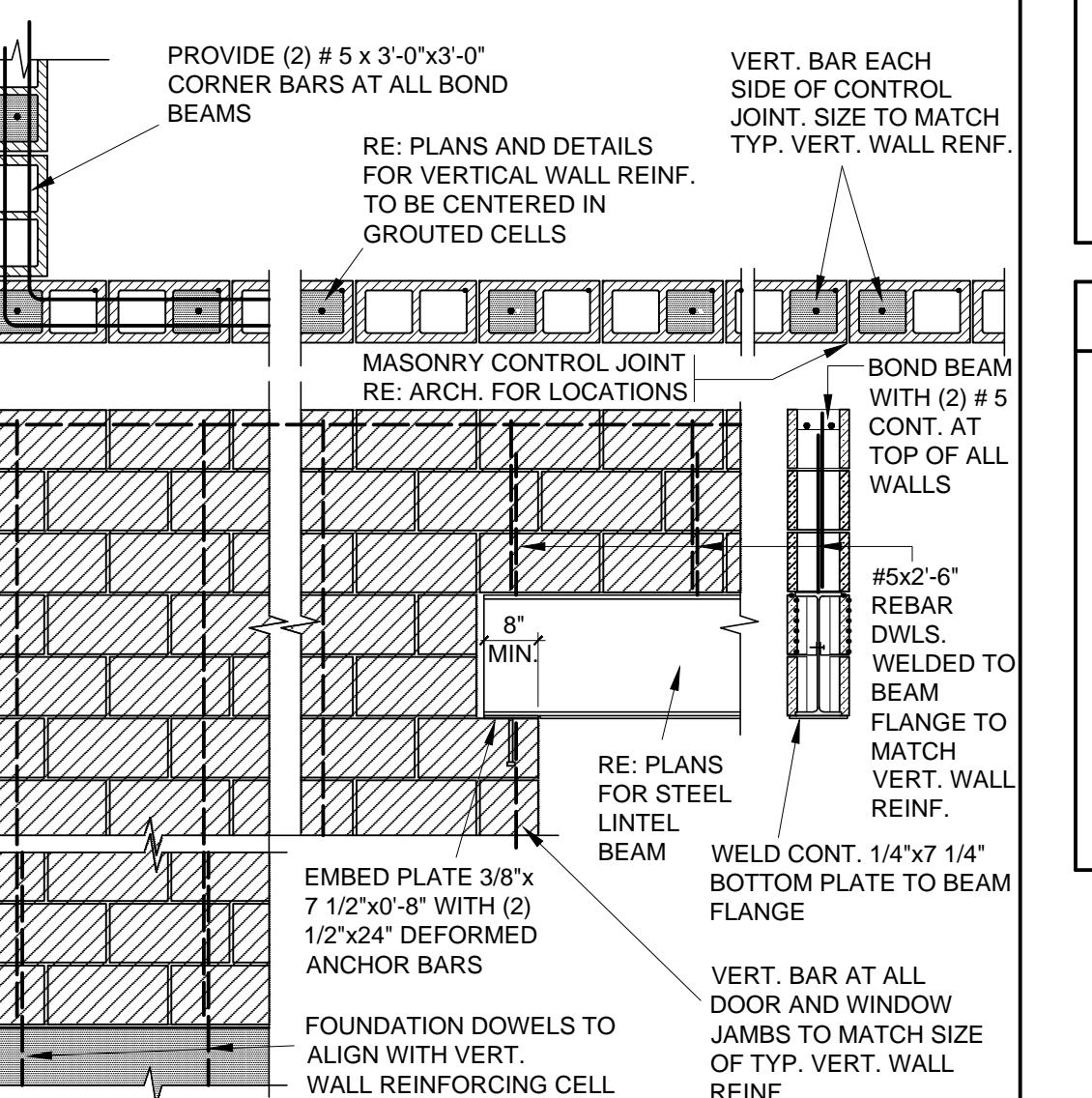


MASONRY		
CODES	ACI 530, ASCE 5 & TMS 402 BUILDING CODE REQUIREMENTS ACI 530, ASCE 6 & TMS 602 SPECS. FOR MASONRY STRUCTURES	
CONCRETE BLOCK (CMU) f'm = 1,500 PSI	COMPONENT CMU BLOCK ASTM C90, N GROUT IBC 2103.10 MORTAR IBC 2103.7(2), S	CODE, GRADE 1,900 PSI 2,000 PSI 1,800 PSI
REINFORCING	VERTICAL BARS GRADE 60 ALL BARS (EXCEPT AS NOTED OTHERWISE)	NEW BILLET STEEL - ASTM A615
LAP SPLICES	BAR SIZE # 4 # 5 # 6 # 7 # 8 # 9 # 10 # 11	Ld 24 in. 30 in. 36 in. 42 in. 48 in. 55 in. 61 in. 68 in.
HORIZONTAL JOINT REINFORCING	1. STANDARD WEIGHT "DUR-O-WALL" AT 16° o.c. 2. PROVIDE PREFABRICATED CORNER AND TEE SECTIONS AT WALL CORNERS AND INTERSECTIONS.	
GENERAL NOTES	1. PROVIDE CLEANOUTS AT THE BOTTOM OF GROUTED CELLS AND USE LOW LIFT GROUTING PROCEDURES. LIFTS SHALL NOT EXCEED 4'0" IN HEIGHT. 2. MECHANICAL VIBRATORS SHALL BE USED TO CONSOLIDATE GROUT AND RE-CONSOLIDATE GROUT 15 MINUTES AFTER THE INITIAL CONSOLIDATION. 3. BOND BEAMS UNITS SHALL BE PRODUCED FROM STANDARD VERTICALLY VOIDED UNITS WITH PRECUT KNOCK-OUT CROSS WALLS, UNO. ALL BOND BEAMS SHALL BE REINFORCED WITH (2) #5 CONTINUOUS INCLUDING CORNER BARS, UNO. 4. EXCEPT AS NOTED ON THE DRAWINGS, ALL BOLTS, ANCHORS, AND EMBEDDED ITEMS SHALL BE GROUTED IN PLACE. 5. PROVIDE FULL SHOVED MORTAR IN ALL HEAD AND BED JOINTS AND BEHIND ALL BRICK BELOW BRACE. 6. ALL MASONRY SHALL BE LAID UP RUNNING BOND WITH EXPOSED JOINTS TOOLED. 7. ALL ANCHOR BOLTS FOR BEAM AND COLUMN BEARING PLATES SHALL BE PLACED WITH SETTING TEMPLATES. 8. FILL ALL VOIDS AND CELLS WITHIN 12" EITHER SIDE OF CENTERLINE OF BEAM AND/OR COLUMN BEARING LOCATIONS WITH A #5 REINFORCING BAR AND GROUT UNLESS NOTED OTHERWISE ON DRAWINGS. 9. ALL CELLS WITH REINFORCING STEEL SHALL BE GROUTED SOLID. 10. AT EVERY WALL CORNER, END, AND INTERSECTION, AS WELL AS AT THE JAMB OF EVERY OPENING AND EACH SIDE OF EACH VERTICAL CONTROLJOINT, PROVIDE #5 VERTICAL FULL HEIGHT OF WALL.	

