KFS FRAMEMAKER 1420 SECTION PROPERTIES MANUAL

Version 2025.1

SCOTTSDALE

THE TRUSTED STEEL-FRAMING PARTNER

DISCLOSURES

The SCOTTSDALE CONSTRUCTION SYSTEMS mission is to take care of its customers by being the safest, highest quality, lowest cost, most productive and most profitable load bearing light gauge steel framing products company in the world.

This manual collects all the current practices, methods, tools and organization that SCOTTSDALE CONSTRUCTION SYSTEMS utilizes to ensure the quality of its products. These elements together with this manual constitute SCOTTSDALE CONSTRUCTION SYSTEMS Production Quality Assurance System for all of its manufacturing facilities. The information compiled here will be helpful for the purposes of training, audits, internal and external reviews.

The contents of this manual will be reviewed annually and updated as required by the Industrial Engineering function within the manufacturing organization for SCOTTSDALE CONSTRUCTION SYSTEMS, to assure accuracy and completeness of the information.

SCOTTSDALE
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SECTION I INTRODUCTION

KFS FRAMEMAKER 1420

The KFS FRAMEMAKER 1420 are best suited for the load bearing structural applications within the commercial and residential sectors. This manual describes the section properties of the profiles that can be manufactured using the KFS FRAMEMAKER 1420. Profile shapes that can be manufactured using the KFS FRAMEMAKER 1420 are shown below.

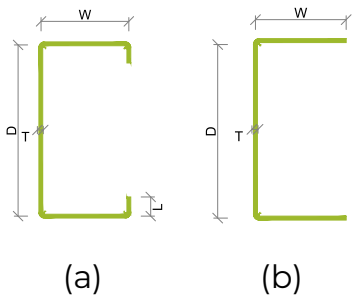

Figure 1 (a) Lipped Channel Section (b) Unlipped Channel Section

Legend
D = Section depth
W = Section width
L = Lip length
T = Section thickness

Sections properties are important parameters that are needed for structural design purposes. The KFS FRAMEMAKER 1420 produces sections that are in line with the SFIA/CSSBI specifications. Section properties and strength as per AISI S100 for 6” and 12” stud and track sections that can be manufactured using KFS 1420 are computed and listed below.

SECTION II NAMING CONVENTIONS

SFIA NAMING CONVENTIONS

SFIA naming conventions are followed throughout this manual. An example of the typical naming conventions and corresponding explanations are shown below.

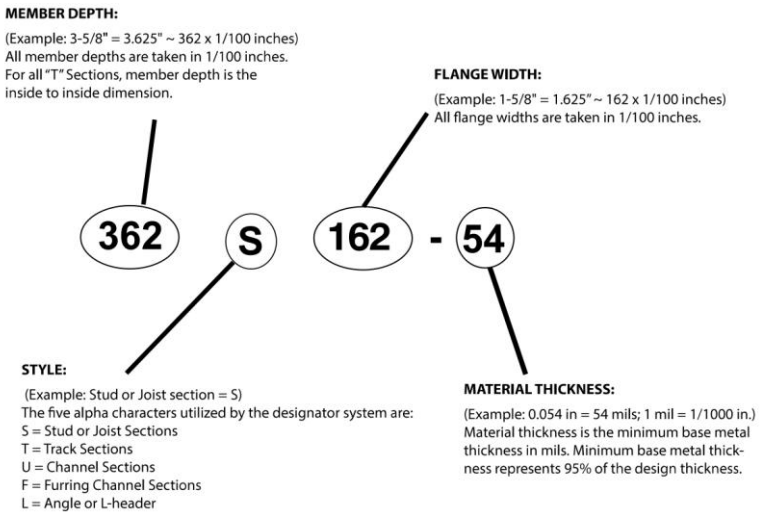

Table below also shows commonly used material thicknesses and stiffening length conversions

Thickness Table

Designation Thickness (Mils)	Minimum Thickness[1] (in)	Design Thickness (in)	Design Inside Corner Radii[2] (in)	Reference Gauge No.
18	0.0179	0.0188	0.0844	25
27	0.0269	0.0283	0.0796	22
30	0.0296	0.0312	0.0782	20-Drywall
33	0.0329	0.0346	0.0765	20-Structural
43	0.0428	0.0451	0.0712	18
54	0.0538	0.0566	0.0849	16
68	0.0677	0.0713	0.1070	14
97	0.0966	0.1017	0.1526	12
118	0.1180	0.1242	0.1863	10

Stiffening Lip Length

Section	Flange Width	Design Stiffening Lip Length (in)
S125	1 1/4"	0.188
S137	1 3/8"	0.375
S162	1 5/8"	0.500
S200	2"	0.625
S250	2 1/2"	0.625
S300	3"	0.625
S350	3 1/2"	1.000

SECTION III STUD SECTION PROPERTIES AND STRENGTH

362S162-30

Full Section Properties

Area	0.23679 in²	Wt.	0.00080508 k/ft	Flat	7.5893 in
Ix	0.49901 in⁴	rx	1.4517 in	Ixy	0.00000 in⁴
Sx(t)	0.27532 in³	y(t)	1.8125 in	α	0.000 deg
Sx(b)	0.27532 in³	y(b)	1.8125 in		
Zx	0.31735 in³	Height	3.6250 in		
Iy	0.09018 in⁴	ry	0.6171 in	x_o	-1.3104 in
Sy(l)	0.16798 in³	x(l)	0.5369 in	y_o	0.0000 in
Sy(r)	0.08288 in³	x(r)	1.0881 in	jx	2.0763 in
Zy	0.12213 in³	Width	1.6250 in	jy	0.0000 in
I_1	0.49901 in⁴	r_1	1.4517 in	Cw	0.25879 in⁶
I_2	0.09018 in⁴	r_2	0.6171 in	J	0.00007683 in⁴
Ic	0.58920 in⁴	rc	1.5774 in		
I_o	0.99582 in⁴	r_o	2.0507 in		

Net Section Properties

Ix	0.49024 in⁴	rx	1.6064 in	Area	0.18999 in²
Sx(t)	0.27048 in³	y(t)	1.8125 in	Ixy	0.00000 in⁴
Sx(b)	0.27048 in³	y(b)	1.8125 in	α	0.000 deg
Zx	0.29980 in³				
Iy	0.07433 in⁴	ry	0.6255 in	x_o	-1.4530 in
Sy(l)	0.11173 in³	x(l)	0.6653 in	y_o	0.0000 in
Sy(r)	0.07745 in³	x(r)	0.9597 in	jx	1.8388 in
Zy	0.10677 in³			jy	0.0000 in
Ic	0.56457 in⁴	rc	1.7238 in	Cw	0.25323 in⁶
I_o	0.96566 in⁴	r_o	2.2545 in	J	0.00006165 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial			Positive Bending		Positive Bending		
ϕPno	5.5714	k	ϕMnxo	9.6753	k-in	ϕMnyo	3.3278 k-in
Ae	0.13109	in²	Ixe	0.43378	in⁴	Iye	0.07195 in⁴
ϕTn	9.2619	k	Sxe(t)	0.21501	in³	Sye(l)	0.11035 in³
			Sxe(b)	0.26985	in³	Sye(r)	0.07395 in³
Shear							
ϕVny	0.4157	k	Negative Bending			Negative Bending	
ϕVnx	2.3281	k	ϕMnxo	9.6753	k-in	ϕMnyo	3.1474 k-in
			Ixe	0.43378	in⁴	Iye	0.05771 in⁴
Torsion			Sxe(t)	0.26985	in³	Sye(l)	0.07215 in³
ϕBn	4.427	k-in²	Sxe(b)	0.21501	in³	Sye(r)	0.06994 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Stud corner 2
    - t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
    - Fyc=68.69 ksi — Eq. A3.3.2-2
  - Stud corner 3
    - t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
    - Fyc=68.69 ksi — Eq. A3.3.2-2
  - Stud corner 4
    - t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
    - Fyc=68.69 ksi — Eq. A3.3.2-2
  - Stud corner 5
    - t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
    - Fyc=68.69 ksi — Eq. A3.3.2-2
  - Fya=51.45 ksi — Eq. A3.3.2-1
  - Max compression stress allowed: Fya=50 ksi
- Bending about X-axis
  - Stud corner 2
    - t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
    - Fyc=68.69 ksi — Eq. A3.3.2-2
  - Stud corner 3
    - t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
    - Fyc=68.69 ksi — Eq. A3.3.2-2
  - Stud corner 4
    - t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
    - Fyc=68.69 ksi — Eq. A3.3.2-2
  - Stud corner 5
    - t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
    - Fyc=68.69 ksi — Eq. A3.3.2-2
  - Fya=53.235 ksi — Eq. A3.3.2-1
  - Max compression stress allowed for positive bending: Fya=50 ksi
  - Max compression stress allowed for negative bending: Fya=50 ksi
- Bending about Y-axis

Stud corner 2
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi — Eq. A3.3.2-2
Stud corner 5
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi — Eq. A3.3.2-2
Fya=55.114 ksi — Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.23679 in², Fy=51.45 ksi
Tn=12.183 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.18999 in², Fu=65 ksi
Tn=12.349 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Stud element 2
Vn=1.2934 k at 180 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Stud element 3
Vyh=1.0982 k — Eq. G3-2
kv=3.5335 — Eq. G3-8
Vcrh=0.35241 k — Eq. G3-6
Vn=0.46194 k at 90 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Stud element 4
Vn=1.2934 k at 0 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3907 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.82697 — Eq. 1.1-3
ρ=0.88754 — Eq. 1.1-2
b=0.34676 in (ineffective width=0.043938 in) — Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.091 — Eq. 1.3-7
Ia=0.00016273 in⁴ — Eq. 1.3-8
Is=0.00015506 in⁴
ds=0.33042 in (lip ineffective width=0.01634 in) — Eq. 1.3-6
k=3.4239 — Table 1.3-1
Element 2: Partially stiffened, w=1.4064 in
f=50 ksi, k=3.4239
λ=1.055 — Eq. 1.1-3

```
      ρ=0.75023                                          Eq. 1.1-2
      b=1.0551 in (ineffective width=0.35127 in)         Eq. 1.1-1
      b₁=0.5027 in, b₂=0.55242 in
    Element 3: Treat as two unstiffened elements
      f₁=50 ksi, f₂=50 ksi
      ψ=1                                                Eq. 1.2.2-1
      k=0.43                                             Eq. 1.2.2-3
      λ=2.0176                                           Eq. 1.1-3
      ρ=0.4416                                           Eq. 1.1-2
      b=0.42093 in (ineffective width=0.53227 in)        Eq. 1.1-1
      f₁=50 ksi, f₂=50 ksi
      ψ=1                                                Eq. 1.2.2-1
      k=0.43                                             Eq. 1.2.2-3
      λ=2.0176                                           Eq. 1.1-3
      ρ=0.4416                                           Eq. 1.1-2
      b=0.42093 in (ineffective width=0.53227 in)        Eq. 1.1-1
    Element 5: Unstiffened, w=0.3907 in
      f₁=50 ksi, f₂=50 ksi
      ψ=1                                                Eq. 1.2.2-1
      k=0.43                                             Eq. 1.2.2-3
      λ=0.82697                                          Eq. 1.1-3
      ρ=0.88754                                          Eq. 1.1-2
      b=0.34676 in (ineffective width=0.043938 in)       Eq. 1.1-1
    Element 4: Check for lip stiffener reduction
      S=31.091                                           Eq. 1.3-7
      Ia=0.00016273 in⁴                                  Eq. 1.3-8
      Is=0.00015506 in⁴
      ds=0.33042 in (lip ineffective width=0.016341 in)  Eq. 1.3-6
      k=3.4239                                           Table 1.3-1
    Element 4: Partially stiffened, w=1.4064 in
      f=50 ksi, k=3.4239
      λ=1.055                                            Eq. 1.1-3
      ρ=0.75023                                          Eq. 1.1-2
      b=1.0551 in (ineffective width=0.35127 in)         Eq. 1.1-1
      b₁=0.5027 in, b₂=0.55242 in
  Ae=0.13109 in², Fn=50 ksi
  Pn=6.5546 k                                            Eq. E3.1-1
  Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
  Effective width calculations for Stud
    Element 1: No compressive stress (fully effective)
    Element 2: No compressive stress (fully effective)
    Element 3: Treat as two unstiffened elements
      f₁=47.291 ksi, f₂=23.667 ksi
      ψ=0.50044                                          Eq. 1.2.2-1
      k=0.68773                                          Eq. 1.2.2-2
      λ=1.5515                                           Eq. 1.1-3
      ρ=0.55313                                          Eq. 1.1-2
      b=0.52725 in (ineffective width=0.42595 in)        Eq. 1.1-1
    Element 5: Unstiffened, w=0.3907 in
      f₁=47.291 ksi, f₂=37.608 ksi
```

```
      ψ=0.79524                                          Eq. 1.2.2-1
      k=0.50914                                          Eq. 1.2.2-2
      λ=0.73911                                          Eq. 1.1-3
      ρ=0.95026                                          Eq. 1.1-2
      b=0.37127 in (ineffective width=0.019434 in)       Eq. 1.1-1
    Element 4: Check for lip stiffener reduction
      S=31.212                                           Eq. 1.3-7
      Ia=0.00016212 in⁴                                  Eq. 1.3-8
      Is=0.00015506 in⁴
      ds=0.35511 in (lip ineffective width=0.01616 in)   Eq. 1.3-6
      k=3.4276                                           Table 1.3-1
    Element 4: Partially stiffened, w=1.4064 in
      f=49.613 ksi, k=3.4276
      λ=1.0503                                           Eq. 1.1-3
      ρ=0.75268                                          Eq. 1.1-2
      b=1.0586 in (ineffective width=0.34783 in)         Eq. 1.1-1
      b₁=0.50625 in, b₂=0.55232 in
  Center of gravity shift: y=-0.20503 in
  Sxe=0.21501 in³, Fy=50 ksi
  Mnl=10.75 k-in                                         Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
  Effective width calculations for Stud
    Element 1: Unstiffened, w=0.3907 in
      f₁=47.291 ksi, f₂=37.608 ksi
      ψ=0.79524                                          Eq. 1.2.2-1
      k=0.50914                                          Eq. 1.2.2-2
      λ=0.73911                                          Eq. 1.1-3
      ρ=0.95026                                          Eq. 1.1-2
      b=0.37127 in (ineffective width=0.019434 in)       Eq. 1.1-1
    Element 2: Check for lip stiffener reduction
      S=31.212                                           Eq. 1.3-7
      Ia=0.00016212 in⁴                                  Eq. 1.3-8
      Is=0.00015506 in⁴
      ds=0.35511 in (lip ineffective width=0.01616 in)   Eq. 1.3-6
      k=3.4276                                           Table 1.3-1
    Element 2: Partially stiffened, w=1.4064 in
      f=49.613 ksi, k=3.4276
      λ=1.0503                                           Eq. 1.1-3
      ρ=0.75268                                          Eq. 1.1-2
      b=1.0586 in (ineffective width=0.34783 in)         Eq. 1.1-1
      b₁=0.50625 in, b₂=0.55232 in
    Element 3: Treat as two unstiffened elements
      f₁=47.291 ksi, f₂=23.667 ksi
      ψ=0.50044                                          Eq. 1.2.2-1
      k=0.68773                                          Eq. 1.2.2-2
      λ=1.5515                                           Eq. 1.1-3
      ρ=0.55313                                          Eq. 1.1-2
      b=0.52725 in (ineffective width=0.42595 in)        Eq. 1.1-1
    Element 5: No compressive stress (fully effective)
    Element 4: No compressive stress (fully effective)
```

```
  Center of gravity shift: y=0.20503 in
  Sxe=0.21501 in³, Fy=50 ksi
  Mnl=10.75 k-in                                          Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
  Effective width calculations for Stud
    Element 1: Unstiffened, w=0.3907 in
      f₁=49.198 ksi, f₂=49.198 ksi
      ψ=1                                                 Eq. 1.2.2-1
      k=0.43                                              Eq. 1.2.2-3
      λ=0.82031                                           Eq. 1.1-3
      ρ=0.89211                                           Eq. 1.1-2
      b=0.34855 in (ineffective width=0.042153 in)        Eq. 1.1-1
    Element 2: Stiffened, w=1.4064 in
      f₁=44.383 ksi, f₂=-27.89 ksi
      ψ=0.62839                                           Eq. 1.1.2-1
      k=15.893                                            Eq. 1.1.2-2
      λ=0.46133                                           Eq. 1.1-3
      ρ=1                                                 Eq. 1.1-2
      be=1.4064 in                                        Eq. 1.1-1
      h₀=1.625 in, b₀=0.5 in, h₀/b₀=3.25
      b₁=0.38761 in                                       Eq. 1.1.2-3
      b₂=0.7032 in                                        Eq. 1.1.2-4
      Compression width=0.86367 in
      b₁+b₂ > compression width (fully effective)
    Element 3: No compressive stress (fully effective)
    Element 5: Unstiffened, w=0.3907 in
      f₁=49.198 ksi, f₂=49.198 ksi
      ψ=1                                                 Eq. 1.2.2-1
      k=0.43                                              Eq. 1.2.2-3
      λ=0.82031                                           Eq. 1.1-3
      ρ=0.89211                                           Eq. 1.1-2
      b=0.34855 in (ineffective width=0.042153 in)        Eq. 1.1-1
    Element 4: Stiffened, w=1.4064 in
      f₁=44.383 ksi, f₂=-27.89 ksi
      ψ=0.62839                                           Eq. 1.1.2-1
      k=15.893                                            Eq. 1.1.2-2
      λ=0.46133                                           Eq. 1.1-3
      ρ=1                                                 Eq. 1.1-2
      be=1.4064 in                                        Eq. 1.1-1
      h₀=1.625 in, b₀=0.5 in, h₀/b₀=3.25
      b₁=0.38761 in                                       Eq. 1.1.2-3
      b₂=0.7032 in                                        Eq. 1.1.2-4
      Compression width=0.86367 in
      b₁+b₂ > compression width (fully effective)
  Center of gravity shift: x=-0.013255 in
  Sye=0.07395 in³, Fy=50 ksi
  Mnl=3.6975 k-in                                         Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
```

```
  Effective width calculations for Stud
    Element 1: No compressive stress (fully effective)
    Element 2: Stiffened, w=1.4064 in
      f₁=41.809 ksi, f₂=-43.38 ksi
      ψ=1.0376                                          Eq. 1.1.2-1
      k=24.994                                          Eq. 1.1.2-2
      λ=0.35704                                         Eq. 1.1-3
      ρ=1                                               Eq. 1.1-2
      be=1.4064 in                                      Eq. 1.1-1
      h₀=1.625 in, b₀=3.625 in, h₀/b₀=0.44828
      b₁=0.34833 in                                     Eq. 1.1.2-3
      b₂=0.7032 in                                      Eq. 1.1.2-4
      Compression width=0.69023 in
      b₁+b₂ > compression width (fully effective)
    Element 3: Treat as two unstiffened elements
      f₁=47.484 ksi, f₂=47.484 ksi
      ψ=1                                               Eq. 1.2.2-1
      k=0.43                                            Eq. 1.2.2-3
      λ=1.9662                                          Eq. 1.1-3
      ρ=0.45169                                         Eq. 1.1-2
      b=0.43056 in (ineffective width=0.52264 in)       Eq. 1.1-1
      f₁=47.484 ksi, f₂=47.484 ksi
      ψ=1                                               Eq. 1.2.2-1
      k=0.43                                            Eq. 1.2.2-3
      λ=1.9662                                          Eq. 1.1-3
      ρ=0.45169                                         Eq. 1.1-2
      b=0.43056 in (ineffective width=0.52264 in)       Eq. 1.1-1
    Element 5: No compressive stress (fully effective)
    Element 4: Stiffened, w=1.4064 in
      f₁=41.809 ksi, f₂=-43.38 ksi
      ψ=1.0376                                          Eq. 1.1.2-1
      k=24.994                                          Eq. 1.1.2-2
      λ=0.35704                                         Eq. 1.1-3
      ρ=1                                               Eq. 1.1-2
      be=1.4064 in                                      Eq. 1.1-1
      h₀=1.625 in, b₀=3.625 in, h₀/b₀=0.44828
      b₁=0.34833 in                                     Eq. 1.1.2-3
      b₂=0.7032 in                                      Eq. 1.1.2-4
      Compression width=0.69023 in
      b₁+b₂ > compression width (fully effective)
  Center of gravity shift: x=0.13463 in
  Sye=0.069943 in³, Fy=50 ksi
  Mnl=3.4972 k-in                                       Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
  Cw=0.25323 in⁶, Wn=2.5741 in², Fy=50 ksi
  Bn=4.9189 k-in²                                       G8.1-1
  Ωb=1.67, ϕb=0.9
```

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Full Section Properties

Area	0.26212 in²	Wt.	0.00089121 k/ft	Flat	7.5757 in
Ix	0.5512 in⁴	rx	1.4502 in	Ixy	0.0000 in⁴
Sx(t)	0.30414 in³	y(t)	1.8125 in	α	0.000 deg
Sx(b)	0.30414 in³	y(b)	1.8125 in		
Zx	0.35092 in³	Height	3.6250 in		
Iy	0.0994 in⁴	ry	0.6157 in	x_o	-1.3066 in
Sy(l)	0.18504 in³	x(l)	0.5370 in	y_o	0.0000 in
Sy(r)	0.09132 in³	x(r)	1.0880 in	jx	2.0732 in
Zy	0.13481 in³	Width	1.6250 in	jy	0.0000 in
I_1	0.5512 in⁴	r_1	1.4502 in	Cw	0.28429 in⁶
I_2	0.0994 in⁴	r_2	0.6157 in	J	0.00010460 in⁴
Ic	0.6506 in⁴	rc	1.5755 in		
I_o	1.0981 in⁴	r_o	2.0468 in		

Net Section Properties

Ix	0.5415 in⁴	rx	1.6050 in	Area	0.21022 in²
Sx(t)	0.29877 in³	y(t)	1.8125 in	Ixy	0.0000 in⁴
Sx(b)	0.29877 in³	y(b)	1.8125 in	α	0.000 deg
Zx	0.33146 in³				
Iy	0.0819 in⁴	ry	0.6241 in	x_o	-1.4491 in
Sy(l)	0.12307 in³	x(l)	0.6653 in	y_o	0.0000 in
Sy(r)	0.08531 in³	x(r)	0.9597 in	jx	1.8353 in
Zy	0.11786 in³			jy	0.0000 in
Ic	0.6234 in⁴	rc	1.7220 in	Cw	0.27815 in⁶
I_o	1.0648 in⁴	r_o	2.2506 in	J	0.00008389 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	6.313 k	ϕMnxo	10.926 k-in	ϕMnyo	3.763 k-in
Ae	0.14853 in²	Ixe	0.48545 in⁴	Iye	0.08074 in⁴
ϕTn	10.248 k	Sxe(t)	0.24279 in³	Sye(l)	0.12242 in³
		Sxe(b)	0.29865 in³	Sye(r)	0.08363 in³
Shear					
ϕVny	0.516 k	Negative Bending		Negative Bending	
ϕVnx	2.621 k	ϕMnxo	10.926 k-in	ϕMnyo	3.513 k-in
		Ixe	0.48545 in⁴	Iye	0.06562 in⁴
Torsion		Sxe(t)	0.29865 in³	Sye(l)	0.08363 in³
ϕBn	4.8821 k-in²	Sxe(b)	0.24279 in³	Sye(r)	0.07808 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Fya=51.575 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Fya=53.516 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Fya=55.565 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength

Ag=0.26212 in², Fy=51.575 ksi	
Tn=13.519 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.21022 in², Fu=65 ksi	
Tn=13.664 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=1.4563 k at 180 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=1.2145 k	Eq. G3-2
kv=3.5321	Eq. G3-8
Vcrh=0.4804 k	Eq. G3-6
Vn=0.5737 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=1.4563 k at 0 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.389 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.74246	Eq. 1.1-3
ρ=0.94778	Eq. 1.1-2
b=0.36869 in (ineffective width=0.020315 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00022212 in⁴	Eq. 1.3-8
Is=0.00016972 in⁴	
ds=0.28171 in (lip ineffective width=0.086971 in)	Eq. 1.3-6
k=3.2075	Table 1.3-1
Element 2: Partially stiffened, w=1.403 in	
f=50 ksi, k=3.2075	
λ=0.98047	Eq. 1.1-3
ρ=0.79107	Eq. 1.1-2
b=1.1099 in (ineffective width=0.29313 in)	Eq. 1.1-1
b_1=0.42403 in, b_2=0.68584 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.8161	Eq. 1.1-3
ρ=0.48393	Eq. 1.1-2
b=0.46046 in (ineffective width=0.49104 in)	Eq. 1.1-1

f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.8161 Eq. 1.1-3
ρ=0.48393 Eq. 1.1-2
b=0.46046 in (ineffective width=0.49104 in) Eq. 1.1-1
Element 5: Unstiffened, w=0.389 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.74246 Eq. 1.1-3
ρ=0.94778 Eq. 1.1-2
b=0.36869 in (ineffective width=0.020315 in) Eq. 1.1-1
Element 4: Check for lip stiffener reduction
S=31.091 Eq. 1.3-7
Ia=0.00022212 in^4 Eq. 1.3-8
Is=0.00016972 in^4
ds=0.28171 in (lip ineffective width=0.086971 in) Eq. 1.3-6
k=3.2075 Table 1.3-1
Element 4: Partially stiffened, w=1.403 in
f=50 ksi, k=3.2075
λ=0.98047 Eq. 1.1-3
ρ=0.79107 Eq. 1.1-2
b=1.1099 in (ineffective width=0.29313 in) Eq. 1.1-1
b_1=0.42403 in, b_2=0.68584 in
Ae=0.14853 in^2, Fn=50 ksi
Pn=7.4266 k Eq. E3.1-1
Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: No compressive stress (fully effective)
Element 3: Treat as two unstiffened elements
f_1=47.224 ksi, f_2=23.429 ksi
ψ=0.49613 Eq. 1.2.2-1
k=0.69128 Eq. 1.2.2-2
λ=1.392 Eq. 1.1-3
ρ=0.60485 Eq. 1.1-2
b=0.57552 in (ineffective width=0.37598 in) Eq. 1.1-1
Element 5: Unstiffened, w=0.389 in
f_1=47.224 ksi, f_2=37.496 ksi
ψ=0.794 Eq. 1.2.2-1
k=0.5097 Eq. 1.2.2-2
λ=0.66275 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 4: Check for lip stiffener reduction
S=31.226 Eq. 1.3-7
Ia=0.00022119 in^4 Eq. 1.3-8
Is=0.00016972 in^4

ds=0.29849 in (lip ineffective width=0.09051 in)	Eq. 1.3-6
k=3.2114	Table 1.3-1
Element 4: Partially stiffened, w=1.403 in	
f=49.567 ksi, k=3.2114	
λ=0.97563	Eq. 1.1-3
ρ=0.79385	Eq. 1.1-2
b=1.1138 in (ineffective width=0.28922 in)	Eq. 1.1-1
b_1=0.42731 in, b_2=0.68646 in	
Center of gravity shift: y=-0.18699 in	
Sxe=0.24279 in^3, Fy=50 ksi	
Mnl=12.139 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.389 in	
f_1=47.224 ksi, f_2=37.496 ksi	
ψ=0.794	Eq. 1.2.2-1
k=0.5097	Eq. 1.2.2-2
λ=0.66275	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.226	Eq. 1.3-7
Ia=0.00022119 in^4	Eq. 1.3-8
Is=0.00016972 in^4	
ds=0.29849 in (lip ineffective width=0.09051 in)	Eq. 1.3-6
k=3.2114	Table 1.3-1
Element 2: Partially stiffened, w=1.403 in	
f=49.567 ksi, k=3.2114	
λ=0.97563	Eq. 1.1-3
ρ=0.79385	Eq. 1.1-2
b=1.1138 in (ineffective width=0.28922 in)	Eq. 1.1-1
b_1=0.42731 in, b_2=0.68646 in	
Element 3: Treat as two unstiffened elements	
f_1=47.224 ksi, f_2=23.429 ksi	
ψ=0.49613	Eq. 1.2.2-1
k=0.69128	Eq. 1.2.2-2
λ=1.392	Eq. 1.1-3
ρ=0.60485	Eq. 1.1-2
b=0.57552 in (ineffective width=0.37598 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.18699 in	
Sxe=0.24279 in^3, Fy=50 ksi	
Mnl=12.139 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud

Element 1: Unstiffened, w=0.389 in

f_1=49.104 ksi, f_2=49.104 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.73578 Eq. 1.1-3
ρ=0.95273 Eq. 1.1-2
b=0.37061 in (ineffective width=0.018389 in) Eq. 1.1-1
Element 2: Stiffened, w=1.403 in
f_1=44.252 ksi, f_2=-28.407 ksi
ψ=0.64194 Eq. 1.1.2-1
k=16.137 Eq. 1.1.2-2
λ=0.41123 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.403 in Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25
b_1=0.38523 in Eq. 1.1.2-3
b_2=0.7015 in Eq. 1.1.2-4
Compression width=0.85448 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.389 in
f_1=49.104 ksi, f_2=49.104 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.73578 Eq. 1.1-3
ρ=0.95273 Eq. 1.1-2
b=0.37061 in (ineffective width=0.018389 in) Eq. 1.1-1
Element 4: Stiffened, w=1.403 in
f_1=44.252 ksi, f_2=-28.407 ksi
ψ=0.64194 Eq. 1.1.2-1
k=16.137 Eq. 1.1.2-2
λ=0.41123 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.403 in Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25
b_1=0.38523 in Eq. 1.1.2-3
b_2=0.7015 in Eq. 1.1.2-4
Compression width=0.85448 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=-0.0057397 in
Sye=0.083625 in^3, Fy=50 ksi
Mnl=4.1813 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.403 in
f_1=40.036 ksi, f_2=-43.399 ksi
ψ=1.084 Eq. 1.1.2-1
k=26.27 Eq. 1.1.2-2

λ=0.30657	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.403 in	Eq. 1.1-1
h_o=1.625 in, b_o=3.625 in, h_o/b_o=0.44828	
b_1=0.34354 in	Eq. 1.1.2-3
b_2=0.7015 in	Eq. 1.1.2-4
Compression width=0.67323 in	
b_1+b_2 > compression width (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=45.609 ksi, f_2=45.609 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.7345	Eq. 1.1-3
ρ=0.50341	Eq. 1.1-2
b=0.479 in (ineffective width=0.4725 in)	Eq. 1.1-1
f_1=45.609 ksi, f_2=45.609 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.7345	Eq. 1.1-3
ρ=0.50341	Eq. 1.1-2
b=0.479 in (ineffective width=0.4725 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: Stiffened, w=1.403 in	
f_1=40.036 ksi, f_2=-43.399 ksi	
ψ=1.084	Eq. 1.1.2-1
k=26.27	Eq. 1.1.2-2
λ=0.30657	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.403 in	Eq. 1.1-1
h_o=1.625 in, b_o=3.625 in, h_o/b_o=0.44828	
b_1=0.34354 in	Eq. 1.1.2-3
b_2=0.7015 in	Eq. 1.1.2-4
Compression width=0.67323 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0.11935 in	
Sye=0.078078 in^3, Fy=50 ksi	
Mnl=3.9039 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud

Cw=0.27815 in^6, Wn=2.5638 in^2, Fy=50 ksi	
Bn=5.4246 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.33977 in²	Wt.	0.0011552 k/ft	Flat	7.5336 in
Ix	0.7099 in⁴	rx	1.4455 in	Ixy	0.0000 in⁴
Sx(t)	0.39169 in³	y(t)	1.8125 in	α	0.000 deg
Sx(b)	0.39169 in³	y(b)	1.8125 in		
Zx	0.45331 in³	Height	3.6250 in		
Iy	0.1269 in⁴	ry	0.6111 in	x_o	-1.2948 in
Sy(l)	0.23621 in³	x(l)	0.5373 in	y_o	0.0000 in
Sy(r)	0.11667 in³	x(r)	1.0877 in	jx	2.0638 in
Zy	0.17319 in³	Width	1.6250 in	jy	0.0000 in
I_1	0.7099 in⁴	r_1	1.4455 in	Cw	0.35980 in⁶
I_2	0.1269 in⁴	r_2	0.6111 in	J	0.00023036 in⁴
Ic	0.8368 in⁴	rc	1.5694 in		
I_o	1.4065 in⁴	r_o	2.0346 in		

Net Section Properties

Ix	0.6972 in⁴	rx	1.6007 in	Area	0.27212 in²
Sx(t)	0.38469 in³	y(t)	1.8125 in	Ixy	0.0000 in⁴
Sx(b)	0.38469 in³	y(b)	1.8125 in	α	0.000 deg
Zx	0.42794 in³				
Iy	0.1045 in⁴	ry	0.6197 in	x_o	-1.4369 in
Sy(l)	0.15712 in³	x(l)	0.6652 in	y_o	0.0000 in
Sy(r)	0.10889 in³	x(r)	0.9598 in	jx	1.8246 in
Zy	0.15146 in³			jy	0.0000 in
Ic	0.8018 in⁴	rc	1.7165 in	Cw	0.35194 in⁶
I_o	1.3636 in⁴	r_o	2.2386 in	J	0.00018450 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	8.775 k	ϕMnxo	14.925 k-in	ϕMnyo	5.571 k-in
Ae	0.20647 in²	Ixe	0.64623 in⁴	Iye	0.10451 in⁴
ϕTn	13.266 k	Sxe(t)	0.33166 in³	Sye(l)	0.15712 in³
		Sxe(b)	0.38546 in³	Sye(r)	0.10889 in³
Shear					
ϕVny	0.883 k	Negative Bending		Negative Bending	
ϕVnx	3.391 k	ϕMnxo	14.925 k-in	ϕMnyo	4.641 k-in
		Ixe	0.64623 in⁴	Iye	0.09105 in⁴
Torsion		Sxe(t)	0.38546 in³	Sye(l)	0.12268 in³
ϕBn	6.2544 k-in²	Sxe(b)	0.33166 in³	Sye(r)	0.10314 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=51.93 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=54.31 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=56.847 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.33977 in², Fy=51.93 ksi

Tn=17.644 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.27212 in², Fu=65 ksi	
Tn=17.688 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=1.8839 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=1.5693 k	Eq. G3-2
kv=3.528	Eq. G3-8
Vcrh=1.0624 k	Eq. G3-6
Vn=0.98154 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=1.8839 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3837 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56184	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00048546 in⁴	Eq. 1.3-8
Is=0.00021231 in⁴	
ds=0.16781 in (lip ineffective width=0.21589 in)	Eq. 1.3-6
k=2.725	Table 1.3-1
Element 2: Partially stiffened, w=1.3924 in	
f=50 ksi, k=2.725	
λ=0.80992	Eq. 1.1-3
ρ=0.89931	Eq. 1.1-2
b=1.2522 in (ineffective width=0.1402 in)	Eq. 1.1-1
b_1=0.27382 in, b_2=0.97838 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.3855	Eq. 1.1-3
ρ=0.60715	Eq. 1.1-2
b=0.57449 in (ineffective width=0.37171 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=1.3855	Eq. 1.1-3
ρ=0.60715	Eq. 1.1-2
b=0.57449 in (ineffective width=0.37171 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.3837 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56184	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00048546 in^4	Eq. 1.3-8
Is=0.00021231 in^4	
ds=0.16781 in (lip ineffective width=0.21589 in)	Eq. 1.3-6
k=2.725	Table 1.3-1
Element 4: Partially stiffened, w=1.3924 in	
f=50 ksi, k=2.725	
λ=0.80992	Eq. 1.1-3
ρ=0.89931	Eq. 1.1-2
b=1.2522 in (ineffective width=0.1402 in)	Eq. 1.1-1
b_1=0.27382 in, b_2=0.97838 in	
Ae=0.20647 in^2, Fn=50 ksi	
Pn=10.323 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=47.016 ksi, f_2=22.734 ksi	
ψ=0.48355	Eq. 1.2.2-1
k=0.70184	Eq. 1.2.2-2
λ=1.0516	Eq. 1.1-3
ρ=0.75198	Eq. 1.1-2
b=0.71153 in (ineffective width=0.23467 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.3837 in	
f_1=47.016 ksi, f_2=37.169 ksi	
ψ=0.79057	Eq. 1.2.2-1
k=0.51125	Eq. 1.2.2-2
λ=0.49966	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.273	Eq. 1.3-7
Ia=0.00047295 in^4	Eq. 1.3-8
Is=0.00021231 in^4	
ds=0.17225 in (lip ineffective width=0.21145 in)	Eq. 1.3-6
k=2.7424	Table 1.3-1
Element 4: Partially stiffened, w=1.3924 in	

f=49.421 ksi, k=2.7424
λ=0.80265 Eq. 1.1-3
ρ=0.90439 Eq. 1.1-2
b=1.2593 in (ineffective width=0.13313 in) Eq. 1.1-1
b_1=0.28265 in, b_2=0.97662 in
Center of gravity shift: y=-0.13599 in
Sxe=0.33166 in^3, Fy=50 ksi
Mnl=16.583 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3837 in
f_1=47.016 ksi, f_2=37.169 ksi
ψ=0.79057 Eq. 1.2.2-1
k=0.51125 Eq. 1.2.2-2
λ=0.49966 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.273 Eq. 1.3-7
Ia=0.00047295 in^4 Eq. 1.3-8
Is=0.00021231 in^4
ds=0.17225 in (lip ineffective width=0.21145 in) Eq. 1.3-6
k=2.7424 Table 1.3-1
Element 2: Partially stiffened, w=1.3924 in
f=49.421 ksi, k=2.7424
λ=0.80265 Eq. 1.1-3
ρ=0.90439 Eq. 1.1-2
b=1.2593 in (ineffective width=0.13313 in) Eq. 1.1-1
b_1=0.28265 in, b_2=0.97662 in
Element 3: Treat as two unstiffened elements
f_1=47.016 ksi, f_2=22.734 ksi
ψ=0.48355 Eq. 1.2.2-1
k=0.70184 Eq. 1.2.2-2
λ=1.0516 Eq. 1.1-3
ρ=0.75198 Eq. 1.1-2
b=0.71153 in (ineffective width=0.23467 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0.13599 in
Sxe=0.33166 in^3, Fy=50 ksi
Mnl=16.583 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3837 in
f_1=55.511 ksi, f_2=55.511 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3

λ=0.592	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=1.3924 in	
f_1=49.959 ksi, f_2=-32.511 ksi	
ψ=0.65076	Eq. 1.1.2-1
k=16.298	Eq. 1.1.2-2
λ=0.33103	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.3924 in	Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25	
b_1=0.3814 in	Eq. 1.1.2-3
b_2=0.6962 in	Eq. 1.1.2-4
Compression width=0.84349 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.3837 in	
f_1=55.511 ksi, f_2=55.511 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.592	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Stiffened, w=1.3924 in	
f_1=49.959 ksi, f_2=-32.511 ksi	
ψ=0.65076	Eq. 1.1.2-1
k=16.298	Eq. 1.1.2-2
λ=0.33103	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.3924 in	Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25	
b_1=0.3814 in	Eq. 1.1.2-3
b_2=0.6962 in	Eq. 1.1.2-4
Compression width=0.84349 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0 in	
Sye=0.10889 in^3, Fy=56.847 ksi	
Mnl=6.1903 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: Stiffened, w=1.3924 in	
f_1=35.418 ksi, f_2=-43.415 ksi	
ψ=1.2258	Eq. 1.1.2-1
k=30.505	Eq. 1.1.2-2
λ=0.20373	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.3924 in	Eq. 1.1-1
h_o=1.625 in, b_o=3.625 in, h_o/b_o=0.44828	
b_1=0.3295 in	Eq. 1.1.2-3

b_2=0.6962 in	Eq. 1.1.2-4
Compression width=0.62557 in	
b_1+b_2 > compression width (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=40.726 ksi, f_2=40.726 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.2504	Eq. 1.1-3
ρ=0.65902	Eq. 1.1-2
b=0.62357 in (ineffective width=0.32263 in)	Eq. 1.1-1
f_1=40.726 ksi, f_2=40.726 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.2504	Eq. 1.1-3
ρ=0.65902	Eq. 1.1-2
b=0.62357 in (ineffective width=0.32263 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: Stiffened, w=1.3924 in	
f_1=35.418 ksi, f_2=-43.415 ksi	
ψ=1.2258	Eq. 1.1.2-1
k=30.505	Eq. 1.1.2-2
λ=0.20373	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.3924 in	Eq. 1.1-1
h_o=1.625 in, b_o=3.625 in, h_o/b_o=0.44828	
b_1=0.3295 in	Eq. 1.1.2-3
b_2=0.6962 in	Eq. 1.1.2-4
Compression width=0.62557 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0.076959 in	
Sye=0.10314 in^3, Fy=50 ksi	
Mnl=5.1568 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud

Cw=0.35194 in^6, Wn=2.5322 in^2, Fy=50 ksi	
Bn=6.9493 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.42191 in²	Wt.	0.0014345 k/ft	Flat	7.4543 in
Ix	0.8730 in⁴	rx	1.4385 in	Ixy	0.0000 in⁴
Sx(t)	0.48167 in³	y(t)	1.8125 in	α	0.000 deg
Sx(b)	0.48167 in³	y(b)	1.8125 in		
Zx	0.55986 in³	Height	3.6250 in		
Iy	0.1543 in⁴	ry	0.6048 in	x_o	-1.2798 in
Sy(l)	0.28777 in³	x(l)	0.5363 in	y_o	0.0000 in
Sy(r)	0.14177 in³	x(r)	1.0887 in	jx	2.0547 in
Zy	0.21235 in³	Width	1.6250 in	jy	0.0000 in
I_1	0.8730 in⁴	r_1	1.4385 in	Cw	0.43256 in⁶
I_2	0.1543 in⁴	r_2	0.6048 in	J	0.0004505 in⁴
Ic	1.0274 in⁴	rc	1.5605 in		
I_o	1.7185 in⁴	r_o	2.0182 in		

Net Section Properties

Ix	0.8571 in⁴	rx	1.5948 in	Area	0.33701 in²
Sx(t)	0.47288 in³	y(t)	1.8125 in	Ixy	0.0000 in⁴
Sx(b)	0.47288 in³	y(b)	1.8125 in	α	0.000 deg
Zx	0.52802 in³				
Iy	0.1269 in⁴	ry	0.6136 in	x_o	-1.4222 in
Sy(l)	0.19100 in³	x(l)	0.6643 in	y_o	0.0000 in
Sy(r)	0.13208 in³	x(r)	0.9607 in	jx	1.8136 in
Zy	0.18557 in³			jy	0.0000 in
Ic	0.9840 in⁴	rc	1.7087 in	Cw	0.42290 in⁶
I_o	1.6656 in⁴	r_o	2.2231 in	J	0.00035988 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	12.562 k	ϕMnxo	20.437 k-in	ϕMnyo	6.944 k-in
Ae	0.29557 in²	Ixe	0.84111 in⁴	Iye	0.12689 in⁴
ϕTn	16.429 k	Sxe(t)	0.45415 in³	Sye(l)	0.19100 in³
		Sxe(b)	0.47442 in³	Sye(r)	0.13208 in³
Shear					
ϕVny	1.329 k	Negative Bending		Negative Bending	
ϕVnx	4.102 k	ϕMnxo	20.437 k-in	ϕMnyo	5.803 k-in
		Ixe	0.84111 in⁴	Iye	0.11934 in⁴
Torsion		Sxe(t)	0.47442 in³	Sye(l)	0.17061 in³
ϕBn	7.6264 k-in²	Sxe(b)	0.45415 in³	Sye(r)	0.12895 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=52.422 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=55.318 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=58.416 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.42191 in², Fy=52.422 ksi

Tn=22.117 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.33701 in², Fu=65 ksi	
Tn=21.906 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=2.2787 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=1.8881 k	Eq. G3-2
kv=3.5079	Eq. G3-8
Vcrh=2.0846 k	Eq. G3-6
Vn=1.4767 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=2.2787 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3585 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41829	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00033614 in⁴	Eq. 1.3-8
Is=0.00021732 in⁴	
ds=0.23177 in (lip ineffective width=0.12673 in)	Eq. 1.3-6
k=2.9231	Table 1.3-1
Element 2: Partially stiffened, w=1.342 in	
f=50 ksi, k=2.9231	
λ=0.60055	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.0746	Eq. 1.1-3
ρ=0.74007	Eq. 1.1-2
b=0.6816 in (ineffective width=0.2394 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.0746	Eq. 1.1-3

ρ=0.74007	Eq. 1.1-2
b=0.6816 in (ineffective width=0.2394 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.3585 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41829	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00033614 in^4	Eq. 1.3-8
Is=0.00021732 in^4	
ds=0.23177 in (lip ineffective width=0.12673 in)	Eq. 1.3-6
k=2.9231	Table 1.3-1
Element 4: Partially stiffened, w=1.342 in	
f=50 ksi, k=2.9231	
λ=0.60055	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Ae=0.29557 in^2, Fn=50 ksi	
Pn=14.778 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=46.178 ksi, f_2=21.304 ksi	
ψ=0.46135	Eq. 1.2.2-1
k=0.72128	Eq. 1.2.2-2
λ=0.79737	Eq. 1.1-3
ρ=0.9081	Eq. 1.1-2
b=0.83636 in (ineffective width=0.084639 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.3585 in	
f_1=46.178 ksi, f_2=36.496 ksi	
ψ=0.79033	Eq. 1.2.2-1
k=0.51136	Eq. 1.2.2-2
λ=0.36862	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.331	Eq. 1.3-7
Ia=0.00032275 in^4	Eq. 1.3-8
Is=0.00021732 in^4	
ds=0.24139 in (lip ineffective width=0.11711 in)	Eq. 1.3-6
k=2.9616	Table 1.3-1
Element 4: Partially stiffened, w=1.342 in	
f=49.236 ksi, k=2.9616	
λ=0.59206	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Center of gravity shift: y=-0.039569 in	

Sxe=0.45415 in³, Fy=50 ksi
Mnl=22.707 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3585 in
f_1=46.178 ksi, f_2=36.496 ksi
ψ=0.79033 — Eq. 1.2.2-1
k=0.51136 — Eq. 1.2.2-2
λ=0.36862 — Eq. 1.1-3
λ<0.673 (fully effective) — Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.331 — Eq. 1.3-7
Ia=0.00032275 in⁴ — Eq. 1.3-8
Is=0.00021732 in⁴
ds=0.24139 in (lip ineffective width=0.11711 in) — Eq. 1.3-6
k=2.9616 — Table 1.3-1
Element 2: Partially stiffened, w=1.342 in
f=49.236 ksi, k=2.9616
λ=0.59206 — Eq. 1.1-3
λ<0.673 (fully effective) — Eq. 1.1-1
Element 3: Treat as two unstiffened elements
f_1=46.178 ksi, f_2=21.304 ksi
ψ=0.46135 — Eq. 1.2.2-1
k=0.72128 — Eq. 1.2.2-2
λ=0.79737 — Eq. 1.1-3
ρ=0.9081 — Eq. 1.1-2
b=0.83636 in (ineffective width=0.084639 in) — Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0.039569 in
Sxe=0.45415 in³, Fy=50 ksi
Mnl=22.707 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3585 in
f_1=56.695 ksi, f_2=56.695 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.44541 — Eq. 1.1-3
λ<0.673 (fully effective) — Eq. 1.1-1
Element 2: Stiffened, w=1.342 in
f_1=49.812 ksi, f_2=-31.792 ksi
ψ=0.63825 — Eq. 1.1.2-1
k=16.07 — Eq. 1.1.2-2
λ=0.25565 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2

be=1.342 in	Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25	
b_1=0.36886 in	Eq. 1.1.2-3
b_2=0.671 in	Eq. 1.1.2-4
Compression width=0.81917 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.3585 in	
f_1=56.695 ksi, f_2=56.695 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.44541	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Stiffened, w=1.342 in	
f_1=49.812 ksi, f_2=-31.792 ksi	
ψ=0.63825	Eq. 1.1.2-1
k=16.07	Eq. 1.1.2-2
λ=0.25565	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.342 in	Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25	
b_1=0.36886 in	Eq. 1.1.2-3
b_2=0.671 in	Eq. 1.1.2-4
Compression width=0.81917 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0 in	
Sye=0.13208 in^3, Fy=58.416 ksi	
Mnl=7.7156 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: Stiffened, w=1.342 in	
f_1=30.081 ksi, f_2=-42.362 ksi	
ψ=1.4082	Eq. 1.1.2-1
k=36.751	Eq. 1.1.2-2
λ=0.13137	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.342 in	Eq. 1.1-1
h_o=1.625 in, b_o=3.625 in, h_o/b_o=0.44828	
b_1=0.30443 in	Eq. 1.1.2-3
b_2=0.671 in	Eq. 1.1.2-4
Compression width=0.55725 in	
b_1+b_2 > compression width (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=36.192 ksi, f_2=36.192 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.91425	Eq. 1.1-3

ρ=0.83059	Eq. 1.1-2
b=0.76497 in (ineffective width=0.15603 in)	Eq. 1.1-1
f_1=36.192 ksi, f_2=36.192 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.91425	Eq. 1.1-3
ρ=0.83059	Eq. 1.1-2
b=0.76497 in (ineffective width=0.15603 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: Stiffened, w=1.342 in	
f_1=30.081 ksi, f_2=-42.362 ksi	
ψ=1.4082	Eq. 1.1.2-1
k=36.751	Eq. 1.1.2-2
λ=0.13137	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.342 in	Eq. 1.1-1
h_o=1.625 in, b_o=3.625 in, h_o/b_o=0.44828	
b_1=0.30443 in	Eq. 1.1.2-3
b_2=0.671 in	Eq. 1.1.2-4
Compression width=0.55725 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0.035177 in	
Sye=0.12895 in^3, Fy=50 ksi	
Mnl=6.4474 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud

Cw=0.4229 in^6, Wn=2.4953 in^2, Fy=50 ksi	
Bn=8.4738 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.52370 in²	Wt.	0.0017806 k/ft	Flat	7.3451 in
Ix	1.0693 in⁴	rx	1.4289 in	Ixy	0.0000 in⁴
Sx(t)	0.58997 in³	y(t)	1.8125 in	α	0.000 deg
Sx(b)	0.58997 in³	y(b)	1.8125 in		
Zx	0.68977 in³	Height	3.6250 in		
Iy	0.1862 in⁴	ry	0.5963 in	x_o	-1.2599 in
Sy(l)	0.34820 in³	x(l)	0.5349 in	y_o	0.0000 in
Sy(r)	0.17084 in³	x(r)	1.0901 in	jx	2.0433 in
Zy	0.25908 in³	Width	1.6250 in	jy	0.0000 in
I_1	1.0693 in⁴	r_1	1.4289 in	Cw	0.51369 in⁶
I_2	0.1862 in⁴	r_2	0.5963 in	J	0.0008874 in⁴
Ic	1.2556 in⁴	rc	1.5484 in		
I_o	2.0869 in⁴	r_o	1.9962 in		

Net Section Properties

Ix	1.0493 in⁴	rx	1.5867 in	Area	0.41675 in²
Sx(t)	0.57891 in³	y(t)	1.8125 in	Ixy	0.0000 in⁴
Sx(b)	0.57891 in³	y(b)	1.8125 in	α	0.000 deg
Zx	0.64966 in³				
Iy	0.1527 in⁴	ry	0.6053 in	x_o	-1.4026 in
Sy(l)	0.23032 in³	x(l)	0.6630 in	y_o	0.0000 in
Sy(r)	0.15873 in³	x(r)	0.9620 in	jx	1.7994 in
Zy	0.22613 in³			jy	0.0000 in
Ic	1.2020 in⁴	rc	1.6983 in	Cw	0.50186 in⁶
I_o	2.0218 in⁴	r_o	2.2026 in	J	0.0007062 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	17.138 k	ϕMnxo	28.801 k-in	ϕMnyo	8.631 k-in
Ae	0.40326 in²	Ixe	1.0493 in⁴	Iye	0.1527 in⁴
ϕTn	20.317 k	Sxe(t)	0.57891 in³	Sye(l)	0.23032 in³
		Sxe(b)	0.57891 in³	Sye(r)	0.15873 in³
Shear					
ϕVny	1.877 k	Negative Bending		Negative Bending	
ϕVnx	4.884 k	ϕMnxo	28.801 k-in	ϕMnyo	7.143 k-in
		Ixe	1.0493 in⁴	Iye	0.1527 in⁴
Torsion		Sxe(t)	0.57891 in³	Sye(l)	0.23032 in³
ϕBn	9.2285 k-in²	Sxe(b)	0.57891 in³	Sye(r)	0.15873 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Fya=53.096 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Fya=56.625 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=55.279 ksi	
Max net section stress allowed for positive bending: Fya=55.279 ksi	
Max compression stress allowed for negative bending: Fya=55.279 ksi	
Max net section stress allowed for negative bending: Fya=55.279 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Fya=60.418 ksi	Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi	

Axial Tension Strength

Ag=0.5237 in², Fy=53.096 ksi	
Tn=27.807 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.41675 in², Fu=65 ksi	
Tn=27.089 k	Eq. D3-1
Ωt=2, ϕt=0.75	

Shear Strength

Stud element 2	
Vn=2.7135 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=2.231 k	Eq. G3-2
kv=3.4775	Eq. G3-8
Vcrh=4.1182 k	Eq. G3-6
Vn=2.0857 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=2.7135 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	

Axial Compression Strength

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3218 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.29806	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00015029 in⁴	Eq. 1.3-8
Is=0.000198 in⁴ > Ia (no lip reduction)	
k=3.2793	Table 1.3-1
Element 2: Partially stiffened, w=1.2686 in	
f=50 ksi, k=3.2793	
λ=0.42548	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.81905	Eq. 1.1-3
ρ=0.89298	Eq. 1.1-2
b=0.78966 in (ineffective width=0.094638 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3

λ=0.81905	Eq. 1.1-3
ρ=0.89298	Eq. 1.1-2
b=0.78966 in (ineffective width=0.094638 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.3218 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.29806	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00015029 in^4	Eq. 1.3-8
Is=0.000198 in^4 > Ia (no lip reduction)	
k=3.2793	Table 1.3-1
Element 4: Partially stiffened, w=1.2686 in	
f=50 ksi, k=3.2793	
λ=0.42548	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Ae=0.40326 in^2, Fn=50 ksi	
Pn=20.163 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=49.844 ksi, f_2=22.874 ksi	
ψ=0.45891	Eq. 1.2.2-1
k=0.72348	Eq. 1.2.2-2
λ=0.63045	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 5: Unstiffened, w=0.3218 in	
f_1=49.844 ksi, f_2=40.03 ksi	
ψ=0.8031	Eq. 1.2.2-1
k=0.50564	Eq. 1.2.2-2
λ=0.27443	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=29.864	Eq. 1.3-7
Ia=0.00019798 in^4	Eq. 1.3-8
Is=0.000198 in^4 > Ia (no lip reduction)	
k=3.2793	Table 1.3-1
Element 4: Partially stiffened, w=1.2686 in	
f=54.192 ksi, k=3.2793	
λ=0.44296	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Center of gravity shift: y=0 in	
Sxe=0.57891 in^3, Fy=55.279 ksi	
Mnl=32.001 k-in	Eq. F3.1-1

Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3218 in
f_1=49.844 ksi, f_2=40.03 ksi
ψ=0.8031 Eq. 1.2.2-1
k=0.50564 Eq. 1.2.2-2
λ=0.27443 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=29.864 Eq. 1.3-7
Ia=0.00019798 in^4 Eq. 1.3-8
Is=0.000198 in^4 > Ia (no lip reduction)
k=3.2793 Table 1.3-1
Element 2: Partially stiffened, w=1.2686 in
f=54.192 ksi, k=3.2793
λ=0.44296 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 3: Treat as two unstiffened elements
f_1=49.844 ksi, f_2=22.874 ksi
ψ=0.45891 Eq. 1.2.2-1
k=0.72348 Eq. 1.2.2-2
λ=0.63045 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0 in
Sxe=0.57891 in^3, Fy=55.279 ksi
Mnl=32.001 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3218 in
f_1=58.179 ksi, f_2=58.179 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.32151 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 2: Stiffened, w=1.2686 in
f_1=49.227 ksi, f_2=-30.446 ksi
ψ=0.61848 Eq. 1.1.2-1
k=15.716 Eq. 1.1.2-2
λ=0.19285 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.2686 in Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25
b_1=0.35059 in Eq. 1.1.2-3
b_2=0.6343 in Eq. 1.1.2-4

```
      Compression width=0.78382 in
      b₁+b₂ > compression width (fully effective)
    Element 3: No compressive stress (fully effective)
    Element 5: Unstiffened, w=0.3218 in
      f₁=58.179 ksi, f₂=58.179 ksi
      ψ=1                                                Eq. 1.2.2-1
      k=0.43                                             Eq. 1.2.2-3
      λ=0.32151                                          Eq. 1.1-3
      λ<0.673 (fully effective)                          Eq. 1.1-1
    Element 4: Stiffened, w=1.2686 in
      f₁=49.227 ksi, f₂=-30.446 ksi
      ψ=0.61848                                          Eq. 1.1.2-1
      k=15.716                                           Eq. 1.1.2-2
      λ=0.19285                                          Eq. 1.1-3
      ρ=1                                                Eq. 1.1-2
      be=1.2686 in                                       Eq. 1.1-1
      h₀=1.625 in, b₀=0.5 in, h₀/b₀=3.25
      b₁=0.35059 in                                      Eq. 1.1.2-3
      b₂=0.6343 in                                       Eq. 1.1.2-4
      Compression width=0.78382 in
      b₁+b₂ > compression width (fully effective)
  Center of gravity shift: x=0 in
  Sye=0.15873 in³, Fy=60.418 ksi
  Mnl=9.5901 k-in                                        Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
  Effective width calculations for Stud
    Element 1: No compressive stress (fully effective)
    Element 2: Stiffened, w=1.2686 in
      f₁=25.196 ksi, f₂=-40.738 ksi
      ψ=1.6169                                           Eq. 1.1.2-1
      k=45.074                                           Eq. 1.1.2-2
      λ=0.081468                                         Eq. 1.1-3
      ρ=1                                                Eq. 1.1-2
      be=1.2686 in                                       Eq. 1.1-1
      h₀=1.625 in, b₀=3.625 in, h₀/b₀=0.44828
      b₁=0.27478 in                                      Eq. 1.1.2-3
      b₂=0.6343 in                                       Eq. 1.1.2-4
      Compression width=0.48478 in
      b₁+b₂ > compression width (fully effective)
    Element 3: Treat as two unstiffened elements
      f₁=32.605 ksi, f₂=32.605 ksi
      ψ=1                                                Eq. 1.2.2-1
      k=0.43                                             Eq. 1.2.2-3
      λ=0.6614                                           Eq. 1.1-3
      λ<0.673 (fully effective)                          Eq. 1.1-1
      f₁=32.605 ksi, f₂=32.605 ksi
      ψ=1                                                Eq. 1.2.2-1
      k=0.43                                             Eq. 1.2.2-3
      λ=0.6614                                           Eq. 1.1-3
      λ<0.673 (fully effective)                          Eq. 1.1-1
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    Element 5: No compressive stress (fully effective)
    Element 4: Stiffened, w=1.2686 in
      f₁=25.196 ksi, f₂=-40.738 ksi
      ψ=1.6169                                          Eq. 1.1.2-1
      k=45.074                                          Eq. 1.1.2-2
      λ=0.081468                                        Eq. 1.1-3
      ρ=1                                               Eq. 1.1-2
      be=1.2686 in                                      Eq. 1.1-1
      h₀=1.625 in, b₀=3.625 in, h₀/b₀=0.44828
      b₁=0.27478 in                                     Eq. 1.1.2-3
      b₂=0.6343 in                                      Eq. 1.1.2-4
      Compression width=0.48478 in
      b₁+b₂ > compression width (fully effective)
  Center of gravity shift: x=0 in
  Sye=0.15873 in³, Fy=50 ksi
  Mnl=7.9365 k-in                                       Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
  Cw=0.50186 in⁶, Wn=2.4472 in², Fy=50 ksi
  Bn=10.254 k-in²                                       G8.1-1
  Ωb=1.67, ϕb=0.9
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Full Section Properties

Area	0.26799 in²	Wt.	0.00091116 k/ft	Flat	8.5893 in
Ix	0.5868 in⁴	rx	1.4797 in	Ixy	0.0000 in⁴
Sx(t)	0.32373 in³	y(t)	1.8125 in	α	0.000 deg
Sx(b)	0.32373 in³	y(b)	1.8125 in		
Zx	0.36915 in³	Height	3.6250 in		
Iy	0.1604 in⁴	ry	0.7735 in	x_o	-1.7447 in
Sy(l)	0.22032 in³	x(l)	0.7278 in	y_o	0.0000 in
Sy(r)	0.12604 in³	x(r)	1.2722 in	jx	2.3405 in
Zy	0.18127 in³	Width	2.0000 in	jy	0.0000 in
I_1	0.5868 in⁴	r_1	1.4797 in	Cw	0.50738 in⁶
I_2	0.1604 in⁴	r_2	0.7735 in	J	0.00008696 in⁴
Ic	0.7471 in⁴	rc	1.6697 in		
I_o	1.5628 in⁴	r_o	2.4149 in		

Net Section Properties

Ix	0.5780 in⁴	rx	1.6165 in	Area	0.22119 in²
Sx(t)	0.31889 in³	y(t)	1.8125 in	Ixy	0.0000 in⁴
Sx(b)	0.31889 in³	y(b)	1.8125 in	α	0.000 deg
Zx	0.35160 in³				
Iy	0.1316 in⁴	ry	0.7713 in	x_o	-1.9110 in
Sy(l)	0.14978 in³	x(l)	0.8785 in	y_o	0.0000 in
Sy(r)	0.11733 in³	x(r)	1.1215 in	jx	2.1652 in
Zy	0.15422 in³			jy	0.0000 in
Ic	0.7096 in⁴	rc	1.7911 in	Cw	0.49789 in⁶
I_o	1.5174 in⁴	r_o	2.6192 in	J	0.00007177 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	5.875 k	ϕMnxo	10.244 k-in	ϕMnyo	4.661 k-in
Ae	0.13825 in²	Ixe	0.47886 in⁴	Iye	0.12074 in⁴
ϕTn	10.783 k	Sxe(t)	0.22765 in³	Sye(l)	0.14475 in³
		Sxe(b)	0.31473 in³	Sye(r)	0.10357 in³
Shear					
ϕVny	0.420 k	Negative Bending		Negative Bending	
ϕVnx	2.609 k	ϕMnxo	10.244 k-in	ϕMnyo	4.485 k-in
		Ixe	0.47886 in⁴	Iye	0.10266 in⁴
Torsion		Sxe(t)	0.31473 in³	Sye(l)	0.09967 in³
ϕBn	6.4284 k-in²	Sxe(b)	0.22765 in³	Sye(r)	0.10584 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Fya=51.281 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Fya=52.65 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Fya=54.15 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength

```
  Ag=0.26799 in², Fy=51.281 ksi
  Tn=13.743 k                                                    Eq. D2-1
  Ωt=1.67, ϕt=0.9

  An=0.22119 in², Fu=65 ksi
  Tn=14.377 k                                                    Eq. D3-1
  Ωt=2, ϕt=0.75

Shear Strength
  Stud element 2
    Vn=1.4492 k at 180 deg                                       Eq. G2.1-2
    Ωv=1.67, ϕv=0.9
  Stud element 3
    Vyh=1.0982 k                                                 Eq. G3-2
    kv=3.5962                                                    Eq. G3-8
    Vcrh=0.35866 k                                               Eq. G3-6
    Vn=0.46652 k at 90 deg                                       Eq. G2.1-2
    Ωv=1.67, ϕv=0.9
    Stud element 4
      Vn=1.4492 k at 0 deg                                       Eq. G2.1-2
      Ωv=1.67, ϕv=0.9

Axial Compression Strength
  Effective width calculations for Stud
    Element 1: Unstiffened, w=0.5157 in
      f₁=50 ksi, f₂=50 ksi
      ψ=1                                                        Eq. 1.2.2-1
      k=0.43                                                     Eq. 1.2.2-3
      λ=1.0916                                                   Eq. 1.1-3
      ρ=0.73148                                                  Eq. 1.1-2
      b=0.37723 in (ineffective width=0.13847 in)                Eq. 1.1-1
    Element 2: Check for lip stiffener reduction
      S=31.091                                                   Eq. 1.3-7
      Ia=0.00020486 in⁴                                          Eq. 1.3-8
      Is=0.00035659 in⁴ > Ia (no lip reduction)
      k=3.4958                                                   Table 1.3-1
    Element 2: Partially stiffened, w=1.7814 in
      f=50 ksi, k=3.4958
      λ=1.3224                                                   Eq. 1.1-3
      ρ=0.63039                                                  Eq. 1.1-2
      b=1.123 in (ineffective width=0.65843 in)                  Eq. 1.1-1
      b₁=0.56148 in, b₂=0.56148 in
    Element 3: Treat as two unstiffened elements
      f₁=50 ksi, f₂=50 ksi
      ψ=1                                                        Eq. 1.2.2-1
      k=0.43                                                     Eq. 1.2.2-3
      λ=2.0176                                                   Eq. 1.1-3
      ρ=0.4416                                                   Eq. 1.1-2
      b=0.42093 in (ineffective width=0.53227 in)                Eq. 1.1-1
      f₁=50 ksi, f₂=50 ksi
      ψ=1                                                        Eq. 1.2.2-1
```

```
      k=0.43                                                Eq. 1.2.2-3
      λ=2.0176                                              Eq. 1.1-3
      ρ=0.4416                                              Eq. 1.1-2
      b=0.42093 in (ineffective width=0.53227 in)           Eq. 1.1-1
    Element 5: Unstiffened, w=0.5157 in
      f₁=50 ksi, f₂=50 ksi
      ψ=1                                                   Eq. 1.2.2-1
      k=0.43                                                Eq. 1.2.2-3
      λ=1.0916                                              Eq. 1.1-3
      ρ=0.73148                                             Eq. 1.1-2
      b=0.37723 in (ineffective width=0.13847 in)           Eq. 1.1-1
    Element 4: Check for lip stiffener reduction
      S=31.091                                              Eq. 1.3-7
      Ia=0.00020486 in⁴                                     Eq. 1.3-8
      Is=0.00035659 in⁴ > Ia (no lip reduction)
      k=3.4958                                              Table 1.3-1
    Element 4: Partially stiffened, w=1.7814 in
      f=50 ksi, k=3.4958
      λ=1.3224                                              Eq. 1.1-3
      ρ=0.63039                                             Eq. 1.1-2
      b=1.123 in (ineffective width=0.65843 in)             Eq. 1.1-1
      b₁=0.56148 in, b₂=0.56148 in
  Ae=0.13825 in², Fn=50 ksi
  Pn=6.9123 k                                               Eq. E3.1-1
  Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
  Effective width calculations for Stud
    Element 1: No compressive stress (fully effective)
    Element 2: No compressive stress (fully effective)
    Element 3: Treat as two unstiffened elements
      f₁=47.402 ksi, f₂=24.742 ksi
      ψ=0.52197                                             Eq. 1.2.2-1
      k=0.67056                                             Eq. 1.2.2-2
      λ=1.5731                                              Eq. 1.1-3
      ρ=0.54678                                             Eq. 1.1-2
      b=0.52119 in (ineffective width=0.43201 in)           Eq. 1.1-1
    Element 5: Unstiffened, w=0.5157 in
      f₁=47.402 ksi, f₂=35.142 ksi
      ψ=0.74138                                             Eq. 1.2.2-1
      k=0.5345                                              Eq. 1.2.2-2
      λ=0.95327                                             Eq. 1.1-3
      ρ=0.80692                                             Eq. 1.1-2
      b=0.41613 in (ineffective width=0.099569 in)          Eq. 1.1-1
    Element 4: Check for lip stiffener reduction
      S=31.207                                              Eq. 1.3-7
      Ia=0.00020411 in⁴                                     Eq. 1.3-8
      Is=0.00035659 in⁴ > Ia (no lip reduction)
      k=3.4958                                              Table 1.3-1
    Element 4: Partially stiffened, w=1.7814 in
      f=49.629 ksi, k=3.4958
      λ=1.3175                                              Eq. 1.1-3
```

```
      ρ=0.63227                                          Eq. 1.1-2
      b=1.1263 in (ineffective width=0.65508 in)         Eq. 1.1-1
      b₁=0.56316 in, b₂=0.56316 in
  Center of gravity shift: y=-0.29099 in
  Sxe=0.22765 in³, Fy=50 ksi
  Mnl=11.382 k-in                                        Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
  Effective width calculations for Stud
    Element 1: Unstiffened, w=0.5157 in
      f₁=47.402 ksi, f₂=35.142 ksi
      ψ=0.74138                                          Eq. 1.2.2-1
      k=0.5345                                           Eq. 1.2.2-2
      λ=0.95327                                          Eq. 1.1-3
      ρ=0.80692                                          Eq. 1.1-2
      b=0.41613 in (ineffective width=0.099569 in)       Eq. 1.1-1
    Element 2: Check for lip stiffener reduction
      S=31.207                                           Eq. 1.3-7
      Ia=0.00020411 in⁴                                  Eq. 1.3-8
      Is=0.00035659 in⁴ > Ia (no lip reduction)
      k=3.4958                                           Table 1.3-1
    Element 2: Partially stiffened, w=1.7814 in
      f=49.629 ksi, k=3.4958
      λ=1.3175                                           Eq. 1.1-3
      ρ=0.63227                                          Eq. 1.1-2
      b=1.1263 in (ineffective width=0.65508 in)         Eq. 1.1-1
      b₁=0.56316 in, b₂=0.56316 in
    Element 3: Treat as two unstiffened elements
      f₁=47.402 ksi, f₂=24.742 ksi
      ψ=0.52197                                          Eq. 1.2.2-1
      k=0.67056                                          Eq. 1.2.2-2
      λ=1.5731                                           Eq. 1.1-3
      ρ=0.54678                                          Eq. 1.1-2
      b=0.52119 in (ineffective width=0.43201 in)        Eq. 1.1-1
    Element 5: No compressive stress (fully effective)
    Element 4: No compressive stress (fully effective)
  Center of gravity shift: y=0.29099 in
  Sxe=0.22765 in³, Fy=50 ksi
  Mnl=11.382 k-in                                        Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
  Effective width calculations for Stud
    Element 1: Unstiffened, w=0.5157 in
      f₁=49.331 ksi, f₂=49.331 ksi
      ψ=1                                                Eq. 1.2.2-1
      k=0.43                                             Eq. 1.2.2-3
      λ=1.0842                                           Eq. 1.1-3
      ρ=0.73517                                          Eq. 1.1-2
      b=0.37913 in (ineffective width=0.13657 in)        Eq. 1.1-1
    Element 2: Stiffened, w=1.7814 in
```

```
      f₁=45.312 ksi, f₂=-31.091 ksi
      ψ=0.68615                                          Eq. 1.1.2-1
      k=16.96                                            Eq. 1.1.2-2
      λ=0.57155                                          Eq. 1.1-3
      ρ=1                                                Eq. 1.1-2
      be=1.7814 in                                       Eq. 1.1-1
      h₀=2 in, b₀=0.625 in, h₀/b₀=3.2
      b₁=0.48327 in                                      Eq. 1.1.2-3
      b₂=0.8907 in                                       Eq. 1.1.2-4
      Compression width=1.0565 in
      b₁+b₂ > compression width (fully effective)
    Element 3: No compressive stress (fully effective)
    Element 5: Unstiffened, w=0.5157 in
      f₁=49.331 ksi, f₂=49.331 ksi
      ψ=1                                                Eq. 1.2.2-1
      k=0.43                                             Eq. 1.2.2-2
      λ=1.0842                                           Eq. 1.1-3
      ρ=0.73517                                          Eq. 1.1-2
      b=0.37913 in (ineffective width=0.13657 in)        Eq. 1.1-1
    Element 4: Stiffened, w=1.7814 in
      f₁=45.312 ksi, f₂=-31.091 ksi
      ψ=0.68615                                          Eq. 1.1.2-1
      k=16.96                                            Eq. 1.1.2-2
      λ=0.57155                                          Eq. 1.1-3
      ρ=1                                                Eq. 1.1-2
      be=1.7814 in                                       Eq. 1.1-1
      h₀=2 in, b₀=0.625 in, h₀/b₀=3.2
      b₁=0.48327 in                                      Eq. 1.1.2-3
      b₂=0.8907 in                                       Eq. 1.1.2-4
      Compression width=1.0565 in
      b₁+b₂ > compression width (fully effective)
  Center of gravity shift: x=-0.044316 in
  Sye=0.10357 in³, Fy=50 ksi
  Mnl=5.1785 k-in                                        Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
  Effective width calculations for Stud
    Element 1: No compressive stress (fully effective)
    Element 2: Stiffened, w=1.7814 in
      f₁=44.694 ksi, f₂=-41.781 ksi
      ψ=0.93483                                          Eq. 1.1.2-1
      k=22.356                                           Eq. 1.1.2-2
      λ=0.49441                                          Eq. 1.1-3
      ρ=1                                                Eq. 1.1-2
      be=1.7814 in                                       Eq. 1.1-1
      h₀=2 in, b₀=3.625 in, h₀/b₀=0.55172
      b₁=0.45273 in                                      Eq. 1.1.2-3
      b₂=0.8907 in                                       Eq. 1.1.2-4
      Compression width=0.9207 in
      b₁+b₂ > compression width (fully effective)
    Element 3: Treat as two unstiffened elements
```

```
      f₁=49.243 ksi, f₂=49.243 ksi
      ψ=1                                                  Eq. 1.2.2-1
      k=0.43                                               Eq. 1.2.2-3
      λ=2.0022                                             Eq. 1.1-3
      ρ=0.44456                                            Eq. 1.1-2
      b=0.42376 in (ineffective width=0.52944 in)          Eq. 1.1-1
      f₁=49.243 ksi, f₂=49.243 ksi
      ψ=1                                                  Eq. 1.2.2-1
      k=0.43                                               Eq. 1.2.2-3
      λ=2.0022                                             Eq. 1.1-3
      ρ=0.44456                                            Eq. 1.1-2
      b=0.42376 in (ineffective width=0.52944 in)          Eq. 1.1-1
    Element 5: No compressive stress (fully effective)
    Element 4: Stiffened, w=1.7814 in
      f₁=44.694 ksi, f₂=-41.781 ksi
      ψ=0.93483                                            Eq. 1.1.2-1
      k=22.356                                             Eq. 1.1.2-2
      λ=0.49441                                            Eq. 1.1-3
      ρ=1                                                  Eq. 1.1-2
      be=1.7814 in                                         Eq. 1.1-1
      h₀=2 in, b₀=3.625 in, h₀/b₀=0.55172
      b₁=0.45273 in                                        Eq. 1.1.2-3
      b₂=0.8907 in                                         Eq. 1.1.2-4
      Compression width=0.9207 in
      b₁+b₂ > compression width (fully effective)
  Center of gravity shift: x=0.15152 in
  Sye=0.099672 in³, Fy=50 ksi
  Mnl=4.9836 k-in                                          Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
  Cw=0.49789 in⁶, Wn=3.4853 in², Fy=50 ksi
  Bn=7.1426 k-in²                                          G8.1-1
  Ωb=1.67, ϕb=0.9
```

362S200-33

Full Section Properties

Area	0.29672 in²	Wt.	0.0010088 k/ft	Flat	8.5757 in
Ix	0.6484 in⁴	rx	1.4783 in	Ixy	0.0000 in⁴
Sx(t)	0.35774 in³	y(t)	1.8125 in	α	0.000 deg
Sx(b)	0.35774 in³	y(b)	1.8125 in		
Zx	0.40832 in³	Height	3.6250 in		
Iy	0.1769 in⁴	ry	0.7721 in	x_o	-1.7408 in
Sy(l)	0.24302 in³	x(l)	0.7278 in	y_o	0.0000 in
Sy(r)	0.13904 in³	x(r)	1.2722 in	jx	2.3369 in
Zy	0.20029 in³	Width	2.0000 in	jy	0.0000 in
I_1	0.6484 in⁴	r_1	1.4783 in	Cw	0.55806 in⁶
I_2	0.1769 in⁴	r_2	0.7721 in	J	0.00011841 in⁴
Ic	0.8253 in⁴	rc	1.6677 in		
I_o	1.7244 in⁴	r_o	2.4107 in		

Net Section Properties

Ix	0.6387 in⁴	rx	1.6152 in	Area	0.24482 in²
Sx(t)	0.35237 in³	y(t)	1.8125 in	Ixy	0.0000 in⁴
Sx(b)	0.35237 in³	y(b)	1.8125 in	α	0.000 deg
Zx	0.38885 in³				
Iy	0.1451 in⁴	ry	0.7699 in	x_o	-1.9071 in
Sy(l)	0.16519 in³	x(l)	0.8785 in	y_o	0.0000 in
Sy(r)	0.12939 in³	x(r)	1.1215 in	jx	2.1614 in
Zy	0.17038 in³			jy	0.0000 in
Ic	0.7838 in⁴	rc	1.7893 in	Cw	0.54758 in⁶
I_o	1.6742 in⁴	r_o	2.6151 in	J	0.00009770 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	6.995 k	ϕMnxo	12.068 k-in	ϕMnyo	5.295 k-in
Ae	0.16460 in²	Ixe	0.54959 in⁴	Iye	0.13595 in⁴
ϕTn	11.935 k	Sxe(t)	0.26818 in³	Sye(l)	0.16097 in³
		Sxe(b)	0.34880 in³	Sye(r)	0.11767 in³
Shear					
ϕVny	0.521 k	Negative Bending		Negative Bending	
ϕVnx	3.083 k	ϕMnxo	12.068 k-in	ϕMnyo	5.141 k-in
		Ixe	0.54959 in⁴	Iye	0.11609 in⁴
Torsion		Sxe(t)	0.34880 in³	Sye(l)	0.11424 in³
ϕBn	7.0948 k-in²	Sxe(b)	0.26818 in³	Sye(r)	0.11799 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Fya=51.392 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Fya=52.88 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Fya=54.513 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength

Ag=0.29672 in², Fy=51.392 ksi	
Tn=15.249 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.24482 in², Fu=65 ksi	
Tn=15.913 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=1.7129 k at 180 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=1.2145 k	Eq. G3-2
kv=3.5949	Eq. G3-8
Vcrh=0.48895 k	Eq. G3-6
Vn=0.57925 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=1.7129 k at 0 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.514 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.98104	Eq. 1.1-3
ρ=0.79074	Eq. 1.1-2
b=0.40644 in (ineffective width=0.10756 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00027958 in⁴	Eq. 1.3-8
Is=0.00039155 in⁴ > Ia (no lip reduction)	
k=3.4924	Table 1.3-1
Element 2: Partially stiffened, w=1.778 in	
f=50 ksi, k=3.4924	
λ=1.1908	Eq. 1.1-3
ρ=0.68464	Eq. 1.1-2
b=1.2173 in (ineffective width=0.56072 in)	Eq. 1.1-1
b_1=0.60864 in, b_2=0.60864 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.8161	Eq. 1.1-3
ρ=0.48393	Eq. 1.1-2
b=0.46046 in (ineffective width=0.49104 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.8161	Eq. 1.1-3
ρ=0.48393	Eq. 1.1-2
b=0.46046 in (ineffective width=0.49104 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.514 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.98104	Eq. 1.1-3
ρ=0.79074	Eq. 1.1-2
b=0.40644 in (ineffective width=0.10756 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00027958 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.4924	Table 1.3-1
Element 4: Partially stiffened, w=1.778 in	
f=50 ksi, k=3.4924	
λ=1.1908	Eq. 1.1-3
ρ=0.68464	Eq. 1.1-2
b=1.2173 in (ineffective width=0.56072 in)	Eq. 1.1-1
b_1=0.60864 in, b_2=0.60864 in	
Ae=0.1646 in^2, Fn=50 ksi	
Pn=8.2298 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=47.292 ksi, f_2=24.075 ksi	
ψ=0.50908	Eq. 1.2.2-1
k=0.68074	Eq. 1.2.2-2
λ=1.4037	Eq. 1.1-3
ρ=0.60074	Eq. 1.1-2
b=0.5716 in (ineffective width=0.3799 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.514 in	
f_1=47.292 ksi, f_2=34.75 ksi	
ψ=0.73481	Eq. 1.2.2-1
k=0.53777	Eq. 1.2.2-2
λ=0.85316	Eq. 1.1-3
ρ=0.86987	Eq. 1.1-2
b=0.44711 in (ineffective width=0.066889 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.223	Eq. 1.3-7
Ia=0.00027842 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.4924	Table 1.3-1

Element 4: Partially stiffened, w=1.778 in
f=49.578 ksi, k=3.4924
λ=1.1857 Eq. 1.1-3
ρ=0.68688 Eq. 1.1-2
b=1.2213 in (ineffective width=0.55672 in) Eq. 1.1-1
b_1=0.61064 in, b_2=0.61064 in
Center of gravity shift: y=-0.23685 in
Sxe=0.26818 in^3, Fy=50 ksi
Mnl=13.409 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.514 in
f_1=47.292 ksi, f_2=34.75 ksi
ψ=0.73481 Eq. 1.2.2-1
k=0.53777 Eq. 1.2.2-2
λ=0.85316 Eq. 1.1-3
ρ=0.86987 Eq. 1.1-2
b=0.44711 in (ineffective width=0.066889 in) Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.223 Eq. 1.3-7
Ia=0.00027842 in^4 Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)
k=3.4924 Table 1.3-1
Element 2: Partially stiffened, w=1.778 in
f=49.578 ksi, k=3.4924
λ=1.1857 Eq. 1.1-3
ρ=0.68688 Eq. 1.1-2
b=1.2213 in (ineffective width=0.55672 in) Eq. 1.1-1
b_1=0.61064 in, b_2=0.61064 in
Element 3: Treat as two unstiffened elements
f_1=47.292 ksi, f_2=24.075 ksi
ψ=0.50908 Eq. 1.2.2-1
k=0.68074 Eq. 1.2.2-2
λ=1.4037 Eq. 1.1-3
ρ=0.60074 Eq. 1.1-2
b=0.5716 in (ineffective width=0.3799 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0.23685 in
Sxe=0.26818 in^3, Fy=50 ksi
Mnl=13.409 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.514 in
f_1=49.251 ksi, f_2=49.251 ksi
ψ=1 Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=0.97367	Eq. 1.1-3
ρ=0.79498	Eq. 1.1-2
b=0.40862 in (ineffective width=0.10538 in)	Eq. 1.1-1
Element 2: Stiffened, w=1.778 in	
f_1=45.196 ksi, f_2=-31.747 ksi	
ψ=0.70241	Eq. 1.1.2-1
k=17.273	Eq. 1.1.2-2
λ=0.50907	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.778 in	Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2	
b_1=0.48023 in	Eq. 1.1.2-3
b_2=0.889 in	Eq. 1.1.2-4
Compression width=1.0444 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.514 in	
f_1=49.251 ksi, f_2=49.251 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=0.97367	Eq. 1.1-3
ρ=0.79498	Eq. 1.1-2
b=0.40862 in (ineffective width=0.10538 in)	Eq. 1.1-1
Element 4: Stiffened, w=1.778 in	
f_1=45.196 ksi, f_2=-31.747 ksi	
ψ=0.70241	Eq. 1.1.2-1
k=17.273	Eq. 1.1.2-2
λ=0.50907	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.778 in	Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2	
b_1=0.48023 in	Eq. 1.1.2-3
b_2=0.889 in	Eq. 1.1.2-4
Compression width=1.0444 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=-0.0339 in	
Sye=0.11767 in^3, Fy=50 ksi	
Mnl=5.8833 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: Stiffened, w=1.778 in	
f_1=44.538 ksi, f_2=-42.956 ksi	
ψ=0.96448	Eq. 1.1.2-1
k=23.091	Eq. 1.1.2-2
λ=0.43706	Eq. 1.1-3
ρ=1	Eq. 1.1-2

be=1.778 in	Eq. 1.1-1
h_o=2 in, b_o=3.625 in, h_o/b_o=0.55172	
b_1=0.44848 in	Eq. 1.1.2-3
b_2=0.889 in	Eq. 1.1.2-4
Compression width=0.90508 in	
b_1+b_2 > compression width (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=49.149 ksi, f_2=49.149 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.8005	Eq. 1.1-3
ρ=0.48753	Eq. 1.1-2
b=0.46388 in (ineffective width=0.48762 in)	Eq. 1.1-1
f_1=49.149 ksi, f_2=49.149 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.8005	Eq. 1.1-3
ρ=0.48753	Eq. 1.1-2
b=0.46388 in (ineffective width=0.48762 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: Stiffened, w=1.778 in	
f_1=44.538 ksi, f_2=-42.956 ksi	
ψ=0.96448	Eq. 1.1.2-1
k=23.091	Eq. 1.1.2-2
λ=0.43706	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.778 in	Eq. 1.1-1
h_o=2 in, b_o=3.625 in, h_o/b_o=0.55172	
b_1=0.44848 in	Eq. 1.1.2-3
b_2=0.889 in	Eq. 1.1.2-4
Compression width=0.90508 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0.13767 in	
Sye=0.11424 in^3, Fy=50 ksi	
Mnl=5.7122 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud

Cw=0.54758 in^6, Wn=3.4731 in^2, Fy=50 ksi	
Bn=7.8831 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.38487 in²	Wt.	0.0013086 k/ft	Flat	8.5336 in
Ix	0.8359 in⁴	rx	1.4738 in	Ixy	0.0000 in⁴
Sx(t)	0.46121 in³	y(t)	1.8125 in	α	0.000 deg
Sx(b)	0.46121 in³	y(b)	1.8125 in		
Zx	0.52795 in³	Height	3.6250 in		
Iy	0.2268 in⁴	ry	0.7676 in	x_o	-1.7287 in
Sy(l)	0.31154 in³	x(l)	0.7280 in	y_o	0.0000 in
Sy(r)	0.17829 in³	x(r)	1.2720 in	jx	2.3260 in
Zy	0.25813 in³	Width	2.0000 in	jy	0.0000 in
I_1	0.8359 in⁴	r_1	1.4738 in	Cw	0.70908 in⁶
I_2	0.2268 in⁴	r_2	0.7676 in	J	0.0002609 in⁴
Ic	1.0627 in⁴	rc	1.6617 in		
I_o	2.2128 in⁴	r_o	2.3978 in		

Net Section Properties

Ix	0.8233 in⁴	rx	1.6110 in	Area	0.31722 in²
Sx(t)	0.45421 in³	y(t)	1.8125 in	Ixy	0.0000 in⁴
Sx(b)	0.45421 in³	y(b)	1.8125 in	α	0.000 deg
Zx	0.50258 in³				
Iy	0.1859 in⁴	ry	0.7656 in	x_o	-1.8949 in
Sy(l)	0.21168 in³	x(l)	0.8784 in	y_o	0.0000 in
Sy(r)	0.16578 in³	x(r)	1.1216 in	jx	2.1498 in
Zy	0.21949 in³			jy	0.0000 in
Ic	1.0092 in⁴	rc	1.7836 in	Cw	0.69560 in⁶
I_o	2.1482 in⁴	r_o	2.6023 in	J	0.0002151 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	10.324 k	ϕMnxo	17.415 k-in	ϕMnyo	7.301 k-in
Ae	0.24291 in²	Ixe	0.75619 in⁴	Iye	0.18323 in⁴
ϕTn	15.464 k	Sxe(t)	0.38699 in³	Sye(l)	0.21045 in³
		Sxe(b)	0.45254 in³	Sye(r)	0.16224 in³
Shear					
ϕVny	0.891 k	Negative Bending		Negative Bending	
ϕVnx	4.304 k	ϕMnxo	17.415 k-in	ϕMnyo	7.016 k-in
		Ixe	0.75619 in⁴	Iye	0.15993 in⁴
Torsion		Sxe(t)	0.45254 in³	Sye(l)	0.16417 in³
ϕBn	9.1112 k-in²	Sxe(b)	0.38699 in³	Sye(r)	0.15590 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=51.704 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=53.526 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=55.542 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength

Ag=0.38487 in², Fy=51.704 ksi	
Tn=19.899 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.31722 in², Fu=65 ksi	
Tn=20.619 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=2.3913 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=1.5693 k	Eq. G3-2
kv=3.591	Eq. G3-8
Vcrh=1.0813 k	Eq. G3-6
Vn=0.99014 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=2.3913 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.74488	Eq. 1.1-3
ρ=0.94599	Eq. 1.1-2
b=0.48123 in (ineffective width=0.027474 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00062038 in⁴	Eq. 1.3-8
Is=0.00049474 in⁴	
ds=0.38377 in (lip ineffective width=0.097452 in)	Eq. 1.3-6
k=3.2601	Table 1.3-1
Element 2: Partially stiffened, w=1.7674 in	
f=50 ksi, k=3.2601	
λ=0.93989	Eq. 1.1-3
ρ=0.81492	Eq. 1.1-2
b=1.4403 in (ineffective width=0.32712 in)	Eq. 1.1-1
b_1=0.57431 in, b_2=0.86598 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.3855	Eq. 1.1-3
ρ=0.60715	Eq. 1.1-2
b=0.57449 in (ineffective width=0.37171 in)	Eq. 1.1-1

f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.3855 Eq. 1.1-3
ρ=0.60715 Eq. 1.1-2
b=0.57449 in (ineffective width=0.37171 in) Eq. 1.1-1
Element 5: Unstiffened, w=0.5087 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.74488 Eq. 1.1-3
ρ=0.94599 Eq. 1.1-2
b=0.48123 in (ineffective width=0.027474 in) Eq. 1.1-1
Element 4: Check for lip stiffener reduction
S=31.091 Eq. 1.3-7
Ia=0.00062038 in^4 Eq. 1.3-8
Is=0.00049474 in^4
ds=0.38377 in (lip ineffective width=0.097452 in) Eq. 1.3-6
k=3.2601 Table 1.3-1
Element 4: Partially stiffened, w=1.7674 in
f=50 ksi, k=3.2601
λ=0.93989 Eq. 1.1-3
ρ=0.81492 Eq. 1.1-2
b=1.4403 in (ineffective width=0.32712 in) Eq. 1.1-1
b_1=0.57431 in, b_2=0.86598 in
Ae=0.24291 in^2, Fn=50 ksi
Pn=12.146 k Eq. E3.1-1
Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: No compressive stress (fully effective)
Element 3: Treat as two unstiffened elements
f_1=47.024 ksi, f_2=22.812 ksi
ψ=0.48511 Eq. 1.2.2-1
k=0.70052 Eq. 1.2.2-2
λ=1.0527 Eq. 1.1-3
ρ=0.75141 Eq. 1.1-2
b=0.71098 in (ineffective width=0.23522 in) Eq. 1.1-1
Element 5: Unstiffened, w=0.5087 in
f_1=47.024 ksi, f_2=34.007 ksi
ψ=0.72318 Eq. 1.2.2-1
k=0.54365 Eq. 1.2.2-2
λ=0.64244 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 4: Check for lip stiffener reduction
S=31.272 Eq. 1.3-7
Ia=0.0006169 in^4 Eq. 1.3-8
Is=0.00049474 in^4

ds=0.40797 in (lip ineffective width=0.10073 in)	Eq. 1.3-6
k=3.2654	Table 1.3-1
Element 4: Partially stiffened, w=1.7674 in	
f=49.423 ksi, k=3.2654	
λ=0.93369	Eq. 1.1-3
ρ=0.81866	Eq. 1.1-2
b=1.4469 in (ineffective width=0.3205 in)	Eq. 1.1-1
b_1=0.58019 in, b_2=0.86671 in	
Center of gravity shift: y=-0.14151 in	
Sxe=0.38699 in^3, Fy=50 ksi	
Mnl=19.35 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	
f_1=47.024 ksi, f_2=34.007 ksi	
ψ=0.72318	Eq. 1.2.2-1
k=0.54365	Eq. 1.2.2-2
λ=0.64244	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.272	Eq. 1.3-7
Ia=0.0006169 in^4	Eq. 1.3-8
Is=0.00049474 in^4	
ds=0.40797 in (lip ineffective width=0.10073 in)	Eq. 1.3-6
k=3.2654	Table 1.3-1
Element 2: Partially stiffened, w=1.7674 in	
f=49.423 ksi, k=3.2654	
λ=0.93369	Eq. 1.1-3
ρ=0.81866	Eq. 1.1-2
b=1.4469 in (ineffective width=0.3205 in)	Eq. 1.1-1
b_1=0.58019 in, b_2=0.86671 in	
Element 3: Treat as two unstiffened elements	
f_1=47.024 ksi, f_2=22.812 ksi	
ψ=0.48511	Eq. 1.2.2-1
k=0.70052	Eq. 1.2.2-2
λ=1.0527	Eq. 1.1-3
ρ=0.75141	Eq. 1.1-2
b=0.71098 in (ineffective width=0.23522 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.14151 in	
Sxe=0.38699 in^3, Fy=50 ksi	
Mnl=19.35 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	

f_1=49.002 ksi, f_2=49.002 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.73741 Eq. 1.1-3
ρ=0.95152 Eq. 1.1-2
b=0.48404 in (ineffective width=0.024662 in) Eq. 1.1-1
Element 2: Stiffened, w=1.7674 in
f_1=44.851 ksi, f_2=-33.397 ksi
ψ=0.74463 Eq. 1.1.2-1
k=18.11 Eq. 1.1.2-2
λ=0.37769 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.7674 in Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2
b_1=0.47198 in Eq. 1.1.2-3
b_2=0.8837 in Eq. 1.1.2-4
Compression width=1.0131 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.5087 in
f_1=49.002 ksi, f_2=49.002 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.73741 Eq. 1.1-3
ρ=0.95152 Eq. 1.1-2
b=0.48404 in (ineffective width=0.024662 in) Eq. 1.1-1
Element 4: Stiffened, w=1.7674 in
f_1=44.851 ksi, f_2=-33.397 ksi
ψ=0.74463 Eq. 1.1.2-1
k=18.11 Eq. 1.1.2-2
λ=0.37769 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.7674 in Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2
b_1=0.47198 in Eq. 1.1.2-3
b_2=0.8837 in Eq. 1.1.2-4
Compression width=1.0131 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=-0.0077614 in
Sye=0.16224 in^3, Fy=50 ksi
Mnl=8.1121 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.7674 in
f_1=41.791 ksi, f_2=-44.333 ksi
ψ=1.0608 Eq. 1.1.2-1
k=25.626 Eq. 1.1.2-2

λ=0.30648	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.7674 in	Eq. 1.1-1
h_o=2 in, b_o=3.625 in, h_o/b_o=0.55172	
b_1=0.43523 in	Eq. 1.1.2-3
b_2=0.8837 in	Eq. 1.1.2-4
Compression width=0.85762 in	
b_1+b_2 > compression width (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=46.359 ksi, f_2=46.359 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.3341	Eq. 1.1-3
ρ=0.62596	Eq. 1.1-2
b=0.59228 in (ineffective width=0.35392 in)	Eq. 1.1-1
f_1=46.359 ksi, f_2=46.359 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.3341	Eq. 1.1-3
ρ=0.62596	Eq. 1.1-2
b=0.59228 in (ineffective width=0.35392 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: Stiffened, w=1.7674 in	
f_1=41.791 ksi, f_2=-44.333 ksi	
ψ=1.0608	Eq. 1.1.2-1
k=25.626	Eq. 1.1.2-2
λ=0.30648	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.7674 in	Eq. 1.1-1
h_o=2 in, b_o=3.625 in, h_o/b_o=0.55172	
b_1=0.43523 in	Eq. 1.1.2-3
b_2=0.8837 in	Eq. 1.1.2-4
Compression width=0.85762 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0.095767 in	
Sye=0.1559 in^3, Fy=50 ksi	
Mnl=7.7952 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud

Cw=0.6956 in^6, Wn=3.4355 in^2, Fy=50 ksi	
Bn=10.124 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.47851 in²	Wt.	0.0016269 k/ft	Flat	8.4543 in
Ix	1.0303 in⁴	rx	1.4674 in	Ixy	0.0000 in⁴
Sx(t)	0.56844 in³	y(t)	1.8125 in	α	0.000 deg
Sx(b)	0.56844 in³	y(b)	1.8125 in		
Zx	0.65328 in³	Height	3.6250 in		
Iy	0.2775 in⁴	ry	0.7615 in	x_o	-1.7139 in
Sy(l)	0.38165 in³	x(l)	0.7270 in	y_o	0.0000 in
Sy(r)	0.21797 in³	x(r)	1.2730 in	jx	2.3146 in
Zy	0.31803 in³	Width	2.0000 in	jy	0.0000 in
I_1	1.0303 in⁴	r_1	1.4674 in	Cw	0.85827 in⁶
I_2	0.2775 in⁴	r_2	0.7615 in	J	0.0005110 in⁴
Ic	1.3078 in⁴	rc	1.6532 in		
I_o	2.7133 in⁴	r_o	2.3812 in		

Net Section Properties

Ix	1.0144 in⁴	rx	1.6053 in	Area	0.39361 in²
Sx(t)	0.55965 in³	y(t)	1.8125 in	Ixy	0.0000 in⁴
Sx(b)	0.55965 in³	y(b)	1.8125 in	α	0.000 deg
Zx	0.62145 in³				
Iy	0.2271 in⁴	ry	0.7595 in	x_o	-1.8805 in
Sy(l)	0.25868 in³	x(l)	0.8777 in	y_o	0.0000 in
Sy(r)	0.20232 in³	x(r)	1.1223 in	jx	2.1373 in
Zy	0.27003 in³			jy	0.0000 in
Ic	1.2414 in⁴	rc	1.7759 in	Cw	0.84161 in⁶
I_o	2.6334 in⁴	r_o	2.5866 in	J	0.0004203 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	13.653 k	ϕMnxo	22.592 k-in	ϕMnyo	10.347 k-in
Ae	0.32124 in²	Ixe	0.95919 in⁴	Iye	0.22706 in⁴
ϕTn	19.189 k	Sxe(t)	0.50203 in³	Sye(l)	0.25868 in³
		Sxe(b)	0.55949 in³	Sye(r)	0.20232 in³
Shear					
ϕVny	1.339 k	Negative Bending		Negative Bending	
ϕVnx	5.248 k	ϕMnxo	22.592 k-in	ϕMnyo	8.826 k-in
		Ixe	0.95919 in⁴	Iye	0.21027 in⁴
Torsion		Sxe(t)	0.55949 in³	Sye(l)	0.22660 in³
ϕBn	11.166 k-in²	Sxe(b)	0.50203 in³	Sye(r)	0.19613 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=52.136 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=54.356 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=56.825 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.47851 in², Fy=52.136 ksi

Tn=24.947 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.39361 in², Fu=65 ksi	
Tn=25.585 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=2.9155 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=1.8881 k	Eq. G3-2
kv=3.5718	Eq. G3-8
Vcrh=2.1226 k	Eq. G3-6
Vn=1.4878 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=2.9155 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4835 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56413	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0011127 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.23166 in (lip ineffective width=0.25184 in)	Eq. 1.3-6
k=2.7693	Table 1.3-1
Element 2: Partially stiffened, w=1.717 in	
f=50 ksi, k=2.7693	
λ=0.78941	Eq. 1.1-3
ρ=0.91373	Eq. 1.1-2
b=1.5689 in (ineffective width=0.14812 in)	Eq. 1.1-1
b_1=0.37585 in, b_2=1.193 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.0746	Eq. 1.1-3
ρ=0.74007	Eq. 1.1-2
b=0.6816 in (ineffective width=0.2394 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=1.0746	Eq. 1.1-3
ρ=0.74007	Eq. 1.1-2
b=0.6816 in (ineffective width=0.2394 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4835 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56413	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0011127 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.23166 in (lip ineffective width=0.25184 in)	Eq. 1.3-6
k=2.7693	Table 1.3-1
Element 4: Partially stiffened, w=1.717 in	
f=50 ksi, k=2.7693	
λ=0.78941	Eq. 1.1-3
ρ=0.91373	Eq. 1.1-2
b=1.5689 in (ineffective width=0.14812 in)	Eq. 1.1-1
b_1=0.37585 in, b_2=1.193 in	
Ae=0.32124 in^2, Fn=50 ksi	
Pn=16.062 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=46.297 ksi, f_2=22.194 ksi	
ψ=0.47939	Eq. 1.2.2-1
k=0.70541	Eq. 1.2.2-2
λ=0.80733	Eq. 1.1-3
ρ=0.90112	Eq. 1.1-2
b=0.82993 in (ineffective width=0.091072 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4835 in	
f_1=46.297 ksi, f_2=33.644 ksi	
ψ=0.72669	Eq. 1.2.2-1
k=0.54186	Eq. 1.2.2-2
λ=0.48357	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.324	Eq. 1.3-7
Ia=0.0010757 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.23962 in (lip ineffective width=0.24388 in)	Eq. 1.3-6
k=2.7932	Table 1.3-1
Element 4: Partially stiffened, w=1.717 in	

f=49.259 ksi, k=2.7932	
λ=0.78019	Eq. 1.1-3
ρ=0.92031	Eq. 1.1-2
b=1.5802 in (ineffective width=0.13683 in)	Eq. 1.1-1
b_1=0.39157 in, b_2=1.1886 in	
Center of gravity shift: y=-0.098098 in	
Sxe=0.50203 in^3, Fy=50 ksi	
Mnl=25.102 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4835 in	
f_1=46.297 ksi, f_2=33.644 ksi	
ψ=0.72669	Eq. 1.2.2-1
k=0.54186	Eq. 1.2.2-2
λ=0.48357	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.324	Eq. 1.3-7
Ia=0.0010757 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.23962 in (lip ineffective width=0.24388 in)	Eq. 1.3-6
k=2.7932	Table 1.3-1
Element 2: Partially stiffened, w=1.717 in	
f=49.259 ksi, k=2.7932	
λ=0.78019	Eq. 1.1-3
ρ=0.92031	Eq. 1.1-2
b=1.5802 in (ineffective width=0.13683 in)	Eq. 1.1-1
b_1=0.39157 in, b_2=1.1886 in	
Element 3: Treat as two unstiffened elements	
f_1=46.297 ksi, f_2=22.194 ksi	
ψ=0.47939	Eq. 1.2.2-1
k=0.70541	Eq. 1.2.2-2
λ=0.80733	Eq. 1.1-3
ρ=0.90112	Eq. 1.1-2
b=0.82993 in (ineffective width=0.091072 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.098098 in	
Sxe=0.50203 in^3, Fy=50 ksi	
Mnl=25.102 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4835 in	
f_1=55.392 ksi, f_2=55.392 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3

λ=0.59377	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=1.717 in	
f_1=49.661 ksi, f_2=-37.279 ksi	
ψ=0.75068	Eq. 1.1.2-1
k=18.233	Eq. 1.1.2-2
λ=0.30661	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.717 in	Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2	
b_1=0.45778 in	Eq. 1.1.2-3
b_2=0.8585 in	Eq. 1.1.2-4
Compression width=0.98076 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.4835 in	
f_1=55.392 ksi, f_2=55.392 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.59377	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Stiffened, w=1.717 in	
f_1=49.661 ksi, f_2=-37.279 ksi	
ψ=0.75068	Eq. 1.1.2-1
k=18.233	Eq. 1.1.2-2
λ=0.30661	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.717 in	Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2	
b_1=0.45778 in	Eq. 1.1.2-3
b_2=0.8585 in	Eq. 1.1.2-4
Compression width=0.98076 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0 in	
Sye=0.20232 in^3, Fy=56.825 ksi	
Mnl=11.497 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: Stiffened, w=1.717 in	
f_1=36.605 ksi, f_2=-43.406 ksi	
ψ=1.1858	Eq. 1.1.2-1
k=29.258	Eq. 1.1.2-2
λ=0.20781	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.717 in	Eq. 1.1-1
h_o=2 in, b_o=3.625 in, h_o/b_o=0.55172	
b_1=0.4102 in	Eq. 1.1.2-3

b_2=0.8585 in	Eq. 1.1.2-4
Compression width=0.78553 in	
b_1+b_2 > compression width (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=41.88 ksi, f_2=41.88 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.98348	Eq. 1.1-3
ρ=0.78935	Eq. 1.1-2
b=0.72699 in (ineffective width=0.19401 in)	Eq. 1.1-1
f_1=41.88 ksi, f_2=41.88 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.98348	Eq. 1.1-3
ρ=0.78935	Eq. 1.1-2
b=0.72699 in (ineffective width=0.19401 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: Stiffened, w=1.717 in	
f_1=36.605 ksi, f_2=-43.406 ksi	
ψ=1.1858	Eq. 1.1.2-1
k=29.258	Eq. 1.1.2-2
λ=0.20781	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.717 in	Eq. 1.1-1
h_o=2 in, b_o=3.625 in, h_o/b_o=0.55172	
b_1=0.4102 in	Eq. 1.1.2-3
b_2=0.8585 in	Eq. 1.1.2-4
Compression width=0.78553 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0.050197 in	
Sye=0.19613 in^3, Fy=50 ksi	
Mnl=9.8067 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud

Cw=0.84161 in^6, Wn=3.3916 in^2, Fy=50 ksi	
Bn=12.407 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.59500 in²	Wt.	0.0020230 k/ft	Flat	8.3451 in
Ix	1.2661 in⁴	rx	1.4587 in	Ixy	0.0000 in⁴
Sx(t)	0.69851 in³	y(t)	1.8125 in	α	0.000 deg
Sx(b)	0.69851 in³	y(b)	1.8125 in		
Zx	0.80707 in³	Height	3.6250 in		
Iy	0.3376 in⁴	ry	0.7532 in	x_o	-1.6943 in
Sy(l)	0.46530 in³	x(l)	0.7255 in	y_o	0.0000 in
Sy(r)	0.26489 in³	x(r)	1.2745 in	jx	2.2999 in
Zy	0.39062 in³	Width	2.0000 in	jy	0.0000 in
I_1	1.2661 in⁴	r_1	1.4587 in	Cw	1.0292 in⁶
I_2	0.3376 in⁴	r_2	0.7532 in	J	0.0010083 in⁴
Ic	1.6036 in⁴	rc	1.6417 in		
I_o	3.3116 in⁴	r_o	2.3592 in		

Net Section Properties

Ix	1.2460 in⁴	rx	1.5978 in	Area	0.48805 in²
Sx(t)	0.68745 in³	y(t)	1.8125 in	Ixy	0.0000 in⁴
Sx(b)	0.68745 in³	y(b)	1.8125 in	α	0.000 deg
Zx	0.76696 in³				
Iy	0.2755 in⁴	ry	0.7513 in	x_o	-1.8616 in
Sy(l)	0.31423 in³	x(l)	0.8767 in	y_o	0.0000 in
Sy(r)	0.24526 in³	x(r)	1.1233 in	jx	2.1211 in
Zy	0.33093 in³			jy	0.0000 in
Ic	1.5215 in⁴	rc	1.7656 in	Cw	1.0087 in⁶
I_o	3.2129 in⁴	r_o	2.5658 in	J	0.0008270 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	19.430 k	ϕMnxo	30.327 k-in	ϕMnyo	12.908 k-in
Ae	0.45718 in²	Ixe	1.2344 in⁴	Iye	0.2755 in⁴
ϕTn	23.793 k	Sxe(t)	0.67393 in³	Sye(l)	0.31423 in³
		Sxe(b)	0.68832 in³	Sye(r)	0.24526 in³
Shear					
ϕVny	1.886 k	Negative Bending		Negative Bending	
ϕVnx	6.328 k	ϕMnxo	30.327 k-in	ϕMnyo	10.992 k-in
		Ixe	1.2344 in⁴	Iye	0.2728 in⁴
Torsion		Sxe(t)	0.68832 in³	Sye(l)	0.30878 in³
ϕBn	13.613 k-in²	Sxe(b)	0.67393 in³	Sye(r)	0.24427 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=52.725 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=55.437 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=58.477 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.595 in², Fy=52.725 ksi

Tn=31.372 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.48805 in², Fu=65 ksi	
Tn=31.723 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=3.5157 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=2.231 k	Eq. G3-2
kv=3.5429	Eq. G3-8
Vcrh=4.1956 k	Eq. G3-6
Vn=2.0958 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=3.5157 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4468 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41383	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00072868 in⁴	Eq. 1.3-8
Is=0.00052997 in⁴	
ds=0.32495 in (lip ineffective width=0.12185 in)	Eq. 1.3-6
k=3.0024	Table 1.3-1
Element 2: Partially stiffened, w=1.6436 in	
f=50 ksi, k=3.0024	
λ=0.57612	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.81905	Eq. 1.1-3
ρ=0.89298	Eq. 1.1-2
b=0.78966 in (ineffective width=0.094638 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.81905	Eq. 1.1-3

ρ=0.89298	Eq. 1.1-2
b=0.78966 in (ineffective width=0.094638 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4468 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41383	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00072868 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.32495 in (lip ineffective width=0.12185 in)	Eq. 1.3-6
k=3.0024	Table 1.3-1
Element 4: Partially stiffened, w=1.6436 in	
f=50 ksi, k=3.0024	
λ=0.57612	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Ae=0.45718 in^2, Fn=50 ksi	
Pn=22.859 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=45.135 ksi, f_2=20.995 ksi	
ψ=0.46517	Eq. 1.2.2-1
k=0.71786	Eq. 1.2.2-2
λ=0.60228	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4468 in	
f_1=45.135 ksi, f_2=32.939 ksi	
ψ=0.72977	Eq. 1.2.2-1
k=0.5403	Eq. 1.2.2-2
λ=0.35076	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.398	Eq. 1.3-7
Ia=0.00069101 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.34267 in (lip ineffective width=0.10413 in)	Eq. 1.3-6
k=3.0559	Table 1.3-1
Element 4: Partially stiffened, w=1.6436 in	
f=49.027 ksi, k=3.0559	
λ=0.56547	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Center of gravity shift: y=-0.019148 in	
Sxe=0.67393 in^3, Fy=50 ksi	

Mnl=33.697 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	
Negative Flexural Strength about X-axis	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4468 in	
f_1=45.135 ksi, f_2=32.939 ksi	
ψ=0.72977	Eq. 1.2.2-1
k=0.5403	Eq. 1.2.2-2
λ=0.35076	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.398	Eq. 1.3-7
Ia=0.00069101 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.34267 in (lip ineffective width=0.10413 in)	Eq. 1.3-6
k=3.0559	Table 1.3-1
Element 2: Partially stiffened, w=1.6436 in	
f=49.027 ksi, k=3.0559	
λ=0.56547	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 3: Treat as two unstiffened elements	
f_1=45.135 ksi, f_2=20.995 ksi	
ψ=0.46517	Eq. 1.2.2-1
k=0.71786	Eq. 1.2.2-2
λ=0.60228	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.019148 in	
Sxe=0.67393 in^3, Fy=50 ksi	
Mnl=33.697 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	
Positive Flexural Strength about Y-axis	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4468 in	
f_1=56.621 ksi, f_2=56.621 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.44038	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=1.6436 in	
f_1=49.2 ksi, f_2=-36.365 ksi	
ψ=0.73913	Eq. 1.1.2-1
k=17.998	Eq. 1.1.2-2
λ=0.23341	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.6436 in	Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2	

b_1=0.43957 in	Eq. 1.1.2-3
b_2=0.8218 in	Eq. 1.1.2-4
Compression width=0.94507 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.4468 in	
f_1=56.621 ksi, f_2=56.621 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.44038	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Stiffened, w=1.6436 in	
f_1=49.2 ksi, f_2=-36.365 ksi	
ψ=0.73913	Eq. 1.1.2-1
k=17.998	Eq. 1.1.2-2
λ=0.23341	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.6436 in	Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2	
b_1=0.43957 in	Eq. 1.1.2-3
b_2=0.8218 in	Eq. 1.1.2-4
Compression width=0.94507 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0 in	
Sye=0.24526 in^3, Fy=58.477 ksi	
Mnl=14.342 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: Stiffened, w=1.6436 in	
f_1=31.523 ksi, f_2=-42.026 ksi	
ψ=1.3332	Eq. 1.1.2-1
k=34.069	Eq. 1.1.2-2
λ=0.1358	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.6436 in	Eq. 1.1-1
h_o=2 in, b_o=3.625 in, h_o/b_o=0.55172	
b_1=0.3793 in	Eq. 1.1.2-3
b_2=0.8218 in	Eq. 1.1.2-4
Compression width=0.70444 in	
b_1+b_2 > compression width (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=37.901 ksi, f_2=37.901 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.71311	Eq. 1.1-3
ρ=0.96969	Eq. 1.1-2
b=0.8575 in (ineffective width=0.026805 in)	Eq. 1.1-1

f_1=37.901 ksi, f_2=37.901 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.71311 Eq. 1.1-3
ρ=0.96969 Eq. 1.1-2
b=0.85749 in (ineffective width=0.026805 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=1.6436 in
f_1=31.523 ksi, f_2=-42.026 ksi
ψ=1.3332 Eq. 1.1.2-1
k=34.069 Eq. 1.1.2-2
λ=0.1358 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.6436 in Eq. 1.1-1
h_o=2 in, b_o=3.625 in, h_o/b_o=0.55172
b_1=0.3793 in Eq. 1.1.2-3
b_2=0.8218 in Eq. 1.1.2-4
Compression width=0.70444 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.0066392 in
Sye=0.24427 in^3, Fy=50 ksi
Mnl=12.214 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=1.0087 in^6, Wn=3.3343 in^2, Fy=50 ksi
Bn=15.125 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

362S250-30

Full Section Properties

Area	0.29919 in²	Wt.	0.0010172 k/ft	Flat	9.5893 in
Ix	0.6875 in⁴	rx	1.5159 in	Ixy	0.0000 in⁴
Sx(t)	0.37932 in³	y(t)	1.8125 in	α	0.000 deg
Sx(b)	0.37932 in³	y(b)	1.8125 in		
Zx	0.42522 in³	Height	3.6250 in		
Iy	0.2713 in⁴	ry	0.9522 in	x_o	-2.2147 in
Sy(l)	0.28728 in³	x(l)	0.9443 in	y_o	0.0000 in
Sy(r)	0.17437 in³	x(r)	1.5557 in	jx	2.7402 in
Zy	0.25217 in³	Width	2.5000 in	jy	0.0000 in
I_1	0.6875 in⁴	r_1	1.5159 in	Cw	0.84992 in⁶
I_2	0.2713 in⁴	r_2	0.9522 in	J	0.0000971 in⁴
Ic	0.9588 in⁴	rc	1.7901 in		
I_o	2.4262 in⁴	r_o	2.8477 in		

Net Section Properties

Ix	0.6787 in⁴	rx	1.6399 in	Area	0.25239 in²
Sx(t)	0.37447 in³	y(t)	1.8125 in	Ixy	0.0000 in⁴
Sx(b)	0.37447 in³	y(b)	1.8125 in	α	0.000 deg
Zx	0.40767 in³				
Iy	0.2234 in⁴	ry	0.9409 in	x_o	-2.4035 in
Sy(l)	0.20012 in³	x(l)	1.1165 in	y_o	0.0000 in
Sy(r)	0.16149 in³	x(r)	1.3835 in	jx	2.6210 in
Zy	0.21341 in³			jy	0.0000 in
Ic	0.9022 in⁴	rc	1.8906 in	Cw	0.83523 in⁶
I_o	2.3601 in⁴	r_o	3.0580 in	J	0.00008189 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	6.146 k	ϕMnxo	10.822 k-in	ϕMnyo	6.503 k-in
Ae	0.14461 in²	Ixe	0.52621 in⁴	Iye	0.20688 in⁴
ϕTn	12.304 k	Sxe(t)	0.24049 in³	Sye(l)	0.19361 in³
		Sxe(b)	0.36621 in³	Sye(r)	0.14452 in³
Shear					
ϕVny	0.425 k	Negative Bending		Negative Bending	
ϕVnx	2.734 k	ϕMnxo	10.822 k-in	ϕMnyo	6.221 k-in
		Ixe	0.52621 in⁴	Iye	0.17730 in⁴
Torsion		Sxe(t)	0.36621 in³	Sye(l)	0.13824 in³
ϕBn	8.5688 k-in²	Sxe(b)	0.24049 in³	Sye(r)	0.14562 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Fya=51.147 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Fya=52.136 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Fya=54.15 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength

Ag=0.29919 in², Fy=51.147 ksi
Tn=15.303 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.25239 in², Fu=65 ksi
Tn=16.405 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Stud element 2
Vn=1.519 k at 180 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Stud element 3
Vyh=1.0982 k — Eq. G3-2
kv=3.6799 — Eq. G3-8
Vcrh=0.36701 k — Eq. G3-6
Vn=0.47257 k at 90 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Stud element 4
Vn=1.519 k at 0 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Stud
Element 1: Unstiffened, w=0.5157 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=1.0916 — Eq. 1.1-3
ρ=0.73148 — Eq. 1.1-2
b=0.37723 in (ineffective width=0.13847 in) — Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.091 — Eq. 1.3-7
Ia=0.00026103 in⁴ — Eq. 1.3-8
Is=0.00035659 in⁴ > Ia (no lip reduction)
k=3.8802 — Table 1.3-1
Element 2: Partially stiffened, w=2.2814 in
f=50 ksi, k=3.8802
λ=1.6075 — Eq. 1.1-3
ρ=0.53694 — Eq. 1.1-2
b=1.225 in (ineffective width=1.0564 in) — Eq. 1.1-1
b_1=0.61249 in, b_2=0.61249 in
Element 3: Treat as two unstiffened elements
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=2.0176 — Eq. 1.1-3
ρ=0.4416 — Eq. 1.1-2
b=0.42093 in (ineffective width=0.53227 in) — Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1

```
      k=0.43                                                Eq. 1.2.2-3
      λ=2.0176                                              Eq. 1.1-3
      ρ=0.4416                                              Eq. 1.1-2
      b=0.42093 in (ineffective width=0.53227 in)           Eq. 1.1-1
    Element 5: Unstiffened, w=0.5157 in
      f₁=50 ksi, f₂=50 ksi
      ψ=1                                                   Eq. 1.2.2-1
      k=0.43                                                Eq. 1.2.2-3
      λ=1.0916                                              Eq. 1.1-3
      ρ=0.73148                                             Eq. 1.1-2
      b=0.37723 in (ineffective width=0.13847 in)           Eq. 1.1-1
    Element 4: Check for lip stiffener reduction
      S=31.091                                              Eq. 1.3-7
      Ia=0.00026103 in⁴                                     Eq. 1.3-8
      Is=0.00035659 in⁴ > Ia (no lip reduction)
      k=3.8802                                              Table 1.3-1
    Element 4: Partially stiffened, w=2.2814 in
      f=50 ksi, k=3.8802
      λ=1.6075                                              Eq. 1.1-3
      ρ=0.53694                                             Eq. 1.1-2
      b=1.225 in (ineffective width=1.0564 in)              Eq. 1.1-1
      b₁=0.61249 in, b₂=0.61249 in
  Ae=0.14461 in², Fn=50 ksi
  Pn=7.2306 k                                               Eq. E3.1-1
  Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
  Effective width calculations for Stud
    Element 1: No compressive stress (fully effective)
    Element 2: No compressive stress (fully effective)
    Element 3: Treat as two unstiffened elements
      f₁=47.502 ksi, f₂=25.719 ksi
      ψ=0.54143                                             Eq. 1.2.2-1
      k=0.65576                                             Eq. 1.2.2-2
      λ=1.5924                                              Eq. 1.1-3
      ρ=0.54121                                             Eq. 1.1-2
      b=0.51588 in (ineffective width=0.43732 in)           Eq. 1.1-1
    Element 5: Unstiffened, w=0.5157 in
      f₁=47.502 ksi, f₂=35.717 ksi
      ψ=0.7519                                              Eq. 1.2.2-1
      k=0.52935                                             Eq. 1.2.2-2
      λ=0.95891                                             Eq. 1.1-3
      ρ=0.80359                                             Eq. 1.1-2
      b=0.41441 in (ineffective width=0.10129 in)           Eq. 1.1-1
    Element 4: Check for lip stiffener reduction
      S=31.203                                              Eq. 1.3-7
      Ia=0.00026011 in⁴                                     Eq. 1.3-8
      Is=0.00035659 in⁴ > Ia (no lip reduction)
      k=3.8802                                              Table 1.3-1
    Element 4: Partially stiffened, w=2.2814 in
      f=49.643 ksi, k=3.8802
      λ=1.6018                                              Eq. 1.1-3
```

```
      ρ=0.53856                                          Eq. 1.1-2
      b=1.2287 in (ineffective width=1.0527 in)          Eq. 1.1-1
      b₁=0.61434 in, b₂=0.61434 in
  Center of gravity shift: y=-0.3756 in
  Sxe=0.24049 in³, Fy=50 ksi
  Mnl=12.024 k-in                                        Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
  Effective width calculations for Stud
    Element 1: Unstiffened, w=0.5157 in
      f₁=47.502 ksi, f₂=35.717 ksi
      ψ=0.7519                                           Eq. 1.2.2-1
      k=0.52935                                          Eq. 1.2.2-2
      λ=0.95891                                          Eq. 1.1-3
      ρ=0.80359                                          Eq. 1.1-2
      b=0.41441 in (ineffective width=0.10129 in)        Eq. 1.1-1
    Element 2: Check for lip stiffener reduction
      S=31.203                                           Eq. 1.3-7
      Ia=0.00026011 in⁴                                  Eq. 1.3-8
      Is=0.00035659 in⁴ > Ia (no lip reduction)
      k=3.8802                                           Table 1.3-1
    Element 2: Partially stiffened, w=2.2814 in
      f=49.643 ksi, k=3.8802
      λ=1.6018                                           Eq. 1.1-3
      ρ=0.53856                                          Eq. 1.1-2
      b=1.2287 in (ineffective width=1.0527 in)          Eq. 1.1-1
      b₁=0.61434 in, b₂=0.61434 in
    Element 3: Treat as two unstiffened elements
      f₁=47.502 ksi, f₂=25.719 ksi
      ψ=0.54143                                          Eq. 1.2.2-1
      k=0.65576                                          Eq. 1.2.2-2
      λ=1.5924                                           Eq. 1.1-3
      ρ=0.54121                                          Eq. 1.1-2
      b=0.51588 in (ineffective width=0.43732 in)        Eq. 1.1-1
    Element 5: No compressive stress (fully effective)
    Element 4: No compressive stress (fully effective)
  Center of gravity shift: y=0.3756 in
  Sxe=0.24049 in³, Fy=50 ksi
  Mnl=12.024 k-in                                        Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
  Effective width calculations for Stud
    Element 1: Unstiffened, w=0.5157 in
      f₁=49.455 ksi, f₂=49.455 ksi
      ψ=1                                                Eq. 1.2.2-1
      k=0.43                                             Eq. 1.2.2-3
      λ=1.0856                                           Eq. 1.1-3
      ρ=0.73448                                          Eq. 1.1-2
      b=0.37877 in (ineffective width=0.13693 in)        Eq. 1.1-1
    Element 2: Stiffened, w=2.2814 in
```

```
      f₁=46.182 ksi, f₂=-33.507 ksi
      ψ=0.72554                                          Eq. 1.1.2-1
      k=17.727                                           Eq. 1.1.2-2
      λ=0.7228                                           Eq. 1.1-3
      ρ=0.9624                                           Eq. 1.1-2
      be=2.1956 in                                       Eq. 1.1-1
      h₀=2.5 in, b₀=0.625 in, h₀/b₀=4
      b₁=0.58934 in                                      Eq. 1.1.2-3
      b₂=1.0978 in                                       Eq. 1.1.2-4
      Compression width=1.3221 in
      b₁+b₂ > compression width (fully effective)
    Element 3: No compressive stress (fully effective)
    Element 5: Unstiffened, w=0.5157 in
      f₁=49.455 ksi, f₂=49.455 ksi
      ψ=1                                                Eq. 1.2.2-1
      k=0.43                                             Eq. 1.2.2-2
      λ=1.0856                                           Eq. 1.1-3
      ρ=0.73448                                          Eq. 1.1-2
      b=0.37877 in (ineffective width=0.13693 in)        Eq. 1.1-1
    Element 4: Stiffened, w=2.2814 in
      f₁=46.182 ksi, f₂=-33.507 ksi
      ψ=0.72554                                          Eq. 1.1.2-1
      k=17.727                                           Eq. 1.1.2-2
      λ=0.7228                                           Eq. 1.1-3
      ρ=0.9624                                           Eq. 1.1-2
      be=2.1956 in                                       Eq. 1.1-1
      h₀=2.5 in, b₀=0.625 in, h₀/b₀=4
      b₁=0.58934 in                                      Eq. 1.1.2-3
      b₂=1.0978 in                                       Eq. 1.1.2-4
      Compression width=1.3221 in
      b₁+b₂ > compression width (fully effective)
  Center of gravity shift: x=-0.047932 in
  Sye=0.14452 in³, Fy=50 ksi
  Mnl=7.2261 k-in                                        Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
  Effective width calculations for Stud
    Element 1: No compressive stress (fully effective)
    Element 2: Stiffened, w=2.2814 in
      f₁=45.739 ksi, f₂=-43.206 ksi
      ψ=0.94463                                          Eq. 1.1.2-1
      k=22.597                                           Eq. 1.1.2-2
      λ=0.63711                                          Eq. 1.1-3
      ρ=1                                                Eq. 1.1-2
      be=2.2814 in                                       Eq. 1.1-1
      h₀=2.5 in, b₀=3.625 in, h₀/b₀=0.68966
      b₁=0.57836 in                                      Eq. 1.1.2-3
      b₂=1.1407 in                                       Eq. 1.1.2-4
      Compression width=1.1732 in
      b₁+b₂ > compression width (fully effective)
    Element 3: Treat as two unstiffened elements
```

