	JOB No.:	DATE:	DESIGNED BY: RLC	SHEET 1
RCSE Campbell STRUCTURAL **Robert L. Campbell Structural Engineer, P.C.** 200 E. 16TH Street, Suite 100 Yuma, AZ 85364	25032	04/23/25	**CHECKED BY:** RLC	**OF** 33

CLIENT:	Sternco Engineers, Inc.	
	202 S. 1st Ave, Suite 205	
	Yuma, AZ 85364	
PROJECT:	Yuma County Foothills Library	
	HVAC Replacement – Structural Report	
	13226 E. South Frontage Rd, Yuma AZ 85367	

[Engineer's seal: Registered Professional Engineer (Structural), CERTIFICATE NO. 22963, ROBERT L. CAMPBELL, Date Signed 04/23/2025, ARIZONA U.S.A., signature]

STRUCTURAL CALCULATIONS

DESIGN DATA	CODE DATA
CALCULATION SUMMARY	**Building Code:** 2018 I.B.C.

CALCULATION SUMMARY

This project consists of replacing the existing roof top HVAC units at the Yuma Co. Foothills Library with new heavier units. The original construction documents show the steel roof joist are scheduled to support 1,500 lb mechanical units. The replacement units are in the range of 1,800 lb.

RCSE performed structural calculations to determine the existing joist shear and moment capacity. The same joists were checked with an actual dead load based on our field observations along with the 1,800 lb mechanical unit weight.

The results of our analysis indicate the existing steel joist capacity exceeds the new demand on the joist. All shear and moment demand/capacity ratio checks are less than 1.0 and consequently, no joist strengthening is required.

REVIEWED FOR CODE COMPLIANCE

Approved plans, specifications or inspection shall not be construed to approve a violation of any provision of an adopted code or ordinance of Yuma County
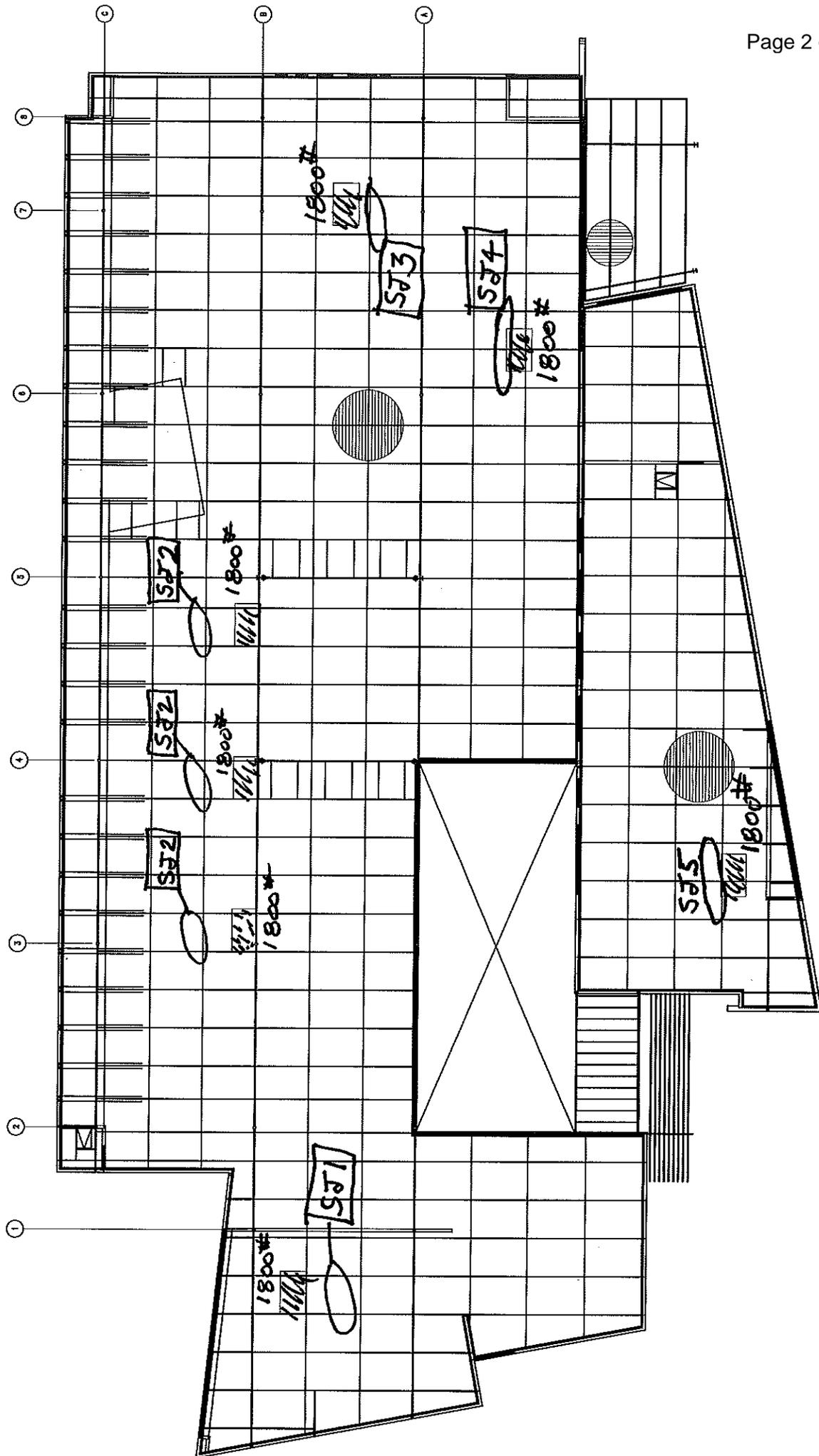
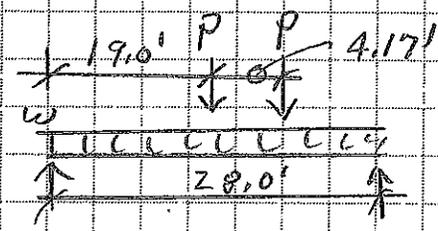| 33 pages By: *[signature]*	05/23/2025 12:44:03 PM

STAMPED APPROVED PLANS MUST BE ON SITE

SJ3   1800#

SJ4   1800#

SJ2   1800#

SJ2   1800#

SJ2   1800#

SJ5   1800#

SJ1   1800#

STEEL JOIST ORIGINAL DESIGN CAPACITY

SJ1

$w = 255^{PLF} / 135^{PLF}$ (DL+LLR) (LLR)

$P = 1500 \left(\frac{1}{4}\right) = 375^{\#}$

SJ2

$w = 255^{PLF} / 135^{PLF}$

$P = 375^{\#}$
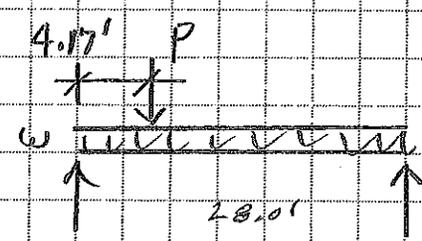
SJ3

$w = 255/135^{PLF}$

$P = 375^{\#}$
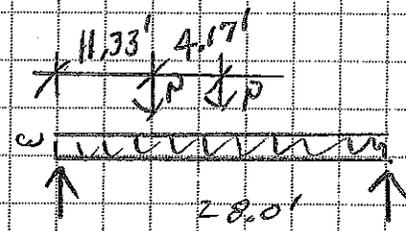
SJ4

$w = 255/135^{PLF}$

$P = 375^{\#}$

SJ5

$w = 255/135^{PLF}$

$P = 375^{\#}$

JOB 25032 Yuma Co. Foothills Library

Page 4 of 33

SHEET NO. _____ OF _____

CALCULATED BY PLC   DATE 4/2025

CHECKED BY _____   DATE _____

SCALE _____

Campbell STRUCTURAL
200 E. 16th St., Suite 100
Yuma, AZ 85364
(928) 726-2646
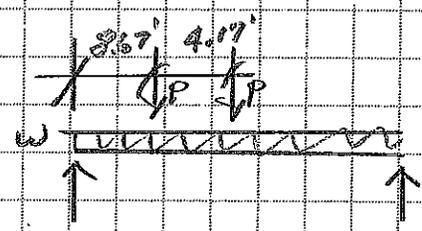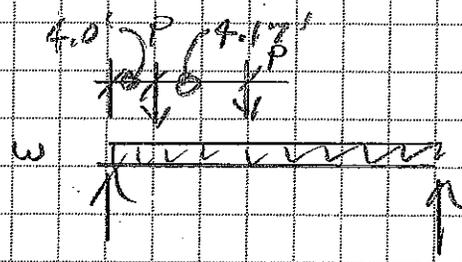
NEW MECH UNITS
STEEL JOIST PROPOSED DESIGN DEMAND

SJ1

$w = 233^{PLF} / 135^{PLF}$ (DL+LLR / LLR)

$P = 1800 (1/4) = 450^{\#}$
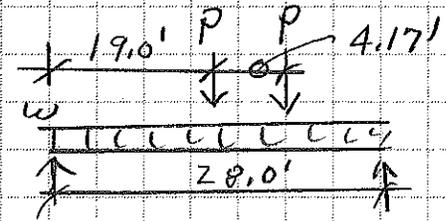
SJ2

$w = 233^{PLF} / 135^{PLF}$
$P = 450^{\#}$
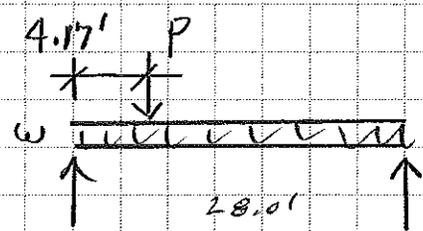
SJ3

$w = 233 / 135^{PLF}$
$P = 450^{\#}$
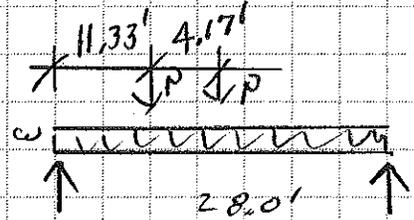
SJ4

$w = 233 / 135^{PLF}$
$P = 450^{\#}$

SJ5

$w = 233 / 135^{PLF}$
$P = 450^{\#}$

PRODUCT 204-1 (Single Sheets) 205-1 (Padded)
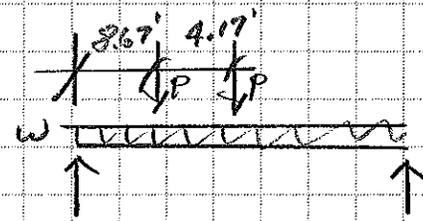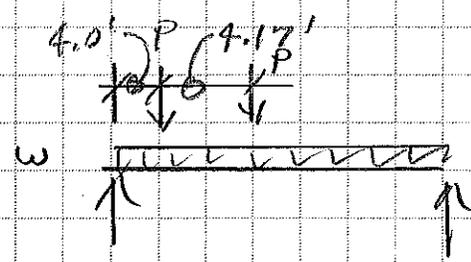
EXISTING VS. NEW UNITS WEIGHTS

MARK	EXISTING UNIT INFORMATION			EXISTING UNIT WEIGHT W/ ACCESSORIES (LBS)	NEW UNIT WEIGHT W/ ACCESSORIES (LBS)				REMARKS
	MAKE	MODEL	SERIAL #		UNIT ONLY	PE ACCESSORY	CURB ADAPTER	TOTAL	
HP-1, 2	TRANE	WSC120A3R0A	820102570L (HP-1, TYP)	941 + 344 = 1285	1286	160	115	1561	1,2
HP-3,4,5,6,7	TRANE	WSC120A3R0A	820102588L (HP-3, TYP)	941 + 344 = 1285	1306	160	115	1581	1,2
REMARKS:									
1.	EXISTING UNITS INCLUDE CANFAB MODEL 6144-MPE ECONOMIZER AND POWERED EXHAUST ACCESSORIES.								
2.	ALL (7) UNITS SCHEDULED ARE THE SAME MODEL NUMBER AND A TYPICAL SERIAL NUMBER IS SHOWN.								