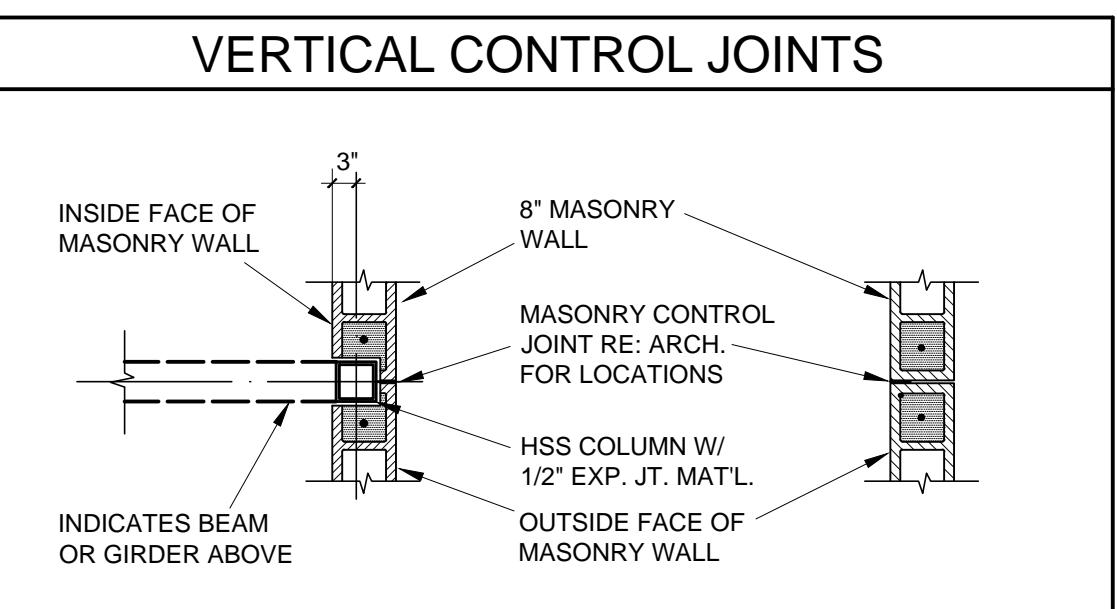


#### LOOSE LINTEL SCHEDULE

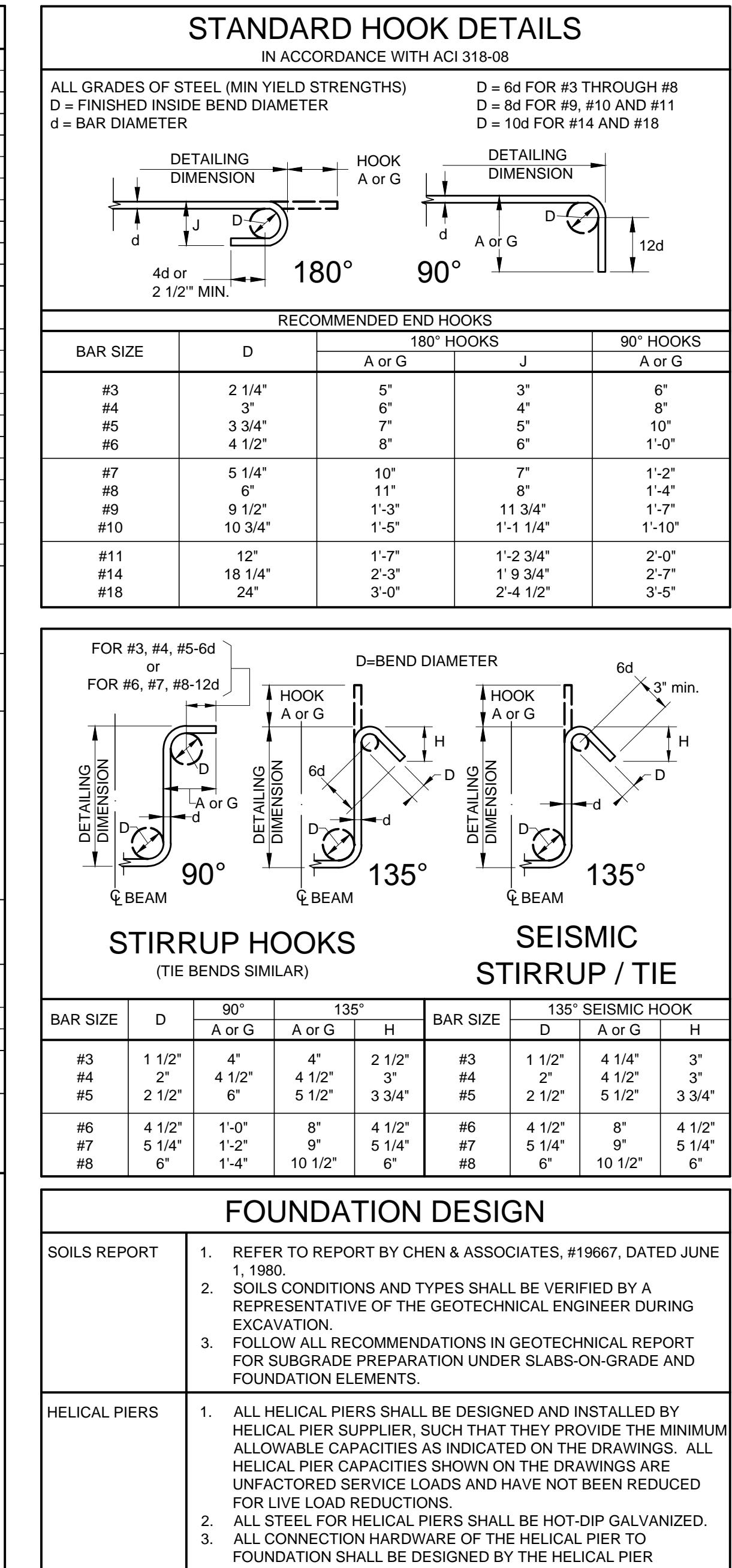
SPAN	LINTEL SIZE	BRG. EACH END	TYPICAL DETAIL
UP TO 1'-4"	1/4" FLAT PLATE	4"	
1'-4" TO 3'-6"	L 3 1/2" x 3" x 1/4" LLH	4"	
3'-6" TO 4'-6"	L 3 1/2" x 3 1/2" x 1/4"	6"	
4'-6" TO 5'-6"	L 4 1/2" x 2" x 1/4" LLV	6"	
5'-6" TO 7'-0"	L 5' x 3 1/2" x 16" LLV	8"	
7'-0" & GREATER	REFER TO PLANS	8"	

NOTES: 1. (1) ANGLE FOR EACH 4" WITHE OF MASONRY  
2. RE: ARCHL & MECHL FOR OPENING SIZES AND LOCATIONS

STEEL		
CODES	AISC SPECIFICATIONS AND CODE OF STANDARD PRACTICE MANUAL	
STEEL SECTIONS	LATEST EDITION	
	SECTION TYPE	MIN. YIELD STRENGTH
	PIPES	35 KSI
	HSS ROUND	42KSI
	HSS SQUARE/RECT	46 KSI
	W, WT SHAPES	50 KSI
	C, MC, S, M, SHAPES	50 KSI
	ANGLES & PLATES	36 KSI
CONNECTIONS	USE STANDARD AISC FRAMED CONNECTIONS (U.N.O.)	
	TYPE	DESCRIPTION
	BOLTS	A325N-3/4 in.DIA.(U.N.O.) OR WELDED EQUIV.
	1. ALL BOLTED CONNECTIONS ARE TO BE 'SNUG-TIGHTENED' (U.N.O.).	
	2. USE WASHERS AT SHORT SLOTS AND 5/16" WASHER PLATES AT LONG SLOTS.	
WELDS	1. MINIMUM OF 3/16 in. CONTINUOUS FILLET USING E70XX ELECTRODES (U.N.O.).	
	2. WELDING OF REBAR ANCHORS TO STEEL SECTIONS OR PLATES SHALL DEVELOP 1.5 TIMES REBAR YIELD STRENGTH.	
	3. ALL WELDING SHALL BE PERFORMED BY A CERTIFIED WELDER IN ACCORDANCE WITH AISC AND AWS SPECIFICATIONS AND RECOMMENDATIONS.	
	4. DELAY PAINTING WITHIN 3' OF FIELD WELDS UNTIL WELDS ARE COMPLETED.	
ANGLES	1. CONNECTIONS SHALL CONSIST OF PAIRS OF 1/4" ANGLES USING THE MAXIMUM NUMBER OF BOLTS REQUIRED IN TABLE 10.1 IN THE AISC SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS, 13TH EDITION.	
OPEN WEB JOISTS AND JOIST GIRDERS	1. DESIGN, FABRICATION AND ERECTION SHALL BE IN ACCORDANCE WITH THE "STEEL JOIST INSTITUTE" AND 2006 IBC SECTION 2206.	
	2. DESIGN CALCULATIONS AND SHOP DRAWINGS SHALL BE PREPARED UNDER THE SUPERVISION AND BEAR THE SEAL AND SIGNATURE OF A PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN THE STATE OF COLORADO. SHOP DRAWINGS SHALL BE SUBMITTED FOR REVIEW BY THE STRUCTURAL ENGINEER.	
	3. REFER TO PLANS AND DETAILS FOR SPECIAL LOADING REQUIREMENTS.	
	4. PROVIDE JOISTS WITH SPECIAL END BEARINGS AND JOIST EXTENSIONS AS SHOWN ON THE DRAWINGS.	
	5. PROVIDE CONTINUOUS HORIZONTAL BRIDGING FOR ALL JOISTS IN ACCORDANCE WITH SJ1 REQUIREMENTS.	
STEEL DECK	SHALL BE ERECTED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. 3-SPAN MINIMUM.	
FORM DECK	REFER TO PLANS AND DETAILS FOR CONCRETE SLAB FORM DECK REQUIREMENTS. REFER TO PLANS AND MANUFACTURER'S RECOMMENDATIONS FOR ATTACHMENT TO SUPPORTS.	
ROOF DECK	REFER TO PLANS AND DETAILS FOR DECK REQUIREMENTS. REFER TO PLANS AND MANUFACTURER'S RECOMMENDATIONS FOR ATTACHMENT TO SUPPORTS.	

