July 23, 2021

Attn: Mr. Pat Hastings
Dynamic Energy (484) 318-8802
1550 Liberty Ridge Drive, Suite 310
Wayne, PA 19087

RE: STAG – Pepe Farms
Roof Framing Analysis
40 Pepes Farm Road
Milford, CT 06460 SEI Project No.: 21355.00

Dear Mr. Hastings,

Structural Enginuity Inc. (SEI) has analyzed the existing building for a new roof solar array using the 2018 Connecticut State Building Code. Based on Dynamic Energy's site observations, the roof framing is understood to consist of a metal deck on 30" deep joists spaced 6'-2'' apart and spanning between 36" deep joist girders. The building uses steel columns consisting of wide flange shapes.

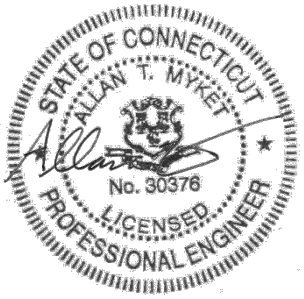
The exiting roof has been analyzed to support a new solar array system. The building construction can support a new solar PV array with a maximum average load of 6.0 psf. These proposed loads and the analysis of the existing members can be seen in SEI's attached calculations. This weight is typically enough to accommodate a fully ballasted racking system. Therefore, it is SEI's professional opinion that the existing roof framing is structurally adequate to support the proposed solar array system. It should be noted that the proposed loading is assuming that the proposed solar array covers the entirety of the roof and the existing framing may be able to support a higher load for an array that is limited to only a portion of the roof surface. If a higher load is necessary, SEI would need to further analyze the detailed racking layout in order to determine if the framing is acceptable.

Please contact our office, at your convenience, should you have any further questions relating to this matter.

Sincerely,

Peter Martin
Engineer III
pmartin@structuralenginuityinc.com

Allan T. Myket, P.E.
President/Founder
amyket@structuralenginuityinc.com



7/23/2021

Structural Enginuity Inc.

Attachments:
- SEI Roof Structural Framing Analysis
- Dynamic Energy Drawings

Structural Enginuity, Inc.
1815 W. Diehl Rd, Ste 100
Naperville, IL 60563
(630) 219-1997
www.structuralenginuityinc.com

Project Name:	STAG Industrial Holdings
Project No.:	21355.00
Client Name:	Dynamic Energy
Date:	7/23/2021

Project Name: STAG INDUSTRIAL HOLDINGS
Roof Structural Analysis
40 Peper Farm Road
Milford, CT 06460

Project Client: Dynamic Energy™
1550 Liberty Ridge Drive, Suite 310
Wayne, PA 19087
(877) 809-8884

Client Contact: Pat Hastings
phastings@dynamicenergy.com

Design References: 2018 Connecticut State Building Code
ASCE 7-16

Scope of Work:

Provide structural engineering services required in the preparation of construction contract documents for the installation of solar panels at the address listed above. The racking system and proposed array layout, provided by client, will be used in conformance with the 2018 Connecticut State Building Code to determine if the existing structure has the capacity to support the addition of the array.

Existing Structure:

The storage facility Is approximately 642'-5" x 315'-4" with a flat roof. The roof is supported by 30" deep open web steel joists which run to 36" deep joist girders.

Loads

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DEAD LOADS

Building Section: Roof 1

Building Section Description: Solar PV modules to be mounted on roof with a ballasted racking system. The roof consists of a waterproofing membrane over rigid insulation and a metal deck. The deck is supported by open web metal bar joists

Existing Dead Loads

Roof deck with foam insulation	3	psf
Metal Deck	3	psf
Steel Joists	3	psf
MEP & Misc	5	psf
	14	psf

Proposed Dead Loads

Proposed Solar Array	6	psf

LIVE LOADS

Building Section: Main Roof

Proposed Live Loads

Roofs - Ordinary flat pitched, and curved roofs[1]	20	psf	*IBC 2018 Table 1607.1*

Note 1: Per IBC 2018 1607.13.5.1: Roof live loads need not be applied to the area covered by photovoltaic panels where the clear space between the panels and the roof surface is 24 inches or less.

