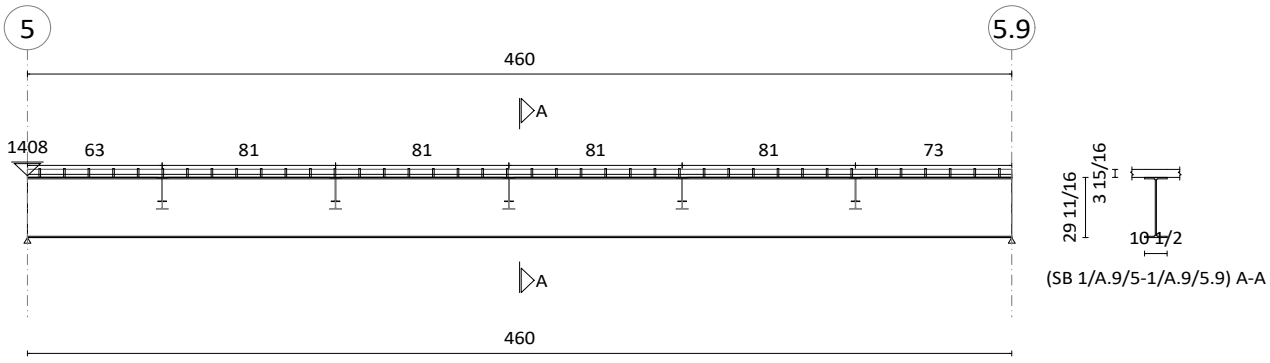
SB 1/A.9/5-1/A.9/5.9



St. 1 (1): SB 1/A.9/5-1/A.9/5.9 - 1 (W 30x99 A992-50 (40) [Deformed # 3 @ 8])

Restraints

Source	Distance / Length [ft, in]	LTB Top / Sub-Beam	LTB Top Factor	LTB Btm / Sub-Beam	LTB Btm Factor	Strut Major / Sub-Beam	Strut Major Factor	Strut Minor / Sub-Beam	Strut Minor Factor
support	0″	●		●		●		●	
sub-beam	5′ 3″		1.000		1.000		1.000		1.000
member	5′ 3″	●						●	
sub-beam	6′ 9″		1.000		1.000		1.000		1.000
member	12′ 0″	●						●	
sub-beam	6′ 9″		1.000		1.000		1.000		1.000
member	18′ 9″	●						●	
sub-beam	6′ 9″		1.000		1.000		1.000		1.000
member	25′ 6″	●						●	
sub-beam	6′ 9″		1.000		1.000		1.000		1.000
member	32′ 3″	●						●	
sub-beam	6′ 1″		1.000		1.000		1.000		1.000
support	38′ 4″	●		●		●		●	

Connectors\Layout

Name	Diameter	As welded height	Specified ultimate tensile strength
AISC 3/4 x 4 3/8	3/4	4	65.00

Distance end 1 [ft, in]	Distance end 2 [ft, in]	Number of connectors in length	Number of connectors in group	Group spacing distance [in]
0″	38′ 4″	40	1	11 1/2

Decking

Manufacturer	Name	Gauge	Yield strength
USD	B-LOK 33ksi 30"	1/32 in	33.00 ksi

Slab

Overall depth	Effective Width	Concrete type	Minimum compressive strength, f_c'
3 15/16 in	10′ 1″ ft, in	Normal	4.00 ksi

Reinforcement

Transverse reinforcement			Reinforcement for crack control or fire requirements		
Type	Area	Yield strength	Type	Area	Yield strength
Deformed # 3 @ 8	0.17 in^2/ft	60.00 ksi	6x6 W1.4xW1.4	0.03 in^2/ft	65.00 ksi

Static Design Summary

Summary W 30x99 (40 (40))

Design Condition	#	Design Value	Design Capacity	Units	U.R.	Status
Construction Stage	-	-	-	-	-1.000	Not required
Classification	7	Compact	-	-	-	✔ Pass
Vertical Shear	8	119.4	463.3	kip	0.258	✔ Pass
Flexure	8	1271.5	1574.9	kip ft	0.807	✔ Pass
Connector Resistance	7	20	40 (40)		-	✔ Pass
Natural Frequency	14	0.00	-	Hz	-	Not required
Deflection Self weight	14	0.1	-	in	-	-
Deflection Slab	14	0.4	1.9	in	0.230	✔ Pass
Deflection Dead	14	0.6	1.3	in	0.505	✔ Pass
Deflection Post Composite	14	0.6	1.3	in	0.505	✔ Pass
Deflection Total	14	1.2	1.9	in	0.609	✔ Pass

Regional code: United States (ACI/AISC), design code: AISC 360/341 LRFD (2016)

Static Design Calculations

Classification

3D Building Analysis - Critical

7 LRFD$_1$-1.4D - Critical

Span 1 W 30x99 A992-50 - Critical

Position 18' 9" - Critical

Web class — Compact AISC 360 Table B4.1b

h / t_w =**51.900**

h / t_w limit for plastic stress distribution =**90.553**

Vertical Shear

3D Building Analysis - Critical

8 LRFD$_2$-1.2D+1.6L - Critical

Span 1 W 30x99 A992-50 - Critical

Position 0" - Critical

Position of V_{ry} =**0"** ft, in

Required major axis shear strength, V_{ry} =**119.4** kip

Design shear strength =**463.3** kip AISC 360 G2

Ratio =**0.258**

✔ Pass

Flexure

3D Building Analysis - Critical

8 LRFD$_2$-1.2D+1.6L - Critical

Span 1 W 30x99 A992-50 - Critical

18' 9" Max Moment Position - Critical

Distance of M along member =**18' 9"** ft, in

Required flexural strength, M_x =**1271.5** kip ft

Design flexural strength =**1574.9** kip ft

Ratio =**0.807**

✔ Pass

Connector Resistance

3D Building Analysis - Critical

7 LRFD$_1$-1.4D - Critical

Span 1 W 30x99 A992-50 - Critical

18' 9" Max Moment and UR Position - Critical

Layout and strength of shear connectors

Maximum group spacing, s	=**11 1/2** in
Maximum permitted group spacing	=**31 1/2** in
Number of shear connectors over full beam length	40
Number of shear connectors to critical point, N_a	20
Degree of shear connection	=**0.300**
Absolute minimum degree of shear connection	=**0.250**
Optimum amount of shear connection	=**0.500**

Partial shear connection

✔ Pass

Deflection

3D Building Analysis - Critical

14 (Operating) LRFD$_{11.1}$-1.2D+L+0.15S+E - Critical

Span 1 W 30x99 A992-50 - Critical

Deflection Total - Critical

Short term inertia, $I_{\alpha S}$	=**9359.5** in^4
Long term inertia, $I_{\alpha L}$	=**7025.6** in^4
Short term inertia @ partial interaction, $I_{\alpha S}$	=**6930.1** in^4
Long term inertia @ partial interaction, $I_{\alpha L}$	=**5652.2** in^4
Position Total load deflection	=**19' 1/4"** ft, in
Deflection with full shear connection n, δ	=**1.0** in
Deflection of steel beam alone, δ_s	=**1.4** in
Minimum degree of shear connection	=**29.98** %
Deflection with partial shear connection, δ	=**1.2** in
Span over limit	=**1.9** in
Design limit	=**1.9** in
Utilization Ratio	=**0.609**

✔ Pass