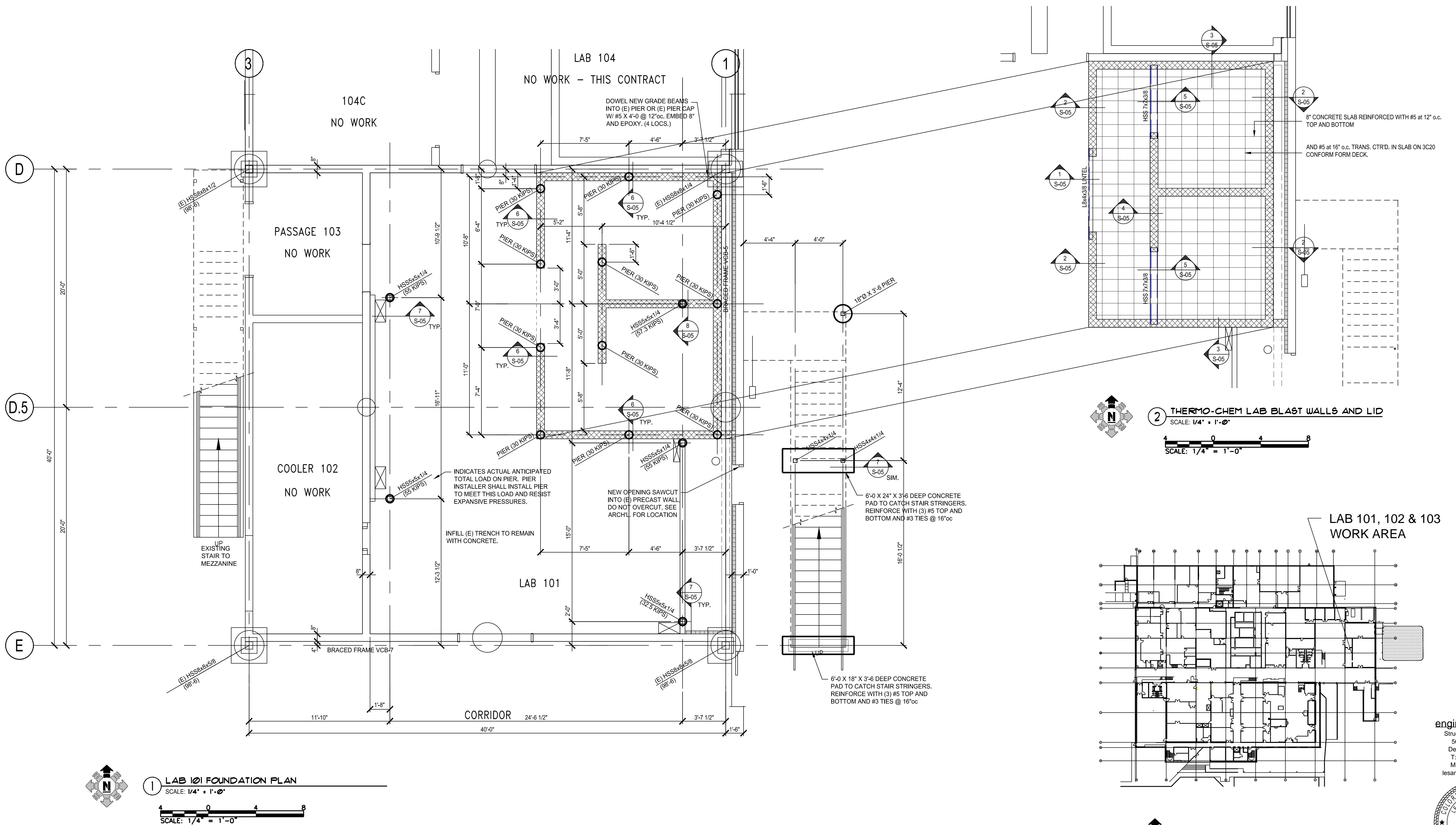


CONCRETE		
CODES	ACI 318-08 - BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE	
CONCRETE	ACI 301-8 - SPECIFICATIONS FOR STRUCTURAL CONCRETE	
AGGREGATE	STONE (UNLESS NOTED OTHERWISE)	
MIN. 28 DAY COMPRESSIVE STRENGTHS	CAISONS WALLS ELEVATED SLABS	3000 PSI 3500 PSI 4000 PSI
REINFORCING	REINFORCING	ASTM A615, GRADE 60
	WELDED BAR	ASTM A706-82a, GRADE 60.
	CORNER BARS	MATCH ALL ROWS OF HORIZONTAL BARS
	OPENINGS	(2) #5 MIN. AROUND ALL SIDES OF OPENINGS AND EXTEND 2'-0" PAST OPENING EDGES.
DEVELOPMENT LENGTH Ld and LAP SPLICES	REBAR	3000 PSI CONCRETE 4000 PSI CONCRETE
	STD. Ld	STD. Ld CLASS B
	TYP. TOP	TYP. TOP TYP. TOP
#4	22	29 29 37 19 25 25 33
#5	28	36 36 47 24 31 31 41
#6	33	43 43 55 29 37 37 49
#7	48	63 63 81 42 54 54 71
#8	55	72 72 93 48 62 62 81
#9	62	81 81 105 54 70 70 91
#10	70	91 91 118 61 79 79 102
#11	78	101 101 131 67 87 87 113
WELDED WIRE FABRIC	ACCORDING WITH ASTM A185 (1) FULL MESH MIN. LAP, NO WELDING U.N.O.	
OPEN WEB JOISTS AND JOIST GIRDERS	1. DESIGN, FABRICATION AND ERECTION SHALL BE IN ACCORDANCE WITH THE "STEEL JOIST INSTITUTE" AND 2006 IBC SECTION 2206.	
	2. DESIGN CALCULATIONS AND SHOP DRAWINGS SHALL BE PREPARED UNDER THE SUPERVISION AND BEAR THE SEAL AND SIGNATURE OF A PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN THE STATE OF COLORADO. SHOP DRAWINGS SHALL BE SUBMITTED FOR REVIEW BY THE STRUCTURAL ENGINEER.	
	3. REFER TO PLANS AND DETAILS FOR SPECIAL LOADING REQUIREMENTS.	
	4. PROVIDE JOISTS WITH SPECIAL END BEARINGS AND JOIST EXTENSIONS AS SHOWN ON THE DRAWINGS.	
	5. PROVIDE CONTINUOUS HORIZONTAL BRIDGING FOR ALL JOISTS IN ACCORDANCE WITH SJ1 REQUIREMENTS.	
STEEL DECK	SHALL BE ERECTED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. 3-SPAN MINIMUM.	
FORM DECK	REFER TO PLANS AND DETAILS FOR CONCRETE SLAB FORM DECK REQUIREMENTS. REFER TO PLANS AND MANUFACTURER'S RECOMMENDATIONS FOR ATTACHMENT TO SUPPORTS.	
ROOF DECK	REFER TO PLANS AND DETAILS FOR DECK REQUIREMENTS. REFER TO PLANS AND MANUFACTURER'S RECOMMENDATIONS FOR ATTACHMENT TO SUPPORTS.	
REINFORCING	1. CONTRACTOR SHALL NOTIFY ENGINEER OF COLD JOINT LOCATIONS PRIOR TO OR DURING CONCRETE FORMING.	
	2. COLD WEATHER AND/OR HOT WEATHER CONCRETING PROCEDURES SHALL BE PROVIDED, IF CONDITIONS WARRANT, AS RECOMMENDED IN THE AG MANUAL OF CONCRETE PRACTICE.	
	3. ALL EXPOSED EDGES AND CORNERS SHALL BE CHAMFERED 3/4".	
	4. ALL ANCHOR BOLTS FOR BEAM AND COLUMN BEARING PLATES SHALL BE PLACED WITH SETTING TEMPLATES.	
	5. JOINTS NOT SHOWN SHALL BE MADE AND LOCATED TO LEAST IMPAIR STRENGTH AND APPEARANCE OF STRUCTURE AS APPROVED BY THE ARCHITECT. NO HORIZONTAL JOINTS SHALL BE PERMITTED IN CONCRETE EXCEPT WHERE THEY NORMALLY OCCUR OR WHERE NOTED.	
	6. ALL CONSTRUCTION JOINTS SHALL BE PREPARED BY ROUGHENING THE SURFACE OF THE CONCRETE IN AN APPROVED MANNER SUCH THAT THE AGGREGATE SHALL BE EXPOSED UNIFORMLY, LEAVING NO LATANCE, LOOSENED PARTICLES, OR DAMAGED CONCRETE.	
	7. PIPE MAY PASS THROUGH STRUCTURAL CONCRETE IN SLEEVES, BUT NOT BE EMBEDDED THEREIN.	
	8. PROVIDE CONTINUOUS SHEAR KEYS AT VERTICAL COLD JOINTS OR WHERE SHOWN ON DRAWINGS.	



