a zero permeability barrier, sealing all seams as directed by the manufacturer.
   f. Provide sawcut control joints or construction joints at 12'-0" (maximum) square pattern (see slab plan for other requirements). Cut 1" joints as soon as possible after finishing (within 8 hours of placement). Construction joints shall be formed by thickening the slab to 8" within 18" of the joint and installing a continuous key or ¾" dowels at 18" o.c. Joint filler specification to be by owner or architect.
   g. Provide isolation joints at column boxouts, walls, and penetrations.
   h. Reinforce at all re-entrant corners with no control joints with (2) #3 x 4'-0" long centered on the corner, located in the top of the slab. Reinforce around all pipe or box penetrations greater than 3" with (4) #3 in diamond pattern.
   i. Specification of exterior concrete paving or sidewalks is by the Civil Engineer.
   j. Concrete splatter on walls or adjacent slabs shall be removed.
8. Reinforcing Steel:
   a. All detailing, fabrication, and placing shall be in accordance with ACI 315.
   b. Reinforcing steel shall be new billet bars conforming to ASTM A615, grade 60.
   c. Provide 3" concrete cover for all concrete cast against earth.
9. Post-Installed Anchors
   a. Expansion Anchors to be Hilti Kwik Bolt 3, ITW Redhead Trubolt, or approved equal. Sleeve anchors to be Hilti HLC Sleeve Anchor or ITW Redhead Dynabolt.
   b. Epoxy or chemical adhesive shall be Ramset Epcon A7 or C6; Hilti HY 150; or Simpson SET Epoxy-TIE.
   c. Anchors labeled as LDT anchors are to be hot-dip galvanized anchors with cutting threads such as Ramset/Redhead LDT; Simpson Titen HD; or Powers Wedge.

05120 STRUCTURAL STEEL:

1. Design, fabrication and erection of all structural steel shall be in accordance with the AISC Manual of Steel Construction, ASD, Thirteenth Edition.
2. Minimum material specifications:

a.	W-Structural Steel Shapes:	ASTM A992
b.	Rolled Steel Floor Plates:	ASTM A786 Commercial Grade
c.	Steel Pipe:	ASTM A53 gr. B
d.	Hollow Structural Sections:	ASTM A500 gr. B
e.	M, S, C, MC, HP Shapes:	ASTM A36
f.	Plates:	ASTM A36
g.	Angles:	ASTM A36
h.	Anchor Rods:	ASTM F1554 gr. 36
i.	Bolts:	ASTM A325N
j.	Weld Electrodes:	AWS E70xx
k.	Shear Connectors	ASTM A108, grades 1015 through 1020, headed stud type
l.	Non-shrink grout:	ASTM C 1107, non metallic – 5000 psi

3. Product Submittals:
   a. Typical shop fabrication and field erection drawings.
      i. The field erection drawings should clearly state length and size of field welds of diagonal braces to gussets
   b. Calculations for braced frames to include weld, gusset, and localized column and beam checks.
4. Provide 2 mils DFT of rust inhibitive primer after power tool cleaning. Provide coating for columns or any other steel below slab such as Sherwin Williams Tar Guard B69B60.
5. Field connections shall be bolted unless shown otherwise on the drawings. Bolted connections shall be made with A325N bolts. Snug-tight connections shall be designed per the fabricator's engineer to resist half of the uniform load given in Table 3-6 in the 13th Edition of AISC "Manual of Steel Construction".
6. Any steel permanently exposed to view such as the canopy frames shall be considered AESS.
   a. Piece Marks, erection aides, or similar components shall be removed.
   b. Steel shall be commercial blast cleaned prior to shop priming and one coat of shop paint at the direction of the architect.
7. Post-Installed Anchors
   a. Expansion Anchors to be Hilti Kwik Bolt 3, ITW Redhead Trubolt, or approved equal. Sleeve anchors to be Hilti HLC Sleeve Anchor or ITW Redhead Dynabolt.
   b. Epoxy or chemical adhesive shall be Ramset Epcon A7 or C6; Hilti HY 150; or Simpson SET Epoxy-TIE.
8. The fabricator and erector shall include a minimum of 1.5 tons of field weldedmiscellaneous angles, etc. for deck support, openings, etc. which may be added during the course of the project.

05210 STEEL JOISTS:

1. Design, fabrication and erection of all steel joists shall be in accordance with the Steel Joist Institute (SJI).
2. Use special joists at roof top units using the unit layout and weights shown on the structural drawings or on the mechanical drawings. Add unit weights to the K joist design values.
3. Bridging is to be designed and installed per SJI requirements. Anchor by welding to steel beam (per SJI).
4. Joists to be designed for a net uplift of 15 psf at a perimeter band of 20'-0" and 12 psf elsewhere. Provide joist bridging as required and note on erection drawings.
5. Joists shall receive a shop-coat of rust-inhibitive primer (1 mil DFT minimum).
6. Do not weld bottom chord struts or girders or joist bottom chord extensions to stabilizer plates unless noted on the drawings.
7. Hang piping, lights, ceiling, etc. from joists only at panel points. Any point load greater than 100 pounds located between panel points must be accompanied by a chord strengthening detail per the joist shop drawings.
8. Joist vendor to coordinate sprinkler piping from sprinkler contractor's drawing.

05300 STEEL DECK:

1. Design, fabrication and erection of all steel deck shall be in accordance with the Steel Deck Institute. All welds shall be made following AWS D1.3 specifications by qualified welding operators.
2. Deck Sheet Steel shall conform with ASTM A611 and shall have FM Label attached.
3. Deck Vendor shall supply closures, ridge plates, valley plates, sump pans, etc. necessary to provide a finished roof surface. Deck Vendor shall supply pour stops, closures, and accessories required to provide a finished floor deck surface prior to placing concrete.
4. Deck Sheet shall extend over a minimum of (3) spans of structural steel.
5. Roof deck shall be, 1-1/2" deep, 22 gage, type B, painted, (I) minimum = 0.16 in4/ft., 33 ksi. As a minimum, deck attachment to supports supports shall be made with a 36/4 (12" o.c.) pattern using 5/8" puddle welds. As a minimum, install (2) #10 sidelap screws between all supports. End laps of sheets shall be a minimum of 4" and shall occur over supports.
6. Floor deck shall be 2", 20 gage, factory primed steel deck. Attach to supports at 12" o.c. using 5/8" puddle welds. Sidelap connections shall be (1) #10 screw placed between each support.

Building Code
2012 International Building Code

Building Use
Business

Risk Category II

Vertical Loads

Dead Loads at Roof	
Single Ply membrane and insulation	2 psf
Steel Framing	4 psf
Collateral	8 psf
Dead Loads at Floor	
5" Concrete Slab with Deck	50 psf
Steel Framing	8 psf
Collateral	8 psf
Live Loads at Roof	
Occupancy (Reducible of Area, Slope)	20 psf
Live Loads at Floor	
Offices	50 psf
Corridors (first floor)	100 psf
Corridors (above first floor)	80 psf
Snow Loads	
Ground Snow Load	10 psf
Importance Factor	1.0
Rain on Snow Surcharge	5 psf
Design Snow Load (No surcharge)	8.0 psf

LATERAL LOADS

Wind Loads	
Velocity (Ultimate Wind Design Speed)	115 mph
Exposure	B
Enclosed Building	
Internal Pressure Coefficient	+/-0.18

Components and Cladding
Wall Interior Zones (ht, areas, pressures)
30', 10 sf, 18 psf, -19 psf
30', 100 sf, 15 psf, -17 psf

Wall Corner Zones (7'-0" from exterior corners)
30', 10 sf, 18 psf, -24 psf
30', 100 sf, 15 psf, -18 psf

Roof Components Loads (6'-0" band)
30', 10 sf, -19 psf (Zone 1), - 33 psf (Zone2),
-47 psf (Zone 3)

Seismic Loads	
Importance Factor	1.25
Ss, Short Term Spectral Response	0.28
S1, 1 second Spectral Response	0.11
Site Class (Confirmed)	D
Response Modification Coefficient (Steel Systems not specifically detailed for Seismic Reinforcing)	3
Spectral Response, Sds	0.29
Spectral Response, Sd1	0.17
Design Category	C
Analysis Type	ELF

2012 IBC CHAPTER 17 –STRUCTURAL TESTS AND SPECIAL INSPECTIONS

The Owner shall engage a special inspection coordinator. Below represents the inspections required for structural elements by Chapter 17 and additional testing needed to assist in Quality Assurance and shall be considered the project's Statement of Special Inspections.

STATEMENT OF SPECIAL INSPECTIONS

1. Section 1704 – Special Inspections
   a. 1704.1.2 Report Requirements
      i. Special Inspection Reports shall be emailed to the Contractor within one week of performing Tests and/or Inspections.
      ii. Non-conforming items shall be immediately brought to the attention of the contractor for correction.
      iii. If non-conforming items are not corrected, the items shall be brought to the attention of the building official and the Design Professional in Responsible Charge prior to completion of that portion of the work and prior to that work being covered.
      iv. All Inspection Reports shall be compiled by the Contractor and submitted to the Design Professional in Responsible Charge.
      v. At the Project's completion, the Special Inspection's Coordinator shall issue a final report documenting special inspections were performed per this Statement of Special Inspections and Deficiencies were corrected.
   a. 1704.2 – Inspection of Fabricators
      i. Precast Concrete Fabricator shall provide quality control procedures to the special inspector or the fabricator must be certified by the National Precast Concrete Association.
   b. 1705.2 – Steel Construction
      i. Welding.
         1) Review field welds to ensure welds conform with AWS D1.1.
         2) Visually inspect floor and roof deck welds.
         3) Test 10% of the field welded connections.
      ii. Details.
         1) Inspect anchor rods for all columns to ensure proper washer and nut installation.
         2) Inspect all horizontal and vertical rod bracing to ensure proper tension and nut/bolt installation.
         3) Inspect all purlin and girt bolted connections to ensure snug tight condition.
      iii. High-Strength bolts.
         1) Test 10% of high strength bolted connections.
         2) Obtain Certificate of Compliance for bolts, nuts, and washers for all types used.
   c. 1705.3 – Concrete Construction
      i. The Testing Agency shall inspect foundation reinforcing (size, spacing, and laps) for each set of foundations placed.
      ii. Obtain mix designs, and ensure each concrete placement uses the approved mix design.
      iii. The Testing agency shall field sample concrete. The following tests should be performed for each day's first load and each 100 cubic yards:
         1. Weight of concrete, ASTM C 138.
         2. Slump, ASTM C 143,
         3. If required, Air content of freshly mixed concrete by pressure method, ASTM C 231 or volumetric method, ASTM C 173.
         4. Concrete temperature at placement time.
         5. Air temperature and weather (windy, cloudy, etc) at placement time.
         6. Strength determined in accordance with ASTM C 39.
      iv. The Testing Agency shall observed curing of slabs, noting weather, techniques, and time of sawcutting slab control joints.
   e. 1704.7 – Soils
      i. See geotechnical engineer's requirements for testing of fill and stone base.

Owner

CU-ICAR
RESEARCH ONE

arrowood
+
arrowood
Arrowood & Arrowood, PC
412-B Pettigru Street
Greenville, SC 29607
864.233.9383 (t)
864.232.7855 (f)

A&A PROJECT #12-LS3P-17

LS3P

110 WEST NORTH STREET SUITE 300
GREENVILLE, SOUTH CAROLINA 29601
TEL. 864.235.0405 FAX 864.233.4027

SOUTH CAROLINA PROFESSIONAL ENGINEER
No. 28477
12-9-14
ANTHONY JOHN ARROWOOD

SOUTH CAROLINA
ARROWOOD & ARROWOOD, PC
No. C03038
CERTIFICATE OF AUTHORIZATION

MEMBERS OF THE AMERICAN INSTITUTE OF ARCHITECTS

REVISIONS:

No.	Description	Date

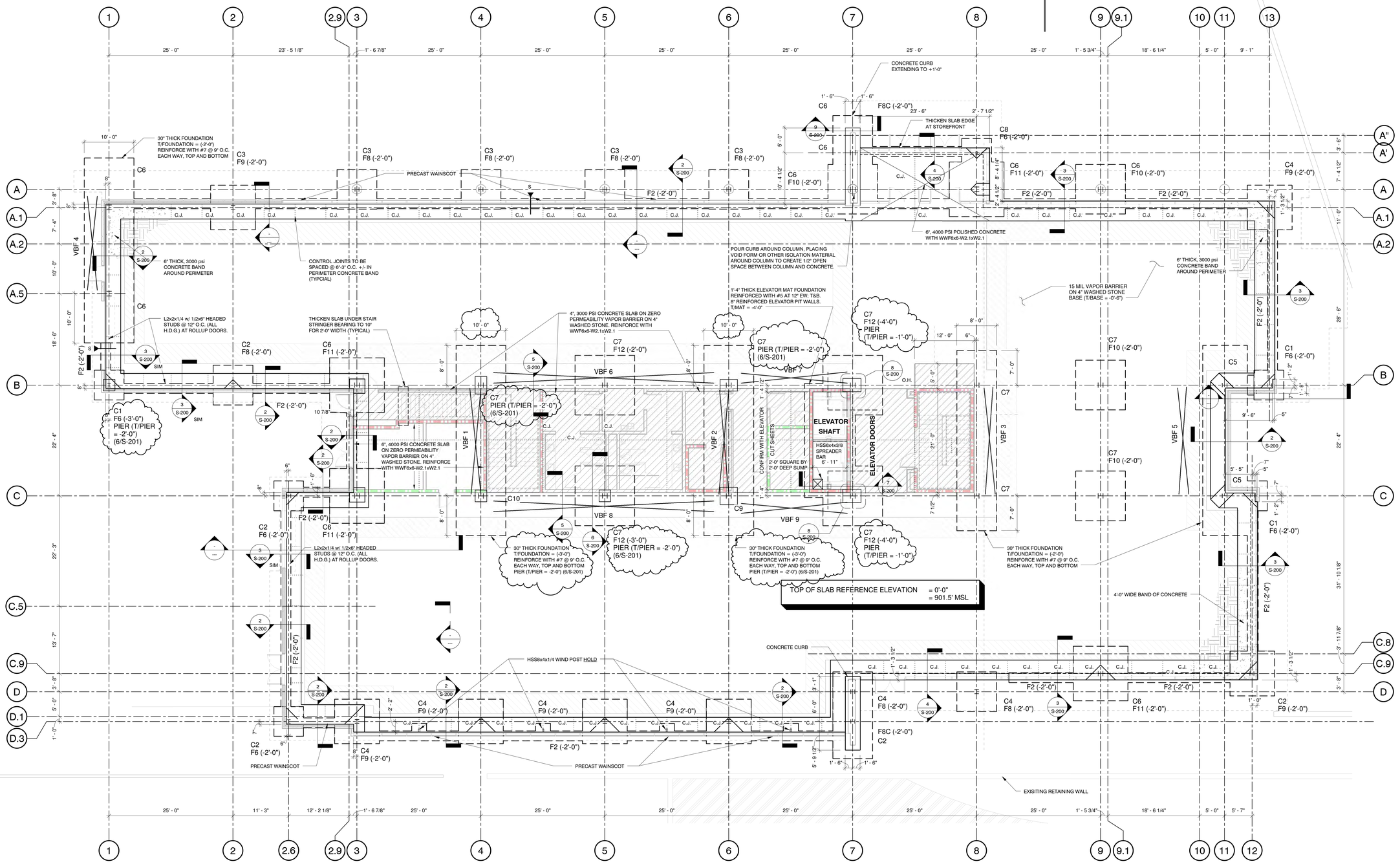
ISSUE FOR FOUNDATION PERMIT 12.9.14

PROJECT: 12-LS3P-17
DATE: 11.05.2014
DRAWN BY: WHB
CHECKED BY: AJA

GENERAL NOTES & DESIGN CRITERIA

S-100

12.9.2014



FOUNDATION / SLAB PLAN

1/8" = 1'-0"