NEW UNIT DESIGN WT
1581 + 215 = 1,800#

ORIGINAL DESIGN WT.
curb
1285 + 215 = 1,500#

Robert L. Campbell
Structural Engineer, P.C.
183 E. 24th Street, Suite 7
Yuma, AZ 85364

PROJECT
Yuma County Library District
Foothills Branch Library
Yuma, AZ

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JOB NO. 07040

3

DATE: Jun-07

BY: KLB

GRAVITY DESIGN LOADS

2003 INTERNATIONAL BUILDING CODE - Dead and Live Loads

ROOF - High Roof Structure

DEAD LOADS

Corrugated Metal Roofing	2.0 psf
6" Polystyrene	3.0 psf
Steel Accoustic Deck	4.4 psf
Steel Beams	2.0 psf
MPE	2.0 psf
Sprinkler	1.5 psf
Misc.	1.1 psf
Total DL	16.0 psf

LIVE LOADS   Roof L_r 20 psf (reducible)

BUILT UP ROOF - Main Structure

DEAD LOADS

Roofing	2.5 psf
6" Polystyrene	1.0 → 3.0 psf
Steel deck	2.3 psf
Steel Joists	2.0 psf
5/8 Gypboard Ceiling ACOUSTIC CLG.	1.8 → 2.8 psf
MPE	1.8 psf
Sprinkler	1.5 psf
Misc.	2.1 psf
Total DL ACTUAL DL = 15 PSF	18.0 psf

LIVE LOADS   Roof L_r 20 psf (reducible)

CEILING - Vestibule Framing

DEAD LOADS

Light Gauge Framing	2.0 psf
Plywood	1.5 psf
5/8 Gypboard Ceiling	2.8 psf
MPE	1.8 psf
Sprinkler	1.9 psf
	10.0 psf

LIVE LOADS   Roof L_r (reducible)

Robert L. Campbell Structural Engineer, P.C.	PROJECT Foothills Branch Libr.	JOB NO. 07040	DATE	BY	SHEET NO.

Joist Design / Criteria

$DL = 18 \, psf$

$LL_R = 20 \, psf$

$$W = 6.67(18+20) \, psf = (120 + 133) \, plf$$

Used: 16k (255/135) at 23'-2" span

ORIGINAL CAPACITY $\longrightarrow$ 20k (255/135) at 28'-1" span

24k (255/135) at 33'-4" span

26k (255/135) at 40'-2" span

ACTUAL UNIFORM

$$\left(\underset{\underset{TL}{\uparrow}}{233} / \underset{\underset{LL_e}{\uparrow}}{135} \right)$$

FOAMULAR® Extruded Polystyrene (XPS) Insulation
SI and I-P Units for Selected Properties

Technical Bulletin

This bulletin provides thermal conductivity, thermal resistance, density and compressive strength for FOAMULAR® 150, 250, 400, 600 and 1000 insulation in thicknesses of 2", 3" and 4". SI units are provided in the tables, followed by I-P units in parenthesis.

FOAMULAR® 150 Insulation

Thickness, mm	Thermal Conductivity, W/mK, max.	Thermal Resistance, m²K/W, min.	Density, kg/m³, min.	Compressive Strength, kPa, min.
100 (4")	0.029 (k=0.20)	3.53 (R-20)	20.8 (1.3 pcf)	103 (15 psi)
75 (3")	0.029 (k=0.20)	2.65 (R-15)	20.8 (1.3 pcf)	103 (15 psi)
50 (2")	0.029 (k=0.20)	1.77 (R-10)	20.8 (1.3 pcf)	103 (15 psi)

FOAMULAR® 250 Insulation

Thickness, mm	Thermal Conductivity, W/mK, max.	Thermal Resistance, m²K/W, min.	Density, kg/m³, min.	Compressive Strength, kPa, min.
100 (4")	0.029 (k=0.20)	3.53 (R-20)	24.8 (1.55 pcf)	172 (25 psi)
75 (3")	0.029 (k=0.20)	2.65 (R-15)	24.8 (1.55 pcf)	172 (25 psi)
50 (2")	0.029 (k=0.20)	1.77 (R-10)	24.8 (1.55 pcf)	172 (25 psi)

FOAMULAR® 400 Insulation

Thickness, mm	Thermal Conductivity, W/mK, max.	Thermal Resistance, m²K/W, min.	Density, kg/m³, min.	Compressive Strength, kPa, min.
100 (4")	0.029 (k=0.20)	3.53 (R-20)	28.9 (1.8 pcf)	276 (40 psi)
75 (3")	0.029 (k=0.20)	2.65 (R-15)	28.9 (1.8 pcf)	276 (40 psi)
50 (2")	0.029 (k=0.20)	1.77 (R-10)	28.9 (1.8 pcf)	276 (40 psi)

FOAMULAR® 600 Insulation

Thickness, mm	Thermal Conductivity, W/mK, max.	Thermal Resistance, m²K/W, min.	Density, kg/m³, min.	Compressive Strength, kPa, min.
100 (4")	0.029 (k=0.20)	3.53 (R-20)	35.3 (2.2 pcf)	414 (60 psi)
75 (3")	0.029 (k=0.20)	2.65 (R-15)	35.3 (2.2 pcf)	414 (60 psi)
50 (2")	0.029 (k=0.20)	1.77 (R-10)	35.3 (2.2 pcf)	414 (60 psi)

FOAMULAR® 1000 Insulation

Thickness, mm	Thermal Conductivity, W/mK, max.	Thermal Resistance, m²K/W, min.	Density, kg/m³, min.	Compressive Strength, kPa, min.
100 (4")	0.029 (k=0.20)	3.53 (R-20)	48.1 (3.0 pcf)	690 (100 psi)
75 (3")	0.029 (k=0.20)	2.65 (R-15)	48.1 (3.0 pcf)	690 (100 psi)
50 (2")	0.029 (k=0.20)	1.77 (R-10)	48.1 (3.0 pcf)	690 (100 psi)

Notes:

1. SI, the International System of Units (Metric). I-P, inch-pound units (English).

2. Conversions are approximate, rounded to the nearest significant digit that is customary for a given property as shown in the tables.

3. I-P unit definitions:
   Thermal Conductivity, "k" = Btu•in/ft.²•hr•°F
   Thermal Resistance, "R" = hr•ft²•°F/Btu
   Compressive Strength, "psi" = pounds per square inch
   Density, "pcf" = pounds per cubic foot

$$\frac{3}{12} \times 4 = 1.0 \, \text{PSF}$$

JOB _2 5032 Yuma Co, Foothills Library_

SHEET NO. _____

Page 9 of 33
OF ___

CALCULATED BY _PLC_   DATE _4/2025_

CHECKED BY _____   DATE _____

SCALE _____

Campbell STRUCTURAL

200 E. 16th St., Suite 100
Yuma, AZ 85364
(928) 726-2646

DEMAND/CAPACITY TABLE
REF: RISA 3d Printout

	CAPACITY		DEMAND		DCR	
	V (14)	M (1-14)	(14) V	(1-14) M	V	M
SJ1	4.135	27.6	3.94	26.05	0.95	0.94
SJ2	3.889	25.78	3.645	23.78	0.94	0.92
SJ3	3.961	29.46	3.73	28.2	0.94	0.96
SJ4	4.03	29.18	3.82	27.92	0.95	0.96
SJ5	4.157	27.3	3.97	25.65	0.96	0.94

DEMAND ON JOIST IS LESS THAN CAPACITY
THEREFORE JOIST ARE O.K.

Y
Z → X

SJ1 Capacity

SJ2 Capacity

SJ3 Capacity

SJ4 Capacity

SJ5 Capacity

SJ1 Demand

SJ2 Demand

SJ3 Demand

SJ4 Demand

SJ5 Demand
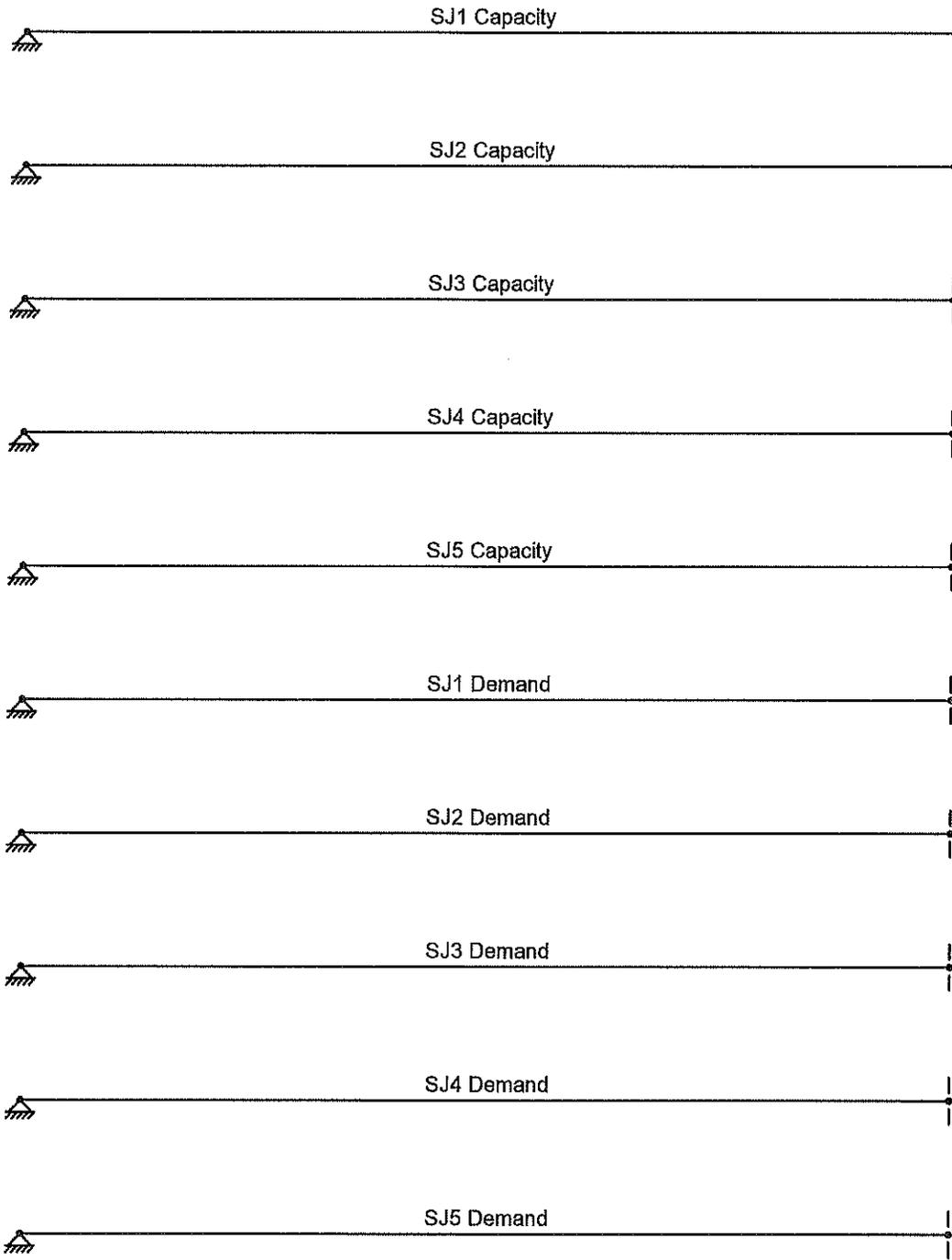
RISA	RCSE	Steel Joist Capacity Check	SK-1
	Rob		Steel Joist Check.r3d
	25032		

Y
Z X

-0.12 k/ft
-0.375 k   -0.375 k
-0.375 k
SJ1 Capacity

-0.12 k/ft
SJ2 Capacity -0.375 k
-0.375 k

-0.12 k/ft
-0.375 k -0.375 k
SJ3 Capacity

-0.12 k/ft
-0.375 k -0.375 k
SJ4 Capacity

-0.12 k/ft
SJ5 Capacity
-0.45 k   -0.45 k

-0.098 k/ft
-0.45 k
SJ1 Demand

-0.098 k/ft
-0.45 k   -0.45 k
SJ2 Demand

-0.098 k/ft
-0.45 k   -0.45 k
SJ3 Demand

-0.098 k/ft
-0.45 k   -0.45 k
SJ4 Demand

-0.098 k/ft
SJ5 Demand

Loads: BLC 1, Dead

RISA	RCSE	Steel Joist Capacity Check	SK-2
	Rob		Steel Joist Check.r3d
	25032		

Y
Z   X

-0.135 k/ft

SJ1 Capacity

-0.135 k/ft

SJ2 Capacity

-0.135 k/ft

SJ3 Capacity

-0.135 k/ft

SJ4 Capacity

-0.135 k/ft

SJ5 Capacity

-0.135 k/ft

SJ1 Demand

-0.135 k/ft

SJ2 Demand

-0.135 k/ft

SJ3 Demand

-0.135 k/ft

SJ4 Demand

-0.135 k/ft

SJ5 Demand

Loads: BLC 2, Roof Live

RISA	RCSE	Steel Joist Capacity Check	SK-3
	Rob		Steel Joist Check.r3d
	25032		

Y
Z ← → X

-0.375 k   -0.375 k

-0.255 k/ft

SJ1 Capacity

-0.375 k

-0.255 k/ft

SJ2 Capacity
-0.375 k   -0.375 k

-0.255 k/ft

-0.375 k   SJ3 Capacity
-0.375 k

-0.255 k/ft

-0.375 k   -0.375 k   SJ4 Capacity

-0.255 k/ft

SJ5 Capacity   -0.45 k   -0.45 k

-0.233 k/ft

-0.45 k   SJ1 Demand

-0.233 k/ft

-0.45 k   SJ2 Demand   -0.45 k

-0.233 k/ft

-0.45 k   SJ3 Demand   -0.45 k

-0.233 k/ft

-0.45 k   -0.45 k   SJ4 Demand

-0.233 k/ft

SJ5 Demand

Loads: LC 2, DL+RLL

RCSE	Steel Joist Capacity Check	SK-4
Rob		Steel Joist Check.r3d
25032		

IIRISA

Company   : RCSE
Designer   : Rob
Job Number : 25032
Model Name : Steel Joist Capacity Check