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SNOW LOADS

Ground snow load, p_g	30	psf	*CT BC 2018 Appendix N*
Exposure Factor, C_e	1		*ASCE Table 7.3-1*
Thermal Factor, C_t	1.2		*ASCE Table 7.3-2*
Importance Factor, I_s	1		*ASCE Table 1.5-2*

Flat roof snow load, $p_f = 0.7C_eC_tI_sp_g$ 25.2 psf *ASCE Equation 7.3-1*

Building Section: Main Roof

Roof Slope	1.2	degrees	
Roof Slopw Factor, C_s	1		*ASCE Fig 7.4-1*

Minimum snow load for roofs with slopes less than 15 degrees

$p_m = 20I_s$	20	psf	*ASCE 7.3.4*
Controlling snow load	**25.2**	**psf**	

Decking Check

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DECKING:

Assume Vulcraft 1.5B 22 Gauge roof deck
3 span condition
6'-2'' ft span

Per inspection, existing metal deck is type 1.5B deck manufactured by Vulcraft.

Allowable loading	87	psf		*Vulcraft Deck Catalog*
Roof loading				
Dead Load	14	psf		
Roof Live Load	20	psf		
Snow Load	25.2	psf		
Proposed Solar Array	6	psf		
Load combinations				
D	14	psf		
D+Lr	34	psf		
D+S+Solar	45.20	psf	**CONTROLS**	
D+0.75Lr	29	psf		
D+0.75S	32.9	psf		

Controlling load combination **45.2 psf < Allowable load = 87 psf OK**

Vulcraft 1.5B 22 Gauge deck OK

Framing Check

GENERAL STANDARD JOIST ANALYSIS

For Steel Joists Considered as Simple-Span Beams
Subjected to Non-Standard Loads

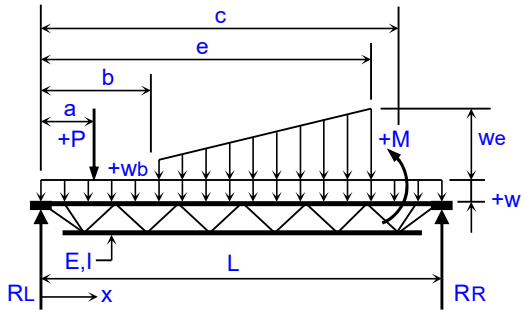
Job Name:		Subject:			
Job Number:		Originator:		Checker:	

Input Data:

Joist Data:

Designation =	K-series	
Span, L =	38.7100	ft.
Modulus, E =	29000000	psi
Inertia, Ix =	382.86	in.^4

W(LL) = 253



Nomenclature

Original Design or Capacity Loads:

Full Uniform:

w = 336 plf

Distributed:	Start b (ft.)	Start wb (plf)	End e (ft.)	End we (plf)
#1:				
#2:				
#3:				
#4:				
#5:				
#6:				
#7:				
#8:				

Moments:	c (ft.)	M (ft-lbs)
#1:		
#2:		
#3:		
#4:		

Point Loads:	a (ft.)	P (lbs.)
#1:		
#2:		
#3:		
#4:		
#5:		
#6:		
#7:		
#8:		
#9:		
#10:		
#11:		
#12:		
#13:		
#14:		
#15:		

New Design Loads:

Full Uniform:

w = plf

Distributed:	Start b (ft.)	Start wb (plf)	End e (ft.)	End we (plf)	
#1:	0.0000	86.33333	38.7100	86.33333	Dead Load
#2:	0.0000	155.4	38.7100	155.4	Snow Loac
#3:	0.0000	37	38.7100	37	Solar Load
#4:					
#5:					
#6:					
#7:					
#8:					

Moments:	c (ft.)	M (ft-lbs)
#1:		
#2:		
#3:		
#4:		

Point Loads:	a (ft.)	P (lbs.)
#1:		
#2:		
#3:		
#4:		
#5:		
#6:		
#7:		
#8:		
#9:		
#10:		
#11:		
#12:		
#13:		
#14:		
#15:		

Results of Joist Analysis:

Original Design or Capacity Loads:

End Reactions:

RL = 6503.3 lbs. RR = 6503.3 lbs.

Minimum Design Web Member Shear:

Vw(min) = 1625.82 lbs. (25% of maximum end reaction for K-series and LH-series joists per SJI Spec's.)

Maximum Moments:

+Mx(max) = 62935.5 ft-lbs @ x = 19.36 ft.
-Mx(max) = 0.0 ft-lbs @ x = 0.00 ft.

***Maximum Deflections:**

-Δ(max) = -1.758 in. @ x = 19.36 ft.
+Δ(max) = 0.000 in. @ x = 0.00 ft.
Δ(ratio) = L/264

**Note: deflections shown above include a 15% increase above the values calculated using traditional "simple-beam" flexure in order to more closely match actual test results obtained by SJI.*

New Design Loads:

End Reactions:

RL = 5394.9 lbs. RR = 5394.9 lbs.

