THE APPROVED CONSTRUCTION PLANS AND ALL ENGINEERING DOCUMENTS MUST BE POSTED ON THE JOB AT ALL INSPECTIONS IN A VISIBLE AND READILY ACCESSIBLE LOCATION.

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Reviewed 1/31/2023 DL
Subject to field inspectors approvals.

STRUCTURAL CALCULATIONS FOR

RETAIL TENANT IMPROVEMENT

Bath & Body Works – SOUTH HILL MALL

Space No. 235

3500 S. Meridian Street

Puyallup, WA 98373

REV	Issue Date	Issue	Revised/Added Pages
	12/23/2022	POR REV 1	Initial Calc Submittal

Proj. 20221012

MICHAEL E. HAAS
STATE OF WASHINGTON
19110324
REGISTERED
PROFESSIONAL ENGINEER

expires 6/18/24
date 12/23/22

GF Project # 20221012.0

Building Code: 2018 International Building Code

PRCTI20221802

Bath&Body Works
South Hill

PROJECT NUMBER 20221012.0
PROJECT LOCATION: Puyallup, WA

City of Puyallup
Development & Permitting Services
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ASCE 7-16 WIND LOADING ON MECHANICAL EQUIPMENT

Wind Design Criteria

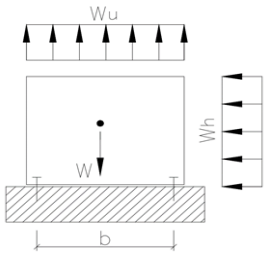
$F_v = q_h GC_r A_r$ (Eq. 29.4-3)

$q_h = 0.00256 K_h K_{zt} K_d K_e V^2$ (Equation 26.10-1)

z =	19.00	ft	K_d =	0.85	(Table 26.6-1)
K_h =	0.89	(Table 26.10-1)	K_e =	0.98	(Table 26.9-1)
K_{zt} =	1.00	(Section 26.8.2)	V =	97	mph
z_g =	433.00	(ft)			
q_z =	**17.98**	psf			

Uplift on Mechanical Unit
$F_v = q_h GC_r A_r$

GC_r =	1.5	(Eq 29.4-3)
W_r =	**26.97**	**x A_r**



Uplift on Mechanical Units

Unit(s)	Weight D (lbs)	Ar (ft^2)	A_h (ft^2)	X (ft)	Curb Length (ft)	Curb Width (ft)	F_v (lbs)	Net Uplift 0.6W-0.6D (lbs)	Curb Uplift (plf)
RTU 1	1093	21.47	19.83	2.87	5.48	3.41	579	-308	-17
RTU 2	1252	32.77	28.85	3.12	7.04	4.20	884	-221	-10

A_r = Width x Length
A_h = Height x Length
x = Component center of gravity above point of attachment
- Uplift = Unit Weight > Uplift Load

Connection Notes:

Connect RTU Curb to Framing w/ 1/8"x3" Plate w/ (2) #12 screws ea. side
Tallow = 383 lbs (Wood Connection)
Tallow = 353.75 lbs (Cold-Formed Connection)
Tallow = 1061.25 lbs per plate (Tension)

Straps have adequate capacity

PRCTI20221802

Bath&BodyWorks
South Hill

PROJECT NUMBER 20221012.0
PROJECT LOCATION: Puyallup, WA

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ASCE 7-16 WIND LOADING ON MECHANICAL EQUIPMENT

Wind Design Criteria

$F_h = q_h GC_r Af$ (Eq. 29.4-2)

$q_h = 0.00256 K_h K_{zt} K_d K_e V^2$ (Equation 26.10-1)

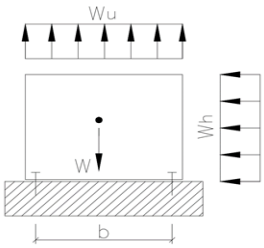
z =	19.00	ft	K_d =	0.85	(Table 26.6-1)
K_h =	0.89	(Table 26.10-1)	K_e =	0.98	(Table 26.9-1)
K_{zt} =	1.00	(Section 26.8.2)	V =	97	mph
q_z =	**17.98**	psf			

Lateral on Mechanical Unit

$F_h = q_h GC_r A_f$

GC_r = 1.9 (Eq 29.4-2)