```
      f₁=49.392 ksi, f₂=49.392 ksi
      ψ=1                                                Eq. 1.2.2-1
      k=0.43                                             Eq. 1.2.2-3
      λ=2.0053                                           Eq. 1.1-3
      ρ=0.44397                                          Eq. 1.1-2
      b=0.4232 in (ineffective width=0.53 in)            Eq. 1.1-1
      f₁=49.392 ksi, f₂=49.392 ksi
      ψ=1                                                Eq. 1.2.2-1
      k=0.43                                             Eq. 1.2.2-2
      λ=2.0053                                           Eq. 1.1-3
      ρ=0.44397                                          Eq. 1.1-2
      b=0.4232 in (ineffective width=0.53 in)            Eq. 1.1-1
    Element 5: No compressive stress (fully effective)
    Element 4: Stiffened, w=2.2814 in
      f₁=45.739 ksi, f₂=-43.206 ksi
      ψ=0.94463                                          Eq. 1.1.2-1
      k=22.597                                           Eq. 1.1.2-2
      λ=0.63711                                          Eq. 1.1-3
      ρ=1                                                Eq. 1.1-2
      be=2.2814 in                                       Eq. 1.1-1
      h₀=2.5 in, b₀=3.625 in, h₀/b₀=0.68966
      b₁=0.57836 in                                      Eq. 1.1.2-3
      b₂=1.1407 in                                       Eq. 1.1.2-4
      Compression width=1.1732 in
      b₁+b₂ > compression width (fully effective)
  Center of gravity shift: x=0.16601 in
  Sye=0.13824 in³, Fy=50 ksi
  Mnl=6.9122 k-in                                        Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
  Cw=0.83523 in⁶, Wn=4.3863 in², Fy=50 ksi
  Bn=9.5209 k-in²                                        G8.1-1
  Ωb=1.67, ϕb=0.9
```

362S250-33

Full Section Properties

Area	0.33132 in²	Wt.	0.0011265 k/ft	Flat	9.5757 in
Ix	0.7599 in⁴	rx	1.5145 in	Ixy	0.0000 in⁴
Sx(t)	0.41926 in³	y(t)	1.8125 in	α	0.000 deg
Sx(b)	0.41926 in³	y(b)	1.8125 in		
Zx	0.47043 in³	Height	3.6250 in		
Iy	0.2995 in⁴	ry	0.9508 in	x_o	-2.2107 in
Sy(l)	0.31718 in³	x(l)	0.9443 in	y_o	0.0000 in
Sy(r)	0.19251 in³	x(r)	1.5557 in	jx	2.7364 in
Zy	0.27880 in³	Width	2.5000 in	jy	0.0000 in
I_1	0.7599 in⁴	r_1	1.5145 in	Cw	0.93563 in⁶
I_2	0.2995 in⁴	r_2	0.9508 in	J	0.0001322 in⁴
Ic	1.0594 in⁴	rc	1.7882 in		
I_o	2.6786 in⁴	r_o	2.8433 in		

Net Section Properties

Ix	0.7502 in⁴	rx	1.6385 in	Area	0.27942 in²
Sx(t)	0.41390 in³	y(t)	1.8125 in	Ixy	0.0000 in⁴
Sx(b)	0.41390 in³	y(b)	1.8125 in	α	0.000 deg
Zx	0.45097 in³				
Iy	0.2466 in⁴	ry	0.9395 in	x_o	-2.3995 in
Sy(l)	0.22089 in³	x(l)	1.1164 in	y_o	0.0000 in
Sy(r)	0.17825 in³	x(r)	1.3836 in	jx	2.6171 in
Zy	0.23591 in³			jy	0.0000 in
Ic	0.9968 in⁴	rc	1.8888 in	Cw	0.91939 in⁶
I_o	2.6056 in⁴	r_o	3.0537 in	J	0.00011150 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	7.340 k	ϕMnxo	12.798 k-in	ϕMnyo	7.369 k-in
Ae	0.17270 in²	Ixe	0.60630 in⁴	Iye	0.23258 in⁴
ϕTn	13.622 k	Sxe(t)	0.28441 in³	Sye(l)	0.21542 in³
		Sxe(b)	0.40605 in³	Sye(r)	0.16375 in³
Shear					
ϕVny	0.528 k	Negative Bending		Negative Bending	
ϕVnx	3.317 k	ϕMnxo	12.798 k-in	ϕMnyo	7.106 k-in
		Ixe	0.60630 in⁴	Iye	0.20017 in⁴
Torsion		Sxe(t)	0.40605 in³	Sye(l)	0.15791 in³
ϕBn	9.4622 k-in²	Sxe(b)	0.28441 in³	Sye(r)	0.16243 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Fya=51.246 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Fya=52.32 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Fya=54.513 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength

Ag=0.33132 in², Fy=51.246 ksi	
Tn=16.979 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.27942 in², Fu=65 ksi	
Tn=18.162 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=1.843 k at 180 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=1.2145 k	Eq. G3-2
kv=3.6787	Eq. G3-8
Vcrh=0.50034 k	Eq. G3-6
Vn=0.58656 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=1.843 k at 0 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.514 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.98104	Eq. 1.1-3
ρ=0.79074	Eq. 1.1-2
b=0.40644 in (ineffective width=0.10756 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00035618 in⁴	Eq. 1.3-8
Is=0.00039155 in⁴ > Ia (no lip reduction)	
k=3.8782	Table 1.3-1
Element 2: Partially stiffened, w=2.278 in	
f=50 ksi, k=3.8782	
λ=1.4478	Eq. 1.1-3
ρ=0.58576	Eq. 1.1-2
b=1.3344 in (ineffective width=0.94364 in)	Eq. 1.1-1
b_1=0.66718 in, b_2=0.66718 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.8161	Eq. 1.1-3
ρ=0.48393	Eq. 1.1-2
b=0.46046 in (ineffective width=0.49104 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.8161	Eq. 1.1-3
ρ=0.48393	Eq. 1.1-2
b=0.46046 in (ineffective width=0.49104 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.514 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.98104	Eq. 1.1-3
ρ=0.79074	Eq. 1.1-2
b=0.40644 in (ineffective width=0.10756 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00035618 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.8782	Table 1.3-1
Element 4: Partially stiffened, w=2.278 in	
f=50 ksi, k=3.8782	
λ=1.4478	Eq. 1.1-3
ρ=0.58576	Eq. 1.1-2
b=1.3344 in (ineffective width=0.94364 in)	Eq. 1.1-1
b_1=0.66718 in, b_2=0.66718 in	
Ae=0.1727 in^2, Fn=50 ksi	
Pn=8.6349 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=47.396 ksi, f_2=25.078 ksi	
ψ=0.52911	Eq. 1.2.2-1
k=0.66505	Eq. 1.2.2-2
λ=1.4218	Eq. 1.1-3
ρ=0.59451	Eq. 1.1-2
b=0.56568 in (ineffective width=0.38582 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.514 in	
f_1=47.396 ksi, f_2=35.34 ksi	
ψ=0.74563	Eq. 1.2.2-1
k=0.53241	Eq. 1.2.2-2
λ=0.85839	Eq. 1.1-3
ρ=0.86639	Eq. 1.1-2
b=0.44533 in (ineffective width=0.068673 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.218	Eq. 1.3-7
Ia=0.00035476 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.8782	Table 1.3-1

Element 4: Partially stiffened, w=2.278 in
f=49.594 ksi, k=3.8782
λ=1.4419 Eq. 1.1-3
ρ=0.58772 Eq. 1.1-2
b=1.3388 in (ineffective width=0.93917 in) Eq. 1.1-1
b_1=0.66941 in, b_2=0.66941 in
Center of gravity shift: y=-0.31932 in
Sxe=0.28441 in^3, Fy=50 ksi
Mnl=14.22 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.514 in
f_1=47.396 ksi, f_2=35.34 ksi
ψ=0.74563 Eq. 1.2.2-1
k=0.53241 Eq. 1.2.2-2
λ=0.85839 Eq. 1.1-3
ρ=0.86639 Eq. 1.1-2
b=0.44533 in (ineffective width=0.068673 in) Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.218 Eq. 1.3-7
Ia=0.00035476 in^4 Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)
k=3.8782 Table 1.3-1
Element 2: Partially stiffened, w=2.278 in
f=49.594 ksi, k=3.8782
λ=1.4419 Eq. 1.1-3
ρ=0.58772 Eq. 1.1-2
b=1.3388 in (ineffective width=0.93918 in) Eq. 1.1-1
b_1=0.66941 in, b_2=0.66941 in
Element 3: Treat as two unstiffened elements
f_1=47.396 ksi, f_2=25.078 ksi
ψ=0.52911 Eq. 1.2.2-1
k=0.66505 Eq. 1.2.2-2
λ=1.4218 Eq. 1.1-3
ρ=0.59451 Eq. 1.1-2
b=0.56568 in (ineffective width=0.38582 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0.31932 in
Sxe=0.28441 in^3, Fy=50 ksi
Mnl=14.22 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.514 in
f_1=49.391 ksi, f_2=49.391 ksi
ψ=1 Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=0.97505	Eq. 1.1-3
ρ=0.79419	Eq. 1.1-2
b=0.40821 in (ineffective width=0.10579 in)	Eq. 1.1-1
Element 2: Stiffened, w=2.278 in	
f_1=46.092 ksi, f_2=-34.102 ksi	
ψ=0.73986	Eq. 1.1.2-1
k=18.013	Eq. 1.1.2-2
λ=0.64498	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.278 in	Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4	
b_1=0.60911 in	Eq. 1.1.2-3
b_2=1.139 in	Eq. 1.1.2-4
Compression width=1.3093 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.514 in	
f_1=49.391 ksi, f_2=49.391 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=0.97505	Eq. 1.1-3
ρ=0.79419	Eq. 1.1-2
b=0.40821 in (ineffective width=0.10579 in)	Eq. 1.1-1
Element 4: Stiffened, w=2.278 in	
f_1=46.092 ksi, f_2=-34.102 ksi	
ψ=0.73986	Eq. 1.1.2-1
k=18.013	Eq. 1.1.2-2
λ=0.64498	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.278 in	Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4	
b_1=0.60911 in	Eq. 1.1.2-3
b_2=1.139 in	Eq. 1.1.2-4
Compression width=1.3093 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=-0.036758 in	
Sye=0.16375 in^3, Fy=50 ksi	
Mnl=8.1876 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: Stiffened, w=2.278 in	
f_1=45.622 ksi, f_2=-44.231 ksi	
ψ=0.96951	Eq. 1.1.2-1
k=23.218	Eq. 1.1.2-2
λ=0.56519	Eq. 1.1-3
ρ=1	Eq. 1.1-2

be=2.278 in	Eq. 1.1-1
h_o=2.5 in, b_o=3.625 in, h_o/b_o=0.68966	
b_1=0.57387 in	Eq. 1.1.2-3
b_2=1.139 in	Eq. 1.1.2-4
Compression width=1.1566 in	
b_1+b_2 > compression width (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=49.318 ksi, f_2=49.318 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.8036	Eq. 1.1-3
ρ=0.48681	Eq. 1.1-2
b=0.4632 in (ineffective width=0.4883 in)	Eq. 1.1-1
f_1=49.318 ksi, f_2=49.318 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=1.8036	Eq. 1.1-3
ρ=0.48681	Eq. 1.1-2
b=0.4632 in (ineffective width=0.4883 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: Stiffened, w=2.278 in	
f_1=45.622 ksi, f_2=-44.231 ksi	
ψ=0.96951	Eq. 1.1.2-1
k=23.218	Eq. 1.1.2-2
λ=0.56519	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.278 in	Eq. 1.1-1
h_o=2.5 in, b_o=3.625 in, h_o/b_o=0.68966	
b_1=0.57387 in	Eq. 1.1.2-3
b_2=1.139 in	Eq. 1.1.2-4
Compression width=1.1566 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0.15121 in	
Sye=0.15791 in^3, Fy=50 ksi	
Mnl=7.8955 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud

Cw=0.91939 in^6, Wn=4.3724 in^2, Fy=50 ksi	
Bn=10.514 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.42997 in²	Wt.	0.0014619 k/ft	Flat	9.5336 in
Ix	0.9804 in⁴	rx	1.5101 in	Ixy	0.0000 in⁴
Sx(t)	0.54094 in³	y(t)	1.8125 in	α	0.000 deg
Sx(b)	0.54094 in³	y(b)	1.8125 in		
Zx	0.60867 in³	Height	3.6250 in		
Iy	0.3850 in⁴	ry	0.9463 in	x_o	-2.1983 in
Sy(l)	0.40777 in³	x(l)	0.9442 in	y_o	0.0000 in
Sy(r)	0.24748 in³	x(r)	1.5558 in	jx	2.7247 in
Zy	0.35998 in³	Width	2.5000 in	jy	0.0000 in
I_1	0.9804 in⁴	r_1	1.5101 in	Cw	1.1921 in⁶
I_2	0.3850 in⁴	r_2	0.9463 in	J	0.0002915 in⁴
Ic	1.3655 in⁴	rc	1.7821 in		
I_o	3.4433 in⁴	r_o	2.8299 in		

Net Section Properties

Ix	0.9678 in⁴	rx	1.6343 in	Area	0.36232 in²
Sx(t)	0.53394 in³	y(t)	1.8125 in	Ixy	0.0000 in⁴
Sx(b)	0.53394 in³	y(b)	1.8125 in	α	0.000 deg
Zx	0.58330 in³				
Iy	0.3168 in⁴	ry	0.9351 in	x_o	-2.3871 in
Sy(l)	0.28381 in³	x(l)	1.1163 in	y_o	0.0000 in
Sy(r)	0.22897 in³	x(r)	1.3837 in	jx	2.6050 in
Zy	0.30443 in³			jy	0.0000 in
Ic	1.2846 in⁴	rc	1.8829 in	Cw	1.1711 in⁶
I_o	3.3492 in⁴	r_o	3.0404 in	J	0.0002457 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	10.459 k	ϕMnxo	18.012 k-in	ϕMnyo	10.103 k-in
Ae	0.24610 in²	Ixe	0.82476 in⁴	Iye	0.31258 in⁴
ϕTn	17.663 k	Sxe(t)	0.40026 in³	Sye(l)	0.28219 in³
		Sxe(b)	0.52719 in³	Sye(r)	0.22451 in³
Shear					
ϕVny	0.901 k	Negative Bending		Negative Bending	
ϕVnx	5.185 k	ϕMnxo	18.012 k-in	ϕMnyo	9.675 k-in
		Ixe	0.82476 in⁴	Iye	0.27459 in⁴
Torsion		Sxe(t)	0.52719 in³	Sye(l)	0.22455 in³
ϕBn	12.172 k-in²	Sxe(b)	0.40026 in³	Sye(r)	0.21500 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=51.525 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=52.838 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=55.542 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength

Ag=0.42997 in², Fy=51.525 ksi	
Tn=22.154 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.36232 in², Fu=65 ksi	
Tn=23.551 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=2.8807 k at 180 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=1.5693 k	Eq. G3-2
kv=3.675	Eq. G3-8
Vcrh=1.1066 k	Eq. G3-6
Vn=1.0014 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=2.8807 k at 0 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.74488	Eq. 1.1-3
ρ=0.94599	Eq. 1.1-2
b=0.48123 in (ineffective width=0.027474 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00079003 in⁴	Eq. 1.3-8
Is=0.00049474 in⁴	
ds=0.30136 in (lip ineffective width=0.17987 in)	Eq. 1.3-6
k=3.3746	Table 1.3-1
Element 2: Partially stiffened, w=2.2674 in	
f=50 ksi, k=3.3746	
λ=1.1852	Eq. 1.1-3
ρ=0.68714	Eq. 1.1-2
b=1.558 in (ineffective width=0.70937 in)	Eq. 1.1-1
b_1=0.48785 in, b_2=1.0702 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.3855	Eq. 1.1-3
ρ=0.60715	Eq. 1.1-2
b=0.57449 in (ineffective width=0.37171 in)	Eq. 1.1-1

f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.3855 Eq. 1.1-3
ρ=0.60715 Eq. 1.1-2
b=0.57449 in (ineffective width=0.37171 in) Eq. 1.1-1
Element 5: Unstiffened, w=0.5087 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.74488 Eq. 1.1-3
ρ=0.94599 Eq. 1.1-2
b=0.48123 in (ineffective width=0.027474 in) Eq. 1.1-1
Element 4: Check for lip stiffener reduction
S=31.091 Eq. 1.3-7
Ia=0.00079003 in^4 Eq. 1.3-8
Is=0.00049474 in^4
ds=0.30136 in (lip ineffective width=0.17987 in) Eq. 1.3-6
k=3.3746 Table 1.3-1
Element 4: Partially stiffened, w=2.2674 in
f=50 ksi, k=3.3746
λ=1.1852 Eq. 1.1-3
ρ=0.68714 Eq. 1.1-2
b=1.558 in (ineffective width=0.70937 in) Eq. 1.1-1
b_1=0.48785 in, b_2=1.0702 in
Ae=0.2461 in^2, Fn=50 ksi
Pn=12.305 k Eq. E3.1-1
Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: No compressive stress (fully effective)
Element 3: Treat as two unstiffened elements
f_1=47.178 ksi, f_2=24.217 ksi
ψ=0.51332 Eq. 1.2.2-1
k=0.67736 Eq. 1.2.2-2
λ=1.0723 Eq. 1.1-3
ρ=0.74124 Eq. 1.1-2
b=0.70136 in (ineffective width=0.24484 in) Eq. 1.1-1
Element 5: Unstiffened, w=0.5087 in
f_1=47.178 ksi, f_2=34.834 ksi
ψ=0.73835 Eq. 1.2.2-1
k=0.536 Eq. 1.2.2-2
λ=0.64807 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 4: Check for lip stiffener reduction
S=31.263 Eq. 1.3-7
Ia=0.00078581 in^4 Eq. 1.3-8
Is=0.00049474 in^4

ds=0.32028 in (lip ineffective width=0.18842 in)	Eq. 1.3-6
k=3.3799	Table 1.3-1
Element 4: Partially stiffened, w=2.2674 in	
f=49.453 ksi, k=3.3799	
λ=1.1777	Eq. 1.1-3
ρ=0.69048	Eq. 1.1-2
b=1.5656 in (ineffective width=0.70181 in)	Eq. 1.1-1
b_1=0.49285 in, b_2=1.0727 in	
Center of gravity shift: y=-0.24807 in	
Sxe=0.40026 in^3, Fy=50 ksi	
Mnl=20.013 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	
f_1=47.178 ksi, f_2=34.834 ksi	
ψ=0.73835	Eq. 1.2.2-1
k=0.536	Eq. 1.2.2-2
λ=0.64807	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.263	Eq. 1.3-7
Ia=0.00078581 in^4	Eq. 1.3-8
Is=0.00049474 in^4	
ds=0.32028 in (lip ineffective width=0.18842 in)	Eq. 1.3-6
k=3.3799	Table 1.3-1
Element 2: Partially stiffened, w=2.2674 in	
f=49.453 ksi, k=3.3799	
λ=1.1777	Eq. 1.1-3
ρ=0.69048	Eq. 1.1-2
b=1.5656 in (ineffective width=0.70181 in)	Eq. 1.1-1
b_1=0.49285 in, b_2=1.0727 in	
Element 3: Treat as two unstiffened elements	
f_1=47.178 ksi, f_2=24.217 ksi	
ψ=0.51332	Eq. 1.2.2-1
k=0.67736	Eq. 1.2.2-2
λ=1.0723	Eq. 1.1-3
ρ=0.74124	Eq. 1.1-2
b=0.70136 in (ineffective width=0.24484 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.24807 in	
Sxe=0.40026 in^3, Fy=50 ksi	
Mnl=20.013 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	

f_1=49.19 ksi, f_2=49.19 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.73882 Eq. 1.1-3
ρ=0.95047 Eq. 1.1-2
b=0.4835 in (ineffective width=0.025196 in) Eq. 1.1-1
Element 2: Stiffened, w=2.2674 in
f_1=45.823 ksi, f_2=-35.604 ksi
ψ=0.77699 Eq. 1.1.2-1
k=18.776 Eq. 1.1.2-2
λ=0.48099 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.2674 in Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.60032 in Eq. 1.1.2-3
b_2=1.1337 in Eq. 1.1.2-4
Compression width=1.276 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.5087 in
f_1=49.19 ksi, f_2=49.19 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.73882 Eq. 1.1-3
ρ=0.95047 Eq. 1.1-2
b=0.4835 in (ineffective width=0.025196 in) Eq. 1.1-1
Element 4: Stiffened, w=2.2674 in
f_1=45.823 ksi, f_2=-35.604 ksi
ψ=0.77699 Eq. 1.1.2-1
k=18.776 Eq. 1.1.2-2
λ=0.48099 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.2674 in Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.60032 in Eq. 1.1.2-3
b_2=1.1337 in Eq. 1.1.2-4
Compression width=1.276 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=-0.0085918 in
Sye=0.22451 in^3, Fy=50 ksi
Mnl=11.226 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=2.2674 in
f_1=43.212 ksi, f_2=-45.452 ksi
ψ=1.0518 Eq. 1.1.2-1
k=25.38 Eq. 1.1.2-2

λ=0.40175	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.2674 in	Eq. 1.1-1
h_o=2.5 in, b_o=3.625 in, h_o/b_o=0.68966	
b_1=0.5596 in	Eq. 1.1.2-3
b_2=1.1337 in	Eq. 1.1.2-4
Compression width=1.1051 in	
b_1+b_2 > compression width (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=46.878 ksi, f_2=46.878 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.3416	Eq. 1.1-3
ρ=0.62317	Eq. 1.1-2
b=0.58964 in (ineffective width=0.35656 in)	Eq. 1.1-1
f_1=46.878 ksi, f_2=46.878 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=1.3416	Eq. 1.1-3
ρ=0.62317	Eq. 1.1-2
b=0.58964 in (ineffective width=0.35656 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: Stiffened, w=2.2674 in	
f_1=43.212 ksi, f_2=-45.452 ksi	
ψ=1.0518	Eq. 1.1.2-1
k=25.38	Eq. 1.1.2-2
λ=0.40175	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.2674 in	Eq. 1.1-1
h_o=2.5 in, b_o=3.625 in, h_o/b_o=0.68966	
b_1=0.5596 in	Eq. 1.1.2-3
b_2=1.1337 in	Eq. 1.1.2-4
Compression width=1.1051 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0.10655 in	
Sye=0.215 in^3, Fy=50 ksi	
Mnl=10.75 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud

Cw=1.1711 in^6, Wn=4.3297 in^2, Fy=50 ksi	
Bn=13.524 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.53511 in²	Wt.	0.0018194 k/ft	Flat	9.4543 in
Ix	1.2105 in⁴	rx	1.5040 in	Ixy	0.0000 in⁴
Sx(t)	0.66785 in³	y(t)	1.8125 in	α	0.000 deg
Sx(b)	0.66785 in³	y(b)	1.8125 in		
Zx	0.75427 in³	Height	3.6250 in		
Iy	0.4728 in⁴	ry	0.9400 in	x_o	-2.1832 in
Sy(l)	0.50131 in³	x(l)	0.9431 in	y_o	0.0000 in
Sy(r)	0.30367 in³	x(r)	1.5569 in	jx	2.7118 in
Zy	0.44474 in³	Width	2.5000 in	jy	0.0000 in
I_1	1.2105 in⁴	r_1	1.5040 in	Cw	1.4484 in⁶
I_2	0.4728 in⁴	r_2	0.9400 in	J	0.0005714 in⁴
Ic	1.6833 in⁴	rc	1.7736 in		
I_o	4.2338 in⁴	r_o	2.8128 in		

Net Section Properties

Ix	1.1946 in⁴	rx	1.6289 in	Area	0.45021 in²
Sx(t)	0.65907 in³	y(t)	1.8125 in	Ixy	0.0000 in⁴
Sx(b)	0.65907 in³	y(b)	1.8125 in	α	0.000 deg
Zx	0.72243 in³				
Iy	0.3883 in⁴	ry	0.9287 in	x_o	-2.3726 in
Sy(l)	0.34807 in³	x(l)	1.1156 in	y_o	0.0000 in
Sy(r)	0.28049 in³	x(r)	1.3844 in	jx	2.5916 in
Zy	0.37550 in³			jy	0.0000 in
Ic	1.5829 in⁴	rc	1.8751 in	Cw	1.4225 in⁶
I_o	4.1172 in⁴	r_o	3.0241 in	J	0.0004808 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	14.062 k	ϕMnxo	23.652 k-in	ϕMnyo	14.345 k-in
Ae	0.33087 in²	Ixe	1.0552 in⁴	Iye	0.3883 in⁴
ϕTn	21.948 k	Sxe(t)	0.52559 in³	Sye(l)	0.34807 in³
		Sxe(b)	0.65247 in³	Sye(r)	0.28049 in³
Shear					
ϕVny	1.352 k	Negative Bending		Negative Bending	
ϕVnx	6.776 k	ϕMnxo	23.652 k-in	ϕMnyo	12.210 k-in
		Ixe	1.0552 in⁴	Iye	0.3599 in⁴
Torsion		Sxe(t)	0.65247 in³	Sye(l)	0.30664 in³
ϕBn	14.955 k-in²	Sxe(b)	0.52559 in³	Sye(r)	0.27134 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=51.91 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=53.509 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=56.825 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.53511 in², Fy=51.91 ksi

Tn=27.777 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.45021 in², Fu=65 ksi	
Tn=29.264 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=3.7645 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=1.8881 k	Eq. G3-2
kv=3.6571	Eq. G3-8
Vcrh=2.1732 k	Eq. G3-6
Vn=1.5021 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=3.7645 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4835 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56413	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0015382 in⁴	Eq. 1.3-8
Is=0.00053312 in⁴	
ds=0.16757 in (lip ineffective width=0.31593 in)	Eq. 1.3-6
k=2.8256	Table 1.3-1
Element 2: Partially stiffened, w=2.217 in	
f=50 ksi, k=2.8256	
λ=1.0091	Eq. 1.1-3
ρ=0.77494	Eq. 1.1-2
b=1.718 in (ineffective width=0.49896 in)	Eq. 1.1-1
b_1=0.29773 in, b_2=1.4203 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.0746	Eq. 1.1-3
ρ=0.74007	Eq. 1.1-2
b=0.6816 in (ineffective width=0.2394 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=1.0746	Eq. 1.1-3
ρ=0.74007	Eq. 1.1-2
b=0.6816 in (ineffective width=0.2394 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4835 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56413	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0015382 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.16757 in (lip ineffective width=0.31593 in)	Eq. 1.3-6
k=2.8256	Table 1.3-1
Element 4: Partially stiffened, w=2.217 in	
f=50 ksi, k=2.8256	
λ=1.0091	Eq. 1.1-3
ρ=0.77494	Eq. 1.1-2
b=1.718 in (ineffective width=0.49896 in)	Eq. 1.1-1
b_1=0.29773 in, b_2=1.4203 in	
Ae=0.33087 in^2, Fn=50 ksi	
Pn=16.543 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=46.476 ksi, f_2=23.539 ksi	
ψ=0.50647	Eq. 1.2.2-1
k=0.68283	Eq. 1.2.2-2
λ=0.82215	Eq. 1.1-3
ρ=0.89085	Eq. 1.1-2
b=0.82047 in (ineffective width=0.10053 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4835 in	
f_1=46.476 ksi, f_2=34.435 ksi	
ψ=0.74091	Eq. 1.2.2-1
k=0.53473	Eq. 1.2.2-2
λ=0.48773	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.313	Eq. 1.3-7
Ia=0.0015277 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.16873 in (lip ineffective width=0.31477 in)	Eq. 1.3-6
k=2.8311	Table 1.3-1
Element 4: Partially stiffened, w=2.217 in	

f=49.295 ksi, k=2.8311	
λ=1.001	Eq. 1.1-3
ρ=0.77945	Eq. 1.1-2
b=1.728 in (ineffective width=0.48896 in)	Eq. 1.1-1
b_1=0.30152 in, b_2=1.4265 in	
Center of gravity shift: y=-0.1952 in	
Sxe=0.52559 in^3, Fy=50 ksi	
Mnl=26.28 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4835 in	
f_1=46.476 ksi, f_2=34.435 ksi	
ψ=0.74091	Eq. 1.2.2-1
k=0.53473	Eq. 1.2.2-2
λ=0.48773	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.313	Eq. 1.3-7
Ia=0.0015277 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.16873 in (lip ineffective width=0.31477 in)	Eq. 1.3-6
k=2.8311	Table 1.3-1
Element 2: Partially stiffened, w=2.217 in	
f=49.295 ksi, k=2.8311	
λ=1.001	Eq. 1.1-3
ρ=0.77945	Eq. 1.1-2
b=1.728 in (ineffective width=0.48896 in)	Eq. 1.1-1
b_1=0.30152 in, b_2=1.4265 in	
Element 3: Treat as two unstiffened elements	
f_1=46.476 ksi, f_2=23.539 ksi	
ψ=0.50647	Eq. 1.2.2-1
k=0.68283	Eq. 1.2.2-2
λ=0.82215	Eq. 1.1-3
ρ=0.89085	Eq. 1.1-2
b=0.82047 in (ineffective width=0.10053 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.1952 in	
Sxe=0.52559 in^3, Fy=50 ksi	
Mnl=26.28 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4835 in	
f_1=55.664 ksi, f_2=55.664 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3

λ=0.59523	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=2.217 in	
f_1=51.017 ksi, f_2=-39.984 ksi	
ψ=0.78374	Eq. 1.1.2-1
k=18.918	Eq. 1.1.2-2
λ=0.39393	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.217 in	Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4	
b_1=0.58593 in	Eq. 1.1.2-3
b_2=1.1085 in	Eq. 1.1.2-4
Compression width=1.2429 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.4835 in	
f_1=55.664 ksi, f_2=55.664 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.59523	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Stiffened, w=2.217 in	
f_1=51.017 ksi, f_2=-39.984 ksi	
ψ=0.78374	Eq. 1.1.2-1
k=18.918	Eq. 1.1.2-2
λ=0.39393	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.217 in	Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4	
b_1=0.58593 in	Eq. 1.1.2-3
b_2=1.1085 in	Eq. 1.1.2-4
Compression width=1.2429 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0 in	
Sye=0.28049 in^3, Fy=56.825 ksi	
Mnl=15.939 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: Stiffened, w=2.217 in	
f_1=38.854 ksi, f_2=-44.669 ksi	
ψ=1.1497	Eq. 1.1.2-1
k=28.167	Eq. 1.1.2-2
λ=0.28174	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.217 in	Eq. 1.1-1
h_o=2.5 in, b_o=3.625 in, h_o/b_o=0.68966	
b_1=0.53426 in	Eq. 1.1.2-3

b_2=1.1085 in	Eq. 1.1.2-4
Compression width=1.0313 in	
b_1+b_2 > compression width (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=43.119 ksi, f_2=43.119 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.99791	Eq. 1.1-3
ρ=0.78117	Eq. 1.1-2
b=0.71946 in (ineffective width=0.20154 in)	Eq. 1.1-1
f_1=43.119 ksi, f_2=43.119 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=0.99791	Eq. 1.1-3
ρ=0.78117	Eq. 1.1-2
b=0.71946 in (ineffective width=0.20154 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: Stiffened, w=2.217 in	
f_1=38.854 ksi, f_2=-44.669 ksi	
ψ=1.1497	Eq. 1.1.2-1
k=28.167	Eq. 1.1.2-2
λ=0.28174	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.217 in	Eq. 1.1-1
h_o=2.5 in, b_o=3.625 in, h_o/b_o=0.68966	
b_1=0.53426 in	Eq. 1.1.2-3
b_2=1.1085 in	Eq. 1.1.2-4
Compression width=1.0313 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0.058041 in	
Sye=0.27134 in^3, Fy=50 ksi	
Mnl=13.567 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud

Cw=1.4225 in^6, Wn=4.2802 in^2, Fy=50 ksi	
Bn=16.617 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.66630 in²	Wt.	0.0022654 k/ft	Flat	9.3451 in
Ix	1.4912 in⁴	rx	1.4960 in	Ixy	0.0000 in⁴
Sx(t)	0.82272 in³	y(t)	1.8125 in	α	0.000 deg
Sx(b)	0.82272 in³	y(b)	1.8125 in		
Zx	0.93376 in³	Height	3.6250 in		
Iy	0.5781 in⁴	ry	0.9314 in	x_o	-2.1632 in
Sy(l)	0.61406 in³	x(l)	0.9414 in	y_o	0.0000 in
Sy(r)	0.37088 in³	x(r)	1.5586 in	jx	2.6950 in
Zy	0.54828 in³	Width	2.5000 in	jy	0.0000 in
I_1	1.4912 in⁴	r_1	1.4960 in	Cw	1.7463 in⁶
I_2	0.5781 in⁴	r_2	0.9314 in	J	0.0011291 in⁴
Ic	2.0693 in⁴	rc	1.7623 in		
I_o	5.1872 in⁴	r_o	2.7902 in		

Net Section Properties

Ix	1.4711 in⁴	rx	1.6217 in	Area	0.55935 in²
Sx(t)	0.81166 in³	y(t)	1.8125 in	Ixy	0.0000 in⁴
Sx(b)	0.81166 in³	y(b)	1.8125 in	α	0.000 deg
Zx	0.89365 in³				
Iy	0.4735 in⁴	ry	0.9201 in	x_o	-2.3535 in
Sy(l)	0.42484 in³	x(l)	1.1146 in	y_o	0.0000 in
Sy(r)	0.34178 in³	x(r)	1.3854 in	jx	2.5741 in
Zy	0.46185 in³			jy	0.0000 in
Ic	1.9446 in⁴	rc	1.8646 in	Cw	1.7142 in⁶
I_o	5.0430 in⁴	r_o	3.0026 in	J	0.0009479 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	19.390 k	ϕMnxo	31.478 k-in	ϕMnyo	17.987 k-in
Ae	0.45624 in²	Ixe	1.3581 in⁴	Iye	0.4735 in⁴
ϕTn	27.268 k	Sxe(t)	0.69950 in³	Sye(l)	0.42484 in³
		Sxe(b)	0.80678 in³	Sye(r)	0.34178 in³
Shear					
ϕVny	1.898 k	Negative Bending		Negative Bending	
ϕVnx	8.253 k	ϕMnxo	31.478 k-in	ϕMnyo	15.292 k-in
		Ixe	1.3581 in⁴	Iye	0.4673 in⁴
Torsion		Sxe(t)	0.80678 in³	Sye(l)	0.41548 in³
ϕBn	18.297 k-in²	Sxe(b)	0.69950 in³	Sye(r)	0.33983 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=52.434 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=54.388 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=58.477 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.6663 in², Fy=52.434 ksi

Tn=34.937 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.55935 in², Fu=65 ksi	
Tn=36.358 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=4.5852 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=2.231 k	Eq. G3-2
kv=3.6301	Eq. G3-8
Vcrh=4.2989 k	Eq. G3-6
Vn=2.1087 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=4.5852 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4468 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41383	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0026903 in⁴	Eq. 1.3-8
Is=0.00052997 in⁴	
ds=0.088017 in (lip ineffective width=0.35878 in)	Eq. 1.3-6
k=2.3644	Table 1.3-1
Element 2: Partially stiffened, w=2.1436 in	
f=50 ksi, k=2.3644	
λ=0.84669	Eq. 1.1-3
ρ=0.87418	Eq. 1.1-2
b=1.8739 in (ineffective width=0.2697 in)	Eq. 1.1-1
b_1=0.18457 in, b_2=1.6893 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.81905	Eq. 1.1-3
ρ=0.89298	Eq. 1.1-2
b=0.78966 in (ineffective width=0.094638 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=0.81905	Eq. 1.1-3
ρ=0.89298	Eq. 1.1-2
b=0.78966 in (ineffective width=0.094638 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4468 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41383	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0026903 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.088017 in (lip ineffective width=0.35878 in)	Eq. 1.3-6
k=2.3644	Table 1.3-1
Element 4: Partially stiffened, w=2.1436 in	
f=50 ksi, k=2.3644	
λ=0.84669	Eq. 1.1-3
ρ=0.87418	Eq. 1.1-2
b=1.8739 in (ineffective width=0.2697 in)	Eq. 1.1-1
b_1=0.18457 in, b_2=1.6893 in	
Ae=0.45624 in^2, Fn=50 ksi	
Pn=22.812 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=45.41 ksi, f_2=22.633 ksi	
ψ=0.49841	Eq. 1.2.2-1
k=0.6894	Eq. 1.2.2-2
λ=0.61646	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4468 in	
f_1=45.41 ksi, f_2=33.902 ksi	
ψ=0.74657	Eq. 1.2.2-1
k=0.53195	Eq. 1.2.2-2
λ=0.35458	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.381	Eq. 1.3-7
Ia=0.0025792 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.091808 in (lip ineffective width=0.35499 in)	Eq. 1.3-6
k=2.3855	Table 1.3-1
Element 4: Partially stiffened, w=2.1436 in	
f=49.082 ksi, k=2.3855	

λ=0.83517	Eq. 1.1-3
ρ=0.88195	Eq. 1.1-2
b=1.8905 in (ineffective width=0.25305 in)	Eq. 1.1-1
b_1=0.19423 in, b_2=1.6963 in	
Center of gravity shift: y=-0.12909 in	
Sxe=0.6995 in^3, Fy=50 ksi	
Mnl=34.975 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4468 in	
f_1=45.41 ksi, f_2=33.902 ksi	
ψ=0.74657	Eq. 1.2.2-1
k=0.53195	Eq. 1.2.2-2
λ=0.35458	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.381	Eq. 1.3-7
Ia=0.0025792 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.091808 in (lip ineffective width=0.35499 in)	Eq. 1.3-6
k=2.3855	Table 1.3-1
Element 2: Partially stiffened, w=2.1436 in	
f=49.082 ksi, k=2.3855	
λ=0.83517	Eq. 1.1-3
ρ=0.88195	Eq. 1.1-2
b=1.8905 in (ineffective width=0.25305 in)	Eq. 1.1-1
b_1=0.19423 in, b_2=1.6963 in	
Element 3: Treat as two unstiffened elements	
f_1=45.41 ksi, f_2=22.633 ksi	
ψ=0.49841	Eq. 1.2.2-1
k=0.6894	Eq. 1.2.2-2
λ=0.61646	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.12909 in	
Sxe=0.6995 in^3, Fy=50 ksi	
Mnl=34.975 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4468 in	
f_1=56.972 ksi, f_2=56.972 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.44174	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1

Element 2: Stiffened, w=2.1436 in
f_1=50.955 ksi, f_2=-39.522 ksi
ψ=0.77562 Eq. 1.1.2-1
k=18.748 Eq. 1.1.2-2
λ=0.30355 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.1436 in Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.56775 in Eq. 1.1.2-3
b_2=1.0718 in Eq. 1.1.2-4
Compression width=1.2072 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.4468 in
f_1=56.972 ksi, f_2=56.972 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.44174 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 4: Stiffened, w=2.1436 in
f_1=50.955 ksi, f_2=-39.522 ksi
ψ=0.77562 Eq. 1.1.2-1
k=18.748 Eq. 1.1.2-2
λ=0.30355 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.1436 in Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.56775 in Eq. 1.1.2-3
b_2=1.0718 in Eq. 1.1.2-4
Compression width=1.2072 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0 in
Sye=0.34178 in^3, Fy=58.477 ksi
Mnl=19.986 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=2.1436 in
f_1=34.354 ksi, f_2=-43.526 ksi
ψ=1.267 Eq. 1.1.2-1
k=31.835 Eq. 1.1.2-2
λ=0.19127 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.1436 in Eq. 1.1-1
h_o=2.5 in, b_o=3.625 in, h_o/b_o=0.68966
b_1=0.50237 in Eq. 1.1.2-3
b_2=1.0718 in Eq. 1.1.2-4
Compression width=0.94558 in

b_1+b_2 > compression width (fully effective)

Element 3: Treat as two unstiffened elements

f_1=39.533 ksi, f_2=39.533 ksi

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.72829	Eq. 1.1-3
ρ=0.9583	Eq. 1.1-2
b=0.84743 in (ineffective width=0.036875 in)	Eq. 1.1-1

f_1=39.533 ksi, f_2=39.533 ksi

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=0.72829	Eq. 1.1-3
ρ=0.9583	Eq. 1.1-2
b=0.84742 in (ineffective width=0.036875 in)	Eq. 1.1-1

Element 5: No compressive stress (fully effective)

Element 4: Stiffened, w=2.1436 in

f_1=34.354 ksi, f_2=-43.526 ksi

ψ=1.267	Eq. 1.1.2-1
k=31.835	Eq. 1.1.2-2
λ=0.19127	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.1436 in	Eq. 1.1-1

h_o=2.5 in, b_o=3.625 in, h_o/b_o=0.68966

b_1=0.50237 in	Eq. 1.1.2-3
b_2=1.0718 in	Eq. 1.1.2-4

Compression width=0.94558 in

b_1+b_2 > compression width (fully effective)

Center of gravity shift: x=0.010239 in

Sye=0.33983 in^3, Fy=50 ksi

Mnl=16.991 k-in	Eq. F3.1-1

Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud

Cw=1.7142 in^6, Wn=4.2157 in^2, Fy=50 ksi

Bn=20.331 k-in^2	G8.1-1

Ωb=1.67, ϕb=0.9

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Full Section Properties

Area	0.66630 in²	Wt.	0.0022654 k/ft	Flat	9.3451 in
Ix	1.4912 in⁴	rx	1.4960 in	Ixy	0.0000 in⁴
Sx(t)	0.82272 in³	y(t)	1.8125 in	α	0.000 deg
Sx(b)	0.82272 in³	y(b)	1.8125 in		
Zx	0.93376 in³	Height	3.6250 in		
Iy	0.5781 in⁴	ry	0.9314 in	x_o	-2.1632 in
Sy(l)	0.61406 in³	x(l)	0.9414 in	y_o	0.0000 in
Sy(r)	0.37088 in³	x(r)	1.5586 in	jx	2.6950 in
Zy	0.54828 in³	Width	2.5000 in	jy	0.0000 in
I_1	1.4912 in⁴	r_1	1.4960 in	Cw	1.7463 in⁶
I_2	0.5781 in⁴	r_2	0.9314 in	J	0.0011291 in⁴
Ic	2.0693 in⁴	rc	1.7623 in		
I_o	5.1872 in⁴	r_o	2.7902 in		

Net Section Properties

Ix	1.4711 in⁴	rx	1.6217 in	Area	0.55935 in²
Sx(t)	0.81166 in³	y(t)	1.8125 in	Ixy	0.0000 in⁴
Sx(b)	0.81166 in³	y(b)	1.8125 in	α	0.000 deg
Zx	0.89365 in³				
Iy	0.4735 in⁴	ry	0.9201 in	x_o	-2.3535 in
Sy(l)	0.42484 in³	x(l)	1.1146 in	y_o	0.0000 in
Sy(r)	0.34178 in³	x(r)	1.3854 in	jx	2.5741 in
Zy	0.46185 in³			jy	0.0000 in
Ic	1.9446 in⁴	rc	1.8646 in	Cw	1.7142 in⁶
I_o	5.0430 in⁴	r_o	3.0026 in	J	0.0009479 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	19.390 k	ϕMnxo	31.478 k-in	ϕMnyo	17.987 k-in
Ae	0.45624 in²	Ixe	1.3581 in⁴	Iye	0.4735 in⁴
ϕTn	27.268 k	Sxe(t)	0.69950 in³	Sye(l)	0.42484 in³
		Sxe(b)	0.80678 in³	Sye(r)	0.34178 in³
Shear					
ϕVny	1.898 k	Negative Bending		Negative Bending	
ϕVnx	8.253 k	ϕMnxo	31.478 k-in	ϕMnyo	15.292 k-in
		Ixe	1.3581 in⁴	Iye	0.4673 in⁴
Torsion		Sxe(t)	0.80678 in³	Sye(l)	0.41548 in³
ϕBn	18.297 k-in²	Sxe(b)	0.69950 in³	Sye(r)	0.33983 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=52.434 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=54.388 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=58.477 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.6663 in², Fy=52.434 ksi

Tn=34.937 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.55935 in², Fu=65 ksi	
Tn=36.358 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=4.5852 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=2.231 k	Eq. G3-2
kv=3.6301	Eq. G3-8
Vcrh=4.2989 k	Eq. G3-6
Vn=2.1087 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=4.5852 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4468 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41383	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0026903 in⁴	Eq. 1.3-8
Is=0.00052997 in⁴	
ds=0.088017 in (lip ineffective width=0.35878 in)	Eq. 1.3-6
k=2.3644	Table 1.3-1
Element 2: Partially stiffened, w=2.1436 in	
f=50 ksi, k=2.3644	
λ=0.84669	Eq. 1.1-3
ρ=0.87418	Eq. 1.1-2
b=1.8739 in (ineffective width=0.2697 in)	Eq. 1.1-1
b_1=0.18457 in, b_2=1.6893 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.81905	Eq. 1.1-3
ρ=0.89298	Eq. 1.1-2
b=0.78966 in (ineffective width=0.094638 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=0.81905	Eq. 1.1-3
ρ=0.89298	Eq. 1.1-2
b=0.78966 in (ineffective width=0.094638 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4468 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41383	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0026903 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.088017 in (lip ineffective width=0.35878 in)	Eq. 1.3-6
k=2.3644	Table 1.3-1
Element 4: Partially stiffened, w=2.1436 in	
f=50 ksi, k=2.3644	
λ=0.84669	Eq. 1.1-3
ρ=0.87418	Eq. 1.1-2
b=1.8739 in (ineffective width=0.2697 in)	Eq. 1.1-1
b_1=0.18457 in, b_2=1.6893 in	
Ae=0.45624 in^2, Fn=50 ksi	
Pn=22.812 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=45.41 ksi, f_2=22.633 ksi	
ψ=0.49841	Eq. 1.2.2-1
k=0.6894	Eq. 1.2.2-2
λ=0.61646	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4468 in	
f_1=45.41 ksi, f_2=33.902 ksi	
ψ=0.74657	Eq. 1.2.2-1
k=0.53195	Eq. 1.2.2-2
λ=0.35458	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.381	Eq. 1.3-7
Ia=0.0025792 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.091808 in (lip ineffective width=0.35499 in)	Eq. 1.3-6
k=2.3855	Table 1.3-1
Element 4: Partially stiffened, w=2.1436 in	
f=49.082 ksi, k=2.3855	

λ=0.83517	Eq. 1.1-3
ρ=0.88195	Eq. 1.1-2
b=1.8905 in (ineffective width=0.25305 in)	Eq. 1.1-1
b_1=0.19423 in, b_2=1.6963 in	
Center of gravity shift: y=-0.12909 in	
Sxe=0.6995 in^3, Fy=50 ksi	
Mnl=34.975 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4468 in	
f_1=45.41 ksi, f_2=33.902 ksi	
ψ=0.74657	Eq. 1.2.2-1
k=0.53195	Eq. 1.2.2-2
λ=0.35458	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.381	Eq. 1.3-7
Ia=0.0025792 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.091808 in (lip ineffective width=0.35499 in)	Eq. 1.3-6
k=2.3855	Table 1.3-1
Element 2: Partially stiffened, w=2.1436 in	
f=49.082 ksi, k=2.3855	
λ=0.83517	Eq. 1.1-3
ρ=0.88195	Eq. 1.1-2
b=1.8905 in (ineffective width=0.25305 in)	Eq. 1.1-1
b_1=0.19423 in, b_2=1.6963 in	
Element 3: Treat as two unstiffened elements	
f_1=45.41 ksi, f_2=22.633 ksi	
ψ=0.49841	Eq. 1.2.2-1
k=0.6894	Eq. 1.2.2-2
λ=0.61646	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.12909 in	
Sxe=0.6995 in^3, Fy=50 ksi	
Mnl=34.975 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4468 in	
f_1=56.972 ksi, f_2=56.972 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.44174	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1

Element 2: Stiffened, w=2.1436 in
f_1=50.955 ksi, f_2=-39.522 ksi
ψ=0.77562 Eq. 1.1.2-1
k=18.748 Eq. 1.1.2-2
λ=0.30355 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.1436 in Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.56775 in Eq. 1.1.2-3
b_2=1.0718 in Eq. 1.1.2-4
Compression width=1.2072 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.4468 in
f_1=56.972 ksi, f_2=56.972 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.44174 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 4: Stiffened, w=2.1436 in
f_1=50.955 ksi, f_2=-39.522 ksi
ψ=0.77562 Eq. 1.1.2-1
k=18.748 Eq. 1.1.2-2
λ=0.30355 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.1436 in Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.56775 in Eq. 1.1.2-3
b_2=1.0718 in Eq. 1.1.2-4
Compression width=1.2072 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0 in
Sye=0.34178 in^3, Fy=58.477 ksi
Mnl=19.986 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=2.1436 in
f_1=34.354 ksi, f_2=-43.526 ksi
ψ=1.267 Eq. 1.1.2-1
k=31.835 Eq. 1.1.2-2
λ=0.19127 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.1436 in Eq. 1.1-1
h_o=2.5 in, b_o=3.625 in, h_o/b_o=0.68966
b_1=0.50237 in Eq. 1.1.2-3
b_2=1.0718 in Eq. 1.1.2-4
Compression width=0.94558 in

b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=39.533 ksi, f_2=39.533 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.72829 Eq. 1.1-3
ρ=0.9583 Eq. 1.1-2
b=0.84743 in (ineffective width=0.036875 in) Eq. 1.1-1
f_1=39.533 ksi, f_2=39.533 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=0.72829 Eq. 1.1-3
ρ=0.9583 Eq. 1.1-2
b=0.84742 in (ineffective width=0.036875 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=2.1436 in
f_1=34.354 ksi, f_2=-43.526 ksi
ψ=1.267 Eq. 1.1.2-1
k=31.835 Eq. 1.1.2-2
λ=0.19127 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.1436 in Eq. 1.1-1
h_o=2.5 in, b_o=3.625 in, h_o/b_o=0.68966
b_1=0.50237 in Eq. 1.1.2-3
b_2=1.0718 in Eq. 1.1.2-4
Compression width=0.94558 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.010239 in
Sye=0.33983 in^3, Fy=50 ksi
Mnl=16.991 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=1.7142 in^6, Wn=4.2157 in^2, Fy=50 ksi
Bn=20.331 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

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Full Section Properties

Area	0.27510 in²	Wt.	0.00093532 k/ft	Flat	7.9507 in
Ix	0.6922 in⁴	rx	1.5863 in	Ixy	0.0000 in⁴
Sx(t)	0.34610 in³	y(t)	2.0000 in	α	0.000 deg
Sx(b)	0.34610 in³	y(b)	2.0000 in		
Zx	0.40128 in³	Height	4.0000 in		
Iy	0.1027 in⁴	ry	0.6110 in	x_o	-1.2611 in
Sy(l)	0.20040 in³	x(l)	0.5125 in	y_o	0.0000 in
Sy(r)	0.09231 in³	x(r)	1.1125 in	jx	2.2029 in
Zy	0.13600 in³	Width	1.6250 in	jy	0.0000 in
I_1	0.6922 in⁴	r_1	1.5863 in	Cw	0.34752 in⁶
I_2	0.1027 in⁴	r_2	0.6110 in	J	0.00010978 in⁴
Ic	0.7949 in⁴	rc	1.6999 in		
I_o	1.2324 in⁴	r_o	2.1166 in		

Net Section Properties

Ix	0.6825 in⁴	rx	1.7486 in	Area	0.22320 in²
Sx(t)	0.34124 in³	y(t)	2.0000 in	Ixy	0.0000 in⁴
Sx(b)	0.34124 in³	y(b)	2.0000 in	α	0.000 deg
Zx	0.38182 in³				
Iy	0.0870 in⁴	ry	0.6244 in	x_o	-1.3871 in
Sy(l)	0.13864 in³	x(l)	0.6276 in	y_o	0.0000 in
Sy(r)	0.08723 in³	x(r)	0.9974 in	jx	1.9365 in
Zy	0.12392 in³			jy	0.0000 in
Ic	0.7695 in⁴	rc	1.8568 in	Cw	0.34173 in⁶
I_o	1.1989 in⁴	r_o	2.3177 in	J	0.00008907 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	6.343 k	ϕMnxo	12.240 k-in	ϕMnyo	3.848 k-in
Ae	0.14925 in²	Ixe	0.60595 in⁴	Iye	0.08577 in⁴
ϕTn	10.881 k	Sxe(t)	0.27199 in³	Sye(l)	0.13791 in³
		Sxe(b)	0.34193 in³	Sye(r)	0.08551 in³
Shear					
ϕVny	0.596 k	Negative Bending		Negative Bending	
ϕVnx	2.621 k	ϕMnxo	12.240 k-in	ϕMnyo	3.526 k-in
		Ixe	0.60595 in⁴	Iye	0.06617 in⁴
Torsion		Sxe(t)	0.34193 in³	Sye(l)	0.08478 in³
ϕBn	5.5956 k-in²	Sxe(b)	0.27199 in³	Sye(r)	0.07836 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Fya=51.501 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Fya=53.516 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Fya=55.565 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength

Ag=0.2751 in², Fy=51.501 ksi	
Tn=14.168 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.2232 in², Fu=65 ksi	
Tn=14.508 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=1.4563 k at 180 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=1.5984 k	Eq. G3-2
kv=3.6639	Eq. G3-8
Vcrh=0.49872 k	Eq. G3-6
Vn=0.6618 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=1.4563 k at 0 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.389 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.74246	Eq. 1.1-3
ρ=0.94778	Eq. 1.1-2
b=0.36869 in (ineffective width=0.020315 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00022212 in⁴	Eq. 1.3-8
Is=0.00016972 in⁴	
ds=0.28171 in (lip ineffective width=0.086971 in)	Eq. 1.3-6
k=3.2075	Table 1.3-1
Element 2: Partially stiffened, w=1.403 in	
f=50 ksi, k=3.2075	
λ=0.98047	Eq. 1.1-3
ρ=0.79107	Eq. 1.1-2
b=1.1099 in (ineffective width=0.29313 in)	Eq. 1.1-1
b_1=0.42403 in, b_2=0.68584 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.1739	Eq. 1.1-3
ρ=0.41344	Eq. 1.1-2
b=0.47091 in (ineffective width=0.66809 in)	Eq. 1.1-1

f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.1739	Eq. 1.1-3
ρ=0.41344	Eq. 1.1-2
b=0.47091 in (ineffective width=0.66809 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.389 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.74246	Eq. 1.1-3
ρ=0.94778	Eq. 1.1-2
b=0.36869 in (ineffective width=0.020315 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00022212 in^4	Eq. 1.3-8
Is=0.00016972 in^4	
ds=0.28171 in (lip ineffective width=0.086971 in)	Eq. 1.3-6
k=3.2075	Table 1.3-1
Element 4: Partially stiffened, w=1.403 in	
f=50 ksi, k=3.2075	
λ=0.98047	Eq. 1.1-3
ρ=0.79107	Eq. 1.1-2
b=1.1099 in (ineffective width=0.29313 in)	Eq. 1.1-1
b_1=0.42403 in, b_2=0.68584 in	
Ae=0.14925 in^2, Fn=50 ksi	
Pn=7.4627 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=47.509 ksi, f_2=21.944 ksi	
ψ=0.46189	Eq. 1.2.2-1
k=0.7208	Eq. 1.2.2-2
λ=1.6367	Eq. 1.1-3
ρ=0.52885	Eq. 1.1-2
b=0.60236 in (ineffective width=0.53664 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.389 in	
f_1=47.509 ksi, f_2=38.778 ksi	
ψ=0.81622	Eq. 1.2.2-1
k=0.4999	Eq. 1.2.2-2
λ=0.67122	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.213	Eq. 1.3-7
Ia=0.00022128 in^4	Eq. 1.3-8
Is=0.00016972 in^4	

ds=0.29836 in (lip ineffective width=0.090639 in)	Eq. 1.3-6
k=3.211	Table 1.3-1
Element 4: Partially stiffened, w=1.403 in	
f=49.612 ksi, k=3.211	
λ=0.97612	Eq. 1.1-3
ρ=0.79357	Eq. 1.1-2
b=1.1134 in (ineffective width=0.28963 in)	Eq. 1.1-1
b_1=0.42698 in, b_2=0.6864 in	
Center of gravity shift: y=-0.22783 in	
Sxe=0.27199 in^3, Fy=50 ksi	
Mnl=13.6 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.389 in	
f_1=47.509 ksi, f_2=38.778 ksi	
ψ=0.81622	Eq. 1.2.2-1
k=0.4999	Eq. 1.2.2-2
λ=0.67122	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.213	Eq. 1.3-7
Ia=0.00022128 in^4	Eq. 1.3-8
Is=0.00016972 in^4	
ds=0.29836 in (lip ineffective width=0.090639 in)	Eq. 1.3-6
k=3.211	Table 1.3-1
Element 2: Partially stiffened, w=1.403 in	
f=49.612 ksi, k=3.211	
λ=0.97612	Eq. 1.1-3
ρ=0.79357	Eq. 1.1-2
b=1.1134 in (ineffective width=0.28963 in)	Eq. 1.1-1
b_1=0.42698 in, b_2=0.6864 in	
Element 3: Treat as two unstiffened elements	
f_1=47.509 ksi, f_2=21.944 ksi	
ψ=0.46189	Eq. 1.2.2-1
k=0.7208	Eq. 1.2.2-2
λ=1.6367	Eq. 1.1-3
ρ=0.52885	Eq. 1.1-2
b=0.60236 in (ineffective width=0.53664 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.22783 in	
Sxe=0.27199 in^3, Fy=50 ksi	
Mnl=13.6 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.389 in	

f_1=49.138 ksi, f_2=49.138 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.73603 Eq. 1.1-3
ρ=0.95254 Eq. 1.1-2
b=0.37054 in (ineffective width=0.018462 in) Eq. 1.1-1
Element 2: Stiffened, w=1.403 in
f_1=44.467 ksi, f_2=-25.47 ksi
ψ=0.57279 Eq. 1.1.2-1
k=14.927 Eq. 1.1.2-2
λ=0.42862 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.403 in Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25
b_1=0.39269 in Eq. 1.1.2-3
b_2=0.7015 in Eq. 1.1.2-4
Compression width=0.89205 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.389 in
f_1=49.138 ksi, f_2=49.138 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.73603 Eq. 1.1-3
ρ=0.95254 Eq. 1.1-2
b=0.37054 in (ineffective width=0.018462 in) Eq. 1.1-1
Element 4: Stiffened, w=1.403 in
f_1=44.467 ksi, f_2=-25.47 ksi
ψ=0.57279 Eq. 1.1.2-1
k=14.927 Eq. 1.1.2-2
λ=0.42862 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.403 in Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25
b_1=0.39269 in Eq. 1.1.2-3
b_2=0.7015 in Eq. 1.1.2-4
Compression width=0.89205 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=-0.0056424 in
Sye=0.085513 in^3, Fy=50 ksi
Mnl=4.2756 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.403 in
f_1=39.58 ksi, f_2=-43.432 ksi
ψ=1.0973 Eq. 1.1.2-1
k=26.646 Eq. 1.1.2-2

λ=0.30266	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.403 in	Eq. 1.1-1
h_o=1.625 in, b_o=4 in, h_o/b_o=0.40625	
b_1=0.34242 in	Eq. 1.1.2-3
b_2=0.7015 in	Eq. 1.1.2-4
Compression width=0.66894 in	
b_1+b_2 > compression width (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=45.124 ksi, f_2=45.124 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.0652	Eq. 1.1-3
ρ=0.43263	Eq. 1.1-2
b=0.49276 in (ineffective width=0.64624 in)	Eq. 1.1-1
f_1=45.124 ksi, f_2=45.124 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.0652	Eq. 1.1-3
ρ=0.43263	Eq. 1.1-2
b=0.49276 in (ineffective width=0.64624 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: Stiffened, w=1.403 in	
f_1=39.58 ksi, f_2=-43.432 ksi	
ψ=1.0973	Eq. 1.1.2-1
k=26.646	Eq. 1.1.2-2
λ=0.30266	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.403 in	Eq. 1.1-1
h_o=1.625 in, b_o=4 in, h_o/b_o=0.40625	
b_1=0.34242 in	Eq. 1.1.2-3
b_2=0.7015 in	Eq. 1.1.2-4
Compression width=0.66894 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0.15292 in	
Sye=0.07836 in^3, Fy=50 ksi	
Mnl=3.918 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud

Cw=0.34173 in^6, Wn=2.7482 in^2, Fy=50 ksi	
Bn=6.2173 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

400S162-43

Full Section Properties

Area	0.35668 in²	Wt.	0.0012127 k/ft	Flat	7.9086 in
Ix	0.8921 in⁴	rx	1.5815 in	Ixy	0.0000 in⁴
Sx(t)	0.44603 in³	y(t)	2.0000 in	α	0.000 deg
Sx(b)	0.44603 in³	y(b)	2.0000 in		
Zx	0.51860 in³	Height	4.0000 in		
Iy	0.1312 in⁴	ry	0.6064 in	x_o	-1.2494 in
Sy(l)	0.25578 in³	x(l)	0.5128 in	y_o	0.0000 in
Sy(r)	0.11795 in³	x(r)	1.1122 in	jx	2.1944 in
Zy	0.17466 in³	Width	1.6250 in	jy	0.0000 in
I_1	0.8921 in⁴	r_1	1.5815 in	Cw	0.44025 in⁶
I_2	0.1312 in⁴	r_2	0.6064 in	J	0.00024183 in⁴
Ic	1.0232 in⁴	rc	1.6938 in		
I_o	1.5800 in⁴	r_o	2.1047 in		

Net Section Properties

Ix	0.8794 in⁴	rx	1.7443 in	Area	0.28903 in²
Sx(t)	0.43969 in³	y(t)	2.0000 in	Ixy	0.0000 in⁴
Sx(b)	0.43969 in³	y(b)	2.0000 in	α	0.000 deg
Zx	0.49323 in³				
Iy	0.1111 in⁴	ry	0.6200 in	x_o	-1.3751 in
Sy(l)	0.17701 in³	x(l)	0.6276 in	y_o	0.0000 in
Sy(r)	0.11138 in³	x(r)	0.9974 in	jx	1.9266 in
Zy	0.15927 in³			jy	0.0000 in
Ic	0.9905 in⁴	rc	1.8512 in	Cw	0.43284 in⁶
I_o	1.5370 in⁴	r_o	2.3061 in	J	0.00019596 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	8.844 k	ϕMnxo	16.770 k-in	ϕMnyo	5.699 k-in
Ae	0.20809 in²	Ixe	0.80840 in⁴	Iye	0.11109 in⁴
ϕTn	14.090 k	Sxe(t)	0.37266 in³	Sye(l)	0.17701 in³
		Sxe(b)	0.44158 in³	Sye(r)	0.11138 in³
Shear					
ϕVny	1.032 k	Negative Bending		Negative Bending	
ϕVnx	3.391 k	ϕMnxo	16.770 k-in	ϕMnyo	4.667 k-in
		Ixe	0.80840 in⁴	Iye	0.09230 in⁴
Torsion		Sxe(t)	0.44158 in³	Sye(l)	0.12557 in³
ϕBn	7.1719 k-in²	Sxe(b)	0.37266 in³	Sye(r)	0.10371 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=51.839 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=54.31 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=56.847 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.35668 in², Fy=51.839 ksi

Tn=18.49 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.28903 in², Fu=65 ksi	
Tn=18.787 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=1.8839 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=2.069 k	Eq. G3-2
kv=3.6606	Eq. G3-8
Vcrh=1.1037 k	Eq. G3-6
Vn=1.1467 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=1.8839 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3837 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56184	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00048546 in⁴	Eq. 1.3-8
Is=0.00021231 in⁴	
ds=0.16781 in (lip ineffective width=0.21589 in)	Eq. 1.3-6
k=2.725	Table 1.3-1
Element 2: Partially stiffened, w=1.3924 in	
f=50 ksi, k=2.725	
λ=0.80992	Eq. 1.1-3
ρ=0.89931	Eq. 1.1-2
b=1.2522 in (ineffective width=0.1402 in)	Eq. 1.1-1
b_1=0.27382 in, b_2=0.97838 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.6601	Eq. 1.1-3
ρ=0.52256	Eq. 1.1-2
b=0.59242 in (ineffective width=0.54128 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=1.6601	Eq. 1.1-3
ρ=0.52256	Eq. 1.1-2
b=0.59242 in (ineffective width=0.54128 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.3837 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56184	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00048546 in^4	Eq. 1.3-8
Is=0.00021231 in^4	
ds=0.16781 in (lip ineffective width=0.21589 in)	Eq. 1.3-6
k=2.725	Table 1.3-1
Element 4: Partially stiffened, w=1.3924 in	
f=50 ksi, k=2.725	
λ=0.80992	Eq. 1.1-3
ρ=0.89931	Eq. 1.1-2
b=1.2522 in (ineffective width=0.1402 in)	Eq. 1.1-1
b_1=0.27382 in, b_2=0.97838 in	
Ae=0.20809 in^2, Fn=50 ksi	
Pn=10.404 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=47.319 ksi, f_2=21.187 ksi	
ψ=0.44775	Eq. 1.2.2-1
k=0.73374	Eq. 1.2.2-2
λ=1.2363	Eq. 1.1-3
ρ=0.66493	Eq. 1.1-2
b=0.75383 in (ineffective width=0.37987 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.3837 in	
f_1=47.319 ksi, f_2=38.475 ksi	
ψ=0.81309	Eq. 1.2.2-1
k=0.50126	Eq. 1.2.2-2
λ=0.50624	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.254	Eq. 1.3-7
Ia=0.00047422 in^4	Eq. 1.3-8
Is=0.00021231 in^4	
ds=0.17179 in (lip ineffective width=0.21191 in)	Eq. 1.3-6
k=2.7406	Table 1.3-1
Element 4: Partially stiffened, w=1.3924 in	

f=49.48 ksi, k=2.7406
λ=0.8034 Eq. 1.1-3
ρ=0.90387 Eq. 1.1-2
b=1.2585 in (ineffective width=0.13386 in) Eq. 1.1-1
b_1=0.28173 in, b_2=0.97681 in
Center of gravity shift: y=-0.16929 in
Sxe=0.37266 in^3, Fy=50 ksi
Mnl=18.633 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3837 in
f_1=47.319 ksi, f_2=38.475 ksi
ψ=0.81309 Eq. 1.2.2-1
k=0.50126 Eq. 1.2.2-2
λ=0.50624 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.254 Eq. 1.3-7
Ia=0.00047422 in^4 Eq. 1.3-8
Is=0.00021231 in^4
ds=0.17179 in (lip ineffective width=0.21191 in) Eq. 1.3-6
k=2.7406 Table 1.3-1
Element 2: Partially stiffened, w=1.3924 in
f=49.48 ksi, k=2.7406
λ=0.8034 Eq. 1.1-3
ρ=0.90387 Eq. 1.1-2
b=1.2585 in (ineffective width=0.13386 in) Eq. 1.1-1
b_1=0.28173 in, b_2=0.97681 in
Element 3: Treat as two unstiffened elements
f_1=47.319 ksi, f_2=21.187 ksi
ψ=0.44775 Eq. 1.2.2-1
k=0.73374 Eq. 1.2.2-2
λ=1.2363 Eq. 1.1-3
ρ=0.66493 Eq. 1.1-2
b=0.75383 in (ineffective width=0.37987 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0.16929 in
Sxe=0.37266 in^3, Fy=50 ksi
Mnl=18.633 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3837 in
f_1=55.562 ksi, f_2=55.562 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3

λ=0.59227	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=1.3924 in	
f_1=50.218 ksi, f_2=-29.142 ksi	
ψ=0.58031	Eq. 1.1.2-1
k=15.054	Eq. 1.1.2-2
λ=0.34534	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.3924 in	Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25	
b_1=0.38891 in	Eq. 1.1.2-3
b_2=0.6962 in	Eq. 1.1.2-4
Compression width=0.88109 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.3837 in	
f_1=55.562 ksi, f_2=55.562 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.59227	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Stiffened, w=1.3924 in	
f_1=50.218 ksi, f_2=-29.142 ksi	
ψ=0.58031	Eq. 1.1.2-1
k=15.054	Eq. 1.1.2-2
λ=0.34534	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.3924 in	Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25	
b_1=0.38891 in	Eq. 1.1.2-3
b_2=0.6962 in	Eq. 1.1.2-4
Compression width=0.88109 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0 in	
Sye=0.11138 in^3, Fy=56.847 ksi	
Mnl=6.3319 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: Stiffened, w=1.3924 in	
f_1=34.712 ksi, f_2=-43.47 ksi	
ψ=1.2523	Eq. 1.1.2-1
k=31.356	Eq. 1.1.2-2
λ=0.19894	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.3924 in	Eq. 1.1-1
h_o=1.625 in, b_o=4 in, h_o/b_o=0.40625	
b_1=0.32745 in	Eq. 1.1.2-3

b_2=0.6962 in	Eq. 1.1.2-4
Compression width=0.61821 in	
b_1+b_2 > compression width (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=39.976 ksi, f_2=39.976 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.4844	Eq. 1.1-3
ρ=0.57384	Eq. 1.1-2
b=0.65057 in (ineffective width=0.48313 in)	Eq. 1.1-1
f_1=39.976 ksi, f_2=39.976 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.4844	Eq. 1.1-3
ρ=0.57384	Eq. 1.1-2
b=0.65057 in (ineffective width=0.48313 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: Stiffened, w=1.3924 in	
f_1=34.712 ksi, f_2=-43.47 ksi	
ψ=1.2523	Eq. 1.1.2-1
k=31.356	Eq. 1.1.2-2
λ=0.19894	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.3924 in	Eq. 1.1-1
h_o=1.625 in, b_o=4 in, h_o/b_o=0.40625	
b_1=0.32745 in	Eq. 1.1.2-3
b_2=0.6962 in	Eq. 1.1.2-4
Compression width=0.61821 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0.10742 in	
Sye=0.10371 in^3, Fy=50 ksi	
Mnl=5.1856 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud

Cw=0.43284 in^6, Wn=2.7158 in^2, Fy=50 ksi	
Bn=7.9688 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.44314 in²	Wt.	0.0015067 k/ft	Flat	7.8293 in
Ix	1.0980 in⁴	rx	1.5741 in	Ixy	0.0000 in⁴
Sx(t)	0.54902 in³	y(t)	2.0000 in	α	0.000 deg
Sx(b)	0.54902 in³	y(b)	2.0000 in		
Zx	0.64095 in³	Height	4.0000 in		
Iy	0.1596 in⁴	ry	0.6001 in	x_o	-1.2346 in
Sy(l)	0.31164 in³	x(l)	0.5120 in	y_o	0.0000 in
Sy(r)	0.14337 in³	x(r)	1.1130 in	jx	2.1870 in
Zy	0.21409 in³	Width	1.6250 in	jy	0.0000 in
I_1	1.0980 in⁴	r_1	1.5741 in	Cw	0.52990 in⁶
I_2	0.1596 in⁴	r_2	0.6001 in	J	0.0004732 in⁴
Ic	1.2576 in⁴	rc	1.6846 in		
I_o	1.9330 in⁴	r_o	2.0886 in		

Net Section Properties

Ix	1.0821 in⁴	rx	1.7380 in	Area	0.35824 in²
Sx(t)	0.54106 in³	y(t)	2.0000 in	Ixy	0.0000 in⁴
Sx(b)	0.54106 in³	y(b)	2.0000 in	α	0.000 deg
Zx	0.60912 in³				
Iy	0.1350 in⁴	ry	0.6138 in	x_o	-1.3603 in
Sy(l)	0.21538 in³	x(l)	0.6266 in	y_o	0.0000 in
Sy(r)	0.13519 in³	x(r)	0.9984 in	jx	1.9170 in
Zy	0.19525 in³			jy	0.0000 in
Ic	1.2171 in⁴	rc	1.8432 in	Cw	0.52080 in⁶
I_o	1.8799 in⁴	r_o	2.2908 in	J	0.00038254 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	12.704 k	ϕMnxo	23.074 k-in	ϕMnyo	7.108 k-in
Ae	0.29893 in²	Ixe	1.0562 in⁴	Iye	0.1350 in⁴
ϕTn	17.464 k	Sxe(t)	0.51276 in³	Sye(l)	0.21538 in³
		Sxe(b)	0.54436 in³	Sye(r)	0.13519 in³
Shear					
ϕVny	1.589 k	Negative Bending		Negative Bending	
ϕVnx	4.102 k	ϕMnxo	23.074 k-in	ϕMnyo	5.850 k-in
		Ixe	1.0562 in⁴	Iye	0.1218 in⁴
Torsion		Sxe(t)	0.54436 in³	Sye(l)	0.17711 in³
ϕBn	8.75 k-in²	Sxe(b)	0.51276 in³	Sye(r)	0.13001 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=52.306 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=55.318 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=58.416 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.44314 in², Fy=52.306 ksi

Tn=23.179 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.35824 in², Fu=65 ksi	
Tn=23.285 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=2.2787 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=2.5102 k	Eq. G3-2
kv=3.6443	Eq. G3-8
Vcrh=2.1735 k	Eq. G3-6
Vn=1.7655 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=2.2787 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3585 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41829	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00033614 in⁴	Eq. 1.3-8
Is=0.00021732 in⁴	
ds=0.23177 in (lip ineffective width=0.12673 in)	Eq. 1.3-6
k=2.9231	Table 1.3-1
Element 2: Partially stiffened, w=1.342 in	
f=50 ksi, k=2.9231	
λ=0.60055	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.2934	Eq. 1.1-3
ρ=0.64166	Eq. 1.1-2
b=0.71128 in (ineffective width=0.39722 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.2934	Eq. 1.1-3

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    ρ=0.64166                                                    Eq. 1.1-2
    b=0.71128 in (ineffective width=0.39722 in)                  Eq. 1.1-1
  Element 5: Unstiffened, w=0.3585 in
    f₁=50 ksi, f₂=50 ksi
    ψ=1                                                          Eq. 1.2.2-1
    k=0.43                                                       Eq. 1.2.2-3
    λ=0.41829                                                    Eq. 1.1-3
    λ<0.673 (fully effective)                                    Eq. 1.1-1
  Element 4: Check for lip stiffener reduction
    S=31.091                                                     Eq. 1.3-7
    Ia=0.00033614 in⁴                                            Eq. 1.3-8
    Is=0.00021732 in⁴
    ds=0.23177 in (lip ineffective width=0.12673 in)             Eq. 1.3-6
    k=2.9231                                                     Table 1.3-1
  Element 4: Partially stiffened, w=1.342 in
    f=50 ksi, k=2.9231
    λ=0.60055                                                    Eq. 1.1-3
    λ<0.673 (fully effective)                                    Eq. 1.1-1
 Ae=0.29893 in², Fn=50 ksi
 Pn=14.946 k                                                     Eq. E3.1-1
 Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
 Effective width calculations for Stud
  Element 1: No compressive stress (fully effective)
  Element 2: No compressive stress (fully effective)
  Element 3: Treat as two unstiffened elements
    f₁=46.565 ksi, f₂=19.656 ksi
    ψ=0.42213                                                    Eq. 1.2.2-1
    k=0.7584                                                     Eq. 1.2.2-2
        λ=0.93983                                                Eq. 1.1-3
        ρ=0.81495                                                Eq. 1.1-2
        b=0.90337 in (ineffective width=0.20513 in)              Eq. 1.1-1
      Element 5: Unstiffened, w=0.3585 in
        f₁=46.565 ksi, f₂=37.863 ksi
        ψ=0.81311                                                Eq. 1.2.2-1
        k=0.50125                                                Eq. 1.2.2-2
        λ=0.37387                                                Eq. 1.1-3
        λ<0.673 (fully effective)                                Eq. 1.1-1
      Element 4: Check for lip stiffener reduction
        S=31.307                                                 Eq. 1.3-7
        Ia=0.00032409 in⁴                                        Eq. 1.3-8
        Is=0.00021732 in⁴
        ds=0.24039 in (lip ineffective width=0.11811 in)         Eq. 1.3-6
        k=2.9576                                                 Table 1.3-1
      Element 4: Partially stiffened, w=1.342 in
        f=49.313 ksi, k=2.9576
        λ=0.59292                                                Eq. 1.1-3
        λ<0.673 (fully effective)                                Eq. 1.1-1
   Center of gravity shift: y=-0.059776 in
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  Sxe=0.51276 in³, Fy=50 ksi
  Mnl=25.638 k-in                                          Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
  Effective width calculations for Stud
    Element 1: Unstiffened, w=0.3585 in
      f₁=46.565 ksi, f₂=37.863 ksi
      ψ=0.81311                                            Eq. 1.2.2-1
      k=0.50125                                            Eq. 1.2.2-2
      λ=0.37387                                            Eq. 1.1-3
      λ<0.673 (fully effective)                            Eq. 1.1-1
    Element 2: Check for lip stiffener reduction
      S=31.307                                             Eq. 1.3-7
      Ia=0.00032409 in⁴                                    Eq. 1.3-8
      Is=0.00021732 in⁴
      ds=0.24039 in (lip ineffective width=0.11811 in)     Eq. 1.3-6
      k=2.9576                                             Table 1.3-1
    Element 2: Partially stiffened, w=1.342 in
      f=49.313 ksi, k=2.9576
      λ=0.59292                                            Eq. 1.1-3
      λ<0.673 (fully effective)                            Eq. 1.1-1
    Element 3: Treat as two unstiffened elements
      f₁=46.565 ksi, f₂=19.656 ksi
      ψ=0.42213                                            Eq. 1.2.2-1
      k=0.7584                                             Eq. 1.2.2-2
      λ=0.93983                                            Eq. 1.1-3
      ρ=0.81495                                            Eq. 1.1-2
      b=0.90337 in (ineffective width=0.20513 in)          Eq. 1.1-1
    Element 5: No compressive stress (fully effective)
    Element 4: No compressive stress (fully effective)
  Center of gravity shift: y=0.059777 in
  Sxe=0.51276 in³, Fy=50 ksi
  Mnl=25.638 k-in                                          Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
  Effective width calculations for Stud
    Element 1: Unstiffened, w=0.3585 in
      f₁=56.76 ksi, f₂=56.76 ksi
      ψ=1                                                  Eq. 1.2.2-1
      k=0.43                                               Eq. 1.2.2-3
      λ=0.44567                                            Eq. 1.1-3
      λ<0.673 (fully effective)                            Eq. 1.1-1
    Element 2: Stiffened, w=1.342 in
      f₁=50.137 ksi, f₂=-28.387 ksi
      ψ=0.5662                                             Eq. 1.1.2-1
      k=14.816                                             Eq. 1.1.2-2
      λ=0.26711                                            Eq. 1.1-3
      ρ=1                                                  Eq. 1.1-2
      be=1.342 in                                          Eq. 1.1-1
      h₀=1.625 in, b₀=0.5 in, h₀/b₀=3.25
```

```
      b₁=0.37631 in                                          Eq. 1.1.2-3
      b₂=0.671 in                                            Eq. 1.1.2-4
      Compression width=0.85685 in
      b₁+b₂ > compression width (fully effective)
    Element 3: No compressive stress (fully effective)
    Element 5: Unstiffened, w=0.3585 in
      f₁=56.76 ksi, f₂=56.76 ksi
      ψ=1                                                    Eq. 1.2.2-1
      k=0.43                                                 Eq. 1.2.2-3
      λ=0.44567                                              Eq. 1.1-3
      λ<0.673 (fully effective)                              Eq. 1.1-1
    Element 4: Stiffened, w=1.342 in
      f₁=50.137 ksi, f₂=-28.387 ksi
      ψ=0.5662                                               Eq. 1.1.2-1
      k=14.816                                               Eq. 1.1.2-2
      λ=0.26711                                              Eq. 1.1-3
      ρ=1                                                    Eq. 1.1-2
      be=1.342 in                                            Eq. 1.1-1
      h₀=1.625 in, b₀=0.5 in, h₀/b₀=3.25
      b₁=0.37631 in                                          Eq. 1.1.2-3
      b₂=0.671 in                                            Eq. 1.1.2-4
      Compression width=0.85685 in
      b₁+b₂ > compression width (fully effective)
  Center of gravity shift: x=0 in
  Sye=0.13519 in³, Fy=58.416 ksi
  Mnl=7.8974 k-in                                            Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
  Effective width calculations for Stud
    Element 1: No compressive stress (fully effective)
    Element 2: Stiffened, w=1.342 in
      f₁=29.127 ksi, f₂=-42.453 ksi
      ψ=1.4575                                               Eq. 1.1.2-1
      k=38.598                                               Eq. 1.1.2-2
      λ=0.12614                                              Eq. 1.1-3
      ρ=1                                                    Eq. 1.1-2
      be=1.342 in                                            Eq. 1.1-1
      h₀=1.625 in, b₀=4 in, h₀/b₀=0.40625
      b₁=0.30107 in                                          Eq. 1.1.2-3
      b₂=0.671 in                                            Eq. 1.1.2-4
      Compression width=0.54609 in
      b₁+b₂ > compression width (fully effective)
    Element 3: Treat as two unstiffened elements
      f₁=35.165 ksi, f₂=35.165 ksi
      ψ=1                                                    Eq. 1.2.2-1
      k=0.43                                                 Eq. 1.2.2-3
      λ=1.0847                                               Eq. 1.1-3
      ρ=0.73495                                              Eq. 1.1-2
      b=0.81469 in (ineffective width=0.29381 in)            Eq. 1.1-1
      f₁=35.165 ksi, f₂=35.165 ksi
      ψ=1                                                    Eq. 1.2.2-1
```

```
      k=0.43                                                Eq. 1.2.2-3
      λ=1.0847                                              Eq. 1.1-3
      ρ=0.73495                                             Eq. 1.1-2
      b=0.81469 in (ineffective width=0.29381 in)           Eq. 1.1-1
    Element 5: No compressive stress (fully effective)
    Element 4: Stiffened, w=1.342 in
      f₁=29.127 ksi, f₂=-42.453 ksi
      ψ=1.4575                                              Eq. 1.1.2-1
      k=38.598                                              Eq. 1.1.2-2
      λ=0.12614                                             Eq. 1.1-3
      ρ=1                                                   Eq. 1.1-2
      be=1.342 in                                           Eq. 1.1-1
      h₀=1.625 in, b₀=4 in, h₀/b₀=0.40625
      b₁=0.30107 in                                         Eq. 1.1.2-3
      b₂=0.671 in                                           Eq. 1.1.2-4
      Compression width=0.54609 in
      b₁+b₂ > compression width (fully effective)
  Center of gravity shift: x=0.061236 in
  Sye=0.13001 in³, Fy=50 ksi
  Mnl=6.5005 k-in                                           Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
  Cw=0.5208 in⁶, Wn=2.6784 in², Fy=50 ksi
  Bn=9.7223 k-in²                                           G8.1-1
  Ωb=1.67, ϕb=0.9
```

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Full Section Properties

Area	0.55044 in²	Wt.	0.0018715 k/ft	Flat	7.7201 in
Ix	1.3467 in⁴	rx	1.5642 in	Ixy	0.0000 in⁴
Sx(t)	0.67336 in³	y(t)	2.0000 in	α	0.000 deg
Sx(b)	0.67336 in³	y(b)	2.0000 in		
Zx	0.79047 in³	Height	4.0000 in		
Iy	0.1926 in⁴	ry	0.5915 in	x_o	-1.2148 in
Sy(l)	0.37717 in³	x(l)	0.5106 in	y_o	0.0000 in
Sy(r)	0.17282 in³	x(r)	1.1144 in	jx	2.1779 in
Zy	0.26111 in³	Width	1.6250 in	jy	0.0000 in
I_1	1.3467 in⁴	r_1	1.5642 in	Cw	0.63031 in⁶
I_2	0.1926 in⁴	r_2	0.5915 in	J	0.0009328 in⁴
Ic	1.5393 in⁴	rc	1.6723 in		
I_o	2.3516 in⁴	r_o	2.0669 in		

Net Section Properties

Ix	1.3267 in⁴	rx	1.7296 in	Area	0.44349 in²
Sx(t)	0.66333 in³	y(t)	2.0000 in	Ixy	0.0000 in⁴
Sx(b)	0.66333 in³	y(b)	2.0000 in	α	0.000 deg
Zx	0.75037 in³				
Iy	0.1626 in⁴	ry	0.6055 in	x_o	-1.3405 in
Sy(l)	0.26009 in³	x(l)	0.6252 in	y_o	0.0000 in
Sy(r)	0.16263 in³	x(r)	0.9998 in	jx	1.9049 in
Zy	0.23812 in³			jy	0.0000 in
Ic	1.4893 in⁴	rc	1.8325 in	Cw	0.61916 in⁶
I_o	2.2862 in⁴	r_o	2.2705 in	J	0.0007515 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	17.446 k	ϕMnxo	32.755 k-in	ϕMnyo	8.843 k-in
Ae	0.41049 in²	Ixe	1.3241 in⁴	Iye	0.1626 in⁴
ϕTn	21.620 k	Sxe(t)	0.65961 in³	Sye(l)	0.26009 in³
		Sxe(b)	0.66451 in³	Sye(r)	0.16263 in³
Shear					
ϕVny	2.340 k	Negative Bending		Negative Bending	
ϕVnx	4.884 k	ϕMnxo	32.755 k-in	ϕMnyo	7.244 k-in
		Ixe	1.3241 in⁴	Iye	0.1583 in⁴
Torsion		Sxe(t)	0.66451 in³	Sye(l)	0.24672 in³
ϕBn	10.596 k-in²	Sxe(b)	0.65961 in³	Sye(r)	0.16097 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Fya=52.946 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Fya=56.625 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=55.176 ksi	
Max net section stress allowed for positive bending: Fya=55.176 ksi	
Max compression stress allowed for negative bending: Fya=55.176 ksi	
Max net section stress allowed for negative bending: Fya=55.176 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Fya=60.418 ksi	Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi	

Axial Tension Strength

Ag=0.55044 in², Fy=52.946 ksi	
Tn=29.144 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.44349 in², Fu=65 ksi	
Tn=28.827 k	Eq. D3-1
Ωt=2, ϕt=0.75	

Shear Strength

Stud element 2	
Vn=2.7135 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=3.0052 k	Eq. G3-2
kv=3.6198	Eq. G3-8
Vcrh=4.3184 k	Eq. G3-6
Vn=2.6001 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=2.7135 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	

Axial Compression Strength

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3218 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.29806	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00015029 in⁴	Eq. 1.3-8
Is=0.000198 in⁴ > Ia (no lip reduction)	
k=3.2793	Table 1.3-1
Element 2: Partially stiffened, w=1.2686 in	
f=50 ksi, k=3.2793	
λ=0.42548	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.99272	Eq. 1.1-3
ρ=0.7841	Eq. 1.1-2
b=0.84039 in (ineffective width=0.23141 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3

λ=0.99272	Eq. 1.1-3
ρ=0.7841	Eq. 1.1-2
b=0.84039 in (ineffective width=0.23141 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.3218 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.29806	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00015029 in^4	Eq. 1.3-8
Is=0.000198 in^4 > Ia (no lip reduction)	
k=3.2793	Table 1.3-1
Element 4: Partially stiffened, w=1.2686 in	
f=50 ksi, k=3.2793	
λ=0.42548	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Ae=0.41049 in^2, Fn=50 ksi	
Pn=20.525 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=50.277 ksi, f_2=20.815 ksi	
ψ=0.41401	Eq. 1.2.2-1
k=0.76656	Eq. 1.2.2-2
λ=0.74557	Eq. 1.1-3
ρ=0.94549	Eq. 1.1-2
b=1.0134 in (ineffective width=0.058428 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.3218 in	
f_1=50.277 ksi, f_2=41.432 ksi	
ψ=0.82406	Eq. 1.2.2-1
k=0.49654	Eq. 1.2.2-2
λ=0.27814	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=29.863	Eq. 1.3-7
Ia=0.00019803 in^4	Eq. 1.3-8
Is=0.000198 in^4	
ds=0.32175 in (lip ineffective width=4.9859e-5 in)	Eq. 1.3-6
k=3.2791	Table 1.3-1
Element 4: Partially stiffened, w=1.2686 in	
f=54.196 ksi, k=3.2791	
λ=0.44298	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Center of gravity shift: y=-0.0074011 in	

Sxe=0.65961 in³, Fy=55.176 ksi
Mnl=36.394 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3218 in
f_1=50.277 ksi, f_2=41.431 ksi
ψ=0.82406 — Eq. 1.2.2-1
k=0.49654 — Eq. 1.2.2-2
λ=0.27814 — Eq. 1.1-3
λ<0.673 (fully effective) — Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=29.863 — Eq. 1.3-7
Ia=0.00019803 in⁴ — Eq. 1.3-8
Is=0.000198 in⁴
ds=0.32175 in (lip ineffective width=4.9591e-5 in) — Eq. 1.3-6
k=3.2791 — Table 1.3-1
Element 2: Partially stiffened, w=1.2686 in
f=54.196 ksi, k=3.2791
λ=0.44298 — Eq. 1.1-3
λ<0.673 (fully effective) — Eq. 1.1-1
Element 3: Treat as two unstiffened elements
f_1=50.277 ksi, f_2=20.815 ksi
ψ=0.41401 — Eq. 1.2.2-1
k=0.76656 — Eq. 1.2.2-2
λ=0.74557 — Eq. 1.1-3
ρ=0.94549 — Eq. 1.1-2
b=1.0134 in (ineffective width=0.058428 in) — Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0.007401 in
Sxe=0.65961 in³, Fy=55.176 ksi
Mnl=36.394 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3218 in
f_1=58.264 ksi, f_2=58.264 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.32175 — Eq. 1.1-3
λ<0.673 (fully effective) — Eq. 1.1-1
Element 2: Stiffened, w=1.2686 in
f_1=49.65 ksi, f_2=-27.009 ksi
ψ=0.54398 — Eq. 1.1.2-1
k=14.449 — Eq. 1.1.2-2
λ=0.20199 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2

be=1.2686 in	Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25	
b_1=0.35796 in	Eq. 1.1.2-3
b_2=0.6343 in	Eq. 1.1.2-4
Compression width=0.82164 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.3218 in	
f_1=58.264 ksi, f_2=58.264 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.32175	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Stiffened, w=1.2686 in	
f_1=49.65 ksi, f_2=-27.009 ksi	
ψ=0.54398	Eq. 1.1.2-1
k=14.449	Eq. 1.1.2-2
λ=0.20199	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.2686 in	Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25	
b_1=0.35796 in	Eq. 1.1.2-3
b_2=0.6343 in	Eq. 1.1.2-4
Compression width=0.82164 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0 in	
Sye=0.16263 in^3, Fy=60.418 ksi	
Mnl=9.8256 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: Stiffened, w=1.2686 in	
f_1=23.535 ksi, f_2=-40.943 ksi	
ψ=1.7397	Eq. 1.1.2-1
k=50.605	Eq. 1.1.2-2
λ=0.07431	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.2686 in	Eq. 1.1-1
h_o=1.625 in, b_o=4 in, h_o/b_o=0.40625	
b_1=0.26766 in	Eq. 1.1.2-3
b_2=0.6343 in	Eq. 1.1.2-4
Compression width=0.46305 in	
b_1+b_2 > compression width (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=30.78 ksi, f_2=30.78 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.77889	Eq. 1.1-3

ρ=0.92124	Eq. 1.1-2
b=0.98739 in (ineffective width=0.084413 in)	Eq. 1.1-1
f_1=30.78 ksi, f_2=30.78 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.77889	Eq. 1.1-3
ρ=0.92124	Eq. 1.1-2
b=0.98739 in (ineffective width=0.084413 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: Stiffened, w=1.2686 in	
f_1=23.535 ksi, f_2=-40.943 ksi	
ψ=1.7397	Eq. 1.1.2-1
k=50.605	Eq. 1.1.2-2
λ=0.07431	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.2686 in	Eq. 1.1-1
h_o=1.625 in, b_o=4 in, h_o/b_o=0.40625	
b_1=0.26766 in	Eq. 1.1.2-3
b_2=0.6343 in	Eq. 1.1.2-4
Compression width=0.46305 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0.016447 in	
Sye=0.16097 in^3, Fy=50 ksi	
Mnl=8.0484 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud

Cw=0.61916 in^6, Wn=2.6295 in^2, Fy=50 ksi	
Bn=11.773 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.27969 in²	Wt.	0.00095094 k/ft	Flat	8.9643 in
Ix	0.7348 in⁴	rx	1.6208 in	Ixy	0.0000 in⁴
Sx(t)	0.36738 in³	y(t)	2.0000 in	α	0.000 deg
Sx(b)	0.36738 in³	y(b)	2.0000 in		
Zx	0.42050 in³	Height	4.0000 in		
Iy	0.1660 in⁴	ry	0.7705 in	x_o	-1.6909 in
Sy(l)	0.23787 in³	x(l)	0.6980 in	y_o	0.0000 in
Sy(r)	0.12753 in³	x(r)	1.3020 in	jx	2.4284 in
Zy	0.18529 in³	Width	2.0000 in	jy	0.0000 in
I_1	0.7348 in⁴	r_1	1.6208 in	Cw	0.61214 in⁶
I_2	0.1660 in⁴	r_2	0.7705 in	J	0.0000908 in⁴
Ic	0.9008 in⁴	rc	1.7946 in		
I_o	1.7005 in⁴	r_o	2.4658 in		

Net Section Properties

Ix	0.7260 in⁴	rx	1.7656 in	Area	0.23289 in²
Sx(t)	0.36299 in³	y(t)	2.0000 in	Ixy	0.0000 in⁴
Sx(b)	0.36299 in³	y(b)	2.0000 in	α	0.000 deg
Zx	0.40295 in³				
Iy	0.1399 in⁴	ry	0.7750 in	x_o	-1.8402 in
Sy(l)	0.16747 in³	x(l)	0.8351 in	y_o	0.0000 in
Sy(r)	0.12007 in³	x(r)	1.1649 in	jx	2.2267 in
Zy	0.16262 in³			jy	0.0000 in
Ic	0.8658 in⁴	rc	1.9282 in	Cw	0.60310 in⁶
I_o	1.6545 in⁴	r_o	2.6654 in	J	0.00007557 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	5.898 k	ϕMnxo	11.457 k-in	ϕMnyo	4.772 k-in
Ae	0.13878 in²	Ixe	0.59576 in⁴	Iye	0.12817 in⁴
ϕTn	11.353 k	Sxe(t)	0.25461 in³	Sye(l)	0.16194 in³
		Sxe(b)	0.35887 in³	Sye(r)	0.10606 in³
Shear					
ϕVny	0.482 k	Negative Bending		Negative Bending	
ϕVnx	2.609 k	ϕMnxo	11.457 k-in	ϕMnyo	4.522 k-in
		Ixe	0.59576 in⁴	Iye	0.10322 in⁴
Torsion		Sxe(t)	0.35887 in³	Sye(l)	0.10049 in³
ϕBn	7.3436 k-in²	Sxe(b)	0.25461 in³	Sye(r)	0.10609 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Fya=51.227 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Fya=52.65 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Fya=54.15 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength

Ag=0.27969 in², Fy=51.227 ksi	
Tn=14.328 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.23289 in², Fu=65 ksi	
Tn=15.138 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=1.4492 k at 180 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=1.4446 k	Eq. G3-2
kv=3.7215	Eq. G3-8
Vcrh=0.3714 k	Eq. G3-6
Vn=0.53568 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=1.4492 k at 0 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5157 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.0916	Eq. 1.1-3
ρ=0.73148	Eq. 1.1-2
b=0.37723 in (ineffective width=0.13847 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00020486 in⁴	Eq. 1.3-8
Is=0.00035659 in⁴ > Ia (no lip reduction)	
k=3.4958	Table 1.3-1
Element 2: Partially stiffened, w=1.7814 in	
f=50 ksi, k=3.4958	
λ=1.3224	Eq. 1.1-3
ρ=0.63039	Eq. 1.1-2
b=1.123 in (ineffective width=0.65843 in)	Eq. 1.1-1
b_1=0.56148 in, b_2=0.56148 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.4144	Eq. 1.1-3
ρ=0.37643	Eq. 1.1-2
b=0.4294 in (ineffective width=0.7113 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.4144	Eq. 1.1-3
ρ=0.37643	Eq. 1.1-2
b=0.4294 in (ineffective width=0.7113 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.5157 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.0916	Eq. 1.1-3
ρ=0.73148	Eq. 1.1-2
b=0.37723 in (ineffective width=0.13847 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00020486 in^4	Eq. 1.3-8
Is=0.00035659 in^4 > Ia (no lip reduction)	
k=3.4958	Table 1.3-1
Element 4: Partially stiffened, w=1.7814 in	
f=50 ksi, k=3.4958	
λ=1.3224	Eq. 1.1-3
ρ=0.63039	Eq. 1.1-2
b=1.123 in (ineffective width=0.65843 in)	Eq. 1.1-1
b_1=0.56148 in, b_2=0.56148 in	
Ae=0.13878 in^2, Fn=50 ksi	
Pn=6.9388 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=47.664 ksi, f_2=23.287 ksi	
ψ=0.48855	Eq. 1.2.2-1
k=0.6976	Eq. 1.2.2-2
λ=1.8508	Eq. 1.1-3
ρ=0.47608	Eq. 1.1-2
b=0.54307 in (ineffective width=0.59763 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.5157 in	
f_1=47.664 ksi, f_2=36.643 ksi	
ψ=0.76878	Eq. 1.2.2-1
k=0.52129	Eq. 1.2.2-2
λ=0.96794	Eq. 1.1-3
ρ=0.79831	Eq. 1.1-2
b=0.41169 in (ineffective width=0.10401 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.195	Eq. 1.3-7
Ia=0.00020419 in^4	Eq. 1.3-8
Is=0.00035659 in^4 > Ia (no lip reduction)	
k=3.4958	Table 1.3-1

Element 4: Partially stiffened, w=1.7814 in
f=49.667 ksi, k=3.4958
λ=1.318 Eq. 1.1-3
ρ=0.63208 Eq. 1.1-2
b=1.126 in (ineffective width=0.65542 in) Eq. 1.1-1
b_1=0.56299 in, b_2=0.56299 in
Center of gravity shift: y=-0.3399 in
Sxe=0.25461 in^3, Fy=50 ksi
Mnl=12.731 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.5157 in
f_1=47.664 ksi, f_2=36.643 ksi
ψ=0.76878 Eq. 1.2.2-1
k=0.52129 Eq. 1.2.2-2
λ=0.96794 Eq. 1.1-3
ρ=0.79831 Eq. 1.1-2
b=0.41169 in (ineffective width=0.10401 in) Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.195 Eq. 1.3-7
Ia=0.00020419 in^4 Eq. 1.3-8
Is=0.00035659 in^4 > Ia (no lip reduction)
k=3.4958 Table 1.3-1
Element 2: Partially stiffened, w=1.7814 in
f=49.667 ksi, k=3.4958
λ=1.318 Eq. 1.1-3
ρ=0.63208 Eq. 1.1-2
b=1.126 in (ineffective width=0.65542 in) Eq. 1.1-1
b_1=0.56299 in, b_2=0.56299 in
Element 3: Treat as two unstiffened elements
f_1=47.664 ksi, f_2=23.287 ksi
ψ=0.48855 Eq. 1.2.2-1
k=0.6976 Eq. 1.2.2-2
λ=1.8508 Eq. 1.1-3
ρ=0.47608 Eq. 1.1-2
b=0.54307 in (ineffective width=0.59763 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0.3399 in
Sxe=0.25461 in^3, Fy=50 ksi
Mnl=12.731 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.5157 in
f_1=49.355 ksi, f_2=49.355 ksi
ψ=1 Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=1.0845	Eq. 1.1-3
ρ=0.73504	Eq. 1.1-2
b=0.37906 in (ineffective width=0.13664 in)	Eq. 1.1-1
Element 2: Stiffened, w=1.7814 in	
f_1=45.478 ksi, f_2=-28.225 ksi	
ψ=0.62063	Eq. 1.1.2-1
k=15.754	Eq. 1.1.2-2
λ=0.5941	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.7814 in	Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2	
b_1=0.49201 in	Eq. 1.1.2-3
b_2=0.8907 in	Eq. 1.1.2-4
Compression width=1.0992 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.5157 in	
f_1=49.355 ksi, f_2=49.355 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=1.0845	Eq. 1.1-3
ρ=0.73504	Eq. 1.1-2
b=0.37906 in (ineffective width=0.13664 in)	Eq. 1.1-1
Element 4: Stiffened, w=1.7814 in	
f_1=45.478 ksi, f_2=-28.225 ksi	
ψ=0.62063	Eq. 1.1.2-1
k=15.754	Eq. 1.1.2-2
λ=0.5941	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.7814 in	Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2	
b_1=0.49201 in	Eq. 1.1.2-3
b_2=0.8907 in	Eq. 1.1.2-4
Compression width=1.0992 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=-0.043675 in	
Sye=0.10606 in^3, Fy=50 ksi	
Mnl=5.3028 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: Stiffened, w=1.7814 in	
f_1=44.679 ksi, f_2=-42.04 ksi	
ψ=0.94093	Eq. 1.1.2-1
k=22.506	Eq. 1.1.2-2
λ=0.49268	Eq. 1.1-3
ρ=1	Eq. 1.1-2

be=1.7814 in	Eq. 1.1-1
h_o=2 in, b_o=4 in, h_o/b_o=0.5	
b_1=0.45203 in	Eq. 1.1.2-3
b_2=0.8907 in	Eq. 1.1.2-4
Compression width=0.91781 in	
b_1+b_2 > compression width (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=49.241 ksi, f_2=49.241 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.396	Eq. 1.1-3
ρ=0.37903	Eq. 1.1-2
b=0.43236 in (ineffective width=0.70834 in)	Eq. 1.1-1
f_1=49.241 ksi, f_2=49.241 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.396	Eq. 1.1-3
ρ=0.37903	Eq. 1.1-2
b=0.43236 in (ineffective width=0.70834 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: Stiffened, w=1.7814 in	
f_1=44.679 ksi, f_2=-42.04 ksi	
ψ=0.94093	Eq. 1.1.2-1
k=22.506	Eq. 1.1.2-2
λ=0.49268	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.7814 in	Eq. 1.1-1
h_o=2 in, b_o=4 in, h_o/b_o=0.5	
b_1=0.45203 in	Eq. 1.1.2-3
b_2=0.8907 in	Eq. 1.1.2-4
Compression width=0.91781 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0.19198 in	
Sye=0.10049 in^3, Fy=50 ksi	
Mnl=5.0244 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud

Cw=0.6031 in^6, Wn=3.6957 in^2, Fy=50 ksi	
Bn=8.1595 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

400S200-33

Full Section Properties

Area	0.30970 in²	Wt.	0.0010530 k/ft	Flat	8.9507 in
Ix	0.8121 in⁴	rx	1.6193 in	Ixy	0.0000 in⁴
Sx(t)	0.40605 in³	y(t)	2.0000 in	α	0.000 deg
Sx(b)	0.40605 in³	y(b)	2.0000 in		
Zx	0.46517 in³	Height	4.0000 in		
Iy	0.1832 in⁴	ry	0.7690 in	x_o	-1.6870 in
Sy(l)	0.26238 in³	x(l)	0.6981 in	y_o	0.0000 in
Sy(r)	0.14068 in³	x(r)	1.3019 in	jx	2.4251 in
Zy	0.20473 in³	Width	2.0000 in	jy	0.0000 in
I_1	0.8121 in⁴	r_1	1.6193 in	Cw	0.67347 in⁶
I_2	0.1832 in⁴	r_2	0.7690 in	J	0.0001236 in⁴
Ic	0.9953 in⁴	rc	1.7927 in		
I_o	1.8767 in⁴	r_o	2.4617 in		

Net Section Properties

Ix	0.8024 in⁴	rx	1.7642 in	Area	0.25780 in²
Sx(t)	0.40119 in³	y(t)	2.0000 in	Ixy	0.0000 in⁴
Sx(b)	0.40119 in³	y(b)	2.0000 in	α	0.000 deg
Zx	0.44570 in³				
Iy	0.1543 in⁴	ry	0.7735 in	x_o	-1.8363 in
Sy(l)	0.18471 in³	x(l)	0.8351 in	y_o	0.0000 in
Sy(r)	0.13243 in³	x(r)	1.1649 in	jx	2.2230 in
Zy	0.17968 in³			jy	0.0000 in
Ic	0.9566 in⁴	rc	1.9264 in	Cw	0.66350 in⁶
I_o	1.8259 in⁴	r_o	2.6614 in	J	0.00010287 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	7.026 k	ϕMnxo	13.515 k-in	ϕMnyo	5.421 k-in
Ae	0.16532 in²	Ixe	0.68471 in⁴	Iye	0.14437 in⁴
ϕTn	12.568 k	Sxe(t)	0.30033 in³	Sye(l)	0.18008 in³
		Sxe(b)	0.39804 in³	Sye(r)	0.12048 in³
Shear					
ϕVny	0.601 k	Negative Bending		Negative Bending	
ϕVnx	3.083 k	ϕMnxo	13.515 k-in	ϕMnyo	5.191 k-in
		Ixe	0.68471 in⁴	Iye	0.11682 in⁴
Torsion		Sxe(t)	0.39804 in³	Sye(l)	0.11536 in³
ϕBn	8.1063 k-in²	Sxe(b)	0.30033 in³	Sye(r)	0.11832 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Fya=51.333 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Fya=52.88 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Fya=54.513 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength

Ag=0.3097 in², Fy=51.333 ksi	
Tn=15.898 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.2578 in², Fu=65 ksi	
Tn=16.757 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=1.7129 k at 180 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=1.5984 k	Eq. G3-2
kv=3.7205	Eq. G3-8
Vcrh=0.50642 k	Eq. G3-6
Vn=0.66754 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=1.7129 k at 0 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.514 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.98104	Eq. 1.1-3
ρ=0.79074	Eq. 1.1-2
b=0.40644 in (ineffective width=0.10756 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00027958 in⁴	Eq. 1.3-8
Is=0.00039155 in⁴ > Ia (no lip reduction)	
k=3.4924	Table 1.3-1
Element 2: Partially stiffened, w=1.778 in	
f=50 ksi, k=3.4924	
λ=1.1908	Eq. 1.1-3
ρ=0.68464	Eq. 1.1-2
b=1.2173 in (ineffective width=0.56072 in)	Eq. 1.1-1
b_1=0.60864 in, b_2=0.60864 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.1739	Eq. 1.1-3
ρ=0.41344	Eq. 1.1-2
b=0.47091 in (ineffective width=0.66809 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.1739	Eq. 1.1-3
ρ=0.41344	Eq. 1.1-2
b=0.47091 in (ineffective width=0.66809 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.514 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.98104	Eq. 1.1-3
ρ=0.79074	Eq. 1.1-2
b=0.40644 in (ineffective width=0.10756 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00027958 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.4924	Table 1.3-1
Element 4: Partially stiffened, w=1.778 in	
f=50 ksi, k=3.4924	
λ=1.1908	Eq. 1.1-3
ρ=0.68464	Eq. 1.1-2
b=1.2173 in (ineffective width=0.56072 in)	Eq. 1.1-1
b_1=0.60864 in, b_2=0.60864 in	
Ae=0.16532 in^2, Fn=50 ksi	
Pn=8.2659 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=47.565 ksi, f_2=22.583 ksi	
ψ=0.47478	Eq. 1.2.2-1
k=0.7094	Eq. 1.2.2-2
λ=1.6508	Eq. 1.1-3
ρ=0.52503	Eq. 1.1-2
b=0.59801 in (ineffective width=0.54099 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.514 in	
f_1=47.565 ksi, f_2=36.291 ksi	
ψ=0.76298	Eq. 1.2.2-1
k=0.52403	Eq. 1.2.2-2
λ=0.86677	Eq. 1.1-3
ρ=0.86088	Eq. 1.1-2
b=0.44249 in (ineffective width=0.071508 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.21	Eq. 1.3-7
Ia=0.00027854 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.4924	Table 1.3-1

Element 4: Partially stiffened, w=1.778 in
f=49.621 ksi, k=3.4924
λ=1.1862 Eq. 1.1-3
ρ=0.68665 Eq. 1.1-2
b=1.2209 in (ineffective width=0.55713 in) Eq. 1.1-1
b_1=0.61044 in, b_2=0.61044 in
Center of gravity shift: y=-0.27982 in
Sxe=0.30033 in^3, Fy=50 ksi
Mnl=15.017 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.514 in
f_1=47.565 ksi, f_2=36.291 ksi
ψ=0.76298 Eq. 1.2.2-1
k=0.52403 Eq. 1.2.2-2
λ=0.86677 Eq. 1.1-3
ρ=0.86088 Eq. 1.1-2
b=0.44249 in (ineffective width=0.071508 in) Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.21 Eq. 1.3-7
Ia=0.00027854 in^4 Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)
k=3.4924 Table 1.3-1
Element 2: Partially stiffened, w=1.778 in
f=49.621 ksi, k=3.4924
λ=1.1862 Eq. 1.1-3
ρ=0.68665 Eq. 1.1-2
b=1.2209 in (ineffective width=0.55713 in) Eq. 1.1-1
b_1=0.61044 in, b_2=0.61044 in
Element 3: Treat as two unstiffened elements
f_1=47.565 ksi, f_2=22.583 ksi
ψ=0.47478 Eq. 1.2.2-1
k=0.7094 Eq. 1.2.2-2
λ=1.6508 Eq. 1.1-3
ρ=0.52503 Eq. 1.1-2
b=0.59801 in (ineffective width=0.54099 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0.27982 in
Sxe=0.30033 in^3, Fy=50 ksi
Mnl=15.017 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.514 in
f_1=49.278 ksi, f_2=49.278 ksi
ψ=1 Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=0.97394	Eq. 1.1-3
ρ=0.79483	Eq. 1.1-2
b=0.40854 in (ineffective width=0.10546 in)	Eq. 1.1-1
Element 2: Stiffened, w=1.778 in	
f_1=45.368 ksi, f_2=-28.821 ksi	
ψ=0.63528	Eq. 1.1.2-1
k=16.016	Eq. 1.1.2-2
λ=0.52966	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.778 in	Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2	
b_1=0.4891 in	Eq. 1.1.2-3
b_2=0.889 in	Eq. 1.1.2-4
Compression width=1.0873 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.514 in	
f_1=49.278 ksi, f_2=49.278 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=0.97394	Eq. 1.1-3
ρ=0.79483	Eq. 1.1-2
b=0.40854 in (ineffective width=0.10546 in)	Eq. 1.1-1
Element 4: Stiffened, w=1.778 in	
f_1=45.368 ksi, f_2=-28.821 ksi	
ψ=0.63528	Eq. 1.1.2-1
k=16.016	Eq. 1.1.2-2
λ=0.52966	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.778 in	Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2	
b_1=0.4891 in	Eq. 1.1.2-3
b_2=0.889 in	Eq. 1.1.2-4
Compression width=1.0873 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=-0.033432 in	
Sye=0.12048 in^3, Fy=50 ksi	
Mnl=6.0238 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: Stiffened, w=1.778 in	
f_1=44.519 ksi, f_2=-43.268 ksi	
ψ=0.97189	Eq. 1.1.2-1
k=23.279	Eq. 1.1.2-2
λ=0.43521	Eq. 1.1-3
ρ=1	Eq. 1.1-2

be=1.778 in	Eq. 1.1-1
h_o=2 in, b_o=4 in, h_o/b_o=0.5	
b_1=0.44765 in	Eq. 1.1.2-3
b_2=0.889 in	Eq. 1.1.2-4
Compression width=0.90167 in	
b_1+b_2 > compression width (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=49.146 ksi, f_2=49.146 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.1553	Eq. 1.1-3
ρ=0.41661	Eq. 1.1-2
b=0.47452 in (ineffective width=0.66448 in)	Eq. 1.1-1
f_1=49.146 ksi, f_2=49.146 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.1553	Eq. 1.1-3
ρ=0.41661	Eq. 1.1-2
b=0.47452 in (ineffective width=0.66448 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: Stiffened, w=1.778 in	
f_1=44.519 ksi, f_2=-43.268 ksi	
ψ=0.97189	Eq. 1.1.2-1
k=23.279	Eq. 1.1.2-2
λ=0.43521	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.778 in	Eq. 1.1-1
h_o=2 in, b_o=4 in, h_o/b_o=0.5	
b_1=0.44765 in	Eq. 1.1.2-3
b_2=0.889 in	Eq. 1.1.2-4
Compression width=0.90167 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0.17754 in	
Sye=0.11536 in^3, Fy=50 ksi	
Mnl=5.768 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud

Cw=0.6635 in^6, Wn=3.6832 in^2, Fy=50 ksi	
Bn=9.007 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.40178 in²	Wt.	0.0013661 k/ft	Flat	8.9086 in
Ix	1.0477 in⁴	rx	1.6148 in	Ixy	0.0000 in⁴
Sx(t)	0.52383 in³	y(t)	2.0000 in	α	0.000 deg
Sx(b)	0.52383 in³	y(b)	2.0000 in		
Zx	0.60169 in³	Height	4.0000 in		
Iy	0.2349 in⁴	ry	0.7645 in	x_o	-1.6751 in
Sy(l)	0.33634 in³	x(l)	0.6983 in	y_o	0.0000 in
Sy(r)	0.18042 in³	x(r)	1.3017 in	jx	2.4148 in
Zy	0.26383 in³	Width	2.0000 in	jy	0.0000 in
I_1	1.0477 in⁴	r_1	1.6148 in	Cw	0.85649 in⁶
I_2	0.2349 in⁴	r_2	0.7645 in	J	0.0002724 in⁴
Ic	1.2825 in⁴	rc	1.7866 in		
I_o	2.4098 in⁴	r_o	2.4491 in		

Net Section Properties

Ix	1.0350 in⁴	rx	1.7600 in	Area	0.33413 in²
Sx(t)	0.51748 in³	y(t)	2.0000 in	Ixy	0.0000 in⁴
Sx(b)	0.51748 in³	y(b)	2.0000 in	α	0.000 deg
Zx	0.57633 in³				
Iy	0.1977 in⁴	ry	0.7692 in	x_o	-1.8241 in
Sy(l)	0.23674 in³	x(l)	0.8351 in	y_o	0.0000 in
Sy(r)	0.16971 in³	x(r)	1.1649 in	jx	2.2119 in
Zy	0.23153 in³			jy	0.0000 in
Ic	1.2327 in⁴	rc	1.9207 in	Cw	0.84367 in⁶
I_o	2.3445 in⁴	r_o	2.6489 in	J	0.0002265 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	10.393 k	ϕMnxo	19.576 k-in	ϕMnyo	7.474 k-in
Ae	0.24453 in²	Ixe	0.94489 in⁴	Iye	0.19477 in⁴
ϕTn	16.289 k	Sxe(t)	0.43503 in³	Sye(l)	0.23540 in³
		Sxe(b)	0.51691 in³	Sye(r)	0.16610 in³
Shear					
ϕVny	1.040 k	Negative Bending		Negative Bending	
ϕVnx	4.304 k	ϕMnxo	19.576 k-in	ϕMnyo	7.050 k-in
		Ixe	0.94489 in⁴	Iye	0.16180 in⁴
Torsion		Sxe(t)	0.51691 in³	Sye(l)	0.16727 in³
ϕBn	10.416 k-in²	Sxe(b)	0.43503 in³	Sye(r)	0.15667 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=51.632 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=53.526 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=55.542 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength

Ag=0.40178 in², Fy=51.632 ksi	
Tn=20.745 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.33413 in², Fu=65 ksi	
Tn=21.718 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=2.3913 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=2.069 k	Eq. G3-2
kv=3.7173	Eq. G3-8
Vcrh=1.1208 k	Eq. G3-6
Vn=1.1559 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=2.3913 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.74488	Eq. 1.1-3
ρ=0.94599	Eq. 1.1-2
b=0.48123 in (ineffective width=0.027474 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00062038 in⁴	Eq. 1.3-8
Is=0.00049474 in⁴	
ds=0.38377 in (lip ineffective width=0.097452 in)	Eq. 1.3-6
k=3.2601	Table 1.3-1
Element 2: Partially stiffened, w=1.7674 in	
f=50 ksi, k=3.2601	
λ=0.93989	Eq. 1.1-3
ρ=0.81492	Eq. 1.1-2
b=1.4403 in (ineffective width=0.32712 in)	Eq. 1.1-1
b_1=0.57431 in, b_2=0.86598 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.6601	Eq. 1.1-3
ρ=0.52256	Eq. 1.1-2
b=0.59242 in (ineffective width=0.54128 in)	Eq. 1.1-1

f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.6601	Eq. 1.1-3
ρ=0.52256	Eq. 1.1-2
b=0.59242 in (ineffective width=0.54128 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.5087 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.74488	Eq. 1.1-3
ρ=0.94599	Eq. 1.1-2
b=0.48123 in (ineffective width=0.027474 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00062038 in^4	Eq. 1.3-8
Is=0.00049474 in^4	
ds=0.38377 in (lip ineffective width=0.097452 in)	Eq. 1.3-6
k=3.2601	Table 1.3-1
Element 4: Partially stiffened, w=1.7674 in	
f=50 ksi, k=3.2601	
λ=0.93989	Eq. 1.1-3
ρ=0.81492	Eq. 1.1-2
b=1.4403 in (ineffective width=0.32712 in)	Eq. 1.1-1
b_1=0.57431 in, b_2=0.86598 in	
Ae=0.24453 in^2, Fn=50 ksi	
Pn=12.227 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=47.323 ksi, f_2=21.224 ksi	
ψ=0.44849	Eq. 1.2.2-1
k=0.73305	Eq. 1.2.2-2
λ=1.2369	Eq. 1.1-3
ρ=0.66467	Eq. 1.1-2
b=0.75353 in (ineffective width=0.38017 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.5087 in	
f_1=47.323 ksi, f_2=35.612 ksi	
ψ=0.75253	Eq. 1.2.2-1
k=0.52905	Eq. 1.2.2-2
λ=0.65332	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.254	Eq. 1.3-7
Ia=0.00061725 in^4	Eq. 1.3-8
Is=0.00049474 in^4	

ds=0.40774 in (lip ineffective width=0.10096 in)	Eq. 1.3-6
k=3.2649	Table 1.3-1
Element 4: Partially stiffened, w=1.7674 in	
f=49.481 ksi, k=3.2649	
λ=0.93431	Eq. 1.1-3
ρ=0.81828	Eq. 1.1-2
b=1.4462 in (ineffective width=0.32117 in)	Eq. 1.1-1
b_1=0.5796 in, b_2=0.86664 in	
Center of gravity shift: y=-0.17202 in	
Sxe=0.43503 in^3, Fy=50 ksi	
Mnl=21.752 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	
f_1=47.323 ksi, f_2=35.612 ksi	
ψ=0.75253	Eq. 1.2.2-1
k=0.52905	Eq. 1.2.2-2
λ=0.65332	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.254	Eq. 1.3-7
Ia=0.00061725 in^4	Eq. 1.3-8
Is=0.00049474 in^4	
ds=0.40774 in (lip ineffective width=0.10096 in)	Eq. 1.3-6
k=3.2649	Table 1.3-1
Element 2: Partially stiffened, w=1.7674 in	
f=49.481 ksi, k=3.2649	
λ=0.93431	Eq. 1.1-3
ρ=0.81828	Eq. 1.1-2
b=1.4462 in (ineffective width=0.32117 in)	Eq. 1.1-1
b_1=0.5796 in, b_2=0.86664 in	
Element 3: Treat as two unstiffened elements	
f_1=47.323 ksi, f_2=21.224 ksi	
ψ=0.44849	Eq. 1.2.2-1
k=0.73305	Eq. 1.2.2-2
λ=1.2369	Eq. 1.1-3
ρ=0.66467	Eq. 1.1-2
b=0.75353 in (ineffective width=0.38017 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.17202 in	
Sxe=0.43503 in^3, Fy=50 ksi	
Mnl=21.752 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	

f_1=49.038 ksi, f_2=49.038 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.73768 Eq. 1.1-3
ρ=0.95131 Eq. 1.1-2
b=0.48393 in (ineffective width=0.024766 in) Eq. 1.1-1
Element 2: Stiffened, w=1.7674 in
f_1=45.041 ksi, f_2=-30.321 ksi
ψ=0.6732 Eq. 1.1.2-1
k=16.715 Eq. 1.1.2-2
λ=0.39397 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.7674 in Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2
b_1=0.48116 in Eq. 1.1.2-3
b_2=0.8837 in Eq. 1.1.2-4
Compression width=1.0563 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.5087 in
f_1=49.038 ksi, f_2=49.038 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.73768 Eq. 1.1-3
ρ=0.95131 Eq. 1.1-2
b=0.48393 in (ineffective width=0.024766 in) Eq. 1.1-1
Element 4: Stiffened, w=1.7674 in
f_1=45.041 ksi, f_2=-30.321 ksi
ψ=0.6732 Eq. 1.1.2-1
k=16.715 Eq. 1.1.2-2
λ=0.39397 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.7674 in Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2
b_1=0.48116 in Eq. 1.1.2-3
b_2=0.8837 in Eq. 1.1.2-4
Compression width=1.0563 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=-0.007689 in
Sye=0.1661 in^3, Fy=50 ksi
Mnl=8.3048 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.7674 in
f_1=41.164 ksi, f_2=-44.372 ksi
ψ=1.0779 Eq. 1.1.2-1
k=26.1 Eq. 1.1.2-2

λ=0.3014	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.7674 in	Eq. 1.1-1
h_o=2 in, b_o=4 in, h_o/b_o=0.5	
b_1=0.43341 in	Eq. 1.1.2-3
b_2=0.8837 in	Eq. 1.1.2-4
Compression width=0.85056 in	
b_1+b_2 > compression width (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=45.701 ksi, f_2=45.701 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.5871	Eq. 1.1-3
ρ=0.54274	Eq. 1.1-2
b=0.61531 in (ineffective width=0.51839 in)	Eq. 1.1-1
f_1=45.701 ksi, f_2=45.701 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.5871	Eq. 1.1-3
ρ=0.54274	Eq. 1.1-2
b=0.61531 in (ineffective width=0.51839 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: Stiffened, w=1.7674 in	
f_1=41.164 ksi, f_2=-44.372 ksi	
ψ=1.0779	Eq. 1.1.2-1
k=26.1	Eq. 1.1.2-2
λ=0.3014	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.7674 in	Eq. 1.1-1
h_o=2 in, b_o=4 in, h_o/b_o=0.5	
b_1=0.43341 in	Eq. 1.1.2-3
b_2=0.8837 in	Eq. 1.1.2-4
Compression width=0.85056 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0.13221 in	
Sye=0.15667 in^3, Fy=50 ksi	
Mnl=7.8337 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud

Cw=0.84367 in^6, Wn=3.645 in^2, Fy=50 ksi	
Bn=11.573 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.49974 in²	Wt.	0.0016991 k/ft	Flat	8.8293 in
Ix	1.2923 in⁴	rx	1.6081 in	Ixy	0.0000 in⁴
Sx(t)	0.64617 in³	y(t)	2.0000 in	α	0.000 deg
Sx(b)	0.64617 in³	y(b)	2.0000 in		
Zx	0.74499 in³	Height	4.0000 in		
Iy	0.2874 in⁴	ry	0.7584 in	x_o	-1.6603 in
Sy(l)	0.41213 in³	x(l)	0.6974 in	y_o	0.0000 in
Sy(r)	0.22063 in³	x(r)	1.3027 in	jx	2.4043 in
Zy	0.32506 in³	Width	2.0000 in	jy	0.0000 in
I_1	1.2923 in⁴	r_1	1.6081 in	Cw	1.0378 in⁶
I_2	0.2874 in⁴	r_2	0.7584 in	J	0.0005336 in⁴
Ic	1.5797 in⁴	rc	1.7780 in		
I_o	2.9573 in⁴	r_o	2.4326 in		

Net Section Properties

Ix	1.2764 in⁴	rx	1.7541 in	Area	0.41484 in²
Sx(t)	0.63821 in³	y(t)	2.0000 in	Ixy	0.0000 in⁴
Sx(b)	0.63821 in³	y(b)	2.0000 in	α	0.000 deg
Zx	0.71316 in³				
Iy	0.2416 in⁴	ry	0.7631 in	x_o	-1.8096 in
Sy(l)	0.28958 in³	x(l)	0.8343 in	y_o	0.0000 in
Sy(r)	0.20725 in³	x(r)	1.1657 in	jx	2.2001 in
Zy	0.28501 in³			jy	0.0000 in
Ic	1.5180 in⁴	rc	1.9129 in	Cw	1.0219 in⁶
I_o	2.8764 in⁴	r_o	2.6332 in	J	0.0004430 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	13.795 k	ϕMnxo	25.457 k-in	ϕMnyo	10.599 k-in
Ae	0.32460 in²	Ixe	1.2004 in⁴	Iye	0.2416 in⁴
ϕTn	20.223 k	Sxe(t)	0.56570 in³	Sye(l)	0.28958 in³
		Sxe(b)	0.63916 in³	Sye(r)	0.20725 in³
Shear					
ϕVny	1.600 k	Negative Bending		Negative Bending	
ϕVnx	5.248 k	ϕMnxo	25.457 k-in	ϕMnyo	8.891 k-in
		Ixe	1.2004 in⁴	Iye	0.2141 in⁴
Torsion		Sxe(t)	0.63916 in³	Sye(l)	0.23354 in³
ϕBn	12.772 k-in²	Sxe(b)	0.56570 in³	Sye(r)	0.19758 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=52.045 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=54.356 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=56.825 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.49974 in², Fy=52.045 ksi

Tn=26.009 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.41484 in², Fu=65 ksi	
Tn=26.964 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=2.9155 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=2.5102 k	Eq. G3-2
kv=3.7018	Eq. G3-8
Vcrh=2.2078 k	Eq. G3-6
Vn=1.7782 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=2.9155 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4835 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56413	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0011127 in⁴	Eq. 1.3-8
Is=0.00053312 in⁴	
ds=0.23166 in (lip ineffective width=0.25184 in)	Eq. 1.3-6
k=2.7693	Table 1.3-1
Element 2: Partially stiffened, w=1.717 in	
f=50 ksi, k=2.7693	
λ=0.78941	Eq. 1.1-3
ρ=0.91373	Eq. 1.1-2
b=1.5689 in (ineffective width=0.14812 in)	Eq. 1.1-1
b_1=0.37585 in, b_2=1.193 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.2934	Eq. 1.1-3
ρ=0.64166	Eq. 1.1-2
b=0.71128 in (ineffective width=0.39722 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=1.2934	Eq. 1.1-3
ρ=0.64166	Eq. 1.1-2
b=0.71128 in (ineffective width=0.39722 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4835 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56413	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0011127 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.23166 in (lip ineffective width=0.25184 in)	Eq. 1.3-6
k=2.7693	Table 1.3-1
Element 4: Partially stiffened, w=1.717 in	
f=50 ksi, k=2.7693	
λ=0.78941	Eq. 1.1-3
ρ=0.91373	Eq. 1.1-2
b=1.5689 in (ineffective width=0.14812 in)	Eq. 1.1-1
b_1=0.37585 in, b_2=1.193 in	
Ae=0.3246 in^2, Fn=50 ksi	
Pn=16.23 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=46.666 ksi, f_2=20.545 ksi	
ψ=0.44025	Eq. 1.2.2-1
k=0.74078	Eq. 1.2.2-2
λ=0.95197	Eq. 1.1-3
ρ=0.80769	Eq. 1.1-2
b=0.89533 in (ineffective width=0.21317 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4835 in	
f_1=46.666 ksi, f_2=35.272 ksi	
ψ=0.75585	Eq. 1.2.2-1
k=0.52744	Eq. 1.2.2-2
λ=0.49209	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.301	Eq. 1.3-7
Ia=0.0010794 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.23881 in (lip ineffective width=0.24469 in)	Eq. 1.3-6
k=2.7907	Table 1.3-1
Element 4: Partially stiffened, w=1.717 in	

f=49.333 ksi, k=2.7907
λ=0.78111 Eq. 1.1-3
ρ=0.91965 Eq. 1.1-2
b=1.579 in (ineffective width=0.13796 in) Eq. 1.1-1
b_1=0.38996 in, b_2=1.1891 in
Center of gravity shift: y=-0.12193 in
Sxe=0.5657 in^3, Fy=50 ksi
Mnl=28.285 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.4835 in
f_1=46.666 ksi, f_2=35.272 ksi
ψ=0.75585 Eq. 1.2.2-1
k=0.52744 Eq. 1.2.2-2
λ=0.49209 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.301 Eq. 1.3-7
Ia=0.0010794 in^4 Eq. 1.3-8
Is=0.00053312 in^4
ds=0.23881 in (lip ineffective width=0.24469 in) Eq. 1.3-6
k=2.7907 Table 1.3-1
Element 2: Partially stiffened, w=1.717 in
f=49.333 ksi, k=2.7907
λ=0.78111 Eq. 1.1-3
ρ=0.91965 Eq. 1.1-2
b=1.579 in (ineffective width=0.13796 in) Eq. 1.1-1
b_1=0.38996 in, b_2=1.1891 in
Element 3: Treat as two unstiffened elements
f_1=46.666 ksi, f_2=20.545 ksi
ψ=0.44025 Eq. 1.2.2-1
k=0.74078 Eq. 1.2.2-2
λ=0.95197 Eq. 1.1-3
ρ=0.80769 Eq. 1.1-2
b=0.89533 in (ineffective width=0.21317 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0.12193 in
Sxe=0.5657 in^3, Fy=50 ksi
Mnl=28.285 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.4835 in
f_1=55.446 ksi, f_2=55.446 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3

λ=0.59406	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=1.717 in	
f_1=49.928 ksi, f_2=-33.771 ksi	
ψ=0.67639	Eq. 1.1.2-1
k=16.775	Eq. 1.1.2-2
λ=0.32051	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.717 in	Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2	
b_1=0.46703 in	Eq. 1.1.2-3
b_2=0.8585 in	Eq. 1.1.2-4
Compression width=1.0242 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.4835 in	
f_1=55.446 ksi, f_2=55.446 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.59406	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Stiffened, w=1.717 in	
f_1=49.928 ksi, f_2=-33.771 ksi	
ψ=0.67639	Eq. 1.1.2-1
k=16.775	Eq. 1.1.2-2
λ=0.32051	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.717 in	Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2	
b_1=0.46703 in	Eq. 1.1.2-3
b_2=0.8585 in	Eq. 1.1.2-4
Compression width=1.0242 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0 in	
Sye=0.20725 in^3, Fy=56.825 ksi	
Mnl=11.777 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: Stiffened, w=1.717 in	
f_1=35.748 ksi, f_2=-43.471 ksi	
ψ=1.2161	Eq. 1.1.2-1
k=30.198	Eq. 1.1.2-2
λ=0.20214	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.717 in	Eq. 1.1-1
h_o=2 in, b_o=4 in, h_o/b_o=0.5	
b_1=0.40725 in	Eq. 1.1.2-3

b_2=0.8585 in	Eq. 1.1.2-4
Compression width=0.7748 in	
b_1+b_2 > compression width (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=40.971 ksi, f_2=40.971 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.1708	Eq. 1.1-3
ρ=0.69364	Eq. 1.1-2
b=0.7689 in (ineffective width=0.3396 in)	Eq. 1.1-1
f_1=40.971 ksi, f_2=40.971 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.1708	Eq. 1.1-3
ρ=0.69364	Eq. 1.1-2
b=0.7689 in (ineffective width=0.3396 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: Stiffened, w=1.717 in	
f_1=35.748 ksi, f_2=-43.471 ksi	
ψ=1.2161	Eq. 1.1.2-1
k=30.198	Eq. 1.1.2-2
λ=0.20214	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.717 in	Eq. 1.1-1
h_o=2 in, b_o=4 in, h_o/b_o=0.5	
b_1=0.40725 in	Eq. 1.1.2-3
b_2=0.8585 in	Eq. 1.1.2-4
Compression width=0.7748 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0.082319 in	
Sye=0.19758 in^3, Fy=50 ksi	
Mnl=9.879 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud

Cw=1.0219 in^6, Wn=3.6005 in^2, Fy=50 ksi	
Bn=14.191 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.62174 in²	Wt.	0.0021139 k/ft	Flat	8.7201 in
Ix	1.5899 in⁴	rx	1.5991 in	Ixy	0.0000 in⁴
Sx(t)	0.79497 in³	y(t)	2.0000 in	α	0.000 deg
Sx(b)	0.79497 in³	y(b)	2.0000 in		
Zx	0.92114 in³	Height	4.0000 in		
Iy	0.3498 in⁴	ry	0.7501 in	x_o	-1.6407 in
Sy(l)	0.50265 in³	x(l)	0.6959 in	y_o	0.0000 in
Sy(r)	0.26822 in³	x(r)	1.3041 in	jx	2.3910 in
Zy	0.39927 in³	Width	2.0000 in	jy	0.0000 in
I_1	1.5899 in⁴	r_1	1.5991 in	Cw	1.2461 in⁶
I_2	0.3498 in⁴	r_2	0.7501 in	J	0.0010536 in⁴
Ic	1.9397 in⁴	rc	1.7663 in		
I_o	3.6134 in⁴	r_o	2.4107 in		

Net Section Properties

Ix	1.5699 in⁴	rx	1.7463 in	Area	0.51479 in²
Sx(t)	0.78494 in³	y(t)	2.0000 in	Ixy	0.0000 in⁴
Sx(b)	0.78494 in³	y(b)	2.0000 in	α	0.000 deg
Zx	0.88103 in³				
Iy	0.2934 in⁴	ry	0.7550 in	x_o	-1.7904 in
Sy(l)	0.35224 in³	x(l)	0.8330 in	y_o	0.0000 in
Sy(r)	0.25145 in³	x(r)	1.1670 in	jx	2.1850 in
Zy	0.34961 in³			jy	0.0000 in
Ic	1.8633 in⁴	rc	1.9025 in	Cw	1.2266 in⁶
I_o	3.5135 in⁴	r_o	2.6125 in	J	0.0008723 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	19.738 k	ϕMnxo	34.510 k-in	ϕMnyo	13.234 k-in
Ae	0.46442 in²	Ixe	1.5528 in⁴	Iye	0.2934 in⁴
ϕTn	25.096 k	Sxe(t)	0.76690 in³	Sye(l)	0.35224 in³
		Sxe(b)	0.78617 in³	Sye(r)	0.25145 in³
Shear					
ϕVny	2.353 k	Negative Bending		Negative Bending	
ϕVnx	6.328 k	ϕMnxo	34.510 k-in	ϕMnyo	11.120 k-in
		Ixe	1.5528 in⁴	Iye	0.2807 in⁴
Torsion		Sxe(t)	0.78617 in³	Sye(l)	0.32484 in³
ϕBn	15.582 k-in²	Sxe(b)	0.76690 in³	Sye(r)	0.24710 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=52.608 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=55.437 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=58.477 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.62174 in², Fy=52.608 ksi

Tn=32.709 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.51479 in², Fu=65 ksi	
Tn=33.461 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=3.5157 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=3.0052 k	Eq. G3-2
kv=3.6785	Eq. G3-8
Vcrh=4.3884 k	Eq. G3-6
Vn=2.6147 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=3.5157 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4468 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41383	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00072868 in⁴	Eq. 1.3-8
Is=0.00052997 in⁴	
ds=0.32495 in (lip ineffective width=0.12185 in)	Eq. 1.3-6
k=3.0024	Table 1.3-1
Element 2: Partially stiffened, w=1.6436 in	
f=50 ksi, k=3.0024	
λ=0.57612	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.99272	Eq. 1.1-3
ρ=0.7841	Eq. 1.1-2
b=0.84039 in (ineffective width=0.23141 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.99272	Eq. 1.1-3

ρ=0.7841	Eq. 1.1-2
b=0.84039 in (ineffective width=0.23141 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4468 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41383	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00072868 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.32495 in (lip ineffective width=0.12185 in)	Eq. 1.3-6
k=3.0024	Table 1.3-1
Element 4: Partially stiffened, w=1.6436 in	
f=50 ksi, k=3.0024	
λ=0.57612	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Ae=0.46442 in^2, Fn=50 ksi	
Pn=23.221 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=45.599 ksi, f_2=19.127 ksi	
ψ=0.41946	Eq. 1.2.2-1
k=0.76107	Eq. 1.2.2-2
λ=0.71259	Eq. 1.1-3
ρ=0.97008	Eq. 1.1-2
b=1.0397 in (ineffective width=0.03207 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4468 in	
f_1=45.599 ksi, f_2=34.563 ksi	
ψ=0.75799	Eq. 1.2.2-1
k=0.52642	Eq. 1.2.2-2
λ=0.35718	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.369	Eq. 1.3-7
Ia=0.00069456 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.34092 in (lip ineffective width=0.10588 in)	Eq. 1.3-6
k=3.0506	Table 1.3-1
Element 4: Partially stiffened, w=1.6436 in	
f=49.119 ksi, k=3.0506	
λ=0.56649	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Center of gravity shift: y=-0.024817 in	

Sxe=0.7669 in³, Fy=50 ksi	
Mnl=38.345 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	
Negative Flexural Strength about X-axis	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4468 in	
f_1=45.599 ksi, f_2=34.563 ksi	
ψ=0.75799	Eq. 1.2.2-1
k=0.52642	Eq. 1.2.2-2
λ=0.35718	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.369	Eq. 1.3-7
Ia=0.00069456 in⁴	Eq. 1.3-8
Is=0.00052997 in⁴	
ds=0.34092 in (lip ineffective width=0.10588 in)	Eq. 1.3-6
k=3.0506	Table 1.3-1
Element 2: Partially stiffened, w=1.6436 in	
f=49.119 ksi, k=3.0506	
λ=0.56649	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 3: Treat as two unstiffened elements	
f_1=45.599 ksi, f_2=19.127 ksi	
ψ=0.41946	Eq. 1.2.2-1
k=0.76107	Eq. 1.2.2-2
λ=0.71259	Eq. 1.1-3
ρ=0.97008	Eq. 1.1-2
b=1.0397 in (ineffective width=0.03207 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.024817 in	
Sxe=0.7669 in³, Fy=50 ksi	
Mnl=38.345 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	
Positive Flexural Strength about Y-axis	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4468 in	
f_1=56.69 ksi, f_2=56.69 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.44065	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=1.6436 in	
f_1=49.547 ksi, f_2=-32.814 ksi	
ψ=0.66229	Eq. 1.1.2-1
k=16.511	Eq. 1.1.2-2
λ=0.24456	Eq. 1.1-3
ρ=1	Eq. 1.1-2

be=1.6436 in Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2
b_1=0.44879 in Eq. 1.1.2-3
b_2=0.8218 in Eq. 1.1.2-4
Compression width=0.98876 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.4468 in
f_1=56.69 ksi, f_2=56.69 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.44065 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 4: Stiffened, w=1.6436 in
f_1=49.547 ksi, f_2=-32.814 ksi
ψ=0.66229 Eq. 1.1.2-1
k=16.511 Eq. 1.1.2-2
λ=0.24456 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.6436 in Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2
b_1=0.44879 in Eq. 1.1.2-3
b_2=0.8218 in Eq. 1.1.2-4
Compression width=0.98876 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0 in
Sye=0.25145 in^3, Fy=58.477 ksi
Mnl=14.704 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.6436 in
f_1=30.148 ksi, f_2=-42.16 ksi
ψ=1.3985 Eq. 1.1.2-1
k=36.392 Eq. 1.1.2-2
λ=0.12849 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.6436 in Eq. 1.1-1
h_o=2 in, b_o=4 in, h_o/b_o=0.5
b_1=0.37368 in Eq. 1.1.2-3
b_2=0.8218 in Eq. 1.1.2-4
Compression width=0.68527 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=36.419 ksi, f_2=36.419 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.84724 Eq. 1.1-3

ρ=0.87382	Eq. 1.1-2
b=0.93656 in (ineffective width=0.13524 in)	Eq. 1.1-1
f_1=36.419 ksi, f_2=36.419 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.84724	Eq. 1.1-3
ρ=0.87382	Eq. 1.1-2
b=0.93656 in (ineffective width=0.13524 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: Stiffened, w=1.6436 in	
f_1=30.148 ksi, f_2=-42.16 ksi	
ψ=1.3985	Eq. 1.1.2-1
k=36.392	Eq. 1.1.2-2
λ=0.12849	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.6436 in	Eq. 1.1-1
h_o=2 in, b_o=4 in, h_o/b_o=0.5	
b_1=0.37368 in	Eq. 1.1.2-3
b_2=0.8218 in	Eq. 1.1.2-4
Compression width=0.68527 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0.031035 in	
Sye=0.2471 in^3, Fy=50 ksi	
Mnl=12.355 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud

Cw=1.2266 in^6, Wn=3.5425 in^2, Fy=50 ksi	
Bn=17.313 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

400S250-30

Full Section Properties

Area	0.31089 in²	Wt.	0.0010570 k/ft	Flat	9.9643 in
Ix	0.8576 in⁴	rx	1.6609 in	Ixy	0.0000 in⁴
Sx(t)	0.42881 in³	y(t)	2.0000 in	α	0.000 deg
Sx(b)	0.42881 in³	y(b)	2.0000 in		
Zx	0.48241 in³	Height	4.0000 in		
Iy	0.2810 in⁴	ry	0.9507 in	x_o	-2.1542 in
Sy(l)	0.30901 in³	x(l)	0.9093 in	y_o	0.0000 in
Sy(r)	0.17665 in³	x(r)	1.5907 in	jx	2.8009 in
Zy	0.25912 in³	Width	2.5000 in	jy	0.0000 in
I_1	0.8576 in⁴	r_1	1.6609 in	Cw	1.0257 in⁶
I_2	0.2810 in⁴	r_2	0.9507 in	J	0.0001009 in⁴
Ic	1.1386 in⁴	rc	1.9138 in		
I_o	2.5812 in⁴	r_o	2.8815 in		

Net Section Properties

Ix	0.8488 in⁴	rx	1.7928 in	Area	0.26409 in²
Sx(t)	0.42442 in³	y(t)	2.0000 in	Ixy	0.0000 in⁴
Sx(b)	0.42442 in³	y(b)	2.0000 in	α	0.000 deg
Zx	0.46486 in³				
Iy	0.2370 in⁴	ry	0.9473 in	x_o	-2.3256 in
Sy(l)	0.22195 in³	x(l)	1.0677 in	y_o	0.0000 in
Sy(r)	0.16545 in³	x(r)	1.4323 in	jx	2.6561 in
Zy	0.22475 in³			jy	0.0000 in
Ic	1.0858 in⁴	rc	2.0277 in	Cw	1.0116 in⁶
I_o	2.5141 in⁴	r_o	3.0854 in	J	0.0000857 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	6.168 k	ϕMnxo	12.095 k-in	ϕMnyo	6.668 k-in
Ae	0.14514 in²	Ixe	0.65287 in⁴	Iye	0.21925 in⁴
ϕTn	12.874 k	Sxe(t)	0.26879 in³	Sye(l)	0.21488 in³
		Sxe(b)	0.41557 in³	Sye(r)	0.14817 in³
Shear					
ϕVny	0.488 k	Negative Bending		Negative Bending	
ϕVnx	2.734 k	ϕMnxo	12.095 k-in	ϕMnyo	6.266 k-in
		Ixe	0.65287 in⁴	Iye	0.17815 in⁴
Torsion		Sxe(t)	0.41557 in³	Sye(l)	0.13925 in³
ϕBn	9.8006 k-in²	Sxe(b)	0.26879 in³	Sye(r)	0.14596 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Fya=51.104 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Fya=52.136 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Fya=54.15 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength

```
  Ag=0.31089 in², Fy=51.104 ksi
  Tn=15.888 k                                                    Eq. D2-1
  Ωt=1.67, ϕt=0.9

  An=0.26409 in², Fu=65 ksi
  Tn=17.166 k                                                    Eq. D3-1
  Ωt=2, ϕt=0.75

Shear Strength
  Stud element 2
    Vn=1.519 k at 180 deg                                        Eq. G2.1-2
    Ωv=1.67, ϕv=0.9
  Stud element 3
    Vyh=1.4446 k                                                 Eq. G3-2
    kv=3.7969                                                    Eq. G3-8
    Vcrh=0.37892 k                                               Eq. G3-6
    Vn=0.54188 k at 90 deg                                       Eq. G2.1-2
    Ωv=1.67, ϕv=0.9
    Stud element 4
      Vn=1.519 k at 0 deg                                        Eq. G2.1-2
      Ωv=1.67, ϕv=0.9

Axial Compression Strength
  Effective width calculations for Stud
    Element 1: Unstiffened, w=0.5157 in
      f₁=50 ksi, f₂=50 ksi
      ψ=1                                                        Eq. 1.2.2-1
      k=0.43                                                     Eq. 1.2.2-3
      λ=1.0916                                                   Eq. 1.1-3
      ρ=0.73148                                                  Eq. 1.1-2
      b=0.37723 in (ineffective width=0.13847 in)                Eq. 1.1-1
    Element 2: Check for lip stiffener reduction
      S=31.091                                                   Eq. 1.3-7
      Ia=0.00026103 in⁴                                          Eq. 1.3-8
      Is=0.00035659 in⁴ > Ia (no lip reduction)
      k=3.8802                                                   Table 1.3-1
    Element 2: Partially stiffened, w=2.2814 in
      f=50 ksi, k=3.8802
      λ=1.6075                                                   Eq. 1.1-3
      ρ=0.53694                                                  Eq. 1.1-2
      b=1.225 in (ineffective width=1.0564 in)                   Eq. 1.1-1
      b₁=0.61249 in, b₂=0.61249 in
    Element 3: Treat as two unstiffened elements
      f₁=50 ksi, f₂=50 ksi
      ψ=1                                                        Eq. 1.2.2-1
      k=0.43                                                     Eq. 1.2.2-3
      λ=2.4144                                                   Eq. 1.1-3
      ρ=0.37643                                                  Eq. 1.1-2
      b=0.4294 in (ineffective width=0.7113 in)                  Eq. 1.1-1
      f₁=50 ksi, f₂=50 ksi
      ψ=1                                                        Eq. 1.2.2-1
```

```
      k=0.43                                                Eq. 1.2.2-3
      λ=2.4144                                              Eq. 1.1-3
      ρ=0.37643                                             Eq. 1.1-2
      b=0.4294 in (ineffective width=0.7113 in)             Eq. 1.1-1
    Element 5: Unstiffened, w=0.5157 in
      f₁=50 ksi, f₂=50 ksi
      ψ=1                                                   Eq. 1.2.2-1
      k=0.43                                                Eq. 1.2.2-3
      λ=1.0916                                              Eq. 1.1-3
      ρ=0.73148                                             Eq. 1.1-2
      b=0.37723 in (ineffective width=0.13847 in)           Eq. 1.1-1
    Element 4: Check for lip stiffener reduction
      S=31.091                                              Eq. 1.3-7
      Ia=0.00026103 in⁴                                     Eq. 1.3-8
      Is=0.00035659 in⁴ > Ia (no lip reduction)
      k=3.8802                                              Table 1.3-1
    Element 4: Partially stiffened, w=2.2814 in
      f=50 ksi, k=3.8802
      λ=1.6075                                              Eq. 1.1-3
      ρ=0.53694                                             Eq. 1.1-2
      b=1.225 in (ineffective width=1.0564 in)              Eq. 1.1-1
      b₁=0.61249 in, b₂=0.61249 in
  Ae=0.14514 in², Fn=50 ksi
  Pn=7.257 k                                                Eq. E3.1-1
  Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
  Effective width calculations for Stud
    Element 1: No compressive stress (fully effective)
    Element 2: No compressive stress (fully effective)
    Element 3: Treat as two unstiffened elements
      f₁=47.75 ksi, f₂=24.266 ksi
      ψ=0.50819                                             Eq. 1.2.2-1
      k=0.68145                                             Eq. 1.2.2-2
      λ=1.8743                                              Eq. 1.1-3
      ρ=0.47091                                             Eq. 1.1-2
      b=0.53717 in (ineffective width=0.60353 in)           Eq. 1.1-1
    Element 5: Unstiffened, w=0.5157 in
      f₁=47.75 ksi, f₂=37.133 ksi
      ψ=0.77766                                             Eq. 1.2.2-1
      k=0.51715                                             Eq. 1.2.2-2
      λ=0.97268                                             Eq. 1.1-3
      ρ=0.79556                                             Eq. 1.1-2
      b=0.41027 in (ineffective width=0.10543 in)           Eq. 1.1-1
    Element 4: Check for lip stiffener reduction
      S=31.191                                              Eq. 1.3-7
      Ia=0.0002602 in⁴                                      Eq. 1.3-8
      Is=0.00035659 in⁴ > Ia (no lip reduction)
      k=3.8802                                              Table 1.3-1
    Element 4: Partially stiffened, w=2.2814 in
      f=49.679 ksi, k=3.8802
      λ=1.6023                                              Eq. 1.1-3
```

```
      ρ=0.5384                                          Eq. 1.1-2
      b=1.2283 in (ineffective width=1.0531 in)         Eq. 1.1-1
      b₁=0.61415 in, b₂=0.61415 in
  Center of gravity shift: y=-0.42897 in
  Sxe=0.26879 in³, Fy=50 ksi
  Mnl=13.439 k-in                                       Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
  Effective width calculations for Stud
    Element 1: Unstiffened, w=0.5157 in
      f₁=47.75 ksi, f₂=37.133 ksi
      ψ=0.77766                                         Eq. 1.2.2-1
      k=0.51715                                         Eq. 1.2.2-2
      λ=0.97268                                         Eq. 1.1-3
      ρ=0.79556                                         Eq. 1.1-2
      b=0.41027 in (ineffective width=0.10543 in)       Eq. 1.1-1
    Element 2: Check for lip stiffener reduction
      S=31.191                                          Eq. 1.3-7
      Ia=0.0002602 in⁴                                  Eq. 1.3-8
      Is=0.00035659 in⁴ > Ia (no lip reduction)
      k=3.8802                                          Table 1.3-1
    Element 2: Partially stiffened, w=2.2814 in
      f=49.679 ksi, k=3.8802
      λ=1.6023                                          Eq. 1.1-3
      ρ=0.5384                                          Eq. 1.1-2
      b=1.2283 in (ineffective width=1.0531 in)         Eq. 1.1-1
      b₁=0.61415 in, b₂=0.61415 in
    Element 3: Treat as two unstiffened elements
      f₁=47.75 ksi, f₂=24.266 ksi
      ψ=0.50819                                         Eq. 1.2.2-1
      k=0.68145                                         Eq. 1.2.2-2
      λ=1.8743                                          Eq. 1.1-3
      ρ=0.47091                                         Eq. 1.1-2
      b=0.53717 in (ineffective width=0.60353 in)       Eq. 1.1-1
    Element 5: No compressive stress (fully effective)
    Element 4: No compressive stress (fully effective)
  Center of gravity shift: y=0.42897 in
  Sxe=0.26878 in³, Fy=50 ksi
  Mnl=13.439 k-in                                       Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
  Effective width calculations for Stud
    Element 1: Unstiffened, w=0.5157 in
      f₁=49.473 ksi, f₂=49.473 ksi
      ψ=1                                               Eq. 1.2.2-1
      k=0.43                                            Eq. 1.2.2-3
      λ=1.0858                                          Eq. 1.1-3
      ρ=0.73438                                         Eq. 1.1-2
      b=0.37872 in (ineffective width=0.13698 in)       Eq. 1.1-1
    Element 2: Stiffened, w=2.2814 in
```

```
      f₁=46.307 ksi, f₂=-30.785 ksi
      ψ=0.66481                                          Eq. 1.1.2-1
      k=16.558                                           Eq. 1.1.2-2
      λ=0.74888                                          Eq. 1.1-3
      ρ=0.94304                                          Eq. 1.1-2
      be=2.1515 in                                       Eq. 1.1-1
      h₀=2.5 in, b₀=0.625 in, h₀/b₀=4
      b₁=0.58706 in                                      Eq. 1.1.2-3
      b₂=1.0757 in                                       Eq. 1.1.2-4
      Compression width=1.3704 in
      b₁+b₂ > compression width (fully effective)
    Element 3: No compressive stress (fully effective)
    Element 5: Unstiffened, w=0.5157 in
      f₁=49.473 ksi, f₂=49.473 ksi
      ψ=1                                                Eq. 1.2.2-1
      k=0.43                                             Eq. 1.2.2-2
      λ=1.0858                                           Eq. 1.1-3
      ρ=0.73438                                          Eq. 1.1-2
      b=0.37872 in (ineffective width=0.13698 in)        Eq. 1.1-1
    Element 4: Stiffened, w=2.2814 in
      f₁=46.307 ksi, f₂=-30.785 ksi
      ψ=0.66481                                          Eq. 1.1.2-1
      k=16.558                                           Eq. 1.1.2-2
      λ=0.74888                                          Eq. 1.1-3
      ρ=0.94304                                          Eq. 1.1-2
      be=2.1515 in                                       Eq. 1.1-1
      h₀=2.5 in, b₀=0.625 in, h₀/b₀=4
      b₁=0.58706 in                                      Eq. 1.1.2-3
      b₂=1.0757 in                                       Eq. 1.1.2-4
      Compression width=1.3704 in
      b₁+b₂ > compression width (fully effective)
  Center of gravity shift: x=-0.047386 in
  Sye=0.14817 in³, Fy=50 ksi
  Mnl=7.4086 k-in                                        Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
  Effective width calculations for Stud
    Element 1: No compressive stress (fully effective)
    Element 2: Stiffened, w=2.2814 in
      f₁=45.728 ksi, f₂=-43.431 ksi
      ψ=0.94977                                          Eq. 1.1.2-1
      k=22.724                                           Eq. 1.1.2-2
      λ=0.63526                                          Eq. 1.1-3
      ρ=1                                                Eq. 1.1-2
      be=2.2814 in                                       Eq. 1.1-1
      h₀=2.5 in, b₀=4 in, h₀/b₀=0.625
      b₁=0.5776 in                                       Eq. 1.1.2-3
      b₂=1.1407 in                                       Eq. 1.1.2-4
      Compression width=1.1701 in
      b₁+b₂ > compression width (fully effective)
    Element 3: Treat as two unstiffened elements
```

```
      f₁=49.39 ksi, f₂=49.39 ksi
      ψ=1                                                  Eq. 1.2.2-1
      k=0.43                                               Eq. 1.2.2-3
      λ=2.3997                                             Eq. 1.1-3
      ρ=0.37852                                            Eq. 1.1-2
      b=0.43177 in (ineffective width=0.70893 in)          Eq. 1.1-1
      f₁=49.39 ksi, f₂=49.39 ksi
      ψ=1                                                  Eq. 1.2.2-1
      k=0.43                                               Eq. 1.2.2-2
      λ=2.3997                                             Eq. 1.1-3
      ρ=0.37852                                            Eq. 1.1-2
      b=0.43177 in (ineffective width=0.70893 in)          Eq. 1.1-1
    Element 5: No compressive stress (fully effective)
    Element 4: Stiffened, w=2.2814 in
      f₁=45.728 ksi, f₂=-43.431 ksi
      ψ=0.94977                                            Eq. 1.1.2-1
      k=22.724                                             Eq. 1.1.2-2
      λ=0.63526                                            Eq. 1.1-3
      ρ=1                                                  Eq. 1.1-2
      be=2.2814 in                                         Eq. 1.1-1
      h₀=2.5 in, b₀=4 in, h₀/b₀=0.625
      b₁=0.5776 in                                         Eq. 1.1.2-3
      b₂=1.1407 in                                         Eq. 1.1.2-4
      Compression width=1.1701 in
      b₁+b₂ > compression width (fully effective)
  Center of gravity shift: x=0.2117 in
  Sye=0.13925 in³, Fy=50 ksi
  Mnl=6.9624 k-in                                          Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
  Cw=1.0116 in⁶, Wn=4.645 in², Fy=50 ksi
  Bn=10.89 k-in²                                           G8.1-1
  Ωb=1.67, ϕb=0.9
```

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Full Section Properties

Area	0.34430 in²	Wt.	0.0011706 k/ft	Flat	9.9507 in
Ix	0.9481 in⁴	rx	1.6595 in	Ixy	0.0000 in⁴
Sx(t)	0.47406 in³	y(t)	2.0000 in	α	0.000 deg
Sx(b)	0.47406 in³	y(b)	2.0000 in		
Zx	0.53377 in³	Height	4.0000 in		
Iy	0.3102 in⁴	ry	0.9492 in	x_o	-2.1502 in
Sy(l)	0.34116 in³	x(l)	0.9093 in	y_o	0.0000 in
Sy(r)	0.19503 in³	x(r)	1.5907 in	jx	2.7973 in
Zy	0.28648 in³	Width	2.5000 in	jy	0.0000 in
I_1	0.9481 in⁴	r_1	1.6595 in	Cw	1.1295 in⁶
I_2	0.3102 in⁴	r_2	0.9492 in	J	0.0001374 in⁴
Ic	1.2584 in⁴	rc	1.9118 in		
I_o	2.8501 in⁴	r_o	2.8772 in		

Net Section Properties

Ix	0.9384 in⁴	rx	1.7915 in	Area	0.29240 in²
Sx(t)	0.46920 in³	y(t)	2.0000 in	Ixy	0.0000 in⁴
Sx(b)	0.46920 in³	y(b)	2.0000 in	α	0.000 deg
Zx	0.51431 in³				
Iy	0.2616 in⁴	ry	0.9459 in	x_o	-2.3216 in
Sy(l)	0.24502 in³	x(l)	1.0677 in	y_o	0.0000 in
Sy(r)	0.18264 in³	x(r)	1.4323 in	jx	2.6523 in
Zy	0.24845 in³			jy	0.0000 in
Ic	1.2000 in⁴	rc	2.0258 in	Cw	1.1139 in⁶
I_o	2.7759 in⁴	r_o	3.0812 in	J	0.0001167 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	7.370 k	ϕMnxo	14.321 k-in	ϕMnyo	7.554 k-in
Ae	0.17342 in²	Ixe	0.75316 in⁴	Iye	0.24655 in⁴
ϕTn	14.254 k	Sxe(t)	0.31824 in³	Sye(l)	0.23907 in³
		Sxe(b)	0.46113 in³	Sye(r)	0.16787 in³
Shear					
ϕVny	0.608 k	Negative Bending		Negative Bending	
ϕVnx	3.317 k	ϕMnxo	14.321 k-in	ϕMnyo	7.168 k-in
		Ixe	0.75316 in⁴	Iye	0.20132 in⁴
Torsion		Sxe(t)	0.46113 in³	Sye(l)	0.15928 in³
ϕBn	10.824 k-in²	Sxe(b)	0.31824 in³	Sye(r)	0.16287 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Fya=51.199 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Fya=52.32 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Fya=54.513 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength

Ag=0.3443 in², Fy=51.199 ksi	
Tn=17.628 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.2924 in², Fu=65 ksi	
Tn=19.006 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=1.843 k at 180 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=1.5984 k	Eq. G3-2
kv=3.7959	Eq. G3-8
Vcrh=0.51669 k	Eq. G3-6
Vn=0.67511 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=1.843 k at 0 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.514 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.98104	Eq. 1.1-3
ρ=0.79074	Eq. 1.1-2
b=0.40644 in (ineffective width=0.10756 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00035618 in⁴	Eq. 1.3-8
Is=0.00039155 in⁴ > Ia (no lip reduction)	
k=3.8782	Table 1.3-1
Element 2: Partially stiffened, w=2.278 in	
f=50 ksi, k=3.8782	
λ=1.4478	Eq. 1.1-3
ρ=0.58576	Eq. 1.1-2
b=1.3344 in (ineffective width=0.94364 in)	Eq. 1.1-1
b_1=0.66718 in, b_2=0.66718 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.1739	Eq. 1.1-3
ρ=0.41344	Eq. 1.1-2
b=0.47091 in (ineffective width=0.66809 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.1739	Eq. 1.1-3
ρ=0.41344	Eq. 1.1-2
b=0.47091 in (ineffective width=0.66809 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.514 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.98104	Eq. 1.1-3
ρ=0.79074	Eq. 1.1-2
b=0.40644 in (ineffective width=0.10756 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00035618 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.8782	Table 1.3-1
Element 4: Partially stiffened, w=2.278 in	
f=50 ksi, k=3.8782	
λ=1.4478	Eq. 1.1-3
ρ=0.58576	Eq. 1.1-2
b=1.3344 in (ineffective width=0.94364 in)	Eq. 1.1-1
b_1=0.66718 in, b_2=0.66718 in	
Ae=0.17342 in^2, Fn=50 ksi	
Pn=8.671 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=47.655 ksi, f_2=23.589 ksi	
ψ=0.495	Eq. 1.2.2-1
k=0.69221	Eq. 1.2.2-2
λ=1.6728	Eq. 1.1-3
ρ=0.51919	Eq. 1.1-2
b=0.59136 in (ineffective width=0.54764 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.514 in	
f_1=47.655 ksi, f_2=36.795 ksi	
ψ=0.77211	Eq. 1.2.2-1
k=0.51973	Eq. 1.2.2-2
λ=0.87116	Eq. 1.1-3
ρ=0.85801	Eq. 1.1-2
b=0.44102 in (ineffective width=0.072985 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.205	Eq. 1.3-7
Ia=0.0003549 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.8782	Table 1.3-1

Element 4: Partially stiffened, w=2.278 in
f=49.634 ksi, k=3.8782
λ=1.4425 Eq. 1.1-3
ρ=0.58752 Eq. 1.1-2
b=1.3384 in (ineffective width=0.93962 in) Eq. 1.1-1
b_1=0.66919 in, b_2=0.66919 in
Center of gravity shift: y=-0.36669 in
Sxe=0.31824 in^3, Fy=50 ksi
Mnl=15.912 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.514 in
f_1=47.655 ksi, f_2=36.795 ksi
ψ=0.77211 Eq. 1.2.2-1
k=0.51973 Eq. 1.2.2-2
λ=0.87116 Eq. 1.1-3
ρ=0.85801 Eq. 1.1-2
b=0.44102 in (ineffective width=0.072985 in) Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.205 Eq. 1.3-7
Ia=0.0003549 in^4 Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)
k=3.8782 Table 1.3-1
Element 2: Partially stiffened, w=2.278 in
f=49.634 ksi, k=3.8782
λ=1.4425 Eq. 1.1-3
ρ=0.58752 Eq. 1.1-2
b=1.3384 in (ineffective width=0.93962 in) Eq. 1.1-1
b_1=0.66919 in, b_2=0.66919 in
Element 3: Treat as two unstiffened elements
f_1=47.655 ksi, f_2=23.589 ksi
ψ=0.495 Eq. 1.2.2-1
k=0.69221 Eq. 1.2.2-2
λ=1.6728 Eq. 1.1-3
ρ=0.51919 Eq. 1.1-2
b=0.59136 in (ineffective width=0.54764 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0.36669 in
Sxe=0.31824 in^3, Fy=50 ksi
Mnl=15.912 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.514 in
f_1=49.411 ksi, f_2=49.411 ksi
ψ=1 Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=0.97525	Eq. 1.1-3
ρ=0.79407	Eq. 1.1-2
b=0.40815 in (ineffective width=0.10585 in)	Eq. 1.1-1
Element 2: Stiffened, w=2.278 in	
f_1=46.221 ksi, f_2=-31.332 ksi	
ψ=0.67786	Eq. 1.1.2-1
k=16.803	Eq. 1.1.2-2
λ=0.66874	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.278 in	Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4	
b_1=0.61938 in	Eq. 1.1.2-3
b_2=1.139 in	Eq. 1.1.2-4
Compression width=1.3577 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.514 in	
f_1=49.411 ksi, f_2=49.411 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=0.97525	Eq. 1.1-3
ρ=0.79407	Eq. 1.1-2
b=0.40815 in (ineffective width=0.10585 in)	Eq. 1.1-1
Element 4: Stiffened, w=2.278 in	
f_1=46.221 ksi, f_2=-31.332 ksi	
ψ=0.67786	Eq. 1.1.2-1
k=16.803	Eq. 1.1.2-2
λ=0.66874	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.278 in	Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4	
b_1=0.61938 in	Eq. 1.1.2-3
b_2=1.139 in	Eq. 1.1.2-4
Compression width=1.3577 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=-0.036358 in	
Sye=0.16787 in^3, Fy=50 ksi	
Mnl=8.3936 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: Stiffened, w=2.278 in	
f_1=45.609 ksi, f_2=-44.508 ksi	
ψ=0.97585	Eq. 1.1.2-1
k=23.379	Eq. 1.1.2-2
λ=0.56317	Eq. 1.1-3
ρ=1	Eq. 1.1-2

be=2.278 in	Eq. 1.1-1
h_o=2.5 in, b_o=4 in, h_o/b_o=0.625	
b_1=0.57296 in	Eq. 1.1.2-3
b_2=1.139 in	Eq. 1.1.2-4
Compression width=1.1529 in	
b_1+b_2 > compression width (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=49.316 ksi, f_2=49.316 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.159	Eq. 1.1-3
ρ=0.41598	Eq. 1.1-2
b=0.4738 in (ineffective width=0.6652 in)	Eq. 1.1-1
f_1=49.316 ksi, f_2=49.316 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=2.159	Eq. 1.1-3
ρ=0.41598	Eq. 1.1-2
b=0.4738 in (ineffective width=0.6652 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: Stiffened, w=2.278 in	
f_1=45.609 ksi, f_2=-44.508 ksi	
ψ=0.97585	Eq. 1.1.2-1
k=23.379	Eq. 1.1.2-2
λ=0.56317	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.278 in	Eq. 1.1-1
h_o=2.5 in, b_o=4 in, h_o/b_o=0.625	
b_1=0.57296 in	Eq. 1.1.2-3
b_2=1.139 in	Eq. 1.1.2-4
Compression width=1.1529 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0.19626 in	
Sye=0.15928 in^3, Fy=50 ksi	
Mnl=7.964 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud

Cw=1.1139 in^6, Wn=4.6309 in^2, Fy=50 ksi	
Bn=12.027 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.44688 in²	Wt.	0.0015194 k/ft	Flat	9.9086 in
Ix	1.2240 in⁴	rx	1.6550 in	Ixy	0.0000 in⁴
Sx(t)	0.61201 in³	y(t)	2.0000 in	α	0.000 deg
Sx(b)	0.61201 in³	y(b)	2.0000 in		
Zx	0.69088 in³	Height	4.0000 in		
Iy	0.3989 in⁴	ry	0.9447 in	x_o	-2.1379 in
Sy(l)	0.43862 in³	x(l)	0.9093 in	y_o	0.0000 in
Sy(r)	0.25075 in³	x(r)	1.5907 in	jx	2.7859 in
Zy	0.36991 in³	Width	2.5000 in	jy	0.0000 in
I_1	1.2240 in⁴	r_1	1.6550 in	Cw	1.4403 in⁶
I_2	0.3989 in⁴	r_2	0.9447 in	J	0.0003030 in⁴
Ic	1.6229 in⁴	rc	1.9057 in		
I_o	3.6654 in⁴	r_o	2.8639 in		

Net Section Properties

Ix	1.2113 in⁴	rx	1.7872 in	Area	0.37923 in²
Sx(t)	0.60567 in³	y(t)	2.0000 in	Ixy	0.0000 in⁴
Sx(b)	0.60567 in³	y(b)	2.0000 in	α	0.000 deg
Zx	0.66551 in³				
Iy	0.3362 in⁴	ry	0.9415 in	x_o	-2.3092 in
Sy(l)	0.31489 in³	x(l)	1.0675 in	y_o	0.0000 in
Sy(r)	0.23467 in³	x(r)	1.4325 in	jx	2.6404 in
Zy	0.32070 in³			jy	0.0000 in
Ic	1.5475 in⁴	rc	2.0200 in	Cw	1.4203 in⁶
I_o	3.5697 in⁴	r_o	3.0681 in	J	0.0002571 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	10.528 k	ϕMnxo	20.213 k-in	ϕMnyo	10.355 k-in
Ae	0.24772 in²	Ixe	1.0268 in⁴	Iye	0.3316 in⁴
ϕTn	18.487 k	Sxe(t)	0.44919 in³	Sye(l)	0.31312 in³
		Sxe(b)	0.59898 in³	Sye(r)	0.23011 in³
Shear					
ϕVny	1.051 k	Negative Bending		Negative Bending	
ϕVnx	5.185 k	ϕMnxo	20.213 k-in	ϕMnyo	9.720 k-in
		Ixe	1.0268 in⁴	Iye	0.2774 in⁴
Torsion		Sxe(t)	0.59898 in³	Sye(l)	0.22814 in³
ϕBn	13.932 k-in²	Sxe(b)	0.44919 in³	Sye(r)	0.21600 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses

Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Fya=51.468 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Fya=52.838 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Fya=55.542 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	

Axial Tension Strength

Ag=0.44688 in², Fy=51.468 ksi	
Tn=23 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.37923 in², Fu=65 ksi	
Tn=24.65 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=2.8807 k at 180 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=2.069 k	Eq. G3-2
kv=3.793	Eq. G3-8
Vcrh=1.1436 k	Eq. G3-6
Vn=1.168 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=2.8807 k at 0 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.74488	Eq. 1.1-3
ρ=0.94599	Eq. 1.1-2
b=0.48123 in (ineffective width=0.027474 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00079003 in⁴	Eq. 1.3-8
Is=0.00049474 in⁴	
ds=0.30136 in (lip ineffective width=0.17987 in)	Eq. 1.3-6
k=3.3746	Table 1.3-1
Element 2: Partially stiffened, w=2.2674 in	
f=50 ksi, k=3.3746	
λ=1.1852	Eq. 1.1-3
ρ=0.68714	Eq. 1.1-2
b=1.558 in (ineffective width=0.70937 in)	Eq. 1.1-1
b_1=0.48785 in, b_2=1.0702 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.6601	Eq. 1.1-3
ρ=0.52256	Eq. 1.1-2
b=0.59242 in (ineffective width=0.54128 in)	Eq. 1.1-1

f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.6601 Eq. 1.1-3
ρ=0.52256 Eq. 1.1-2
b=0.59242 in (ineffective width=0.54128 in) Eq. 1.1-1
Element 5: Unstiffened, w=0.5087 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.74488 Eq. 1.1-3
ρ=0.94599 Eq. 1.1-2
b=0.48123 in (ineffective width=0.027474 in) Eq. 1.1-1
Element 4: Check for lip stiffener reduction
S=31.091 Eq. 1.3-7
Ia=0.00079003 in^4 Eq. 1.3-8
Is=0.00049474 in^4
ds=0.30136 in (lip ineffective width=0.17987 in) Eq. 1.3-6
k=3.3746 Table 1.3-1
Element 4: Partially stiffened, w=2.2674 in
f=50 ksi, k=3.3746
λ=1.1852 Eq. 1.1-3
ρ=0.68714 Eq. 1.1-2
b=1.558 in (ineffective width=0.70937 in) Eq. 1.1-1
b_1=0.48785 in, b_2=1.0702 in
Ae=0.24772 in^2, Fn=50 ksi
Pn=12.386 k Eq. E3.1-1
Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: No compressive stress (fully effective)
Element 3: Treat as two unstiffened elements
f_1=47.456 ksi, f_2=22.656 ksi
ψ=0.47741 Eq. 1.2.2-1
k=0.70711 Eq. 1.2.2-2
λ=1.2612 Eq. 1.1-3
ρ=0.6546 Eq. 1.1-2
b=0.74212 in (ineffective width=0.39158 in) Eq. 1.1-1
Element 5: Unstiffened, w=0.5087 in
f_1=47.456 ksi, f_2=36.328 ksi
ψ=0.76551 Eq. 1.2.2-1
k=0.52284 Eq. 1.2.2-2
λ=0.65811 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 4: Check for lip stiffener reduction
S=31.246 Eq. 1.3-7
Ia=0.00078622 in^4 Eq. 1.3-8
Is=0.00049474 in^4

ds=0.32011 in (lip ineffective width=0.18859 in)	Eq. 1.3-6
k=3.3794	Table 1.3-1
Element 4: Partially stiffened, w=2.2674 in	
f=49.507 ksi, k=3.3794	
λ=1.1785	Eq. 1.1-3
ρ=0.69015	Eq. 1.1-2
b=1.5648 in (ineffective width=0.70256 in)	Eq. 1.1-1
b_1=0.49235 in, b_2=1.0725 in	
Center of gravity shift: y=-0.28582 in	
Sxe=0.44919 in^3, Fy=50 ksi	
Mnl=22.459 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	
f_1=47.456 ksi, f_2=36.328 ksi	
ψ=0.76551	Eq. 1.2.2-1
k=0.52284	Eq. 1.2.2-2
λ=0.65811	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.246	Eq. 1.3-7
Ia=0.00078622 in^4	Eq. 1.3-8
Is=0.00049474 in^4	
ds=0.32011 in (lip ineffective width=0.18859 in)	Eq. 1.3-6
k=3.3794	Table 1.3-1
Element 2: Partially stiffened, w=2.2674 in	
f=49.507 ksi, k=3.3794	
λ=1.1785	Eq. 1.1-3
ρ=0.69015	Eq. 1.1-2
b=1.5648 in (ineffective width=0.70256 in)	Eq. 1.1-1
b_1=0.49235 in, b_2=1.0725 in	
Element 3: Treat as two unstiffened elements	
f_1=47.456 ksi, f_2=22.656 ksi	
ψ=0.47741	Eq. 1.2.2-1
k=0.70711	Eq. 1.2.2-2
λ=1.2612	Eq. 1.1-3
ρ=0.6546	Eq. 1.1-2
b=0.74212 in (ineffective width=0.39158 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.28582 in	
Sxe=0.44919 in^3, Fy=50 ksi	
Mnl=22.459 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	

f_1=49.218 ksi, f_2=49.218 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.73903 Eq. 1.1-3
ρ=0.95032 Eq. 1.1-2
b=0.48343 in (ineffective width=0.025274 in) Eq. 1.1-1
Element 2: Stiffened, w=2.2674 in
f_1=45.965 ksi, f_2=-32.71 ksi
ψ=0.71164 Eq. 1.1.2-1
k=17.453 Eq. 1.1.2-2
λ=0.49967 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.2674 in Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.61089 in Eq. 1.1.2-3
b_2=1.1337 in Eq. 1.1.2-4
Compression width=1.3247 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.5087 in
f_1=49.218 ksi, f_2=49.218 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.73903 Eq. 1.1-3
ρ=0.95032 Eq. 1.1-2
b=0.48343 in (ineffective width=0.025274 in) Eq. 1.1-1
Element 4: Stiffened, w=2.2674 in
f_1=45.965 ksi, f_2=-32.71 ksi
ψ=0.71165 Eq. 1.1.2-1
k=17.453 Eq. 1.1.2-2
λ=0.49967 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.2674 in Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.61089 in Eq. 1.1.2-3
b_2=1.1337 in Eq. 1.1.2-4
Compression width=1.3247 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=-0.0085267 in
Sye=0.23011 in^3, Fy=50 ksi
Mnl=11.506 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=2.2674 in
f_1=42.788 ksi, f_2=-45.473 ksi
ψ=1.0628 Eq. 1.1.2-1
k=25.68 Eq. 1.1.2-2