ABBREVIATIONS		
(TYP.)	TYPICAL CONDITION	A.B. ANCHOR BOLT
(SIM.)	SIMILAR CONDITION	CMU CONCRETE MASONRY UNIT
(U.N.O.)	UNLESS NOTED OTHERWISE	DIA. DIAMETER
(O.H.)	OPPOSITE HAND CONDITION	F.D. FLOOR DRAIN
C.J.	CONTROL JOINT	EXT. EXTERIOR
GA.	GAGE	STD. STANDARD
O.C.	ON CENTER	W.W.F. WELDED WIRE FABRIC
		¢ CENTERLINE
		H.A.S. HEADED ANCHOR STUD
		P.D.F. POWDER DRIVEN FASTENER
SYMBOLS		
DETAIL NUMBER	DETAIL SECTION, OR ELEVATION REFERENCE	
DETAIL LOCATION (SHEET NUMBER)		

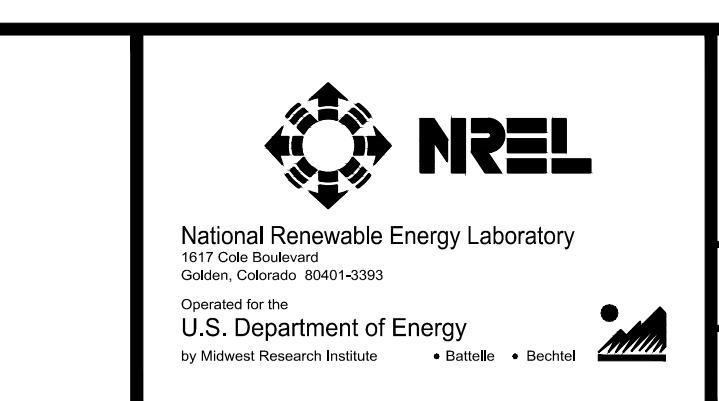
DESIGN CRITERIA			
BUILDING CODE	2009 IBC, ASCE 7-05	TYPE	UNIFORM CONCENTRATED
LOADS	MEZZ	DEAD MEZZANINE	75 PSF N/A
	LIVE MEZZANINE (LAB)	200 PSF 2000 LBS	
	DEAD STAIRS	50 PSF N/A	
	LIVE STAIRS	100 PSF 300 LBS	
PENT-HOUSE	DEAD FLOOR	55 PSF N/A	
	LIVE FLOOR	50 PSF N/A	
	DEAD ROOF	25 PSF N/A	
	LIVE ROOF	20 PSF N/A	
FAN LOFT	DEAD FLOOR	60 PSF N/A	
	LIVE FLOOR	50 PSF N/A	
SNOW LOADS	GROUND SNOW LOAD, Pg	30 PSF	
	IMPORTANCE FACTOR, I	1.1	
	Thermal Factor, Cl	1.0	
	Exposure Factor, Ce	1.0	
	Roof Snow Load, Pg Minimum	30 PSF	
WIND DESIGN	BASIC WIND SPEED, V3s	110 MPH	
	EXPOSURE	C	
	IMPORTANCE FACTOR, I	1.15	
EARTHQUAKE DESIGN	OCCUPANCY CATEGORY	III	
	IMPORTANCE FACTOR, I	1.25	
	SITE CLASS	C	
	SPECTRAL RESPONSE, Ss	0.234g	
	SPECTRAL RESPONSE, S1	0.059g	
	SPECTRAL RESPONSE, SD1	0.067g	
	SEISMIC DESIGN CATEGORY	B	
	SEISMIC FORCE RESISTING SYSTEM	MOMENT FRAME	
	RESPONSE MODIFICATION COEFF, R	3.5	
	ANALYSIS PROCEDURE	EQUIV. LATERAL FORCE	
SPECIAL INSPECTIONS AND TESTING			
TYPE OF WORK	PERFORM TO IBC SECTION	COMMENTS	
STEEL CONSTRUCTION	1704.3, TABLE 1704.3		
CONCRETE CONSTRUCTION	1704.4, TABLE 1704.4		
MASONRY CONSTRUCTION	1704.5, TABLE 1704.5.1 1		



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PLOT INFO.:	NREL.STB					

ENGINEERING REVIEW		
	APPROVAL	DATE
DESIGNER		.
ENGINEER		.
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A/E APPROVED BY	.	.
NREL APPROVED BY	.	.
BLDG. AREA ENG.	.	.



LB			SIGNATURE AND DATE
<p style="text-align: center;">STRUCT</p> <p style="text-align: center;">HERMOCHEMICAL BIOMASS CONVERSION LAB</p> <p style="text-align: center;">TASK ORDER 13</p> <p style="text-align: center;">LAB 101 FOUNDATION PLAN</p>			
AWING NO. PREFIX FTLB-135-	DRAWING NO. <b>S-01</b>	REVISION NO. <b>3</b>	
NREL PROJECT NO. <b>X2010034</b>	NREL WORK ORDER NO. <b>13</b>	A/E PROJECT NO.	

**LT**  
Engineering, LLC  
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[lesantyssen@msn.com](mailto:lesantyssen@msn.com)

A circular registration stamp. The outer ring contains the words "COLORADO REGISTERED ENGINEER" at the top and "PROFESSIONAL" at the bottom, separated by stars. The inner circle contains the name "LESLIE ANN TYSON" and the registration number "29922" in the center.

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SIGNATURE AND DATE

STRUCT

## STRUCT CONVERSION LAB

CONVERSION LAB

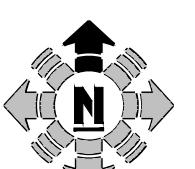
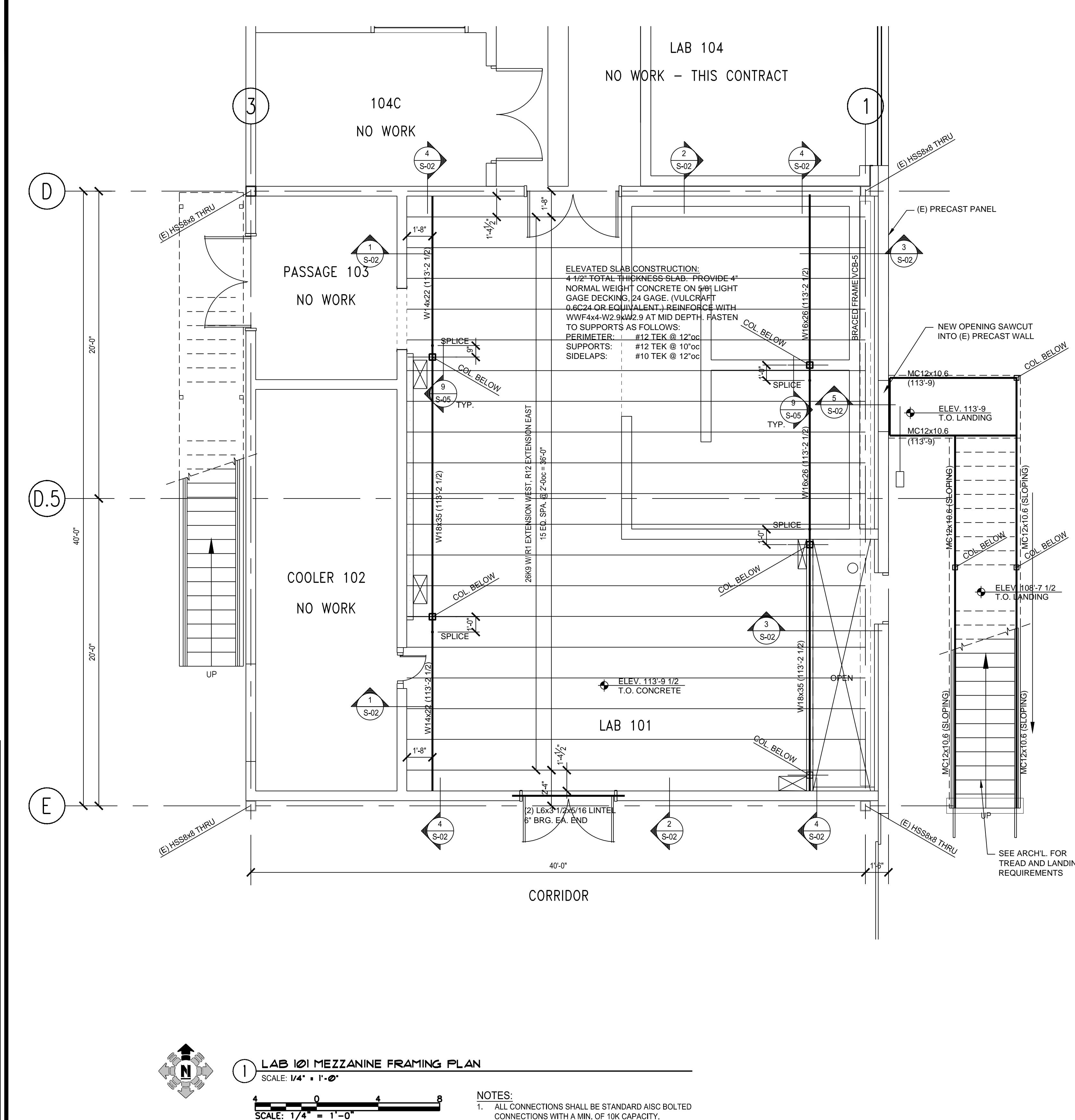
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REVISION NO.