COORDINATION

1) ROOF DRAIN LEADERS

2) ELEVATOR CUT SHEETS

3) STOREFRONT / PRECAST SILL

4) DROP FOOTINGS FOR EQUIPMENT

5) TRUCK DOCK AND WALL

LEGEND

CX = COLUMN TYPE "X". SEE SCHEDULE

FX(-X-X") = FOOTING TYPE "X" WITH TOP OF FOOTING REFERENCING TOP OF 1ST FLOOR ELEVATION

S = FOOTING ELEVATION STEP. SEE A/S-200

VBF = VERTICAL BRACE FRAME, SEE S-205

C.J. = 1 1/2" SAWCUT CONTROL JOINT

COLUMN SCHEDULE	
TYPE	SIZE
C1	W10x33
C2	W10x49
C3	W10x54
C4	W10x60
C5	W12x58
C6	W12x65
C7	W12x72
C8	HSS5x5x3/8
C9	W12x79
C10	W12x87

NOTES:

1. SEE S-201 FOR ANCHOR ROD DETAILS

FOUNDATION SCHEDULE			
TYPE	WIDTH x LENGTH	THICK.	REINFORCING
F2	2'-0" x CONTINUOUS	12"	(2) #5 CONT.w/#5@32" SW *
F4	4'-0" x 4'-0"	16"	(9) #6 EACH WAY; TOP & BOTTOM
F6	6'-0" x 6'-0"	16"	(12) #8 EACH WAY; TOP & BOTTOM
F8	8'-0" x 8'-0"	18"	(9) #6 EACH WAY; TOP & BOTTOM
F8C	8'-0" x CONTINUOUS	21"	#6 @ 9"EACH WAY; TOP & BOTTOM
F9	9'-0" x 9'-0"	18"	(9) #6 EACH WAY; TOP & BOTTOM
F10	10'-0" x 10'-0"	24"	(12) #8 EACH WAY; TOP & BOTTOM
F11	11'-0" x 11'-0"	30"	(16) #8 EACH WAY; TOP & BOTTOM
F1210	12'-0" x 10'-0"	28"	(18) #8 EACH WAY; TOP & BOTTOM
F12	12'-0" x 12'-0"	24"	(12) #8 EACH WAY; TOP & BOTTOM
F13	13'-0" x 13'-0"	30"	(16) #8 EACH WAY; TOP & BOTTOM
1410	14'-0" x 10'-0"	28"	(18) #8 EACH WAY; TOP & BOTTOM
15	15'-0" x 15'-0"	30"	(18) #8 EACH WAY; TOP & BOTTOM

Owner

CU-ICAR
CLEMSON UNIVERSITY INTERNATIONAL CENTER FOR AUTOMOTIVE RESEARCH

CU-ICAR RESEARCH ONE

arrowood + arrowood
Arrowood & Arrowood, PC
412-B Pettigru Street
Greenville, SC 29607
864.233.9383 (t)
864.232.7855 (f)

A&A PROJECT #12-LS3P-17

LS3P

110 WEST NORTH STREET SUITE 300
GREENVILLE, SOUTH CAROLINA 29601
TEL. 864.235.0405 FAX 864.233.4027

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER No. 22477 JOHN ARROWOOD 12.9.14

SOUTH CAROLINA ARROWOOD & ARROWOOD, PC No. C03036 CERTIFICATE OF AUTHORIZATION

MEMBERS OF THE AMERICAN INSTITUTE OF ARCHITECTS

ISSUE FOR FOUNDATION PERMIT 12.9.14

REVISIONS:

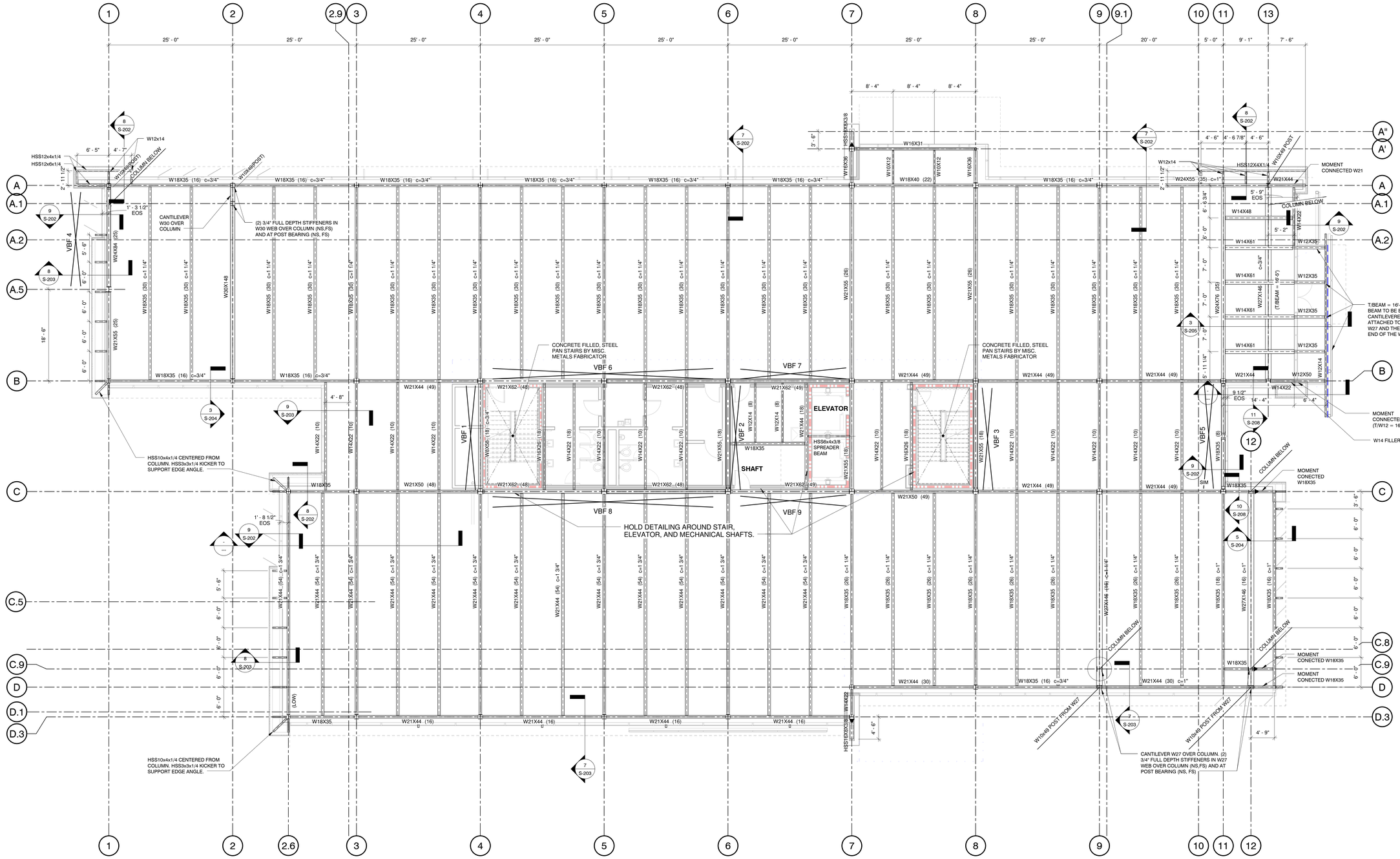
No.	Description	Date
1	Issue for ------	00-00-0000

PROJECT: 12-LS3P-17
DATE: 11.05.2014
DRAWN BY: AP/WB
CHECKED BY: ARROWOOD

FOUNDATION/SLAB PLAN

S-101

12.9.2014



SECOND FLOOR FRAMING PLAN

1/8" = 1'-0"

NOTES

1. FLOOR SLAB TO BE 5" (3000 PSI) CONCRETE WITH WWF 6x6-w2.9Xw2.9 WITH 2"x20/20 GA GALVANIZED (G60) COMPOSITE STEEL DECK.

Composite Beam End Reaction Schedule		
Beam Class	End Shear Reaction	Notes
W14	25 kips	
W16	30 kips	
W18	35 kips	
W21	45 kips	
W24	60 kips	
W27	85 kips	
W30	130 kips	

1. Fabricator to design beam shear connections for the minimum reaction listed above.

LEGEND

C = CAMBER IN BEAM
(X) = X NUMBER OF 3/4"x5" HEADED STUDS. SEE S204
▶ = MOMENT CONNECTION. SEE 5/S201
VBF = VERTICAL BRACED FRAME. SEE S205
XX k-ft = END MOMENT FOR MOMENT CONNECTION DESIGNS
= 1 1/2"x22 GAGE, TYPE B STEEL DECK

PRICING NOTES

1) ELEVATOR STEEL - ASSUME HSS5x5x1/4 ELEVATOR GUIDERAIL BRACKET SUPPORT POSTS, (3) TOTAL. ASSUME FIELD WELDED PLATE 1"x8x1'-4" FOR CONNECTION OF BRACKET TO BE SPACED @ 12'-0" O.C. ALSO ASSUME W8x24 HOIST BEAMS.

2) EDGES - TYPICAL SLAB EDGE TO BE BENT PLATE 1/4 w/ 3/4"x8" H.S. @ 12" O.C. PROVIDE L2 KICKERS @ 4'-0" O.C. FOR BENT PLATE SUPPORT.

COORDINATION

1) OPENING IN BEAMS FOR CONDUIT ROUTING

Owner

CU-ICAR
CLEMSON UNIVERSITY INTERNATIONAL CENTER FOR AUTOMOTIVE RESEARCH

CU-ICAR RESEARCH ONE

arrowood + arrowood
Arrowood & Arrowood, PC
412-B Pettigru Street
Greenville, SC 29607
864.233.9383 (t)
864.232.7855 (f)

A&A PROJECT #12-LS3P-17

LS3P

110 WEST NORTH STREET SUITE 300
GREENVILLE, SOUTH CAROLINA 29601
TEL. 864.235.0405 FAX 864.233.4027

SOUTH CAROLINA PROFESSIONAL ENGINEER — No. 22417 — 12.9.14 — ANTHONY JOHN ARROWOOD
ARROWOOD & ARROWOOD, PC No. C03036 — CERTIFICATE OF AUTHORIZATION

MEMBERS OF THE AMERICAN INSTITUTE OF ARCHITECTS

REVISIONS:

No.	Description	Date

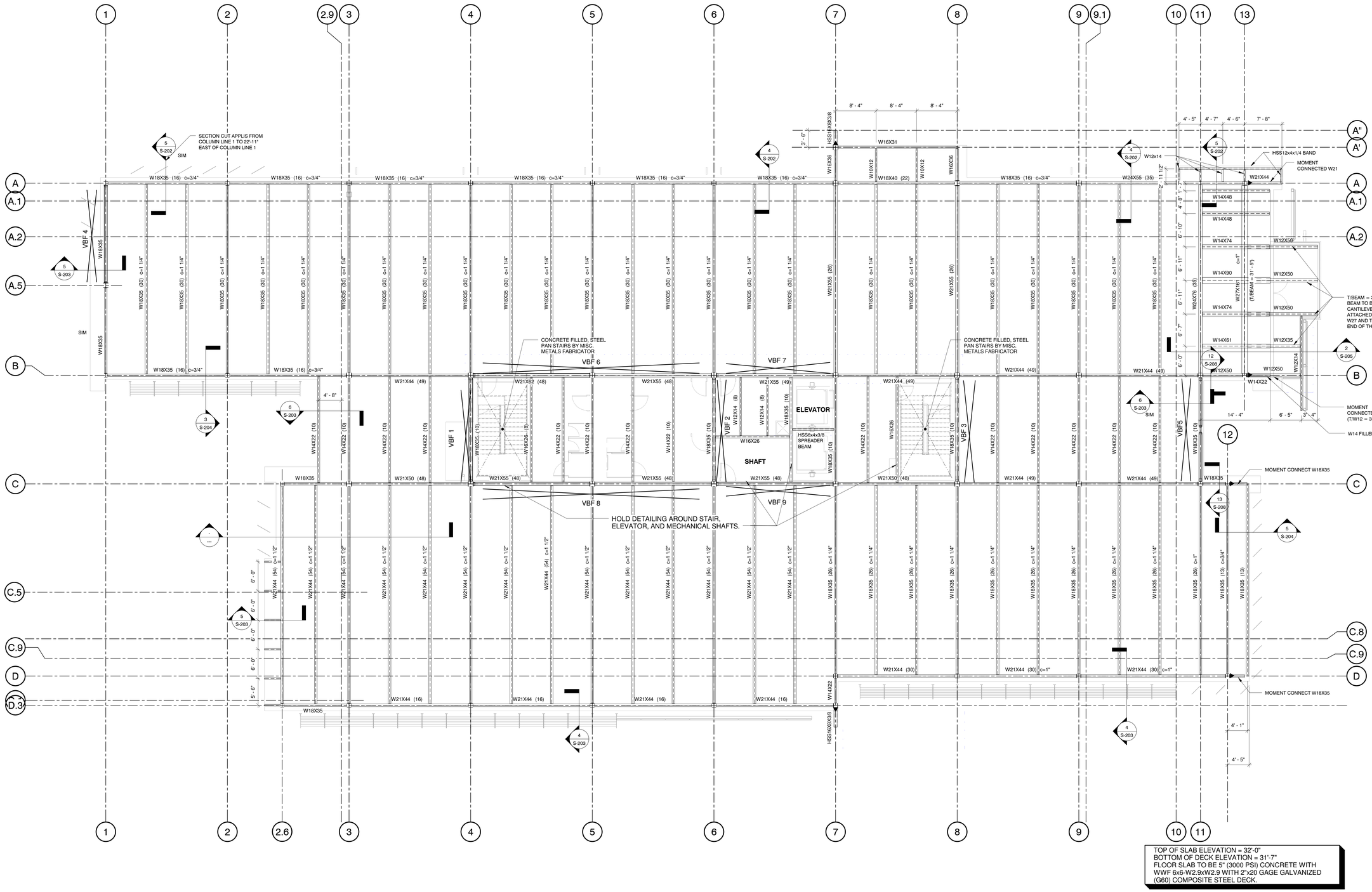
ISSUE FOR FOUNDATION PERMIT 12.9.14

PROJECT: 12-LS3P-17
DATE: 11.05.2014
DRAWN BY: AP/WB
CHECKED BY: ARROWOOD

SECOND FLOOR FRAMING PLAN

S-102

12.9.2014



THIRD FLOOR FRAMING PLAN

1/8" = 1'-0"

NOTES

1. FLOOR SLAB TO BE 5" (3000 PSI) CONCRETE WITH WWF 6x6-w2.9Xw2.9 WITH 2"x20/20 GA GALVANIZED (G60) COMPOSITE STEEL DECK.

Composite Beam End Reaction Schedule		
Beam Class	End Shear Reaction	Notes
W14	25 kips	
W16	30 kips	
W18	35 kips	
W21	45 kips	
W24	60 kips	
W27	85 kips	
W30	130 kips	

1. Fabricator to design beam shear connections for the minimum reaction listed above.

LEGEND

C = CAMBER IN BEAM
(X) = X NUMBER OF 3/4"x5" HEADED STUDS. SEE S204
▶ = MOMENT CONNECTION. SEE 5/S201
VBF = VERTICAL BRACED FRAME. SEE S205
XX k-ft = END MOMENT FOR MOMENT CONNECTION DESIGNS
= 1 1/2"x22 GAGE, TYPE B STEEL DECK

PRICING NOTES

1) ELEVATOR STEEL - ASSUME HSS5x5x1/4 ELEVATOR GUIDERAIL BRACKET SUPPORT POSTS, (3) TOTAL. ASSUME FIELD WELDED PLATE 1"x8x1'-4" FOR CONNECTION OF BRACKET TO BE SPACED @ 12'-0" O.C. ALSO ASSUME W8x24 HOIST BEAMS.