λ=0.39744	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.2674 in	Eq. 1.1-1
h_o=2.5 in, b_o=4 in, h_o/b_o=0.625	
b_1=0.55809 in	Eq. 1.1.2-3
b_2=1.1337 in	Eq. 1.1.2-4
Compression width=1.0992 in	
b_1+b_2 > compression width (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=46.437 ksi, f_2=46.437 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.5998	Eq. 1.1-3
ρ=0.53912	Eq. 1.1-2
b=0.6112 in (ineffective width=0.5225 in)	Eq. 1.1-1
f_1=46.437 ksi, f_2=46.437 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=1.5998	Eq. 1.1-3
ρ=0.53912	Eq. 1.1-2
b=0.6112 in (ineffective width=0.5225 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: Stiffened, w=2.2674 in	
f_1=42.788 ksi, f_2=-45.473 ksi	
ψ=1.0628	Eq. 1.1.2-1
k=25.68	Eq. 1.1.2-2
λ=0.39744	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.2674 in	Eq. 1.1-1
h_o=2.5 in, b_o=4 in, h_o/b_o=0.625	
b_1=0.55809 in	Eq. 1.1.2-3
b_2=1.1337 in	Eq. 1.1.2-4
Compression width=1.0992 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0.1483 in	
Sye=0.216 in^3, Fy=50 ksi	
Mnl=10.8 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud

Cw=1.4203 in^6, Wn=4.5876 in^2, Fy=50 ksi	
Bn=15.479 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

400S250-54

Full Section Properties

Area	0.55634 in²	Wt.	0.0018915 k/ft	Flat	9.8293 in
Ix	1.5124 in⁴	rx	1.6488 in	Ixy	0.0000 in⁴
Sx(t)	0.75620 in³	y(t)	2.0000 in	α	0.000 deg
Sx(b)	0.75620 in³	y(b)	2.0000 in		
Zx	0.85659 in³	Height	4.0000 in		
Iy	0.4899 in⁴	ry	0.9384 in	x_o	-2.1228 in
Sy(l)	0.53939 in³	x(l)	0.9082 in	y_o	0.0000 in
Sy(r)	0.30775 in³	x(r)	1.5918 in	jx	2.7736 in
Zy	0.45707 in³	Width	2.5000 in	jy	0.0000 in
I_1	1.5124 in⁴	r_1	1.6488 in	Cw	1.7518 in⁶
I_2	0.4899 in⁴	r_2	0.9384 in	J	0.0005941 in⁴
Ic	2.0023 in⁴	rc	1.8971 in		
I_o	4.5092 in⁴	r_o	2.8470 in		

Net Section Properties

Ix	1.4965 in⁴	rx	1.7817 in	Area	0.47144 in²
Sx(t)	0.74824 in³	y(t)	2.0000 in	Ixy	0.0000 in⁴
Sx(b)	0.74824 in³	y(b)	2.0000 in	α	0.000 deg
Zx	0.82475 in³				
Iy	0.4123 in⁴	ry	0.9352 in	x_o	-2.2944 in
Sy(l)	0.38652 in³	x(l)	1.0667 in	y_o	0.0000 in
Sy(r)	0.28763 in³	x(r)	1.4333 in	jx	2.6274 in
Zy	0.39580 in³			jy	0.0000 in
Ic	1.9088 in⁴	rc	2.0122 in	Cw	1.7270 in⁶
I_o	4.3906 in⁴	r_o	3.0518 in	J	0.0005034 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	14.205 k	ϕMnxo	26.619 k-in	ϕMnyo	14.710 k-in
Ae	0.33423 in²	Ixe	1.3162 in⁴	Iye	0.4123 in⁴
ϕTn	22.983 k	Sxe(t)	0.59154 in³	Sye(l)	0.38652 in³
		Sxe(b)	0.74155 in³	Sye(r)	0.28763 in³
Shear					
ϕVny	1.615 k	Negative Bending		Negative Bending	
ϕVnx	6.776 k	ϕMnxo	26.619 k-in	ϕMnyo	12.300 k-in
		Ixe	1.3162 in⁴	Iye	0.3659 in⁴
Torsion		Sxe(t)	0.74155 in³	Sye(l)	0.31501 in³
ϕBn	17.127 k-in²	Sxe(b)	0.59154 in³	Sye(r)	0.27333 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=51.837 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=53.509 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=56.825 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.55634 in², Fy=51.837 ksi

Tn=28.839 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.47144 in², Fu=65 ksi	
Tn=30.643 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=3.7645 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=2.5102 k	Eq. G3-2
kv=3.7785	Eq. G3-8
Vcrh=2.2535 k	Eq. G3-6
Vn=1.7948 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=3.7645 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4835 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56413	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0015382 in⁴	Eq. 1.3-8
Is=0.00053312 in⁴	
ds=0.16757 in (lip ineffective width=0.31593 in)	Eq. 1.3-6
k=2.8256	Table 1.3-1
Element 2: Partially stiffened, w=2.217 in	
f=50 ksi, k=2.8256	
λ=1.0091	Eq. 1.1-3
ρ=0.77494	Eq. 1.1-2
b=1.718 in (ineffective width=0.49896 in)	Eq. 1.1-1
b_1=0.29773 in, b_2=1.4203 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.2934	Eq. 1.1-3
ρ=0.64166	Eq. 1.1-2
b=0.71128 in (ineffective width=0.39722 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=1.2934	Eq. 1.1-3
ρ=0.64166	Eq. 1.1-2
b=0.71128 in (ineffective width=0.39722 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4835 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56413	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0015382 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.16757 in (lip ineffective width=0.31593 in)	Eq. 1.3-6
k=2.8256	Table 1.3-1
Element 4: Partially stiffened, w=2.217 in	
f=50 ksi, k=2.8256	
λ=1.0091	Eq. 1.1-3
ρ=0.77494	Eq. 1.1-2
b=1.718 in (ineffective width=0.49896 in)	Eq. 1.1-1
b_1=0.29773 in, b_2=1.4203 in	
Ae=0.33423 in^2, Fn=50 ksi	
Pn=16.711 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=46.82 ksi, f_2=21.91 ksi	
ψ=0.46795	Eq. 1.2.2-1
k=0.71539	Eq. 1.2.2-2
λ=0.97032	Eq. 1.1-3
ρ=0.79692	Eq. 1.1-2
b=0.88339 in (ineffective width=0.22511 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4835 in	
f_1=46.82 ksi, f_2=35.955 ksi	
ψ=0.76793	Eq. 1.2.2-1
k=0.52169	Eq. 1.2.2-2
λ=0.49561	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.291	Eq. 1.3-7
Ia=0.0015287 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.16861 in (lip ineffective width=0.31489 in)	Eq. 1.3-6
k=2.8305	Table 1.3-1
Element 4: Partially stiffened, w=2.217 in	

f=49.364 ksi, k=2.8305	
λ=1.0018	Eq. 1.1-3
ρ=0.77901	Eq. 1.1-2
b=1.7271 in (ineffective width=0.48994 in)	Eq. 1.1-1
b_1=0.30115 in, b_2=1.4259 in	
Center of gravity shift: y=-0.22505 in	
Sxe=0.59154 in^3, Fy=50 ksi	
Mnl=29.577 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4835 in	
f_1=46.82 ksi, f_2=35.955 ksi	
ψ=0.76793	Eq. 1.2.2-1
k=0.52169	Eq. 1.2.2-2
λ=0.49561	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.291	Eq. 1.3-7
Ia=0.0015287 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.16861 in (lip ineffective width=0.31489 in)	Eq. 1.3-6
k=2.8305	Table 1.3-1
Element 2: Partially stiffened, w=2.217 in	
f=49.364 ksi, k=2.8305	
λ=1.0018	Eq. 1.1-3
ρ=0.77901	Eq. 1.1-2
b=1.7271 in (ineffective width=0.48994 in)	Eq. 1.1-1
b_1=0.30115 in, b_2=1.4259 in	
Element 3: Treat as two unstiffened elements	
f_1=46.82 ksi, f_2=21.91 ksi	
ψ=0.46795	Eq. 1.2.2-1
k=0.71539	Eq. 1.2.2-2
λ=0.97032	Eq. 1.1-3
ρ=0.79692	Eq. 1.1-2
b=0.88339 in (ineffective width=0.22511 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.22505 in	
Sxe=0.59154 in^3, Fy=50 ksi	
Mnl=29.577 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4835 in	
f_1=55.703 ksi, f_2=55.703 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3

λ=0.59544	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=2.217 in	
f_1=51.216 ksi, f_2=-36.678 ksi	
ψ=0.71615	Eq. 1.1.2-1
k=17.541	Eq. 1.1.2-2
λ=0.4099	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.217 in	Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4	
b_1=0.59659 in	Eq. 1.1.2-3
b_2=1.1085 in	Eq. 1.1.2-4
Compression width=1.2918 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.4835 in	
f_1=55.703 ksi, f_2=55.703 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.59544	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Stiffened, w=2.217 in	
f_1=51.216 ksi, f_2=-36.678 ksi	
ψ=0.71615	Eq. 1.1.2-1
k=17.541	Eq. 1.1.2-2
λ=0.4099	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.217 in	Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4	
b_1=0.59659 in	Eq. 1.1.2-3
b_2=1.1085 in	Eq. 1.1.2-4
Compression width=1.2918 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0 in	
Sye=0.28763 in^3, Fy=56.825 ksi	
Mnl=16.345 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: Stiffened, w=2.217 in	
f_1=37.99 ksi, f_2=-44.721 ksi	
ψ=1.1772	Eq. 1.1.2-1
k=28.995	Eq. 1.1.2-2
λ=0.27458	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.217 in	Eq. 1.1-1
h_o=2.5 in, b_o=4 in, h_o/b_o=0.625	
b_1=0.53074 in	Eq. 1.1.2-3

b_2=1.1085 in	Eq. 1.1.2-4
Compression width=1.0183 in	
b_1+b_2 > compression width (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=42.213 ksi, f_2=42.213 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.1884	Eq. 1.1-3
ρ=0.6857	Eq. 1.1-2
b=0.7601 in (ineffective width=0.3484 in)	Eq. 1.1-1
f_1=42.213 ksi, f_2=42.213 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=1.1884	Eq. 1.1-3
ρ=0.6857	Eq. 1.1-2
b=0.7601 in (ineffective width=0.3484 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: Stiffened, w=2.217 in	
f_1=37.99 ksi, f_2=-44.721 ksi	
ψ=1.1772	Eq. 1.1.2-1
k=28.995	Eq. 1.1.2-2
λ=0.27458	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.217 in	Eq. 1.1-1
h_o=2.5 in, b_o=4 in, h_o/b_o=0.625	
b_1=0.53074 in	Eq. 1.1.2-3
b_2=1.1085 in	Eq. 1.1.2-4
Compression width=1.0183 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0.094797 in	
Sye=0.27333 in^3, Fy=50 ksi	
Mnl=13.666 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud

Cw=1.727 in^6, Wn=4.5375 in^2, Fy=50 ksi	
Bn=19.03 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

400S250-68

Full Section Properties

Area	0.69304 in²	Wt.	0.0023563 k/ft	Flat	9.7201 in
Ix	1.8651 in⁴	rx	1.6405 in	Ixy	0.0000 in⁴
Sx(t)	0.9325 in³	y(t)	2.0000 in	α	0.000 deg
Sx(b)	0.9325 in³	y(b)	2.0000 in		
Zx	1.0612 in³	Height	4.0000 in		
Iy	0.5992 in⁴	ry	0.9298 in	x_o	-2.1027 in
Sy(l)	0.6610 in³	x(l)	0.9064 in	y_o	0.0000 in
Sy(r)	0.3760 in³	x(r)	1.5936 in	jx	2.7578 in
Zy	0.5636 in³	Width	2.5000 in	jy	0.0000 in
I_1	1.8651 in⁴	r_1	1.6405 in	Cw	2.1148 in⁶
I_2	0.5992 in⁴	r_2	0.9298 in	J	0.0011744 in⁴
Ic	2.4643 in⁴	rc	1.8857 in		
I_o	5.5285 in⁴	r_o	2.8244 in		

Net Section Properties

Ix	1.8450 in⁴	rx	1.7743 in	Area	0.58609 in²
Sx(t)	0.9225 in³	y(t)	2.0000 in	Ixy	0.0000 in⁴
Sx(b)	0.9225 in³	y(b)	2.0000 in	α	0.000 deg
Zx	1.0211 in³				
Iy	0.5032 in⁴	ry	0.9266 in	x_o	-2.2750 in
Sy(l)	0.4724 in³	x(l)	1.0653 in	y_o	0.0000 in
Sy(r)	0.3508 in³	x(r)	1.4347 in	jx	2.6106 in
Zy	0.4872 in³			jy	0.0000 in
Ic	2.3483 in⁴	rc	2.0017 in	Cw	2.0841 in⁶
I_o	5.3817 in⁴	r_o	3.0302 in	J	0.0009932 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	19.698 k	ϕMnxo	35.693 k-in	ϕMnyo	18.460 k-in
Ae	0.46347 in²	Ixe	1.7005 in⁴	Iye	0.5032 in⁴
ϕTn	28.572 k	Sxe(t)	0.79317 in³	Sye(l)	0.47236 in³
		Sxe(b)	0.91613 in³	Sye(r)	0.35076 in³
Shear					
ϕVny	2.370 k	Negative Bending		Negative Bending	
ϕVnx	8.253 k	ϕMnxo	35.693 k-in	ϕMnyo	15.466 k-in
		Ixe	1.7005 in⁴	Iye	0.4797 in⁴
Torsion		Sxe(t)	0.91613 in³	Sye(l)	0.43432 in³
ϕBn	20.97 k-in²	Sxe(b)	0.79317 in³	Sye(r)	0.34369 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=52.34 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=54.388 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=58.477 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.69304 in², Fy=52.34 ksi

Tn=36.274 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.58609 in², Fu=65 ksi	
Tn=38.096 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=4.5852 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=3.0052 k	Eq. G3-2
kv=3.7567	Eq. G3-8
Vcrh=4.4817 k	Eq. G3-6
Vn=2.6335 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=4.5852 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4468 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41383	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0026903 in⁴	Eq. 1.3-8
Is=0.00052997 in⁴	
ds=0.088017 in (lip ineffective width=0.35878 in)	Eq. 1.3-6
k=2.3644	Table 1.3-1
Element 2: Partially stiffened, w=2.1436 in	
f=50 ksi, k=2.3644	
λ=0.84669	Eq. 1.1-3
ρ=0.87418	Eq. 1.1-2
b=1.8739 in (ineffective width=0.2697 in)	Eq. 1.1-1
b_1=0.18457 in, b_2=1.6893 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.99272	Eq. 1.1-3
ρ=0.7841	Eq. 1.1-2
b=0.84039 in (ineffective width=0.23141 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=0.99272	Eq. 1.1-3
ρ=0.7841	Eq. 1.1-2
b=0.84039 in (ineffective width=0.23141 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4468 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41383	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0026903 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.088017 in (lip ineffective width=0.35878 in)	Eq. 1.3-6
k=2.3644	Table 1.3-1
Element 4: Partially stiffened, w=2.1436 in	
f=50 ksi, k=2.3644	
λ=0.84669	Eq. 1.1-3
ρ=0.87418	Eq. 1.1-2
b=1.8739 in (ineffective width=0.2697 in)	Eq. 1.1-1
b_1=0.18457 in, b_2=1.6893 in	
Ae=0.46347 in^2, Fn=50 ksi	
Pn=23.174 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=45.844 ksi, f_2=20.847 ksi	
ψ=0.45473	Eq. 1.2.2-1
k=0.72729	Eq. 1.2.2-2
λ=0.73091	Eq. 1.1-3
ρ=0.95635	Eq. 1.1-2
b=1.025 in (ineffective width=0.046781 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4468 in	
f_1=45.844 ksi, f_2=35.423 ksi	
ψ=0.77269	Eq. 1.2.2-1
k=0.51946	Eq. 1.2.2-2
λ=0.36053	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.353	Eq. 1.3-7
Ia=0.0025896 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.091439 in (lip ineffective width=0.35536 in)	Eq. 1.3-6
k=2.3834	Table 1.3-1
Element 4: Partially stiffened, w=2.1436 in	

f=49.169 ksi, k=2.3834
λ=0.83627 Eq. 1.1-3
ρ=0.88121 Eq. 1.1-2
b=1.889 in (ineffective width=0.25464 in) Eq. 1.1-1
b_1=0.19329 in, b_2=1.6957 in
Center of gravity shift: y=-0.14387 in
Sxe=0.79317 in^3, Fy=50 ksi
Mnl=39.659 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.4468 in
f_1=45.844 ksi, f_2=35.423 ksi
ψ=0.77269 Eq. 1.2.2-1
k=0.51946 Eq. 1.2.2-2
λ=0.36053 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.353 Eq. 1.3-7
Ia=0.0025896 in^4 Eq. 1.3-8
Is=0.00052997 in^4
ds=0.091439 in (lip ineffective width=0.35536 in) Eq. 1.3-6
k=2.3834 Table 1.3-1
Element 2: Partially stiffened, w=2.1436 in
f=49.169 ksi, k=2.3834
λ=0.83627 Eq. 1.1-3
ρ=0.88121 Eq. 1.1-2
b=1.889 in (ineffective width=0.25464 in) Eq. 1.1-1
b_1=0.19329 in, b_2=1.6957 in
Element 3: Treat as two unstiffened elements
f_1=45.844 ksi, f_2=20.847 ksi
ψ=0.45473 Eq. 1.2.2-1
k=0.72729 Eq. 1.2.2-2
λ=0.73091 Eq. 1.1-3
ρ=0.95635 Eq. 1.1-2
b=1.025 in (ineffective width=0.046781 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0.14387 in
Sxe=0.79317 in^3, Fy=50 ksi
Mnl=39.659 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.4468 in
f_1=57.024 ksi, f_2=57.024 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3

λ=0.44194	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=2.1436 in	
f_1=51.213 ksi, f_2=-36.16 ksi	
ψ=0.70606	Eq. 1.1.2-1
k=17.344	Eq. 1.1.2-2
λ=0.31639	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.1436 in	Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4	
b_1=0.5784 in	Eq. 1.1.2-3
b_2=1.0718 in	Eq. 1.1.2-4
Compression width=1.2565 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.4468 in	
f_1=57.024 ksi, f_2=57.024 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.44194	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Stiffened, w=2.1436 in	
f_1=51.213 ksi, f_2=-36.16 ksi	
ψ=0.70606	Eq. 1.1.2-1
k=17.344	Eq. 1.1.2-2
λ=0.31639	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.1436 in	Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4	
b_1=0.5784 in	Eq. 1.1.2-3
b_2=1.0718 in	Eq. 1.1.2-4
Compression width=1.2565 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0 in	
Sye=0.35076 in^3, Fy=58.477 ksi	
Mnl=20.511 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: Stiffened, w=2.1436 in	
f_1=33.145 ksi, f_2=-43.619 ksi	
ψ=1.316	Eq. 1.1.2-1
k=33.477	Eq. 1.1.2-2
λ=0.1832	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.1436 in	Eq. 1.1-1
h_o=2.5 in, b_o=4 in, h_o/b_o=0.625	
b_1=0.49666 in	Eq. 1.1.2-3

b_2=1.0718 in	Eq. 1.1.2-4
Compression width=0.92556 in	
b_1+b_2 > compression width (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=38.25 ksi, f_2=38.25 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.86827	Eq. 1.1-3
ρ=0.8599	Eq. 1.1-2
b=0.92164 in (ineffective width=0.15016 in)	Eq. 1.1-1
f_1=38.25 ksi, f_2=38.25 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=0.86827	Eq. 1.1-3
ρ=0.8599	Eq. 1.1-2
b=0.92164 in (ineffective width=0.15016 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: Stiffened, w=2.1436 in	
f_1=33.145 ksi, f_2=-43.619 ksi	
ψ=1.316	Eq. 1.1.2-1
k=33.477	Eq. 1.1.2-2
λ=0.1832	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.1436 in	Eq. 1.1-1
h_o=2.5 in, b_o=4 in, h_o/b_o=0.625	
b_1=0.49666 in	Eq. 1.1.2-3
b_2=1.0718 in	Eq. 1.1.2-4
Compression width=0.92556 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0.039047 in	
Sye=0.34369 in^3, Fy=50 ksi	
Mnl=17.184 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud

Cw=2.0841 in^6, Wn=4.4724 in^2, Fy=50 ksi	
Bn=23.299 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

600S162-30

Full Section Properties

Area	0.31089 in²	Wt.	0.0010570 k/ft	Flat	9.9643 in
Ix	1.6215 in⁴	rx	2.2838 in	Ixy	0.0000 in⁴
Sx(t)	0.54049 in³	y(t)	3.0000 in	α	0.000 deg
Sx(b)	0.54049 in³	y(b)	3.0000 in		
Zx	0.64254 in³	Height	6.0000 in		
Iy	0.1055 in⁴	ry	0.5826 in	x_o	-1.0717 in
Sy(l)	0.25574 in³	x(l)	0.4126 in	y_o	0.0000 in
Sy(r)	0.08704 in³	x(r)	1.2124 in	jx	3.2365 in
Zy	0.12415 in³	Width	1.6250 in	jy	0.0000 in
I_1	1.6215 in⁴	r_1	2.2838 in	Cw	0.75162 in⁶
I_2	0.1055 in⁴	r_2	0.5826 in	J	0.0001009 in⁴
Ic	1.7270 in⁴	rc	2.3569 in		
I_o	2.0840 in⁴	r_o	2.5891 in		

Net Section Properties

Ix	1.6127 in⁴	rx	2.4712 in	Area	0.26409 in²
Sx(t)	0.53756 in³	y(t)	3.0000 in	Ixy	0.0000 in⁴
Sx(b)	0.53756 in³	y(b)	3.0000 in	α	0.000 deg
Zx	0.62499 in³				
Iy	0.0968 in⁴	ry	0.6055 in	x_o	-1.1457 in
Sy(l)	0.20050 in³	x(l)	0.4830 in	y_o	0.0000 in
Sy(r)	0.08479 in³	x(r)	1.1420 in	jx	2.8460 in
Zy	0.12355 in³			jy	0.0000 in
Ic	1.7095 in⁴	rc	2.5443 in	Cw	0.74760 in⁶
I_o	2.0562 in⁴	r_o	2.7903 in	J	0.00008569 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	5.647 k	ϕMnxo	17.824 k-in	ϕMnyo	3.646 k-in
Ae	0.13288 in²	Ixe	1.3665 in⁴	Iye	0.0934 in⁴
ϕTn	12.874 k	Sxe(t)	0.39608 in³	Sye(l)	0.19815 in³
		Sxe(b)	0.53593 in³	Sye(r)	0.08101 in³
Shear					
ϕVny	0.676 k	Negative Bending		Negative Bending	
ϕVnx	2.328 k	ϕMnxo	17.824 k-in	ϕMnyo	3.179 k-in
		Ixe	1.3665 in⁴	Iye	0.0591 in⁴
Torsion		Sxe(t)	0.53593 in³	Sye(l)	0.07489 in³
ϕBn	8.7948 k-in²	Sxe(b)	0.39608 in³	Sye(r)	0.07065 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Fya=51.104 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Fya=53.235 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Fya=55.114 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength

Ag=0.31089 in², Fy=51.104 ksi	
Tn=15.888 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.26409 in², Fu=65 ksi	
Tn=17.166 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=1.2934 k at 180 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=3.5005 k	Eq. G3-2
kv=4.0784	Eq. G3-8
Vcrh=0.35872 k	Eq. G3-6
Vn=0.75095 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=1.2934 k at 0 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3907 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.82697	Eq. 1.1-3
ρ=0.88754	Eq. 1.1-2
b=0.34676 in (ineffective width=0.043938 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00016273 in^4	Eq. 1.3-8
Is=0.00015506 in^4	
ds=0.33042 in (lip ineffective width=0.01634 in)	Eq. 1.3-6
k=3.4239	Table 1.3-1
Element 2: Partially stiffened, w=1.4064 in	
f=50 ksi, k=3.4239	
λ=1.055	Eq. 1.1-3
ρ=0.75023	Eq. 1.1-2
b=1.0551 in (ineffective width=0.35127 in)	Eq. 1.1-1
b_1=0.5027 in, b_2=0.55242 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.5311	Eq. 1.1-3
ρ=0.20998	Eq. 1.1-2
b=0.44951 in (ineffective width=1.6912 in)	Eq. 1.1-1

f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.5311	Eq. 1.1-3
ρ=0.20998	Eq. 1.1-2
b=0.44951 in (ineffective width=1.6912 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.3907 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.82697	Eq. 1.1-3
ρ=0.88754	Eq. 1.1-2
b=0.34676 in (ineffective width=0.043938 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00016273 in^4	Eq. 1.3-8
Is=0.00015506 in^4	
ds=0.33042 in (lip ineffective width=0.016341 in)	Eq. 1.3-6
k=3.4239	Table 1.3-1
Element 4: Partially stiffened, w=1.4064 in	
f=50 ksi, k=3.4239	
λ=1.055	Eq. 1.1-3
ρ=0.75023	Eq. 1.1-2
b=1.0551 in (ineffective width=0.35127 in)	Eq. 1.1-1
b_1=0.5027 in, b_2=0.55242 in	
Ae=0.13288 in^2, Fn=50 ksi	
Pn=6.6438 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=5.7814 in	
f_1=48.416 ksi, f_2=-35.394 ksi	
ψ=0.73105	Eq. 1.1.2-1
k=17.836	Eq. 1.1.2-2
λ=1.8697	Eq. 1.1-3
ρ=0.47192	Eq. 1.1-2
be=2.7283 in	Eq. 1.1-1
h_o=6 in, b_o=1.625 in, h_o/b_o=3.6923	
b_1=0.73125 in	Eq. 1.1.2-3
b_2=1.3642 in	Eq. 1.1.2-4
Compression width=3.3398 in	
Ineffective width=1.2444 in	
Element 5: Unstiffened, w=0.3907 in	
f_1=48.416 ksi, f_2=42.752 ksi	
ψ=0.88302	Eq. 1.2.2-1
k=0.4726	Eq. 1.2.2-2
λ=0.77622	Eq. 1.1-3

ρ=0.92316	Eq. 1.1-2
b=0.36068 in (ineffective width=0.030021 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.162	Eq. 1.3-7
Ia=0.00016237 in^4	Eq. 1.3-8
Is=0.00015506 in^4	
ds=0.34444 in (lip ineffective width=0.016239 in)	Eq. 1.3-6
k=3.426	Table 1.3-1
Element 4: Partially stiffened, w=1.4064 in	
f=49.774 ksi, k=3.426	
λ=1.0522	Eq. 1.1-3
ρ=0.75166	Eq. 1.1-2
b=1.0571 in (ineffective width=0.34926 in)	Eq. 1.1-1
b_1=0.50477 in, b_2=0.55237 in	
Center of gravity shift: y=-0.45015 in	
Sxe=0.39608 in^3, Fy=50 ksi	
Mnl=19.804 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3907 in	
f_1=48.416 ksi, f_2=42.752 ksi	
ψ=0.88302	Eq. 1.2.2-1
k=0.4726	Eq. 1.2.2-2
λ=0.77622	Eq. 1.1-3
ρ=0.92316	Eq. 1.1-2
b=0.36068 in (ineffective width=0.030021 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.162	Eq. 1.3-7
Ia=0.00016237 in^4	Eq. 1.3-8
Is=0.00015506 in^4	
ds=0.34444 in (lip ineffective width=0.016239 in)	Eq. 1.3-6
k=3.426	Table 1.3-1
Element 2: Partially stiffened, w=1.4064 in	
f=49.774 ksi, k=3.426	
λ=1.0522	Eq. 1.1-3
ρ=0.75166	Eq. 1.1-2
b=1.0571 in (ineffective width=0.34926 in)	Eq. 1.1-1
b_1=0.50477 in, b_2=0.55237 in	
Element 3: Stiffened, w=5.7814 in	
f_1=48.416 ksi, f_2=-35.394 ksi	
ψ=0.73105	Eq. 1.1.2-1
k=17.836	Eq. 1.1.2-2
λ=1.8697	Eq. 1.1-3
ρ=0.47192	Eq. 1.1-2
be=2.7283 in	Eq. 1.1-1
h_o=6 in, b_o=1.625 in, h_o/b_o=3.6923	
b_1=0.73125 in	Eq. 1.1.2-3
b_2=1.3642 in	Eq. 1.1.2-4

Compression width=3.3398 in
Ineffective width=1.2444 in
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0.45015 in
Sxe=0.39608 in^3, Fy=50 ksi
Mnl=19.804 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3907 in
f_1=49.324 ksi, f_2=49.324 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.82136 Eq. 1.1-3
ρ=0.89139 Eq. 1.1-2
b=0.34827 in (ineffective width=0.042434 in) Eq. 1.1-1
Element 2: Stiffened, w=1.4064 in
f_1=45.262 ksi, f_2=-15.704 ksi
ψ=0.34697 Eq. 1.1.2-1
k=11.582 Eq. 1.1.2-2
λ=0.54574 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.4064 in Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25
b_1=0.4202 in Eq. 1.1.2-3
b_2=0.7032 in Eq. 1.1.2-4
Compression width=1.0441 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.3907 in
f_1=49.324 ksi, f_2=49.324 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=0.82136 Eq. 1.1-3
ρ=0.89139 Eq. 1.1-2
b=0.34827 in (ineffective width=0.042434 in) Eq. 1.1-1
Element 4: Stiffened, w=1.4064 in
f_1=45.262 ksi, f_2=-15.704 ksi
ψ=0.34697 Eq. 1.1.2-1
k=11.582 Eq. 1.1.2-2
λ=0.54574 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.4064 in Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25
b_1=0.4202 in Eq. 1.1.2-3
b_2=0.7032 in Eq. 1.1.2-4
Compression width=1.0441 in
b_1+b_2 > compression width (fully effective)

Center of gravity shift: x=-0.011408 in
Sye=0.081013 in^3, Fy=50 ksi
Mnl=4.0506 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.4064 in
f_1=40.61 ksi, f_2=-43.466 ksi
ψ=1.0703 Eq. 1.1.2-1
k=25.888 Eq. 1.1.2-2
λ=0.34576 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.4064 in Eq. 1.1-1
h_o=1.625 in, b_o=6 in, h_o/b_o=0.27083
b_1=0.34553 in Eq. 1.1.2-3
b_2=0.7032 in Eq. 1.1.2-4
Compression width=0.67931 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=46.212 ksi, f_2=46.212 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=4.3561 Eq. 1.1-3
ρ=0.21797 Eq. 1.1-2
b=0.46661 in (ineffective width=1.6741 in) Eq. 1.1-1
f_1=46.212 ksi, f_2=46.212 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=4.3561 Eq. 1.1-3
ρ=0.21797 Eq. 1.1-2
b=0.46661 in (ineffective width=1.6741 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=1.4064 in
f_1=40.61 ksi, f_2=-43.466 ksi
ψ=1.0703 Eq. 1.1.2-1
k=25.888 Eq. 1.1.2-2
λ=0.34576 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.4064 in Eq. 1.1-1
h_o=1.625 in, b_o=6 in, h_o/b_o=0.27083
b_1=0.34553 in Eq. 1.1.2-3
b_2=0.7032 in Eq. 1.1.2-4
Compression width=0.67931 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.30587 in
Sye=0.070651 in^3, Fy=50 ksi
Mnl=3.5325 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=0.7476 in^6, Wn=3.8252 in^2, Fy=50 ksi
Bn=9.772 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

600S162-33

Full Section Properties

Area	0.34430 in²	Wt.	0.0011706 k/ft	Flat	9.9507 in
Ix	1.7929 in⁴	rx	2.2820 in	Ixy	0.0000 in⁴
Sx(t)	0.59764 in³	y(t)	3.0000 in	α	0.000 deg
Sx(b)	0.59764 in³	y(b)	3.0000 in		
Zx	0.71098 in³	Height	6.0000 in		
Iy	0.1163 in⁴	ry	0.5811 in	x_o	-1.0682 in
Sy(l)	0.28155 in³	x(l)	0.4129 in	y_o	0.0000 in
Sy(r)	0.09592 in³	x(r)	1.2121 in	jx	3.2362 in
Zy	0.13710 in³	Width	1.6250 in	jy	0.0000 in
I_1	1.7929 in⁴	r_1	2.2820 in	Cw	0.82674 in⁶
I_2	0.1163 in⁴	r_2	0.5811 in	J	0.0001374 in⁴
Ic	1.9092 in⁴	rc	2.3548 in		
I_o	2.3021 in⁴	r_o	2.5858 in		

Net Section Properties

Ix	1.7832 in⁴	rx	2.4695 in	Area	0.29240 in²
Sx(t)	0.59440 in³	y(t)	3.0000 in	Ixy	0.0000 in⁴
Sx(b)	0.59440 in³	y(b)	3.0000 in	α	0.000 deg
Zx	0.69151 in³				
Iy	0.1067 in⁴	ry	0.6041 in	x_o	-1.1421 in
Sy(l)	0.22082 in³	x(l)	0.4832 in	y_o	0.0000 in
Sy(r)	0.09344 in³	x(r)	1.1418 in	jx	2.8450 in
Zy	0.13637 in³			jy	0.0000 in
Ic	1.8899 in⁴	rc	2.5423 in	Cw	0.82231 in⁶
I_o	2.2713 in⁴	r_o	2.7871 in	J	0.0001167 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	6.416 k	ϕMnxo	20.770 k-in	ϕMnyo	4.122 k-in
Ae	0.15097 in²	Ixe	1.5531 in⁴	Iye	0.1050 in⁴
ϕTn	14.254 k	Sxe(t)	0.46155 in³	Sye(l)	0.21969 in³
		Sxe(b)	0.58941 in³	Sye(r)	0.09160 in³
Shear					
ϕVny	0.850 k	Negative Bending		Negative Bending	
ϕVnx	2.621 k	ϕMnxo	20.770 k-in	ϕMnyo	3.556 k-in
		Ixe	1.5531 in⁴	Iye	0.0675 in⁴
Torsion		Sxe(t)	0.58941 in³	Sye(l)	0.08757 in³
ϕBn	9.7042 k-in²	Sxe(b)	0.46155 in³	Sye(r)	0.07902 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Fya=51.199 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Fya=53.516 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Fya=55.565 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength

Ag=0.3443 in², Fy=51.199 ksi	
Tn=17.628 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.2924 in², Fu=65 ksi	
Tn=19.006 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=1.4563 k at 180 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=3.8779 k	Eq. G3-2
kv=4.0779	Eq. G3-8
Vcrh=0.48931 k	Eq. G3-6
Vn=0.94407 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=1.4563 k at 0 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.389 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.74246	Eq. 1.1-3
ρ=0.94778	Eq. 1.1-2
b=0.36869 in (ineffective width=0.020315 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00022212 in⁴	Eq. 1.3-8
Is=0.00016972 in⁴	
ds=0.28171 in (lip ineffective width=0.086971 in)	Eq. 1.3-6
k=3.2075	Table 1.3-1
Element 2: Partially stiffened, w=1.403 in	
f=50 ksi, k=3.2075	
λ=0.98047	Eq. 1.1-3
ρ=0.79107	Eq. 1.1-2
b=1.1099 in (ineffective width=0.29313 in)	Eq. 1.1-1
b_1=0.42403 in, b_2=0.68584 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.0826	Eq. 1.1-3
ρ=0.23174	Eq. 1.1-2
b=0.4957 in (ineffective width=1.6433 in)	Eq. 1.1-1

f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=4.0826 Eq. 1.1-3
ρ=0.23174 Eq. 1.1-2
b=0.4957 in (ineffective width=1.6433 in) Eq. 1.1-1
Element 5: Unstiffened, w=0.389 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.74246 Eq. 1.1-3
ρ=0.94778 Eq. 1.1-2
b=0.36869 in (ineffective width=0.020315 in) Eq. 1.1-1
Element 4: Check for lip stiffener reduction
S=31.091 Eq. 1.3-7
Ia=0.00022212 in^4 Eq. 1.3-8
Is=0.00016972 in^4
ds=0.28171 in (lip ineffective width=0.086971 in) Eq. 1.3-6
k=3.2075 Table 1.3-1
Element 4: Partially stiffened, w=1.403 in
f=50 ksi, k=3.2075
λ=0.98047 Eq. 1.1-3
ρ=0.79107 Eq. 1.1-2
b=1.1099 in (ineffective width=0.29313 in) Eq. 1.1-1
b_1=0.42403 in, b_2=0.68584 in
Ae=0.15097 in^2, Fn=50 ksi
Pn=7.5485 k Eq. E3.1-1
Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: No compressive stress (fully effective)
Element 3: Stiffened, w=5.778 in
f_1=48.35 ksi, f_2=-37.536 ksi
ψ=0.77633 Eq. 1.1.2-1
k=18.763 Eq. 1.1.2-2
λ=1.6417 Eq. 1.1-3
ρ=0.52749 Eq. 1.1-2
be=3.0478 in Eq. 1.1-1
h_o=6 in, b_o=1.625 in, h_o/b_o=3.6923
b_1=0.80708 in Eq. 1.1.2-3
b_2=1.5239 in Eq. 1.1.2-4
Compression width=3.2528 in
Ineffective width=0.92177 in
Element 5: Unstiffened, w=0.389 in
f_1=48.35 ksi, f_2=42.568 ksi
ψ=0.88041 Eq. 1.2.2-1
k=0.47361 Eq. 1.2.2-2
λ=0.69568 Eq. 1.1-3

ρ=0.98287	Eq. 1.1-2
b=0.38234 in (ineffective width=0.0066646 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.171	Eq. 1.3-7
Ia=0.00022157 in^4	Eq. 1.3-8
Is=0.00016972 in^4	
ds=0.29287 in (lip ineffective width=0.089461 in)	Eq. 1.3-6
k=3.2098	Table 1.3-1
Element 4: Partially stiffened, w=1.403 in	
f=49.743 ksi, k=3.2098	
λ=0.97759	Eq. 1.1-3
ρ=0.79272	Eq. 1.1-2
b=1.1122 in (ineffective width=0.29081 in)	Eq. 1.1-1
b_1=0.42598 in, b_2=0.68621 in	
Center of gravity shift: y=-0.36496 in	
Sxe=0.46155 in^3, Fy=50 ksi	
Mnl=23.078 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.389 in	
f_1=48.35 ksi, f_2=42.568 ksi	
ψ=0.88041	Eq. 1.2.2-1
k=0.47361	Eq. 1.2.2-2
λ=0.69568	Eq. 1.1-3
ρ=0.98287	Eq. 1.1-2
b=0.38234 in (ineffective width=0.0066646 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.171	Eq. 1.3-7
Ia=0.00022157 in^4	Eq. 1.3-8
Is=0.00016972 in^4	
ds=0.29287 in (lip ineffective width=0.089461 in)	Eq. 1.3-6
k=3.2098	Table 1.3-1
Element 2: Partially stiffened, w=1.403 in	
f=49.743 ksi, k=3.2098	
λ=0.97759	Eq. 1.1-3
ρ=0.79272	Eq. 1.1-2
b=1.1122 in (ineffective width=0.29081 in)	Eq. 1.1-1
b_1=0.42598 in, b_2=0.68621 in	
Element 3: Stiffened, w=5.778 in	
f_1=48.35 ksi, f_2=-37.536 ksi	
ψ=0.77633	Eq. 1.1.2-1
k=18.763	Eq. 1.1.2-2
λ=1.6417	Eq. 1.1-3
ρ=0.52749	Eq. 1.1-2
be=3.0478 in	Eq. 1.1-1
h_o=6 in, b_o=1.625 in, h_o/b_o=3.6923	
b_1=0.80708 in	Eq. 1.1.2-3
b_2=1.5239 in	Eq. 1.1.2-4

Compression width=3.2528 in
Ineffective width=0.92177 in
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0.36496 in
Sxe=0.46155 in³, Fy=50 ksi
Mnl=23.078 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.389 in
f_1=49.246 ksi, f_2=49.246 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.73684 — Eq. 1.1-3
ρ=0.95194 — Eq. 1.1-2
b=0.3703 in (ineffective width=0.018696 in) — Eq. 1.1-1
Element 2: Stiffened, w=1.403 in
f_1=45.161 ksi, f_2=-16.007 ksi
ψ=0.35446 — Eq. 1.1.2-1
k=11.679 — Eq. 1.1.2-2
λ=0.48833 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=1.403 in — Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25
b_1=0.41825 in — Eq. 1.1.2-3
b_2=0.7015 in — Eq. 1.1.2-4
Compression width=1.0358 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.389 in
f_1=49.246 ksi, f_2=49.246 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-2
λ=0.73684 — Eq. 1.1-3
ρ=0.95194 — Eq. 1.1-2
b=0.3703 in (ineffective width=0.018696 in) — Eq. 1.1-1
Element 4: Stiffened, w=1.403 in
f_1=45.161 ksi, f_2=-16.007 ksi
ψ=0.35446 — Eq. 1.1.2-1
k=11.679 — Eq. 1.1.2-2
λ=0.48833 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=1.403 in — Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25
b_1=0.41825 in — Eq. 1.1.2-3
b_2=0.7015 in — Eq. 1.1.2-4
Compression width=1.0358 in
b_1+b_2 > compression width (fully effective)

Center of gravity shift: x=-0.0049978 in
Sye=0.091596 in^3, Fy=50 ksi
Mnl=4.5798 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.403 in
f_1=38.591 ksi, f_2=-43.505 ksi
ψ=1.1273 Eq. 1.1.2-1
k=27.51 Eq. 1.1.2-2
λ=0.29412 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.403 in Eq. 1.1-1
h_o=1.625 in, b_o=6 in, h_o/b_o=0.27083
b_1=0.33993 in Eq. 1.1.2-3
b_2=0.7015 in Eq. 1.1.2-4
Compression width=0.65951 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=44.073 ksi, f_2=44.073 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=3.833 Eq. 1.1-3
ρ=0.24592 Eq. 1.1-2
b=0.52602 in (ineffective width=1.613 in) Eq. 1.1-1
f_1=44.073 ksi, f_2=44.073 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=3.833 Eq. 1.1-3
ρ=0.24592 Eq. 1.1-2
b=0.52602 in (ineffective width=1.613 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=1.403 in
f_1=38.591 ksi, f_2=-43.505 ksi
ψ=1.1273 Eq. 1.1.2-1
k=27.51 Eq. 1.1.2-2
λ=0.29412 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.403 in Eq. 1.1-1
h_o=1.625 in, b_o=6 in, h_o/b_o=0.27083
b_1=0.33993 in Eq. 1.1.2-3
b_2=0.7015 in Eq. 1.1.2-4
Compression width=0.65951 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.28764 in
Sye=0.079018 in^3, Fy=50 ksi
Mnl=3.9509 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=0.82231 in^6, Wn=3.8132 in^2, Fy=50 ksi
Bn=10.782 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

600S162-43

Full Section Properties

Area	0.44688 in²	Wt.	0.0015194 k/ft	Flat	9.9086 in
Ix	2.3160 in⁴	rx	2.2765 in	Ixy	0.0000 in⁴
Sx(t)	0.77200 in³	y(t)	3.0000 in	α	0.000 deg
Sx(b)	0.77200 in³	y(b)	3.0000 in		
Zx	0.92038 in³	Height	6.0000 in		
Iy	0.1485 in⁴	ry	0.5765 in	x_o	-1.0575 in
Sy(l)	0.35879 in³	x(l)	0.4139 in	y_o	0.0000 in
Sy(r)	0.12261 in³	x(r)	1.2111 in	jx	3.2351 in
Zy	0.17642 in³	Width	1.6250 in	jy	0.0000 in
I_1	2.3160 in⁴	r_1	2.2765 in	Cw	1.0506 in⁶
I_2	0.1485 in⁴	r_2	0.5765 in	J	0.0003030 in⁴
Ic	2.4645 in⁴	rc	2.3484 in		
I_o	2.9643 in⁴	r_o	2.5755 in		

Net Section Properties

Ix	2.3033 in⁴	rx	2.4645 in	Area	0.37923 in²
Sx(t)	0.76778 in³	y(t)	3.0000 in	Ixy	0.0000 in⁴
Sx(b)	0.76778 in³	y(b)	3.0000 in	α	0.000 deg
Zx	0.89501 in³				
Iy	0.1363 in⁴	ry	0.5995 in	x_o	-1.1310 in
Sy(l)	0.28174 in³	x(l)	0.4837 in	y_o	0.0000 in
Sy(r)	0.11940 in³	x(r)	1.1413 in	jx	2.8418 in
Zy	0.17519 in³			jy	0.0000 in
Ic	2.4396 in⁴	rc	2.5363 in	Cw	1.0450 in⁶
I_o	2.9247 in⁴	r_o	2.7771 in	J	0.0002571 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	9.006 k	ϕMnxo	31.430 k-in	ϕMnyo	6.109 k-in
Ae	0.21191 in²	Ixe	2.1785 in⁴	Iye	0.1363 in⁴
ϕTn	18.487 k	Sxe(t)	0.69845 in³	Sye(l)	0.28174 in³
		Sxe(b)	0.75620 in³	Sye(r)	0.11940 in³
Shear					
ϕVny	1.517 k	Negative Bending		Negative Bending	
ϕVnx	3.391 k	ϕMnxo	31.430 k-in	ϕMnyo	4.728 k-in
		Ixe	2.1785 in⁴	Iye	0.0953 in⁴
Torsion		Sxe(t)	0.75620 in³	Sye(l)	0.13274 in³
ϕBn	12.453 k-in²	Sxe(b)	0.69845 in³	Sye(r)	0.10506 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=51.468 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=54.31 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=56.847 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.44688 in², Fy=51.468 ksi

Tn=23 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.37923 in², Fu=65 ksi	
Tn=24.65 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=1.8839 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=5.0382 k	Eq. G3-2
kv=4.0765	Eq. G3-8
Vcrh=1.0842 k	Eq. G3-6
Vn=1.6852 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=1.8839 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3837 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56184	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00048546 in⁴	Eq. 1.3-8
Is=0.00021231 in⁴	
ds=0.16781 in (lip ineffective width=0.21589 in)	Eq. 1.3-6
k=2.725	Table 1.3-1
Element 2: Partially stiffened, w=1.3924 in	
f=50 ksi, k=2.725	
λ=0.80992	Eq. 1.1-3
ρ=0.89931	Eq. 1.1-2
b=1.2522 in (ineffective width=0.1402 in)	Eq. 1.1-1
b_1=0.27382 in, b_2=0.97838 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=3.1243	Eq. 1.1-3
ρ=0.29753	Eq. 1.1-2
b=0.63484 in (ineffective width=1.4989 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=3.1243	Eq. 1.1-3
ρ=0.29753	Eq. 1.1-2
b=0.63484 in (ineffective width=1.4989 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.3837 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56184	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00048546 in^4	Eq. 1.3-8
Is=0.00021231 in^4	
ds=0.16781 in (lip ineffective width=0.21589 in)	Eq. 1.3-6
k=2.725	Table 1.3-1
Element 4: Partially stiffened, w=1.3924 in	
f=50 ksi, k=2.725	
λ=0.80992	Eq. 1.1-3
ρ=0.89931	Eq. 1.1-2
b=1.2522 in (ineffective width=0.1402 in)	Eq. 1.1-1
b_1=0.27382 in, b_2=0.97838 in	
Ae=0.21191 in^2, Fn=50 ksi	
Pn=10.596 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=5.7674 in	
f_1=48.136 ksi, f_2=-44.321 ksi	
ψ=0.92074	Eq. 1.1.2-1
k=22.014	Eq. 1.1.2-2
λ=1.1581	Eq. 1.1-3
ρ=0.69946	Eq. 1.1-2
be=4.034 in	Eq. 1.1-1
h_o=6 in, b_o=1.625 in, h_o/b_o=3.6923	
b_1=1.0289 in	Eq. 1.1.2-3
b_2=2.017 in	Eq. 1.1.2-4
Compression width=3.0027 in	
b_1+b_2 > compression width (fully effective)	
Element 5: Unstiffened, w=0.3837 in	
f_1=48.136 ksi, f_2=41.985 ksi	
ψ=0.87221	Eq. 1.2.2-1
k=0.47681	Eq. 1.2.2-2
λ=0.52351	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.204	Eq. 1.3-7

Ia=0.00047763 in^4	Eq. 1.3-8
Is=0.00021231 in^4	
ds=0.17056 in (lip ineffective width=0.21314 in)	Eq. 1.3-6
k=2.7358	Table 1.3-1
Element 4: Partially stiffened, w=1.3924 in	
f=49.639 ksi, k=2.7358	
λ=0.80539	Eq. 1.1-3
ρ=0.90247	Eq. 1.1-2
b=1.2566 in (ineffective width=0.1358 in)	Eq. 1.1-1
b_1=0.27929 in, b_2=0.97732 in	
Center of gravity shift: y=-0.1191 in	
Sxe=0.69845 in^3, Fy=50 ksi	
Mnl=34.922 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3837 in	
f_1=48.136 ksi, f_2=41.985 ksi	
ψ=0.87221	Eq. 1.2.2-1
k=0.47681	Eq. 1.2.2-2
λ=0.52351	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.204	Eq. 1.3-7
Ia=0.00047763 in^4	Eq. 1.3-8
Is=0.00021231 in^4	
ds=0.17056 in (lip ineffective width=0.21314 in)	Eq. 1.3-6
k=2.7358	Table 1.3-1
Element 2: Partially stiffened, w=1.3924 in	
f=49.639 ksi, k=2.7358	
λ=0.80539	Eq. 1.1-3
ρ=0.90247	Eq. 1.1-2
b=1.2566 in (ineffective width=0.1358 in)	Eq. 1.1-1
b_1=0.27929 in, b_2=0.97732 in	
Element 3: Stiffened, w=5.7674 in	
f_1=48.136 ksi, f_2=-44.321 ksi	
ψ=0.92074	Eq. 1.1.2-1
k=22.014	Eq. 1.1.2-2
λ=1.1581	Eq. 1.1-3
ρ=0.69946	Eq. 1.1-2
be=4.034 in	Eq. 1.1-1
h_o=6 in, b_o=1.625 in, h_o/b_o=3.6923	
b_1=1.0289 in	Eq. 1.1.2-3
b_2=2.017 in	Eq. 1.1.2-4
Compression width=3.0027 in	
b_1+b_2 > compression width (fully effective)	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.1191 in	

Sxe=0.69845 in³, Fy=50 ksi
Mnl=34.922 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3837 in
f_1=55.724 ksi, f_2=55.724 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.59313 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 2: Stiffened, w=1.3924 in
f_1=51.054 ksi, f_2=-18.299 ksi
ψ=0.35843 Eq. 1.1.2-1
k=11.73 Eq. 1.1.2-2
λ=0.39446 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.3924 in Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25
b_1=0.4146 in Eq. 1.1.2-3
b_2=0.6962 in Eq. 1.1.2-4
Compression width=1.025 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.3837 in
f_1=55.724 ksi, f_2=55.724 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.59313 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 4: Stiffened, w=1.3924 in
f_1=51.054 ksi, f_2=-18.299 ksi
ψ=0.35843 Eq. 1.1.2-1
k=11.73 Eq. 1.1.2-2
λ=0.39446 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.3924 in Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25
b_1=0.4146 in Eq. 1.1.2-3
b_2=0.6962 in Eq. 1.1.2-4
Compression width=1.025 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0 in
Sye=0.1194 in³, Fy=56.847 ksi
Mnl=6.7877 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud

Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.3924 in

f_1=33.124 ksi, f_2=-43.592 ksi	
ψ=1.316	Eq. 1.1.2-1
k=33.479	Eq. 1.1.2-2
λ=0.18807	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.3924 in	Eq. 1.1-1
h_o=1.625 in, b_o=6 in, h_o/b_o=0.27083	
b_1=0.32261 in	Eq. 1.1.2-3
b_2=0.6962 in	Eq. 1.1.2-4
Compression width=0.6012 in	
b_1+b_2 > compression width (fully effective)	

Element 3: Treat as two unstiffened elements

f_1=38.289 ksi, f_2=38.289 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.7341	Eq. 1.1-3
ρ=0.33632	Eq. 1.1-2
b=0.71761 in (ineffective width=1.4161 in)	Eq. 1.1-1
f_1=38.289 ksi, f_2=38.289 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.7341	Eq. 1.1-3
ρ=0.33632	Eq. 1.1-2
b=0.71761 in (ineffective width=1.4161 in)	Eq. 1.1-1

Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=1.3924 in

f_1=33.124 ksi, f_2=-43.592 ksi	
ψ=1.316	Eq. 1.1.2-1
k=33.479	Eq. 1.1.2-2
λ=0.18807	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.3924 in	Eq. 1.1-1
h_o=1.625 in, b_o=6 in, h_o/b_o=0.27083	
b_1=0.32261 in	Eq. 1.1.2-3
b_2=0.6962 in	Eq. 1.1.2-4
Compression width=0.6012 in	
b_1+b_2 > compression width (fully effective)	

Center of gravity shift: x=0.2342 in
Sye=0.10506 in^3, Fy=50 ksi

Mnl=5.2528 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud
Cw=1.045 in^6, Wn=3.7762 in^2, Fy=50 ksi

Bn=13.836 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.55634 in²	Wt.	0.0018915 k/ft	Flat	9.8293 in
Ix	2.8608 in⁴	rx	2.2677 in	Ixy	0.0000 in⁴
Sx(t)	0.9536 in³	y(t)	3.0000 in	α	0.000 deg
Sx(b)	0.9536 in³	y(b)	3.0000 in		
Zx	1.1407 in³	Height	6.0000 in		
Iy	0.1807 in⁴	ry	0.5699 in	x_o	-1.0434 in
Sy(l)	0.4369 in³	x(l)	0.4136 in	y_o	0.0000 in
Sy(r)	0.1492 in³	x(r)	1.2114 in	jx	3.2398 in
Zy	0.2168 in³	Width	1.6250 in	jy	0.0000 in
I_1	2.8608 in⁴	r_1	2.2677 in	Cw	1.2698 in⁶
I_2	0.1807 in⁴	r_2	0.5699 in	J	0.0005941 in⁴
Ic	3.0415 in⁴	rc	2.3382 in		
I_o	3.6472 in⁴	r_o	2.5604 in		

Net Section Properties

Ix	2.8449 in⁴	rx	2.4565 in	Area	0.47144 in²
Sx(t)	0.9483 in³	y(t)	3.0000 in	Ixy	0.0000 in⁴
Sx(b)	0.9483 in³	y(b)	3.0000 in	α	0.000 deg
Zx	1.1089 in³				
Iy	0.1658 in⁴	ry	0.5930 in	x_o	-1.1164 in
Sy(l)	0.3433 in³	x(l)	0.4830 in	y_o	0.0000 in
Sy(r)	0.1452 in³	x(r)	1.1420 in	jx	2.8436 in
Zy	0.2149 in³			jy	0.0000 in
Ic	3.0107 in⁴	rc	2.5271 in	Cw	1.2628 in⁶
I_o	3.5983 in⁴	r_o	2.7627 in	J	0.0005034 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	13.037 k	ϕMnxo	41.469 k-in	ϕMnyo	7.633 k-in
Ae	0.30675 in²	Ixe	2.7994 in⁴	Iye	0.1658 in⁴
ϕTn	22.983 k	Sxe(t)	0.92153 in³	Sye(l)	0.34328 in³
		Sxe(b)	0.94500 in³	Sye(r)	0.14518 in³
Shear					
ϕVny	2.454 k	Negative Bending		Negative Bending	
ϕVnx	4.102 k	ϕMnxo	41.469 k-in	ϕMnyo	5.962 k-in
		Ixe	2.7994 in⁴	Iye	0.1279 in⁴
Torsion		Sxe(t)	0.94500 in³	Sye(l)	0.19387 in³
ϕBn	15.214 k-in²	Sxe(b)	0.92153 in³	Sye(r)	0.13248 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=51.837 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=55.318 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=58.416 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.55634 in², Fy=51.837 ksi

Tn=28.839 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.47144 in², Fu=65 ksi	
Tn=30.643 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=2.2787 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=6.2242 k	Eq. G3-2
kv=4.0696	Eq. G3-8
Vcrh=2.1483 k	Eq. G3-6
Vn=2.7271 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=2.2787 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3585 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41829	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00033614 in⁴	Eq. 1.3-8
Is=0.00021732 in⁴	
ds=0.23177 in (lip ineffective width=0.12673 in)	Eq. 1.3-6
k=2.9231	Table 1.3-1
Element 2: Partially stiffened, w=1.342 in	
f=50 ksi, k=2.9231	
λ=0.60055	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.4601	Eq. 1.1-3
ρ=0.37013	Eq. 1.1-2
b=0.78042 in (ineffective width=1.3281 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.4601	Eq. 1.1-3

ρ=0.37013	Eq. 1.1-2
b=0.78042 in (ineffective width=1.3281 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.3585 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41829	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00033614 in^4	Eq. 1.3-8
Is=0.00021732 in^4	
ds=0.23177 in (lip ineffective width=0.12673 in)	Eq. 1.3-6
k=2.9231	Table 1.3-1
Element 4: Partially stiffened, w=1.342 in	
f=50 ksi, k=2.9231	
λ=0.60055	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Ae=0.30675 in^2, Fn=50 ksi	
Pn=15.338 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=5.717 in	
f_1=47.671 ksi, f_2=-46.43 ksi	
ψ=0.97397	Eq. 1.1.2-1
k=23.331	Eq. 1.1.2-2
λ=0.88422	Eq. 1.1-3
ρ=0.84955	Eq. 1.1-2
be=4.8569 in	Eq. 1.1-1
h_o=6 in, b_o=1.625 in, h_o/b_o=3.6923	
b_1=1.2222 in	Eq. 1.1.2-3
b_2=2.4285 in	Eq. 1.1.2-4
Compression width=2.8962 in	
b_1+b_2 > compression width (fully effective)	
Element 5: Unstiffened, w=0.3585 in	
f_1=47.671 ksi, f_2=41.77 ksi	
ψ=0.87622	Eq. 1.2.2-1
k=0.47524	Eq. 1.2.2-2
λ=0.3885	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.237	Eq. 1.3-7
Ia=0.00032795 in^4	Eq. 1.3-8
Is=0.00021732 in^4	
ds=0.23757 in (lip ineffective width=0.12093 in)	Eq. 1.3-6
k=2.9464	Table 1.3-1

Element 4: Partially stiffened, w=1.342 in
f=49.534 ksi, k=2.9464
λ=0.59538 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Center of gravity shift: y=-0.037724 in
Sxe=0.92153 in^3, Fy=50 ksi
Mnl=46.077 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3585 in
f_1=47.671 ksi, f_2=41.77 ksi
ψ=0.87622 Eq. 1.2.2-1
k=0.47524 Eq. 1.2.2-2
λ=0.3885 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.237 Eq. 1.3-7
Ia=0.00032795 in^4 Eq. 1.3-8
Is=0.00021732 in^4
ds=0.23757 in (lip ineffective width=0.12093 in) Eq. 1.3-6
k=2.9464 Table 1.3-1
Element 2: Partially stiffened, w=1.342 in
f=49.534 ksi, k=2.9464
λ=0.59538 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 3: Stiffened, w=5.717 in
f_1=47.671 ksi, f_2=-46.43 ksi
ψ=0.97397 Eq. 1.1.2-1
k=23.331 Eq. 1.1.2-2
λ=0.88422 Eq. 1.1-3
ρ=0.84955 Eq. 1.1-2
be=4.8569 in Eq. 1.1-1
h_o=6 in, b_o=1.625 in, h_o/b_o=3.6923
b_1=1.2222 in Eq. 1.1.2-3
b_2=2.4285 in Eq. 1.1.2-4
Compression width=2.8962 in
b_1+b_2 > compression width (fully effective)
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0.037724 in
Sxe=0.92153 in^3, Fy=50 ksi
Mnl=46.077 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3585 in
f_1=56.969 ksi, f_2=56.969 ksi

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.44648	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=1.342 in	
f_1=51.178 ksi, f_2=-17.467 ksi	
ψ=0.3413	Eq. 1.1.2-1
k=11.509	Eq. 1.1.2-2
λ=0.30621	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.342 in	Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25	
b_1=0.40164 in	Eq. 1.1.2-3
b_2=0.671 in	Eq. 1.1.2-4
Compression width=1.0005 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.3585 in	
f_1=56.969 ksi, f_2=56.969 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.44648	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Stiffened, w=1.342 in	
f_1=51.178 ksi, f_2=-17.467 ksi	
ψ=0.3413	Eq. 1.1.2-1
k=11.509	Eq. 1.1.2-2
λ=0.30621	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.342 in	Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25	
b_1=0.40164 in	Eq. 1.1.2-3
b_2=0.671 in	Eq. 1.1.2-4
Compression width=1.0005 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0 in	
Sye=0.14518 in^3, Fy=58.416 ksi	
Mnl=8.4807 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: Stiffened, w=1.342 in	
f_1=26.806 ksi, f_2=-42.674 ksi	
ψ=1.592	Eq. 1.1.2-1
k=44.011	Eq. 1.1.2-2
λ=0.11332	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.342 in	Eq. 1.1-1

h_o=1.625 in, b_o=6 in, h_o/b_o=0.27083
b_1=0.29225 in — Eq. 1.1.2-3
b_2=0.671 in — Eq. 1.1.2-4
Compression width=0.51775 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=32.666 ksi, f_2=32.666 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=1.9885 — Eq. 1.1-3
ρ=0.44725 — Eq. 1.1-2
b=0.94304 in (ineffective width=1.1655 in) — Eq. 1.1-1
f_1=32.666 ksi, f_2=32.666 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=1.9885 — Eq. 1.1-3
ρ=0.44725 — Eq. 1.1-2
b=0.94304 in (ineffective width=1.1655 in) — Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=1.342 in
f_1=26.806 ksi, f_2=-42.674 ksi
ψ=1.592 — Eq. 1.1.2-1
k=44.011 — Eq. 1.1.2-2
λ=0.11332 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=1.342 in — Eq. 1.1-1
h_o=1.625 in, b_o=6 in, h_o/b_o=0.27083
b_1=0.29225 in — Eq. 1.1.2-3
b_2=0.671 in — Eq. 1.1.2-4
Compression width=0.51775 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.17668 in
Sye=0.13248 in^3, Fy=50 ksi
Mnl=6.624 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=1.2628 in^6, Wn=3.7352 in^2, Fy=50 ksi
Bn=16.905 k-in^2 — G8.1-1
Ωb=1.67, ϕb=0.9

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Full Section Properties

Area	0.69304 in²	Wt.	0.0023563 k/ft	Flat	9.7201 in
Ix	3.5256 in⁴	rx	2.2555 in	Ixy	0.0000 in⁴
Sx(t)	1.1752 in³	y(t)	3.0000 in	α	0.000 deg
Sx(b)	1.1752 in³	y(b)	3.0000 in		
Zx	1.4122 in³	Height	6.0000 in		
Iy	0.2182 in⁴	ry	0.5611 in	x_o	-1.0245 in
Sy(l)	0.5285 in³	x(l)	0.4129 in	y_o	0.0000 in
Sy(r)	0.1800 in³	x(r)	1.2121 in	jx	3.2478 in
Zy	0.2653 in³	Width	1.6250 in	jy	0.0000 in
I_1	3.5256 in⁴	r_1	2.2555 in	Cw	1.5189 in⁶
I_2	0.2182 in⁴	r_2	0.5611 in	J	0.0011744 in⁴
Ic	3.7438 in⁴	rc	2.3242 in		
I_o	4.4713 in⁴	r_o	2.5400 in		

Net Section Properties

Ix	3.5056 in⁴	rx	2.4457 in	Area	0.58609 in²
Sx(t)	1.1685 in³	y(t)	3.0000 in	Ixy	0.0000 in⁴
Sx(b)	1.1685 in³	y(b)	3.0000 in	α	0.000 deg
Zx	1.3721 in³				
Iy	0.2002 in⁴	ry	0.5844 in	x_o	-1.0971 in
Sy(l)	0.4155 in³	x(l)	0.4817 in	y_o	0.0000 in
Sy(r)	0.1751 in³	x(r)	1.1433 in	jx	2.8475 in
Zy	0.2623 in³			jy	0.0000 in
Ic	3.7057 in⁴	rc	2.5145 in	Cw	1.5104 in⁶
I_o	4.4111 in⁴	r_o	2.7434 in	J	0.0009932 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	18.146 k	ϕMnxo	57.673 k-in	ϕMnyo	9.520 k-in
Ae	0.42696 in²	Ixe	3.5056 in⁴	Iye	0.2002 in⁴
ϕTn	28.572 k	Sxe(t)	1.1685 in³	Sye(l)	0.4155 in³
		Sxe(b)	1.1685 in³	Sye(r)	0.1751 in³
Shear					
ϕVny	3.928 k	Negative Bending		Negative Bending	
ϕVnx	4.884 k	ϕMnxo	57.673 k-in	ϕMnyo	7.448 k-in
		Ixe	3.5056 in⁴	Iye	0.1705 in⁴
Torsion		Sxe(t)	1.1685 in³	Sye(l)	0.2864 in³
ϕBn	18.458 k-in²	Sxe(b)	1.1685 in³	Sye(r)	0.1655 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Fya=52.34 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Fya=56.625 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=54.839 ksi	
Max net section stress allowed for positive bending: Fya=54.839 ksi	
Max compression stress allowed for negative bending: Fya=54.839 ksi	
Max net section stress allowed for negative bending: Fya=54.839 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Fya=60.418 ksi	Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi	

Axial Tension Strength
Ag=0.69304 in², Fy=52.34 ksi
Tn=36.274 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.58609 in², Fu=65 ksi
Tn=38.096 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Stud element 2
Vn=2.7135 k at 180 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9
Stud element 3
Vyh=7.6601 k — Eq. G3-2
kv=4.0593 — Eq. G3-8
Vcrh=4.3094 k — Eq. G3-6
Vn=4.3639 k at 90 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Stud element 4
Vn=2.7135 k at 0 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3218 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.29806 — Eq. 1.1-3
λ<0.673 (fully effective) — Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.091 — Eq. 1.3-7
Ia=0.00015029 in⁴ — Eq. 1.3-8
Is=0.000198 in⁴ > Ia (no lip reduction)
k=3.2793 — Table 1.3-1
Element 2: Partially stiffened, w=1.2686 in
f=50 ksi, k=3.2793
λ=0.42548 — Eq. 1.1-3
λ<0.673 (fully effective) — Eq. 1.1-1
Element 3: Treat as two unstiffened elements
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=1.9189 — Eq. 1.1-3
ρ=0.46138 — Eq. 1.1-2
b=0.95588 in (ineffective width=1.1159 in) — Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3

λ=1.9189	Eq. 1.1-3
ρ=0.46138	Eq. 1.1-2
b=0.95588 in (ineffective width=1.1159 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.3218 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.29806	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00015029 in^4	Eq. 1.3-8
Is=0.000198 in^4 > Ia (no lip reduction)	
k=3.2793	Table 1.3-1
Element 4: Partially stiffened, w=1.2686 in	
f=50 ksi, k=3.2793	
λ=0.42548	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Ae=0.42696 in^2, Fn=50 ksi	
Pn=21.348 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=5.6436 in	
f_1=51.582 ksi, f_2=-51.582 ksi	
ψ=1	Eq. 1.1.2-1
k=24	Eq. 1.1.2-2
λ=0.71066	Eq. 1.1-3
ρ=0.97153	Eq. 1.1-2
be=5.483 in	Eq. 1.1-1
h_o=6 in, b_o=1.625 in, h_o/b_o=3.6923	
b_1=1.3707 in	Eq. 1.1.2-3
b_2=2.7415 in	Eq. 1.1.2-4
Compression width=2.8218 in	
b_1+b_2 > compression width (fully effective)	
Element 5: Unstiffened, w=0.3218 in	
f_1=51.582 ksi, f_2=45.699 ksi	
ψ=0.88596	Eq. 1.2.2-1
k=0.47147	Eq. 1.2.2-2
λ=0.28911	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=29.866	Eq. 1.3-7
Ia=0.00019793 in^4	Eq. 1.3-8
Is=0.000198 in^4 > Ia (no lip reduction)	
k=3.2793	Table 1.3-1
Element 4: Partially stiffened, w=1.2686 in	

f=54.187 ksi, k=3.2793
λ=0.44294 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Center of gravity shift: y=0 in
Sxe=1.1685 in^3, Fy=54.839 ksi
Mnl=64.081 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3218 in
f_1=51.582 ksi, f_2=45.699 ksi
ψ=0.88596 Eq. 1.2.2-1
k=0.47147 Eq. 1.2.2-2
λ=0.28911 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=29.866 Eq. 1.3-7
Ia=0.00019793 in^4 Eq. 1.3-8
Is=0.000198 in^4 > Ia (no lip reduction)
k=3.2793 Table 1.3-1
Element 2: Partially stiffened, w=1.2686 in
f=54.187 ksi, k=3.2793
λ=0.44294 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 3: Stiffened, w=5.6436 in
f_1=51.582 ksi, f_2=-51.582 ksi
ψ=1 Eq. 1.1.2-1
k=24 Eq. 1.1.2-2
λ=0.71066 Eq. 1.1-3
ρ=0.97153 Eq. 1.1-2
be=5.483 in Eq. 1.1-1
h_o=6 in, b_o=1.625 in, h_o/b_o=3.6923
b_1=1.3707 in Eq. 1.1.2-3
b_2=2.7415 in Eq. 1.1.2-4
Compression width=2.8218 in
b_1+b_2 > compression width (fully effective)
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0 in
Sxe=1.1685 in^3, Fy=54.839 ksi
Mnl=64.081 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3218 in
f_1=58.534 ksi, f_2=58.534 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3

λ=0.32249	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=1.2686 in	
f_1=51.001 ksi, f_2=-16.04 ksi	
ψ=0.31451	Eq. 1.1.2-1
k=11.172	Eq. 1.1.2-2
λ=0.23282	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.2686 in	Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25	
b_1=0.38274 in	Eq. 1.1.2-3
b_2=0.6343 in	Eq. 1.1.2-4
Compression width=0.96507 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.3218 in	
f_1=58.534 ksi, f_2=58.534 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.32249	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Stiffened, w=1.2686 in	
f_1=51.001 ksi, f_2=-16.04 ksi	
ψ=0.31451	Eq. 1.1.2-1
k=11.172	Eq. 1.1.2-2
λ=0.23282	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.2686 in	Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25	
b_1=0.38274 in	Eq. 1.1.2-3
b_2=0.6343 in	Eq. 1.1.2-4
Compression width=0.96507 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0 in	
Sye=0.17508 in^3, Fy=60.418 ksi	
Mnl=10.578 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: Stiffened, w=1.2686 in	
f_1=20.158 ksi, f_2=-41.359 ksi	
ψ=2.0518	Eq. 1.1.2-1
k=66.947	Eq. 1.1.2-2
λ=0.059792	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.2686 in	Eq. 1.1-1
h_o=1.625 in, b_o=6 in, h_o/b_o=0.27083	
b_1=0.25112 in	Eq. 1.1.2-3

b_2=0.6343 in	Eq. 1.1.2-4
Compression width=0.4157 in	
b_1+b_2 > compression width (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=27.07 ksi, f_2=27.07 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.412	Eq. 1.1-3
ρ=0.59789	Eq. 1.1-2
b=1.2387 in (ineffective width=0.8331 in)	Eq. 1.1-1
f_1=27.07 ksi, f_2=27.07 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.412	Eq. 1.1-3
ρ=0.59789	Eq. 1.1-2
b=1.2387 in (ineffective width=0.8331 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: Stiffened, w=1.2686 in	
f_1=20.158 ksi, f_2=-41.359 ksi	
ψ=2.0518	Eq. 1.1.2-1
k=66.947	Eq. 1.1.2-2
λ=0.059792	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.2686 in	Eq. 1.1-1
h_o=1.625 in, b_o=6 in, h_o/b_o=0.27083	
b_1=0.25112 in	Eq. 1.1.2-3
b_2=0.6343 in	Eq. 1.1.2-4
Compression width=0.4157 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0.11341 in	
Sye=0.16552 in^3, Fy=50 ksi	
Mnl=8.2758 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud

Cw=1.5104 in^6, Wn=3.6823 in^2, Fy=50 ksi	
Bn=20.509 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

600S200-30

Full Section Properties

Area	0.34209 in²	Wt.	0.0011631 k/ft	Flat	10.964 in
Ix	1.8762 in⁴	rx	2.3419 in	Ixy	0.0000 in⁴
Sx(t)	0.62541 in³	y(t)	3.0000 in	α	0.000 deg
Sx(b)	0.62541 in³	y(b)	3.0000 in		
Zx	0.73138 in³	Height	6.0000 in		
Iy	0.1898 in⁴	ry	0.7449 in	x_o	-1.4580 in
Sy(l)	0.33093 in³	x(l)	0.5735 in	y_o	0.0000 in
Sy(r)	0.13306 in³	x(r)	1.4265 in	jx	3.1803 in
Zy	0.19120 in³	Width	2.0000 in	jy	0.0000 in
I_1	1.8762 in⁴	r_1	2.3419 in	Cw	1.3998 in⁶
I_2	0.1898 in⁴	r_2	0.7449 in	J	0.0001110 in⁴
Ic	2.0660 in⁴	rc	2.4575 in		
I_o	2.7932 in⁴	r_o	2.8575 in		

Net Section Properties

Ix	1.8675 in⁴	rx	2.5148 in	Area	0.29529 in²
Sx(t)	0.62249 in³	y(t)	3.0000 in	Ixy	0.0000 in⁴
Sx(b)	0.62249 in³	y(b)	3.0000 in	α	0.000 deg
Zx	0.71383 in³				
Iy	0.1729 in⁴	ry	0.7652 in	x_o	-1.5506 in
Sy(l)	0.26122 in³	x(l)	0.6620 in	y_o	0.0000 in
Sy(r)	0.12923 in³	x(r)	1.3380 in	jx	2.8680 in
Zy	0.18895 in³			jy	0.0000 in
Ic	2.0404 in⁴	rc	2.6287 in	Cw	1.3926 in⁶
I_o	2.7504 in⁴	r_o	3.0519 in	J	0.0000958 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	5.951 k	ϕMnxo	18.546 k-in	ϕMnyo	5.147 k-in
Ae	0.14003 in²	Ixe	1.4813 in⁴	Iye	0.1575 in⁴
ϕTn	14.395 k	Sxe(t)	0.41213 in³	Sye(l)	0.25304 in³
		Sxe(b)	0.61571 in³	Sye(r)	0.11437 in³
Shear					
ϕVny	0.680 k	Negative Bending		Negative Bending	
ϕVnx	2.609 k	ϕMnxo	18.546 k-in	ϕMnyo	4.609 k-in
		Ixe	1.4813 in⁴	Iye	0.1045 in⁴
Torsion		Sxe(t)	0.61571 in³	Sye(l)	0.10243 in³
ϕBn	12.737 k-in²	Sxe(b)	0.41213 in³	Sye(r)	0.10668 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Fya=51.004 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Fya=52.65 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Fya=54.15 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength

Ag=0.34209 in², Fy=51.004 ksi	
Tn=17.448 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.29529 in², Fu=65 ksi	
Tn=19.194 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=1.4492 k at 180 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=3.5005 k	Eq. G3-2
kv=4.1154	Eq. G3-8
Vcrh=0.36197 k	Eq. G3-6
Vn=0.7551 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=1.4492 k at 0 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5157 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.0916	Eq. 1.1-3
ρ=0.73148	Eq. 1.1-2
b=0.37723 in (ineffective width=0.13847 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00020486 in⁴	Eq. 1.3-8
Is=0.00035659 in⁴ > Ia (no lip reduction)	
k=3.4958	Table 1.3-1
Element 2: Partially stiffened, w=1.7814 in	
f=50 ksi, k=3.4958	
λ=1.3224	Eq. 1.1-3
ρ=0.63039	Eq. 1.1-2
b=1.123 in (ineffective width=0.65843 in)	Eq. 1.1-1
b_1=0.56148 in, b_2=0.56148 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.5311	Eq. 1.1-3
ρ=0.20998	Eq. 1.1-2
b=0.44951 in (ineffective width=1.6912 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.5311	Eq. 1.1-3
ρ=0.20998	Eq. 1.1-2
b=0.44951 in (ineffective width=1.6912 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.5157 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.0916	Eq. 1.1-3
ρ=0.73148	Eq. 1.1-2
b=0.37723 in (ineffective width=0.13847 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00020486 in^4	Eq. 1.3-8
Is=0.00035659 in^4 > Ia (no lip reduction)	
k=3.4958	Table 1.3-1
Element 4: Partially stiffened, w=1.7814 in	
f=50 ksi, k=3.4958	
λ=1.3224	Eq. 1.1-3
ρ=0.63039	Eq. 1.1-2
b=1.123 in (ineffective width=0.65843 in)	Eq. 1.1-1
b_1=0.56148 in, b_2=0.56148 in	
Ae=0.14003 in^2, Fn=50 ksi	
Pn=7.0015 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=5.7814 in	
f_1=48.479 ksi, f_2=-31.954 ksi	
ψ=0.65913	Eq. 1.1.2-1
k=16.452	Eq. 1.1.2-2
λ=1.948	Eq. 1.1-3
ρ=0.45537	Eq. 1.1-2
be=2.6327 in	Eq. 1.1-1
h_o=6 in, b_o=2 in, h_o/b_o=3	
b_1=0.71948 in	Eq. 1.1.2-3
b_2=1.3163 in	Eq. 1.1.2-4
Compression width=3.4846 in	
Ineffective width=1.4488 in	
Element 5: Unstiffened, w=0.5157 in	
f_1=48.479 ksi, f_2=41.305 ksi	
ψ=0.85201	Eq. 1.2.2-1
k=0.4849	Eq. 1.2.2-2
λ=1.0122	Eq. 1.1-3
ρ=0.77324	Eq. 1.1-2
b=0.39876 in (ineffective width=0.11694 in)	Eq. 1.1-1

Element 4: Check for lip stiffener reduction

S=31.159	Eq. 1.3-7
Ia=0.00020442 in^4	Eq. 1.3-8
Is=0.00035659 in^4 > Ia (no lip reduction)	
k=3.4958	Table 1.3-1

Element 4: Partially stiffened, w=1.7814 in

f=49.783 ksi, k=3.4958	
λ=1.3196	Eq. 1.1-3
ρ=0.63148	Eq. 1.1-2
b=1.1249 in (ineffective width=0.65647 in)	Eq. 1.1-1
b_1=0.56246 in, b_2=0.56246 in	

Center of gravity shift: y=-0.59419 in

Sxe=0.41213 in^3, Fy=50 ksi

Mnl=20.607 k-in	Eq. F3.1-1

Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis

Effective width calculations for Stud

Element 1: Unstiffened, w=0.5157 in

f_1=48.479 ksi, f_2=41.305 ksi	
ψ=0.85201	Eq. 1.2.2-1
k=0.4849	Eq. 1.2.2-2
λ=1.0122	Eq. 1.1-3
ρ=0.77324	Eq. 1.1-2
b=0.39876 in (ineffective width=0.11694 in)	Eq. 1.1-1

Element 2: Check for lip stiffener reduction

S=31.159	Eq. 1.3-7
Ia=0.00020442 in^4	Eq. 1.3-8
Is=0.00035659 in^4 > Ia (no lip reduction)	
k=3.4958	Table 1.3-1

Element 2: Partially stiffened, w=1.7814 in

f=49.783 ksi, k=3.4958	
λ=1.3196	Eq. 1.1-3
ρ=0.63148	Eq. 1.1-2
b=1.1249 in (ineffective width=0.65647 in)	Eq. 1.1-1
b_1=0.56246 in, b_2=0.56246 in	

Element 3: Stiffened, w=5.7814 in

f_1=48.479 ksi, f_2=-31.954 ksi	
ψ=0.65912	Eq. 1.1.2-1
k=16.452	Eq. 1.1.2-2
λ=1.948	Eq. 1.1-3
ρ=0.45537	Eq. 1.1-2
be=2.6327 in	Eq. 1.1-1
h_o=6 in, b_o=2 in, h_o/b_o=3	
b_1=0.71948 in	Eq. 1.1.2-3
b_2=1.3163 in	Eq. 1.1.2-4
Compression width=3.4846 in	
Ineffective width=1.4488 in	

Element 5: No compressive stress (fully effective)

Element 4: No compressive stress (fully effective)

Center of gravity shift: y=0.59419 in
Sxe=0.41213 in³, Fy=50 ksi
Mnl=20.607 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.5157 in
f_1=49.434 ksi, f_2=49.434 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=1.0854 — Eq. 1.1-3
ρ=0.7346 — Eq. 1.1-2
b=0.37883 in (ineffective width=0.13687 in) — Eq. 1.1-1
Element 2: Stiffened, w=1.7814 in
f_1=46.032 ksi, f_2=-18.632 ksi
ψ=0.40477 — Eq. 1.1.2-1
k=12.354 — Eq. 1.1.2-2
λ=0.67498 — Eq. 1.1-3
ρ=0.99865 — Eq. 1.1-2
be=1.779 in — Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2
b_1=0.5225 in — Eq. 1.1.2-3
b_2=0.88949 in — Eq. 1.1.2-4
Compression width=1.2681 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.5157 in
f_1=49.434 ksi, f_2=49.434 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-2
λ=1.0854 — Eq. 1.1-3
ρ=0.7346 — Eq. 1.1-2
b=0.37883 in (ineffective width=0.13687 in) — Eq. 1.1-1
Element 4: Stiffened, w=1.7814 in
f_1=46.032 ksi, f_2=-18.632 ksi
ψ=0.40477 — Eq. 1.1.2-1
k=12.354 — Eq. 1.1.2-2
λ=0.67498 — Eq. 1.1-3
ρ=0.99865 — Eq. 1.1-2
be=1.779 in — Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2
b_1=0.5225 in — Eq. 1.1.2-3
b_2=0.88949 in — Eq. 1.1.2-4
Compression width=1.2681 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=-0.039387 in
Sye=0.11437 in³, Fy=50 ksi
Mnl=5.7186 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis

Effective width calculations for Stud

Element 1: No compressive stress (fully effective)

Element 2: Stiffened, w=1.7814 in

f_1=44.644 ksi, f_2=-42.651 ksi

ψ=0.95537	Eq. 1.1.2-1
k=22.863	Eq. 1.1.2-2
λ=0.48862	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.7814 in	Eq. 1.1-1
h_o=2 in, b_o=6 in, h_o/b_o=0.33333	
b_1=0.45038 in	Eq. 1.1.2-3
b_2=0.8907 in	Eq. 1.1.2-4
Compression width=0.91103 in	
b_1+b_2 > compression width (fully effective)	

Element 3: Treat as two unstiffened elements

f_1=49.236 ksi, f_2=49.236 ksi

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.4963	Eq. 1.1-3
ρ=0.21152	Eq. 1.1-2
b=0.45281 in (ineffective width=1.6879 in)	Eq. 1.1-1

f_1=49.236 ksi, f_2=49.236 ksi

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.4963	Eq. 1.1-3
ρ=0.21152	Eq. 1.1-2
b=0.45281 in (ineffective width=1.6879 in)	Eq. 1.1-1

Element 5: No compressive stress (fully effective)

Element 4: Stiffened, w=1.7814 in

f_1=44.644 ksi, f_2=-42.651 ksi

ψ=0.95537	Eq. 1.1.2-1
k=22.863	Eq. 1.1.2-2
λ=0.48862	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.7814 in	Eq. 1.1-1
h_o=2 in, b_o=6 in, h_o/b_o=0.33333	
b_1=0.45038 in	Eq. 1.1.2-3
b_2=0.8907 in	Eq. 1.1.2-4
Compression width=0.91103 in	
b_1+b_2 > compression width (fully effective)	

Center of gravity shift: x=0.35837 in

Sye=0.10243 in^3, Fy=50 ksi

Mnl=5.1214 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud

Cw=1.3926 in^6, Wn=4.9204 in^2, Fy=50 ksi

Bn=14.152 k-in^2	G8.1-1

$\Omega b=1.67$, $\phi b=0.9$

600S200-33

Full Section Properties

Area	0.37890 in²	Wt.	0.0012882 k/ft	Flat	10.951 in
Ix	2.0752 in⁴	rx	2.3403 in	Ixy	0.0000 in⁴
Sx(t)	0.69173 in³	y(t)	3.0000 in	α	0.000 deg
Sx(b)	0.69173 in³	y(b)	3.0000 in		
Zx	0.80946 in³	Height	6.0000 in		
Iy	0.2094 in⁴	ry	0.7434 in	x_o	-1.4543 in
Sy(l)	0.36494 in³	x(l)	0.5737 in	y_o	0.0000 in
Sy(r)	0.14680 in³	x(r)	1.4263 in	jx	3.1784 in
Zy	0.21126 in³	Width	2.0000 in	jy	0.0000 in
I_1	2.0752 in⁴	r_1	2.3403 in	Cw	1.5416 in⁶
I_2	0.2094 in⁴	r_2	0.7434 in	J	0.0001512 in⁴
Ic	2.2846 in⁴	rc	2.4555 in		
I_o	3.0860 in⁴	r_o	2.8539 in		

Net Section Properties

Ix	2.0655 in⁴	rx	2.5133 in	Area	0.32700 in²
Sx(t)	0.68849 in³	y(t)	3.0000 in	Ixy	0.0000 in⁴
Sx(b)	0.68849 in³	y(b)	3.0000 in	α	0.000 deg
Zx	0.79000 in³				
Iy	0.1908 in⁴	ry	0.7638 in	x_o	-1.5469 in
Sy(l)	0.28812 in³	x(l)	0.6621 in	y_o	0.0000 in
Sy(r)	0.14257 in³	x(r)	1.3379 in	jx	2.8657 in
Zy	0.20876 in³			jy	0.0000 in
Ic	2.2562 in⁴	rc	2.6268 in	Cw	1.5337 in⁶
I_o	3.0387 in⁴	r_o	3.0484 in	J	0.0001305 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	7.099 k	ϕMnxo	22.528 k-in	ϕMnyo	5.845 k-in
Ae	0.16703 in²	Ixe	1.7289 in⁴	Iye	0.1777 in⁴
ϕTn	15.941 k	Sxe(t)	0.50062 in³	Sye(l)	0.28125 in³
		Sxe(b)	0.67891 in³	Sye(r)	0.12988 in³
Shear					
ϕVny	0.854 k	Negative Bending		Negative Bending	
ϕVnx	3.083 k	ϕMnxo	22.528 k-in	ϕMnyo	5.310 k-in
		Ixe	1.7289 in⁴	Iye	0.1185 in⁴
Torsion		Sxe(t)	0.67891 in³	Sye(l)	0.11800 in³
ϕBn	14.066 k-in²	Sxe(b)	0.50062 in³	Sye(r)	0.11908 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Fya=51.09 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Fya=52.88 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Fya=54.513 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength

Ag=0.3789 in², Fy=51.09 ksi	
Tn=19.358 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.327 in², Fu=65 ksi	
Tn=21.255 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=1.7129 k at 180 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=3.8779 k	Eq. G3-2
kv=4.1149	Eq. G3-8
Vcrh=0.49375 k	Eq. G3-6
Vn=0.94924 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=1.7129 k at 0 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.514 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.98104	Eq. 1.1-3
ρ=0.79074	Eq. 1.1-2
b=0.40644 in (ineffective width=0.10756 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00027958 in⁴	Eq. 1.3-8
Is=0.00039155 in⁴ > Ia (no lip reduction)	
k=3.4924	Table 1.3-1
Element 2: Partially stiffened, w=1.778 in	
f=50 ksi, k=3.4924	
λ=1.1908	Eq. 1.1-3
ρ=0.68464	Eq. 1.1-2
b=1.2173 in (ineffective width=0.56072 in)	Eq. 1.1-1
b_1=0.60864 in, b_2=0.60864 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.0826	Eq. 1.1-3
ρ=0.23174	Eq. 1.1-2
b=0.4957 in (ineffective width=1.6433 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.0826	Eq. 1.1-3
ρ=0.23174	Eq. 1.1-2
b=0.4957 in (ineffective width=1.6433 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.514 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.98104	Eq. 1.1-3
ρ=0.79074	Eq. 1.1-2
b=0.40644 in (ineffective width=0.10756 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00027958 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.4924	Table 1.3-1
Element 4: Partially stiffened, w=1.778 in	
f=50 ksi, k=3.4924	
λ=1.1908	Eq. 1.1-3
ρ=0.68464	Eq. 1.1-2
b=1.2173 in (ineffective width=0.56072 in)	Eq. 1.1-1
b_1=0.60864 in, b_2=0.60864 in	
Ae=0.16703 in^2, Fn=50 ksi	
Pn=8.3517 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=5.778 in	
f_1=48.392 ksi, f_2=-35.285 ksi	
ψ=0.72915	Eq. 1.1.2-1
k=17.798	Eq. 1.1.2-2
λ=1.6864	Eq. 1.1-3
ρ=0.51563	Eq. 1.1-2
be=2.9793 in	Eq. 1.1-1
h_o=6 in, b_o=2 in, h_o/b_o=3	
b_1=0.79893 in	Eq. 1.1.2-3
b_2=1.4897 in	Eq. 1.1.2-4
Compression width=3.3415 in	
Ineffective width=1.0529 in	
Element 5: Unstiffened, w=0.514 in	
f_1=48.392 ksi, f_2=40.949 ksi	
ψ=0.84618	Eq. 1.2.2-1
k=0.48728	Eq. 1.2.2-2
λ=0.90665	Eq. 1.1-3
ρ=0.83533	Eq. 1.1-2
b=0.42936 in (ineffective width=0.084641 in)	Eq. 1.1-1

Element 4: Check for lip stiffener reduction

S=31.169	Eq. 1.3-7
Ia=0.00027889 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.4924	Table 1.3-1

Element 4: Partially stiffened, w=1.778 in

f=49.749 ksi, k=3.4924	
λ=1.1878	Eq. 1.1-3
ρ=0.68597	Eq. 1.1-2
b=1.2196 in (ineffective width=0.55835 in)	Eq. 1.1-1
b_1=0.60982 in, b_2=0.60982 in	

Center of gravity shift: y=-0.45345 in

Sxe=0.50062 in^3, Fy=50 ksi

Mnl=25.031 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud

Element 1: Unstiffened, w=0.514 in

f_1=48.392 ksi, f_2=40.949 ksi	
ψ=0.84618	Eq. 1.2.2-1
k=0.48728	Eq. 1.2.2-2
λ=0.90665	Eq. 1.1-3
ρ=0.83533	Eq. 1.1-2
b=0.42936 in (ineffective width=0.084641 in)	Eq. 1.1-1

Element 2: Check for lip stiffener reduction

S=31.169	Eq. 1.3-7
Ia=0.00027889 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.4924	Table 1.3-1

Element 2: Partially stiffened, w=1.778 in

f=49.749 ksi, k=3.4924	
λ=1.1878	Eq. 1.1-3
ρ=0.68597	Eq. 1.1-2
b=1.2196 in (ineffective width=0.55835 in)	Eq. 1.1-1
b_1=0.60982 in, b_2=0.60982 in	

Element 3: Stiffened, w=5.778 in

f_1=48.392 ksi, f_2=-35.285 ksi	
ψ=0.72915	Eq. 1.1.2-1
k=17.798	Eq. 1.1.2-2
λ=1.6864	Eq. 1.1-3
ρ=0.51563	Eq. 1.1-2
be=2.9793 in	Eq. 1.1-1
h_o=6 in, b_o=2 in, h_o/b_o=3	
b_1=0.79893 in	Eq. 1.1.2-3
b_2=1.4897 in	Eq. 1.1.2-4
Compression width=3.3415 in	
Ineffective width=1.0529 in	

Element 5: No compressive stress (fully effective)

Element 4: No compressive stress (fully effective)

Center of gravity shift: y=0.45345 in
Sxe=0.50062 in³, Fy=50 ksi
Mnl=25.031 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.514 in
f_1=49.368 ksi, f_2=49.368 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.97482 — Eq. 1.1-3
ρ=0.79432 — Eq. 1.1-2
b=0.40828 in (ineffective width=0.10572 in) — Eq. 1.1-1
Element 2: Stiffened, w=1.778 in
f_1=45.943 ksi, f_2=-19.035 ksi
ψ=0.41431 — Eq. 1.1.2-1
k=12.487 — Eq. 1.1.2-2
λ=0.60366 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=1.778 in — Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2
b_1=0.52075 in — Eq. 1.1.2-3
b_2=0.889 in — Eq. 1.1.2-4
Compression width=1.2572 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.514 in
f_1=49.368 ksi, f_2=49.368 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-2
λ=0.97482 — Eq. 1.1-3
ρ=0.79432 — Eq. 1.1-2
b=0.40828 in (ineffective width=0.10572 in) — Eq. 1.1-1
Element 4: Stiffened, w=1.778 in
f_1=45.943 ksi, f_2=-19.035 ksi
ψ=0.41431 — Eq. 1.1.2-1
k=12.487 — Eq. 1.1.2-2
λ=0.60366 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=1.778 in — Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2
b_1=0.52075 in — Eq. 1.1.2-3
b_2=0.889 in — Eq. 1.1.2-4
Compression width=1.2571 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=-0.030223 in
Sye=0.12988 in³, Fy=50 ksi
Mnl=6.4942 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis

Effective width calculations for Stud

Element 1: No compressive stress (fully effective)

Element 2: Stiffened, w=1.778 in

f_1=44.475 ksi, f_2=-44.024 ksi

ψ=0.98986	Eq. 1.1.2-1
k=23.738	Eq. 1.1.2-2
λ=0.43077	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.778 in	Eq. 1.1-1
h_o=2 in, b_o=6 in, h_o/b_o=0.33333	
b_1=0.44563 in	Eq. 1.1.2-3
b_2=0.889 in	Eq. 1.1.2-4
Compression width=0.89353 in	
b_1+b_2 > compression width (fully effective)	

Element 3: Treat as two unstiffened elements

f_1=49.139 ksi, f_2=49.139 ksi

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.0473	Eq. 1.1-3
ρ=0.23365	Eq. 1.1-2
b=0.49977 in (ineffective width=1.6392 in)	Eq. 1.1-1

f_1=49.139 ksi, f_2=49.139 ksi

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.0473	Eq. 1.1-3
ρ=0.23365	Eq. 1.1-2
b=0.49977 in (ineffective width=1.6392 in)	Eq. 1.1-1

Element 5: No compressive stress (fully effective)

Element 4: Stiffened, w=1.778 in

f_1=44.475 ksi, f_2=-44.024 ksi

ψ=0.98986	Eq. 1.1.2-1
k=23.738	Eq. 1.1.2-2
λ=0.43077	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.778 in	Eq. 1.1-1
h_o=2 in, b_o=6 in, h_o/b_o=0.33333	
b_1=0.44563 in	Eq. 1.1.2-3
b_2=0.889 in	Eq. 1.1.2-4
Compression width=0.89353 in	
b_1+b_2 > compression width (fully effective)	

Center of gravity shift: x=0.34247 in

Sye=0.118 in^3, Fy=50 ksi

Mnl=5.9002 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud

Cw=1.5337 in^6, Wn=4.9065 in^2, Fy=50 ksi

Bn=15.629 k-in^2	G8.1-1

$\Omega b=1.67$, $\phi b=0.9$

600S200-43

Full Section Properties

Area	0.49198 in²	Wt.	0.0016727 k/ft	Flat	10.909 in
Ix	2.6829 in⁴	rx	2.3352 in	Ixy	0.0000 in⁴
Sx(t)	0.8943 in³	y(t)	3.0000 in	α	0.000 deg
Sx(b)	0.8943 in³	y(b)	3.0000 in		
Zx	1.0486 in³	Height	6.0000 in		
Iy	0.2685 in⁴	ry	0.7388 in	x_o	-1.4431 in
Sy(l)	0.4675 in³	x(l)	0.5744 in	y_o	0.0000 in
Sy(r)	0.1883 in³	x(r)	1.4256 in	jx	3.1726 in
Zy	0.2723 in³	Width	2.0000 in	jy	0.0000 in
I_1	2.6829 in⁴	r_1	2.3352 in	Cw	1.9665 in⁶
I_2	0.2685 in⁴	r_2	0.7388 in	J	0.0003336 in⁴
Ic	2.9514 in⁴	rc	2.4493 in		
I_o	3.9760 in⁴	r_o	2.8428 in		

Net Section Properties

Ix	2.6702 in⁴	rx	2.5085 in	Area	0.42433 in²
Sx(t)	0.8901 in³	y(t)	3.0000 in	Ixy	0.0000 in⁴
Sx(b)	0.8901 in³	y(b)	3.0000 in	α	0.000 deg
Zx	1.0232 in³				
Iy	0.2446 in⁴	ry	0.7592 in	x_o	-1.5353 in
Sy(l)	0.3693 in³	x(l)	0.6624 in	y_o	0.0000 in
Sy(r)	0.1829 in³	x(r)	1.3376 in	jx	2.8587 in
Zy	0.2690 in³			jy	0.0000 in
Ic	2.9148 in⁴	rc	2.6209 in	Cw	1.9564 in⁶
I_o	3.9150 in⁴	r_o	3.0375 in	J	0.0002877 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	10.555 k	ϕMnxo	35.966 k-in	ϕMnyo	8.054 k-in
Ae	0.24836 in²	Ixe	2.5059 in⁴	Iye	0.2407 in⁴
ϕTn	20.686 k	Sxe(t)	0.79925 in³	Sye(l)	0.36726 in³
		Sxe(b)	0.87475 in³	Sye(r)	0.17898 in³
Shear					
ϕVny	1.525 k	Negative Bending		Negative Bending	
ϕVnx	4.304 k	ϕMnxo	35.966 k-in	ϕMnyo	7.132 k-in
		Ixe	2.5059 in⁴	Iye	0.1663 in⁴
Torsion		Sxe(t)	0.87475 in³	Sye(l)	0.17488 in³
ϕBn	18.1 k-in²	Sxe(b)	0.79925 in³	Sye(r)	0.15848 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=51.333 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=53.526 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=55.542 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength

Ag=0.49198 in², Fy=51.333 ksi	
Tn=25.255 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.42433 in², Fu=65 ksi	
Tn=27.581 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=2.3913 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=5.0382 k	Eq. G3-2
kv=4.1136	Eq. G3-8
Vcrh=1.0941 k	Eq. G3-6
Vn=1.6941 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=2.3913 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.74488	Eq. 1.1-3
ρ=0.94599	Eq. 1.1-2
b=0.48123 in (ineffective width=0.027474 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00062038 in⁴	Eq. 1.3-8
Is=0.00049474 in⁴	
ds=0.38377 in (lip ineffective width=0.097452 in)	Eq. 1.3-6
k=3.2601	Table 1.3-1
Element 2: Partially stiffened, w=1.7674 in	
f=50 ksi, k=3.2601	
λ=0.93989	Eq. 1.1-3
ρ=0.81492	Eq. 1.1-2
b=1.4403 in (ineffective width=0.32712 in)	Eq. 1.1-1
b_1=0.57431 in, b_2=0.86598 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=3.1243	Eq. 1.1-3
ρ=0.29753	Eq. 1.1-2
b=0.63484 in (ineffective width=1.4989 in)	Eq. 1.1-1

f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=3.1243 Eq. 1.1-3
ρ=0.29753 Eq. 1.1-2
b=0.63484 in (ineffective width=1.4989 in) Eq. 1.1-1
Element 5: Unstiffened, w=0.5087 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.74488 Eq. 1.1-3
ρ=0.94599 Eq. 1.1-2
b=0.48123 in (ineffective width=0.027474 in) Eq. 1.1-1
Element 4: Check for lip stiffener reduction
S=31.091 Eq. 1.3-7
Ia=0.00062038 in^4 Eq. 1.3-8
Is=0.00049474 in^4
ds=0.38377 in (lip ineffective width=0.097452 in) Eq. 1.3-6
k=3.2601 Table 1.3-1
Element 4: Partially stiffened, w=1.7674 in
f=50 ksi, k=3.2601
λ=0.93989 Eq. 1.1-3
ρ=0.81492 Eq. 1.1-2
b=1.4403 in (ineffective width=0.32712 in) Eq. 1.1-1
b_1=0.57431 in, b_2=0.86598 in
Ae=0.24836 in^2, Fn=50 ksi
Pn=12.418 k Eq. E3.1-1
Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: No compressive stress (fully effective)
Element 3: Stiffened, w=5.7674 in
f_1=48.145 ksi, f_2=-43.84 ksi
ψ=0.91058 Eq. 1.1.2-1
k=21.77 Eq. 1.1.2-2
λ=1.1647 Eq. 1.1-3
ρ=0.69642 Eq. 1.1-2
be=4.0165 in Eq. 1.1-1
h_o=6 in, b_o=2 in, h_o/b_o=3
b_1=1.0271 in Eq. 1.1.2-3
b_2=2.0083 in Eq. 1.1.2-4
Compression width=3.0187 in
b_1+b_2 > compression width (fully effective)
Element 5: Unstiffened, w=0.5087 in
f_1=48.145 ksi, f_2=40.032 ksi
ψ=0.83148 Eq. 1.2.2-1
k=0.49339 Eq. 1.2.2-2
λ=0.68236 Eq. 1.1-3

ρ=0.99301	Eq. 1.1-2
b=0.50514 in (ineffective width=0.0035576 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.204	Eq. 1.3-7
Ia=0.00061821 in^4	Eq. 1.3-8
Is=0.00049474 in^4	
ds=0.40425 in (lip ineffective width=0.10089 in)	Eq. 1.3-6
k=3.2634	Table 1.3-1
Element 4: Partially stiffened, w=1.7674 in	
f=49.64 ksi, k=3.2634	
λ=0.93603	Eq. 1.1-3
ρ=0.81724	Eq. 1.1-2
b=1.4444 in (ineffective width=0.323 in)	Eq. 1.1-1
b_1=0.57796 in, b_2=0.86644 in	
Center of gravity shift: y=-0.13531 in	
Sxe=0.79925 in^3, Fy=50 ksi	
Mnl=39.962 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	
f_1=48.145 ksi, f_2=40.032 ksi	
ψ=0.83148	Eq. 1.2.2-1
k=0.49339	Eq. 1.2.2-2
λ=0.68236	Eq. 1.1-3
ρ=0.99301	Eq. 1.1-2
b=0.50514 in (ineffective width=0.0035576 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.204	Eq. 1.3-7
Ia=0.00061821 in^4	Eq. 1.3-8
Is=0.00049474 in^4	
ds=0.40425 in (lip ineffective width=0.10089 in)	Eq. 1.3-6
k=3.2634	Table 1.3-1
Element 2: Partially stiffened, w=1.7674 in	
f=49.64 ksi, k=3.2634	
λ=0.93603	Eq. 1.1-3
ρ=0.81724	Eq. 1.1-2
b=1.4444 in (ineffective width=0.323 in)	Eq. 1.1-1
b_1=0.57796 in, b_2=0.86644 in	
Element 3: Stiffened, w=5.7674 in	
f_1=48.145 ksi, f_2=-43.84 ksi	
ψ=0.91058	Eq. 1.1.2-1
k=21.77	Eq. 1.1.2-2
λ=1.1647	Eq. 1.1-3
ρ=0.69642	Eq. 1.1-2
be=4.0165 in	Eq. 1.1-1
h_o=6 in, b_o=2 in, h_o/b_o=3	
b_1=1.0271 in	Eq. 1.1.2-3
b_2=2.0083 in	Eq. 1.1.2-4

Compression width=3.0187 in
b_1+b_2 > compression width (fully effective)
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0.13531 in
Sxe=0.79925 in³, Fy=50 ksi
Mnl=39.962 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.5087 in
f_1=49.162 ksi, f_2=49.162 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.73861 — Eq. 1.1-3
ρ=0.95063 — Eq. 1.1-2
b=0.48359 in (ineffective width=0.025115 in) — Eq. 1.1-1
Element 2: Stiffened, w=1.7674 in
f_1=45.676 ksi, f_2=-20.042 ksi
ψ=0.43879 — Eq. 1.1.2-1
k=12.835 — Eq. 1.1.2-2
λ=0.45275 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=1.7674 in — Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2
b_1=0.51396 in — Eq. 1.1.2-3
b_2=0.8837 in — Eq. 1.1.2-4
Compression width=1.2284 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.5087 in
f_1=49.161 ksi, f_2=49.161 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.73861 — Eq. 1.1-3
ρ=0.95063 — Eq. 1.1-2
b=0.48359 in (ineffective width=0.025115 in) — Eq. 1.1-1
Element 4: Stiffened, w=1.7674 in
f_1=45.676 ksi, f_2=-20.042 ksi
ψ=0.43879 — Eq. 1.1.2-1
k=12.835 — Eq. 1.1.2-2
λ=0.45275 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=1.7674 in — Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2
b_1=0.51396 in — Eq. 1.1.2-3
b_2=0.8837 in — Eq. 1.1.2-4
Compression width=1.2284 in
b_1+b_2 > compression width (fully effective)

Center of gravity shift: x=-0.0070585 in
Sye=0.17898 in^3, Fy=50 ksi
Mnl=8.9488 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.7674 in
f_1=39.745 ksi, f_2=-44.459 ksi
ψ=1.1186 Eq. 1.1.2-1
k=27.256 Eq. 1.1.2-2
λ=0.28982 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.7674 in Eq. 1.1-1
h_o=2 in, b_o=6 in, h_o/b_o=0.33333
b_1=0.42913 in Eq. 1.1.2-3
b_2=0.8837 in Eq. 1.1.2-4
Compression width=0.83423 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=44.212 ksi, f_2=44.212 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=2.9379 Eq. 1.1-3
ρ=0.31489 Eq. 1.1-2
b=0.67187 in (ineffective width=1.4618 in) Eq. 1.1-1
f_1=44.212 ksi, f_2=44.212 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=2.9379 Eq. 1.1-3
ρ=0.31489 Eq. 1.1-2
b=0.67187 in (ineffective width=1.4618 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=1.7674 in
f_1=39.745 ksi, f_2=-44.459 ksi
ψ=1.1186 Eq. 1.1.2-1
k=27.256 Eq. 1.1.2-2
λ=0.28982 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.7674 in Eq. 1.1-1
h_o=2 in, b_o=6 in, h_o/b_o=0.33333
b_1=0.42913 in Eq. 1.1.2-3
b_2=0.8837 in Eq. 1.1.2-4
Compression width=0.83423 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.28845 in
Sye=0.15848 in^3, Fy=50 ksi
Mnl=7.9239 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=1.9564 in^6, Wn=4.864 in^2, Fy=50 ksi
Bn=20.111 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

600S200-54

Full Section Properties

Area	0.61294 in²	Wt.	0.0020840 k/ft	Flat	10.829 in
Ix	3.3198 in⁴	rx	2.3273 in	Ixy	0.0000 in⁴
Sx(t)	1.1066 in³	y(t)	3.0000 in	α	0.000 deg
Sx(b)	1.1066 in³	y(b)	3.0000 in		
Zx	1.3013 in³	Height	6.0000 in		
Iy	0.3287 in⁴	ry	0.7324 in	x_o	-1.4287 in
Sy(l)	0.5729 in³	x(l)	0.5738 in	y_o	0.0000 in
Sy(r)	0.2305 in³	x(r)	1.4262 in	jx	3.1697 in
Zy	0.3356 in³	Width	2.0000 in	jy	0.0000 in
I_1	3.3198 in⁴	r_1	2.3273 in	Cw	2.3915 in⁶
I_2	0.3287 in⁴	r_2	0.7324 in	J	0.0006545 in⁴
Ic	3.6485 in⁴	rc	2.4398 in		
I_o	4.8996 in⁴	r_o	2.8273 in		

Net Section Properties

Ix	3.3039 in⁴	rx	2.5014 in	Area	0.52804 in²
Sx(t)	1.1013 in³	y(t)	3.0000 in	Ixy	0.0000 in⁴
Sx(b)	1.1013 in³	y(b)	3.0000 in	α	0.000 deg
Zx	1.2695 in³				
Iy	0.2994 in⁴	ry	0.7530 in	x_o	-1.5206 in
Sy(l)	0.4526 in³	x(l)	0.6615 in	y_o	0.0000 in
Sy(r)	0.2237 in³	x(r)	1.3385 in	jx	2.8538 in
Zy	0.3313 in³			jy	0.0000 in
Ic	3.6033 in⁴	rc	2.6123 in	Cw	2.3791 in⁶
I_o	4.8243 in⁴	r_o	3.0226 in	J	0.0005639 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	14.128 k	ϕMnxo	45.335 k-in	ϕMnyo	11.439 k-in
Ae	0.33242 in²	Ixe	3.1391 in⁴	Iye	0.2994 in⁴
ϕTn	25.742 k	Sxe(t)	1.0074 in³	Sye(l)	0.4526 in³
		Sxe(b)	1.0885 in³	Sye(r)	0.2237 in³
Shear					
ϕVny	2.467 k	Negative Bending		Negative Bending	
ϕVnx	5.248 k	ϕMnxo	45.335 k-in	ϕMnyo	9.045 k-in
		Ixe	3.1391 in⁴	Iye	0.2234 in⁴
Torsion		Sxe(t)	1.0885 in³	Sye(l)	0.2513 in³
ϕBn	22.229 k-in²	Sxe(b)	1.0074 in³	Sye(r)	0.2010 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=51.667 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=54.356 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=56.825 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.61294 in², Fy=51.667 ksi

Tn=31.669 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.52804 in², Fu=65 ksi	
Tn=34.322 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=2.9155 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=6.2242 k	Eq. G3-2
kv=4.107	Eq. G3-8
Vcrh=2.168 k	Eq. G3-6
Vn=2.741 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=2.9155 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4835 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56413	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0011127 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.23166 in (lip ineffective width=0.25184 in)	Eq. 1.3-6
k=2.7693	Table 1.3-1
Element 2: Partially stiffened, w=1.717 in	
f=50 ksi, k=2.7693	
λ=0.78941	Eq. 1.1-3
ρ=0.91373	Eq. 1.1-2
b=1.5689 in (ineffective width=0.14812 in)	Eq. 1.1-1
b_1=0.37585 in, b_2=1.193 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.4601	Eq. 1.1-3
ρ=0.37013	Eq. 1.1-2
b=0.78042 in (ineffective width=1.3281 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=2.4601	Eq. 1.1-3
ρ=0.37013	Eq. 1.1-2
b=0.78042 in (ineffective width=1.3281 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4835 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56413	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0011127 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.23166 in (lip ineffective width=0.25184 in)	Eq. 1.3-6
k=2.7693	Table 1.3-1
Element 4: Partially stiffened, w=1.717 in	
f=50 ksi, k=2.7693	
λ=0.78941	Eq. 1.1-3
ρ=0.91373	Eq. 1.1-2
b=1.5689 in (ineffective width=0.14812 in)	Eq. 1.1-1
b_1=0.37585 in, b_2=1.193 in	
Ae=0.33242 in^2, Fn=50 ksi	
Pn=16.621 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=5.717 in	
f_1=47.729 ksi, f_2=-44.012 ksi	
ψ=0.92213	Eq. 1.1.2-1
k=22.047	Eq. 1.1.2-2
λ=0.91016	Eq. 1.1-3
ρ=0.83313	Eq. 1.1-2
be=4.763 in	Eq. 1.1-1
h_o=6 in, b_o=2 in, h_o/b_o=3	
b_1=1.2144 in	Eq. 1.1.2-3
b_2=2.3815 in	Eq. 1.1.2-4
Compression width=2.9743 in	
b_1+b_2 > compression width (fully effective)	
Element 5: Unstiffened, w=0.4835 in	
f_1=47.729 ksi, f_2=39.971 ksi	
ψ=0.83744	Eq. 1.2.2-1
k=0.49089	Eq. 1.2.2-2
λ=0.51586	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.233	Eq. 1.3-7

Ia=0.0010899 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.23649 in (lip ineffective width=0.24701 in)	Eq. 1.3-6
k=2.7838	Table 1.3-1
Element 4: Partially stiffened, w=1.717 in	
f=49.546 ksi, k=2.7838	
λ=0.78377	Eq. 1.1-3
ρ=0.91775	Eq. 1.1-2
b=1.5758 in (ineffective width=0.14122 in)	Eq. 1.1-1
b_1=0.38538 in, b_2=1.1904 in	
Center of gravity shift: y=-0.11596 in	
Sxe=1.0074 in^3, Fy=50 ksi	
Mnl=50.372 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4835 in	
f_1=47.729 ksi, f_2=39.97 ksi	
ψ=0.83744	Eq. 1.2.2-1
k=0.49089	Eq. 1.2.2-2
λ=0.51586	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.233	Eq. 1.3-7
Ia=0.0010899 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.23649 in (lip ineffective width=0.24701 in)	Eq. 1.3-6
k=2.7838	Table 1.3-1
Element 2: Partially stiffened, w=1.717 in	
f=49.546 ksi, k=2.7838	
λ=0.78377	Eq. 1.1-3
ρ=0.91775	Eq. 1.1-2
b=1.5758 in (ineffective width=0.14122 in)	Eq. 1.1-1
b_1=0.38538 in, b_2=1.1904 in	
Element 3: Stiffened, w=5.717 in	
f_1=47.729 ksi, f_2=-44.012 ksi	
ψ=0.92213	Eq. 1.1.2-1
k=22.047	Eq. 1.1.2-2
λ=0.91016	Eq. 1.1-3
ρ=0.83313	Eq. 1.1-2
be=4.763 in	Eq. 1.1-1
h_o=6 in, b_o=2 in, h_o/b_o=3	
b_1=1.2144 in	Eq. 1.1.2-3
b_2=2.3815 in	Eq. 1.1.2-4
Compression width=2.9743 in	
b_1+b_2 > compression width (fully effective)	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.11596 in	

Sxe=1.0074 in³, Fy=50 ksi
Mnl=50.372 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.4835 in
f_1=55.624 ksi, f_2=55.624 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.59501 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 2: Stiffened, w=1.717 in
f_1=50.818 ksi, f_2=-22.076 ksi
ψ=0.43441 Eq. 1.1.2-1
k=12.772 Eq. 1.1.2-2
λ=0.37059 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.717 in Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2
b_1=0.49994 in Eq. 1.1.2-3
b_2=0.8585 in Eq. 1.1.2-4
Compression width=1.197 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.4835 in
f_1=55.624 ksi, f_2=55.624 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.59501 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 4: Stiffened, w=1.717 in
f_1=50.818 ksi, f_2=-22.076 ksi
ψ=0.43441 Eq. 1.1.2-1
k=12.772 Eq. 1.1.2-2
λ=0.37059 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.717 in Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2
b_1=0.49994 in Eq. 1.1.2-3
b_2=0.8585 in Eq. 1.1.2-4
Compression width=1.197 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0 in
Sye=0.22368 in³, Fy=56.825 ksi
Mnl=12.711 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud

Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.717 in
f_1=33.505 ksi, f_2=-43.642 ksi
ψ=1.3026 Eq. 1.1.2-1
k=33.021 Eq. 1.1.2-2
λ=0.18714 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.717 in Eq. 1.1-1
h_o=2 in, b_o=6 in, h_o/b_o=0.33333
b_1=0.39906 in Eq. 1.1.2-3
b_2=0.8585 in Eq. 1.1.2-4
Compression width=0.74569 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=38.591 ksi, f_2=38.591 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=2.1613 Eq. 1.1-3
ρ=0.41559 Eq. 1.1-2
b=0.87627 in (ineffective width=1.2322 in) Eq. 1.1-1
f_1=38.591 ksi, f_2=38.591 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=2.1613 Eq. 1.1-3
ρ=0.41559 Eq. 1.1-2
b=0.87627 in (ineffective width=1.2322 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=1.717 in
f_1=33.505 ksi, f_2=-43.642 ksi
ψ=1.3026 Eq. 1.1.2-1
k=33.021 Eq. 1.1.2-2
λ=0.18714 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.717 in Eq. 1.1-1
h_o=2 in, b_o=6 in, h_o/b_o=0.33333
b_1=0.39906 in Eq. 1.1.2-3
b_2=0.8585 in Eq. 1.1.2-4
Compression width=0.74569 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.22732 in
Sye=0.201 in^3, Fy=50 ksi
Mnl=10.05 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=2.3791 in^6, Wn=4.8162 in^2, Fy=50 ksi
Bn=24.699 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

600S200-68

Full Section Properties

Area	0.76434 in²	Wt.	0.0025988 k/ft	Flat	10.720 in
Ix	4.1015 in⁴	rx	2.3165 in	Ixy	0.0000 in⁴
Sx(t)	1.3672 in³	y(t)	3.0000 in	α	0.000 deg
Sx(b)	1.3672 in³	y(b)	3.0000 in		
Zx	1.6142 in³	Height	6.0000 in		
Iy	0.4004 in⁴	ry	0.7238 in	x_o	-1.4095 in
Sy(l)	0.6992 in³	x(l)	0.5727 in	y_o	0.0000 in
Sy(r)	0.2805 in³	x(r)	1.4273 in	jx	3.1668 in
Zy	0.4125 in³	Width	2.0000 in	jy	0.0000 in
I_1	4.1015 in⁴	r_1	2.3165 in	Cw	2.8862 in⁶
I_2	0.4004 in⁴	r_2	0.7238 in	J	0.0012952 in⁴
Ic	4.5019 in⁴	rc	2.4269 in		
I_o	6.0205 in⁴	r_o	2.8065 in		

Net Section Properties

Ix	4.0814 in⁴	rx	2.4917 in	Area	0.65739 in²
Sx(t)	1.3605 in³	y(t)	3.0000 in	Ixy	0.0000 in⁴
Sx(b)	1.3605 in³	y(b)	3.0000 in	α	0.000 deg
Zx	1.5741 in³				
Iy	0.3645 in⁴	ry	0.7446 in	x_o	-1.5012 in
Sy(l)	0.5522 in³	x(l)	0.6601 in	y_o	0.0000 in
Sy(r)	0.2720 in³	x(r)	1.3399 in	jx	2.8484 in
Zy	0.4069 in³			jy	0.0000 in
Ic	4.4459 in⁴	rc	2.6006 in	Cw	2.8708 in⁶
I_o	5.9274 in⁴	r_o	3.0028 in	J	0.0011140 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	20.438 k	ϕMnxo	59.916 k-in	ϕMnyo	14.317 k-in
Ae	0.48089 in²	Ixe	4.0340 in⁴	Iye	0.3645 in⁴
ϕTn	32.048 k	Sxe(t)	1.3315 in³	Sye(l)	0.5522 in³
		Sxe(b)	1.3581 in³	Sye(r)	0.2720 in³
Shear					
ϕVny	3.946 k	Negative Bending		Negative Bending	
ϕVnx	6.328 k	ϕMnxo	59.916 k-in	ϕMnyo	11.407 k-in
		Ixe	4.0340 in⁴	Iye	0.2996 in⁴
Torsion		Sxe(t)	1.3581 in³	Sye(l)	0.3663 in³
ϕBn	27.173 k-in²	Sxe(b)	1.3315 in³	Sye(r)	0.2535 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=52.121 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=55.437 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=58.477 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.76434 in², Fy=52.121 ksi

Tn=39.839 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.65739 in², Fu=65 ksi	
Tn=42.73 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=3.5157 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=7.6601 k	Eq. G3-2
kv=4.0972	Eq. G3-8
Vcrh=4.3497 k	Eq. G3-6
Vn=4.3848 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=3.5157 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4468 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41383	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00072868 in⁴	Eq. 1.3-8
Is=0.00052997 in⁴	
ds=0.32495 in (lip ineffective width=0.12185 in)	Eq. 1.3-6
k=3.0024	Table 1.3-1
Element 2: Partially stiffened, w=1.6436 in	
f=50 ksi, k=3.0024	
λ=0.57612	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.9189	Eq. 1.1-3
ρ=0.46138	Eq. 1.1-2
b=0.95588 in (ineffective width=1.1159 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.9189	Eq. 1.1-3

ρ=0.46138	Eq. 1.1-2
b=0.95588 in (ineffective width=1.1159 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4468 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41383	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00072868 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.32495 in (lip ineffective width=0.12185 in)	Eq. 1.3-6
k=3.0024	Table 1.3-1
Element 4: Partially stiffened, w=1.6436 in	
f=50 ksi, k=3.0024	
λ=0.57612	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Ae=0.48089 in^2, Fn=50 ksi	
Pn=24.044 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=5.6436 in	
f_1=47.059 ksi, f_2=-46.08 ksi	
ψ=0.97919	Eq. 1.1.2-1
k=23.464	Eq. 1.1.2-2
λ=0.68649	Eq. 1.1-3
ρ=0.98986	Eq. 1.1-2
be=5.5864 in	Eq. 1.1-1
h_o=6 in, b_o=2 in, h_o/b_o=3	
b_1=1.4039 in	Eq. 1.1.2-3
b_2=2.7932 in	Eq. 1.1.2-4
Compression width=2.8515 in	
b_1+b_2 > compression width (fully effective)	
Element 5: Unstiffened, w=0.4468 in	
f_1=47.059 ksi, f_2=39.685 ksi	
ψ=0.84331	Eq. 1.2.2-1
k=0.48846	Eq. 1.2.2-2
λ=0.37669	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.276	Eq. 1.3-7
Ia=0.00070579 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.33549 in (lip ineffective width=0.11131 in)	Eq. 1.3-6
k=3.0343	Table 1.3-1

Element 4: Partially stiffened, w=1.6436 in
f=49.412 ksi, k=3.0343
λ=0.56969 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Center of gravity shift: y=-0.029702 in
Sxe=1.3315 in^3, Fy=50 ksi
Mnl=66.574 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.4468 in
f_1=47.059 ksi, f_2=39.685 ksi
ψ=0.84331 Eq. 1.2.2-1
k=0.48846 Eq. 1.2.2-2
λ=0.37669 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.276 Eq. 1.3-7
Ia=0.00070579 in^4 Eq. 1.3-8
Is=0.00052997 in^4
ds=0.33549 in (lip ineffective width=0.11131 in) Eq. 1.3-6
k=3.0343 Table 1.3-1
Element 2: Partially stiffened, w=1.6436 in
f=49.412 ksi, k=3.0343
λ=0.56969 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 3: Stiffened, w=5.6436 in
f_1=47.059 ksi, f_2=-46.08 ksi
ψ=0.97919 Eq. 1.1.2-1
k=23.464 Eq. 1.1.2-2
λ=0.68649 Eq. 1.1-3
ρ=0.98986 Eq. 1.1-2
be=5.5864 in Eq. 1.1-1
h_o=6 in, b_o=2 in, h_o/b_o=3
b_1=1.4039 in Eq. 1.1.2-3
b_2=2.7932 in Eq. 1.1.2-4
Compression width=2.8515 in
b_1+b_2 > compression width (fully effective)
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0.029702 in
Sxe=1.3315 in^3, Fy=50 ksi
Mnl=66.574 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.4468 in
f_1=56.921 ksi, f_2=56.921 ksi

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.44155	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=1.6436 in	
f_1=50.7 ksi, f_2=-21.03 ksi	
ψ=0.41479	Eq. 1.1.2-1
k=12.493	Eq. 1.1.2-2
λ=0.28439	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.6436 in	Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2	
b_1=0.48132 in	Eq. 1.1.2-3
b_2=0.8218 in	Eq. 1.1.2-4
Compression width=1.1617 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.4468 in	
f_1=56.921 ksi, f_2=56.921 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.44155	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Stiffened, w=1.6436 in	
f_1=50.7 ksi, f_2=-21.03 ksi	
ψ=0.41479	Eq. 1.1.2-1
k=12.493	Eq. 1.1.2-2
λ=0.28439	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.6436 in	Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2	
b_1=0.48132 in	Eq. 1.1.2-3
b_2=0.8218 in	Eq. 1.1.2-4
Compression width=1.1617 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0 in	
Sye=0.27203 in^3, Fy=58.477 ksi	
Mnl=15.907 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: Stiffened, w=1.6436 in	
f_1=26.975 ksi, f_2=-42.471 ksi	
ψ=1.5744	Eq. 1.1.2-1
k=43.274	Eq. 1.1.2-2
λ=0.11146	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.6436 in	Eq. 1.1-1

```
  h₀=2 in, b₀=6 in, h₀/b₀=0.33333
      b₁=0.3593 in                                          Eq. 1.1.2-3
      b₂=0.8218 in                                          Eq. 1.1.2-4
      Compression width=0.63843 in
      b₁+b₂ > compression width (fully effective)
    Element 3: Treat as two unstiffened elements
      f₁=32.998 ksi, f₂=32.998 ksi
      ψ=1                                                   Eq. 1.2.2-1
      k=0.43                                                Eq. 1.2.2-3
      λ=1.5589                                              Eq. 1.1-3
      ρ=0.55095                                             Eq. 1.1-2
      b=1.1415 in (ineffective width=0.93035 in)            Eq. 1.1-1
      f₁=32.998 ksi, f₂=32.998 ksi
      ψ=1                                                   Eq. 1.2.2-1
      k=0.43                                                Eq. 1.2.2-3
      λ=1.5589                                              Eq. 1.1-3
      ρ=0.55095                                             Eq. 1.1-2
      b=1.1415 in (ineffective width=0.93035 in)            Eq. 1.1-1
    Element 5: No compressive stress (fully effective)
    Element 4: Stiffened, w=1.6436 in
      f₁=26.975 ksi, f₂=-42.471 ksi
      ψ=1.5744                                              Eq. 1.1.2-1
      k=43.274                                              Eq. 1.1.2-2
      λ=0.11146                                             Eq. 1.1-3
      ρ=1                                                   Eq. 1.1-2
      be=1.6436 in                                          Eq. 1.1-1
      h₀=2 in, b₀=6 in, h₀/b₀=0.33333
      b₁=0.3593 in                                          Eq. 1.1.2-3
      b₂=0.8218 in                                          Eq. 1.1.2-4
      Compression width=0.63843 in
      b₁+b₂ > compression width (fully effective)
  Center of gravity shift: x=0.15788 in
  Sye=0.25349 in³, Fy=50 ksi
  Mnl=12.674 k-in                                           Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
  Cw=2.8708 in⁶, Wn=4.7542 in², Fy=50 ksi
  Bn=30.192 k-in²                                           G8.1-1
  Ωb=1.67, ϕb=0.9
```

600S250-30

Full Section Properties

Area	0.37329 in²	Wt.	0.0012692 k/ft	Flat	11.964 in
Ix	2.1541 in⁴	rx	2.4022 in	Ixy	0.0000 in⁴
Sx(t)	0.71804 in³	y(t)	3.0000 in	α	0.000 deg
Sx(b)	0.71804 in³	y(b)	3.0000 in		
Zx	0.82450 in³	Height	6.0000 in		
Iy	0.3225 in⁴	ry	0.9295 in	x_o	-1.8866 in
Sy(l)	0.42439 in³	x(l)	0.7599 in	y_o	0.0000 in
Sy(r)	0.18534 in³	x(r)	1.7401 in	jx	3.3611 in
Zy	0.27764 in³	Width	2.5000 in	jy	0.0000 in
I_1	2.1541 in⁴	r_1	2.4022 in	Cw	2.3461 in⁶
I_2	0.3225 in⁴	r_2	0.9295 in	J	0.0001211 in⁴
Ic	2.4766 in⁴	rc	2.5758 in		
I_o	3.8053 in⁴	r_o	3.1928 in		

Net Section Properties

Ix	2.1454 in⁴	rx	2.5634 in	Area	0.32649 in²
Sx(t)	0.71512 in³	y(t)	3.0000 in	Ixy	0.0000 in⁴
Sx(b)	0.71512 in³	y(b)	3.0000 in	α	0.000 deg
Zx	0.80695 in³				
Iy	0.2929 in⁴	ry	0.9471 in	x_o	-1.9980 in
Sy(l)	0.33793 in³	x(l)	0.8666 in	y_o	0.0000 in
Sy(r)	0.17929 in³	x(r)	1.6334 in	jx	3.1143 in
Zy	0.26667 in³			jy	0.0000 in
Ic	2.4382 in⁴	rc	2.7328 in	Cw	2.3346 in⁶
I_o	3.7416 in⁴	r_o	3.3853 in	J	0.0001059 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	6.222 k	ϕMnxo	19.521 k-in	ϕMnyo	7.241 k-in
Ae	0.14640 in²	Ixe	1.6062 in⁴	Iye	0.2699 in⁴
ϕTn	15.916 k	Sxe(t)	0.43380 in³	Sye(l)	0.32786 in³
		Sxe(b)	0.69920 in³	Sye(r)	0.16092 in³
Shear					
ϕVny	0.685 k	Negative Bending		Negative Bending	
ϕVnx	2.734 k	ϕMnxo	19.521 k-in	ϕMnyo	6.373 k-in
		Ixe	1.6062 in⁴	Iye	0.1802 in⁴
Torsion		Sxe(t)	0.69920 in³	Sye(l)	0.14163 in³
ϕBn	17.108 k-in²	Sxe(b)	0.43380 in³	Sye(r)	0.14674 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Fya=50.92 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Fya=52.136 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Fya=54.15 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength

Ag=0.37329 in², Fy=50.92 ksi	
Tn=19.008 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.32649 in², Fu=65 ksi	
Tn=21.222 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=1.519 k at 180 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=3.5005 k	Eq. G3-2
kv=4.1647	Eq. G3-8
Vcrh=0.3663 k	Eq. G3-6
Vn=0.7606 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=1.519 k at 0 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5157 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.0916	Eq. 1.1-3
ρ=0.73148	Eq. 1.1-2
b=0.37723 in (ineffective width=0.13847 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00026103 in⁴	Eq. 1.3-8
Is=0.00035659 in⁴ > Ia (no lip reduction)	
k=3.8802	Table 1.3-1
Element 2: Partially stiffened, w=2.2814 in	
f=50 ksi, k=3.8802	
λ=1.6075	Eq. 1.1-3
ρ=0.53694	Eq. 1.1-2
b=1.225 in (ineffective width=1.0564 in)	Eq. 1.1-1
b_1=0.61249 in, b_2=0.61249 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.5311	Eq. 1.1-3
ρ=0.20998	Eq. 1.1-2
b=0.44951 in (ineffective width=1.6912 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.5311	Eq. 1.1-3
ρ=0.20998	Eq. 1.1-2
b=0.44951 in (ineffective width=1.6912 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.5157 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.0916	Eq. 1.1-3
ρ=0.73148	Eq. 1.1-2
b=0.37723 in (ineffective width=0.13847 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00026103 in^4	Eq. 1.3-8
Is=0.00035659 in^4 > Ia (no lip reduction)	
k=3.8802	Table 1.3-1
Element 4: Partially stiffened, w=2.2814 in	
f=50 ksi, k=3.8802	
λ=1.6075	Eq. 1.1-3
ρ=0.53694	Eq. 1.1-2
b=1.225 in (ineffective width=1.0564 in)	Eq. 1.1-1
b_1=0.61249 in, b_2=0.61249 in	
Ae=0.1464 in^2, Fn=50 ksi	
Pn=7.3198 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=5.7814 in	
f_1=48.524 ksi, f_2=-29.558 ksi	
ψ=0.60915	Eq. 1.1.2-1
k=15.552	Eq. 1.1.2-2
λ=2.0046	Eq. 1.1-3
ρ=0.44411	Eq. 1.1-2
be=2.5676 in	Eq. 1.1-1
h_o=6 in, b_o=2.5 in, h_o/b_o=2.4	
b_1=0.71141 in	Eq. 1.1.2-3
b_2=1.2838 in	Eq. 1.1.2-4
Compression width=3.5928 in	
Ineffective width=1.5976 in	
Element 5: Unstiffened, w=0.5157 in	
f_1=48.524 ksi, f_2=41.559 ksi	
ψ=0.85646	Eq. 1.2.2-1
k=0.48309	Eq. 1.2.2-2
λ=1.0145	Eq. 1.1-3
ρ=0.77195	Eq. 1.1-2
b=0.39809 in (ineffective width=0.11761 in)	Eq. 1.1-1

Element 4: Check for lip stiffener reduction

S=31.157	Eq. 1.3-7
Ia=0.00026048 in^4	Eq. 1.3-8
Is=0.00035659 in^4 > Ia (no lip reduction)	
k=3.8802	Table 1.3-1

Element 4: Partially stiffened, w=2.2814 in

f=49.789 ksi, k=3.8802	
λ=1.6041	Eq. 1.1-3
ρ=0.5379	Eq. 1.1-2
b=1.2272 in (ineffective width=1.0542 in)	Eq. 1.1-1
b_1=0.61358 in, b_2=0.61358 in	

Center of gravity shift: y=-0.70275 in

Sxe=0.4338 in^3, Fy=50 ksi

Mnl=21.69 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud

Element 1: Unstiffened, w=0.5157 in

f_1=48.524 ksi, f_2=41.559 ksi	
ψ=0.85646	Eq. 1.2.2-1
k=0.48309	Eq. 1.2.2-2
λ=1.0145	Eq. 1.1-3
ρ=0.77195	Eq. 1.1-2
b=0.39809 in (ineffective width=0.11761 in)	Eq. 1.1-1

Element 2: Check for lip stiffener reduction

S=31.157	Eq. 1.3-7
Ia=0.00026048 in^4	Eq. 1.3-8
Is=0.00035659 in^4 > Ia (no lip reduction)	
k=3.8802	Table 1.3-1

Element 2: Partially stiffened, w=2.2814 in

f=49.789 ksi, k=3.8802	
λ=1.6041	Eq. 1.1-3
ρ=0.5379	Eq. 1.1-2
b=1.2272 in (ineffective width=1.0542 in)	Eq. 1.1-1
b_1=0.61358 in, b_2=0.61358 in	

Element 3: Stiffened, w=5.7814 in

f_1=48.524 ksi, f_2=-29.558 ksi	
ψ=0.60915	Eq. 1.1.2-1
k=15.552	Eq. 1.1.2-2
λ=2.0046	Eq. 1.1-3
ρ=0.44411	Eq. 1.1-2
be=2.5676 in	Eq. 1.1-1
h_o=6 in, b_o=2.5 in, h_o/b_o=2.4	
b_1=0.71141 in	Eq. 1.1.2-3
b_2=1.2838 in	Eq. 1.1.2-4
Compression width=3.5928 in	
Ineffective width=1.5976 in	

Element 5: No compressive stress (fully effective)

Element 4: No compressive stress (fully effective)

Center of gravity shift: y=0.70275 in
Sxe=0.4338 in^3, Fy=50 ksi
Mnl=21.69 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.5157 in
f_1=49.535 ksi, f_2=49.535 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=1.0865 — Eq. 1.1-3
ρ=0.73404 — Eq. 1.1-2
b=0.37855 in (ineffective width=0.13715 in) — Eq. 1.1-1
Element 2: Stiffened, w=2.2814 in
f_1=46.741 ksi, f_2=-21.283 ksi
ψ=0.45533 — Eq. 1.1.2-1
k=13.075 — Eq. 1.1.2-2
λ=0.84668 — Eq. 1.1-3
ρ=0.87419 — Eq. 1.1-2
be=1.9944 in — Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.57719 in — Eq. 1.1.2-3
b_2=0.99719 in — Eq. 1.1.2-4
Compression width=1.5676 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.5157 in
f_1=49.535 ksi, f_2=49.535 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-2
λ=1.0865 — Eq. 1.1-3
ρ=0.73404 — Eq. 1.1-2
b=0.37855 in (ineffective width=0.13715 in) — Eq. 1.1-1
Element 4: Stiffened, w=2.2814 in
f_1=46.741 ksi, f_2=-21.283 ksi
ψ=0.45533 — Eq. 1.1.2-1
k=13.075 — Eq. 1.1.2-2
λ=0.84668 — Eq. 1.1-3
ρ=0.87419 — Eq. 1.1-2
be=1.9944 in — Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.57719 in — Eq. 1.1.2-3
b_2=0.99719 in — Eq. 1.1.2-4
Compression width=1.5676 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=-0.04355 in
Sye=0.16092 in^3, Fy=50 ksi
Mnl=8.046 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis

Effective width calculations for Stud

Element 1: No compressive stress (fully effective)

Element 2: Stiffened, w=2.2814 in

f_1=45.704 ksi, f_2=-43.964 ksi

ψ=0.96193	Eq. 1.1.2-1
k=23.027	Eq. 1.1.2-2
λ=0.63089	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.2814 in	Eq. 1.1-1
h_o=2.5 in, b_o=6 in, h_o/b_o=0.41667	
b_1=0.57583 in	Eq. 1.1.2-3
b_2=1.1407 in	Eq. 1.1.2-4

Compression width=1.1628 in

b_1+b_2 > compression width (fully effective)

Element 3: Treat as two unstiffened elements

f_1=49.387 ksi, f_2=49.387 ksi

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.5032	Eq. 1.1-3
ρ=0.21121	Eq. 1.1-2
b=0.45215 in (ineffective width=1.6886 in)	Eq. 1.1-1

f_1=49.387 ksi, f_2=49.387 ksi

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=4.5032	Eq. 1.1-3
ρ=0.21121	Eq. 1.1-2
b=0.45215 in (ineffective width=1.6886 in)	Eq. 1.1-1

Element 5: No compressive stress (fully effective)

Element 4: Stiffened, w=2.2814 in

f_1=45.704 ksi, f_2=-43.964 ksi

ψ=0.96193	Eq. 1.1.2-1
k=23.027	Eq. 1.1.2-2
λ=0.63089	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.2814 in	Eq. 1.1-1
h_o=2.5 in, b_o=6 in, h_o/b_o=0.41667	
b_1=0.57583 in	Eq. 1.1.2-3
b_2=1.1407 in	Eq. 1.1.2-4

Compression width=1.1628 in

b_1+b_2 > compression width (fully effective)

Center of gravity shift: x=0.40552 in

Sye=0.14163 in^3, Fy=50 ksi

Mnl=7.0815 k-in	Eq. F3.1-1

Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud

Cw=2.3346 in^6, Wn=6.1407 in^2, Fy=50 ksi

Bn=19.009 k-in^2	G8.1-1

$\Omega b=1.67$, $\phi b=0.9$

600S250-33

Full Section Properties

Area	0.41350 in²	Wt.	0.0014059 k/ft	Flat	11.951 in
Ix	2.3830 in⁴	rx	2.4007 in	Ixy	0.0000 in⁴
Sx(t)	0.79434 in³	y(t)	3.0000 in	α	0.000 deg
Sx(b)	0.79434 in³	y(b)	3.0000 in		
Zx	0.91266 in³	Height	6.0000 in		
Iy	0.3561 in⁴	ry	0.9280 in	x_o	-1.8829 in
Sy(l)	0.46850 in³	x(l)	0.7600 in	y_o	0.0000 in
Sy(r)	0.20465 in³	x(r)	1.7400 in	jx	3.3583 in
Zy	0.30691 in³	Width	2.5000 in	jy	0.0000 in
I_1	2.3830 in⁴	r_1	2.4007 in	Cw	2.5859 in⁶
I_2	0.3561 in⁴	r_2	0.9280 in	J	0.0001650 in⁴
Ic	2.7391 in⁴	rc	2.5738 in		
I_o	4.2050 in⁴	r_o	3.1890 in		

Net Section Properties

Ix	2.3733 in⁴	rx	2.5619 in	Area	0.36160 in²
Sx(t)	0.79110 in³	y(t)	3.0000 in	Ixy	0.0000 in⁴
Sx(b)	0.79110 in³	y(b)	3.0000 in	α	0.000 deg
Zx	0.89320 in³				
Iy	0.3233 in⁴	ry	0.9456 in	x_o	-1.9942 in
Sy(l)	0.37309 in³	x(l)	0.8667 in	y_o	0.0000 in
Sy(r)	0.19796 in³	x(r)	1.6333 in	jx	3.1113 in
Zy	0.29483 in³			jy	0.0000 in
Ic	2.6966 in⁴	rc	2.7309 in	Cw	2.5732 in⁶
I_o	4.1346 in⁴	r_o	3.3815 in	J	0.0001443 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	7.443 k	ϕMnxo	23.347 k-in	ϕMnyo	8.201 k-in
Ae	0.17514 in²	Ixe	1.8657 in⁴	Iye	0.3038 in⁴
ϕTn	17.628 k	Sxe(t)	0.51882 in³	Sye(l)	0.36460 in³
		Sxe(b)	0.77611 in³	Sye(r)	0.18225 in³
Shear					
ϕVny	0.860 k	Negative Bending		Negative Bending	
ϕVnx	3.317 k	ϕMnxo	23.347 k-in	ϕMnyo	7.314 k-in
		Ixe	1.8657 in⁴	Iye	0.2040 in⁴
Torsion		Sxe(t)	0.77611 in³	Sye(l)	0.16253 in³
ϕBn	18.904 k-in²	Sxe(b)	0.51882 in³	Sye(r)	0.16388 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Fya=50.999 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Fya=52.32 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi Eq. A3.3.2-2
Fya=54.513 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength

Ag=0.4135 in², Fy=50.999 ksi	
Tn=21.088 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.3616 in², Fu=65 ksi	
Tn=23.504 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=1.843 k at 180 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=3.8779 k	Eq. G3-2
kv=4.1643	Eq. G3-8
Vcrh=0.49967 k	Eq. G3-6
Vn=0.9561 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=1.843 k at 0 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.514 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.98104	Eq. 1.1-3
ρ=0.79074	Eq. 1.1-2
b=0.40644 in (ineffective width=0.10756 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00035618 in⁴	Eq. 1.3-8
Is=0.00039155 in⁴ > Ia (no lip reduction)	
k=3.8782	Table 1.3-1
Element 2: Partially stiffened, w=2.278 in	
f=50 ksi, k=3.8782	
λ=1.4478	Eq. 1.1-3
ρ=0.58576	Eq. 1.1-2
b=1.3344 in (ineffective width=0.94364 in)	Eq. 1.1-1
b_1=0.66718 in, b_2=0.66718 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.0826	Eq. 1.1-3
ρ=0.23174	Eq. 1.1-2
b=0.4957 in (ineffective width=1.6433 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.0826	Eq. 1.1-3
ρ=0.23174	Eq. 1.1-2
b=0.4957 in (ineffective width=1.6433 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.514 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.98104	Eq. 1.1-3
ρ=0.79074	Eq. 1.1-2
b=0.40644 in (ineffective width=0.10756 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00035618 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.8782	Table 1.3-1
Element 4: Partially stiffened, w=2.278 in	
f=50 ksi, k=3.8782	
λ=1.4478	Eq. 1.1-3
ρ=0.58576	Eq. 1.1-2
b=1.3344 in (ineffective width=0.94364 in)	Eq. 1.1-1
b_1=0.66718 in, b_2=0.66718 in	
Ae=0.17514 in^2, Fn=50 ksi	
Pn=8.7568 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=5.778 in	
f_1=48.456 ksi, f_2=-31.898 ksi	
ψ=0.65829	Eq. 1.1.2-1
k=16.437	Eq. 1.1.2-2
λ=1.756	Eq. 1.1-3
ρ=0.49814	Eq. 1.1-2
be=2.8782 in	Eq. 1.1-1
h_o=6 in, b_o=2.5 in, h_o/b_o=2.4	
b_1=0.78677 in	Eq. 1.1.2-3
b_2=1.4391 in	Eq. 1.1.2-4
Compression width=3.4843 in	
Ineffective width=1.2584 in	
Element 5: Unstiffened, w=0.514 in	
f_1=48.456 ksi, f_2=41.308 ksi	
ψ=0.85248	Eq. 1.2.2-1
k=0.4847	Eq. 1.2.2-2
λ=0.90965	Eq. 1.1-3
ρ=0.83345	Eq. 1.1-2
b=0.42839 in (ineffective width=0.085606 in)	Eq. 1.1-1

Element 4: Check for lip stiffener reduction

S=31.166	Eq. 1.3-7
Ia=0.00035534 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.8782	Table 1.3-1

Element 4: Partially stiffened, w=2.278 in

f=49.759 ksi, k=3.8782	
λ=1.4443	Eq. 1.1-3
ρ=0.58692	Eq. 1.1-2
b=1.337 in (ineffective width=0.941 in)	Eq. 1.1-1
b_1=0.6685 in, b_2=0.6685 in	

Center of gravity shift: y=-0.59607 in

Sxe=0.51882 in^3, Fy=50 ksi

Mnl=25.941 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud

Element 1: Unstiffened, w=0.514 in

f_1=48.456 ksi, f_2=41.308 ksi	
ψ=0.85248	Eq. 1.2.2-1
k=0.4847	Eq. 1.2.2-2
λ=0.90965	Eq. 1.1-3
ρ=0.83345	Eq. 1.1-2
b=0.42839 in (ineffective width=0.085606 in)	Eq. 1.1-1

Element 2: Check for lip stiffener reduction

S=31.166	Eq. 1.3-7
Ia=0.00035534 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.8782	Table 1.3-1

Element 2: Partially stiffened, w=2.278 in

f=49.759 ksi, k=3.8782	
λ=1.4443	Eq. 1.1-3
ρ=0.58692	Eq. 1.1-2
b=1.337 in (ineffective width=0.941 in)	Eq. 1.1-1
b_1=0.6685 in, b_2=0.6685 in	

Element 3: Stiffened, w=5.778 in

f_1=48.456 ksi, f_2=-31.898 ksi	
ψ=0.65829	Eq. 1.1.2-1
k=16.437	Eq. 1.1.2-2
λ=1.756	Eq. 1.1-3
ρ=0.49814	Eq. 1.1-2
be=2.8782 in	Eq. 1.1-1
h_o=6 in, b_o=2.5 in, h_o/b_o=2.4	
b_1=0.78677 in	Eq. 1.1.2-3
b_2=1.4391 in	Eq. 1.1.2-4
Compression width=3.4843 in	
Ineffective width=1.2584 in	

Element 5: No compressive stress (fully effective)

Element 4: No compressive stress (fully effective)

Center of gravity shift: y=0.59607 in
Sxe=0.51882 in³, Fy=50 ksi
Mnl=25.941 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.514 in
f_1=49.481 ksi, f_2=49.481 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.97594 — Eq. 1.1-3
ρ=0.79367 — Eq. 1.1-2
b=0.40795 in (ineffective width=0.10605 in) — Eq. 1.1-1
Element 2: Stiffened, w=2.278 in
f_1=46.67 ksi, f_2=-21.664 ksi
ψ=0.46418 — Eq. 1.1.2-1
k=13.206 — Eq. 1.1.2-2
λ=0.75798 — Eq. 1.1-3
ρ=0.93638 — Eq. 1.1-2
be=2.1331 in — Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.61575 in — Eq. 1.1.2-3
b_2=1.0665 in — Eq. 1.1.2-4
Compression width=1.5558 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.514 in
f_1=49.481 ksi, f_2=49.481 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-2
λ=0.97594 — Eq. 1.1-3
ρ=0.79367 — Eq. 1.1-2
b=0.40795 in (ineffective width=0.10605 in) — Eq. 1.1-1
Element 4: Stiffened, w=2.278 in
f_1=46.67 ksi, f_2=-21.664 ksi
ψ=0.46418 — Eq. 1.1.2-1
k=13.206 — Eq. 1.1.2-2
λ=0.75798 — Eq. 1.1-3
ρ=0.93638 — Eq. 1.1-2
be=2.1331 in — Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.61575 in — Eq. 1.1.2-3
b_2=1.0665 in — Eq. 1.1.2-4
Compression width=1.5558 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=-0.033478 in
Sye=0.18225 in³, Fy=50 ksi
Mnl=9.1123 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis

Effective width calculations for Stud

Element 1: No compressive stress (fully effective)

Element 2: Stiffened, w=2.278 in

f_1=45.577 ksi, f_2=-45.184 ksi

ψ=0.99136	Eq. 1.1.2-1
k=23.776	Eq. 1.1.2-2
λ=0.55825	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.278 in	Eq. 1.1-1
h_o=2.5 in, b_o=6 in, h_o/b_o=0.41667	
b_1=0.57073 in	Eq. 1.1.2-3
b_2=1.139 in	Eq. 1.1.2-4
Compression width=1.1439 in	
b_1+b_2 > compression width (fully effective)	

Element 3: Treat as two unstiffened elements

f_1=49.311 ksi, f_2=49.311 ksi

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.0544	Eq. 1.1-3
ρ=0.23326	Eq. 1.1-2
b=0.49895 in (ineffective width=1.64 in)	Eq. 1.1-1
f_1=49.311 ksi, f_2=49.311 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=4.0544	Eq. 1.1-3
ρ=0.23326	Eq. 1.1-2
b=0.49895 in (ineffective width=1.64 in)	Eq. 1.1-1

Element 5: No compressive stress (fully effective)

Element 4: Stiffened, w=2.278 in

f_1=45.577 ksi, f_2=-45.184 ksi

ψ=0.99136	Eq. 1.1.2-1
k=23.776	Eq. 1.1.2-2
λ=0.55825	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.278 in	Eq. 1.1-1
h_o=2.5 in, b_o=6 in, h_o/b_o=0.41667	
b_1=0.57073 in	Eq. 1.1.2-3
b_2=1.139 in	Eq. 1.1.2-4
Compression width=1.1439 in	
b_1+b_2 > compression width (fully effective)	

Center of gravity shift: x=0.38852 in

Sye=0.16253 in^3, Fy=50 ksi

Mnl=8.1265 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud

Cw=2.5732 in^6, Wn=6.1253 in^2, Fy=50 ksi

Bn=21.005 k-in^2	G8.1-1

$\Omega b=1.67$, $\phi b=0.9$

600S250-43

Full Section Properties

Area	0.53708 in²	Wt.	0.0018261 k/ft	Flat	11.909 in
Ix	3.0827 in⁴	rx	2.3958 in	Ixy	0.0000 in⁴
Sx(t)	1.0276 in³	y(t)	3.0000 in	α	0.000 deg
Sx(b)	1.0276 in³	y(b)	3.0000 in		
Zx	1.1829 in³	Height	6.0000 in		
Iy	0.4579 in⁴	ry	0.9233 in	x_o	-1.8712 in
Sy(l)	0.6022 in³	x(l)	0.7604 in	y_o	0.0000 in
Sy(r)	0.2632 in³	x(r)	1.7396 in	jx	3.3499 in
Zy	0.3961 in³	Width	2.5000 in	jy	0.0000 in
I_1	3.0827 in⁴	r_1	2.3958 in	Cw	3.3076 in⁶
I_2	0.4579 in⁴	r_2	0.9233 in	J	0.0003641 in⁴
Ic	3.5406 in⁴	rc	2.5676 in		
I_o	5.4211 in⁴	r_o	3.1771 in		