F_h = **34.17** x A_f



Combined Lateral & Uplift on Mechanical Units

Unit(s)	Weight D (lbs)	A_h (ft^2)	X (ft)	Curb Length (ft)	Curb Width (ft)	F_v (lbs)	F_h (lbs)	M_{OT} (0.6W) (lb-ft)	M_R (0.6D) (lb-ft)	Tension (0.6W-0.6D) (lbs)	T (plf)
RTU 1	1093	19.83	2.87	5.48438	3.40625	579	-308	61	1116.91	-310	-57
RTU 2	1252	28.85	3.12	7.04167	4.19792	884	-221	700	1576.74	-209	-30

A_h = Height x Length
x = Component center of gravity above point of attachment
- T = Resisting Moment > Overturning Moment, no tension loads

Connection Notes:

Connect RTU Curb to Framing w/ 1/8"x3" Plate w/ (2) #12 screws ea. side
Tallow = 383 lbs (Wood Connection)
Tallow = 353.75 lbs (Cold-Formed Connection)
Tallow = 1061.25 lbs per plate (Tension)

Straps have adequate capacity

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Bath&Body Works

South Hill

PROJECT NUMBER: 20221012.0
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ASCE 7-16 SEISMIC LOADING ON NONSTRUCTURAL COMPONENTS

Seismic Design Criteria		
S_{DS} =	1.011	ft
h =	19.00	ft (Average Roof Height)

Component Input									
Component	Weight (lbs)	a_p	R_p	z (ft)	I_p	x (ft)	Length (ft)	Width (ft)	z/h
RTU 1	1093	2.50	6.00	19.00	1.00	2.87	5.48	3.41	1.00
RTU 2	1252	2.50	6.00	19.00	1.00	3.12	7.04	4.20	1.00

a_p & R_p = Per ASCE 7-16 Table 13.5-1 or 13.6-1
z = Height in structure of point of attachment w/ respect to base
x = Component center of gravity above point of attachment

Component Seismic Calculations										
Fp Limit	Fp Limit	Fp Calculated (Eq. 13.3-1)		F_p Design (lbs)		± Vert Force (lbs)	M_{OT} (0.7E_h)	M_R (0.6D-0.7E_v)**	Tension	Tension
(13.3-2)	(13.3-3)	Component	Connection	Component	Connection	(Section 13.3.1.2)	(ft-lbs)	(ft-lbs)	(plf)	(lbs)
1768.0	331.5	552.5	552.5	552.5	552.5	221.0	1110.0	854.4	13.7	75.0
2025.2	379.7	632.9	632.9	632.9	632.9	253.2	1382.2	1205.4	6.0	42.1

**M_R assumes worst case direction
- Tension = Resisting Moment > Overturning Moment, no tension loads

Connection Notes:

Connect RTU Curb to Framing w/ 1/8"x3" Plate w/ (2) #12 screws ea. side
Tallow = 383 lbs (Wood Connection)
Tallow = 353.75 lbs (Cold-Formed Connection)
Tallow = 1061.25 lbs per plate (Tension)
Straps have adequate capacity

PRCTI20221802

"JOIST.xls" Program
Version 1.1

GENERAL STANDARD JOIST ANALYSIS

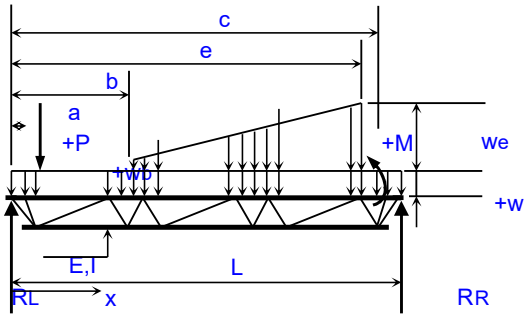
For Steel Joists Considered as Simple-Span Beams
Subjected to Non-Standard Loads

Job Name:	BBW SOUTH HILL	Subject:	RTU 1		
Job Number:	20221012.0	Originator:	AD	Checker:	MH

Input Data:

Joist Data:

Designation =	K-series	
Span, L =	50.0000	ft.
Modulus, E =	29000000	psi
Inertia, Ix =	731.45	in.^4



Original Design or Capacity Loads:

Full Uniform:

w = 366 lbs./ft. **32LH07 @ 7'-6"**

Nomenclature

Distributed:	Start b (ft.)	Wb (lbs./ft.)	End e (ft.)	We (lbs/ft.)
#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 = 277.5 lbs./ft.