Owner

CU-ICAR
CLEMSON UNIVERSITY INTERNATIONAL CENTER FOR AUTOMOTIVE RESEARCH

CU-ICAR RESEARCH ONE

arrowood + arrowood
Arrowood & Arrowood, PC
412-B Pettigru Street
Greenville, SC 29607
864.233.9383 (t)
864.232.7855 (f)

A&A PROJECT #12-LS3P-17

LS3P

110 WEST NORTH STREET SUITE 300
GREENVILLE, SOUTH CAROLINA 29601
TEL. 864.235.0405 FAX 864.233.4027

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — No. 24477 — 12.9.14 — ANTHONY JOHN ARROWOOD

SOUTH CAROLINA — ARROWOOD & ARROWOOD, PC No. C03038 — CERTIFICATE OF AUTHORIZATION

MEMBERS OF THE AMERICAN INSTITUTE OF ARCHITECTS

REVISIONS:

No.	Description	Date

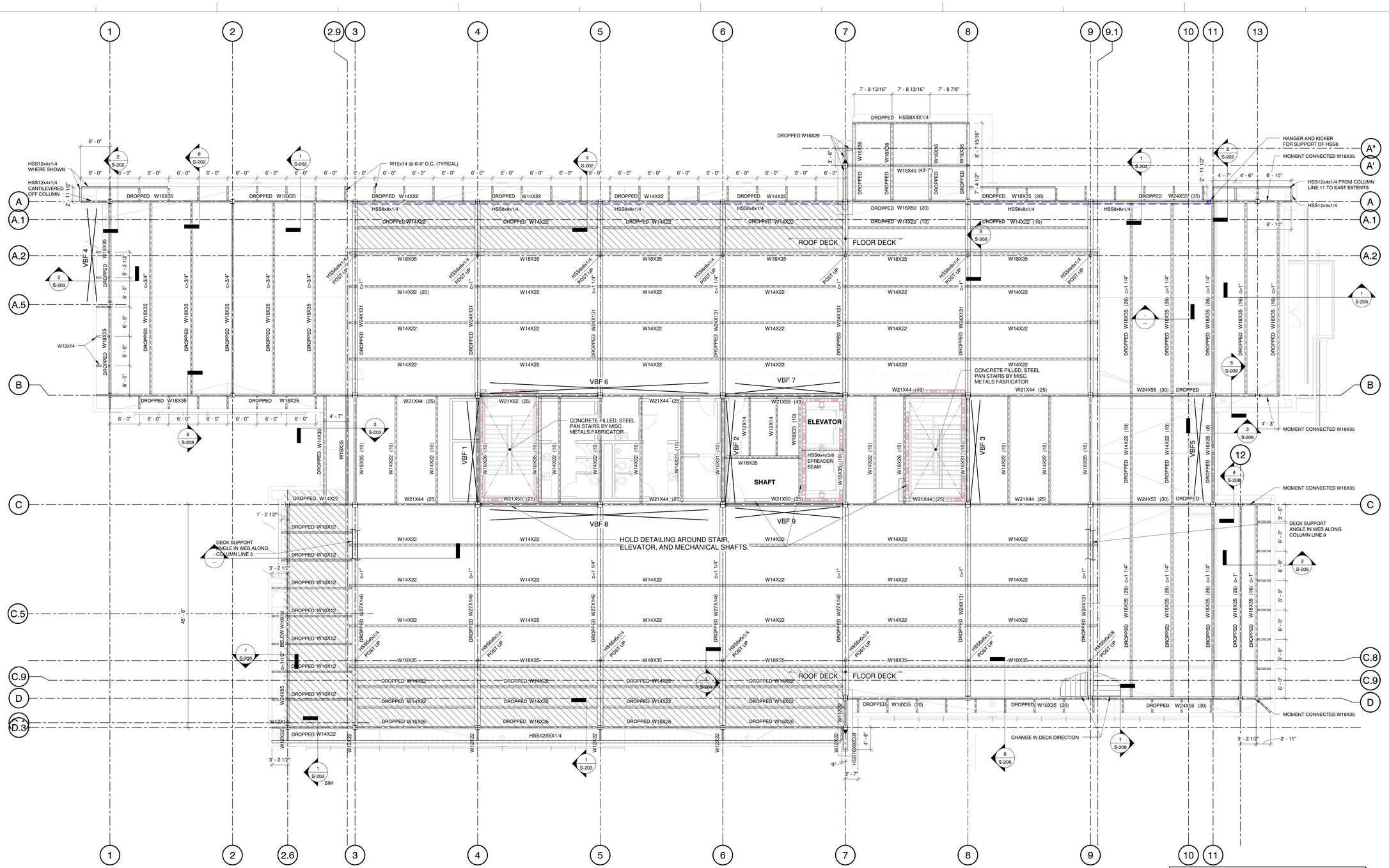
ISSUE FOR FOUNDATION PERMIT 12.9.14

PROJECT: 12-LS3P-17
DATE: 11.05.2014
DRAWN BY: AP/WB
CHECKED BY: ARROWOOD

THIRD FLOOR FRAMING PLAN

S-103

12.9.2014



FOURTH FLOOR FRAMING PLAN

1/8" = 1'-0"

NOTES

1. FLOOR SLAB TO BE 5" (3000 PSI) CONCRETE WITH WWF 6x6-w2.9Xw2.9 WITH 2"x20/20 GA GALVANIZED (G60) COMPOSITE STEEL DECK.

Composite Beam End Reaction Schedule		
Beam Class	End Shear Reaction	Notes
W14	25 kips	
W16	30 kips	
W18	35 kips	
W21	45 kips	
W24	60 kips	
W27	85 kips	
W30	130 kips	

1. Fabricator to design beam shear connections for the minimum reaction listed above.

LEGEND

C = CAMBER IN BEAM
(X) = X NUMBER OF 3/4"x5" HEADED STUDS. SEE S204
▶ = MOMENT CONNECTION. SEE 5/S201
VBF = VERTICAL BRACED FRAME. SEE S205
XX k-ft = END MOMENT FOR MOMENT CONNECTION DESIGNS
▨ = 1 1/2"x22 GAGE, TYPE B STEEL DECK

PRICING NOTES

1) ELEVATOR STEEL - ASSUME HSS5x5x1/4 ELEVATOR GUIDERAIL BRACKET SUPPORT POSTS, (3) TOTAL. ASSUME FIELD WELDED PLATE 1"x8x1'-4" FOR CONNECTION OF BRACKET TO BE SPACED @ 12'-0" O.C. ALSO ASSUME W8x24 HOIST BEAMS.

2) EDGES - TYPICAL SLAB EDGE TO BE BENT PLATE 1/4 w/ 3/4"x8" H.S. @ 12" O.C. PROVIDE L2 KICKERS @ 4'-0" O.C. FOR BENT PLATE SUPPORT.

Coordinate openings in beams for utilities....

Owner

CU-ICAR
CLEMSON UNIVERSITY INTERNATIONAL CENTER FOR AUTOMOTIVE RESEARCH

CU-ICAR RESEARCH ONE

arrowood + arrowood
Arrowood & Arrowood, PC
412-B Pettigru Street
Greenville, SC 29607
864.233.9383 (t)
864.232.7855 (f)

A&A PROJECT #12-LS3P-17

LS3P

110 WEST NORTH STREET SUITE 300
GREENVILLE, SOUTH CAROLINA 29601
TEL. 864.235.0405 FAX 864.233.4027

SOUTH CAROLINA PROFESSIONAL ENGINEER
No. 24417
12.9.14
ANTHONY JOHN ARROWOOD
SOUTH CAROLINA
ARROWOOD & ARROWOOD, PC
No. C03036
CERTIFICATE OF AUTHORIZATION

MEMBERS OF THE AMERICAN INSTITUTE OF ARCHITECTS

REVISIONS:

No.	Description	Date

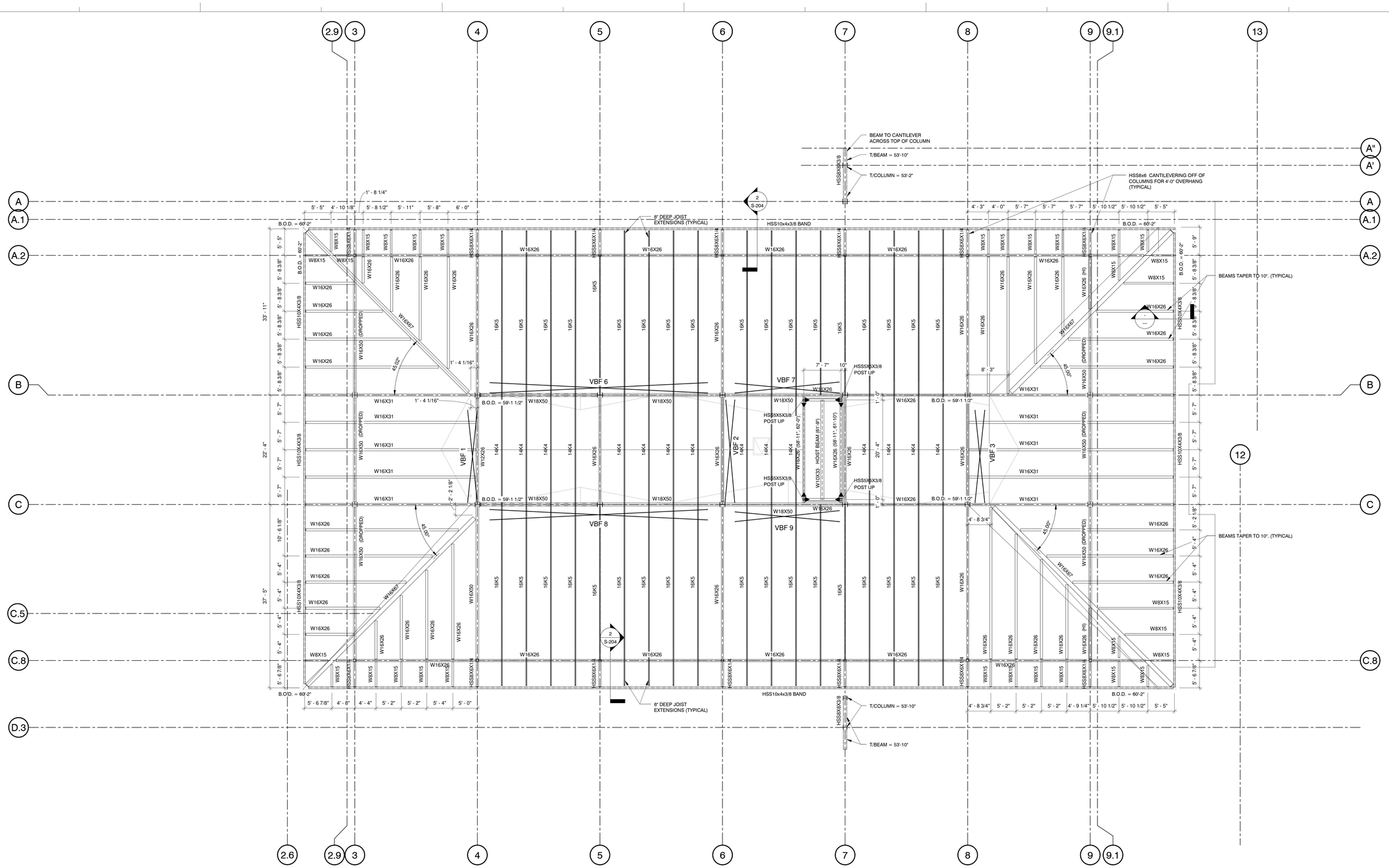
ISSUE FOR FOUNDATION PERMIT 12.9.14

PROJECT: 12-LS3P-17
DATE: 11.05.2014
DRAWN BY: AP/WB
CHECKED BY: ARROWOOD

FOURTH FLOOR FRAMING PLAN

S-104

12.9.2014



ROOF FRAMING PLAN

1/8" = 1'-0"

LEGEND

C = CAMBER IN BEAM

▲ = MOMENT CONNECTION. SEE 5/S-201

VBF = VERTICAL BRACED FRAME. SEE S-205

FRAMING NOTES

1. DECK TO BE 1 1/2"x22GAGE, TYPE B STEEL ROOF DECK.

PRICING NOTES

1) ASSUME (5) L4 FRAMES FOR EXHAUST & OTHER PENETRATIONS.

Owner

CU-ICAR
CLEMSON UNIVERSITY INTERNATIONAL CENTER FOR AUTOMOTIVE RESEARCH

CU-ICAR RESEARCH ONE

arrowood + arrowood
Arrowood & Arrowood, PC
412-B Pettigru Street
Greenville, SC 29607
864.233.9383 (t)
864.232.7855 (f)

A&A PROJECT #12-LS3P-17

LS3P

110 WEST NORTH STREET SUITE 300
GREENVILLE, SOUTH CAROLINA 29601
TEL. 864.235.0405 FAX 864.233.4027

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER
No. 22477
12.9.14
ANTHONY JOHN ARROWOOD

SOUTH CAROLINA
ARROWOOD & ARROWOOD, PC
No. C03036
CERTIFICATE OF AUTHORIZATION

MEMBERS OF THE AMERICAN INSTITUTE OF ARCHITECTS

REVISIONS:

No.	Description	Date

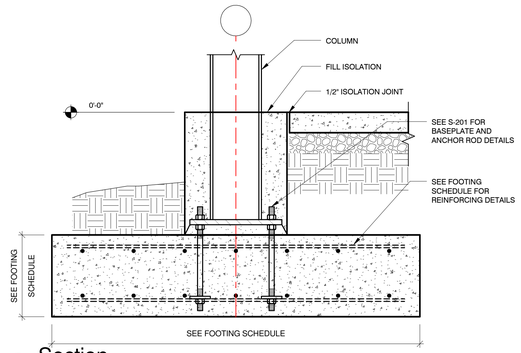
ISSUE FOR FOUNDATION PERMIT 12.9.14

PROJECT: 12-LS3P-17
DATE: 11.05.2014
DRAWN BY: AP/WB
CHECKED BY: ARROWOOD

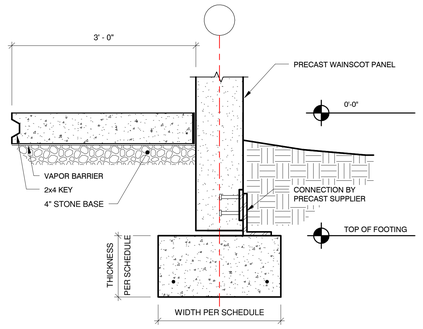
ROOF FRAMING PLAN

S-105

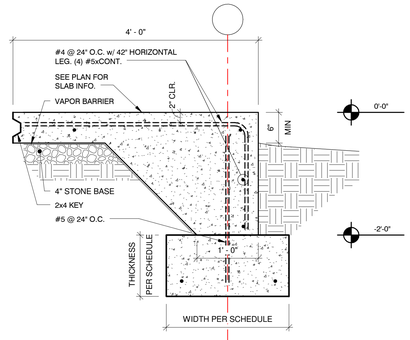
12.9.2014



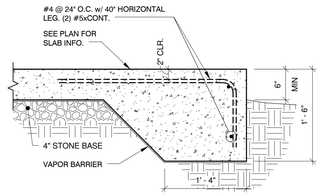
1 S-200 Section
1" = 1'-0"



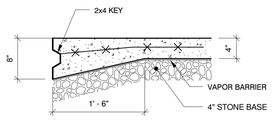
2 S-200 Footing @ Precast Panel
1" = 1'-0"



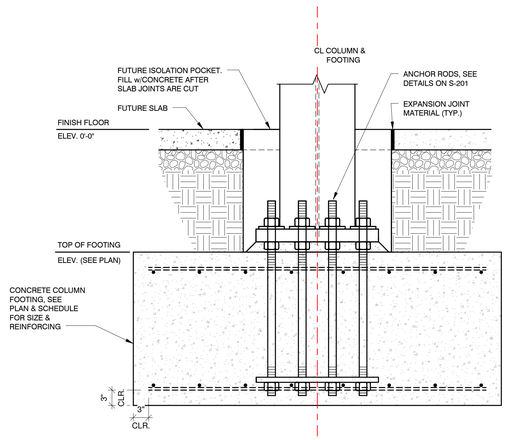
3 S-200 Thickened Edge Slab
1" = 1'-0"