3

A/E PROJECT NO.

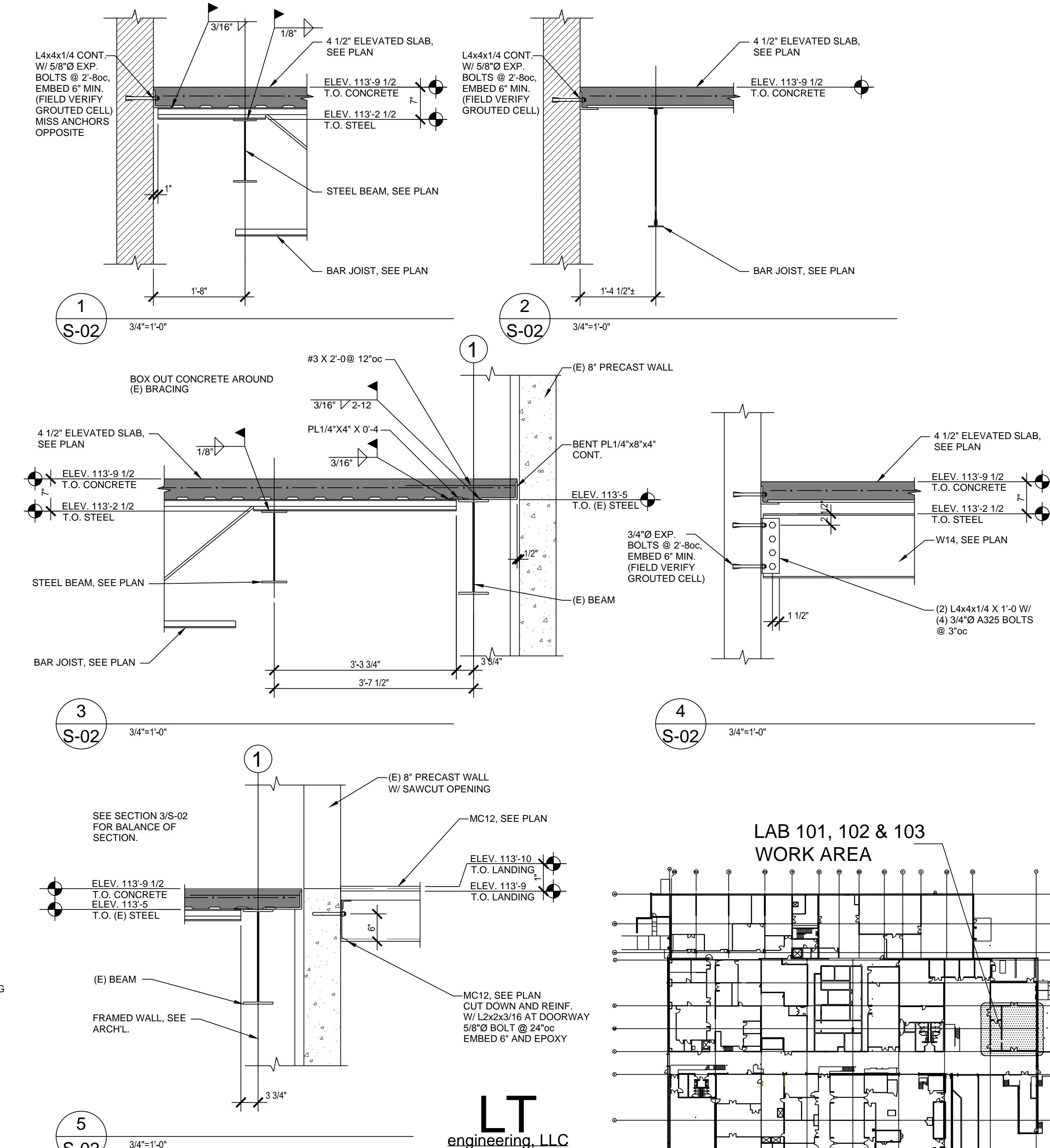
Journal of Oral Rehabilitation 2003 30: 103–109



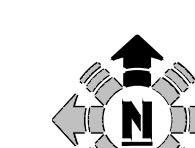
1 LAB 101 MEZZANINE FRAMING PLAN

A scale bar diagram consisting of a horizontal line with tick marks. The left end has a circle containing the number 1. To its right is a vertical line segment labeled "SCALE: 1/4". Further to the right is another vertical line segment labeled "1'-0"". Below the line, there are four major tick marks. The first tick mark is labeled "4" above it. The second tick mark is labeled "0" above it. The third tick mark is labeled "4" above it. The fourth tick mark is labeled "8" above it. The distance between the first and second tick marks is labeled "1/4". The distance between the second and third tick marks is labeled "1'-0"".

NOTES:



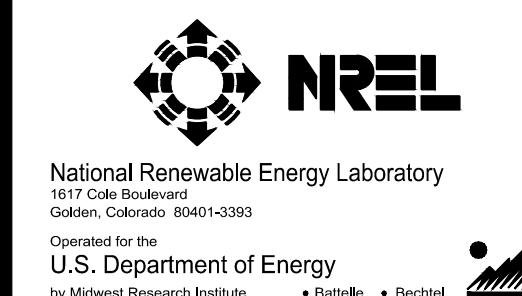
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**engineering, LLC**  
Structural Consultants  
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Denver, CO 80221  
T: 303.477.3861  
M: 720.319.0503



KEYPLAN  
SCALE: 1" = 50'

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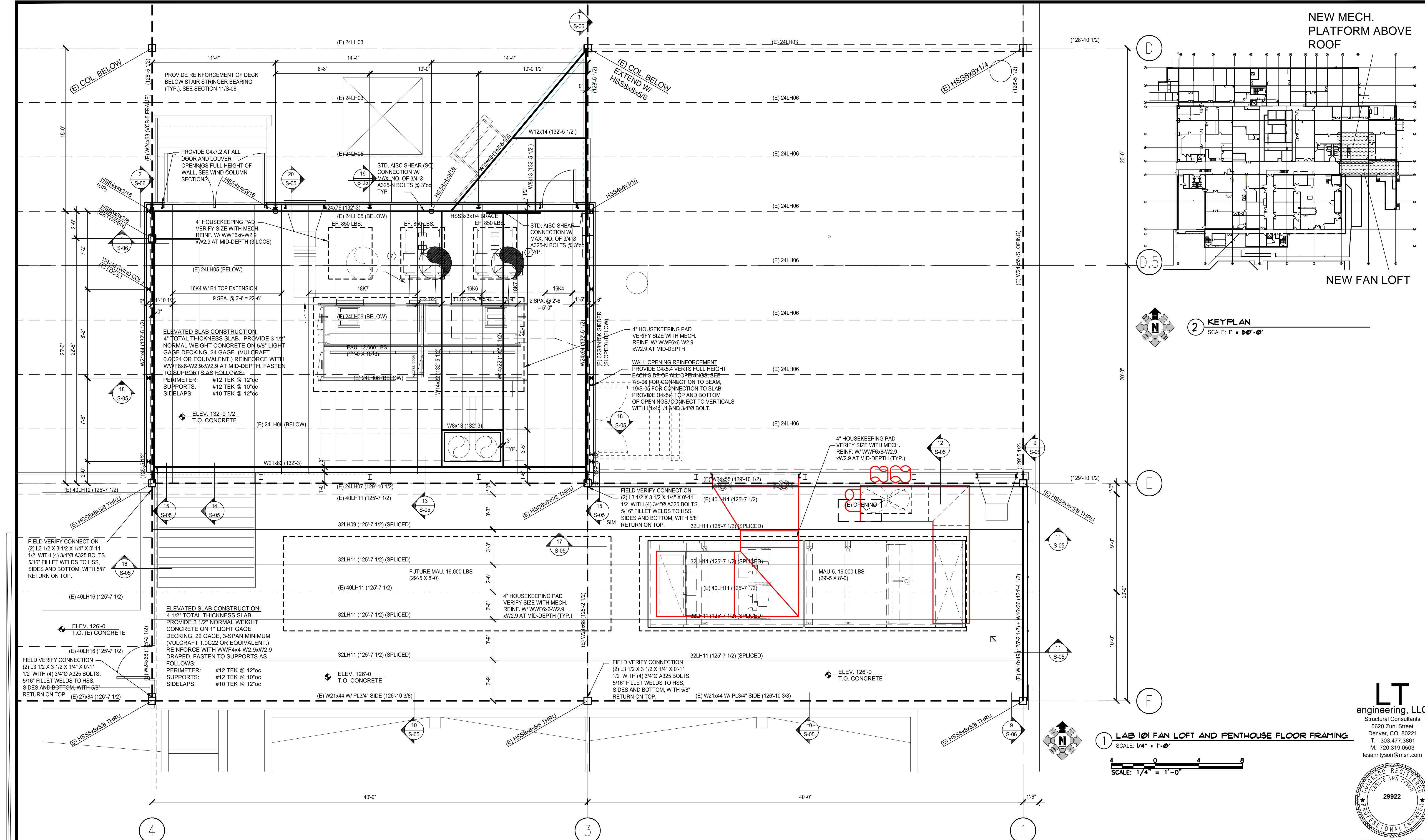
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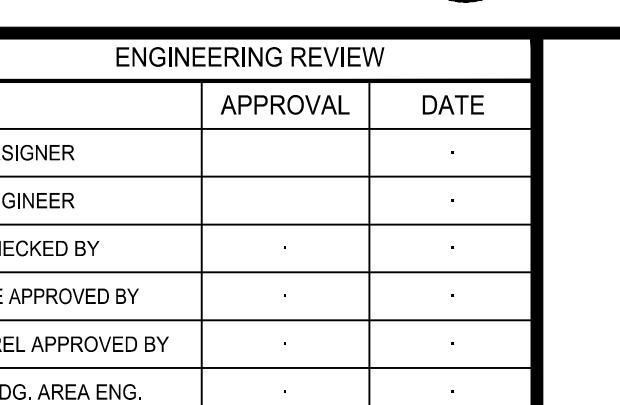
**FTLB STRUCT  
THERMOCHEMICAL BIOMASS CONVERSION LAB  
TASK ORDER 13  
LAB 101 MEZZANINE FRAMING PLAN**