Distributed:	Start b (ft.)	Wb (lbs./ft.)	End e (ft.)	We (lbs/ft.)
#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:	19.2500	382.55
#2:	26.4000	382.55
#3:		
#4:		
#5:		
#6:		
#7:		
#8:		
#9:		
#10:		
#11:		
#12:		
#13:		
#14:		
#15:		

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Results of Joist Analysis:

Original Design or Capacity Loads:

End Reactions:

R_L = 9150.0 lbs. R_R = 9150.0 lbs.

Minimum Design Web Member Shear:

$V_{w(min)}$ = 2287.5 lbs. (25% of maximum end reaction for K-series and LH-series joists per SJI Spec's.)

Maximum Moments:

+Mx(max) = 114375.0 ft-lbs @ x = 25.00 ft.
-Mx(max) = 0.0 ft-lbs @ x = 0.00 ft.

***Maximum Deflections:**

-Δ(max) = -2.790 in. @ x = 25.00 ft.
+Δ(max) = 0.000 in. @ x = 0.00 ft.
Δ(ratio) = L/215

**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:

R_L = 7353.3 lbs. R_R = 7286.8 lbs.

Maximum Moments:

+Mx(max) = 94916.9 ft-lbs @ x = 25.12 ft.
-Mx(max) = 0.0 ft-lbs @ x = 0.00 ft.

***Maximum Deflections:**

-Δ(max) = -2.295 in. @ x = 24.96 ft.
+Δ(max) = 0.000 in. @ x = 0.00 ft.
Δ(ratio) = L/261

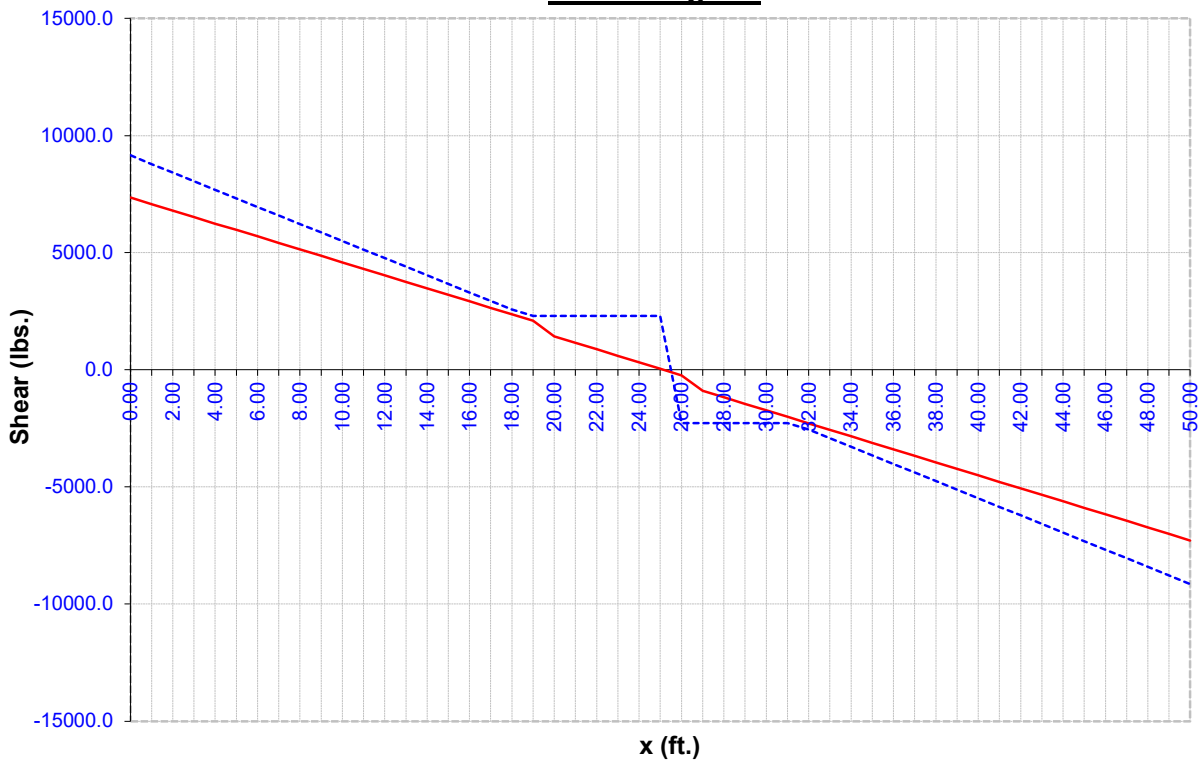
**Note: deflections shown above include a 15% increase above the values calculated using traditional "simple-beam" flexure in order to more closely match actual test results obtained by SJI.*