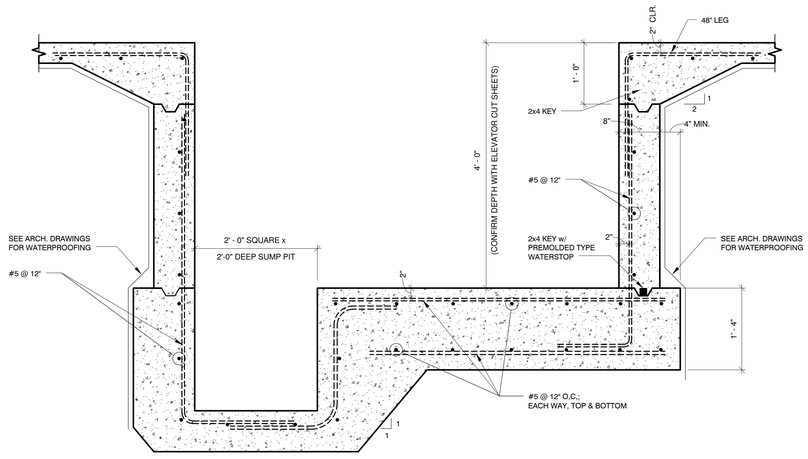
4 S-200 Turn Down Slab
1" = 1'-0"



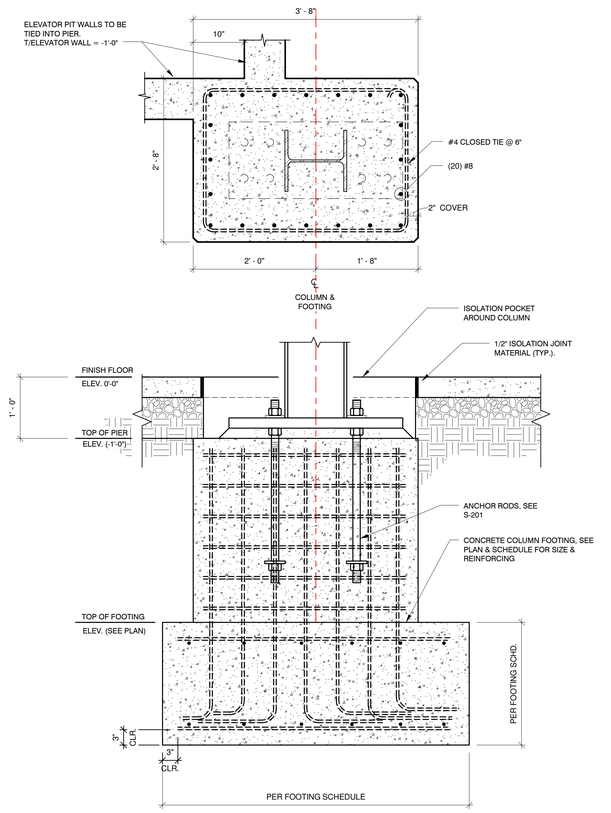
5 S-200 Section
1" = 1'-0"



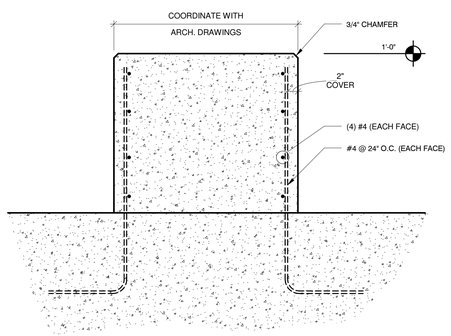
6 S-200 Interior Column Footing
1" = 1'-0"



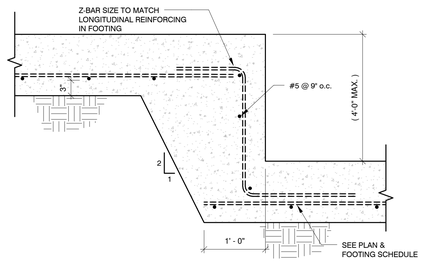
7 S-200 ELEVATOR PIT SECTION
1" = 1'-0"



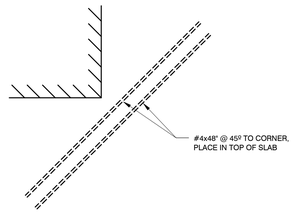
8 S-200 Pier And Footing Detail
1" = 1'-0"



9 S-200 Curb Section
1" = 1'-0"



A S-200 Step Footing Detail
1" = 1'-0"



B S-200 Corner Reinforcing Detail
1" = 1'-0"

Owner

CU-ICAR
CLEMSON UNIVERSITY INTERNATIONAL CENTER FOR AUTOMOTIVE RESEARCH

CU-ICAR RESEARCH ONE

arrowood + arrowood
Arrowood & Arrowood, PC
412-B Pettigru Street
Greenville, SC 29607
864.233.9383 (t)
864.232.7855 (f)

A&A PROJECT #12-LS3P-17

LS3P

110 WEST NORTH STREET SUITE 300
GREENVILLE, SOUTH CAROLINA 29601
TEL. 864.235.0405 FAX 864.233.4027

SOUTH CAROLINA PROFESSIONAL ENGINEER No. 22417 12.9.14 ANTHONY JOHN ARROWOOD
SOUTH CAROLINA ARROWOOD & ARROWOOD, PC No. C03036 CERTIFICATE OF AUTHORIZATION

MEMBERS OF THE AMERICAN INSTITUTE OF ARCHITECTS

REVISIONS:

No.	Description	Date

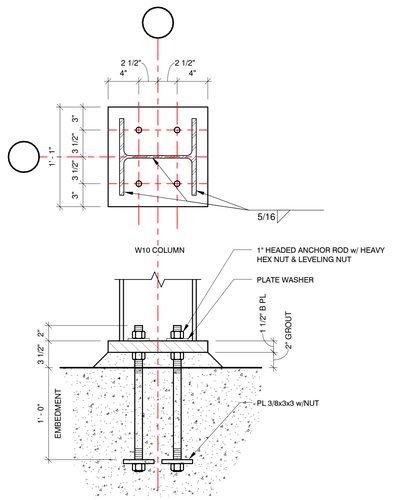
ISSUE FOR FOUNDATION PERMIT 12.9.14

PROJECT: 12-LS3P-17
DATE: 11.05.2014
DRAWN BY: AP/WB
CHECKED BY: ARROWOOD

SECTIONS & DETAILS

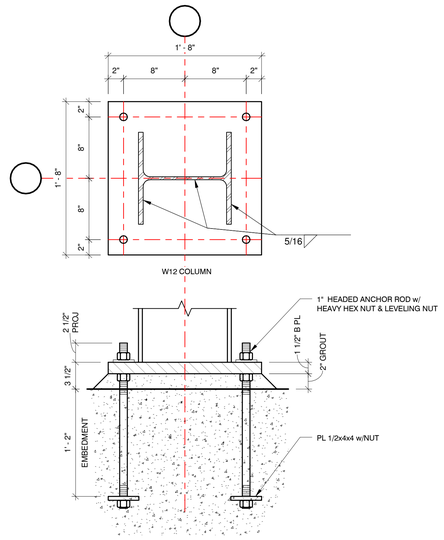
S-200

12.9.2014



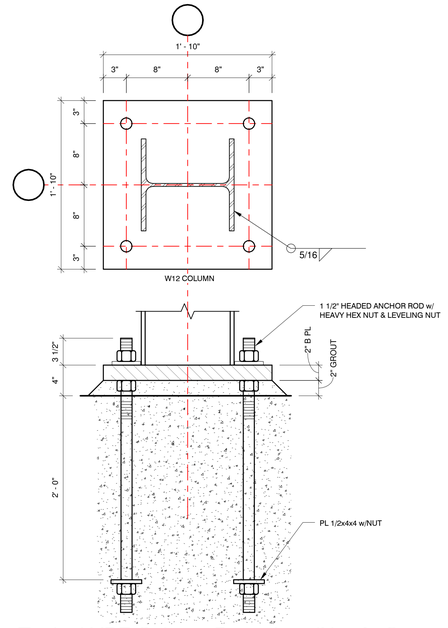
1 S-201 **Typical W10 Baseplate**

1 1/2" = 1'-0"



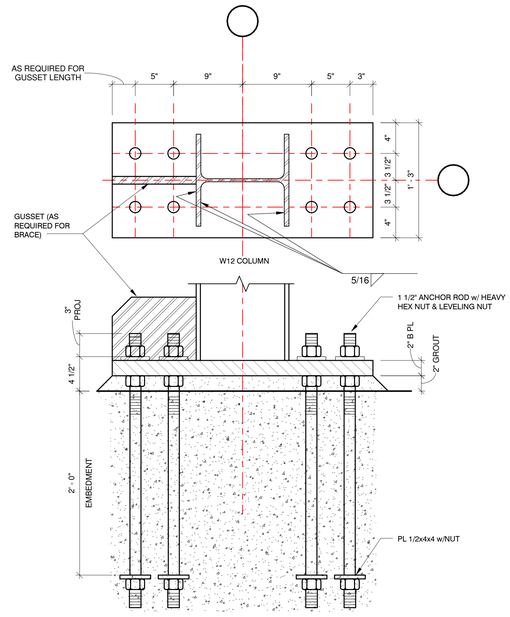
2 S-201 **Typical W12 Baseplate**

1 1/2" = 1'-0"



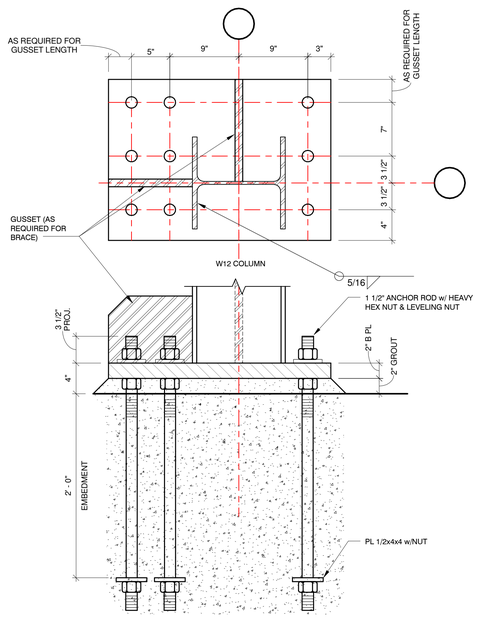
3 S-201 **Typical VBF Column Baseplate (Not At Gusset)**

1 1/2" = 1'-0"



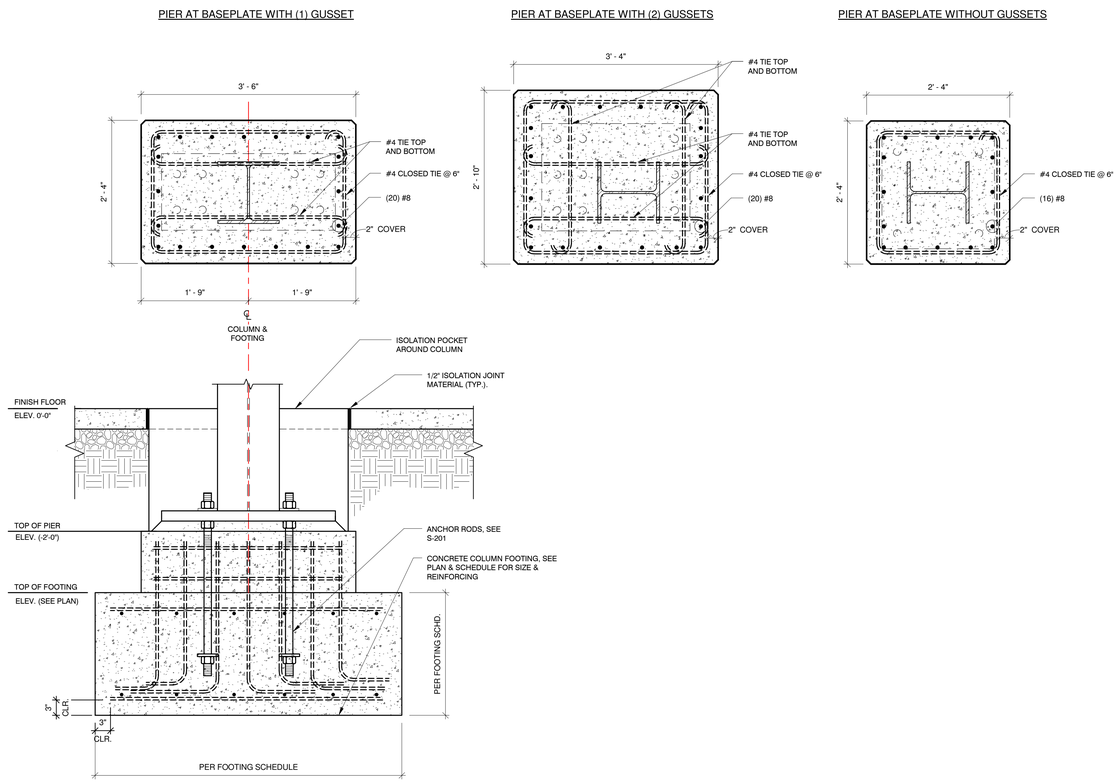
4 S-201 **VBF Baseplate with (1) Gusset**

1 1/2" = 1'-0"



5 S-201 **VBF Baseplate with (2) Gussets**

1 1/2" = 1'-0"



6 S-201 **Pier and Footing Detail At VBF Columns**

1" = 1'-0"

Owner

CU-ICAR
CLEMSON UNIVERSITY INTERNATIONAL CENTER FOR AUTOMOTIVE RESEARCH

CU-ICAR RESEARCH ONE

arrowood + arrowood
Arrowood & Arrowood, PC
412-B Pettigru Street
Greenville, SC 29607
864.233.9383 (t)
864.232.7855 (f)

A&A PROJECT #12-LS3P-17

LS3P

110 WEST NORTH STREET SUITE 300
GREENVILLE, SOUTH CAROLINA 29601
TEL. 864.235.0405 FAX 864.233.4027

SOUTH CAROLINA PROFESSIONAL ENGINEER No. 29477 12-9-14 ANTHONY JOHN ARROWOOD

SOUTH CAROLINA ARROWOOD & ARROWOOD, PC No. C03038 CERTIFICATE OF AUTHORIZATION

MEMBERS OF THE AMERICAN INSTITUTE OF ARCHITECTS

REVISIONS:

No.	Description	Date

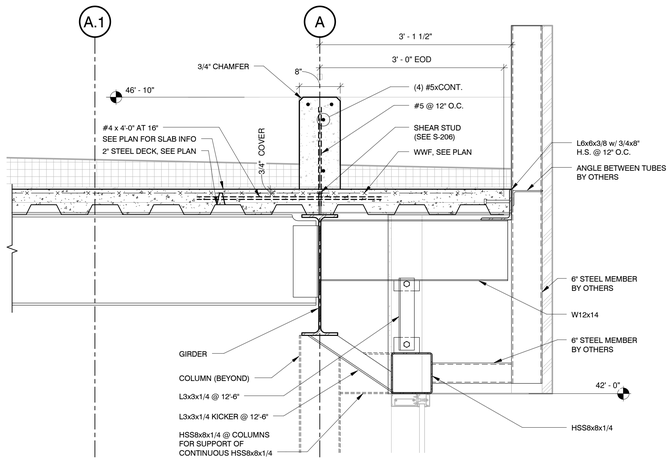
ISSUE FOR FOUNDATION PERMIT 12.9.14

PROJECT: 12-LS3P-17
DATE: 11.05.2014
DRAWN BY: Author
CHECKED BY: Checker

SECTIONS & DETAILS

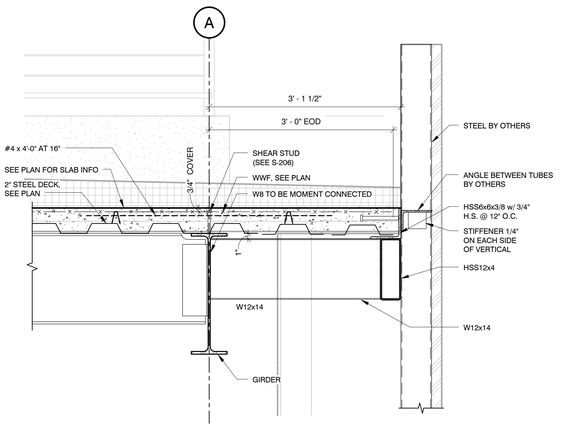
S-201

12.9.2014



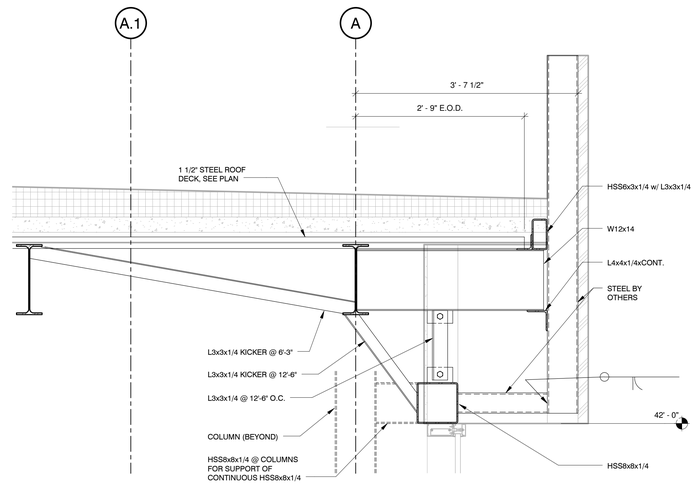
1 S-202 Fourth Floor Slab Edge Store Front (North)