Member SJ1 Capacity, Envelope

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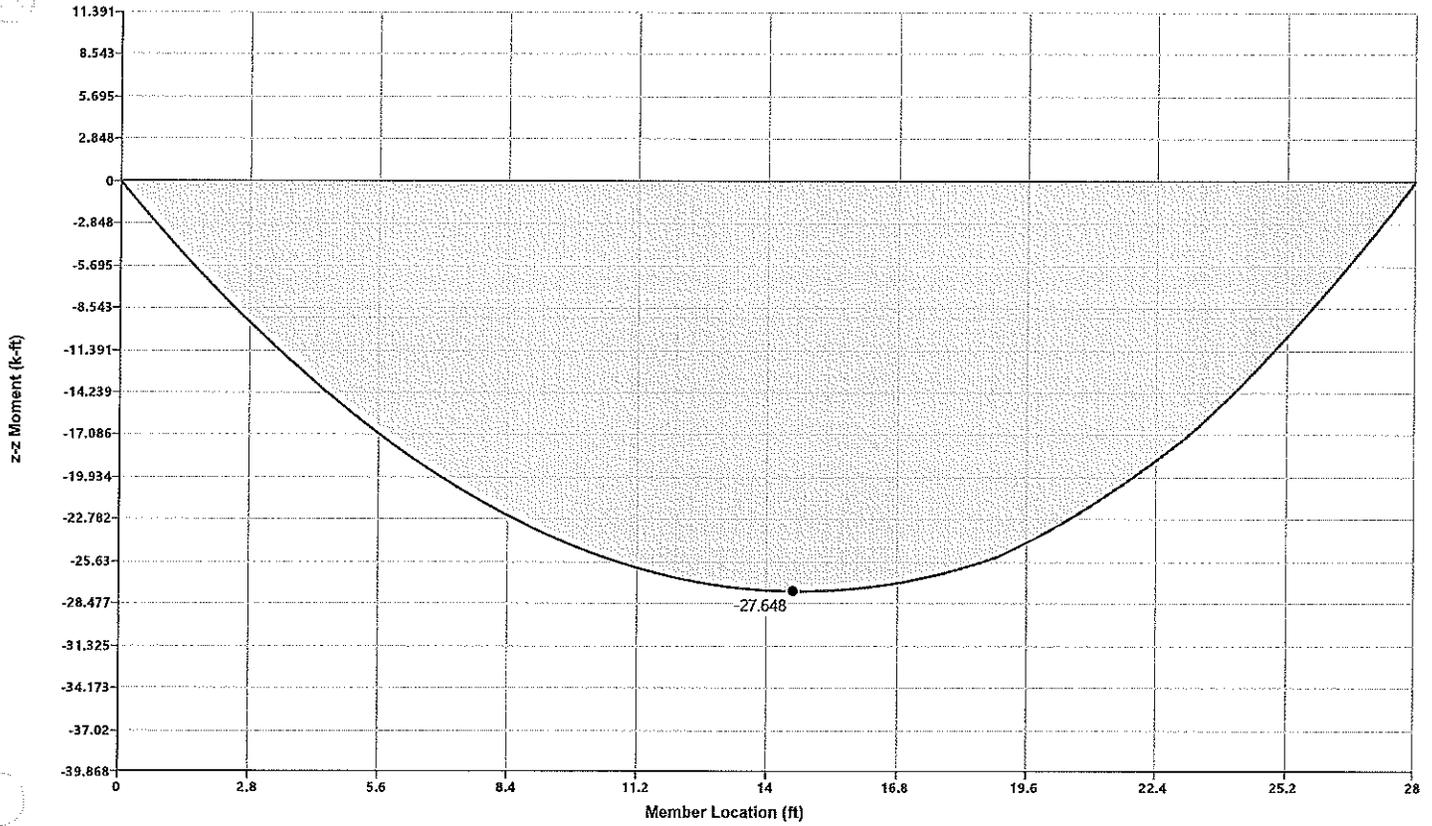
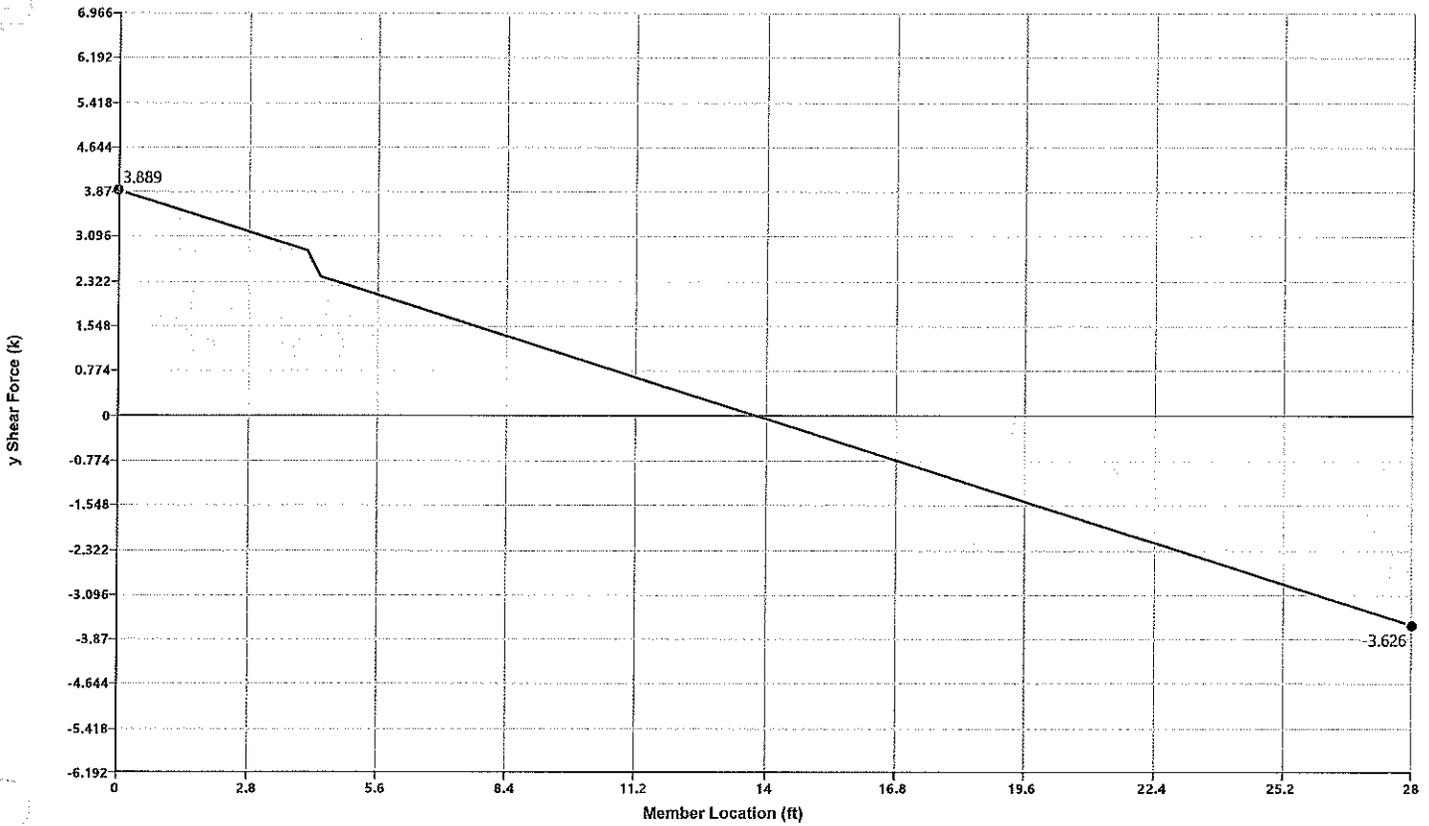Company : RCSE
Designer : Rob
Job Number : 25032
Model Name : Steel Joist Capacity Check

Checked By : _____

Member SJ1 Capacity, Envelope

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  Max Value: 0 (LC 2) k-ft
  Min Value: 0 (LC 2) k-ft

Company   : RCSE
Designer   : Rob
Job Number : 25032
Model Name : Steel Joist Capacity Check

Checked By : _____

Member SJ2 Capacity, Envelope

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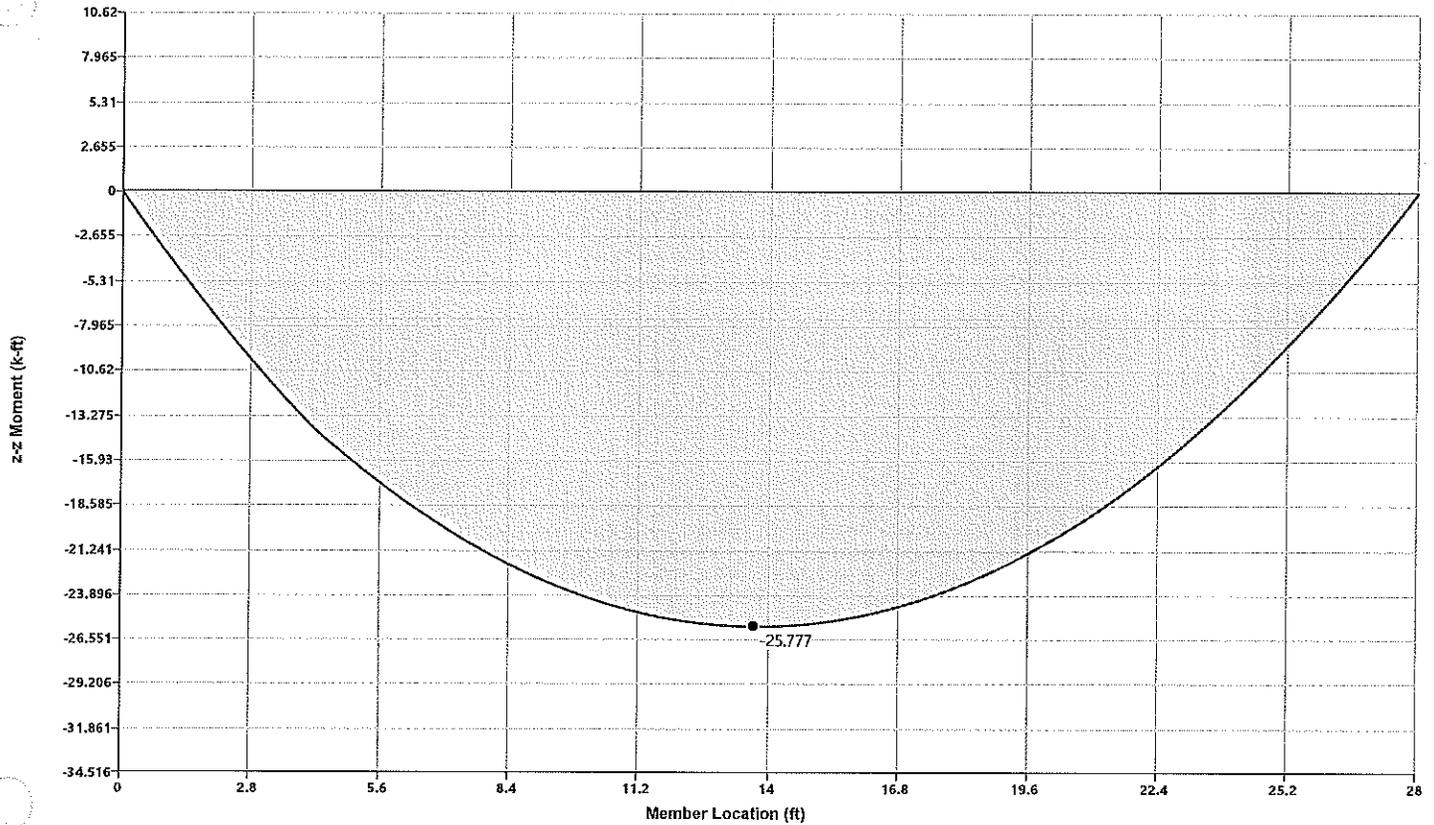
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Designer : Rob
Job Number : 25032
Model Name : Steel Joist Capacity Check

