

Calculation Sheet

Rev	Date	By	Ck	Title
A	04/05/04	J.Shing	A.A.	FAA - SCT ETG LAB SAN DIEGO, CALIFORNIA

1.0) DESIGN CRITERIA
1.1) DESCRIPTION OF STRUCTURAL SYSTEM

PROVIDE NEW STRUCTURAL SUPPORT FOR THE NEW ARCHITECTURAL METAL STUD WALL FRAMING AT MAINTENANCE AISLE # 277, NEW OPENING AT EXISTING WALL IN MAINTENANCE AISLE # 260. NEW W8 HANGERS WILL BE CONNECTED TO THE BOTTOM OF EXISTING ROOF BEAMS TO SUPPORT HORIZONTAL FRAMING BELOW AS REQUIRED BY ARCHITECTURAL. SIMPLE SHEAR CONNECTIONS WILL BE UTILIZED AT TYPICAL BEAM CONNECTION. LATERAL SUPPORTS FOR NEW FRAMING WAS PROVIDED BY EXISTING STEEL TRUSSES IN LONGITUDINAL AND TRANSVERSE DIRECTIONS

THE ADEQUACY OF EXISTING ROOF BEAM IS VERIFIED FOR ADDITIONAL GRAVITY LOADS TO BE SUPPORTED. EXISTING OVERALL RAISED FLOOR SYSTEM IS DESIGNED FOR THE FULLY LOAD CONDITION, THEREFORE NO REANALYSIS OF THE EXISTING RAISED FLOOR IS REQUIRED. HOWEVER, HOLD DOWN ANCHORAGE FOR NEW EQUIPMENT WILL BE DESIGNED PER UBC 1997.

1.2) GRAVITY LOADING AT NEW STRUCTURAL SUPPORT:

	FRAMING MAINTENANCE AISLE
DEAD LOAD	7.00 psf
LIVE LOAD	20.00 psf
TOTAL LOAD	27.00 psf

1.3) SEISMIC LOADING:

EXISTING STRUCTURE WAS DESIGNED IN ACCORDANCE WITH UBC 1988.
SEISMIC RESTRAINT FOR EQUIPMENT IS EVALUATED IN ACCORDANCE WITH UBC 1997.

1.4) CODES AND STANDARDS:

1. AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC 9TH EDITION)
2. UNIFORM BUILDING CODE (1997)
3. AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM)
4. AMERICAN WELDING SOCIETY, INC. (AWS)
5. UNIFORM BUILDING CODE (1988) - FOR REFERENCE ONLY

1.5) MATERIALS:

STRUCTURAL STEEL:
ASTM A36 ($F_y = 36$ KSI)



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2.0) NEW STEEL FRAMING DESIGN

(A) Loading

DL

Total DL = 7.00 psf

LL

Basic LL = 20.00 psf

(B) New Beams qt ceiling: Design for DL+LL

BM W8x18

Span = 9.25 ft
 Trib. width = 4.00 ft
 $w_{D+L} = 0.108$ k/ft
 $w_D = 0.028$ k/ft
 $M_{D+L} = 1.16$ k-ft $wL^2/8$

USE W8x18

$S_x = 15.20$ in³ $d/A_f = 4.70$
 UNBR $L_b = 9.25$ ft $r_t = 1.39$ in
 $b_f = 5.25$ in $L/r_t = 79.86$
 $L_c = 5.54$ ft $0.66F_y = 23.76$ ksi

$F_{b1} = 18.60$ ksi ---- Eq. (F1-6 or F1-7)

$F_{b2} = 23.00$ ksi ---- Eq. (F1-8)

F_b allowable = 23.00 ksi

$f_{bD+L} = 12 * M_{D+L} / S = 0.91$ ksi < 23.00 ksi

UNBR $L_b @$ bot. = 9.25 ft $F_{b2} = 23.00$ ksi ---- Eq. (F1-8)

$\Delta_{DL} = 5w_D * L^4 / (384EI) = 0.003$ in = L/43202

$\Delta_{LL} = 5w_L * L^4 / (384EI) = 0.007$ in = L/15121 $I = 61.90$ in⁴

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3.0) EVALUATION OF EXISTING W16 ROOF BEAM:**(A) Loading**

DL - Based on design drawing WP-E-675-41800-S0.1 furnished by FAA

Total DL = **105.00** psf

DL - Based on design drawing WP-E-675-41800-S0.1 furnished by FAA

Basic LL = **20.00** psf non reducible**(B) Existing Beams W16x26**

The existing beam is design as composite beam with 16 - 3/4" diameter x 5" stud uniformly spaced.
The existing roof decking is 3" deep 20 gage with 2.5 inches topping (total depth = 5.5 inches).