1" = 1'-0"



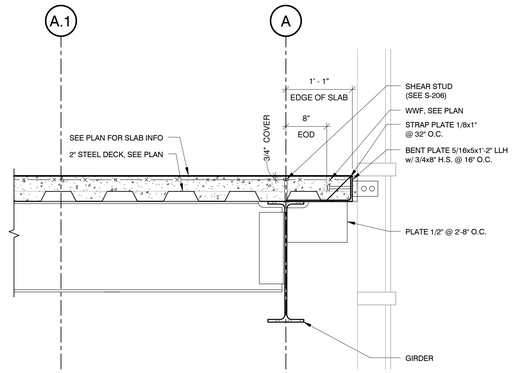
2 S-202 Fourth Floor Slab Edge Metal Panel (North)

1" = 1'-0"



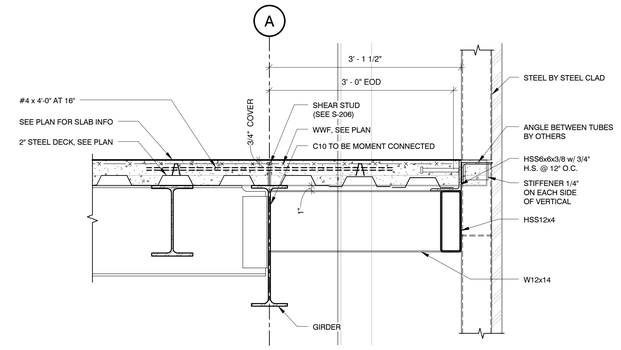
3 S-202 Fourth Floor Slab Edge Store Front Center (North)

1" = 1'-0"



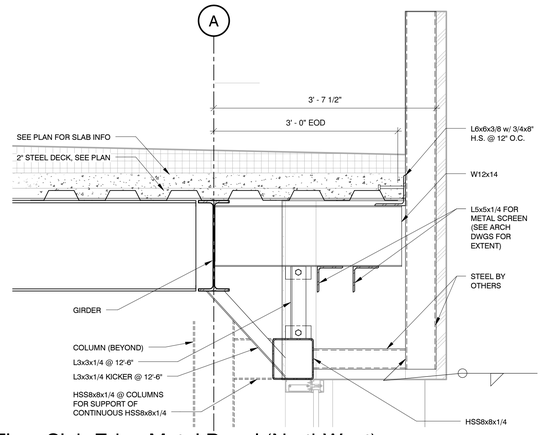
4 S-202 Third Floor Slab Edge Store Front (North)

1" = 1'-0"



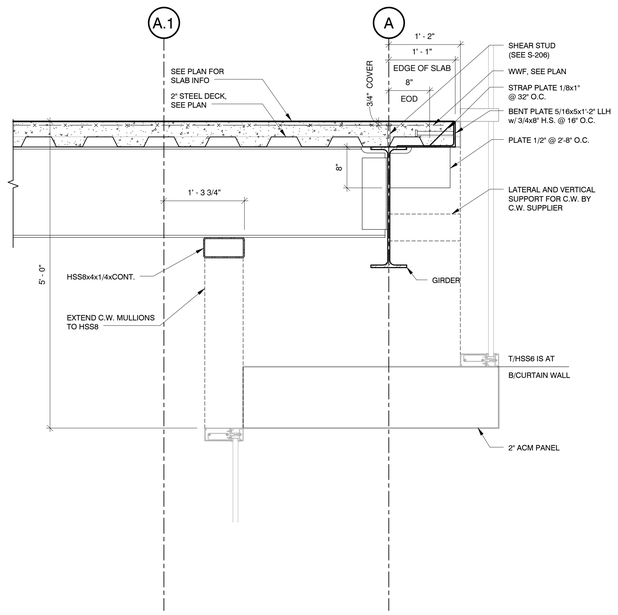
5 S-202 Third Floor Slab Edge Metal Panel (North)

1" = 1'-0"



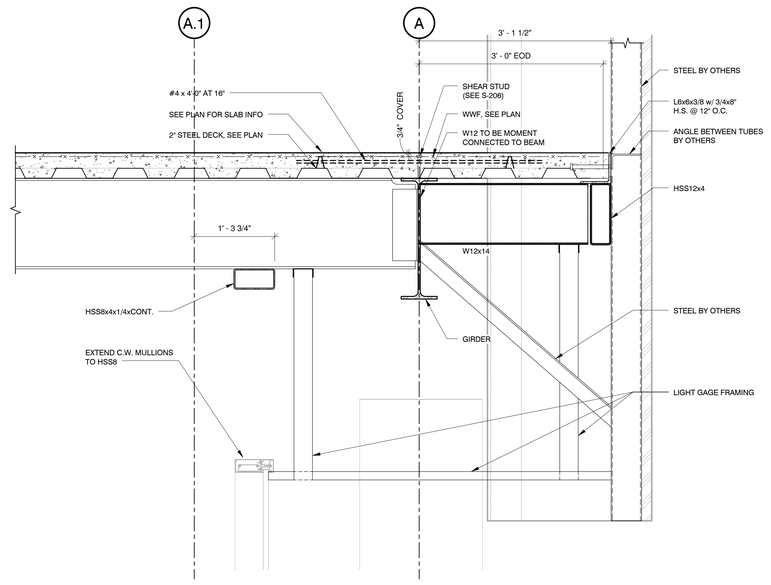
6 S-202 Fourth Floor Slab Edge Metal Panel (NorthWest)

1" = 1'-0"



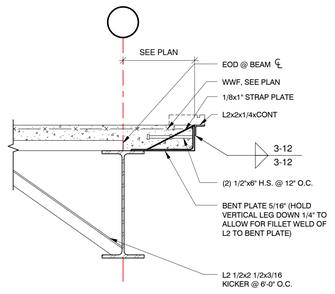
7 S-202 Second Floor Slab Edge Store Front (North)

1" = 1'-0"



8 S-202 Second Floor Slab Edge Metal Panel (North)

1" = 1'-0"



9 S-202 Second Floor Typical Slab Edge

1" = 1'-0"

Owner

CU-ICAR
CLEMSON UNIVERSITY INTERNATIONAL CENTER FOR AUTOMOTIVE RESEARCH

CU-ICAR RESEARCH ONE

LS3P

110 WEST NORTH STREET SUITE 300
GREENVILLE, SOUTH CAROLINA 29601
TEL. 864.235.0405 FAX 864.233.4027

SOUTH CAROLINA PROFESSIONAL ENGINEER
No. 22417
12.9.14
ANTHONY JOHN ARROWOOD
ARROWOOD & ARROWOOD, PC
No. C03036
CERTIFICATE OF AUTHORIZATION
SOUTH CAROLINA

MEMBERS OF THE AMERICAN INSTITUTE OF ARCHITECTS

REVISIONS:

No.	Description	Date

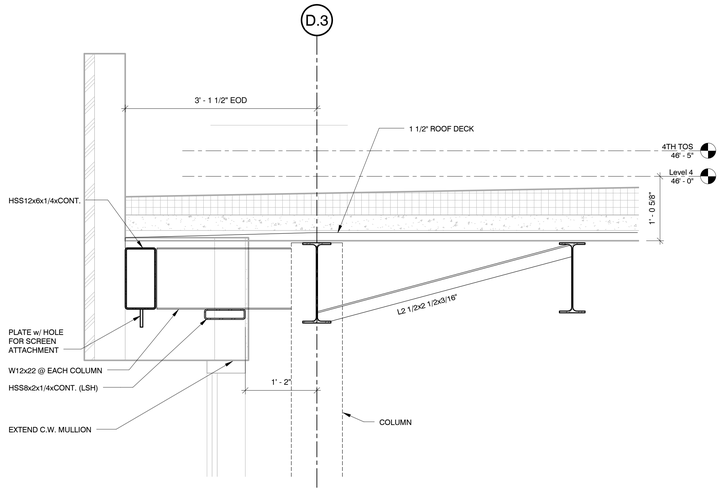
ISSUE FOR FOUNDATION PERMIT 12.9.14

PROJECT: 12-LS3P-17
DATE: 11.05.2014
DRAWN BY: AP/WB
CHECKED BY: AJA

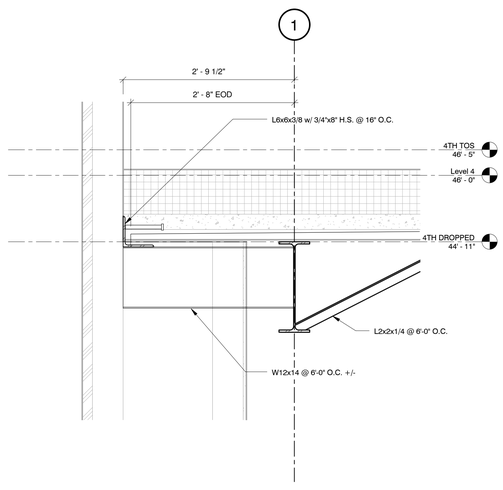
SECTIONS & DETAILS

S-202

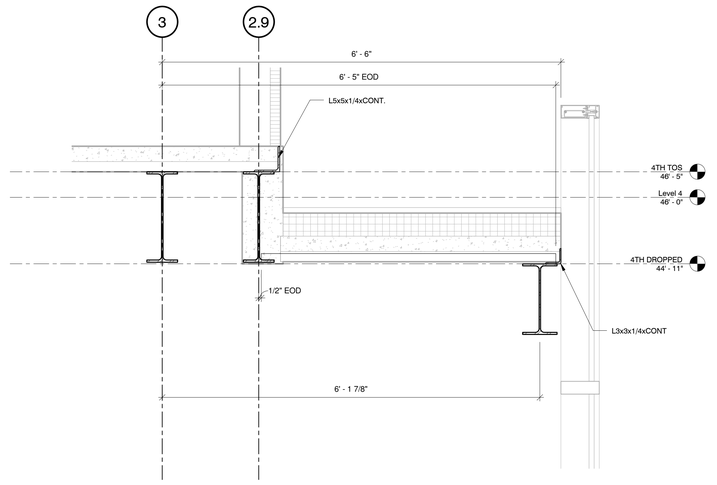
12.9.2014



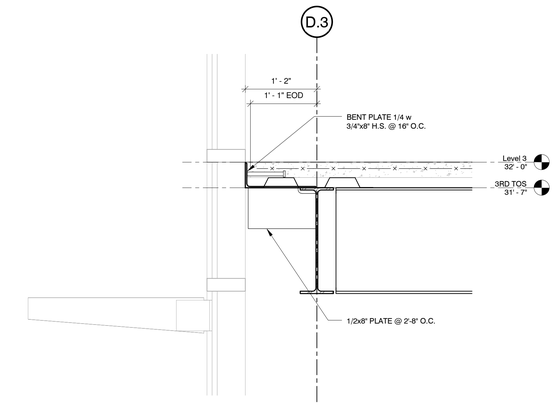
1 S-203 Section
1" = 1'-0"



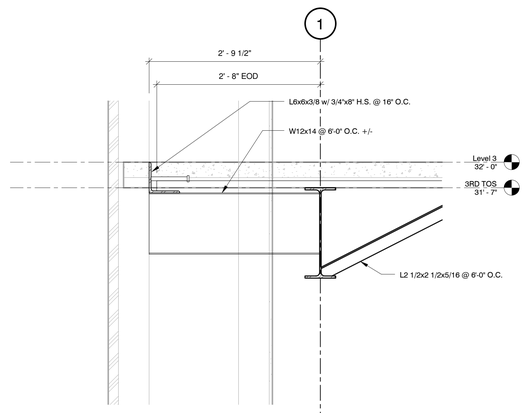
2 S-203 Section
1" = 1'-0"



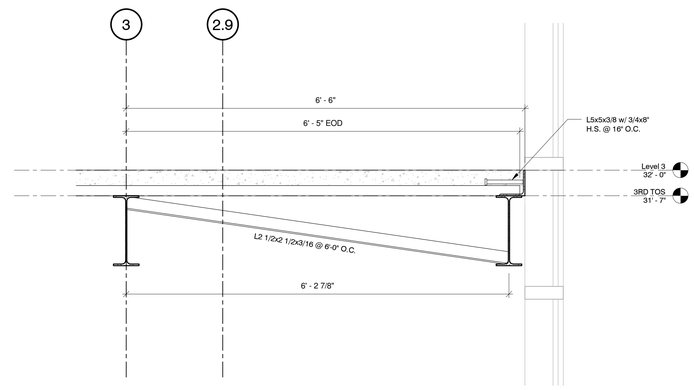
3 S-203 Section
1" = 1'-0"



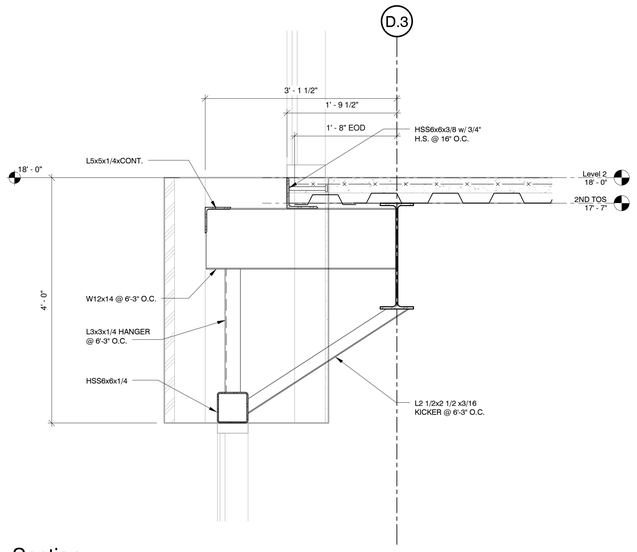
4 S-203 Section
1" = 1'-0"



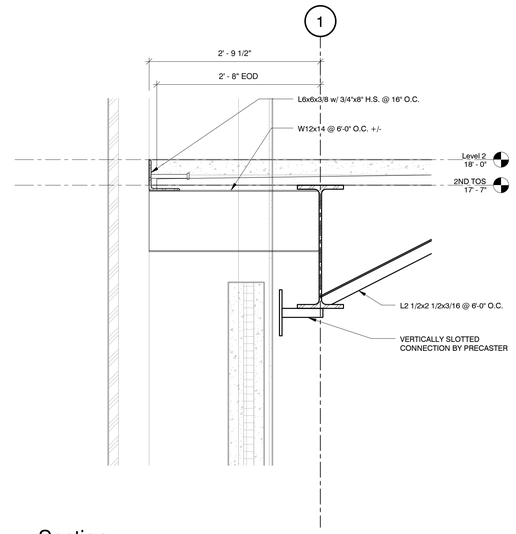
5 S-203 Section
1" = 1'-0"