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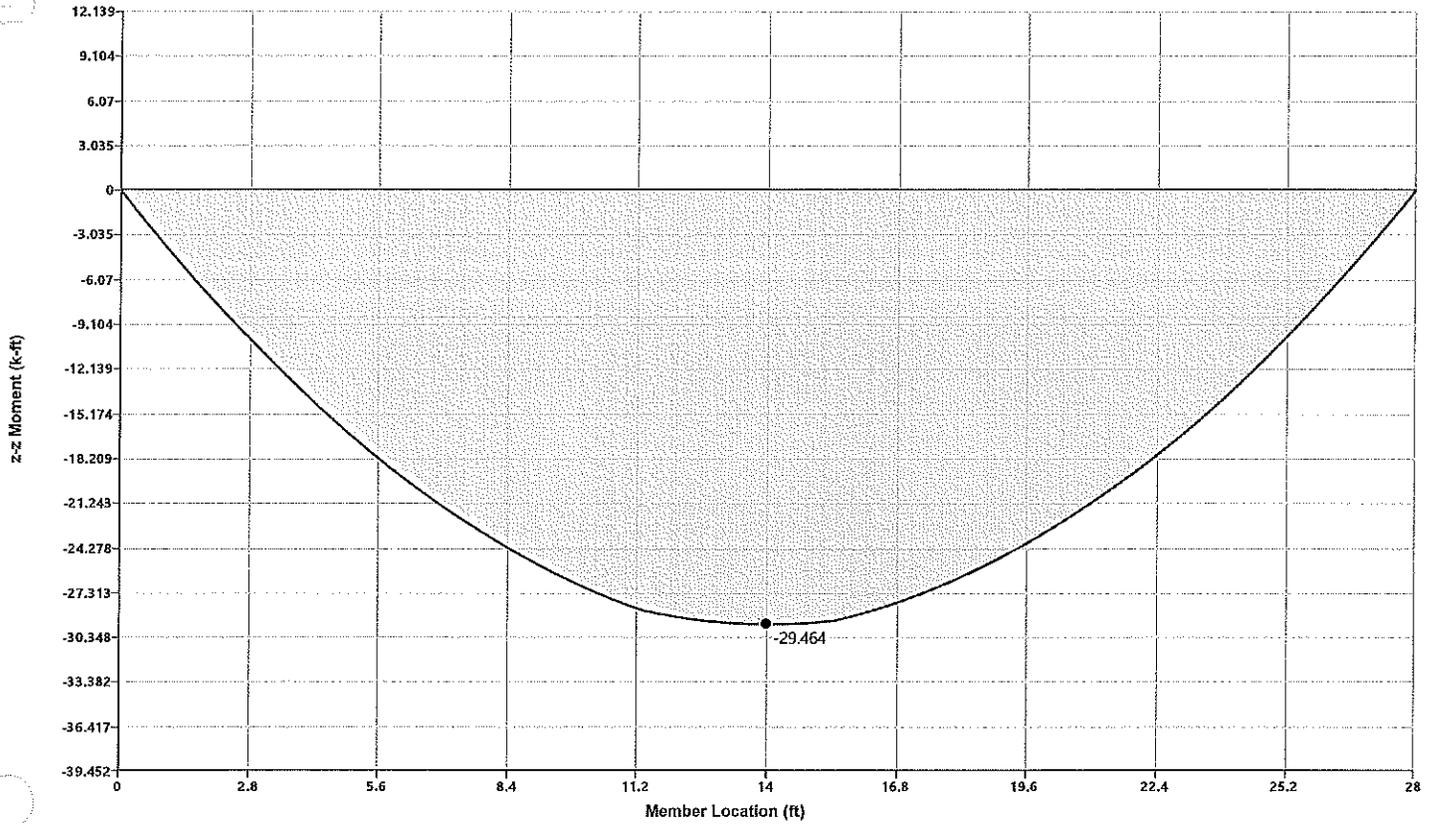Max Value: 0 (LC 2) k-ft
Min Value: 0 (LC 2) k-ft

Company : RCSE
Designer : Rob
Job Number : 25032
Model Name : Steel Joist Capacity Check

Checked By : _____

Member SJ3 Capacity, Envelope
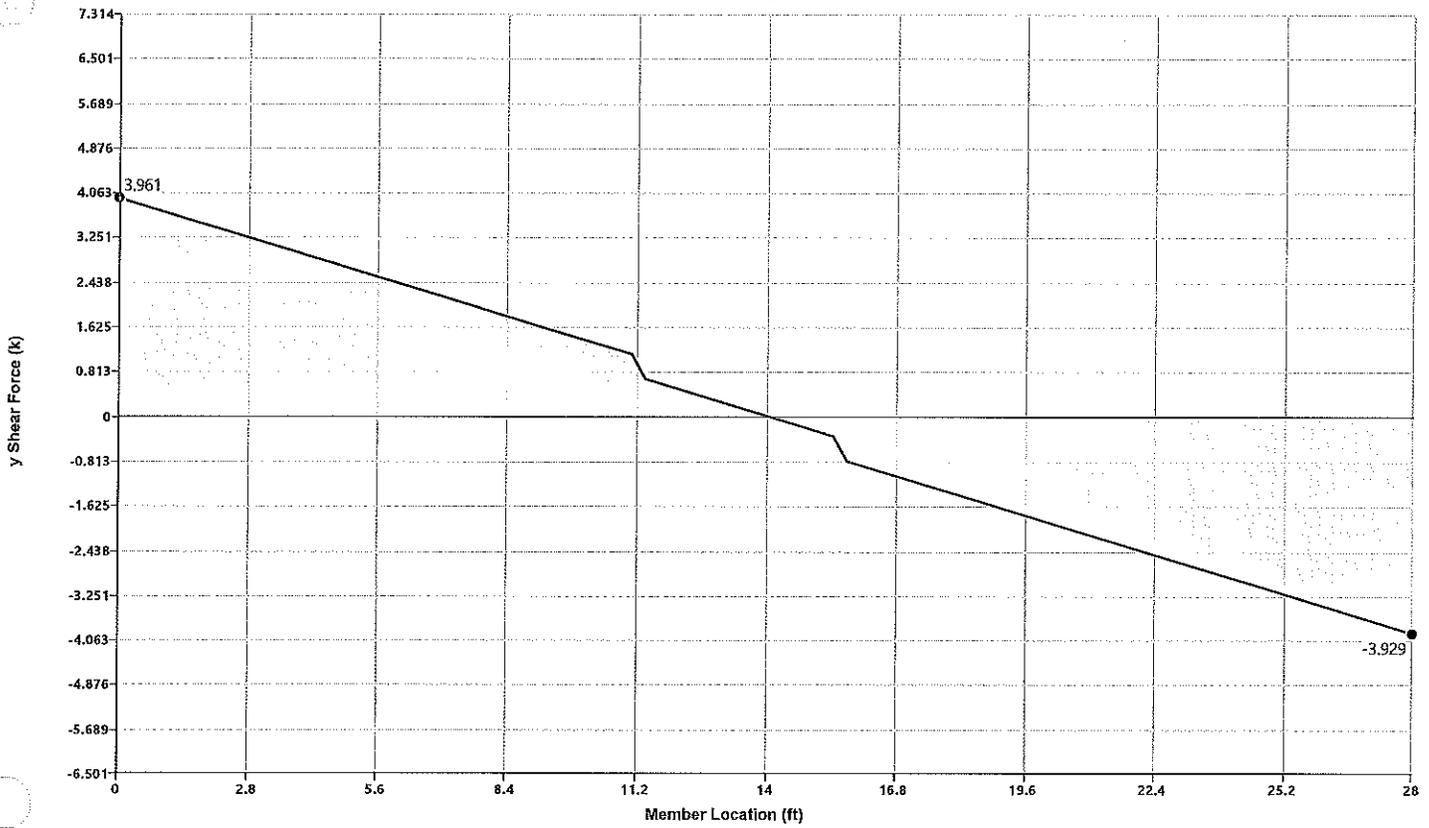
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Location: 0 ft
Max Value: 3.961 (LC 2) k
Min Value: 3.961 (LC 2) k

Company   : RCSE
Designer   : Rob
Job Number : 25032
Model Name : Steel Joist Capacity Check

Member SJ3 Capacity, Envelope

Selected Location Values:
Location: 0 ft
Max Value: 0 (LC 2) k-ft
Min Value: 0 (LC 2) k-ft

Company : RCSE
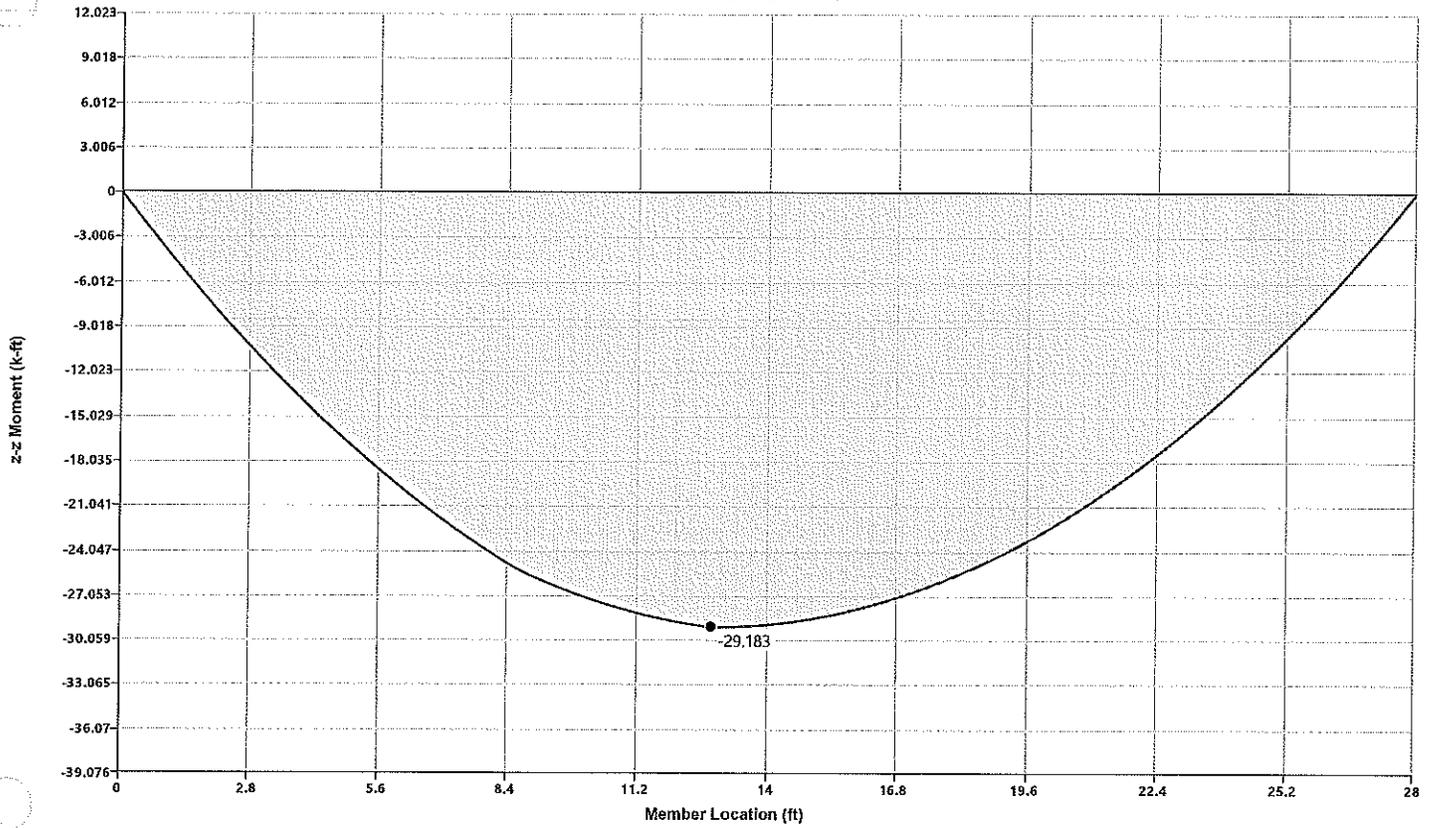Designer : Rob
Job Number : 25032
Model Name : Steel Joist Capacity Check