Maximum Stress Ratios:

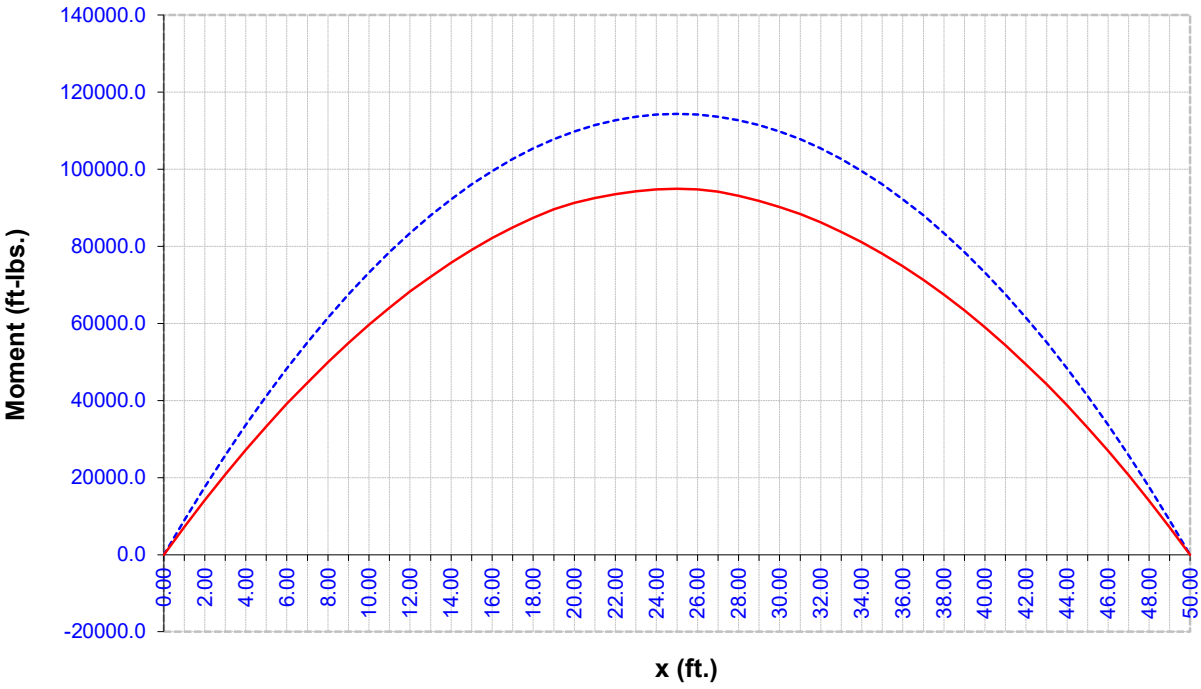
S.R. = **0.921** for Shear @ x = 18.00 ft.
S.R. = **0.831** for Moment @ x = 19.00 ft.