NEW MECH.  
PLATFORM ABOVE  
ROOF



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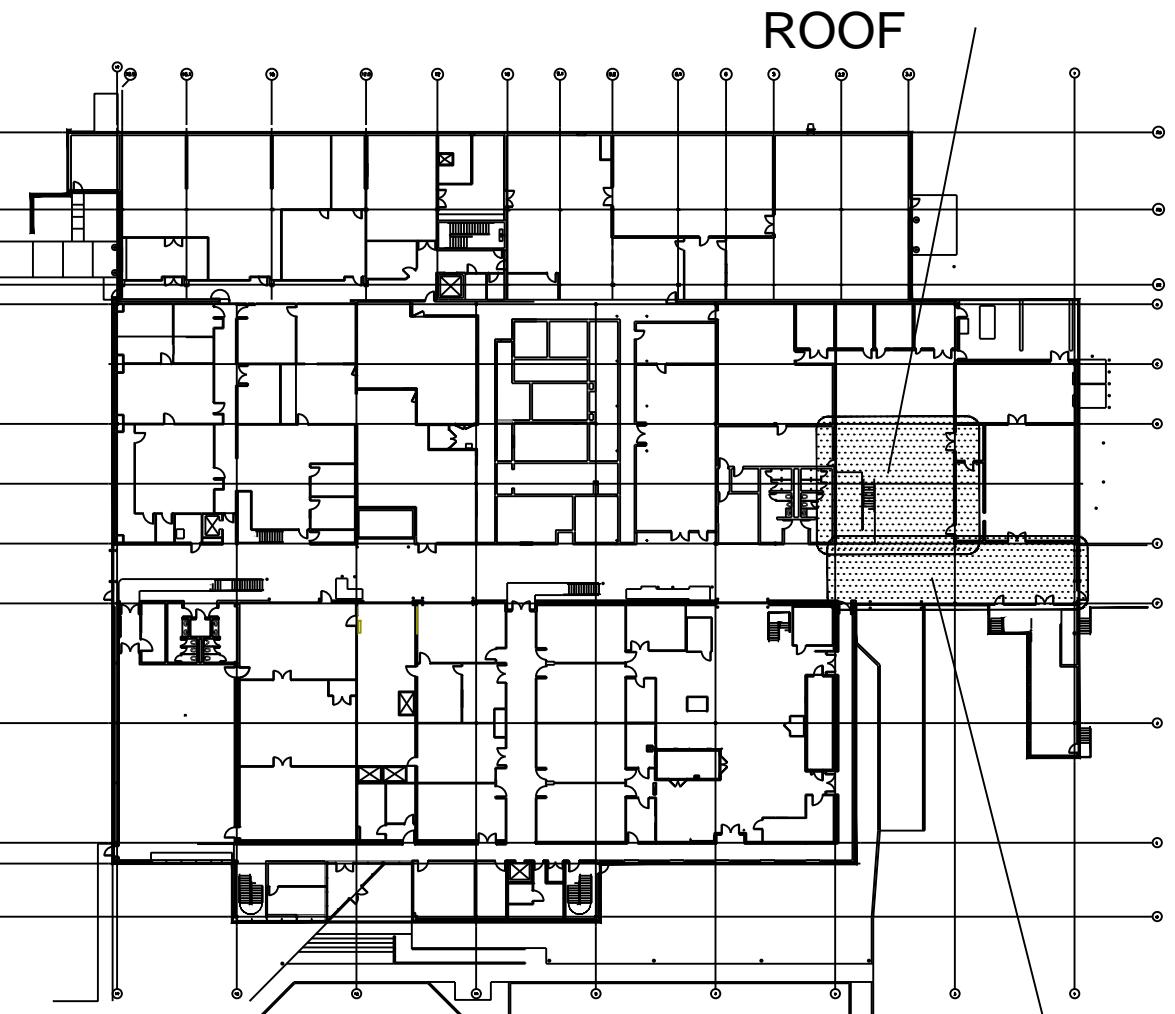
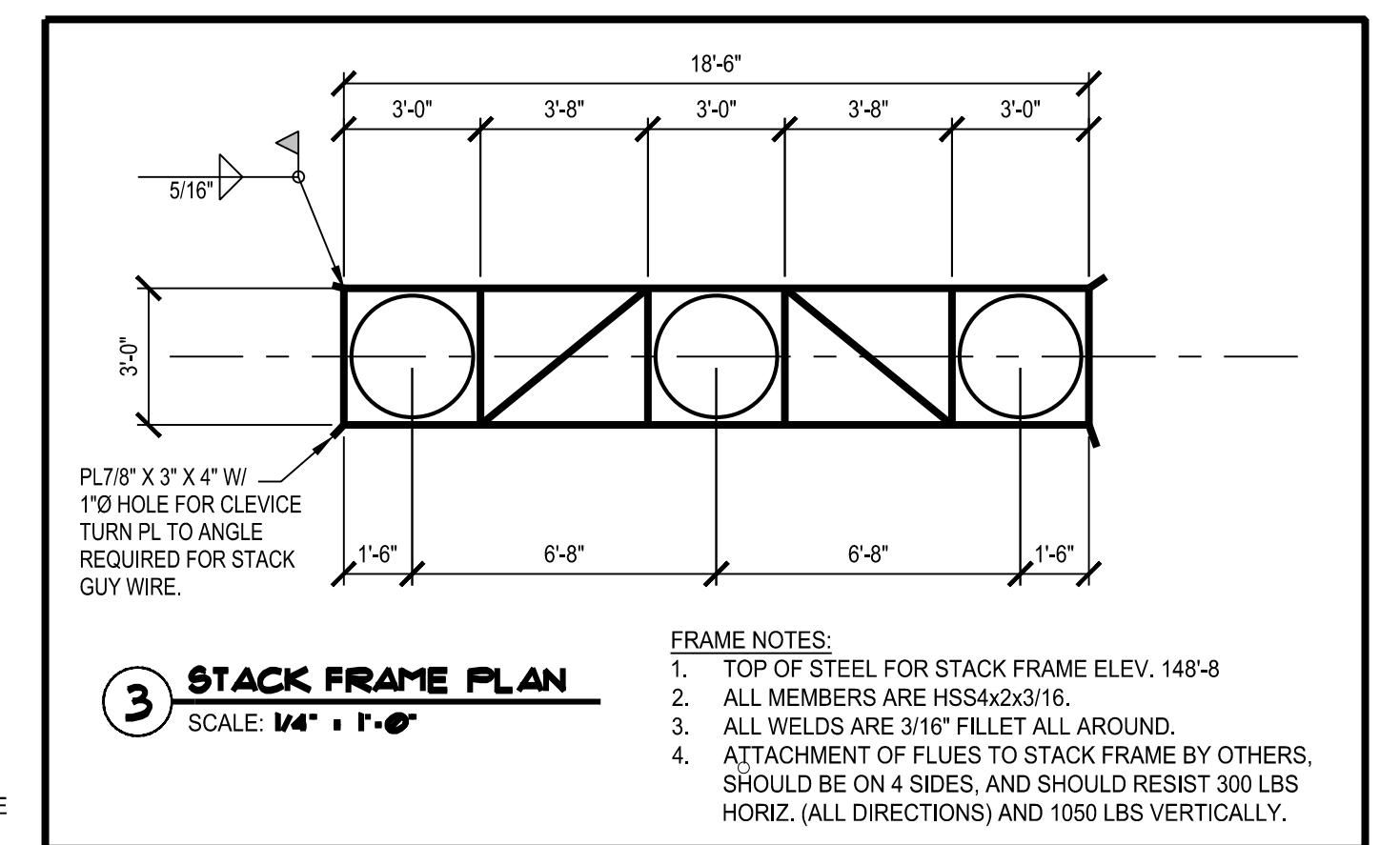
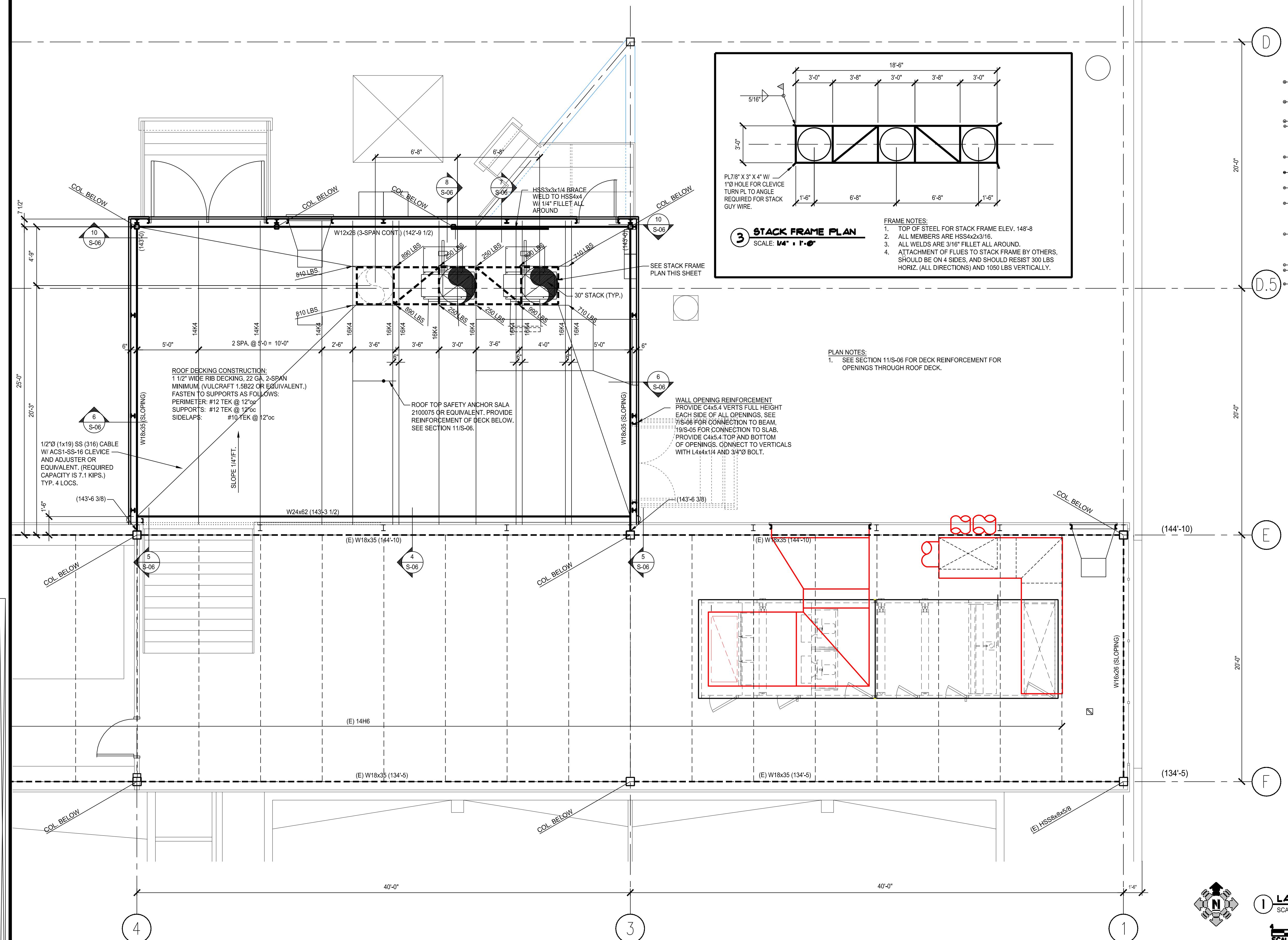
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PLOT INFO: NREL.STB			BLDG. AREA ENG.			.