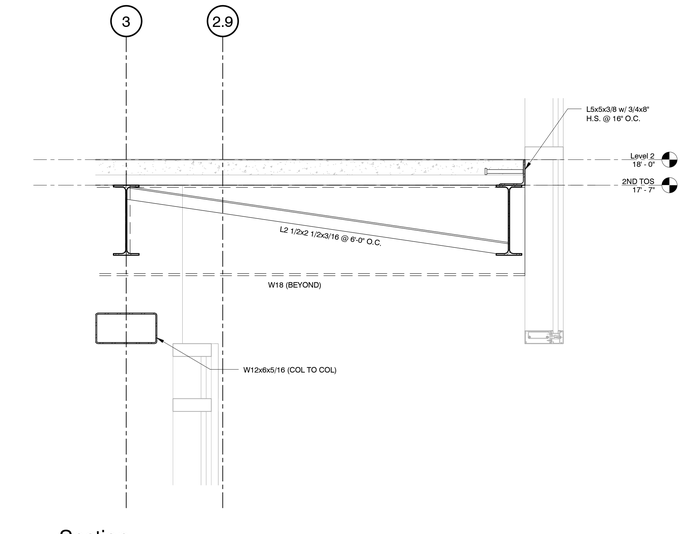
6 S-203 Section
1" = 1'-0"



7 S-203 Section
1" = 1'-0"



8 S-203 Section
1" = 1'-0"



9 S-203 Section
1" = 1'-0"

Owner

CU-ICAR
CLEMSON UNIVERSITY INTERNATIONAL CENTER FOR AUTOMOTIVE RESEARCH

CU-ICAR RESEARCH ONE

LS3P

110 WEST NORTH STREET SUITE 300
GREENVILLE, SOUTH CAROLINA 29601
TEL. 864.235.0405 FAX 864.233.4027

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER
No. 22417
12.9.14
ANTHONY JOHN ARROWOOD
SOUTH CAROLINA
ARROWOOD & ARROWOOD, PC
No. C03038
CERTIFICATE OF AUTHORIZATION

MEMBERS OF THE AMERICAN INSTITUTE OF ARCHITECTS

ISSUE FOR FOUNDATION PERMIT 12.9.14

REVISIONS:

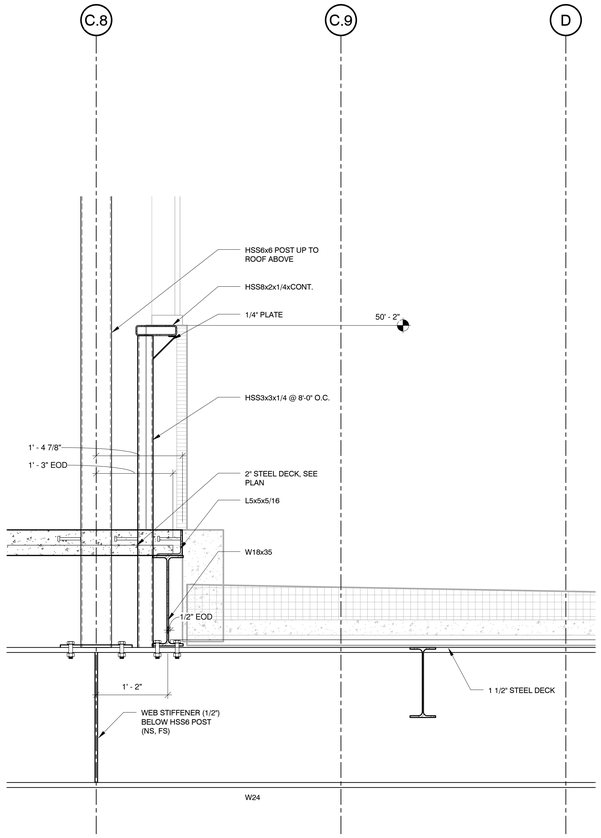
No.	Description	Date

PROJECT: 12-LS3P-17
DATE: 11.05.2014
DRAWN BY: AP/WB
CHECKED BY: AJA

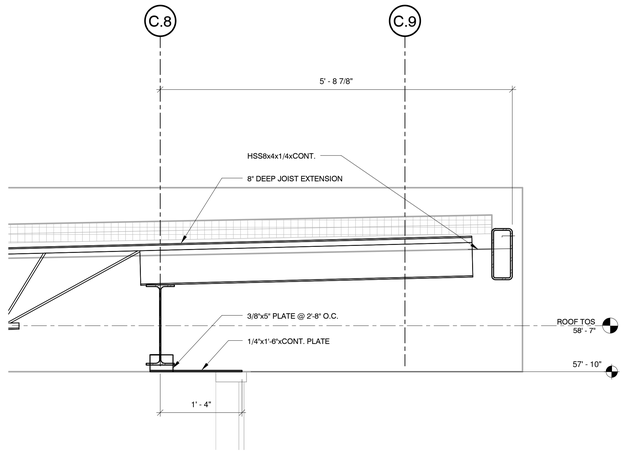
SECTIONS & DETAILS

S-203

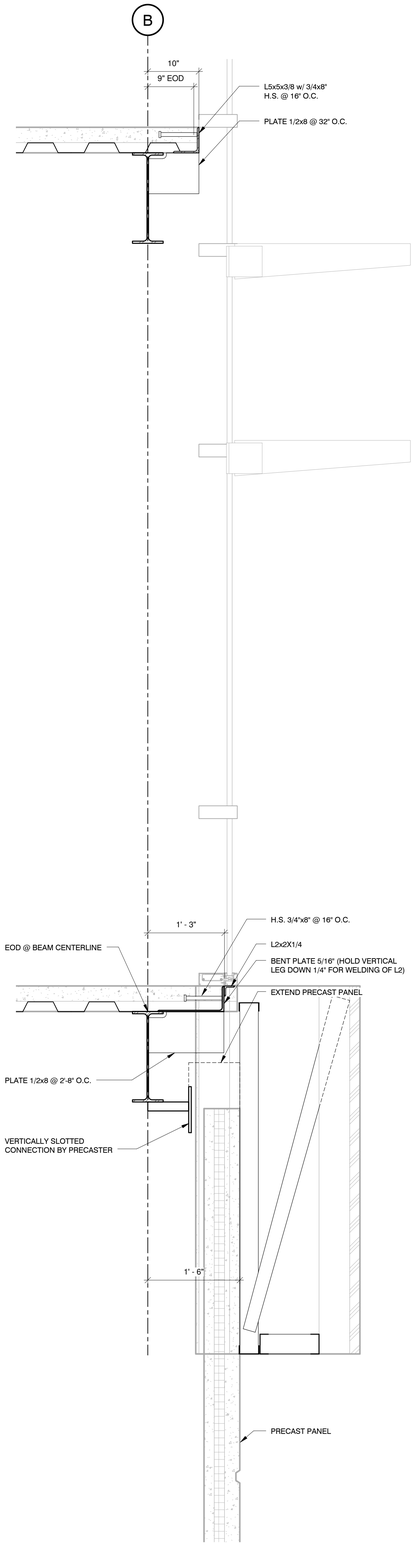
12.9.2014



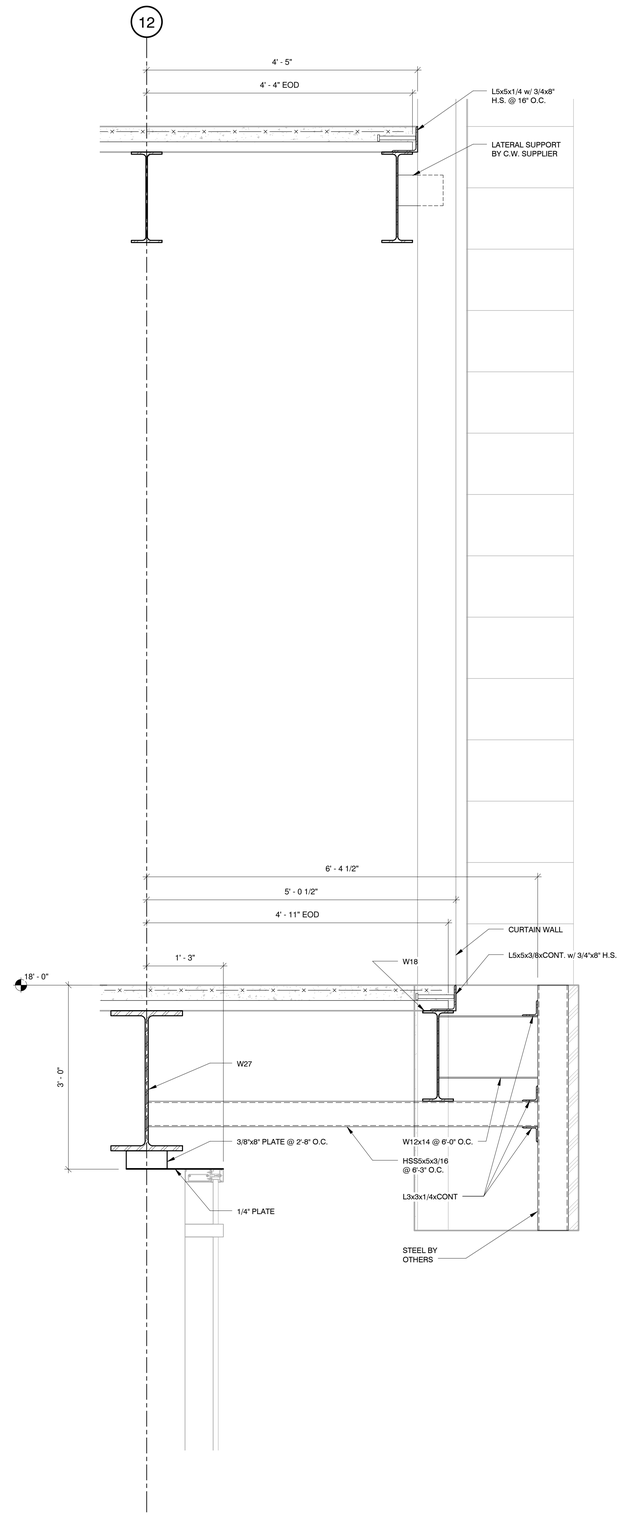
1 S-204 Section
1" = 1'-0"



2 S-204 Section
1" = 1'-0"



3 S-204 Section
1" = 1'-0"



5 S-204 Section
1" = 1'-0"

Owner

CU-ICAR
CLEMSON UNIVERSITY INTERNATIONAL CENTER FOR AUTOMOTIVE RESEARCH

CU-ICAR RESEARCH ONE

LS3P

110 WEST NORTH STREET SUITE 300
GREENVILLE, SOUTH CAROLINA 29601
TEL. 864.235.0405 FAX 864.233.4027

SOUTH CAROLINA PROFESSIONAL ENGINEER No. 28477 12-9-14 ANTHONY JOHN ARROWOOD

SOUTH CAROLINA ARROWOOD & ARROWOOD, PC No. C03038 CERTIFICATE OF AUTHORIZATION

MEMBERS OF THE AMERICAN INSTITUTE OF ARCHITECTS

ISSUE FOR FOUNDATION PERMIT 12.9.14

REVISIONS:

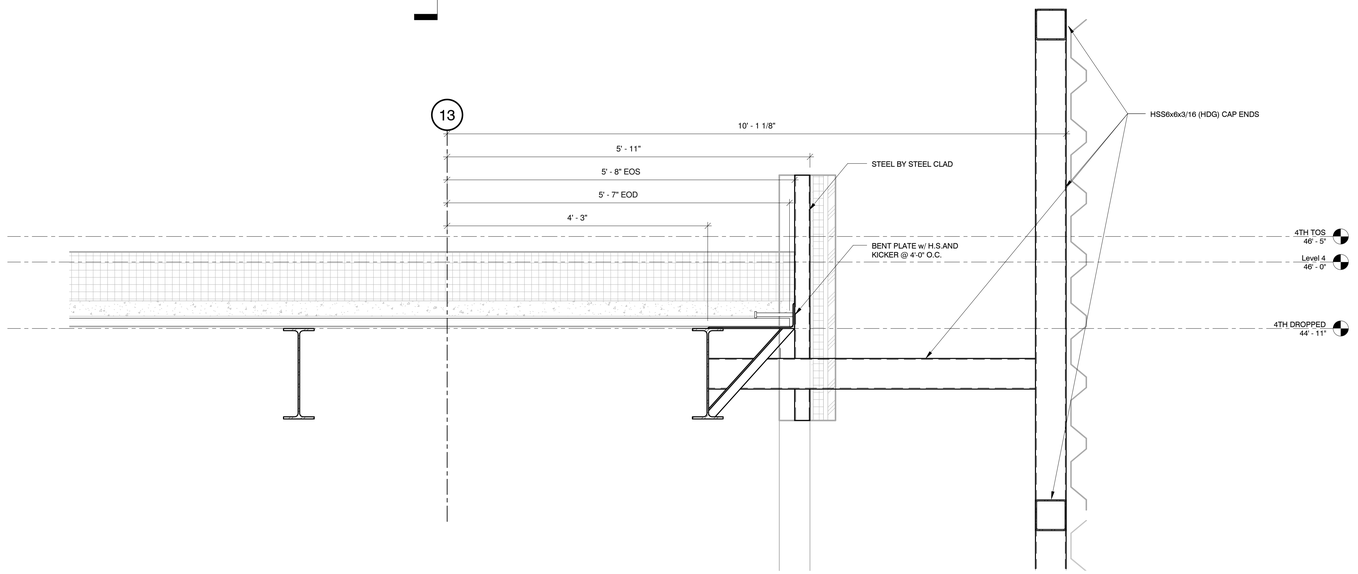
No.	Description	Date

PROJECT: 12-LS3P-17
DATE: 11.05.2014
DRAWN BY: Author
CHECKED BY: Checker

SECTIONS & DETAILS

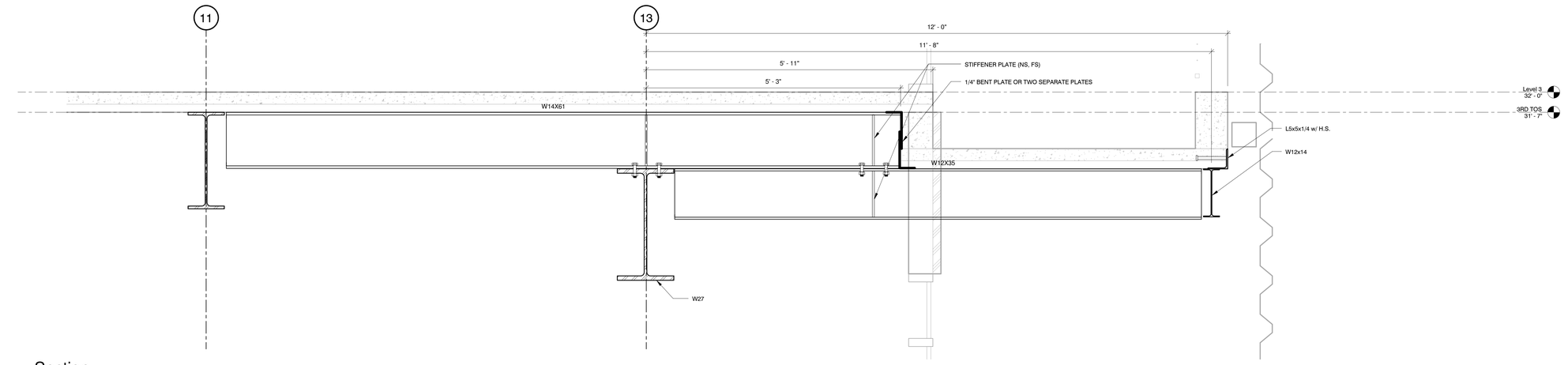
S-204

12.9.2014



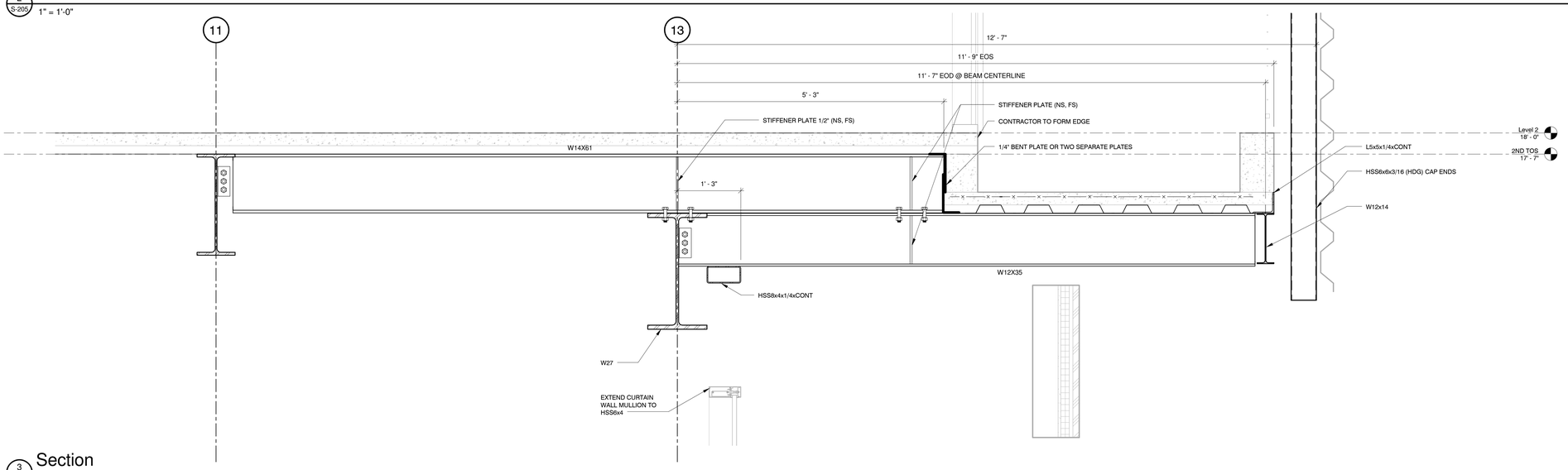
1 S-205 Section

1" = 1'-0"