Net Section Properties

Ix	3.0700 in⁴	rx	2.5573 in	Area	0.46943 in²
Sx(t)	1.0233 in³	y(t)	3.0000 in	Ixy	0.0000 in⁴
Sx(b)	1.0233 in³	y(b)	3.0000 in	α	0.000 deg
Zx	1.1575 in³				
Iy	0.4157 in⁴	ry	0.9411 in	x_o	-1.9822 in
Sy(l)	0.4797 in³	x(l)	0.8667 in	y_o	0.0000 in
Sy(r)	0.2545 in³	x(r)	1.6333 in	jx	3.1020 in
Zy	0.3807 in³			jy	0.0000 in
Ic	3.4858 in⁴	rc	2.7250 in	Cw	3.2912 in⁶
I_o	5.3302 in⁴	r_o	3.3697 in	J	0.0003183 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	10.691 k	ϕMnxo	35.681 k-in	ϕMnyo	11.234 k-in
Ae	0.25155 in²	Ixe	2.6464 in⁴	Iye	0.4097 in⁴
ϕTn	22.885 k	Sxe(t)	0.79291 in³	Sye(l)	0.47710 in³
		Sxe(b)	0.99400 in³	Sye(r)	0.24965 in³
Shear					
ϕVny	1.535 k	Negative Bending		Negative Bending	
ϕVnx	5.185 k	ϕMnxo	35.681 k-in	ϕMnyo	9.829 k-in
		Ixe	2.6464 in⁴	Iye	0.2843 in⁴
Torsion		Sxe(t)	0.99400 in³	Sye(l)	0.23724 in³
ϕBn	24.368 k-in²	Sxe(b)	0.79291 in³	Sye(r)	0.21842 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=51.221 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=52.838 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=55.542 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength

Ag=0.53708 in², Fy=51.221 ksi	
Tn=27.51 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.46943 in², Fu=65 ksi	
Tn=30.513 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=2.8807 k at 180 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=5.0382 k	Eq. G3-2
kv=4.163	Eq. G3-8
Vcrh=1.1072 k	Eq. G3-6
Vn=1.706 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=2.8807 k at 0 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.74488	Eq. 1.1-3
ρ=0.94599	Eq. 1.1-2
b=0.48123 in (ineffective width=0.027474 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00079003 in⁴	Eq. 1.3-8
Is=0.00049474 in⁴	
ds=0.30136 in (lip ineffective width=0.17987 in)	Eq. 1.3-6
k=3.3746	Table 1.3-1
Element 2: Partially stiffened, w=2.2674 in	
f=50 ksi, k=3.3746	
λ=1.1852	Eq. 1.1-3
ρ=0.68714	Eq. 1.1-2
b=1.558 in (ineffective width=0.70937 in)	Eq. 1.1-1
b_1=0.48785 in, b_2=1.0702 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=3.1243	Eq. 1.1-3
ρ=0.29753	Eq. 1.1-2
b=0.63484 in (ineffective width=1.4989 in)	Eq. 1.1-1

f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=3.1243	Eq. 1.1-3
ρ=0.29753	Eq. 1.1-2
b=0.63484 in (ineffective width=1.4989 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.5087 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.74488	Eq. 1.1-3
ρ=0.94599	Eq. 1.1-2
b=0.48123 in (ineffective width=0.027474 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00079003 in^4	Eq. 1.3-8
Is=0.00049474 in^4	
ds=0.30136 in (lip ineffective width=0.17987 in)	Eq. 1.3-6
k=3.3746	Table 1.3-1
Element 4: Partially stiffened, w=2.2674 in	
f=50 ksi, k=3.3746	
λ=1.1852	Eq. 1.1-3
ρ=0.68714	Eq. 1.1-2
b=1.558 in (ineffective width=0.70937 in)	Eq. 1.1-1
b_1=0.48785 in, b_2=1.0702 in	
Ae=0.25155 in^2, Fn=50 ksi	
Pn=12.577 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=5.7674 in	
f_1=48.257 ksi, f_2=-38.157 ksi	
ψ=0.7907	Eq. 1.1.2-1
k=19.066	Eq. 1.1.2-2
λ=1.246	Eq. 1.1-3
ρ=0.66087	Eq. 1.1-2
be=3.8115 in	Eq. 1.1-1
h_o=6 in, b_o=2.5 in, h_o/b_o=2.4	
b_1=1.0055 in	Eq. 1.1.2-3
b_2=1.9058 in	Eq. 1.1.2-4
Compression width=3.2207 in	
Ineffective width=0.3095 in	
Element 5: Unstiffened, w=0.5087 in	
f_1=48.257 ksi, f_2=40.635 ksi	
ψ=0.84206	Eq. 1.2.2-1
k=0.48898	Eq. 1.2.2-2
λ=0.68623	Eq. 1.1-3

ρ=0.99005	Eq. 1.1-2
b=0.50364 in (ineffective width=0.0050592 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.197	Eq. 1.3-7
Ia=0.00078742 in^4	Eq. 1.3-8
Is=0.00049474 in^4	
ds=0.31644 in (lip ineffective width=0.1872 in)	Eq. 1.3-6
k=3.3779	Table 1.3-1
Element 4: Partially stiffened, w=2.2674 in	
f=49.662 ksi, k=3.3779	
λ=1.1806	Eq. 1.1-3
ρ=0.6892	Eq. 1.1-2
b=1.5627 in (ineffective width=0.70471 in)	Eq. 1.1-1
b_1=0.49092 in, b_2=1.0718 in	
Center of gravity shift: y=-0.33761 in	
Sxe=0.79291 in^3, Fy=50 ksi	
Mnl=39.645 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	
f_1=48.257 ksi, f_2=40.635 ksi	
ψ=0.84206	Eq. 1.2.2-1
k=0.48898	Eq. 1.2.2-2
λ=0.68623	Eq. 1.1-3
ρ=0.99005	Eq. 1.1-2
b=0.50364 in (ineffective width=0.0050592 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.197	Eq. 1.3-7
Ia=0.00078742 in^4	Eq. 1.3-8
Is=0.00049474 in^4	
ds=0.31644 in (lip ineffective width=0.1872 in)	Eq. 1.3-6
k=3.3779	Table 1.3-1
Element 2: Partially stiffened, w=2.2674 in	
f=49.662 ksi, k=3.3779	
λ=1.1806	Eq. 1.1-3
ρ=0.6892	Eq. 1.1-2
b=1.5627 in (ineffective width=0.70471 in)	Eq. 1.1-1
b_1=0.49092 in, b_2=1.0718 in	
Element 3: Stiffened, w=5.7674 in	
f_1=48.257 ksi, f_2=-38.157 ksi	
ψ=0.7907	Eq. 1.1.2-1
k=19.066	Eq. 1.1.2-2
λ=1.246	Eq. 1.1-3
ρ=0.66087	Eq. 1.1-2
be=3.8115 in	Eq. 1.1-1
h_o=6 in, b_o=2.5 in, h_o/b_o=2.4	
b_1=1.0055 in	Eq. 1.1.2-3
b_2=1.9058 in	Eq. 1.1.2-4

Compression width=3.2207 in
Ineffective width=0.30951 in
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0.33761 in
Sxe=0.79291 in^3, Fy=50 ksi
Mnl=39.645 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.5087 in
f_1=49.313 ksi, f_2=49.313 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.73975 Eq. 1.1-3
ρ=0.94979 Eq. 1.1-2
b=0.48316 in (ineffective width=0.025543 in) Eq. 1.1-1
Element 2: Stiffened, w=2.2674 in
f_1=46.457 ksi, f_2=-22.621 ksi
ψ=0.48692 Eq. 1.1.2-1
k=13.549 Eq. 1.1.2-2
λ=0.57013 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.2674 in Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.65026 in Eq. 1.1.2-3
b_2=1.1337 in Eq. 1.1.2-4
Compression width=1.5249 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.5087 in
f_1=49.313 ksi, f_2=49.313 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.73975 Eq. 1.1-3
ρ=0.94979 Eq. 1.1-2
b=0.48316 in (ineffective width=0.025543 in) Eq. 1.1-1
Element 4: Stiffened, w=2.2674 in
f_1=46.457 ksi, f_2=-22.621 ksi
ψ=0.48692 Eq. 1.1.2-1
k=13.549 Eq. 1.1.2-2
λ=0.57013 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.2674 in Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.65026 in Eq. 1.1.2-3
b_2=1.1337 in Eq. 1.1.2-4
Compression width=1.5249 in
b_1+b_2 > compression width (fully effective)

Center of gravity shift: x=-0.0079445 in
Sye=0.24965 in³, Fy=50 ksi
Mnl=12.483 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=2.2674 in
f_1=41.481 ksi, f_2=-45.537 ksi
ψ=1.0978 Eq. 1.1.2-1
k=26.659 Eq. 1.1.2-2
λ=0.38407 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.2674 in Eq. 1.1-1
h_o=2.5 in, b_o=6 in, h_o/b_o=0.41667
b_1=0.55333 in Eq. 1.1.2-3
b_2=1.1337 in Eq. 1.1.2-4
Compression width=1.0809 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=45.079 ksi, f_2=45.079 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=2.9666 Eq. 1.1-3
ρ=0.31209 Eq. 1.1-2
b=0.6659 in (ineffective width=1.4678 in) Eq. 1.1-1
f_1=45.079 ksi, f_2=45.079 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=2.9666 Eq. 1.1-3
ρ=0.31209 Eq. 1.1-2
b=0.6659 in (ineffective width=1.4678 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=2.2674 in
f_1=41.481 ksi, f_2=-45.537 ksi
ψ=1.0978 Eq. 1.1.2-1
k=26.659 Eq. 1.1.2-2
λ=0.38407 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.2674 in Eq. 1.1-1
h_o=2.5 in, b_o=6 in, h_o/b_o=0.41667
b_1=0.55333 in Eq. 1.1.2-3
b_2=1.1337 in Eq. 1.1.2-4
Compression width=1.0809 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.33162 in
Sye=0.21842 in³, Fy=50 ksi
Mnl=10.921 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=3.2912 in^6, Wn=6.0779 in^2, Fy=50 ksi
Bn=27.075 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

600S250-54

Full Section Properties

Area	0.66954 in²	Wt.	0.0022764 k/ft	Flat	11.829 in
Ix	3.8197 in⁴	rx	2.3885 in	Ixy	0.0000 in⁴
Sx(t)	1.2732 in³	y(t)	3.0000 in	α	0.000 deg
Sx(b)	1.2732 in³	y(b)	3.0000 in		
Zx	1.4695 in³	Height	6.0000 in		
Iy	0.5627 in⁴	ry	0.9168 in	x_o	-1.8562 in
Sy(l)	0.7410 in³	x(l)	0.7594 in	y_o	0.0000 in
Sy(r)	0.3233 in³	x(r)	1.7406 in	jx	3.3427 in
Zy	0.4893 in³	Width	2.5000 in	jy	0.0000 in
I_1	3.8197 in⁴	r_1	2.3885 in	Cw	4.0375 in⁶
I_2	0.5627 in⁴	r_2	0.9168 in	J	0.0007150 in⁴
Ic	4.3824 in⁴	rc	2.5584 in		
I_o	6.6893 in⁴	r_o	3.1609 in		

Net Section Properties

Ix	3.8037 in⁴	rx	2.5507 in	Area	0.58464 in²
Sx(t)	1.2679 in³	y(t)	3.0000 in	Ixy	0.0000 in⁴
Sx(b)	1.2679 in³	y(b)	3.0000 in	α	0.000 deg
Zx	1.4377 in³				
Iy	0.5107 in⁴	ry	0.9347 in	x_o	-1.9671 in
Sy(l)	0.5900 in³	x(l)	0.8656 in	y_o	0.0000 in
Sy(r)	0.3125 in³	x(r)	1.6344 in	jx	3.0935 in
Zy	0.4704 in³			jy	0.0000 in
Ic	4.3145 in⁴	rc	2.7166 in	Cw	4.0172 in⁶
I_o	6.5767 in⁴	r_o	3.3540 in	J	0.0006243 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	14.537 k	ϕMnxo	47.429 k-in	ϕMnyo	15.981 k-in
Ae	0.34205 in²	Ixe	3.4124 in⁴	Iye	0.5107 in⁴
ϕTn	28.501 k	Sxe(t)	1.0540 in³	Sye(l)	0.5900 in³
		Sxe(b)	1.2353 in³	Sye(r)	0.3125 in³
Shear					
ϕVny	2.483 k	Negative Bending		Negative Bending	
ϕVnx	6.776 k	ϕMnxo	47.429 k-in	ϕMnyo	12.505 k-in
		Ixe	3.4124 in⁴	Iye	0.3800 in⁴
Torsion		Sxe(t)	1.2353 in³	Sye(l)	0.3355 in³
ϕBn	30.006 k-in²	Sxe(b)	1.0540 in³	Sye(r)	0.2779 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=51.526 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=53.509 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=56.825 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.66954 in², Fy=51.526 ksi

Tn=34.499 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.58464 in², Fu=65 ksi	
Tn=38.001 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=3.7645 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=6.2242 k	Eq. G3-2
kv=4.1568	Eq. G3-8
Vcrh=2.1944 k	Eq. G3-6
Vn=2.7594 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=3.7645 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4835 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56413	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0015382 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.16757 in (lip ineffective width=0.31593 in)	Eq. 1.3-6
k=2.8256	Table 1.3-1
Element 2: Partially stiffened, w=2.217 in	
f=50 ksi, k=2.8256	
λ=1.0091	Eq. 1.1-3
ρ=0.77494	Eq. 1.1-2
b=1.718 in (ineffective width=0.49896 in)	Eq. 1.1-1
b_1=0.29773 in, b_2=1.4203 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.4601	Eq. 1.1-3
ρ=0.37013	Eq. 1.1-2
b=0.78042 in (ineffective width=1.3281 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=2.4601	Eq. 1.1-3
ρ=0.37013	Eq. 1.1-2
b=0.78042 in (ineffective width=1.3281 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4835 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56413	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0015382 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.16757 in (lip ineffective width=0.31593 in)	Eq. 1.3-6
k=2.8256	Table 1.3-1
Element 4: Partially stiffened, w=2.217 in	
f=50 ksi, k=2.8256	
λ=1.0091	Eq. 1.1-3
ρ=0.77494	Eq. 1.1-2
b=1.718 in (ineffective width=0.49896 in)	Eq. 1.1-1
b_1=0.29773 in, b_2=1.4203 in	
Ae=0.34205 in^2, Fn=50 ksi	
Pn=17.103 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=5.717 in	
f_1=47.815 ksi, f_2=-40.48 ksi	
ψ=0.8466	Eq. 1.1.2-1
k=20.287	Eq. 1.1.2-2
λ=0.94968	Eq. 1.1-3
ρ=0.80906	Eq. 1.1-2
be=4.6254 in	Eq. 1.1-1
h_o=6 in, b_o=2.5 in, h_o/b_o=2.4	
b_1=1.2025 in	Eq. 1.1.2-3
b_2=2.3127 in	Eq. 1.1.2-4
Compression width=3.096 in	
b_1+b_2 > compression width (fully effective)	
Element 5: Unstiffened, w=0.4835 in	
f_1=47.815 ksi, f_2=40.347 ksi	
ψ=0.84383	Eq. 1.2.2-1
k=0.48825	Eq. 1.2.2-2
λ=0.51772	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.228	Eq. 1.3-7

Ia=0.0015317 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.16829 in (lip ineffective width=0.31521 in)	Eq. 1.3-6
k=2.829	Table 1.3-1
Element 4: Partially stiffened, w=2.217 in	
f=49.563 ksi, k=2.829	
λ=1.0041	Eq. 1.1-3
ρ=0.77773	Eq. 1.1-2
b=1.7242 in (ineffective width=0.49278 in)	Eq. 1.1-1
b_1=0.30007 in, b_2=1.4242 in	
Center of gravity shift: y=-0.23765 in	
Sxe=1.054 in^3, Fy=50 ksi	
Mnl=52.699 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4835 in	
f_1=47.815 ksi, f_2=40.347 ksi	
ψ=0.84383	Eq. 1.2.2-1
k=0.48825	Eq. 1.2.2-2
λ=0.51772	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.228	Eq. 1.3-7
Ia=0.0015317 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.16829 in (lip ineffective width=0.31521 in)	Eq. 1.3-6
k=2.829	Table 1.3-1
Element 2: Partially stiffened, w=2.217 in	
f=49.563 ksi, k=2.829	
λ=1.0041	Eq. 1.1-3
ρ=0.77773	Eq. 1.1-2
b=1.7242 in (ineffective width=0.49278 in)	Eq. 1.1-1
b_1=0.30007 in, b_2=1.4242 in	
Element 3: Stiffened, w=5.717 in	
f_1=47.815 ksi, f_2=-40.48 ksi	
ψ=0.8466	Eq. 1.1.2-1
k=20.287	Eq. 1.1.2-2
λ=0.94968	Eq. 1.1-3
ρ=0.80906	Eq. 1.1-2
be=4.6254 in	Eq. 1.1-1
h_o=6 in, b_o=2.5 in, h_o/b_o=2.4	
b_1=1.2025 in	Eq. 1.1.2-3
b_2=2.3127 in	Eq. 1.1.2-4
Compression width=3.096 in	
b_1+b_2 > compression width (fully effective)	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.23765 in	

Sxe=1.054 in³, Fy=50 ksi
Mnl=52.699 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.4835 in
f_1=55.841 ksi, f_2=55.841 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.59618 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 2: Stiffened, w=2.217 in
f_1=51.906 ksi, f_2=-25.176 ksi
ψ=0.48503 Eq. 1.1.2-1
k=13.52 Eq. 1.1.2-2
λ=0.47002 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.217 in Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.63615 in Eq. 1.1.2-3
b_2=1.1085 in Eq. 1.1.2-4
Compression width=1.4929 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.4835 in
f_1=55.841 ksi, f_2=55.841 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.59618 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 4: Stiffened, w=2.217 in
f_1=51.906 ksi, f_2=-25.176 ksi
ψ=0.48503 Eq. 1.1.2-1
k=13.52 Eq. 1.1.2-2
λ=0.47002 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.217 in Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.63615 in Eq. 1.1.2-3
b_2=1.1085 in Eq. 1.1.2-4
Compression width=1.4929 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0 in
Sye=0.31249 in³, Fy=56.825 ksi
Mnl=17.757 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud

Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=2.217 in
f_1=36.16 ksi, f_2=-44.831 ksi
ψ=1.2398 Eq. 1.1.2-1
k=30.952 Eq. 1.1.2-2
λ=0.25928 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.217 in Eq. 1.1-1
h_o=2.5 in, b_o=6 in, h_o/b_o=0.41667
b_1=0.52291 in Eq. 1.1.2-3
b_2=1.1085 in Eq. 1.1.2-4
Compression width=0.98983 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=40.296 ksi, f_2=40.296 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=2.2085 Eq. 1.1-3
ρ=0.40769 Eq. 1.1-2
b=0.85961 in (ineffective width=1.2489 in) Eq. 1.1-1
f_1=40.296 ksi, f_2=40.296 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=2.2085 Eq. 1.1-3
ρ=0.40769 Eq. 1.1-2
b=0.85961 in (ineffective width=1.2489 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=2.217 in
f_1=36.16 ksi, f_2=-44.831 ksi
ψ=1.2398 Eq. 1.1.2-1
k=30.952 Eq. 1.1.2-2
λ=0.25928 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.217 in Eq. 1.1-1
h_o=2.5 in, b_o=6 in, h_o/b_o=0.41667
b_1=0.52291 in Eq. 1.1.2-3
b_2=1.1085 in Eq. 1.1.2-4
Compression width=0.98983 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.26705 in
Sye=0.27788 in^3, Fy=50 ksi
Mnl=13.894 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=4.0172 in^6, Wn=6.0247 in^2, Fy=50 ksi
Bn=33.339 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

600S250-68

Full Section Properties

Area	0.83564 in²	Wt.	0.0028412 k/ft	Flat	11.720 in
Ix	4.7281 in⁴	rx	2.3787 in	Ixy	0.0000 in⁴
Sx(t)	1.5760 in³	y(t)	3.0000 in	α	0.000 deg
Sx(b)	1.5760 in³	y(b)	3.0000 in		
Zx	1.8255 in³	Height	6.0000 in		
Iy	0.6889 in⁴	ry	0.9080 in	x_o	-1.8364 in
Sy(l)	0.9090 in³	x(l)	0.7578 in	y_o	0.0000 in
Sy(r)	0.3954 in³	x(r)	1.7422 in	jx	3.3340 in
Zy	0.6032 in³	Width	2.5000 in	jy	0.0000 in
I_1	4.7281 in⁴	r_1	2.3787 in	Cw	4.8977 in⁶
I_2	0.6889 in⁴	r_2	0.9080 in	J	0.0014160 in⁴
Ic	5.4170 in⁴	rc	2.5461 in		
I_o	8.2350 in⁴	r_o	3.1392 in		

Net Section Properties

Ix	4.7080 in⁴	rx	2.5418 in	Area	0.72869 in²
Sx(t)	1.5693 in³	y(t)	3.0000 in	Ixy	0.0000 in⁴
Sx(b)	1.5693 in³	y(b)	3.0000 in	α	0.000 deg
Zx	1.7854 in³				
Iy	0.6249 in⁴	ry	0.9260 in	x_o	-1.9471 in
Sy(l)	0.7234 in³	x(l)	0.8638 in	y_o	0.0000 in
Sy(r)	0.3819 in³	x(r)	1.6362 in	jx	3.0831 in
Zy	0.5802 in³			jy	0.0000 in
Ic	5.3329 in⁴	rc	2.7053 in	Cw	4.8727 in⁶
I_o	8.0956 in⁴	r_o	3.3331 in	J	0.0012348 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	20.397 k	ϕMnxo	61.775 k-in	ϕMnyo	20.100 k-in
Ae	0.47994 in²	Ixe	4.3584 in⁴	Iye	0.6249 in⁴
ϕTn	35.524 k	Sxe(t)	1.3728 in³	Sye(l)	0.7234 in³
		Sxe(b)	1.5428 in³	Sye(r)	0.3819 in³
Shear					
ϕVny	3.971 k	Negative Bending		Negative Bending	
ϕVnx	8.253 k	ϕMnxo	61.775 k-in	ϕMnyo	15.860 k-in
		Ixe	4.3584 in⁴	Iye	0.5090 in⁴
Torsion		Sxe(t)	1.5428 in³	Sye(l)	0.4821 in³
ϕBn	36.815 k-in²	Sxe(b)	1.3728 in³	Sye(r)	0.3524 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=51.94 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=54.388 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=58.477 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.83564 in², Fy=51.94 ksi

Tn=43.404 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.72869 in², Fu=65 ksi	
Tn=47.365 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=4.5852 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=7.6601 k	Eq. G3-2
kv=4.1477	Eq. G3-8
Vcrh=4.4033 k	Eq. G3-6
Vn=4.4125 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=4.5852 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4468 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41383	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0026903 in⁴	Eq. 1.3-8
Is=0.00052997 in⁴	
ds=0.088017 in (lip ineffective width=0.35878 in)	Eq. 1.3-6
k=2.3644	Table 1.3-1
Element 2: Partially stiffened, w=2.1436 in	
f=50 ksi, k=2.3644	
λ=0.84669	Eq. 1.1-3
ρ=0.87418	Eq. 1.1-2
b=1.8739 in (ineffective width=0.2697 in)	Eq. 1.1-1
b_1=0.18457 in, b_2=1.6893 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.9189	Eq. 1.1-3
ρ=0.46138	Eq. 1.1-2
b=0.95588 in (ineffective width=1.1159 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=1.9189	Eq. 1.1-3
ρ=0.46138	Eq. 1.1-2
b=0.95588 in (ineffective width=1.1159 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4468 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41383	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0026903 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.088017 in (lip ineffective width=0.35878 in)	Eq. 1.3-6
k=2.3644	Table 1.3-1
Element 4: Partially stiffened, w=2.1436 in	
f=50 ksi, k=2.3644	
λ=0.84669	Eq. 1.1-3
ρ=0.87418	Eq. 1.1-2
b=1.8739 in (ineffective width=0.2697 in)	Eq. 1.1-1
b_1=0.18457 in, b_2=1.6893 in	
Ae=0.47994 in^2, Fn=50 ksi	
Pn=23.997 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=5.6436 in	
f_1=47.193 ksi, f_2=-41.692 ksi	
ψ=0.88342	Eq. 1.1.2-1
k=21.129	Eq. 1.1.2-2
λ=0.72447	Eq. 1.1-3
ρ=0.96116	Eq. 1.1-2
be=5.4244 in	Eq. 1.1-1
h_o=6 in, b_o=2.5 in, h_o/b_o=2.4	
b_1=1.3968 in	Eq. 1.1.2-3
b_2=2.7122 in	Eq. 1.1.2-4
Compression width=2.9965 in	
b_1+b_2 > compression width (fully effective)	
Element 5: Unstiffened, w=0.4468 in	
f_1=47.193 ksi, f_2=40.156 ksi	
ψ=0.85089	Eq. 1.2.2-1
k=0.48535	Eq. 1.2.2-2
λ=0.37843	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.267	Eq. 1.3-7

Ia=0.0026221 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.090306 in (lip ineffective width=0.35649 in)	Eq. 1.3-6
k=2.3772	Table 1.3-1
Element 4: Partially stiffened, w=2.1436 in	
f=49.439 ksi, k=2.3772	
λ=0.83967	Eq. 1.1-3
ρ=0.87891	Eq. 1.1-2
b=1.884 in (ineffective width=0.25957 in)	Eq. 1.1-1
b_1=0.1904 in, b_2=1.6936 in	
Center of gravity shift: y=-0.17489 in	
Sxe=1.3728 in^3, Fy=50 ksi	
Mnl=68.639 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4468 in	
f_1=47.193 ksi, f_2=40.156 ksi	
ψ=0.85089	Eq. 1.2.2-1
k=0.48535	Eq. 1.2.2-2
λ=0.37843	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.267	Eq. 1.3-7
Ia=0.0026221 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.090305 in (lip ineffective width=0.35649 in)	Eq. 1.3-6
k=2.3772	Table 1.3-1
Element 2: Partially stiffened, w=2.1436 in	
f=49.439 ksi, k=2.3772	
λ=0.83967	Eq. 1.1-3
ρ=0.87891	Eq. 1.1-2
b=1.884 in (ineffective width=0.25957 in)	Eq. 1.1-1
b_1=0.1904 in, b_2=1.6936 in	
Element 3: Stiffened, w=5.6436 in	
f_1=47.193 ksi, f_2=-41.692 ksi	
ψ=0.88342	Eq. 1.1.2-1
k=21.129	Eq. 1.1.2-2
λ=0.72447	Eq. 1.1-3
ρ=0.96116	Eq. 1.1-2
be=5.4244 in	Eq. 1.1-1
h_o=6 in, b_o=2.5 in, h_o/b_o=2.4	
b_1=1.3968 in	Eq. 1.1.2-3
b_2=2.7122 in	Eq. 1.1.2-4
Compression width=2.9965 in	
b_1+b_2 > compression width (fully effective)	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.17489 in	

Sxe=1.3728 in³, Fy=50 ksi
Mnl=68.639 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.4468 in
f_1=57.202 ksi, f_2=57.202 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.44264 — Eq. 1.1-3
λ<0.673 (fully effective) — Eq. 1.1-1
Element 2: Stiffened, w=2.1436 in
f_1=52.108 ksi, f_2=-24.505 ksi
ψ=0.47027 — Eq. 1.1.2-1
k=13.297 — Eq. 1.1.2-2
λ=0.36448 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=2.1436 in — Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.6177 in — Eq. 1.1.2-3
b_2=1.0718 in — Eq. 1.1.2-4
Compression width=1.458 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.4468 in
f_1=57.202 ksi, f_2=57.202 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.44264 — Eq. 1.1-3
λ<0.673 (fully effective) — Eq. 1.1-1
Element 4: Stiffened, w=2.1436 in
f_1=52.108 ksi, f_2=-24.505 ksi
ψ=0.47027 — Eq. 1.1.2-1
k=13.297 — Eq. 1.1.2-2
λ=0.36448 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=2.1436 in — Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.6177 in — Eq. 1.1.2-3
b_2=1.0718 in — Eq. 1.1.2-4
Compression width=1.458 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0 in
Sye=0.38192 in³, Fy=58.477 ksi
Mnl=22.334 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud

Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=2.1436 in
f_1=30.318 ksi, f_2=-43.836 ksi
ψ=1.4459 Eq. 1.1.2-1
k=38.156 Eq. 1.1.2-2
λ=0.16412 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.1436 in Eq. 1.1-1
h_o=2.5 in, b_o=6 in, h_o/b_o=0.41667
b_1=0.48215 in Eq. 1.1.2-3
b_2=1.0718 in Eq. 1.1.2-4
Compression width=0.87641 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=35.249 ksi, f_2=35.249 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.6112 Eq. 1.1-3
ρ=0.53591 Eq. 1.1-2
b=1.1103 in (ineffective width=0.9615 in) Eq. 1.1-1
f_1=35.249 ksi, f_2=35.249 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=1.6112 Eq. 1.1-3
ρ=0.53591 Eq. 1.1-2
b=1.1103 in (ineffective width=0.9615 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=2.1436 in
f_1=30.318 ksi, f_2=-43.836 ksi
ψ=1.4459 Eq. 1.1.2-1
k=38.156 Eq. 1.1.2-2
λ=0.16412 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.1436 in Eq. 1.1-1
h_o=2.5 in, b_o=6 in, h_o/b_o=0.41667
b_1=0.48215 in Eq. 1.1.2-3
b_2=1.0718 in Eq. 1.1.2-4
Compression width=0.87641 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.19195 in
Sye=0.35244 in^3, Fy=50 ksi
Mnl=17.622 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=4.8727 in^6, Wn=5.9559 in^2, Fy=50 ksi
Bn=40.906 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

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Full Section Properties

Area	0.37329 in²	Wt.	0.0012692 k/ft	Flat	11.964 in
Ix	3.2382 in⁴	rx	2.9453 in	Ixy	0.0000 in⁴
Sx(t)	0.80956 in³	y(t)	4.0000 in	α	0.000 deg
Sx(b)	0.80956 in³	y(b)	4.0000 in		
Zx	0.98462 in³	Height	8.0000 in		
Iy	0.1137 in⁴	ry	0.5519 in	x_o	-0.9339 in
Sy(l)	0.32843 in³	x(l)	0.3463 in	y_o	0.0000 in
Sy(r)	0.08893 in³	x(r)	1.2787 in	jx	4.8270 in
Zy	0.12481 in³	Width	1.6250 in	jy	0.0000 in
I_1	3.2382 in⁴	r_1	2.9453 in	Cw	1.4239 in⁶
I_2	0.1137 in⁴	r_2	0.5519 in	J	0.0001211 in⁴
Ic	3.3519 in⁴	rc	2.9966 in		
I_o	3.6775 in⁴	r_o	3.1388 in		

Net Section Properties

Ix	3.2295 in⁴	rx	3.1451 in	Area	0.32649 in²
Sx(t)	0.80736 in³	y(t)	4.0000 in	Ixy	0.0000 in⁴
Sx(b)	0.80736 in³	y(b)	4.0000 in	α	0.000 deg
Zx	0.96707 in³				
Iy	0.1079 in⁴	ry	0.5748 in	x_o	-0.9830 in
Sy(l)	0.27402 in³	x(l)	0.3937 in	y_o	0.0000 in
Sy(r)	0.08760 in³	x(r)	1.2313 in	jx	4.3279 in
Zy	0.12432 in³			jy	0.0000 in
Ic	3.3373 in⁴	rc	3.1972 in	Cw	1.4207 in⁶
I_o	3.6528 in⁴	r_o	3.3449 in	J	0.0001059 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	5.667 k	ϕMnxo	21.230 k-in	ϕMnyo	3.767 k-in
Ae	0.13333 in²	Ixe	2.5563 in⁴	Iye	0.1039 in⁴
ϕTn	15.916 k	Sxe(t)	0.53076 in³	Sye(l)	0.27082 in³
		Sxe(b)	0.80293 in³	Sye(r)	0.08371 in³
Shear					
ϕVny	0.673 k	Negative Bending		Negative Bending	
ϕVnx	2.328 k	ϕMnxo	21.230 k-in	ϕMnyo	3.188 k-in
		Ixe	2.5563 in⁴	Iye	0.0594 in⁴
Torsion		Sxe(t)	0.80293 in³	Sye(l)	0.07562 in³
ϕBn	12.792 k-in²	Sxe(b)	0.53076 in³	Sye(r)	0.07083 in³

```
Stud element 3 h/t exceeds 200.
```

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=50.92 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=53.235 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=55.114 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	

Axial Tension Strength

Ag=0.37329 in², Fy=50.92 ksi	
Tn=19.008 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.32649 in², Fu=65 ksi	
Tn=21.222 k	Eq. D3-1
Ωt=2, ϕt=0.75	

Shear Strength

Stud element 2	
Vn=1.2934 k at 180 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=5.7137 k	Eq. G3-2
kv=4.2793	Eq. G3-8
Vcrh=0.31856 k	Eq. G3-6
h/t exceeds 200 (rational analysis)	
Vn=0.84148 k at 90 deg	Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)	
Stud element 4	
Vn=1.2934 k at 0 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	

Axial Compression Strength

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3907 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.82697	Eq. 1.1-3
ρ=0.88754	Eq. 1.1-2
b=0.34676 in (ineffective width=0.043938 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00016273 in⁴	Eq. 1.3-8
Is=0.00015506 in⁴	
ds=0.33042 in (lip ineffective width=0.01634 in)	Eq. 1.3-6
k=3.4239	Table 1.3-1
Element 2: Partially stiffened, w=1.4064 in	
f=50 ksi, k=3.4239	
λ=1.055	Eq. 1.1-3
ρ=0.75023	Eq. 1.1-2
b=1.0551 in (ineffective width=0.35127 in)	Eq. 1.1-1
b_1=0.5027 in, b_2=0.55242 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3

λ=6.6477	Eq. 1.1-3
ρ=0.14545	Eq. 1.1-2
b=0.45681 in (ineffective width=2.6839 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=6.6477	Eq. 1.1-3
ρ=0.14545	Eq. 1.1-2
b=0.45681 in (ineffective width=2.6839 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.3907 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.82697	Eq. 1.1-3
ρ=0.88754	Eq. 1.1-2
b=0.34676 in (ineffective width=0.043938 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00016273 in^4	Eq. 1.3-8
Is=0.00015506 in^4	
ds=0.33042 in (lip ineffective width=0.016341 in)	Eq. 1.3-6
k=3.4239	Table 1.3-1
Element 4: Partially stiffened, w=1.4064 in	
f=50 ksi, k=3.4239	
λ=1.055	Eq. 1.1-3
ρ=0.75023	Eq. 1.1-2
b=1.0551 in (ineffective width=0.35127 in)	Eq. 1.1-1
b_1=0.5027 in, b_2=0.55242 in	
Ae=0.13333 in^2, Fn=50 ksi	
Pn=6.6666 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=7.7814 in	
h/t greater than 200, treat as rational analysis	
f_1=48.865 ksi, f_2=-31.942 ksi	
ψ=0.65368	Eq. 1.1.2-1
k=16.352	Eq. 1.1.2-2
λ=2.6404	Eq. 1.1-3
ρ=0.34718	Eq. 1.1-2
be=2.7015 in	Eq. 1.1-1
h_o=8 in, b_o=1.625 in, h_o/b_o=4.9231	
b_1=0.73939 in	Eq. 1.1.2-6
b_2=0.89424 in	Eq. 1.1.2-7
Compression width=4.7055 in	
Ineffective width=3.0719 in	
Element 5: Unstiffened, w=0.3907 in	

f_1=48.865 ksi, f_2=44.808 ksi	
ψ=0.91697	Eq. 1.2.2-1
k=0.45984	Eq. 1.2.2-2
λ=0.79056	Eq. 1.1-3
ρ=0.91292	Eq. 1.1-2
b=0.35668 in (ineffective width=0.034024 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.142	Eq. 1.3-7
Ia=0.00016247 in^4	Eq. 1.3-8
Is=0.00015506 in^4	
ds=0.3404 in (lip ineffective width=0.016272 in)	Eq. 1.3-6
k=3.4254	Table 1.3-1
Element 4: Partially stiffened, w=1.4064 in	
f=49.838 ksi, k=3.4254	
λ=1.053	Eq. 1.1-3
ρ=0.75126	Eq. 1.1-2
b=1.0566 in (ineffective width=0.34983 in)	Eq. 1.1-1
b_1=0.50418 in, b_2=0.55238 in	
Center of gravity shift: y=-0.81631 in	
Sxe=0.53076 in^3, Fy=50 ksi	
Mnl=26.538 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3907 in	
f_1=48.865 ksi, f_2=44.808 ksi	
ψ=0.91697	Eq. 1.2.2-1
k=0.45984	Eq. 1.2.2-2
λ=0.79056	Eq. 1.1-3
ρ=0.91292	Eq. 1.1-2
b=0.35668 in (ineffective width=0.034024 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.142	Eq. 1.3-7
Ia=0.00016247 in^4	Eq. 1.3-8
Is=0.00015506 in^4	
ds=0.3404 in (lip ineffective width=0.016272 in)	Eq. 1.3-6
k=3.4254	Table 1.3-1
Element 2: Partially stiffened, w=1.4064 in	
f=49.838 ksi, k=3.4254	
λ=1.053	Eq. 1.1-3
ρ=0.75126	Eq. 1.1-2
b=1.0566 in (ineffective width=0.34983 in)	Eq. 1.1-1
b_1=0.50418 in, b_2=0.55238 in	
Element 3: Stiffened, w=7.7814 in	
h/t greater than 200, treat as rational analysis	
f_1=48.865 ksi, f_2=-31.942 ksi	
ψ=0.65368	Eq. 1.1.2-1
k=16.352	Eq. 1.1.2-2
λ=2.6404	Eq. 1.1-3

ρ=0.34718	Eq. 1.1-2
be=2.7015 in	Eq. 1.1-1
h_o=8 in, b_o=1.625 in, h_o/b_o=4.9231	
b_1=0.73939 in	Eq. 1.1.2-6
b_2=0.89424 in	Eq. 1.1.2-7
Compression width=4.7055 in	
Ineffective width=3.0719 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.81631 in	
Sxe=0.53076 in^3, Fy=50 ksi	
Mnl=26.538 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3907 in	
f_1=49.372 ksi, f_2=49.372 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.82176	Eq. 1.1-3
ρ=0.89112	Eq. 1.1-2
b=0.34816 in (ineffective width=0.042541 in)	Eq. 1.1-1
Element 2: Stiffened, w=1.4064 in	
f_1=45.597 ksi, f_2=-11.052 ksi	
ψ=0.24239	Eq. 1.1.2-1
k=10.32	Eq. 1.1.2-2
λ=0.58027	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.4064 in	Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25	
b_1=0.43375 in	Eq. 1.1.2-3
b_2=0.7032 in	Eq. 1.1.2-4
Compression width=1.132 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.3907 in	
f_1=49.372 ksi, f_2=49.372 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=0.82176	Eq. 1.1-3
ρ=0.89112	Eq. 1.1-2
b=0.34816 in (ineffective width=0.042541 in)	Eq. 1.1-1
Element 4: Stiffened, w=1.4064 in	
f_1=45.597 ksi, f_2=-11.052 ksi	
ψ=0.24239	Eq. 1.1.2-1
k=10.32	Eq. 1.1.2-2
λ=0.58027	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.4064 in	Eq. 1.1-1

h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25
b_1=0.43375 in Eq. 1.1.2-3
b_2=0.7032 in Eq. 1.1.2-4
Compression width=1.132 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=-0.0099659 in
Sye=0.083711 in^3, Fy=50 ksi
Mnl=4.1855 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.4064 in
f_1=40.281 ksi, f_2=-43.49 ksi
ψ=1.0796 Eq. 1.1.2-1
k=26.148 Eq. 1.1.2-2
λ=0.34264 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.4064 in Eq. 1.1-1
h_o=1.625 in, b_o=8 in, h_o/b_o=0.20313
b_1=0.34474 in Eq. 1.1.2-3
b_2=0.7032 in Eq. 1.1.2-4
Compression width=0.67627 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=45.863 ksi, f_2=45.863 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=6.3667 Eq. 1.1-3
ρ=0.15164 Eq. 1.1-2
b=0.47625 in (ineffective width=2.6644 in) Eq. 1.1-1
f_1=45.863 ksi, f_2=45.863 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=6.3667 Eq. 1.1-3
ρ=0.15164 Eq. 1.1-2
b=0.47625 in (ineffective width=2.6644 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=1.4064 in
f_1=40.281 ksi, f_2=-43.49 ksi
ψ=1.0796 Eq. 1.1.2-1
k=26.148 Eq. 1.1.2-2
λ=0.34264 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.4064 in Eq. 1.1-1
h_o=1.625 in, b_o=8 in, h_o/b_o=0.20313
b_1=0.34474 in Eq. 1.1.2-3
b_2=0.7032 in Eq. 1.1.2-4
Compression width=0.67627 in

b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.3923 in
Sye=0.070833 in³, Fy=50 ksi
Mnl=3.5417 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=1.4207 in⁶, Wn=4.9977 in², Fy=50 ksi
Bn=14.214 k-in² G8.1-1
Ωb=1.67, ϕb=0.9

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Full Section Properties

Area	0.41350 in²	Wt.	0.0014059 k/ft	Flat	11.951 in
Ix	3.5823 in⁴	rx	2.9434 in	Ixy	0.0000 in⁴
Sx(t)	0.8956 in³	y(t)	4.0000 in	α	0.000 deg
Sx(b)	0.8956 in³	y(b)	4.0000 in		
Zx	1.0899 in³	Height	8.0000 in		
Iy	0.1253 in⁴	ry	0.5504 in	x_o	-0.9307 in
Sy(l)	0.3613 in³	x(l)	0.3467 in	y_o	0.0000 in
Sy(r)	0.0980 in³	x(r)	1.2783 in	jx	4.8302 in
Zy	0.1379 in³	Width	1.6250 in	jy	0.0000 in
I_1	3.5823 in⁴	r_1	2.9434 in	Cw	1.5670 in⁶
I_2	0.1253 in⁴	r_2	0.5504 in	J	0.0001650 in⁴
Ic	3.7075 in⁴	rc	2.9944 in		
I_o	4.0657 in⁴	r_o	3.1357 in		

Net Section Properties

Ix	3.5725 in⁴	rx	3.1432 in	Area	0.36160 in²
Sx(t)	0.8931 in³	y(t)	4.0000 in	Ixy	0.0000 in⁴
Sx(b)	0.8931 in³	y(b)	4.0000 in	α	0.000 deg
Zx	1.0704 in³				
Iy	0.1188 in⁴	ry	0.5733 in	x_o	-0.9797 in
Sy(l)	0.3016 in³	x(l)	0.3940 in	y_o	0.0000 in
Sy(r)	0.0965 in³	x(r)	1.2310 in	jx	4.3302 in
Zy	0.1373 in³			jy	0.0000 in
Ic	3.6914 in⁴	rc	3.1951 in	Cw	1.5635 in⁶
I_o	4.0384 in⁴	r_o	3.3419 in	J	0.0001443 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	6.443 k	ϕMnxo	24.153 k-in	ϕMnyo	4.259 k-in
Ae	0.15159 in²	Ixe	2.8803 in⁴	Iye	0.1169 in⁴
ϕTn	17.628 k	Sxe(t)	0.60382 in³	Sye(l)	0.30008 in³
		Sxe(b)	0.89176 in³	Sye(r)	0.09464 in³
Shear					
ϕVny	0.849 k	Negative Bending		Negative Bending	
ϕVnx	2.621 k	ϕMnxo	24.153 k-in	ϕMnyo	3.567 k-in
		Ixe	2.8803 in⁴	Iye	0.0680 in⁴
Torsion		Sxe(t)	0.89176 in³	Sye(l)	0.08863 in³
ϕBn	14.117 k-in²	Sxe(b)	0.60382 in³	Sye(r)	0.07926 in³

```
Stud element 3 h/t exceeds 200.
```

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=50.999 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=53.516 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=55.565 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	

Axial Tension Strength

Ag=0.4135 in², Fy=50.999 ksi	
Tn=21.088 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.3616 in², Fu=65 ksi	
Tn=23.504 k	Eq. D3-1
Ωt=2, ϕt=0.75	

Shear Strength

Stud element 2	
Vn=1.4563 k at 180 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=6.3321 k	Eq. G3-2
kv=4.279	Eq. G3-8
Vcrh=0.43457 k	Eq. G3-6
h/t exceeds 200 (rational analysis)	
Vn=1.0613 k at 90 deg	Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)	
Stud element 4	
Vn=1.4563 k at 0 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	

Axial Compression Strength

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.389 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.74246	Eq. 1.1-3
ρ=0.94778	Eq. 1.1-2
b=0.36869 in (ineffective width=0.020315 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00022212 in⁴	Eq. 1.3-8
Is=0.00016972 in⁴	
ds=0.28171 in (lip ineffective width=0.086971 in)	Eq. 1.3-6
k=3.2075	Table 1.3-1
Element 2: Partially stiffened, w=1.403 in	
f=50 ksi, k=3.2075	
λ=0.98047	Eq. 1.1-3
ρ=0.79107	Eq. 1.1-2
b=1.1099 in (ineffective width=0.29313 in)	Eq. 1.1-1
b_1=0.42403 in, b_2=0.68584 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3

λ=5.9912	Eq. 1.1-3
ρ=0.16078	Eq. 1.1-2
b=0.50469 in (ineffective width=2.6343 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=5.9912	Eq. 1.1-3
ρ=0.16078	Eq. 1.1-2
b=0.50469 in (ineffective width=2.6343 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.389 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.74246	Eq. 1.1-3
ρ=0.94778	Eq. 1.1-2
b=0.36869 in (ineffective width=0.020315 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00022212 in^4	Eq. 1.3-8
Is=0.00016972 in^4	
ds=0.28171 in (lip ineffective width=0.086971 in)	Eq. 1.3-6
k=3.2075	Table 1.3-1
Element 4: Partially stiffened, w=1.403 in	
f=50 ksi, k=3.2075	
λ=0.98047	Eq. 1.1-3
ρ=0.79107	Eq. 1.1-2
b=1.1099 in (ineffective width=0.29313 in)	Eq. 1.1-1
b_1=0.42403 in, b_2=0.68584 in	
Ae=0.15159 in^2, Fn=50 ksi	
Pn=7.5796 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=7.778 in	
h/t greater than 200, treat as rational analysis	
f_1=48.836 ksi, f_2=-32.693 ksi	
ψ=0.66944	Eq. 1.1.2-1
k=16.644	Eq. 1.1.2-2
λ=2.3582	Eq. 1.1-3
ρ=0.38449	Eq. 1.1-2
be=2.9906 in	Eq. 1.1-1
h_o=8 in, b_o=1.625 in, h_o/b_o=4.9231	
b_1=0.815 in	Eq. 1.1.2-6
b_2=0.97637 in	Eq. 1.1.2-7
Compression width=4.659 in	
Ineffective width=2.8677 in	
Element 5: Unstiffened, w=0.389 in	

f_1=48.836 ksi, f_2=44.759 ksi	
ψ=0.91651	Eq. 1.2.2-1
k=0.46001	Eq. 1.2.2-2
λ=0.70944	Eq. 1.1-3
ρ=0.97245	Eq. 1.1-2
b=0.37828 in (ineffective width=0.010716 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.148	Eq. 1.3-7
Ia=0.00022173 in^4	Eq. 1.3-8
Is=0.00016972 in^4	
ds=0.28956 in (lip ineffective width=0.088726 in)	Eq. 1.3-6
k=3.2091	Table 1.3-1
Element 4: Partially stiffened, w=1.403 in	
f=49.819 ksi, k=3.2091	
λ=0.97844	Eq. 1.1-3
ρ=0.79223	Eq. 1.1-2
b=1.1115 in (ineffective width=0.2915 in)	Eq. 1.1-1
b_1=0.4254 in, b_2=0.6861 in	
Center of gravity shift: y=-0.77011 in	
Sxe=0.60382 in^3, Fy=50 ksi	
Mnl=30.191 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	
Negative Flexural Strength about X-axis	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.389 in	
f_1=48.836 ksi, f_2=44.759 ksi	
ψ=0.91651	Eq. 1.2.2-1
k=0.46001	Eq. 1.2.2-2
λ=0.70944	Eq. 1.1-3
ρ=0.97245	Eq. 1.1-2
b=0.37828 in (ineffective width=0.010716 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.148	Eq. 1.3-7
Ia=0.00022173 in^4	Eq. 1.3-8
Is=0.00016972 in^4	
ds=0.28956 in (lip ineffective width=0.088726 in)	Eq. 1.3-6
k=3.2091	Table 1.3-1
Element 2: Partially stiffened, w=1.403 in	
f=49.819 ksi, k=3.2091	
λ=0.97844	Eq. 1.1-3
ρ=0.79223	Eq. 1.1-2
b=1.1115 in (ineffective width=0.2915 in)	Eq. 1.1-1
b_1=0.4254 in, b_2=0.6861 in	
Element 3: Stiffened, w=7.778 in	
h/t greater than 200, treat as rational analysis	
f_1=48.836 ksi, f_2=-32.693 ksi	
ψ=0.66944	Eq. 1.1.2-1
k=16.644	Eq. 1.1.2-2
λ=2.3582	Eq. 1.1-3

ρ=0.38449	Eq. 1.1-2
be=2.9906 in	Eq. 1.1-1
h_o=8 in, b_o=1.625 in, h_o/b_o=4.9231	
b_1=0.815 in	Eq. 1.1.2-6
b_2=0.97637 in	Eq. 1.1.2-7
Compression width=4.659 in	
Ineffective width=2.8677 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.77011 in	
Sxe=0.60382 in^3, Fy=50 ksi	
Mnl=30.191 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.389 in	
f_1=49.3 ksi, f_2=49.3 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.73725	Eq. 1.1-3
ρ=0.95164	Eq. 1.1-2
b=0.37019 in (ineffective width=0.018812 in)	Eq. 1.1-1
Element 2: Stiffened, w=1.403 in	
f_1=45.507 ksi, f_2=-11.277 ksi	
ψ=0.2478	Eq. 1.1.2-1
k=10.381	Eq. 1.1.2-2
λ=0.51993	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.403 in	Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25	
b_1=0.43199 in	Eq. 1.1.2-3
b_2=0.7015 in	Eq. 1.1.2-4
Compression width=1.1244 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.389 in	
f_1=49.3 ksi, f_2=49.3 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=0.73725	Eq. 1.1-3
ρ=0.95164	Eq. 1.1-2
b=0.37019 in (ineffective width=0.018812 in)	Eq. 1.1-1
Element 4: Stiffened, w=1.403 in	
f_1=45.507 ksi, f_2=-11.277 ksi	
ψ=0.2478	Eq. 1.1.2-1
k=10.381	Eq. 1.1.2-2
λ=0.51993	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.403 in	Eq. 1.1-1

h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25
b_1=0.43198 in Eq. 1.1.2-3
b_2=0.7015 in Eq. 1.1.2-4
Compression width=1.1244 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=-0.0043853 in
Sye=0.094639 in^3, Fy=50 ksi
Mnl=4.7319 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.403 in
f_1=38.196 ksi, f_2=-43.534 ksi
ψ=1.1397 Eq. 1.1.2-1
k=27.873 Eq. 1.1.2-2
λ=0.29071 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.403 in Eq. 1.1-1
h_o=1.625 in, b_o=8 in, h_o/b_o=0.20313
b_1=0.33891 in Eq. 1.1.2-3
b_2=0.7015 in Eq. 1.1.2-4
Compression width=0.65569 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=43.655 ksi, f_2=43.655 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=5.5982 Eq. 1.1-3
ρ=0.17161 Eq. 1.1-2
b=0.53868 in (ineffective width=2.6003 in) Eq. 1.1-1
f_1=43.655 ksi, f_2=43.655 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=5.5982 Eq. 1.1-3
ρ=0.17161 Eq. 1.1-2
b=0.53868 in (ineffective width=2.6003 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=1.403 in
f_1=38.197 ksi, f_2=-43.534 ksi
ψ=1.1397 Eq. 1.1.2-1
k=27.873 Eq. 1.1.2-2
λ=0.29071 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.403 in Eq. 1.1-1
h_o=1.625 in, b_o=8 in, h_o/b_o=0.20313
b_1=0.33891 in Eq. 1.1.2-3
b_2=0.7015 in Eq. 1.1.2-4
Compression width=0.65569 in

b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.37315 in
Sye=0.079261 in^3, Fy=50 ksi
Mnl=3.963 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=1.5635 in^6, Wn=4.9839 in^2, Fy=50 ksi
Bn=15.685 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

800S162-43

Full Section Properties

Area	0.53708 in²	Wt.	0.0018261 k/ft	Flat	11.909 in
Ix	4.6337 in⁴	rx	2.9373 in	Ixy	0.0000 in⁴
Sx(t)	1.1584 in³	y(t)	4.0000 in	α	0.000 deg
Sx(b)	1.1584 in³	y(b)	4.0000 in		
Zx	1.4124 in³	Height	8.0000 in		
Iy	0.1600 in⁴	ry	0.5458 in	x_o	-0.9209 in
Sy(l)	0.4596 in³	x(l)	0.3482 in	y_o	0.0000 in
Sy(r)	0.1253 in³	x(r)	1.2768 in	jx	4.8401 in
Zy	0.1778 in³	Width	1.6250 in	jy	0.0000 in
I_1	4.6337 in⁴	r_1	2.9373 in	Cw	1.9944 in⁶
I_2	0.1600 in⁴	r_2	0.5458 in	J	0.0003641 in⁴
Ic	4.7937 in⁴	rc	2.9876 in		
I_o	5.2492 in⁴	r_o	3.1263 in		

Net Section Properties

Ix	4.6210 in⁴	rx	3.1375 in	Area	0.46943 in²
Sx(t)	1.1553 in³	y(t)	4.0000 in	Ixy	0.0000 in⁴
Sx(b)	1.1553 in³	y(b)	4.0000 in	α	0.000 deg
Zx	1.3870 in³				
Iy	0.1518 in⁴	ry	0.5686 in	x_o	-0.9694 in
Sy(l)	0.3842 in³	x(l)	0.3951 in	y_o	0.0000 in
Sy(r)	0.1234 in³	x(r)	1.2299 in	jx	4.3374 in
Zy	0.1768 in³			jy	0.0000 in
Ic	4.7728 in⁴	rc	3.1886 in	Cw	1.9898 in⁶
I_o	5.2140 in⁴	r_o	3.3327 in	J	0.0003183 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	9.065 k	ϕMnxo	37.960 k-in	ϕMnyo	6.314 k-in
Ae	0.21330 in²	Ixe	3.9122 in⁴	Iye	0.1518 in⁴
ϕTn	22.885 k	Sxe(t)	0.8436 in³	Sye(l)	0.3842 in³
		Sxe(b)	1.1636 in³	Sye(r)	0.1234 in³
Shear					
ϕVny	1.723 k	Negative Bending		Negative Bending	
ϕVnx	3.391 k	ϕMnxo	37.960 k-in	ϕMnyo	4.750 k-in
		Ixe	3.9122 in⁴	Iye	0.0964 in⁴
Torsion		Sxe(t)	1.1636 in³	Sye(l)	0.1355 in³
ϕBn	18.12 k-in²	Sxe(b)	0.8436 in³	Sye(r)	0.1055 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=51.221 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=54.31 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=56.847 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.53708 in², Fy=51.221 ksi

Tn=27.51 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.46943 in², Fu=65 ksi	
Tn=30.513 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=1.8839 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=8.2364 k	Eq. G3-2
kv=4.2782	Eq. G3-8
Vcrh=0.96306 k	Eq. G3-6
Vn=1.9147 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=1.8839 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3837 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56184	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00048546 in⁴	Eq. 1.3-8
Is=0.00021231 in⁴	
ds=0.16781 in (lip ineffective width=0.21589 in)	Eq. 1.3-6
k=2.725	Table 1.3-1
Element 2: Partially stiffened, w=1.3924 in	
f=50 ksi, k=2.725	
λ=0.80992	Eq. 1.1-3
ρ=0.89931	Eq. 1.1-2
b=1.2522 in (ineffective width=0.1402 in)	Eq. 1.1-1
b_1=0.27382 in, b_2=0.97838 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.5886	Eq. 1.1-3
ρ=0.20748	Eq. 1.1-2
b=0.65019 in (ineffective width=2.4835 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=4.5886	Eq. 1.1-3
ρ=0.20748	Eq. 1.1-2
b=0.65019 in (ineffective width=2.4835 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.3837 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56184	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00048546 in^4	Eq. 1.3-8
Is=0.00021231 in^4	
ds=0.16781 in (lip ineffective width=0.21589 in)	Eq. 1.3-6
k=2.725	Table 1.3-1
Element 4: Partially stiffened, w=1.3924 in	
f=50 ksi, k=2.725	
λ=0.80992	Eq. 1.1-3
ρ=0.89931	Eq. 1.1-2
b=1.2522 in (ineffective width=0.1402 in)	Eq. 1.1-1
b_1=0.27382 in, b_2=0.97838 in	
Ae=0.2133 in^2, Fn=50 ksi	
Pn=10.665 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=7.7674 in	
f_1=48.746 ksi, f_2=-34.998 ksi	
ψ=0.71796	Eq. 1.1.2-1
k=17.577	Eq. 1.1.2-2
λ=1.7565	Eq. 1.1-3
ρ=0.498	Eq. 1.1-2
be=3.8682 in	Eq. 1.1-1
h_o=8 in, b_o=1.625 in, h_o/b_o=4.9231	
b_1=1.0404 in	Eq. 1.1.2-6
b_2=1.2112 in	Eq. 1.1.2-7
Compression width=4.5213 in	
Ineffective width=2.2697 in	
Element 5: Unstiffened, w=0.3837 in	
f_1=48.746 ksi, f_2=44.609 ksi	
ψ=0.91513	Eq. 1.2.2-1
k=0.46051	Eq. 1.2.2-2
λ=0.53606	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.167	Eq. 1.3-7

Ia=0.00048019 in^4	Eq. 1.3-8
Is=0.00021231 in^4	
ds=0.16965 in (lip ineffective width=0.21405 in)	Eq. 1.3-6
k=2.7322	Table 1.3-1
Element 4: Partially stiffened, w=1.3924 in	
f=49.757 ksi, k=2.7322	
λ=0.80687	Eq. 1.1-3
ρ=0.90143	Eq. 1.1-2
b=1.2552 in (ineffective width=0.13724 in)	Eq. 1.1-1
b_1=0.27748 in, b_2=0.97768 in	
Center of gravity shift: y=-0.63772 in	
Sxe=0.84356 in^3, Fy=50 ksi	
Mnl=42.178 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3837 in	
f_1=48.746 ksi, f_2=44.609 ksi	
ψ=0.91513	Eq. 1.2.2-1
k=0.46051	Eq. 1.2.2-2
λ=0.53606	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.167	Eq. 1.3-7
Ia=0.00048019 in^4	Eq. 1.3-8
Is=0.00021231 in^4	
ds=0.16965 in (lip ineffective width=0.21405 in)	Eq. 1.3-6
k=2.7322	Table 1.3-1
Element 2: Partially stiffened, w=1.3924 in	
f=49.757 ksi, k=2.7322	
λ=0.80687	Eq. 1.1-3
ρ=0.90143	Eq. 1.1-2
b=1.2552 in (ineffective width=0.13724 in)	Eq. 1.1-1
b_1=0.27748 in, b_2=0.97768 in	
Element 3: Stiffened, w=7.7674 in	
f_1=48.746 ksi, f_2=-34.998 ksi	
ψ=0.71796	Eq. 1.1.2-1
k=17.577	Eq. 1.1.2-2
λ=1.7565	Eq. 1.1-3
ρ=0.49801	Eq. 1.1-2
be=3.8682 in	Eq. 1.1-1
h_o=8 in, b_o=1.625 in, h_o/b_o=4.9231	
b_1=1.0404 in	Eq. 1.1.2-6
b_2=1.2112 in	Eq. 1.1.2-7
Compression width=4.5213 in	
Ineffective width=2.2697 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.63772 in	

```
  Sxe=0.84356 in³, Fy=50 ksi
  Mnl=42.178 k-in                                          Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
  Effective width calculations for Stud
    Element 1: Unstiffened, w=0.3837 in
      f₁=55.805 ksi, f₂=55.805 ksi
      ψ=1                                                  Eq. 1.2.2-1
      k=0.43                                               Eq. 1.2.2-3
      λ=0.59356                                            Eq. 1.1-3
      λ<0.673 (fully effective)                            Eq. 1.1-1
    Element 2: Stiffened, w=1.3924 in
      f₁=51.472 ksi, f₂=-12.886 ksi
      ψ=0.25034                                            Eq. 1.1.2-1
      k=10.41                                              Eq. 1.1.2-2
      λ=0.42043                                            Eq. 1.1-3
      ρ=1                                                  Eq. 1.1-2
      be=1.3924 in                                         Eq. 1.1-1
      h₀=1.625 in, b₀=0.5 in, h₀/b₀=3.25
      b₁=0.42839 in                                        Eq. 1.1.2-3
      b₂=0.6962 in                                         Eq. 1.1.2-4
      Compression width=1.1136 in
      b₁+b₂ > compression width (fully effective)
    Element 3: No compressive stress (fully effective)
    Element 5: Unstiffened, w=0.3837 in
      f₁=55.805 ksi, f₂=55.805 ksi
      ψ=1                                                  Eq. 1.2.2-1
      k=0.43                                               Eq. 1.2.2-3
      λ=0.59356                                            Eq. 1.1-3
      λ<0.673 (fully effective)                            Eq. 1.1-1
    Element 4: Stiffened, w=1.3924 in
      f₁=51.472 ksi, f₂=-12.886 ksi
      ψ=0.25034                                            Eq. 1.1.2-1
      k=10.41                                              Eq. 1.1.2-2
      λ=0.42043                                            Eq. 1.1-3
      ρ=1                                                  Eq. 1.1-2
      be=1.3924 in                                         Eq. 1.1-1
      h₀=1.625 in, b₀=0.5 in, h₀/b₀=3.25
      b₁=0.42839 in                                        Eq. 1.1.2-3
      b₂=0.6962 in                                         Eq. 1.1.2-4
      Compression width=1.1136 in
      b₁+b₂ > compression width (fully effective)
  Center of gravity shift: x=0 in
  Sye=0.12341 in³, Fy=56.847 ksi
  Mnl=7.0156 k-in                                          Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
  Effective width calculations for Stud
    Element 1: No compressive stress (fully effective)
    Element 2: Stiffened, w=1.3924 in
```

```
      f₁=32.511 ksi, f₂=-43.64 ksi
      ψ=1.3423                                          Eq. 1.1.2-1
      k=34.387                                          Eq. 1.1.2-2
      λ=0.18385                                         Eq. 1.1-3
      ρ=1                                               Eq. 1.1-2
      be=1.3924 in                                      Eq. 1.1-1
      h₀=1.625 in, b₀=8 in, h₀/b₀=0.20313
      b₁=0.32066 in                                     Eq. 1.1.2-3
      b₂=0.6962 in                                      Eq. 1.1.2-4
      Compression width=0.59445 in
      b₁+b₂ > compression width (fully effective)
    Element 3: Treat as two unstiffened elements
      f₁=37.638 ksi, f₂=37.638 ksi
      ψ=1                                               Eq. 1.2.2-1
      k=0.43                                            Eq. 1.2.2-3
      λ=3.9811                                          Eq. 1.1-3
      ρ=0.2373                                          Eq. 1.1-2
      b=0.74364 in (ineffective width=2.3901 in)        Eq. 1.1-1
      f₁=37.638 ksi, f₂=37.638 ksi
      ψ=1                                               Eq. 1.2.2-1
      k=0.43                                            Eq. 1.2.2-2
      λ=3.9811                                          Eq. 1.1-3
      ρ=0.2373                                          Eq. 1.1-2
      b=0.74364 in (ineffective width=2.3901 in)        Eq. 1.1-1
    Element 5: No compressive stress (fully effective)
    Element 4: Stiffened, w=1.3924 in
      f₁=32.511 ksi, f₂=-43.64 ksi
      ψ=1.3423                                          Eq. 1.1.2-1
      k=34.387                                          Eq. 1.1.2-2
      λ=0.18385                                         Eq. 1.1-3
      ρ=1                                               Eq. 1.1-2
      be=1.3924 in                                      Eq. 1.1-1
      h₀=1.625 in, b₀=8 in, h₀/b₀=0.20313
      b₁=0.32066 in                                     Eq. 1.1.2-3
      b₂=0.6962 in                                      Eq. 1.1.2-4
      Compression width=0.59445 in
      b₁+b₂ > compression width (fully effective)
  Center of gravity shift: x=0.31638 in
  Sye=0.10555 in³, Fy=50 ksi
  Mnl=5.2774 k-in                                       Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
  Cw=1.9898 in⁶, Wn=4.9416 in², Fy=50 ksi
  Bn=20.134 k-in²                                       G8.1-1
  Ωb=1.67, ϕb=0.9
```

800S162-54

Full Section Properties

Area	0.66954 in²	Wt.	0.0022764 k/ft	Flat	11.829 in
Ix	5.7363 in⁴	rx	2.9270 in	Ixy	0.0000 in⁴
Sx(t)	1.4341 in³	y(t)	4.0000 in	α	0.000 deg
Sx(b)	1.4341 in³	y(b)	4.0000 in		
Zx	1.7536 in³	Height	8.0000 in		
Iy	0.1947 in⁴	ry	0.5392 in	x_o	-0.9075 in
Sy(l)	0.5587 in³	x(l)	0.3484 in	y_o	0.0000 in
Sy(r)	0.1525 in³	x(r)	1.2766 in	jx	4.8623 in
Zy	0.2189 in³	Width	1.6250 in	jy	0.0000 in
I_1	5.7363 in⁴	r_1	2.9270 in	Cw	2.4153 in⁶
I_2	0.1947 in⁴	r_2	0.5392 in	J	0.0007150 in⁴
Ic	5.9310 in⁴	rc	2.9763 in		
I_o	6.4824 in⁴	r_o	3.1116 in		

Net Section Properties

Ix	5.7204 in⁴	rx	3.1280 in	Area	0.58464 in²
Sx(t)	1.4301 in³	y(t)	4.0000 in	Ixy	0.0000 in⁴
Sx(b)	1.4301 in³	y(b)	4.0000 in	α	0.000 deg
Zx	1.7218 in³				
Iy	0.1847 in⁴	ry	0.5621 in	x_o	-0.9557 in
Sy(l)	0.4677 in³	x(l)	0.3949 in	y_o	0.0000 in
Sy(r)	0.1502 in³	x(r)	1.2301 in	jx	4.3559 in
Zy	0.2174 in³			jy	0.0000 in
Ic	5.9051 in⁴	rc	3.1781 in	Cw	2.4098 in⁶
I_o	6.4390 in⁴	r_o	3.3187 in	J	0.0006243 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	13.156 k	ϕMnxo	54.221 k-in	ϕMnyo	7.894 k-in
Ae	0.30954 in²	Ixe	5.2650 in⁴	Iye	0.1847 in⁴
ϕTn	28.501 k	Sxe(t)	1.2049 in³	Sye(l)	0.4677 in³
		Sxe(b)	1.4503 in³	Sye(r)	0.1502 in³
Shear					
ϕVny	2.833 k	Negative Bending		Negative Bending	
ϕVnx	4.102 k	ϕMnxo	54.221 k-in	ϕMnyo	6.001 k-in
		Ixe	5.2650 in⁴	Iye	0.1301 in⁴
Torsion		Sxe(t)	1.4503 in³	Sye(l)	0.2005 in³
ϕBn	22.147 k-in²	Sxe(b)	1.2049 in³	Sye(r)	0.1334 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=51.526 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=55.318 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=58.416 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.66954 in², Fy=51.526 ksi

Tn=34.499 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.58464 in², Fu=65 ksi	
Tn=38.001 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=2.2787 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=10.234 k	Eq. G3-2
kv=4.2744	Eq. G3-8
Vcrh=1.9098 k	Eq. G3-6
Vn=3.1482 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=2.2787 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3585 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41829	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00033614 in⁴	Eq. 1.3-8
Is=0.00021732 in⁴	
ds=0.23177 in (lip ineffective width=0.12673 in)	Eq. 1.3-6
k=2.9231	Table 1.3-1
Element 2: Partially stiffened, w=1.342 in	
f=50 ksi, k=2.9231	
λ=0.60055	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=3.6269	Eq. 1.1-3
ρ=0.25899	Eq. 1.1-2
b=0.80508 in (ineffective width=2.3034 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=3.6269	Eq. 1.1-3

ρ=0.25899	Eq. 1.1-2
b=0.80508 in (ineffective width=2.3034 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.3585 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41829	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00033614 in^4	Eq. 1.3-8
Is=0.00021732 in^4	
ds=0.23177 in (lip ineffective width=0.12673 in)	Eq. 1.3-6
k=2.9231	Table 1.3-1
Element 4: Partially stiffened, w=1.342 in	
f=50 ksi, k=2.9231	
λ=0.60055	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Ae=0.30954 in^2, Fn=50 ksi	
Pn=15.477 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=7.717 in	
f_1=48.38 ksi, f_2=-39.95 ksi	
ψ=0.82575	Eq. 1.1.2-1
k=19.823	Eq. 1.1.2-2
λ=1.3045	Eq. 1.1-3
ρ=0.63731	Eq. 1.1-2
be=4.9182 in	Eq. 1.1-1
h_o=8 in, b_o=1.625 in, h_o/b_o=4.9231	
b_1=1.2855 in	Eq. 1.1.2-6
b_2=1.4082 in	Eq. 1.1.2-7
Compression width=4.2267 in	
Ineffective width=1.533 in	
Element 5: Unstiffened, w=0.3585 in	
f_1=48.38 ksi, f_2=44.277 ksi	
ψ=0.91518	Eq. 1.2.2-1
k=0.46049	Eq. 1.2.2-2
λ=0.3976	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.192	Eq. 1.3-7
Ia=0.00033044 in^4	Eq. 1.3-8
Is=0.00021732 in^4	
ds=0.23578 in (lip ineffective width=0.12272 in)	Eq. 1.3-6
k=2.9392	Table 1.3-1

Element 4: Partially stiffened, w=1.342 in
f=49.676 ksi, k=2.9392
λ=0.59696 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Center of gravity shift: y=-0.36967 in
Sxe=1.2049 in^3, Fy=50 ksi
Mnl=60.245 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3585 in
f_1=48.38 ksi, f_2=44.277 ksi
ψ=0.91518 Eq. 1.2.2-1
k=0.46049 Eq. 1.2.2-2
λ=0.3976 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.192 Eq. 1.3-7
Ia=0.00033044 in^4 Eq. 1.3-8
Is=0.00021732 in^4
ds=0.23578 in (lip ineffective width=0.12272 in) Eq. 1.3-6
k=2.9392 Table 1.3-1
Element 2: Partially stiffened, w=1.342 in
f=49.676 ksi, k=2.9392
λ=0.59696 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 3: Stiffened, w=7.717 in
f_1=48.38 ksi, f_2=-39.95 ksi
ψ=0.82575 Eq. 1.1.2-1
k=19.823 Eq. 1.1.2-2
λ=1.3045 Eq. 1.1-3
ρ=0.63731 Eq. 1.1-2
be=4.9182 in Eq. 1.1-1
h_o=8 in, b_o=1.625 in, h_o/b_o=4.9231
b_1=1.2855 in Eq. 1.1.2-6
b_2=1.4082 in Eq. 1.1.2-7
Compression width=4.2267 in
Ineffective width=1.533 in
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0.36967 in
Sxe=1.2049 in^3, Fy=50 ksi
Mnl=60.245 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3585 in
f_1=57.072 ksi, f_2=57.072 ksi

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.44689	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=1.342 in	
f_1=51.696 ksi, f_2=-12.036 ksi	
ψ=0.23282	Eq. 1.1.2-1
k=10.213	Eq. 1.1.2-2
λ=0.32669	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.342 in	Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25	
b_1=0.41512 in	Eq. 1.1.2-3
b_2=0.92688 in	Eq. 1.1.2-5
Compression width=1.0886 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.3585 in	
f_1=57.072 ksi, f_2=57.072 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.44689	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Stiffened, w=1.342 in	
f_1=51.696 ksi, f_2=-12.036 ksi	
ψ=0.23282	Eq. 1.1.2-1
k=10.213	Eq. 1.1.2-2
λ=0.32669	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.342 in	Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25	
b_1=0.41512 in	Eq. 1.1.2-3
b_2=0.92688 in	Eq. 1.1.2-5
Compression width=1.0886 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0 in	
Sye=0.15015 in^3, Fy=58.416 ksi	
Mnl=8.7713 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: Stiffened, w=1.342 in	
f_1=25.945 ksi, f_2=-42.756 ksi	
ψ=1.6479	Eq. 1.1.2-1
k=46.428	Eq. 1.1.2-2
λ=0.10855	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.342 in	Eq. 1.1-1

h_o=1.625 in, b_o=8 in, h_o/b_o=0.20313
b_1=0.28873 in — Eq. 1.1.2-3
b_2=0.671 in — Eq. 1.1.2-4
Compression width=0.50681 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=31.74 ksi, f_2=31.74 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=2.8897 — Eq. 1.1-3
ρ=0.31971 — Eq. 1.1-2
b=0.99381 in (ineffective width=2.1147 in) — Eq. 1.1-1
f_1=31.741 ksi, f_2=31.741 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-2
λ=2.8897 — Eq. 1.1-3
ρ=0.31971 — Eq. 1.1-2
b=0.99381 in (ineffective width=2.1147 in) — Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=1.342 in
f_1=25.945 ksi, f_2=-42.756 ksi
ψ=1.6479 — Eq. 1.1.2-1
k=46.428 — Eq. 1.1.2-2
λ=0.10855 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=1.342 in — Eq. 1.1-1
h_o=1.625 in, b_o=8 in, h_o/b_o=0.20313
b_1=0.28873 in — Eq. 1.1.2-3
b_2=0.671 in — Eq. 1.1.2-4
Compression width=0.50681 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.25421 in
Sye=0.13336 in^3, Fy=50 ksi
Mnl=6.6681 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=2.4098 in^6, Wn=4.8964 in^2, Fy=50 ksi
Bn=24.608 k-in^2 — G8.1-1
Ωb=1.67, ϕb=0.9

800S162-68

Full Section Properties

Area	0.83564 in²	Wt.	0.0028412 k/ft	Flat	11.720 in
Ix	7.0906 in⁴	rx	2.9129 in	Ixy	0.0000 in⁴
Sx(t)	1.7727 in³	y(t)	4.0000 in	α	0.000 deg
Sx(b)	1.7727 in³	y(b)	4.0000 in		
Zx	2.1766 in³	Height	8.0000 in		
Iy	0.2351 in⁴	ry	0.5304 in	x_o	-0.8898 in
Sy(l)	0.6746 in³	x(l)	0.3485 in	y_o	0.0000 in
Sy(r)	0.1842 in³	x(r)	1.2765 in	jx	4.8945 in
Zy	0.2687 in³	Width	1.6250 in	jy	0.0000 in
I_1	7.0906 in⁴	r_1	2.9129 in	Cw	2.8975 in⁶
I_2	0.2351 in⁴	r_2	0.5304 in	J	0.0014160 in⁴
Ic	7.3257 in⁴	rc	2.9608 in		
I_o	7.9873 in⁴	r_o	3.0916 in		

Net Section Properties

Ix	7.0706 in⁴	rx	3.1150 in	Area	0.72869 in²
Sx(t)	1.7676 in³	y(t)	4.0000 in	Ixy	0.0000 in⁴
Sx(b)	1.7676 in³	y(b)	4.0000 in	α	0.000 deg
Zx	2.1364 in³				
Iy	0.2230 in⁴	ry	0.5533 in	x_o	-0.9373 in
Sy(l)	0.5655 in³	x(l)	0.3944 in	y_o	0.0000 in
Sy(r)	0.1813 in³	x(r)	1.2306 in	jx	4.3831 in
Zy	0.2662 in³			jy	0.0000 in
Ic	7.2936 in⁴	rc	3.1637 in	Cw	2.8908 in⁶
I_o	7.9338 in⁴	r_o	3.2997 in	J	0.0012348 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	18.390 k	ϕMnxo	74.131 k-in	ϕMnyo	9.856 k-in
Ae	0.43271 in²	Ixe	6.8515 in⁴	Iye	0.2230 in⁴
ϕTn	35.524 k	Sxe(t)	1.6474 in³	Sye(l)	0.5655 in³
		Sxe(b)	1.7838 in³	Sye(r)	0.1813 in³
Shear					
ϕVny	4.647 k	Negative Bending		Negative Bending	
ϕVnx	4.884 k	ϕMnxo	74.131 k-in	ϕMnyo	7.517 k-in
		Ixe	6.8515 in⁴	Iye	0.1748 in⁴
Torsion		Sxe(t)	1.7838 in³	Sye(l)	0.3022 in³
ϕBn	26.886 k-in²	Sxe(b)	1.6474 in³	Sye(r)	0.1671 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=51.94 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=56.625 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=60.418 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.83564 in², Fy=51.94 ksi

Tn=43.404 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.72869 in², Fu=65 ksi	
Tn=47.365 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=2.7135 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=12.703 k	Eq. G3-2
kv=4.2688	Eq. G3-8
Vcrh=3.8356 k	Eq. G3-6
Vn=5.1631 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=2.7135 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3218 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.29806	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00015029 in⁴	Eq. 1.3-8
Is=0.000198 in⁴ > Ia (no lip reduction)	
k=3.2793	Table 1.3-1
Element 2: Partially stiffened, w=1.2686 in	
f=50 ksi, k=3.2793	
λ=0.42548	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.8451	Eq. 1.1-3
ρ=0.3243	Eq. 1.1-2
b=0.99618 in (ineffective width=2.0756 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.8451	Eq. 1.1-3
ρ=0.3243	Eq. 1.1-2

b=0.99618 in (ineffective width=2.0756 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.3218 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.29806	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00015029 in^4	Eq. 1.3-8
Is=0.000198 in^4 > Ia (no lip reduction)	
k=3.2793	Table 1.3-1
Element 4: Partially stiffened, w=1.2686 in	
f=50 ksi, k=3.2793	
λ=0.42548	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Ae=0.43271 in^2, Fn=50 ksi	
Pn=21.635 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=7.6436 in	
f_1=47.857 ksi, f_2=-44.043 ksi	
ψ=0.9203	Eq. 1.1.2-1
k=22.003	Eq. 1.1.2-2
λ=0.96826	Eq. 1.1-3
ρ=0.79812	Eq. 1.1-2
be=6.1005 in	Eq. 1.1-1
h_o=8 in, b_o=1.625 in, h_o/b_o=4.9231	
b_1=1.5561 in	Eq. 1.1.2-6
b_2=1.6207 in	Eq. 1.1.2-7
Compression width=3.9804 in	
Ineffective width=0.80356 in	
Element 5: Unstiffened, w=0.3218 in	
f_1=47.857 ksi, f_2=43.988 ksi	
ψ=0.91915	Eq. 1.2.2-1
k=0.45904	Eq. 1.2.2-2
λ=0.28223	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.225	Eq. 1.3-7
Ia=0.0001458 in^4	Eq. 1.3-8
Is=0.000198 in^4 > Ia (no lip reduction)	
k=3.2793	Table 1.3-1
Element 4: Partially stiffened, w=1.2686 in	
f=49.571 ksi, k=3.2793	
λ=0.42365	Eq. 1.1-3

$\lambda<0.673$ (fully effective)	Eq. 1.1-1
Center of gravity shift: y=-0.15906 in	
Sxe=1.6474 in^3, Fy=50 ksi	
Mnl=82.368 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3218 in	
f_1=47.857 ksi, f_2=43.988 ksi	
ψ=0.91915	Eq. 1.2.2-1
k=0.45904	Eq. 1.2.2-2
λ=0.28223	Eq. 1.1-3
$\lambda<0.673$ (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.225	Eq. 1.3-7
Ia=0.0001458 in^4	Eq. 1.3-8
Is=0.000198 in^4 > Ia (no lip reduction)	
k=3.2793	Table 1.3-1
Element 2: Partially stiffened, w=1.2686 in	
f=49.571 ksi, k=3.2793	
λ=0.42365	Eq. 1.1-3
$\lambda<0.673$ (fully effective)	Eq. 1.1-1
Element 3: Stiffened, w=7.6436 in	
f_1=47.857 ksi, f_2=-44.043 ksi	
ψ=0.9203	Eq. 1.1.2-1
k=22.003	Eq. 1.1.2-2
λ=0.96826	Eq. 1.1-3
ρ=0.79812	Eq. 1.1-2
be=6.1005 in	Eq. 1.1-1
h_o=8 in, b_o=1.625 in, h_o/b_o=4.9231	
b_1=1.5561 in	Eq. 1.1.2-6
b_2=1.6207 in	Eq. 1.1.2-7
Compression width=3.9804 in	
Ineffective width=0.80356 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.15906 in	
Sxe=1.6474 in^3, Fy=50 ksi	
Mnl=82.368 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3218 in	
f_1=58.668 ksi, f_2=58.668 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.32286	Eq. 1.1-3
$\lambda<0.673$ (fully effective)	Eq. 1.1-1

Element 2: Stiffened, w=1.2686 in
f_1=51.669 ksi, f_2=-10.617 ksi
ψ=0.20547 Eq. 1.1.2-1
k=9.9144 Eq. 1.1.2-2
λ=0.24875 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.2686 in Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25
b_1=0.39576 in Eq. 1.1.2-3
b_2=0.87284 in Eq. 1.1.2-5
Compression width=1.0524 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.3218 in
f_1=58.668 ksi, f_2=58.668 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.32286 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 4: Stiffened, w=1.2686 in
f_1=51.669 ksi, f_2=-10.617 ksi
ψ=0.20547 Eq. 1.1.2-1
k=9.9144 Eq. 1.1.2-2
λ=0.24875 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.2686 in Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25
b_1=0.39576 in Eq. 1.1.2-3
b_2=0.87284 in Eq. 1.1.2-5
Compression width=1.0524 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0 in
Sye=0.18125 in^3, Fy=60.418 ksi
Mnl=10.951 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.2686 in
f_1=19.071 ksi, f_2=-41.493 ksi
ψ=2.1757 Eq. 1.1.2-1
k=74.405 Eq. 1.1.2-2
λ=0.055166 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.2686 in Eq. 1.1-1
h_o=1.625 in, b_o=8 in, h_o/b_o=0.20313
b_1=0.24511 in Eq. 1.1.2-3
b_2=0.6343 in Eq. 1.1.2-4
Compression width=0.39947 in

b_1+b_2 > compression width (fully effective)

Element 3: Treat as two unstiffened elements

f_1=25.876 ksi, f_2=25.876 ksi

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.0468	Eq. 1.1-3
ρ=0.43606	Eq. 1.1-2
b=1.3395 in (ineffective width=1.7323 in)	Eq. 1.1-1

f_1=25.876 ksi, f_2=25.876 ksi

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=2.0468	Eq. 1.1-3
ρ=0.43606	Eq. 1.1-2
b=1.3395 in (ineffective width=1.7323 in)	Eq. 1.1-1

Element 5: No compressive stress (fully effective)

Element 4: Stiffened, w=1.2686 in

f_1=19.071 ksi, f_2=-41.493 ksi

ψ=2.1757	Eq. 1.1.2-1
k=74.405	Eq. 1.1.2-2
λ=0.055166	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.2686 in	Eq. 1.1-1

h_o=1.625 in, b_o=8 in, h_o/b_o=0.20313

b_1=0.24511 in	Eq. 1.1.2-3
b_2=0.6343 in	Eq. 1.1.2-4

Compression width=0.39947 in

b_1+b_2 > compression width (fully effective)

Center of gravity shift: x=0.18401 in

Sye=0.16705 in^3, Fy=50 ksi

Mnl=8.3526 k-in	Eq. F3.1-1

Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud

Cw=2.8908 in^6, Wn=4.8385 in^2, Fy=50 ksi

Bn=29.873 k-in^2	G8.1-1

Ωb=1.67, ϕb=0.9

800S200-30

Full Section Properties

Area	0.40449 in²	Wt.	0.0013753 k/ft	Flat	12.964 in
Ix	3.7019 in⁴	rx	3.0252 in	Ixy	0.0000 in⁴
Sx(t)	0.9255 in³	y(t)	4.0000 in	α	0.000 deg
Sx(b)	0.9255 in³	y(b)	4.0000 in		
Zx	1.1047 in³	Height	8.0000 in		
Iy	0.2062 in⁴	ry	0.7140 in	x_o	-1.2871 in
Sy(l)	0.4231 in³	x(l)	0.4875 in	y_o	0.0000 in
Sy(r)	0.1364 in³	x(r)	1.5125 in	jx	4.3924 in
Zy	0.1920 in³	Width	2.0000 in	jy	0.0000 in
I_1	3.7019 in⁴	r_1	3.0252 in	Cw	2.6118 in⁶
I_2	0.2062 in⁴	r_2	0.7140 in	J	0.0001312 in⁴
Ic	3.9081 in⁴	rc	3.1084 in		
I_o	4.5782 in⁴	r_o	3.3643 in		

Net Section Properties

Ix	3.6931 in⁴	rx	3.2133 in	Area	0.35769 in²
Sx(t)	0.9233 in³	y(t)	4.0000 in	Ixy	0.0000 in⁴
Sx(b)	0.9233 in³	y(b)	4.0000 in	α	0.000 deg
Zx	1.0871 in³				
Iy	0.1944 in⁴	ry	0.7373 in	x_o	-1.3508 in
Sy(l)	0.3541 in³	x(l)	0.5492 in	y_o	0.0000 in
Sy(r)	0.1340 in³	x(r)	1.4508 in	jx	3.9885 in
Zy	0.1914 in³			jy	0.0000 in
Ic	3.8876 in⁴	rc	3.2968 in	Cw	2.6059 in⁶
I_o	4.5402 in⁴	r_o	3.5628 in	J	0.0001161 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	5.971 k	ϕMnxo	22.467 k-in	ϕMnyo	5.342 k-in
Ae	0.14049 in²	Ixe	2.7726 in⁴	Iye	0.1764 in⁴
ϕTn	17.437 k	Sxe(t)	0.56168 in³	Sye(l)	0.34316 in³
		Sxe(b)	0.90499 in³	Sye(r)	0.11872 in³
Shear					
ϕVny	0.676 k	Negative Bending		Negative Bending	
ϕVnx	2.609 k	ϕMnxo	22.467 k-in	ϕMnyo	4.641 k-in
		Ixe	2.7726 in⁴	Iye	0.1050 in⁴
Torsion		Sxe(t)	0.90498 in³	Sye(l)	0.10313 in³
ϕBn	18.677 k-in²	Sxe(b)	0.56168 in³	Sye(r)	0.10689 in³

```
Stud element 3 h/t exceeds 200.
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Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=50.849 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=52.65 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=54.15 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	

Axial Tension Strength
Ag=0.40449 in², Fy=50.849 ksi
Tn=20.568 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.35769 in², Fu=65 ksi
Tn=23.25 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Stud element 2
Vn=1.4492 k at 180 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Stud element 3
Vyh=5.7137 k — Eq. G3-2
kv=4.3068 — Eq. G3-8
Vcrh=0.32061 k — Eq. G3-6
h/t exceeds 200 (rational analysis)
Vn=0.84485 k at 90 deg — Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)
Stud element 4
Vn=1.4492 k at 0 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Stud
Element 1: Unstiffened, w=0.5157 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=1.0916 — Eq. 1.1-3
ρ=0.73148 — Eq. 1.1-2
b=0.37723 in (ineffective width=0.13847 in) — Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.091 — Eq. 1.3-7
Ia=0.00020486 in⁴ — Eq. 1.3-8
Is=0.00035659 in⁴ > Ia (no lip reduction)
k=3.4958 — Table 1.3-1
Element 2: Partially stiffened, w=1.7814 in
f=50 ksi, k=3.4958
λ=1.3224 — Eq. 1.1-3
ρ=0.63039 — Eq. 1.1-2
b=1.123 in (ineffective width=0.65843 in) — Eq. 1.1-1
b_1=0.56148 in, b_2=0.56148 in
Element 3: Treat as two unstiffened elements
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=6.6477 — Eq. 1.1-3

ρ=0.14545	Eq. 1.1-2
b=0.45681 in (ineffective width=2.6839 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=6.6477	Eq. 1.1-3
ρ=0.14545	Eq. 1.1-2
b=0.45681 in (ineffective width=2.6839 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.5157 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.0916	Eq. 1.1-3
ρ=0.73148	Eq. 1.1-2
b=0.37723 in (ineffective width=0.13847 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00020486 in^4	Eq. 1.3-8
Is=0.00035659 in^4 > Ia (no lip reduction)	
k=3.4958	Table 1.3-1
Element 4: Partially stiffened, w=1.7814 in	
f=50 ksi, k=3.4958	
λ=1.3224	Eq. 1.1-3
ρ=0.63039	Eq. 1.1-2
b=1.123 in (ineffective width=0.65843 in)	Eq. 1.1-1
b_1=0.56148 in, b_2=0.56148 in	
Ae=0.14049 in^2, Fn=50 ksi	
Pn=7.0243 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=7.7814 in	
h/t greater than 200, treat as rational analysis	
f_1=48.893 ksi, f_2=-29.929 ksi	
ψ=0.61214	Eq. 1.1.2-1
k=15.604	Eq. 1.1.2-2
λ=2.7037	Eq. 1.1-3
ρ=0.33977	Eq. 1.1-2
be=2.6439 in	Eq. 1.1-1
h_o=8 in, b_o=2 in, h_o/b_o=4	
b_1=0.73194 in	Eq. 1.1.2-3
b_2=1.3219 in	Eq. 1.1.2-4
Compression width=4.8267 in	
Ineffective width=2.7729 in	
Element 5: Unstiffened, w=0.5157 in	
f_1=48.893 ksi, f_2=43.669 ksi	
ψ=0.89316	Eq. 1.2.2-1

k=0.46872	Eq. 1.2.2-2
λ=1.0339	Eq. 1.1-3
ρ=0.76142	Eq. 1.1-2
b=0.39267 in (ineffective width=0.12303 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.14	Eq. 1.3-7
Ia=0.00020454 in^4	Eq. 1.3-8
Is=0.00035659 in^4 > Ia (no lip reduction)	
k=3.4958	Table 1.3-1
Element 4: Partially stiffened, w=1.7814 in	
f=49.842 ksi, k=3.4958	
λ=1.3203	Eq. 1.1-3
ρ=0.63119	Eq. 1.1-2
b=1.1244 in (ineffective width=0.65701 in)	Eq. 1.1-1
b_1=0.5622 in, b_2=0.5622 in	
Center of gravity shift: y=-0.93628 in	
Sxe=0.56168 in^3, Fy=50 ksi	
Mnl=28.084 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5157 in	
f_1=48.893 ksi, f_2=43.669 ksi	
ψ=0.89316	Eq. 1.2.2-1
k=0.46872	Eq. 1.2.2-2
λ=1.0339	Eq. 1.1-3
ρ=0.76142	Eq. 1.1-2
b=0.39267 in (ineffective width=0.12303 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.14	Eq. 1.3-7
Ia=0.00020454 in^4	Eq. 1.3-8
Is=0.00035659 in^4 > Ia (no lip reduction)	
k=3.4958	Table 1.3-1
Element 2: Partially stiffened, w=1.7814 in	
f=49.842 ksi, k=3.4958	
λ=1.3203	Eq. 1.1-3
ρ=0.63119	Eq. 1.1-2
b=1.1244 in (ineffective width=0.65701 in)	Eq. 1.1-1
b_1=0.5622 in, b_2=0.5622 in	
Element 3: Stiffened, w=7.7814 in	
h/t greater than 200, treat as rational analysis	
f_1=48.893 ksi, f_2=-29.929 ksi	
ψ=0.61214	Eq. 1.1.2-1
k=15.604	Eq. 1.1.2-2
λ=2.7037	Eq. 1.1-3
ρ=0.33977	Eq. 1.1-2
be=2.6439 in	Eq. 1.1-1
h_o=8 in, b_o=2 in, h_o/b_o=4	
b_1=0.73194 in	Eq. 1.1.2-3

b_2=1.3219 in Eq. 1.1.2-4
Compression width=4.8267 in
Ineffective width=2.7729 in
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0.93628 in
Sxe=0.56168 in³, Fy=50 ksi
Mnl=28.084 k-in Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.5157 in
f_1=49.475 ksi, f_2=49.475 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.0858 Eq. 1.1-3
ρ=0.73437 Eq. 1.1-2
b=0.37872 in (ineffective width=0.13698 in) Eq. 1.1-1
Element 2: Stiffened, w=1.7814 in
f_1=46.322 ksi, f_2=-13.62 ksi
ψ=0.29403 Eq. 1.1.2-1
k=10.922 Eq. 1.1.2-2
λ=0.72012 Eq. 1.1-3
ρ=0.96442 Eq. 1.1-2
be=1.718 in Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2
b_1=0.52155 in Eq. 1.1.2-3
b_2=0.85901 in Eq. 1.1.2-4
Compression width=1.3766 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.5157 in
f_1=49.475 ksi, f_2=49.475 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=1.0858 Eq. 1.1-3
ρ=0.73437 Eq. 1.1-2
b=0.37872 in (ineffective width=0.13698 in) Eq. 1.1-1
Element 4: Stiffened, w=1.7814 in
f_1=46.322 ksi, f_2=-13.62 ksi
ψ=0.29403 Eq. 1.1.2-1
k=10.922 Eq. 1.1.2-2
λ=0.72012 Eq. 1.1-3
ρ=0.96442 Eq. 1.1-2
be=1.718 in Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2
b_1=0.52155 in Eq. 1.1.2-3
b_2=0.85901 in Eq. 1.1.2-4
Compression width=1.3766 in

b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=-0.035137 in
Sye=0.11872 in³, Fy=50 ksi
Mnl=5.936 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.7814 in
f_1=44.631 ksi, f_2=-42.874 ksi
ψ=0.96064 — Eq. 1.1.2-1
k=22.995 — Eq. 1.1.2-2
λ=0.48714 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=1.7814 in — Eq. 1.1-1
h_o=2 in, b_o=8 in, h_o/b_o=0.25
b_1=0.44978 in — Eq. 1.1.2-3
b_2=0.8907 in — Eq. 1.1.2-4
Compression width=0.90858 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=49.234 ksi, f_2=49.234 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=6.5966 — Eq. 1.1-3
ρ=0.14654 — Eq. 1.1-2
b=0.46023 in (ineffective width=2.6805 in) — Eq. 1.1-1
f_1=49.234 ksi, f_2=49.234 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-2
λ=6.5966 — Eq. 1.1-3
ρ=0.14654 — Eq. 1.1-2
b=0.46023 in (ineffective width=2.6805 in) — Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=1.7814 in
f_1=44.631 ksi, f_2=-42.874 ksi
ψ=0.96064 — Eq. 1.1.2-1
k=22.995 — Eq. 1.1.2-2
λ=0.48715 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=1.7814 in — Eq. 1.1-1
h_o=2 in, b_o=8 in, h_o/b_o=0.25
b_1=0.44978 in — Eq. 1.1.2-3
b_2=0.8907 in — Eq. 1.1.2-4
Compression width=0.90858 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.46869 in
Sye=0.10313 in³, Fy=50 ksi
Mnl=5.1566 k-in — Eq. F3.1-1

Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud

Cw=2.6059 in^6, Wn=6.2787 in^2, Fy=50 ksi

Bn=20.752 k-in^2 G8.1-1

Ωb=1.67, ϕb=0.9

800S200-33

Full Section Properties

Area	0.44810 in²	Wt.	0.0015235 k/ft	Flat	12.951 in
Ix	4.0961 in⁴	rx	3.0234 in	Ixy	0.0000 in⁴
Sx(t)	1.0240 in³	y(t)	4.0000 in	α	0.000 deg
Sx(b)	1.0240 in³	y(b)	4.0000 in		
Zx	1.2230 in³	Height	8.0000 in		
Iy	0.2275 in⁴	ry	0.7125 in	x_o	-1.2837 in
Sy(l)	0.4664 in³	x(l)	0.4878 in	y_o	0.0000 in
Sy(r)	0.1504 in³	x(r)	1.5122 in	jx	4.3928 in
Zy	0.2122 in³	Width	2.0000 in	jy	0.0000 in
I_1	4.0961 in⁴	r_1	3.0234 in	Cw	2.8778 in⁶
I_2	0.2275 in⁴	r_2	0.7125 in	J	0.0001788 in⁴
Ic	4.3236 in⁴	rc	3.1063 in		
I_o	5.0620 in⁴	r_o	3.3611 in		

Net Section Properties

Ix	4.0864 in⁴	rx	3.2115 in	Area	0.39620 in²
Sx(t)	1.0216 in³	y(t)	4.0000 in	Ixy	0.0000 in⁴
Sx(b)	1.0216 in³	y(b)	4.0000 in	α	0.000 deg
Zx	1.2035 in³				
Iy	0.2145 in⁴	ry	0.7358 in	x_o	-1.3473 in
Sy(l)	0.3904 in³	x(l)	0.5494 in	y_o	0.0000 in
Sy(r)	0.1479 in³	x(r)	1.4506 in	jx	3.9883 in
Zy	0.2115 in³			jy	0.0000 in
Ic	4.3009 in⁴	rc	3.2948 in	Cw	2.8713 in⁶
I_o	5.0200 in⁴	r_o	3.5596 in	J	0.0001581 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	7.125 k	ϕMnxo	26.621 k-in	ϕMnyo	6.066 k-in
Ae	0.16766 in²	Ixe	3.2114 in⁴	Iye	0.1992 in⁴
ϕTn	19.315 k	Sxe(t)	0.6655 in³	Sye(l)	0.3812 in³
		Sxe(b)	1.0116 in³	Sye(r)	0.1348 in³
Shear					
ϕVny	0.852 k	Negative Bending		Negative Bending	
ϕVnx	3.083 k	ϕMnxo	26.621 k-in	ϕMnyo	5.353 k-in
		Ixe	3.2114 in⁴	Iye	0.1192 in⁴
Torsion		Sxe(t)	1.0116 in³	Sye(l)	0.1190 in³
ϕBn	20.63 k-in²	Sxe(b)	0.6655 in³	Sye(r)	0.1193 in³

```
Stud element 3 h/t exceeds 200.
```

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=50.922 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=52.88 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=54.513 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	

Axial Tension Strength
Ag=0.4481 in², Fy=50.922 ksi
Tn=22.818 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.3962 in², Fu=65 ksi
Tn=25.753 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Stud element 2
Vn=1.7129 k at 180 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Stud element 3
Vyh=6.3321 k — Eq. G3-2
kv=4.3065 — Eq. G3-8
Vcrh=0.43736 k — Eq. G3-6
h/t exceeds 200 (rational analysis)
Vn=1.0655 k at 90 deg — Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)
Stud element 4
Vn=1.7129 k at 0 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Stud
Element 1: Unstiffened, w=0.514 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.98104 — Eq. 1.1-3
ρ=0.79074 — Eq. 1.1-2
b=0.40644 in (ineffective width=0.10756 in) — Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.091 — Eq. 1.3-7
Ia=0.00027958 in⁴ — Eq. 1.3-8
Is=0.00039155 in⁴ > Ia (no lip reduction)
k=3.4924 — Table 1.3-1
Element 2: Partially stiffened, w=1.778 in
f=50 ksi, k=3.4924
λ=1.1908 — Eq. 1.1-3
ρ=0.68464 — Eq. 1.1-2
b=1.2173 in (ineffective width=0.56072 in) — Eq. 1.1-1
b_1=0.60864 in, b_2=0.60864 in
Element 3: Treat as two unstiffened elements
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=5.9912 — Eq. 1.1-3

ρ=0.16078	Eq. 1.1-2
b=0.50469 in (ineffective width=2.6343 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=5.9912	Eq. 1.1-3
ρ=0.16078	Eq. 1.1-2
b=0.50469 in (ineffective width=2.6343 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.514 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.98104	Eq. 1.1-3
ρ=0.79074	Eq. 1.1-2
b=0.40644 in (ineffective width=0.10756 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00027958 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.4924	Table 1.3-1
Element 4: Partially stiffened, w=1.778 in	
f=50 ksi, k=3.4924	
λ=1.1908	Eq. 1.1-3
ρ=0.68464	Eq. 1.1-2
b=1.2173 in (ineffective width=0.56072 in)	Eq. 1.1-1
b_1=0.60864 in, b_2=0.60864 in	
Ae=0.16766 in^2, Fn=50 ksi	
Pn=8.3828 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=7.778 in	
h/t greater than 200, treat as rational analysis	
f_1=48.849 ksi, f_2=-31.772 ksi	
ψ=0.65041	Eq. 1.1.2-1
k=16.292	Eq. 1.1.2-2
λ=2.3839	Eq. 1.1-3
ρ=0.38077	Eq. 1.1-2
be=2.9616 in	Eq. 1.1-1
h_o=8 in, b_o=2 in, h_o/b_o=4	
b_1=0.81131 in	Eq. 1.1.2-3
b_2=1.4808 in	Eq. 1.1.2-4
Compression width=4.7128 in	
Ineffective width=2.4207 in	
Element 5: Unstiffened, w=0.514 in	
f_1=48.849 ksi, f_2=43.522 ksi	
ψ=0.89093	Eq. 1.2.2-1

k=0.46956	Eq. 1.2.2-2
λ=0.92794	Eq. 1.1-3
ρ=0.82216	Eq. 1.1-2
b=0.42259 in (ineffective width=0.09141 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.147	Eq. 1.3-7
Ia=0.00027909 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.4924	Table 1.3-1
Element 4: Partially stiffened, w=1.778 in	
f=49.821 ksi, k=3.4924	
λ=1.1886	Eq. 1.1-3
ρ=0.68559	Eq. 1.1-2
b=1.219 in (ineffective width=0.55902 in)	Eq. 1.1-1
b_1=0.60949 in, b_2=0.60949 in	
Center of gravity shift: y=-0.82548 in	
Sxe=0.66551 in^3, Fy=50 ksi	
Mnl=33.276 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.514 in	
f_1=48.849 ksi, f_2=43.522 ksi	
ψ=0.89093	Eq. 1.2.2-1
k=0.46956	Eq. 1.2.2-2
λ=0.92794	Eq. 1.1-3
ρ=0.82216	Eq. 1.1-2
b=0.42259 in (ineffective width=0.09141 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.147	Eq. 1.3-7
Ia=0.00027909 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.4924	Table 1.3-1
Element 2: Partially stiffened, w=1.778 in	
f=49.821 ksi, k=3.4924	
λ=1.1886	Eq. 1.1-3
ρ=0.68559	Eq. 1.1-2
b=1.219 in (ineffective width=0.55902 in)	Eq. 1.1-1
b_1=0.60949 in, b_2=0.60949 in	
Element 3: Stiffened, w=7.778 in	
h/t greater than 200, treat as rational analysis	
f_1=48.849 ksi, f_2=-31.772 ksi	
ψ=0.65041	Eq. 1.1.2-1
k=16.292	Eq. 1.1.2-2
λ=2.3839	Eq. 1.1-3
ρ=0.38077	Eq. 1.1-2
be=2.9616 in	Eq. 1.1-1
h_o=8 in, b_o=2 in, h_o/b_o=4	
b_1=0.81131 in	Eq. 1.1.2-3

b_2=1.4808 in Eq. 1.1.2-4
Compression width=4.7128 in
Ineffective width=2.4207 in
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0.82548 in
Sxe=0.66551 in^3, Fy=50 ksi
Mnl=33.276 k-in Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.514 in
f_1=49.415 ksi, f_2=49.415 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.97528 Eq. 1.1-3
ρ=0.79405 Eq. 1.1-2
b=0.40814 in (ineffective width=0.10586 in) Eq. 1.1-1
Element 2: Stiffened, w=1.778 in
f_1=46.244 ksi, f_2=-13.924 ksi
ψ=0.30109 Eq. 1.1.2-1
k=11.007 Eq. 1.1.2-2
λ=0.64505 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.778 in Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2
b_1=0.53861 in Eq. 1.1.2-3
b_2=0.889 in Eq. 1.1.2-4
Compression width=1.3665 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.514 in
f_1=49.415 ksi, f_2=49.415 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=0.97528 Eq. 1.1-3
ρ=0.79405 Eq. 1.1-2
b=0.40814 in (ineffective width=0.10586 in) Eq. 1.1-1
Element 4: Stiffened, w=1.778 in
f_1=46.244 ksi, f_2=-13.924 ksi
ψ=0.30109 Eq. 1.1.2-1
k=11.007 Eq. 1.1.2-2
λ=0.64505 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.778 in Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2
b_1=0.53861 in Eq. 1.1.2-3
b_2=0.889 in Eq. 1.1.2-4
Compression width=1.3665 in

b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=-0.026999 in
Sye=0.1348 in³, Fy=50 ksi
Mnl=6.7399 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.778 in
f_1=44.459 ksi, f_2=-44.304 ksi
ψ=0.99652 Eq. 1.1.2-1
k=23.91 Eq. 1.1.2-2
λ=0.42914 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.778 in Eq. 1.1-1
h_o=2 in, b_o=8 in, h_o/b_o=0.25
b_1=0.44489 in Eq. 1.1.2-3
b_2=0.889 in Eq. 1.1.2-4
Compression width=0.89055 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=49.136 ksi, f_2=49.136 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=5.9393 Eq. 1.1-3
ρ=0.16213 Eq. 1.1-2
b=0.50894 in (ineffective width=2.6301 in) Eq. 1.1-1
f_1=49.136 ksi, f_2=49.136 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=5.9393 Eq. 1.1-3
ρ=0.16213 Eq. 1.1-2
b=0.50894 in (ineffective width=2.6301 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=1.778 in
f_1=44.459 ksi, f_2=-44.304 ksi
ψ=0.99652 Eq. 1.1.2-1
k=23.91 Eq. 1.1.2-2
λ=0.42914 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.778 in Eq. 1.1-1
h_o=2 in, b_o=8 in, h_o/b_o=0.25
b_1=0.44489 in Eq. 1.1.2-3
b_2=0.889 in Eq. 1.1.2-4
Compression width=0.89055 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.45216 in
Sye=0.11896 in³, Fy=50 ksi
Mnl=5.9482 k-in Eq. F3.1-1

Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud

Cw=2.8713 in^6, Wn=6.2633 in^2, Fy=50 ksi

Bn=22.922 k-in^2 G8.1-1

Ωb=1.67, ϕb=0.9

800S200-43

Full Section Properties

Area	0.58218 in²	Wt.	0.0019794 k/ft	Flat	12.909 in
Ix	5.3021 in⁴	rx	3.0178 in	Ixy	0.0000 in⁴
Sx(t)	1.3255 in³	y(t)	4.0000 in	α	0.000 deg
Sx(b)	1.3255 in³	y(b)	4.0000 in		
Zx	1.5857 in³	Height	8.0000 in		
Iy	0.2917 in⁴	ry	0.7079 in	x_o	-1.2733 in
Sy(l)	0.5967 in³	x(l)	0.4889 in	y_o	0.0000 in
Sy(r)	0.1931 in³	x(r)	1.5111 in	jx	4.3939 in
Zy	0.2738 in³	Width	2.0000 in	jy	0.0000 in
I_1	5.3021 in⁴	r_1	3.0178 in	Cw	3.6767 in⁶
I_2	0.2917 in⁴	r_2	0.7079 in	J	0.0003947 in⁴
Ic	5.5938 in⁴	rc	3.0997 in		
I_o	6.5376 in⁴	r_o	3.3511 in		

Net Section Properties

Ix	5.2894 in⁴	rx	3.2063 in	Area	0.51453 in²
Sx(t)	1.3224 in³	y(t)	4.0000 in	Ixy	0.0000 in⁴
Sx(b)	1.3223 in³	y(b)	4.0000 in	α	0.000 deg
Zx	1.5603 in³				
Iy	0.2751 in⁴	ry	0.7312 in	x_o	-1.3365 in
Sy(l)	0.5000 in³	x(l)	0.5502 in	y_o	0.0000 in
Sy(r)	0.1897 in³	x(r)	1.4498 in	jx	3.9877 in
Zy	0.2727 in³			jy	0.0000 in
Ic	5.5645 in⁴	rc	3.2886 in	Cw	3.6684 in⁶
I_o	6.4835 in⁴	r_o	3.5498 in	J	0.0003489 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	10.614 k	ϕMnxo	46.591 k-in	ϕMnyo	8.356 k-in
Ae	0.24974 in²	Ixe	4.6207 in⁴	Iye	0.2704 in⁴
ϕTn	25.083 k	Sxe(t)	1.0354 in³	Sye(l)	0.4972 in³
		Sxe(b)	1.3063 in³	Sye(r)	0.1857 in³
Shear					
ϕVny	1.730 k	Negative Bending		Negative Bending	
ϕVnx	4.304 k	ϕMnxo	46.591 k-in	ϕMnyo	7.161 k-in
		Ixe	4.6207 in⁴	Iye	0.1679 in⁴
Torsion		Sxe(t)	1.3063 in³	Sye(l)	0.1778 in³
ϕBn	26.558 k-in²	Sxe(b)	1.0354 in³	Sye(r)	0.1591 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Fya=51.127 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Fya=53.526 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Fya=55.542 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	

Axial Tension Strength

Ag=0.58218 in², Fy=51.127 ksi	
Tn=29.765 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.51453 in², Fu=65 ksi	
Tn=33.444 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=2.3913 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=8.2364 k	Eq. G3-2
kv=4.3058	Eq. G3-8
Vcrh=0.96926 k	Eq. G3-6
Vn=1.9222 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=2.3913 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.74488	Eq. 1.1-3
ρ=0.94599	Eq. 1.1-2
b=0.48123 in (ineffective width=0.027474 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00062038 in⁴	Eq. 1.3-8
Is=0.00049474 in⁴	
ds=0.38377 in (lip ineffective width=0.097452 in)	Eq. 1.3-6
k=3.2601	Table 1.3-1
Element 2: Partially stiffened, w=1.7674 in	
f=50 ksi, k=3.2601	
λ=0.93989	Eq. 1.1-3
ρ=0.81492	Eq. 1.1-2
b=1.4403 in (ineffective width=0.32712 in)	Eq. 1.1-1
b_1=0.57431 in, b_2=0.86598 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.5886	Eq. 1.1-3
ρ=0.20748	Eq. 1.1-2
b=0.65019 in (ineffective width=2.4835 in)	Eq. 1.1-1

f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=4.5886 Eq. 1.1-3
ρ=0.20748 Eq. 1.1-2
b=0.65019 in (ineffective width=2.4835 in) Eq. 1.1-1
Element 5: Unstiffened, w=0.5087 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.74488 Eq. 1.1-3
ρ=0.94599 Eq. 1.1-2
b=0.48123 in (ineffective width=0.027474 in) Eq. 1.1-1
Element 4: Check for lip stiffener reduction
S=31.091 Eq. 1.3-7
Ia=0.00062038 in^4 Eq. 1.3-8
Is=0.00049474 in^4
ds=0.38377 in (lip ineffective width=0.097452 in) Eq. 1.3-6
k=3.2601 Table 1.3-1
Element 4: Partially stiffened, w=1.7674 in
f=50 ksi, k=3.2601
λ=0.93989 Eq. 1.1-3
ρ=0.81492 Eq. 1.1-2
b=1.4403 in (ineffective width=0.32712 in) Eq. 1.1-1
b_1=0.57431 in, b_2=0.86598 in
Ae=0.24974 in^2, Fn=50 ksi
Pn=12.487 k Eq. E3.1-1
Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: No compressive stress (fully effective)
Element 3: Stiffened, w=7.7674 in
f_1=48.697 ksi, f_2=-38.351 ksi
ψ=0.78755 Eq. 1.1.2-1
k=18.999 Eq. 1.1.2-2
λ=1.6886 Eq. 1.1-3
ρ=0.51504 Eq. 1.1-2
be=4.0005 in Eq. 1.1-1
h_o=8 in, b_o=2 in, h_o/b_o=4
b_1=1.0562 in Eq. 1.1.2-3
b_2=2.0003 in Eq. 1.1.2-4
Compression width=4.3453 in
Ineffective width=1.2888 in
Element 5: Unstiffened, w=0.5087 in
f_1=48.697 ksi, f_2=42.996 ksi
ψ=0.88293 Eq. 1.2.2-1
k=0.47264 Eq. 1.2.2-2
λ=0.70117 Eq. 1.1-3

ρ=0.97871	Eq. 1.1-2
b=0.49787 in (ineffective width=0.010832 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.17	Eq. 1.3-7
Ia=0.00061886 in^4	Eq. 1.3-8
Is=0.00049474 in^4	
ds=0.39802 in (lip ineffective width=0.099849 in)	Eq. 1.3-6
k=3.2624	Table 1.3-1
Element 4: Partially stiffened, w=1.7674 in	
f=49.747 ksi, k=3.2624	
λ=0.93718	Eq. 1.1-3
ρ=0.81655	Eq. 1.1-2
b=1.4432 in (ineffective width=0.32423 in)	Eq. 1.1-1
b_1=0.57687 in, b_2=0.8663 in	
Center of gravity shift: y=-0.46286 in	
Sxe=1.0354 in^3, Fy=50 ksi	
Mnl=51.768 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	
f_1=48.697 ksi, f_2=42.996 ksi	
ψ=0.88293	Eq. 1.2.2-1
k=0.47264	Eq. 1.2.2-2
λ=0.70117	Eq. 1.1-3
ρ=0.97871	Eq. 1.1-2
b=0.49787 in (ineffective width=0.010832 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.17	Eq. 1.3-7
Ia=0.00061886 in^4	Eq. 1.3-8
Is=0.00049474 in^4	
ds=0.39802 in (lip ineffective width=0.099849 in)	Eq. 1.3-6
k=3.2624	Table 1.3-1
Element 2: Partially stiffened, w=1.7674 in	
f=49.747 ksi, k=3.2624	
λ=0.93718	Eq. 1.1-3
ρ=0.81655	Eq. 1.1-2
b=1.4432 in (ineffective width=0.32423 in)	Eq. 1.1-1
b_1=0.57687 in, b_2=0.8663 in	
Element 3: Stiffened, w=7.7674 in	
f_1=48.697 ksi, f_2=-38.351 ksi	
ψ=0.78755	Eq. 1.1.2-1
k=18.999	Eq. 1.1.2-2
λ=1.6886	Eq. 1.1-3
ρ=0.51504	Eq. 1.1-2
be=4.0005 in	Eq. 1.1-1
h_o=8 in, b_o=2 in, h_o/b_o=4	
b_1=1.0562 in	Eq. 1.1.2-3
b_2=2.0003 in	Eq. 1.1.2-4

```
      Compression width=4.3453 in
      Ineffective width=1.2888 in
    Element 5: No compressive stress (fully effective)
    Element 4: No compressive stress (fully effective)
  Center of gravity shift: y=0.46286 in
  Sxe=1.0354 in³, Fy=50 ksi
  Mnl=51.768 k-in                                          Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
  Effective width calculations for Stud
    Element 1: Unstiffened, w=0.5087 in
      f₁=49.226 ksi, f₂=49.226 ksi
      ψ=1                                                  Eq. 1.2.2-1
      k=0.43                                               Eq. 1.2.2-3
      λ=0.73909                                            Eq. 1.1-3
      ρ=0.95027                                            Eq. 1.1-2
      b=0.4834 in (ineffective width=0.025297 in)          Eq. 1.1-1
    Element 2: Stiffened, w=1.7674 in
      f₁=46.007 ksi, f₂=-14.681 ksi
      ψ=0.3191                                             Eq. 1.1.2-1
      k=11.229                                             Eq. 1.1.2-2
      λ=0.4858                                             Eq. 1.1-3
      ρ=1                                                  Eq. 1.1-2
      be=1.7674 in                                         Eq. 1.1-1
      h₀=2 in, b₀=0.625 in, h₀/b₀=3.2
      b₁=0.53249 in                                        Eq. 1.1.2-3
      b₂=0.8837 in                                         Eq. 1.1.2-4
      Compression width=1.3399 in
      b₁+b₂ > compression width (fully effective)
    Element 3: No compressive stress (fully effective)
    Element 5: Unstiffened, w=0.5087 in
      f₁=49.226 ksi, f₂=49.226 ksi
      ψ=1                                                  Eq. 1.2.2-1
      k=0.43                                               Eq. 1.2.2-3
      λ=0.73909                                            Eq. 1.1-3
      ρ=0.95027                                            Eq. 1.1-2
      b=0.4834 in (ineffective width=0.025297 in)          Eq. 1.1-1
    Element 4: Stiffened, w=1.7674 in
      f₁=46.007 ksi, f₂=-14.681 ksi
      ψ=0.3191                                             Eq. 1.1.2-1
      k=11.229                                             Eq. 1.1.2-2
      λ=0.4858                                             Eq. 1.1-3
      ρ=1                                                  Eq. 1.1-2
      be=1.7674 in                                         Eq. 1.1-1
      h₀=2 in, b₀=0.625 in, h₀/b₀=3.2
      b₁=0.53249 in                                        Eq. 1.1.2-3
      b₂=0.8837 in                                         Eq. 1.1.2-4
      Compression width=1.3399 in
      b₁+b₂ > compression width (fully effective)
  Center of gravity shift: x=-0.0063575 in
  Sye=0.1857 in³, Fy=50 ksi
```

```
  Mnl=9.2849 k-in                                          Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
  Effective width calculations for Stud
    Element 1: No compressive stress (fully effective)
    Element 2: Stiffened, w=1.7674 in
      f₁=39.205 ksi, f₂=-44.492 ksi
      ψ=1.1349                                             Eq. 1.1.2-1
      k=27.73                                              Eq. 1.1.2-2
      λ=0.28537                                            Eq. 1.1-3
      ρ=1                                                  Eq. 1.1-2
      be=1.7674 in                                         Eq. 1.1-1
      h₀=2 in, b₀=8 in, h₀/b₀=0.25
      b₁=0.42744 in                                        Eq. 1.1.2-3
      b₂=0.8837 in                                         Eq. 1.1.2-4
      Compression width=0.82787 in
      b₁+b₂ > compression width (fully effective)
    Element 3: Treat as two unstiffened elements
      f₁=43.645 ksi, f₂=43.645 ksi
      ψ=1                                                  Eq. 1.2.2-1
      k=0.43                                               Eq. 1.2.2-3
      λ=4.2871                                             Eq. 1.1-3
      ρ=0.22129                                            Eq. 1.1-2
      b=0.69345 in (ineffective width=2.4402 in)           Eq. 1.1-1
      f₁=43.645 ksi, f₂=43.645 ksi
      ψ=1                                                  Eq. 1.2.2-1
      k=0.43                                               Eq. 1.2.2-2
      λ=4.2871                                             Eq. 1.1-3
      ρ=0.22129                                            Eq. 1.1-2
      b=0.69345 in (ineffective width=2.4402 in)           Eq. 1.1-1
    Element 5: No compressive stress (fully effective)
    Element 4: Stiffened, w=1.7674 in
      f₁=39.205 ksi, f₂=-44.492 ksi
      ψ=1.1349                                             Eq. 1.1.2-1
      k=27.73                                              Eq. 1.1.2-2
      λ=0.28537                                            Eq. 1.1-3
      ρ=1                                                  Eq. 1.1-2
      be=1.7674 in                                         Eq. 1.1-1
      h₀=2 in, b₀=8 in, h₀/b₀=0.25
      b₁=0.42744 in                                        Eq. 1.1.2-3
      b₂=0.8837 in                                         Eq. 1.1.2-4
      Compression width=0.82787 in
      b₁+b₂ > compression width (fully effective)
  Center of gravity shift: x=0.39448 in
  Sye=0.15914 in³, Fy=50 ksi
  Mnl=7.9568 k-in                                          Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
  Cw=3.6684 in⁶, Wn=6.2158 in², Fy=50 ksi
  Bn=29.509 k-in²                                          G8.1-1
```

$\Omega b=1.67$, $\phi b=0.9$

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Full Section Properties

Area	0.72614 in²	Wt.	0.0024689 k/ft	Flat	12.829 in
Ix	6.5731 in⁴	rx	3.0087 in	Ixy	0.0000 in⁴
Sx(t)	1.6433 in³	y(t)	4.0000 in	α	0.000 deg
Sx(b)	1.6433 in³	y(b)	4.0000 in		
Zx	1.9709 in³	Height	8.0000 in		
Iy	0.3572 in⁴	ry	0.7014 in	x_o	-1.2594 in
Sy(l)	0.7309 in³	x(l)	0.4887 in	y_o	0.0000 in
Sy(r)	0.2364 in³	x(r)	1.5113 in	jx	4.4020 in
Zy	0.3380 in³	Width	2.0000 in	jy	0.0000 in
I_1	6.5731 in⁴	r_1	3.0087 in	Cw	4.4805 in⁶
I_2	0.3572 in⁴	r_2	0.7014 in	J	0.0007754 in⁴
Ic	6.9303 in⁴	rc	3.0894 in		
I_o	8.0821 in⁴	r_o	3.3362 in		

Net Section Properties

Ix	6.5572 in⁴	rx	3.1978 in	Area	0.64124 in²
Sx(t)	1.6393 in³	y(t)	4.0000 in	Ixy	0.0000 in⁴
Sx(b)	1.6393 in³	y(b)	4.0000 in	α	0.000 deg
Zx	1.9390 in³				
Iy	0.3368 in⁴	ry	0.7247 in	x_o	-1.3223 in
Sy(l)	0.6127 in³	x(l)	0.5497 in	y_o	0.0000 in
Sy(r)	0.2322 in³	x(r)	1.4503 in	jx	3.9934 in
Zy	0.3362 in³			jy	0.0000 in
Ic	6.8940 in⁴	rc	3.2789 in	Cw	4.4703 in⁶
I_o	8.0152 in⁴	r_o	3.5355 in	J	0.0006847 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	14.247 k	ϕMnxo	66.742 k-in	ϕMnyo	11.877 k-in
Ae	0.33521 in²	Ixe	6.1846 in⁴	Iye	0.3368 in⁴
ϕTn	31.260 k	Sxe(t)	1.4831 in³	Sye(l)	0.6127 in³
		Sxe(b)	1.6147 in³	Sye(r)	0.2322 in³
Shear					
ϕVny	2.844 k	Negative Bending		Negative Bending	
ϕVnx	5.248 k	ϕMnxo	66.742 k-in	ϕMnyo	9.098 k-in
		Ixe	6.1846 in⁴	Iye	0.2266 in⁴
Torsion		Sxe(t)	1.6147 in³	Sye(l)	0.2578 in³
ϕBn	32.634 k-in²	Sxe(b)	1.4831 in³	Sye(r)	0.2022 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=51.407 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=54.356 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=56.825 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.72614 in², Fy=51.407 ksi

Tn=37.329 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.64124 in², Fu=65 ksi	
Tn=41.68 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=2.9155 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=10.234 k	Eq. G3-2
kv=4.3021	Eq. G3-8
Vcrh=1.9221 k	Eq. G3-6
Vn=3.1602 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=2.9155 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4835 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56413	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0011127 in⁴	Eq. 1.3-8
Is=0.00053312 in⁴	
ds=0.23166 in (lip ineffective width=0.25184 in)	Eq. 1.3-6
k=2.7693	Table 1.3-1
Element 2: Partially stiffened, w=1.717 in	
f=50 ksi, k=2.7693	
λ=0.78941	Eq. 1.1-3
ρ=0.91373	Eq. 1.1-2
b=1.5689 in (ineffective width=0.14812 in)	Eq. 1.1-1
b_1=0.37585 in, b_2=1.193 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=3.6269	Eq. 1.1-3
ρ=0.25899	Eq. 1.1-2
b=0.80508 in (ineffective width=2.3034 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=3.6269	Eq. 1.1-3
ρ=0.25899	Eq. 1.1-2
b=0.80508 in (ineffective width=2.3034 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4835 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56413	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0011127 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.23166 in (lip ineffective width=0.25184 in)	Eq. 1.3-6
k=2.7693	Table 1.3-1
Element 4: Partially stiffened, w=1.717 in	
f=50 ksi, k=2.7693	
λ=0.78941	Eq. 1.1-3
ρ=0.91373	Eq. 1.1-2
b=1.5689 in (ineffective width=0.14812 in)	Eq. 1.1-1
b_1=0.37585 in, b_2=1.193 in	
Ae=0.33521 in^2, Fn=50 ksi	
Pn=16.761 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=7.717 in	
f_1=48.303 ksi, f_2=-44.262 ksi	
ψ=0.91635	Eq. 1.1.2-1
k=21.908	Eq. 1.1.2-2
λ=1.2398	Eq. 1.1-3
ρ=0.66344	Eq. 1.1-2
be=5.1197 in	Eq. 1.1-1
h_o=8 in, b_o=2 in, h_o/b_o=4	
b_1=1.3073 in	Eq. 1.1.2-3
b_2=2.5599 in	Eq. 1.1.2-4
Compression width=4.0269 in	
Ineffective width=0.15979 in	
Element 5: Unstiffened, w=0.4835 in	
f_1=48.303 ksi, f_2=42.503 ksi	
ψ=0.87993	Eq. 1.2.2-1
k=0.4738	Eq. 1.2.2-2
λ=0.52823	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.197	Eq. 1.3-7

Ia=0.0010957 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.23526 in (lip ineffective width=0.24824 in)	Eq. 1.3-6
k=2.7801	Table 1.3-1
Element 4: Partially stiffened, w=1.717 in	
f=49.661 ksi, k=2.7801	
λ=0.7852	Eq. 1.1-3
ρ=0.91673	Eq. 1.1-2
b=1.574 in (ineffective width=0.14297 in)	Eq. 1.1-1
b_1=0.38294 in, b_2=1.1911 in	
Center of gravity shift: y=-0.16991 in	
Sxe=1.4831 in^3, Fy=50 ksi	
Mnl=74.157 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4835 in	
f_1=48.303 ksi, f_2=42.503 ksi	
ψ=0.87993	Eq. 1.2.2-1
k=0.4738	Eq. 1.2.2-2
λ=0.52823	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.197	Eq. 1.3-7
Ia=0.0010957 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.23526 in (lip ineffective width=0.24824 in)	Eq. 1.3-6
k=2.7801	Table 1.3-1
Element 2: Partially stiffened, w=1.717 in	
f=49.661 ksi, k=2.7801	
λ=0.7852	Eq. 1.1-3
ρ=0.91673	Eq. 1.1-2
b=1.574 in (ineffective width=0.14297 in)	Eq. 1.1-1
b_1=0.38294 in, b_2=1.1911 in	
Element 3: Stiffened, w=7.717 in	
f_1=48.303 ksi, f_2=-44.262 ksi	
ψ=0.91635	Eq. 1.1.2-1
k=21.908	Eq. 1.1.2-2
λ=1.2398	Eq. 1.1-3
ρ=0.66344	Eq. 1.1-2
be=5.1197 in	Eq. 1.1-1
h_o=8 in, b_o=2 in, h_o/b_o=4	
b_1=1.3073 in	Eq. 1.1.2-3
b_2=2.5599 in	Eq. 1.1.2-4
Compression width=4.0269 in	
Ineffective width=0.15979 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.16991 in	

Sxe=1.4831 in³, Fy=50 ksi
Mnl=74.157 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.4835 in
f_1=55.716 ksi, f_2=55.716 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.59551 — Eq. 1.1-3
λ<0.673 (fully effective) — Eq. 1.1-1
Element 2: Stiffened, w=1.717 in
f_1=51.281 ksi, f_2=-15.995 ksi
ψ=0.3119 — Eq. 1.1.2-1
k=11.14 — Eq. 1.1.2-2
λ=0.39861 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=1.717 in — Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2
b_1=0.51843 in — Eq. 1.1.2-3
b_2=0.8585 in — Eq. 1.1.2-4
Compression width=1.3088 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.4835 in
f_1=55.716 ksi, f_2=55.716 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.59551 — Eq. 1.1-3
λ<0.673 (fully effective) — Eq. 1.1-1
Element 4: Stiffened, w=1.717 in
f_1=51.281 ksi, f_2=-15.995 ksi
ψ=0.3119 — Eq. 1.1.2-1
k=11.14 — Eq. 1.1.2-2
λ=0.39861 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=1.717 in — Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2
b_1=0.51843 in — Eq. 1.1.2-3
b_2=0.8585 in — Eq. 1.1.2-4
Compression width=1.3088 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0 in
Sye=0.23223 in³, Fy=56.825 ksi
Mnl=13.196 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud

Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.717 in
f_1=32.844 ksi, f_2=-43.693 ksi
ψ=1.3303 Eq. 1.1.2-1
k=33.969 Eq. 1.1.2-2
λ=0.18268 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.717 in Eq. 1.1-1
h_o=2 in, b_o=8 in, h_o/b_o=0.25
b_1=0.39651 in Eq. 1.1.2-3
b_2=0.8585 in Eq. 1.1.2-4
Compression width=0.73682 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=37.89 ksi, f_2=37.89 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=3.1573 Eq. 1.1-3
ρ=0.29466 Eq. 1.1-2
b=0.91594 in (ineffective width=2.1926 in) Eq. 1.1-1
f_1=37.89 ksi, f_2=37.89 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=3.1573 Eq. 1.1-3
ρ=0.29466 Eq. 1.1-2
b=0.91594 in (ineffective width=2.1926 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=1.717 in
f_1=32.844 ksi, f_2=-43.692 ksi
ψ=1.3303 Eq. 1.1.2-1
k=33.969 Eq. 1.1.2-2
λ=0.18268 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.717 in Eq. 1.1-1
h_o=2 in, b_o=8 in, h_o/b_o=0.25
b_1=0.39651 in Eq. 1.1.2-3
b_2=0.8585 in Eq. 1.1.2-4
Compression width=0.73682 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.32926 in
Sye=0.20217 in^3, Fy=50 ksi
Mnl=10.109 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=4.4703 in^6, Wn=6.1642 in^2, Fy=50 ksi
Bn=36.26 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

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Full Section Properties

Area	0.90694 in²	Wt.	0.0030836 k/ft	Flat	12.720 in
Ix	8.1417 in⁴	rx	2.9962 in	Ixy	0.0000 in⁴
Sx(t)	2.0354 in³	y(t)	4.0000 in	α	0.000 deg
Sx(b)	2.0354 in³	y(b)	4.0000 in		
Zx	2.4498 in³	Height	8.0000 in		
Iy	0.4351 in⁴	ry	0.6927 in	x_o	-1.2410 in
Sy(l)	0.8912 in³	x(l)	0.4883 in	y_o	0.0000 in
Sy(r)	0.2878 in³	x(r)	1.5117 in	jx	4.4143 in
Zy	0.4163 in³	Width	2.0000 in	jy	0.0000 in
I_1	8.1417 in⁴	r_1	2.9962 in	Cw	5.4221 in⁶
I_2	0.4351 in⁴	r_2	0.6927 in	J	0.0015369 in⁴
Ic	8.5769 in⁴	rc	3.0752 in		
I_o	9.9737 in⁴	r_o	3.3162 in		

Net Section Properties

Ix	8.1217 in⁴	rx	3.1863 in	Area	0.79999 in²
Sx(t)	2.0304 in³	y(t)	4.0000 in	Ixy	0.0000 in⁴
Sx(b)	2.0304 in³	y(b)	4.0000 in	α	0.000 deg
Zx	2.4097 in³				
Iy	0.4102 in⁴	ry	0.7161 in	x_o	-1.3035 in
Sy(l)	0.7476 in³	x(l)	0.5488 in	y_o	0.0000 in
Sy(r)	0.2827 in³	x(r)	1.4512 in	jx	4.0026 in
Zy	0.4135 in³			jy	0.0000 in
Ic	8.5319 in⁴	rc	3.2657 in	Cw	5.4096 in⁶
I_o	9.8912 in⁴	r_o	3.5163 in	J	0.0013556 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	20.682 k	ϕMnxo	89.493 k-in	ϕMnyo	14.878 k-in
Ae	0.48663 in²	Ixe	8.0250 in⁴	Iye	0.4102 in⁴
ϕTn	39.000 k	Sxe(t)	1.9887 in³	Sye(l)	0.7476 in³
		Sxe(b)	2.0241 in³	Sye(r)	0.2827 in³
Shear					
ϕVny	4.664 k	Negative Bending		Negative Bending	
ϕVnx	6.328 k	ϕMnxo	89.493 k-in	ϕMnyo	11.505 k-in
		Ixe	8.0250 in⁴	Iye	0.3064 in⁴
Torsion		Sxe(t)	2.0241 in³	Sye(l)	0.3824 in³
ϕBn	39.921 k-in²	Sxe(b)	1.9887 in³	Sye(r)	0.2557 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Fya=51.788 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Fya=55.437 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²	
Fyc=75.391 ksi	Eq. A3.3.2-2
Fya=58.477 ksi	Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi	

Axial Tension Strength
Ag=0.90694 in², Fy=51.788 ksi

Tn=46.969 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.79999 in², Fu=65 ksi	
Tn=51.999 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=3.5157 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=12.703 k	Eq. G3-2
kv=4.2968	Eq. G3-8
Vcrh=3.8608 k	Eq. G3-6
Vn=5.1822 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=3.5157 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4468 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41383	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00072868 in⁴	Eq. 1.3-8
Is=0.00052997 in⁴	
ds=0.32495 in (lip ineffective width=0.12185 in)	Eq. 1.3-6
k=3.0024	Table 1.3-1
Element 2: Partially stiffened, w=1.6436 in	
f=50 ksi, k=3.0024	
λ=0.57612	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.8451	Eq. 1.1-3
ρ=0.3243	Eq. 1.1-2
b=0.99618 in (ineffective width=2.0756 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.8451	Eq. 1.1-3

ρ=0.3243	Eq. 1.1-2
b=0.99618 in (ineffective width=2.0756 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4468 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41383	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00072868 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.32495 in (lip ineffective width=0.12185 in)	Eq. 1.3-6
k=3.0024	Table 1.3-1
Element 4: Partially stiffened, w=1.6436 in	
f=50 ksi, k=3.0024	
λ=0.57612	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Ae=0.48663 in^2, Fn=50 ksi	
Pn=24.332 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=7.6436 in	
f_1=47.792 ksi, f_2=-46.92 ksi	
ψ=0.98175	Eq. 1.1.2-1
k=23.529	Eq. 1.1.2-2
λ=0.93569	Eq. 1.1-3
ρ=0.81745	Eq. 1.1-2
be=6.2483 in	Eq. 1.1-1
h_o=8 in, b_o=2 in, h_o/b_o=4	
b_1=1.5692 in	Eq. 1.1.2-3
b_2=3.1241 in	Eq. 1.1.2-4
Compression width=3.857 in	
b_1+b_2 > compression width (fully effective)	
Element 5: Unstiffened, w=0.4468 in	
f_1=47.792 ksi, f_2=42.256 ksi	
ψ=0.88416	Eq. 1.2.2-1
k=0.47216	Eq. 1.2.2-2
λ=0.38611	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.229	Eq. 1.3-7
Ia=0.00071147 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.33282 in (lip ineffective width=0.11398 in)	Eq. 1.3-6
k=3.0263	Table 1.3-1

Element 4: Partially stiffened, w=1.6436 in
f=49.558 ksi, k=3.0263
λ=0.5713 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Center of gravity shift: y=-0.035223 in
Sxe=1.9887 in^3, Fy=50 ksi
Mnl=99.436 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.4468 in
f_1=47.792 ksi, f_2=42.256 ksi
ψ=0.88416 Eq. 1.2.2-1
k=0.47216 Eq. 1.2.2-2
λ=0.38611 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.229 Eq. 1.3-7
Ia=0.00071147 in^4 Eq. 1.3-8
Is=0.00052997 in^4
ds=0.33282 in (lip ineffective width=0.11398 in) Eq. 1.3-6
k=3.0263 Table 1.3-1
Element 2: Partially stiffened, w=1.6436 in
f=49.558 ksi, k=3.0263
λ=0.5713 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 3: Stiffened, w=7.6436 in
f_1=47.792 ksi, f_2=-46.92 ksi
ψ=0.98175 Eq. 1.1.2-1
k=23.529 Eq. 1.1.2-2
λ=0.93569 Eq. 1.1-3
ρ=0.81745 Eq. 1.1-2
be=6.2483 in Eq. 1.1-1
h_o=8 in, b_o=2 in, h_o/b_o=4
b_1=1.5692 in Eq. 1.1.2-3
b_2=3.1241 in Eq. 1.1.2-4
Compression width=3.857 in
b_1+b_2 > compression width (fully effective)
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0.035223 in
Sxe=1.9887 in^3, Fy=50 ksi
Mnl=99.436 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.4468 in
f_1=57.04 ksi, f_2=57.04 ksi

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.44201	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=1.6436 in	
f_1=51.296 ksi, f_2=-14.932 ksi	
ψ=0.29109	Eq. 1.1.2-1
k=10.886	Eq. 1.1.2-2
λ=0.30645	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.6436 in	Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2	
b_1=0.49941 in	Eq. 1.1.2-3
b_2=0.8218 in	Eq. 1.1.2-4
Compression width=1.273 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.4468 in	
f_1=57.04 ksi, f_2=57.04 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.44201	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Stiffened, w=1.6436 in	
f_1=51.296 ksi, f_2=-14.932 ksi	
ψ=0.29109	Eq. 1.1.2-1
k=10.886	Eq. 1.1.2-2
λ=0.30645	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.6436 in	Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2	
b_1=0.49941 in	Eq. 1.1.2-3
b_2=0.8218 in	Eq. 1.1.2-4
Compression width=1.273 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0 in	
Sye=0.28269 in^3, Fy=58.477 ksi	
Mnl=16.531 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: Stiffened, w=1.6436 in	
f_1=25.953 ksi, f_2=-42.571 ksi	
ψ=1.6403	Eq. 1.1.2-1
k=46.091	Eq. 1.1.2-2
λ=0.10594	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.6436 in	Eq. 1.1-1

h_o=2 in, b_o=8 in, h_o/b_o=0.25
b_1=0.3542 in Eq. 1.1.2-3
b_2=0.8218 in Eq. 1.1.2-4
Compression width=0.62251 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=31.896 ksi, f_2=31.896 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=2.2724 Eq. 1.1-3
ρ=0.39745 Eq. 1.1-2
b=1.2209 in (ineffective width=1.8509 in) Eq. 1.1-1
f_1=31.896 ksi, f_2=31.896 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=2.2724 Eq. 1.1-3
ρ=0.39745 Eq. 1.1-2
b=1.2209 in (ineffective width=1.8509 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=1.6436 in
f_1=25.953 ksi, f_2=-42.571 ksi
ψ=1.6403 Eq. 1.1.2-1
k=46.091 Eq. 1.1.2-2
λ=0.10594 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.6436 in Eq. 1.1-1
h_o=2 in, b_o=8 in, h_o/b_o=0.25
b_1=0.3542 in Eq. 1.1.2-3
b_2=0.8218 in Eq. 1.1.2-4
Compression width=0.62251 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.25265 in
Sye=0.25566 in^3, Fy=50 ksi
Mnl=12.783 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=5.4096 in^6, Wn=6.0978 in^2, Fy=50 ksi
Bn=44.357 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

800S250-30

Full Section Properties

Area	0.43569 in²	Wt.	0.0014813 k/ft	Flat	13.964 in
Ix	4.1972 in⁴	rx	3.1038 in	Ixy	0.0000 in⁴
Sx(t)	1.0493 in³	y(t)	4.0000 in	α	0.000 deg
Sx(b)	1.0493 in³	y(b)	4.0000 in		
Zx	1.2290 in³	Height	8.0000 in		
Iy	0.3521 in⁴	ry	0.8990 in	x_o	-1.6851 in
Sy(l)	0.5390 in³	x(l)	0.6533 in	y_o	0.0000 in
Sy(r)	0.1907 in³	x(r)	1.8467 in	jx	4.3035 in
Zy	0.2786 in³	Width	2.5000 in	jy	0.0000 in
I_1	4.1972 in⁴	r_1	3.1038 in	Cw	4.3798 in⁶
I_2	0.3521 in⁴	r_2	0.8990 in	J	0.0001414 in⁴
Ic	4.5493 in⁴	rc	3.2314 in		
I_o	5.7865 in⁴	r_o	3.6444 in		

Net Section Properties

Ix	4.1884 in⁴	rx	3.2818 in	Area	0.38889 in²
Sx(t)	1.0471 in³	y(t)	4.0000 in	Ixy	0.0000 in⁴
Sx(b)	1.0471 in³	y(b)	4.0000 in	α	0.000 deg
Zx	1.2114 in³				
Iy	0.3308 in⁴	ry	0.9223 in	x_o	-1.7641 in
Sy(l)	0.4531 in³	x(l)	0.7301 in	y_o	0.0000 in
Sy(r)	0.1869 in³	x(r)	1.7699 in	jx	3.9768 in
Zy	0.2780 in³			jy	0.0000 in
Ic	4.5192 in⁴	rc	3.4090 in	Cw	4.3701 in⁶
I_o	5.7294 in⁴	r_o	3.8383 in	J	0.0001262 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	6.241 k	ϕMnxo	23.638 k-in	ϕMnyo	7.024 k-in
Ae	0.14685 in²	Ixe	2.9871 in⁴	Iye	0.2886 in⁴
ϕTn	18.958 k	Sxe(t)	0.5909 in³	Sye(l)	0.4431 in³
		Sxe(b)	1.0142 in³	Sye(r)	0.1561 in³
Shear					
ϕVny	0.679 k	Negative Bending		Negative Bending	
ϕVnx	2.734 k	ϕMnxo	23.638 k-in	ϕMnyo	6.412 k-in
		Ixe	2.9871 in⁴	Iye	0.1809 in⁴
Torsion		Sxe(t)	1.0142 in³	Sye(l)	0.1425 in³
ϕBn	25.241 k-in²	Sxe(b)	0.5909 in³	Sye(r)	0.1470 in³

```
Stud element 3 h/t exceeds 200.
```

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=50.788 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=52.136 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=54.15 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	

Axial Tension Strength
Ag=0.43569 in², Fy=50.788 ksi
Tn=22.128 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.38889 in², Fu=65 ksi
Tn=25.278 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Stud element 2
Vn=1.519 k at 180 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Stud element 3
Vyh=5.7137 k — Eq. G3-2
kv=4.3434 — Eq. G3-8
Vcrh=0.32334 k — Eq. G3-6
h/t exceeds 200 (rational analysis)
Vn=0.84933 k at 90 deg — Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)
Stud element 4
Vn=1.519 k at 0 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Stud
Element 1: Unstiffened, w=0.5157 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=1.0916 — Eq. 1.1-3
ρ=0.73148 — Eq. 1.1-2
b=0.37723 in (ineffective width=0.13847 in) — Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.091 — Eq. 1.3-7
Ia=0.00026103 in⁴ — Eq. 1.3-8
Is=0.00035659 in⁴ > Ia (no lip reduction)
k=3.8802 — Table 1.3-1
Element 2: Partially stiffened, w=2.2814 in
f=50 ksi, k=3.8802
λ=1.6075 — Eq. 1.1-3
ρ=0.53694 — Eq. 1.1-2
b=1.225 in (ineffective width=1.0564 in) — Eq. 1.1-1
b_1=0.61249 in, b_2=0.61249 in
Element 3: Treat as two unstiffened elements
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=6.6477 — Eq. 1.1-3

ρ=0.14545	Eq. 1.1-2
b=0.45681 in (ineffective width=2.6839 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=6.6477	Eq. 1.1-3
ρ=0.14545	Eq. 1.1-2
b=0.45681 in (ineffective width=2.6839 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.5157 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.0916	Eq. 1.1-3
ρ=0.73148	Eq. 1.1-2
b=0.37723 in (ineffective width=0.13847 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00026103 in^4	Eq. 1.3-8
Is=0.00035659 in^4 > Ia (no lip reduction)	
k=3.8802	Table 1.3-1
Element 4: Partially stiffened, w=2.2814 in	
f=50 ksi, k=3.8802	
λ=1.6075	Eq. 1.1-3
ρ=0.53694	Eq. 1.1-2
b=1.225 in (ineffective width=1.0564 in)	Eq. 1.1-1
b_1=0.61249 in, b_2=0.61249 in	
Ae=0.14685 in^2, Fn=50 ksi	
Pn=7.3426 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=7.7814 in	
h/t greater than 200, treat as rational analysis	
f_1=48.919 ksi, f_2=-28.055 ksi	
ψ=0.57351	Eq. 1.1.2-1
k=14.939	Eq. 1.1.2-2
λ=2.764	Eq. 1.1-3
ρ=0.333	Eq. 1.1-2
be=2.5912 in	Eq. 1.1-1
h_o=8 in, b_o=2.5 in, h_o/b_o=3.2	
b_1=0.72512 in	Eq. 1.1.2-3
b_2=1.2956 in	Eq. 1.1.2-4
Compression width=4.9453 in	
Ineffective width=2.9245 in	
Element 5: Unstiffened, w=0.5157 in	
f_1=48.919 ksi, f_2=43.817 ksi	
ψ=0.89572	Eq. 1.2.2-1

k=0.46774	Eq. 1.2.2-2
λ=1.0352	Eq. 1.1-3
ρ=0.7607	Eq. 1.1-2
b=0.39229 in (ineffective width=0.12341 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.139	Eq. 1.3-7
Ia=0.00026063 in^4	Eq. 1.3-8
Is=0.00035659 in^4 > Ia (no lip reduction)	
k=3.8802	Table 1.3-1
Element 4: Partially stiffened, w=2.2814 in	
f=49.846 ksi, k=3.8802	
λ=1.605	Eq. 1.1-3
ρ=0.53764	Eq. 1.1-2
b=1.2266 in (ineffective width=1.0548 in)	Eq. 1.1-1
b_1=0.61329 in, b_2=0.61329 in	
Center of gravity shift: y=-1.0547 in	
Sxe=0.59094 in^3, Fy=50 ksi	
Mnl=29.547 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5157 in	
f_1=48.919 ksi, f_2=43.817 ksi	
ψ=0.89572	Eq. 1.2.2-1
k=0.46774	Eq. 1.2.2-2
λ=1.0352	Eq. 1.1-3
ρ=0.7607	Eq. 1.1-2
b=0.39229 in (ineffective width=0.12341 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.139	Eq. 1.3-7
Ia=0.00026063 in^4	Eq. 1.3-8
Is=0.00035659 in^4 > Ia (no lip reduction)	
k=3.8802	Table 1.3-1
Element 2: Partially stiffened, w=2.2814 in	
f=49.846 ksi, k=3.8802	
λ=1.605	Eq. 1.1-3
ρ=0.53764	Eq. 1.1-2
b=1.2266 in (ineffective width=1.0548 in)	Eq. 1.1-1
b_1=0.61329 in, b_2=0.61329 in	
Element 3: Stiffened, w=7.7814 in	
h/t greater than 200, treat as rational analysis	
f_1=48.919 ksi, f_2=-28.055 ksi	
ψ=0.57351	Eq. 1.1.2-1
k=14.939	Eq. 1.1.2-2
λ=2.764	Eq. 1.1-3
ρ=0.333	Eq. 1.1-2
be=2.5912 in	Eq. 1.1-1
h_o=8 in, b_o=2.5 in, h_o/b_o=3.2	
b_1=0.72512 in	Eq. 1.1.2-3

b_2=1.2956 in	Eq. 1.1.2-4
Compression width=4.9453 in	
Ineffective width=2.9245 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=1.0547 in	
Sxe=0.59094 in³, Fy=50 ksi	
Mnl=29.547 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5157 in	
f_1=49.578 ksi, f_2=49.578 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.0869	Eq. 1.1-3
ρ=0.7338	Eq. 1.1-2
b=0.37842 in (ineffective width=0.13728 in)	Eq. 1.1-1
Element 2: Stiffened, w=2.2814 in	
f_1=47.044 ksi, f_2=-14.663 ksi	
ψ=0.31169	Eq. 1.1.2-1
k=11.137	Eq. 1.1.2-2
λ=0.92037	Eq. 1.1-3
ρ=0.8268	Eq. 1.1-2
be=1.8863 in	Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4	
b_1=0.56958 in	Eq. 1.1.2-3
b_2=0.94313 in	Eq. 1.1.2-4
Compression width=1.7393 in	
Ineffective width=0.22657 in	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.5157 in	
f_1=49.578 ksi, f_2=49.578 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=1.0869	Eq. 1.1-3
ρ=0.7338	Eq. 1.1-2
b=0.37842 in (ineffective width=0.13728 in)	Eq. 1.1-1
Element 4: Stiffened, w=2.2814 in	
f_1=47.044 ksi, f_2=-14.663 ksi	
ψ=0.31169	Eq. 1.1.2-1
k=11.137	Eq. 1.1.2-2
λ=0.92037	Eq. 1.1-3
ρ=0.8268	Eq. 1.1-2
be=1.8863 in	Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4	
b_1=0.56958 in	Eq. 1.1.2-3
b_2=0.94313 in	Eq. 1.1.2-4
Compression width=1.7393 in	

Ineffective width=0.22657 in
Center of gravity shift: x=-0.07879 in
Sye=0.1561 in³, Fy=50 ksi
Mnl=7.805 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=2.2814 in
f_1=45.695 ksi, f_2=-44.158 ksi
ψ=0.96636 Eq. 1.1.2-1
k=23.139 Eq. 1.1.2-2
λ=0.6293 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.2814 in Eq. 1.1-1
h_o=2.5 in, b_o=8 in, h_o/b_o=0.3125
b_1=0.57519 in Eq. 1.1.2-3
b_2=1.1407 in Eq. 1.1.2-4
Compression width=1.1602 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=49.386 ksi, f_2=49.386 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=6.6068 Eq. 1.1-3
ρ=0.14632 Eq. 1.1-2
b=0.45955 in (ineffective width=2.6812 in) Eq. 1.1-1
f_1=49.386 ksi, f_2=49.386 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=6.6068 Eq. 1.1-3
ρ=0.14632 Eq. 1.1-2
b=0.45955 in (ineffective width=2.6812 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=2.2814 in
f_1=45.695 ksi, f_2=-44.158 ksi
ψ=0.96636 Eq. 1.1.2-1
k=23.139 Eq. 1.1.2-2
λ=0.6293 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.2814 in Eq. 1.1-1
h_o=2.5 in, b_o=8 in, h_o/b_o=0.3125
b_1=0.57519 in Eq. 1.1.2-3
b_2=1.1407 in Eq. 1.1.2-4
Compression width=1.1602 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.53945 in
Sye=0.1425 in³, Fy=50 ksi
Mnl=7.1248 k-in Eq. F3.1-1

Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud

Cw=4.3701 in^6, Wn=7.7913 in^2, Fy=50 ksi

Bn=28.045 k-in^2 G8.1-1

Ωb=1.67, ϕb=0.9

800S250-33

Full Section Properties

Area	0.48270 in²	Wt.	0.0016412 k/ft	Flat	13.951 in
Ix	4.6449 in⁴	rx	3.1021 in	Ixy	0.0000 in⁴
Sx(t)	1.1612 in³	y(t)	4.0000 in	α	0.000 deg
Sx(b)	1.1612 in³	y(b)	4.0000 in		
Zx	1.3608 in³	Height	8.0000 in		
Iy	0.3888 in⁴	ry	0.8975 in	x_o	-1.6815 in
Sy(l)	0.5949 in³	x(l)	0.6536 in	y_o	0.0000 in
Sy(r)	0.2106 in³	x(r)	1.8464 in	jx	4.3022 in
Zy	0.3081 in³	Width	2.5000 in	jy	0.0000 in
I_1	4.6449 in⁴	r_1	3.1021 in	Cw	4.8300 in⁶
I_2	0.3888 in⁴	r_2	0.8975 in	J	0.0001926 in⁴
Ic	5.0337 in⁴	rc	3.2293 in		
I_o	6.3986 in⁴	r_o	3.6409 in		

Net Section Properties

Ix	4.6352 in⁴	rx	3.2802 in	Area	0.43080 in²
Sx(t)	1.1588 in³	y(t)	4.0000 in	Ixy	0.0000 in⁴
Sx(b)	1.1588 in³	y(b)	4.0000 in	α	0.000 deg
Zx	1.3413 in³				
Iy	0.3652 in⁴	ry	0.9208 in	x_o	-1.7604 in
Sy(l)	0.5002 in³	x(l)	0.7302 in	y_o	0.0000 in
Sy(r)	0.2064 in³	x(r)	1.7698 in	jx	3.9752 in
Zy	0.3073 in³			jy	0.0000 in
Ic	5.0004 in⁴	rc	3.4070 in	Cw	4.8193 in⁶
I_o	6.3355 in⁴	r_o	3.8349 in	J	0.0001719 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	7.470 k	ϕMnxo	28.087 k-in	ϕMnyo	8.368 k-in
Ae	0.17576 in²	Ixe	3.4693 in⁴	Iye	0.3370 in⁴
ϕTn	21.001 k	Sxe(t)	0.7022 in³	Sye(l)	0.4899 in³
		Sxe(b)	1.1340 in³	Sye(r)	0.1860 in³
Shear					
ϕVny	0.857 k	Negative Bending		Negative Bending	
ϕVnx	3.317 k	ϕMnxo	28.087 k-in	ϕMnyo	7.367 k-in
		Ixe	3.4693 in⁴	Iye	0.2050 in⁴
Torsion		Sxe(t)	1.1340 in³	Sye(l)	0.1637 in³
ϕBn	27.895 k-in²	Sxe(b)	0.7022 in³	Sye(r)	0.1642 in³