Checked By : _____

Member SJ4 Capacity, Envelope
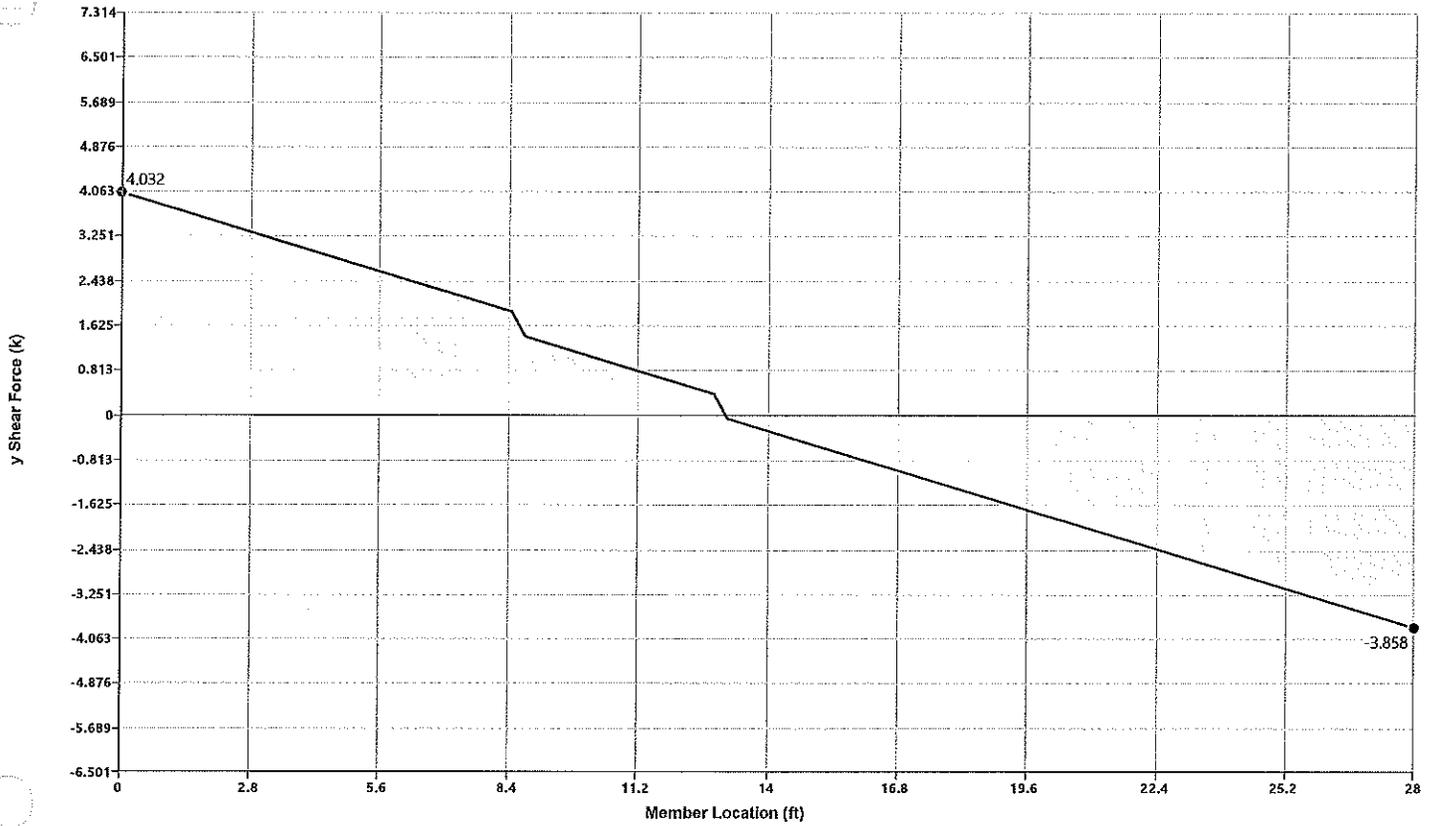
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Location: 0 ft
Max Value: 4.032 (LC 2) k
Min Value: 4.032 (LC 2) k

Company : RCSE
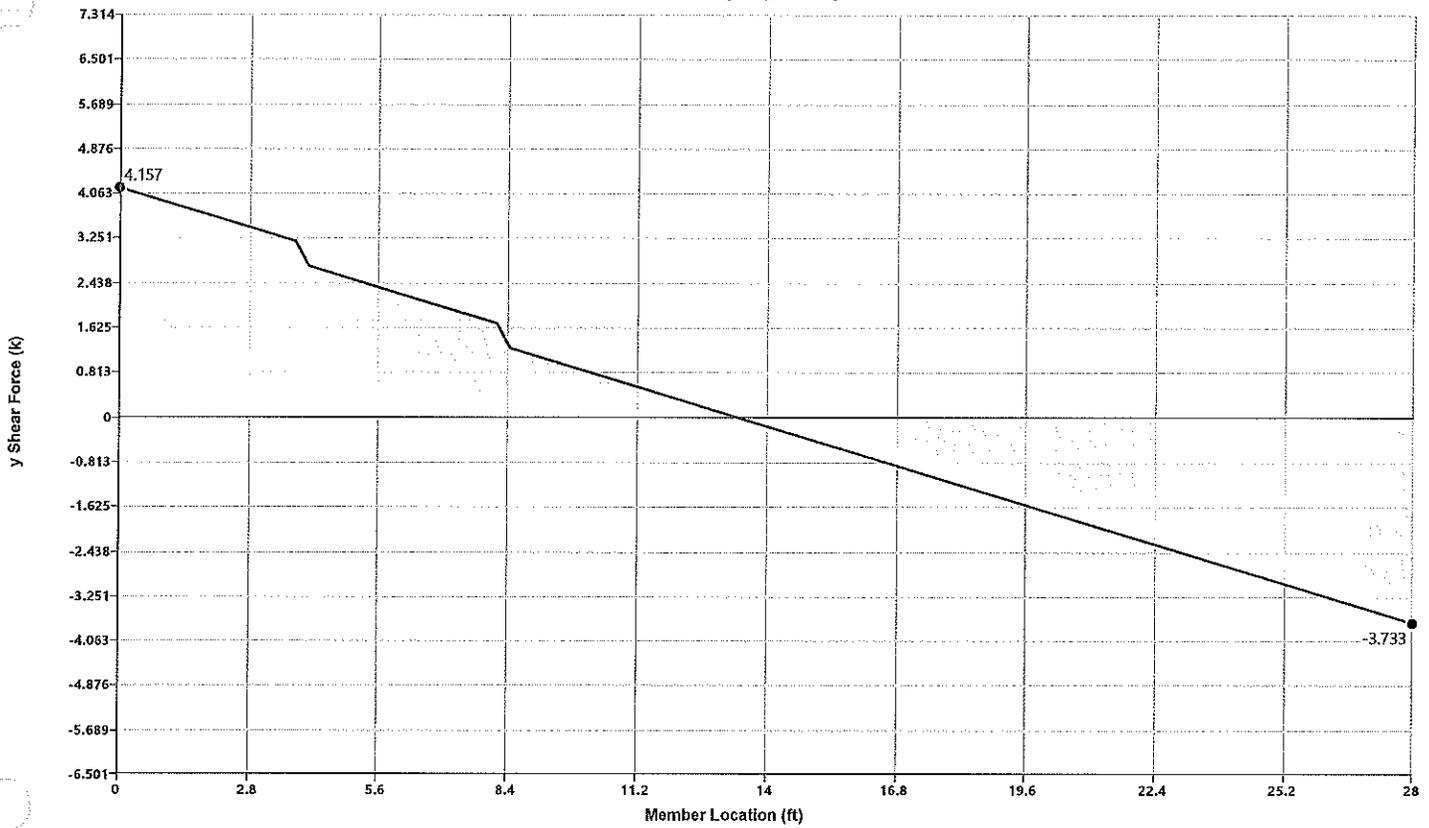Designer : Rob
Job Number : 25032
Model Name : Steel Joist Capacity Check

Checked By : _____

Member SJ4 Capacity, Envelope

Selected Location Values:
  Location: 0 ft
  Max Value: 0 (LC 2) k-ft
  Min Value: 0 (LC 2) k-ft

RISA A NEMETSCHEK COMPANY
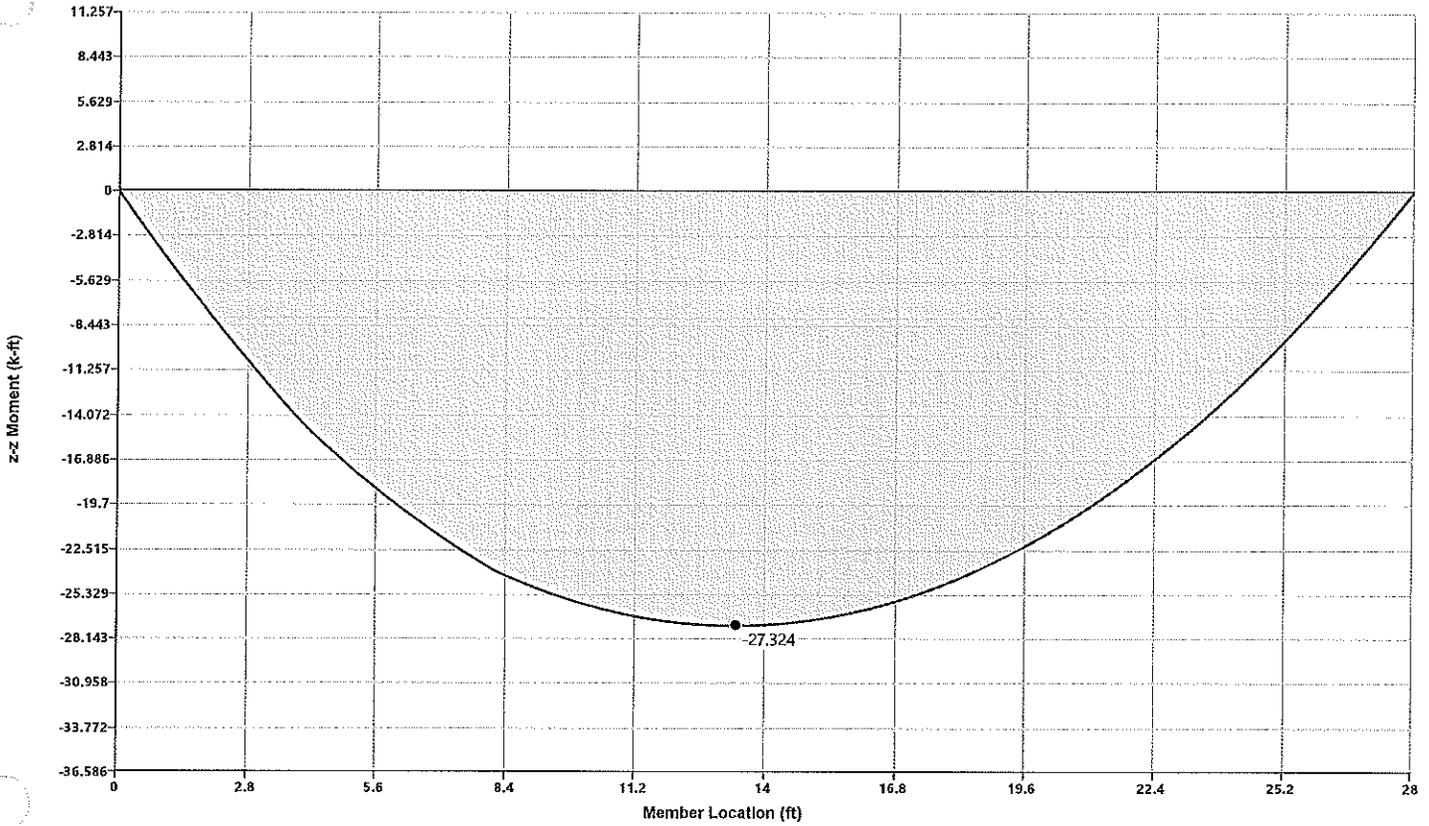
Company : RCSE
Designer : Rob
Job Number : 25032
Model Name : Steel Joist Capacity Check