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FTLB STRUCT  
THERMOCHEMICAL BIOMASS CONVERSION LAB  
TASK ORDER 13  
FAN LOFT AND MECH. PLATFORM  
FLOOR FRAMING  
DRAWING NO. PREFIX: S-03  
DRAWING NO. 3  
NREL PROJECT NO. EX2010034  
NREL WORK ORDER NO. 13  
A/E PROJECT NO. 13

NEW MECH.  
PLATFORM ABOVE  
ROOF



**2 KEYPLAN**

SCALE: 1" = 50'-0"

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**1 LAB 101 PENTHOUSE ROOF FRAMING**

SCALE: 1/4" = 1'-0"

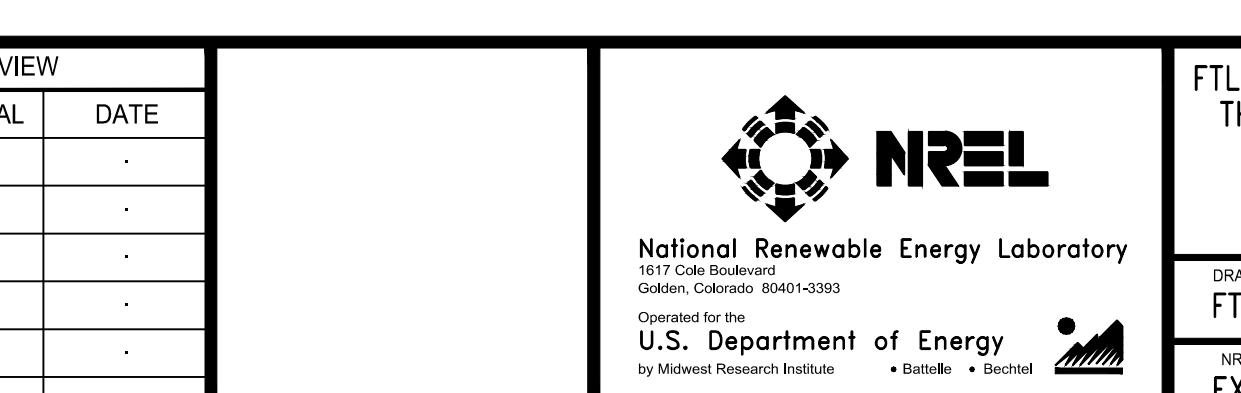
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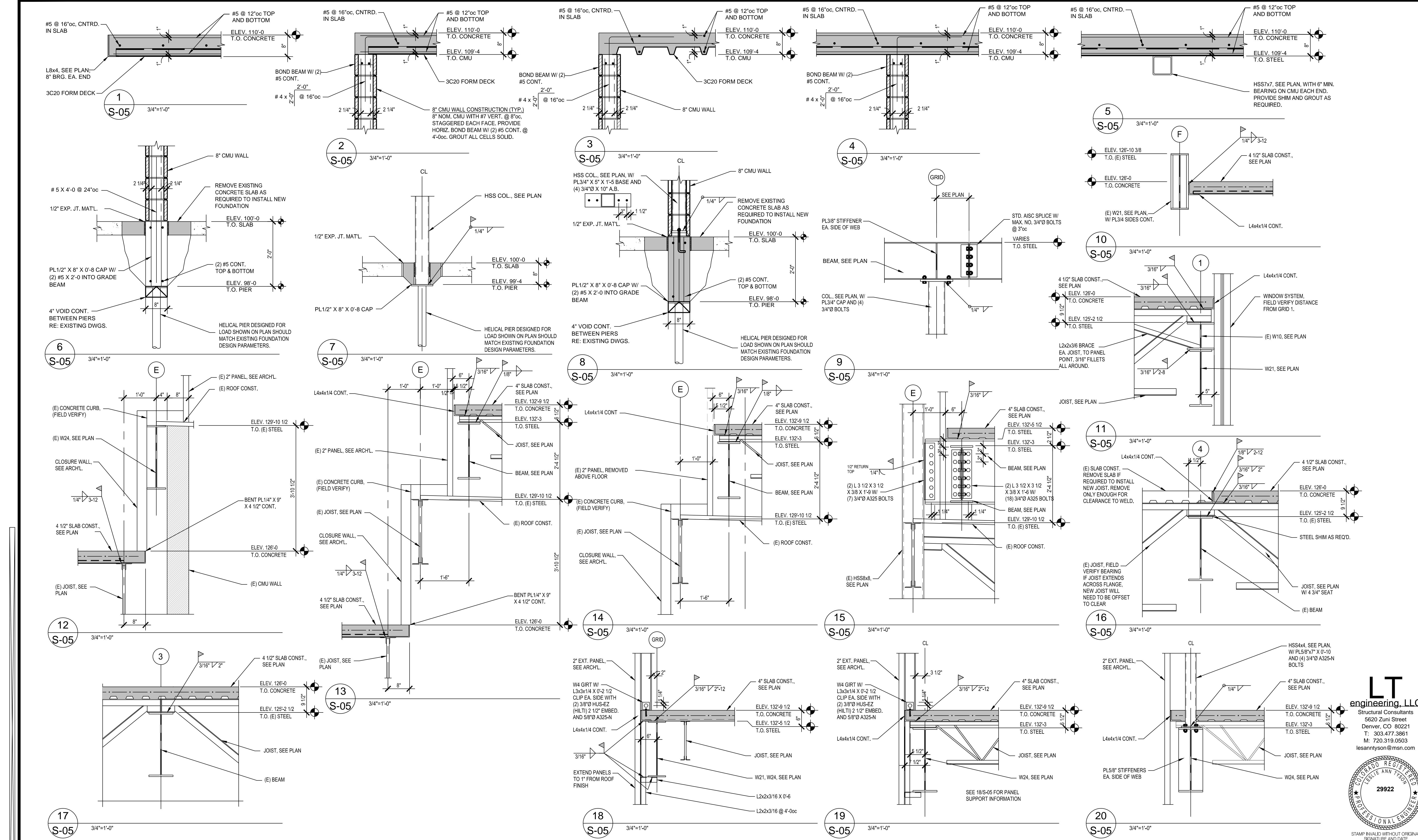
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3	FOR CONSTRUCTION	01.20.12	.	.	.	.	.	.	.	.	.
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PLOT INFO: NREL.STB						