2 S-205 Section

1" = 1'-0"



3 S-205 Section

1" = 1'-0"

Owner

CU-ICAR

CLEMSON UNIVERSITY INTERNATIONAL CENTER FOR AUTOMOTIVE RESEARCH

CU-ICAR RESEARCH ONE

LS3P

110 WEST NORTH STREET SUITE 300
GREENVILLE, SOUTH CAROLINA 29601
TEL. 864.235.0405 FAX 864.233.4027

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER JOHN ARROWOOD No. 22477 12.9.14

ARROWOOD & ARROWOOD, PC No. C03036 CERTIFICATE OF AUTHORIZATION SOUTH CAROLINA

MEMBERS OF THE AMERICAN INSTITUTE OF ARCHITECTS

REVISIONS:

No.	Description	Date

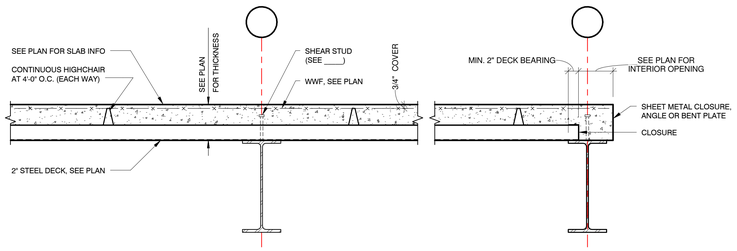
ISSUE FOR FOUNDATION PERMIT 12.9.14

PROJECT: 12-LS3P-17
DATE: 11.05.2014
DRAWN BY: Author
CHECKED BY: Checker

SECTIONS & DETAILS

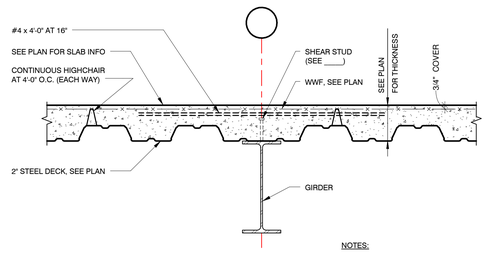
S-205

12.9.2014



FLOOR BEAM

BEAM AT FLOOR OPENINGS

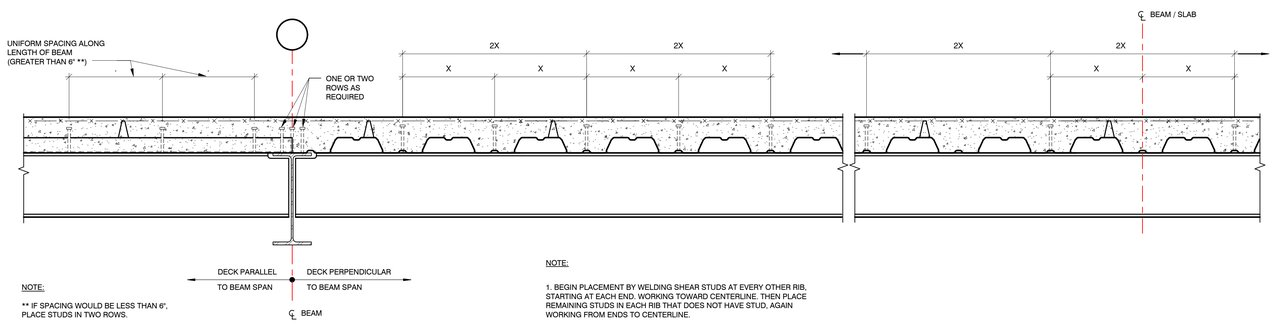


FLOOR GIRDER

NOTES:
1. SEE SPECIFICATIONS SHEET FOR DECK ATTACHMENT AND SIDELAP SIZE AND SPACING.
2. DECKING IS NOT TO BE SHORED.

1 S-206 TYPICAL ELEVATED FLOOR SLAB DETAILS

1" = 1'-0"

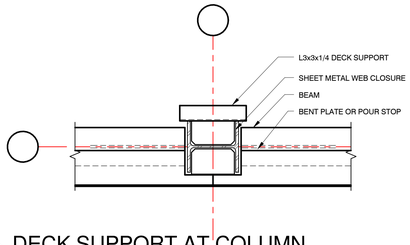


NOTE:
** IF SPACING WOULD BE LESS THAN 6", PLACE STUDS IN TWO ROWS.

NOTE:
1. BEGIN PLACEMENT BY WELDING SHEAR STUDS AT EVERY OTHER RIB, STARTING AT EACH END, WORKING TOWARD CENTERLINE. THEN PLACE REMAINING STUDS IN EACH RIB THAT DOES NOT HAVE STUD, AGAIN WORKING FROM ENDS TO CENTERLINE.

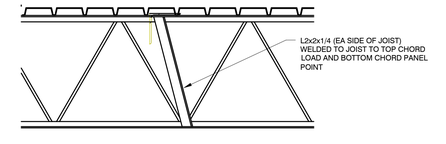
2 S-206 SHEAR STUD PLACEMENT DETAIL

1" = 1'-0"

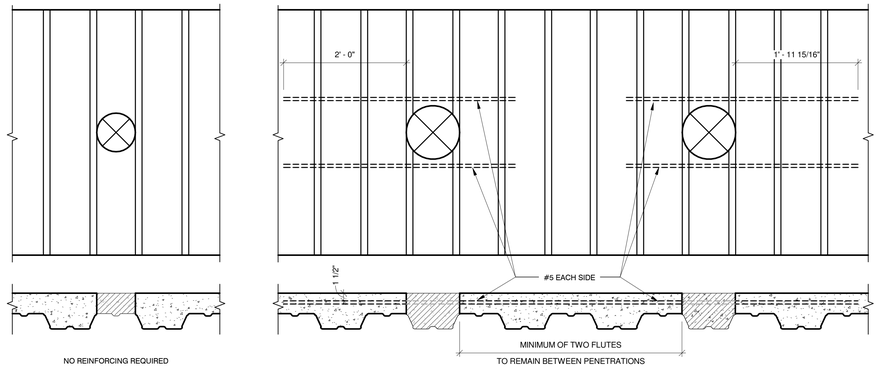


3 S-206 DECK SUPPORT AT COLUMN

1" = 1'-0"



PROVIDE L2 WHERE A POINT LOAD GREATER THAN 100# WILL BE IN PLACE 6" AWAY FROM PANEL POINT

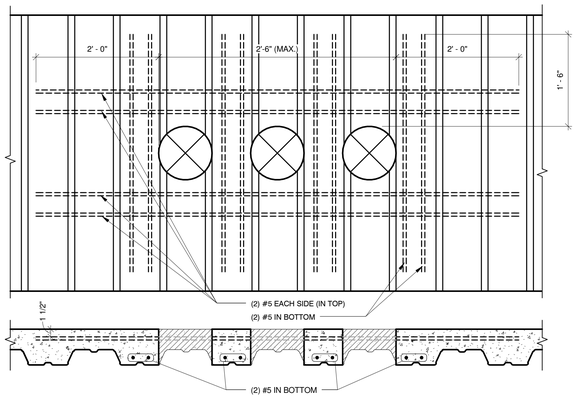


OPENING BETWEEN FLUTES

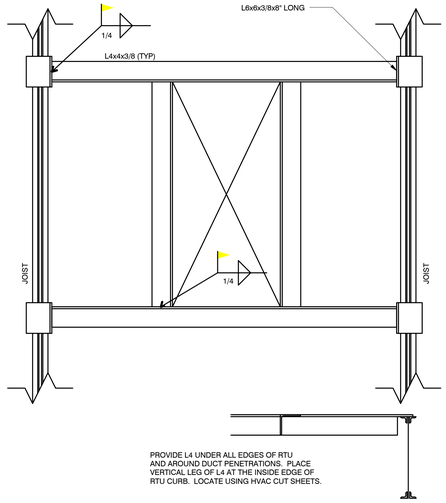
OPENING THROUGH ONE FLUTE

NOTE:
1. SEE MECHANICAL DRAWINGS FOR PENETRATION SIZES AND LOCATIONS.

TYPICAL METAL DECK DETAILS



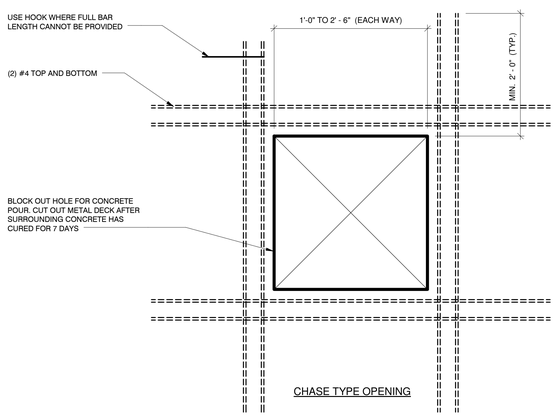
GANGED OPENINGS



PROVIDE L4 UNDER ALL EDGES OF RTU AND AROUND DUCT PENETRATIONS. PLACE VERTICAL LEG OF L4 AT THE INSIDE EDGE OF RTU CURB. LOCATE USING HVAC CUT SHEETS.

5 S-206 ROOF OPENING FRAME DETAIL

1" = 1'-0"



CHASE TYPE OPENING

4 S-206 TYPICAL PENETRATION IN STEEL DECK

1" = 1'-0"

Owner

CU-ICAR
CLEMSON UNIVERSITY INTERNATIONAL CENTER FOR AUTOMOTIVE RESEARCH

CU-ICAR RESEARCH ONE

arrowood + arrowood
Arrowood & Arrowood, PC
412-B Pettigru Street
Greenville, SC 29607
864.233.9383 (t)
864.232.7855 (f)

A&A PROJECT #12-LS3P-17

LS3P

110 WEST NORTH STREET SUITE 300
GREENVILLE, SOUTH CAROLINA 29601
TEL. 864.235.0405 FAX 864.233.4027

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — No. 22417 — 12.9.14 — ANTHONY JOHN ARROWOOD
SOUTH CAROLINA — ARROWOOD & ARROWOOD, PC — No. C03038 — CERTIFICATE OF AUTHORIZATION

MEMBERS OF THE AMERICAN INSTITUTE OF ARCHITECTS

REVISIONS:

No.	Description	Date

ISSUE FOR FOUNDATION PERMIT 12.9.14

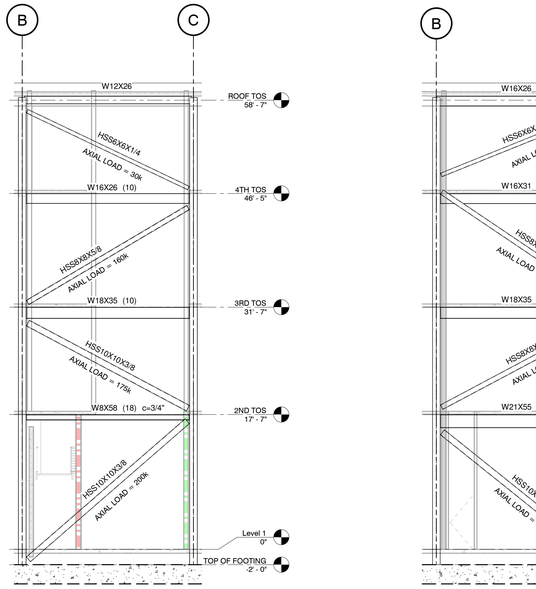
PROJECT: 12-LS3P-17
DATE: 11.05.2014
DRAWN BY: AP/WB
CHECKED BY: ARROWOOD

SECTIONS & DETAILS

S-206

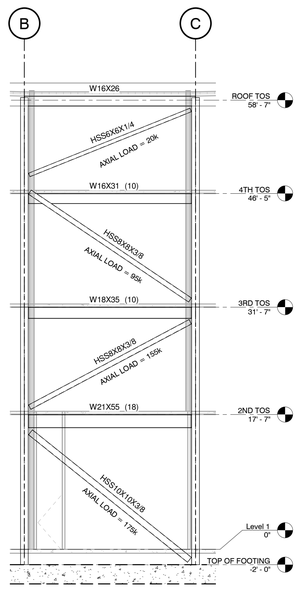
[redacted]

12.9.2014



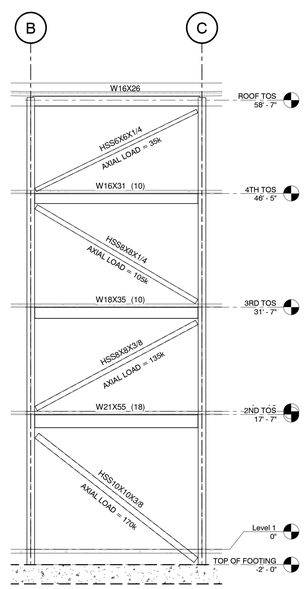
1 S-207 VBF 1 ELEVATION ALONG 4

1/8" = 1'-0"



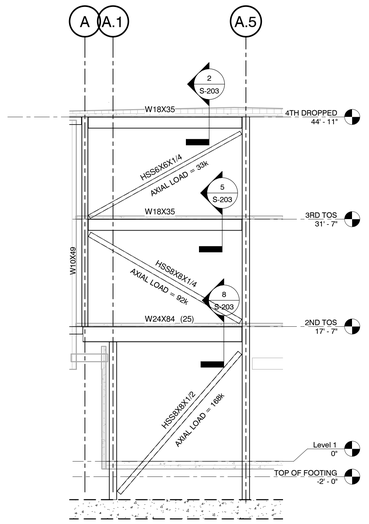
2 S-207 VBF 2 ELEVATION ALONG 6

1/8" = 1'-0"



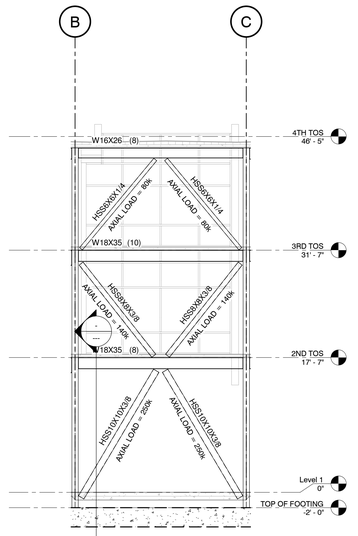
3 S-207 VBF 3 ELEVATION ALONG 8

1/8" = 1'-0"