Maximum Moments:

+Mx(max) = 52209.0 ft-lbs @ x = 19.36 ft.
-Mx(max) = 0.0 ft-lbs @ x = 0.00 ft.

***Maximum Deflections:**

-Δ(max) = -1.459 in. @ x = 19.36 ft.
+Δ(max) = 0.000 in. @ x = 0.00 ft.
Δ(ratio) = L/318

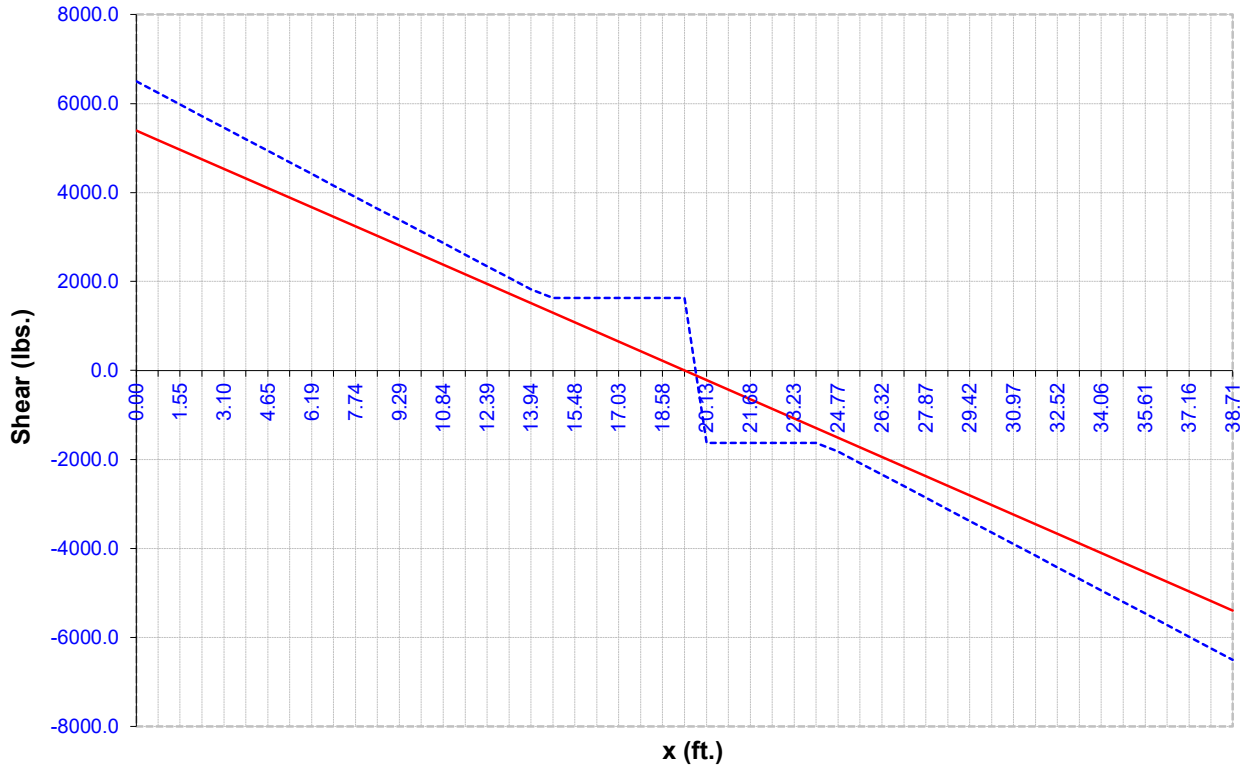
**Note: deflections shown above include a 15% increase above the values calculated using traditional "simple-beam" flexure in order to more closely match actual test results obtained by SJI.*

Maximum Stress Ratios:

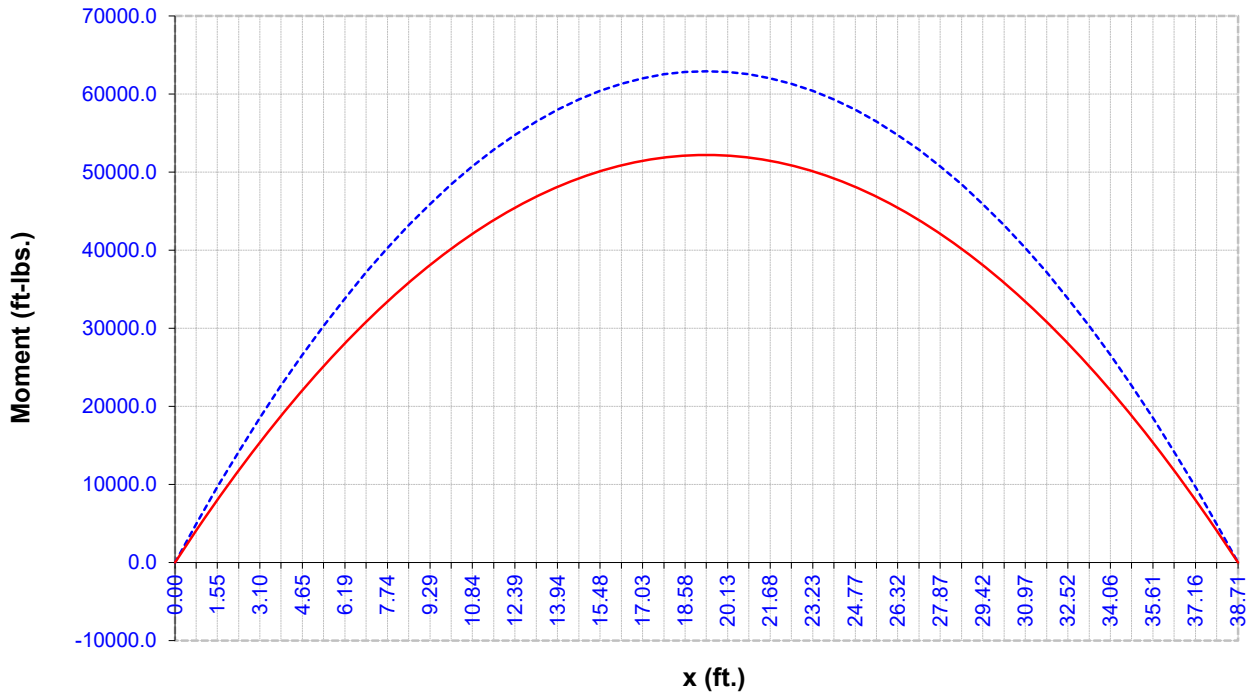
S.R. = **0.830** for Shear @ x = 34.06 ft.
S.R. = **0.830** for Moment @ x = 36.39 ft.

Comments:

Shear Diagram



Moment Diagram



= curves for original design or capacity loads

= curves for new design loads

Appendix A: DynamiC Energy Drawings

STAG INDUSTRIAL HOLDINGS

40 PEPES FARM ROAD
MILFORD, CT 06460

SYSTEM DESCRIPTION

TOTAL SYSTEM SIZE:	2160 kW DC STC TOTAL
MODULE TYPE:	400W JINKO
QUANTITY:	5400 MODULES
TOTAL STRINGS:	156 STRINGS
MODULES PER STRING:	15
TILT ANGLE:	10.0 DEGREES
AZIMUTH:	143.544 DEGREES

MODULE DESCRIPTION:

MAXIMUM POWER (W):	400 W
OPEN CIRCUIT VOLTAGE (Voc):	49.8 V
MAXIMUM POWER VOLTAGE (Vpm):	41.7 V
SHORT CIRCUIT CURRENT (Isc):	10.36 A
MAXIMUM POWER CURRENT (Ipm):	9.60 A
EFFICIENCY (%):	19.88 %
MAXIMUM SYSTEM VOLTAGE:	1500 VDC

INVERTER DESCRIPTION: CHINT POWER SYSTEMS

TYPE OF INVERTER:	50KW
TOTAL NUMBER OF INV:	30
MODEL NUMBER:	CPS-SCA50KTL
DIMENSIONS:	1000*600*260mm
CONTINUOUS POWER:	50KW
DC PEAK POWER TRACKING RANGE:	480-850V
CEC PEAK EFFICIENCY:	98.5%

RACKING DESCRIPTION:

RACKING MANUFACTURER:	DCE SOLAR
RACKING TYPE:	BALLASTED

PROJECT CONTACTS

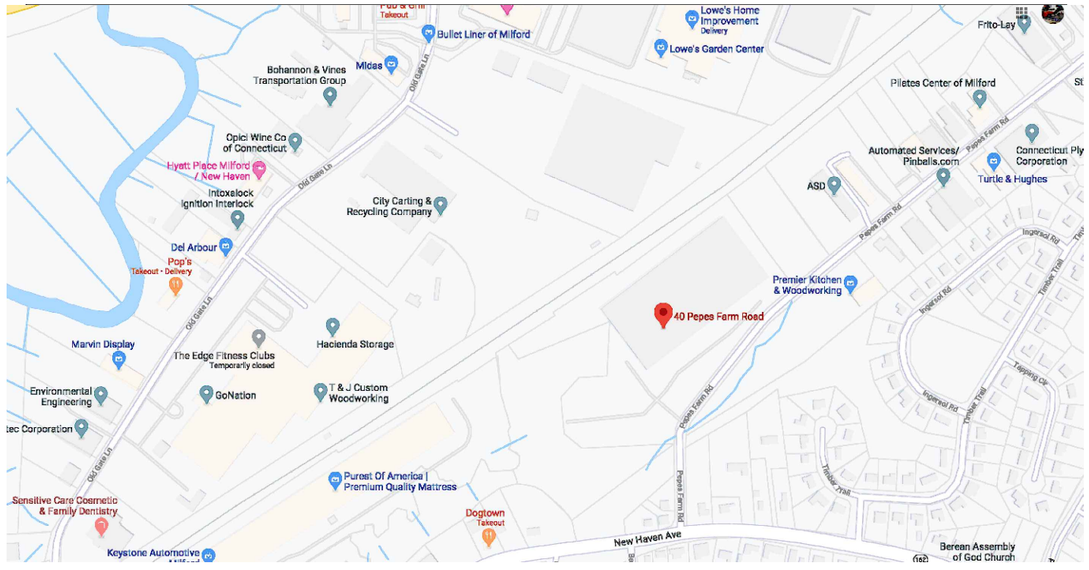
PROJECT MANAGER:
MANOLI ALLEXOPOULOS
1550 LIBERTY RIDGE DR., STE 310
WAYNE, PA 19087
PHONE: (717) 951-0518

CONSTRUCTION MANAGER:
MANOLI ALLEXOPOULOS
1550 LIBERTY RIDGE DR., STE 310
WAYNE, PA 19087
PHONE: (717) 951-0518

ELECTRICAL ENGINEER:
HENDRIK BURGER
1550 LIBERTY RIDGE DR., STE 310
WAYNE, PA 19087
PHONE: (484) 323-1154
LICENCE#: 31153

STRUCTURAL ENGINEER
JAMES A MARX, P.E.
10 HIGH MOUNTAIN ROAD
RINGWOOD, NJ 07456
ASCENT CONSULTING ENGINEERING
NORTH WINDS CENTER
LICENCE#: CT (NO. 17349)

1 AERIAL PHOTO
SCALE: N.T.S.



2 VICINITY MAP
SCALE: N.T.S.

DRAWING LIST

DESIGN CRITERIA:

WIND SPEED:	123 MPH EXP.B
GROUND SNOW LOAD:	30 PSF
ROOF SNOW LOAD:	30 PSF

APPLICABLE CODES

2018 CONNECTICUT STATE
BUILDING CODE
ELECTRICAL CODE NFPA 70, 2017 ED,

STRUCTURAL ENGINUITY
1815 W. DIEHL RD SUITE 100
NAPERSVILLE, IL 60563

SEAL

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STAG INDUSTRIAL HOLDINGS
40 PEPES FARM ROAD
MILFORD, CT 06460

DRAWING ISSUE
- [ ] INTERCONNECTION
- [x] PERMITTING
- [ ] CONSTRUCTION
- [ ] RECORD

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DRAWING NAME
COVERSHEET

DRAWING NUMBER
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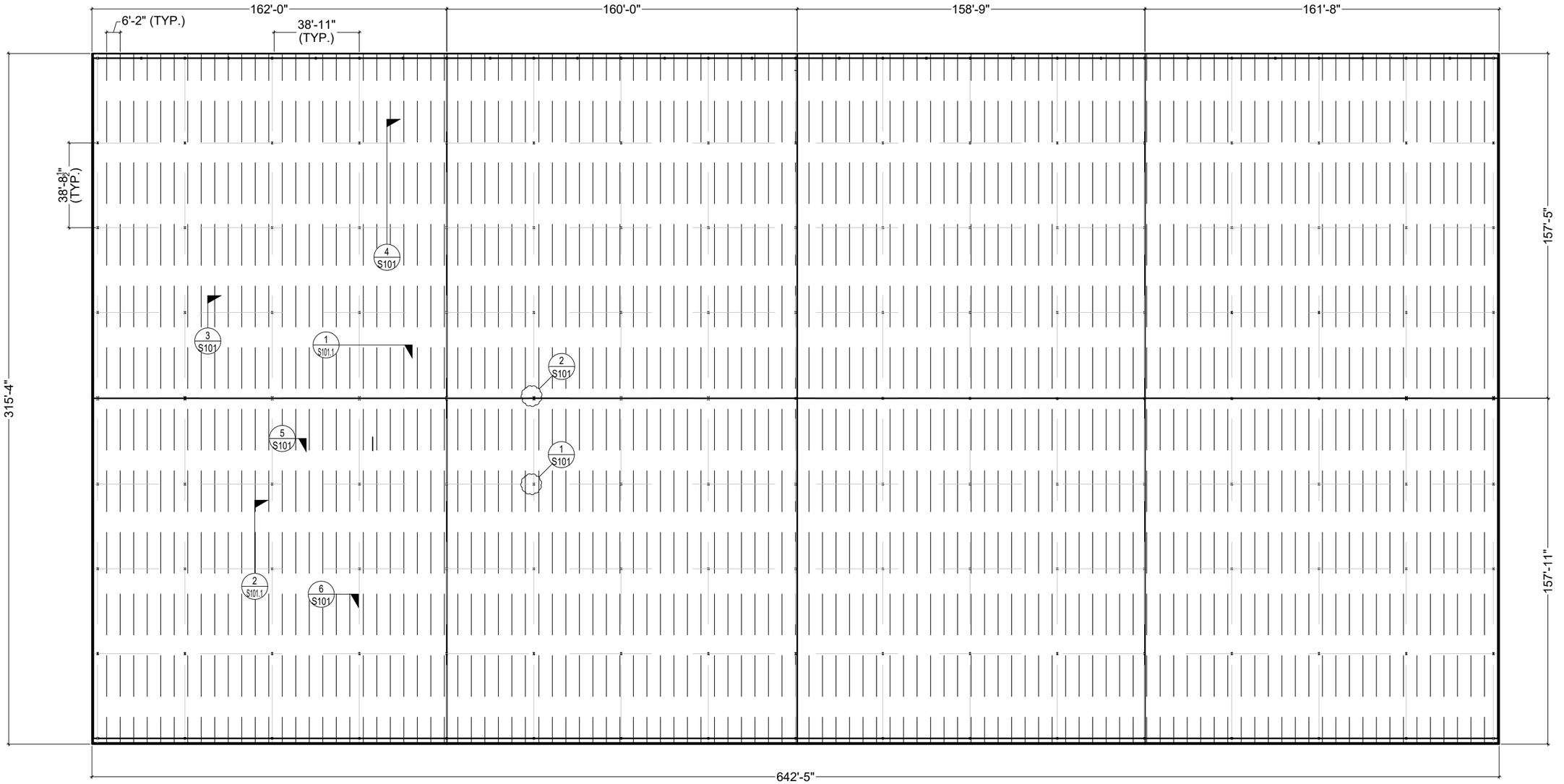

0' 25' 50' 75'

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MILFORD, CT 06460

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- [x] PERMITTING
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REV. #	DESCRIPTION:	DATE
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DRAWING NAME
BUILDING OVERVIEW

DRAWING NUMBER
S100

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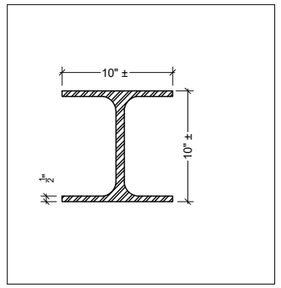
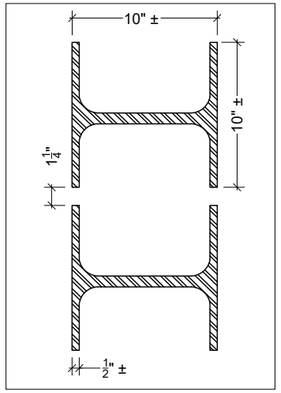
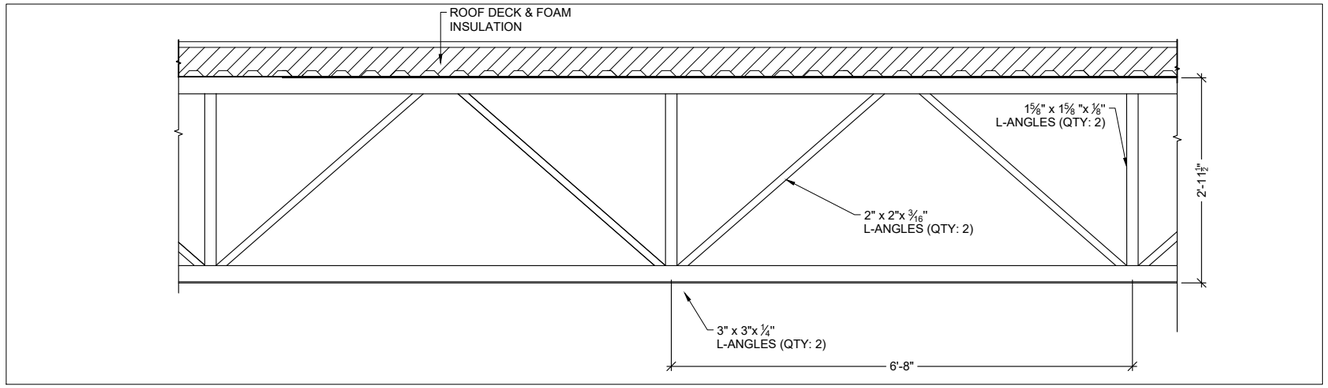