```
Stud element 3 h/t exceeds 200.
```

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=50.856 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=52.32 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=54.513 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	

Axial Tension Strength
Ag=0.4827 in², Fy=50.856 ksi
Tn=24.548 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.4308 in², Fu=65 ksi
Tn=28.002 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Stud element 2
Vn=1.843 k at 180 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Stud element 3
Vyh=6.3321 k — Eq. G3-2
kv=4.3432 — Eq. G3-8
Vcrh=0.44108 k — Eq. G3-6
h/t exceeds 200 (rational analysis)
Vn=1.0711 k at 90 deg — Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)
Stud element 4
Vn=1.843 k at 0 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Stud
Element 1: Unstiffened, w=0.514 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.98104 — Eq. 1.1-3
ρ=0.79074 — Eq. 1.1-2
b=0.40644 in (ineffective width=0.10756 in) — Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.091 — Eq. 1.3-7
Ia=0.00035618 in⁴ — Eq. 1.3-8
Is=0.00039155 in⁴ > Ia (no lip reduction)
k=3.8782 — Table 1.3-1
Element 2: Partially stiffened, w=2.278 in
f=50 ksi, k=3.8782
λ=1.4478 — Eq. 1.1-3
ρ=0.58576 — Eq. 1.1-2
b=1.3344 in (ineffective width=0.94364 in) — Eq. 1.1-1
b_1=0.66718 in, b_2=0.66718 in
Element 3: Treat as two unstiffened elements
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=5.9912 — Eq. 1.1-3

ρ=0.16078	Eq. 1.1-2
b=0.50469 in (ineffective width=2.6343 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=5.9912	Eq. 1.1-3
ρ=0.16078	Eq. 1.1-2
b=0.50469 in (ineffective width=2.6343 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.514 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.98104	Eq. 1.1-3
ρ=0.79074	Eq. 1.1-2
b=0.40644 in (ineffective width=0.10756 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00035618 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.8782	Table 1.3-1
Element 4: Partially stiffened, w=2.278 in	
f=50 ksi, k=3.8782	
λ=1.4478	Eq. 1.1-3
ρ=0.58576	Eq. 1.1-2
b=1.3344 in (ineffective width=0.94364 in)	Eq. 1.1-1
b_1=0.66718 in, b_2=0.66718 in	
Ae=0.17576 in^2, Fn=50 ksi	
Pn=8.7879 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=7.778 in	
h/t greater than 200, treat as rational analysis	
f_1=48.877 ksi, f_2=-29.848 ksi	
ψ=0.61069	Eq. 1.1.2-1
k=15.579	Eq. 1.1.2-2
λ=2.4385	Eq. 1.1-3
ρ=0.37309	Eq. 1.1-2
be=2.9019 in	Eq. 1.1-1
h_o=8 in, b_o=2.5 in, h_o/b_o=3.2	
b_1=0.80369 in	Eq. 1.1.2-3
b_2=1.4509 in	Eq. 1.1.2-4
Compression width=4.829 in	
Ineffective width=2.5744 in	
Element 5: Unstiffened, w=0.514 in	
f_1=48.877 ksi, f_2=43.674 ksi	
ψ=0.89356	Eq. 1.2.2-1

k=0.46856	Eq. 1.2.2-2
λ=0.92919	Eq. 1.1-3
ρ=0.8214	Eq. 1.1-2
b=0.4222 in (ineffective width=0.091801 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.146	Eq. 1.3-7
Ia=0.00035557 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.8782	Table 1.3-1
Element 4: Partially stiffened, w=2.278 in	
f=49.825 ksi, k=3.8782	
λ=1.4452	Eq. 1.1-3
ρ=0.5866	Eq. 1.1-2
b=1.3363 in (ineffective width=0.94172 in)	Eq. 1.1-1
b_1=0.66814 in, b_2=0.66814 in	
Center of gravity shift: y=-0.94066 in	
Sxe=0.70219 in^3, Fy=50 ksi	
Mnl=35.109 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.514 in	
f_1=48.877 ksi, f_2=43.674 ksi	
ψ=0.89356	Eq. 1.2.2-1
k=0.46856	Eq. 1.2.2-2
λ=0.92919	Eq. 1.1-3
ρ=0.8214	Eq. 1.1-2
b=0.4222 in (ineffective width=0.091801 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.146	Eq. 1.3-7
Ia=0.00035557 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.8782	Table 1.3-1
Element 2: Partially stiffened, w=2.278 in	
f=49.825 ksi, k=3.8782	
λ=1.4452	Eq. 1.1-3
ρ=0.5866	Eq. 1.1-2
b=1.3363 in (ineffective width=0.94172 in)	Eq. 1.1-1
b_1=0.66814 in, b_2=0.66814 in	
Element 3: Stiffened, w=7.778 in	
h/t greater than 200, treat as rational analysis	
f_1=48.877 ksi, f_2=-29.848 ksi	
ψ=0.61069	Eq. 1.1.2-1
k=15.579	Eq. 1.1.2-2
λ=2.4385	Eq. 1.1-3
ρ=0.37309	Eq. 1.1-2
be=2.9019 in	Eq. 1.1-1
h_o=8 in, b_o=2.5 in, h_o/b_o=3.2	
b_1=0.80369 in	Eq. 1.1.2-3

b_2=1.4509 in Eq. 1.1.2-4
Compression width=4.829 in
Ineffective width=2.5744 in
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0.94066 in
Sxe=0.70219 in³, Fy=50 ksi
Mnl=35.109 k-in Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.514 in
f_1=49.523 ksi, f_2=49.523 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.97635 Eq. 1.1-3
ρ=0.79344 Eq. 1.1-2
b=0.40783 in (ineffective width=0.10617 in) Eq. 1.1-1
Element 2: Stiffened, w=2.278 in
f_1=46.937 ksi, f_2=-15.928 ksi
ψ=0.33935 Eq. 1.1.2-1
k=11.484 Eq. 1.1.2-2
λ=0.81515 Eq. 1.1-3
ρ=0.89568 Eq. 1.1-2
be=2.0403 in Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.611 in Eq. 1.1.2-3
b_2=1.0202 in Eq. 1.1.2-4
Compression width=1.7008 in
Ineffective width=0.069646 in
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.514 in
f_1=49.523 ksi, f_2=49.523 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=0.97635 Eq. 1.1-3
ρ=0.79344 Eq. 1.1-2
b=0.40783 in (ineffective width=0.10617 in) Eq. 1.1-1
Element 4: Stiffened, w=2.278 in
f_1=46.937 ksi, f_2=-15.928 ksi
ψ=0.33935 Eq. 1.1.2-1
k=11.484 Eq. 1.1.2-2
λ=0.81515 Eq. 1.1-3
ρ=0.89568 Eq. 1.1-2
be=2.0403 in Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.611 in Eq. 1.1.2-3
b_2=1.0202 in Eq. 1.1.2-4
Compression width=1.7008 in

```
      Ineffective width=0.069645 in
  Center of gravity shift: x=-0.042419 in
  Sye=0.18595 in³, Fy=50 ksi
  Mnl=9.2975 k-in                                        Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
  Effective width calculations for Stud
    Element 1: No compressive stress (fully effective)
    Element 2: Stiffened, w=2.278 in
      f₁=45.567 ksi, f₂=-45.405 ksi
      ψ=0.99644                                          Eq. 1.1.2-1
      k=23.908                                           Eq. 1.1.2-2
      λ=0.55665                                          Eq. 1.1-3
      ρ=1                                                Eq. 1.1-2
      be=2.278 in                                        Eq. 1.1-1
      h₀=2.5 in, b₀=8 in, h₀/b₀=0.3125
      b₁=0.57001 in                                      Eq. 1.1.2-3
      b₂=1.139 in                                        Eq. 1.1.2-4
      Compression width=1.141 in
      b₁+b₂ > compression width (fully effective)
    Element 3: Treat as two unstiffened elements
      f₁=49.309 ksi, f₂=49.309 ksi
      ψ=1                                                Eq. 1.2.2-1
      k=0.43                                             Eq. 1.2.2-3
      λ=5.9497                                           Eq. 1.1-3
      ρ=0.16186                                          Eq. 1.1-2
      b=0.50808 in (ineffective width=2.6309 in)         Eq. 1.1-1
      f₁=49.309 ksi, f₂=49.309 ksi
      ψ=1                                                Eq. 1.2.2-1
      k=0.43                                             Eq. 1.2.2-3
      λ=5.9497                                           Eq. 1.1-3
      ρ=0.16186                                          Eq. 1.1-2
      b=0.50808 in (ineffective width=2.6309 in)         Eq. 1.1-1
    Element 5: No compressive stress (fully effective)
    Element 4: Stiffened, w=2.278 in
      f₁=45.567 ksi, f₂=-45.405 ksi
      ψ=0.99644                                          Eq. 1.1.2-1
      k=23.908                                           Eq. 1.1.2-2
      λ=0.55665                                          Eq. 1.1-3
      ρ=1                                                Eq. 1.1-2
      be=2.278 in                                        Eq. 1.1-1
      h₀=2.5 in, b₀=8 in, h₀/b₀=0.3125
      b₁=0.57001 in                                      Eq. 1.1.2-3
      b₂=1.139 in                                        Eq. 1.1.2-4
      Compression width=1.141 in
      b₁+b₂ > compression width (fully effective)
  Center of gravity shift: x=0.52181 in
  Sye=0.16371 in³, Fy=50 ksi
  Mnl=8.1854 k-in                                        Eq. F3.1-1
  Ωb=1.67, ϕb=0.9
```

```
Bimoment Strength, Stud
  Cw=4.8193 in⁶, Wn=7.7744 in², Fy=50 ksi
  Bn=30.995 k-in²                                        G8.1-1
  Ωb=1.67, ϕb=0.9
```

800S250-43

Full Section Properties

Area	0.62728 in²	Wt.	0.0021328 k/ft	Flat	13.909 in
Ix	6.0156 in⁴	rx	3.0968 in	Ixy	0.0000 in⁴
Sx(t)	1.5039 in³	y(t)	4.0000 in	α	0.000 deg
Sx(b)	1.5039 in³	y(b)	4.0000 in		
Zx	1.7650 in³	Height	8.0000 in		
Iy	0.5000 in⁴	ry	0.8928 in	x_o	-1.6705 in
Sy(l)	0.7641 in³	x(l)	0.6543 in	y_o	0.0000 in
Sy(r)	0.2709 in³	x(r)	1.8457 in	jx	4.2983 in
Zy	0.3979 in³	Width	2.5000 in	jy	0.0000 in
I_1	6.0156 in⁴	r_1	3.0968 in	Cw	6.1876 in⁶
I_2	0.5000 in⁴	r_2	0.8928 in	J	0.0004253 in⁴
Ic	6.5155 in⁴	rc	3.2229 in		
I_o	8.2660 in⁴	r_o	3.6301 in		

Net Section Properties

Ix	6.0029 in⁴	rx	3.2751 in	Area	0.55963 in²
Sx(t)	1.5007 in³	y(t)	4.0000 in	Ixy	0.0000 in⁴
Sx(b)	1.5007 in³	y(b)	4.0000 in	α	0.000 deg
Zx	1.7397 in³				
Iy	0.4697 in⁴	ry	0.9161 in	x_o	-1.7491 in
Sy(l)	0.6428 in³	x(l)	0.7307 in	y_o	0.0000 in
Sy(r)	0.2655 in³	x(r)	1.7693 in	jx	3.9701 in
Zy	0.3966 in³			jy	0.0000 in
Ic	6.4726 in⁴	rc	3.4009 in	Cw	6.1739 in⁶
I_o	8.1846 in⁴	r_o	3.8243 in	J	0.0003794 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	10.750 k	ϕMnxo	46.704 k-in	ϕMnyo	11.717 k-in
Ae	0.25293 in²	Ixe	4.8633 in⁴	Iye	0.4626 in⁴
ϕTn	27.282 k	Sxe(t)	1.0379 in³	Sye(l)	0.6394 in³
		Sxe(b)	1.4675 in³	Sye(r)	0.2604 in³
Shear					
ϕVny	1.739 k	Negative Bending		Negative Bending	
ϕVnx	5.185 k	ϕMnxo	46.704 k-in	ϕMnyo	9.867 k-in
		Ixe	4.8633 in⁴	Iye	0.2868 in⁴
Torsion		Sxe(t)	1.4675 in³	Sye(l)	0.2405 in³
ϕBn	35.977 k-in²	Sxe(b)	1.0379 in³	Sye(r)	0.2193 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=51.046 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=52.838 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=55.542 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength

Ag=0.62728 in², Fy=51.046 ksi	
Tn=32.02 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.55963 in², Fu=65 ksi	
Tn=36.376 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=2.8807 k at 180 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=8.2364 k	Eq. G3-2
kv=4.3425	Eq. G3-8
Vcrh=0.97752 k	Eq. G3-6
Vn=1.9321 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=2.8807 k at 0 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.74488	Eq. 1.1-3
ρ=0.94599	Eq. 1.1-2
b=0.48123 in (ineffective width=0.027474 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00079003 in⁴	Eq. 1.3-8
Is=0.00049474 in⁴	
ds=0.30136 in (lip ineffective width=0.17987 in)	Eq. 1.3-6
k=3.3746	Table 1.3-1
Element 2: Partially stiffened, w=2.2674 in	
f=50 ksi, k=3.3746	
λ=1.1852	Eq. 1.1-3
ρ=0.68714	Eq. 1.1-2
b=1.558 in (ineffective width=0.70937 in)	Eq. 1.1-1
b_1=0.48785 in, b_2=1.0702 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.5886	Eq. 1.1-3
ρ=0.20748	Eq. 1.1-2
b=0.65019 in (ineffective width=2.4835 in)	Eq. 1.1-1

f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=4.5886 Eq. 1.1-3
ρ=0.20748 Eq. 1.1-2
b=0.65019 in (ineffective width=2.4835 in) Eq. 1.1-1
Element 5: Unstiffened, w=0.5087 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.74488 Eq. 1.1-3
ρ=0.94599 Eq. 1.1-2
b=0.48123 in (ineffective width=0.027474 in) Eq. 1.1-1
Element 4: Check for lip stiffener reduction
S=31.091 Eq. 1.3-7
Ia=0.00079003 in^4 Eq. 1.3-8
Is=0.00049474 in^4
ds=0.30136 in (lip ineffective width=0.17987 in) Eq. 1.3-6
k=3.3746 Table 1.3-1
Element 4: Partially stiffened, w=2.2674 in
f=50 ksi, k=3.3746
λ=1.1852 Eq. 1.1-3
ρ=0.68714 Eq. 1.1-2
b=1.558 in (ineffective width=0.70937 in) Eq. 1.1-1
b_1=0.48785 in, b_2=1.0702 in
Ae=0.25293 in^2, Fn=50 ksi
Pn=12.646 k Eq. E3.1-1
Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: No compressive stress (fully effective)
Element 3: Stiffened, w=7.7674 in
f_1=48.759 ksi, f_2=-34.145 ksi
ψ=0.70029 Eq. 1.1.2-1
k=17.232 Eq. 1.1.2-2
λ=1.7742 Eq. 1.1-3
ρ=0.49373 Eq. 1.1-2
be=3.835 in Eq. 1.1-1
h_o=8 in, b_o=2.5 in, h_o/b_o=3.2
b_1=1.0364 in Eq. 1.1.2-3
b_2=1.9175 in Eq. 1.1.2-4
Compression width=4.5683 in
Ineffective width=1.6144 in
Element 5: Unstiffened, w=0.5087 in
f_1=48.759 ksi, f_2=43.329 ksi
ψ=0.88865 Eq. 1.2.2-1
k=0.47044 Eq. 1.2.2-2
λ=0.70325 Eq. 1.1-3

ρ=0.97713	Eq. 1.1-2
b=0.49707 in (ineffective width=0.011635 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.166	Eq. 1.3-7
Ia=0.00078817 in^4	Eq. 1.3-8
Is=0.00049474 in^4	
ds=0.31201 in (lip ineffective width=0.18505 in)	Eq. 1.3-6
k=3.3769	Table 1.3-1
Element 4: Partially stiffened, w=2.2674 in	
f=49.759 ksi, k=3.3769	
λ=1.1819	Eq. 1.1-3
ρ=0.6886	Eq. 1.1-2
b=1.5613 in (ineffective width=0.70606 in)	Eq. 1.1-1
b_1=0.49003 in, b_2=1.0713 in	
Center of gravity shift: y=-0.68593 in	
Sxe=1.0379 in^3, Fy=50 ksi	
Mnl=51.893 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	
f_1=48.759 ksi, f_2=43.329 ksi	
ψ=0.88865	Eq. 1.2.2-1
k=0.47044	Eq. 1.2.2-2
λ=0.70325	Eq. 1.1-3
ρ=0.97713	Eq. 1.1-2
b=0.49707 in (ineffective width=0.011635 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.166	Eq. 1.3-7
Ia=0.00078817 in^4	Eq. 1.3-8
Is=0.00049474 in^4	
ds=0.31201 in (lip ineffective width=0.18505 in)	Eq. 1.3-6
k=3.3769	Table 1.3-1
Element 2: Partially stiffened, w=2.2674 in	
f=49.759 ksi, k=3.3769	
λ=1.1819	Eq. 1.1-3
ρ=0.6886	Eq. 1.1-2
b=1.5613 in (ineffective width=0.70606 in)	Eq. 1.1-1
b_1=0.49003 in, b_2=1.0713 in	
Element 3: Stiffened, w=7.7674 in	
f_1=48.759 ksi, f_2=-34.145 ksi	
ψ=0.70029	Eq. 1.1.2-1
k=17.232	Eq. 1.1.2-2
λ=1.7742	Eq. 1.1-3
ρ=0.49373	Eq. 1.1-2
be=3.835 in	Eq. 1.1-1
h_o=8 in, b_o=2.5 in, h_o/b_o=3.2	
b_1=1.0364 in	Eq. 1.1.2-3
b_2=1.9175 in	Eq. 1.1.2-4

Compression width=4.5683 in
Ineffective width=1.6144 in
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0.68593 in
Sxe=1.0379 in^3, Fy=50 ksi
Mnl=51.893 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.5087 in
f_1=49.365 ksi, f_2=49.365 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.74014 Eq. 1.1-3
ρ=0.9495 Eq. 1.1-2
b=0.48301 in (ineffective width=0.025691 in) Eq. 1.1-1
Element 2: Stiffened, w=2.2674 in
f_1=46.727 ksi, f_2=-17.087 ksi
ψ=0.36567 Eq. 1.1.2-1
k=11.825 Eq. 1.1.2-2
λ=0.61204 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.2674 in Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.67368 in Eq. 1.1.2-3
b_2=1.1337 in Eq. 1.1.2-4
Compression width=1.6603 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.5087 in
f_1=49.365 ksi, f_2=49.365 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.74014 Eq. 1.1-3
ρ=0.9495 Eq. 1.1-2
b=0.48301 in (ineffective width=0.025691 in) Eq. 1.1-1
Element 4: Stiffened, w=2.2674 in
f_1=46.727 ksi, f_2=-17.087 ksi
ψ=0.36567 Eq. 1.1.2-1
k=11.825 Eq. 1.1.2-2
λ=0.61204 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.2674 in Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.67368 in Eq. 1.1.2-3
b_2=1.1337 in Eq. 1.1.2-4
Compression width=1.6603 in
b_1+b_2 > compression width (fully effective)

Center of gravity shift: x=-0.0072632 in
Sye=0.26037 in³, Fy=50 ksi
Mnl=13.019 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=2.2674 in
f_1=41.107 ksi, f_2=-45.555 ksi
ψ=1.1082 Eq. 1.1.2-1
k=26.956 Eq. 1.1.2-2
λ=0.38022 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.2674 in Eq. 1.1-1
h_o=2.5 in, b_o=8 in, h_o/b_o=0.3125
b_1=0.55192 in Eq. 1.1.2-3
b_2=1.1337 in Eq. 1.1.2-4
Compression width=1.0755 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=44.69 ksi, f_2=44.69 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=4.3381 Eq. 1.1-3
ρ=0.21882 Eq. 1.1-2
b=0.68573 in (ineffective width=2.448 in) Eq. 1.1-1
f_1=44.69 ksi, f_2=44.69 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=4.3381 Eq. 1.1-3
ρ=0.21882 Eq. 1.1-2
b=0.68573 in (ineffective width=2.448 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=2.2674 in
f_1=41.107 ksi, f_2=-45.555 ksi
ψ=1.1082 Eq. 1.1.2-1
k=26.956 Eq. 1.1.2-2
λ=0.38022 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.2674 in Eq. 1.1-1
h_o=2.5 in, b_o=8 in, h_o/b_o=0.3125
b_1=0.55192 in Eq. 1.1.2-3
b_2=1.1337 in Eq. 1.1.2-4
Compression width=1.0755 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.46148 in
Sye=0.21926 in³, Fy=50 ksi
Mnl=10.963 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud

C_w=6.1739 in^6, W_n=7.7224 in^2, F_y=50 ksi

B_n=39.974 k-in^2 G8.1-1

Ω_b=1.67, ϕ_b=0.9

800S250-54

Full Section Properties

Area	0.78274 in²	Wt.	0.0026613 k/ft	Flat	13.829 in
Ix	7.466 in⁴	rx	3.0884 in	Ixy	0.000 in⁴
Sx(t)	1.8665 in³	y(t)	4.0000 in	α	0.000 deg
Sx(b)	1.8665 in³	y(b)	4.0000 in		
Zx	2.1957 in³	Height	8.0000 in		
Iy	0.615 in⁴	ry	0.8861 in	x_o	-1.6560 in
Sy(l)	0.9401 in³	x(l)	0.6537 in	y_o	0.0000 in
Sy(r)	0.3328 in³	x(r)	1.8463 in	jx	4.2988 in
Zy	0.4921 in³	Width	2.5000 in	jy	0.0000 in
I_1	7.466 in⁴	r_1	3.0884 in	Cw	7.5682 in⁶
I_2	0.615 in⁴	r_2	0.8861 in	J	0.0008358 in⁴
Ic	8.080 in⁴	rc	3.2130 in		
I_o	10.227 in⁴	r_o	3.6146 in		

Net Section Properties

Ix	7.450 in⁴	rx	3.2674 in	Area	0.69784 in²
Sx(t)	1.8625 in³	y(t)	4.0000 in	Ixy	0.000 in⁴
Sx(b)	1.8625 in³	y(b)	4.0000 in	α	0.000 deg
Zx	2.1638 in³				
Iy	0.577 in⁴	ry	0.9095 in	x_o	-1.7343 in
Sy(l)	0.7910 in³	x(l)	0.7298 in	y_o	0.0000 in
Sy(r)	0.3261 in³	x(r)	1.7702 in	jx	3.9689 in
Zy	0.4900 in³			jy	0.0000 in
Ic	8.027 in⁴	rc	3.3916 in	Cw	7.5513 in⁶
I_o	10.126 in⁴	r_o	3.8093 in	J	0.0007452 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	14.656 k	ϕMnxo	67.050 k-in	ϕMnyo	16.677 k-in
Ae	0.34484 in²	Ixe	6.5365 in⁴	Iye	0.5772 in⁴
ϕTn	34.020 k	Sxe(t)	1.4900 in³	Sye(l)	0.7910 in³
		Sxe(b)	1.8091 in³	Sye(r)	0.3261 in³
Shear					
ϕVny	2.859 k	Negative Bending		Negative Bending	
ϕVnx	6.776 k	ϕMnxo	67.050 k-in	ϕMnyo	12.576 k-in
		Ixe	6.5365 in⁴	Iye	0.3850 in⁴
Torsion		Sxe(t)	1.8091 in³	Sye(l)	0.3431 in³
ϕBn	44.328 k-in²	Sxe(b)	1.4900 in³	Sye(r)	0.2795 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=51.306 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=53.509 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=56.825 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.78274 in², Fy=51.306 ksi

Tn=40.159 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.69784 in², Fu=65 ksi	
Tn=45.359 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=3.7645 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=10.234 k	Eq. G3-2
kv=4.3391	Eq. G3-8
Vcrh=1.9386 k	Eq. G3-6
Vn=3.1762 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=3.7645 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4835 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56413	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0015382 in⁴	Eq. 1.3-8
Is=0.00053312 in⁴	
ds=0.16757 in (lip ineffective width=0.31593 in)	Eq. 1.3-6
k=2.8256	Table 1.3-1
Element 2: Partially stiffened, w=2.217 in	
f=50 ksi, k=2.8256	
λ=1.0091	Eq. 1.1-3
ρ=0.77494	Eq. 1.1-2
b=1.718 in (ineffective width=0.49896 in)	Eq. 1.1-1
b_1=0.29773 in, b_2=1.4203 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=3.6269	Eq. 1.1-3
ρ=0.25899	Eq. 1.1-2
b=0.80508 in (ineffective width=2.3034 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=3.6269	Eq. 1.1-3
ρ=0.25899	Eq. 1.1-2
b=0.80508 in (ineffective width=2.3034 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4835 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56413	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0015382 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.16757 in (lip ineffective width=0.31593 in)	Eq. 1.3-6
k=2.8256	Table 1.3-1
Element 4: Partially stiffened, w=2.217 in	
f=50 ksi, k=2.8256	
λ=1.0091	Eq. 1.1-3
ρ=0.77494	Eq. 1.1-2
b=1.718 in (ineffective width=0.49896 in)	Eq. 1.1-1
b_1=0.29773 in, b_2=1.4203 in	
Ae=0.34484 in^2, Fn=50 ksi	
Pn=17.242 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=7.717 in	
f_1=48.387 ksi, f_2=-39.594 ksi	
ψ=0.81828	Eq. 1.1.2-1
k=19.66	Eq. 1.1.2-2
λ=1.31	Eq. 1.1-3
ρ=0.63517	Eq. 1.1-2
be=4.9016 in	Eq. 1.1-1
h_o=8 in, b_o=2.5 in, h_o/b_o=3.2	
b_1=1.2837 in	Eq. 1.1.2-3
b_2=2.4508 in	Eq. 1.1.2-4
Compression width=4.2441 in	
Ineffective width=0.50957 in	
Element 5: Unstiffened, w=0.4835 in	
f_1=48.387 ksi, f_2=42.874 ksi	
ψ=0.88608	Eq. 1.2.2-1
k=0.47142	Eq. 1.2.2-2
λ=0.53002	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.192	Eq. 1.3-7

Ia=0.0015334 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.1681 in (lip ineffective width=0.3154 in)	Eq. 1.3-6
k=2.8281	Table 1.3-1
Element 4: Partially stiffened, w=2.217 in	
f=49.677 ksi, k=2.8281	
λ=1.0054	Eq. 1.1-3
ρ=0.777	Eq. 1.1-2
b=1.7226 in (ineffective width=0.4944 in)	Eq. 1.1-1
b_1=0.29945 in, b_2=1.4231 in	
Center of gravity shift: y=-0.38693 in	
Sxe=1.49 in^3, Fy=50 ksi	
Mnl=74.5 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4835 in	
f_1=48.387 ksi, f_2=42.874 ksi	
ψ=0.88608	Eq. 1.2.2-1
k=0.47142	Eq. 1.2.2-2
λ=0.53002	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.192	Eq. 1.3-7
Ia=0.0015334 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.1681 in (lip ineffective width=0.3154 in)	Eq. 1.3-6
k=2.8281	Table 1.3-1
Element 2: Partially stiffened, w=2.217 in	
f=49.677 ksi, k=2.8281	
λ=1.0054	Eq. 1.1-3
ρ=0.777	Eq. 1.1-2
b=1.7226 in (ineffective width=0.4944 in)	Eq. 1.1-1
b_1=0.29945 in, b_2=1.4231 in	
Element 3: Stiffened, w=7.717 in	
f_1=48.387 ksi, f_2=-39.594 ksi	
ψ=0.81828	Eq. 1.1.2-1
k=19.66	Eq. 1.1.2-2
λ=1.31	Eq. 1.1-3
ρ=0.63517	Eq. 1.1-2
be=4.9016 in	Eq. 1.1-1
h_o=8 in, b_o=2.5 in, h_o/b_o=3.2	
b_1=1.2837 in	Eq. 1.1.2-3
b_2=2.4508 in	Eq. 1.1.2-4
Compression width=4.2441 in	
Ineffective width=0.50957 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.38693 in	

Sxe=1.49 in³, Fy=50 ksi
Mnl=74.5 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.4835 in
f_1=55.917 ksi, f_2=55.917 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.59658 — Eq. 1.1-3
λ<0.673 (fully effective) — Eq. 1.1-1
Element 2: Stiffened, w=2.217 in
f_1=52.283 ksi, f_2=-18.884 ksi
ψ=0.36119 — Eq. 1.1.2-1
k=11.767 — Eq. 1.1.2-2
λ=0.50566 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=2.217 in — Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.65959 in — Eq. 1.1.2-3
b_2=1.1085 in — Eq. 1.1.2-4
Compression width=1.6287 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.4835 in
f_1=55.917 ksi, f_2=55.917 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.59658 — Eq. 1.1-3
λ<0.673 (fully effective) — Eq. 1.1-1
Element 4: Stiffened, w=2.217 in
f_1=52.283 ksi, f_2=-18.884 ksi
ψ=0.36119 — Eq. 1.1.2-1
k=11.767 — Eq. 1.1.2-2
λ=0.50566 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=2.217 in — Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.65959 in — Eq. 1.1.2-3
b_2=1.1085 in — Eq. 1.1.2-4
Compression width=1.6287 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0 in
Sye=0.32609 in³, Fy=56.825 ksi
Mnl=18.53 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud

Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=2.217 in
f_1=35.566 ksi, f_2=-44.866 ksi
ψ=1.2615 Eq. 1.1.2-1
k=31.655 Eq. 1.1.2-2
λ=0.25427 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.217 in Eq. 1.1-1
h_o=2.5 in, b_o=8 in, h_o/b_o=0.3125
b_1=0.52024 in Eq. 1.1.2-3
b_2=1.1085 in Eq. 1.1.2-4
Compression width=0.98033 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=39.673 ksi, f_2=39.673 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=3.2307 Eq. 1.1-3
ρ=0.28845 Eq. 1.1-2
b=0.89665 in (ineffective width=2.2119 in) Eq. 1.1-1
f_1=39.673 ksi, f_2=39.673 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=3.2307 Eq. 1.1-3
ρ=0.28845 Eq. 1.1-2
b=0.89665 in (ineffective width=2.2119 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=2.217 in
f_1=35.566 ksi, f_2=-44.866 ksi
ψ=1.2615 Eq. 1.1.2-1
k=31.655 Eq. 1.1.2-2
λ=0.25427 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.217 in Eq. 1.1-1
h_o=2.5 in, b_o=8 in, h_o/b_o=0.3125
b_1=0.52024 in Eq. 1.1.2-3
b_2=1.1085 in Eq. 1.1.2-4
Compression width=0.98033 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.39253 in
Sye=0.27947 in^3, Fy=50 ksi
Mnl=13.974 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=7.5513 in^6, Wn=7.6658 in^2, Fy=50 ksi
Bn=49.253 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

800S250-68

Full Section Properties

Area	0.97824 in²	Wt.	0.0033260 k/ft	Flat	13.720 in
Ix	9.262 in⁴	rx	3.0771 in	Ixy	0.000 in⁴
Sx(t)	2.3156 in³	y(t)	4.0000 in	α	0.000 deg
Sx(b)	2.3156 in³	y(b)	4.0000 in		
Zx	2.7325 in³	Height	8.0000 in		
Iy	0.752 in⁴	ry	0.8771 in	x_o	-1.6367 in
Sy(l)	1.1531 in³	x(l)	0.6526 in	y_o	0.0000 in
Sy(r)	0.4073 in³	x(r)	1.8474 in	jx	4.3007 in
Zy	0.6076 in³	Width	2.5000 in	jy	0.0000 in
I_1	9.262 in⁴	r_1	3.0771 in	Cw	9.2056 in⁶
I_2	0.752 in⁴	r_2	0.8771 in	J	0.0016577 in⁴
Ic	10.015 in⁴	rc	3.1996 in		
I_o	12.635 in⁴	r_o	3.5939 in		

Net Section Properties

Ix	9.242 in⁴	rx	3.2569 in	Area	0.87129 in²
Sx(t)	2.3106 in³	y(t)	4.0000 in	Ixy	0.000 in⁴
Sx(b)	2.3106 in³	y(b)	4.0000 in	α	0.000 deg
Zx	2.6924 in³				
Iy	0.707 in⁴	ry	0.9006 in	x_o	-1.7146 in
Sy(l)	0.9704 in³	x(l)	0.7283 in	y_o	0.0000 in
Sy(r)	0.3989 in³	x(r)	1.7717 in	jx	3.9686 in
Zy	0.6044 in³			jy	0.0000 in
Ic	9.949 in⁴	rc	3.3792 in	Cw	9.1847 in⁶
I_o	12.510 in⁴	r_o	3.7893 in	J	0.0014765 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	20.642 k	ϕMnxo	92.103 k-in	ϕMnyo	20.994 k-in
Ae	0.48569 in²	Ixe	8.5941 in⁴	Iye	0.7068 in⁴
ϕTn	42.475 k	Sxe(t)	2.0467 in³	Sye(l)	0.9704 in³
		Sxe(b)	2.2610 in³	Sye(r)	0.3989 in³
Shear					
ϕVny	4.687 k	Negative Bending		Negative Bending	
ϕVnx	8.253 k	ϕMnxo	92.103 k-in	ϕMnyo	15.994 k-in
		Ixe	8.5941 in⁴	Iye	0.5195 in⁴
Torsion		Sxe(t)	2.2610 in³	Sye(l)	0.5003 in³
ϕBn	54.433 k-in²	Sxe(b)	2.0467 in³	Sye(r)	0.3554 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=51.658 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=54.388 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=58.477 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.97824 in², Fy=51.658 ksi

Tn=50.534 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.87129 in², Fu=65 ksi	
Tn=56.634 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=4.5852 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=12.703 k	Eq. G3-2
kv=4.3341	Eq. G3-8
Vcrh=3.8943 k	Eq. G3-6
Vn=5.2075 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=4.5852 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4468 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41383	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0026903 in⁴	Eq. 1.3-8
Is=0.00052997 in⁴	
ds=0.088017 in (lip ineffective width=0.35878 in)	Eq. 1.3-6
k=2.3644	Table 1.3-1
Element 2: Partially stiffened, w=2.1436 in	
f=50 ksi, k=2.3644	
λ=0.84669	Eq. 1.1-3
ρ=0.87418	Eq. 1.1-2
b=1.8739 in (ineffective width=0.2697 in)	Eq. 1.1-1
b_1=0.18457 in, b_2=1.6893 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.8451	Eq. 1.1-3
ρ=0.3243	Eq. 1.1-2
b=0.99618 in (ineffective width=2.0756 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=2.8451	Eq. 1.1-3
ρ=0.3243	Eq. 1.1-2
b=0.99618 in (ineffective width=2.0756 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4468 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41383	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0026903 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.088017 in (lip ineffective width=0.35878 in)	Eq. 1.3-6
k=2.3644	Table 1.3-1
Element 4: Partially stiffened, w=2.1436 in	
f=50 ksi, k=2.3644	
λ=0.84669	Eq. 1.1-3
ρ=0.87418	Eq. 1.1-2
b=1.8739 in (ineffective width=0.2697 in)	Eq. 1.1-1
b_1=0.18457 in, b_2=1.6893 in	
Ae=0.48569 in^2, Fn=50 ksi	
Pn=24.284 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=7.6436 in	
f_1=47.878 ksi, f_2=-43.144 ksi	
ψ=0.90113	Eq. 1.1.2-1
k=21.545	Eq. 1.1.2-2
λ=0.97871	Eq. 1.1-3
ρ=0.79208	Eq. 1.1-2
be=6.0543 in	Eq. 1.1-1
h_o=8 in, b_o=2.5 in, h_o/b_o=3.2	
b_1=1.5519 in	Eq. 1.1.2-3
b_2=3.0272 in	Eq. 1.1.2-4
Compression width=4.0206 in	
b_1+b_2 > compression width (fully effective)	
Element 5: Unstiffened, w=0.4468 in	
f_1=47.878 ksi, f_2=42.557 ksi	
ψ=0.88887	Eq. 1.2.2-1
k=0.47035	Eq. 1.2.2-2
λ=0.3872	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.224	Eq. 1.3-7

Ia=0.0026386 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.089739 in (lip ineffective width=0.35706 in)	Eq. 1.3-6
k=2.374	Table 1.3-1
Element 4: Partially stiffened, w=2.1436 in	
f=49.575 ksi, k=2.374	
λ=0.84139	Eq. 1.1-3
ρ=0.87775	Eq. 1.1-2
b=1.8815 in (ineffective width=0.26206 in)	Eq. 1.1-1
b_1=0.18895 in, b_2=1.6926 in	
Center of gravity shift: y=-0.19892 in	
Sxe=2.0467 in^3, Fy=50 ksi	
Mnl=102.34 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4468 in	
f_1=47.878 ksi, f_2=42.557 ksi	
ψ=0.88887	Eq. 1.2.2-1
k=0.47035	Eq. 1.2.2-2
λ=0.3872	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.224	Eq. 1.3-7
Ia=0.0026386 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.089739 in (lip ineffective width=0.35706 in)	Eq. 1.3-6
k=2.374	Table 1.3-1
Element 2: Partially stiffened, w=2.1436 in	
f=49.575 ksi, k=2.374	
λ=0.84139	Eq. 1.1-3
ρ=0.87775	Eq. 1.1-2
b=1.8815 in (ineffective width=0.26206 in)	Eq. 1.1-1
b_1=0.18895 in, b_2=1.6926 in	
Element 3: Stiffened, w=7.6436 in	
f_1=47.878 ksi, f_2=-43.144 ksi	
ψ=0.90113	Eq. 1.1.2-1
k=21.545	Eq. 1.1.2-2
λ=0.97871	Eq. 1.1-3
ρ=0.79207	Eq. 1.1-2
be=6.0543 in	Eq. 1.1-1
h_o=8 in, b_o=2.5 in, h_o/b_o=3.2	
b_1=1.5519 in	Eq. 1.1.2-3
b_2=3.0272 in	Eq. 1.1.2-4
Compression width=4.0206 in	
b_1+b_2 > compression width (fully effective)	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.19892 in	

Sxe=2.0467 in³, Fy=50 ksi
Mnl=102.34 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.4468 in
f_1=57.3 ksi, f_2=57.3 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.44301 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 2: Stiffened, w=2.1436 in
f_1=52.595 ksi, f_2=-18.156 ksi
ψ=0.34521 Eq. 1.1.2-1
k=11.559 Eq. 1.1.2-2
λ=0.39275 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.1436 in Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.6408 in Eq. 1.1.2-3
b_2=1.0718 in Eq. 1.1.2-4
Compression width=1.5935 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.4468 in
f_1=57.3 ksi, f_2=57.3 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.44301 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 4: Stiffened, w=2.1436 in
f_1=52.595 ksi, f_2=-18.156 ksi
ψ=0.34521 Eq. 1.1.2-1
k=11.559 Eq. 1.1.2-2
λ=0.39275 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.1436 in Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.6408 in Eq. 1.1.2-3
b_2=1.0718 in Eq. 1.1.2-4
Compression width=1.5935 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0 in
Sye=0.39891 in³, Fy=58.477 ksi
Mnl=23.327 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud

Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=2.1436 in
f_1=29.395 ksi, f_2=-43.906 ksi
ψ=1.4937 Eq. 1.1.2-1
k=40.001 Eq. 1.1.2-2
λ=0.15784 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.1436 in Eq. 1.1-1
h_o=2.5 in, b_o=8 in, h_o/b_o=0.3125
b_1=0.47703 in Eq. 1.1.2-3
b_2=1.0718 in Eq. 1.1.2-4
Compression width=0.85961 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=34.269 ksi, f_2=34.269 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=2.3554 Eq. 1.1-3
ρ=0.3849 Eq. 1.1-2
b=1.1823 in (ineffective width=1.8895 in) Eq. 1.1-1
f_1=34.269 ksi, f_2=34.269 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=2.3554 Eq. 1.1-3
ρ=0.3849 Eq. 1.1-2
b=1.1823 in (ineffective width=1.8895 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=2.1436 in
f_1=29.395 ksi, f_2=-43.906 ksi
ψ=1.4937 Eq. 1.1.2-1
k=40.001 Eq. 1.1.2-2
λ=0.15784 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.1436 in Eq. 1.1-1
h_o=2.5 in, b_o=8 in, h_o/b_o=0.3125
b_1=0.47703 in Eq. 1.1.2-3
b_2=1.0718 in Eq. 1.1.2-4
Compression width=0.85961 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.31008 in
Sye=0.35543 in^3, Fy=50 ksi
Mnl=17.771 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=9.1847 in^6, Wn=7.593 in^2, Fy=50 ksi
Bn=60.481 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

1000S162-30

Full Section Properties

Area	0.43569 in²	Wt.	0.0014813 k/ft	Flat	13.964 in
Ix	5.6016 in⁴	rx	3.5856 in	Ixy	0.0000 in⁴
Sx(t)	1.1203 in³	y(t)	5.0000 in	α	0.000 deg
Sx(b)	1.1203 in³	y(b)	5.0000 in		
Zx	1.3891 in³	Height	10.0000 in		
Iy	0.1196 in⁴	ry	0.5239 in	x_o	-0.8296 in
Sy(l)	0.4000 in³	x(l)	0.2989 in	y_o	0.0000 in
Sy(r)	0.0902 in³	x(r)	1.3261 in	jx	6.9666 in
Zy	0.1254 in³	Width	1.6250 in	jy	0.0000 in
I_1	5.6016 in⁴	r_1	3.5856 in	Cw	2.3526 in⁶
I_2	0.1196 in⁴	r_2	0.5239 in	J	0.0001414 in⁴
Ic	5.7211 in⁴	rc	3.6237 in		
I_o	6.0210 in⁴	r_o	3.7175 in		

Net Section Properties

Ix	5.5928 in⁴	rx	3.7923 in	Area	0.38889 in²
Sx(t)	1.1186 in³	y(t)	5.0000 in	Ixy	0.0000 in⁴
Sx(b)	1.1186 in³	y(b)	5.0000 in	α	0.000 deg
Zx	1.3716 in³				
Iy	0.1154 in⁴	ry	0.5446 in	x_o	-0.8645 in
Sy(l)	0.3464 in³	x(l)	0.3330 in	y_o	0.0000 in
Sy(r)	0.0893 in³	x(r)	1.2920 in	jx	6.3634 in
Zy	0.1250 in³			jy	0.0000 in
Ic	5.7081 in⁴	rc	3.8312 in	Cw	2.3500 in⁶
I_o	5.9988 in⁴	r_o	3.9275 in	J	0.0001262 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	5.677 k	ϕMnxo	26.936 k-in	ϕMnyo	3.840 k-in
Ae	0.13357 in²	Ixe	4.1678 in⁴	Iye	0.1110 in⁴
ϕTn	18.958 k	Sxe(t)	0.6734 in³	Sye(l)	0.3424 in³
		Sxe(b)	1.0937 in³	Sye(r)	0.0853 in³
Shear					
ϕVny	0.704 k	Negative Bending		Negative Bending	
ϕVnx	2.328 k	ϕMnxo	26.936 k-in	ϕMnyo	3.192 k-in
		Ixe	4.1678 in⁴	Iye	0.0596 in⁴
Torsion		Sxe(t)	1.0937 in³	Sye(l)	0.0760 in³
ϕBn	16.929 k-in²	Sxe(b)	0.6734 in³	Sye(r)	0.0709 in³

```
Stud element 3 h/t exceeds 300.
Stud element 3 h/t exceeds 200.
```

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=50.788 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=53.235 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=55.114 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	

Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.43569 in², Fy=50.788 ksi
Tn=22.128 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.38889 in², Fu=65 ksi
Tn=25.278 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Stud element 2
Vn=1.2934 k at 180 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Stud element 3
Vyh=7.9889 k — Eq. G3-2
kv=4.398 — Eq. G3-8
Vcrh=0.28024 k — Eq. G3-6
h/t exceeds 200 (rational analysis)
Vn=0.87961 k at 90 deg — Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)
Stud element 4
Vn=1.2934 k at 0 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3907 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.82697 — Eq. 1.1-3
ρ=0.88754 — Eq. 1.1-2
b=0.34676 in (ineffective width=0.043938 in) — Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.091 — Eq. 1.3-7
Ia=0.00016273 in⁴ — Eq. 1.3-8
Is=0.00015506 in⁴
ds=0.33042 in (lip ineffective width=0.01634 in) — Eq. 1.3-6
k=3.4239 — Table 1.3-1
Element 2: Partially stiffened, w=1.4064 in
f=50 ksi, k=3.4239
λ=1.055 — Eq. 1.1-3
ρ=0.75023 — Eq. 1.1-2
b=1.0551 in (ineffective width=0.35127 in) — Eq. 1.1-1
b_1=0.5027 in, b_2=0.55242 in
Element 3: Treat as two unstiffened elements
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=8.7644	Eq. 1.1-3
ρ=0.11123	Eq. 1.1-2
b=0.46059 in (ineffective width=3.6801 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=8.7644	Eq. 1.1-3
ρ=0.11123	Eq. 1.1-2
b=0.46059 in (ineffective width=3.6801 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.3907 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.82697	Eq. 1.1-3
ρ=0.88754	Eq. 1.1-2
b=0.34676 in (ineffective width=0.043938 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00016273 in^4	Eq. 1.3-8
Is=0.00015506 in^4	
ds=0.33042 in (lip ineffective width=0.016341 in)	Eq. 1.3-6
k=3.4239	Table 1.3-1
Element 4: Partially stiffened, w=1.4064 in	
f=50 ksi, k=3.4239	
λ=1.055	Eq. 1.1-3
ρ=0.75023	Eq. 1.1-2
b=1.0551 in (ineffective width=0.35127 in)	Eq. 1.1-1
b_1=0.5027 in, b_2=0.55242 in	
Ae=0.13357 in^2, Fn=50 ksi	
Pn=6.6784 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=9.7814 in	
h/t greater than 200, treat as rational analysis	
f_1=49.117 ksi, f_2=-29.903 ksi	
ψ=0.60882	Eq. 1.1.2-1
k=15.546	Eq. 1.1.2-2
λ=3.4128	Eq. 1.1-3
ρ=0.27413	Eq. 1.1-2
be=2.6814 in	Eq. 1.1-1
h_o=10 in, b_o=1.625 in, h_o/b_o=6.1538	
b_1=0.743 in	Eq. 1.1.2-6
b_2=0.92366 in	Eq. 1.1.2-7
Compression width=6.0799 in	
Ineffective width=4.4132 in	

Element 5: Unstiffened, w=0.3907 in
f_1=49.117 ksi, f_2=45.961 ksi
ψ=0.93574 Eq. 1.2.2-1
k=0.45307 Eq. 1.2.2-2
λ=0.79849 Eq. 1.1-3
ρ=0.90731 Eq. 1.1-2
b=0.35449 in (ineffective width=0.036214 in) Eq. 1.1-1
Element 4: Check for lip stiffener reduction
S=31.13 Eq. 1.3-7
Ia=0.00016253 in^4 Eq. 1.3-8
Is=0.00015506 in^4
ds=0.3382 in (lip ineffective width=0.01629 in) Eq. 1.3-6
k=3.4251 Table 1.3-1
Element 4: Partially stiffened, w=1.4064 in
f=49.874 ksi, k=3.4251
λ=1.0534 Eq. 1.1-3
ρ=0.75103 Eq. 1.1-2
b=1.0562 in (ineffective width=0.35015 in) Eq. 1.1-1
b_1=0.50385 in, b_2=0.55239 in
Center of gravity shift: y=-1.1892 in
Sxe=0.6734 in^3, Fy=50 ksi
Mnl=33.67 k-in Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)

Negative Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3907 in
f_1=49.117 ksi, f_2=45.961 ksi
ψ=0.93574 Eq. 1.2.2-1
k=0.45307 Eq. 1.2.2-2
λ=0.79849 Eq. 1.1-3
ρ=0.90731 Eq. 1.1-2
b=0.35449 in (ineffective width=0.036214 in) Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.13 Eq. 1.3-7
Ia=0.00016253 in^4 Eq. 1.3-8
Is=0.00015506 in^4
ds=0.3382 in (lip ineffective width=0.01629 in) Eq. 1.3-6
k=3.4251 Table 1.3-1
Element 2: Partially stiffened, w=1.4064 in
f=49.874 ksi, k=3.4251
λ=1.0534 Eq. 1.1-3
ρ=0.75103 Eq. 1.1-2
b=1.0562 in (ineffective width=0.35015 in) Eq. 1.1-1
b_1=0.50385 in, b_2=0.55239 in
Element 3: Stiffened, w=9.7814 in
h/t greater than 200, treat as rational analysis
f_1=49.117 ksi, f_2=-29.903 ksi
ψ=0.60882 Eq. 1.1.2-1
k=15.546 Eq. 1.1.2-2

λ=3.4128	Eq. 1.1-3
ρ=0.27413	Eq. 1.1-2
be=2.6814 in	Eq. 1.1-1
h_o=10 in, b_o=1.625 in, h_o/b_o=6.1538	
b_1=0.743 in	Eq. 1.1.2-6
b_2=0.92366 in	Eq. 1.1.2-7
Compression width=6.0799 in	
Ineffective width=4.4132 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=1.1892 in	
Sxe=0.6734 in^3, Fy=50 ksi	
Mnl=33.67 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3907 in	
f_1=49.4 ksi, f_2=49.4 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.822	Eq. 1.1-3
ρ=0.89095	Eq. 1.1-2
b=0.34809 in (ineffective width=0.042605 in)	Eq. 1.1-1
Element 2: Stiffened, w=1.4064 in	
f_1=45.799 ksi, f_2=-8.2606 ksi	
ψ=0.18037	Eq. 1.1.2-1
k=9.6499	Eq. 1.1.2-2
λ=0.60141	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.4064 in	Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25	
b_1=0.44221 in	Eq. 1.1.2-3
b_2=0.96419 in	Eq. 1.1.2-5
Compression width=1.1915 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.3907 in	
f_1=49.4 ksi, f_2=49.4 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=0.822	Eq. 1.1-3
ρ=0.89095	Eq. 1.1-2
b=0.34809 in (ineffective width=0.042605 in)	Eq. 1.1-1
Element 4: Stiffened, w=1.4064 in	
f_1=45.799 ksi, f_2=-8.2606 ksi	
ψ=0.18037	Eq. 1.1.2-1
k=9.6499	Eq. 1.1.2-2
λ=0.60141	Eq. 1.1-3
ρ=1	Eq. 1.1-2

be=1.4064 in Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25
b_1=0.44221 in Eq. 1.1.2-3
b_2=0.96419 in Eq. 1.1.2-5
Compression width=1.1915 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=-0.0087861 in
Sye=0.085331 in^3, Fy=50 ksi
Mnl=4.2666 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.4064 in
f_1=40.105 ksi, f_2=-43.502 ksi
ψ=1.0847 Eq. 1.1.2-1
k=26.29 Eq. 1.1.2-2
λ=0.34096 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.4064 in Eq. 1.1-1
h_o=1.625 in, b_o=10 in, h_o/b_o=0.1625
b_1=0.34431 in Eq. 1.1.2-3
b_2=0.7032 in Eq. 1.1.2-4
Compression width=0.67462 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=45.675 ksi, f_2=45.675 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=8.3767 Eq. 1.1-3
ρ=0.11624 Eq. 1.1-2
b=0.48133 in (ineffective width=3.6594 in) Eq. 1.1-1
f_1=45.675 ksi, f_2=45.675 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=8.3767 Eq. 1.1-3
ρ=0.11624 Eq. 1.1-2
b=0.48133 in (ineffective width=3.6594 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=1.4064 in
f_1=40.105 ksi, f_2=-43.502 ksi
ψ=1.0847 Eq. 1.1.2-1
k=26.29 Eq. 1.1.2-2
λ=0.34096 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.4064 in Eq. 1.1-1
h_o=1.625 in, b_o=10 in, h_o/b_o=0.1625
b_1=0.34431 in Eq. 1.1.2-3
b_2=0.7032 in Eq. 1.1.2-4

Compression width=0.67462 in

b_1+b_2 > compression width (fully effective)

Center of gravity shift: x=0.45144 in

Sye=0.070928 in^3, Fy=50 ksi

Mnl=3.5464 k-in Eq. F3.1-1

Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud

Cw=2.35 in^6, Wn=6.2466 in^2, Fy=50 ksi

Bn=18.81 k-in^2 G8.1-1

Ωb=1.67, ϕb=0.9

1000S162-33

Full Section Properties

Area	0.48270 in²	Wt.	0.0016412 k/ft	Flat	13.951 in
Ix	6.1986 in⁴	rx	3.5835 in	Ixy	0.0000 in⁴
Sx(t)	1.2397 in³	y(t)	5.0000 in	α	0.000 deg
Sx(b)	1.2397 in³	y(b)	5.0000 in		
Zx	1.5380 in³	Height	10.0000 in		
Iy	0.1317 in⁴	ry	0.5224 in	x_o	-0.8266 in
Sy(l)	0.4398 in³	x(l)	0.2995 in	y_o	0.0000 in
Sy(r)	0.0994 in³	x(r)	1.3255 in	jx	6.9745 in
Zy	0.1386 in³	Width	1.6250 in	jy	0.0000 in
I_1	6.1986 in⁴	r_1	3.5835 in	Cw	2.5897 in⁶
I_2	0.1317 in⁴	r_2	0.5224 in	J	0.0001926 in⁴
Ic	6.3303 in⁴	rc	3.6214 in		
I_o	6.6601 in⁴	r_o	3.7145 in		

Net Section Properties

Ix	6.1888 in⁴	rx	3.7903 in	Area	0.43080 in²
Sx(t)	1.2378 in³	y(t)	5.0000 in	Ixy	0.0000 in⁴
Sx(b)	1.2378 in³	y(b)	5.0000 in	α	0.000 deg
Zx	1.5185 in³				
Iy	0.1271 in⁴	ry	0.5431 in	x_o	-0.8615 in
Sy(l)	0.3811 in³	x(l)	0.3335 in	y_o	0.0000 in
Sy(r)	0.0984 in³	x(r)	1.2915 in	jx	6.3702 in
Zy	0.1381 in³			jy	0.0000 in
Ic	6.3159 in⁴	rc	3.8290 in	Cw	2.5868 in⁶
I_o	6.6356 in⁴	r_o	3.9247 in	J	0.0001719 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	6.456 k	ϕMnxo	30.685 k-in	ϕMnyo	4.341 k-in
Ae	0.15191 in²	Ixe	4.7053 in⁴	Iye	0.1250 in⁴
ϕTn	21.001 k	Sxe(t)	0.7671 in³	Sye(l)	0.3791 in³
		Sxe(b)	1.2170 in³	Sye(r)	0.0965 in³
Shear					
ϕVny	0.889 k	Negative Bending		Negative Bending	
ϕVnx	2.621 k	ϕMnxo	30.685 k-in	ϕMnyo	3.572 k-in
		Ixe	4.7053 in⁴	Iye	0.0683 in⁴
Torsion		Sxe(t)	1.2170 in³	Sye(l)	0.0892 in³
ϕBn	18.682 k-in²	Sxe(b)	0.7671 in³	Sye(r)	0.0794 in³

```
Stud element 3 h/t exceeds 200.
```

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=50.856 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=53.516 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=55.565 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	

Axial Tension Strength
Ag=0.4827 in², Fy=50.856 ksi
Tn=24.548 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.4308 in², Fu=65 ksi
Tn=28.002 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Stud element 2
Vn=1.4563 k at 180 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Stud element 3
Vyh=8.8552 k — Eq. G3-2
kv=4.3979 — Eq. G3-8
Vcrh=0.38229 k — Eq. G3-6
h/t exceeds 200 (rational analysis)
Vn=1.1111 k at 90 deg — Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)
Stud element 4
Vn=1.4563 k at 0 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Stud
Element 1: Unstiffened, w=0.389 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.74246 — Eq. 1.1-3
ρ=0.94778 — Eq. 1.1-2
b=0.36869 in (ineffective width=0.020315 in) — Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.091 — Eq. 1.3-7
Ia=0.00022212 in⁴ — Eq. 1.3-8
Is=0.00016972 in⁴
ds=0.28171 in (lip ineffective width=0.086971 in) — Eq. 1.3-6
k=3.2075 — Table 1.3-1
Element 2: Partially stiffened, w=1.403 in
f=50 ksi, k=3.2075
λ=0.98047 — Eq. 1.1-3
ρ=0.79107 — Eq. 1.1-2
b=1.1099 in (ineffective width=0.29313 in) — Eq. 1.1-1
b_1=0.42403 in, b_2=0.68584 in
Element 3: Treat as two unstiffened elements
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3

λ=7.8999	Eq. 1.1-3
ρ=0.12306	Eq. 1.1-2
b=0.50934 in (ineffective width=3.6297 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=7.8999	Eq. 1.1-3
ρ=0.12306	Eq. 1.1-2
b=0.50934 in (ineffective width=3.6297 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.389 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.74246	Eq. 1.1-3
ρ=0.94778	Eq. 1.1-2
b=0.36869 in (ineffective width=0.020315 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00022212 in^4	Eq. 1.3-8
Is=0.00016972 in^4	
ds=0.28171 in (lip ineffective width=0.086971 in)	Eq. 1.3-6
k=3.2075	Table 1.3-1
Element 4: Partially stiffened, w=1.403 in	
f=50 ksi, k=3.2075	
λ=0.98047	Eq. 1.1-3
ρ=0.79107	Eq. 1.1-2
b=1.1099 in (ineffective width=0.29313 in)	Eq. 1.1-1
b_1=0.42403 in, b_2=0.68584 in	
Ae=0.15191 in^2, Fn=50 ksi	
Pn=7.5957 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=9.778 in	
h/t greater than 200, treat as rational analysis	
f_1=49.095 ksi, f_2=-30.613 ksi	
ψ=0.62354	Eq. 1.1.2-1
k=15.806	Eq. 1.1.2-2
λ=3.0502	Eq. 1.1-3
ρ=0.3042	Eq. 1.1-2
be=2.9745 in	Eq. 1.1-1
h_o=10 in, b_o=1.625 in, h_o/b_o=6.1538	
b_1=0.82087 in	Eq. 1.1.2-6
b_2=1.0112 in	Eq. 1.1.2-7
Compression width=6.0226 in	
Ineffective width=4.1906 in	
Element 5: Unstiffened, w=0.389 in	

f_1=49.095 ksi, f_2=45.924 ksi	
ψ=0.93541	Eq. 1.2.2-1
k=0.45319	Eq. 1.2.2-2
λ=0.71665	Eq. 1.1-3
ρ=0.96703	Eq. 1.1-2
b=0.37617 in (ineffective width=0.012827 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.135	Eq. 1.3-7
Ia=0.00022182 in^4	Eq. 1.3-8
Is=0.00016972 in^4	
ds=0.28783 in (lip ineffective width=0.088344 in)	Eq. 1.3-6
k=3.2088	Table 1.3-1
Element 4: Partially stiffened, w=1.403 in	
f=49.859 ksi, k=3.2088	
λ=0.97889	Eq. 1.1-3
ρ=0.79197	Eq. 1.1-2
b=1.1111 in (ineffective width=0.29186 in)	Eq. 1.1-1
b_1=0.42509 in, b_2=0.68604 in	
Center of gravity shift: y=-1.1337 in	
Sxe=0.76712 in^3, Fy=50 ksi	
Mnl=38.356 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.389 in	
f_1=49.095 ksi, f_2=45.924 ksi	
ψ=0.93541	Eq. 1.2.2-1
k=0.45319	Eq. 1.2.2-2
λ=0.71665	Eq. 1.1-3
ρ=0.96703	Eq. 1.1-2
b=0.37617 in (ineffective width=0.012827 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.135	Eq. 1.3-7
Ia=0.00022182 in^4	Eq. 1.3-8
Is=0.00016972 in^4	
ds=0.28783 in (lip ineffective width=0.088344 in)	Eq. 1.3-6
k=3.2088	Table 1.3-1
Element 2: Partially stiffened, w=1.403 in	
f=49.859 ksi, k=3.2088	
λ=0.97889	Eq. 1.1-3
ρ=0.79197	Eq. 1.1-2
b=1.1111 in (ineffective width=0.29186 in)	Eq. 1.1-1
b_1=0.42509 in, b_2=0.68604 in	
Element 3: Stiffened, w=9.778 in	
h/t greater than 200, treat as rational analysis	
f_1=49.095 ksi, f_2=-30.613 ksi	
ψ=0.62354	Eq. 1.1.2-1
k=15.806	Eq. 1.1.2-2
λ=3.0502	Eq. 1.1-3

ρ=0.3042	Eq. 1.1-2
be=2.9745 in	Eq. 1.1-1
h_o=10 in, b_o=1.625 in, h_o/b_o=6.1538	
b_1=0.82087 in	Eq. 1.1.2-6
b_2=1.0112 in	Eq. 1.1.2-7
Compression width=6.0226 in	
Ineffective width=4.1906 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=1.1337 in	
Sxe=0.76712 in^3, Fy=50 ksi	
Mnl=38.356 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.389 in	
f_1=49.332 ksi, f_2=49.332 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.73749	Eq. 1.1-3
ρ=0.95146	Eq. 1.1-2
b=0.37012 in (ineffective width=0.018882 in)	Eq. 1.1-1
Element 2: Stiffened, w=1.403 in	
f_1=45.716 ksi, f_2=-8.4383 ksi	
ψ=0.18458	Eq. 1.1.2-1
k=9.6937	Eq. 1.1.2-2
λ=0.53929	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.403 in	Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25	
b_1=0.44056 in	Eq. 1.1.2-3
b_2=0.96244 in	Eq. 1.1.2-5
Compression width=1.1844 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.389 in	
f_1=49.332 ksi, f_2=49.332 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=0.73749	Eq. 1.1-3
ρ=0.95146	Eq. 1.1-2
b=0.37012 in (ineffective width=0.018882 in)	Eq. 1.1-1
Element 4: Stiffened, w=1.403 in	
f_1=45.716 ksi, f_2=-8.4383 ksi	
ψ=0.18458	Eq. 1.1.2-1
k=9.6937	Eq. 1.1.2-2
λ=0.53929	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.403 in	Eq. 1.1-1

h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25
b_1=0.44056 in — Eq. 1.1.2-3
b_2=0.96244 in — Eq. 1.1.2-5
Compression width=1.1844 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=-0.0038766 in
Sye=0.096467 in^3, Fy=50 ksi
Mnl=4.8233 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.403 in
f_1=37.985 ksi, f_2=-43.549 ksi
ψ=1.1465 — Eq. 1.1.2-1
k=28.073 — Eq. 1.1.2-2
λ=0.28886 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=1.403 in — Eq. 1.1-1
h_o=1.625 in, b_o=10 in, h_o/b_o=0.1625
b_1=0.33836 in — Eq. 1.1.2-3
b_2=0.7015 in — Eq. 1.1.2-4
Compression width=0.65362 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=43.43 ksi, f_2=43.43 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=7.3626 — Eq. 1.1-3
ρ=0.13176 — Eq. 1.1-2
b=0.54537 in (ineffective width=3.5936 in) — Eq. 1.1-1
f_1=43.43 ksi, f_2=43.43 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-2
λ=7.3626 — Eq. 1.1-3
ρ=0.13176 — Eq. 1.1-2
b=0.54537 in (ineffective width=3.5936 in) — Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=1.403 in
f_1=37.985 ksi, f_2=-43.549 ksi
ψ=1.1465 — Eq. 1.1.2-1
k=28.073 — Eq. 1.1.2-2
λ=0.28886 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=1.403 in — Eq. 1.1-1
h_o=1.625 in, b_o=10 in, h_o/b_o=0.1625
b_1=0.33836 in — Eq. 1.1.2-3
b_2=0.7015 in — Eq. 1.1.2-4
Compression width=0.65362 in

b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.43176 in
Sye=0.079387 in^3, Fy=50 ksi
Mnl=3.9693 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=2.5868 in^6, Wn=6.2309 in^2, Fy=50 ksi
Bn=20.758 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

1000S162-43

Full Section Properties

Area	0.62728 in²	Wt.	0.0021328 k/ft	Flat	13.909 in
Ix	8.0256 in⁴	rx	3.5769 in	Ixy	0.0000 in⁴
Sx(t)	1.6051 in³	y(t)	5.0000 in	α	0.000 deg
Sx(b)	1.6051 in³	y(b)	5.0000 in		
Zx	1.9945 in³	Height	10.0000 in		
Iy	0.1682 in⁴	ry	0.5178 in	x_o	-0.8175 in
Sy(l)	0.5582 in³	x(l)	0.3013 in	y_o	0.0000 in
Sy(r)	0.1271 in³	x(r)	1.3237 in	jx	6.9989 in
Zy	0.1790 in³	Width	1.6250 in	jy	0.0000 in
I_1	8.0256 in⁴	r_1	3.5769 in	Cw	3.2986 in⁶
I_2	0.1682 in⁴	r_2	0.5178 in	J	0.0004253 in⁴
Ic	8.1938 in⁴	rc	3.6142 in		
I_o	8.6130 in⁴	r_o	3.7055 in		

Net Section Properties

Ix	8.0129 in⁴	rx	3.7839 in	Area	0.55963 in²
Sx(t)	1.6026 in³	y(t)	5.0000 in	Ixy	0.0000 in⁴
Sx(b)	1.6026 in³	y(b)	5.0000 in	α	0.000 deg
Zx	1.9692 in³				
Iy	0.1623 in⁴	ry	0.5385 in	x_o	-0.8521 in
Sy(l)	0.4844 in³	x(l)	0.3350 in	y_o	0.0000 in
Sy(r)	0.1258 in³	x(r)	1.2900 in	jx	6.3912 in
Zy	0.1781 in³			jy	0.0000 in
Ic	8.1752 in⁴	rc	3.8221 in	Cw	3.2949 in⁶
I_o	8.5815 in⁴	r_o	3.9159 in	J	0.0003794 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	9.096 k	ϕMnxo	43.108 k-in	ϕMnyo	6.437 k-in
Ae	0.21401 in²	Ixe	6.4350 in⁴	Iye	0.1623 in⁴
ϕTn	27.282 k	Sxe(t)	1.0777 in³	Sye(l)	0.4844 in³
		Sxe(b)	1.5972 in³	Sye(r)	0.1258 in³
Shear					
ϕVny	1.612 k	Negative Bending		Negative Bending	
ϕVnx	3.391 k	ϕMnxo	43.108 k-in	ϕMnyo	4.761 k-in
		Ixe	6.4350 in⁴	Iye	0.0970 in⁴
Torsion		Sxe(t)	1.5972 in³	Sye(l)	0.1370 in³
ϕBn	23.982 k-in²	Sxe(b)	1.0777 in³	Sye(r)	0.1058 in³

```
Stud element 3 h/t exceeds 200.
```

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Fya=51.046 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Fya=54.31 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Fya=56.847 ksi	Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi	

Axial Tension Strength
Ag=0.62728 in², Fy=51.046 ksi
Tn=32.02 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.55963 in², Fu=65 ksi
Tn=36.376 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Stud element 2
Vn=1.8839 k at 180 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9
Stud element 3
Vyh=11.525 k — Eq. G3-2
kv=4.3974 — Eq. G3-8
Vcrh=0.84719 k — Eq. G3-6
h/t exceeds 200 (rational analysis)
Vn=2.0155 k at 90 deg — Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)
Stud element 4
Vn=1.8839 k at 0 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3837 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.56184 — Eq. 1.1-3
λ<0.673 (fully effective) — Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.091 — Eq. 1.3-7
Ia=0.00048546 in⁴ — Eq. 1.3-8
Is=0.00021231 in⁴
ds=0.16781 in (lip ineffective width=0.21589 in) — Eq. 1.3-6
k=2.725 — Table 1.3-1
Element 2: Partially stiffened, w=1.3924 in
f=50 ksi, k=2.725
λ=0.80992 — Eq. 1.1-3
ρ=0.89931 — Eq. 1.1-2
b=1.2522 in (ineffective width=0.1402 in) — Eq. 1.1-1
b_1=0.27382 in, b_2=0.97838 in
Element 3: Treat as two unstiffened elements
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=6.0529 — Eq. 1.1-3
ρ=0.15921 — Eq. 1.1-2

b=0.65811 in (ineffective width=3.4756 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=6.0529	Eq. 1.1-3
ρ=0.15921	Eq. 1.1-2
b=0.65811 in (ineffective width=3.4756 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.3837 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56184	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00048546 in^4	Eq. 1.3-8
Is=0.00021231 in^4	
ds=0.16781 in (lip ineffective width=0.21589 in)	Eq. 1.3-6
k=2.725	Table 1.3-1
Element 4: Partially stiffened, w=1.3924 in	
f=50 ksi, k=2.725	
λ=0.80992	Eq. 1.1-3
ρ=0.89931	Eq. 1.1-2
b=1.2522 in (ineffective width=0.1402 in)	Eq. 1.1-1
b_1=0.27382 in, b_2=0.97838 in	
Ae=0.21401 in^2, Fn=50 ksi	
Pn=10.701 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=9.7674 in	
h/t greater than 200, treat as rational analysis	
f_1=49.026 ksi, f_2=-32.766 ksi	
ψ=0.66834	Eq. 1.1.2-1
k=16.624	Eq. 1.1.2-2
λ=2.2777	Eq. 1.1-3
ρ=0.39663	Eq. 1.1-2
be=3.874 in	Eq. 1.1-1
h_o=10 in, b_o=1.625 in, h_o/b_o=6.1538	
b_1=1.0561 in	Eq. 1.1.2-6
b_2=1.266 in	Eq. 1.1.2-7
Compression width=5.8546 in	
Ineffective width=3.5325 in	
Element 5: Unstiffened, w=0.3837 in	
f_1=49.026 ksi, f_2=45.813 ksi	
ψ=0.93446	Eq. 1.2.2-1
k=0.45352	Eq. 1.2.2-2

λ=0.54172	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.15	Eq. 1.3-7
Ia=0.00048136 in^4	Eq. 1.3-8
Is=0.00021231 in^4	
ds=0.16924 in (lip ineffective width=0.21446 in)	Eq. 1.3-6
k=2.7306	Table 1.3-1
Element 4: Partially stiffened, w=1.3924 in	
f=49.811 ksi, k=2.7306	
λ=0.80755	Eq. 1.1-3
ρ=0.90096	Eq. 1.1-2
b=1.2545 in (ineffective width=0.1379 in)	Eq. 1.1-1
b_1=0.27665 in, b_2=0.97784 in	
Center of gravity shift: y=-0.97104 in	
Sxe=1.0777 in^3, Fy=50 ksi	
Mnl=53.885 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3837 in	
f_1=49.026 ksi, f_2=45.813 ksi	
ψ=0.93446	Eq. 1.2.2-1
k=0.45352	Eq. 1.2.2-2
λ=0.54172	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.15	Eq. 1.3-7
Ia=0.00048136 in^4	Eq. 1.3-8
Is=0.00021231 in^4	
ds=0.16924 in (lip ineffective width=0.21446 in)	Eq. 1.3-6
k=2.7306	Table 1.3-1
Element 2: Partially stiffened, w=1.3924 in	
f=49.811 ksi, k=2.7306	
λ=0.80755	Eq. 1.1-3
ρ=0.90096	Eq. 1.1-2
b=1.2545 in (ineffective width=0.1379 in)	Eq. 1.1-1
b_1=0.27665 in, b_2=0.97784 in	
Element 3: Stiffened, w=9.7674 in	
h/t greater than 200, treat as rational analysis	
f_1=49.026 ksi, f_2=-32.766 ksi	
ψ=0.66834	Eq. 1.1.2-1
k=16.624	Eq. 1.1.2-2
λ=2.2777	Eq. 1.1-3
ρ=0.39663	Eq. 1.1-2
be=3.874 in	Eq. 1.1-1
h_o=10 in, b_o=1.625 in, h_o/b_o=6.1538	
b_1=1.0561 in	Eq. 1.1.2-6
b_2=1.266 in	Eq. 1.1.2-7

Compression width=5.8546 in
Ineffective width=3.5325 in
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0.97104 in
Sxe=1.0777 in^3, Fy=50 ksi
Mnl=53.885 k-in Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3837 in
f_1=55.853 ksi, f_2=55.853 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.59382 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 2: Stiffened, w=1.3924 in
f_1=51.722 ksi, f_2=-9.6396 ksi
ψ=0.18637 Eq. 1.1.2-1
k=9.7124 Eq. 1.1.2-2
λ=0.43633 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.3924 in Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25
b_1=0.43699 in Eq. 1.1.2-3
b_2=0.95541 in Eq. 1.1.2-5
Compression width=1.1737 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.3837 in
f_1=55.853 ksi, f_2=55.853 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.59382 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 4: Stiffened, w=1.3924 in
f_1=51.722 ksi, f_2=-9.6397 ksi
ψ=0.18638 Eq. 1.1.2-1
k=9.7124 Eq. 1.1.2-2
λ=0.43633 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.3924 in Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25
b_1=0.43699 in Eq. 1.1.2-3
b_2=0.95541 in Eq. 1.1.2-5
Compression width=1.1737 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0 in
Sye=0.12582 in^3, Fy=56.847 ksi

Mnl=7.1525 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.3924 in
f_1=32.18 ksi, f_2=-43.665 ksi
ψ=1.3569 Eq. 1.1.2-1
k=34.899 Eq. 1.1.2-2
λ=0.18156 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.3924 in Eq. 1.1-1
h_o=1.625 in, b_o=10 in, h_o/b_o=0.1625
b_1=0.31958 in Eq. 1.1.2-3
b_2=0.6962 in Eq. 1.1.2-4
Compression width=0.59078 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=37.287 ksi, f_2=37.287 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=5.227 Eq. 1.1-3
ρ=0.18326 Eq. 1.1-2
b=0.75755 in (ineffective width=3.3762 in) Eq. 1.1-1
f_1=37.287 ksi, f_2=37.287 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=5.227 Eq. 1.1-3
ρ=0.18326 Eq. 1.1-2
b=0.75755 in (ineffective width=3.3762 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=1.3924 in
f_1=32.18 ksi, f_2=-43.665 ksi
ψ=1.3569 Eq. 1.1.2-1
k=34.899 Eq. 1.1.2-2
λ=0.18156 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.3924 in Eq. 1.1-1
h_o=1.625 in, b_o=10 in, h_o/b_o=0.1625
b_1=0.31959 in Eq. 1.1.2-3
b_2=0.6962 in Eq. 1.1.2-4
Compression width=0.59078 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.37304 in
Sye=0.1058 in^3, Fy=50 ksi
Mnl=5.2902 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud

C_w=3.2949 in^6, W_n=6.1826 in^2, F_y=50 ksi
B_n=26.647 k-in^2 G8.1-1
Ω_b=1.67, ϕ_b=0.9

1000S162-54

Full Section Properties

Area	0.78274 in²	Wt.	0.0026613 k/ft	Flat	13.829 in
Ix	9.951 in⁴	rx	3.5655 in	Ixy	0.000 in⁴
Sx(t)	1.9902 in³	y(t)	5.0000 in	α	0.000 deg
Sx(b)	1.9902 in³	y(b)	5.0000 in		
Zx	2.4798 in³	Height	10.0000 in		
Iy	0.205 in⁴	ry	0.5113 in	x_o	-0.8050 in
Sy(l)	0.6773 in³	x(l)	0.3021 in	y_o	0.0000 in
Sy(r)	0.1547 in³	x(r)	1.3229 in	jx	7.0437 in
Zy	0.2209 in³	Width	1.6250 in	jy	0.0000 in
I_1	9.951 in⁴	r_1	3.5655 in	Cw	3.9997 in⁶
I_2	0.205 in⁴	r_2	0.5113 in	J	0.0008358 in⁴
Ic	10.155 in⁴	rc	3.6020 in		
I_o	10.663 in⁴	r_o	3.6908 in		

Net Section Properties

Ix	9.935 in⁴	rx	3.7732 in	Area	0.69784 in²
Sx(t)	1.9870 in³	y(t)	5.0000 in	Ixy	0.000 in⁴
Sx(b)	1.9870 in³	y(b)	5.0000 in	α	0.000 deg
Zx	2.4479 in³				
Iy	0.197 in⁴	ry	0.5320 in	x_o	-0.8391 in
Sy(l)	0.5887 in³	x(l)	0.3355 in	y_o	0.0000 in
Sy(r)	0.1531 in³	x(r)	1.2895 in	jx	6.4315 in
Zy	0.2194 in³			jy	0.0000 in
Ic	10.132 in⁴	rc	3.8105 in	Cw	3.9952 in⁶
I_o	10.624 in⁴	r_o	3.9018 in	J	0.0007452 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	13.216 k	ϕMnxo	68.885 k-in	ϕMnyo	8.051 k-in
Ae	0.31098 in²	Ixe	8.7061 in⁴	Iye	0.1975 in⁴
ϕTn	34.020 k	Sxe(t)	1.5308 in³	Sye(l)	0.5887 in³
		Sxe(b)	2.0188 in³	Sye(r)	0.1531 in³
Shear					
ϕVny	3.005 k	Negative Bending		Negative Bending	
ϕVnx	4.102 k	ϕMnxo	68.885 k-in	ϕMnyo	6.022 k-in
		Ixe	8.7061 in⁴	Iye	0.1313 in⁴
Torsion		Sxe(t)	2.0188 in³	Sye(l)	0.2040 in³
ϕBn	29.316 k-in²	Sxe(b)	1.5308 in³	Sye(r)	0.1338 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=51.306 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=55.318 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=58.416 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.78274 in², Fy=51.306 ksi

Tn=40.159 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.69784 in², Fu=65 ksi	
Tn=45.359 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=2.2787 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=14.359 k	Eq. G3-2
kv=4.395	Eq. G3-8
Vcrh=1.6799 k	Eq. G3-6
Vn=3.3392 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=2.2787 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3585 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41829	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00033614 in⁴	Eq. 1.3-8
Is=0.00021732 in⁴	
ds=0.23177 in (lip ineffective width=0.12673 in)	Eq. 1.3-6
k=2.9231	Table 1.3-1
Element 2: Partially stiffened, w=1.342 in	
f=50 ksi, k=2.9231	
λ=0.60055	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.7937	Eq. 1.1-3
ρ=0.19903	Eq. 1.1-2
b=0.81773 in (ineffective width=3.2908 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.7937	Eq. 1.1-3

ρ=0.19903	Eq. 1.1-2
b=0.81773 in (ineffective width=3.2908 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.3585 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41829	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00033614 in^4	Eq. 1.3-8
Is=0.00021732 in^4	
ds=0.23177 in (lip ineffective width=0.12673 in)	Eq. 1.3-6
k=2.9231	Table 1.3-1
Element 4: Partially stiffened, w=1.342 in	
f=50 ksi, k=2.9231	
λ=0.60055	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Ae=0.31098 in^2, Fn=50 ksi	
Pn=15.549 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=9.717 in	
f_1=48.756 ksi, f_2=-36.678 ksi	
ψ=0.75228	Eq. 1.1.2-1
k=18.265	Eq. 1.1.2-2
λ=1.7178	Eq. 1.1-3
ρ=0.50759	Eq. 1.1-2
be=4.9322 in	Eq. 1.1-1
h_o=10 in, b_o=1.625 in, h_o/b_o=6.1538	
b_1=1.3145 in	Eq. 1.1.2-6
b_2=1.5003 in	Eq. 1.1.2-7
Compression width=5.5454 in	
Ineffective width=2.7306 in	
Element 5: Unstiffened, w=0.3585 in	
f_1=48.756 ksi, f_2=45.604 ksi	
ψ=0.93535	Eq. 1.2.2-1
k=0.45321	Eq. 1.2.2-2
λ=0.40233	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.169	Eq. 1.3-7
Ia=0.00033175 in^4	Eq. 1.3-8
Is=0.00021732 in^4	
ds=0.23484 in (lip ineffective width=0.12366 in)	Eq. 1.3-6
k=2.9354	Table 1.3-1

Element 4: Partially stiffened, w=1.342 in
f=49.751 ksi, k=2.9354
λ=0.59779 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Center of gravity shift: y=-0.68742 in
Sxe=1.5308 in^3, Fy=50 ksi
Mnl=76.538 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3585 in
f_1=48.756 ksi, f_2=45.604 ksi
ψ=0.93535 Eq. 1.2.2-1
k=0.45321 Eq. 1.2.2-2
λ=0.40233 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.169 Eq. 1.3-7
Ia=0.00033175 in^4 Eq. 1.3-8
Is=0.00021732 in^4
ds=0.23484 in (lip ineffective width=0.12366 in) Eq. 1.3-6
k=2.9354 Table 1.3-1
Element 2: Partially stiffened, w=1.342 in
f=49.751 ksi, k=2.9354
λ=0.59779 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 3: Stiffened, w=9.717 in
f_1=48.756 ksi, f_2=-36.678 ksi
ψ=0.75228 Eq. 1.1.2-1
k=18.265 Eq. 1.1.2-2
λ=1.7178 Eq. 1.1-3
ρ=0.50759 Eq. 1.1-2
be=4.9322 in Eq. 1.1-1
h_o=10 in, b_o=1.625 in, h_o/b_o=6.1538
b_1=1.3145 in Eq. 1.1.2-6
b_2=1.5003 in Eq. 1.1.2-7
Compression width=5.5454 in
Ineffective width=2.7306 in
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0.68742 in
Sxe=1.5308 in^3, Fy=50 ksi
Mnl=76.538 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3585 in
f_1=57.134 ksi, f_2=57.134 ksi

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.44713	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=1.342 in	
f_1=52.006 ksi, f_2=-8.7866 ksi	
ψ=0.16895	Eq. 1.1.2-1
k=9.5325	Eq. 1.1.2-2
λ=0.33916	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.342 in	Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25	
b_1=0.42348 in	Eq. 1.1.2-3
b_2=0.91852 in	Eq. 1.1.2-5
Compression width=1.148 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.3585 in	
f_1=57.134 ksi, f_2=57.134 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.44713	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Stiffened, w=1.342 in	
f_1=52.006 ksi, f_2=-8.7866 ksi	
ψ=0.16895	Eq. 1.1.2-1
k=9.5325	Eq. 1.1.2-2
λ=0.33916	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.342 in	Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25	
b_1=0.42348 in	Eq. 1.1.2-3
b_2=0.91852 in	Eq. 1.1.2-5
Compression width=1.148 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0 in	
Sye=0.15314 in^3, Fy=58.416 ksi	
Mnl=8.9456 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: Stiffened, w=1.342 in	
f_1=25.486 ksi, f_2=-42.8 ksi	
ψ=1.6794	Eq. 1.1.2-1
k=47.829	Eq. 1.1.2-2
λ=0.106	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.342 in	Eq. 1.1-1

h_o=1.625 in, b_o=10 in, h_o/b_o=0.1625
b_1=0.28679 in — Eq. 1.1.2-3
b_2=0.671 in — Eq. 1.1.2-4
Compression width=0.50087 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=31.246 ksi, f_2=31.246 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=3.7895 — Eq. 1.1-3
ρ=0.24857 — Eq. 1.1-2
b=1.0212 in (ineffective width=3.0873 in) — Eq. 1.1-1
f_1=31.246 ksi, f_2=31.246 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-2
λ=3.7895 — Eq. 1.1-3
ρ=0.24857 — Eq. 1.1-2
b=1.0212 in (ineffective width=3.0873 in) — Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=1.342 in
f_1=25.486 ksi, f_2=-42.8 ksi
ψ=1.6794 — Eq. 1.1.2-1
k=47.829 — Eq. 1.1.2-2
λ=0.106 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=1.342 in — Eq. 1.1-1
h_o=1.625 in, b_o=10 in, h_o/b_o=0.1625
b_1=0.28679 in — Eq. 1.1.2-3
b_2=0.671 in — Eq. 1.1.2-4
Compression width=0.50087 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.30815 in
Sye=0.13382 in^3, Fy=50 ksi
Mnl=6.691 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=3.9952 in^6, Wn=6.1326 in^2, Fy=50 ksi
Bn=32.573 k-in^2 — G8.1-1
Ωb=1.67, ϕb=0.9

1000S162-68

Full Section Properties

Area	0.97824 in²	Wt.	0.0033260 k/ft	Flat	13.720 in
Ix	12.327 in⁴	rx	3.5498 in	Ixy	0.000 in⁴
Sx(t)	2.4654 in³	y(t)	5.0000 in	α	0.000 deg
Sx(b)	2.4654 in³	y(b)	5.0000 in		
Zx	3.0835 in³	Height	10.0000 in		
Iy	0.247 in⁴	ry	0.5026 in	x_o	-0.7882 in
Sy(l)	0.8157 in³	x(l)	0.3029 in	y_o	0.0000 in
Sy(r)	0.1869 in³	x(r)	1.3221 in	jx	7.1071 in
Zy	0.2717 in³	Width	1.6250 in	jy	0.0000 in
I_1	12.327 in⁴	r_1	3.5498 in	Cw	4.8060 in⁶
I_2	0.247 in⁴	r_2	0.5026 in	J	0.0016577 in⁴
Ic	12.574 in⁴	rc	3.5852 in		
I_o	13.182 in⁴	r_o	3.6708 in		

Net Section Properties

Ix	12.307 in⁴	rx	3.7583 in	Area	0.87129 in²
Sx(t)	2.4614 in³	y(t)	5.0000 in	Ixy	0.000 in⁴
Sx(b)	2.4614 in³	y(b)	5.0000 in	α	0.000 deg
Zx	3.0434 in³				
Iy	0.238 in⁴	ry	0.5231 in	x_o	-0.8219 in
Sy(l)	0.7103 in³	x(l)	0.3357 in	y_o	0.0000 in
Sy(r)	0.1850 in³	x(r)	1.2893 in	jx	6.4890 in
Zy	0.2695 in³			jy	0.0000 in
Ic	12.545 in⁴	rc	3.7945 in	Cw	4.8005 in⁶
I_o	13.134 in⁴	r_o	3.8825 in	J	0.0014765 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	18.514 k	ϕMnxo	95.481 k-in	ϕMnyo	10.057 k-in
Ae	0.43563 in²	Ixe	11.467 in⁴	Iye	0.238 in⁴
ϕTn	42.475 k	Sxe(t)	2.1218 in³	Sye(l)	0.7103 in³
		Sxe(b)	2.4953 in³	Sye(r)	0.1850 in³
Shear					
ϕVny	4.985 k	Negative Bending		Negative Bending	
ϕVnx	4.884 k	ϕMnxo	95.481 k-in	ϕMnyo	7.553 k-in
		Ixe	11.467 in⁴	Iye	0.177 in⁴
Torsion		Sxe(t)	2.4953 in³	Sye(l)	0.3111 in³
ϕBn	35.595 k-in²	Sxe(b)	2.1218 in³	Sye(r)	0.1679 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=51.658 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=56.625 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=60.418 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.97824 in², Fy=51.658 ksi

Tn=50.534 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.87129 in², Fu=65 ksi	
Tn=56.634 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=2.7135 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=17.896 k	Eq. G3-2
kv=4.3914	Eq. G3-8
Vcrh=3.3737 k	Eq. G3-6
Vn=5.5384 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=2.7135 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3218 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.29806	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00015029 in⁴	Eq. 1.3-8
Is=0.000198 in⁴ > Ia (no lip reduction)	
k=3.2793	Table 1.3-1
Element 2: Partially stiffened, w=1.2686 in	
f=50 ksi, k=3.2793	
λ=0.42548	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=3.7714	Eq. 1.1-3
ρ=0.24969	Eq. 1.1-2
b=1.0167 in (ineffective width=3.0551 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=3.7714	Eq. 1.1-3
ρ=0.24969	Eq. 1.1-2

b=1.0167 in (ineffective width=3.0551 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.3218 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.29806	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00015029 in^4	Eq. 1.3-8
Is=0.000198 in^4 > Ia (no lip reduction)	
k=3.2793	Table 1.3-1
Element 4: Partially stiffened, w=1.2686 in	
f=50 ksi, k=3.2793	
λ=0.42548	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Ae=0.43563 in^2, Fn=50 ksi	
Pn=21.782 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=9.6436 in	
f_1=48.351 ksi, f_2=-40.896 ksi	
ψ=0.84583	Eq. 1.1.2-1
k=20.269	Eq. 1.1.2-2
λ=1.2793	Eq. 1.1-3
ρ=0.64724	Eq. 1.1-2
be=6.2417 in	Eq. 1.1-1
h_o=10 in, b_o=1.625 in, h_o/b_o=6.1538	
b_1=1.623 in	Eq. 1.1.2-6
b_2=1.7586 in	Eq. 1.1.2-7
Compression width=5.2245 in	
Ineffective width=1.843 in	
Element 5: Unstiffened, w=0.3218 in	
f_1=48.351 ksi, f_2=45.373 ksi	
ψ=0.93841	Eq. 1.2.2-1
k=0.45213	Eq. 1.2.2-2
λ=0.28584	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.194	Eq. 1.3-7
Ia=0.00014683 in^4	Eq. 1.3-8
Is=0.000198 in^4 > Ia (no lip reduction)	
k=3.2793	Table 1.3-1
Element 4: Partially stiffened, w=1.2686 in	
f=49.67 ksi, k=3.2793	
λ=0.42407	Eq. 1.1-3

$\lambda<0.673$ (fully effective)	Eq. 1.1-1
Center of gravity shift: y=-0.40446 in	
Sxe=2.1218 in^3, Fy=50 ksi	
Mnl=106.09 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3218 in	
f_1=48.351 ksi, f_2=45.373 ksi	
ψ=0.93841	Eq. 1.2.2-1
k=0.45213	Eq. 1.2.2-2
λ=0.28584	Eq. 1.1-3
$\lambda<0.673$ (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.194	Eq. 1.3-7
Ia=0.00014683 in^4	Eq. 1.3-8
Is=0.000198 in^4 > Ia (no lip reduction)	
k=3.2793	Table 1.3-1
Element 2: Partially stiffened, w=1.2686 in	
f=49.67 ksi, k=3.2793	
λ=0.42407	Eq. 1.1-3
$\lambda<0.673$ (fully effective)	Eq. 1.1-1
Element 3: Stiffened, w=9.6436 in	
f_1=48.351 ksi, f_2=-40.896 ksi	
ψ=0.84583	Eq. 1.1.2-1
k=20.269	Eq. 1.1.2-2
λ=1.2793	Eq. 1.1-3
ρ=0.64724	Eq. 1.1-2
be=6.2417 in	Eq. 1.1-1
h_o=10 in, b_o=1.625 in, h_o/b_o=6.1538	
b_1=1.623 in	Eq. 1.1.2-6
b_2=1.7586 in	Eq. 1.1.2-7
Compression width=5.2245 in	
Ineffective width=1.843 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.40446 in	
Sxe=2.1218 in^3, Fy=50 ksi	
Mnl=106.09 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3218 in	
f_1=58.748 ksi, f_2=58.748 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.32308	Eq. 1.1-3
$\lambda<0.673$ (fully effective)	Eq. 1.1-1

Element 2: Stiffened, w=1.2686 in
f_1=52.067 ksi, f_2=-7.3813 ksi
ψ=0.14176 Eq. 1.1.2-1
k=9.2604 Eq. 1.1.2-2
λ=0.25838 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.2686 in Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25
b_1=0.40379 in Eq. 1.1.2-3
b_2=0.86481 in Eq. 1.1.2-5
Compression width=1.1111 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.3218 in
f_1=58.748 ksi, f_2=58.748 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.32308 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 4: Stiffened, w=1.2686 in
f_1=52.067 ksi, f_2=-7.3813 ksi
ψ=0.14176 Eq. 1.1.2-1
k=9.2604 Eq. 1.1.2-2
λ=0.25838 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.2686 in Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25
b_1=0.40379 in Eq. 1.1.2-3
b_2=0.86481 in Eq. 1.1.2-5
Compression width=1.1111 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0 in
Sye=0.18495 in^3, Fy=60.418 ksi
Mnl=11.174 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.2686 in
f_1=18.457 ksi, f_2=-41.568 ksi
ψ=2.2522 Eq. 1.1.2-1
k=79.301 Eq. 1.1.2-2
λ=0.052568 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.2686 in Eq. 1.1-1
h_o=1.625 in, b_o=10 in, h_o/b_o=0.1625
b_1=0.24154 in Eq. 1.1.2-3
b_2=0.6343 in Eq. 1.1.2-4
Compression width=0.39007 in

b_1+b_2 > compression width (fully effective)

Element 3: Treat as two unstiffened elements

f_1=25.202 ksi, f_2=25.202 ksi

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.6775	Eq. 1.1-3
ρ=0.3428	Eq. 1.1-2
b=1.3958 in (ineffective width=2.676 in)	Eq. 1.1-1

f_1=25.202 ksi, f_2=25.202 ksi

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=2.6775	Eq. 1.1-3
ρ=0.3428	Eq. 1.1-2
b=1.3958 in (ineffective width=2.676 in)	Eq. 1.1-1

Element 5: No compressive stress (fully effective)

Element 4: Stiffened, w=1.2686 in

f_1=18.457 ksi, f_2=-41.568 ksi

ψ=2.2522	Eq. 1.1.2-1
k=79.3	Eq. 1.1.2-2
λ=0.052568	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.2686 in	Eq. 1.1-1

h_o=1.625 in, b_o=10 in, h_o/b_o=0.1625

b_1=0.24154 in	Eq. 1.1.2-3
b_2=0.6343 in	Eq. 1.1.2-4

Compression width=0.39007 in

b_1+b_2 > compression width (fully effective)

Center of gravity shift: x=0.23383 in

Sye=0.16785 in^3, Fy=50 ksi

Mnl=8.3926 k-in	Eq. F3.1-1

Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud

Cw=4.8005 in^6, Wn=6.0689 in^2, Fy=50 ksi

Bn=39.55 k-in^2	G8.1-1

Ωb=1.67, ϕb=0.9

1000S200-30

Full Section Properties

Area	0.46689 in²	Wt.	0.0015874 k/ft	Flat	14.964 in
Ix	6.3365 in⁴	rx	3.6840 in	Ixy	0.0000 in⁴
Sx(t)	1.2673 in³	y(t)	5.0000 in	α	0.000 deg
Sx(b)	1.2673 in³	y(b)	5.0000 in		
Zx	1.5404 in³	Height	10.0000 in		
Iy	0.2183 in⁴	ry	0.6838 in	x_o	-1.1551 in
Sy(l)	0.5143 in³	x(l)	0.4244 in	y_o	0.0000 in
Sy(r)	0.1385 in³	x(r)	1.5756 in	jx	6.0530 in
Zy	0.1926 in³	Width	2.0000 in	jy	0.0000 in
I_1	6.3365 in⁴	r_1	3.6840 in	Cw	4.2880 in⁶
I_2	0.2183 in⁴	r_2	0.6838 in	J	0.0001515 in⁴
Ic	6.5548 in⁴	rc	3.7469 in		
I_o	7.1778 in⁴	r_o	3.9209 in		

Net Section Properties

Ix	6.3277 in⁴	rx	3.8811 in	Area	0.42009 in²
Sx(t)	1.2655 in³	y(t)	5.0000 in	Ixy	0.0000 in⁴
Sx(b)	1.2656 in³	y(b)	5.0000 in	α	0.000 deg
Zx	1.5228 in³				
Iy	0.2096 in⁴	ry	0.7063 in	x_o	-1.2017 in
Sy(l)	0.4460 in³	x(l)	0.4699 in	y_o	0.0000 in
Sy(r)	0.1370 in³	x(r)	1.5301 in	jx	5.5630 in
Zy	0.1921 in³			jy	0.0000 in
Ic	6.5373 in⁴	rc	3.9448 in	Cw	4.2831 in⁶
I_o	7.1440 in⁴	r_o	4.1238 in	J	0.0001363 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	5.981 k	ϕMnxo	28.515 k-in	ϕMnyo	5.463 k-in
Ae	0.14072 in²	Ixe	4.5005 in⁴	Iye	0.1896 in⁴
ϕTn	20.479 k	Sxe(t)	0.7129 in³	Sye(l)	0.4323 in³
		Sxe(b)	1.2207 in³	Sye(r)	0.1214 in³
Shear					
ϕVny	0.706 k	Negative Bending		Negative Bending	
ϕVnx	2.609 k	ϕMnxo	28.515 k-in	ϕMnyo	4.657 k-in
		Ixe	4.5005 in⁴	Iye	0.1052 in⁴
Torsion		Sxe(t)	1.2207 in³	Sye(l)	0.1035 in³
ϕBn	24.915 k-in²	Sxe(b)	0.7129 in³	Sye(r)	0.1070 in³

```
Stud element 3 h/t exceeds 300.
Stud element 3 h/t exceeds 200.
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Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=50.735 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=52.65 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=54.15 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	

Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.46689 in², Fy=50.735 ksi
Tn=23.688 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.42009 in², Fu=65 ksi
Tn=27.306 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Stud element 2
Vn=1.4492 k at 180 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Stud element 3
Vyh=7.9889 k — Eq. G3-2
kv=4.4199 — Eq. G3-8
Vcrh=0.28163 k — Eq. G3-6
h/t exceeds 200 (rational analysis)
Vn=0.88236 k at 90 deg — Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)
Stud element 4
Vn=1.4492 k at 0 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Stud
Element 1: Unstiffened, w=0.5157 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=1.0916 — Eq. 1.1-3
ρ=0.73148 — Eq. 1.1-2
b=0.37723 in (ineffective width=0.13847 in) — Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.091 — Eq. 1.3-7
Ia=0.00020486 in⁴ — Eq. 1.3-8
Is=0.00035659 in⁴ > Ia (no lip reduction)
k=3.4958 — Table 1.3-1
Element 2: Partially stiffened, w=1.7814 in
f=50 ksi, k=3.4958
λ=1.3224 — Eq. 1.1-3
ρ=0.63039 — Eq. 1.1-2
b=1.123 in (ineffective width=0.65843 in) — Eq. 1.1-1
b_1=0.56148 in, b_2=0.56148 in
Element 3: Treat as two unstiffened elements
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3

λ=8.7644	Eq. 1.1-3
ρ=0.11123	Eq. 1.1-2
b=0.46059 in (ineffective width=3.6801 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=8.7644	Eq. 1.1-3
ρ=0.11123	Eq. 1.1-2
b=0.46059 in (ineffective width=3.6801 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.5157 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.0916	Eq. 1.1-3
ρ=0.73148	Eq. 1.1-2
b=0.37723 in (ineffective width=0.13847 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00020486 in^4	Eq. 1.3-8
Is=0.00035659 in^4 > Ia (no lip reduction)	
k=3.4958	Table 1.3-1
Element 4: Partially stiffened, w=1.7814 in	
f=50 ksi, k=3.4958	
λ=1.3224	Eq. 1.1-3
ρ=0.63039	Eq. 1.1-2
b=1.123 in (ineffective width=0.65843 in)	Eq. 1.1-1
b_1=0.56148 in, b_2=0.56148 in	
Ae=0.14072 in^2, Fn=50 ksi	
Pn=7.0361 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=9.7814 in	
h/t greater than 200, treat as rational analysis	
f_1=49.134 ksi, f_2=-28.357 ksi	
ψ=0.57713	Eq. 1.1.2-1
k=15	Eq. 1.1.2-2
λ=3.4749	Eq. 1.1-3
ρ=0.26956	Eq. 1.1-2
be=2.6367 in	Eq. 1.1-1
h_o=10 in, b_o=2 in, h_o/b_o=5	
b_1=0.73709 in	Eq. 1.1.2-6
b_2=0.93472 in	Eq. 1.1.2-7
Compression width=6.202 in	
Ineffective width=4.5302 in	
Element 5: Unstiffened, w=0.5157 in	
f_1=49.134 ksi, f_2=45.049 ksi	

ψ=0.91685	Eq. 1.2.2-1
k=0.45988	Eq. 1.2.2-2
λ=1.0463	Eq. 1.1-3
ρ=0.75478	Eq. 1.1-2
b=0.38924 in (ineffective width=0.12646 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.13	Eq. 1.3-7
Ia=0.00020461 in^4	Eq. 1.3-8
Is=0.00035659 in^4 > Ia (no lip reduction)	
k=3.4958	Table 1.3-1
Element 4: Partially stiffened, w=1.7814 in	
f=49.876 ksi, k=3.4958	
λ=1.3208	Eq. 1.1-3
ρ=0.63101	Eq. 1.1-2
b=1.1241 in (ineffective width=0.65732 in)	Eq. 1.1-1
b_1=0.56204 in, b_2=0.56204 in	
Center of gravity shift: y=-1.3132 in	
Sxe=0.71287 in^3, Fy=50 ksi	
Mnl=35.643 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5157 in	
f_1=49.134 ksi, f_2=45.049 ksi	
ψ=0.91685	Eq. 1.2.2-1
k=0.45988	Eq. 1.2.2-2
λ=1.0463	Eq. 1.1-3
ρ=0.75478	Eq. 1.1-2
b=0.38924 in (ineffective width=0.12646 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.13	Eq. 1.3-7
Ia=0.00020461 in^4	Eq. 1.3-8
Is=0.00035659 in^4 > Ia (no lip reduction)	
k=3.4958	Table 1.3-1
Element 2: Partially stiffened, w=1.7814 in	
f=49.876 ksi, k=3.4958	
λ=1.3208	Eq. 1.1-3
ρ=0.63101	Eq. 1.1-2
b=1.1241 in (ineffective width=0.65732 in)	Eq. 1.1-1
b_1=0.56204 in, b_2=0.56204 in	
Element 3: Stiffened, w=9.7814 in	
h/t greater than 200, treat as rational analysis	
f_1=49.134 ksi, f_2=-28.357 ksi	
ψ=0.57713	Eq. 1.1.2-1
k=15	Eq. 1.1.2-2
λ=3.4749	Eq. 1.1-3
ρ=0.26956	Eq. 1.1-2
be=2.6367 in	Eq. 1.1-1
h_o=10 in, b_o=2 in, h_o/b_o=5	

b_1=0.73709 in — Eq. 1.1.2-6
b_2=0.93472 in — Eq. 1.1.2-7
Compression width=6.202 in
Ineffective width=4.5302 in
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=1.3132 in
Sxe=0.71287 in^3, Fy=50 ksi
Mnl=35.643 k-in — Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.5157 in
f_1=49.5 ksi, f_2=49.5 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=1.0861 — Eq. 1.1-3
ρ=0.73423 — Eq. 1.1-2
b=0.37864 in (ineffective width=0.13706 in) — Eq. 1.1-1
Element 2: Stiffened, w=1.7814 in
f_1=46.5 ksi, f_2=-10.54 ksi
ψ=0.22666 — Eq. 1.1.2-1
k=10.145 — Eq. 1.1.2-2
λ=0.74862 — Eq. 1.1-3
ρ=0.94324 — Eq. 1.1-2
be=1.6803 in — Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2
b_1=0.52075 in — Eq. 1.1.2-3
b_2=1.1595 in — Eq. 1.1.2-5
Compression width=1.4522 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.5157 in
f_1=49.5 ksi, f_2=49.5 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-2
λ=1.0861 — Eq. 1.1-3
ρ=0.73423 — Eq. 1.1-2
b=0.37864 in (ineffective width=0.13706 in) — Eq. 1.1-1
Element 4: Stiffened, w=1.7814 in
f_1=46.5 ksi, f_2=-10.54 ksi
ψ=0.22666 — Eq. 1.1.2-1
k=10.145 — Eq. 1.1.2-2
λ=0.74862 — Eq. 1.1-3
ρ=0.94324 — Eq. 1.1-2
be=1.6803 in — Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2
b_1=0.52075 in — Eq. 1.1.2-3
b_2=1.1595 in — Eq. 1.1.2-5

Compression width=1.4522 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=-0.031473 in
Sye=0.12139 in³, Fy=50 ksi
Mnl=6.0696 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.7814 in
f_1=44.624 ksi, f_2=-42.99 ksi
ψ=0.96337 — Eq. 1.1.2-1
k=23.064 — Eq. 1.1.2-2
λ=0.48638 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=1.7814 in — Eq. 1.1-1
h_o=2 in, b_o=10 in, h_o/b_o=0.2
b_1=0.44947 in — Eq. 1.1.2-3
b_2=0.8907 in — Eq. 1.1.2-4
Compression width=0.90732 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=49.233 ksi, f_2=49.233 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=8.6969 — Eq. 1.1-3
ρ=0.11208 — Eq. 1.1-2
b=0.46407 in (ineffective width=3.6766 in) — Eq. 1.1-1
f_1=49.233 ksi, f_2=49.233 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-2
λ=8.6969 — Eq. 1.1-3
ρ=0.11208 — Eq. 1.1-2
b=0.46407 in (ineffective width=3.6766 in) — Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=1.7814 in
f_1=44.624 ksi, f_2=-42.99 ksi
ψ=0.96337 — Eq. 1.1.2-1
k=23.064 — Eq. 1.1.2-2
λ=0.48638 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=1.7814 in — Eq. 1.1-1
h_o=2 in, b_o=10 in, h_o/b_o=0.2
b_1=0.44947 in — Eq. 1.1.2-3
b_2=0.8907 in — Eq. 1.1.2-4
Compression width=0.90732 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.54669 in
Sye=0.1035 in³, Fy=50 ksi

Mnl=5.1748 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=4.2831 in^6, Wn=7.7359 in^2, Fy=50 ksi
Bn=27.683 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

1000S200-33

Full Section Properties

Area	0.51730 in²	Wt.	0.0017588 k/ft	Flat	14.951 in
Ix	7.0132 in⁴	rx	3.6820 in	Ixy	0.0000 in⁴
Sx(t)	1.4026 in³	y(t)	5.0000 in	α	0.000 deg
Sx(b)	1.4026 in³	y(b)	5.0000 in		
Zx	1.7057 in³	Height	10.0000 in		
Iy	0.2408 in⁴	ry	0.6822 in	x_o	-1.1519 in
Sy(l)	0.5667 in³	x(l)	0.4249 in	y_o	0.0000 in
Sy(r)	0.1529 in³	x(r)	1.5751 in	jx	6.0563 in
Zy	0.2130 in³	Width	2.0000 in	jy	0.0000 in
I_1	7.0132 in⁴	r_1	3.6820 in	Cw	4.7260 in⁶
I_2	0.2408 in⁴	r_2	0.6822 in	J	0.0002064 in⁴
Ic	7.2540 in⁴	rc	3.7447 in		
I_o	7.9404 in⁴	r_o	3.9179 in		

Net Section Properties

Ix	7.0034 in⁴	rx	3.8792 in	Area	0.46540 in²
Sx(t)	1.4007 in³	y(t)	5.0000 in	Ixy	0.0000 in⁴
Sx(b)	1.4007 in³	y(b)	5.0000 in	α	0.000 deg
Zx	1.6862 in³				
Iy	0.2312 in⁴	ry	0.7048 in	x_o	-1.1984 in
Sy(l)	0.4916 in³	x(l)	0.4703 in	y_o	0.0000 in
Sy(r)	0.1511 in³	x(r)	1.5297 in	jx	5.5657 in
Zy	0.2124 in³			jy	0.0000 in
Ic	7.2346 in⁴	rc	3.9427 in	Cw	4.7206 in⁶
I_o	7.9031 in⁴	r_o	4.1208 in	J	0.0001857 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	7.139 k	ϕMnxo	33.810 k-in	ϕMnyo	6.202 k-in
Ae	0.16798 in²	Ixe	5.2264 in⁴	Iye	0.2142 in⁴
ϕTn	22.688 k	Sxe(t)	0.8452 in³	Sye(l)	0.4800 in³
		Sxe(b)	1.3693 in³	Sye(r)	0.1378 in³
Shear					
ϕVny	0.892 k	Negative Bending		Negative Bending	
ϕVnx	3.083 k	ϕMnxo	33.810 k-in	ϕMnyo	5.377 k-in
		Ixe	5.2264 in⁴	Iye	0.1195 in⁴
Torsion		Sxe(t)	1.3693 in³	Sye(l)	0.1195 in³
ϕBn	27.521 k-in²	Sxe(b)	0.8452 in³	Sye(r)	0.1195 in³

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Stud element 3 h/t exceeds 200.
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Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=50.798 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=52.88 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=54.513 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	

Axial Tension Strength
Ag=0.5173 in², Fy=50.798 ksi
Tn=26.278 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.4654 in², Fu=65 ksi
Tn=30.251 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Stud element 2
Vn=1.7129 k at 180 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Stud element 3
Vyh=8.8552 k — Eq. G3-2
kv=4.4197 — Eq. G3-8
Vcrh=0.38419 k — Eq. G3-6
h/t exceeds 200 (rational analysis)
Vn=1.1146 k at 90 deg — Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)
Stud element 4
Vn=1.7129 k at 0 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Stud
Element 1: Unstiffened, w=0.514 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.98104 — Eq. 1.1-3
ρ=0.79074 — Eq. 1.1-2
b=0.40644 in (ineffective width=0.10756 in) — Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.091 — Eq. 1.3-7
Ia=0.00027958 in⁴ — Eq. 1.3-8
Is=0.00039155 in⁴ > Ia (no lip reduction)
k=3.4924 — Table 1.3-1
Element 2: Partially stiffened, w=1.778 in
f=50 ksi, k=3.4924
λ=1.1908 — Eq. 1.1-3
ρ=0.68464 — Eq. 1.1-2
b=1.2173 in (ineffective width=0.56072 in) — Eq. 1.1-1
b_1=0.60864 in, b_2=0.60864 in
Element 3: Treat as two unstiffened elements
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=7.8999 — Eq. 1.1-3

ρ=0.12306	Eq. 1.1-2
b=0.50934 in (ineffective width=3.6297 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=7.8999	Eq. 1.1-3
ρ=0.12306	Eq. 1.1-2
b=0.50934 in (ineffective width=3.6297 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.514 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.98104	Eq. 1.1-3
ρ=0.79074	Eq. 1.1-2
b=0.40644 in (ineffective width=0.10756 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00027958 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.4924	Table 1.3-1
Element 4: Partially stiffened, w=1.778 in	
f=50 ksi, k=3.4924	
λ=1.1908	Eq. 1.1-3
ρ=0.68464	Eq. 1.1-2
b=1.2173 in (ineffective width=0.56072 in)	Eq. 1.1-1
b_1=0.60864 in, b_2=0.60864 in	
Ae=0.16798 in^2, Fn=50 ksi	
Pn=8.3989 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=9.778 in	
h/t greater than 200, treat as rational analysis	
f_1=49.102 ksi, f_2=-29.967 ksi	
ψ=0.61029	Eq. 1.1.2-1
k=15.572	Eq. 1.1.2-2
λ=3.0733	Eq. 1.1-3
ρ=0.30209	Eq. 1.1-2
be=2.9538 in	Eq. 1.1-1
h_o=10 in, b_o=2 in, h_o/b_o=5	
b_1=0.81817 in	Eq. 1.1.2-6
b_2=1.0162 in	Eq. 1.1.2-7
Compression width=6.0722 in	
Ineffective width=4.2379 in	
Element 5: Unstiffened, w=0.514 in	
f_1=49.102 ksi, f_2=44.946 ksi	
ψ=0.91535	Eq. 1.2.2-1

k=0.46043	Eq. 1.2.2-2
λ=0.93952	Eq. 1.1-3
ρ=0.81514	Eq. 1.1-2
b=0.41898 in (ineffective width=0.09502 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.135	Eq. 1.3-7
Ia=0.00027919 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.4924	Table 1.3-1
Element 4: Partially stiffened, w=1.778 in	
f=49.86 ksi, k=3.4924	
λ=1.1891	Eq. 1.1-3
ρ=0.68538	Eq. 1.1-2
b=1.2186 in (ineffective width=0.5594 in)	Eq. 1.1-1
b_1=0.6093 in, b_2=0.6093 in	
Center of gravity shift: y=-1.1833 in	
Sxe=0.84524 in^3, Fy=50 ksi	
Mnl=42.262 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.514 in	
f_1=49.102 ksi, f_2=44.946 ksi	
ψ=0.91535	Eq. 1.2.2-1
k=0.46043	Eq. 1.2.2-2
λ=0.93952	Eq. 1.1-3
ρ=0.81514	Eq. 1.1-2
b=0.41898 in (ineffective width=0.09502 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.135	Eq. 1.3-7
Ia=0.00027919 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.4924	Table 1.3-1
Element 2: Partially stiffened, w=1.778 in	
f=49.86 ksi, k=3.4924	
λ=1.1891	Eq. 1.1-3
ρ=0.68538	Eq. 1.1-2
b=1.2186 in (ineffective width=0.5594 in)	Eq. 1.1-1
b_1=0.6093 in, b_2=0.6093 in	
Element 3: Stiffened, w=9.778 in	
h/t greater than 200, treat as rational analysis	
f_1=49.102 ksi, f_2=-29.967 ksi	
ψ=0.61029	Eq. 1.1.2-1
k=15.572	Eq. 1.1.2-2
λ=3.0733	Eq. 1.1-3
ρ=0.30209	Eq. 1.1-2
be=2.9538 in	Eq. 1.1-1
h_o=10 in, b_o=2 in, h_o/b_o=5	
b_1=0.81817 in	Eq. 1.1.2-6

b_2=1.0162 in	Eq. 1.1.2-7
Compression width=6.0722 in	
Ineffective width=4.2379 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=1.1833 in	
Sxe=0.84524 in^3, Fy=50 ksi	
Mnl=42.262 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	
Positive Flexural Strength about Y-axis	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.514 in	
f_1=49.443 ksi, f_2=49.443 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.97557	Eq. 1.1-3
ρ=0.79389	Eq. 1.1-2
b=0.40806 in (ineffective width=0.10594 in)	Eq. 1.1-1
Element 2: Stiffened, w=1.778 in	
f_1=46.428 ksi, f_2=-10.783 ksi	
ψ=0.23226	Eq. 1.1.2-1
k=10.207	Eq. 1.1.2-2
λ=0.6712	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.778 in	Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2	
b_1=0.55008 in	Eq. 1.1.2-3
b_2=1.2279 in	Eq. 1.1.2-5
Compression width=1.4429 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.514 in	
f_1=49.443 ksi, f_2=49.443 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=0.97557	Eq. 1.1-3
ρ=0.79389	Eq. 1.1-2
b=0.40806 in (ineffective width=0.10594 in)	Eq. 1.1-1
Element 4: Stiffened, w=1.778 in	
f_1=46.428 ksi, f_2=-10.783 ksi	
ψ=0.23226	Eq. 1.1.2-1
k=10.207	Eq. 1.1.2-2
λ=0.6712	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.778 in	Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2	
b_1=0.55008 in	Eq. 1.1.2-3
b_2=1.2279 in	Eq. 1.1.2-5
Compression width=1.4429 in	

b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=-0.024205 in
Sye=0.13782 in³, Fy=50 ksi
Mnl=6.891 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.778 in
f_1=44.416 ksi, f_2=-44.452 ksi
ψ=1.0008 Eq. 1.1.2-1
k=24.021 Eq. 1.1.2-2
λ=0.42794 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.778 in Eq. 1.1-1
h_o=2 in, b_o=10 in, h_o/b_o=0.2
b_1=0.44441 in Eq. 1.1.2-3
b_2=0.889 in Eq. 1.1.2-4
Compression width=0.88864 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=49.1 ksi, f_2=49.1 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=7.8284 Eq. 1.1-3
ρ=0.12415 Eq. 1.1-2
b=0.51385 in (ineffective width=3.6251 in) Eq. 1.1-1
f_1=49.1 ksi, f_2=49.1 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=7.8284 Eq. 1.1-3
ρ=0.12415 Eq. 1.1-2
b=0.51385 in (ineffective width=3.6251 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=1.778 in
f_1=44.416 ksi, f_2=-44.452 ksi
ψ=1.0008 Eq. 1.1.2-1
k=24.021 Eq. 1.1.2-2
λ=0.42794 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.778 in Eq. 1.1-1
h_o=2 in, b_o=10 in, h_o/b_o=0.2
b_1=0.44441 in Eq. 1.1.2-3
b_2=0.889 in Eq. 1.1.2-4
Compression width=0.88865 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.52973 in
Sye=0.11948 in³, Fy=50 ksi
Mnl=5.974 k-in Eq. F3.1-1

Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud

Cw=4.7206 in^6, Wn=7.7187 in^2, Fy=50 ksi

Bn=30.579 k-in^2 G8.1-1

Ωb=1.67, ϕb=0.9

1000S200-43

Full Section Properties

Area	0.67238 in²	Wt.	0.0022861 k/ft	Flat	14.909 in
Ix	9.086 in⁴	rx	3.6760 in	Ixy	0.000 in⁴
Sx(t)	1.8171 in³	y(t)	5.0000 in	α	0.000 deg
Sx(b)	1.8171 in³	y(b)	5.0000 in		
Zx	2.2129 in³	Height	10.0000 in		
Iy	0.309 in⁴	ry	0.6776 in	x_o	-1.1421 in
Sy(l)	0.7242 in³	x(l)	0.4263 in	y_o	0.0000 in
Sy(r)	0.1962 in³	x(r)	1.5737 in	jx	6.0667 in
Zy	0.2752 in³	Width	2.0000 in	jy	0.0000 in
I_1	9.086 in⁴	r_1	3.6760 in	Cw	6.0434 in⁶
I_2	0.309 in⁴	r_2	0.6776 in	J	0.0004559 in⁴
Ic	9.394 in⁴	rc	3.7379 in		
I_o	10.271 in⁴	r_o	3.9085 in		

Net Section Properties

Ix	9.073 in⁴	rx	3.8734 in	Area	0.60473 in²
Sx(t)	1.8146 in³	y(t)	5.0000 in	Ixy	0.000 in⁴
Sx(b)	1.8146 in³	y(b)	5.0000 in	α	0.000 deg
Zx	2.1876 in³				
Iy	0.296 in⁴	ry	0.7002 in	x_o	-1.1883 in
Sy(l)	0.6288 in³	x(l)	0.4715 in	y_o	0.0000 in
Sy(r)	0.1940 in³	x(r)	1.5285 in	jx	5.5739 in
Zy	0.2742 in³			jy	0.0000 in
Ic	9.369 in⁴	rc	3.9362 in	Cw	6.0365 in⁶
I_o	10.223 in⁴	r_o	4.1117 in	J	0.0004100 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	10.644 k	ϕMnxo	49.903 k-in	ϕMnyo	8.542 k-in
Ae	0.25046 in²	Ixe	7.3921 in⁴	Iye	0.2912 in⁴
ϕTn	29.481 k	Sxe(t)	1.2476 in³	Sye(l)	0.6253 in³
		Sxe(b)	1.8141 in³	Sye(r)	0.1898 in³
Shear					
ϕVny	1.617 k	Negative Bending		Negative Bending	
ϕVnx	4.304 k	ϕMnxo	49.903 k-in	ϕMnyo	7.176 k-in
		Ixe	7.3921 in⁴	Iye	0.1688 in⁴
Torsion		Sxe(t)	1.8141 in³	Sye(l)	0.1793 in³
ϕBn	35.436 k-in²	Sxe(b)	1.2476 in³	Sye(r)	0.1595 in³

```
Stud element 3 h/t exceeds 200.
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Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Fya=50.975 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Fya=53.526 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Fya=55.542 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	

Axial Tension Strength
Ag=0.67238 in², Fy=50.975 ksi
Tn=34.275 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.60473 in², Fu=65 ksi
Tn=39.307 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Stud element 2
Vn=2.3913 k at 180 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9
Stud element 3
Vyh=11.525 k — Eq. G3-2
kv=4.4192 — Eq. G3-8
Vcrh=0.85141 k — Eq. G3-6
h/t exceeds 200 (rational analysis)
Vn=2.0217 k at 90 deg — Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)
Stud element 4
Vn=2.3913 k at 0 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Stud
Element 1: Unstiffened, w=0.5087 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.74488 — Eq. 1.1-3
ρ=0.94599 — Eq. 1.1-2
b=0.48123 in (ineffective width=0.027474 in) — Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.091 — Eq. 1.3-7
Ia=0.00062038 in⁴ — Eq. 1.3-8
Is=0.00049474 in⁴
ds=0.38377 in (lip ineffective width=0.097452 in) — Eq. 1.3-6
k=3.2601 — Table 1.3-1
Element 2: Partially stiffened, w=1.7674 in
f=50 ksi, k=3.2601
λ=0.93989 — Eq. 1.1-3
ρ=0.81492 — Eq. 1.1-2
b=1.4403 in (ineffective width=0.32712 in) — Eq. 1.1-1
b_1=0.57431 in, b_2=0.86598 in
Element 3: Treat as two unstiffened elements
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3

λ=6.0529	Eq. 1.1-3
ρ=0.15921	Eq. 1.1-2
b=0.65811 in (ineffective width=3.4756 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=6.0529	Eq. 1.1-3
ρ=0.15921	Eq. 1.1-2
b=0.65811 in (ineffective width=3.4756 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.5087 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.74488	Eq. 1.1-3
ρ=0.94599	Eq. 1.1-2
b=0.48123 in (ineffective width=0.027474 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00062038 in^4	Eq. 1.3-8
Is=0.00049474 in^4	
ds=0.38377 in (lip ineffective width=0.097452 in)	Eq. 1.3-6
k=3.2601	Table 1.3-1
Element 4: Partially stiffened, w=1.7674 in	
f=50 ksi, k=3.2601	
λ=0.93989	Eq. 1.1-3
ρ=0.81492	Eq. 1.1-2
b=1.4403 in (ineffective width=0.32712 in)	Eq. 1.1-1
b_1=0.57431 in, b_2=0.86598 in	
Ae=0.25046 in^2, Fn=50 ksi	
Pn=12.523 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=9.7674 in	
h/t greater than 200, treat as rational analysis	
f_1=49.019 ksi, f_2=-33.405 ksi	
ψ=0.68149	Eq. 1.1.2-1
k=16.871	Eq. 1.1.2-2
λ=2.2608	Eq. 1.1-3
ρ=0.39928	Eq. 1.1-2
be=3.9 in	Eq. 1.1-1
h_o=10 in, b_o=2 in, h_o/b_o=5	
b_1=1.0593 in	Eq. 1.1.2-6
b_2=1.26 in	Eq. 1.1.2-7
Compression width=5.8088 in	
Ineffective width=3.4894 in	
Element 5: Unstiffened, w=0.5087 in	

f_1=49.019 ksi, f_2=44.726 ksi	
ψ=0.91243	Eq. 1.2.2-1
k=0.4615	Eq. 1.2.2-2
λ=0.71191	Eq. 1.1-3
ρ=0.97059	Eq. 1.1-2
b=0.49374 in (ineffective width=0.014963 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.15	Eq. 1.3-7
Ia=0.00061923 in^4	Eq. 1.3-8
Is=0.00049474 in^4	
ds=0.39448 in (lip ineffective width=0.09926 in)	Eq. 1.3-6
k=3.2619	Table 1.3-1
Element 4: Partially stiffened, w=1.7674 in	
f=49.81 ksi, k=3.2619	
λ=0.93785	Eq. 1.1-3
ρ=0.81615	Eq. 1.1-2
b=1.4425 in (ineffective width=0.32494 in)	Eq. 1.1-1
b_1=0.57623 in, b_2=0.86622 in	
Center of gravity shift: y=-0.92523 in	
Sxe=1.2476 in^3, Fy=50 ksi	
Mnl=62.378 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	
Negative Flexural Strength about X-axis	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	
f_1=49.019 ksi, f_2=44.726 ksi	
ψ=0.91243	Eq. 1.2.2-1
k=0.4615	Eq. 1.2.2-2
λ=0.71191	Eq. 1.1-3
ρ=0.97059	Eq. 1.1-2
b=0.49374 in (ineffective width=0.014963 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.15	Eq. 1.3-7
Ia=0.00061923 in^4	Eq. 1.3-8
Is=0.00049474 in^4	
ds=0.39448 in (lip ineffective width=0.09926 in)	Eq. 1.3-6
k=3.2619	Table 1.3-1
Element 2: Partially stiffened, w=1.7674 in	
f=49.81 ksi, k=3.2619	
λ=0.93785	Eq. 1.1-3
ρ=0.81615	Eq. 1.1-2
b=1.4425 in (ineffective width=0.32494 in)	Eq. 1.1-1
b_1=0.57623 in, b_2=0.86622 in	
Element 3: Stiffened, w=9.7674 in	
h/t greater than 200, treat as rational analysis	
f_1=49.019 ksi, f_2=-33.405 ksi	
ψ=0.68149	Eq. 1.1.2-1
k=16.871	Eq. 1.1.2-2
λ=2.2608	Eq. 1.1-3

ρ=0.39928	Eq. 1.1-2
be=3.9 in	Eq. 1.1-1
h_o=10 in, b_o=2 in, h_o/b_o=5	
b_1=1.0593 in	Eq. 1.1.2-6
b_2=1.26 in	Eq. 1.1.2-7
Compression width=5.8088 in	
Ineffective width=3.4894 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.92523 in	
Sxe=1.2476 in^3, Fy=50 ksi	
Mnl=62.378 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	
f_1=49.265 ksi, f_2=49.265 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.73939	Eq. 1.1-3
ρ=0.95005	Eq. 1.1-2
b=0.48329 in (ineffective width=0.025408 in)	Eq. 1.1-1
Element 2: Stiffened, w=1.7674 in	
f_1=46.21 ksi, f_2=-11.389 ksi	
ψ=0.24646	Eq. 1.1.2-1
k=10.366	Eq. 1.1.2-2
λ=0.50672	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.7674 in	Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2	
b_1=0.54441 in	Eq. 1.1.2-3
b_2=0.8837 in	Eq. 1.1.2-4
Compression width=1.4179 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.5087 in	
f_1=49.265 ksi, f_2=49.265 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.73939	Eq. 1.1-3
ρ=0.95005	Eq. 1.1-2
b=0.48329 in (ineffective width=0.025408 in)	Eq. 1.1-1
Element 4: Stiffened, w=1.7674 in	
f_1=46.21 ksi, f_2=-11.389 ksi	
ψ=0.24646	Eq. 1.1.2-1
k=10.366	Eq. 1.1.2-2
λ=0.50672	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.7674 in	Eq. 1.1-1

h_o=2 in, b_o=0.625 in, h_o/b_o=3.2
b_1=0.54441 in Eq. 1.1.2-3
b_2=0.8837 in Eq. 1.1.2-4
Compression width=1.4179 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=-0.005729 in
Sye=0.18983 in³, Fy=50 ksi
Mnl=9.4914 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.7674 in
f_1=38.917 ksi, f_2=-44.51 ksi
ψ=1.1437 Eq. 1.1.2-1
k=27.99 Eq. 1.1.2-2
λ=0.28299 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.7674 in Eq. 1.1-1
h_o=2 in, b_o=10 in, h_o/b_o=0.2
b_1=0.42653 in Eq. 1.1.2-3
b_2=0.8837 in Eq. 1.1.2-4
Compression width=0.82446 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=43.343 ksi, f_2=43.343 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=5.6355 Eq. 1.1-3
ρ=0.17052 Eq. 1.1-2
b=0.70487 in (ineffective width=3.4288 in) Eq. 1.1-1
f_1=43.343 ksi, f_2=43.343 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=5.6355 Eq. 1.1-3
ρ=0.17052 Eq. 1.1-2
b=0.70487 in (ineffective width=3.4288 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=1.7674 in
f_1=38.917 ksi, f_2=-44.51 ksi
ψ=1.1437 Eq. 1.1.2-1
k=27.99 Eq. 1.1.2-2
λ=0.28299 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.7674 in Eq. 1.1-1
h_o=2 in, b_o=10 in, h_o/b_o=0.2
b_1=0.42653 in Eq. 1.1.2-3
b_2=0.8837 in Eq. 1.1.2-4
Compression width=0.82446 in

b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.46996 in
Sye=0.15948 in^3, Fy=50 ksi
Mnl=7.9739 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=6.0365 in^6, Wn=7.6658 in^2, Fy=50 ksi
Bn=39.373 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

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Full Section Properties

Area	0.83934 in²	Wt.	0.0028537 k/ft	Flat	14.829 in
Ix	11.279 in⁴	rx	3.6657 in	Ixy	0.000 in⁴
Sx(t)	2.2557 in³	y(t)	5.0000 in	α	0.000 deg
Sx(b)	2.2557 in³	y(b)	5.0000 in		
Zx	2.7536 in³	Height	10.0000 in		
Iy	0.378 in⁴	ry	0.6711 in	x_o	-1.1289 in
Sy(l)	0.8860 in³	x(l)	0.4266 in	y_o	0.0000 in
Sy(r)	0.2402 in³	x(r)	1.5734 in	jx	6.0892 in
Zy	0.3401 in³	Width	2.0000 in	jy	0.0000 in
I_1	11.279 in⁴	r_1	3.6657 in	Cw	7.3734 in⁶
I_2	0.378 in⁴	r_2	0.6711 in	J	0.0008963 in⁴
Ic	11.657 in⁴	rc	3.7267 in		
I_o	12.726 in⁴	r_o	3.8939 in		

Net Section Properties

Ix	11.263 in⁴	rx	3.8638 in	Area	0.75444 in²
Sx(t)	2.2526 in³	y(t)	5.0000 in	Ixy	0.000 in⁴
Sx(b)	2.2526 in³	y(b)	5.0000 in	α	0.000 deg
Zx	2.7218 in³				
Iy	0.363 in⁴	ry	0.6936 in	x_o	-1.1748 in
Sy(l)	0.7699 in³	x(l)	0.4715 in	y_o	0.0000 in
Sy(r)	0.2375 in³	x(r)	1.5285 in	jx	5.5935 in
Zy	0.3386 in³			jy	0.0000 in
Ic	11.626 in⁴	rc	3.9255 in	Cw	7.3649 in⁶
I_o	12.667 in⁴	r_o	4.0976 in	J	0.0008056 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	14.307 k	ϕMnxo	74.729 k-in	ϕMnyo	12.145 k-in
Ae	0.33665 in²	Ixe	9.5921 in⁴	Iye	0.3630 in⁴
ϕTn	36.779 k	Sxe(t)	1.6606 in³	Sye(l)	0.7699 in³
		Sxe(b)	2.2710 in³	Sye(r)	0.2375 in³
Shear					
ϕVny	3.014 k	Negative Bending		Negative Bending	
ϕVnx	5.248 k	ϕMnxo	74.729 k-in	ϕMnyo	9.126 k-in
		Ixe	9.5921 in⁴	Iye	0.2284 in⁴
Torsion		Sxe(t)	2.2710 in³	Sye(l)	0.2615 in³
ϕBn	43.552 k-in²	Sxe(b)	1.6606 in³	Sye(r)	0.2028 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=51.218 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=54.356 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=56.825 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.83934 in², Fy=51.218 ksi

Tn=42.989 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.75444 in², Fu=65 ksi	
Tn=49.038 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=2.9155 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=14.359 k	Eq. G3-2
kv=4.417	Eq. G3-8
Vcrh=1.6883 k	Eq. G3-6
Vn=3.3493 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=2.9155 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4835 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56413	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0011127 in⁴	Eq. 1.3-8
Is=0.00053312 in⁴	
ds=0.23166 in (lip ineffective width=0.25184 in)	Eq. 1.3-6
k=2.7693	Table 1.3-1
Element 2: Partially stiffened, w=1.717 in	
f=50 ksi, k=2.7693	
λ=0.78941	Eq. 1.1-3
ρ=0.91373	Eq. 1.1-2
b=1.5689 in (ineffective width=0.14812 in)	Eq. 1.1-1
b_1=0.37585 in, b_2=1.193 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.7937	Eq. 1.1-3
ρ=0.19903	Eq. 1.1-2
b=0.81773 in (ineffective width=3.2908 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=4.7937	Eq. 1.1-3
ρ=0.19903	Eq. 1.1-2
b=0.81773 in (ineffective width=3.2908 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4835 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56413	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0011127 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.23166 in (lip ineffective width=0.25184 in)	Eq. 1.3-6
k=2.7693	Table 1.3-1
Element 4: Partially stiffened, w=1.717 in	
f=50 ksi, k=2.7693	
λ=0.78941	Eq. 1.1-3
ρ=0.91373	Eq. 1.1-2
b=1.5689 in (ineffective width=0.14812 in)	Eq. 1.1-1
b_1=0.37585 in, b_2=1.193 in	
Ae=0.33665 in^2, Fn=50 ksi	
Pn=16.832 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=9.717 in	
f_1=48.775 ksi, f_2=-35.364 ksi	
ψ=0.72505	Eq. 1.1.2-1
k=17.717	Eq. 1.1.2-2
λ=1.7445	Eq. 1.1-3
ρ=0.50094	Eq. 1.1-2
be=4.8676 in	Eq. 1.1-1
h_o=10 in, b_o=2 in, h_o/b_o=5	
b_1=1.3067 in	Eq. 1.1.2-6
b_2=1.515 in	Eq. 1.1.2-7
Compression width=5.6329 in	
Ineffective width=2.8112 in	
Element 5: Unstiffened, w=0.4835 in	
f_1=48.775 ksi, f_2=44.588 ksi	
ψ=0.91417	Eq. 1.2.2-1
k=0.46086	Eq. 1.2.2-2
λ=0.5382	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.168	Eq. 1.3-7

Ia=0.0011004 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.23425 in (lip ineffective width=0.24925 in)	Eq. 1.3-6
k=2.7771	Table 1.3-1
Element 4: Partially stiffened, w=1.717 in	
f=49.755 ksi, k=2.7771	
λ=0.78637	Eq. 1.1-3
ρ=0.9159	Eq. 1.1-2
b=1.5726 in (ineffective width=0.14441 in)	Eq. 1.1-1
b_1=0.38095 in, b_2=1.1916 in	
Center of gravity shift: y=-0.77619 in	
Sxe=1.6606 in^3, Fy=50 ksi	
Mnl=83.032 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4835 in	
f_1=48.775 ksi, f_2=44.588 ksi	
ψ=0.91416	Eq. 1.2.2-1
k=0.46086	Eq. 1.2.2-2
λ=0.5382	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.168	Eq. 1.3-7
Ia=0.0011004 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.23425 in (lip ineffective width=0.24925 in)	Eq. 1.3-6
k=2.7771	Table 1.3-1
Element 2: Partially stiffened, w=1.717 in	
f=49.755 ksi, k=2.7771	
λ=0.78637	Eq. 1.1-3
ρ=0.9159	Eq. 1.1-2
b=1.5726 in (ineffective width=0.14441 in)	Eq. 1.1-1
b_1=0.38095 in, b_2=1.1916 in	
Element 3: Stiffened, w=9.717 in	
f_1=48.775 ksi, f_2=-35.364 ksi	
ψ=0.72505	Eq. 1.1.2-1
k=17.717	Eq. 1.1.2-2
λ=1.7445	Eq. 1.1-3
ρ=0.50094	Eq. 1.1-2
be=4.8676 in	Eq. 1.1-1
h_o=10 in, b_o=2 in, h_o/b_o=5	
b_1=1.3067 in	Eq. 1.1.2-6
b_2=1.515 in	Eq. 1.1.2-7
Compression width=5.6329 in	
Ineffective width=2.8112 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.77619 in	

Sxe=1.6606 in³, Fy=50 ksi
Mnl=83.032 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.4835 in
f_1=55.773 ksi, f_2=55.773 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.59581 — Eq. 1.1-3
λ<0.673 (fully effective) — Eq. 1.1-1
Element 2: Stiffened, w=1.717 in
f_1=51.565 ksi, f_2=-12.267 ksi
ψ=0.2379 — Eq. 1.1.2-1
k=10.27 — Eq. 1.1.2-2
λ=0.4163 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=1.717 in — Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2
b_1=0.53028 in — Eq. 1.1.2-3
b_2=0.8585 in — Eq. 1.1.2-4
Compression width=1.387 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.4835 in
f_1=55.773 ksi, f_2=55.773 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.59581 — Eq. 1.1-3
λ<0.673 (fully effective) — Eq. 1.1-1
Element 4: Stiffened, w=1.717 in
f_1=51.565 ksi, f_2=-12.267 ksi
ψ=0.2379 — Eq. 1.1.2-1
k=10.27 — Eq. 1.1.2-2
λ=0.4163 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=1.717 in — Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2
b_1=0.53028 in — Eq. 1.1.2-3
b_2=0.8585 in — Eq. 1.1.2-4
Compression width=1.387 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0 in
Sye=0.23747 in³, Fy=56.825 ksi
Mnl=13.495 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud

Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.717 in
f_1=32.43 ksi, f_2=-43.724 ksi
ψ=1.3483 Eq. 1.1.2-1
k=34.595 Eq. 1.1.2-2
λ=0.17988 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.717 in Eq. 1.1-1
h_o=2 in, b_o=10 in, h_o/b_o=0.2
b_1=0.39487 in Eq. 1.1.2-3
b_2=0.8585 in Eq. 1.1.2-4
Compression width=0.73118 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=37.451 ksi, f_2=37.451 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=4.1487 Eq. 1.1-3
ρ=0.22826 Eq. 1.1-2
b=0.93779 in (ineffective width=3.1707 in) Eq. 1.1-1
f_1=37.451 ksi, f_2=37.451 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=4.1487 Eq. 1.1-3
ρ=0.22826 Eq. 1.1-2
b=0.93779 in (ineffective width=3.1707 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=1.717 in
f_1=32.43 ksi, f_2=-43.724 ksi
ψ=1.3483 Eq. 1.1.2-1
k=34.595 Eq. 1.1.2-2
λ=0.17988 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.717 in Eq. 1.1-1
h_o=2 in, b_o=10 in, h_o/b_o=0.2
b_1=0.39487 in Eq. 1.1.2-3
b_2=0.8585 in Eq. 1.1.2-4
Compression width=0.73118 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.40218 in
Sye=0.2028 in^3, Fy=50 ksi
Mnl=10.14 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=7.3649 in^6, Wn=7.6098 in^2, Fy=50 ksi
Bn=48.391 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

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Full Section Properties

Area	1.0495 in²	Wt.	0.0035684 k/ft	Flat	14.720 in
Ix	13.996 in⁴	rx	3.6517 in	Ixy	0.000 in⁴
Sx(t)	2.7992 in³	y(t)	5.0000 in	α	0.000 deg
Sx(b)	2.7992 in³	y(b)	5.0000 in		
Zx	3.4281 in³	Height	10.0000 in		
Iy	0.460 in⁴	ry	0.6623 in	x_o	-1.1114 in
Sy(l)	1.0789 in³	x(l)	0.4268 in	y_o	0.0000 in
Sy(r)	0.2927 in³	x(r)	1.5732 in	jx	6.1214 in
Zy	0.4197 in³	Width	2.0000 in	jy	0.0000 in
I_1	13.996 in⁴	r_1	3.6517 in	Cw	8.9378 in⁶
I_2	0.460 in⁴	r_2	0.6623 in	J	0.0017785 in⁴
Ic	14.456 in⁴	rc	3.7113 in		
I_o	15.753 in⁴	r_o	3.8742 in		

Net Section Properties

Ix	13.976 in⁴	rx	3.8506 in	Area	0.94259 in²
Sx(t)	2.7952 in³	y(t)	5.0000 in	Ixy	0.000 in⁴
Sx(b)	2.7952 in³	y(b)	5.0000 in	α	0.000 deg
Zx	3.3880 in³				
Iy	0.442 in⁴	ry	0.6849 in	x_o	-1.1568 in
Sy(l)	0.9385 in³	x(l)	0.4711 in	y_o	0.0000 in
Sy(r)	0.2892 in³	x(r)	1.5289 in	jx	5.6219 in
Zy	0.4172 in³			jy	0.0000 in
Ic	14.418 in⁴	rc	3.9110 in	Cw	8.9274 in⁶
I_o	15.679 in⁴	r_o	4.0785 in	J	0.0015973 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	20.806 k	ϕMnxo	107.49 k-in	ϕMnyo	15.22 k-in
Ae	0.48956 in²	Ixe	12.949 in⁴	Iye	0.442 in⁴
ϕTn	45.951 k	Sxe(t)	2.3887 in³	Sye(l)	0.9385 in³
		Sxe(b)	2.8280 in³	Sye(r)	0.2892 in³
Shear					
ϕVny	4.999 k	Negative Bending		Negative Bending	
ϕVnx	6.328 k	ϕMnxo	107.49 k-in	ϕMnyo	11.56 k-in
		Ixe	12.949 in⁴	Iye	0.310 in⁴
Torsion		Sxe(t)	2.8280 in³	Sye(l)	0.3911 in³
ϕBn	53.292 k-in²	Sxe(b)	2.3887 in³	Sye(r)	0.2568 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=51.545 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=55.437 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=58.477 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=1.0495 in², Fy=51.545 ksi

Tn=54.099 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.94259 in², Fu=65 ksi	
Tn=61.268 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=3.5157 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=17.896 k	Eq. G3-2
kv=4.4136	Eq. G3-8
Vcrh=3.3908 k	Eq. G3-6
Vn=5.5549 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=3.5157 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4468 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41383	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00072868 in⁴	Eq. 1.3-8
Is=0.00052997 in⁴	
ds=0.32495 in (lip ineffective width=0.12185 in)	Eq. 1.3-6
k=3.0024	Table 1.3-1
Element 2: Partially stiffened, w=1.6436 in	
f=50 ksi, k=3.0024	
λ=0.57612	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=3.7714	Eq. 1.1-3
ρ=0.24969	Eq. 1.1-2
b=1.0167 in (ineffective width=3.0551 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=3.7714	Eq. 1.1-3

ρ=0.24969	Eq. 1.1-2
b=1.0167 in (ineffective width=3.0551 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4468 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41383	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00072868 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.32495 in (lip ineffective width=0.12185 in)	Eq. 1.3-6
k=3.0024	Table 1.3-1
Element 4: Partially stiffened, w=1.6436 in	
f=50 ksi, k=3.0024	
λ=0.57612	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Ae=0.48956 in^2, Fn=50 ksi	
Pn=24.478 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=9.6436 in	
f_1=48.356 ksi, f_2=-40.614 ksi	
ψ=0.8399	Eq. 1.1.2-1
k=20.137	Eq. 1.1.2-2
λ=1.2836	Eq. 1.1-3
ρ=0.64553	Eq. 1.1-2
be=6.2253 in	Eq. 1.1-1
h_o=10 in, b_o=2 in, h_o/b_o=5	
b_1=1.6212 in	Eq. 1.1.2-6
b_2=1.7623 in	Eq. 1.1.2-7
Compression width=5.2414 in	
Ineffective width=1.8579 in	
Element 5: Unstiffened, w=0.4468 in	
f_1=48.356 ksi, f_2=44.234 ksi	
ψ=0.91475	Eq. 1.2.2-1
k=0.46065	Eq. 1.2.2-2
λ=0.3932	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.194	Eq. 1.3-7
Ia=0.00071585 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.33078 in (lip ineffective width=0.11602 in)	Eq. 1.3-6
k=3.0201	Table 1.3-1

Element 4: Partially stiffened, w=1.6436 in
f=49.671 ksi, k=3.0201
λ=0.57253 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Center of gravity shift: y=-0.42101 in
Sxe=2.3887 in^3, Fy=50 ksi
Mnl=119.44 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.4468 in
f_1=48.356 ksi, f_2=44.234 ksi
ψ=0.91475 Eq. 1.2.2-1
k=0.46065 Eq. 1.2.2-2
λ=0.3932 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.194 Eq. 1.3-7
Ia=0.00071585 in^4 Eq. 1.3-8
Is=0.00052997 in^4
ds=0.33078 in (lip ineffective width=0.11602 in) Eq. 1.3-6
k=3.0201 Table 1.3-1
Element 2: Partially stiffened, w=1.6436 in
f=49.671 ksi, k=3.0201
λ=0.57253 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 3: Stiffened, w=9.6436 in
f_1=48.356 ksi, f_2=-40.614 ksi
ψ=0.8399 Eq. 1.1.2-1
k=20.137 Eq. 1.1.2-2
λ=1.2836 Eq. 1.1-3
ρ=0.64553 Eq. 1.1-2
be=6.2253 in Eq. 1.1-1
h_o=10 in, b_o=2 in, h_o/b_o=5
b_1=1.6212 in Eq. 1.1.2-6
b_2=1.7623 in Eq. 1.1.2-7
Compression width=5.2414 in
Ineffective width=1.8579 in
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0.42101 in
Sxe=2.3887 in^3, Fy=50 ksi
Mnl=119.44 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.4468 in
f_1=57.113 ksi, f_2=57.113 ksi

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.44229	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=1.6436 in	
f_1=51.661 ksi, f_2=-11.205 ksi	
ψ=0.21689	Eq. 1.1.2-1
k=10.038	Eq. 1.1.2-2
λ=0.32027	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.6436 in	Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2	
b_1=0.51093 in	Eq. 1.1.2-3
b_2=1.1327 in	Eq. 1.1.2-5
Compression width=1.3507 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.4468 in	
f_1=57.113 ksi, f_2=57.113 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.44229	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Stiffened, w=1.6436 in	
f_1=51.661 ksi, f_2=-11.205 ksi	
ψ=0.21689	Eq. 1.1.2-1
k=10.038	Eq. 1.1.2-2
λ=0.32027	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.6436 in	Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2	
b_1=0.51093 in	Eq. 1.1.2-3
b_2=1.1327 in	Eq. 1.1.2-5
Compression width=1.3507 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0 in	
Sye=0.28922 in^3, Fy=58.477 ksi	
Mnl=16.912 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: Stiffened, w=1.6436 in	
f_1=25.374 ksi, f_2=-42.627 ksi	
ψ=1.68	Eq. 1.1.2-1
k=47.856	Eq. 1.1.2-2
λ=0.1028	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.6436 in	Eq. 1.1-1

h_o=2 in, b_o=10 in, h_o/b_o=0.2
b_1=0.3512 in — Eq. 1.1.2-3
b_2=0.8218 in — Eq. 1.1.2-4
Compression width=0.61329 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=31.272 ksi, f_2=31.272 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=2.9826 — Eq. 1.1-3
ρ=0.31055 — Eq. 1.1-2
b=1.2645 in (ineffective width=2.8073 in) — Eq. 1.1-1
f_1=31.272 ksi, f_2=31.272 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-2
λ=2.9826 — Eq. 1.1-3
ρ=0.31055 — Eq. 1.1-2
b=1.2645 in (ineffective width=2.8073 in) — Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=1.6436 in
f_1=25.374 ksi, f_2=-42.627 ksi
ψ=1.68 — Eq. 1.1.2-1
k=47.856 — Eq. 1.1.2-2
λ=0.1028 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=1.6436 in — Eq. 1.1-1
h_o=2 in, b_o=10 in, h_o/b_o=0.2
b_1=0.3512 in — Eq. 1.1.2-3
b_2=0.8218 in — Eq. 1.1.2-4
Compression width=0.61329 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.32149 in
Sye=0.25679 in^3, Fy=50 ksi
Mnl=12.839 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=8.9274 in^6, Wn=7.5383 in^2, Fy=50 ksi
Bn=59.213 k-in^2 — G8.1-1
Ωb=1.67, ϕb=0.9

1000S250-30

Full Section Properties

Area	0.49809 in²	Wt.	0.0016935 k/ft	Flat	15.964 in
Ix	7.1117 in⁴	rx	3.7786 in	Ixy	0.0000 in⁴
Sx(t)	1.4223 in³	y(t)	5.0000 in	α	0.000 deg
Sx(b)	1.4223 in³	y(b)	5.0000 in		
Zx	1.6959 in³	Height	10.0000 in		
Iy	0.3743 in⁴	ry	0.8669 in	x_o	-1.5263 in
Sy(l)	0.6528 in³	x(l)	0.5734 in	y_o	0.0000 in
Sy(r)	0.1943 in³	x(r)	1.9266 in	jx	5.6162 in
Zy	0.2793 in³	Width	2.5000 in	jy	0.0000 in
I_1	7.1117 in⁴	r_1	3.7786 in	Cw	7.2002 in⁶
I_2	0.3743 in⁴	r_2	0.8669 in	J	0.0001616 in⁴
Ic	7.4860 in⁴	rc	3.8768 in		
I_o	8.6463 in⁴	r_o	4.1664 in		

Net Section Properties

Ix	7.1029 in⁴	rx	3.9673 in	Area	0.45129 in²
Sx(t)	1.4206 in³	y(t)	5.0000 in	Ixy	0.0000 in⁴
Sx(b)	1.4206 in³	y(b)	5.0000 in	α	0.000 deg
Zx	1.6783 in³				
Iy	0.3583 in⁴	ry	0.8910 in	x_o	-1.5853 in
Sy(l)	0.5675 in³	x(l)	0.6313 in	y_o	0.0000 in
Sy(r)	0.1917 in³	x(r)	1.8687 in	jx	5.2166 in
Zy	0.2788 in³			jy	0.0000 in
Ic	7.4611 in⁴	rc	4.0661 in	Cw	7.1919 in⁶
I_o	8.5953 in⁴	r_o	4.3642 in	J	0.0001464 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	6.251 k	ϕMnxo	29.992 k-in	ϕMnyo	7.030 k-in
Ae	0.14709 in²	Ixe	4.8268 in⁴	Iye	0.3051 in⁴
ϕTn	22.000 k	Sxe(t)	0.7498 in³	Sye(l)	0.5577 in³
		Sxe(b)	1.3548 in³	Sye(r)	0.1562 in³
Shear					
ϕVny	0.709 k	Negative Bending		Negative Bending	
ϕVnx	2.734 k	ϕMnxo	29.992 k-in	ϕMnyo	6.432 k-in
		Ixe	4.8268 in⁴	Iye	0.1813 in⁴
Torsion		Sxe(t)	1.3548 in³	Sye(l)	0.1429 in³
ϕBn	33.852 k-in²	Sxe(b)	0.7498 in³	Sye(r)	0.1472 in³