FTLB	STRUCT
Thermochemical Biomass Conversion Lab	THERMOCHEMICAL BIOMASS CONVERSION LAB
Task Order 13	FAN LOFT AND MECH. PLATFORM
	ROOF FRAMING
DRAWING NO. PREFIX	FTLB-135-
DRAWING NO.	S-04
REVISION NO.	3
NREL PROJECT NO.	EX2010034
NREL WORK ORDER NO.	13
A/E PROJECT NO.	



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ACAD VERSION:	AUTOCAD 2010			
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**National Renewable Energy Laboratory**  
1617 Cole Boulevard  
Golden, Colorado 80401-3393

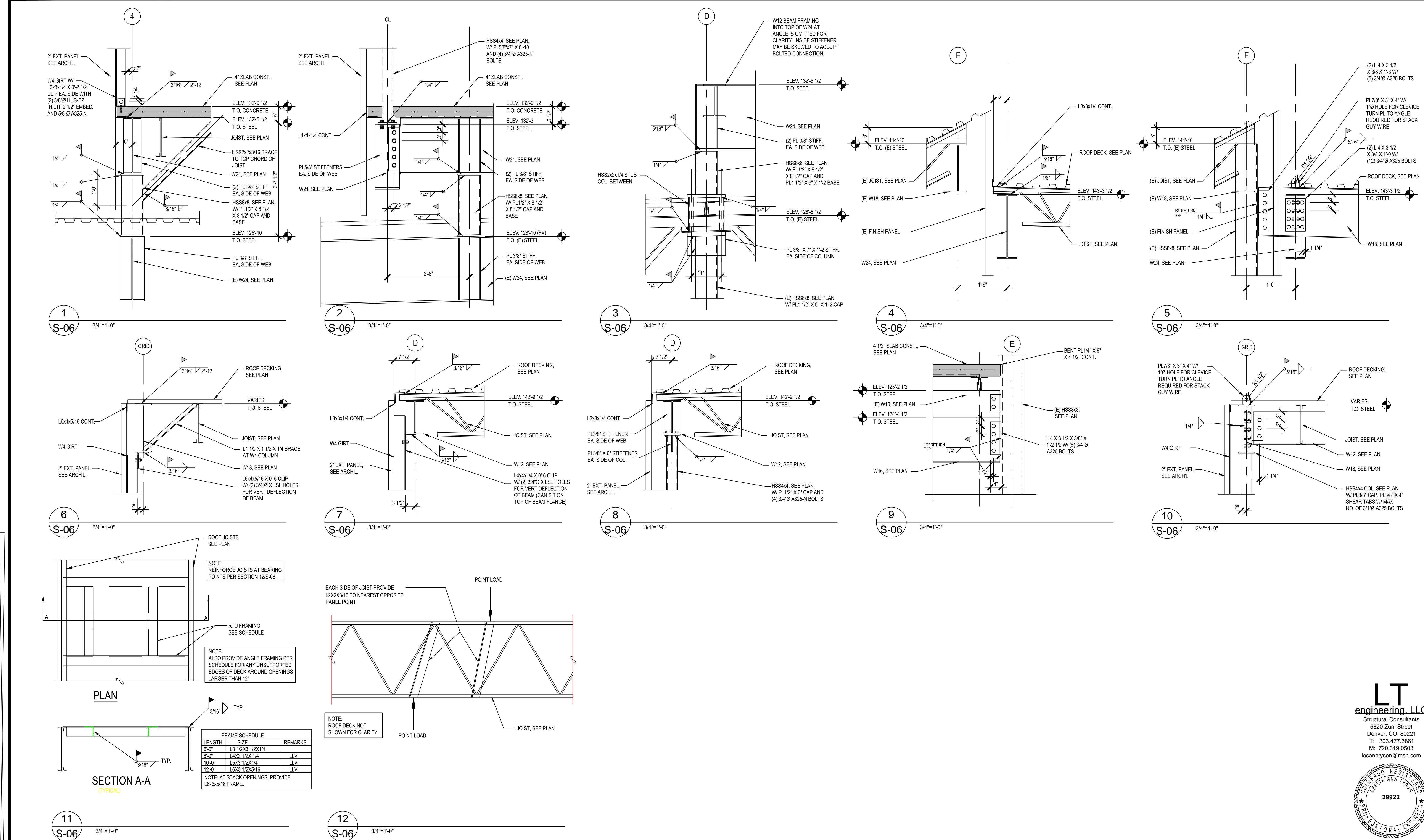
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STRUCT  
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THERMOCHEMICAL BIOMASS CONVERSION LAB  
TASK ORDER 13  
SECTIONS

DRAWING NO. PREFIX <b>FTLB-135-</b>	DRAWING NO. <b>S-05</b>	REVISION NO. <b>3</b>
NREL PROJECT NO. <b>EX2010034</b>	NREL WORK ORDER NO. <b>13</b>	A/E PROJECT NO.

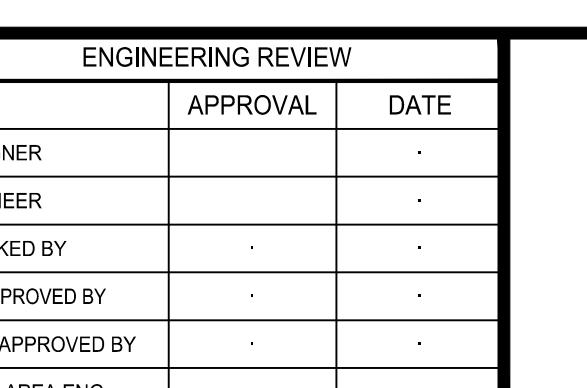


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NO.	REVISIONS	DATE	BY	APP'D.	BAE	NO.	REVISIONS	DATE	BY	APP'D.
0	50% CONSTRUCTION	08.12.11	.	.	.	.		.	.	.
1	90% CONSTRUCTION	09.29.11	.	.	.	.		.	.	.
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FTLB THERMOCHEMICAL BIOMASS CONVERSION LAB TASK ORDER 13 SECTIONS		
DRAWING NO. PREFIX <b>FTLB-135-</b>	DRAWING NO. <b>S-06</b>	REVISION NO. <b>3</b>
NREL PROJECT NO. <b>FX2010034</b>	NREL WORK ORDER NO. <b>13</b>	A/E PROJECT NO.