1 S101 EX STEEL DETAIL (COLUMNS)



2 S101 EX STEEL DETAIL (BEAMS)



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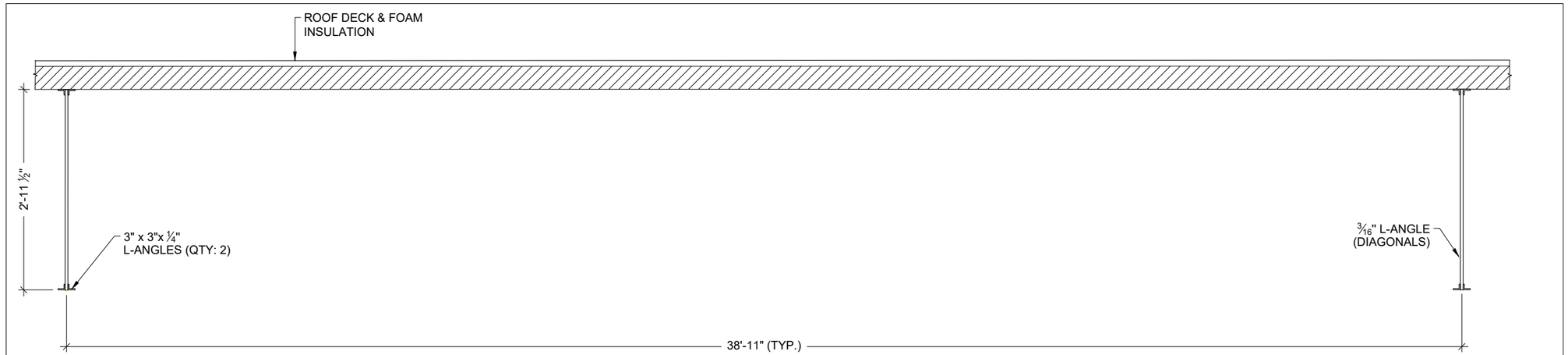
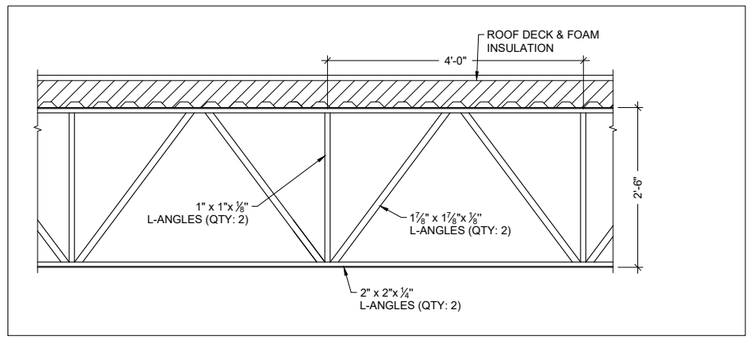
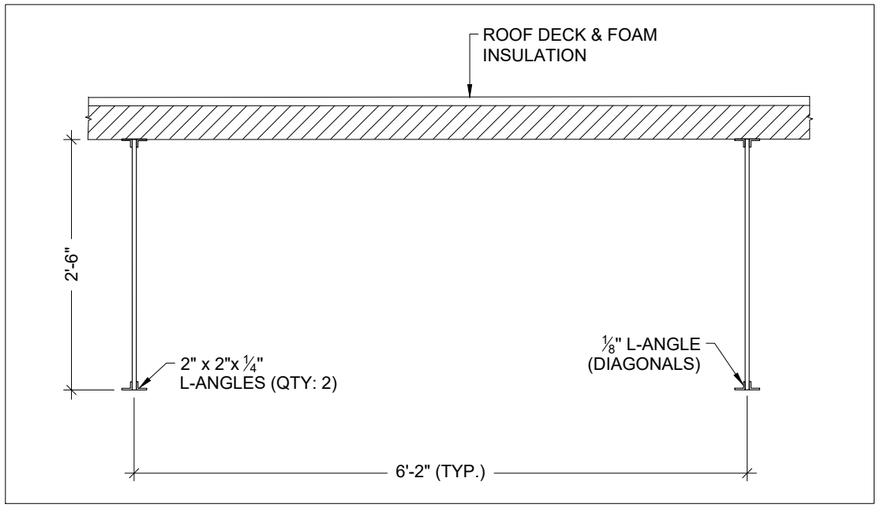