```
Stud element 3 h/t exceeds 300.
Stud element 3 h/t exceeds 200.
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Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=50.689 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=52.136 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=54.15 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	

Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.49809 in², Fy=50.689 ksi
Tn=25.248 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.45129 in², Fu=65 ksi
Tn=29.334 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Stud element 2
Vn=1.519 k at 180 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Stud element 3
Vyh=7.9889 k — Eq. G3-2
kv=4.449 — Eq. G3-8
Vcrh=0.28349 k — Eq. G3-6
h/t exceeds 200 (rational analysis)
Vn=0.88603 k at 90 deg — Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)
Stud element 4
Vn=1.519 k at 0 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Stud
Element 1: Unstiffened, w=0.5157 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=1.0916 — Eq. 1.1-3
ρ=0.73148 — Eq. 1.1-2
b=0.37723 in (ineffective width=0.13847 in) — Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.091 — Eq. 1.3-7
Ia=0.00026103 in⁴ — Eq. 1.3-8
Is=0.00035659 in⁴ > Ia (no lip reduction)
k=3.8802 — Table 1.3-1
Element 2: Partially stiffened, w=2.2814 in
f=50 ksi, k=3.8802
λ=1.6075 — Eq. 1.1-3
ρ=0.53694 — Eq. 1.1-2
b=1.225 in (ineffective width=1.0564 in) — Eq. 1.1-1
b_1=0.61249 in, b_2=0.61249 in
Element 3: Treat as two unstiffened elements
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3

λ=8.7644	Eq. 1.1-3
ρ=0.11123	Eq. 1.1-2
b=0.46059 in (ineffective width=3.6801 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=8.7644	Eq. 1.1-3
ρ=0.11123	Eq. 1.1-2
b=0.46059 in (ineffective width=3.6801 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.5157 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.0916	Eq. 1.1-3
ρ=0.73148	Eq. 1.1-2
b=0.37723 in (ineffective width=0.13847 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00026103 in^4	Eq. 1.3-8
Is=0.00035659 in^4 > Ia (no lip reduction)	
k=3.8802	Table 1.3-1
Element 4: Partially stiffened, w=2.2814 in	
f=50 ksi, k=3.8802	
λ=1.6075	Eq. 1.1-3
ρ=0.53694	Eq. 1.1-2
b=1.225 in (ineffective width=1.0564 in)	Eq. 1.1-1
b_1=0.61249 in, b_2=0.61249 in	
Ae=0.14709 in^2, Fn=50 ksi	
Pn=7.3544 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=9.7814 in	
h/t greater than 200, treat as rational analysis	
f_1=49.151 ksi, f_2=-26.826 ksi	
ψ=0.54578	Eq. 1.1.2-1
k=14.479	Eq. 1.1.2-2
λ=3.5375	Eq. 1.1-3
ρ=0.2651	Eq. 1.1-2
be=2.5931 in	Eq. 1.1-1
h_o=10 in, b_o=2.5 in, h_o/b_o=4	
b_1=0.73131 in	Eq. 1.1.2-3
b_2=1.2965 in	Eq. 1.1.2-4
Compression width=6.3278 in	
Ineffective width=4.3 in	
Element 5: Unstiffened, w=0.5157 in	
f_1=49.151 ksi, f_2=45.145 ksi	

ψ=0.9185	Eq. 1.2.2-1
k=0.45928	Eq. 1.2.2-2
λ=1.0472	Eq. 1.1-3
ρ=0.75432	Eq. 1.1-2
b=0.389 in (ineffective width=0.1267 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.129	Eq. 1.3-7
Ia=0.00026071 in^4	Eq. 1.3-8
Is=0.00035659 in^4 > Ia (no lip reduction)	
k=3.8802	Table 1.3-1
Element 4: Partially stiffened, w=2.2814 in	
f=49.879 ksi, k=3.8802	
λ=1.6056	Eq. 1.1-3
ρ=0.53749	Eq. 1.1-2
b=1.2262 in (ineffective width=1.0552 in)	Eq. 1.1-1
b_1=0.61312 in, b_2=0.61312 in	
Center of gravity shift: y=-1.4373 in	
Sxe=0.74981 in^3, Fy=50 ksi	
Mnl=37.49 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5157 in	
f_1=49.151 ksi, f_2=45.145 ksi	
ψ=0.9185	Eq. 1.2.2-1
k=0.45928	Eq. 1.2.2-2
λ=1.0472	Eq. 1.1-3
ρ=0.75432	Eq. 1.1-2
b=0.389 in (ineffective width=0.1267 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.129	Eq. 1.3-7
Ia=0.00026071 in^4	Eq. 1.3-8
Is=0.00035659 in^4 > Ia (no lip reduction)	
k=3.8802	Table 1.3-1
Element 2: Partially stiffened, w=2.2814 in	
f=49.879 ksi, k=3.8802	
λ=1.6056	Eq. 1.1-3
ρ=0.53749	Eq. 1.1-2
b=1.2262 in (ineffective width=1.0552 in)	Eq. 1.1-1
b_1=0.61312 in, b_2=0.61312 in	
Element 3: Stiffened, w=9.7814 in	
h/t greater than 200, treat as rational analysis	
f_1=49.151 ksi, f_2=-26.826 ksi	
ψ=0.54578	Eq. 1.1.2-1
k=14.479	Eq. 1.1.2-2
λ=3.5375	Eq. 1.1-3
ρ=0.2651	Eq. 1.1-2
be=2.5931 in	Eq. 1.1-1
h_o=10 in, b_o=2.5 in, h_o/b_o=4	

b_1=0.73132 in	Eq. 1.1.2-3
b_2=1.2965 in	Eq. 1.1.2-4
Compression width=6.3278 in	
Ineffective width=4.3 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=1.4373 in	
Sxe=0.74981 in^3, Fy=50 ksi	
Mnl=37.49 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5157 in	
f_1=49.591 ksi, f_2=49.591 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.0871	Eq. 1.1-3
ρ=0.73373	Eq. 1.1-2
b=0.37838 in (ineffective width=0.13732 in)	Eq. 1.1-1
Element 2: Stiffened, w=2.2814 in	
f_1=47.137 ksi, f_2=-12.624 ksi	
ψ=0.26782	Eq. 1.1.2-1
k=10.611	Eq. 1.1.2-2
λ=0.94382	Eq. 1.1-3
ρ=0.81255	Eq. 1.1-2
be=1.8538 in	Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4	
b_1=0.56727 in	Eq. 1.1.2-3
b_2=0.92688 in	Eq. 1.1.2-4
Compression width=1.7995 in	
Ineffective width=0.30531 in	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.5157 in	
f_1=49.591 ksi, f_2=49.591 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=1.0871	Eq. 1.1-3
ρ=0.73373	Eq. 1.1-2
b=0.37838 in (ineffective width=0.13732 in)	Eq. 1.1-1
Element 4: Stiffened, w=2.2814 in	
f_1=47.137 ksi, f_2=-12.624 ksi	
ψ=0.26783	Eq. 1.1.2-1
k=10.611	Eq. 1.1.2-2
λ=0.94382	Eq. 1.1-3
ρ=0.81255	Eq. 1.1-2
be=1.8538 in	Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4	
b_1=0.56727 in	Eq. 1.1.2-3
b_2=0.92688 in	Eq. 1.1.2-4

Compression width=1.7995 in
Ineffective width=0.30531 in
Center of gravity shift: x=-0.084222 in
Sye=0.15622 in³, Fy=50 ksi
Mnl=7.811 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=2.2814 in
f_1=45.691 ksi, f_2=-44.259 ksi
ψ=0.96866 — Eq. 1.1.2-1
k=23.197 — Eq. 1.1.2-2
λ=0.62849 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=2.2814 in — Eq. 1.1-1
h_o=2.5 in, b_o=10 in, h_o/b_o=0.25
b_1=0.57485 in — Eq. 1.1.2-3
b_2=1.1407 in — Eq. 1.1.2-4
Compression width=1.1589 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=49.385 ksi, f_2=49.385 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=8.7103 — Eq. 1.1-3
ρ=0.11191 — Eq. 1.1-2
b=0.46337 in (ineffective width=3.6773 in) — Eq. 1.1-1
f_1=49.385 ksi, f_2=49.385 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-2
λ=8.7103 — Eq. 1.1-3
ρ=0.11191 — Eq. 1.1-2
b=0.46337 in (ineffective width=3.6773 in) — Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=2.2814 in
f_1=45.691 ksi, f_2=-44.258 ksi
ψ=0.96866 — Eq. 1.1.2-1
k=23.197 — Eq. 1.1.2-2
λ=0.62849 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=2.2814 in — Eq. 1.1-1
h_o=2.5 in, b_o=10 in, h_o/b_o=0.25
b_1=0.57485 in — Eq. 1.1.2-3
b_2=1.1407 in — Eq. 1.1.2-4
Compression width=1.1589 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.63689 in
Sye=0.14294 in³, Fy=50 ksi

Mnl=7.1472 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=7.1919 in^6, Wn=9.5603 in^2, Fy=50 ksi
Bn=37.614 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

1000S250-33

Full Section Properties

Area	0.55190 in²	Wt.	0.0018764 k/ft	Flat	15.951 in
Ix	7.8722 in⁴	rx	3.7768 in	Ixy	0.0000 in⁴
Sx(t)	1.5744 in³	y(t)	5.0000 in	α	0.000 deg
Sx(b)	1.5744 in³	y(b)	5.0000 in		
Zx	1.8781 in³	Height	10.0000 in		
Iy	0.4133 in⁴	ry	0.8654 in	x_o	-1.5229 in
Sy(l)	0.7203 in³	x(l)	0.5738 in	y_o	0.0000 in
Sy(r)	0.2146 in³	x(r)	1.9262 in	jx	5.6169 in
Zy	0.3089 in³	Width	2.5000 in	jy	0.0000 in
I_1	7.8722 in⁴	r_1	3.7768 in	Cw	7.9426 in⁶
I_2	0.4133 in⁴	r_2	0.8654 in	J	0.0002202 in⁴
Ic	8.2855 in⁴	rc	3.8746 in		
I_o	9.5655 in⁴	r_o	4.1632 in		

Net Section Properties

Ix	7.8625 in⁴	rx	3.9655 in	Area	0.50000 in²
Sx(t)	1.5725 in³	y(t)	5.0000 in	Ixy	0.0000 in⁴
Sx(b)	1.5725 in³	y(b)	5.0000 in	α	0.000 deg
Zx	1.8586 in³				
Iy	0.3956 in⁴	ry	0.8894 in	x_o	-1.5819 in
Sy(l)	0.6263 in³	x(l)	0.6315 in	y_o	0.0000 in
Sy(r)	0.2117 in³	x(r)	1.8685 in	jx	5.2168 in
Zy	0.3083 in³			jy	0.0000 in
Ic	8.2580 in⁴	rc	4.0640 in	Cw	7.9335 in⁶
I_o	9.5092 in⁴	r_o	4.3610 in	J	0.0001995 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	7.483 k	ϕMnxo	35.657 k-in	ϕMnyo	8.198 k-in
Ae	0.17608 in²	Ixe	5.6190 in⁴	Iye	0.3517 in⁴
ϕTn	24.375 k	Sxe(t)	0.8914 in³	Sye(l)	0.6179 in³
		Sxe(b)	1.5200 in³	Sye(r)	0.1822 in³
Shear					
ϕVny	0.895 k	Negative Bending		Negative Bending	
ϕVnx	3.317 k	ϕMnxo	35.657 k-in	ϕMnyo	7.394 k-in
		Ixe	5.6190 in⁴	Iye	0.2055 in⁴
Torsion		Sxe(t)	1.5200 in³	Sye(l)	0.1643 in³
ϕBn	37.415 k-in²	Sxe(b)	0.8914 in³	Sye(r)	0.1644 in³

```
Stud element 3 h/t exceeds 200.
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Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=50.748 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=52.32 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=54.513 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	

Axial Tension Strength
Ag=0.5519 in², Fy=50.748 ksi
Tn=28.008 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.5 in², Fu=65 ksi
Tn=32.5 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Stud element 2
Vn=1.843 k at 180 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Stud element 3
Vyh=8.8552 k — Eq. G3-2
kv=4.4489 — Eq. G3-8
Vcrh=0.38672 k — Eq. G3-6
h/t exceeds 200 (rational analysis)
Vn=1.1192 k at 90 deg — Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)
Stud element 4
Vn=1.843 k at 0 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Stud
Element 1: Unstiffened, w=0.514 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.98104 — Eq. 1.1-3
ρ=0.79074 — Eq. 1.1-2
b=0.40644 in (ineffective width=0.10756 in) — Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.091 — Eq. 1.3-7
Ia=0.00035618 in⁴ — Eq. 1.3-8
Is=0.00039155 in⁴ > Ia (no lip reduction)
k=3.8782 — Table 1.3-1
Element 2: Partially stiffened, w=2.278 in
f=50 ksi, k=3.8782
λ=1.4478 — Eq. 1.1-3
ρ=0.58576 — Eq. 1.1-2
b=1.3344 in (ineffective width=0.94364 in) — Eq. 1.1-1
b_1=0.66718 in, b_2=0.66718 in
Element 3: Treat as two unstiffened elements
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=7.8999 — Eq. 1.1-3

ρ=0.12306	Eq. 1.1-2
b=0.50934 in (ineffective width=3.6297 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=7.8999	Eq. 1.1-3
ρ=0.12306	Eq. 1.1-2
b=0.50934 in (ineffective width=3.6297 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.514 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.98104	Eq. 1.1-3
ρ=0.79074	Eq. 1.1-2
b=0.40644 in (ineffective width=0.10756 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00035618 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.8782	Table 1.3-1
Element 4: Partially stiffened, w=2.278 in	
f=50 ksi, k=3.8782	
λ=1.4478	Eq. 1.1-3
ρ=0.58576	Eq. 1.1-2
b=1.3344 in (ineffective width=0.94364 in)	Eq. 1.1-1
b_1=0.66718 in, b_2=0.66718 in	
Ae=0.17608 in^2, Fn=50 ksi	
Pn=8.804 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=9.778 in	
h/t greater than 200, treat as rational analysis	
f_1=49.119 ksi, f_2=-28.445 ksi	
ψ=0.5791	Eq. 1.1.2-1
k=15.033	Eq. 1.1.2-2
λ=3.1284	Eq. 1.1-3
ρ=0.29717	Eq. 1.1-2
be=2.9058 in	Eq. 1.1-1
h_o=10 in, b_o=2.5 in, h_o/b_o=4	
b_1=0.81187 in	Eq. 1.1.2-3
b_2=1.4529 in	Eq. 1.1.2-4
Compression width=6.1921 in	
Ineffective width=3.9274 in	
Element 5: Unstiffened, w=0.514 in	
f_1=49.119 ksi, f_2=45.042 ksi	
ψ=0.91699	Eq. 1.2.2-1

k=0.45983	Eq. 1.2.2-2
λ=0.9403	Eq. 1.1-3
ρ=0.81467	Eq. 1.1-2
b=0.41874 in (ineffective width=0.095261 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.134	Eq. 1.3-7
Ia=0.0003557 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.8782	Table 1.3-1
Element 4: Partially stiffened, w=2.278 in	
f=49.863 ksi, k=3.8782	
λ=1.4458	Eq. 1.1-3
ρ=0.58642	Eq. 1.1-2
b=1.3359 in (ineffective width=0.94214 in)	Eq. 1.1-1
b_1=0.66793 in, b_2=0.66793 in	
Center of gravity shift: y=-1.3034 in	
Sxe=0.89144 in^3, Fy=50 ksi	
Mnl=44.572 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.514 in	
f_1=49.119 ksi, f_2=45.042 ksi	
ψ=0.91699	Eq. 1.2.2-1
k=0.45983	Eq. 1.2.2-2
λ=0.9403	Eq. 1.1-3
ρ=0.81467	Eq. 1.1-2
b=0.41874 in (ineffective width=0.095261 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.134	Eq. 1.3-7
Ia=0.0003557 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.8782	Table 1.3-1
Element 2: Partially stiffened, w=2.278 in	
f=49.863 ksi, k=3.8782	
λ=1.4458	Eq. 1.1-3
ρ=0.58642	Eq. 1.1-2
b=1.3359 in (ineffective width=0.94214 in)	Eq. 1.1-1
b_1=0.66793 in, b_2=0.66793 in	
Element 3: Stiffened, w=9.778 in	
h/t greater than 200, treat as rational analysis	
f_1=49.119 ksi, f_2=-28.445 ksi	
ψ=0.5791	Eq. 1.1.2-1
k=15.033	Eq. 1.1.2-2
λ=3.1284	Eq. 1.1-3
ρ=0.29717	Eq. 1.1-2
be=2.9058 in	Eq. 1.1-1
h_o=10 in, b_o=2.5 in, h_o/b_o=4	
b_1=0.81187 in	Eq. 1.1.2-3

b_2=1.4529 in	Eq. 1.1.2-4
Compression width=6.1921 in	
Ineffective width=3.9274 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=1.3034 in	
Sxe=0.89144 in³, Fy=50 ksi	
Mnl=44.572 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	
Positive Flexural Strength about Y-axis	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.514 in	
f_1=49.552 ksi, f_2=49.552 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.97664	Eq. 1.1-3
ρ=0.79327	Eq. 1.1-2
b=0.40774 in (ineffective width=0.10626 in)	Eq. 1.1-1
Element 2: Stiffened, w=2.278 in	
f_1=47.125 ksi, f_2=-11.879 ksi	
ψ=0.25208	Eq. 1.1.2-1
k=10.43	Eq. 1.1.2-2
λ=0.85706	Eq. 1.1-3
ρ=0.86728	Eq. 1.1-2
be=1.9757 in	Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4	
b_1=0.6075 in	Eq. 1.1.2-3
b_2=0.98783 in	Eq. 1.1.2-4
Compression width=1.8194 in	
Ineffective width=0.22404 in	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.514 in	
f_1=49.552 ksi, f_2=49.552 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=0.97664	Eq. 1.1-3
ρ=0.79327	Eq. 1.1-2
b=0.40774 in (ineffective width=0.10626 in)	Eq. 1.1-1
Element 4: Stiffened, w=2.278 in	
f_1=47.125 ksi, f_2=-11.879 ksi	
ψ=0.25208	Eq. 1.1.2-1
k=10.43	Eq. 1.1.2-2
λ=0.85706	Eq. 1.1-3
ρ=0.86728	Eq. 1.1-2
be=1.9757 in	Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4	
b_1=0.6075 in	Eq. 1.1.2-3
b_2=0.98783 in	Eq. 1.1.2-4
Compression width=1.8194 in	

Ineffective width=0.22404 in
Center of gravity shift: x=-0.062253 in
Sye=0.18218 in³, Fy=50 ksi
Mnl=9.1092 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=2.278 in
f_1=45.561 ksi, f_2=-45.547 ksi
ψ=0.99969 — Eq. 1.1.2-1
k=23.992 — Eq. 1.1.2-2
λ=0.55564 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=2.278 in — Eq. 1.1-1
h_o=2.5 in, b_o=10 in, h_o/b_o=0.25
b_1=0.56954 in — Eq. 1.1.2-3
b_2=1.139 in — Eq. 1.1.2-4
Compression width=1.1392 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=49.308 ksi, f_2=49.308 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=7.845 — Eq. 1.1-3
ρ=0.12389 — Eq. 1.1-2
b=0.5128 in (ineffective width=3.6262 in) — Eq. 1.1-1
f_1=49.308 ksi, f_2=49.308 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-2
λ=7.845 — Eq. 1.1-3
ρ=0.12389 — Eq. 1.1-2
b=0.5128 in (ineffective width=3.6262 in) — Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=2.278 in
f_1=45.561 ksi, f_2=-45.546 ksi
ψ=0.99969 — Eq. 1.1.2-1
k=23.992 — Eq. 1.1.2-2
λ=0.55564 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=2.278 in — Eq. 1.1-1
h_o=2.5 in, b_o=10 in, h_o/b_o=0.25
b_1=0.56954 in — Eq. 1.1.2-3
b_2=1.139 in — Eq. 1.1.2-4
Compression width=1.1392 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.61886 in
Sye=0.16432 in³, Fy=50 ksi
Mnl=8.2159 k-in — Eq. F3.1-1

Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud

Cw=7.9335 in^6, Wn=9.5417 in^2, Fy=50 ksi

Bn=41.573 k-in^2 G8.1-1

Ωb=1.67, ϕb=0.9

1000S250-43

Full Section Properties

Area	0.71748 in²	Wt.	0.0024394 k/ft	Flat	15.909 in
Ix	10.203 in⁴	rx	3.7710 in	Ixy	0.000 in⁴
Sx(t)	2.0406 in³	y(t)	5.0000 in	α	0.000 deg
Sx(b)	2.0406 in³	y(b)	5.0000 in		
Zx	2.4374 in³	Height	10.0000 in		
Iy	0.531 in⁴	ry	0.8606 in	x_o	-1.5125 in
Sy(l)	0.9244 in³	x(l)	0.5749 in	y_o	0.0000 in
Sy(r)	0.2761 in³	x(r)	1.9251 in	jx	5.6191 in
Zy	0.3994 in³	Width	2.5000 in	jy	0.0000 in
I_1	10.203 in⁴	r_1	3.7710 in	Cw	10.184 in⁶
I_2	0.531 in⁴	r_2	0.8606 in	J	0.0004865 in⁴
Ic	10.734 in⁴	rc	3.8680 in		
I_o	12.376 in⁴	r_o	4.1532 in		

Net Section Properties

Ix	10.190 in⁴	rx	3.9600 in	Area	0.64983 in²
Sx(t)	2.0381 in³	y(t)	5.0000 in	Ixy	0.000 in⁴
Sx(b)	2.0381 in³	y(b)	5.0000 in	α	0.000 deg
Zx	2.4120 in³				
Iy	0.509 in⁴	ry	0.8847 in	x_o	-1.5712 in
Sy(l)	0.8043 in³	x(l)	0.6324 in	y_o	0.0000 in
Sy(r)	0.2723 in³	x(r)	1.8676 in	jx	5.2176 in
Zy	0.3983 in³			jy	0.0000 in
Ic	10.699 in⁴	rc	4.0576 in	Cw	10.173 in⁶
I_o	12.303 in⁴	r_o	4.3512 in	J	0.0004406 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	10.780 k	ϕMnxo	51.343 k-in	ϕMnyo	12.022 k-in
Ae	0.25364 in²	Ixe	7.8179 in⁴	Iye	0.5007 in⁴
ϕTn	31.679 k	Sxe(t)	1.2836 in³	Sye(l)	0.8001 in³
		Sxe(b)	1.9999 in³	Sye(r)	0.2671 in³
Shear					
ϕVny	1.624 k	Negative Bending		Negative Bending	
ϕVnx	5.185 k	ϕMnxo	51.343 k-in	ϕMnyo	9.887 k-in
		Ixe	7.8179 in⁴	Iye	0.2881 in⁴
Torsion		Sxe(t)	1.9999 in³	Sye(l)	0.2423 in³
ϕBn	48.264 k-in²	Sxe(b)	1.2836 in³	Sye(r)	0.2197 in³

```
Stud element 3 h/t exceeds 200.
```

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Fya=50.914 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Fya=52.838 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Fya=55.542 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	

Axial Tension Strength
Ag=0.71748 in², Fy=50.914 ksi
Tn=36.53 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.64983 in², Fu=65 ksi
Tn=42.239 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Stud element 2
Vn=2.8807 k at 180 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Stud element 3
Vyh=11.525 k — Eq. G3-2
kv=4.4484 — Eq. G3-8
Vcrh=0.85703 k — Eq. G3-6
h/t exceeds 200 (rational analysis)
Vn=2.03 k at 90 deg — Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)
Stud element 4
Vn=2.8807 k at 0 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Stud
Element 1: Unstiffened, w=0.5087 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.74488 — Eq. 1.1-3
ρ=0.94599 — Eq. 1.1-2
b=0.48123 in (ineffective width=0.027474 in) — Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.091 — Eq. 1.3-7
Ia=0.00079003 in⁴ — Eq. 1.3-8
Is=0.00049474 in⁴
ds=0.30136 in (lip ineffective width=0.17987 in) — Eq. 1.3-6
k=3.3746 — Table 1.3-1
Element 2: Partially stiffened, w=2.2674 in
f=50 ksi, k=3.3746
λ=1.1852 — Eq. 1.1-3
ρ=0.68714 — Eq. 1.1-2
b=1.558 in (ineffective width=0.70937 in) — Eq. 1.1-1
b_1=0.48785 in, b_2=1.0702 in
Element 3: Treat as two unstiffened elements
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3

λ=6.0529	Eq. 1.1-3
ρ=0.15921	Eq. 1.1-2
b=0.65811 in (ineffective width=3.4756 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=6.0529	Eq. 1.1-3
ρ=0.15921	Eq. 1.1-2
b=0.65811 in (ineffective width=3.4756 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.5087 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.74488	Eq. 1.1-3
ρ=0.94599	Eq. 1.1-2
b=0.48123 in (ineffective width=0.027474 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00079003 in^4	Eq. 1.3-8
Is=0.00049474 in^4	
ds=0.30136 in (lip ineffective width=0.17987 in)	Eq. 1.3-6
k=3.3746	Table 1.3-1
Element 4: Partially stiffened, w=2.2674 in	
f=50 ksi, k=3.3746	
λ=1.1852	Eq. 1.1-3
ρ=0.68714	Eq. 1.1-2
b=1.558 in (ineffective width=0.70937 in)	Eq. 1.1-1
b_1=0.48785 in, b_2=1.0702 in	
Ae=0.25364 in^2, Fn=50 ksi	
Pn=12.682 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=9.7674 in	
h/t greater than 200, treat as rational analysis	
f_1=49.045 ksi, f_2=-31.156 ksi	
ψ=0.63524	Eq. 1.1.2-1
k=16.016	Eq. 1.1.2-2
λ=2.321	Eq. 1.1-3
ρ=0.39001	Eq. 1.1-2
be=3.8094 in	Eq. 1.1-1
h_o=10 in, b_o=2.5 in, h_o/b_o=4	
b_1=1.0479 in	Eq. 1.1.2-3
b_2=1.9047 in	Eq. 1.1.2-4
Compression width=5.9731 in	
Ineffective width=3.0205 in	
Element 5: Unstiffened, w=0.5087 in	

f_1=49.045 ksi, f_2=44.868 ksi	
ψ=0.91483	Eq. 1.2.2-1
k=0.46062	Eq. 1.2.2-2
λ=0.71279	Eq. 1.1-3
ρ=0.96993	Eq. 1.1-2
b=0.4934 in (ineffective width=0.015299 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.149	Eq. 1.3-7
Ia=0.0007886 in^4	Eq. 1.3-8
Is=0.00049474 in^4	
ds=0.30954 in (lip ineffective width=0.18386 in)	Eq. 1.3-6
k=3.3764	Table 1.3-1
Element 4: Partially stiffened, w=2.2674 in	
f=49.815 ksi, k=3.3764	
λ=1.1826	Eq. 1.1-3
ρ=0.68827	Eq. 1.1-2
b=1.5606 in (ineffective width=0.70683 in)	Eq. 1.1-1
b_1=0.48953 in, b_2=1.071 in	
Center of gravity shift: y=-1.0908 in	
Sxe=1.2836 in^3, Fy=50 ksi	
Mnl=64.178 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	
f_1=49.045 ksi, f_2=44.868 ksi	
ψ=0.91483	Eq. 1.2.2-1
k=0.46062	Eq. 1.2.2-2
λ=0.71279	Eq. 1.1-3
ρ=0.96993	Eq. 1.1-2
b=0.4934 in (ineffective width=0.015299 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.149	Eq. 1.3-7
Ia=0.0007886 in^4	Eq. 1.3-8
Is=0.00049474 in^4	
ds=0.30954 in (lip ineffective width=0.18386 in)	Eq. 1.3-6
k=3.3764	Table 1.3-1
Element 2: Partially stiffened, w=2.2674 in	
f=49.815 ksi, k=3.3764	
λ=1.1826	Eq. 1.1-3
ρ=0.68827	Eq. 1.1-2
b=1.5606 in (ineffective width=0.70683 in)	Eq. 1.1-1
b_1=0.48953 in, b_2=1.071 in	
Element 3: Stiffened, w=9.7674 in	
h/t greater than 200, treat as rational analysis	
f_1=49.045 ksi, f_2=-31.156 ksi	
ψ=0.63524	Eq. 1.1.2-1
k=16.016	Eq. 1.1.2-2
λ=2.321	Eq. 1.1-3

ρ=0.39001	Eq. 1.1-2
be=3.8094 in	Eq. 1.1-1
h_o=10 in, b_o=2.5 in, h_o/b_o=4	
b_1=1.0479 in	Eq. 1.1.2-3
b_2=1.9047 in	Eq. 1.1.2-4
Compression width=5.9731 in	
Ineffective width=3.0205 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=1.0908 in	
Sxe=1.2836 in^3, Fy=50 ksi	
Mnl=64.178 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	
f_1=49.398 ksi, f_2=49.398 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.74039	Eq. 1.1-3
ρ=0.94931	Eq. 1.1-2
b=0.48292 in (ineffective width=0.025785 in)	Eq. 1.1-1
Element 2: Stiffened, w=2.2674 in	
f_1=46.897 ksi, f_2=-13.591 ksi	
ψ=0.2898	Eq. 1.1.2-1
k=10.871	Eq. 1.1.2-2
λ=0.6395	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.2674 in	Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4	
b_1=0.68922 in	Eq. 1.1.2-3
b_2=1.1337 in	Eq. 1.1.2-4
Compression width=1.7579 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.5087 in	
f_1=49.398 ksi, f_2=49.398 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.74039	Eq. 1.1-3
ρ=0.94931	Eq. 1.1-2
b=0.48292 in (ineffective width=0.025785 in)	Eq. 1.1-1
Element 4: Stiffened, w=2.2674 in	
f_1=46.897 ksi, f_2=-13.591 ksi	
ψ=0.2898	Eq. 1.1.2-1
k=10.871	Eq. 1.1.2-2
λ=0.6395	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.2674 in	Eq. 1.1-1

h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.68922 in — Eq. 1.1.2-3
b_2=1.1337 in — Eq. 1.1.2-4
Compression width=1.7579 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=-0.0066273 in
Sye=0.26715 in³, Fy=50 ksi
Mnl=13.357 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=2.2674 in
f_1=40.866 ksi, f_2=-45.567 ksi
ψ=1.115 — Eq. 1.1.2-1
k=27.153 — Eq. 1.1.2-2
λ=0.37772 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=2.2674 in — Eq. 1.1-1
h_o=2.5 in, b_o=10 in, h_o/b_o=0.25
b_1=0.551 in — Eq. 1.1.2-3
b_2=1.1337 in — Eq. 1.1.2-4
Compression width=1.072 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=44.439 ksi, f_2=44.439 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=5.7064 — Eq. 1.1-3
ρ=0.16849 — Eq. 1.1-2
b=0.69647 in (ineffective width=3.4372 in) — Eq. 1.1-1
f_1=44.439 ksi, f_2=44.439 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-2
λ=5.7064 — Eq. 1.1-3
ρ=0.16849 — Eq. 1.1-2
b=0.69647 in (ineffective width=3.4372 in) — Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=2.2674 in
f_1=40.866 ksi, f_2=-45.567 ksi
ψ=1.115 — Eq. 1.1.2-1
k=27.153 — Eq. 1.1.2-2
λ=0.37772 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=2.2674 in — Eq. 1.1-1
h_o=2.5 in, b_o=10 in, h_o/b_o=0.25
b_1=0.551 in — Eq. 1.1.2-3
b_2=1.1337 in — Eq. 1.1.2-4
Compression width=1.072 in

b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.55643 in
Sye=0.21971 in^3, Fy=50 ksi
Mnl=10.986 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=10.173 in^6, Wn=9.4847 in^2, Fy=50 ksi
Bn=53.627 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

1000S250-54

Full Section Properties

Area	0.89594 in²	Wt.	0.0030462 k/ft	Flat	15.829 in
Ix	12.678 in⁴	rx	3.7617 in	Ixy	0.000 in⁴
Sx(t)	2.5356 in³	y(t)	5.0000 in	α	0.000 deg
Sx(b)	2.5356 in³	y(b)	5.0000 in		
Zx	3.0350 in³	Height	10.0000 in		
Iy	0.653 in⁴	ry	0.8539 in	x_o	-1.4984 in
Sy(l)	1.1367 in³	x(l)	0.5747 in	y_o	0.0000 in
Sy(r)	0.3393 in³	x(r)	1.9253 in	jx	5.6295 in
Zy	0.4944 in³	Width	2.5000 in	jy	0.0000 in
I_1	12.678 in⁴	r_1	3.7617 in	Cw	12.472 in⁶
I_2	0.653 in⁴	r_2	0.8539 in	J	0.0009567 in⁴
Ic	13.331 in⁴	rc	3.8574 in		
I_o	15.343 in⁴	r_o	4.1382 in		

Net Section Properties

Ix	12.662 in⁴	rx	3.9512 in	Area	0.81104 in²
Sx(t)	2.5324 in³	y(t)	5.0000 in	Ixy	0.000 in⁴
Sx(b)	2.5324 in³	y(b)	5.0000 in	α	0.000 deg
Zx	3.0032 in³				
Iy	0.625 in⁴	ry	0.8780 in	x_o	-1.5568 in
Sy(l)	0.9894 in³	x(l)	0.6319 in	y_o	0.0000 in
Sy(r)	0.3347 in³	x(r)	1.8681 in	jx	5.2261 in
Zy	0.4927 in³			jy	0.0000 in
Ic	13.287 in⁴	rc	4.0476 in	Cw	12.458 in⁶
I_o	15.253 in⁴	r_o	4.3367 in	J	0.0008661 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	14.717 k	ϕMnxo	81.984 k-in	ϕMnyo	17.116 k-in
Ae	0.34628 in²	Ixe	10.477 in⁴	Iye	0.625 in⁴
ϕTn	39.538 k	Sxe(t)	1.8219 in³	Sye(l)	0.9894 in³
		Sxe(b)	2.4658 in³	Sye(r)	0.3347 in³
Shear					
ϕVny	3.026 k	Negative Bending		Negative Bending	
ϕVnx	6.776 k	ϕMnxo	81.984 k-in	ϕMnyo	12.614 k-in
		Ixe	10.477 in⁴	Iye	0.388 in⁴
Torsion		Sxe(t)	2.4658 in³	Sye(l)	0.3472 in³
ϕBn	59.485 k-in²	Sxe(b)	1.8219 in³	Sye(r)	0.2803 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=51.141 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=53.509 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=56.825 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.89594 in², Fy=51.141 ksi

Tn=45.819 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.81104 in², Fu=65 ksi	
Tn=52.717 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=3.7645 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=14.359 k	Eq. G3-2
kv=4.4463	Eq. G3-8
Vcrh=1.6995 k	Eq. G3-6
Vn=3.3628 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=3.7645 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4835 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56413	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0015382 in⁴	Eq. 1.3-8
Is=0.00053312 in⁴	
ds=0.16757 in (lip ineffective width=0.31593 in)	Eq. 1.3-6
k=2.8256	Table 1.3-1
Element 2: Partially stiffened, w=2.217 in	
f=50 ksi, k=2.8256	
λ=1.0091	Eq. 1.1-3
ρ=0.77494	Eq. 1.1-2
b=1.718 in (ineffective width=0.49896 in)	Eq. 1.1-1
b_1=0.29773 in, b_2=1.4203 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.7937	Eq. 1.1-3
ρ=0.19903	Eq. 1.1-2
b=0.81773 in (ineffective width=3.2908 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=4.7937	Eq. 1.1-3
ρ=0.19903	Eq. 1.1-2
b=0.81773 in (ineffective width=3.2908 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4835 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56413	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0015382 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.16757 in (lip ineffective width=0.31593 in)	Eq. 1.3-6
k=2.8256	Table 1.3-1
Element 4: Partially stiffened, w=2.217 in	
f=50 ksi, k=2.8256	
λ=1.0091	Eq. 1.1-3
ρ=0.77494	Eq. 1.1-2
b=1.718 in (ineffective width=0.49896 in)	Eq. 1.1-1
b_1=0.29773 in, b_2=1.4203 in	
Ae=0.34628 in^2, Fn=50 ksi	
Pn=17.314 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=9.717 in	
f_1=48.769 ksi, f_2=-35.744 ksi	
ψ=0.73292	Eq. 1.1.2-1
k=17.874	Eq. 1.1.2-2
λ=1.7367	Eq. 1.1-3
ρ=0.50286	Eq. 1.1-2
be=4.8863 in	Eq. 1.1-1
h_o=10 in, b_o=2.5 in, h_o/b_o=4	
b_1=1.309 in	Eq. 1.1.2-3
b_2=2.4431 in	Eq. 1.1.2-4
Compression width=5.6073 in	
Ineffective width=1.8552 in	
Element 5: Unstiffened, w=0.4835 in	
f_1=48.769 ksi, f_2=44.564 ksi	
ψ=0.91377	Eq. 1.2.2-1
k=0.46101	Eq. 1.2.2-2
λ=0.53808	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.168	Eq. 1.3-7

Ia=0.0015345 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.16798 in (lip ineffective width=0.31552 in)	Eq. 1.3-6
k=2.8275	Table 1.3-1
Element 4: Partially stiffened, w=2.217 in	
f=49.754 ksi, k=2.8275	
λ=1.0063	Eq. 1.1-3
ρ=0.77651	Eq. 1.1-2
b=1.7215 in (ineffective width=0.49549 in)	Eq. 1.1-1
b_1=0.29904 in, b_2=1.4225 in	
Center of gravity shift: y=-0.7509 in	
Sxe=1.8219 in^3, Fy=50 ksi	
Mnl=91.093 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4835 in	
f_1=48.769 ksi, f_2=44.564 ksi	
ψ=0.91377	Eq. 1.2.2-1
k=0.46101	Eq. 1.2.2-2
λ=0.53808	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.168	Eq. 1.3-7
Ia=0.0015345 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.16798 in (lip ineffective width=0.31552 in)	Eq. 1.3-6
k=2.8275	Table 1.3-1
Element 2: Partially stiffened, w=2.217 in	
f=49.754 ksi, k=2.8275	
λ=1.0063	Eq. 1.1-3
ρ=0.77651	Eq. 1.1-2
b=1.7215 in (ineffective width=0.49549 in)	Eq. 1.1-1
b_1=0.29904 in, b_2=1.4225 in	
Element 3: Stiffened, w=9.717 in	
f_1=48.769 ksi, f_2=-35.744 ksi	
ψ=0.73292	Eq. 1.1.2-1
k=17.874	Eq. 1.1.2-2
λ=1.7367	Eq. 1.1-3
ρ=0.50286	Eq. 1.1-2
be=4.8863 in	Eq. 1.1-1
h_o=10 in, b_o=2.5 in, h_o/b_o=4	
b_1=1.309 in	Eq. 1.1.2-3
b_2=2.4431 in	Eq. 1.1.2-4
Compression width=5.6073 in	
Ineffective width=1.8552 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.7509 in	

Sxe=1.8219 in³, Fy=50 ksi
Mnl=91.093 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.4835 in
f_1=55.964 ksi, f_2=55.964 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.59683 — Eq. 1.1-3
λ<0.673 (fully effective) — Eq. 1.1-1
Element 2: Stiffened, w=2.217 in
f_1=52.521 ksi, f_2=-14.916 ksi
ψ=0.284 — Eq. 1.1.2-1
k=10.802 — Eq. 1.1.2-2
λ=0.52895 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=2.217 in — Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.67509 in — Eq. 1.1.2-3
b_2=1.1085 in — Eq. 1.1.2-4
Compression width=1.7266 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.4835 in
f_1=55.964 ksi, f_2=55.964 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.59683 — Eq. 1.1-3
λ<0.673 (fully effective) — Eq. 1.1-1
Element 4: Stiffened, w=2.217 in
f_1=52.521 ksi, f_2=-14.916 ksi
ψ=0.28401 — Eq. 1.1.2-1
k=10.802 — Eq. 1.1.2-2
λ=0.52895 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=2.217 in — Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.67509 in — Eq. 1.1.2-3
b_2=1.1085 in — Eq. 1.1.2-4
Compression width=1.7266 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0 in
Sye=0.33467 in³, Fy=56.825 ksi
Mnl=19.018 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud

Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=2.217 in
f_1=35.21 ksi, f_2=-44.888 ksi
ψ=1.2748 Eq. 1.1.2-1
k=32.094 Eq. 1.1.2-2
λ=0.25126 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.217 in Eq. 1.1-1
h_o=2.5 in, b_o=10 in, h_o/b_o=0.25
b_1=0.51862 in Eq. 1.1.2-3
b_2=1.1085 in Eq. 1.1.2-4
Compression width=0.97457 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=39.3 ksi, f_2=39.3 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=4.2499 Eq. 1.1-3
ρ=0.22312 Eq. 1.1-2
b=0.91668 in (ineffective width=3.1918 in) Eq. 1.1-1
f_1=39.3 ksi, f_2=39.3 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=4.2499 Eq. 1.1-3
ρ=0.22312 Eq. 1.1-2
b=0.91668 in (ineffective width=3.1918 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=2.217 in
f_1=35.21 ksi, f_2=-44.888 ksi
ψ=1.2748 Eq. 1.1.2-1
k=32.094 Eq. 1.1.2-2
λ=0.25126 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.217 in Eq. 1.1-1
h_o=2.5 in, b_o=10 in, h_o/b_o=0.25
b_1=0.51862 in Eq. 1.1.2-3
b_2=1.1085 in Eq. 1.1.2-4
Compression width=0.97457 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.48492 in
Sye=0.28031 in^3, Fy=50 ksi
Mnl=14.016 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=12.458 in^6, Wn=9.4243 in^2, Fy=50 ksi
Bn=66.094 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

1000S250-68

Full Section Properties

Area	1.1208 in²	Wt.	0.0038109 k/ft	Flat	15.720 in
Ix	15.753 in⁴	rx	3.7490 in	Ixy	0.000 in⁴
Sx(t)	3.1506 in³	y(t)	5.0000 in	α	0.000 deg
Sx(b)	3.1506 in³	y(b)	5.0000 in		
Zx	3.7820 in³	Height	10.0000 in		
Iy	0.800 in⁴	ry	0.8448 in	x_o	-1.4798 in
Sy(l)	1.3934 in³	x(l)	0.5741 in	y_o	0.0000 in
Sy(r)	0.4153 in³	x(r)	1.9259 in	jx	5.6453 in
Zy	0.6113 in³	Width	2.5000 in	jy	0.0000 in
I_1	15.753 in⁴	r_1	3.7490 in	Cw	15.196 in⁶
I_2	0.800 in⁴	r_2	0.8448 in	J	0.0018993 in⁴
Ic	16.553 in⁴	rc	3.8430 in		
I_o	19.007 in⁴	r_o	4.1180 in		

Net Section Properties

Ix	15.733 in⁴	rx	3.9392 in	Area	1.0139 in²
Sx(t)	3.1466 in³	y(t)	5.0000 in	Ixy	0.000 in⁴
Sx(b)	3.1466 in³	y(b)	5.0000 in	α	0.000 deg
Zx	3.7419 in³				
Iy	0.766 in⁴	ry	0.8690 in	x_o	-1.5378 in
Sy(l)	1.2136 in³	x(l)	0.6309 in	y_o	0.0000 in
Sy(r)	0.4096 in³	x(r)	1.8691 in	jx	5.2392 in
Zy	0.6086 in³			jy	0.0000 in
Ic	16.499 in⁴	rc	4.0339 in	Cw	15.178 in⁶
I_o	18.896 in⁴	r_o	4.3171 in	J	0.0017181 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	20.766 k	ϕMnxo	123.13 k-in	ϕMnyo	21.56 k-in
Ae	0.48861 in²	Ixe	14.469 in⁴	Iye	0.766 in⁴
ϕTn	49.427 k	Sxe(t)	2.7363 in³	Sye(l)	1.2136 in³
		Sxe(b)	3.0705 in³	Sye(r)	0.4096 in³
Shear					
ϕVny	5.019 k	Negative Bending		Negative Bending	
ϕVnx	8.253 k	ϕMnxo	123.13 k-in	ϕMnyo	16.06 k-in
		Ixe	14.469 in⁴	Iye	0.525 in⁴
Torsion		Sxe(t)	3.0705 in³	Sye(l)	0.5101 in³
ϕBn	73.073 k-in²	Sxe(b)	2.7363 in³	Sye(r)	0.3570 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=51.447 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=54.388 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=58.477 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=1.1208 in², Fy=51.447 ksi

Tn=57.664 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=1.0139 in², Fu=65 ksi	
Tn=65.903 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=4.5852 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=17.896 k	Eq. G3-2
kv=4.4431	Eq. G3-8
Vcrh=3.4135 k	Eq. G3-6
Vn=5.5768 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=4.5852 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4468 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41383	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0026903 in⁴	Eq. 1.3-8
Is=0.00052997 in⁴	
ds=0.088017 in (lip ineffective width=0.35878 in)	Eq. 1.3-6
k=2.3644	Table 1.3-1
Element 2: Partially stiffened, w=2.1436 in	
f=50 ksi, k=2.3644	
λ=0.84669	Eq. 1.1-3
ρ=0.87418	Eq. 1.1-2
b=1.8739 in (ineffective width=0.2697 in)	Eq. 1.1-1
b_1=0.18457 in, b_2=1.6893 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=3.7714	Eq. 1.1-3
ρ=0.24969	Eq. 1.1-2
b=1.0167 in (ineffective width=3.0551 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=3.7714	Eq. 1.1-3
ρ=0.24969	Eq. 1.1-2
b=1.0167 in (ineffective width=3.0551 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4468 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41383	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0026903 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.088017 in (lip ineffective width=0.35878 in)	Eq. 1.3-6
k=2.3644	Table 1.3-1
Element 4: Partially stiffened, w=2.1436 in	
f=50 ksi, k=2.3644	
λ=0.84669	Eq. 1.1-3
ρ=0.87418	Eq. 1.1-2
b=1.8739 in (ineffective width=0.2697 in)	Eq. 1.1-1
b_1=0.18457 in, b_2=1.6893 in	
Ae=0.48861 in^2, Fn=50 ksi	
Pn=24.43 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=9.6436 in	
f_1=48.315 ksi, f_2=-42.892 ksi	
ψ=0.88777	Eq. 1.1.2-1
k=21.23	Eq. 1.1.2-2
λ=1.2496	Eq. 1.1-3
ρ=0.65938	Eq. 1.1-2
be=6.3588 in	Eq. 1.1-1
h_o=10 in, b_o=2.5 in, h_o/b_o=4	
b_1=1.6356 in	Eq. 1.1.2-3
b_2=3.1794 in	Eq. 1.1.2-4
Compression width=5.1085 in	
Ineffective width=0.29351 in	
Element 5: Unstiffened, w=0.4468 in	
f_1=48.315 ksi, f_2=44.089 ksi	
ψ=0.91254	Eq. 1.2.2-1
k=0.46146	Eq. 1.2.2-2
λ=0.39269	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.196	Eq. 1.3-7

Ia=0.0026492 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.08938 in (lip ineffective width=0.35742 in)	Eq. 1.3-6
k=2.372	Table 1.3-1
Element 4: Partially stiffened, w=2.1436 in	
f=49.663 ksi, k=2.372	
λ=0.84248	Eq. 1.1-3
ρ=0.87701	Eq. 1.1-2
b=1.88 in (ineffective width=0.26364 in)	Eq. 1.1-1
b_1=0.18804 in, b_2=1.6919 in	
Center of gravity shift: y=-0.28774 in	
Sxe=2.7363 in^3, Fy=50 ksi	
Mnl=136.82 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4468 in	
f_1=48.315 ksi, f_2=44.089 ksi	
ψ=0.91254	Eq. 1.2.2-1
k=0.46146	Eq. 1.2.2-2
λ=0.39269	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.196	Eq. 1.3-7
Ia=0.0026492 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.08938 in (lip ineffective width=0.35742 in)	Eq. 1.3-6
k=2.372	Table 1.3-1
Element 2: Partially stiffened, w=2.1436 in	
f=49.663 ksi, k=2.372	
λ=0.84248	Eq. 1.1-3
ρ=0.87701	Eq. 1.1-2
b=1.88 in (ineffective width=0.26364 in)	Eq. 1.1-1
b_1=0.18804 in, b_2=1.6919 in	
Element 3: Stiffened, w=9.6436 in	
f_1=48.315 ksi, f_2=-42.892 ksi	
ψ=0.88777	Eq. 1.1.2-1
k=21.23	Eq. 1.1.2-2
λ=1.2496	Eq. 1.1-3
ρ=0.65938	Eq. 1.1-2
be=6.3588 in	Eq. 1.1-1
h_o=10 in, b_o=2.5 in, h_o/b_o=4	
b_1=1.6356 in	Eq. 1.1.2-3
b_2=3.1794 in	Eq. 1.1.2-4
Compression width=5.1085 in	
Ineffective width=0.29351 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.28774 in	

Sxe=2.7363 in³, Fy=50 ksi
Mnl=136.82 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.4468 in
f_1=57.361 ksi, f_2=57.361 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.44325 — Eq. 1.1-3
λ<0.673 (fully effective) — Eq. 1.1-1
Element 2: Stiffened, w=2.1436 in
f_1=52.902 ksi, f_2=-14.162 ksi
ψ=0.26771 — Eq. 1.1.2-1
k=10.61 — Eq. 1.1.2-2
λ=0.41113 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=2.1436 in — Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.656 in — Eq. 1.1.2-3
b_2=1.0718 in — Eq. 1.1.2-4
Compression width=1.6909 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.4468 in
f_1=57.361 ksi, f_2=57.361 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.44325 — Eq. 1.1-3
λ<0.673 (fully effective) — Eq. 1.1-1
Element 4: Stiffened, w=2.1436 in
f_1=52.902 ksi, f_2=-14.162 ksi
ψ=0.26771 — Eq. 1.1.2-1
k=10.61 — Eq. 1.1.2-2
λ=0.41113 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=2.1436 in — Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.656 in — Eq. 1.1.2-3
b_2=1.0718 in — Eq. 1.1.2-4
Compression width=1.6909 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0 in
Sye=0.4096 in³, Fy=58.477 ksi
Mnl=23.952 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud

Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=2.1436 in
f_1=28.881 ksi, f_2=-43.946 ksi
ψ=1.5216 Eq. 1.1.2-1
k=41.11 Eq. 1.1.2-2
λ=0.15433 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.1436 in Eq. 1.1-1
h_o=2.5 in, b_o=10 in, h_o/b_o=0.25
b_1=0.47408 in Eq. 1.1.2-3
b_2=1.0718 in Eq. 1.1.2-4
Compression width=0.85009 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=33.724 ksi, f_2=33.724 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=3.0973 Eq. 1.1-3
ρ=0.29993 Eq. 1.1-2
b=1.2212 in (ineffective width=2.8506 in) Eq. 1.1-1
f_1=33.724 ksi, f_2=33.724 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=3.0973 Eq. 1.1-3
ρ=0.29993 Eq. 1.1-2
b=1.2212 in (ineffective width=2.8506 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=2.1436 in
f_1=28.881 ksi, f_2=-43.946 ksi
ψ=1.5216 Eq. 1.1.2-1
k=41.11 Eq. 1.1.2-2
λ=0.15433 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.1436 in Eq. 1.1-1
h_o=2.5 in, b_o=10 in, h_o/b_o=0.25
b_1=0.47408 in Eq. 1.1.2-3
b_2=1.0718 in Eq. 1.1.2-4
Compression width=0.85009 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.39834 in
Sye=0.35698 in^3, Fy=50 ksi
Mnl=17.849 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=15.178 in^6, Wn=9.3471 in^2, Fy=50 ksi
Bn=81.192 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

1200S162-30

Full Section Properties

Area	0.49809 in^2	Wt.	0.0016935 k/ft	Flat	15.964 in
Ix	8.8363 in^4	rx	4.2119 in	Ixy	0.0000 in^4
Sx(t)	1.4727 in^3	y(t)	6.0000 in	α	0.000 deg
Sx(b)	1.4727 in^3	y(b)	6.0000 in		
Zx	1.8560 in^3	Height	12.0000 in		
Iy	0.1240 in^4	ry	0.4989 in	x_o	-0.7473 in
Sy(l)	0.4706 in^3	x(l)	0.2634 in	y_o	0.0000 in
Sy(r)	0.0910 in^3	x(r)	1.3616 in	jx	9.6498 in
Zy	0.1260 in^3	Width	1.6250 in	jy	0.0000 in
I_1	8.8363 in^4	r_1	4.2119 in	Cw	3.5507 in^6
I_2	0.1240 in^4	r_2	0.4989 in	J	0.0001616 in^4
Ic	8.9602 in^4	rc	4.2414 in		
I_o	9.2383 in^4	r_o	4.3067 in		

Net Section Properties

Ix	8.8275 in^4	rx	4.4227 in	Area	0.45129 in^2
Sx(t)	1.4712 in^3	y(t)	6.0000 in	Ixy	0.0000 in^4
Sx(b)	1.4712 in^3	y(b)	6.0000 in	α	0.000 deg
Zx	1.8384 in^3				
Iy	0.1208 in^4	ry	0.5173 in	x_o	-0.7734 in
Sy(l)	0.4178 in^3	x(l)	0.2891 in	y_o	0.0000 in
Sy(r)	0.0904 in^3	x(r)	1.3359 in	jx	8.9444 in
Zy	0.1255 in^3			jy	0.0000 in
Ic	8.9483 in^4	rc	4.4529 in	Cw	3.5485 in^6
I_o	9.2182 in^4	r_o	4.5196 in	J	0.0001464 in^4

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	5.683 k	ϕMnxo	32.730 k-in	ϕMnyo	3.889 k-in
Ae	0.13371 in^2	Ixe	6.2099 in^4	Iye	0.1161 in^4
ϕTn	22.000 k	Sxe(t)	0.8183 in^3	Sye(l)	0.4128 in^3
		Sxe(b)	1.4079 in^3	Sye(r)	0.0864 in^3
Shear					
ϕVny	0.715 k	Negative Bending		Negative Bending	
ϕVnx	2.328 k	ϕMnxo	32.730 k-in	ϕMnyo	3.194 k-in
		Ixe	6.2099 in^4	Iye	0.0597 in^4
Torsion		Sxe(t)	1.4079 in^3	Sye(l)	0.0762 in^3
ϕBn	21.142 k-in^2	Sxe(b)	0.8183 in^3	Sye(r)	0.0710 in^3

```
Stud element 3 h/t exceeds 300.
Stud element 3 h/t exceeds 200.
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Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=50.689 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=53.235 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=55.114 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	

Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.49809 in², Fy=50.689 ksi
Tn=25.248 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.45129 in², Fu=65 ksi
Tn=29.334 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Stud element 2
Vn=1.2934 k at 180 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Stud element 3
Vyh=10.295 k — Eq. G3-2
kv=4.4765 — Eq. G3-8
Vcrh=0.24819 k — Eq. G3-6
h/t exceeds 200 (rational analysis)
Vn=0.89389 k at 90 deg — Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)
Stud element 4
Vn=1.2934 k at 0 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3907 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.82697 — Eq. 1.1-3
ρ=0.88754 — Eq. 1.1-2
b=0.34676 in (ineffective width=0.043938 in) — Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.091 — Eq. 1.3-7
Ia=0.00016273 in⁴ — Eq. 1.3-8
Is=0.00015506 in⁴
ds=0.33042 in (lip ineffective width=0.01634 in) — Eq. 1.3-6
k=3.4239 — Table 1.3-1
Element 2: Partially stiffened, w=1.4064 in
f=50 ksi, k=3.4239
λ=1.055 — Eq. 1.1-3
ρ=0.75023 — Eq. 1.1-2
b=1.0551 in (ineffective width=0.35127 in) — Eq. 1.1-1
b_1=0.5027 in, b_2=0.55242 in
Element 3: Treat as two unstiffened elements
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=10.881	Eq. 1.1-3
ρ=0.090045	Eq. 1.1-2
b=0.4629 in (ineffective width=4.6778 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=10.881	Eq. 1.1-3
ρ=0.090045	Eq. 1.1-2
b=0.4629 in (ineffective width=4.6778 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.3907 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.82697	Eq. 1.1-3
ρ=0.88754	Eq. 1.1-2
b=0.34676 in (ineffective width=0.043938 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00016273 in^4	Eq. 1.3-8
Is=0.00015506 in^4	
ds=0.33042 in (lip ineffective width=0.016341 in)	Eq. 1.3-6
k=3.4239	Table 1.3-1
Element 4: Partially stiffened, w=1.4064 in	
f=50 ksi, k=3.4239	
λ=1.055	Eq. 1.1-3
ρ=0.75023	Eq. 1.1-2
b=1.0551 in (ineffective width=0.35127 in)	Eq. 1.1-1
b_1=0.5027 in, b_2=0.55242 in	
Ae=0.13371 in^2, Fn=50 ksi	
Pn=6.6856 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=11.781 in	
h/t greater than 200, treat as rational analysis	
f_1=49.28 ksi, f_2=-28.34 ksi	
ψ=0.57509	Eq. 1.1.2-1
k=14.966	Eq. 1.1.2-2
λ=4.1964	Eq. 1.1-3
ρ=0.2258	Eq. 1.1-2
be=2.6603 in	Eq. 1.1-1
h_o=12 in, b_o=1.625 in, h_o/b_o=7.3846	
b_1=0.74412 in	Eq. 1.1.2-6
b_2=0.94486 in	Eq. 1.1.2-7
Compression width=7.4798 in	
Ineffective width=5.7908 in	

Element 5: Unstiffened, w=0.3907 in
f_1=49.28 ksi, f_2=46.706 ksi
ψ=0.94777 Eq. 1.2.2-1
k=0.44884 Eq. 1.2.2-2
λ=0.80358 Eq. 1.1-3
ρ=0.90374 Eq. 1.1-2
b=0.35309 in (ineffective width=0.03761 in) Eq. 1.1-1
Element 4: Check for lip stiffener reduction
S=31.123 Eq. 1.3-7
Ia=0.00016257 in^4 Eq. 1.3-8
Is=0.00015506 in^4
ds=0.33679 in (lip ineffective width=0.016303 in) Eq. 1.3-6
k=3.4248 Table 1.3-1
Element 4: Partially stiffened, w=1.4064 in
f=49.897 ksi, k=3.4248
λ=1.0537 Eq. 1.1-3
ρ=0.75088 Eq. 1.1-2
b=1.056 in (ineffective width=0.35036 in) Eq. 1.1-1
b_1=0.50364 in, b_2=0.5524 in
Center of gravity shift: y=-1.5892 in
Sxe=0.81825 in^3, Fy=50 ksi
Mnl=40.913 k-in Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)

Negative Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3907 in
f_1=49.28 ksi, f_2=46.706 ksi
ψ=0.94777 Eq. 1.2.2-1
k=0.44884 Eq. 1.2.2-2
λ=0.80358 Eq. 1.1-3
ρ=0.90374 Eq. 1.1-2
b=0.35309 in (ineffective width=0.03761 in) Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.123 Eq. 1.3-7
Ia=0.00016257 in^4 Eq. 1.3-8
Is=0.00015506 in^4
ds=0.33679 in (lip ineffective width=0.016302 in) Eq. 1.3-6
k=3.4248 Table 1.3-1
Element 2: Partially stiffened, w=1.4064 in
f=49.897 ksi, k=3.4248
λ=1.0537 Eq. 1.1-3
ρ=0.75088 Eq. 1.1-2
b=1.056 in (ineffective width=0.35036 in) Eq. 1.1-1
b_1=0.50364 in, b_2=0.5524 in
Element 3: Stiffened, w=11.781 in
h/t greater than 200, treat as rational analysis
f_1=49.28 ksi, f_2=-28.34 ksi
ψ=0.57509 Eq. 1.1.2-1
k=14.966 Eq. 1.1.2-2

λ=4.1964	Eq. 1.1-3
ρ=0.2258	Eq. 1.1-2
be=2.6603 in	Eq. 1.1-1
h_o=12 in, b_o=1.625 in, h_o/b_o=7.3846	
b_1=0.74412 in	Eq. 1.1.2-6
b_2=0.94486 in	Eq. 1.1.2-7
Compression width=7.4798 in	
Ineffective width=5.7908 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=1.5892 in	
Sxe=0.81825 in^3, Fy=50 ksi	
Mnl=40.913 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3907 in	
f_1=49.42 ksi, f_2=49.42 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.82216	Eq. 1.1-3
ρ=0.89084	Eq. 1.1-2
b=0.34805 in (ineffective width=0.042648 in)	Eq. 1.1-1
Element 2: Stiffened, w=1.4064 in	
f_1=45.933 ksi, f_2=-6.3992 ksi	
ψ=0.13932	Eq. 1.1.2-1
k=9.2364	Eq. 1.1.2-2
λ=0.61562	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.4064 in	Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25	
b_1=0.448 in	Eq. 1.1.2-3
b_2=0.9584 in	Eq. 1.1.2-5
Compression width=1.2344 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.3907 in	
f_1=49.42 ksi, f_2=49.42 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=0.82216	Eq. 1.1-3
ρ=0.89084	Eq. 1.1-2
b=0.34805 in (ineffective width=0.042648 in)	Eq. 1.1-1
Element 4: Stiffened, w=1.4064 in	
f_1=45.933 ksi, f_2=-6.3992 ksi	
ψ=0.13932	Eq. 1.1.2-1
k=9.2364	Eq. 1.1.2-2
λ=0.61562	Eq. 1.1-3
ρ=1	Eq. 1.1-2

be=1.4064 in	Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25	
b_1=0.448 in	Eq. 1.1.2-3
b_2=0.9584 in	Eq. 1.1.2-5
Compression width=1.2344 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=-0.007832 in	
Sye=0.086412 in^3, Fy=50 ksi	
Mnl=4.3206 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: Stiffened, w=1.4064 in	
f_1=39.992 ksi, f_2=-43.51 ksi	
ψ=1.088	Eq. 1.1.2-1
k=26.381	Eq. 1.1.2-2
λ=0.33989	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.4064 in	Eq. 1.1-1
h_o=1.625 in, b_o=12 in, h_o/b_o=0.13542	
b_1=0.34403 in	Eq. 1.1.2-3
b_2=0.7032 in	Eq. 1.1.2-4
Compression width=0.67357 in	
b_1+b_2 > compression width (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=45.556 ksi, f_2=45.556 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=10.386	Eq. 1.1-3
ρ=0.094242	Eq. 1.1-2
b=0.48447 in (ineffective width=4.6562 in)	Eq. 1.1-1
f_1=45.556 ksi, f_2=45.556 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=10.386	Eq. 1.1-3
ρ=0.094242	Eq. 1.1-2
b=0.48447 in (ineffective width=4.6562 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: Stiffened, w=1.4064 in	
f_1=39.992 ksi, f_2=-43.51 ksi	
ψ=1.088	Eq. 1.1.2-1
k=26.381	Eq. 1.1.2-2
λ=0.3399	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.4064 in	Eq. 1.1-1
h_o=1.625 in, b_o=12 in, h_o/b_o=0.13542	
b_1=0.34403 in	Eq. 1.1.2-3
b_2=0.7032 in	Eq. 1.1.2-4

Compression width=0.67357 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.49438 in
Sye=0.070987 in^3, Fy=50 ksi
Mnl=3.5493 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=3.5485 in^6, Wn=7.5528 in^2, Fy=50 ksi
Bn=23.491 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

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Full Section Properties

Area	0.55190 in²	Wt.	0.0018764 k/ft	Flat	15.951 in
Ix	9.780 in⁴	rx	4.2097 in	Ixy	0.000 in⁴
Sx(t)	1.6300 in³	y(t)	6.0000 in	α	0.000 deg
Sx(b)	1.6300 in³	y(b)	6.0000 in		
Zx	2.0553 in³	Height	12.0000 in		
Iy	0.137 in⁴	ry	0.4974 in	x_o	-0.7445 in
Sy(l)	0.5170 in³	x(l)	0.2641 in	y_o	0.0000 in
Sy(r)	0.1003 in³	x(r)	1.3609 in	jx	9.6636 in
Zy	0.1393 in³	Width	1.6250 in	jy	0.0000 in
I_1	9.780 in⁴	r_1	4.2097 in	Cw	3.9091 in⁶
I_2	0.137 in⁴	r_2	0.4974 in	J	0.0002202 in⁴
Ic	9.917 in⁴	rc	4.2389 in		
I_o	10.223 in⁴	r_o	4.3038 in		

Net Section Properties

Ix	9.771 in⁴	rx	4.4205 in	Area	0.50000 in²
Sx(t)	1.6284 in³	y(t)	6.0000 in	Ixy	0.000 in⁴
Sx(b)	1.6284 in³	y(b)	6.0000 in	α	0.000 deg
Zx	2.0358 in³				
Iy	0.133 in⁴	ry	0.5159 in	x_o	-0.7706 in
Sy(l)	0.4592 in³	x(l)	0.2897 in	y_o	0.0000 in
Sy(r)	0.0996 in³	x(r)	1.3353 in	jx	8.9568 in
Zy	0.1388 in³			jy	0.0000 in
Ic	9.904 in⁴	rc	4.4505 in	Cw	3.9067 in⁶
I_o	10.201 in⁴	r_o	4.5168 in	J	0.0001995 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	6.465 k	ϕMnxo	37.310 k-in	ϕMnyo	4.396 k-in
Ae	0.15211 in²	Ixe	7.0202 in⁴	Iye	0.1308 in⁴
ϕTn	24.375 k	Sxe(t)	0.9328 in³	Sye(l)	0.4568 in³
		Sxe(b)	1.5692 in³	Sye(r)	0.0977 in³
Shear					
ϕVny	0.904 k	Negative Bending		Negative Bending	
ϕVnx	2.621 k	ϕMnxo	37.311 k-in	ϕMnyo	3.576 k-in
		Ixe	7.0202 in⁴	Iye	0.0684 in⁴
Torsion		Sxe(t)	1.5692 in³	Sye(l)	0.0895 in³
ϕBn	23.331 k-in²	Sxe(b)	0.9328 in³	Sye(r)	0.0795 in³

```
Stud element 3 h/t exceeds 300.
Stud element 3 h/t exceeds 200.
```

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=50.748 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=53.516 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=55.565 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	

Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.5519 in², Fy=50.748 ksi
Tn=28.008 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.5 in², Fu=65 ksi
Tn=32.5 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Stud element 2
Vn=1.4563 k at 180 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Stud element 3
Vyh=11.413 k — Eq. G3-2
kv=4.4763 — Eq. G3-8
Vcrh=0.33857 k — Eq. G3-6
h/t exceeds 200 (rational analysis)
Vn=1.1303 k at 90 deg — Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)
Stud element 4
Vn=1.4563 k at 0 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Stud
Element 1: Unstiffened, w=0.389 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.74246 — Eq. 1.1-3
ρ=0.94778 — Eq. 1.1-2
b=0.36869 in (ineffective width=0.020315 in) — Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.091 — Eq. 1.3-7
Ia=0.00022212 in⁴ — Eq. 1.3-8
Is=0.00016972 in⁴
ds=0.28171 in (lip ineffective width=0.086971 in) — Eq. 1.3-6
k=3.2075 — Table 1.3-1
Element 2: Partially stiffened, w=1.403 in
f=50 ksi, k=3.2075
λ=0.98047 — Eq. 1.1-3
ρ=0.79107 — Eq. 1.1-2
b=1.1099 in (ineffective width=0.29313 in) — Eq. 1.1-1
b_1=0.42403 in, b_2=0.68584 in
Element 3: Treat as two unstiffened elements
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=9.8085	Eq. 1.1-3
ρ=0.099665	Eq. 1.1-2
b=0.51218 in (ineffective width=4.6268 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=9.8085	Eq. 1.1-3
ρ=0.099665	Eq. 1.1-2
b=0.51218 in (ineffective width=4.6268 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.389 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.74246	Eq. 1.1-3
ρ=0.94778	Eq. 1.1-2
b=0.36869 in (ineffective width=0.020315 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00022212 in^4	Eq. 1.3-8
Is=0.00016972 in^4	
ds=0.28171 in (lip ineffective width=0.086971 in)	Eq. 1.3-6
k=3.2075	Table 1.3-1
Element 4: Partially stiffened, w=1.403 in	
f=50 ksi, k=3.2075	
λ=0.98047	Eq. 1.1-3
ρ=0.79107	Eq. 1.1-2
b=1.1099 in (ineffective width=0.29313 in)	Eq. 1.1-1
b_1=0.42403 in, b_2=0.68584 in	
Ae=0.15211 in^2, Fn=50 ksi	
Pn=7.6055 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=11.778 in	
h/t greater than 200, treat as rational analysis	
f_1=49.263 ksi, f_2=-28.985 ksi	
ψ=0.58838	Eq. 1.1.2-1
k=15.192	Eq. 1.1.2-2
λ=3.7541	Eq. 1.1-3
ρ=0.25077	Eq. 1.1-2
be=2.9535 in	Eq. 1.1-1
h_o=12 in, b_o=1.625 in, h_o/b_o=7.3846	
b_1=0.82308 in	Eq. 1.1.2-6
b_2=1.0364 in	Eq. 1.1.2-7
Compression width=7.4151 in	
Ineffective width=5.5556 in	

Element 5: Unstiffened, w=0.389 in
f_1=49.263 ksi, f_2=46.678 ksi
ψ=0.94754 Eq. 1.2.2-1
k=0.44892 Eq. 1.2.2-2
λ=0.72127 Eq. 1.1-3
ρ=0.96355 Eq. 1.1-2
b=0.37482 in (ineffective width=0.014178 in) Eq. 1.1-1
Element 4: Check for lip stiffener reduction
S=31.127 Eq. 1.3-7
Ia=0.00022187 in^4 Eq. 1.3-8
Is=0.00016972 in^4
ds=0.28672 in (lip ineffective width=0.088099 in) Eq. 1.3-6
k=3.2085 Table 1.3-1
Element 4: Partially stiffened, w=1.403 in
f=49.885 ksi, k=3.2085
λ=0.97918 Eq. 1.1-3
ρ=0.79181 Eq. 1.1-2
b=1.1109 in (ineffective width=0.2921 in) Eq. 1.1-1
b_1=0.4249 in, b_2=0.68601 in
Center of gravity shift: y=-1.5262 in
Sxe=0.93276 in^3, Fy=50 ksi
Mnl=46.638 k-in Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)

Negative Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.389 in
f_1=49.263 ksi, f_2=46.678 ksi
ψ=0.94754 Eq. 1.2.2-1
k=0.44892 Eq. 1.2.2-2
λ=0.72127 Eq. 1.1-3
ρ=0.96355 Eq. 1.1-2
b=0.37482 in (ineffective width=0.014178 in) Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.127 Eq. 1.3-7
Ia=0.00022187 in^4 Eq. 1.3-8
Is=0.00016972 in^4
ds=0.28672 in (lip ineffective width=0.088099 in) Eq. 1.3-6
k=3.2085 Table 1.3-1
Element 2: Partially stiffened, w=1.403 in
f=49.885 ksi, k=3.2085
λ=0.97918 Eq. 1.1-3
ρ=0.79181 Eq. 1.1-2
b=1.1109 in (ineffective width=0.2921 in) Eq. 1.1-1
b_1=0.4249 in, b_2=0.68601 in
Element 3: Stiffened, w=11.778 in
h/t greater than 200, treat as rational analysis
f_1=49.263 ksi, f_2=-28.985 ksi
ψ=0.58838 Eq. 1.1.2-1
k=15.192 Eq. 1.1.2-2

λ=3.7541	Eq. 1.1-3
ρ=0.25077	Eq. 1.1-2
be=2.9535 in	Eq. 1.1-1
h_o=12 in, b_o=1.625 in, h_o/b_o=7.3846	
b_1=0.82308 in	Eq. 1.1.2-6
b_2=1.0364 in	Eq. 1.1.2-7
Compression width=7.4151 in	
Ineffective width=5.5556 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=1.5262 in	
Sxe=0.93276 in^3, Fy=50 ksi	
Mnl=46.638 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.389 in	
f_1=49.354 ksi, f_2=49.354 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.73765	Eq. 1.1-3
ρ=0.95134	Eq. 1.1-2
b=0.37007 in (ineffective width=0.018929 in)	Eq. 1.1-1
Element 2: Stiffened, w=1.403 in	
f_1=45.854 ksi, f_2=-6.5461 ksi	
ψ=0.14276	Eq. 1.1.2-1
k=9.2702	Eq. 1.1.2-2
λ=0.5523	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.403 in	Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25	
b_1=0.44642 in	Eq. 1.1.2-3
b_2=0.95658 in	Eq. 1.1.2-5
Compression width=1.2277 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.389 in	
f_1=49.354 ksi, f_2=49.354 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=0.73765	Eq. 1.1-3
ρ=0.95134	Eq. 1.1-2
b=0.37007 in (ineffective width=0.018929 in)	Eq. 1.1-1
Element 4: Stiffened, w=1.403 in	
f_1=45.854 ksi, f_2=-6.5461 ksi	
ψ=0.14276	Eq. 1.1.2-1
k=9.2702	Eq. 1.1.2-2
λ=0.5523	Eq. 1.1-3
ρ=1	Eq. 1.1-2

be=1.403 in	Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25	
b_1=0.44642 in	Eq. 1.1.2-3
b_2=0.95658 in	Eq. 1.1.2-5
Compression width=1.2277 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=-0.0034619 in	
Sye=0.097686 in^3, Fy=50 ksi	
Mnl=4.8843 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: Stiffened, w=1.403 in	
f_1=37.849 ksi, f_2=-43.559 ksi	
ψ=1.1509	Eq. 1.1.2-1
k=28.202	Eq. 1.1.2-2
λ=0.28769	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.403 in	Eq. 1.1-1
h_o=1.625 in, b_o=12 in, h_o/b_o=0.13542	
b_1=0.338 in	Eq. 1.1.2-3
b_2=0.7015 in	Eq. 1.1.2-4
Compression width=0.6523 in	
b_1+b_2 > compression width (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=43.286 ksi, f_2=43.286 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=9.1263	Eq. 1.1-3
ρ=0.10693	Eq. 1.1-2
b=0.54953 in (ineffective width=4.5895 in)	Eq. 1.1-1
f_1=43.286 ksi, f_2=43.286 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=9.1263	Eq. 1.1-3
ρ=0.10693	Eq. 1.1-2
b=0.54953 in (ineffective width=4.5895 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: Stiffened, w=1.403 in	
f_1=37.849 ksi, f_2=-43.559 ksi	
ψ=1.1509	Eq. 1.1.2-1
k=28.202	Eq. 1.1.2-2
λ=0.28769	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.403 in	Eq. 1.1-1
h_o=1.625 in, b_o=12 in, h_o/b_o=0.13542	
b_1=0.338 in	Eq. 1.1.2-3
b_2=0.7015 in	Eq. 1.1.2-4

Compression width=0.6523 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.47434 in
Sye=0.079465 in^3, Fy=50 ksi
Mnl=3.9732 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=3.9067 in^6, Wn=7.535 in^2, Fy=50 ksi
Bn=25.924 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

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Full Section Properties

Area	0.71748 in²	Wt.	0.0024394 k/ft	Flat	15.909 in
Ix	12.672 in⁴	rx	4.2026 in	Ixy	0.000 in⁴
Sx(t)	2.1120 in³	y(t)	6.0000 in	α	0.000 deg
Sx(b)	2.1120 in³	y(b)	6.0000 in		
Zx	2.6669 in³	Height	12.0000 in		
Iy	0.174 in⁴	ry	0.4930 in	x_o	-0.7360 in
Sy(l)	0.6547 in³	x(l)	0.2663 in	y_o	0.0000 in
Sy(r)	0.1283 in³	x(r)	1.3587 in	jx	9.7059 in
Zy	0.1802 in³	Width	1.6250 in	jy	0.0000 in
I_1	12.672 in⁴	r_1	4.2026 in	Cw	4.9817 in⁶
I_2	0.174 in⁴	r_2	0.4930 in	J	0.0004865 in⁴
Ic	12.846 in⁴	rc	4.2314 in		
I_o	13.235 in⁴	r_o	4.2950 in		

Net Section Properties

Ix	12.659 in⁴	rx	4.4137 in	Area	0.64983 in²
Sx(t)	2.1099 in³	y(t)	6.0000 in	Ixy	0.000 in⁴
Sx(b)	2.1099 in³	y(b)	6.0000 in	α	0.000 deg
Zx	2.6416 in³				
Iy	0.170 in⁴	ry	0.5113 in	x_o	-0.7619 in
Sy(l)	0.5825 in³	x(l)	0.2917 in	y_o	0.0000 in
Sy(r)	0.1274 in³	x(r)	1.3333 in	jx	8.9952 in
Zy	0.1793 in³			jy	0.0000 in
Ic	12.829 in⁴	rc	4.4432 in	Cw	4.9786 in⁶
I_o	13.206 in⁴	r_o	4.5081 in	J	0.0004406 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	9.114 k	ϕMnxo	52.584 k-in	ϕMnyo	6.519 k-in
Ae	0.21445 in²	Ixe	9.6475 in⁴	Iye	0.1699 in⁴
ϕTn	31.679 k	Sxe(t)	1.3146 in³	Sye(l)	0.5825 in³
		Sxe(b)	2.0697 in³	Sye(r)	0.1274 in³
Shear					
ϕVny	1.645 k	Negative Bending		Negative Bending	
ϕVnx	3.391 k	ϕMnxo	52.584 k-in	ϕMnyo	4.768 k-in
		Ixe	9.6475 in⁴	Iye	0.0974 in⁴
Torsion		Sxe(t)	2.0697 in³	Sye(l)	0.1379 in³
ϕBn	29.951 k-in²	Sxe(b)	1.3146 in³	Sye(r)	0.1060 in³

```
Stud element 3 h/t exceeds 200.
```

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Fya=50.914 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Fya=54.31 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Fya=56.847 ksi	Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi	

Axial Tension Strength

Ag=0.71748 in², Fy=50.914 ksi	
Tn=36.53 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.64983 in², Fu=65 ksi	
Tn=42.239 k	Eq. D3-1
Ωt=2, ϕt=0.75	

Shear Strength

Stud element 2	
Vn=1.8839 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=14.858 k	Eq. G3-2
kv=4.476	Eq. G3-8
Vcrh=0.75026 k	Eq. G3-6
h/t exceeds 200 (rational analysis)	
Vn=2.0568 k at 90 deg	Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)	
Stud element 4	
Vn=1.8839 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	

Axial Compression Strength

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3837 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56184	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00048546 in⁴	Eq. 1.3-8
Is=0.00021231 in⁴	
ds=0.16781 in (lip ineffective width=0.21589 in)	Eq. 1.3-6
k=2.725	Table 1.3-1
Element 2: Partially stiffened, w=1.3924 in	
f=50 ksi, k=2.725	
λ=0.80992	Eq. 1.1-3
ρ=0.89931	Eq. 1.1-2
b=1.2522 in (ineffective width=0.1402 in)	Eq. 1.1-1
b_1=0.27382 in, b_2=0.97838 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=7.5172	Eq. 1.1-3
ρ=0.12914	Eq. 1.1-2

b=0.66294 in (ineffective width=4.4708 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=7.5172	Eq. 1.1-3
ρ=0.12914	Eq. 1.1-2
b=0.66294 in (ineffective width=4.4708 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.3837 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56184	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00048546 in^4	Eq. 1.3-8
Is=0.00021231 in^4	
ds=0.16781 in (lip ineffective width=0.21589 in)	Eq. 1.3-6
k=2.725	Table 1.3-1
Element 4: Partially stiffened, w=1.3924 in	
f=50 ksi, k=2.725	
λ=0.80992	Eq. 1.1-3
ρ=0.89931	Eq. 1.1-2
b=1.2522 in (ineffective width=0.1402 in)	Eq. 1.1-1
b_1=0.27382 in, b_2=0.97838 in	
Ae=0.21445 in^2, Fn=50 ksi	
Pn=10.722 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=11.767 in	
h/t greater than 200, treat as rational analysis	
f_1=49.208 ksi, f_2=-30.968 ksi	
ψ=0.62934	Eq. 1.1.2-1
k=15.91	Eq. 1.1.2-2
λ=2.8102	Eq. 1.1-3
ρ=0.32799	Eq. 1.1-2
be=3.8595 in	Eq. 1.1-1
h_o=12 in, b_o=1.625 in, h_o/b_o=7.3846	
b_1=1.0634 in	Eq. 1.1.2-6
b_2=1.3054 in	Eq. 1.1.2-7
Compression width=7.2222 in	
Ineffective width=4.8534 in	
Element 5: Unstiffened, w=0.3837 in	
f_1=49.208 ksi, f_2=46.593 ksi	
ψ=0.94687	Eq. 1.2.2-1
k=0.44915	Eq. 1.2.2-2

λ=0.54536	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.139	Eq. 1.3-7
Ia=0.00048212 in^4	Eq. 1.3-8
Is=0.00021231 in^4	
ds=0.16897 in (lip ineffective width=0.21473 in)	Eq. 1.3-6
k=2.7296	Table 1.3-1
Element 4: Partially stiffened, w=1.3924 in	
f=49.846 ksi, k=2.7296	
λ=0.80799	Eq. 1.1-3
ρ=0.90065	Eq. 1.1-2
b=1.2541 in (ineffective width=0.13833 in)	Eq. 1.1-1
b_1=0.27612 in, b_2=0.97794 in	
Center of gravity shift: y=-1.3387 in	
Sxe=1.3146 in^3, Fy=50 ksi	
Mnl=65.73 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3837 in	
f_1=49.208 ksi, f_2=46.593 ksi	
ψ=0.94687	Eq. 1.2.2-1
k=0.44915	Eq. 1.2.2-2
λ=0.54536	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.139	Eq. 1.3-7
Ia=0.00048212 in^4	Eq. 1.3-8
Is=0.00021231 in^4	
ds=0.16897 in (lip ineffective width=0.21473 in)	Eq. 1.3-6
k=2.7296	Table 1.3-1
Element 2: Partially stiffened, w=1.3924 in	
f=49.846 ksi, k=2.7296	
λ=0.80799	Eq. 1.1-3
ρ=0.90065	Eq. 1.1-2
b=1.2541 in (ineffective width=0.13833 in)	Eq. 1.1-1
b_1=0.27612 in, b_2=0.97794 in	
Element 3: Stiffened, w=11.767 in	
h/t greater than 200, treat as rational analysis	
f_1=49.208 ksi, f_2=-30.968 ksi	
ψ=0.62934	Eq. 1.1.2-1
k=15.91	Eq. 1.1.2-2
λ=2.8102	Eq. 1.1-3
ρ=0.32799	Eq. 1.1-2
be=3.8595 in	Eq. 1.1-1
h_o=12 in, b_o=1.625 in, h_o/b_o=7.3846	
b_1=1.0634 in	Eq. 1.1.2-6
b_2=1.3054 in	Eq. 1.1.2-7

Compression width=7.2222 in
Ineffective width=4.8534 in
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=1.3387 in
Sxe=1.3146 in³, Fy=50 ksi
Mnl=65.73 k-in Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3837 in
f_1=55.886 ksi, f_2=55.886 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.59399 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 2: Stiffened, w=1.3924 in
f_1=51.889 ksi, f_2=-7.4767 ksi
ψ=0.14409 Eq. 1.1.2-1
k=9.2833 Eq. 1.1.2-2
λ=0.44702 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.3924 in Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25
b_1=0.44286 in Eq. 1.1.2-3
b_2=0.94954 in Eq. 1.1.2-5
Compression width=1.217 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.3837 in
f_1=55.886 ksi, f_2=55.886 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.59399 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 4: Stiffened, w=1.3924 in
f_1=51.889 ksi, f_2=-7.4767 ksi
ψ=0.14409 Eq. 1.1.2-1
k=9.2833 Eq. 1.1.2-2
λ=0.44702 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.3924 in Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25
b_1=0.44286 in Eq. 1.1.2-3
b_2=0.94954 in Eq. 1.1.2-5
Compression width=1.217 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0 in
Sye=0.12743 in³, Fy=56.847 ksi

Mnl=7.2439 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Stud

Element 1: No compressive stress (fully effective)

Element 2: Stiffened, w=1.3924 in

f_1=31.969 ksi, f_2=-43.681 ksi	
ψ=1.3664	Eq. 1.1.2-1
k=35.235	Eq. 1.1.2-2
λ=0.1801	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.3924 in	Eq. 1.1-1
h_o=1.625 in, b_o=12 in, h_o/b_o=0.13542	
b_1=0.31889 in	Eq. 1.1.2-3
b_2=0.6962 in	Eq. 1.1.2-4
Compression width=0.58841 in	
b_1+b_2 > compression width (fully effective)	

Element 3: Treat as two unstiffened elements

f_1=37.062 ksi, f_2=37.062 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=6.472	Eq. 1.1-3
ρ=0.14926	Eq. 1.1-2
b=0.76626 in (ineffective width=4.3674 in)	Eq. 1.1-1
f_1=37.062 ksi, f_2=37.062 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=6.472	Eq. 1.1-3
ρ=0.14926	Eq. 1.1-2
b=0.76626 in (ineffective width=4.3674 in)	Eq. 1.1-1

Element 5: No compressive stress (fully effective)

Element 4: Stiffened, w=1.3924 in

f_1=31.969 ksi, f_2=-43.681 ksi	
ψ=1.3664	Eq. 1.1.2-1
k=35.235	Eq. 1.1.2-2
λ=0.1801	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.3924 in	Eq. 1.1-1
h_o=1.625 in, b_o=12 in, h_o/b_o=0.13542	
b_1=0.31889 in	Eq. 1.1.2-3
b_2=0.6962 in	Eq. 1.1.2-4
Compression width=0.58841 in	
b_1+b_2 > compression width (fully effective)	

Center of gravity shift: x=0.41431 in

Sye=0.10596 in^3, Fy=50 ksi	
Mnl=5.2981 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud

C_w=4.9786 in^6, W_n=7.4802 in^2, F_y=50 ksi
B_n=33.279 k-in^2 G8.1-1
Ω_b=1.67, ϕ_b=0.9

1200S162-54

Full Section Properties

Area	0.89594 in²	Wt.	0.0030462 k/ft	Flat	15.829 in
Ix	15.731 in⁴	rx	4.1902 in	Ixy	0.000 in⁴
Sx(t)	2.6218 in³	y(t)	6.0000 in	α	0.000 deg
Sx(b)	2.6218 in³	y(b)	6.0000 in		
Zx	3.3191 in³	Height	12.0000 in		
Iy	0.212 in⁴	ry	0.4865 in	x_o	-0.7242 in
Sy(l)	0.7927 in³	x(l)	0.2675 in	y_o	0.0000 in
Sy(r)	0.1562 in³	x(r)	1.3575 in	jx	9.7784 in
Zy	0.2227 in³	Width	1.6250 in	jy	0.0000 in
I_1	15.731 in⁴	r_1	4.1902 in	Cw	6.0447 in⁶
I_2	0.212 in⁴	r_2	0.4865 in	J	0.0009567 in⁴
Ic	15.943 in⁴	rc	4.2184 in		
I_o	16.413 in⁴	r_o	4.2801 in		

Net Section Properties

Ix	15.715 in⁴	rx	4.4019 in	Area	0.81104 in²
Sx(t)	2.6191 in³	y(t)	6.0000 in	Ixy	0.000 in⁴
Sx(b)	2.6191 in³	y(b)	6.0000 in	α	0.000 deg
Zx	3.2873 in³				
Iy	0.207 in⁴	ry	0.5048 in	x_o	-0.7498 in
Sy(l)	0.7064 in³	x(l)	0.2926 in	y_o	0.0000 in
Sy(r)	0.1551 in³	x(r)	1.3324 in	jx	9.0625 in
Zy	0.2213 in³			jy	0.0000 in
Ic	15.922 in⁴	rc	4.4307 in	Cw	6.0410 in⁶
I_o	16.378 in⁴	r_o	4.4937 in	J	0.0008661 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	13.254 k	ϕMnxo	74.812 k-in	ϕMnyo	8.156 k-in
Ae	0.31185 in²	Ixe	13.135 in⁴	Iye	0.207 in⁴
ϕTn	39.538 k	Sxe(t)	1.8703 in³	Sye(l)	0.7064 in³
		Sxe(b)	2.6391 in³	Sye(r)	0.1551 in³
Shear					
ϕVny	2.738 k	Negative Bending		Negative Bending	
ϕVnx	4.102 k	ϕMnxo	74.812 k-in	ϕMnyo	6.035 k-in
		Ixe	13.135 in⁴	Iye	0.132 in⁴
Torsion		Sxe(t)	2.6391 in³	Sye(l)	0.2063 in³
ϕBn	36.614 k-in²	Sxe(b)	1.8703 in³	Sye(r)	0.1341 in³

```
Stud element 3 h/t exceeds 200.
```

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Fya=51.141 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Fya=55.318 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Fya=58.416 ksi	Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi	

Axial Tension Strength

Ag=0.89594 in², Fy=51.141 ksi	
Tn=45.819 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.81104 in², Fu=65 ksi	
Tn=52.717 k	Eq. D3-1
Ωt=2, ϕt=0.75	

Shear Strength

Stud element 2	
Vn=2.2787 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=18.541 k	Eq. G3-2
kv=4.4743	Eq. G3-8
Vcrh=1.4873 k	Eq. G3-6
h/t exceeds 200 (rational analysis)	
Vn=3.4223 k at 90 deg	Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)	
Stud element 4	
Vn=2.2787 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	

Axial Compression Strength

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3585 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41829	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00033614 in⁴	Eq. 1.3-8
Is=0.00021732 in⁴	
ds=0.23177 in (lip ineffective width=0.12673 in)	Eq. 1.3-6
k=2.9231	Table 1.3-1
Element 2: Partially stiffened, w=1.342 in	
f=50 ksi, k=2.9231	
λ=0.60055	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=5.9604	Eq. 1.1-3
ρ=0.16158	Eq. 1.1-2
b=0.82543 in (ineffective width=4.2831 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	

ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=5.9604	Eq. 1.1-3
ρ=0.16158	Eq. 1.1-2
b=0.82543 in (ineffective width=4.2831 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.3585 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41829	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00033614 in^4	Eq. 1.3-8
Is=0.00021732 in^4	
ds=0.23177 in (lip ineffective width=0.12673 in)	Eq. 1.3-6
k=2.9231	Table 1.3-1
Element 4: Partially stiffened, w=1.342 in	
f=50 ksi, k=2.9231	
λ=0.60055	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Ae=0.31185 in^2, Fn=50 ksi	
Pn=15.592 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=11.717 in	
h/t greater than 200, treat as rational analysis	
f_1=48.993 ksi, f_2=-34.43 ksi	
ψ=0.70276	Eq. 1.1.2-1
k=17.279	Eq. 1.1.2-2
λ=2.1348	Eq. 1.1-3
ρ=0.42016	Eq. 1.1-2
be=4.923 in	Eq. 1.1-1
h_o=12 in, b_o=1.625 in, h_o/b_o=7.3846	
b_1=1.3296 in	Eq. 1.1.2-6
b_2=1.5616 in	Eq. 1.1.2-7
Compression width=6.8812 in	
Ineffective width=3.99 in	
Element 5: Unstiffened, w=0.3585 in	
f_1=48.993 ksi, f_2=46.44 ksi	
ψ=0.9479	Eq. 1.2.2-1
k=0.44879	Eq. 1.2.2-2
λ=0.40529	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.154	Eq. 1.3-7

Ia=0.00033259 in^4	Eq. 1.3-8
Is=0.00021732 in^4	
ds=0.23425 in (lip ineffective width=0.12425 in)	Eq. 1.3-6
k=2.9331	Table 1.3-1
Element 4: Partially stiffened, w=1.342 in	
f=49.799 ksi, k=2.9331	
λ=0.59832	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Center of gravity shift: y=-1.023 in	
Sxe=1.8703 in^3, Fy=50 ksi	
Mnl=93.515 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3585 in	
f_1=48.993 ksi, f_2=46.44 ksi	
ψ=0.9479	Eq. 1.2.2-1
k=0.44879	Eq. 1.2.2-2
λ=0.40529	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.154	Eq. 1.3-7
Ia=0.00033259 in^4	Eq. 1.3-8
Is=0.00021732 in^4	
ds=0.23425 in (lip ineffective width=0.12425 in)	Eq. 1.3-6
k=2.9331	Table 1.3-1
Element 2: Partially stiffened, w=1.342 in	
f=49.799 ksi, k=2.9331	
λ=0.59832	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 3: Stiffened, w=11.717 in	
h/t greater than 200, treat as rational analysis	
f_1=48.993 ksi, f_2=-34.43 ksi	
ψ=0.70276	Eq. 1.1.2-1
k=17.279	Eq. 1.1.2-2
λ=2.1348	Eq. 1.1-3
ρ=0.42016	Eq. 1.1-2
be=4.923 in	Eq. 1.1-1
h_o=12 in, b_o=1.625 in, h_o/b_o=7.3846	
b_1=1.3296 in	Eq. 1.1.2-6
b_2=1.5616 in	Eq. 1.1.2-7
Compression width=6.8812 in	
Ineffective width=3.99 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=1.023 in	
Sxe=1.8703 in^3, Fy=50 ksi	
Mnl=93.515 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.3585 in
f_1=57.175 ksi, f_2=57.175 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.44729 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 2: Stiffened, w=1.342 in
f_1=52.212 ksi, f_2=-6.6242 ksi
ψ=0.12687 Eq. 1.1.2-1
k=9.1156 Eq. 1.1.2-2
λ=0.34752 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.342 in Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25
b_1=0.42918 in Eq. 1.1.2-3
b_2=0.91282 in Eq. 1.1.2-5
Compression width=1.1909 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.3585 in
f_1=57.175 ksi, f_2=57.175 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.44729 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 4: Stiffened, w=1.342 in
f_1=52.212 ksi, f_2=-6.6242 ksi
ψ=0.12687 Eq. 1.1.2-1
k=9.1156 Eq. 1.1.2-2
λ=0.34752 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.342 in Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25
b_1=0.42918 in Eq. 1.1.2-3
b_2=0.91282 in Eq. 1.1.2-5
Compression width=1.1909 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0 in
Sye=0.15513 in^3, Fy=58.416 ksi
Mnl=9.062 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9
Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.342 in
f_1=25.194 ksi, f_2=-42.828 ksi
ψ=1.6999 Eq. 1.1.2-1

k=48.763	Eq. 1.1.2-2
λ=0.10437	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.342 in	Eq. 1.1-1
h_o=1.625 in, b_o=12 in, h_o/b_o=0.13542	
b_1=0.28554 in	Eq. 1.1.2-3
b_2=0.671 in	Eq. 1.1.2-4
Compression width=0.49705 in	
b_1+b_2 > compression width (fully effective)	
Element 3: Treat as two unstiffened elements	
f_1=30.931 ksi, f_2=30.931 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.6881	Eq. 1.1-3
ρ=0.2033	Eq. 1.1-2
b=1.0385 in (ineffective width=4.07 in)	Eq. 1.1-1
f_1=30.931 ksi, f_2=30.931 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=4.6881	Eq. 1.1-3
ρ=0.2033	Eq. 1.1-2
b=1.0385 in (ineffective width=4.07 in)	Eq. 1.1-1
Element 5: No compressive stress (fully effective)	
Element 4: Stiffened, w=1.342 in	
f_1=25.194 ksi, f_2=-42.828 ksi	
ψ=1.6999	Eq. 1.1.2-1
k=48.763	Eq. 1.1.2-2
λ=0.10437	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.342 in	Eq. 1.1-1
h_o=1.625 in, b_o=12 in, h_o/b_o=0.13542	
b_1=0.28554 in	Eq. 1.1.2-3
b_2=0.671 in	Eq. 1.1.2-4
Compression width=0.49705 in	
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0.34758 in	
Sye=0.1341 in^3, Fy=50 ksi	
Mnl=6.7051 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud

Cw=6.041 in^6, Wn=7.4247 in^2, Fy=50 ksi	
Bn=40.682 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	1.1208 in²	Wt.	0.0038109 k/ft	Flat	15.720 in
Ix	19.520 in⁴	rx	4.1732 in	Ixy	0.000 in⁴
Sx(t)	3.2533 in³	y(t)	6.0000 in	α	0.000 deg
Sx(b)	3.2533 in³	y(b)	6.0000 in		
Zx	4.1330 in³	Height	12.0000 in		
Iy	0.256 in⁴	ry	0.4779 in	x_o	-0.7085 in
Sy(l)	0.9521 in³	x(l)	0.2689 in	y_o	0.0000 in
Sy(r)	0.1888 in³	x(r)	1.3561 in	jx	9.8800 in
Zy	0.2746 in³	Width	1.6250 in	jy	0.0000 in
I_1	19.520 in⁴	r_1	4.1732 in	Cw	7.2705 in⁶
I_2	0.256 in⁴	r_2	0.4779 in	J	0.0018993 in⁴
Ic	19.776 in⁴	rc	4.2004 in		
I_o	20.338 in⁴	r_o	4.2598 in		

Net Section Properties

Ix	19.500 in⁴	rx	4.3855 in	Area	1.0139 in²
Sx(t)	3.2499 in³	y(t)	6.0000 in	Ixy	0.000 in⁴
Sx(b)	3.2499 in³	y(b)	6.0000 in	α	0.000 deg
Zx	4.0929 in³				
Iy	0.250 in⁴	ry	0.4961 in	x_o	-0.7336 in
Sy(l)	0.8502 in³	x(l)	0.2935 in	y_o	0.0000 in
Sy(r)	0.1874 in³	x(r)	1.3315 in	jx	9.1570 in
Zy	0.2725 in³			jy	0.0000 in
Ic	19.749 in⁴	rc	4.4135 in	Cw	7.2659 in⁶
I_o	20.295 in⁴	r_o	4.4740 in	J	0.0017181 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	18.590 k	ϕMnxo	116.60 k-in	ϕMnyo	10.19 k-in
Ae	0.43740 in²	Ixe	17.405 in⁴	Iye	0.250 in⁴
ϕTn	49.427 k	Sxe(t)	2.5911 in³	Sye(l)	0.8502 in³
		Sxe(b)	3.2945 in³	Sye(r)	0.1874 in³
Shear					
ϕVny	5.141 k	Negative Bending		Negative Bending	
ϕVnx	4.884 k	ϕMnxo	116.60 k-in	ϕMnyo	7.58 k-in
		Ixe	17.405 in⁴	Iye	0.179 in⁴
Torsion		Sxe(t)	3.2945 in³	Sye(l)	0.3167 in³
ϕBn	44.459 k-in²	Sxe(b)	2.5911 in³	Sye(r)	0.1683 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=51.447 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=56.625 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=60.418 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=1.1208 in², Fy=51.447 ksi

Tn=57.664 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=1.0139 in², Fu=65 ksi	
Tn=65.903 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=2.7135 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=23.162 k	Eq. G3-2
kv=4.4719	Eq. G3-8
Vcrh=2.9861 k	Eq. G3-6
Vn=5.7125 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=2.7135 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3218 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.29806	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00015029 in⁴	Eq. 1.3-8
Is=0.000198 in⁴ > Ia (no lip reduction)	
k=3.2793	Table 1.3-1
Element 2: Partially stiffened, w=1.2686 in	
f=50 ksi, k=3.2793	
λ=0.42548	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.6976	Eq. 1.1-3
ρ=0.20291	Eq. 1.1-2
b=1.0291 in (ineffective width=4.0427 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.6976	Eq. 1.1-3
ρ=0.20291	Eq. 1.1-2

b=1.0291 in (ineffective width=4.0427 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.3218 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.29806	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00015029 in^4	Eq. 1.3-8
Is=0.000198 in^4 > Ia (no lip reduction)	
k=3.2793	Table 1.3-1
Element 4: Partially stiffened, w=1.2686 in	
f=50 ksi, k=3.2793	
λ=0.42548	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Ae=0.4374 in^2, Fn=50 ksi	
Pn=21.87 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=11.644 in	
f_1=48.673 ksi, f_2=-38.046 ksi	
ψ=0.78167	Eq. 1.1.2-1
k=18.875	Eq. 1.1.2-2
λ=1.606	Eq. 1.1-3
ρ=0.53736	Eq. 1.1-2
be=6.2568 in	Eq. 1.1-1
h_o=12 in, b_o=1.625 in, h_o/b_o=7.3846	
b_1=1.6545 in	Eq. 1.1.2-6
b_2=1.8573 in	Eq. 1.1.2-7
Compression width=6.5352 in	
Ineffective width=3.0234 in	
Element 5: Unstiffened, w=0.3218 in	
f_1=48.673 ksi, f_2=46.276 ksi	
ψ=0.95076	Eq. 1.2.2-1
k=0.4478	Eq. 1.2.2-2
λ=0.28817	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.174	Eq. 1.3-7
Ia=0.0001475 in^4	Eq. 1.3-8
Is=0.000198 in^4 > Ia (no lip reduction)	
k=3.2793	Table 1.3-1
Element 4: Partially stiffened, w=1.2686 in	
f=49.734 ksi, k=3.2793	
λ=0.42435	Eq. 1.1-3

$\lambda<0.673$ (fully effective)	Eq. 1.1-1
Center of gravity shift: y=-0.71709 in	
Sxe=2.5911 in^3, Fy=50 ksi	
Mnl=129.56 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3218 in	
f_1=48.673 ksi, f_2=46.276 ksi	
ψ=0.95076	Eq. 1.2.2-1
k=0.4478	Eq. 1.2.2-2
λ=0.28817	Eq. 1.1-3
$\lambda<0.673$ (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.174	Eq. 1.3-7
Ia=0.0001475 in^4	Eq. 1.3-8
Is=0.000198 in^4 > Ia (no lip reduction)	
k=3.2793	Table 1.3-1
Element 2: Partially stiffened, w=1.2686 in	
f=49.734 ksi, k=3.2793	
λ=0.42435	Eq. 1.1-3
$\lambda<0.673$ (fully effective)	Eq. 1.1-1
Element 3: Stiffened, w=11.644 in	
f_1=48.673 ksi, f_2=-38.046 ksi	
ψ=0.78167	Eq. 1.1.2-1
k=18.875	Eq. 1.1.2-2
λ=1.606	Eq. 1.1-3
ρ=0.53736	Eq. 1.1-2
be=6.2568 in	Eq. 1.1-1
h_o=12 in, b_o=1.625 in, h_o/b_o=7.3846	
b_1=1.6545 in	Eq. 1.1.2-6
b_2=1.8573 in	Eq. 1.1.2-7
Compression width=6.5352 in	
Ineffective width=3.0234 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.71709 in	
Sxe=2.5911 in^3, Fy=50 ksi	
Mnl=129.56 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.3218 in	
f_1=58.801 ksi, f_2=58.801 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.32322	Eq. 1.1-3
$\lambda<0.673$ (fully effective)	Eq. 1.1-1

Element 2: Stiffened, w=1.2686 in
f_1=52.332 ksi, f_2=-5.2323 ksi
ψ=0.099983 Eq. 1.1.2-1
k=8.8618 Eq. 1.1.2-2
λ=0.26479 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.2686 in Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25
b_1=0.40923 in Eq. 1.1.2-3
b_2=0.85937 in Eq. 1.1.2-5
Compression width=1.1533 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.3218 in
f_1=58.801 ksi, f_2=58.801 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.32322 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 4: Stiffened, w=1.2686 in
f_1=52.332 ksi, f_2=-5.2324 ksi
ψ=0.099984 Eq. 1.1.2-1
k=8.8618 Eq. 1.1.2-2
λ=0.26479 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.2686 in Eq. 1.1-1
h_o=1.625 in, b_o=0.5 in, h_o/b_o=3.25
b_1=0.40923 in Eq. 1.1.2-3
b_2=0.85937 in Eq. 1.1.2-5
Compression width=1.1533 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0 in
Sye=0.18742 in^3, Fy=60.418 ksi
Mnl=11.324 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.2686 in
f_1=18.071 ksi, f_2=-41.616 ksi
ψ=2.303 Eq. 1.1.2-1
k=82.674 Eq. 1.1.2-2
λ=0.050943 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.2686 in Eq. 1.1-1
h_o=1.625 in, b_o=12 in, h_o/b_o=0.13542
b_1=0.23922 in Eq. 1.1.2-3
b_2=0.6343 in Eq. 1.1.2-4
Compression width=0.38408 in

b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=24.777 ksi, f_2=24.777 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=3.3069 Eq. 1.1-3
ρ=0.28228 Eq. 1.1-2
b=1.4317 in (ineffective width=3.6401 in) Eq. 1.1-1
f_1=24.777 ksi, f_2=24.777 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=3.3069 Eq. 1.1-3
ρ=0.28228 Eq. 1.1-2
b=1.4317 in (ineffective width=3.6401 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=1.2686 in
f_1=18.071 ksi, f_2=-41.616 ksi
ψ=2.303 Eq. 1.1.2-1
k=82.673 Eq. 1.1.2-2
λ=0.050944 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.2686 in Eq. 1.1-1
h_o=1.625 in, b_o=12 in, h_o/b_o=0.13542
b_1=0.23923 in Eq. 1.1.2-3
b_2=0.6343 in Eq. 1.1.2-4
Compression width=0.38408 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.27051 in
Sye=0.16834 in^3, Fy=50 ksi
Mnl=8.417 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=7.2659 in^6, Wn=7.3543 in^2, Fy=50 ksi
Bn=49.399 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

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Full Section Properties

Area	0.52929 in²	Wt.	0.0017996 k/ft	Flat	16.964 in
Ix	9.905 in⁴	rx	4.3259 in	Ixy	0.000 in⁴
Sx(t)	1.6508 in³	y(t)	6.0000 in	α	0.000 deg
Sx(b)	1.6508 in³	y(b)	6.0000 in		
Zx	2.0384 in³	Height	12.0000 in		
Iy	0.227 in⁴	ry	0.6556 in	x_o	-1.0493 in
Sy(l)	0.6047 in³	x(l)	0.3762 in	y_o	0.0000 in
Sy(r)	0.1401 in³	x(r)	1.6238 in	jx	8.1560 in
Zy	0.1932 in³	Width	2.0000 in	jy	0.0000 in
I_1	9.905 in⁴	r_1	4.3259 in	Cw	6.4566 in⁶
I_2	0.227 in⁴	r_2	0.6556 in	J	0.0001717 in⁴
Ic	10.132 in⁴	rc	4.3753 in		
I_o	10.715 in⁴	r_o	4.4994 in		

Net Section Properties

Ix	9.896 in⁴	rx	4.5289 in	Area	0.48249 in²
Sx(t)	1.6494 in³	y(t)	6.0000 in	Ixy	0.000 in⁴
Sx(b)	1.6494 in³	y(b)	6.0000 in	α	0.000 deg
Zx	2.0209 in³				
Iy	0.221 in⁴	ry	0.6765 in	x_o	-1.0849 in
Sy(l)	0.5370 in³	x(l)	0.4112 in	y_o	0.0000 in
Sy(r)	0.1390 in³	x(r)	1.5888 in	jx	7.5823 in
Zy	0.1928 in³			jy	0.0000 in
Ic	10.117 in⁴	rc	4.5791 in	Cw	6.4524 in⁶
I_o	10.685 in⁴	r_o	4.7059 in	J	0.0001566 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	5.987 k	ϕMnxo	34.641 k-in	ϕMnyo	5.544 k-in
Ae	0.14087 in²	Ixe	6.6821 in⁴	Iye	0.1992 in⁴
ϕTn	23.521 k	Sxe(t)	0.8660 in³	Sye(l)	0.5205 in³
		Sxe(b)	1.5597 in³	Sye(r)	0.1232 in³
Shear					
ϕVny	0.717 k	Negative Bending		Negative Bending	
ϕVnx	2.609 k	ϕMnxo	34.641 k-in	ϕMnyo	4.667 k-in
		Ixe	6.6821 in⁴	Iye	0.1054 in⁴
Torsion		Sxe(t)	1.5597 in³	Sye(l)	0.1037 in³
ϕBn	31.325 k-in²	Sxe(b)	0.8660 in³	Sye(r)	0.1071 in³

```
Stud element 3 h/t exceeds 300.
Stud element 3 h/t exceeds 200.
```

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=50.649 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=52.65 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=54.15 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	

Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength

Ag=0.52929 in², Fy=50.649 ksi	
Tn=26.808 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.48249 in², Fu=65 ksi	
Tn=31.362 k	Eq. D3-1
Ωt=2, ϕt=0.75	

Shear Strength

Stud element 2	
Vn=1.4492 k at 180 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=10.295 k	Eq. G3-2
kv=4.4946	Eq. G3-8
Vcrh=0.2492 k	Eq. G3-6
h/t exceeds 200 (rational analysis)	
Vn=0.89619 k at 90 deg	Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)	
Stud element 4	
Vn=1.4492 k at 0 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	

Axial Compression Strength

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5157 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.0916	Eq. 1.1-3
ρ=0.73148	Eq. 1.1-2
b=0.37723 in (ineffective width=0.13847 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00020486 in⁴	Eq. 1.3-8
Is=0.00035659 in⁴ > Ia (no lip reduction)	
k=3.4958	Table 1.3-1
Element 2: Partially stiffened, w=1.7814 in	
f=50 ksi, k=3.4958	
λ=1.3224	Eq. 1.1-3
ρ=0.63039	Eq. 1.1-2
b=1.123 in (ineffective width=0.65843 in)	Eq. 1.1-1
b_1=0.56148 in, b_2=0.56148 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3

λ=10.881	Eq. 1.1-3
ρ=0.090045	Eq. 1.1-2
b=0.4629 in (ineffective width=4.6778 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=10.881	Eq. 1.1-3
ρ=0.090045	Eq. 1.1-2
b=0.4629 in (ineffective width=4.6778 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.5157 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.0916	Eq. 1.1-3
ρ=0.73148	Eq. 1.1-2
b=0.37723 in (ineffective width=0.13847 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00020486 in^4	Eq. 1.3-8
Is=0.00035659 in^4 > Ia (no lip reduction)	
k=3.4958	Table 1.3-1
Element 4: Partially stiffened, w=1.7814 in	
f=50 ksi, k=3.4958	
λ=1.3224	Eq. 1.1-3
ρ=0.63039	Eq. 1.1-2
b=1.123 in (ineffective width=0.65843 in)	Eq. 1.1-1
b_1=0.56148 in, b_2=0.56148 in	
Ae=0.14087 in^2, Fn=50 ksi	
Pn=7.0433 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=11.781 in	
h/t greater than 200, treat as rational analysis	
f_1=49.292 ksi, f_2=-27.057 ksi	
ψ=0.54891	Eq. 1.1.2-1
k=14.53	Eq. 1.1.2-2
λ=4.2594	Eq. 1.1-3
ρ=0.22265	Eq. 1.1-2
be=2.6231 in	Eq. 1.1-1
h_o=12 in, b_o=2 in, h_o/b_o=6	
b_1=0.73913 in	Eq. 1.1.2-6
b_2=0.95439 in	Eq. 1.1.2-7
Compression width=7.6062 in	
Ineffective width=5.9127 in	
Element 5: Unstiffened, w=0.5157 in	
f_1=49.292 ksi, f_2=45.95 ksi	

ψ=0.9322	Eq. 1.2.2-1
k=0.45433	Eq. 1.2.2-2
λ=1.0544	Eq. 1.1-3
ρ=0.75054	Eq. 1.1-2
b=0.38705 in (ineffective width=0.12865 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.123	Eq. 1.3-7
Ia=0.00020465 in^4	Eq. 1.3-8
Is=0.00035659 in^4 > Ia (no lip reduction)	
k=3.4958	Table 1.3-1
Element 4: Partially stiffened, w=1.7814 in	
f=49.899 ksi, k=3.4958	
λ=1.3211	Eq. 1.1-3
ρ=0.6309	Eq. 1.1-2
b=1.1239 in (ineffective width=0.65752 in)	Eq. 1.1-1
b_1=0.56194 in, b_2=0.56194 in	
Center of gravity shift: y=-1.7159 in	
Sxe=0.86601 in^3, Fy=50 ksi	
Mnl=43.301 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5157 in	
f_1=49.292 ksi, f_2=45.95 ksi	
ψ=0.9322	Eq. 1.2.2-1
k=0.45433	Eq. 1.2.2-2
λ=1.0544	Eq. 1.1-3
ρ=0.75054	Eq. 1.1-2
b=0.38705 in (ineffective width=0.12865 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.123	Eq. 1.3-7
Ia=0.00020465 in^4	Eq. 1.3-8
Is=0.00035659 in^4 > Ia (no lip reduction)	
k=3.4958	Table 1.3-1
Element 2: Partially stiffened, w=1.7814 in	
f=49.899 ksi, k=3.4958	
λ=1.3211	Eq. 1.1-3
ρ=0.6309	Eq. 1.1-2
b=1.1239 in (ineffective width=0.65752 in)	Eq. 1.1-1
b_1=0.56194 in, b_2=0.56194 in	
Element 3: Stiffened, w=11.781 in	
h/t greater than 200, treat as rational analysis	
f_1=49.292 ksi, f_2=-27.057 ksi	
ψ=0.54891	Eq. 1.1.2-1
k=14.53	Eq. 1.1.2-2
λ=4.2594	Eq. 1.1-3
ρ=0.22265	Eq. 1.1-2
be=2.6231 in	Eq. 1.1-1
h_o=12 in, b_o=2 in, h_o/b_o=6	

b_1=0.73913 in	Eq. 1.1.2-6
b_2=0.95439 in	Eq. 1.1.2-7
Compression width=7.6062 in	
Ineffective width=5.9127 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=1.7159 in	
Sxe=0.86601 in^3, Fy=50 ksi	
Mnl=43.301 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5157 in	
f_1=49.518 ksi, f_2=49.518 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.0863	Eq. 1.1-3
ρ=0.73414	Eq. 1.1-2
b=0.37859 in (ineffective width=0.13711 in)	Eq. 1.1-1
Element 2: Stiffened, w=1.7814 in	
f_1=46.621 ksi, f_2=-8.4555 ksi	
ψ=0.18137	Eq. 1.1.2-1
k=9.6602	Eq. 1.1.2-2
λ=0.76816	Eq. 1.1-3
ρ=0.92897	Eq. 1.1-2
be=1.6549 in	Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2	
b_1=0.52018 in	Eq. 1.1.2-3
b_2=1.1347 in	Eq. 1.1.2-5
Compression width=1.5079 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.5157 in	
f_1=49.518 ksi, f_2=49.518 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=1.0863	Eq. 1.1-3
ρ=0.73414	Eq. 1.1-2
b=0.37859 in (ineffective width=0.13711 in)	Eq. 1.1-1
Element 4: Stiffened, w=1.7814 in	
f_1=46.621 ksi, f_2=-8.4555 ksi	
ψ=0.18137	Eq. 1.1.2-1
k=9.6602	Eq. 1.1.2-2
λ=0.76816	Eq. 1.1-3
ρ=0.92897	Eq. 1.1-2
be=1.6549 in	Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2	
b_1=0.52018 in	Eq. 1.1.2-3
b_2=1.1347 in	Eq. 1.1.2-5

Compression width=1.5079 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=-0.0284 in
Sye=0.1232 in³, Fy=50 ksi
Mnl=6.16 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.7814 in
f_1=44.619 ksi, f_2=-43.081 ksi
ψ=0.96553 Eq. 1.1.2-1
k=23.118 Eq. 1.1.2-2
λ=0.48578 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.7814 in Eq. 1.1-1
h_o=2 in, b_o=12 in, h_o/b_o=0.16667
b_1=0.44922 in Eq. 1.1.2-3
b_2=0.8907 in Eq. 1.1.2-4
Compression width=0.90632 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=49.232 ksi, f_2=49.232 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=10.797 Eq. 1.1-3
ρ=0.09073 Eq. 1.1-2
b=0.46642 in (ineffective width=4.6743 in) Eq. 1.1-1
f_1=49.232 ksi, f_2=49.232 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=10.797 Eq. 1.1-3
ρ=0.09073 Eq. 1.1-2
b=0.46642 in (ineffective width=4.6743 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=1.7814 in
f_1=44.619 ksi, f_2=-43.081 ksi
ψ=0.96553 Eq. 1.1.2-1
k=23.118 Eq. 1.1.2-2
λ=0.48578 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.7814 in Eq. 1.1-1
h_o=2 in, b_o=12 in, h_o/b_o=0.16667
b_1=0.44922 in Eq. 1.1.2-3
b_2=0.8907 in Eq. 1.1.2-4
Compression width=0.90632 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.60468 in
Sye=0.10372 in³, Fy=50 ksi

Mnl=5.186 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=6.4524 in^6, Wn=9.2691 in^2, Fy=50 ksi
Bn=34.806 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

1200S200-33

Full Section Properties

Area	0.58650 in²	Wt.	0.0019941 k/ft	Flat	16.951 in
Ix	10.965 in⁴	rx	4.3238 in	Ixy	0.000 in⁴
Sx(t)	1.8275 in³	y(t)	6.0000 in	α	0.000 deg
Sx(b)	1.8275 in³	y(b)	6.0000 in		
Zx	2.2575 in³	Height	12.0000 in		
Iy	0.251 in⁴	ry	0.6541 in	x_o	-1.0464 in
Sy(l)	0.6660 in³	x(l)	0.3768 in	y_o	0.0000 in
Sy(r)	0.1546 in³	x(r)	1.6232 in	jx	8.1630 in
Zy	0.2137 in³	Width	2.0000 in	jy	0.0000 in
I_1	10.965 in⁴	r_1	4.3238 in	Cw	7.1174 in⁶
I_2	0.251 in⁴	r_2	0.6541 in	J	0.0002340 in⁴
Ic	11.216 in⁴	rc	4.3730 in		
I_o	11.858 in⁴	r_o	4.4965 in		

Net Section Properties

Ix	10.955 in⁴	rx	4.5268 in	Area	0.53460 in²
Sx(t)	1.8259 in³	y(t)	6.0000 in	Ixy	0.000 in⁴
Sx(b)	1.8259 in³	y(b)	6.0000 in	α	0.000 deg
Zx	2.2381 in³				
Iy	0.244 in⁴	ry	0.6750 in	x_o	-1.0819 in
Sy(l)	0.5916 in³	x(l)	0.4117 in	y_o	0.0000 in
Sy(r)	0.1533 in³	x(r)	1.5883 in	jx	7.5886 in
Zy	0.2132 in³			jy	0.0000 in
Ic	11.199 in⁴	rc	4.5769 in	Cw	7.1128 in⁶
I_o	11.824 in⁴	r_o	4.7030 in	J	0.0002133 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	7.147 k	ϕMnxo	41.086 k-in	ϕMnyo	6.294 k-in
Ae	0.16817 in²	Ixe	7.7745 in⁴	Iye	0.2252 in⁴
ϕTn	26.062 k	Sxe(t)	1.0272 in³	Sye(l)	0.5777 in³
		Sxe(b)	1.7545 in³	Sye(r)	0.1399 in³
Shear					
ϕVny	0.907 k	Negative Bending		Negative Bending	
ϕVnx	3.083 k	ϕMnxo	41.086 k-in	ϕMnyo	5.382 k-in
		Ixe	7.7745 in⁴	Iye	0.1197 in⁴
Torsion		Sxe(t)	1.7545 in³	Sye(l)	0.1198 in³
ϕBn	34.603 k-in²	Sxe(b)	1.0272 in³	Sye(r)	0.1196 in³

```
Stud element 3 h/t exceeds 300.
Stud element 3 h/t exceeds 200.
```

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=50.704 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=52.88 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=54.513 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	

Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.5865 in², Fy=50.704 ksi
Tn=29.738 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.5346 in², Fu=65 ksi
Tn=34.749 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Stud element 2
Vn=1.7129 k at 180 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Stud element 3
Vyh=11.413 k — Eq. G3-2
kv=4.4945 — Eq. G3-8
Vcrh=0.33994 k — Eq. G3-6
h/t exceeds 200 (rational analysis)
Vn=1.1332 k at 90 deg — Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)
Stud element 4
Vn=1.7129 k at 0 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Stud
Element 1: Unstiffened, w=0.514 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.98104 — Eq. 1.1-3
ρ=0.79074 — Eq. 1.1-2
b=0.40644 in (ineffective width=0.10756 in) — Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.091 — Eq. 1.3-7
Ia=0.00027958 in⁴ — Eq. 1.3-8
Is=0.00039155 in⁴ > Ia (no lip reduction)
k=3.4924 — Table 1.3-1
Element 2: Partially stiffened, w=1.778 in
f=50 ksi, k=3.4924
λ=1.1908 — Eq. 1.1-3
ρ=0.68464 — Eq. 1.1-2
b=1.2173 in (ineffective width=0.56072 in) — Eq. 1.1-1
b_1=0.60864 in, b_2=0.60864 in
Element 3: Treat as two unstiffened elements
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3

λ=9.8085	Eq. 1.1-3
ρ=0.099665	Eq. 1.1-2
b=0.51218 in (ineffective width=4.6268 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=9.8085	Eq. 1.1-3
ρ=0.099665	Eq. 1.1-2
b=0.51218 in (ineffective width=4.6268 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.514 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.98104	Eq. 1.1-3
ρ=0.79074	Eq. 1.1-2
b=0.40644 in (ineffective width=0.10756 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00027958 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.4924	Table 1.3-1
Element 4: Partially stiffened, w=1.778 in	
f=50 ksi, k=3.4924	
λ=1.1908	Eq. 1.1-3
ρ=0.68464	Eq. 1.1-2
b=1.2173 in (ineffective width=0.56072 in)	Eq. 1.1-1
b_1=0.60864 in, b_2=0.60864 in	
Ae=0.16817 in^2, Fn=50 ksi	
Pn=8.4087 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=11.778 in	
h/t greater than 200, treat as rational analysis	
f_1=49.267 ksi, f_2=-28.539 ksi	
ψ=0.57927	Eq. 1.1.2-1
k=15.036	Eq. 1.1.2-2
λ=3.7736	Eq. 1.1-3
ρ=0.24955	Eq. 1.1-2
be=2.9392 in	Eq. 1.1-1
h_o=12 in, b_o=2 in, h_o/b_o=6	
b_1=0.82118 in	Eq. 1.1.2-6
b_2=1.0399 in	Eq. 1.1.2-7
Compression width=7.4579 in	
Ineffective width=5.5967 in	
Element 5: Unstiffened, w=0.514 in	
f_1=49.267 ksi, f_2=45.871 ksi	

ψ=0.93108	Eq. 1.2.2-1
k=0.45473	Eq. 1.2.2-2
λ=0.94697	Eq. 1.1-3
ρ=0.81067	Eq. 1.1-2
b=0.41668 in (ineffective width=0.097316 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.127	Eq. 1.3-7
Ia=0.00027926 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.4924	Table 1.3-1
Element 4: Partially stiffened, w=1.778 in	
f=49.886 ksi, k=3.4924	
λ=1.1894	Eq. 1.1-3
ρ=0.68524	Eq. 1.1-2
b=1.2184 in (ineffective width=0.55964 in)	Eq. 1.1-1
b_1=0.60918 in, b_2=0.60918 in	
Center of gravity shift: y=-1.5689 in	
Sxe=1.0272 in^3, Fy=50 ksi	
Mnl=51.358 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.514 in	
f_1=49.267 ksi, f_2=45.871 ksi	
ψ=0.93108	Eq. 1.2.2-1
k=0.45473	Eq. 1.2.2-2
λ=0.94697	Eq. 1.1-3
ρ=0.81067	Eq. 1.1-2
b=0.41668 in (ineffective width=0.097316 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.127	Eq. 1.3-7
Ia=0.00027926 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.4924	Table 1.3-1
Element 2: Partially stiffened, w=1.778 in	
f=49.886 ksi, k=3.4924	
λ=1.1894	Eq. 1.1-3
ρ=0.68524	Eq. 1.1-2
b=1.2184 in (ineffective width=0.55964 in)	Eq. 1.1-1
b_1=0.60918 in, b_2=0.60918 in	
Element 3: Stiffened, w=11.778 in	
h/t greater than 200, treat as rational analysis	
f_1=49.267 ksi, f_2=-28.539 ksi	
ψ=0.57927	Eq. 1.1.2-1
k=15.036	Eq. 1.1.2-2
λ=3.7736	Eq. 1.1-3
ρ=0.24955	Eq. 1.1-2
be=2.9392 in	Eq. 1.1-1
h_o=12 in, b_o=2 in, h_o/b_o=6	

b_1=0.82118 in	Eq. 1.1.2-6
b_2=1.0399 in	Eq. 1.1.2-7
Compression width=7.4579 in	
Ineffective width=5.5967 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=1.5689 in	
Sxe=1.0272 in^3, Fy=50 ksi	
Mnl=51.358 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.514 in	
f_1=49.463 ksi, f_2=49.463 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.97576	Eq. 1.1-3
ρ=0.79378	Eq. 1.1-2
b=0.408 in (ineffective width=0.106 in)	Eq. 1.1-1
Element 2: Stiffened, w=1.778 in	
f_1=46.553 ksi, f_2=-8.6584 ksi	
ψ=0.18599	Eq. 1.1.2-1
k=9.7083	Eq. 1.1.2-2
λ=0.68914	Eq. 1.1-3
ρ=0.98784	Eq. 1.1-2
be=1.7564 in	Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2	
b_1=0.55128 in	Eq. 1.1.2-3
b_2=1.2051 in	Eq. 1.1.2-5
Compression width=1.4992 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.514 in	
f_1=49.463 ksi, f_2=49.463 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=0.97576	Eq. 1.1-3
ρ=0.79378	Eq. 1.1-2
b=0.408 in (ineffective width=0.106 in)	Eq. 1.1-1
Element 4: Stiffened, w=1.778 in	
f_1=46.553 ksi, f_2=-8.6584 ksi	
ψ=0.18599	Eq. 1.1.2-1
k=9.7083	Eq. 1.1.2-2
λ=0.68914	Eq. 1.1-3
ρ=0.98784	Eq. 1.1-2
be=1.7564 in	Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2	
b_1=0.55128 in	Eq. 1.1.2-3
b_2=1.2051 in	Eq. 1.1.2-5

Compression width=1.4992 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=-0.021856 in
Sye=0.13987 in³, Fy=50 ksi
Mnl=6.9933 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.778 in
f_1=44.303 ksi, f_2=-44.459 ksi
ψ=1.0035 Eq. 1.1.2-1
k=24.092 Eq. 1.1.2-2
λ=0.42677 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.778 in Eq. 1.1-1
h_o=2 in, b_o=12 in, h_o/b_o=0.16667
b_1=0.44411 in Eq. 1.1.2-3
b_2=0.889 in Eq. 1.1.2-4
Compression width=0.88744 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=48.981 ksi, f_2=48.981 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=9.708 Eq. 1.1-3
ρ=0.10067 Eq. 1.1-2
b=0.51736 in (ineffective width=4.6216 in) Eq. 1.1-1
f_1=48.981 ksi, f_2=48.981 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=9.708 Eq. 1.1-3
ρ=0.10067 Eq. 1.1-2
b=0.51736 in (ineffective width=4.6216 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=1.778 in
f_1=44.303 ksi, f_2=-44.459 ksi
ψ=1.0035 Eq. 1.1.2-1
k=24.091 Eq. 1.1.2-2
λ=0.42677 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.778 in Eq. 1.1-1
h_o=2 in, b_o=12 in, h_o/b_o=0.16667
b_1=0.44411 in Eq. 1.1.2-3
b_2=0.889 in Eq. 1.1.2-4
Compression width=0.88744 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.58726 in
Sye=0.11959 in³, Fy=50 ksi

Mnl=5.9796 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=7.1128 in^6, Wn=9.25 in^2, Fy=50 ksi
Bn=38.448 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

1200S200-43

Full Section Properties

Area	0.76258 in²	Wt.	0.0025928 k/ft	Flat	16.909 in
Ix	14.214 in⁴	rx	4.3173 in	Ixy	0.000 in⁴
Sx(t)	2.3690 in³	y(t)	6.0000 in	α	0.000 deg
Sx(b)	2.3690 in³	y(b)	6.0000 in		
Zx	2.9304 in³	Height	12.0000 in		
Iy	0.322 in⁴	ry	0.6495 in	x_o	-1.0372 in
Sy(l)	0.8498 in³	x(l)	0.3786 in	y_o	0.0000 in
Sy(r)	0.1984 in³	x(r)	1.6214 in	jx	8.1850 in
Zy	0.2764 in³	Width	2.0000 in	jy	0.0000 in
I_1	14.214 in⁴	r_1	4.3173 in	Cw	9.1064 in⁶
I_2	0.322 in⁴	r_2	0.6495 in	J	0.0005170 in⁴
Ic	14.536 in⁴	rc	4.3659 in		
I_o	15.356 in⁴	r_o	4.4874 in		

Net Section Properties

Ix	14.201 in⁴	rx	4.5206 in	Area	0.69493 in²
Sx(t)	2.3669 in³	y(t)	6.0000 in	Ixy	0.000 in⁴
Sx(b)	2.3669 in³	y(b)	6.0000 in	α	0.000 deg
Zx	2.9050 in³				
Iy	0.312 in⁴	ry	0.6704 in	x_o	-1.0724 in
Sy(l)	0.7557 in³	x(l)	0.4132 in	y_o	0.0000 in
Sy(r)	0.1968 in³	x(r)	1.5868 in	jx	7.6080 in
Zy	0.2755 in³			jy	0.0000 in
Ic	14.514 in⁴	rc	4.5700 in	Cw	9.1005 in⁶
I_o	15.313 in⁴	r_o	4.6941 in	J	0.0004712 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	10.663 k	ϕMnxo	60.761 k-in	ϕMnyo	8.668 k-in
Ae	0.25089 in²	Ixe	11.050 in⁴	Iye	0.307 in⁴
ϕTn	33.878 k	Sxe(t)	1.5190 in³	Sye(l)	0.7515 in³
		Sxe(b)	2.3385 in³	Sye(r)	0.1926 in³
Shear					
ϕVny	1.650 k	Negative Bending		Negative Bending	
ϕVnx	4.304 k	ϕMnxo	60.761 k-in	ϕMnyo	7.186 k-in
		Ixe	11.050 in⁴	Iye	0.169 in⁴
Torsion		Sxe(t)	2.3385 in³	Sye(l)	0.1803 in³
ϕBn	44.556 k-in²	Sxe(b)	1.5190 in³	Sye(r)	0.1597 in³

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Stud element 3 h/t exceeds 200.
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Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Fya=50.86 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Fya=53.526 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Fya=55.542 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	

Axial Tension Strength

Ag=0.76258 in², Fy=50.86 ksi	
Tn=38.785 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.69493 in², Fu=65 ksi	
Tn=45.17 k	Eq. D3-1
Ωt=2, ϕt=0.75	

Shear Strength

Stud element 2	
Vn=2.3913 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=14.858 k	Eq. G3-2
kv=4.4942	Eq. G3-8
Vcrh=0.75331 k	Eq. G3-6
h/t exceeds 200 (rational analysis)	
Vn=2.0621 k at 90 deg	Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)	
Stud element 4	
Vn=2.3913 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	

Axial Compression Strength

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.74488	Eq. 1.1-3
ρ=0.94599	Eq. 1.1-2
b=0.48123 in (ineffective width=0.027474 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00062038 in⁴	Eq. 1.3-8
Is=0.00049474 in⁴	
ds=0.38377 in (lip ineffective width=0.097452 in)	Eq. 1.3-6
k=3.2601	Table 1.3-1
Element 2: Partially stiffened, w=1.7674 in	
f=50 ksi, k=3.2601	
λ=0.93989	Eq. 1.1-3
ρ=0.81492	Eq. 1.1-2
b=1.4403 in (ineffective width=0.32712 in)	Eq. 1.1-1
b_1=0.57431 in, b_2=0.86598 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3

λ=7.5172	Eq. 1.1-3
ρ=0.12914	Eq. 1.1-2
b=0.66294 in (ineffective width=4.4708 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=7.5172	Eq. 1.1-3
ρ=0.12914	Eq. 1.1-2
b=0.66294 in (ineffective width=4.4708 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.5087 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.74488	Eq. 1.1-3
ρ=0.94599	Eq. 1.1-2
b=0.48123 in (ineffective width=0.027474 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00062038 in^4	Eq. 1.3-8
Is=0.00049474 in^4	
ds=0.38377 in (lip ineffective width=0.097452 in)	Eq. 1.3-6
k=3.2601	Table 1.3-1
Element 4: Partially stiffened, w=1.7674 in	
f=50 ksi, k=3.2601	
λ=0.93989	Eq. 1.1-3
ρ=0.81492	Eq. 1.1-2
b=1.4403 in (ineffective width=0.32712 in)	Eq. 1.1-1
b_1=0.57431 in, b_2=0.86598 in	
Ae=0.25089 in^2, Fn=50 ksi	
Pn=12.545 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=11.767 in	
h/t greater than 200, treat as rational analysis	
f_1=49.201 ksi, f_2=-31.681 ksi	
ψ=0.64392	Eq. 1.1.2-1
k=16.173	Eq. 1.1.2-2
λ=2.787	Eq. 1.1-3
ρ=0.33048	Eq. 1.1-2
be=3.8889 in	Eq. 1.1-1
h_o=12 in, b_o=2 in, h_o/b_o=6	
b_1=1.0672 in	Eq. 1.1.2-6
b_2=1.2984 in	Eq. 1.1.2-7
Compression width=7.1581 in	
Ineffective width=4.7925 in	
Element 5: Unstiffened, w=0.5087 in	

f_1=49.201 ksi, f_2=45.704 ksi	
ψ=0.92893	Eq. 1.2.2-1
k=0.4555	Eq. 1.2.2-2
λ=0.71792	Eq. 1.1-3
ρ=0.96607	Eq. 1.1-2
b=0.49144 in (ineffective width=0.017262 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.139	Eq. 1.3-7
Ia=0.00061945 in^4	Eq. 1.3-8
Is=0.00049474 in^4	
ds=0.39251 in (lip ineffective width=0.098932 in)	Eq. 1.3-6
k=3.2616	Table 1.3-1
Element 4: Partially stiffened, w=1.7674 in	
f=49.845 ksi, k=3.2616	
λ=0.93823	Eq. 1.1-3
ρ=0.81592	Eq. 1.1-2
b=1.4421 in (ineffective width=0.32535 in)	Eq. 1.1-1
b_1=0.57588 in, b_2=0.86618 in	
Center of gravity shift: y=-1.2746 in	
Sxe=1.519 in^3, Fy=50 ksi	
Mnl=75.951 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	
f_1=49.201 ksi, f_2=45.704 ksi	
ψ=0.92893	Eq. 1.2.2-1
k=0.4555	Eq. 1.2.2-2
λ=0.71792	Eq. 1.1-3
ρ=0.96607	Eq. 1.1-2
b=0.49144 in (ineffective width=0.017262 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.139	Eq. 1.3-7
Ia=0.00061945 in^4	Eq. 1.3-8
Is=0.00049474 in^4	
ds=0.39251 in (lip ineffective width=0.098932 in)	Eq. 1.3-6
k=3.2616	Table 1.3-1
Element 2: Partially stiffened, w=1.7674 in	
f=49.845 ksi, k=3.2616	
λ=0.93823	Eq. 1.1-3
ρ=0.81592	Eq. 1.1-2
b=1.4421 in (ineffective width=0.32535 in)	Eq. 1.1-1
b_1=0.57588 in, b_2=0.86618 in	
Element 3: Stiffened, w=11.767 in	
h/t greater than 200, treat as rational analysis	
f_1=49.201 ksi, f_2=-31.681 ksi	
ψ=0.64392	Eq. 1.1.2-1
k=16.173	Eq. 1.1.2-2
λ=2.787	Eq. 1.1-3

ρ=0.33048	Eq. 1.1-2
be=3.8889 in	Eq. 1.1-1
h_o=12 in, b_o=2 in, h_o/b_o=6	
b_1=1.0672 in	Eq. 1.1.2-6
b_2=1.2984 in	Eq. 1.1.2-7
Compression width=7.1581 in	
Ineffective width=4.7925 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=1.2746 in	
Sxe=1.519 in^3, Fy=50 ksi	
Mnl=75.951 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	
f_1=49.292 ksi, f_2=49.292 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.73959	Eq. 1.1-3
ρ=0.9499	Eq. 1.1-2
b=0.48322 in (ineffective width=0.025483 in)	Eq. 1.1-1
Element 2: Stiffened, w=1.7674 in	
f_1=46.347 ksi, f_2=-9.1627 ksi	
ψ=0.1977	Eq. 1.1.2-1
k=9.8315	Eq. 1.1.2-2
λ=0.52109	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.7674 in	Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2	
b_1=0.55271 in	Eq. 1.1.2-3
b_2=1.2147 in	Eq. 1.1.2-5
Compression width=1.4757 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.5087 in	
f_1=49.292 ksi, f_2=49.292 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.73959	Eq. 1.1-3
ρ=0.94991	Eq. 1.1-2
b=0.48322 in (ineffective width=0.025483 in)	Eq. 1.1-1
Element 4: Stiffened, w=1.7674 in	
f_1=46.347 ksi, f_2=-9.1627 ksi	
ψ=0.1977	Eq. 1.1.2-1
k=9.8315	Eq. 1.1.2-2
λ=0.52109	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.7674 in	Eq. 1.1-1

h_o=2 in, b_o=0.625 in, h_o/b_o=3.2
b_1=0.55271 in Eq. 1.1.2-3
b_2=1.2147 in Eq. 1.1.2-5
Compression width=1.4757 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=-0.0051911 in
Sye=0.19262 in^3, Fy=50 ksi
Mnl=9.6311 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=1.7674 in
f_1=38.735 ksi, f_2=-44.521 ksi
ψ=1.1494 Eq. 1.1.2-1
k=28.158 Eq. 1.1.2-2
λ=0.28149 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.7674 in Eq. 1.1-1
h_o=2 in, b_o=12 in, h_o/b_o=0.16667
b_1=0.42594 in Eq. 1.1.2-3
b_2=0.8837 in Eq. 1.1.2-4
Compression width=0.82228 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=43.152 ksi, f_2=43.152 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=6.9834 Eq. 1.1-3
ρ=0.13869 Eq. 1.1-2
b=0.71197 in (ineffective width=4.4217 in) Eq. 1.1-1
f_1=43.152 ksi, f_2=43.152 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=6.9834 Eq. 1.1-3
ρ=0.13869 Eq. 1.1-2
b=0.71197 in (ineffective width=4.4217 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=1.7674 in
f_1=38.735 ksi, f_2=-44.521 ksi
ψ=1.1494 Eq. 1.1.2-1
k=28.158 Eq. 1.1.2-2
λ=0.28149 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=1.7674 in Eq. 1.1-1
h_o=2 in, b_o=12 in, h_o/b_o=0.16667
b_1=0.42594 in Eq. 1.1.2-3
b_2=0.8837 in Eq. 1.1.2-4
Compression width=0.82228 in

b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.52625 in
Sye=0.15969 in^3, Fy=50 ksi
Mnl=7.9843 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=9.1005 in^6, Wn=9.1911 in^2, Fy=50 ksi
Bn=49.507 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

1200S200-54

Full Section Properties

Area	0.95254 in²	Wt.	0.0032386 k/ft	Flat	16.829 in
Ix	17.663 in⁴	rx	4.3062 in	Ixy	0.000 in⁴
Sx(t)	2.9438 in³	y(t)	6.0000 in	α	0.000 deg
Sx(b)	2.9438 in³	y(b)	6.0000 in		
Zx	3.6495 in³	Height	12.0000 in		
Iy	0.394 in⁴	ry	0.6430 in	x_o	-1.0246 in
Sy(l)	1.0383 in³	x(l)	0.3793 in	y_o	0.0000 in
Sy(r)	0.2430 in³	x(r)	1.6207 in	jx	8.2253 in
Zy	0.3421 in³	Width	2.0000 in	jy	0.0000 in
I_1	17.663 in⁴	r_1	4.3062 in	Cw	11.119 in⁶
I_2	0.394 in⁴	r_2	0.6430 in	J	0.0010172 in⁴
Ic	18.057 in⁴	rc	4.3539 in		
I_o	19.057 in⁴	r_o	4.4728 in		

Net Section Properties

Ix	17.647 in⁴	rx	4.5099 in	Area	0.86764 in²
Sx(t)	2.9412 in³	y(t)	6.0000 in	Ixy	0.000 in⁴
Sx(b)	2.9412 in³	y(b)	6.0000 in	α	0.000 deg
Zx	3.6177 in³				
Iy	0.382 in⁴	ry	0.6638 in	x_o	-1.0595 in
Sy(l)	0.9243 in³	x(l)	0.4137 in	y_o	0.0000 in
Sy(r)	0.2410 in³	x(r)	1.5863 in	jx	7.6448 in
Zy	0.3406 in³			jy	0.0000 in
Ic	18.029 in⁴	rc	4.5585 in	Cw	11.112 in⁶
I_o	19.003 in⁴	r_o	4.6800 in	J	0.0009265 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	14.344 k	ϕMnxo	81.236 k-in	ϕMnyo	12.327 k-in
Ae	0.33752 in²	Ixe	14.415 in⁴	Iye	0.382 in⁴
ϕTn	42.297 k	Sxe(t)	2.0309 in³	Sye(l)	0.9243 in³
		Sxe(b)	2.9405 in³	Sye(r)	0.2410 in³
Shear					
ϕVny	2.745 k	Negative Bending		Negative Bending	
ϕVnx	5.248 k	ϕMnxo	81.236 k-in	ϕMnyo	9.143 k-in
		Ixe	14.415 in⁴	Iye	0.230 in⁴
Torsion		Sxe(t)	2.9405 in³	Sye(l)	0.2637 in³
ϕBn	54.765 k-in²	Sxe(b)	2.0309 in³	Sye(r)	0.2032 in³

```
Stud element 3 h/t exceeds 200.
```

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Fya=51.073 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Fya=54.356 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Fya=56.825 ksi	Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi	

Axial Tension Strength

Ag=0.95254 in², Fy=51.073 ksi	
Tn=48.649 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.86764 in², Fu=65 ksi	
Tn=56.396 k	Eq. D3-1
Ωt=2, ϕt=0.75	

Shear Strength

Stud element 2	
Vn=2.9155 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=18.541 k	Eq. G3-2
kv=4.4926	Eq. G3-8
Vcrh=1.4934 k	Eq. G3-6
h/t exceeds 200 (rational analysis)	
Vn=3.4309 k at 90 deg	Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)	
Stud element 4	
Vn=2.9155 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	

Axial Compression Strength

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4835 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56413	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0011127 in⁴	Eq. 1.3-8
Is=0.00053312 in⁴	
ds=0.23166 in (lip ineffective width=0.25184 in)	Eq. 1.3-6
k=2.7693	Table 1.3-1
Element 2: Partially stiffened, w=1.717 in	
f=50 ksi, k=2.7693	
λ=0.78941	Eq. 1.1-3
ρ=0.91373	Eq. 1.1-2
b=1.5689 in (ineffective width=0.14812 in)	Eq. 1.1-1
b_1=0.37585 in, b_2=1.193 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=5.9604	Eq. 1.1-3
ρ=0.16158	Eq. 1.1-2

b=0.82543 in (ineffective width=4.2831 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=5.9604	Eq. 1.1-3
ρ=0.16158	Eq. 1.1-2
b=0.82543 in (ineffective width=4.2831 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4835 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56413	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0011127 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.23166 in (lip ineffective width=0.25184 in)	Eq. 1.3-6
k=2.7693	Table 1.3-1
Element 4: Partially stiffened, w=1.717 in	
f=50 ksi, k=2.7693	
λ=0.78941	Eq. 1.1-3
ρ=0.91373	Eq. 1.1-2
b=1.5689 in (ineffective width=0.14812 in)	Eq. 1.1-1
b_1=0.37585 in, b_2=1.193 in	
Ae=0.33752 in^2, Fn=50 ksi	
Pn=16.876 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=11.717 in	
h/t greater than 200, treat as rational analysis	
f_1=49.003 ksi, f_2=-33.54 ksi	
ψ=0.68444	Eq. 1.1.2-1
k=16.927	Eq. 1.1.2-2
λ=2.1571	Eq. 1.1-3
ρ=0.41631	Eq. 1.1-2
be=4.8779 in	Eq. 1.1-1
h_o=12 in, b_o=2 in, h_o/b_o=6	
b_1=1.3239 in	Eq. 1.1.2-6
b_2=1.5719 in	Eq. 1.1.2-7
Compression width=6.956 in	
Ineffective width=4.0602 in	
Element 5: Unstiffened, w=0.4835 in	
f_1=49.003 ksi, f_2=45.597 ksi	
ψ=0.93049	Eq. 1.2.2-1
k=0.45494	Eq. 1.2.2-2

λ=0.54296	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.153	Eq. 1.3-7
Ia=0.0011027 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.23376 in (lip ineffective width=0.24974 in)	Eq. 1.3-6
k=2.7756	Table 1.3-1
Element 4: Partially stiffened, w=1.717 in	
f=49.801 ksi, k=2.7756	
λ=0.78694	Eq. 1.1-3
ρ=0.91549	Eq. 1.1-2
b=1.5719 in (ineffective width=0.1451 in)	Eq. 1.1-1
b_1=0.37999 in, b_2=1.1919 in	
Center of gravity shift: y=-1.0978 in	
Sxe=2.0309 in^3, Fy=50 ksi	
Mnl=101.54 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4835 in	
f_1=49.003 ksi, f_2=45.597 ksi	
ψ=0.93049	Eq. 1.2.2-1
k=0.45494	Eq. 1.2.2-2
λ=0.54296	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.153	Eq. 1.3-7
Ia=0.0011027 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.23376 in (lip ineffective width=0.24974 in)	Eq. 1.3-6
k=2.7756	Table 1.3-1
Element 2: Partially stiffened, w=1.717 in	
f=49.801 ksi, k=2.7756	
λ=0.78694	Eq. 1.1-3
ρ=0.91549	Eq. 1.1-2
b=1.5719 in (ineffective width=0.1451 in)	Eq. 1.1-1
b_1=0.37999 in, b_2=1.1919 in	
Element 3: Stiffened, w=11.717 in	
h/t greater than 200, treat as rational analysis	
f_1=49.003 ksi, f_2=-33.54 ksi	
ψ=0.68444	Eq. 1.1.2-1
k=16.927	Eq. 1.1.2-2
λ=2.1571	Eq. 1.1-3
ρ=0.41631	Eq. 1.1-2
be=4.8779 in	Eq. 1.1-1
h_o=12 in, b_o=2 in, h_o/b_o=6	
b_1=1.3239 in	Eq. 1.1.2-6
b_2=1.5719 in	Eq. 1.1.2-7

Compression width=6.956 in
Ineffective width=4.0602 in
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=1.0978 in
Sxe=2.0309 in³, Fy=50 ksi
Mnl=101.54 k-in — Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.4835 in
f_1=55.812 ksi, f_2=55.812 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.59602 — Eq. 1.1-3
λ<0.673 (fully effective) — Eq. 1.1-1
Element 2: Stiffened, w=1.717 in
f_1=51.757 ksi, f_2=-9.749 ksi
ψ=0.18836 — Eq. 1.1.2-1
k=9.7332 — Eq. 1.1.2-2
λ=0.42841 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=1.717 in — Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2
b_1=0.53852 in — Eq. 1.1.2-3
b_2=1.1785 in — Eq. 1.1.2-5
Compression width=1.4448 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.4835 in
f_1=55.812 ksi, f_2=55.812 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.59602 — Eq. 1.1-3
λ<0.673 (fully effective) — Eq. 1.1-1
Element 4: Stiffened, w=1.717 in
f_1=51.757 ksi, f_2=-9.749 ksi
ψ=0.18836 — Eq. 1.1.2-1
k=9.7332 — Eq. 1.1.2-2
λ=0.42841 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=1.717 in — Eq. 1.1-1
h_o=2 in, b_o=0.625 in, h_o/b_o=3.2
b_1=0.53852 in — Eq. 1.1.2-3
b_2=1.1785 in — Eq. 1.1.2-5
Compression width=1.4448 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0 in
Sye=0.24102 in³, Fy=56.825 ksi

Mnl=13.696 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Stud

Element 1: No compressive stress (fully effective)

Element 2: Stiffened, w=1.717 in

f_1=32.169 ksi, f_2=-43.744 ksi	
ψ=1.3598	Eq. 1.1.2-1
k=35.003	Eq. 1.1.2-2
λ=0.1781	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.717 in	Eq. 1.1-1
h_o=2 in, b_o=12 in, h_o/b_o=0.16667	
b_1=0.39382 in	Eq. 1.1.2-3
b_2=0.8585 in	Eq. 1.1.2-4
Compression width=0.72759 in	
b_1+b_2 > compression width (fully effective)	

Element 3: Treat as two unstiffened elements

f_1=37.173 ksi, f_2=37.173 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=5.1394	Eq. 1.1-3
ρ=0.18625	Eq. 1.1-2
b=0.95145 in (ineffective width=4.1571 in)	Eq. 1.1-1
f_1=37.173 ksi, f_2=37.173 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=5.1394	Eq. 1.1-3
ρ=0.18625	Eq. 1.1-2
b=0.95145 in (ineffective width=4.1571 in)	Eq. 1.1-1