Checked By : _____

Member SJ5 Capacity, Envelope

Selected Location Values:
  Location: 0 ft
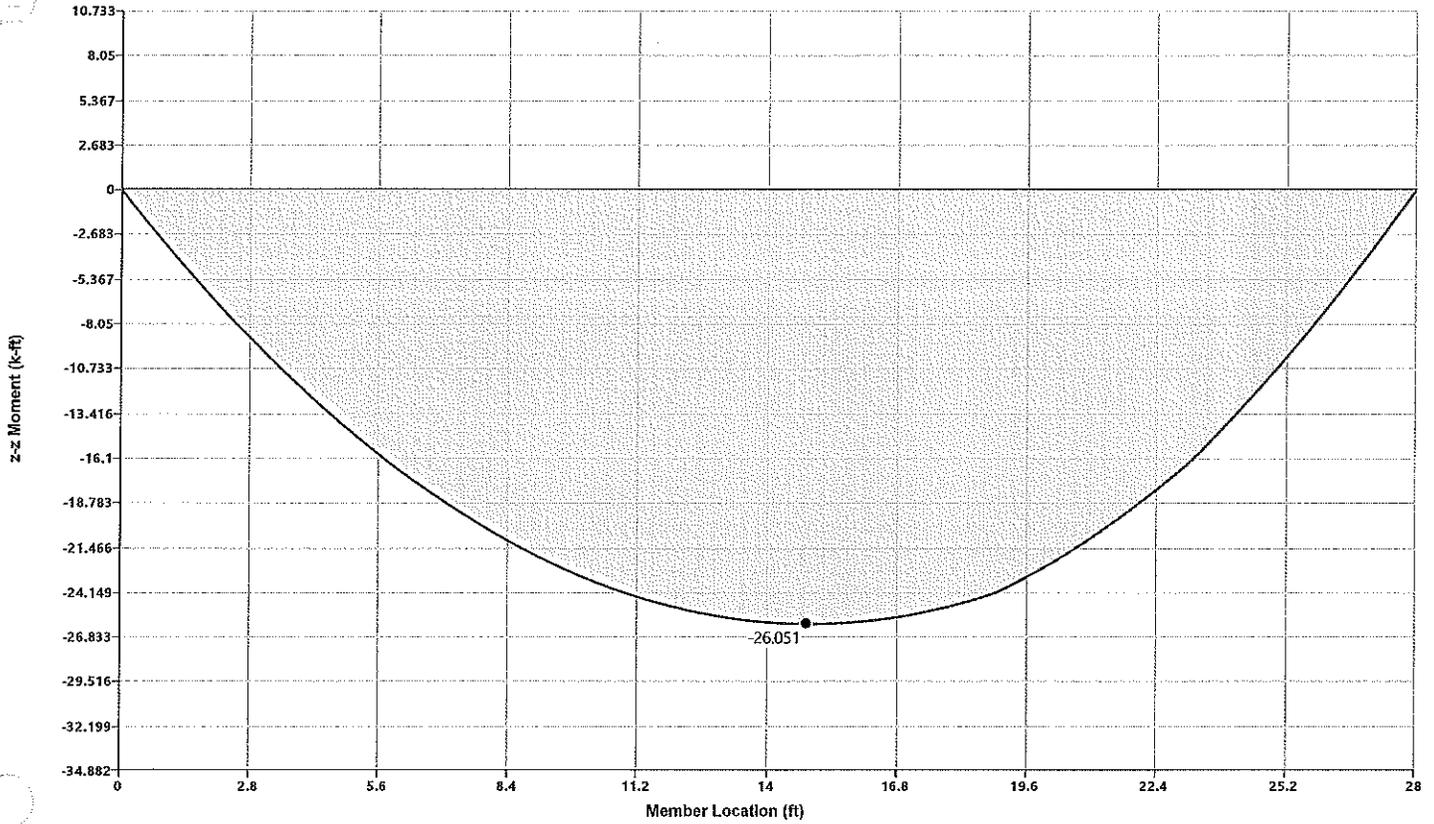 Max Value: 4.157 (LC 2) k
  Min Value: 4.157 (LC 2) k

Company : RCSE
Designer : Rob
Job Number : 25032
Model Name : Steel Joist Capacity Check

Member SJ5 Capacity, Envelope

Selected Location Values:
Location: 0 ft
Max Value: 0 (LC 2) k-ft
Min Value: 0 (LC 2) k-ft

Company : RCSE
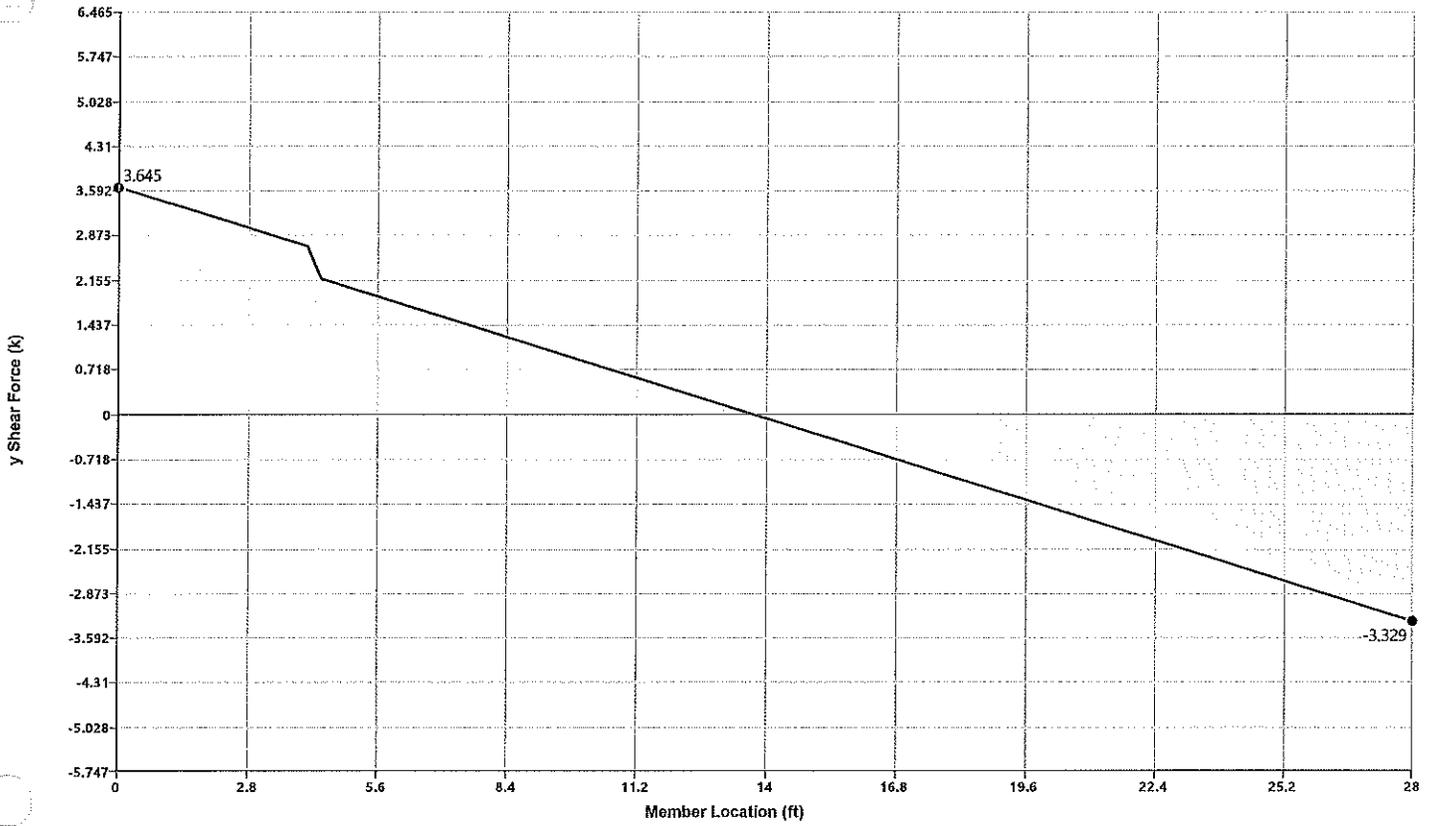Designer : Rob
Job Number : 25032
Model Name : Steel Joist Capacity Check

Member SJ1 Demand, Envelope
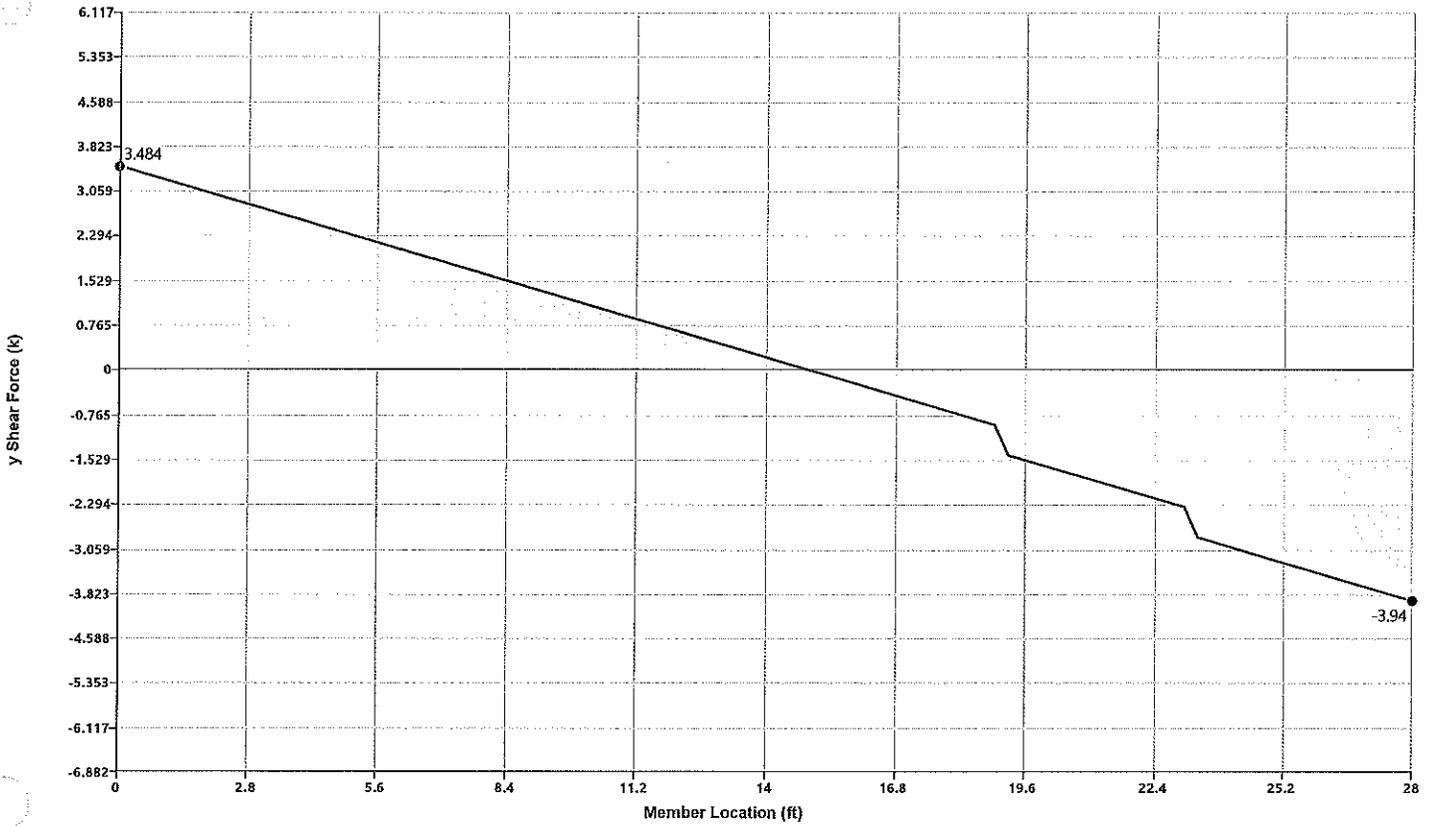
Selected Location Values:

Location: 0 ft

Max Value: 3.484 (LC 2) k

Min Value: 3.484 (LC 2) k

Company   : RCSE
Designer   : Rob
Job Number : 25032
Model Name : Steel Joist Capacity Check

Member SJ1 Demand, Envelope

Selected Location Values:
   Location: 0 ft
   Max Value: 0 (LC 2) k-ft
   Min Value: 0 (LC 2) k-ft