Span = 28.00 ft
Trib. width= 9.25 ft
 w_{D+L} = 1.156 k/ft
 w_D = 0.971 k/ft
 w_L = 0.185 k/ft

(C) Additional loading at existing Beams W16x26

Span = 9.25 ft
Trib. width= 4.00 ft
 w_D = 0.028 k/ft
 w_L = 0.080 k/ft

 P_D = 0.259 k at 7'-8" from support
 P_L = 0.740 k at 7'-8" from support

Based on the calculation as shown in Appendix A, the existing roof beam is capable to support the gravity load of the new framing. Additional horizontal seismic load at ceiling framing is transferred to existing truss system.

(D) W8 to W16 connection:

Use 2-3/4" diameter A325 SC bolts with 1/4" plate. Allowable shear = 15.02 kips O.K.

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Job: EXISTING W16 ROOF BEAM

Steel Code: AISC 9th Ed.

SPAN INFORMATION:

Beam Size (User Selected) = W16X26

Fy = 36.0 ksi

Total Beam Length (ft) = 27.00

COMPOSITE PROPERTIES (Not Shored):

Concrete thickness (in)

Left

Right

Unit weight concrete (pcf)

150.00

150.00

f'c (ksi)

4.00

4.00

Decking Orientation

perpendicular

perpendicular

Decking type

VERCO W3 Formlok

VERCO W3 Formlok

Distance to Adjacent (ft)

Beam: 9.25

Beam: 9.25

beff (in) = 81.00

Y bar (in)

= 19.87

Seff (in**3) = 79.24

Str (in**3)

= 85.37

Ieff (in**4) = 1521.83

Itr (in**4)

= 1705.20

Stud length (in) = 5.00

Stud diameter (in)

= 0.75

Stud Capacity (kips) q = 13.3

of studs: Full = 26 Partial = 9 Actual = 16

Number of Stud Rows = 1, Percent of Full Composite Action = 62.54

LOADS: Self Weight = 0.026 k/ft

Point Loads (kips):

Flange Bracing

Dist DL Pre DL LL

Top Bottom

7.67 0.26 0.00 0.74

Yes No

Line Loads (k/ft):

Dist1 Dist2 DL1 DL2 Pre DL1 Pre DL2 LL1 LL2

0.00 27.00 0.971 0.971 0.000 0.000 0.185 0.185

SHEAR: Max V (kips) = 16.67 fv (ksi) = 4.25 Fv = 14.40

MOMENTS:

Span	Cond	Moment kip-ft	@ ft	Lb ft	Cb	Tension fb	Flange Fb	Comp fb	Flange Fb
Center	Pre DL	2.4	13.4	---	---	0.74	24.00	0.74	24.00
	Max +	111.6	13.3	---	---				
	Mmax/Seff					16.90	24.00	---	---
Controlling	Mprecmp/Sx+Mpost/Seff					17.28	32.40	---	---
		111.6	13.3	---	---	16.90	24.00	---	---

fc (ksi) = 0.43 Fc = 1.80

REACTIONS (kips):

	Left	Right
Initial reaction	0.35	0.35
DL reaction	13.65	13.53
Max + LL reaction	3.03	2.71
Max + total reaction	16.67	16.24

DEFLECTIONS:

Initial load (in)	at	13.50 ft	=	-0.036	L/D =	9051
Live load (in)	at	13.50 ft	=	-0.059	L/D =	5477
Post Comp load (in)	at	13.50 ft	=	-0.325	L/D =	996
Total load (in)	at	13.50 ft	=	-0.361	L/D =	897

RAMSBEAM V2.0 - Load Diagram

APPENDIX P.2 OF 2

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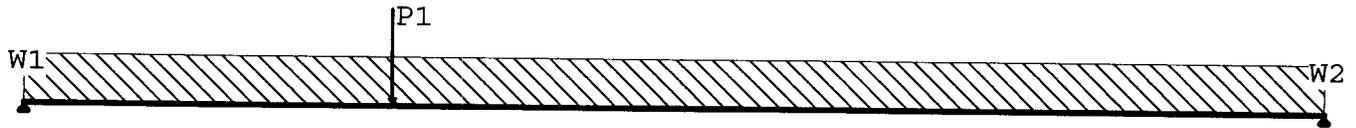
Job: EXISTING W16 ROOF BEAM

Steel Code: AISC 9th Ed.

Beam Size = W16X26

Span information (ft):

Length = 27.00, Left Support at 0.00, Right Support at 27.00



Load	Dist	DL	LL+	LL-	Max Tot
P1	7.67	0.259	0.740	0.000	0.999
W1	0.00	0.997	0.185	0.000	1.182
W2	27.00	0.997	0.185	0.000	1.182