Element 5: No compressive stress (fully effective)

Element 4: Stiffened, w=1.717 in

f_1=32.169 ksi, f_2=-43.744 ksi	
ψ=1.3598	Eq. 1.1.2-1
k=35.003	Eq. 1.1.2-2
λ=0.1781	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=1.717 in	Eq. 1.1-1
h_o=2 in, b_o=12 in, h_o/b_o=0.16667	
b_1=0.39382 in	Eq. 1.1.2-3
b_2=0.8585 in	Eq. 1.1.2-4
Compression width=0.72759 in	
b_1+b_2 > compression width (fully effective)	

Center of gravity shift: x=0.45671 in

Sye=0.20318 in^3, Fy=50 ksi	
Mnl=10.159 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Stud

C_w=11.112 in^6, W_n=9.1304 in^2, F_y=50 ksi
B_n=60.85 k-in^2 G8.1-1
Ω_b=1.67, ϕ_b=0.9

1200S200-68

Full Section Properties

Area	1.1921 in²	Wt.	0.0040533 k/ft	Flat	16.720 in
Ix	21.949 in⁴	rx	4.2909 in	Ixy	0.000 in⁴
Sx(t)	3.6582 in³	y(t)	6.0000 in	α	0.000 deg
Sx(b)	3.6582 in³	y(b)	6.0000 in		
Zx	4.5489 in³	Height	12.0000 in		
Iy	0.480 in⁴	ry	0.6343 in	x_o	-1.0078 in
Sy(l)	1.2624 in³	x(l)	0.3800 in	y_o	0.0000 in
Sy(r)	0.2961 in³	x(r)	1.6200 in	jx	8.2819 in
Zy	0.4227 in³	Width	2.0000 in	jy	0.0000 in
I_1	21.949 in⁴	r_1	4.2909 in	Cw	13.492 in⁶
I_2	0.480 in⁴	r_2	0.6343 in	J	0.0020202 in⁴
Ic	22.429 in⁴	rc	4.3375 in		
I_o	23.640 in⁴	r_o	4.4530 in		

Net Section Properties

Ix	21.929 in⁴	rx	4.4953 in	Area	1.0852 in²
Sx(t)	3.6548 in³	y(t)	6.0000 in	Ixy	0.000 in⁴
Sx(b)	3.6548 in³	y(b)	6.0000 in	α	0.000 deg
Zx	4.5088 in³				
Iy	0.466 in⁴	ry	0.6551 in	x_o	-1.0424 in
Sy(l)	1.1252 in³	x(l)	0.4139 in	y_o	0.0000 in
Sy(r)	0.2936 in³	x(r)	1.5861 in	jx	7.6970 in
Zy	0.4204 in³			jy	0.0000 in
Ic	22.395 in⁴	rc	4.5428 in	Cw	13.483 in⁶
I_o	23.574 in⁴	r_o	4.6608 in	J	0.0018389 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	20.881 k	ϕMnxo	130.99 k-in	ϕMnyo	15.45 k-in
Ae	0.49133 in²	Ixe	19.554 in⁴	Iye	0.466 in⁴
ϕTn	52.903 k	Sxe(t)	2.9109 in³	Sye(l)	1.1252 in³
		Sxe(b)	3.7018 in³	Sye(r)	0.2936 in³
Shear					
ϕVny	5.154 k	Negative Bending		Negative Bending	
ϕVnx	6.328 k	ϕMnxo	130.99 k-in	ϕMnyo	11.59 k-in
		Ixe	19.554 in⁴	Iye	0.312 in⁴
Torsion		Sxe(t)	3.7018 in³	Sye(l)	0.3967 in³
ϕBn	67.021 k-in²	Sxe(b)	2.9109 in³	Sye(r)	0.2575 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=51.36 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=55.437 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=58.477 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=1.1921 in², Fy=51.36 ksi

Tn=61.229 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=1.0852 in², Fu=65 ksi	
Tn=70.537 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=3.5157 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=23.162 k	Eq. G3-2
kv=4.4903	Eq. G3-8
Vcrh=2.9983 k	Eq. G3-6
Vn=5.7267 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=3.5157 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4468 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41383	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00072868 in⁴	Eq. 1.3-8
Is=0.00052997 in⁴	
ds=0.32495 in (lip ineffective width=0.12185 in)	Eq. 1.3-6
k=3.0024	Table 1.3-1
Element 2: Partially stiffened, w=1.6436 in	
f=50 ksi, k=3.0024	
λ=0.57612	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.6976	Eq. 1.1-3
ρ=0.20291	Eq. 1.1-2
b=1.0291 in (ineffective width=4.0427 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.6976	Eq. 1.1-3

ρ=0.20291	Eq. 1.1-2
b=1.0291 in (ineffective width=4.0427 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4468 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41383	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00072868 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.32495 in (lip ineffective width=0.12185 in)	Eq. 1.3-6
k=3.0024	Table 1.3-1
Element 4: Partially stiffened, w=1.6436 in	
f=50 ksi, k=3.0024	
λ=0.57612	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Ae=0.49133 in^2, Fn=50 ksi	
Pn=24.566 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=11.644 in	
f_1=48.673 ksi, f_2=-38.031 ksi	
ψ=0.78136	Eq. 1.1.2-1
k=18.868	Eq. 1.1.2-2
λ=1.6063	Eq. 1.1-3
ρ=0.53728	Eq. 1.1-2
be=6.2559 in	Eq. 1.1-1
h_o=12 in, b_o=2 in, h_o/b_o=6	
b_1=1.6544 in	Eq. 1.1.2-6
b_2=1.8575 in	Eq. 1.1.2-7
Compression width=6.5364 in	
Ineffective width=3.0245 in	
Element 5: Unstiffened, w=0.4468 in	
f_1=48.673 ksi, f_2=45.346 ksi	
ψ=0.93164	Eq. 1.2.2-1
k=0.45453	Eq. 1.2.2-2
λ=0.39713	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.174	Eq. 1.3-7
Ia=0.00071831 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.32965 in (lip ineffective width=0.11715 in)	Eq. 1.3-6
k=3.0167	Table 1.3-1

Element 4: Partially stiffened, w=1.6436 in
f=49.735 ksi, k=3.0167
λ=0.57322 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Center of gravity shift: y=-0.71757 in
Sxe=2.9109 in³, Fy=50 ksi
Mnl=145.55 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.4468 in
f_1=48.673 ksi, f_2=45.346 ksi
ψ=0.93164 Eq. 1.2.2-1
k=0.45453 Eq. 1.2.2-2
λ=0.39713 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.174 Eq. 1.3-7
Ia=0.00071831 in⁴ Eq. 1.3-8
Is=0.00052997 in⁴
ds=0.32965 in (lip ineffective width=0.11715 in) Eq. 1.3-6
k=3.0167 Table 1.3-1
Element 2: Partially stiffened, w=1.6436 in
f=49.735 ksi, k=3.0167
λ=0.57322 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 3: Stiffened, w=11.644 in
f_1=48.673 ksi, f_2=-38.031 ksi
ψ=0.78136 Eq. 1.1.2-1
k=18.868 Eq. 1.1.2-2
λ=1.6063 Eq. 1.1-3
ρ=0.53728 Eq. 1.1-2
be=6.2559 in Eq. 1.1-1
h_o=12 in, b_o=2 in, h_o/b_o=6
b_1=1.6544 in Eq. 1.1.2-6
b_2=1.8575 in Eq. 1.1.2-7
Compression width=6.5364 in
Ineffective width=3.0245 in
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=0.71756 in
Sxe=2.9109 in³, Fy=50 ksi
Mnl=145.55 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.4468 in
f_1=57.162 ksi, f_2=57.162 ksi

```
      ψ=1                                                Eq. 1.2.2-1
      k=0.43                                             Eq. 1.2.2-3
      λ=0.44248                                          Eq. 1.1-3
      λ<0.673 (fully effective)                          Eq. 1.1-1
    Element 2: Stiffened, w=1.6436 in
      f₁=51.907 ksi, f₂=-8.6905 ksi
      ψ=0.16743                                          Eq. 1.1.2-1
      k=9.517                                            Eq. 1.1.2-2
      λ=0.3297                                           Eq. 1.1-3
      ρ=1                                                Eq. 1.1-2
      be=1.6436 in                                       Eq. 1.1-1
      h₀=2 in, b₀=0.625 in, h₀/b₀=3.2
      b₁=0.51891 in                                      Eq. 1.1.2-3
      b₂=1.1247 in                                       Eq. 1.1.2-5
      Compression width=1.4079 in
      b₁+b₂ > compression width (fully effective)
    Element 3: No compressive stress (fully effective)
    Element 5: Unstiffened, w=0.4468 in
      f₁=57.162 ksi, f₂=57.162 ksi
      ψ=1                                                Eq. 1.2.2-1
      k=0.43                                             Eq. 1.2.2-3
      λ=0.44248                                          Eq. 1.1-3
      λ<0.673 (fully effective)                          Eq. 1.1-1
    Element 4: Stiffened, w=1.6436 in
      f₁=51.907 ksi, f₂=-8.6905 ksi
      ψ=0.16743                                          Eq. 1.1.2-1
      k=9.517                                            Eq. 1.1.2-2
      λ=0.3297                                           Eq. 1.1-3
      ρ=1                                                Eq. 1.1-2
      be=1.6436 in                                       Eq. 1.1-1
      h₀=2 in, b₀=0.625 in, h₀/b₀=3.2
      b₁=0.51891 in                                      Eq. 1.1.2-3
      b₂=1.1247 in                                       Eq. 1.1.2-5
      Compression width=1.4079 in
      b₁+b₂ > compression width (fully effective)
  Center of gravity shift: x=0 in
  Sye=0.29363 in³, Fy=58.477 ksi
  Mnl=17.171 k-in                                        Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
  Effective width calculations for Stud
    Element 1: No compressive stress (fully effective)
    Element 2: Stiffened, w=1.6436 in
      f₁=25.011 ksi, f₂=-42.663 ksi
      ψ=1.7057                                           Eq. 1.1.2-1
      k=49.029                                           Eq. 1.1.2-2
      λ=0.10083                                          Eq. 1.1-3
      ρ=1                                                Eq. 1.1-2
      be=1.6436 in                                       Eq. 1.1-1
      h₀=2 in, b₀=12 in, h₀/b₀=0.16667
      b₁=0.34928 in                                      Eq. 1.1.2-3
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```
      b₂=0.8218 in                                          Eq. 1.1.2-4
      Compression width=0.60745 in
      b₁+b₂ > compression width (fully effective)
    Element 3: Treat as two unstiffened elements
      f₁=30.881 ksi, f₂=30.881 ksi
      ψ=1                                                   Eq. 1.2.2-1
      k=0.43                                                Eq. 1.2.2-3
      λ=3.6918                                              Eq. 1.1-3
      ρ=0.25473                                             Eq. 1.1-2
      b=1.292 in (ineffective width=3.7799 in)              Eq. 1.1-1
      f₁=30.881 ksi, f₂=30.881 ksi
      ψ=1                                                   Eq. 1.2.2-1
      k=0.43                                                Eq. 1.2.2-2
      λ=3.6918                                              Eq. 1.1-3
      ρ=0.25473                                             Eq. 1.1-2
      b=1.292 in (ineffective width=3.7799 in)              Eq. 1.1-1
    Element 5: No compressive stress (fully effective)
    Element 4: Stiffened, w=1.6436 in
      f₁=25.011 ksi, f₂=-42.663 ksi
      ψ=1.7057                                              Eq. 1.1.2-1
      k=49.029                                              Eq. 1.1.2-2
      λ=0.10083                                             Eq. 1.1-3
      ρ=1                                                   Eq. 1.1-2
      be=1.6436 in                                          Eq. 1.1-1
      h₀=2 in, b₀=12 in, h₀/b₀=0.16667
      b₁=0.34928 in                                         Eq. 1.1.2-3
      b₂=0.8218 in                                          Eq. 1.1.2-4
      Compression width=0.60745 in
      b₁+b₂ > compression width (fully effective)
  Center of gravity shift: x=0.3733 in
  Sye=0.25747 in³, Fy=50 ksi
  Mnl=12.874 k-in                                           Eq. F3.1-1
  Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
  Cw=13.483 in⁶, Wn=9.0531 in², Fy=50 ksi
  Bn=74.467 k-in²                                           G8.1-1
  Ωb=1.67, ϕb=0.9
```

1200S250-30

Full Section Properties

Area	0.56049 in²	Wt.	0.0019057 k/ft	Flat	17.964 in
Ix	11.022 in⁴	rx	4.4346 in	Ixy	0.000 in⁴
Sx(t)	1.8370 in³	y(t)	6.0000 in	α	0.000 deg
Sx(b)	1.8370 in³	y(b)	6.0000 in		
Zx	2.2252 in³	Height	12.0000 in		
Iy	0.392 in⁴	ry	0.8359 in	x_o	-1.3970 in
Sy(l)	0.7658 in³	x(l)	0.5113 in	y_o	0.0000 in
Sy(r)	0.1969 in³	x(r)	1.9887 in	jx	7.2929 in
Zy	0.2800 in³	Width	2.5000 in	jy	0.0000 in
I_1	11.022 in⁴	r_1	4.4346 in	Cw	10.861 in⁶
I_2	0.392 in⁴	r_2	0.8359 in	J	0.0001819 in⁴
Ic	11.414 in⁴	rc	4.5127 in		
I_o	12.508 in⁴	r_o	4.7240 in		

Net Section Properties

Ix	11.014 in⁴	rx	4.6303 in	Area	0.51369 in²
Sx(t)	1.8356 in³	y(t)	6.0000 in	Ixy	0.000 in⁴
Sx(b)	1.8356 in³	y(b)	6.0000 in	α	0.000 deg
Zx	2.2076 in³				
Iy	0.379 in⁴	ry	0.8590 in	x_o	-1.4429 in
Sy(l)	0.6811 in³	x(l)	0.5565 in	y_o	0.0000 in
Sy(r)	0.1950 in³	x(r)	1.9435 in	jx	6.8233 in
Zy	0.2795 in³			jy	0.0000 in
Ic	11.393 in⁴	rc	4.7094 in	Cw	10.854 in⁶
I_o	12.462 in⁴	r_o	4.9254 in	J	0.0001667 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	6.257 k	ϕMnxo	36.344 k-in	ϕMnyo	7.712 k-in
Ae	0.14723 in²	Ixe	7.1375 in⁴	Iye	0.3404 in⁴
ϕTn	25.042 k	Sxe(t)	0.9086 in³	Sye(l)	0.6622 in³
		Sxe(b)	1.7222 in³	Sye(r)	0.1714 in³
Shear					
ϕVny	0.719 k	Negative Bending		Negative Bending	
ϕVnx	2.734 k	ϕMnxo	36.344 k-in	ϕMnyo	6.445 k-in
		Ixe	7.1375 in⁴	Iye	0.1815 in⁴
Torsion		Sxe(t)	1.7222 in³	Sye(l)	0.1432 in³
ϕBn	42.758 k-in²	Sxe(b)	0.9086 in³	Sye(r)	0.1472 in³

```
Stud element 3 h/t exceeds 300.
Stud element 3 h/t exceeds 200.
```

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=50.613 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=52.136 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=54.15 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	

Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.56049 in², Fy=50.613 ksi
Tn=28.368 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.51369 in², Fu=65 ksi
Tn=33.39 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Stud element 2
Vn=1.519 k at 180 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Stud element 3
Vyh=10.295 k — Eq. G3-2
kv=4.5188 — Eq. G3-8
Vcrh=0.25054 k — Eq. G3-6
h/t exceeds 200 (rational analysis)
Vn=0.89925 k at 90 deg — Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)
Stud element 4
Vn=1.519 k at 0 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Stud
Element 1: Unstiffened, w=0.5157 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=1.0916 — Eq. 1.1-3
ρ=0.73148 — Eq. 1.1-2
b=0.37723 in (ineffective width=0.13847 in) — Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.091 — Eq. 1.3-7
Ia=0.00026103 in⁴ — Eq. 1.3-8
Is=0.00035659 in⁴ > Ia (no lip reduction)
k=3.8802 — Table 1.3-1
Element 2: Partially stiffened, w=2.2814 in
f=50 ksi, k=3.8802
λ=1.6075 — Eq. 1.1-3
ρ=0.53694 — Eq. 1.1-2
b=1.225 in (ineffective width=1.0564 in) — Eq. 1.1-1
b_1=0.61249 in, b_2=0.61249 in
Element 3: Treat as two unstiffened elements
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3

λ=10.881	Eq. 1.1-3
ρ=0.090045	Eq. 1.1-2
b=0.4629 in (ineffective width=4.6778 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=10.881	Eq. 1.1-3
ρ=0.090045	Eq. 1.1-2
b=0.4629 in (ineffective width=4.6778 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.5157 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.0916	Eq. 1.1-3
ρ=0.73148	Eq. 1.1-2
b=0.37723 in (ineffective width=0.13847 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00026103 in^4	Eq. 1.3-8
Is=0.00035659 in^4 > Ia (no lip reduction)	
k=3.8802	Table 1.3-1
Element 4: Partially stiffened, w=2.2814 in	
f=50 ksi, k=3.8802	
λ=1.6075	Eq. 1.1-3
ρ=0.53694	Eq. 1.1-2
b=1.225 in (ineffective width=1.0564 in)	Eq. 1.1-1
b_1=0.61249 in, b_2=0.61249 in	
Ae=0.14723 in^2, Fn=50 ksi	
Pn=7.3615 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=11.781 in	
h/t greater than 200, treat as rational analysis	
f_1=49.304 ksi, f_2=-25.693 ksi	
ψ=0.52112	Eq. 1.1.2-1
k=14.081	Eq. 1.1.2-2
λ=4.3273	Eq. 1.1-3
ρ=0.21934	Eq. 1.1-2
be=2.5842 in	Eq. 1.1-1
h_o=12 in, b_o=2.5 in, h_o/b_o=4.8	
b_1=0.73391 in	Eq. 1.1.2-6
b_2=0.96496 in	Eq. 1.1.2-7
Compression width=7.7452 in	
Ineffective width=6.0464 in	
Element 5: Unstiffened, w=0.5157 in	
f_1=49.304 ksi, f_2=46.021 ksi	

ψ=0.93342	Eq. 1.2.2-1
k=0.4539	Eq. 1.2.2-2
λ=1.055	Eq. 1.1-3
ρ=0.7502	Eq. 1.1-2
b=0.38688 in (ineffective width=0.12882 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.122	Eq. 1.3-7
Ia=0.00026077 in^4	Eq. 1.3-8
Is=0.00035659 in^4 > Ia (no lip reduction)	
k=3.8802	Table 1.3-1
Element 4: Partially stiffened, w=2.2814 in	
f=49.901 ksi, k=3.8802	
λ=1.6059	Eq. 1.1-3
ρ=0.53739	Eq. 1.1-2
b=1.226 in (ineffective width=1.0554 in)	Eq. 1.1-1
b_1=0.613 in, b_2=0.613 in	
Center of gravity shift: y=-1.8556 in	
Sxe=0.9086 in^3, Fy=50 ksi	
Mnl=45.43 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5157 in	
f_1=49.304 ksi, f_2=46.021 ksi	
ψ=0.93342	Eq. 1.2.2-1
k=0.4539	Eq. 1.2.2-2
λ=1.055	Eq. 1.1-3
ρ=0.7502	Eq. 1.1-2
b=0.38688 in (ineffective width=0.12882 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.122	Eq. 1.3-7
Ia=0.00026077 in^4	Eq. 1.3-8
Is=0.00035659 in^4 > Ia (no lip reduction)	
k=3.8802	Table 1.3-1
Element 2: Partially stiffened, w=2.2814 in	
f=49.901 ksi, k=3.8802	
λ=1.6059	Eq. 1.1-3
ρ=0.53739	Eq. 1.1-2
b=1.226 in (ineffective width=1.0554 in)	Eq. 1.1-1
b_1=0.613 in, b_2=0.613 in	
Element 3: Stiffened, w=11.781 in	
h/t greater than 200, treat as rational analysis	
f_1=49.304 ksi, f_2=-25.693 ksi	
ψ=0.52112	Eq. 1.1.2-1
k=14.081	Eq. 1.1.2-2
λ=4.3273	Eq. 1.1-3
ρ=0.21934	Eq. 1.1-2
be=2.5842 in	Eq. 1.1-1
h_o=12 in, b_o=2.5 in, h_o/b_o=4.8	

b_1=0.73391 in	Eq. 1.1.2-6
b_2=0.96496 in	Eq. 1.1.2-7
Compression width=7.7452 in	
Ineffective width=6.0464 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=1.8556 in	
Sxe=0.9086 in^3, Fy=50 ksi	
Mnl=45.43 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5157 in	
f_1=49.607 ksi, f_2=49.607 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.0873	Eq. 1.1-3
ρ=0.73364	Eq. 1.1-2
b=0.37834 in (ineffective width=0.13736 in)	Eq. 1.1-1
Element 2: Stiffened, w=2.2814 in	
f_1=47.249 ksi, f_2=-10.178 ksi	
ψ=0.21542	Eq. 1.1.2-1
k=10.022	Eq. 1.1.2-2
λ=0.97235	Eq. 1.1-3
ρ=0.79575	Eq. 1.1-2
be=1.8154 in	Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4	
b_1=0.5646 in	Eq. 1.1.2-3
b_2=1.2508 in	Eq. 1.1.2-5
Compression width=1.8771 in	
Ineffective width=0.061632 in	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.5157 in	
f_1=49.607 ksi, f_2=49.607 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.0873	Eq. 1.1-3
ρ=0.73364	Eq. 1.1-2
b=0.37834 in (ineffective width=0.13736 in)	Eq. 1.1-1
Element 4: Stiffened, w=2.2814 in	
f_1=47.249 ksi, f_2=-10.178 ksi	
ψ=0.21542	Eq. 1.1.2-1
k=10.022	Eq. 1.1.2-2
λ=0.97235	Eq. 1.1-3
ρ=0.79575	Eq. 1.1-2
be=1.8154 in	Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4	
b_1=0.5646 in	Eq. 1.1.2-3
b_2=1.2508 in	Eq. 1.1.2-5

Compression width=1.8771 in
Ineffective width=0.061631 in
Center of gravity shift: x=-0.04247 in
Sye=0.17139 in³, Fy=50 ksi
Mnl=8.5694 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=2.2814 in
f_1=45.688 ksi, f_2=-44.32 ksi
ψ=0.97006 Eq. 1.1.2-1
k=23.232 Eq. 1.1.2-2
λ=0.62799 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.2814 in Eq. 1.1-1
h_o=2.5 in, b_o=12 in, h_o/b_o=0.20833
b_1=0.57465 in Eq. 1.1.2-3
b_2=1.1407 in Eq. 1.1.2-4
Compression width=1.158 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=49.385 ksi, f_2=49.385 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=10.814 Eq. 1.1-3
ρ=0.090593 Eq. 1.1-2
b=0.46571 in (ineffective width=4.675 in) Eq. 1.1-1
f_1=49.385 ksi, f_2=49.385 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=10.814 Eq. 1.1-3
ρ=0.090593 Eq. 1.1-2
b=0.46571 in (ineffective width=4.675 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=2.2814 in
f_1=45.688 ksi, f_2=-44.32 ksi
ψ=0.97006 Eq. 1.1.2-1
k=23.232 Eq. 1.1.2-2
λ=0.62799 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.2814 in Eq. 1.1-1
h_o=2.5 in, b_o=12 in, h_o/b_o=0.20833
b_1=0.57465 in Eq. 1.1.2-3
b_2=1.1407 in Eq. 1.1.2-4
Compression width=1.158 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.71086 in
Sye=0.14322 in³, Fy=50 ksi

M_{nl}=7.1608 k-in Eq. F3.1-1
Ω_b=1.67, ϕ_b=0.9

Bimoment Strength, Stud
C_w=10.854 in^6, W_n=11.423 in^2, F_y=50 ksi
B_n=47.509 k-in^2 G8.1-1
Ω_b=1.67, ϕ_b=0.9

1200S250-33

Full Section Properties

Area	0.62110 in²	Wt.	0.0021117 k/ft	Flat	17.951 in
Ix	12.203 in⁴	rx	4.4326 in	Ixy	0.000 in⁴
Sx(t)	2.0339 in³	y(t)	6.0000 in	α	0.000 deg
Sx(b)	2.0339 in³	y(b)	6.0000 in		
Zx	2.4646 in³	Height	12.0000 in		
Iy	0.432 in⁴	ry	0.8343 in	x_o	-1.3938 in
Sy(l)	0.8448 in³	x(l)	0.5118 in	y_o	0.0000 in
Sy(r)	0.2175 in³	x(r)	1.9882 in	jx	7.2961 in
Zy	0.3097 in³	Width	2.5000 in	jy	0.0000 in
I_1	12.203 in⁴	r_1	4.4326 in	Cw	11.983 in⁶
I_2	0.432 in⁴	r_2	0.8343 in	J	0.0002479 in⁴
Ic	12.636 in⁴	rc	4.5104 in		
I_o	13.842 in⁴	r_o	4.7209 in		

Net Section Properties

Ix	12.194 in⁴	rx	4.6284 in	Area	0.56920 in²
Sx(t)	2.0323 in³	y(t)	6.0000 in	Ixy	0.000 in⁴
Sx(b)	2.0323 in³	y(b)	6.0000 in	α	0.000 deg
Zx	2.4451 in³				
Iy	0.418 in⁴	ry	0.8575 in	x_o	-1.4396 in
Sy(l)	0.7515 in³	x(l)	0.5569 in	y_o	0.0000 in
Sy(r)	0.2154 in³	x(r)	1.9431 in	jx	6.8260 in
Zy	0.3091 in³			jy	0.0000 in
Ic	12.612 in⁴	rc	4.7072 in	Cw	11.976 in⁶
I_o	13.792 in⁴	r_o	4.9224 in	J	0.0002271 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	7.492 k	ϕMnxo	43.314 k-in	ϕMnyo	8.936 k-in
Ae	0.17628 in²	Ixe	8.3287 in⁴	Iye	0.3909 in⁴
ϕTn	27.748 k	Sxe(t)	1.0829 in³	Sye(l)	0.7352 in³
		Sxe(b)	1.9330 in³	Sye(r)	0.1986 in³
Shear					
ϕVny	0.910 k	Negative Bending		Negative Bending	
ϕVnx	3.317 k	ϕMnxo	43.314 k-in	ϕMnyo	7.405 k-in
		Ixe	8.3287 in⁴	Iye	0.2058 in⁴
Torsion		Sxe(t)	1.9330 in³	Sye(l)	0.1647 in³
ϕBn	47.26 k-in²	Sxe(b)	1.0829 in³	Sye(r)	0.1646 in³

```
Stud element 3 h/t exceeds 300.
Stud element 3 h/t exceeds 200.
```

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=50.665 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=52.32 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=54.513 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	

Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.6211 in², Fy=50.665 ksi
Tn=31.468 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.5692 in², Fu=65 ksi
Tn=36.998 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Stud element 2
Vn=1.843 k at 180 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Stud element 3
Vyh=11.413 k — Eq. G3-2
kv=4.5187 — Eq. G3-8
Vcrh=0.34177 k — Eq. G3-6
h/t exceeds 200 (rational analysis)
Vn=1.137 k at 90 deg — Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)
Stud element 4
Vn=1.843 k at 0 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Stud
Element 1: Unstiffened, w=0.514 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.98104 — Eq. 1.1-3
ρ=0.79074 — Eq. 1.1-2
b=0.40644 in (ineffective width=0.10756 in) — Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.091 — Eq. 1.3-7
Ia=0.00035618 in⁴ — Eq. 1.3-8
Is=0.00039155 in⁴ > Ia (no lip reduction)
k=3.8782 — Table 1.3-1
Element 2: Partially stiffened, w=2.278 in
f=50 ksi, k=3.8782
λ=1.4478 — Eq. 1.1-3
ρ=0.58576 — Eq. 1.1-2
b=1.3344 in (ineffective width=0.94364 in) — Eq. 1.1-1
b_1=0.66718 in, b_2=0.66718 in
Element 3: Treat as two unstiffened elements
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3

λ=9.8085	Eq. 1.1-3
ρ=0.099665	Eq. 1.1-2
b=0.51218 in (ineffective width=4.6268 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=9.8085	Eq. 1.1-3
ρ=0.099665	Eq. 1.1-2
b=0.51218 in (ineffective width=4.6268 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.514 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.98104	Eq. 1.1-3
ρ=0.79074	Eq. 1.1-2
b=0.40644 in (ineffective width=0.10756 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00035618 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.8782	Table 1.3-1
Element 4: Partially stiffened, w=2.278 in	
f=50 ksi, k=3.8782	
λ=1.4478	Eq. 1.1-3
ρ=0.58576	Eq. 1.1-2
b=1.3344 in (ineffective width=0.94364 in)	Eq. 1.1-1
b_1=0.66718 in, b_2=0.66718 in	
Ae=0.17628 in^2, Fn=50 ksi	
Pn=8.8138 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=11.778 in	
h/t greater than 200, treat as rational analysis	
f_1=49.278 ksi, f_2=-27.288 ksi	
ψ=0.55376	Eq. 1.1.2-1
k=14.61	Eq. 1.1.2-2
λ=3.8287	Eq. 1.1-3
ρ=0.24617	Eq. 1.1-2
be=2.8994 in	Eq. 1.1-1
h_o=12 in, b_o=2.5 in, h_o/b_o=4.8	
b_1=0.81588 in	Eq. 1.1.2-6
b_2=1.0502 in	Eq. 1.1.2-7
Compression width=7.5803 in	
Ineffective width=5.7143 in	
Element 5: Unstiffened, w=0.514 in	
f_1=49.278 ksi, f_2=45.937 ksi	

ψ=0.93219	Eq. 1.2.2-1
k=0.45433	Eq. 1.2.2-2
λ=0.9475	Eq. 1.1-3
ρ=0.81035	Eq. 1.1-2
b=0.41652 in (ineffective width=0.097478 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.126	Eq. 1.3-7
Ia=0.00035579 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.8782	Table 1.3-1
Element 4: Partially stiffened, w=2.278 in	
f=49.888 ksi, k=3.8782	
λ=1.4461	Eq. 1.1-3
ρ=0.5863	Eq. 1.1-2
b=1.3356 in (ineffective width=0.94241 in)	Eq. 1.1-1
b_1=0.6678 in, b_2=0.6678 in	
Center of gravity shift: y=-1.6914 in	
Sxe=1.0829 in^3, Fy=50 ksi	
Mnl=54.143 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.514 in	
f_1=49.278 ksi, f_2=45.937 ksi	
ψ=0.93219	Eq. 1.2.2-1
k=0.45433	Eq. 1.2.2-2
λ=0.9475	Eq. 1.1-3
ρ=0.81035	Eq. 1.1-2
b=0.41652 in (ineffective width=0.097478 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.126	Eq. 1.3-7
Ia=0.00035579 in^4	Eq. 1.3-8
Is=0.00039155 in^4 > Ia (no lip reduction)	
k=3.8782	Table 1.3-1
Element 2: Partially stiffened, w=2.278 in	
f=49.888 ksi, k=3.8782	
λ=1.4461	Eq. 1.1-3
ρ=0.5863	Eq. 1.1-2
b=1.3356 in (ineffective width=0.94241 in)	Eq. 1.1-1
b_1=0.6678 in, b_2=0.6678 in	
Element 3: Stiffened, w=11.778 in	
h/t greater than 200, treat as rational analysis	
f_1=49.278 ksi, f_2=-27.288 ksi	
ψ=0.55376	Eq. 1.1.2-1
k=14.61	Eq. 1.1.2-2
λ=3.8287	Eq. 1.1-3
ρ=0.24618	Eq. 1.1-2
be=2.8994 in	Eq. 1.1-1
h_o=12 in, b_o=2.5 in, h_o/b_o=4.8	

b_1=0.81588 in	Eq. 1.1.2-6
b_2=1.0502 in	Eq. 1.1.2-7
Compression width=7.5803 in	
Ineffective width=5.7142 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=1.6914 in	
Sxe=1.0829 in^3, Fy=50 ksi	
Mnl=54.143 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.514 in	
f_1=49.561 ksi, f_2=49.561 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.97672	Eq. 1.1-3
ρ=0.79322	Eq. 1.1-2
b=0.40772 in (ineffective width=0.10628 in)	Eq. 1.1-1
Element 2: Stiffened, w=2.278 in	
f_1=47.18 ksi, f_2=-10.686 ksi	
ψ=0.22648	Eq. 1.1.2-1
k=10.143	Eq. 1.1.2-2
λ=0.86962	Eq. 1.1-3
ρ=0.85902	Eq. 1.1-2
be=1.9568 in	Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4	
b_1=0.60649 in	Eq. 1.1.2-3
b_2=1.3503 in	Eq. 1.1.2-5
Compression width=1.8573 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.514 in	
f_1=49.561 ksi, f_2=49.561 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-2
λ=0.97672	Eq. 1.1-3
ρ=0.79322	Eq. 1.1-2
b=0.40772 in (ineffective width=0.10628 in)	Eq. 1.1-1
Element 4: Stiffened, w=2.278 in	
f_1=47.18 ksi, f_2=-10.686 ksi	
ψ=0.22648	Eq. 1.1.2-1
k=10.143	Eq. 1.1.2-2
λ=0.86962	Eq. 1.1-3
ρ=0.85902	Eq. 1.1-2
be=1.9568 in	Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4	
b_1=0.60649 in	Eq. 1.1.2-3
b_2=1.3503 in	Eq. 1.1.2-5

Compression width=1.8573 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=-0.02521 in
Sye=0.19857 in³, Fy=50 ksi
Mnl=9.9287 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=2.278 in
f_1=45.481 ksi, f_2=-45.564 ksi
ψ=1.0018 Eq. 1.1.2-1
k=24.048 Eq. 1.1.2-2
λ=0.5545 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.278 in Eq. 1.1-1
h_o=2.5 in, b_o=12 in, h_o/b_o=0.20833
b_1=0.56924 in Eq. 1.1.2-3
b_2=1.139 in Eq. 1.1.2-4
Compression width=1.138 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=49.225 ksi, f_2=49.225 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=9.7323 Eq. 1.1-3
ρ=0.10043 Eq. 1.1-2
b=0.5161 in (ineffective width=4.6229 in) Eq. 1.1-1
f_1=49.225 ksi, f_2=49.225 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=9.7323 Eq. 1.1-3
ρ=0.10043 Eq. 1.1-2
b=0.5161 in (ineffective width=4.6229 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=2.278 in
f_1=45.481 ksi, f_2=-45.564 ksi
ψ=1.0018 Eq. 1.1.2-1
k=24.048 Eq. 1.1.2-2
λ=0.5545 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.278 in Eq. 1.1-1
h_o=2.5 in, b_o=12 in, h_o/b_o=0.20833
b_1=0.56924 in Eq. 1.1.2-3
b_2=1.139 in Eq. 1.1.2-4
Compression width=1.138 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.69241 in
Sye=0.16456 in³, Fy=50 ksi

Mnl=8.2278 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=11.976 in^6, Wn=11.403 in^2, Fy=50 ksi
Bn=52.511 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

1200S250-43

Full Section Properties

Area	0.80768 in²	Wt.	0.0027461 k/ft	Flat	17.909 in
Ix	15.825 in⁴	rx	4.4265 in	Ixy	0.000 in⁴
Sx(t)	2.6376 in³	y(t)	6.0000 in	α	0.000 deg
Sx(b)	2.6376 in³	y(b)	6.0000 in		
Zx	3.2000 in³	Height	12.0000 in		
Iy	0.556 in⁴	ry	0.8296 in	x_o	-1.3839 in
Sy(l)	1.0832 in³	x(l)	0.5132 in	y_o	0.0000 in
Sy(r)	0.2798 in³	x(r)	1.9868 in	jx	7.3060 in
Zy	0.4007 in³	Width	2.5000 in	jy	0.0000 in
I_1	15.825 in⁴	r_1	4.4265 in	Cw	15.375 in⁶
I_2	0.556 in⁴	r_2	0.8296 in	J	0.0005476 in⁴
Ic	16.381 in⁴	rc	4.5035 in		
I_o	17.928 in⁴	r_o	4.7114 in		

Net Section Properties

Ix	15.813 in⁴	rx	4.6225 in	Area	0.74003 in²
Sx(t)	2.6354 in³	y(t)	6.0000 in	Ixy	0.000 in⁴
Sx(b)	2.6354 in³	y(b)	6.0000 in	α	0.000 deg
Zx	3.1746 in³				
Iy	0.538 in⁴	ry	0.8527 in	x_o	-1.4295 in
Sy(l)	0.9643 in³	x(l)	0.5581 in	y_o	0.0000 in
Sy(r)	0.2771 in³	x(r)	1.9419 in	jx	6.8342 in
Zy	0.3997 in³			jy	0.0000 in
Ic	16.351 in⁴	rc	4.7005 in	Cw	15.364 in⁶
I_o	17.863 in⁴	r_o	4.9131 in	J	0.0005017 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	10.798 k	ϕMnxo	62.272 k-in	ϕMnyo	12.232 k-in
Ae	0.25408 in²	Ixe	11.616 in⁴	Iye	0.529 in⁴
ϕTn	36.076 k	Sxe(t)	1.5568 in³	Sye(l)	0.9593 in³
		Sxe(b)	2.5596 in³	Sye(r)	0.2718 in³
Shear					
ϕVny	1.655 k	Negative Bending		Negative Bending	
ϕVnx	5.185 k	ϕMnxo	62.272 k-in	ϕMnyo	9.899 k-in
		Ixe	11.616 in⁴	Iye	0.289 in⁴
Torsion		Sxe(t)	2.5596 in³	Sye(l)	0.2434 in³
ϕBn	60.968 k-in²	Sxe(b)	1.5568 in³	Sye(r)	0.2200 in³

```
Stud element 3 h/t exceeds 200.
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Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Stud corner 2
    - t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
    - Fyc=74.687 ksi — Eq. A3.3.2-2
  - Stud corner 3
    - t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
    - Fyc=74.687 ksi — Eq. A3.3.2-2
  - Stud corner 4
    - t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
    - Fyc=74.687 ksi — Eq. A3.3.2-2
  - Stud corner 5
    - t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
    - Fyc=74.687 ksi — Eq. A3.3.2-2
  - Fya=50.812 ksi — Eq. A3.3.2-1
  - Max compression stress allowed: Fya=50 ksi
- Bending about X-axis
  - Stud corner 2
    - t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
    - Fyc=74.687 ksi — Eq. A3.3.2-2
  - Stud corner 3
    - t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
    - Fyc=74.687 ksi — Eq. A3.3.2-2
  - Stud corner 4
    - t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
    - Fyc=74.687 ksi — Eq. A3.3.2-2
  - Stud corner 5
    - t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
    - Fyc=74.687 ksi — Eq. A3.3.2-2
  - Fya=52.838 ksi — Eq. A3.3.2-1
  - Max compression stress allowed for positive bending: Fya=50 ksi
  - Max compression stress allowed for negative bending: Fya=50 ksi
- Bending about Y-axis
  - Stud corner 2
    - t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
    - Fyc=74.687 ksi — Eq. A3.3.2-2
  - Stud corner 5
    - t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
    - Fyc=74.687 ksi — Eq. A3.3.2-2
  - Fya=55.542 ksi — Eq. A3.3.2-1
  - Max compression stress allowed for positive bending: Fya=50 ksi
  - Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=0.80768 in², Fy=50.812 ksi
Tn=41.04 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.74003 in², Fu=65 ksi
Tn=48.102 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Stud element 2
Vn=2.8807 k at 180 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Stud element 3
Vyh=14.858 k — Eq. G3-2
kv=4.5184 — Eq. G3-8
Vcrh=0.75737 k — Eq. G3-6
h/t exceeds 200 (rational analysis)
Vn=2.069 k at 90 deg — Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)
Stud element 4
Vn=2.8807 k at 0 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Stud
Element 1: Unstiffened, w=0.5087 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.74488 — Eq. 1.1-3
ρ=0.94599 — Eq. 1.1-2
b=0.48123 in (ineffective width=0.027474 in) — Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.091 — Eq. 1.3-7
Ia=0.00079003 in⁴ — Eq. 1.3-8
Is=0.00049474 in⁴
ds=0.30136 in (lip ineffective width=0.17987 in) — Eq. 1.3-6
k=3.3746 — Table 1.3-1
Element 2: Partially stiffened, w=2.2674 in
f=50 ksi, k=3.3746
λ=1.1852 — Eq. 1.1-3
ρ=0.68714 — Eq. 1.1-2
b=1.558 in (ineffective width=0.70937 in) — Eq. 1.1-1
b_1=0.48785 in, b_2=1.0702 in
Element 3: Treat as two unstiffened elements
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3

λ=7.5172	Eq. 1.1-3
ρ=0.12914	Eq. 1.1-2
b=0.66294 in (ineffective width=4.4708 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=7.5172	Eq. 1.1-3
ρ=0.12914	Eq. 1.1-2
b=0.66294 in (ineffective width=4.4708 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.5087 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.74488	Eq. 1.1-3
ρ=0.94599	Eq. 1.1-2
b=0.48123 in (ineffective width=0.027474 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.00079003 in^4	Eq. 1.3-8
Is=0.00049474 in^4	
ds=0.30136 in (lip ineffective width=0.17987 in)	Eq. 1.3-6
k=3.3746	Table 1.3-1
Element 4: Partially stiffened, w=2.2674 in	
f=50 ksi, k=3.3746	
λ=1.1852	Eq. 1.1-3
ρ=0.68714	Eq. 1.1-2
b=1.558 in (ineffective width=0.70937 in)	Eq. 1.1-1
b_1=0.48785 in, b_2=1.0702 in	
Ae=0.25408 in^2, Fn=50 ksi	
Pn=12.704 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=11.767 in	
h/t greater than 200, treat as rational analysis	
f_1=49.221 ksi, f_2=-29.634 ksi	
ψ=0.60206	Eq. 1.1.2-1
k=15.428	Eq. 1.1.2-2
λ=2.8542	Eq. 1.1-3
ρ=0.32336	Eq. 1.1-2
be=3.8051 in	Eq. 1.1-1
h_o=12 in, b_o=2.5 in, h_o/b_o=4.8	
b_1=1.0564 in	Eq. 1.1.2-6
b_2=1.3188 in	Eq. 1.1.2-7
Compression width=7.3452 in	
Ineffective width=4.97 in	
Element 5: Unstiffened, w=0.5087 in	

f_1=49.221 ksi, f_2=45.812 ksi	
ψ=0.93074	Eq. 1.2.2-1
k=0.45485	Eq. 1.2.2-2
λ=0.71858	Eq. 1.1-3
ρ=0.96557	Eq. 1.1-2
b=0.49119 in (ineffective width=0.017513 in)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.138	Eq. 1.3-7
Ia=0.00078886 in^4	Eq. 1.3-8
Is=0.00049474 in^4	
ds=0.30805 in (lip ineffective width=0.18313 in)	Eq. 1.3-6
k=3.3761	Table 1.3-1
Element 4: Partially stiffened, w=2.2674 in	
f=49.849 ksi, k=3.3761	
λ=1.1831	Eq. 1.1-3
ρ=0.68806	Eq. 1.1-2
b=1.5601 in (ineffective width=0.70729 in)	Eq. 1.1-1
b_1=0.48922 in, b_2=1.0709 in	
Center of gravity shift: y=-1.4616 in	
Sxe=1.5568 in^3, Fy=50 ksi	
Mnl=77.84 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	
f_1=49.221 ksi, f_2=45.812 ksi	
ψ=0.93074	Eq. 1.2.2-1
k=0.45485	Eq. 1.2.2-2
λ=0.71858	Eq. 1.1-3
ρ=0.96557	Eq. 1.1-2
b=0.49119 in (ineffective width=0.017513 in)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.138	Eq. 1.3-7
Ia=0.00078886 in^4	Eq. 1.3-8
Is=0.00049474 in^4	
ds=0.30805 in (lip ineffective width=0.18313 in)	Eq. 1.3-6
k=3.3761	Table 1.3-1
Element 2: Partially stiffened, w=2.2674 in	
f=49.849 ksi, k=3.3761	
λ=1.1831	Eq. 1.1-3
ρ=0.68806	Eq. 1.1-2
b=1.5601 in (ineffective width=0.70729 in)	Eq. 1.1-1
b_1=0.48922 in, b_2=1.0709 in	
Element 3: Stiffened, w=11.767 in	
h/t greater than 200, treat as rational analysis	
f_1=49.221 ksi, f_2=-29.634 ksi	
ψ=0.60206	Eq. 1.1.2-1
k=15.428	Eq. 1.1.2-2
λ=2.8542	Eq. 1.1-3

ρ=0.32336	Eq. 1.1-2
be=3.8051 in	Eq. 1.1-1
h_o=12 in, b_o=2.5 in, h_o/b_o=4.8	
b_1=1.0564 in	Eq. 1.1.2-6
b_2=1.3188 in	Eq. 1.1.2-7
Compression width=7.3452 in	
Ineffective width=4.97 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=1.4616 in	
Sxe=1.5568 in^3, Fy=50 ksi	
Mnl=77.84 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Positive Flexural Strength about Y-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.5087 in	
f_1=49.421 ksi, f_2=49.421 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.74056	Eq. 1.1-3
ρ=0.94919	Eq. 1.1-2
b=0.48285 in (ineffective width=0.025849 in)	Eq. 1.1-1
Element 2: Stiffened, w=2.2674 in	
f_1=47.015 ksi, f_2=-11.183 ksi	
ψ=0.23786	Eq. 1.1.2-1
k=10.269	Eq. 1.1.2-2
λ=0.6588	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.2674 in	Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4	
b_1=0.70028 in	Eq. 1.1.2-3
b_2=1.1337 in	Eq. 1.1.2-4
Compression width=1.8317 in	
b_1+b_2 > compression width (fully effective)	
Element 3: No compressive stress (fully effective)	
Element 5: Unstiffened, w=0.5087 in	
f_1=49.421 ksi, f_2=49.421 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.74056	Eq. 1.1-3
ρ=0.94919	Eq. 1.1-2
b=0.48285 in (ineffective width=0.025849 in)	Eq. 1.1-1
Element 4: Stiffened, w=2.2674 in	
f_1=47.015 ksi, f_2=-11.183 ksi	
ψ=0.23786	Eq. 1.1.2-1
k=10.269	Eq. 1.1.2-2
λ=0.6588	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=2.2674 in	Eq. 1.1-1

h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.70028 in — Eq. 1.1.2-3
b_2=1.1337 in — Eq. 1.1.2-4
Compression width=1.8317 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=-0.0060664 in
Sye=0.27181 in³, Fy=50 ksi
Mnl=13.591 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=2.2674 in
f_1=40.715 ksi, f_2=-45.574 ksi
ψ=1.1194 — Eq. 1.1.2-1
k=27.278 — Eq. 1.1.2-2
λ=0.37616 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=2.2674 in — Eq. 1.1-1
h_o=2.5 in, b_o=12 in, h_o/b_o=0.20833
b_1=0.55043 in — Eq. 1.1.2-3
b_2=1.1337 in — Eq. 1.1.2-4
Compression width=1.0699 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=44.282 ksi, f_2=44.282 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=7.0743 — Eq. 1.1-3
ρ=0.13696 — Eq. 1.1-2
b=0.70311 in (ineffective width=4.4306 in) — Eq. 1.1-1
f_1=44.282 ksi, f_2=44.282 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-2
λ=7.0743 — Eq. 1.1-3
ρ=0.13696 — Eq. 1.1-2
b=0.70311 in (ineffective width=4.4306 in) — Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=2.2674 in
f_1=40.715 ksi, f_2=-45.574 ksi
ψ=1.1194 — Eq. 1.1.2-1
k=27.278 — Eq. 1.1.2-2
λ=0.37616 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=2.2674 in — Eq. 1.1-1
h_o=2.5 in, b_o=12 in, h_o/b_o=0.20833
b_1=0.55043 in — Eq. 1.1.2-3
b_2=1.1337 in — Eq. 1.1.2-4
Compression width=1.0699 in

b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.62871 in
Sye=0.21999 in^3, Fy=50 ksi
Mnl=10.999 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=15.364 in^6, Wn=11.34 in^2, Fy=50 ksi
Bn=67.743 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

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Full Section Properties

Area	1.0091 in²	Wt.	0.0034311 k/ft	Flat	17.829 in
Ix	19.681 in⁴	rx	4.4163 in	Ixy	0.000 in⁴
Sx(t)	3.2802 in³	y(t)	6.0000 in	α	0.000 deg
Sx(b)	3.2802 in³	y(b)	6.0000 in		
Zx	3.9875 in³	Height	12.0000 in		
Iy	0.683 in⁴	ry	0.8228 in	x_o	-1.3704 in
Sy(l)	1.3309 in³	x(l)	0.5134 in	y_o	0.0000 in
Sy(r)	0.3439 in³	x(r)	1.9866 in	jx	7.3288 in
Zy	0.4965 in³	Width	2.5000 in	jy	0.0000 in
I_1	19.681 in⁴	r_1	4.4163 in	Cw	18.843 in⁶
I_2	0.683 in⁴	r_2	0.8228 in	J	0.0010776 in⁴
Ic	20.365 in⁴	rc	4.4923 in		
I_o	22.260 in⁴	r_o	4.6966 in		

Net Section Properties

Ix	19.666 in⁴	rx	4.6128 in	Area	0.92424 in²
Sx(t)	3.2776 in³	y(t)	6.0000 in	Ixy	0.000 in⁴
Sx(b)	3.2776 in³	y(b)	6.0000 in	α	0.000 deg
Zx	3.9557 in³				
Iy	0.661 in⁴	ry	0.8460 in	x_o	-1.4157 in
Sy(l)	1.1855 in³	x(l)	0.5579 in	y_o	0.0000 in
Sy(r)	0.3406 in³	x(r)	1.9421 in	jx	6.8547 in
Zy	0.4950 in³			jy	0.0000 in
Ic	20.327 in⁴	rc	4.6897 in	Cw	18.831 in⁶
I_o	22.179 in⁴	r_o	4.8987 in	J	0.0009869 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	14.754 k	ϕMnxo	84.302 k-in	ϕMnyo	17.418 k-in
Ae	0.34715 in²	Ixe	15.300 in⁴	Iye	0.661 in⁴
ϕTn	45.057 k	Sxe(t)	2.1076 in³	Sye(l)	1.1855 in³
		Sxe(b)	3.2274 in³	Sye(r)	0.3406 in³
Shear					
ϕVny	2.754 k	Negative Bending		Negative Bending	
ϕVnx	6.776 k	ϕMnxo	84.302 k-in	ϕMnyo	12.637 k-in
		Ixe	15.300 in⁴	Iye	0.389 in⁴
Torsion		Sxe(t)	3.2274 in³	Sye(l)	0.3497 in³
ϕBn	75.152 k-in²	Sxe(b)	2.1076 in³	Sye(r)	0.2808 in³