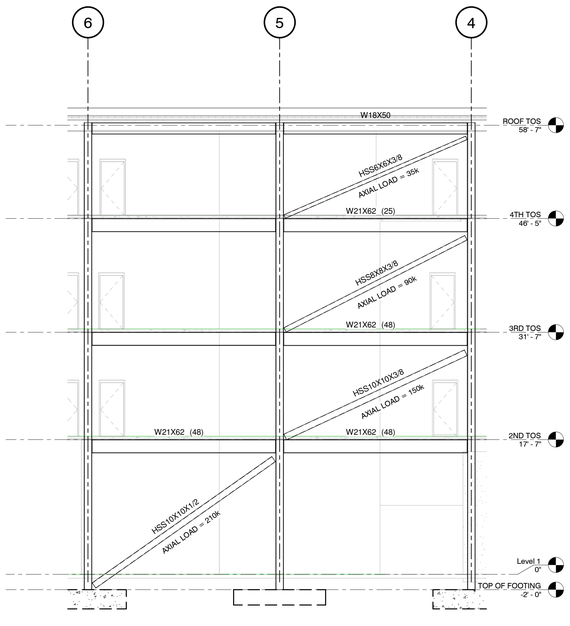
4 S-207 VBF 4 ELEVATION ALONG 1

1/8" = 1'-0"



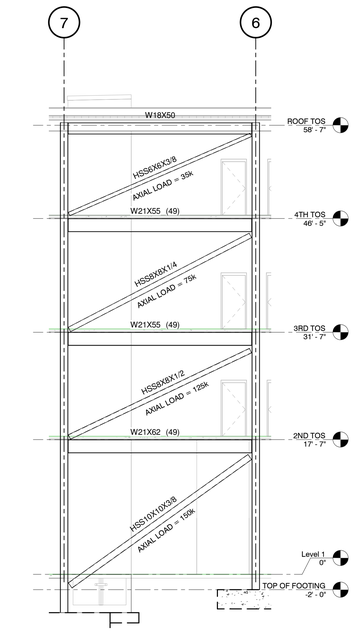
5 S-207 VBF 5 ELEVATION ALONG 11

1/8" = 1'-0"



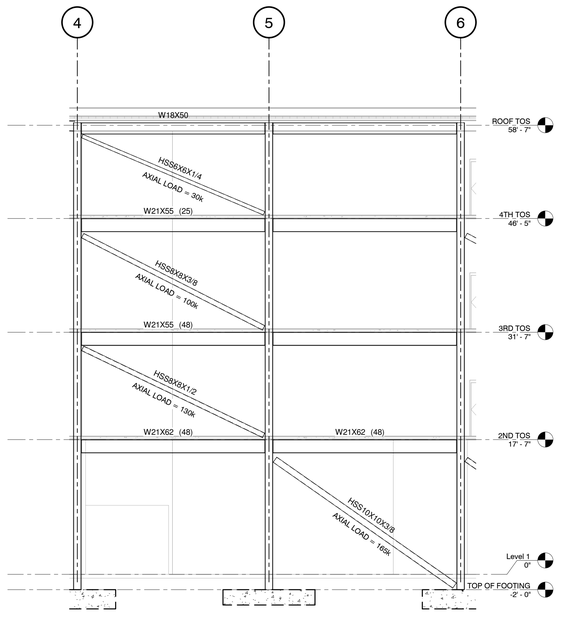
6 S-207 VBF 6 ELEVATION ALONG B

1/8" = 1'-0"



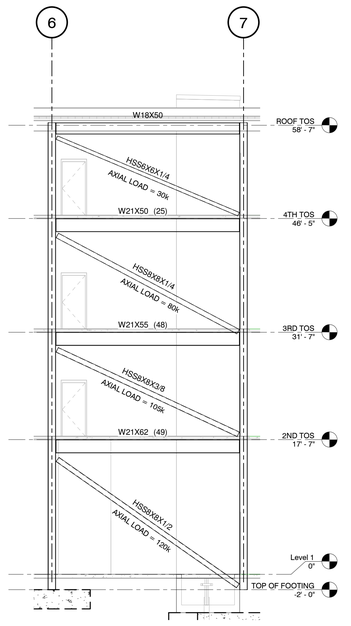
7 S-207 VBF 7 ELEVATION ALONG B

1/8" = 1'-0"



8 S-207 VBF 8 ELEVATION ALONG C

1/8" = 1'-0"



9 S-207 VBF 9 ELEVATION ALONG C

1/8" = 1'-0"

Owner

CU-ICAR
CLEMSON UNIVERSITY INTERNATIONAL CENTER FOR AUTOMOTIVE RESEARCH

CU-ICAR RESEARCH ONE

arrowood + arrowood
Arrowood & Arrowood, PC
412-B Pettigru Street
Greenville, SC 29607
864.233.9383 (t)
864.232.7855 (f)

A&A PROJECT #12-LS3P-17

LS3P

110 WEST NORTH STREET SUITE 300
GREENVILLE, SOUTH CAROLINA 29601
TEL. 864.235.0405 FAX 864.233.4027

SOUTH CAROLINA PROFESSIONAL ENGINEER No. 29477 12-9-14 ANTHONY JOHN ARROWOOD

SOUTH CAROLINA ARROWOOD & ARROWOOD, PC No. C03038 CERTIFICATE OF AUTHORIZATION

MEMBERS OF THE AMERICAN INSTITUTE OF ARCHITECTS

REVISIONS:

No.	Description	Date

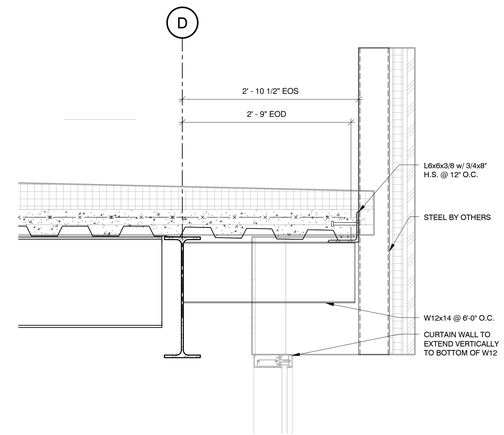
ISSUE FOR FOUNDATION PERMIT 12.9.14

PROJECT: 12-LS3P-17
DATE: 11.05.2014
DRAWN BY: AP/WB
CHECKED BY: ARROWOOD

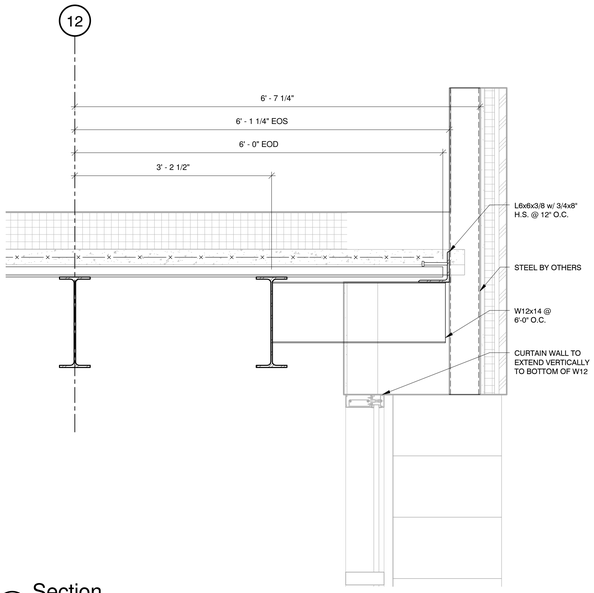
VERTICAL BRACED FRAMES

S-207

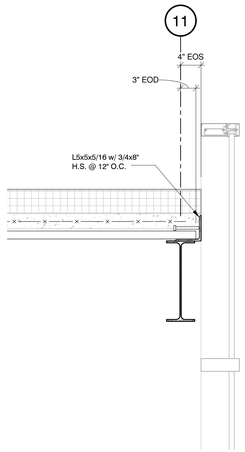
12.9.2014



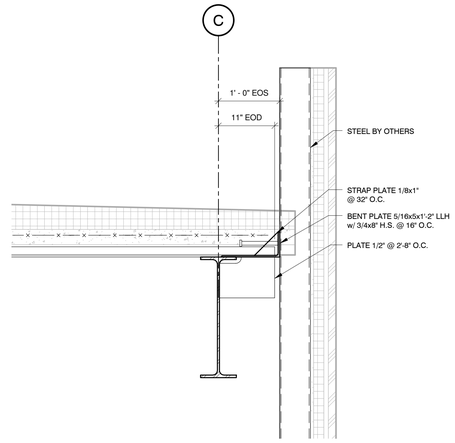
1 S-208 Section
1" = 1'-0"



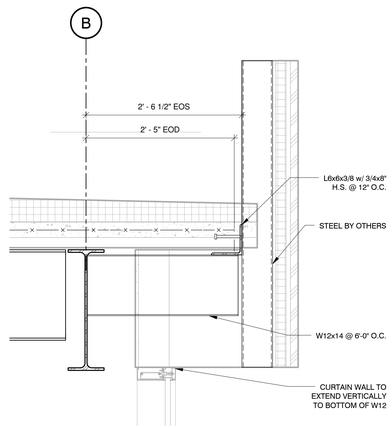
2 S-208 Section
1" = 1'-0"



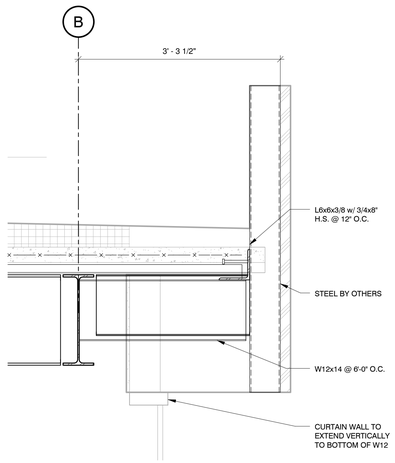
3 S-208 Section
1" = 1'-0"



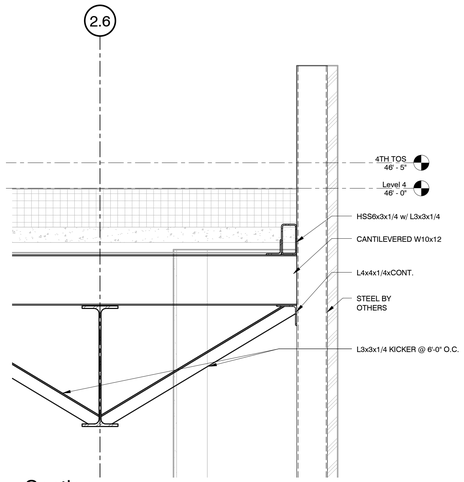
4 S-208 Section
1" = 1'-0"



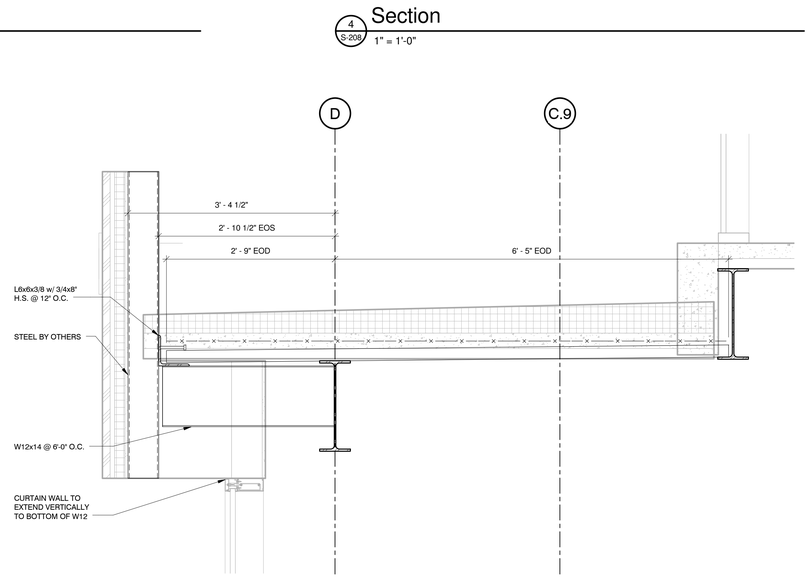
5 S-208 Section
1" = 1'-0"



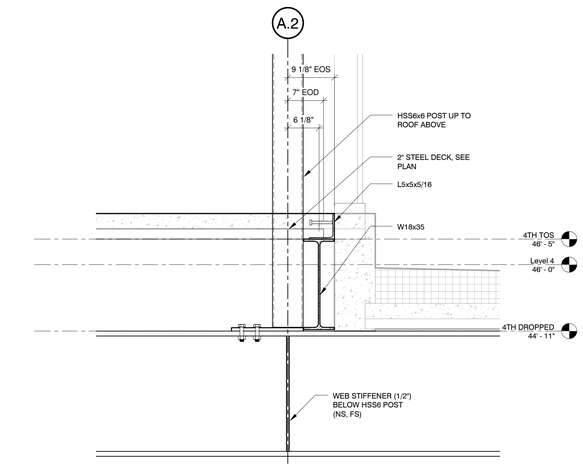
6 S-208 Section
1" = 1'-0"



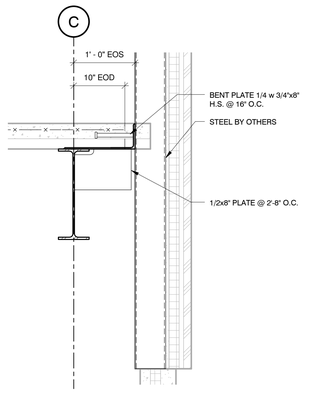
7 S-208 Section
1" = 1'-0"



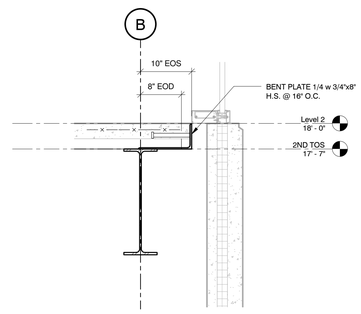
8 S-208 Section
1" = 1'-0"



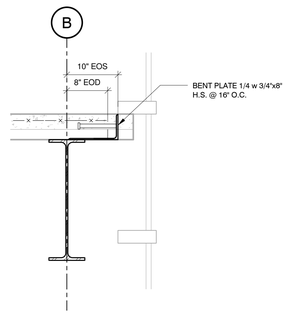
9 S-208 Section
1" = 1'-0"



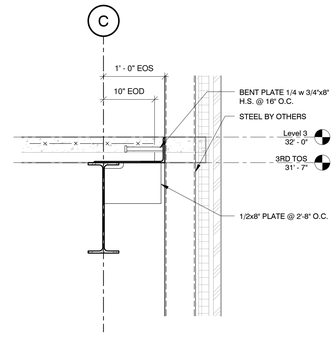
10 S-208 Section
1" = 1'-0"



11 S-208 Section
1" = 1'-0"



12 S-208 Section
1" = 1'-0"



13 S-208 Section
1" = 1'-0"

Owner

CU-ICAR
CLEMSON UNIVERSITY INTERNATIONAL CENTER FOR AUTOMOTIVE RESEARCH

CU-ICAR RESEARCH ONE

LS3P

110 WEST NORTH STREET SUITE 300
GREENVILLE, SOUTH CAROLINA 29601
TEL. 864.235.0405 FAX 864.233.4027

SOUTH CAROLINA PROFESSIONAL ENGINEER No. 22477 12.9.14 JOHN ARROWOOD

SOUTH CAROLINA ARROWOOD & ARROWOOD, PC No. C03038 CERTIFICATE OF AUTHORIZATION

MEMBERS OF THE AMERICAN INSTITUTE OF ARCHITECTS

ISSUE FOR FOUNDATION PERMIT 12.9.14

REVISIONS:

No.	Description	Date

PROJECT: 12-LS3P-17
DATE: 11.05.2014
DRAWN BY: Author
CHECKED BY: Checker

SECTIONS & DETAILS

S-208

12.9.2014