Comments:

Shear Diagram



Moment Diagram



= curves for original design or capacity loads

= curves for new design loads

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"JOIST.xls" Program
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GENERAL STANDARD JOIST ANALYSIS

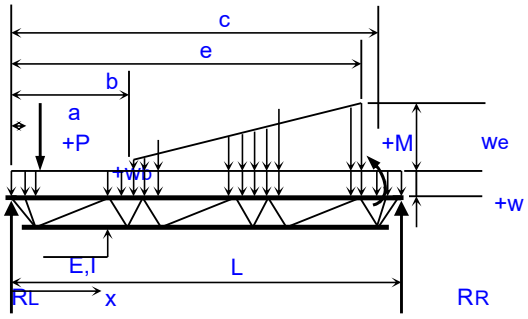
For Steel Joists Considered as Simple-Span Beams
Subjected to Non-Standard Loads

Job Name:	BBW SOUTH HILL	Subject:	RTU 2		
Job Number:	20221012.0	Originator:	AD	Checker:	MH

Input Data:

Joist Data:

Designation =	K-series	
Span, L =	50.0000	ft.
Modulus, E =	29000000	psi
Inertia, Ix =	731.45	in.^4



Original Design or Capacity Loads:

Full Uniform:

w = 366 lbs./ft. **32LH07 @ 7'-6"**

Nomenclature

	Start		End	
Distributed:	b (ft.)	Wb (lbs./ft.)	e (ft.)	We (lbs/ft.)
#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 = 277.5 lbs./ft.

	Start		End	
Distributed:	b (ft.)	Wb (lbs./ft.)	e (ft.)	We (lbs/ft.)
#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:	5.5000	438.2
#2:	12.5000	438.2
#3:		
#4:		
#5:		
#6:		
#7:		
#8:		
#9:		
#10:		
#11:		
#12:		
#13:		
#14:		
#15:		

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Results of Joist Analysis:

Original Design or Capacity Loads:

End Reactions:

R_L = 9150.0 lbs. R_R = 9150.0 lbs.

Minimum Design Web Member Shear:

$V_{w(min)}$ = 2287.5 lbs. (25% of maximum end reaction for K-series and LH-series joists per SJI Spec's.)

Maximum Moments:

+Mx(max) = 114375.0 ft-lbs @ x = 25.00 ft.
-Mx(max) = 0.0 ft-lbs @ x = 0.00 ft.

***Maximum Deflections:**

-Δ(max) = -2.790 in. @ x = 25.00 ft.
+Δ(max) = 0.000 in. @ x = 0.00 ft.
Δ(ratio) = L/215

**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:

R_L = 7656.1 lbs. R_R = 7095.3 lbs.

Maximum Moments:

+Mx(max) = 90707.4 ft-lbs @ x = 24.43 ft.
-Mx(max) = 0.0 ft-lbs @ x = 0.00 ft.

***Maximum Deflections:**

-Δ(max) = -2.224 in. @ x = 24.85 ft.
+Δ(max) = 0.000 in. @ x = 0.00 ft.
Δ(ratio) = L/270

**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. = **0.856** for Shear @ x = 5.00 ft.
S.R. = **0.845** for Moment @ x = 5.00 ft.

Comments:

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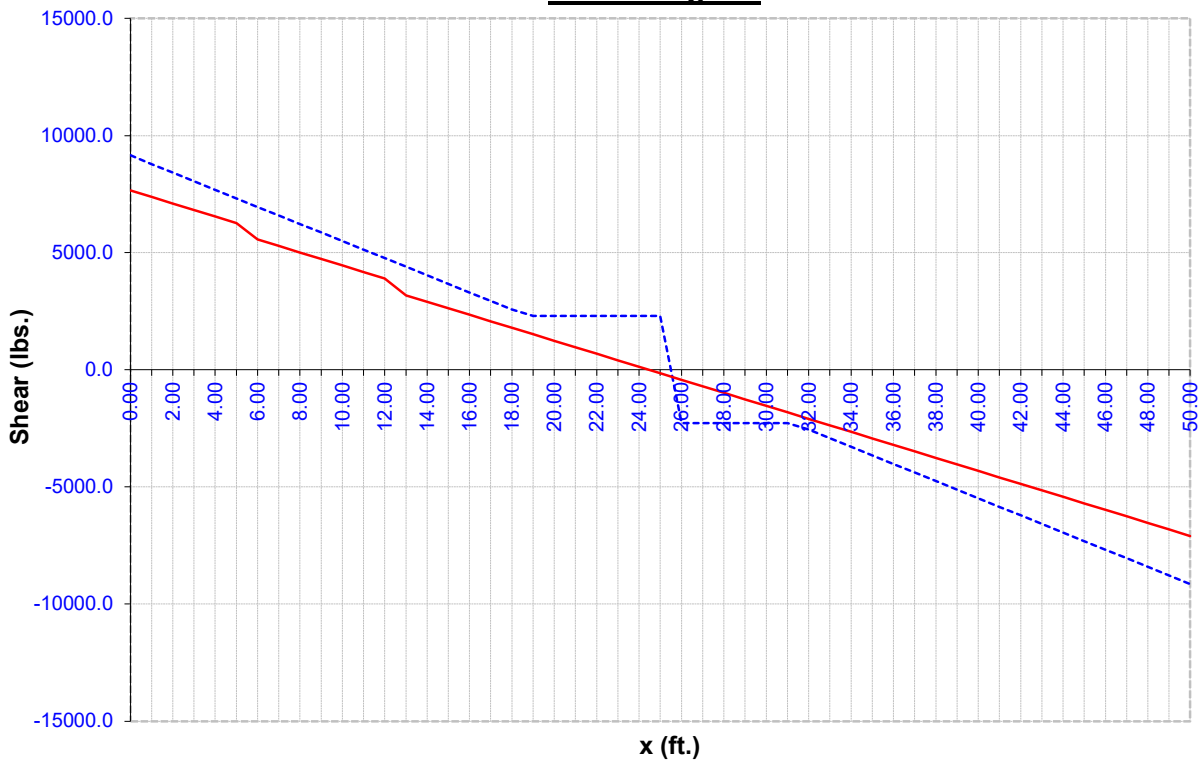
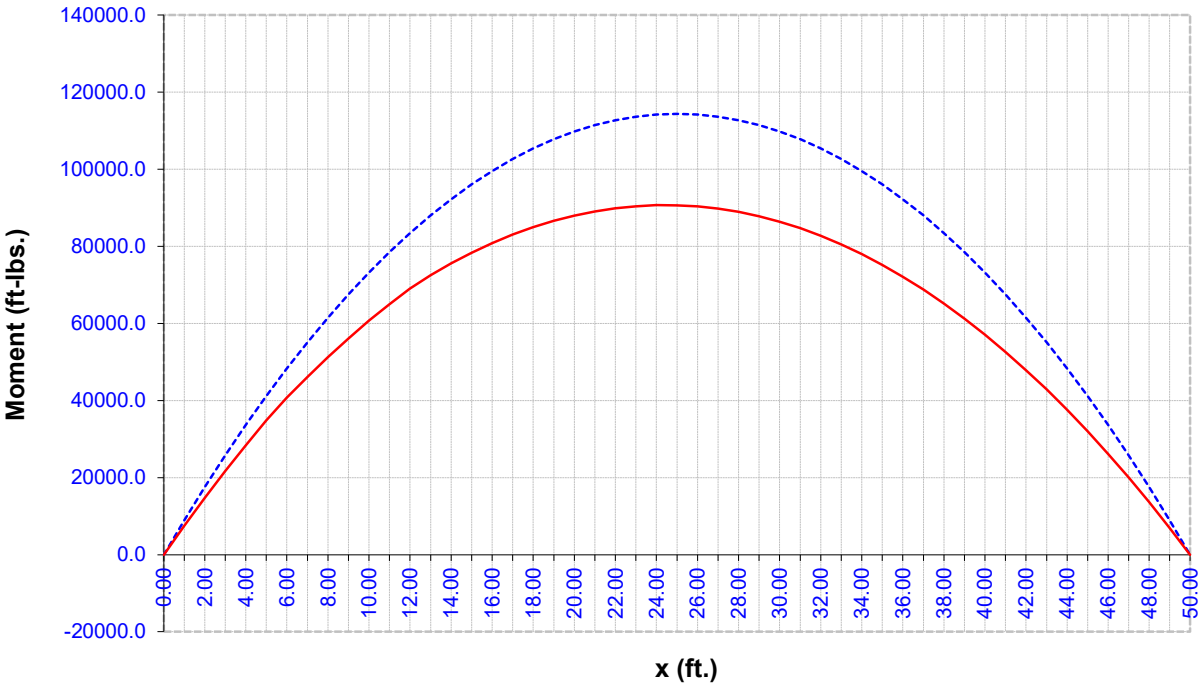
Shear Diagram



Moment Diagram



= curves for original design or capacity loads

= curves for new design loads

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