```
Stud element 3 h/t exceeds 200.
```

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses	
Fy=50 ksi, Fu=65 ksi	
Bc=1.6229	Eq. A3.3.2-3
m=0.1816	Eq. A3.3.2-4
Axial Load	
Stud corner 2	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Fya=51.013 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Stud corner 2	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Stud corner 3	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Stud corner 4	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Fya=53.509 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Stud corner 2	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Stud corner 5	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Fya=56.825 ksi	Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi	

Axial Tension Strength
Ag=1.0091 in², Fy=51.013 ksi
Tn=51.479 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.92424 in², Fu=65 ksi
Tn=60.075 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Stud element 2
Vn=3.7645 k at 180 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9
Stud element 3
Vyh=18.541 k — Eq. G3-2
kv=4.5169 — Eq. G3-8
Vcrh=1.5015 k — Eq. G3-6
h/t exceeds 200 (rational analysis)
Vn=3.4424 k at 90 deg — Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)
Stud element 4
Vn=3.7645 k at 0 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Stud
Element 1: Unstiffened, w=0.4835 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.56413 — Eq. 1.1-3
λ<0.673 (fully effective) — Eq. 1.1-1
Element 2: Check for lip stiffener reduction
S=31.091 — Eq. 1.3-7
Ia=0.0015382 in⁴ — Eq. 1.3-8
Is=0.00053312 in⁴
ds=0.16757 in (lip ineffective width=0.31593 in) — Eq. 1.3-6
k=2.8256 — Table 1.3-1
Element 2: Partially stiffened, w=2.217 in
f=50 ksi, k=2.8256
λ=1.0091 — Eq. 1.1-3
ρ=0.77494 — Eq. 1.1-2
b=1.718 in (ineffective width=0.49896 in) — Eq. 1.1-1
b_1=0.29773 in, b_2=1.4203 in
Element 3: Treat as two unstiffened elements
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=5.9604 — Eq. 1.1-3
ρ=0.16158 — Eq. 1.1-2

b=0.82543 in (ineffective width=4.2831 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=5.9604	Eq. 1.1-3
ρ=0.16158	Eq. 1.1-2
b=0.82543 in (ineffective width=4.2831 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4835 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.56413	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0015382 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.16757 in (lip ineffective width=0.31593 in)	Eq. 1.3-6
k=2.8256	Table 1.3-1
Element 4: Partially stiffened, w=2.217 in	
f=50 ksi, k=2.8256	
λ=1.0091	Eq. 1.1-3
ρ=0.77494	Eq. 1.1-2
b=1.718 in (ineffective width=0.49896 in)	Eq. 1.1-1
b_1=0.29773 in, b_2=1.4203 in	
Ae=0.34715 in^2, Fn=50 ksi	
Pn=17.357 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=11.717 in	
h/t greater than 200, treat as rational analysis	
f_1=49.025 ksi, f_2=-31.678 ksi	
ψ=0.64616	Eq. 1.1.2-1
k=16.214	Eq. 1.1.2-2
λ=2.2045	Eq. 1.1-3
ρ=0.40834	Eq. 1.1-2
be=4.7846 in	Eq. 1.1-1
h_o=12 in, b_o=2.5 in, h_o/b_o=4.8	
b_1=1.3122 in	Eq. 1.1.2-6
b_2=1.5943 in	Eq. 1.1.2-7
Compression width=7.1178 in	
Ineffective width=4.2113 in	
Element 5: Unstiffened, w=0.4835 in	
f_1=49.025 ksi, f_2=45.695 ksi	
ψ=0.93207	Eq. 1.2.2-1
k=0.45438	Eq. 1.2.2-2

λ=0.54342	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.152	Eq. 1.3-7
Ia=0.0015353 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.16789 in (lip ineffective width=0.31561 in)	Eq. 1.3-6
k=2.8271	Table 1.3-1
Element 4: Partially stiffened, w=2.217 in	
f=49.805 ksi, k=2.8271	
λ=1.0069	Eq. 1.1-3
ρ=0.77618	Eq. 1.1-2
b=1.7208 in (ineffective width=0.49621 in)	Eq. 1.1-1
b_1=0.29877 in, b_2=1.422 in	
Center of gravity shift: y=-1.2595 in	
Sxe=2.1076 in^3, Fy=50 ksi	
Mnl=105.38 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4835 in	
f_1=49.025 ksi, f_2=45.695 ksi	
ψ=0.93207	Eq. 1.2.2-1
k=0.45438	Eq. 1.2.2-2
λ=0.54342	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.152	Eq. 1.3-7
Ia=0.0015353 in^4	Eq. 1.3-8
Is=0.00053312 in^4	
ds=0.16789 in (lip ineffective width=0.31561 in)	Eq. 1.3-6
k=2.8271	Table 1.3-1
Element 2: Partially stiffened, w=2.217 in	
f=49.805 ksi, k=2.8271	
λ=1.0069	Eq. 1.1-3
ρ=0.77618	Eq. 1.1-2
b=1.7208 in (ineffective width=0.49621 in)	Eq. 1.1-1
b_1=0.29877 in, b_2=1.422 in	
Element 3: Stiffened, w=11.717 in	
h/t greater than 200, treat as rational analysis	
f_1=49.025 ksi, f_2=-31.678 ksi	
ψ=0.64616	Eq. 1.1.2-1
k=16.214	Eq. 1.1.2-2
λ=2.2045	Eq. 1.1-3
ρ=0.40834	Eq. 1.1-2
be=4.7846 in	Eq. 1.1-1
h_o=12 in, b_o=2.5 in, h_o/b_o=4.8	
b_1=1.3122 in	Eq. 1.1.2-6
b_2=1.5943 in	Eq. 1.1.2-7

Compression width=7.1178 in
Ineffective width=4.2113 in
Element 5: No compressive stress (fully effective)
Element 4: No compressive stress (fully effective)
Center of gravity shift: y=1.2595 in
Sxe=2.1076 in^3, Fy=50 ksi
Mnl=105.38 k-in Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.4835 in
f_1=55.997 ksi, f_2=55.997 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.59701 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 2: Stiffened, w=2.217 in
f_1=52.685 ksi, f_2=-12.185 ksi
ψ=0.23129 Eq. 1.1.2-1
k=10.196 Eq. 1.1.2-2
λ=0.54529 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.217 in Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.6861 in Eq. 1.1.2-3
b_2=1.5309 in Eq. 1.1.2-5
Compression width=1.8006 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.4835 in
f_1=55.997 ksi, f_2=55.997 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=0.59701 Eq. 1.1-3
λ<0.673 (fully effective) Eq. 1.1-1
Element 4: Stiffened, w=2.217 in
f_1=52.685 ksi, f_2=-12.185 ksi
ψ=0.23129 Eq. 1.1.2-1
k=10.196 Eq. 1.1.2-2
λ=0.54529 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.217 in Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.6861 in Eq. 1.1.2-3
b_2=1.5309 in Eq. 1.1.2-5
Compression width=1.8006 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0 in
Sye=0.34058 in^3, Fy=56.825 ksi

Mnl=19.353 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=2.217 in
f_1=34.988 ksi, f_2=-44.901 ksi
ψ=1.2833 Eq. 1.1.2-1
k=32.375 Eq. 1.1.2-2
λ=0.24938 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.217 in Eq. 1.1-1
h_o=2.5 in, b_o=12 in, h_o/b_o=0.20833
b_1=0.51759 in Eq. 1.1.2-3
b_2=1.1085 in Eq. 1.1.2-4
Compression width=0.97095 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=39.067 ksi, f_2=39.067 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=5.2687 Eq. 1.1-3
ρ=0.18188 Eq. 1.1-2
b=0.92911 in (ineffective width=4.1794 in) Eq. 1.1-1
f_1=39.067 ksi, f_2=39.067 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=5.2687 Eq. 1.1-3
ρ=0.18188 Eq. 1.1-2
b=0.92911 in (ineffective width=4.1794 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=2.217 in
f_1=34.988 ksi, f_2=-44.901 ksi
ψ=1.2833 Eq. 1.1.2-1
k=32.375 Eq. 1.1.2-2
λ=0.24938 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.217 in Eq. 1.1-1
h_o=2.5 in, b_o=12 in, h_o/b_o=0.20833
b_1=0.51759 in Eq. 1.1.2-3
b_2=1.1085 in Eq. 1.1.2-4
Compression width=0.97096 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.55545 in
Sye=0.28083 in^3, Fy=50 ksi
Mnl=14.041 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud

C_w=18.831 in^6, W_n=11.276 in^2, F_y=50 ksi
B_n=83.502 k-in^2 G8.1-1
Ω_b=1.67, ϕ_b=0.9

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Full Section Properties

Area	1.2634 in²	Wt.	0.0042957 k/ft	Flat	17.720 in
Ix	24.485 in⁴	rx	4.4023 in	Ixy	0.000 in⁴
Sx(t)	4.0809 in³	y(t)	6.0000 in	α	0.000 deg
Sx(b)	4.0809 in³	y(b)	6.0000 in		
Zx	4.9742 in³	Height	12.0000 in		
Iy	0.837 in⁴	ry	0.8138 in	x_o	-1.3525 in
Sy(l)	1.6299 in³	x(l)	0.5133 in	y_o	0.0000 in
Sy(r)	0.4211 in³	x(r)	1.9867 in	jx	7.3617 in
Zy	0.6146 in³	Width	2.5000 in	jy	0.0000 in
I_1	24.485 in⁴	r_1	4.4023 in	Cw	22.984 in⁶
I_2	0.837 in⁴	r_2	0.8138 in	J	0.002141 in⁴
Ic	25.322 in⁴	rc	4.4769 in		
I_o	27.633 in⁴	r_o	4.6767 in		

Net Section Properties

Ix	24.465 in⁴	rx	4.5994 in	Area	1.1565 in²
Sx(t)	4.0776 in³	y(t)	6.0000 in	Ixy	0.000 in⁴
Sx(b)	4.0776 in³	y(b)	6.0000 in	α	0.000 deg
Zx	4.9341 in³				
Iy	0.810 in⁴	ry	0.8369 in	x_o	-1.3974 in
Sy(l)	1.4529 in³	x(l)	0.5575 in	y_o	0.0000 in
Sy(r)	0.4170 in³	x(r)	1.9425 in	jx	6.8844 in
Zy	0.6121 in³			jy	0.0000 in
Ic	25.275 in⁴	rc	4.6750 in	Cw	22.968 in⁶
I_o	27.534 in⁴	r_o	4.8793 in	J	0.0019597 in⁴

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	20.841 k	ϕMnxo	132.19 k-in	ϕMnyo	21.94 k-in
Ae	0.49038 in²	Ixe	20.458 in⁴	Iye	0.810 in⁴
ϕTn	56.379 k	Sxe(t)	2.9375 in³	Sye(l)	1.4529 in³
		Sxe(b)	4.0628 in³	Sye(r)	0.4170 in³
Shear					
ϕVny	5.171 k	Negative Bending		Negative Bending	
ϕVnx	8.253 k	ϕMnxo	132.19 k-in	ϕMnyo	16.11 k-in
		Ixe	20.458 in⁴	Iye	0.528 in⁴
Torsion		Sxe(t)	4.0628 in³	Sye(l)	0.5163 in³
ϕBn	92.337 k-in²	Sxe(b)	2.9375 in³	Sye(r)	0.3579 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=51.283 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 4
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=54.388 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Stud corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Stud corner 5
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=58.477 ksi Eq. A3.3.2-1
Max compression stress allowed for negative bending: Fya=50 ksi

Axial Tension Strength
Ag=1.2634 in², Fy=51.283 ksi

Tn=64.794 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=1.1565 in², Fu=65 ksi	
Tn=75.172 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Stud element 2	
Vn=4.5852 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Stud element 3	
Vyh=23.162 k	Eq. G3-2
kv=4.5147	Eq. G3-8
Vcrh=3.0147 k	Eq. G3-6
Vn=5.7455 k at 90 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Stud element 4	
Vn=4.5852 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4468 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41383	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0026903 in⁴	Eq. 1.3-8
Is=0.00052997 in⁴	
ds=0.088017 in (lip ineffective width=0.35878 in)	Eq. 1.3-6
k=2.3644	Table 1.3-1
Element 2: Partially stiffened, w=2.1436 in	
f=50 ksi, k=2.3644	
λ=0.84669	Eq. 1.1-3
ρ=0.87418	Eq. 1.1-2
b=1.8739 in (ineffective width=0.2697 in)	Eq. 1.1-1
b_1=0.18457 in, b_2=1.6893 in	
Element 3: Treat as two unstiffened elements	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=4.6976	Eq. 1.1-3
ρ=0.20291	Eq. 1.1-2
b=1.0291 in (ineffective width=4.0427 in)	Eq. 1.1-1
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=4.6976	Eq. 1.1-3
ρ=0.20291	Eq. 1.1-2
b=1.0291 in (ineffective width=4.0427 in)	Eq. 1.1-1
Element 5: Unstiffened, w=0.4468 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=0.41383	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.091	Eq. 1.3-7
Ia=0.0026903 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.088017 in (lip ineffective width=0.35878 in)	Eq. 1.3-6
k=2.3644	Table 1.3-1
Element 4: Partially stiffened, w=2.1436 in	
f=50 ksi, k=2.3644	
λ=0.84669	Eq. 1.1-3
ρ=0.87418	Eq. 1.1-2
b=1.8739 in (ineffective width=0.2697 in)	Eq. 1.1-1
b_1=0.18457 in, b_2=1.6893 in	
Ae=0.49038 in^2, Fn=50 ksi	
Pn=24.519 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: No compressive stress (fully effective)	
Element 2: No compressive stress (fully effective)	
Element 3: Stiffened, w=11.644 in	
f_1=48.721 ksi, f_2=-34.88 ksi	
ψ=0.71591	Eq. 1.1.2-1
k=17.536	Eq. 1.1.2-2
λ=1.667	Eq. 1.1-3
ρ=0.52071	Eq. 1.1-2
be=6.063 in	Eq. 1.1-1
h_o=12 in, b_o=2.5 in, h_o/b_o=4.8	
b_1=1.6316 in	Eq. 1.1.2-6
b_2=1.9018 in	Eq. 1.1.2-7
Compression width=6.7857 in	
Ineffective width=3.2523 in	
Element 5: Unstiffened, w=0.4468 in	
f_1=48.721 ksi, f_2=45.513 ksi	
ψ=0.93416	Eq. 1.2.2-1
k=0.45363	Eq. 1.2.2-2
λ=0.39772	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 4: Check for lip stiffener reduction	
S=31.171	Eq. 1.3-7

Ia=0.0026591 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.089049 in (lip ineffective width=0.35775 in)	Eq. 1.3-6
k=2.3702	Table 1.3-1
Element 4: Partially stiffened, w=2.1436 in	
f=49.744 ksi, k=2.3702	
λ=0.8435	Eq. 1.1-3
ρ=0.87633	Eq. 1.1-2
b=1.8785 in (ineffective width=0.2651 in)	Eq. 1.1-1
b_1=0.1872 in, b_2=1.6913 in	
Center of gravity shift: y=-0.96453 in	
Sxe=2.9375 in^3, Fy=50 ksi	
Mnl=146.87 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Stud	
Element 1: Unstiffened, w=0.4468 in	
f_1=48.721 ksi, f_2=45.513 ksi	
ψ=0.93416	Eq. 1.2.2-1
k=0.45363	Eq. 1.2.2-2
λ=0.39772	Eq. 1.1-3
λ<0.673 (fully effective)	Eq. 1.1-1
Element 2: Check for lip stiffener reduction	
S=31.171	Eq. 1.3-7
Ia=0.0026591 in^4	Eq. 1.3-8
Is=0.00052997 in^4	
ds=0.089049 in (lip ineffective width=0.35775 in)	Eq. 1.3-6
k=2.3702	Table 1.3-1
Element 2: Partially stiffened, w=2.1436 in	
f=49.744 ksi, k=2.3702	
λ=0.8435	Eq. 1.1-3
ρ=0.87633	Eq. 1.1-2
b=1.8785 in (ineffective width=0.2651 in)	Eq. 1.1-1
b_1=0.1872 in, b_2=1.6913 in	
Element 3: Stiffened, w=11.644 in	
f_1=48.721 ksi, f_2=-34.88 ksi	
ψ=0.71591	Eq. 1.1.2-1
k=17.536	Eq. 1.1.2-2
λ=1.667	Eq. 1.1-3
ρ=0.52071	Eq. 1.1-2
be=6.063 in	Eq. 1.1-1
h_o=12 in, b_o=2.5 in, h_o/b_o=4.8	
b_1=1.6316 in	Eq. 1.1.2-6
b_2=1.9018 in	Eq. 1.1.2-7
Compression width=6.7857 in	
Ineffective width=3.2523 in	
Element 5: No compressive stress (fully effective)	
Element 4: No compressive stress (fully effective)	
Center of gravity shift: y=0.96453 in	

Sxe=2.9375 in³, Fy=50 ksi
Mnl=146.87 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Stud
Element 1: Unstiffened, w=0.4468 in
f_1=57.403 ksi, f_2=57.403 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.44341 — Eq. 1.1-3
λ<0.673 (fully effective) — Eq. 1.1-1
Element 2: Stiffened, w=2.1436 in
f_1=53.112 ksi, f_2=-11.418 ksi
ψ=0.21497 — Eq. 1.1.2-1
k=10.017 — Eq. 1.1.2-2
λ=0.42397 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=2.1436 in — Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.66676 in — Eq. 1.1.2-3
b_2=1.4768 in — Eq. 1.1.2-5
Compression width=1.7643 in
b_1+b_2 > compression width (fully effective)
Element 3: No compressive stress (fully effective)
Element 5: Unstiffened, w=0.4468 in
f_1=57.403 ksi, f_2=57.403 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=0.44341 — Eq. 1.1-3
λ<0.673 (fully effective) — Eq. 1.1-1
Element 4: Stiffened, w=2.1436 in
f_1=53.112 ksi, f_2=-11.418 ksi
ψ=0.21497 — Eq. 1.1.2-1
k=10.017 — Eq. 1.1.2-2
λ=0.42397 — Eq. 1.1-3
ρ=1 — Eq. 1.1-2
be=2.1436 in — Eq. 1.1-1
h_o=2.5 in, b_o=0.625 in, h_o/b_o=4
b_1=0.66676 in — Eq. 1.1.2-3
b_2=1.4768 in — Eq. 1.1.2-5
Compression width=1.7643 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0 in
Sye=0.41696 in³, Fy=58.477 ksi
Mnl=24.382 k-in — Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Stud

Element 1: No compressive stress (fully effective)
Element 2: Stiffened, w=2.1436 in
f_1=28.562 ksi, f_2=-43.97 ksi
ψ=1.5395 Eq. 1.1.2-1
k=41.832 Eq. 1.1.2-2
λ=0.15214 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.1436 in Eq. 1.1-1
h_o=2.5 in, b_o=12 in, h_o/b_o=0.20833
b_1=0.47221 in Eq. 1.1.2-3
b_2=1.0718 in Eq. 1.1.2-4
Compression width=0.84411 in
b_1+b_2 > compression width (fully effective)
Element 3: Treat as two unstiffened elements
f_1=33.385 ksi, f_2=33.385 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=3.8386 Eq. 1.1-3
ρ=0.24558 Eq. 1.1-2
b=1.2456 in (ineffective width=3.8262 in) Eq. 1.1-1
f_1=33.385 ksi, f_2=33.385 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=3.8386 Eq. 1.1-3
ρ=0.24558 Eq. 1.1-2
b=1.2456 in (ineffective width=3.8262 in) Eq. 1.1-1
Element 5: No compressive stress (fully effective)
Element 4: Stiffened, w=2.1436 in
f_1=28.562 ksi, f_2=-43.97 ksi
ψ=1.5395 Eq. 1.1.2-1
k=41.832 Eq. 1.1.2-2
λ=0.15214 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=2.1436 in Eq. 1.1-1
h_o=2.5 in, b_o=12 in, h_o/b_o=0.20833
b_1=0.47221 in Eq. 1.1.2-3
b_2=1.0718 in Eq. 1.1.2-4
Compression width=0.84412 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: x=0.46609 in
Sye=0.35792 in^3, Fy=50 ksi
Mnl=17.896 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Stud
Cw=22.968 in^6, Wn=11.193 in^2, Fy=50 ksi
Bn=102.6 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

SECTION IV TRACK SECTION PROPERTIES AND STRENGTH

362T150-30

Full Section Properties

Area	0.20842 in²	Wt.	0.00070864 k/ft	Flat	6.6803 in
Ix	0.46557 in⁴	rx	1.4946 in	Ixy	0.00000 in⁴
Sx(t)	0.24356 in³	y(t)	1.9116 in	α	0.000 deg
Sx(b)	0.24356 in³	y(b)	1.9116 in		
Zx	0.28298 in³	Height	3.8231 in		
Iy	0.04534 in⁴	ry	0.4664 in	x_o	-0.8597 in
Sy(l)	0.13120 in³	x(l)	0.3456 in	y_o	0.0000 in
Sy(r)	0.03928 in³	x(r)	1.1544 in	jx	2.1493 in
Zy	0.06908 in³	Width	1.5000 in	jy	0.0000 in
I_1	0.46557 in⁴	r_1	1.4946 in	Cw	0.11295 in⁶
I_2	0.04534 in⁴	r_2	0.4664 in	J	0.00006763 in⁴
Ic	0.51092 in⁴	rc	1.5657 in		
I_o	0.66496 in⁴	r_o	1.7862 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	3.2923 k	ϕMnxo	6.3389 k-in	ϕMnyo	0.4244 k-in
Ae	0.077465 in²	Ixe	0.32398 in⁴	Iye	0.00571 in⁴
ϕTn	9.5336 k	Sxe(t)	0.14086 in³	Sye(l)	0.05094 in³
		Sxe(b)	0.21270 in³	Sye(r)	0.00943 in³
Shear					
ϕVny	1.3526 k	Negative Bending		Negative Bending	
ϕVnx	2.3096 k	ϕMnxo	6.3389 k-in	ϕMnyo	1.6253 k-in
		Ixe	0.32398 in⁴	Iye	0.03766 in⁴
Torsion		Sxe(t)	0.21270 in³	Sye(l)	0.08236 in³
ϕBn	2.8139 k-in²	Sxe(b)	0.14086 in³	Sye(r)	0.03612 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses

Fy=50 ksi, Fu=65 ksi
Bc=1.6229 Eq. A3.3.2-3
m=0.1816 Eq. A3.3.2-4
Axial Load
Track corner 2
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Track corner 3
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Fya=50.824 ksi Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Track corner 2
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Track corner 3
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi Eq. A3.3.2-2
Fya=51.789 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Fya=50 ksi Eq. A3.3.2-1

Axial Tension Strength
Ag=0.20842 in², Fy=50.824 ksi
Tn=10.593 k Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.20842 in², Fu=65 ksi
Tn=13.548 k Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Track element 1
Vn=1.2831 k at 180 deg Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Track element 2
Vn=1.5029 k at 90 deg Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Track element 3
Vn=1.2831 k at 0 deg Eq. G2.1-2
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Track
Element 1: Unstiffened, w=1.3907 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=2.9436	Eq. 1.1-3
ρ=0.31433	Eq. 1.1-2
b=0.43714 in (ineffective width=0.95356 in)	Eq. 1.1-1
Element 3: Unstiffened, w=1.3907 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.9436	Eq. 1.1-3
ρ=0.31433	Eq. 1.1-2
b=0.43714 in (ineffective width=0.95356 in)	Eq. 1.1-1
Element 2: Stiffened, w=3.6045 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=2.5015	Eq. 1.1-3
ρ=0.36461	Eq. 1.1-2
be=1.3142 in	Eq. 1.1-1
b_1=0.65711 in	Eq. 1.1.2-9
b_2=0.65711 in	Eq. 1.1.2-10
Ineffective width=2.2903 in	
Ae=0.077465 in², Fn=50 ksi	
Pn=3.8733 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Track	
Element 1: No compressive stress (fully effective)	
Element 3: Unstiffened, w=1.3907 in	
f_1=49.661 ksi, f_2=49.661 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.9336	Eq. 1.1-3
ρ=0.31531	Eq. 1.1-2
b=0.43851 in (ineffective width=0.95219 in)	Eq. 1.1-1
Element 2: Stiffened, w=3.6045 in	
f_1=47.623 ksi, f_2=-30.761 ksi	
ψ=0.64593	Eq. 1.1.2-1
k=16.21	Eq. 1.1.2-2
λ=1.2127	Eq. 1.1-3
ρ=0.675	Eq. 1.1-2
be=2.433 in	Eq. 1.1-1
h_o=3.8231 in, b_o=1.5 in, h_o/b_o=2.5487	
b_1=0.66733 in	Eq. 1.1.2-3
b_2=1.2165 in	Eq. 1.1.2-4
Compression width=2.19 in	
Ineffective width=0.3061 in	
Center of gravity shift: y=-0.38839 in	
Sxe=0.14086 in³, Fy=50 ksi	
Mnl=7.0432 k-in	Eq. F3.1-1

Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3907 in
f_1=49.661 ksi, f_2=49.661 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=2.9336 Eq. 1.1-3
ρ=0.31531 Eq. 1.1-2
b=0.43851 in (ineffective width=0.95219 in) Eq. 1.1-1
Element 3: No compressive stress (fully effective)
Element 2: Stiffened, w=3.6045 in
f_1=47.623 ksi, f_2=-30.761 ksi
ψ=0.64593 Eq. 1.1.2-1
k=16.21 Eq. 1.1.2-2
λ=1.2127 Eq. 1.1-3
ρ=0.675 Eq. 1.1-2
be=2.433 in Eq. 1.1-1
h_o=3.8231 in, b_o=1.5 in, h_o/b_o=2.5487
b_1=0.66733 in Eq. 1.1.2-3
b_2=1.2165 in Eq. 1.1.2-4
Compression width=2.19 in
Ineffective width=0.3061 in
Center of gravity shift: y=0.38839 in
Sxe=0.14086 in^3, Fy=50 ksi
Mnl=7.0432 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3907 in
f_1=50 ksi, f_2=-10.235 ksi
ψ=0.2047 Eq. 1.2.2-1
k=0.61592 Eq. 1.2.2-5
λ=2.4595 Eq. 1.1-3
ρ=0.43703 Eq. 1.2.2-4
b=0.60778 in (ineffective width=0.78292 in) Eq. 1.1-1
Element 3: Unstiffened, w=1.3907 in
f_1=50 ksi, f_2=-10.235 ksi
ψ=0.2047 Eq. 1.2.2-1
k=0.61592 Eq. 1.2.2-5
λ=2.4595 Eq. 1.1-3
ρ=0.43703 Eq. 1.2.2-4
b=0.60778 in (ineffective width=0.78292 in) Eq. 1.1-1
Element 2: No compressive stress (fully effective)
Iteration is not required
Center of gravity shift: x=-0.23358 in
Sye=0.0094316 in^3, Fy=50 ksi
Mnl=0.47158 k-in Eq. F3.1-1

Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis

Effective width calculations for Track

Element 1: Unstiffened, w=1.3907 in

f_1=16.668 ksi, f_2=-50 ksi

ψ=2.9997 — Eq. 1.2.2-1

ψ>1 (fully effective) — Eq. 1.1-1

Element 3: Unstiffened, w=1.3907 in

f_1=16.668 ksi, f_2=-50 ksi

ψ=2.9997 — Eq. 1.2.2-1

ψ>1 (fully effective) — Eq. 1.1-1

Element 2: Stiffened, w=3.6045 in

f_1=21.16 ksi, f_2=21.16 ksi

ψ=1 — Eq. 1.1.2-1

k=4 — Eq. 1.1.2-8

λ=1.6273 — Eq. 1.1-3

ρ=0.53143 — Eq. 1.1-2

be=1.9155 in — Eq. 1.1-1

b_1=0.95777 in — Eq. 1.1.2-9

b_2=0.95777 in — Eq. 1.1.2-10

Ineffective width=1.689 in

Center of gravity shift: x=0.11167 in

Sye=0.036117 in^3, Fy=50 ksi

Mnl=1.8058 k-in — Eq. F3.1-1

Ωb=1.67, ϕb=0.9

Bimoment Strength, Track

Cw=0.11295 in^6, Wn=1.8063 in^2, Fy=50 ksi

Bn=3.1266 k-in^2 — G8.1-1

Ωb=1.67, ϕb=0.9

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Full Section Properties

Area	0.23090 in²	Wt.	0.00078507 k/ft	Flat	6.6735 in
Ix	0.51483 in⁴	rx	1.4932 in	Ixy	0.00000 in⁴
Sx(t)	0.26933 in³	y(t)	1.9116 in	α	0.000 deg
Sx(b)	0.26933 in³	y(b)	1.9116 in		
Zx	0.31320 in³	Height	3.8231 in		
Iy	0.05012 in⁴	ry	0.4659 in	x_o	-0.8586 in
Sy(l)	0.14449 in³	x(l)	0.3469 in	y_o	0.0000 in
Sy(r)	0.04346 in³	x(r)	1.1531 in	jx	2.1472 in
Zy	0.07647 in³	Width	1.5000 in	jy	0.0000 in
I_1	0.51483 in⁴	r_1	1.4932 in	Cw	0.12461 in⁶
I_2	0.05012 in⁴	r_2	0.4659 in	J	0.00009214 in⁴
Ic	0.56495 in⁴	rc	1.5642 in		
I_o	0.73519 in⁴	r_o	1.7844 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	3.966 k	ϕMnxo	7.7946 k-in	ϕMnyo	0.5473 k-in
Ae	0.093325 in²	Ixe	0.38342 in⁴	Iye	0.00788 in⁴
ϕTn	10.576 k	Sxe(t)	0.17321 in³	Sye(l)	0.06177 in³
		Sxe(b)	0.23822 in³	Sye(r)	0.01216 in³
Shear					
ϕVny	1.680 k	Negative Bending		Negative Bending	
ϕVnx	2.595 k	ϕMnxo	7.7946 k-in	ϕMnyo	1.8285 k-in
		Ixe	0.38342 in⁴	Iye	0.04312 in⁴
Torsion		Sxe(t)	0.23822 in³	Sye(l)	0.09826 in³
ϕBn	3.1107 k-in²	Sxe(b)	0.17321 in³	Sye(r)	0.04063 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
    - Fyc=70.273 ksi — Eq. A3.3.2-2
  - Track corner 3
    - t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
    - Fyc=70.273 ksi — Eq. A3.3.2-2
  - Fya=50.894 ksi — Eq. A3.3.2-1

Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Track corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi — Eq. A3.3.2-2
Track corner 3
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi — Eq. A3.3.2-2
Fya=51.942 ksi — Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Fya=50 ksi — Eq. A3.3.2-1

Axial Tension Strength
Ag=0.2309 in², Fy=50.894 ksi
Tn=11.752 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.2309 in², Fu=65 ksi
Tn=15.009 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Track element 1
Vn=1.4418 k at 180 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9
Track element 2
Vn=1.8665 k at 90 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Track element 3
Vn=1.4418 k at 0 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Track
Element 1: Unstiffened, w=1.389 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=2.6511 — Eq. 1.1-3
ρ=0.3459 — Eq. 1.1-2
b=0.48045 in (ineffective width=0.90855 in) — Eq. 1.1-1
Element 3: Unstiffened, w=1.389 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=2.6511 — Eq. 1.1-3
ρ=0.3459 — Eq. 1.1-2
b=0.48045 in (ineffective width=0.90855 in) — Eq. 1.1-1

Element 2: Stiffened, w=3.6011 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.1.2-1
k=4 Eq. 1.1.2-8
λ=2.2535 Eq. 1.1-3
ρ=0.40043 Eq. 1.1-2
be=1.442 in Eq. 1.1-1
b_1=0.72099 in Eq. 1.1.2-9
b_2=0.72099 in Eq. 1.1.2-10
Ineffective width=2.1591 in
Ae=0.093325 in², Fn=50 ksi
Pn=4.6662 k Eq. E3.1-1
Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
Effective width calculations for Track
Element 1: No compressive stress (fully effective)
Element 3: Unstiffened, w=1.389 in
f_1=49.609 ksi, f_2=49.609 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=2.6407 Eq. 1.1-3
ρ=0.34714 Eq. 1.1-2
b=0.48217 in (ineffective width=0.90683 in) Eq. 1.1-1
Element 2: Stiffened, w=3.6011 in
f_1=47.492 ksi, f_2=-33.864 ksi
ψ=0.71304 Eq. 1.1.2-1
k=17.48 Eq. 1.1.2-2
λ=1.0506 Eq. 1.1-3
ρ=0.7525 Eq. 1.1-2
be=2.7098 in Eq. 1.1-1
h_o=3.8231 in, b_o=1.5 in, h_o/b_o=2.5487
b_1=0.72981 in Eq. 1.1.2-3
b_2=1.3549 in Eq. 1.1.2-4
Compression width=2.1022 in
Ineffective width=0.017446 in
Center of gravity shift: y=-0.30201 in
Sxe=0.17321 in³, Fy=50 ksi
Mnl=8.6607 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.389 in
f_1=49.609 ksi, f_2=49.609 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=2.6407 Eq. 1.1-3
ρ=0.34714 Eq. 1.1-2
b=0.48217 in (ineffective width=0.90683 in) Eq. 1.1-1

Element 3: No compressive stress (fully effective)
Element 2: Stiffened, w=3.6011 in
f_1=47.492 ksi, f_2=-33.864 ksi
ψ=0.71304 Eq. 1.1.2-1
k=17.48 Eq. 1.1.2-2
λ=1.0506 Eq. 1.1-3
ρ=0.7525 Eq. 1.1-2
be=2.7098 in Eq. 1.1-1
h_o=3.8231 in, b_o=1.5 in, h_o/b_o=2.5487
b_1=0.72981 in Eq. 1.1.2-3
b_2=1.3549 in Eq. 1.1.2-4
Compression width=2.1022 in
Ineffective width=0.017447 in
Center of gravity shift: y=0.30201 in
Sxe=0.17321 in^3, Fy=50 ksi
Mnl=8.6607 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.389 in
f_1=50 ksi, f_2=-10.228 ksi
ψ=0.20456 Eq. 1.2.2-1
k=0.61589 Eq. 1.2.2-5
λ=2.2152 Eq. 1.1-3
ρ=0.47872 Eq. 1.2.2-4
b=0.66494 in (ineffective width=0.72406 in) Eq. 1.1-1
Element 3: Unstiffened, w=1.389 in
f_1=50 ksi, f_2=-10.228 ksi
ψ=0.20456 Eq. 1.2.2-1
k=0.61589 Eq. 1.2.2-5
λ=2.2152 Eq. 1.1-3
ρ=0.47872 Eq. 1.2.2-4
b=0.66494 in (ineffective width=0.72406 in) Eq. 1.1-1
Element 2: No compressive stress (fully effective)
Iteration is not required
Center of gravity shift: x=-0.21924 in
Sye=0.012161 in^3, Fy=50 ksi
Mnl=0.60807 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.389 in
f_1=15.385 ksi, f_2=-50 ksi
ψ=3.25 Eq. 1.2.2-1
ψ>1 (fully effective) Eq. 1.1-1
Element 3: Unstiffened, w=1.389 in
f_1=15.385 ksi, f_2=-50 ksi
ψ=3.25 Eq. 1.2.2-1

ψ>1 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=3.6011 in	
f_1=19.795 ksi, f_2=19.795 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=1.418	Eq. 1.1-3
ρ=0.59582	Eq. 1.1-2
be=2.1456 in	Eq. 1.1-1
b_1=1.0728 in	Eq. 1.1.2-9
b_2=1.0728 in	Eq. 1.1.2-10
Ineffective width=1.4555 in	
Center of gravity shift: x=0.091932 in	
Sye=0.040633 in^3, Fy=50 ksi	
Mnl=2.0316 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Track

Cw=0.12461 in^6, Wn=1.8027 in^2, Fy=50 ksi	
Bn=3.4563 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.30002 in²	Wt.	0.0010201 k/ft	Flat	6.6524 in
Ix	0.66512 in⁴	rx	1.4889 in	Ixy	0.00000 in⁴
Sx(t)	0.34795 in³	y(t)	1.9116 in	α	0.000 deg
Sx(b)	0.34795 in³	y(b)	1.9116 in		
Zx	0.40577 in³	Height	3.8231 in		
Iy	0.06467 in⁴	ry	0.4643 in	x_o	-0.8554 in
Sy(l)	0.18433 in³	x(l)	0.3508 in	y_o	0.0000 in
Sy(r)	0.05627 in³	x(r)	1.1492 in	jx	2.1408 in
Zy	0.09914 in³	Width	1.5000 in	jy	0.0000 in
I_1	0.66512 in⁴	r_1	1.4889 in	Cw	0.15984 in⁶
I_2	0.06467 in⁴	r_2	0.4643 in	J	0.00020342 in⁴
Ic	0.72979 in⁴	rc	1.5596 in		
I_o	0.94930 in⁴	r_o	1.7788 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	6.381 k	ϕMnxo	10.930 k-in	ϕMnyo	1.041 k-in
Ae	0.15014 in²	Ixe	0.52454 in⁴	Iye	0.01780 in⁴
ϕTn	13.796 k	Sxe(t)	0.24289 in³	Sye(l)	0.10077 in³
		Sxe(b)	0.31532 in³	Sye(r)	0.02312 in³
Shear					
ϕVny	2.872 k	Negative Bending		Negative Bending	
ϕVnx	3.370 k	ϕMnxo	10.930 k-in	ϕMnyo	2.456 k-in
		Ixe	0.52454 in⁴	Iye	0.06030 in⁴
Torsion		Sxe(t)	0.31532 in³	Sye(l)	0.15264 in³
ϕBn	4.0152 k-in²	Sxe(b)	0.24289 in³	Sye(r)	0.05458 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
    - Fyc=74.687 ksi — Eq. A3.3.2-2
  - Track corner 3
    - t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
    - Fyc=74.687 ksi — Eq. A3.3.2-2
  - Fya=51.093 ksi — Eq. A3.3.2-1

Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Track corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi — Eq. A3.3.2-2
Track corner 3
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi — Eq. A3.3.2-2
Fya=52.375 ksi — Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Fya=50 ksi — Eq. A3.3.2-1

Axial Tension Strength
Ag=0.30002 in², Fy=51.093 ksi
Tn=15.329 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.30002 in², Fu=65 ksi
Tn=19.502 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Track element 1
Vn=1.8721 k at 180 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9
Track element 2
Vn=3.1914 k at 90 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Track element 3
Vn=1.8721 k at 0 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Track
Element 1: Unstiffened, w=1.3837 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=2.0261 — Eq. 1.1-3
ρ=0.43996 — Eq. 1.1-2
b=0.60878 in (ineffective width=0.77492 in) — Eq. 1.1-1
Element 3: Unstiffened, w=1.3837 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=2.0261 — Eq. 1.1-3
ρ=0.43996 — Eq. 1.1-2
b=0.60878 in (ineffective width=0.77492 in) — Eq. 1.1-1

Element 2: Stiffened, w=3.5905 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.1.2-1
k=4 Eq. 1.1.2-8
λ=1.7238 Eq. 1.1-3
ρ=0.50608 Eq. 1.1-2
be=1.8171 in Eq. 1.1-1
b_1=0.90854 in Eq. 1.1.2-9
b_2=0.90854 in Eq. 1.1.2-10
Ineffective width=1.7734 in
Ae=0.15014 in², Fn=50 ksi
Pn=7.5072 k Eq. E3.1-1
Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
Effective width calculations for Track
Element 1: No compressive stress (fully effective)
Element 3: Unstiffened, w=1.3837 in
f_1=49.478 ksi, f_2=49.478 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=2.0155 Eq. 1.1-3
ρ=0.44199 Eq. 1.1-2
b=0.61159 in (ineffective width=0.77211 in) Eq. 1.1-1
Element 2: Stiffened, w=3.5905 in
f_1=47.307 ksi, f_2=-35.827 ksi
ψ=0.75733 Eq. 1.1.2-1
k=18.369 Eq. 1.1.2-2
λ=0.78244 Eq. 1.1-3
ρ=0.9187 Eq. 1.1-2
be=3.2986 in Eq. 1.1-1
h_o=3.8231 in, b_o=1.5 in, h_o/b_o=2.5487
b_1=0.87791 in Eq. 1.1.2-3
b_2=1.6493 in Eq. 1.1.2-4
Compression width=2.0432 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: y=-0.24803 in
Sxe=0.24289 in³, Fy=50 ksi
Mnl=12.144 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3837 in
f_1=49.478 ksi, f_2=49.478 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=2.0155 Eq. 1.1-3
ρ=0.44199 Eq. 1.1-2
b=0.61159 in (ineffective width=0.77211 in) Eq. 1.1-1

Element 3: No compressive stress (fully effective)
Element 2: Stiffened, w=3.5905 in
f_1=47.307 ksi, f_2=-35.827 ksi
ψ=0.75733 Eq. 1.1.2-1
k=18.369 Eq. 1.1.2-2
λ=0.78244 Eq. 1.1-3
ρ=0.9187 Eq. 1.1-2
be=3.2986 in Eq. 1.1-1
h_o=3.8231 in, b_o=1.5 in, h_o/b_o=2.5487
b_1=0.87791 in Eq. 1.1.2-3
b_2=1.6493 in Eq. 1.1.2-4
Compression width=2.0432 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: y=0.24803 in
Sxe=0.24289 in^3, Fy=50 ksi
Mnl=12.144 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3837 in
f_1=50 ksi, f_2=-10.204 ksi
ψ=0.20407 Eq. 1.2.2-1
k=0.61577 Eq. 1.2.2-5
λ=1.6931 Eq. 1.1-3
ρ=0.59989 Eq. 1.2.2-4
b=0.83006 in (ineffective width=0.55364 in) Eq. 1.1-1
Element 3: Unstiffened, w=1.3837 in
f_1=50 ksi, f_2=-10.204 ksi
ψ=0.20407 Eq. 1.2.2-1
k=0.61577 Eq. 1.2.2-5
λ=1.6931 Eq. 1.1-3
ρ=0.59989 Eq. 1.2.2-4
b=0.83007 in (ineffective width=0.55363 in) Eq. 1.1-1
Element 2: No compressive stress (fully effective)
Iteration is not required
Center of gravity shift: x=-0.1742 in
Sye=0.023122 in^3, Fy=50 ksi
Mnl=1.1561 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3837 in
f_1=12.59 ksi, f_2=-50 ksi
ψ=3.9713 Eq. 1.2.2-1
ψ>1 (fully effective) Eq. 1.1-1
Element 3: Unstiffened, w=1.3837 in
f_1=12.59 ksi, f_2=-50 ksi
ψ=3.9713 Eq. 1.2.2-1

ψ>1 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=3.5905 in	
f_1=16.831 ksi, f_2=16.831 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=1.0001	Eq. 1.1-3
ρ=0.77993	Eq. 1.1-2
be=2.8003 in	Eq. 1.1-1
b_1=1.4002 in	Eq. 1.1.2-9
b_2=1.4002 in	Eq. 1.1.2-10
Ineffective width=0.79016 in	
Center of gravity shift: x=0.044246 in	
Sye=0.054576 in^3, Fy=50 ksi	
Mnl=2.7288 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Track

Cw=0.15984 in^6, Wn=1.7914 in^2, Fy=50 ksi	
Bn=4.4613 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.37428 in²	Wt.	0.0012726 k/ft	Flat	6.6127 in
Ix	0.8232 in⁴	rx	1.4830 in	Ixy	0.0000 in⁴
Sx(t)	0.43062 in³	y(t)	1.9116 in	α	0.000 deg
Sx(b)	0.43062 in³	y(b)	1.9116 in		
Zx	0.50405 in³	Height	3.8231 in		
Iy	0.0801 in⁴	ry	0.4627 in	x_o	-0.8544 in
Sy(l)	0.22508 in³	x(l)	0.3560 in	y_o	0.0000 in
Sy(r)	0.07005 in³	x(r)	1.1440 in	jx	2.1401 in
Zy	0.12366 in³	Width	1.5000 in	jy	0.0000 in
I_1	0.8232 in⁴	r_1	1.4830 in	Cw	0.19580 in⁶
I_2	0.0801 in⁴	r_2	0.4627 in	J	0.00039968 in⁴
Ic	0.9033 in⁴	rc	1.5535 in		
I_o	1.1765 in⁴	r_o	1.7730 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	9.673 k	ϕMnxo	14.680 k-in	ϕMnyo	1.784 k-in
Ae	0.22760 in²	Ixe	0.68674 in⁴	Iye	0.03511 in⁴
ϕTn	17.302 k	Sxe(t)	0.32623 in³	Sye(l)	0.15185 in³
		Sxe(b)	0.39972 in³	Sye(r)	0.03964 in³
Shear					
ϕVny	4.395 k	Negative Bending		Negative Bending	
ϕVnx	4.152 k	ϕMnxo	14.680 k-in	ϕMnyo	3.135 k-in
		Ixe	0.68674 in⁴	Iye	0.07911 in⁴
Torsion		Sxe(t)	0.39972 in³	Sye(l)	0.21708 in³
ϕBn	4.9659 k-in²	Sxe(b)	0.32623 in³	Sye(r)	0.06966 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
    - Fyc=75.384 ksi — Eq. A3.3.2-2
  - Track corner 3
    - t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
    - Fyc=75.384 ksi — Eq. A3.3.2-2
  - Fya=51.365 ksi — Eq. A3.3.2-1

Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Track corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Track corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=52.938 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Fya=50 ksi Eq. A3.3.2-1

Axial Tension Strength
Ag=0.37428 in², Fy=51.365 ksi
Tn=19.225 k Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.37428 in², Fu=65 ksi
Tn=24.328 k Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Track element 1
Vn=2.3067 k at 180 deg Eq. G2.1-1
Ωv=1.67, ϕv=0.9
Track element 2
Vn=4.8836 k at 90 deg Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Track element 3
Vn=2.3067 k at 0 deg Eq. G2.1-1
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Track
Element 1: Unstiffened, w=1.3585 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.5851 Eq. 1.1-3
ρ=0.54333 Eq. 1.1-2
b=0.73811 in (ineffective width=0.62039 in) Eq. 1.1-1
Element 3: Unstiffened, w=1.3585 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.5851 Eq. 1.1-3
ρ=0.54333 Eq. 1.1-2
b=0.73811 in (ineffective width=0.62039 in) Eq. 1.1-1

Element 2: Stiffened, w=3.5401 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.1.2-1
k=4 Eq. 1.1.2-8
λ=1.3543 Eq. 1.1-3
ρ=0.61845 Eq. 1.1-2
be=2.1894 in Eq. 1.1-1
b_1=1.0947 in Eq. 1.1.2-9
b_2=1.0947 in Eq. 1.1.2-10
Ineffective width=1.3507 in
Ae=0.2276 in², Fn=50 ksi
Pn=11.38 k Eq. E3.1-1
Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
Effective width calculations for Track
Element 1: No compressive stress (fully effective)
Element 3: Unstiffened, w=1.3585 in
f_1=49.328 ksi, f_2=49.328 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.5744 Eq. 1.1-3
ρ=0.54642 Eq. 1.1-2
b=0.74231 in (ineffective width=0.61619 in) Eq. 1.1-1
Element 2: Stiffened, w=3.5401 in
f_1=46.639 ksi, f_2=-37.452 ksi
ψ=0.80303 Eq. 1.1.2-1
k=19.329 Eq. 1.1.2-2
λ=0.595 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=3.5401 in Eq. 1.1-1
h_o=3.8231 in, b_o=1.5 in, h_o/b_o=2.5487
b_1=0.93086 in Eq. 1.1.2-3
b_2=1.7701 in Eq. 1.1.2-4
Compression width=1.9634 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: y=-0.19352 in
Sxe=0.32623 in³, Fy=50 ksi
Mnl=16.312 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3585 in
f_1=49.328 ksi, f_2=49.328 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.5744 Eq. 1.1-3
ρ=0.54642 Eq. 1.1-2
b=0.74231 in (ineffective width=0.61619 in) Eq. 1.1-1

Element 3: No compressive stress (fully effective)
Element 2: Stiffened, w=3.5401 in
f_1=46.639 ksi, f_2=-37.452 ksi
ψ=0.80303 Eq. 1.1.2-1
k=19.329 Eq. 1.1.2-2
λ=0.595 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=3.5401 in Eq. 1.1-1
h_o=3.8231 in, b_o=1.5 in, h_o/b_o=2.5487
b_1=0.93086 in Eq. 1.1.2-3
b_2=1.7701 in Eq. 1.1.2-4
Compression width=1.9634 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: y=0.19352 in
Sxe=0.32623 in³, Fy=50 ksi
Mnl=16.312 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3585 in
f_1=50 ksi, f_2=-9.3765 ksi
ψ=0.18753 Eq. 1.2.2-1
k=0.61184 Eq. 1.2.2-5
λ=1.3288 Eq. 1.1-3
ρ=0.71798 Eq. 1.2.2-4
b=0.97537 in (ineffective width=0.38313 in) Eq. 1.1-1
Element 3: Unstiffened, w=1.3585 in
f_1=50 ksi, f_2=-9.3765 ksi
ψ=0.18753 Eq. 1.2.2-1
k=0.61184 Eq. 1.2.2-5
λ=1.3288 Eq. 1.1-3
ρ=0.71798 Eq. 1.2.2-4
b=0.97537 in (ineffective width=0.38313 in) Eq. 1.1-1
Element 2: No compressive stress (fully effective)
Iteration is not required
Center of gravity shift: x=-0.12482 in
Sye=0.039641 in³, Fy=50 ksi
Mnl=1.9821 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3585 in
f_1=9.7427 ksi, f_2=-50 ksi
ψ=5.132 Eq. 1.2.2-1
ψ>1 (fully effective) Eq. 1.1-1
Element 3: Unstiffened, w=1.3585 in
f_1=9.7427 ksi, f_2=-50 ksi
ψ=5.132 Eq. 1.2.2-1

ψ>1 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=3.5401 in	
f_1=14.721 ksi, f_2=14.721 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=0.73483	Eq. 1.1-3
ρ=0.95343	Eq. 1.1-2
be=3.3752 in	Eq. 1.1-1
b_1=1.6876 in	Eq. 1.1.2-9
b_2=1.6876 in	Eq. 1.1.2-10
Ineffective width=0.16485 in	
Center of gravity shift: x=0.0083791 in	
Sye=0.06966 in^3, Fy=50 ksi	
Mnl=3.483 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Track

Cw=0.1958 in^6, Wn=1.7743 in^2, Fy=50 ksi	
Bn=5.5176 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.46760 in²	Wt.	0.0015898 k/ft	Flat	6.5581 in
Ix	1.0175 in⁴	rx	1.4751 in	Ixy	0.0000 in⁴
Sx(t)	0.53227 in³	y(t)	1.9116 in	α	0.000 deg
Sx(b)	0.53227 in³	y(b)	1.9116 in		
Zx	0.62611 in³	Height	3.8231 in		
Iy	0.0993 in⁴	ry	0.4608 in	x_o	-0.8536 in
Sy(l)	0.27357 in³	x(l)	0.3629 in	y_o	0.0000 in
Sy(r)	0.08732 in³	x(r)	1.1371 in	jx	2.1406 in
Zy	0.15454 in³	Width	1.5000 in	jy	0.0000 in
I_1	1.0175 in⁴	r_1	1.4751 in	Cw	0.23852 in⁶
I_2	0.0993 in⁴	r_2	0.4608 in	J	0.00079237 in⁴
Ic	1.1167 in⁴	rc	1.5454 in		
I_o	1.4574 in⁴	r_o	1.7655 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	14.618 k	ϕMnxo	19.865 k-in	ϕMnyo	2.974 k-in
Ae	0.34395 in²	Ixe	0.90197 in⁴	Iye	0.06633 in⁴
ϕTn	21.771 k	Sxe(t)	0.44145 in³	Sye(l)	0.22476 in³
		Sxe(b)	0.50675 in³	Sye(r)	0.06610 in³
Shear					
ϕVny	6.370 k	Negative Bending		Negative Bending	
ϕVnx	5.089 k	ϕMnxo	19.865 k-in	ϕMnyo	3.929 k-in
		Ixe	0.90197 in⁴	Iye	0.09929 in⁴
Torsion		Sxe(t)	0.50675 in³	Sye(l)	0.27357 in³
ϕBn	6.1301 k-in²	Sxe(b)	0.44145 in³	Sye(r)	0.08732 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
    - Fyc=75.391 ksi — Eq. A3.3.2-2
  - Track corner 3
    - t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
    - Fyc=75.391 ksi — Eq. A3.3.2-2
  - Fya=51.734 ksi — Eq. A3.3.2-1

Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Track corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi — Eq. A3.3.2-2
Track corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi — Eq. A3.3.2-2
Fya=53.678 ksi — Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Fya=50 ksi — Eq. A3.3.2-1

Axial Tension Strength
Ag=0.46759 in², Fy=51.734 ksi
Tn=24.19 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.46759 in², Fu=65 ksi
Tn=30.394 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Track element 1
Vn=2.8273 k at 180 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9
Track element 2
Vn=7.0773 k at 90 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Track element 3
Vn=2.8273 k at 0 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Track
Element 1: Unstiffened, w=1.3218 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=1.2243 — Eq. 1.1-3
ρ=0.67003 — Eq. 1.1-2
b=0.88565 in (ineffective width=0.43615 in) — Eq. 1.1-1
Element 3: Unstiffened, w=1.3218 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=1.2243 — Eq. 1.1-3
ρ=0.67003 — Eq. 1.1-2
b=0.88565 in (ineffective width=0.43615 in) — Eq. 1.1-1

Element 2: Stiffened, w=3.4667 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.1.2-1
k=4 Eq. 1.1.2-8
λ=1.0528 Eq. 1.1-3
ρ=0.75138 Eq. 1.1-2
be=2.6048 in Eq. 1.1-1
b_1=1.3024 in Eq. 1.1.2-9
b_2=1.3024 in Eq. 1.1.2-10
Ineffective width=0.86189 in
Ae=0.34395 in², Fn=50 ksi
Pn=17.197 k Eq. E3.1-1
Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
Effective width calculations for Track
Element 1: No compressive stress (fully effective)
Element 3: Unstiffened, w=1.3218 in
f_1=49.128 ksi, f_2=49.128 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.2135 Eq. 1.1-3
ρ=0.67465 Eq. 1.1-2
b=0.89175 in (ineffective width=0.43005 in) Eq. 1.1-1
Element 2: Stiffened, w=3.4667 in
f_1=45.639 ksi, f_2=-39.202 ksi
ψ=0.85896 Eq. 1.1.2-1
k=20.566 Eq. 1.1.2-2
λ=0.44358 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=3.4667 in Eq. 1.1-1
h_o=3.8231 in, b_o=1.5 in, h_o/b_o=2.5487
b_1=0.89835 in Eq. 1.1.2-3
b_2=1.7334 in Eq. 1.1.2-4
Compression width=1.8649 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: y=-0.13165 in
Sxe=0.44145 in³, Fy=50 ksi
Mnl=22.072 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3218 in
f_1=49.128 ksi, f_2=49.128 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.2135 Eq. 1.1-3
ρ=0.67465 Eq. 1.1-2
b=0.89175 in (ineffective width=0.43005 in) Eq. 1.1-1

Element 3: No compressive stress (fully effective)
Element 2: Stiffened, w=3.4667 in
f_1=45.639 ksi, f_2=-39.202 ksi
ψ=0.85896 Eq. 1.1.2-1
k=20.566 Eq. 1.1.2-2
λ=0.44358 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=3.4667 in Eq. 1.1-1
h_o=3.8231 in, b_o=1.5 in, h_o/b_o=2.5487
b_1=0.89835 in Eq. 1.1.2-3
b_2=1.7334 in Eq. 1.1.2-4
Compression width=1.8649 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: y=0.13165 in
Sxe=0.44145 in³, Fy=50 ksi
Mnl=22.072 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3218 in
f_1=50 ksi, f_2=-8.1231 ksi
ψ=0.16246 Eq. 1.2.2-1
k=0.60596 Eq. 1.2.2-5
λ=1.0313 Eq. 1.1-3
ρ=0.84766 Eq. 1.2.2-4
b=1.1204 in (ineffective width=0.20136 in) Eq. 1.1-1
Element 3: Unstiffened, w=1.3218 in
f_1=50 ksi, f_2=-8.1231 ksi
ψ=0.16246 Eq. 1.2.2-1
k=0.60596 Eq. 1.2.2-5
λ=1.0313 Eq. 1.1-3
ρ=0.84766 Eq. 1.2.2-4
b=1.1204 in (ineffective width=0.20136 in) Eq. 1.1-1
Element 2: No compressive stress (fully effective)
Iteration is not required
Center of gravity shift: x=-0.067807 in
Sye=0.066099 in³, Fy=50 ksi
Mnl=3.305 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3218 in
f_1=8.1231 ksi, f_2=-50 ksi
ψ=6.1553 Eq. 1.2.2-1
ψ>1 (fully effective) Eq. 1.1-1
Element 3: Unstiffened, w=1.3218 in
f_1=8.1231 ksi, f_2=-50 ksi
ψ=6.1553 Eq. 1.2.2-1

ψ>1 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=3.4667 in	
f_1=14.391 ksi, f_2=14.391 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=0.56481	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=3.4667 in	Eq. 1.1-1
b_1=1.7333 in	Eq. 1.1.2-9
b_2=1.7334 in	Eq. 1.1.2-10
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0 in	
Sye=0.08732 in^3, Fy=50 ksi	
Mnl=4.366 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Track

Cw=0.23852 in^6, Wn=1.7509 in^2, Fy=50 ksi	
Bn=6.8112 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.22012 in²	Wt.	0.00074842 k/ft	Flat	7.0553 in
Ix	0.57915 in⁴	rx	1.6220 in	Ixy	0.00000 in⁴
Sx(t)	0.27591 in³	y(t)	2.0991 in	α	0.000 deg
Sx(b)	0.27591 in³	y(b)	2.0991 in		
Zx	0.32315 in³	Height	4.1981 in		
Iy	0.04655 in⁴	ry	0.4599 in	x_o	-0.8268 in
Sy(l)	0.14190 in³	x(l)	0.3281 in	y_o	0.0000 in
Sy(r)	0.03972 in³	x(r)	1.1719 in	jx	2.3625 in
Zy	0.06922 in³	Width	1.5000 in	jy	0.0000 in
I_1	0.57915 in⁴	r_1	1.6220 in	Cw	0.14104 in⁶
I_2	0.04655 in⁴	r_2	0.4599 in	J	0.00007143 in⁴
Ic	0.62571 in⁴	rc	1.6860 in		
I_o	0.77618 in⁴	r_o	1.8778 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	3.308 k	ϕMnxo	6.9504 k-in	ϕMnyo	0.4159 k-in
Ae	0.077838 in²	Ixe	0.39499 in⁴	Iye	0.00558 in⁴
ϕTn	10.060 k	Sxe(t)	0.15445 in³	Sye(l)	0.05406 in³
		Sxe(b)	0.24073 in³	Sye(r)	0.00924 in³
Shear					
ϕVny	1.336 k	Negative Bending		Negative Bending	
ϕVnx	2.310 k	ϕMnxo	6.9504 k-in	ϕMnyo	1.6299 k-in
		Ixe	0.39499 in⁴	Iye	0.03789 in⁴
Torsion		Sxe(t)	0.24073 in³	Sye(l)	0.08345 in³
ϕBn	3.1462 k-in²	Sxe(b)	0.15445 in³	Sye(r)	0.03622 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
    - Fyc=68.69 ksi — Eq. A3.3.2-2
  - Track corner 3
    - t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
    - Fyc=68.69 ksi — Eq. A3.3.2-2
  - Fya=50.78 ksi — Eq. A3.3.2-1

Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Track corner 2
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi — Eq. A3.3.2-2
Track corner 3
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi — Eq. A3.3.2-2
Fya=51.789 ksi — Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Fya=50 ksi — Eq. A3.3.2-1

Axial Tension Strength
Ag=0.22012 in², Fy=50.78 ksi
Tn=11.178 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.22012 in², Fu=65 ksi
Tn=14.308 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Track element 1
Vn=1.2831 k at 180 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Track element 2
Vn=1.4847 k at 90 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Track element 3
Vn=1.2831 k at 0 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Track
Element 1: Unstiffened, w=1.3907 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=2.9436 — Eq. 1.1-3
ρ=0.31433 — Eq. 1.1-2
b=0.43714 in (ineffective width=0.95356 in) — Eq. 1.1-1
Element 3: Unstiffened, w=1.3907 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=2.9436 — Eq. 1.1-3
ρ=0.31433 — Eq. 1.1-2
b=0.43714 in (ineffective width=0.95356 in) — Eq. 1.1-1

Element 2: Stiffened, w=3.9795 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.1.2-1
k=4 Eq. 1.1.2-8
λ=2.7617 Eq. 1.1-3
ρ=0.33325 Eq. 1.1-2
be=1.3262 in Eq. 1.1-1
b_1=0.66308 in Eq. 1.1.2-9
b_2=0.66308 in Eq. 1.1.2-10
Ineffective width=2.6533 in
Ae=0.077838 in², Fn=50 ksi
Pn=3.8919 k Eq. E3.1-1
Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
Effective width calculations for Track
Element 1: No compressive stress (fully effective)
Element 3: Unstiffened, w=1.3907 in
f_1=49.695 ksi, f_2=49.695 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=2.9346 Eq. 1.1-3
ρ=0.31521 Eq. 1.1-2
b=0.43837 in (ineffective width=0.95233 in) Eq. 1.1-1
Element 2: Stiffened, w=3.9795 in
f_1=47.863 ksi, f_2=-29.955 ksi
ψ=0.62585 Eq. 1.1.2-1
k=15.847 Eq. 1.1.2-2
λ=1.3575 Eq. 1.1-3
ρ=0.61726 Eq. 1.1-2
be=2.4564 in Eq. 1.1-1
h_o=4.1981 in, b_o=1.5 in, h_o/b_o=2.7987
b_1=0.67746 in Eq. 1.1.2-3
b_2=1.2282 in Eq. 1.1.2-4
Compression width=2.4476 in
Ineffective width=0.542 in
Center of gravity shift: y=-0.45829 in
Sxe=0.15445 in³, Fy=50 ksi
Mnl=7.7226 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3907 in
f_1=49.695 ksi, f_2=49.695 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=2.9346 Eq. 1.1-3
ρ=0.31521 Eq. 1.1-2
b=0.43837 in (ineffective width=0.95233 in) Eq. 1.1-1

Element 3: No compressive stress (fully effective)
Element 2: Stiffened, w=3.9795 in
f_1=47.863 ksi, f_2=-29.955 ksi
ψ=0.62585 Eq. 1.1.2-1
k=15.847 Eq. 1.1.2-2
λ=1.3575 Eq. 1.1-3
ρ=0.61726 Eq. 1.1-2
be=2.4564 in Eq. 1.1-1
h_o=4.1981 in, b_o=1.5 in, h_o/b_o=2.7987
b_1=0.67746 in Eq. 1.1.2-3
b_2=1.2282 in Eq. 1.1.2-4
Compression width=2.4476 in
Ineffective width=0.542 in
Center of gravity shift: y=0.45829 in
Sxe=0.15445 in³, Fy=50 ksi
Mnl=7.7226 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3907 in
f_1=50 ksi, f_2=-9.3335 ksi
ψ=0.18667 Eq. 1.2.2-1
k=0.61164 Eq. 1.2.2-5
λ=2.4681 Eq. 1.1-3
ρ=0.42994 Eq. 1.2.2-4
b=0.59792 in (ineffective width=0.79278 in) Eq. 1.1-1
Element 3: Unstiffened, w=1.3907 in
f_1=50 ksi, f_2=-9.3335 ksi
ψ=0.18667 Eq. 1.2.2-1
k=0.61164 Eq. 1.2.2-5
λ=2.4681 Eq. 1.1-3
ρ=0.42994 Eq. 1.2.2-4
b=0.59792 in (ineffective width=0.79278 in) Eq. 1.1-1
Element 2: No compressive stress (fully effective)
Iteration is not required
Center of gravity shift: x=-0.22481 in
Sye=0.0092417 in³, Fy=50 ksi
Mnl=0.46209 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3907 in
f_1=16.455 ksi, f_2=-50 ksi
ψ=3.0386 Eq. 1.2.2-1
ψ>1 (fully effective) Eq. 1.1-1
Element 3: Unstiffened, w=1.3907 in
f_1=16.455 ksi, f_2=-50 ksi
ψ=3.0386 Eq. 1.2.2-1

ψ>1 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=3.9795 in	
f_1=20.933 ksi, f_2=20.933 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=1.7869	Eq. 1.1-3
ρ=0.49072	Eq. 1.1-2
be=1.9528 in	Eq. 1.1-1
b_1=0.97642 in	Eq. 1.1.2-9
b_2=0.97642 in	Eq. 1.1.2-10
Ineffective width=2.0267 in	
Center of gravity shift: x=0.12593 in	
Sye=0.036219 in^3, Fy=50 ksi	
Mnl=1.811 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Track

Cw=0.14104 in^6, Wn=2.0173 in^2, Fy=50 ksi	
Bn=3.4958 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.24388 in²	Wt.	0.00082918 k/ft	Flat	7.0485 in
Ix	0.64055 in⁴	rx	1.6207 in	Ixy	0.00000 in⁴
Sx(t)	0.30516 in³	y(t)	2.0991 in	α	0.000 deg
Sx(b)	0.30516 in³	y(b)	2.0991 in		
Zx	0.35771 in³	Height	4.1981 in		
Iy	0.05146 in⁴	ry	0.4593 in	x_o	-0.8257 in
Sy(l)	0.15624 in³	x(l)	0.3293 in	y_o	0.0000 in
Sy(r)	0.04395 in³	x(r)	1.1707 in	jx	2.3605 in
Zy	0.07665 in³	Width	1.5000 in	jy	0.0000 in
I_1	0.64055 in⁴	r_1	1.6207 in	Cw	0.15564 in⁶
I_2	0.05146 in⁴	r_2	0.4593 in	J	0.00009732 in⁴
Ic	0.69200 in⁴	rc	1.6845 in		
I_o	0.85829 in⁴	r_o	1.8760 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	3.988 k	ϕMnxo	8.5292 k-in	ϕMnyo	0.5366 k-in
Ae	0.093834 in²	Ixe	0.46698 in⁴	Iye	0.00772 in⁴
ϕTn	11.160 k	Sxe(t)	0.18954 in³	Sye(l)	0.06556 in³
		Sxe(b)	0.26925 in³	Sye(r)	0.01192 in³
Shear					
ϕVny	1.664 k	Negative Bending		Negative Bending	
ϕVnx	2.595 k	ϕMnxo	8.5292 k-in	ϕMnyo	1.8340 k-in
		Ixe	0.46698 in⁴	Iye	0.04340 in⁴
Torsion		Sxe(t)	0.26925 in³	Sye(l)	0.09975 in³
ϕBn	3.4784 k-in²	Sxe(b)	0.18954 in³	Sye(r)	0.04076 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
    - Fyc=70.273 ksi — Eq. A3.3.2-2
  - Track corner 3
    - t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
    - Fyc=70.273 ksi — Eq. A3.3.2-2
  - Fya=50.847 ksi — Eq. A3.3.2-1

Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Track corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi — Eq. A3.3.2-2
Track corner 3
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi — Eq. A3.3.2-2
Fya=51.942 ksi — Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Fya=50 ksi — Eq. A3.3.2-1

Axial Tension Strength
Ag=0.24388 in², Fy=50.847 ksi
Tn=12.4 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.24388 in², Fu=65 ksi
Tn=15.852 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Track element 1
Vn=1.4418 k at 180 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9
Track element 2
Vn=1.8493 k at 90 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Track element 3
Vn=1.4418 k at 0 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Track
Element 1: Unstiffened, w=1.389 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=2.6511 — Eq. 1.1-3
ρ=0.3459 — Eq. 1.1-2
b=0.48045 in (ineffective width=0.90855 in) — Eq. 1.1-1
Element 3: Unstiffened, w=1.389 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=2.6511 — Eq. 1.1-3
ρ=0.3459 — Eq. 1.1-2
b=0.48045 in (ineffective width=0.90855 in) — Eq. 1.1-1

Element 2: Stiffened, w=3.9761 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.1.2-1
k=4 Eq. 1.1.2-8
λ=2.4882 Eq. 1.1-3
ρ=0.36636 Eq. 1.1-2
be=1.4567 in Eq. 1.1-1
b_1=0.72834 in Eq. 1.1.2-9
b_2=0.72834 in Eq. 1.1.2-10
Ineffective width=2.5194 in
Ae=0.093834 in², Fn=50 ksi
Pn=4.6917 k Eq. E3.1-1
Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
Effective width calculations for Track
Element 1: No compressive stress (fully effective)
Element 3: Unstiffened, w=1.389 in
f_1=49.649 ksi, f_2=49.649 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=2.6418 Eq. 1.1-3
ρ=0.34701 Eq. 1.1-2
b=0.482 in (ineffective width=0.907 in) Eq. 1.1-1
Element 2: Stiffened, w=3.9761 in
f_1=47.747 ksi, f_2=-32.966 ksi
ψ=0.69044 Eq. 1.1.2-1
k=17.042 Eq. 1.1.2-2
λ=1.178 Eq. 1.1-3
ρ=0.69036 Eq. 1.1-2
be=2.7449 in Eq. 1.1-1
h_o=4.1981 in, b_o=1.5 in, h_o/b_o=2.7987
b_1=0.7438 in Eq. 1.1.2-3
b_2=1.3725 in Eq. 1.1.2-4
Compression width=2.3521 in
Ineffective width=0.23584 in
Center of gravity shift: y=-0.3647 in
Sxe=0.18954 in³, Fy=50 ksi
Mnl=9.4769 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.389 in
f_1=49.649 ksi, f_2=49.649 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=2.6418 Eq. 1.1-3
ρ=0.34701 Eq. 1.1-2
b=0.482 in (ineffective width=0.907 in) Eq. 1.1-1

Element 3: No compressive stress (fully effective)
Element 2: Stiffened, w=3.9761 in
f_1=47.747 ksi, f_2=-32.966 ksi
ψ=0.69044 Eq. 1.1.2-1
k=17.042 Eq. 1.1.2-2
λ=1.178 Eq. 1.1-3
ρ=0.69036 Eq. 1.1-2
be=2.7449 in Eq. 1.1-1
h_o=4.1981 in, b_o=1.5 in, h_o/b_o=2.7987
b_1=0.7438 in Eq. 1.1.2-3
b_2=1.3725 in Eq. 1.1.2-4
Compression width=2.3521 in
Ineffective width=0.23584 in
Center of gravity shift: y=0.3647 in
Sxe=0.18954 in³, Fy=50 ksi
Mnl=9.4769 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.389 in
f_1=50 ksi, f_2=-9.3258 ksi
ψ=0.18652 Eq. 1.2.2-1
k=0.6116 Eq. 1.2.2-5
λ=2.2229 Eq. 1.1-3
ρ=0.47108 Eq. 1.2.2-4
b=0.65433 in (ineffective width=0.73467 in) Eq. 1.1-1
Element 3: Unstiffened, w=1.389 in
f_1=50 ksi, f_2=-9.3258 ksi
ψ=0.18652 Eq. 1.2.2-1
k=0.6116 Eq. 1.2.2-5
λ=2.2229 Eq. 1.1-3
ρ=0.47108 Eq. 1.2.2-4
b=0.65433 in (ineffective width=0.73467 in) Eq. 1.1-1
Element 2: No compressive stress (fully effective)
Iteration is not required
Center of gravity shift: x=-0.21156 in
Sye=0.011924 in³, Fy=50 ksi
Mnl=0.59618 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.389 in
f_1=15.199 ksi, f_2=-50 ksi
ψ=3.2898 Eq. 1.2.2-1
ψ>1 (fully effective) Eq. 1.1-1
Element 3: Unstiffened, w=1.389 in
f_1=15.199 ksi, f_2=-50 ksi
ψ=3.2898 Eq. 1.2.2-1

$\psi>1$ (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=3.9761 in	
f_1=19.597 ksi, f_2=19.597 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=1.5577	Eq. 1.1-3
ρ=0.55129	Eq. 1.1-2
be=2.192 in	Eq. 1.1-1
b_1=1.096 in	Eq. 1.1.2-9
b_2=1.096 in	Eq. 1.1.2-10
Ineffective width=1.7841 in	
Center of gravity shift: x=0.10575 in	
Sye=0.040757 in^3, Fy=50 ksi	
Mnl=2.0378 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Track

Cw=0.15564 in^6, Wn=2.0135 in^2, Fy=50 ksi	
Bn=3.8649 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.31694 in²	Wt.	0.0010776 k/ft	Flat	7.0274 in
Ix	0.8280 in⁴	rx	1.6164 in	Ixy	0.0000 in⁴
Sx(t)	0.39448 in³	y(t)	2.0991 in	α	0.000 deg
Sx(b)	0.39448 in³	y(b)	2.0991 in		
Zx	0.46361 in³	Height	4.1981 in		
Iy	0.0664 in⁴	ry	0.4577 in	x_o	-0.8225 in
Sy(l)	0.19920 in³	x(l)	0.3333 in	y_o	0.0000 in
Sy(r)	0.05691 in³	x(r)	1.1667 in	jx	2.3542 in
Zy	0.09943 in³	Width	1.5000 in	jy	0.0000 in
I_1	0.8280 in⁴	r_1	1.6164 in	Cw	0.19976 in⁶
I_2	0.0664 in⁴	r_2	0.4577 in	J	0.00021488 in⁴
Ic	0.8944 in⁴	rc	1.6799 in		
I_o	1.1088 in⁴	r_o	1.8704 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	6.429 k	ϕMnxo	12.595 k-in	ϕMnyo	1.022 k-in
Ae	0.15128 in²	Ixe	0.65929 in⁴	Iye	0.01750 in⁴
ϕTn	14.557 k	Sxe(t)	0.27990 in³	Sye(l)	0.10698 in³
		Sxe(b)	0.35779 in³	Sye(r)	0.02272 in³
Shear					
ϕVny	2.876 k	Negative Bending		Negative Bending	
ϕVnx	3.370 k	ϕMnxo	12.595 k-in	ϕMnyo	2.467 k-in
		Ixe	0.65929 in⁴	Iye	0.06092 in⁴
Torsion		Sxe(t)	0.35779 in³	Sye(l)	0.15667 in³
ϕBn	4.4911 k-in²	Sxe(b)	0.27990 in³	Sye(r)	0.05482 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
    - Fyc=74.687 ksi — Eq. A3.3.2-2
  - Track corner 3
    - t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
    - Fyc=74.687 ksi — Eq. A3.3.2-2
  - Fya=51.035 ksi — Eq. A3.3.2-1

Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Track corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Track corner 3
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi Eq. A3.3.2-2
Fya=52.375 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Fya=50 ksi Eq. A3.3.2-1

Axial Tension Strength
Ag=0.31694 in², Fy=51.035 ksi
Tn=16.175 k Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.31694 in², Fu=65 ksi
Tn=20.601 k Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Track element 1
Vn=1.8721 k at 180 deg Eq. G2.1-1
Ωv=1.67, ϕv=0.9
Track element 2
Vn=3.1957 k at 90 deg Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Track element 3
Vn=1.8721 k at 0 deg Eq. G2.1-1
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Track
Element 1: Unstiffened, w=1.3837 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=2.0261 Eq. 1.1-3
ρ=0.43996 Eq. 1.1-2
b=0.60878 in (ineffective width=0.77492 in) Eq. 1.1-1
Element 3: Unstiffened, w=1.3837 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=2.0261 Eq. 1.1-3
ρ=0.43996 Eq. 1.1-2
b=0.60878 in (ineffective width=0.77492 in) Eq. 1.1-1

Element 2: Stiffened, w=3.9655 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.1.2-1
k=4 Eq. 1.1.2-8
λ=1.9038 Eq. 1.1-3
ρ=0.46456 Eq. 1.1-2
be=1.8422 in Eq. 1.1-1
b_1=0.92111 in Eq. 1.1.2-9
b_2=0.92111 in Eq. 1.1.2-10
Ineffective width=2.1233 in
Ae=0.15128 in², Fn=50 ksi
Pn=7.5639 k Eq. E3.1-1
Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
Effective width calculations for Track
Element 1: No compressive stress (fully effective)
Element 3: Unstiffened, w=1.3837 in
f_1=49.521 ksi, f_2=49.521 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=2.0164 Eq. 1.1-3
ρ=0.44182 Eq. 1.1-2
b=0.61135 in (ineffective width=0.77235 in) Eq. 1.1-1
Element 2: Stiffened, w=3.9655 in
f_1=47.531 ksi, f_2=-36.65 ksi
ψ=0.77108 Eq. 1.1.2-1
k=18.653 Eq. 1.1.2-2
λ=0.85958 Eq. 1.1-3
ρ=0.86561 Eq. 1.1-2
be=3.4326 in Eq. 1.1-1
h_o=4.1981 in, b_o=1.5 in, h_o/b_o=2.7987
b_1=0.91024 in Eq. 1.1.2-3
b_2=1.7163 in Eq. 1.1.2-4
Compression width=2.239 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: y=-0.2564 in
Sxe=0.2799 in³, Fy=50 ksi
Mnl=13.995 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3837 in
f_1=49.521 ksi, f_2=49.521 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=2.0164 Eq. 1.1-3
ρ=0.44182 Eq. 1.1-2
b=0.61135 in (ineffective width=0.77235 in) Eq. 1.1-1

Element 3: No compressive stress (fully effective)
Element 2: Stiffened, w=3.9655 in
f_1=47.531 ksi, f_2=-36.65 ksi
ψ=0.77108 Eq. 1.1.2-1
k=18.653 Eq. 1.1.2-2
λ=0.85958 Eq. 1.1-3
ρ=0.86561 Eq. 1.1-2
be=3.4326 in Eq. 1.1-1
h_o=4.1981 in, b_o=1.5 in, h_o/b_o=2.7987
b_1=0.91024 in Eq. 1.1.2-3
b_2=1.7163 in Eq. 1.1.2-4
Compression width=2.239 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: y=0.2564 in
Sxe=0.2799 in³, Fy=50 ksi
Mnl=13.995 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3837 in
f_1=50 ksi, f_2=-9.2997 ksi
ψ=0.18599 Eq. 1.2.2-1
k=0.61148 Eq. 1.2.2-5
λ=1.6991 Eq. 1.1-3
ρ=0.59083 Eq. 1.2.2-4
b=0.81754 in (ineffective width=0.56616 in) Eq. 1.1-1
Element 3: Unstiffened, w=1.3837 in
f_1=50 ksi, f_2=-9.2997 ksi
ψ=0.18599 Eq. 1.2.2-1
k=0.61148 Eq. 1.2.2-5
λ=1.6991 Eq. 1.1-3
ρ=0.59083 Eq. 1.2.2-4
b=0.81754 in (ineffective width=0.56616 in) Eq. 1.1-1
Element 2: No compressive stress (fully effective)
Iteration is not required
Center of gravity shift: x=-0.16972 in
Sye=0.022718 in³, Fy=50 ksi
Mnl=1.1359 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3837 in
f_1=12.228 ksi, f_2=-50 ksi
ψ=4.089 Eq. 1.2.2-1
ψ>1 (fully effective) Eq. 1.1-1
Element 3: Unstiffened, w=1.3837 in
f_1=12.228 ksi, f_2=-50 ksi
ψ=4.089 Eq. 1.2.2-1

ψ>1 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=3.9655 in	
f_1=16.444 ksi, f_2=16.444 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=1.0918	Eq. 1.1-3
ρ=0.73135	Eq. 1.1-2
be=2.9002 in	Eq. 1.1-1
b_1=1.4501 in	Eq. 1.1.2-9
b_2=1.4501 in	Eq. 1.1.2-10
Ineffective width=1.0653 in	
Center of gravity shift: x=0.055525 in	
Sye=0.054823 in^3, Fy=50 ksi	
Mnl=2.7411 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Track

Cw=0.19976 in^6, Wn=2.0015 in^2, Fy=50 ksi	
Bn=4.9901 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.39551 in²	Wt.	0.0013447 k/ft	Flat	6.9877 in
Ix	1.0256 in⁴	rx	1.6103 in	Ixy	0.0000 in⁴
Sx(t)	0.48859 in³	y(t)	2.0991 in	α	0.000 deg
Sx(b)	0.48859 in³	y(b)	2.0991 in		
Zx	0.57622 in³	Height	4.1981 in		
Iy	0.0823 in⁴	ry	0.4562 in	x_o	-0.8214 in
Sy(l)	0.24317 in³	x(l)	0.3384 in	y_o	0.0000 in
Sy(r)	0.07085 in³	x(r)	1.1616 in	jx	2.3541 in
Zy	0.12413 in³	Width	1.5000 in	jy	0.0000 in
I_1	1.0256 in⁴	r_1	1.6103 in	Cw	0.24498 in⁶
I_2	0.0823 in⁴	r_2	0.4562 in	J	0.00042234 in⁴
Ic	1.1079 in⁴	rc	1.6737 in		
I_o	1.3747 in⁴	r_o	1.8644 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	9.771 k	ϕMnxo	16.859 k-in	ϕMnyo	1.758 k-in
Ae	0.22990 in²	Ixe	0.86145 in⁴	Iye	0.03469 in⁴
ϕTn	18.258 k	Sxe(t)	0.37464 in³	Sye(l)	0.16136 in³
		Sxe(b)	0.45372 in³	Sye(r)	0.03907 in³
Shear					
ϕVny	4.471 k	Negative Bending		Negative Bending	
ϕVnx	4.152 k	ϕMnxo	16.859 k-in	ϕMnyo	3.153 k-in
		Ixe	0.86145 in⁴	Iye	0.08018 in⁴
Torsion		Sxe(t)	0.45372 in³	Sye(l)	0.22546 in³
ϕBn	5.5583 k-in²	Sxe(b)	0.37464 in³	Sye(r)	0.07007 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
    - Fyc=75.384 ksi — Eq. A3.3.2-2
  - Track corner 3
    - t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
    - Fyc=75.384 ksi — Eq. A3.3.2-2
  - Fya=51.292 ksi — Eq. A3.3.2-1

Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Track corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi — Eq. A3.3.2-2
Track corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi — Eq. A3.3.2-2
Fya=52.938 ksi — Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Fya=50 ksi — Eq. A3.3.2-1

Axial Tension Strength
Ag=0.39551 in², Fy=51.292 ksi
Tn=20.286 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.39551 in², Fu=65 ksi
Tn=25.708 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Track element 1
Vn=2.3067 k at 180 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9
Track element 2
Vn=4.9683 k at 90 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Track element 3
Vn=2.3067 k at 0 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Track
Element 1: Unstiffened, w=1.3585 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=1.5851 — Eq. 1.1-3
ρ=0.54333 — Eq. 1.1-2
b=0.73811 in (ineffective width=0.62039 in) — Eq. 1.1-1
Element 3: Unstiffened, w=1.3585 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=1.5851 — Eq. 1.1-3
ρ=0.54333 — Eq. 1.1-2
b=0.73811 in (ineffective width=0.62039 in) — Eq. 1.1-1

Element 2: Stiffened, w=3.9151 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.1.2-1
k=4 Eq. 1.1.2-8
λ=1.4977 Eq. 1.1-3
ρ=0.5696 Eq. 1.1-2
be=2.2301 in Eq. 1.1-1
b_1=1.115 in Eq. 1.1.2-9
b_2=1.115 in Eq. 1.1.2-10
Ineffective width=1.685 in
Ae=0.2299 in², Fn=50 ksi
Pn=11.495 k Eq. E3.1-1
Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
Effective width calculations for Track
Element 1: No compressive stress (fully effective)
Element 3: Unstiffened, w=1.3585 in
f_1=49.385 ksi, f_2=49.385 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.5753 Eq. 1.1-3
ρ=0.54615 Eq. 1.1-2
b=0.74195 in (ineffective width=0.61655 in) Eq. 1.1-1
Element 2: Stiffened, w=3.9151 in
f_1=46.923 ksi, f_2=-38.213 ksi
ψ=0.81439 Eq. 1.1.2-1
k=19.575 Eq. 1.1.2-2
λ=0.65588 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=3.9151 in Eq. 1.1-1
h_o=4.1981 in, b_o=1.5 in, h_o/b_o=2.7987
b_1=1.0264 in Eq. 1.1.2-3
b_2=1.9576 in Eq. 1.1.2-4
Compression width=2.1578 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: y=-0.20039 in
Sxe=0.37464 in³, Fy=50 ksi
Mnl=18.732 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3585 in
f_1=49.385 ksi, f_2=49.385 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.5753 Eq. 1.1-3
ρ=0.54615 Eq. 1.1-2
b=0.74195 in (ineffective width=0.61655 in) Eq. 1.1-1

Element 3: No compressive stress (fully effective)
Element 2: Stiffened, w=3.9151 in
f_1=46.923 ksi, f_2=-38.214 ksi
ψ=0.81439 Eq. 1.1.2-1
k=19.575 Eq. 1.1.2-2
λ=0.65588 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=3.9151 in Eq. 1.1-1
h_o=4.1981 in, b_o=1.5 in, h_o/b_o=2.7987
b_1=1.0264 in Eq. 1.1.2-3
b_2=1.9576 in Eq. 1.1.2-4
Compression width=2.1578 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: y=0.20039 in
Sxe=0.37464 in³, Fy=50 ksi
Mnl=18.732 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3585 in
f_1=50 ksi, f_2=-8.4774 ksi
ψ=0.16955 Eq. 1.2.2-1
k=0.60762 Eq. 1.2.2-5
λ=1.3334 Eq. 1.1-3
ρ=0.70786 Eq. 1.2.2-4
b=0.96163 in (ineffective width=0.39687 in) Eq. 1.1-1
Element 3: Unstiffened, w=1.3585 in
f_1=50 ksi, f_2=-8.4774 ksi
ψ=0.16955 Eq. 1.2.2-1
k=0.60762 Eq. 1.2.2-5
λ=1.3334 Eq. 1.1-3
ρ=0.70786 Eq. 1.2.2-4
b=0.96163 in (ineffective width=0.39687 in) Eq. 1.1-1
Element 2: No compressive stress (fully effective)
Iteration is not required
Center of gravity shift: x=-0.12342 in
Sye=0.039066 in³, Fy=50 ksi
Mnl=1.9533 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3585 in
f_1=9.3238 ksi, f_2=-50 ksi
ψ=5.3626 Eq. 1.2.2-1
ψ>1 (fully effective) Eq. 1.1-1
Element 3: Unstiffened, w=1.3585 in
f_1=9.3238 ksi, f_2=-50 ksi
ψ=5.3626 Eq. 1.2.2-1

ψ>1 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=3.9151 in	
f_1=14.267 ksi, f_2=14.267 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=0.80004	Eq. 1.1-3
ρ=0.90622	Eq. 1.1-2
be=3.5479 in	Eq. 1.1-1
b_1=1.774 in	Eq. 1.1.2-9
b_2=1.774 in	Eq. 1.1.2-10
Ineffective width=0.36716 in	
Center of gravity shift: x=0.0172 in	
Sye=0.070068 in^3, Fy=50 ksi	
Mnl=3.5034 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Track

Cw=0.24498 in^6, Wn=1.9834 in^2, Fy=50 ksi	
Bn=6.1759 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

400T150-68

Full Section Properties

Area	0.49433 in²	Wt.	0.0016807 k/ft	Flat	6.9331 in
Ix	1.2690 in⁴	rx	1.6022 in	Ixy	0.0000 in⁴
Sx(t)	0.60456 in³	y(t)	2.0991 in	α	0.000 deg
Sx(b)	0.60456 in³	y(b)	2.0991 in		
Zx	0.71629 in³	Height	4.1981 in		
Iy	0.1020 in⁴	ry	0.4543 in	x_o	-0.8204 in
Sy(l)	0.29548 in³	x(l)	0.3452 in	y_o	0.0000 in
Sy(r)	0.08834 in³	x(r)	1.1548 in	jx	2.3556 in
Zy	0.15528 in³	Width	1.5000 in	jy	0.0000 in
I_1	1.2690 in⁴	r_1	1.6022 in	Cw	0.29897 in⁶
I_2	0.1020 in⁴	r_2	0.4543 in	J	0.00083768 in⁴
Ic	1.3710 in⁴	rc	1.6654 in		
I_o	1.7037 in⁴	r_o	1.8565 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	14.821 k	ϕMnxo	22.737 k-in	ϕMnyo	2.943 k-in
Ae	0.34874 in²	Ixe	1.1296 in⁴	Iye	0.0660 in⁴
ϕTn	22.975 k	Sxe(t)	0.50527 in³	Sye(l)	0.23916 in³
		Sxe(b)	0.57563 in³	Sye(r)	0.06540 in³
Shear					
ϕVny	6.677 k	Negative Bending		Negative Bending	
ϕVnx	5.089 k	ϕMnxo	22.737 k-in	ϕMnyo	3.975 k-in
		Ixe	1.1296 in⁴	Iye	0.1020 in⁴
Torsion		Sxe(t)	0.57563 in³	Sye(l)	0.29548 in³
ϕBn	6.8684 k-in²	Sxe(b)	0.50527 in³	Sye(r)	0.08834 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
    - Fyc=75.391 ksi — Eq. A3.3.2-2
  - Track corner 3
    - t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
    - Fyc=75.391 ksi — Eq. A3.3.2-2
  - Fya=51.64 ksi — Eq. A3.3.2-1

Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Track corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi — Eq. A3.3.2-2
Track corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi — Eq. A3.3.2-2
Fya=53.678 ksi — Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Fya=50 ksi — Eq. A3.3.2-1

Axial Tension Strength
Ag=0.49433 in², Fy=51.64 ksi
Tn=25.527 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.49433 in², Fu=65 ksi
Tn=32.132 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Track element 1
Vn=2.8273 k at 180 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9
Track element 2
Vn=7.4185 k at 90 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Track element 3
Vn=2.8273 k at 0 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Track
Element 1: Unstiffened, w=1.3218 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=1.2243 — Eq. 1.1-3
ρ=0.67003 — Eq. 1.1-2
b=0.88565 in (ineffective width=0.43615 in) — Eq. 1.1-1
Element 3: Unstiffened, w=1.3218 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=1.2243 — Eq. 1.1-3
ρ=0.67003 — Eq. 1.1-2
b=0.88565 in (ineffective width=0.43615 in) — Eq. 1.1-1

Element 2: Stiffened, w=3.8417 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.1.2-1
k=4 Eq. 1.1.2-8
λ=1.1666 Eq. 1.1-3
ρ=0.69552 Eq. 1.1-2
be=2.672 in Eq. 1.1-1
b_1=1.336 in Eq. 1.1.2-9
b_2=1.336 in Eq. 1.1.2-10
Ineffective width=1.1697 in
Ae=0.34874 in², Fn=50 ksi
Pn=17.437 k Eq. E3.1-1
Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
Effective width calculations for Track
Element 1: No compressive stress (fully effective)
Element 3: Unstiffened, w=1.3218 in
f_1=49.203 ksi, f_2=49.203 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.2145 Eq. 1.1-3
ρ=0.67425 Eq. 1.1-2
b=0.89122 in (ineffective width=0.43058 in) Eq. 1.1-1
Element 2: Stiffened, w=3.8417 in
f_1=46.014 ksi, f_2=-39.908 ksi
ψ=0.8673 Eq. 1.1.2-1
k=20.756 Eq. 1.1.2-2
λ=0.49131 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=3.8417 in Eq. 1.1-1
h_o=4.1981 in, b_o=1.5 in, h_o/b_o=2.7987
b_1=0.99338 in Eq. 1.1.2-3
b_2=1.9209 in Eq. 1.1.2-4
Compression width=2.0574 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: y=-0.13663 in
Sxe=0.50527 in³, Fy=50 ksi
Mnl=25.263 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3218 in
f_1=49.203 ksi, f_2=49.203 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.2145 Eq. 1.1-3
ρ=0.67425 Eq. 1.1-2
b=0.89122 in (ineffective width=0.43058 in) Eq. 1.1-1

Element 3: No compressive stress (fully effective)
Element 2: Stiffened, w=3.8417 in
f_1=46.014 ksi, f_2=-39.908 ksi
ψ=0.8673 Eq. 1.1.2-1
k=20.756 Eq. 1.1.2-2
λ=0.49131 Eq. 1.1-3
ρ=1 Eq. 1.1-2
be=3.8417 in Eq. 1.1-1
h_o=4.1981 in, b_o=1.5 in, h_o/b_o=2.7987
b_1=0.99338 in Eq. 1.1.2-3
b_2=1.9209 in Eq. 1.1.2-4
Compression width=2.0574 in
b_1+b_2 > compression width (fully effective)
Center of gravity shift: y=0.13663 in
Sxe=0.50527 in³, Fy=50 ksi
Mnl=25.263 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3218 in
f_1=50 ksi, f_2=-7.2321 ksi
ψ=0.14464 Eq. 1.2.2-1
k=0.60184 Eq. 1.2.2-5
λ=1.0348 Eq. 1.1-3
ρ=0.83694 Eq. 1.2.2-4
b=1.1063 in (ineffective width=0.21553 in) Eq. 1.1-1
Element 3: Unstiffened, w=1.3218 in
f_1=50 ksi, f_2=-7.2321 ksi
ψ=0.14464 Eq. 1.2.2-1
k=0.60184 Eq. 1.2.2-5
λ=1.0348 Eq. 1.1-3
ρ=0.83694 Eq. 1.2.2-4
b=1.1063 in (ineffective width=0.21553 in) Eq. 1.1-1
Element 2: No compressive stress (fully effective)
Iteration is not required
Center of gravity shift: x=-0.069411 in
Sye=0.065398 in³, Fy=50 ksi
Mnl=3.2699 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3218 in
f_1=7.2321 ksi, f_2=-50 ksi
ψ=6.9136 Eq. 1.2.2-1
ψ>1 (fully effective) Eq. 1.1-1
Element 3: Unstiffened, w=1.3218 in
f_1=7.2321 ksi, f_2=-50 ksi
ψ=6.9136 Eq. 1.2.2-1

ψ>1 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=3.8417 in	
f_1=13.404 ksi, f_2=13.404 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=0.60406	Eq. 1.1-3
ρ=1	Eq. 1.1-2
be=3.8417 in	Eq. 1.1-1
b_1=1.9208 in	Eq. 1.1.2-9
b_2=1.9209 in	Eq. 1.1.2-10
b_1+b_2 > compression width (fully effective)	
Center of gravity shift: x=0 in	
Sye=0.088337 in^3, Fy=50 ksi	
Mnl=4.4168 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Track

Cw=0.29897 in^6, Wn=1.9588 in^2, Fy=50 ksi	
Bn=7.6316 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

600T150-30

Full Section Properties

Area	0.28252 in²	Wt.	0.00096058 k/ft	Flat	9.0553 in
Ix	1.4664 in⁴	rx	2.2782 in	Ixy	0.0000 in⁴
Sx(t)	0.47317 in³	y(t)	3.0991 in	α	0.000 deg
Sx(b)	0.47317 in³	y(b)	3.0991 in		
Zx	0.57448 in³	Height	6.1981 in		
Iy	0.0513 in⁴	ry	0.4261 in	x_o	-0.6887 in
Sy(l)	0.19805 in³	x(l)	0.2591 in	y_o	0.0000 in
Sy(r)	0.04134 in³	x(r)	1.2409 in	jx	3.9159 in
Zy	0.06988 in³	Width	1.5000 in	jy	0.0000 in
I_1	1.4664 in⁴	r_1	2.2782 in	Cw	0.35452 in⁶
I_2	0.0513 in⁴	r_2	0.4261 in	J	0.00009167 in⁴
Ic	1.5177 in⁴	rc	2.3177 in		
I_o	1.6517 in⁴	r_o	2.4179 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	3.359 k	ϕMnxo	9.8746 k-in	ϕMnyo	0.3839 k-in
Ae	0.079036 in²	Ixe	0.89147 in⁴	Iye	0.00510 in⁴
ϕTn	12.868 k	Sxe(t)	0.21944 in³	Sye(l)	0.06901 in³
		Sxe(b)	0.41745 in³	Sye(r)	0.00853 in³
Shear					
ϕVny	1.244 k	Negative Bending		Negative Bending	
ϕVnx	2.310 k	ϕMnxo	9.8746 k-in	ϕMnyo	1.6447 k-in
		Ixe	0.89147 in⁴	Iye	0.03862 in⁴
Torsion		Sxe(t)	0.41745 in³	Sye(l)	0.08712 in³
ϕBn	4.9849 k-in²	Sxe(b)	0.21944 in³	Sye(r)	0.03655 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
    - Fyc=68.69 ksi — Eq. A3.3.2-2
  - Track corner 3
    - t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
    - Fyc=68.69 ksi — Eq. A3.3.2-2
  - Fya=50.608 ksi — Eq. A3.3.2-1

Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Track corner 2
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi — Eq. A3.3.2-2
Track corner 3
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi — Eq. A3.3.2-2
Fya=51.789 ksi — Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Fya=50 ksi — Eq. A3.3.2-1

Axial Tension Strength
Ag=0.28252 in², Fy=50.608 ksi
Tn=14.298 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.28252 in², Fu=65 ksi
Tn=18.364 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Track element 1
Vn=1.2831 k at 180 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Track element 2
Vn=1.3822 k at 90 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Track element 3
Vn=1.2831 k at 0 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Track
Element 1: Unstiffened, w=1.3907 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=2.9436 — Eq. 1.1-3
ρ=0.31433 — Eq. 1.1-2
b=0.43714 in (ineffective width=0.95356 in) — Eq. 1.1-1
Element 3: Unstiffened, w=1.3907 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=2.9436 — Eq. 1.1-3
ρ=0.31433 — Eq. 1.1-2
b=0.43714 in (ineffective width=0.95356 in) — Eq. 1.1-1

Element 2: Stiffened, w=5.9795 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.1.2-1
k=4 Eq. 1.1.2-8
λ=4.1497 Eq. 1.1-3
ρ=0.22821 Eq. 1.1-2
be=1.3646 in Eq. 1.1-1
b_1=0.68228 in Eq. 1.1.2-9
b_2=0.68228 in Eq. 1.1.2-10
Ineffective width=4.6149 in
Ae=0.079036 in², Fn=50 ksi
Pn=3.9518 k Eq. E3.1-1
Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
Effective width calculations for Track
Element 1: No compressive stress (fully effective)
Element 3: Unstiffened, w=1.3907 in
f_1=49.808 ksi, f_2=49.808 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=2.938 Eq. 1.1-3
ρ=0.31489 Eq. 1.1-2
b=0.43791 in (ineffective width=0.95279 in) Eq. 1.1-1
Element 2: Stiffened, w=5.9795 in
f_1=48.654 ksi, f_2=-24.954 ksi
ψ=0.51288 Eq. 1.1.2-1
k=13.951 Eq. 1.1.2-2
λ=2.1919 Eq. 1.1-3
ρ=0.41044 Eq. 1.1-2
be=2.4542 in Eq. 1.1-1
h_o=6.1981 in, b_o=1.5 in, h_o/b_o=4.1321
b_1=0.69863 in Eq. 1.1.2-6
b_2=0.92358 in Eq. 1.1.2-7
Compression width=3.9524 in
Ineffective width=2.3302 in
Center of gravity shift: y=-0.96352 in
Sxe=0.21944 in³, Fy=50 ksi
Mnl=10.972 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3907 in
f_1=49.808 ksi, f_2=49.808 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=2.938 Eq. 1.1-3
ρ=0.31489 Eq. 1.1-2
b=0.43791 in (ineffective width=0.95279 in) Eq. 1.1-1

Element 3: No compressive stress (fully effective)
Element 2: Stiffened, w=5.9795 in
f_1=48.655 ksi, f_2=-24.954 ksi
ψ=0.51288 Eq. 1.1.2-1
k=13.951 Eq. 1.1.2-2
λ=2.1919 Eq. 1.1-3
ρ=0.41044 Eq. 1.1-2
be=2.4542 in Eq. 1.1-1
h_o=6.1981 in, b_o=1.5 in, h_o/b_o=4.1321
b_1=0.69863 in Eq. 1.1.2-6
b_2=0.92358 in Eq. 1.1.2-7
Compression width=3.9524 in
Ineffective width=2.3302 in
Center of gravity shift: y=0.96352 in
Sxe=0.21944 in³, Fy=50 ksi
Mnl=10.972 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3907 in
f_1=50 ksi, f_2=-6.0338 ksi
ψ=0.12068 Eq. 1.2.2-1
k=0.59636 Eq. 1.2.2-5
λ=2.4995 Eq. 1.1-3
ρ=0.40413 Eq. 1.2.2-4
b=0.56202 in (ineffective width=0.82868 in) Eq. 1.1-1
Element 3: Unstiffened, w=1.3907 in
f_1=50 ksi, f_2=-6.0338 ksi
ψ=0.12068 Eq. 1.2.2-1
k=0.59636 Eq. 1.2.2-5
λ=2.4995 Eq. 1.1-3
ρ=0.40413 Eq. 1.2.2-4
b=0.56202 in (ineffective width=0.82868 in) Eq. 1.1-1
Element 2: No compressive stress (fully effective)
Iteration is not required
Center of gravity shift: x=-0.18519 in
Sye=0.0085317 in³, Fy=50 ksi
Mnl=0.42658 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3907 in
f_1=15.757 ksi, f_2=-50 ksi
ψ=3.1733 Eq. 1.2.2-1
ψ>1 (fully effective) Eq. 1.1-1
Element 3: Unstiffened, w=1.3907 in
f_1=15.757 ksi, f_2=-50 ksi
ψ=3.1733 Eq. 1.2.2-1

ψ>1 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=5.9795 in	
f_1=20.187 ksi, f_2=20.187 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=2.6367	Eq. 1.1-3
ρ=0.34761	Eq. 1.1-2
be=2.0785 in	Eq. 1.1-1
b_1=1.0393 in	Eq. 1.1.2-9
b_2=1.0393 in	Eq. 1.1.2-10
Ineffective width=3.901 in	
Center of gravity shift: x=0.18425 in	
Sye=0.036549 in^3, Fy=50 ksi	
Mnl=1.8274 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Track

Cw=0.35452 in^6, Wn=3.2003 in^2, Fy=50 ksi	
Bn=5.5387 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.31308 in²	Wt.	0.0010645 k/ft	Flat	9.0485 in
Ix	1.6229 in⁴	rx	2.2768 in	Ixy	0.0000 in⁴
Sx(t)	0.52368 in³	y(t)	3.0991 in	α	0.000 deg
Sx(b)	0.52368 in³	y(b)	3.0991 in		
Zx	0.63619 in³	Height	6.1981 in		
Iy	0.0567 in⁴	ry	0.4256 in	x_o	-0.6877 in
Sy(l)	0.21781 in³	x(l)	0.2604 in	y_o	0.0000 in
Sy(r)	0.04575 in³	x(r)	1.2396 in	jx	3.9146 in
Zy	0.07745 in³	Width	1.5000 in	jy	0.0000 in
I_1	1.6229 in⁴	r_1	2.2768 in	Cw	0.39144 in⁶
I_2	0.0567 in⁴	r_2	0.4256 in	J	0.00012493 in⁴
Ic	1.6796 in⁴	rc	2.3162 in		
I_o	1.8277 in⁴	r_o	2.4162 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	4.057 k	ϕMnxo	11.825 k-in	ϕMnyo	0.496 k-in
Ae	0.095470 in²	Ixe	1.0420 in⁴	Iye	0.0071 in⁴
ϕTn	14.274 k	Sxe(t)	0.26277 in³	Sye(l)	0.08380 in³
		Sxe(b)	0.46665 in³	Sye(r)	0.01103 in³
Shear					
ϕVny	1.562 k	Negative Bending		Negative Bending	
ϕVnx	2.595 k	ϕMnxo	11.825 k-in	ϕMnyo	1.853 k-in
		Ixe	1.0420 in⁴	Iye	0.0444 in⁴
Torsion		Sxe(t)	0.46665 in³	Sye(l)	0.10512 in³
ϕBn	5.5129 k-in²	Sxe(b)	0.26277 in³	Sye(r)	0.04118 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
    - Fyc=70.273 ksi — Eq. A3.3.2-2
  - Track corner 3
    - t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
    - Fyc=70.273 ksi — Eq. A3.3.2-2
  - Fya=50.66 ksi — Eq. A3.3.2-1

Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Track corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi — Eq. A3.3.2-2
Track corner 3
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi — Eq. A3.3.2-2
Fya=51.942 ksi — Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Fya=50 ksi — Eq. A3.3.2-1

Axial Tension Strength
Ag=0.31308 in², Fy=50.66 ksi
Tn=15.86 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.31308 in², Fu=65 ksi
Tn=20.35 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Track element 1
Vn=1.4418 k at 180 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9
Track element 2
Vn=1.7358 k at 90 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Track element 3
Vn=1.4418 k at 0 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Track
Element 1: Unstiffened, w=1.389 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=2.6511 — Eq. 1.1-3
ρ=0.3459 — Eq. 1.1-2
b=0.48045 in (ineffective width=0.90855 in) — Eq. 1.1-1
Element 3: Unstiffened, w=1.389 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=2.6511 — Eq. 1.1-3
ρ=0.3459 — Eq. 1.1-2
b=0.48045 in (ineffective width=0.90855 in) — Eq. 1.1-1

Element 2: Stiffened, w=5.9761 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.1.2-1
k=4 Eq. 1.1.2-8
λ=3.7398 Eq. 1.1-3
ρ=0.25166 Eq. 1.1-2
be=1.504 in Eq. 1.1-1
b_1=0.75199 in Eq. 1.1.2-9
b_2=0.75199 in Eq. 1.1.2-10
Ineffective width=4.4721 in
Ae=0.09547 in², Fn=50 ksi
Pn=4.7735 k Eq. E3.1-1
Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
Effective width calculations for Track
Element 1: No compressive stress (fully effective)
Element 3: Unstiffened, w=1.389 in
f_1=49.782 ksi, f_2=49.782 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=2.6453 Eq. 1.1-3
ρ=0.34659 Eq. 1.1-2
b=0.48141 in (ineffective width=0.90759 in) Eq. 1.1-1
Element 2: Stiffened, w=5.9761 in
f_1=48.6 ksi, f_2=-26.77 ksi
ψ=0.55083 Eq. 1.1.2-1
k=14.561 Eq. 1.1.2-2
λ=1.9325 Eq. 1.1-3
ρ=0.45856 Eq. 1.1-2
be=2.7404 in Eq. 1.1-1
h_o=6.1981 in, b_o=1.5 in, h_o/b_o=4.1321
b_1=0.77177 in Eq. 1.1.2-6
b_2=0.9953 in Eq. 1.1.2-7
Compression width=3.8535 in
Ineffective width=2.0864 in
Center of gravity shift: y=-0.86622 in
Sxe=0.26277 in³, Fy=50 ksi
Mnl=13.139 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.389 in
f_1=49.782 ksi, f_2=49.782 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=2.6453 Eq. 1.1-3
ρ=0.34659 Eq. 1.1-2
b=0.48141 in (ineffective width=0.90759 in) Eq. 1.1-1

Element 3: No compressive stress (fully effective)
Element 2: Stiffened, w=5.9761 in
f_1=48.6 ksi, f_2=-26.77 ksi
ψ=0.55083 Eq. 1.1.2-1
k=14.561 Eq. 1.1.2-2
λ=1.9325 Eq. 1.1-3
ρ=0.45856 Eq. 1.1-2
be=2.7404 in Eq. 1.1-1
h_o=6.1981 in, b_o=1.5 in, h_o/b_o=4.1321
b_1=0.77177 in Eq. 1.1.2-6
b_2=0.9953 in Eq. 1.1.2-7
Compression width=3.8535 in
Ineffective width=2.0864 in
Center of gravity shift: y=0.86622 in
Sxe=0.26277 in³, Fy=50 ksi
Mnl=13.139 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.389 in
f_1=50 ksi, f_2=-6.0249 ksi
ψ=0.1205 Eq. 1.2.2-1
k=0.59632 Eq. 1.2.2-5
λ=2.2512 Eq. 1.1-3
ρ=0.44322 Eq. 1.2.2-4
b=0.61564 in (ineffective width=0.77336 in) Eq. 1.1-1
Element 3: Unstiffened, w=1.389 in
f_1=50 ksi, f_2=-6.0249 ksi
ψ=0.1205 Eq. 1.2.2-1
k=0.59632 Eq. 1.2.2-5
λ=2.2512 Eq. 1.1-3
ρ=0.44322 Eq. 1.2.2-4
b=0.61564 in (ineffective width=0.77336 in) Eq. 1.1-1
Element 2: No compressive stress (fully effective)
Iteration is not required
Center of gravity shift: x=-0.17586 in
Sye=0.01103 in³, Fy=50 ksi
Mnl=0.55148 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.389 in
f_1=14.393 ksi, f_2=-50 ksi
ψ=3.4739 Eq. 1.2.2-1
ψ>1 (fully effective) Eq. 1.1-1
Element 3: Unstiffened, w=1.389 in
f_1=14.393 ksi, f_2=-50 ksi
ψ=3.4739 Eq. 1.2.2-1

ψ>1 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=5.9761 in	
f_1=18.737 ksi, f_2=18.737 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=2.2893	Eq. 1.1-3
ρ=0.39483	Eq. 1.1-2
be=2.3595 in	Eq. 1.1-1
b_1=1.1798 in	Eq. 1.1.2-9
b_2=1.1798 in	Eq. 1.1.2-10
Ineffective width=3.6166 in	
Center of gravity shift: x=0.16184 in	
Sye=0.04118 in^3, Fy=50 ksi	
Mnl=2.059 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Track

Cw=0.39144 in^6, Wn=3.1952 in^2, Fy=50 ksi	
Bn=6.1254 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.40714 in²	Wt.	0.0013843 k/ft	Flat	9.0274 in
Ix	2.1023 in⁴	rx	2.2723 in	Ixy	0.0000 in⁴
Sx(t)	0.67836 in³	y(t)	3.0991 in	α	0.000 deg
Sx(b)	0.67836 in³	y(b)	3.0991 in		
Zx	0.82565 in³	Height	6.1981 in		
Iy	0.0732 in⁴	ry	0.4240 in	x_o	-0.6847 in
Sy(l)	0.27676 in³	x(l)	0.2645 in	y_o	0.0000 in
Sy(r)	0.05924 in³	x(r)	1.2355 in	jx	3.9104 in
Zy	0.10080 in³	Width	1.5000 in	jy	0.0000 in
I_1	2.1023 in⁴	r_1	2.2723 in	Cw	0.50339 in⁶
I_2	0.0732 in⁴	r_2	0.4240 in	J	0.00027604 in⁴
Ic	2.1755 in⁴	rc	2.3116 in		
I_o	2.3663 in⁴	r_o	2.4108 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	6.584 k	ϕMnxo	18.645 k-in	ϕMnyo	0.953 k-in
Ae	0.15492 in²	Ixe	1.5389 in⁴	Iye	0.0163 in⁴
ϕTn	18.616 k	Sxe(t)	0.41433 in³	Sye(l)	0.13726 in³
		Sxe(b)	0.61956 in³	Sye(r)	0.02117 in³
Shear					
ϕVny	2.778 k	Negative Bending		Negative Bending	
ϕVnx	3.370 k	ϕMnxo	18.645 k-in	ϕMnyo	2.502 k-in
		Ixe	1.5389 in⁴	Iye	0.0629 in⁴
Torsion		Sxe(t)	0.61956 in³	Sye(l)	0.17053 in³
ϕBn	7.1247 k-in²	Sxe(b)	0.41433 in³	Sye(r)	0.05560 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
    - Fyc=74.687 ksi — Eq. A3.3.2-2
  - Track corner 3
    - t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
    - Fyc=74.687 ksi — Eq. A3.3.2-2
  - Fya=50.805 ksi — Eq. A3.3.2-1

Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Track corner 2
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi — Eq. A3.3.2-2
Track corner 3
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
Fyc=74.687 ksi — Eq. A3.3.2-2
Fya=52.375 ksi — Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Fya=50 ksi — Eq. A3.3.2-1

Axial Tension Strength
Ag=0.40714 in², Fy=50.805 ksi
Tn=20.685 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.40714 in², Fu=65 ksi
Tn=26.464 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Track element 1
Vn=1.8721 k at 180 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9
Track element 2
Vn=3.0865 k at 90 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Track element 3
Vn=1.8721 k at 0 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Track
Element 1: Unstiffened, w=1.3837 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=2.0261 — Eq. 1.1-3
ρ=0.43996 — Eq. 1.1-2
b=0.60878 in (ineffective width=0.77492 in) — Eq. 1.1-1
Element 3: Unstiffened, w=1.3837 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=2.0261 — Eq. 1.1-3
ρ=0.43996 — Eq. 1.1-2
b=0.60878 in (ineffective width=0.77492 in) — Eq. 1.1-1

Element 2: Stiffened, w=5.9655 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.1.2-1
k=4 Eq. 1.1.2-8
λ=2.864 Eq. 1.1-3
ρ=0.32234 Eq. 1.1-2
be=1.9229 in Eq. 1.1-1
b_1=0.96146 in Eq. 1.1.2-9
b_2=0.96146 in Eq. 1.1.2-10
Ineffective width=4.0426 in
Ae=0.15492 in², Fn=50 ksi
Pn=7.7459 k Eq. E3.1-1
Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
Effective width calculations for Track
Element 1: No compressive stress (fully effective)
Element 3: Unstiffened, w=1.3837 in
f_1=49.696 ksi, f_2=49.696 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=2.02 Eq. 1.1-3
ρ=0.44114 Eq. 1.1-2
b=0.61041 in (ineffective width=0.77329 in) Eq. 1.1-1
Element 2: Stiffened, w=5.9655 in
f_1=48.434 ksi, f_2=-31.882 ksi
ψ=0.65825 Eq. 1.1.2-1
k=16.436 Eq. 1.1.2-2
λ=1.3906 Eq. 1.1-3
ρ=0.60535 Eq. 1.1-2
be=3.6112 in Eq. 1.1-1
h_o=6.1981 in, b_o=1.5 in, h_o/b_o=4.1321
b_1=0.98715 in Eq. 1.1.2-6
b_2=1.1906 in Eq. 1.1.2-7
Compression width=3.5975 in
Ineffective width=1.4197 in
Center of gravity shift: y=-0.61519 in
Sxe=0.41433 in³, Fy=50 ksi
Mnl=20.716 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3837 in
f_1=49.696 ksi, f_2=49.696 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-2
λ=2.02 Eq. 1.1-3
ρ=0.44114 Eq. 1.1-2
b=0.61041 in (ineffective width=0.77329 in) Eq. 1.1-1

Element 3: No compressive stress (fully effective)
Element 2: Stiffened, w=5.9655 in
f_1=48.434 ksi, f_2=-31.882 ksi
ψ=0.65825 Eq. 1.1.2-1
k=16.436 Eq. 1.1.2-2
λ=1.3906 Eq. 1.1-3
ρ=0.60535 Eq. 1.1-2
be=3.6112 in Eq. 1.1-1
h_o=6.1981 in, b_o=1.5 in, h_o/b_o=4.1321
b_1=0.98715 in Eq. 1.1.2-6
b_2=1.1906 in Eq. 1.1.2-7
Compression width=3.5975 in
Ineffective width=1.4197 in
Center of gravity shift: y=0.61519 in
Sxe=0.41433 in^3, Fy=50 ksi
Mnl=20.716 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3837 in
f_1=50 ksi, f_2=-5.9955 ksi
ψ=0.11991 Eq. 1.2.2-1
k=0.59619 Eq. 1.2.2-5
λ=1.7207 Eq. 1.1-3
ρ=0.55765 Eq. 1.2.2-4
b=0.77162 in (ineffective width=0.61208 in) Eq. 1.1-1
Element 3: Unstiffened, w=1.3837 in
f_1=50 ksi, f_2=-5.9955 ksi
ψ=0.11991 Eq. 1.2.2-1
k=0.59619 Eq. 1.2.2-5
λ=1.7207 Eq. 1.1-3
ρ=0.55765 Eq. 1.2.2-4
b=0.77162 in (ineffective width=0.61208 in) Eq. 1.1-1
Element 2: No compressive stress (fully effective)
Iteration is not required
Center of gravity shift: x=-0.14582 in
Sye=0.021167 in^3, Fy=50 ksi
Mnl=1.0583 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3837 in
f_1=11.132 ksi, f_2=-50 ksi
ψ=4.4916 Eq. 1.2.2-1
ψ>1 (fully effective) Eq. 1.1-1
Element 3: Unstiffened, w=1.3837 in
f_1=11.132 ksi, f_2=-50 ksi
ψ=4.4915 Eq. 1.2.2-1

ψ>1 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=5.9655 in	
f_1=15.274 ksi, f_2=15.274 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=1.5829	Eq. 1.1-3
ρ=0.54393	Eq. 1.1-2
be=3.2448 in	Eq. 1.1-1
b_1=1.6224 in	Eq. 1.1.2-9
b_2=1.6224 in	Eq. 1.1.2-10
Ineffective width=2.7207 in	
Center of gravity shift: x=0.10435 in	
Sye=0.055598 in^3, Fy=50 ksi	
Mnl=2.7799 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Track

Cw=0.50339 in^6, Wn=3.1794 in^2, Fy=50 ksi	
Bn=7.9164 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.50871 in²	Wt.	0.0017296 k/ft	Flat	8.9877 in
Ix	2.6113 in⁴	rx	2.2656 in	Ixy	0.0000 in⁴
Sx(t)	0.8426 in³	y(t)	3.0991 in	α	0.000 deg
Sx(b)	0.8426 in³	y(b)	3.0991 in		
Zx	1.0283 in³	Height	6.1981 in		
Iy	0.0908 in⁴	ry	0.4225 in	x_o	-0.6831 in
Sy(l)	0.3370 in³	x(l)	0.2694 in	y_o	0.0000 in
Sy(r)	0.0738 in³	x(r)	1.2306 in	jx	3.9153 in
Zy	0.1263 in³	Width	1.5000 in	jy	0.0000 in
I_1	2.6113 in⁴	r_1	2.2656 in	Cw	0.61991 in⁶
I_2	0.0908 in⁴	r_2	0.4225 in	J	0.0005432 in⁴
Ic	2.7020 in⁴	rc	2.3047 in		
I_o	2.9395 in⁴	r_o	2.4038 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	10.083 k	ϕMnxo	27.454 k-in	ϕMnyo	1.656 k-in
Ae	0.23725 in²	Ixe	2.1301 in⁴	Iye	0.0329 in⁴
ϕTn	23.352 k	Sxe(t)	0.61008 in³	Sye(l)	0.20823 in³
		Sxe(b)	0.78697 in³	Sye(r)	0.03680 in³
Shear					
ϕVny	4.494 k	Negative Bending		Negative Bending	
ϕVnx	4.152 k	ϕMnxo	27.454 k-in	ϕMnyo	3.212 k-in
		Ixe	2.1301 in⁴	Iye	0.0837 in⁴
Torsion		Sxe(t)	0.78697 in³	Sye(l)	0.25635 in³
ϕBn	8.8379 k-in²	Sxe(b)	0.61008 in³	Sye(r)	0.07137 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
    - Fyc=75.384 ksi — Eq. A3.3.2-2
  - Track corner 3
    - t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
    - Fyc=75.384 ksi — Eq. A3.3.2-2
  - Fya=51.004 ksi — Eq. A3.3.2-1

Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Track corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Track corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=52.938 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Fya=50 ksi Eq. A3.3.2-1

Axial Tension Strength
Ag=0.50871 in², Fy=51.004 ksi
Tn=25.946 k Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.50871 in², Fu=65 ksi
Tn=33.066 k Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Track element 1
Vn=2.3067 k at 180 deg Eq. G2.1-1
Ωv=1.67, ϕv=0.9
Track element 2
Vn=4.993 k at 90 deg Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Track element 3
Vn=2.3067 k at 0 deg Eq. G2.1-1
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Track
Element 1: Unstiffened, w=1.3585 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.5851 Eq. 1.1-3
ρ=0.54333 Eq. 1.1-2
b=0.73811 in (ineffective width=0.62039 in) Eq. 1.1-1
Element 3: Unstiffened, w=1.3585 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.5851 Eq. 1.1-3
ρ=0.54333 Eq. 1.1-2
b=0.73811 in (ineffective width=0.62039 in) Eq. 1.1-1

Element 2: Stiffened, w=5.9151 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.1.2-1
k=4 Eq. 1.1.2-8
λ=2.2628 Eq. 1.1-3
ρ=0.39896 Eq. 1.1-2
be=2.3599 in Eq. 1.1-1
b_1=1.1799 in Eq. 1.1.2-9
b_2=1.1799 in Eq. 1.1.2-10
Ineffective width=3.5552 in
Ae=0.23725 in², Fn=50 ksi
Pn=11.863 k Eq. E3.1-1
Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
Effective width calculations for Track
Element 1: No compressive stress (fully effective)
Element 3: Unstiffened, w=1.3585 in
f_1=49.595 ksi, f_2=49.595 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.5786 Eq. 1.1-3
ρ=0.54518 Eq. 1.1-2
b=0.74063 in (ineffective width=0.61787 in) Eq. 1.1-1
Element 2: Stiffened, w=5.9151 in
f_1=47.973 ksi, f_2=-36.766 ksi
ψ=0.76639 Eq. 1.1.2-1
k=18.556 Eq. 1.1.2-2
λ=1.0291 Eq. 1.1-3
ρ=0.76399 Eq. 1.1-2
be=4.5191 in Eq. 1.1-1
h_o=6.1981 in, b_o=1.5 in, h_o/b_o=4.1321
b_1=1.1998 in Eq. 1.1.2-6
b_2=1.3585 in Eq. 1.1.2-7
Compression width=3.3487 in
Ineffective width=0.79033 in
Center of gravity shift: y=-0.3924 in
Sxe=0.61008 in³, Fy=50 ksi
Mnl=30.504 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3585 in
f_1=49.595 ksi, f_2=49.595 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.5786 Eq. 1.1-3
ρ=0.54518 Eq. 1.1-2
b=0.74063 in (ineffective width=0.61787 in) Eq. 1.1-1

Element 3: No compressive stress (fully effective)
Element 2: Stiffened, w=5.9151 in
f_1=47.973 ksi, f_2=-36.766 ksi
ψ=0.76639 Eq. 1.1.2-1
k=18.556 Eq. 1.1.2-2
λ=1.0291 Eq. 1.1-3
ρ=0.76399 Eq. 1.1-2
be=4.5191 in Eq. 1.1-1
h_o=6.1981 in, b_o=1.5 in, h_o/b_o=4.1321
b_1=1.1998 in Eq. 1.1.2-6
b_2=1.3585 in Eq. 1.1.2-7
Compression width=3.3487 in
Ineffective width=0.79033 in
Center of gravity shift: y=0.3924 in
Sxe=0.61008 in^3, Fy=50 ksi
Mnl=30.504 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3585 in
f_1=50 ksi, f_2=-5.1979 ksi
ψ=0.10396 Eq. 1.2.2-1
k=0.59259 Eq. 1.2.2-5
λ=1.3502 Eq. 1.1-3
ρ=0.67055 Eq. 1.2.2-4
b=0.91094 in (ineffective width=0.44756 in) Eq. 1.1-1
Element 3: Unstiffened, w=1.3585 in
f_1=50 ksi, f_2=-5.1979 ksi
ψ=0.10396 Eq. 1.2.2-1
k=0.59259 Eq. 1.2.2-5
λ=1.3502 Eq. 1.1-3
ρ=0.67055 Eq. 1.2.2-4
b=0.91094 in (ineffective width=0.44756 in) Eq. 1.1-1
Element 2: No compressive stress (fully effective)
Iteration is not required
Center of gravity shift: x=-0.11136 in
Sye=0.036801 in^3, Fy=50 ksi
Mnl=1.84 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3585 in
f_1=7.8459 ksi, f_2=-50 ksi
ψ=6.3728 Eq. 1.2.2-1
ψ>1 (fully effective) Eq. 1.1-1
Element 3: Unstiffened, w=1.3585 in
f_1=7.8459 ksi, f_2=-50 ksi
ψ=6.3728 Eq. 1.2.2-1

ψ>1 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=5.9151 in	
f_1=12.666 ksi, f_2=12.666 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=1.1389	Eq. 1.1-3
ρ=0.70843	Eq. 1.1-2
be=4.1904 in	Eq. 1.1-1
b_1=2.0952 in	Eq. 1.1.2-9
b_2=2.0952 in	Eq. 1.1.2-10
Ineffective width=1.7247 in	
Center of gravity shift: x=0.057257 in	
Sye=0.071375 in^3, Fy=50 ksi	
Mnl=3.5687 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Track

Cw=0.61991 in^6, Wn=3.1564 in^2, Fy=50 ksi	
Bn=9.8198 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.63693 in²	Wt.	0.0021656 k/ft	Flat	8.9331 in
Ix	3.2434 in⁴	rx	2.2566 in	Ixy	0.0000 in⁴
Sx(t)	1.0466 in³	y(t)	3.0991 in	α	0.000 deg
Sx(b)	1.0466 in³	y(b)	3.0991 in		
Zx	1.2819 in³	Height	6.1981 in		
Iy	0.1127 in⁴	ry	0.4206 in	x_o	-0.6816 in
Sy(l)	0.4084 in³	x(l)	0.2759 in	y_o	0.0000 in
Sy(r)	0.0920 in³	x(r)	1.2241 in	jx	3.9238 in
Zy	0.1587 in³	Width	1.5000 in	jy	0.0000 in
I_1	3.2434 in⁴	r_1	2.2566 in	Cw	0.76104 in⁶
I_2	0.1127 in⁴	r_2	0.4206 in	J	0.0010793 in⁴
Ic	3.3561 in⁴	rc	2.2955 in		
I_o	3.6520 in⁴	r_o	2.3945 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	15.466 k	ϕMnxo	39.745 k-in	ϕMnyo	2.812 k-in
Ae	0.36389 in²	Ixe	2.9059 in⁴	Iye	0.0641 in⁴
ϕTn	29.392 k	Sxe(t)	0.88321 in³	Sye(l)	0.31071 in³
		Sxe(b)	0.99928 in³	Sye(r)	0.06250 in³
Shear					
ϕVny	7.185 k	Negative Bending		Negative Bending	
ϕVnx	5.089 k	ϕMnxo	39.745 k-in	ϕMnyo	4.100 k-in
		Ixe	2.9059 in⁴	Iye	0.1099 in⁴
Torsion		Sxe(t)	0.99928 in³	Sye(l)	0.37365 in³
ϕBn	10.958 k-in²	Sxe(b)	0.88321 in³	Sye(r)	0.09112 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
    - Fyc=75.391 ksi — Eq. A3.3.2-2
  - Track corner 3
    - t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
    - Fyc=75.391 ksi — Eq. A3.3.2-2
  - Fya=51.273 ksi — Eq. A3.3.2-1

Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Track corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi — Eq. A3.3.2-2
Track corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi — Eq. A3.3.2-2
Fya=53.678 ksi — Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Fya=50 ksi — Eq. A3.3.2-1

Axial Tension Strength
Ag=0.63693 in², Fy=51.273 ksi
Tn=32.657 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.63693 in², Fu=65 ksi
Tn=41.401 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Track element 1
Vn=2.8273 k at 180 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9
Track element 2
Vn=7.9837 k at 90 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Track element 3
Vn=2.8273 k at 0 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Track
Element 1: Unstiffened, w=1.3218 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=1.2243 — Eq. 1.1-3
ρ=0.67003 — Eq. 1.1-2
b=0.88565 in (ineffective width=0.43615 in) — Eq. 1.1-1
Element 3: Unstiffened, w=1.3218 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=1.2243 — Eq. 1.1-3
ρ=0.67003 — Eq. 1.1-2
b=0.88565 in (ineffective width=0.43615 in) — Eq. 1.1-1

Element 2: Stiffened, w=5.8417 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.1.2-1
k=4 Eq. 1.1.2-8
λ=1.774 Eq. 1.1-3
ρ=0.49379 Eq. 1.1-2
be=2.8846 in Eq. 1.1-1
b_1=1.4423 in Eq. 1.1.2-9
b_2=1.4423 in Eq. 1.1.2-10
Ineffective width=2.9571 in
Ae=0.36389 in², Fn=50 ksi
Pn=18.195 k Eq. E3.1-1
Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
Effective width calculations for Track
Element 1: No compressive stress (fully effective)
Element 3: Unstiffened, w=1.3218 in
f_1=49.458 ksi, f_2=49.458 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.2176 Eq. 1.1-3
ρ=0.67289 Eq. 1.1-2
b=0.88942 in (ineffective width=0.43238 in) Eq. 1.1-1
Element 2: Stiffened, w=5.8417 in
f_1=47.292 ksi, f_2=-41.492 ksi
ψ=0.87737 Eq. 1.1.2-1
k=20.988 Eq. 1.1.2-2
λ=0.75319 Eq. 1.1-3
ρ=0.93988 Eq. 1.1-2
be=5.4905 in Eq. 1.1-1
h_o=6.1981 in, b_o=1.5 in, h_o/b_o=4.1321
b_1=1.416 in Eq. 1.1.2-6
b_2=1.5085 in Eq. 1.1.2-7
Compression width=3.1116 in
Ineffective width=0.18706 in
Center of gravity shift: y=-0.19108 in
Sxe=0.88321 in³, Fy=50 ksi
Mnl=44.161 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3218 in
f_1=49.458 ksi, f_2=49.458 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.2176 Eq. 1.1-3
ρ=0.67289 Eq. 1.1-2
b=0.88942 in (ineffective width=0.43238 in) Eq. 1.1-1

Element 3: No compressive stress (fully effective)
Element 2: Stiffened, w=5.8417 in
f_1=47.292 ksi, f_2=-41.492 ksi
ψ=0.87737 Eq. 1.1.2-1
k=20.988 Eq. 1.1.2-2
λ=0.75319 Eq. 1.1-3
ρ=0.93988 Eq. 1.1-2
be=5.4905 in Eq. 1.1-1
h_o=6.1981 in, b_o=1.5 in, h_o/b_o=4.1321
b_1=1.416 in Eq. 1.1.2-6
b_2=1.5085 in Eq. 1.1.2-7
Compression width=3.1116 in
Ineffective width=0.18706 in
Center of gravity shift: y=0.19108 in
Sxe=0.88321 in³, Fy=50 ksi
Mnl=44.161 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3218 in
f_1=50 ksi, f_2=-3.9915 ksi
ψ=0.07983 Eq. 1.2.2-1
k=0.58721 Eq. 1.2.2-5
λ=1.0476 Eq. 1.1-3
ρ=0.797 Eq. 1.2.2-4
b=1.0535 in (ineffective width=0.26833 in) Eq. 1.1-1
Element 3: Unstiffened, w=1.3218 in
f_1=50 ksi, f_2=-3.9915 ksi
ψ=0.07983 Eq. 1.2.2-1
k=0.58721 Eq. 1.2.2-5
λ=1.0476 Eq. 1.1-3
ρ=0.797 Eq. 1.2.2-4
b=1.0535 in (ineffective width=0.26833 in) Eq. 1.1-1
Element 2: No compressive stress (fully effective)
Iteration is not required
Center of gravity shift: x=-0.069662 in
Sye=0.062498 in³, Fy=50 ksi
Mnl=3.1249 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3218 in
f_1=4.7668 ksi, f_2=-50 ksi
ψ=10.489 Eq. 1.2.2-1
ψ>1 (fully effective) Eq. 1.1-1
Element 3: Unstiffened, w=1.3218 in
f_1=4.7669 ksi, f_2=-50 ksi
ψ=10.489 Eq. 1.2.2-1

ψ>1 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=5.8417 in	
f_1=10.673 ksi, f_2=10.673 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=0.81963	Eq. 1.1-3
ρ=0.89258	Eq. 1.1-2
be=5.2142 in	Eq. 1.1-1
b_1=2.6071 in	Eq. 1.1.2-9
b_2=2.6071 in	Eq. 1.1.2-10
Ineffective width=0.62751 in	
Center of gravity shift: x=0.018153 in	
Sye=0.091116 in^3, Fy=50 ksi	
Mnl=4.5558 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Track

Cw=0.76104 in^6, Wn=3.1253 in^2, Fy=50 ksi	
Bn=12.176 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.34492 in²	Wt.	0.0011727 k/ft	Flat	11.055 in
Ix	2.9187 in⁴	rx	2.9089 in	Ixy	0.0000 in⁴
Sx(t)	0.71203 in³	y(t)	4.0991 in	α	0.000 deg
Sx(b)	0.71203 in³	y(b)	4.0991 in		
Zx	0.88820 in³	Height	8.1981 in		
Iy	0.0543 in⁴	ry	0.3969 in	x_o	-0.5919 in
Sy(l)	0.25273 in³	x(l)	0.2150 in	y_o	0.0000 in
Sy(r)	0.04229 in³	x(r)	1.2850 in	jx	6.1622 in
Zy	0.07045 in³	Width	1.5000 in	jy	0.0000 in
I_1	2.9187 in⁴	r_1	2.9089 in	Cw	0.68268 in⁶
I_2	0.0543 in⁴	r_2	0.3969 in	J	0.00011192 in⁴
Ic	2.9730 in⁴	rc	2.9359 in		
I_o	3.0938 in⁴	r_o	2.9949 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	3.384 k	ϕMnxo	13.326 k-in	ϕMnyo	0.365 k-in
Ae	0.079633 in²	Ixe	1.6415 in⁴	Iye	0.0048 in⁴
ϕTn	15.676 k	Sxe(t)	0.29613 in³	Sye(l)	0.08165 in³
		Sxe(b)	0.61832 in³	Sye(r)	0.00811 in³
Shear					
ϕVny	1.037 k	Negative Bending		Negative Bending	
ϕVnx	2.310 k	ϕMnxo	13.326 k-in	ϕMnyo	1.652 k-in
		Ixe	1.6415 in⁴	Iye	0.0390 in⁴
Torsion		Sxe(t)	0.61832 in³	Sye(l)	0.08907 in³
ϕBn	6.8959 k-in²	Sxe(b)	0.29613 in³	Sye(r)	0.03671 in³

Track element 2 h/t exceeds 200.

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
    - Fyc=68.69 ksi — Eq. A3.3.2-2
  - Track corner 3
    - t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²

Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=50.498 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Track corner 2	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Track corner 3	
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²	
Fyc=68.69 ksi	Eq. A3.3.2-2
Fya=51.789 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Fya=50 ksi	Eq. A3.3.2-1
Axial Tension Strength	
Ag=0.34492 in², Fy=50.498 ksi	
Tn=17.418 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.34492 in², Fu=65 ksi	
Tn=22.42 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Track element 1	
Vn=1.2831 k at 180 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Track element 2	
h/t exceeds 200 (rational analysis)	
Vn=1.2957 k at 90 deg	Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)	
Track element 3	
Vn=1.2831 k at 0 deg	Eq. G2.1-2
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Track	
Element 1: Unstiffened, w=1.3907 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.9436	Eq. 1.1-3
ρ=0.31433	Eq. 1.1-2
b=0.43714 in (ineffective width=0.95356 in)	Eq. 1.1-1
Element 3: Unstiffened, w=1.3907 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3

λ=2.9436	Eq. 1.1-3
ρ=0.31433	Eq. 1.1-2
b=0.43714 in (ineffective width=0.95356 in)	Eq. 1.1-1
Element 2: Stiffened, w=7.9795 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=5.5377	Eq. 1.1-3
ρ=0.17341	Eq. 1.1-2
be=1.3837 in	Eq. 1.1-1
b_1=0.69185 in	Eq. 1.1.2-9
b_2=0.69185 in	Eq. 1.1.2-10
Ineffective width=6.5958 in	
Ae=0.079633 in², Fn=50 ksi	
Pn=3.9817 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Track	
Element 1: No compressive stress (fully effective)	
Element 3: Unstiffened, w=1.3907 in	
f_1=49.859 ksi, f_2=49.859 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.9395	Eq. 1.1-3
ρ=0.31474	Eq. 1.1-2
b=0.4377 in (ineffective width=0.953 in)	Eq. 1.1-1
Element 2: Stiffened, w=7.9795 in	
f_1=49.014 ksi, f_2=-22.979 ksi	
ψ=0.46883	Eq. 1.1.2-1
k=13.276	Eq. 1.1.2-2
λ=3.0096	Eq. 1.1-3
ρ=0.30798	Eq. 1.1-2
be=2.4576 in	Eq. 1.1-1
h_o=8.1981 in, b_o=1.5 in, h_o/b_o=5.4654	
b_1=0.70847 in	Eq. 1.1.2-6
b_2=0.96467 in	Eq. 1.1.2-7
Compression width=5.4326 in	
Ineffective width=3.7594 in	
Center of gravity shift: y=-1.4442 in	
Sxe=0.29613 in³, Fy=50 ksi	
Mnl=14.806 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.3907 in	
f_1=49.859 ksi, f_2=49.859 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3

λ=2.9395	Eq. 1.1-3
ρ=0.31474	Eq. 1.1-2
b=0.4377 in (ineffective width=0.953 in)	Eq. 1.1-1
Element 3: No compressive stress (fully effective)	
Element 2: Stiffened, w=7.9795 in	
f_1=49.014 ksi, f_2=-22.979 ksi	
ψ=0.46883	Eq. 1.1.2-1
k=13.276	Eq. 1.1.2-2
λ=3.0096	Eq. 1.1-3
ρ=0.30798	Eq. 1.1-2
be=2.4576 in	Eq. 1.1-1
h_o=8.1981 in, b_o=1.5 in, h_o/b_o=5.4654	
b_1=0.70847 in	Eq. 1.1.2-6
b_2=0.96467 in	Eq. 1.1.2-7
Compression width=5.4326 in	
Ineffective width=3.7594 in	
Center of gravity shift: y=1.4442 in	
Sxe=0.29613 in^3, Fy=50 ksi	
Mnl=14.806 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Positive Flexural Strength about Y-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.3907 in	
f_1=50 ksi, f_2=-4.1132 ksi	
ψ=0.082264	Eq. 1.2.2-1
k=0.58775	Eq. 1.2.2-5
λ=2.5178	Eq. 1.1-3
ρ=0.3892	Eq. 1.2.2-4
b=0.54126 in (ineffective width=0.84944 in)	Eq. 1.1-1
Element 3: Unstiffened, w=1.3907 in	
f_1=50 ksi, f_2=-4.1132 ksi	
ψ=0.082265	Eq. 1.2.2-1
k=0.58775	Eq. 1.2.2-5
λ=2.5178	Eq. 1.1-3
ρ=0.3892	Eq. 1.2.2-4
b=0.54126 in (ineffective width=0.84944 in)	Eq. 1.1-1
Element 2: No compressive stress (fully effective)	
Iteration is not required	
Center of gravity shift: x=-0.1562 in	
Sye=0.0081138 in^3, Fy=50 ksi	
Mnl=0.40569 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.3907 in	
f_1=15.393 ksi, f_2=-50 ksi	
ψ=3.2481	Eq. 1.2.2-1
ψ>1 (fully effective)	Eq. 1.1-1

Element 3: Unstiffened, w=1.3907 in
f_1=15.394 ksi, f_2=-50 ksi
ψ=3.2481 Eq. 1.2.2-1
ψ>1 (fully effective) Eq. 1.1-1
Element 2: Stiffened, w=7.9795 in
f_1=19.799 ksi, f_2=19.799 ksi
ψ=1 Eq. 1.1.2-1
k=4 Eq. 1.1.2-8
λ=3.4847 Eq. 1.1-3
ρ=0.26885 Eq. 1.1-2
be=2.1453 in Eq. 1.1-1
b_1=1.0726 in Eq. 1.1.2-9
b_2=1.0726 in Eq. 1.1.2-10
Ineffective width=5.8342 in
Center of gravity shift: x=0.22283 in
Sye=0.036715 in^3, Fy=50 ksi
Mnl=1.8357 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Track
Cw=0.68268 in^6, Wn=4.4549 in^2, Fy=50 ksi
Bn=7.6621 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

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Full Section Properties

Area	0.38228 in²	Wt.	0.0012997 k/ft	Flat	11.048 in
Ix	3.2314 in⁴	rx	2.9074 in	Ixy	0.0000 in⁴
Sx(t)	0.78834 in³	y(t)	4.0991 in	α	0.000 deg
Sx(b)	0.78834 in³	y(b)	4.0991 in		
Zx	0.98386 in³	Height	8.1981 in		
Iy	0.0601 in⁴	ry	0.3964 in	x_o	-0.5910 in
Sy(l)	0.27761 in³	x(l)	0.2164 in	y_o	0.0000 in
Sy(r)	0.04679 in³	x(r)	1.2836 in	jx	6.1623 in
Zy	0.07816 in³	Width	1.5000 in	jy	0.0000 in
I_1	3.2314 in⁴	r_1	2.9074 in	Cw	0.75402 in⁶
I_2	0.0601 in⁴	r_2	0.3964 in	J	0.00015255 in⁴
Ic	3.2915 in⁴	rc	2.9343 in		
I_o	3.4250 in⁴	r_o	2.9932 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	4.092 k	ϕMnxo	16.002 k-in	ϕMnyo	0.473 k-in
Ae	0.096286 in²	Ixe	1.9271 in⁴	Iye	0.0067 in⁴
ϕTn	17.388 k	Sxe(t)	0.35561 in³	Sye(l)	0.09936 in³
		Sxe(b)	0.69347 in³	Sye(r)	0.01050 in³
Shear					
ϕVny	1.306 k	Negative Bending		Negative Bending	
ϕVnx	2.595 k	ϕMnxo	16.002 k-in	ϕMnyo	1.863 k-in
		Ixe	1.9271 in⁴	Iye	0.0449 in⁴
Torsion		Sxe(t)	0.69347 in³	Sye(l)	0.10800 in³
ϕBn	7.6274 k-in²	Sxe(b)	0.35561 in³	Sye(r)	0.04139 in³

Track element 2 h/t exceeds 200.

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
    - Fyc=70.273 ksi — Eq. A3.3.2-2
  - Track corner 3
    - t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²

Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=50.54 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Track corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Track corner 3	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=51.942 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Fya=50 ksi	Eq. A3.3.2-1
Axial Tension Strength	
Ag=0.38228 in², Fy=50.54 ksi	
Tn=19.32 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.38228 in², Fu=65 ksi	
Tn=24.848 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Track element 1	
Vn=1.4418 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Track element 2	
h/t exceeds 200 (rational analysis)	
Vn=1.6326 k at 90 deg	Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)	
Track element 3	
Vn=1.4418 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Track	
Element 1: Unstiffened, w=1.389 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.6511	Eq. 1.1-3
ρ=0.3459	Eq. 1.1-2
b=0.48045 in (ineffective width=0.90855 in)	Eq. 1.1-1
Element 3: Unstiffened, w=1.389 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3

λ=2.6511	Eq. 1.1-3
ρ=0.3459	Eq. 1.1-2
b=0.48045 in (ineffective width=0.90855 in)	Eq. 1.1-1
Element 2: Stiffened, w=7.9761 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=4.9914	Eq. 1.1-3
ρ=0.19152	Eq. 1.1-2
be=1.5275 in	Eq. 1.1-1
b_1=0.76377 in	Eq. 1.1.2-9
b_2=0.76377 in	Eq. 1.1.2-10
Ineffective width=6.4486 in	
Ae=0.096286 in², Fn=50 ksi	
Pn=4.8143 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Track	
Element 1: No compressive stress (fully effective)	
Element 3: Unstiffened, w=1.389 in	
f_1=49.84 ksi, f_2=49.84 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.6469	Eq. 1.1-3
ρ=0.3464	Eq. 1.1-2
b=0.48115 in (ineffective width=0.90785 in)	Eq. 1.1-1
Element 2: Stiffened, w=7.9761 in	
f_1=48.976 ksi, f_2=-24.634 ksi	
ψ=0.50299	Eq. 1.1.2-1
k=13.796	Eq. 1.1.2-2
λ=2.6599	Eq. 1.1-3
ρ=0.34485	Eq. 1.1-2
be=2.7506 in	Eq. 1.1-1
h_o=8.1981 in, b_o=1.5 in, h_o/b_o=5.4654	
b_1=0.78521 in	Eq. 1.1.2-6
b_2=1.0449 in	Eq. 1.1.2-7
Compression width=5.3068 in	
Ineffective width=3.4768 in	
Center of gravity shift: y=-1.3201 in	
Sxe=0.35561 in³, Fy=50 ksi	
Mnl=17.78 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.389 in	
f_1=49.84 ksi, f_2=49.84 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3

λ=2.6469	Eq. 1.1-3
ρ=0.3464	Eq. 1.1-2
b=0.48115 in (ineffective width=0.90785 in)	Eq. 1.1-1
Element 3: No compressive stress (fully effective)	
Element 2: Stiffened, w=7.9761 in	
f_1=48.976 ksi, f_2=-24.634 ksi	
ψ=0.50299	Eq. 1.1.2-1
k=13.796	Eq. 1.1.2-2
λ=2.6599	Eq. 1.1-3
ρ=0.34485	Eq. 1.1-2
be=2.7506 in	Eq. 1.1-1
h_o=8.1981 in, b_o=1.5 in, h_o/b_o=5.4654	
b_1=0.78521 in	Eq. 1.1.2-6
b_2=1.0449 in	Eq. 1.1.2-7
Compression width=5.3068 in	
Ineffective width=3.4767 in	
Center of gravity shift: y=1.3201 in	
Sxe=0.35561 in^3, Fy=50 ksi	
Mnl=17.78 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Positive Flexural Strength about Y-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.389 in	
f_1=50 ksi, f_2=-4.1045 ksi	
ψ=0.082089	Eq. 1.2.2-1
k=0.58771	Eq. 1.2.2-5
λ=2.2677	Eq. 1.1-3
ρ=0.42709	Eq. 1.2.2-4
b=0.59322 in (ineffective width=0.79578 in)	Eq. 1.1-1
Element 3: Unstiffened, w=1.389 in	
f_1=50 ksi, f_2=-4.1045 ksi	
ψ=0.08209	Eq. 1.2.2-1
k=0.58771	Eq. 1.2.2-5
λ=2.2677	Eq. 1.1-3
ρ=0.42709	Eq. 1.2.2-4
b=0.59322 in (ineffective width=0.79578 in)	Eq. 1.1-1
Element 2: No compressive stress (fully effective)	
Iteration is not required	
Center of gravity shift: x=-0.14907 in	
Sye=0.0105 in^3, Fy=50 ksi	
Mnl=0.525 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.389 in	
f_1=13.976 ksi, f_2=-50 ksi	
ψ=3.5775	Eq. 1.2.2-1
ψ>1 (fully effective)	Eq. 1.1-1

Element 3: Unstiffened, w=1.389 in	
f_1=13.976 ksi, f_2=-50 ksi	
ψ=3.5775	Eq. 1.2.2-1
ψ>1 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=7.9761 in	
f_1=18.292 ksi, f_2=18.292 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=3.019	Eq. 1.1-3
ρ=0.3071	Eq. 1.1-2
be=2.4494 in	Eq. 1.1-1
b_1=1.2247 in	Eq. 1.1.2-9
b_2=1.2247 in	Eq. 1.1.2-10
Ineffective width=5.5267 in	
Center of gravity shift: x=0.19925 in	
Sye=0.041392 in^3, Fy=50 ksi	
Mnl=2.0696 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Track

Cw=0.75402 in^6, Wn=4.4485 in^2, Fy=50 ksi	
Bn=8.4749 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.38228 in²	Wt.	0.0012997 k/ft	Flat	11.048 in
Ix	3.2314 in⁴	rx	2.9074 in	Ixy	0.0000 in⁴
Sx(t)	0.78834 in³	y(t)	4.0991 in	α	0.000 deg
Sx(b)	0.78834 in³	y(b)	4.0991 in		
Zx	0.98386 in³	Height	8.1981 in		
Iy	0.0601 in⁴	ry	0.3964 in	x_o	-0.5910 in
Sy(l)	0.27761 in³	x(l)	0.2164 in	y_o	0.0000 in
Sy(r)	0.04679 in³	x(r)	1.2836 in	jx	6.1623 in
Zy	0.07816 in³	Width	1.5000 in	jy	0.0000 in
I_1	3.2314 in⁴	r_1	2.9074 in	Cw	0.75402 in⁶
I_2	0.0601 in⁴	r_2	0.3964 in	J	0.00015255 in⁴
Ic	3.2915 in⁴	rc	2.9343 in		
I_o	3.4250 in⁴	r_o	2.9932 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	4.092 k	ϕMnxo	16.002 k-in	ϕMnyo	0.473 k-in
Ae	0.096286 in²	Ixe	1.9271 in⁴	Iye	0.0067 in⁴
ϕTn	17.388 k	Sxe(t)	0.35561 in³	Sye(l)	0.09936 in³
		Sxe(b)	0.69347 in³	Sye(r)	0.01050 in³
Shear					
ϕVny	1.306 k	Negative Bending		Negative Bending	
ϕVnx	2.595 k	ϕMnxo	16.002 k-in	ϕMnyo	1.863 k-in
		Ixe	1.9271 in⁴	Iye	0.0449 in⁴
Torsion		Sxe(t)	0.69347 in³	Sye(l)	0.10800 in³
ϕBn	7.6274 k-in²	Sxe(b)	0.35561 in³	Sye(r)	0.04139 in³

Track element 2 h/t exceeds 200.

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
    - Fyc=70.273 ksi — Eq. A3.3.2-2
  - Track corner 3
    - t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²

Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=50.54 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Track corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Track corner 3	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=51.942 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Fya=50 ksi	Eq. A3.3.2-1
Axial Tension Strength	
Ag=0.38228 in², Fy=50.54 ksi	
Tn=19.32 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.38228 in², Fu=65 ksi	
Tn=24.848 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Track element 1	
Vn=1.4418 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Track element 2	
h/t exceeds 200 (rational analysis)	
Vn=1.6326 k at 90 deg	Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)	
Track element 3	
Vn=1.4418 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Track	
Element 1: Unstiffened, w=1.389 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.6511	Eq. 1.1-3
ρ=0.3459	Eq. 1.1-2
b=0.48045 in (ineffective width=0.90855 in)	Eq. 1.1-1
Element 3: Unstiffened, w=1.389 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3

λ=2.6511	Eq. 1.1-3
ρ=0.3459	Eq. 1.1-2
b=0.48045 in (ineffective width=0.90855 in)	Eq. 1.1-1
Element 2: Stiffened, w=7.9761 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=4.9914	Eq. 1.1-3
ρ=0.19152	Eq. 1.1-2
be=1.5275 in	Eq. 1.1-1
b_1=0.76377 in	Eq. 1.1.2-9
b_2=0.76377 in	Eq. 1.1.2-10
Ineffective width=6.4486 in	
Ae=0.096286 in², Fn=50 ksi	
Pn=4.8143 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Track	
Element 1: No compressive stress (fully effective)	
Element 3: Unstiffened, w=1.389 in	
f_1=49.84 ksi, f_2=49.84 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.6469	Eq. 1.1-3
ρ=0.3464	Eq. 1.1-2
b=0.48115 in (ineffective width=0.90785 in)	Eq. 1.1-1
Element 2: Stiffened, w=7.9761 in	
f_1=48.976 ksi, f_2=-24.634 ksi	
ψ=0.50299	Eq. 1.1.2-1
k=13.796	Eq. 1.1.2-2
λ=2.6599	Eq. 1.1-3
ρ=0.34485	Eq. 1.1-2
be=2.7506 in	Eq. 1.1-1
h_o=8.1981 in, b_o=1.5 in, h_o/b_o=5.4654	
b_1=0.78521 in	Eq. 1.1.2-6
b_2=1.0449 in	Eq. 1.1.2-7
Compression width=5.3068 in	
Ineffective width=3.4768 in	
Center of gravity shift: y=-1.3201 in	
Sxe=0.35561 in³, Fy=50 ksi	
Mnl=17.78 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.389 in	
f_1=49.84 ksi, f_2=49.84 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3

λ=2.6469	Eq. 1.1-3
ρ=0.3464	Eq. 1.1-2
b=0.48115 in (ineffective width=0.90785 in)	Eq. 1.1-1
Element 3: No compressive stress (fully effective)	
Element 2: Stiffened, w=7.9761 in	
f_1=48.976 ksi, f_2=-24.634 ksi	
ψ=0.50299	Eq. 1.1.2-1
k=13.796	Eq. 1.1.2-2
λ=2.6599	Eq. 1.1-3
ρ=0.34485	Eq. 1.1-2
be=2.7506 in	Eq. 1.1-1
h_o=8.1981 in, b_o=1.5 in, h_o/b_o=5.4654	
b_1=0.78521 in	Eq. 1.1.2-6
b_2=1.0449 in	Eq. 1.1.2-7
Compression width=5.3068 in	
Ineffective width=3.4767 in	
Center of gravity shift: y=1.3201 in	
Sxe=0.35561 in^3, Fy=50 ksi	
Mnl=17.78 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Positive Flexural Strength about Y-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.389 in	
f_1=50 ksi, f_2=-4.1045 ksi	
ψ=0.082089	Eq. 1.2.2-1
k=0.58771	Eq. 1.2.2-5
λ=2.2677	Eq. 1.1-3
ρ=0.42709	Eq. 1.2.2-4
b=0.59322 in (ineffective width=0.79578 in)	Eq. 1.1-1
Element 3: Unstiffened, w=1.389 in	
f_1=50 ksi, f_2=-4.1045 ksi	
ψ=0.08209	Eq. 1.2.2-1
k=0.58771	Eq. 1.2.2-5
λ=2.2677	Eq. 1.1-3
ρ=0.42709	Eq. 1.2.2-4
b=0.59322 in (ineffective width=0.79578 in)	Eq. 1.1-1
Element 2: No compressive stress (fully effective)	
Iteration is not required	
Center of gravity shift: x=-0.14907 in	
Sye=0.0105 in^3, Fy=50 ksi	
Mnl=0.525 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.389 in	
f_1=13.976 ksi, f_2=-50 ksi	
ψ=3.5775	Eq. 1.2.2-1
ψ>1 (fully effective)	Eq. 1.1-1

Element 3: Unstiffened, w=1.389 in
f_1=13.976 ksi, f_2=-50 ksi
ψ=3.5775 Eq. 1.2.2-1
ψ>1 (fully effective) Eq. 1.1-1
Element 2: Stiffened, w=7.9761 in
f_1=18.292 ksi, f_2=18.292 ksi
ψ=1 Eq. 1.1.2-1
k=4 Eq. 1.1.2-8
λ=3.019 Eq. 1.1-3
ρ=0.3071 Eq. 1.1-2
be=2.4494 in Eq. 1.1-1
b_1=1.2247 in Eq. 1.1.2-9
b_2=1.2247 in Eq. 1.1.2-10
Ineffective width=5.5267 in
Center of gravity shift: x=0.19925 in
Sye=0.041392 in^3, Fy=50 ksi
Mnl=2.0696 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Track
Cw=0.75402 in^6, Wn=4.4485 in^2, Fy=50 ksi
Bn=8.4749 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

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Full Section Properties

Area	0.62191 in²	Wt.	0.0021145 k/ft	Flat	10.988 in
Ix	5.2143 in⁴	rx	2.8956 in	Ixy	0.0000 in⁴
Sx(t)	1.2721 in³	y(t)	4.0991 in	α	0.000 deg
Sx(b)	1.2721 in³	y(b)	4.0991 in		
Zx	1.5936 in³	Height	8.1981 in		
Iy	0.0962 in⁴	ry	0.3933 in	x_o	-0.5865 in
Sy(l)	0.4266 in³	x(l)	0.2255 in	y_o	0.0000 in
Sy(r)	0.0755 in³	x(r)	1.2745 in	jx	6.1743 in
Zy	0.1282 in³	Width	1.5000 in	jy	0.0000 in
I_1	5.2143 in⁴	r_1	2.8956 in	Cw	1.1978 in⁶
I_2	0.0962 in⁴	r_2	0.3933 in	J	0.0006641 in⁴
Ic	5.3106 in⁴	rc	2.9222 in		
I_o	5.5244 in⁴	r_o	2.9805 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	10.238 k	ϕMnxo	38.016 k-in	ϕMnyo	1.592 k-in
Ae	0.24089 in²	Ixe	4.0457 in⁴	Iye	0.0317 in⁴
ϕTn	28.446 k	Sxe(t)	0.8448 in³	Sye(l)	0.2496 in³
		Sxe(b)	1.1867 in³	Sye(r)	0.0354 in³
Shear					
ϕVny	4.339 k	Negative Bending		Negative Bending	
ϕVnx	4.152 k	ϕMnxo	38.016 k-in	ϕMnyo	3.240 k-in
		Ixe	4.0457 in⁴	Iye	0.0855 in⁴
Torsion		Sxe(t)	1.1867 in³	Sye(l)	0.2737 in³
ϕBn	12.247 k-in²	Sxe(b)	0.8448 in³	Sye(r)	0.0720 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
    - Fyc=75.384 ksi — Eq. A3.3.2-2
  - Track corner 3
    - t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
    - Fyc=75.384 ksi — Eq. A3.3.2-2
  - Fya=50.822 ksi — Eq. A3.3.2-1

Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Track corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi — Eq. A3.3.2-2
Track corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi — Eq. A3.3.2-2
Fya=52.938 ksi — Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Fya=50 ksi — Eq. A3.3.2-1

Axial Tension Strength
Ag=0.62191 in², Fy=50.822 ksi
Tn=31.606 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.62191 in², Fu=65 ksi
Tn=40.424 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Track element 1
Vn=2.3067 k at 180 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9
Track element 2
Vn=4.8207 k at 90 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Track element 3
Vn=2.3067 k at 0 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Track
Element 1: Unstiffened, w=1.3585 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=1.5851 — Eq. 1.1-3
ρ=0.54333 — Eq. 1.1-2
b=0.73811 in (ineffective width=0.62039 in) — Eq. 1.1-1
Element 3: Unstiffened, w=1.3585 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=1.5851 — Eq. 1.1-3
ρ=0.54333 — Eq. 1.1-2
b=0.73811 in (ineffective width=0.62039 in) — Eq. 1.1-1

Element 2: Stiffened, w=7.9151 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.1.2-1
k=4 Eq. 1.1.2-8
λ=3.0279 Eq. 1.1-3
ρ=0.30626 Eq. 1.1-2
be=2.4241 in Eq. 1.1-1
b_1=1.2121 in Eq. 1.1.2-9
b_2=1.2121 in Eq. 1.1.2-10
Ineffective width=5.491 in
Ae=0.24089 in², Fn=50 ksi
Pn=12.044 k Eq. E3.1-1
Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
Effective width calculations for Track
Element 1: No compressive stress (fully effective)
Element 3: Unstiffened, w=1.3585 in
f_1=49.704 ksi, f_2=49.704 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.5804 Eq. 1.1-3
ρ=0.54468 Eq. 1.1-2
b=0.73995 in (ineffective width=0.61855 in) Eq. 1.1-1
Element 2: Stiffened, w=7.9151 in
f_1=48.522 ksi, f_2=-34.127 ksi
ψ=0.70333 Eq. 1.1.2-1
k=17.291 Eq. 1.1.2-2
λ=1.4347 Eq. 1.1-3
ρ=0.59013 Eq. 1.1-2
be=4.671 in Eq. 1.1-1
h_o=8.1981 in, b_o=1.5 in, h_o/b_o=5.4654
b_1=1.2613 in Eq. 1.1.2-6
b_2=1.481 in Eq. 1.1.2-7
Compression width=4.6468 in
Ineffective width=1.9046 in
Center of gravity shift: y=-0.68988 in
Sxe=0.84481 in³, Fy=50 ksi
Mnl=42.24 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3585 in
f_1=49.704 ksi, f_2=49.704 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.5804 Eq. 1.1-3
ρ=0.54468 Eq. 1.1-2
b=0.73995 in (ineffective width=0.61855 in) Eq. 1.1-1

Element 3: No compressive stress (fully effective)
Element 2: Stiffened, w=7.9151 in
f_1=48.522 ksi, f_2=-34.127 ksi
ψ=0.70333 Eq. 1.1.2-1
k=17.291 Eq. 1.1.2-2
λ=1.4347 Eq. 1.1-3
ρ=0.59013 Eq. 1.1-2
be=4.671 in Eq. 1.1-1
h_o=8.1981 in, b_o=1.5 in, h_o/b_o=5.4654
b_1=1.2613 in Eq. 1.1.2-6
b_2=1.481 in Eq. 1.1.2-7
Compression width=4.6468 in
Ineffective width=1.9046 in
Center of gravity shift: y=0.68988 in
Sxe=0.84481 in^3, Fy=50 ksi
Mnl=42.24 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3585 in
f_1=50 ksi, f_2=-3.2969 ksi
ψ=0.065939 Eq. 1.2.2-1
k=0.58415 Eq. 1.2.2-5
λ=1.3599 Eq. 1.1-3
ρ=0.64866 Eq. 1.2.2-4
b=0.8812 in (ineffective width=0.4773 in) Eq. 1.1-1
Element 3: Unstiffened, w=1.3585 in
f_1=50 ksi, f_2=-3.2969 ksi
ψ=0.065939 Eq. 1.2.2-1
k=0.58415 Eq. 1.2.2-5
λ=1.3599 Eq. 1.1-3
ρ=0.64866 Eq. 1.2.2-4
b=0.8812 in (ineffective width=0.4773 in) Eq. 1.1-1
Element 2: No compressive stress (fully effective)
Iteration is not required
Center of gravity shift: x=-0.098552 in
Sye=0.035388 in^3, Fy=50 ksi
Mnl=1.7694 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3585 in
f_1=7.1666 ksi, f_2=-50 ksi
ψ=6.9768 Eq. 1.2.2-1
ψ>1 (fully effective) Eq. 1.1-1
Element 3: Unstiffened, w=1.3585 in
f_1=7.1667 ksi, f_2=-50 ksi
ψ=6.9767 Eq. 1.2.2-1

$\psi>1$ (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=7.9151 in	
f_1=11.93 ksi, f_2=11.93 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=1.4791	Eq. 1.1-3
ρ=0.57554	Eq. 1.1-2
be=4.5555 in	Eq. 1.1-1
b_1=2.2777 in	Eq. 1.1.2-9
b_2=2.2777 in	Eq. 1.1.2-10
Ineffective width=3.3596 in	
Center of gravity shift: x=0.086869 in	
Sye=0.071996 in^3, Fy=50 ksi	
Mnl=3.5998 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Track

Cw=1.1978 in^6, Wn=4.401 in^2, Fy=50 ksi	
Bn=13.608 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.77953 in²	Wt.	0.0026504 k/ft	Flat	10.933 in
Ix	6.4918 in⁴	rx	2.8858 in	Ixy	0.0000 in⁴
Sx(t)	1.5837 in³	y(t)	4.0991 in	α	0.000 deg
Sx(b)	1.5837 in³	y(b)	4.0991 in		
Zx	1.9902 in³	Height	8.1981 in		
Iy	0.1195 in⁴	ry	0.3915 in	x_o	-0.5846 in
Sy(l)	0.5150 in³	x(l)	0.2320 in	y_o	0.0000 in
Sy(r)	0.0942 in³	x(r)	1.2680 in	jx	6.1926 in
Zy	0.1617 in³	Width	1.5000 in	jy	0.0000 in
I_1	6.4918 in⁴	r_1	2.8858 in	Cw	1.4751 in⁶
I_2	0.1195 in⁴	r_2	0.3915 in	J	0.0013210 in⁴
Ic	6.6112 in⁴	rc	2.9122 in		
I_o	6.8776 in⁴	r_o	2.9703 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	15.781 k	ϕMnxo	56.140 k-in	ϕMnyo	2.727 k-in
Ae	0.37132 in²	Ixe	5.6088 in⁴	Iye	0.0626 in⁴
ϕTn	35.809 k	Sxe(t)	1.2476 in³	Sye(l)	0.3747 in³
		Sxe(b)	1.5149 in³	Sye(r)	0.0606 in³
Shear					
ϕVny	7.099 k	Negative Bending		Negative Bending	
ϕVnx	5.089 k	ϕMnxo	56.140 k-in	ϕMnyo	4.146 k-in
		Ixe	5.6088 in⁴	Iye	0.1130 in⁴
Torsion		Sxe(t)	1.5149 in³	Sye(l)	0.4122 in³
ϕBn	15.212 k-in²	Sxe(b)	1.2476 in³	Sye(r)	0.0921 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
    - Fyc=75.391 ksi — Eq. A3.3.2-2
  - Track corner 3
    - t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
    - Fyc=75.391 ksi — Eq. A3.3.2-2
  - Fya=51.04 ksi — Eq. A3.3.2-1

Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Track corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Track corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=53.678 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Fya=50 ksi Eq. A3.3.2-1

Axial Tension Strength
Ag=0.77953 in², Fy=51.04 ksi
Tn=39.787 k Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.77953 in², Fu=65 ksi
Tn=50.67 k Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Track element 1
Vn=2.8273 k at 180 deg Eq. G2.1-1
Ωv=1.67, ϕv=0.9
Track element 2
Vn=7.8882 k at 90 deg Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Track element 3
Vn=2.8273 k at 0 deg Eq. G2.1-1
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Track
Element 1: Unstiffened, w=1.3218 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.2243 Eq. 1.1-3
ρ=0.67003 Eq. 1.1-2
b=0.88565 in (ineffective width=0.43615 in) Eq. 1.1-1
Element 3: Unstiffened, w=1.3218 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.2243 Eq. 1.1-3
ρ=0.67003 Eq. 1.1-2
b=0.88565 in (ineffective width=0.43615 in) Eq. 1.1-1

Element 2: Stiffened, w=7.8417 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.1.2-1
k=4 Eq. 1.1.2-8
λ=2.3814 Eq. 1.1-3
ρ=0.38113 Eq. 1.1-2
be=2.9887 in Eq. 1.1-1
b_1=1.4944 in Eq. 1.1.2-9
b_2=1.4944 in Eq. 1.1.2-10
Ineffective width=4.853 in
Ae=0.37132 in², Fn=50 ksi
Pn=18.566 k Eq. E3.1-1
Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
Effective width calculations for Track
Element 1: No compressive stress (fully effective)
Element 3: Unstiffened, w=1.3218 in
f_1=49.603 ksi, f_2=49.603 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.2194 Eq. 1.1-3
ρ=0.67212 Eq. 1.1-2
b=0.88841 in (ineffective width=0.43339 in) Eq. 1.1-1
Element 2: Stiffened, w=7.8417 in
f_1=48.018 ksi, f_2=-39.221 ksi
ψ=0.81681 Eq. 1.1.2-1
k=19.628 Eq. 1.1.2-2
λ=1.0535 Eq. 1.1-3
ρ=0.75099 Eq. 1.1-2
be=5.889 in Eq. 1.1-1
h_o=8.1981 in, b_o=1.5 in, h_o/b_o=5.4654
b_1=1.5429 in Eq. 1.1.2-6
b_2=1.6985 in Eq. 1.1.2-7
Compression width=4.3162 in
Ineffective width=1.0748 in
Center of gravity shift: y=-0.39674 in
Sxe=1.2476 in³, Fy=50 ksi
Mnl=62.378 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3218 in
f_1=49.603 ksi, f_2=49.603 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.2194 Eq. 1.1-3
ρ=0.67212 Eq. 1.1-2
b=0.88841 in (ineffective width=0.43339 in) Eq. 1.1-1

Element 3: No compressive stress (fully effective)
Element 2: Stiffened, w=7.8417 in
f_1=48.018 ksi, f_2=-39.221 ksi
ψ=0.81681 Eq. 1.1.2-1
k=19.628 Eq. 1.1.2-2
λ=1.0535 Eq. 1.1-3
ρ=0.75099 Eq. 1.1-2
be=5.889 in Eq. 1.1-1
h_o=8.1981 in, b_o=1.5 in, h_o/b_o=5.4654
b_1=1.5429 in Eq. 1.1.2-6
b_2=1.6985 in Eq. 1.1.2-7
Compression width=4.3162 in
Ineffective width=1.0748 in
Center of gravity shift: y=0.39674 in
Sxe=1.2476 in³, Fy=50 ksi
Mnl=62.378 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3218 in
f_1=50 ksi, f_2=-2.1201 ksi
ψ=0.042401 Eq. 1.2.2-1
k=0.57903 Eq. 1.2.2-5
λ=1.055 Eq. 1.1-3
ρ=0.77327 Eq. 1.2.2-4
b=1.0221 in (ineffective width=0.29969 in) Eq. 1.1-1
Element 3: Unstiffened, w=1.3218 in
f_1=50 ksi, f_2=-2.1201 ksi
ψ=0.042401 Eq. 1.2.2-1
k=0.57903 Eq. 1.2.2-5
λ=1.055 Eq. 1.1-3
ρ=0.77327 Eq. 1.2.2-4
b=1.0221 in (ineffective width=0.29969 in) Eq. 1.1-1
Element 2: No compressive stress (fully effective)
Iteration is not required
Center of gravity shift: x=-0.064858 in
Sye=0.060597 in³, Fy=50 ksi
Mnl=3.0298 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3218 in
f_1=3.8766 ksi, f_2=-50 ksi
ψ=12.898 Eq. 1.2.2-1
ψ>1 (fully effective) Eq. 1.1-1
Element 3: Unstiffened, w=1.3218 in
f_1=3.8766 ksi, f_2=-50 ksi
ψ=12.898 Eq. 1.2.2-1

ψ>1 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=7.8417 in	
f_1=9.6869 ksi, f_2=9.6869 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=1.0482	Eq. 1.1-3
ρ=0.7538	Eq. 1.1-2
be=5.911 in	Eq. 1.1-1
b_1=2.9555 in	Eq. 1.1.2-9
b_2=2.9555 in	Eq. 1.1.2-10
Ineffective width=1.9307 in	
Center of gravity shift: x=0.042102 in	
Sye=0.092143 in^3, Fy=50 ksi	
Mnl=4.6072 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Track

Cw=1.4751 in^6, Wn=4.3638 in^2, Fy=50 ksi	
Bn=16.902 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

1000T150-30

Full Section Properties

Area	0.40732 in²	Wt.	0.0013849 k/ft	Flat	13.055 in
Ix	5.0608 in⁴	rx	3.5248 in	Ixy	0.0000 in⁴
Sx(t)	0.9925 in³	y(t)	5.0991 in	α	0.000 deg
Sx(b)	0.9925 in³	y(b)	5.0991 in		
Zx	1.2643 in³	Height	10.1981 in		
Iy	0.0564 in⁴	ry	0.3723 in	x_o	-0.5198 in
Sy(l)	0.3060 in³	x(l)	0.1845 in	y_o	0.0000 in
Sy(r)	0.0429 in³	x(r)	1.3155 in	jx	9.0945 in
Zy	0.0710 in³	Width	1.5000 in	jy	0.0000 in
I_1	5.0608 in⁴	r_1	3.5248 in	Cw	1.1324 in⁶
I_2	0.0564 in⁴	r_2	0.3723 in	J	0.00013217 in⁴
Ic	5.1172 in⁴	rc	3.5444 in		
I_o	5.2273 in⁴	r_o	3.5823 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	3.400 k	ϕMnxo	14.908 k-in	ϕMnyo	0.353 k-in
Ae	0.079991 in²	Ixe	2.6361 in⁴	Iye	0.0046 in⁴
ϕTn	18.484 k	Sxe(t)	0.37269 in³	Sye(l)	0.09251 in³
		Sxe(b)	0.84359 in³	Sye(r)	0.00784 in³
Shear					
ϕVny	0.981 k	Negative Bending		Negative Bending	
ϕVnx	2.310 k	ϕMnxo	14.908 k-in	ϕMnyo	1.656 k-in
		Ixe	2.6361 in⁴	Iye	0.0392 in⁴
Torsion		Sxe(t)	0.84359 in³	Sye(l)	0.09013 in³
ϕBn	8.849 k-in²	Sxe(b)	0.37269 in³	Sye(r)	0.03680 in³

Track element 2 h/t exceeds 300.
Track element 2 h/t exceeds 200.

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
    - Fyc=68.69 ksi — Eq. A3.3.2-2
  - Track corner 3

t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi — Eq. A3.3.2-2
Fya=50.421 ksi — Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Track corner 2
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi — Eq. A3.3.2-2
Track corner 3
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi — Eq. A3.3.2-2
Fya=51.789 ksi — Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Fya=50 ksi — Eq. A3.3.2-1

Axial Tension Strength
Ag=0.40732 in², Fy=50.421 ksi
Tn=20.538 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.40732 in², Fu=65 ksi
Tn=26.476 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Track element 1
Vn=1.2831 k at 180 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Track element 2
h/t exceeds 200 (rational analysis)
Vn=1.2261 k at 90 deg — Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)
Track element 3
Vn=1.2831 k at 0 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Track
Element 1: Unstiffened, w=1.3907 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=2.9436 — Eq. 1.1-3
ρ=0.31433 — Eq. 1.1-2
b=0.43714 in (ineffective width=0.95356 in) — Eq. 1.1-1
Element 3: Unstiffened, w=1.3907 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=2.9436	Eq. 1.1-3
ρ=0.31433	Eq. 1.1-2
b=0.43714 in (ineffective width=0.95356 in)	Eq. 1.1-1
Element 2: Stiffened, w=9.9795 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=6.9256	Eq. 1.1-3
ρ=0.1398	Eq. 1.1-2
be=1.3952 in	Eq. 1.1-1
b_1=0.69759 in	Eq. 1.1.2-9
b_2=0.69759 in	Eq. 1.1.2-10
Ineffective width=8.5843 in	
Ae=0.079991 in², Fn=50 ksi	
Pn=3.9996 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Track	
Element 1: No compressive stress (fully effective)	
Element 3: Unstiffened, w=1.3907 in	
f_1=49.89 ksi, f_2=49.89 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.9404	Eq. 1.1-3
ρ=0.31465	Eq. 1.1-2
b=0.43758 in (ineffective width=0.95312 in)	Eq. 1.1-1
Element 2: Stiffened, w=9.9795 in	
f_1=49.227 ksi, f_2=-21.337 ksi	
ψ=0.43344	Eq. 1.1.2-1
k=12.758	Eq. 1.1.2-2
λ=3.8479	Eq. 1.1-3
ρ=0.24502	Eq. 1.1-2
be=2.4452 in	Eq. 1.1-1
h_o=10.198 in, b_o=1.5 in, h_o/b_o=6.7987	
b_1=0.71218 in	Eq. 1.1.2-6
b_2=0.99366 in	Eq. 1.1.2-7
Compression width=6.9619 in	
Ineffective width=5.2561 in	
Center of gravity shift: y=-1.9742 in	
Sxe=0.37269 in³, Fy=50 ksi	
Mnl=18.635 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Negative Flexural Strength about X-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.3907 in	
f_1=49.89 ksi, f_2=49.89 ksi	
ψ=1	Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=2.9404	Eq. 1.1-3
ρ=0.31465	Eq. 1.1-2
b=0.43758 in (ineffective width=0.95312 in)	Eq. 1.1-1
Element 3: No compressive stress (fully effective)	
Element 2: Stiffened, w=9.9795 in	
f_1=49.227 ksi, f_2=-21.337 ksi	
ψ=0.43344	Eq. 1.1.2-1
k=12.758	Eq. 1.1.2-2
λ=3.8479	Eq. 1.1-3
ρ=0.24502	Eq. 1.1-2
be=2.4452 in	Eq. 1.1-1
h_o=10.198 in, b_o=1.5 in, h_o/b_o=6.7987	
b_1=0.71218 in	Eq. 1.1.2-6
b_2=0.99366 in	Eq. 1.1.2-7
Compression width=6.9619 in	
Ineffective width=5.2561 in	
Center of gravity shift: y=1.9742 in	
Sxe=0.37269 in³, Fy=50 ksi	
Mnl=18.635 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Positive Flexural Strength about Y-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.3907 in	
f_1=50 ksi, f_2=-2.8566 ksi	
ψ=0.057133	Eq. 1.2.2-1
k=0.58223	Eq. 1.2.2-5
λ=2.5297	Eq. 1.1-3
ρ=0.37947	Eq. 1.2.2-4
b=0.52773 in (ineffective width=0.86297 in)	Eq. 1.1-1
Element 3: Unstiffened, w=1.3907 in	
f_1=50 ksi, f_2=-2.8567 ksi	
ψ=0.057133	Eq. 1.2.2-1
k=0.58223	Eq. 1.2.2-5
λ=2.5297	Eq. 1.1-3
ρ=0.37947	Eq. 1.2.2-4
b=0.52773 in (ineffective width=0.86297 in)	Eq. 1.1-1
Element 2: No compressive stress (fully effective)	
Iteration is not required	
Center of gravity shift: x=-0.13468 in	
Sye=0.007842 in³, Fy=50 ksi	
Mnl=0.3921 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.3907 in	
f_1=15.26 ksi, f_2=-50 ksi	
ψ=3.2766	Eq. 1.2.2-1

ψ>1 (fully effective)	Eq. 1.1-1
Element 3: Unstiffened, w=1.3907 in	
f_1=15.26 ksi, f_2=-50 ksi	
ψ=3.2766	Eq. 1.2.2-1
ψ>1 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=9.9795 in	
f_1=19.657 ksi, f_2=19.657 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=4.3424	Eq. 1.1-3
ρ=0.21862	Eq. 1.1-2
be=2.1817 in	Eq. 1.1-1
b_1=1.0909 in	Eq. 1.1.2-9
b_2=1.0909 in	Eq. 1.1.2-10
Ineffective width=7.7978 in	
Center of gravity shift: x=0.25045 in	
Sye=0.036803 in^3, Fy=50 ksi	
Mnl=1.8402 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Track

Cw=1.1324 in^6, Wn=5.7584 in^2, Fy=50 ksi	
Bn=9.8323 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

1000T150-33

Full Section Properties

Area	0.45148 in²	Wt.	0.0015350 k/ft	Flat	13.048 in
Ix	5.6045 in⁴	rx	3.5233 in	Ixy	0.0000 in⁴
Sx(t)	1.0991 in³	y(t)	5.0991 in	α	0.000 deg
Sx(b)	1.0991 in³	y(b)	5.0991 in		
Zx	1.4007 in³	Height	10.1981 in		
Iy	0.0624 in⁴	ry	0.3718 in	x_o	-0.5189 in
Sy(l)	0.3357 in³	x(l)	0.1859 in	y_o	0.0000 in
Sy(r)	0.0475 in³	x(r)	1.3141 in	jx	9.0966 in
Zy	0.0788 in³	Width	1.5000 in	jy	0.0000 in
I_1	5.6045 in⁴	r_1	3.5233 in	Cw	1.2509 in⁶
I_2	0.0624 in⁴	r_2	0.3718 in	J	0.00018016 in⁴
Ic	5.6669 in⁴	rc	3.5429 in		
I_o	5.7885 in⁴	r_o	3.5807 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	4.113 k	ϕMnxo	20.173 k-in	ϕMnyo	0.457 k-in
Ae	0.096774 in²	Ixe	3.1046 in⁴	Iye	0.0064 in⁴
ϕTn	20.502 k	Sxe(t)	0.44829 in³	Sye(l)	0.11281 in³
		Sxe(b)	0.94866 in³	Sye(r)	0.01015 in³
Shear					
ϕVny	1.238 k	Negative Bending		Negative Bending	
ϕVnx	2.595 k	ϕMnxo	20.173 k-in	ϕMnyo	1.868 k-in
		Ixe	3.1046 in⁴	Iye	0.0452 in⁴
Torsion		Sxe(t)	0.94866 in³	Sye(l)	0.10960 in³
ϕBn	9.7886 k-in²	Sxe(b)	0.44829 in³	Sye(r)	0.04151 in³

Track element 2 h/t exceeds 200.

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
    - Fyc=70.273 ksi — Eq. A3.3.2-2
  - Track corner 3
    - t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²

Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=50.457 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Track corner 2	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Track corner 3	
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²	
Fyc=70.273 ksi	Eq. A3.3.2-2
Fya=51.942 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Fya=50 ksi	Eq. A3.3.2-1
Axial Tension Strength	
Ag=0.45148 in², Fy=50.457 ksi	
Tn=22.78 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.45148 in², Fu=65 ksi	
Tn=29.346 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Track element 1	
Vn=1.4418 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Track element 2	
h/t exceeds 200 (rational analysis)	
Vn=1.5477 k at 90 deg	Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)	
Track element 3	
Vn=1.4418 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Track	
Element 1: Unstiffened, w=1.389 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.6511	Eq. 1.1-3
ρ=0.3459	Eq. 1.1-2
b=0.48045 in (ineffective width=0.90855 in)	Eq. 1.1-1
Element 3: Unstiffened, w=1.389 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3

λ=2.6511	Eq. 1.1-3
ρ=0.3459	Eq. 1.1-2
b=0.48045 in (ineffective width=0.90855 in)	Eq. 1.1-1
Element 2: Stiffened, w=9.9761 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=6.243	Eq. 1.1-3
ρ=0.15454	Eq. 1.1-2
be=1.5417 in	Eq. 1.1-1
b_1=0.77083 in	Eq. 1.1.2-9
b_2=0.77083 in	Eq. 1.1.2-10
Ineffective width=8.4344 in	
Ae=0.096774 in², Fn=50 ksi	
Pn=4.8387 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Track	
Element 1: No compressive stress (fully effective)	
Element 3: Unstiffened, w=1.389 in	
f_1=49.875 ksi, f_2=49.875 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.6478	Eq. 1.1-3
ρ=0.34629	Eq. 1.1-2
b=0.481 in (ineffective width=0.908 in)	Eq. 1.1-1
Element 2: Stiffened, w=9.9761 in	
f_1=49.198 ksi, f_2=-22.846 ksi	
ψ=0.46436	Eq. 1.1.2-1
k=13.209	Eq. 1.1.2-2
λ=3.4078	Eq. 1.1-3
ρ=0.2745	Eq. 1.1-2
be=2.7384 in	Eq. 1.1-1
h_o=10.198 in, b_o=1.5 in, h_o/b_o=6.7987	
b_1=0.79046 in	Eq. 1.1.2-6
b_2=1.0796 in	Eq. 1.1.2-7
Compression width=6.8126 in	
Ineffective width=4.9425 in	
Center of gravity shift: y=-1.8264 in	
Sxe=0.44829 in³, Fy=50 ksi	
Mnl=22.414 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.389 in	
f_1=49.875 ksi, f_2=49.875 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3

λ=2.6478	Eq. 1.1-3
ρ=0.34629	Eq. 1.1-2
b=0.481 in (ineffective width=0.908 in)	Eq. 1.1-1
Element 3: No compressive stress (fully effective)	
Element 2: Stiffened, w=9.9761 in	
f_1=49.198 ksi, f_2=-22.846 ksi	
ψ=0.46437	Eq. 1.1.2-1
k=13.209	Eq. 1.1.2-2
λ=3.4078	Eq. 1.1-3
ρ=0.2745	Eq. 1.1-2
be=2.7384 in	Eq. 1.1-1
h_o=10.198 in, b_o=1.5 in, h_o/b_o=6.7987	
b_1=0.79046 in	Eq. 1.1.2-6
b_2=1.0796 in	Eq. 1.1.2-7
Compression width=6.8126 in	
Ineffective width=4.9425 in	
Center of gravity shift: y=1.8264 in	
Sxe=0.44829 in^3, Fy=50 ksi	
Mnl=22.414 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Positive Flexural Strength about Y-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.389 in	
f_1=50 ksi, f_2=-2.8482 ksi	
ψ=0.056964	Eq. 1.2.2-1
k=0.58219	Eq. 1.2.2-5
λ=2.2784	Eq. 1.1-3
ρ=0.41656	Eq. 1.2.2-4
b=0.5786 in (ineffective width=0.8104 in)	Eq. 1.1-1
Element 3: Unstiffened, w=1.389 in	
f_1=50 ksi, f_2=-2.8482 ksi	
ψ=0.056965	Eq. 1.2.2-1
k=0.58219	Eq. 1.2.2-5
λ=2.2784	Eq. 1.1-3
ρ=0.41656	Eq. 1.2.2-4
b=0.5786 in (ineffective width=0.8104 in)	Eq. 1.1-1
Element 2: No compressive stress (fully effective)	
Iteration is not required	
Center of gravity shift: x=-0.12892 in	
Sye=0.010154 in^3, Fy=50 ksi	
Mnl=0.5077 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.389 in	
f_1=13.808 ksi, f_2=-50 ksi	
ψ=3.6211	Eq. 1.2.2-1
ψ>1 (fully effective)	Eq. 1.1-1

Element 3: Unstiffened, w=1.389 in
f_1=13.808 ksi, f_2=-50 ksi
ψ=3.6211 Eq. 1.2.2-1
ψ>1 (fully effective) Eq. 1.1-1
Element 2: Stiffened, w=9.9761 in
f_1=18.113 ksi, f_2=18.113 ksi
ψ=1 Eq. 1.1.2-1
k=4 Eq. 1.1.2-8
λ=3.7575 Eq. 1.1-3
ρ=0.25055 Eq. 1.1-2
be=2.4996 in Eq. 1.1-1
b_1=1.2498 in Eq. 1.1.2-9
b_2=1.2498 in Eq. 1.1.2-10
Ineffective width=7.4765 in
Center of gravity shift: x=0.22618 in
Sye=0.041507 in^3, Fy=50 ksi
Mnl=2.0753 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Track
Cw=1.2509 in^6, Wn=5.7506 in^2, Fy=50 ksi
Bn=10.876 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

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Full Section Properties

Area	0.58754 in²	Wt.	0.0019976 k/ft	Flat	13.027 in
Ix	7.2739 in⁴	rx	3.5186 in	Ixy	0.0000 in⁴
Sx(t)	1.4265 in³	y(t)	5.0990 in	α	0.000 deg
Sx(b)	1.4265 in³	y(b)	5.0991 in		
Zx	1.8203 in³	Height	10.1981 in		
Iy	0.0805 in⁴	ry	0.3702 in	x_o	-0.5163 in
Sy(l)	0.4235 in³	x(l)	0.1902 in	y_o	0.0000 in
Sy(r)	0.0615 in³	x(r)	1.3098 in	jx	9.1022 in
Zy	0.1031 in³	Width	1.5000 in	jy	0.0000 in
I_1	7.2739 in⁴	r_1	3.5186 in	Cw	1.6110 in⁶
I_2	0.0805 in⁴	r_2	0.3702 in	J	0.0003984 in⁴
Ic	7.3545 in⁴	rc	3.5380 in		
I_o	7.5111 in⁴	r_o	3.5755 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	6.707 k	ϕMnxo	32.303 k-in	ϕMnyo	0.882 k-in
Ae	0.15781 in²	Ixe	4.6881 in⁴	Iye	0.0150 in⁴
ϕTn	26.734 k	Sxe(t)	0.7178 in³	Sye(l)	0.1867 in³
		Sxe(b)	1.2784 in³	Sye(r)	0.0196 in³
Shear					
ϕVny	2.240 k	Negative Bending		Negative Bending	
ϕVnx	3.370 k	ϕMnxo	32.303 k-in	ϕMnyo	2.530 k-in
		Ixe	4.6881 in⁴	Iye	0.0645 in⁴
Torsion		Sxe(t)	1.2784 in³	Sye(l)	0.1832 in³
ϕBn	12.66 k-in²	Sxe(b)	0.7178 in³	Sye(r)	0.0562 in³

Track element 2 h/t exceeds 200.

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
    - Fyc=74.687 ksi — Eq. A3.3.2-2
  - Track corner 3
    - t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²

Fyc=74.687 ksi	Eq. A3.3.2-2
Fya=50.558 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Track corner 2	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Track corner 3	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Fya=52.375 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Fya=50 ksi	Eq. A3.3.2-1
Axial Tension Strength	
Ag=0.58754 in², Fy=50.558 ksi	
Tn=29.705 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.58754 in², Fu=65 ksi	
Tn=38.19 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Track element 1	
Vn=1.8721 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Track element 2	
h/t exceeds 200 (rational analysis)	
Vn=2.8005 k at 90 deg	Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)	
Track element 3	
Vn=1.8721 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Track	
Element 1: Unstiffened, w=1.3837 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.0261	Eq. 1.1-3
ρ=0.43996	Eq. 1.1-2
b=0.60878 in (ineffective width=0.77492 in)	Eq. 1.1-1
Element 3: Unstiffened, w=1.3837 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3

λ=2.0261	Eq. 1.1-3
ρ=0.43996	Eq. 1.1-2
b=0.60878 in (ineffective width=0.77492 in)	Eq. 1.1-1
Element 2: Stiffened, w=9.9655 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=4.7844	Eq. 1.1-3
ρ=0.1994	Eq. 1.1-2
be=1.9871 in	Eq. 1.1-1
b_1=0.99357 in	Eq. 1.1.2-9
b_2=0.99357 in	Eq. 1.1.2-10
Ineffective width=7.9784 in	
Ae=0.15781 in², Fn=50 ksi	
Pn=7.8907 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Track	
Element 1: No compressive stress (fully effective)	
Element 3: Unstiffened, w=1.3837 in	
f_1=49.827 ksi, f_2=49.827 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.0226	Eq. 1.1-3
ρ=0.44063	Eq. 1.1-2
b=0.6097 in (ineffective width=0.774 in)	Eq. 1.1-1
Element 2: Stiffened, w=9.9655 in	
f_1=49.109 ksi, f_2=-27.205 ksi	
ψ=0.55396	Eq. 1.1.2-1
k=14.613	Eq. 1.1.2-2
λ=2.4808	Eq. 1.1-3
ρ=0.36735	Eq. 1.1-2
be=3.6609 in	Eq. 1.1-1
h_o=10.198 in, b_o=1.5 in, h_o/b_o=6.7987	
b_1=1.0301 in	Eq. 1.1.2-6
b_2=1.3257 in	Eq. 1.1.2-7
Compression width=6.413 in	
Ineffective width=4.0571 in	
Center of gravity shift: y=-1.4318 in	
Sxe=0.71784 in³, Fy=50 ksi	
Mnl=35.892 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.3837 in	
f_1=49.827 ksi, f_2=49.827 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3

λ=2.0226	Eq. 1.1-3
ρ=0.44063	Eq. 1.1-2
b=0.6097 in (ineffective width=0.774 in)	Eq. 1.1-1
Element 3: No compressive stress (fully effective)	
Element 2: Stiffened, w=9.9655 in	
f_1=49.109 ksi, f_2=-27.205 ksi	
ψ=0.55396	Eq. 1.1.2-1
k=14.613	Eq. 1.1.2-2
λ=2.4808	Eq. 1.1-3
ρ=0.36735	Eq. 1.1-2
be=3.6609 in	Eq. 1.1-1
h_o=10.198 in, b_o=1.5 in, h_o/b_o=6.7987	
b_1=1.0301 in	Eq. 1.1.2-6
b_2=1.3257 in	Eq. 1.1.2-7
Compression width=6.413 in	
Ineffective width=4.0571 in	
Center of gravity shift: y=1.4318 in	
Sxe=0.71784 in^3, Fy=50 ksi	
Mnl=35.892 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Positive Flexural Strength about Y-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.3837 in	
f_1=50 ksi, f_2=-2.8201 ksi	
ψ=0.056403	Eq. 1.2.2-1
k=0.58207	Eq. 1.2.2-5
λ=1.7415	Eq. 1.1-3
ρ=0.52566	Eq. 1.2.2-4
b=0.72736 in (ineffective width=0.65634 in)	Eq. 1.1-1
Element 3: Unstiffened, w=1.3837 in	
f_1=50 ksi, f_2=-2.8202 ksi	
ψ=0.056403	Eq. 1.2.2-1
k=0.58207	Eq. 1.2.2-5
λ=1.7415	Eq. 1.1-3
ρ=0.52566	Eq. 1.2.2-4
b=0.72736 in (ineffective width=0.65634 in)	Eq. 1.1-1
Element 2: No compressive stress (fully effective)	
Iteration is not required	
Center of gravity shift: x=-0.11 in	
Sye=0.019606 in^3, Fy=50 ksi	
Mnl=0.98028 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.3837 in	
f_1=10.203 ksi, f_2=-50 ksi	
ψ=4.9005	Eq. 1.2.2-1
ψ>1 (fully effective)	Eq. 1.1-1

Element 3: Unstiffened, w=1.3837 in

f_1=10.203 ksi, f_2=-50 ksi

ψ=4.9005 Eq. 1.2.2-1

ψ>1 (fully effective) Eq. 1.1-1

Element 2: Stiffened, w=9.9655 in

f_1=14.282 ksi, f_2=14.282 ksi

ψ=1 Eq. 1.1.2-1

k=4 Eq. 1.1.2-8

λ=2.557 Eq. 1.1-3

ρ=0.35743 Eq. 1.1-2

be=3.562 in Eq. 1.1-1

b_1=1.781 in Eq. 1.1.2-9

b_2=1.781 in Eq. 1.1.2-10

Ineffective width=6.4035 in

Center of gravity shift: x=0.16205 in

Sye=0.056219 in^3, Fy=50 ksi

Mnl=2.811 k-in Eq. F3.1-1

Ωb=1.67, ϕb=0.9

Bimoment Strength, Track

Cw=1.611 in^6, Wn=5.7266 in^2, Fy=50 ksi

Bn=14.066 k-in^2 G8.1-1

Ωb=1.67, ϕb=0.9

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Full Section Properties

Area	0.73511 in²	Wt.	0.0024994 k/ft	Flat	12.988 in
Ix	9.0612 in⁴	rx	3.5109 in	Ixy	0.0000 in⁴
Sx(t)	1.7770 in³	y(t)	5.0991 in	α	0.000 deg
Sx(b)	1.7770 in³	y(b)	5.0991 in		
Zx	2.2721 in³	Height	10.1981 in		
Iy	0.1000 in⁴	ry	0.3688 in	x_o	-0.5145 in
Sy(l)	0.5122 in³	x(l)	0.1952 in	y_o	0.0000 in
Sy(r)	0.0766 in³	x(r)	1.3048 in	jx	9.1237 in
Zy	0.1299 in³	Width	1.5000 in	jy	0.0000 in
I_1	9.0612 in⁴	r_1	3.5109 in	Cw	1.9907 in⁶
I_2	0.1000 in⁴	r_2	0.3688 in	J	0.0007850 in⁴
Ic	9.1612 in⁴	rc	3.5302 in		
I_o	9.3558 in⁴	r_o	3.5675 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	10.330 k	ϕMnxo	48.582 k-in	ϕMnyo	1.550 k-in
Ae	0.24306 in²	Ixe	6.6474 in⁴	Iye	0.0308 in⁴
ϕTn	33.540 k	Sxe(t)	1.0796 in³	Sye(l)	0.2865 in³
		Sxe(b)	1.6451 in³	Sye(r)	0.0344 in³
Shear					
ϕVny	4.169 k	Negative Bending		Negative Bending	
ϕVnx	4.152 k	ϕMnxo	48.582 k-in	ϕMnyo	3.257 k-in
		Ixe	6.6474 in⁴	Iye	0.0866 in⁴
Torsion		Sxe(t)	1.6451 in³	Sye(l)	0.2852 in³
ϕBn	15.732 k-in²	Sxe(b)	1.0796 in³	Sye(r)	0.0724 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
    - Fyc=75.384 ksi — Eq. A3.3.2-2
  - Track corner 3
    - t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
    - Fyc=75.384 ksi — Eq. A3.3.2-2
  - Fya=50.695 ksi — Eq. A3.3.2-1

Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Track corner 2
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Track corner 3
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
Fyc=75.384 ksi Eq. A3.3.2-2
Fya=52.938 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Fya=50 ksi Eq. A3.3.2-1

Axial Tension Strength
Ag=0.73511 in², Fy=50.695 ksi
Tn=37.266 k Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.73511 in², Fu=65 ksi
Tn=47.782 k Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Track element 1
Vn=2.3067 k at 180 deg Eq. G2.1-1
Ωv=1.67, ϕv=0.9
Track element 2
Vn=4.6322 k at 90 deg Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Track element 3
Vn=2.3067 k at 0 deg Eq. G2.1-1
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Track
Element 1: Unstiffened, w=1.3585 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.5851 Eq. 1.1-3
ρ=0.54333 Eq. 1.1-2
b=0.73811 in (ineffective width=0.62039 in) Eq. 1.1-1
Element 3: Unstiffened, w=1.3585 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.5851 Eq. 1.1-3
ρ=0.54333 Eq. 1.1-2
b=0.73811 in (ineffective width=0.62039 in) Eq. 1.1-1

Element 2: Stiffened, w=9.9151 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.1.2-1
k=4 Eq. 1.1.2-8
λ=3.793 Eq. 1.1-3
ρ=0.24835 Eq. 1.1-2
be=2.4624 in Eq. 1.1-1
b_1=1.2312 in Eq. 1.1.2-9
b_2=1.2312 in Eq. 1.1.2-10
Ineffective width=7.4527 in
Ae=0.24306 in², Fn=50 ksi
Pn=12.153 k Eq. E3.1-1
Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
Effective width calculations for Track
Element 1: No compressive stress (fully effective)
Element 3: Unstiffened, w=1.3585 in
f_1=49.77 ksi, f_2=49.77 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.5814 Eq. 1.1-3
ρ=0.54438 Eq. 1.1-2
b=0.73954 in (ineffective width=0.61896 in) Eq. 1.1-1
Element 2: Stiffened, w=9.9151 in
f_1=48.851 ksi, f_2=-31.679 ksi
ψ=0.64849 Eq. 1.1.2-1
k=16.256 Eq. 1.1.2-2
λ=1.8597 Eq. 1.1-3
ρ=0.4741 Eq. 1.1-2
be=4.7007 in Eq. 1.1-1
h_o=10.198 in, b_o=1.5 in, h_o/b_o=6.7987
b_1=1.2884 in Eq. 1.1.2-6
b_2=1.5631 in Eq. 1.1.2-7
Compression width=6.0147 in
Ineffective width=3.1631 in
Center of gravity shift: y=-1.0582 in
Sxe=1.0796 in³, Fy=50 ksi
Mnl=53.98 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3585 in
f_1=49.77 ksi, f_2=49.77 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.5814 Eq. 1.1-3
ρ=0.54438 Eq. 1.1-2
b=0.73954 in (ineffective width=0.61896 in) Eq. 1.1-1

Element 3: No compressive stress (fully effective)
Element 2: Stiffened, w=9.9151 in
f_1=48.851 ksi, f_2=-31.679 ksi
ψ=0.64849 Eq. 1.1.2-1
k=16.257 Eq. 1.1.2-2
λ=1.8597 Eq. 1.1-3
ρ=0.4741 Eq. 1.1-2
be=4.7007 in Eq. 1.1-1
h_o=10.198 in, b_o=1.5 in, h_o/b_o=6.7987
b_1=1.2884 in Eq. 1.1.2-6
b_2=1.5631 in Eq. 1.1.2-7
Compression width=6.0147 in
Ineffective width=3.1631 in
Center of gravity shift: y=1.0582 in
Sxe=1.0796 in³, Fy=50 ksi
Mnl=53.98 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3585 in
f_1=50 ksi, f_2=-2.0563 ksi
ψ=0.041127 Eq. 1.2.2-1
k=0.57876 Eq. 1.2.2-5
λ=1.3663 Eq. 1.1-3
ρ=0.63428 Eq. 1.2.2-4
b=0.86167 in (ineffective width=0.49683 in) Eq. 1.1-1
Element 3: Unstiffened, w=1.3585 in
f_1=50 ksi, f_2=-2.0564 ksi
ψ=0.041127 Eq. 1.2.2-1
k=0.57876 Eq. 1.2.2-5
λ=1.3663 Eq. 1.1-3
ρ=0.63428 Eq. 1.2.2-4
b=0.86167 in (ineffective width=0.49683 in) Eq. 1.1-1
Element 2: No compressive stress (fully effective)
Iteration is not required
Center of gravity shift: x=-0.087521 in
Sye=0.034438 in³, Fy=50 ksi
Mnl=1.7219 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3585 in
f_1=6.7283 ksi, f_2=-50 ksi
ψ=7.4313 Eq. 1.2.2-1
ψ>1 (fully effective) Eq. 1.1-1
Element 3: Unstiffened, w=1.3585 in
f_1=6.7283 ksi, f_2=-50 ksi
ψ=7.4313 Eq. 1.2.2-1

ψ>1 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=9.9151 in	
f_1=11.455 ksi, f_2=11.455 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=1.8155	Eq. 1.1-3
ρ=0.48406	Eq. 1.1-2
be=4.7995 in	Eq. 1.1-1
b_1=2.3997 in	Eq. 1.1.2-9
b_2=2.3997 in	Eq. 1.1.2-10
Ineffective width=5.1156 in	
Center of gravity shift: x=0.10843 in	
Sye=0.072372 in^3, Fy=50 ksi	
Mnl=3.6186 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Track

Cw=1.9907 in^6, Wn=5.6942 in^2, Fy=50 ksi	
Bn=17.48 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.92213 in²	Wt.	0.0031353 k/ft	Flat	12.933 in
Ix	11.299 in⁴	rx	3.5005 in	Ixy	0.000 in⁴
Sx(t)	2.2159 in³	y(t)	5.0991 in	α	0.000 deg
Sx(b)	2.2159 in³	y(b)	5.0991 in		
Zx	2.8410 in³	Height	10.1981 in		
Iy	0.124 in⁴	ry	0.3670 in	x_o	-0.5125 in
Sy(l)	0.6159 in³	x(l)	0.2016 in	y_o	0.0000 in
Sy(r)	0.0956 in³	x(r)	1.2984 in	jx	9.1542 in
Zy	0.1645 in³	Width	1.5000 in	jy	0.0000 in
I_1	11.299 in⁴	r_1	3.5005 in	Cw	2.4562 in⁶
I_2	0.124 in⁴	r_2	0.3670 in	J	0.0015626 in⁴
Ic	11.423 in⁴	rc	3.5197 in		
I_o	11.666 in⁴	r_o	3.5568 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	15.968 k	ϕMnxo	72.592 k-in	ϕMnyo	2.668 k-in
Ae	0.37573 in²	Ixe	9.3282 in⁴	Iye	0.0615 in⁴
ϕTn	42.226 k	Sxe(t)	1.6132 in³	Sye(l)	0.4323 in³
		Sxe(b)	2.1126 in³	Sye(r)	0.0593 in³
Shear					
ϕVny	6.899 k	Negative Bending		Negative Bending	
ϕVnx	5.089 k	ϕMnxo	72.592 k-in	ϕMnyo	4.174 k-in
		Ixe	9.3282 in⁴	Iye	0.1148 in⁴
Torsion		Sxe(t)	2.1126 in³	Sye(l)	0.4385 in³
ϕBn	19.559 k-in²	Sxe(b)	1.6132 in³	Sye(r)	0.0928 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
    - Fyc=75.391 ksi — Eq. A3.3.2-2
  - Track corner 3
    - t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
    - Fyc=75.391 ksi — Eq. A3.3.2-2
  - Fya=50.879 ksi — Eq. A3.3.2-1

Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Track corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi — Eq. A3.3.2-2
Track corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi — Eq. A3.3.2-2
Fya=53.678 ksi — Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Fya=50 ksi — Eq. A3.3.2-1

Axial Tension Strength
Ag=0.92213 in², Fy=50.879 ksi
Tn=46.917 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.92213 in², Fu=65 ksi
Tn=59.939 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Track element 1
Vn=2.8273 k at 180 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9
Track element 2
Vn=7.6654 k at 90 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Track element 3
Vn=2.8273 k at 0 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Track
Element 1: Unstiffened, w=1.3218 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=1.2243 — Eq. 1.1-3
ρ=0.67003 — Eq. 1.1-2
b=0.88565 in (ineffective width=0.43615 in) — Eq. 1.1-1
Element 3: Unstiffened, w=1.3218 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=1.2243 — Eq. 1.1-3
ρ=0.67003 — Eq. 1.1-2
b=0.88565 in (ineffective width=0.43615 in) — Eq. 1.1-1

Element 2: Stiffened, w=9.8417 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.1.2-1
k=4 Eq. 1.1.2-8
λ=2.9887 Eq. 1.1-3
ρ=0.30996 Eq. 1.1-2
be=3.0505 in Eq. 1.1-1
b_1=1.5253 in Eq. 1.1.2-9
b_2=1.5253 in Eq. 1.1.2-10
Ineffective width=6.7912 in
Ae=0.37573 in², Fn=50 ksi
Pn=18.786 k Eq. E3.1-1
Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
Effective width calculations for Track
Element 1: No compressive stress (fully effective)
Element 3: Unstiffened, w=1.3218 in
f_1=49.692 ksi, f_2=49.692 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.2205 Eq. 1.1-3
ρ=0.67165 Eq. 1.1-2
b=0.88779 in (ineffective width=0.43401 in) Eq. 1.1-1
Element 2: Stiffened, w=9.8417 in
f_1=48.459 ksi, f_2=-36.647 ksi
ψ=0.75626 Eq. 1.1.2-1
k=18.347 Eq. 1.1.2-2
λ=1.3739 Eq. 1.1-3
ρ=0.61132 Eq. 1.1-2
be=6.0164 in Eq. 1.1-1
h_o=10.198 in, b_o=1.5 in, h_o/b_o=6.7987
b_1=1.6017 in Eq. 1.1.2-6
b_2=1.824 in Eq. 1.1.2-7
Compression width=5.6038 in
Ineffective width=2.1781 in
Center of gravity shift: y=-0.68354 in
Sxe=1.6132 in³, Fy=50 ksi
Mnl=80.658 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3218 in
f_1=49.692 ksi, f_2=49.692 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.2205 Eq. 1.1-3
ρ=0.67165 Eq. 1.1-2
b=0.88779 in (ineffective width=0.43401 in) Eq. 1.1-1

Element 3: No compressive stress (fully effective)
Element 2: Stiffened, w=9.8417 in
f_1=48.459 ksi, f_2=-36.647 ksi
ψ=0.75626 Eq. 1.1.2-1
k=18.347 Eq. 1.1.2-2
λ=1.3739 Eq. 1.1-3
ρ=0.61132 Eq. 1.1-2
be=6.0164 in Eq. 1.1-1
h_o=10.198 in, b_o=1.5 in, h_o/b_o=6.7987
b_1=1.6017 in Eq. 1.1.2-6
b_2=1.824 in Eq. 1.1.2-7
Compression width=5.6038 in
Ineffective width=2.1781 in
Center of gravity shift: y=0.68354 in
Sxe=1.6132 in³, Fy=50 ksi
Mnl=80.658 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3218 in
f_1=50 ksi, f_2=-0.9014 ksi
ψ=0.018028 Eq. 1.2.2-1
k=0.57381 Eq. 1.2.2-5
λ=1.0598 Eq. 1.1-3
ρ=0.75758 Eq. 1.2.2-4
b=1.0014 in (ineffective width=0.32043 in) Eq. 1.1-1
Element 3: Unstiffened, w=1.3218 in
f_1=50 ksi, f_2=-0.90142 ksi
ψ=0.018028 Eq. 1.2.2-1
k=0.57381 Eq. 1.2.2-5
λ=1.0598 Eq. 1.1-3
ρ=0.75758 Eq. 1.2.2-4
b=1.0014 in (ineffective width=0.32043 in) Eq. 1.1-1
Element 2: No compressive stress (fully effective)
Iteration is not required
Center of gravity shift: x=-0.059339 in
Sye=0.059287 in³, Fy=50 ksi
Mnl=2.9644 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3218 in
f_1=3.3169 ksi, f_2=-50 ksi
ψ=15.074 Eq. 1.2.2-1
ψ>1 (fully effective) Eq. 1.1-1
Element 3: Unstiffened, w=1.3218 in
f_1=3.3169 ksi, f_2=-50 ksi
ψ=15.074 Eq. 1.2.2-1

ψ>1 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=9.8417 in	
f_1=9.0669 ksi, f_2=9.0669 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=1.2727	Eq. 1.1-3
ρ=0.6499	Eq. 1.1-2
be=6.3962 in	Eq. 1.1-1
b_1=3.1981 in	Eq. 1.1.2-9
b_2=3.1981 in	Eq. 1.1.2-10
Ineffective width=3.4455 in	
Center of gravity shift: x=0.06027 in	
Sye=0.092755 in^3, Fy=50 ksi	
Mnl=4.6377 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Track

Cw=2.4562 in^6, Wn=5.651 in^2, Fy=50 ksi	
Bn=21.733 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.46972 in²	Wt.	0.0015971 k/ft	Flat	15.055 in
Ix	8.0176 in⁴	rx	4.131 in	Ixy	0.0000 in⁴
Sx(t)	1.3146 in³	y(t)	6.099 in	α	0.000 deg
Sx(b)	1.3146 in³	y(b)	6.099 in		
Zx	1.7029 in³	Height	12.198 in		
Iy	0.0580 in⁴	ry	0.351 in	x_o	-0.464 in
Sy(l)	0.3579 in³	x(l)	0.162 in	y_o	0.000 in
Sy(r)	0.0433 in³	x(r)	1.338 in	jx	12.709 in
Zy	0.0715 in³	Width	1.500 in	jy	0.000 in
I_1	8.0176 in⁴	r_1	4.131 in	Cw	1.7077 in⁶
I_2	0.0580 in⁴	r_2	0.351 in	J	0.00015242 in⁴
Ic	8.0756 in⁴	rc	4.146 in		
I_o	8.1765 in⁴	r_o	4.172 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	3.410 k	ϕMnxo	17.967 k-in	ϕMnyo	0.344 k-in
Ae	0.080230 in²	Ixe	3.8811 in⁴	Iye	0.0045 in⁴
ϕTn	21.292 k	Sxe(t)	0.4492 in³	Sye(l)	0.1020 in³
		Sxe(b)	1.0909 in³	Sye(r)	0.0077 in³
Shear					
ϕVny	0.936 k	Negative Bending		Negative Bending	
ϕVnx	2.310 k	ϕMnxo	17.967 k-in	ϕMnyo	1.659 k-in
		Ixe	3.8811 in⁴	Iye	0.0393 in⁴
Torsion		Sxe(t)	1.0909 in³	Sye(l)	0.0909 in³
ϕBn	10.829 k-in²	Sxe(b)	0.4492 in³	Sye(r)	0.0369 in³

Track element 2 h/t exceeds 300.
Track element 2 h/t exceeds 200.

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
    - Fyc=68.69 ksi — Eq. A3.3.2-2
  - Track corner 3

t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi — Eq. A3.3.2-2
Fya=50.365 ksi — Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Track corner 2
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi — Eq. A3.3.2-2
Track corner 3
t=0.0312 in, R=0.0781 in, Ac=0.0045921 in²
Fyc=68.69 ksi — Eq. A3.3.2-2
Fya=51.789 ksi — Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Fya=50 ksi — Eq. A3.3.2-1

Axial Tension Strength
Ag=0.46972 in², Fy=50.365 ksi
Tn=23.658 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.46972 in², Fu=65 ksi
Tn=30.532 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Track element 1
Vn=1.2831 k at 180 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Track element 2
h/t exceeds 200 (rational analysis)
Vn=1.1694 k at 90 deg — Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)
Track element 3
Vn=1.2831 k at 0 deg — Eq. G2.1-2
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Track
Element 1: Unstiffened, w=1.3907 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=2.9436 — Eq. 1.1-3
ρ=0.31433 — Eq. 1.1-2
b=0.43714 in (ineffective width=0.95356 in) — Eq. 1.1-1
Element 3: Unstiffened, w=1.3907 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=2.9436	Eq. 1.1-3
ρ=0.31433	Eq. 1.1-2
b=0.43714 in (ineffective width=0.95356 in)	Eq. 1.1-1
Element 2: Stiffened, w=11.979 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=8.3136	Eq. 1.1-3
ρ=0.1171	Eq. 1.1-2
be=1.4028 in	Eq. 1.1-1
b_1=0.70141 in	Eq. 1.1.2-9
b_2=0.70141 in	Eq. 1.1.2-10
Ineffective width=10.577 in	
Ae=0.08023 in², Fn=50 ksi	
Pn=4.0115 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Track	
Element 1: No compressive stress (fully effective)	
Element 3: Unstiffened, w=1.3907 in	
f_1=49.91 ksi, f_2=49.91 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.9409	Eq. 1.1-3
ρ=0.31459	Eq. 1.1-2
b=0.4375 in (ineffective width=0.9532 in)	Eq. 1.1-1
Element 2: Stiffened, w=11.979 in	
f_1=49.367 ksi, f_2=-19.976 ksi	
ψ=0.40464	Eq. 1.1.2-1
k=12.352	Eq. 1.1.2-2
λ=4.7009	Eq. 1.1-3
ρ=0.20277	Eq. 1.1-2
be=2.4291 in	Eq. 1.1-1
h_o=12.198 in, b_o=1.5 in, h_o/b_o=8.1321	
b_1=0.71346 in	Eq. 1.1.2-6
b_2=1.0159 in	Eq. 1.1.2-7
Compression width=8.5285 in	
Ineffective width=6.7992 in	
Center of gravity shift: y=-2.5413 in	
Sxe=0.44918 in³, Fy=50 ksi	
Mnl=22.459 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Negative Flexural Strength about X-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.3907 in	
f_1=49.91 ksi, f_2=49.91 ksi	
ψ=1	Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=2.9409	Eq. 1.1-3
ρ=0.31459	Eq. 1.1-2
b=0.4375 in (ineffective width=0.9532 in)	Eq. 1.1-1
Element 3: No compressive stress (fully effective)	
Element 2: Stiffened, w=11.979 in	
f_1=49.367 ksi, f_2=-19.976 ksi	
ψ=0.40464	Eq. 1.1.2-1
k=12.352	Eq. 1.1.2-2
λ=4.7009	Eq. 1.1-3
ρ=0.20277	Eq. 1.1-2
be=2.4291 in	Eq. 1.1-1
h_o=12.198 in, b_o=1.5 in, h_o/b_o=8.1321	
b_1=0.71346 in	Eq. 1.1.2-6
b_2=1.0159 in	Eq. 1.1.2-7
Compression width=8.5285 in	
Ineffective width=6.7992 in	
Center of gravity shift: y=2.5413 in	
Sxe=0.44918 in³, Fy=50 ksi	
Mnl=22.459 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Positive Flexural Strength about Y-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.3907 in	
f_1=50 ksi, f_2=-1.9705 ksi	
ψ=0.039409	Eq. 1.2.2-1
k=0.57838	Eq. 1.2.2-5
λ=2.5381	Eq. 1.1-3
ρ=0.37263	Eq. 1.2.2-4
b=0.51821 in (ineffective width=0.87249 in)	Eq. 1.1-1
Element 3: Unstiffened, w=1.3907 in	
f_1=50 ksi, f_2=-1.9705 ksi	
ψ=0.03941	Eq. 1.2.2-1
k=0.57838	Eq. 1.2.2-5
λ=2.5381	Eq. 1.1-3
ρ=0.37263	Eq. 1.2.2-4
b=0.51822 in (ineffective width=0.87248 in)	Eq. 1.1-1
Element 2: No compressive stress (fully effective)	
Iteration is not required	
Center of gravity shift: x=-0.11822 in	
Sye=0.0076526 in³, Fy=50 ksi	
Mnl=0.38263 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.3907 in	
f_1=15.121 ksi, f_2=-50 ksi	
ψ=3.3068	Eq. 1.2.2-1

ψ>1 (fully effective)	Eq. 1.1-1
Element 3: Unstiffened, w=1.3907 in	
f_1=15.121 ksi, f_2=-50 ksi	
ψ=3.3068	Eq. 1.2.2-1
ψ>1 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=11.979 in	
f_1=19.508 ksi, f_2=19.508 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=5.1929	Eq. 1.1-3
ρ=0.18441	Eq. 1.1-2
be=2.2092 in	Eq. 1.1-1
b_1=1.1046 in	Eq. 1.1.2-9
b_2=1.1046 in	Eq. 1.1.2-10
Ineffective width=9.7703 in	
Center of gravity shift: x=0.27071 in	
Sye=0.036868 in^3, Fy=50 ksi	
Mnl=1.8434 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Track

Cw=1.7077 in^6, Wn=7.0965 in^2, Fy=50 ksi	
Bn=12.032 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.52068 in²	Wt.	0.0017703 k/ft	Flat	15.048 in
Ix	8.8805 in⁴	rx	4.130 in	Ixy	0.0000 in⁴
Sx(t)	1.4561 in³	y(t)	6.099 in	α	0.000 deg
Sx(b)	1.4561 in³	y(b)	6.099 in		
Zx	1.8868 in³	Height	12.198 in		
Iy	0.0641 in⁴	ry	0.351 in	x_o	-0.463 in
Sy(l)	0.3922 in³	x(l)	0.163 in	y_o	0.000 in
Sy(r)	0.0480 in³	x(r)	1.337 in	jx	12.713 in
Zy	0.0795 in³	Width	1.500 in	jy	0.000 in
I_1	8.8805 in⁴	r_1	4.130 in	Cw	1.8867 in⁶
I_2	0.0641 in⁴	r_2	0.351 in	J	0.0002078 in⁴
Ic	8.9446 in⁴	rc	4.145 in		
I_o	9.0562 in⁴	r_o	4.171 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	4.127 k	ϕMnxo	21.635 k-in	ϕMnyo	0.446 k-in
Ae	0.097100 in²	Ixe	4.5819 in⁴	Iye	0.0062 in⁴
ϕTn	23.616 k	Sxe(t)	0.5409 in³	Sye(l)	0.1246 in³
		Sxe(b)	1.2294 in³	Sye(r)	0.0099 in³
Shear					
ϕVny	1.182 k	Negative Bending		Negative Bending	
ϕVnx	2.595 k	ϕMnxo	21.635 k-in	ϕMnyo	1.872 k-in
		Ixe	4.5818 in⁴	Iye	0.0454 in⁴
Torsion		Sxe(t)	1.2294 in³	Sye(l)	0.1108 in³
ϕBn	11.979 k-in²	Sxe(b)	0.5409 in³	Sye(r)	0.0416 in³

Track element 2 h/t exceeds 300.
Track element 2 h/t exceeds 200.

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
    - Fyc=70.273 ksi — Eq. A3.3.2-2
  - Track corner 3

t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi — Eq. A3.3.2-2
Fya=50.397 ksi — Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Track corner 2
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi — Eq. A3.3.2-2
Track corner 3
t=0.0346 in, R=0.0764 in, Ac=0.0050926 in²
Fyc=70.273 ksi — Eq. A3.3.2-2
Fya=51.942 ksi — Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Fya=50 ksi — Eq. A3.3.2-1

Axial Tension Strength
Ag=0.52068 in², Fy=50.397 ksi
Tn=26.24 k — Eq. D2-1
Ωt=1.67, ϕt=0.9

An=0.52068 in², Fu=65 ksi
Tn=33.844 k — Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Track element 1
Vn=1.4418 k at 180 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9
Track element 2
h/t exceeds 200 (rational analysis)
Vn=1.4777 k at 90 deg — Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)
Track element 3
Vn=1.4418 k at 0 deg — Eq. G2.1-1
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Track
Element 1: Unstiffened, w=1.389 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1
k=0.43 — Eq. 1.2.2-3
λ=2.6511 — Eq. 1.1-3
ρ=0.3459 — Eq. 1.1-2
b=0.48045 in (ineffective width=0.90855 in) — Eq. 1.1-1
Element 3: Unstiffened, w=1.389 in
f_1=50 ksi, f_2=50 ksi
ψ=1 — Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=2.6511	Eq. 1.1-3
ρ=0.3459	Eq. 1.1-2
b=0.48045 in (ineffective width=0.90855 in)	Eq. 1.1-1
Element 2: Stiffened, w=11.976 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=7.4945	Eq. 1.1-3
ρ=0.12951	Eq. 1.1-2
be=1.5511 in	Eq. 1.1-1
b_1=0.77553 in	Eq. 1.1.2-9
b_2=0.77553 in	Eq. 1.1.2-10
Ineffective width=10.425 in	
Ae=0.0971 in², Fn=50 ksi	
Pn=4.855 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Track	
Element 1: No compressive stress (fully effective)	
Element 3: Unstiffened, w=1.389 in	
f_1=49.898 ksi, f_2=49.898 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.6484	Eq. 1.1-3
ρ=0.34622	Eq. 1.1-2
b=0.4809 in (ineffective width=0.9081 in)	Eq. 1.1-1
Element 2: Stiffened, w=11.976 in	
f_1=49.345 ksi, f_2=-21.362 ksi	
ψ=0.43291	Eq. 1.1.2-1
k=12.75	Eq. 1.1.2-2
λ=4.1702	Eq. 1.1-3
ρ=0.22715	Eq. 1.1-2
be=2.7203 in	Eq. 1.1-1
h_o=12.198 in, b_o=1.5 in, h_o/b_o=8.1321	
b_1=0.79243 in	Eq. 1.1.2-6
b_2=1.106 in	Eq. 1.1.2-7
Compression width=8.3579 in	
Ineffective width=6.4594 in	
Center of gravity shift: y=-2.3723 in	
Sxe=0.54087 in³, Fy=50 ksi	
Mnl=27.043 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Negative Flexural Strength about X-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.389 in	
f_1=49.898 ksi, f_2=49.898 ksi	
ψ=1	Eq. 1.2.2-1

k=0.43	Eq. 1.2.2-3
λ=2.6484	Eq. 1.1-3
ρ=0.34622	Eq. 1.1-2
b=0.4809 in (ineffective width=0.9081 in)	Eq. 1.1-1
Element 3: No compressive stress (fully effective)	
Element 2: Stiffened, w=11.976 in	
f_1=49.345 ksi, f_2=-21.362 ksi	
ψ=0.43291	Eq. 1.1.2-1
k=12.75	Eq. 1.1.2-2
λ=4.1702	Eq. 1.1-3
ρ=0.22715	Eq. 1.1-2
be=2.7203 in	Eq. 1.1-1
h_o=12.198 in, b_o=1.5 in, h_o/b_o=8.1321	
b_1=0.79243 in	Eq. 1.1.2-6
b_2=1.106 in	Eq. 1.1.2-7
Compression width=8.3579 in	
Ineffective width=6.4594 in	
Center of gravity shift: y=2.3723 in	
Sxe=0.54086 in³, Fy=50 ksi	
Mnl=27.043 k-in	Eq. F3.1-1
Ωb=2, ϕb=0.8 (rational analysis)	

Positive Flexural Strength about Y-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.389 in	
f_1=50 ksi, f_2=-1.9624 ksi	
ψ=0.039248	Eq. 1.2.2-1
k=0.57835	Eq. 1.2.2-5
λ=2.2859	Eq. 1.1-3
ρ=0.40915	Eq. 1.2.2-4
b=0.56832 in (ineffective width=0.82068 in)	Eq. 1.1-1
Element 3: Unstiffened, w=1.389 in	
f_1=50 ksi, f_2=-1.9624 ksi	
ψ=0.039249	Eq. 1.2.2-1
k=0.57835	Eq. 1.2.2-5
λ=2.2859	Eq. 1.1-3
ρ=0.40915	Eq. 1.2.2-4
b=0.56832 in (ineffective width=0.82068 in)	Eq. 1.1-1
Element 2: No compressive stress (fully effective)	
Iteration is not required	
Center of gravity shift: x=-0.11339 in	
Sye=0.0099121 in³, Fy=50 ksi	
Mnl=0.4956 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.389 in	
f_1=13.647 ksi, f_2=-50 ksi	
ψ=3.6637	Eq. 1.2.2-1

ψ>1 (fully effective)	Eq. 1.1-1
Element 3: Unstiffened, w=1.389 in	
f_1=13.647 ksi, f_2=-50 ksi	
ψ=3.6637	Eq. 1.2.2-1
ψ>1 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=11.976 in	
f_1=17.941 ksi, f_2=17.941 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=4.4893	Eq. 1.1-3
ρ=0.21183	Eq. 1.1-2
be=2.5369 in	Eq. 1.1-1
b_1=1.2685 in	Eq. 1.1.2-9
b_2=1.2685 in	Eq. 1.1.2-10
Ineffective width=9.4392 in	
Center of gravity shift: x=0.24595 in	
Sye=0.04159 in^3, Fy=50 ksi	
Mnl=2.0795 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Track

Cw=1.8867 in^6, Wn=7.0874 in^2, Fy=50 ksi	
Bn=13.31 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	

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Full Section Properties

Area	0.67774 in²	Wt.	0.0023043 k/ft	Flat	15.027 in
Ix	11.532 in⁴	rx	4.125 in	Ixy	0.000 in⁴
Sx(t)	1.8908 in³	y(t)	6.099 in	α	0.000 deg
Sx(b)	1.8908 in³	y(b)	6.099 in		
Zx	2.4530 in³	Height	12.198 in		
Iy	0.083 in⁴	ry	0.349 in	x_o	-0.460 in
Sy(l)	0.4929 in³	x(l)	0.168 in	y_o	0.000 in
Sy(r)	0.0621 in³	x(r)	1.332 in	jx	12.726 in
Zy	0.1042 in³	Width	1.500 in	jy	0.000 in
I_1	11.532 in⁴	r_1	4.125 in	Cw	2.4307 in⁶
I_2	0.083 in⁴	r_2	0.349 in	J	0.0004595 in⁴
Ic	11.615 in⁴	rc	4.140 in		
I_o	11.759 in⁴	r_o	4.165 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	6.738 k	ϕMnxo	39.119 k-in	ϕMnyo	0.863 k-in
Ae	0.15854 in²	Ixe	6.9685 in⁴	Iye	0.0146 in⁴
ϕTn	30.793 k	Sxe(t)	0.8693 in³	Sye(l)	0.2072 in³
		Sxe(b)	1.6664 in³	Sye(r)	0.0192 in³
Shear					
ϕVny	2.147 k	Negative Bending		Negative Bending	
ϕVnx	3.370 k	ϕMnxo	39.119 k-in	ϕMnyo	2.536 k-in
		Ixe	6.9685 in⁴	Iye	0.0649 in⁴
Torsion		Sxe(t)	1.6664 in³	Sye(l)	0.1862 in³
ϕBn	15.495 k-in²	Sxe(b)	0.8693 in³	Sye(r)	0.0564 in³

Track element 2 h/t exceeds 200.

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²
    - Fyc=74.687 ksi — Eq. A3.3.2-2
  - Track corner 3
    - t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²

Fyc=74.687 ksi	Eq. A3.3.2-2
Fya=50.484 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Track corner 2	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Track corner 3	
t=0.0451 in, R=0.0712 in, Ac=0.0066415 in²	
Fyc=74.687 ksi	Eq. A3.3.2-2
Fya=52.375 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Fya=50 ksi	Eq. A3.3.2-1
Axial Tension Strength	
Ag=0.67774 in², Fy=50.484 ksi	
Tn=34.215 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.67774 in², Fu=65 ksi	
Tn=44.053 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Track element 1	
Vn=1.8721 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Track element 2	
h/t exceeds 200 (rational analysis)	
Vn=2.6836 k at 90 deg	Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)	
Track element 3	
Vn=1.8721 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Track	
Element 1: Unstiffened, w=1.3837 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.0261	Eq. 1.1-3
ρ=0.43996	Eq. 1.1-2
b=0.60878 in (ineffective width=0.77492 in)	Eq. 1.1-1
Element 3: Unstiffened, w=1.3837 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3

λ=2.0261	Eq. 1.1-3
ρ=0.43996	Eq. 1.1-2
b=0.60878 in (ineffective width=0.77492 in)	Eq. 1.1-1
Element 2: Stiffened, w=11.965 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=5.7446	Eq. 1.1-3
ρ=0.16741	Eq. 1.1-2
be=2.0031 in	Eq. 1.1-1
b_1=1.0016 in	Eq. 1.1.2-9
b_2=1.0016 in	Eq. 1.1.2-10
Ineffective width=9.9624 in	
Ae=0.15854 in², Fn=50 ksi	
Pn=7.9268 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Track	
Element 1: No compressive stress (fully effective)	
Element 3: Unstiffened, w=1.3837 in	
f_1=49.859 ksi, f_2=49.859 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=2.0233	Eq. 1.1-3
ρ=0.44051	Eq. 1.1-2
b=0.60953 in (ineffective width=0.77417 in)	Eq. 1.1-1
Element 2: Stiffened, w=11.965 in	
f_1=49.274 ksi, f_2=-25.379 ksi	
ψ=0.51506	Eq. 1.1.2-1
k=13.985	Eq. 1.1.2-2
λ=3.0498	Eq. 1.1-3
ρ=0.30423	Eq. 1.1-2
be=3.6403 in	Eq. 1.1-1
h_o=12.198 in, b_o=1.5 in, h_o/b_o=8.1321	
b_1=1.0356 in	Eq. 1.1.2-6
b_2=1.3671 in	Eq. 1.1.2-7
Compression width=7.8977 in	
Ineffective width=5.495 in	
Center of gravity shift: y=-1.9172 in	
Sxe=0.8693 in³, Fy=50 ksi	
Mnl=43.465 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.3837 in	
f_1=49.859 ksi, f_2=49.859 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3

λ=2.0233	Eq. 1.1-3
ρ=0.44051	Eq. 1.1-2
b=0.60953 in (ineffective width=0.77417 in)	Eq. 1.1-1
Element 3: No compressive stress (fully effective)	
Element 2: Stiffened, w=11.965 in	
f_1=49.274 ksi, f_2=-25.379 ksi	
ψ=0.51506	Eq. 1.1.2-1
k=13.985	Eq. 1.1.2-2
λ=3.0498	Eq. 1.1-3
ρ=0.30423	Eq. 1.1-2
be=3.6403 in	Eq. 1.1-1
h_o=12.198 in, b_o=1.5 in, h_o/b_o=8.1321	
b_1=1.0356 in	Eq. 1.1.2-6
b_2=1.3671 in	Eq. 1.1.2-7
Compression width=7.8977 in	
Ineffective width=5.495 in	
Center of gravity shift: y=1.9172 in	
Sxe=0.8693 in^3, Fy=50 ksi	
Mnl=43.465 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Positive Flexural Strength about Y-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.3837 in	
f_1=50 ksi, f_2=-1.9356 ksi	
ψ=0.038711	Eq. 1.2.2-1
k=0.57823	Eq. 1.2.2-5
λ=1.7472	Eq. 1.1-3
ρ=0.51674	Eq. 1.2.2-4
b=0.71501 in (ineffective width=0.66869 in)	Eq. 1.1-1
Element 3: Unstiffened, w=1.3837 in	
f_1=50 ksi, f_2=-1.9356 ksi	
ψ=0.038711	Eq. 1.2.2-1
k=0.57823	Eq. 1.2.2-5
λ=1.7472	Eq. 1.1-3
ρ=0.51674	Eq. 1.2.2-4
b=0.71501 in (ineffective width=0.66869 in)	Eq. 1.1-1
Element 2: No compressive stress (fully effective)	
Iteration is not required	
Center of gravity shift: x=-0.097473 in	
Sye=0.019169 in^3, Fy=50 ksi	
Mnl=0.95843 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.3837 in	
f_1=10.054 ksi, f_2=-50 ksi	
ψ=4.9731	Eq. 1.2.2-1
ψ>1 (fully effective)	Eq. 1.1-1

Element 3: Unstiffened, w=1.3837 in
f_1=10.054 ksi, f_2=-50 ksi
ψ=4.9731 Eq. 1.2.2-1
ψ>1 (fully effective) Eq. 1.1-1
Element 2: Stiffened, w=11.965 in
f_1=14.123 ksi, f_2=14.123 ksi
ψ=1 Eq. 1.1.2-1
k=4 Eq. 1.1.2-8
λ=3.0531 Eq. 1.1-3
ρ=0.30394 Eq. 1.1-2
be=3.6367 in Eq. 1.1-1
b_1=1.8184 in Eq. 1.1.2-9
b_2=1.8184 in Eq. 1.1.2-10
Ineffective width=8.3288 in
Center of gravity shift: x=0.18068 in
Sye=0.056355 in^3, Fy=50 ksi
Mnl=2.8177 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Bimoment Strength, Track
Cw=2.4307 in^6, Wn=7.0591 in^2, Fy=50 ksi
Bn=17.217 k-in^2 G8.1-1
Ωb=1.67, ϕb=0.9

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Full Section Properties

Area	0.84831 in²	Wt.	0.0028842 k/ft	Flat	14.988 in
Ix	14.378 in⁴	rx	4.117 in	Ixy	0.000 in⁴
Sx(t)	2.3575 in³	y(t)	6.099 in	α	0.000 deg
Sx(b)	2.3575 in³	y(b)	6.099 in		
Zx	3.0638 in³	Height	12.198 in		
Iy	0.103 in⁴	ry	0.348 in	x_o	-0.459 in
Sy(l)	0.5941 in³	x(l)	0.173 in	y_o	0.000 in
Sy(r)	0.0774 in³	x(r)	1.327 in	jx	12.759 in
Zy	0.1316 in³	Width	1.500 in	jy	0.000 in
I_1	14.378 in⁴	r_1	4.117 in	Cw	3.0061 in⁶
I_2	0.103 in⁴	r_2	0.348 in	J	0.0009059 in⁴
Ic	14.481 in⁴	rc	4.132 in		
I_o	14.660 in⁴	r_o	4.157 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	10.391 k	ϕMnxo	59.135 k-in	ϕMnyo	1.519 k-in
Ae	0.24450 in²	Ixe	9.9598 in⁴	Iye	0.0302 in⁴
ϕTn	38.634 k	Sxe(t)	1.3141 in³	Sye(l)	0.3196 in³
		Sxe(b)	2.1562 in³	Sye(r)	0.0338 in³
Shear					
ϕVny	3.567 k	Negative Bending		Negative Bending	
ϕVnx	4.152 k	ϕMnxo	59.135 k-in	ϕMnyo	3.268 k-in
		Ixe	9.9598 in⁴	Iye	0.0873 in⁴
Torsion		Sxe(t)	2.1562 in³	Sye(l)	0.2933 in³
ϕBn	19.264 k-in²	Sxe(b)	1.3141 in³	Sye(r)	0.0726 in³

Track element 2 h/t exceeds 200.

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0566 in, R=0.0849 in, Ac=0.010064 in²
    - Fyc=75.384 ksi — Eq. A3.3.2-2
  - Track corner 3
    - t=0.0566 in, R=0.0849 in, Ac=0.010064 in²

Fyc=75.384 ksi	Eq. A3.3.2-2
Fya=50.602 ksi	Eq. A3.3.2-1
Max compression stress allowed: Fya=50 ksi	
Bending about X-axis	
Track corner 2	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Track corner 3	
t=0.0566 in, R=0.0849 in, Ac=0.010064 in²	
Fyc=75.384 ksi	Eq. A3.3.2-2
Fya=52.938 ksi	Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi	
Max compression stress allowed for negative bending: Fya=50 ksi	
Bending about Y-axis	
Fya=50 ksi	Eq. A3.3.2-1
Axial Tension Strength	
Ag=0.84831 in², Fy=50.602 ksi	
Tn=42.926 k	Eq. D2-1
Ωt=1.67, ϕt=0.9	
An=0.84831 in², Fu=65 ksi	
Tn=55.14 k	Eq. D3-1
Ωt=2, ϕt=0.75	
Shear Strength	
Track element 1	
Vn=2.3067 k at 180 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Track element 2	
h/t exceeds 200 (rational analysis)	
Vn=4.4585 k at 90 deg	Eq. G2.1-2
Ωv=2, ϕv=0.8 (rational analysis)	
Track element 3	
Vn=2.3067 k at 0 deg	Eq. G2.1-1
Ωv=1.67, ϕv=0.9	
Axial Compression Strength	
Effective width calculations for Track	
Element 1: Unstiffened, w=1.3585 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.5851	Eq. 1.1-3
ρ=0.54333	Eq. 1.1-2
b=0.73811 in (ineffective width=0.62039 in)	Eq. 1.1-1
Element 3: Unstiffened, w=1.3585 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3

λ=1.5851	Eq. 1.1-3
ρ=0.54333	Eq. 1.1-2
b=0.73811 in (ineffective width=0.62039 in)	Eq. 1.1-1
Element 2: Stiffened, w=11.915 in	
f_1=50 ksi, f_2=50 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=4.5581	Eq. 1.1-3
ρ=0.2088	Eq. 1.1-2
be=2.4879 in	Eq. 1.1-1
b_1=1.2439 in	Eq. 1.1.2-9
b_2=1.2439 in	Eq. 1.1.2-10
Ineffective width=9.4272 in	
Ae=0.2445 in², Fn=50 ksi	
Pn=12.225 k	Eq. E3.1-1
Ωc=1.8, ϕc=0.85	

Positive Flexural Strength about X-axis

Effective width calculations for Track	
Element 1: No compressive stress (fully effective)	
Element 3: Unstiffened, w=1.3585 in	
f_1=49.813 ksi, f_2=49.813 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3
λ=1.5821	Eq. 1.1-3
ρ=0.54418	Eq. 1.1-2
b=0.73927 in (ineffective width=0.61923 in)	Eq. 1.1-1
Element 2: Stiffened, w=11.915 in	
f_1=49.066 ksi, f_2=-29.557 ksi	
ψ=0.60239	Eq. 1.1.2-1
k=15.434	Eq. 1.1.2-2
λ=2.2987	Eq. 1.1-3
ρ=0.39339	Eq. 1.1-2
be=4.6872 in	Eq. 1.1-1
h_o=12.198 in, b_o=1.5 in, h_o/b_o=8.1321	
b_1=1.3011 in	Eq. 1.1.2-6
b_2=1.624 in	Eq. 1.1.2-7
Compression width=7.4358 in	
Ineffective width=4.5107 in	
Center of gravity shift: y=-1.48 in	
Sxe=1.3141 in³, Fy=50 ksi	
Mnl=65.706 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about X-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.3585 in	
f_1=49.813 ksi, f_2=49.813 ksi	
ψ=1	Eq. 1.2.2-1
k=0.43	Eq. 1.2.2-3

λ=1.5821	Eq. 1.1-3
ρ=0.54418	Eq. 1.1-2
b=0.73927 in (ineffective width=0.61923 in)	Eq. 1.1-1
Element 3: No compressive stress (fully effective)	
Element 2: Stiffened, w=11.915 in	
f_1=49.066 ksi, f_2=-29.557 ksi	
ψ=0.60239	Eq. 1.1.2-1
k=15.434	Eq. 1.1.2-2
λ=2.2987	Eq. 1.1-3
ρ=0.39339	Eq. 1.1-2
be=4.6872 in	Eq. 1.1-1
h_o=12.198 in, b_o=1.5 in, h_o/b_o=8.1321	
b_1=1.3011 in	Eq. 1.1.2-6
b_2=1.624 in	Eq. 1.1.2-7
Compression width=7.4358 in	
Ineffective width=4.5107 in	
Center of gravity shift: y=1.48 in	
Sxe=1.3141 in^3, Fy=50 ksi	
Mnl=65.706 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Positive Flexural Strength about Y-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.3585 in	
f_1=50 ksi, f_2=-1.1829 ksi	
ψ=0.023658	Eq. 1.2.2-1
k=0.57501	Eq. 1.2.2-5
λ=1.3707	Eq. 1.1-3
ρ=0.62411	Eq. 1.2.2-4
b=0.84786 in (ineffective width=0.51064 in)	Eq. 1.1-1
Element 3: Unstiffened, w=1.3585 in	
f_1=50 ksi, f_2=-1.1829 ksi	
ψ=0.023659	Eq. 1.2.2-1
k=0.57501	Eq. 1.2.2-5
λ=1.3707	Eq. 1.1-3
ρ=0.62411	Eq. 1.2.2-4
b=0.84786 in (ineffective width=0.51064 in)	Eq. 1.1-1
Element 2: No compressive stress (fully effective)	
Iteration is not required	
Center of gravity shift: x=-0.078373 in	
Sye=0.033764 in^3, Fy=50 ksi	
Mnl=1.6882 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Negative Flexural Strength about Y-axis

Effective width calculations for Track	
Element 1: Unstiffened, w=1.3585 in	
f_1=6.4307 ksi, f_2=-50 ksi	
ψ=7.7752	Eq. 1.2.2-1
ψ>1 (fully effective)	Eq. 1.1-1

Element 3: Unstiffened, w=1.3585 in

f_1=6.4307 ksi, f_2=-50 ksi

ψ=7.7752 Eq. 1.2.2-1

ψ>1 (fully effective) Eq. 1.1-1

Element 2: Stiffened, w=11.915 in

f_1=11.133 ksi, f_2=11.133 ksi

ψ=1 Eq. 1.1.2-1

k=4 Eq. 1.1.2-8

λ=2.1508 Eq. 1.1-3

ρ=0.41738 Eq. 1.1-2

be=4.9731 in Eq. 1.1-1

b_1=2.4866 in Eq. 1.1.2-9

b_2=2.4866 in Eq. 1.1.2-10

Ineffective width=6.942 in

Center of gravity shift: x=0.12476 in

Sye=0.072623 in^3, Fy=50 ksi

Mnl=3.6311 k-in Eq. F3.1-1

Ωb=1.67, ϕb=0.9

Bimoment Strength, Track

Cw=3.0061 in^6, Wn=7.022 in^2, Fy=50 ksi

Bn=21.405 k-in^2 G8.1-1

Ωb=1.67, ϕb=0.9

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Full Section Properties

Area	1.0647 in²	Wt.	0.0036201 k/ft	Flat	14.933 in
Ix	17.951 in⁴	rx	4.106 in	Ixy	0.000 in⁴
Sx(t)	2.9432 in³	y(t)	6.099 in	α	0.000 deg
Sx(b)	2.9432 in³	y(b)	6.099 in		
Zx	3.8344 in³	Height	12.198 in		
Iy	0.128 in⁴	ry	0.346 in	x_o	-0.457 in
Sy(l)	0.7115 in³	x(l)	0.179 in	y_o	0.000 in
Sy(r)	0.0966 in³	x(r)	1.321 in	jx	12.804 in
Zy	0.1672 in³	Width	1.500 in	jy	0.000 in
I_1	17.951 in⁴	r_1	4.106 in	Cw	3.7136 in⁶
I_2	0.128 in⁴	r_2	0.346 in	J	0.0018043 in⁴
Ic	18.078 in⁴	rc	4.121 in		
I_o	18.300 in⁴	r_o	4.146 in		

Fully Braced Strength - AISI S100-16/S3-22, US, LRFD

Material Type: A1003 ST Grade 50H, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	16.093 k	ϕMnxo	89.050 k-in	ϕMnyo	2.625 k-in
Ae	0.37865 in²	Ixe	14.111 in⁴	Iye	0.061 in⁴
ϕTn	48.643 k	Sxe(t)	1.9789 in³	Sye(l)	0.4845 in³
		Sxe(b)	2.7846 in³	Sye(r)	0.0583 in³
Shear					
ϕVny	6.684 k	Negative Bending		Negative Bending	
ϕVnx	5.089 k	ϕMnxo	89.050 k-in	ϕMnyo	4.191 k-in
		Ixe	14.111 in⁴	Iye	0.116 in⁴
Torsion		Sxe(t)	2.7846 in³	Sye(l)	0.4560 in³
ϕBn	23.967 k-in²	Sxe(b)	1.9789 in³	Sye(r)	0.0931 in³

Calculation Details - AISI S100-16/S3-22, US, LRFD

Cold-work of forming stresses
- Fy=50 ksi, Fu=65 ksi
- Bc=1.6229 — Eq. A3.3.2-3
- m=0.1816 — Eq. A3.3.2-4
- Axial Load
  - Track corner 2
    - t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
    - Fyc=75.391 ksi — Eq. A3.3.2-2
  - Track corner 3
    - t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
    - Fyc=75.391 ksi — Eq. A3.3.2-2
  - Fya=50.761 ksi — Eq. A3.3.2-1

Max compression stress allowed: Fya=50 ksi
Bending about X-axis
Track corner 2
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Track corner 3
t=0.0713 in, R=0.1069 in, Ac=0.015965 in²
Fyc=75.391 ksi Eq. A3.3.2-2
Fya=53.678 ksi Eq. A3.3.2-1
Max compression stress allowed for positive bending: Fya=50 ksi
Max compression stress allowed for negative bending: Fya=50 ksi
Bending about Y-axis
Fya=50 ksi Eq. A3.3.2-1

Axial Tension Strength
Ag=1.0647 in², Fy=50.761 ksi
Tn=54.047 k Eq. D2-1
Ωt=1.67, ϕt=0.9

An=1.0647 in², Fu=65 ksi
Tn=69.208 k Eq. D3-1
Ωt=2, ϕt=0.75

Shear Strength
Track element 1
Vn=2.8273 k at 180 deg Eq. G2.1-1
Ωv=1.67, ϕv=0.9
Track element 2
Vn=7.4262 k at 90 deg Eq. G2.1-2
Ωv=1.67, ϕv=0.9
Track element 3
Vn=2.8273 k at 0 deg Eq. G2.1-1
Ωv=1.67, ϕv=0.9

Axial Compression Strength
Effective width calculations for Track
Element 1: Unstiffened, w=1.3218 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.2243 Eq. 1.1-3
ρ=0.67003 Eq. 1.1-2
b=0.88565 in (ineffective width=0.43615 in) Eq. 1.1-1
Element 3: Unstiffened, w=1.3218 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.2243 Eq. 1.1-3
ρ=0.67003 Eq. 1.1-2
b=0.88565 in (ineffective width=0.43615 in) Eq. 1.1-1

Element 2: Stiffened, w=11.842 in
f_1=50 ksi, f_2=50 ksi
ψ=1 Eq. 1.1.2-1
k=4 Eq. 1.1.2-8
λ=3.5961 Eq. 1.1-3
ρ=0.26107 Eq. 1.1-2
be=3.0915 in Eq. 1.1-1
b_1=1.5457 in Eq. 1.1.2-9
b_2=1.5457 in Eq. 1.1.2-10
Ineffective width=8.7502 in
Ae=0.37865 in², Fn=50 ksi
Pn=18.932 k Eq. E3.1-1
Ωc=1.8, ϕc=0.85

Positive Flexural Strength about X-axis
Effective width calculations for Track
Element 1: No compressive stress (fully effective)
Element 3: Unstiffened, w=1.3218 in
f_1=49.75 ksi, f_2=49.75 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.2212 Eq. 1.1-3
ρ=0.67134 Eq. 1.1-2
b=0.88738 in (ineffective width=0.43442 in) Eq. 1.1-1
Element 2: Stiffened, w=11.842 in
f_1=48.75 ksi, f_2=-34.297 ksi
ψ=0.70352 Eq. 1.1.2-1
k=17.294 Eq. 1.1.2-2
λ=1.7077 Eq. 1.1-3
ρ=0.51014 Eq. 1.1-2
be=6.041 in Eq. 1.1-1
h_o=12.198 in, b_o=1.5 in, h_o/b_o=8.1321
b_1=1.6311 in Eq. 1.1.2-6
b_2=1.915 in Eq. 1.1.2-7
Compression width=6.9513 in
Ineffective width=3.4051 in
Center of gravity shift: y=-1.0316 in
Sxe=1.9789 in³, Fy=50 ksi
Mnl=98.945 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about X-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3218 in
f_1=49.75 ksi, f_2=49.75 ksi
ψ=1 Eq. 1.2.2-1
k=0.43 Eq. 1.2.2-3
λ=1.2212 Eq. 1.1-3
ρ=0.67134 Eq. 1.1-2
b=0.88738 in (ineffective width=0.43442 in) Eq. 1.1-1

Element 3: No compressive stress (fully effective)
Element 2: Stiffened, w=11.842 in
f_1=48.75 ksi, f_2=-34.297 ksi
ψ=0.70352 Eq. 1.1.2-1
k=17.294 Eq. 1.1.2-2
λ=1.7077 Eq. 1.1-3
ρ=0.51014 Eq. 1.1-2
be=6.041 in Eq. 1.1-1
h_o=12.198 in, b_o=1.5 in, h_o/b_o=8.1321
b_1=1.6311 in Eq. 1.1.2-6
b_2=1.915 in Eq. 1.1.2-7
Compression width=6.9513 in
Ineffective width=3.4051 in
Center of gravity shift: y=1.0316 in
Sxe=1.9789 in^3, Fy=50 ksi
Mnl=98.945 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Positive Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3218 in
f_1=50 ksi, f_2=-0.044696 ksi
ψ=0.00089392 Eq. 1.2.2-1
k=0.57019 Eq. 1.2.2-5
λ=1.0632 Eq. 1.1-3
ρ=0.74644 Eq. 1.2.2-4
b=0.98665 in (ineffective width=0.33515 in) Eq. 1.1-1
Element 3: Unstiffened, w=1.3218 in
f_1=50 ksi, f_2=-0.044714 ksi
ψ=0.00089428 Eq. 1.2.2-1
k=0.57019 Eq. 1.2.2-5
λ=1.0632 Eq. 1.1-3
ρ=0.74644 Eq. 1.2.2-4
b=0.98665 in (ineffective width=0.33515 in) Eq. 1.1-1
Element 2: No compressive stress (fully effective)
Iteration is not required
Center of gravity shift: x=-0.054189 in
Sye=0.058343 in^3, Fy=50 ksi
Mnl=2.9171 k-in Eq. F3.1-1
Ωb=1.67, ϕb=0.9

Negative Flexural Strength about Y-axis
Effective width calculations for Track
Element 1: Unstiffened, w=1.3218 in
f_1=3.0265 ksi, f_2=-50 ksi
ψ=16.521 Eq. 1.2.2-1
ψ>1 (fully effective) Eq. 1.1-1
Element 3: Unstiffened, w=1.3218 in
f_1=3.0266 ksi, f_2=-50 ksi
ψ=16.52 Eq. 1.2.2-1

ψ>1 (fully effective)	Eq. 1.1-1
Element 2: Stiffened, w=11.842 in	
f_1=8.7452 ksi, f_2=8.7452 ksi	
ψ=1	Eq. 1.1.2-1
k=4	Eq. 1.1.2-8
λ=1.5039	Eq. 1.1-3
ρ=0.56765	Eq. 1.1-2
be=6.722 in	Eq. 1.1-1
b_1=3.361 in	Eq. 1.1.2-9
b_2=3.361 in	Eq. 1.1.2-10
Ineffective width=5.1197 in	
Center of gravity shift: x=0.074985 in	
Sye=0.093126 in^3, Fy=50 ksi	
Mnl=4.6563 k-in	Eq. F3.1-1
Ωb=1.67, ϕb=0.9	

Bimoment Strength, Track

Cw=3.7136 in^6, Wn=6.9727 in^2, Fy=50 ksi	
Bn=26.63 k-in^2	G8.1-1
Ωb=1.67, ϕb=0.9	