Company   : RCSE
Designer   : Rob
Job Number : 25032
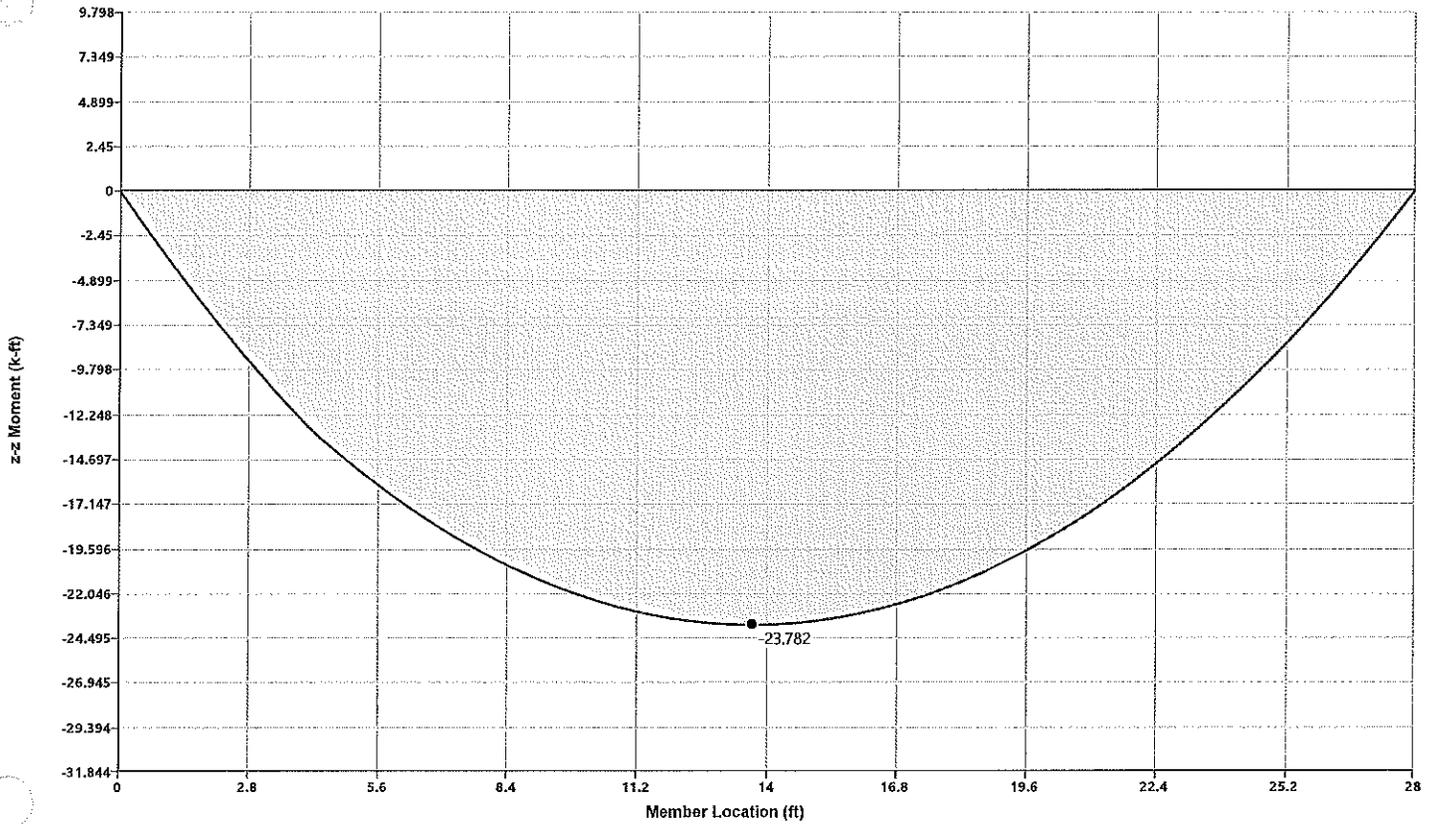Model Name : Steel Joist Capacity Check

Checked By : _____

Member SJ2 Demand, Envelope

Selected Location Values:
Location: 0 ft
Max Value: 3.645 (LC 2) k
Min Value: 3.645 (LC 2) k

Company : RCSE
Designer : Rob
Job Number : 25032
Model Name : Steel Joist Capacity Check

Member SJ2 Demand, Envelope

Selected Location Values:
Location: 0 ft
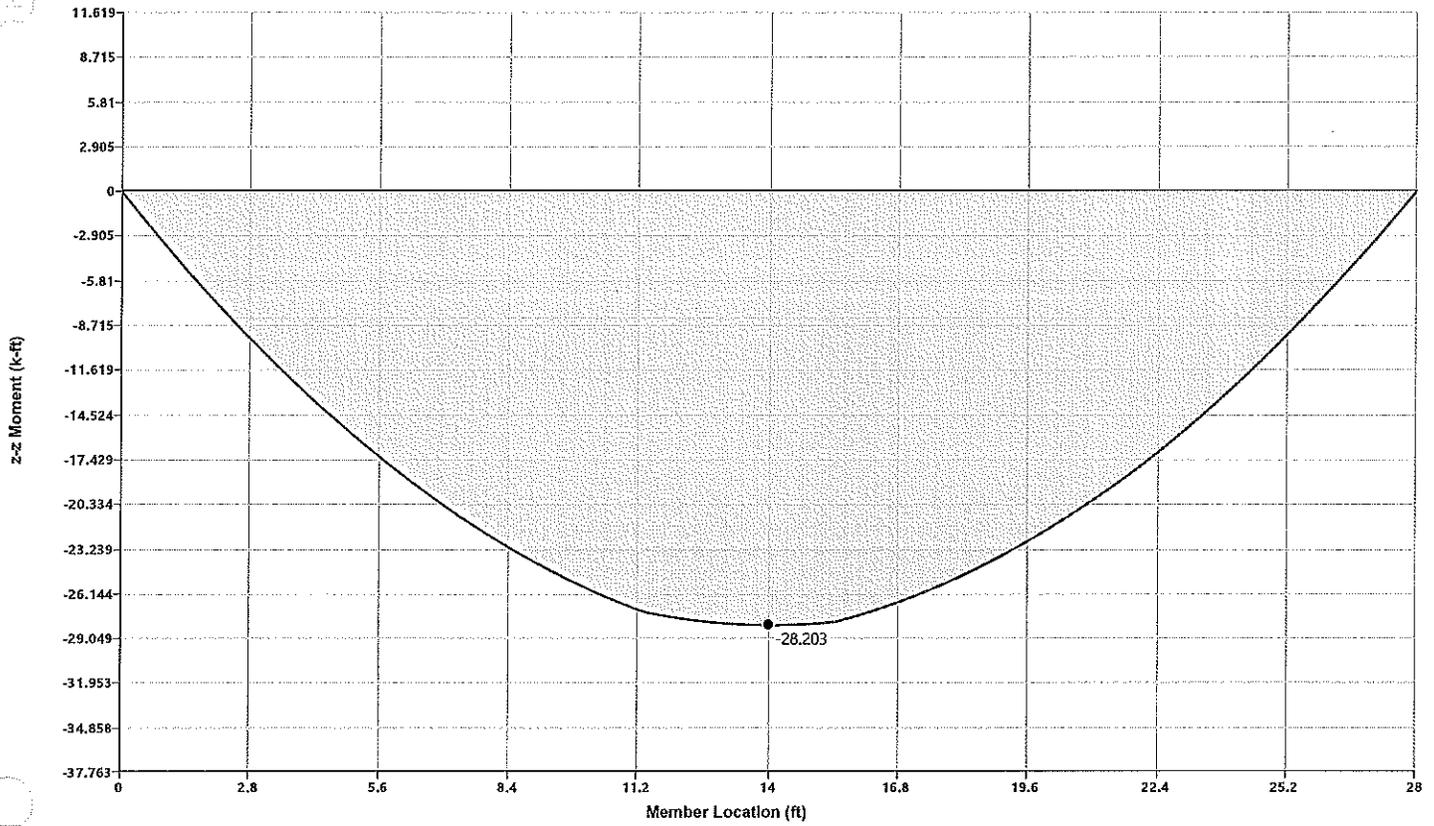Max Value: 0 (LC 2) k-ft
Min Value: 0 (LC 2) k-ft

Company : RCSE
Designer : Rob
Job Number : 25032
Model Name : Steel Joist Capacity Check

Member SJ3 Demand, Envelope
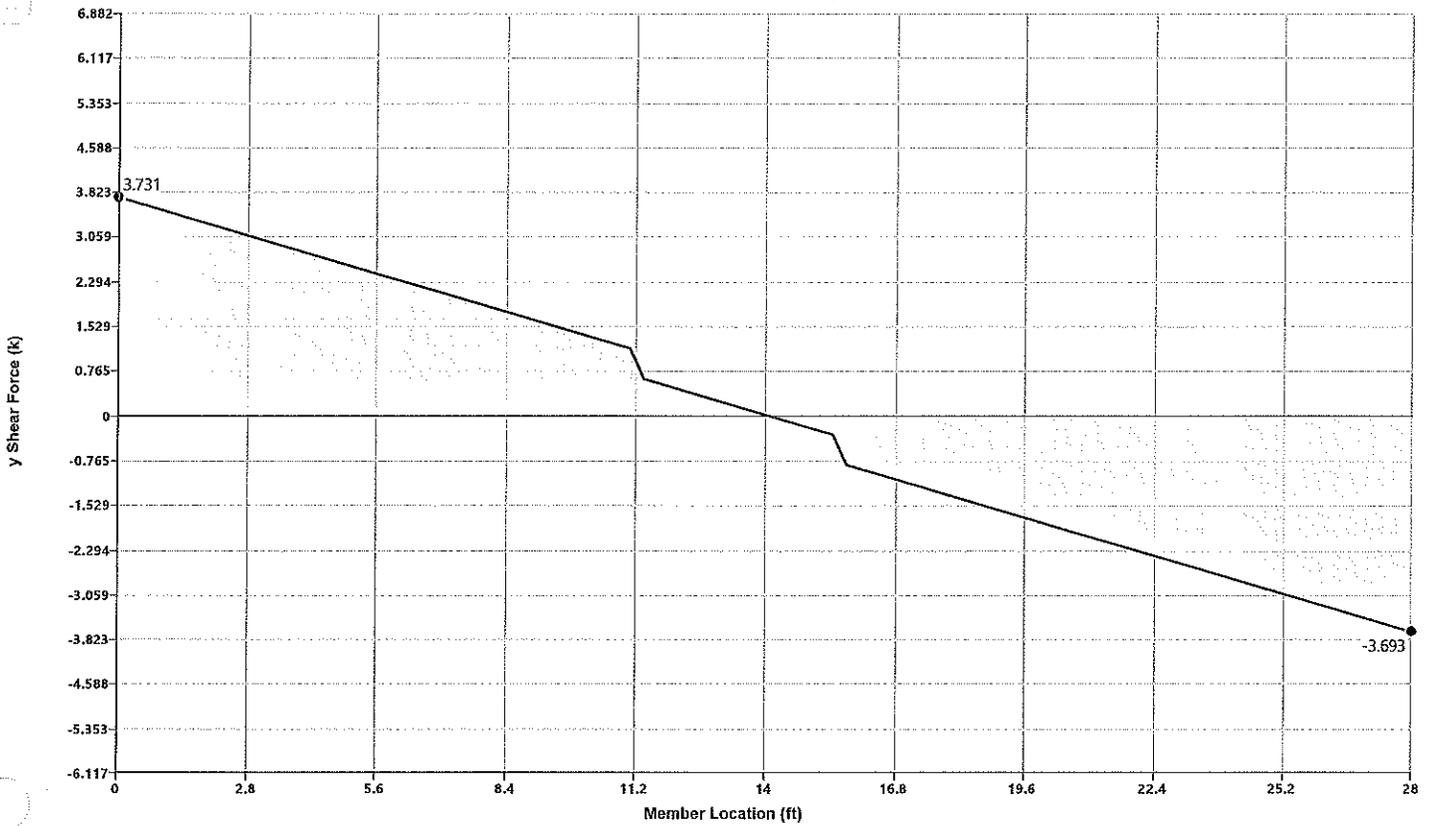
Selected Location Values:

Location: 0 ft
Max Value: 3.731 (LC 2) k
Min Value: 3.731 (LC 2) k

Company   : RCSE
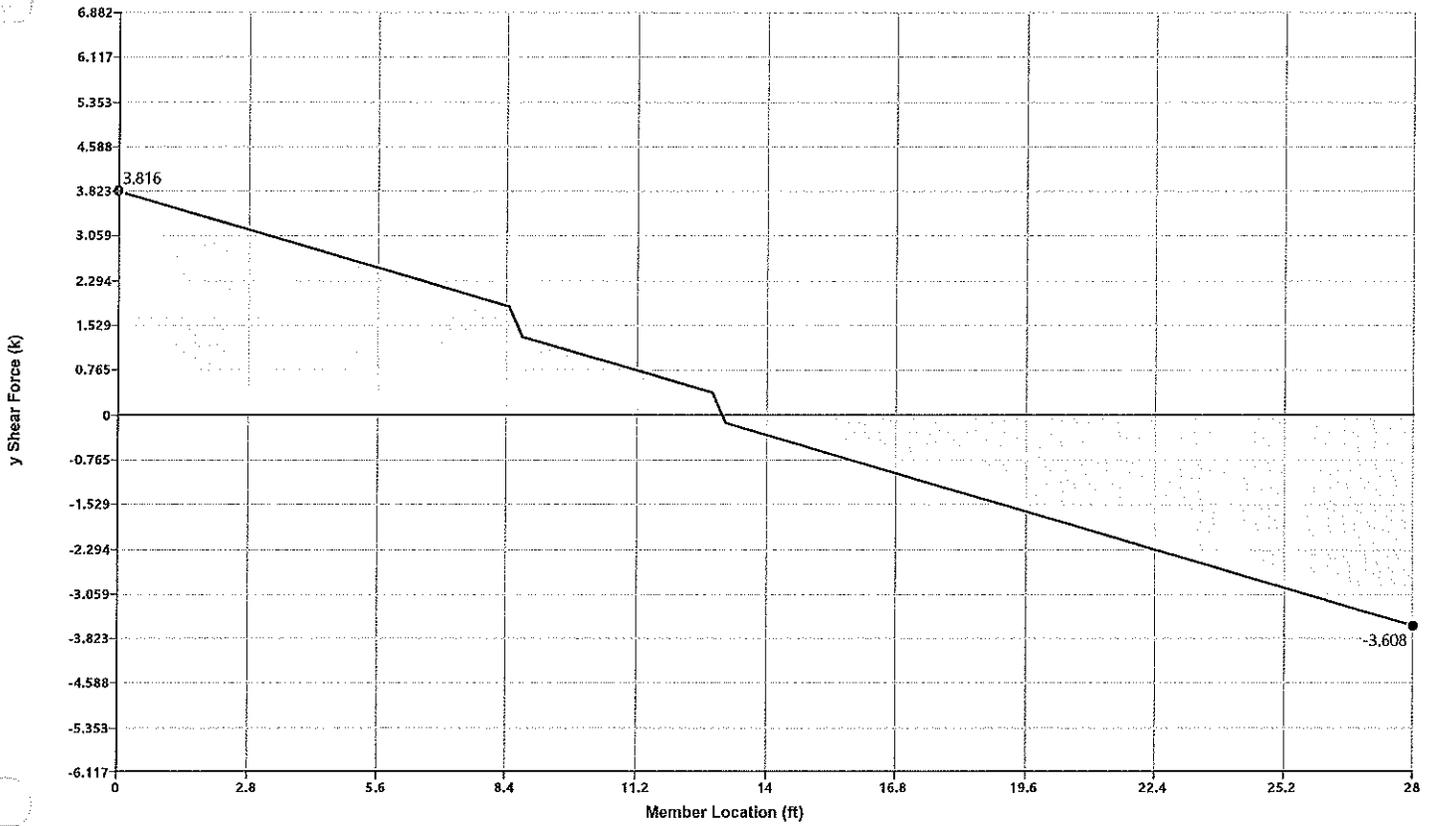Designer   : Rob
Job Number : 25032
Model Name : Steel Joist Capacity Check

Member SJ3 Demand, Envelope

Selected Location Values:

Location: 0 ft
Max Value: 0 (LC 2) k-ft
Min Value: 0 (LC 2) k-ft

IIIRISA
A NEMETSCHEK COMPANY

Company   : RCSE
Designer   : Rob
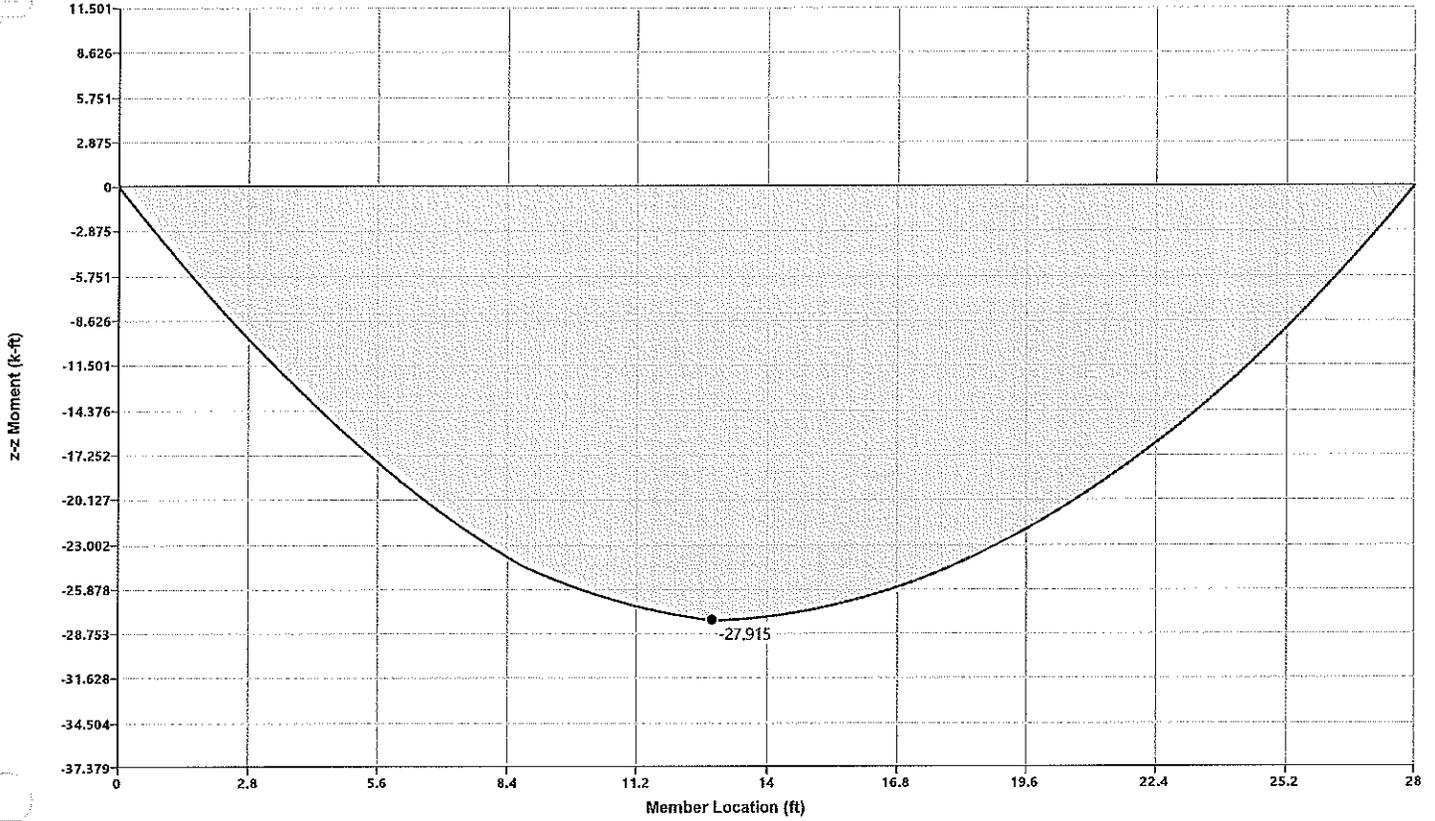Job Number : 25032
Model Name : Steel Joist Capacity Check

Member SJ4 Demand, Envelope

Selected Location Values:

Location: 0 ft
Max Value: 3.816 (LC 2) k
Min Value: 3.816 (LC 2) k

RISA
A NEMETSCHEK COMPANY

Company : RCSE
Designer : Rob
Job Number : 25032
Model Name : Steel Joist Capacity Check

Checked By : _____

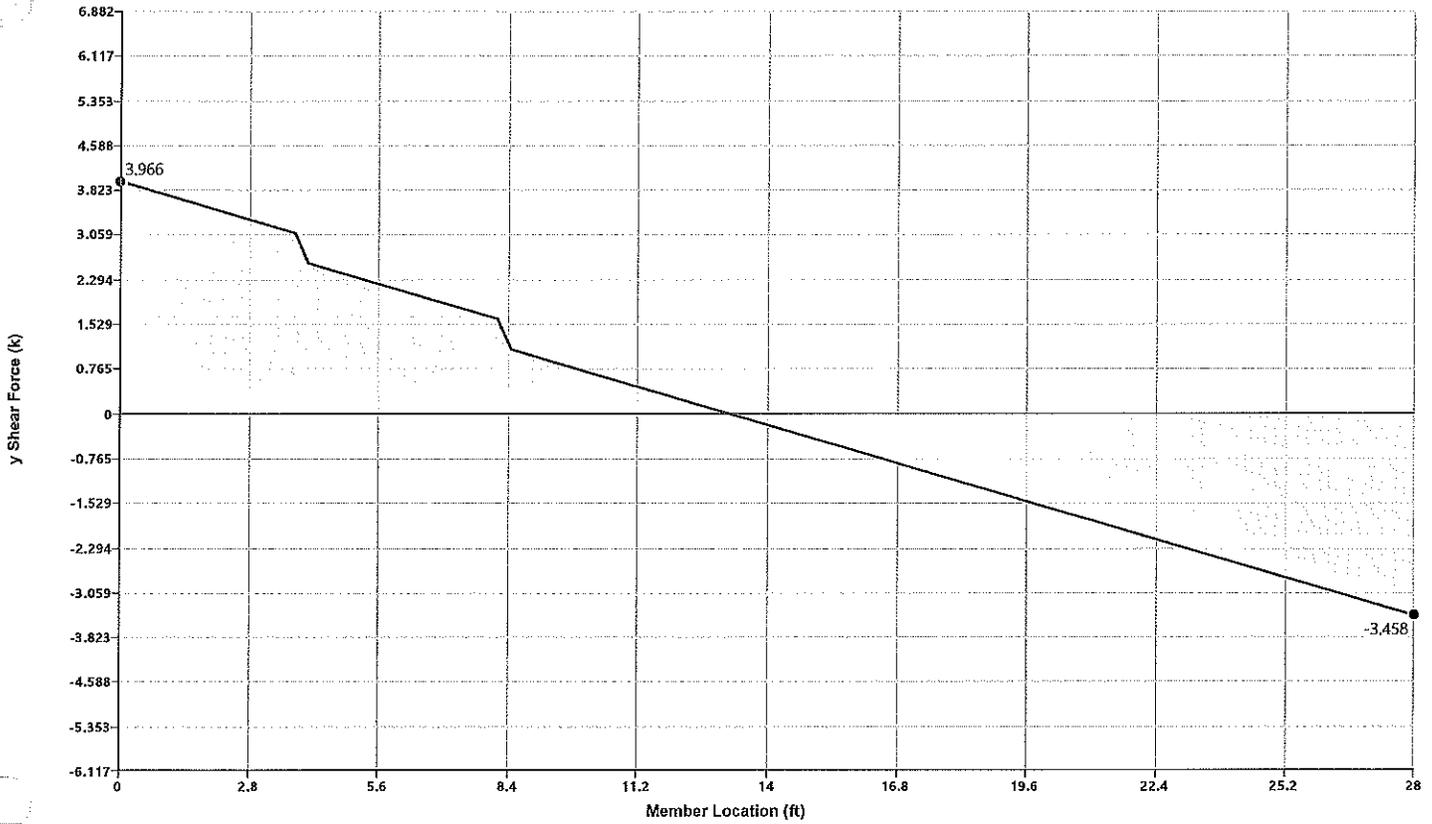Member SJ4 Demand, Envelope

Selected Location Values:

Location: 0 ft
Max Value: 0 (LC 2) k-ft
Min Value: 0 (LC 2) k-ft

Company : RCSE
Designer : Rob
Job Number : 25032
Model Name : Steel Joist Capacity Check

Checked By : _____

Member SJ5 Demand, Envelope

Selected Location Values:
Location: 0 ft
Max Value: 3.966 (LC 2) k
Min Value: 3.966 (LC 2) k

RISA
A NEMETSCHEK COMPANY

Company : RCSE
Designer : Rob
Job Number : 25032
Model Name : Steel Joist Capacity Check

Checked By : _____

Member SJ5 Demand, Envelope

Selected Location Values:
Location: 0 ft
Max Value: 0 (LC 2) k-ft
Min Value: 0 (LC 2) k-ft