4 S101 EX STEEL DETAIL (SECTION)



5 S101 EX STEEL DETAIL (PURLINS)



6 S101 EX STEEL DETAIL (SECTION)

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- ☒ PERMITTING
- ☐ CONSTRUCTION
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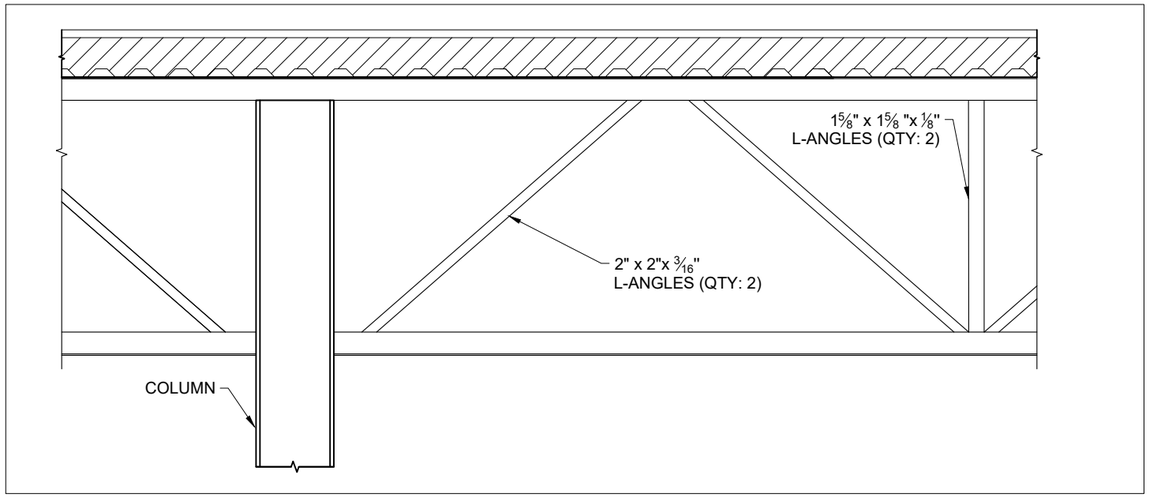
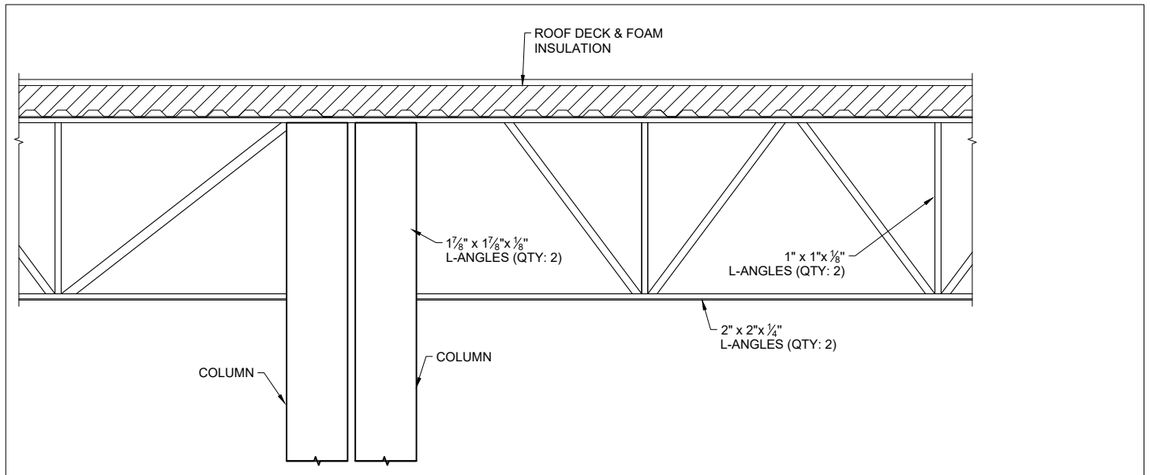
NO.	DESCRIPTION	DATE
1	PERMIT SET ISSUED	06-04-2019

DRAWING NAME
EXISTING STRUCTURAL LAYOUT & DETAILS

DRAWING NUMBER
S101



1 S101.1 EX STEEL DETAIL
(BEAM SECTION)



2 S101.1 EX STEEL DETAIL
(PURLIN SECTION)

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