R & P Supply

SLOTTED COMPENSATION TRACK (SCT) DESIGN

Structural Calculations

Job No. B13-102

JUNE 7, 2013

Prepared for:

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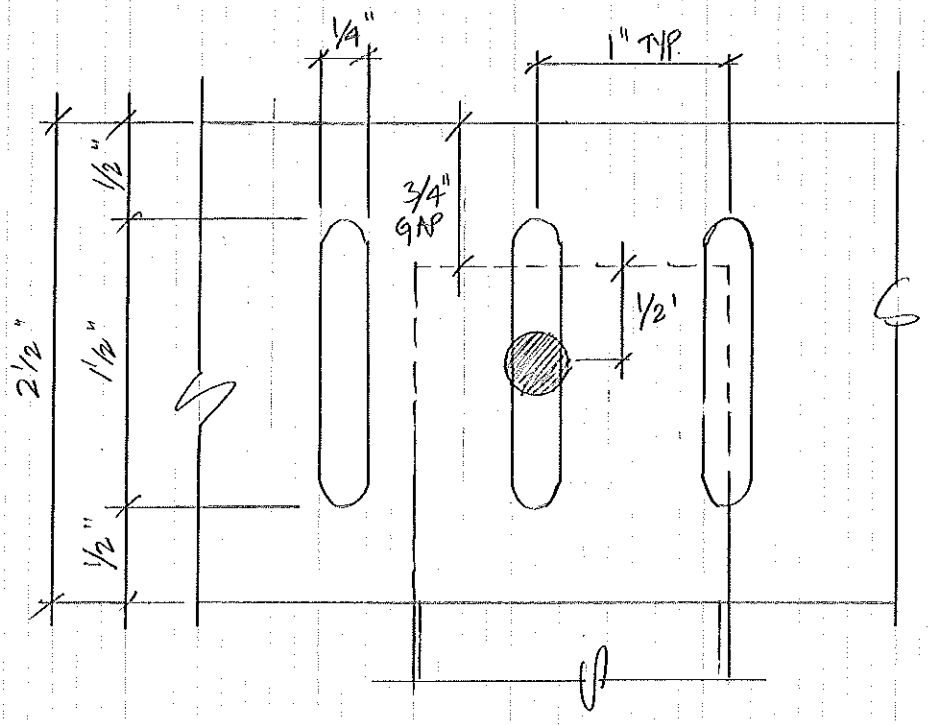
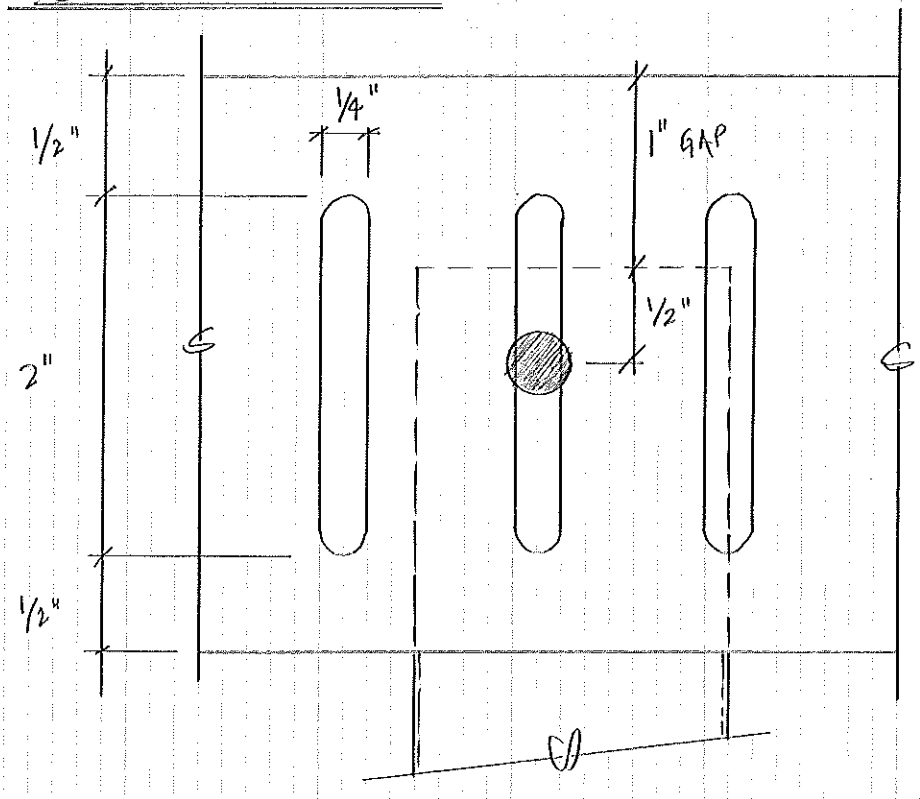
PROJECT SLOTTED TRACK
DATE 8/29/11
DESIGNER EMB
PAGE

2 1/2" VEG SLOTTED TRACK



3" VEG SLOTTED TRACK



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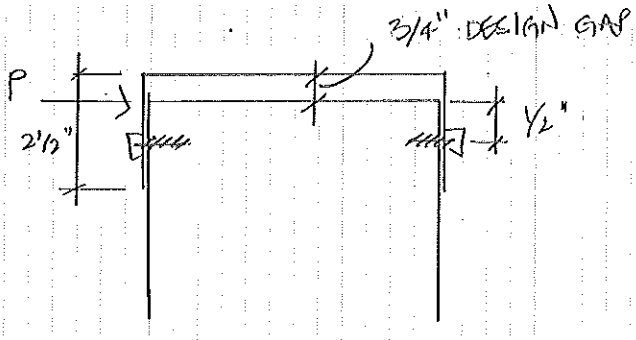
SLOTTED TRACK DESIGN



TO DETERMINE ALLOWABLE POINT LOAD THERE ARE 2 PARTS: (1) TRACK BEARING ON TRACK LEG & (2) SCREW FROM STUD PULLING IN TENSION ON TRACK LEG.

ALLOWABLE POINT LOADS IN SLOTTED TRACK

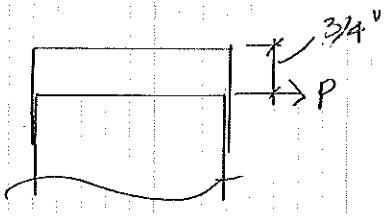
$$P_{ndt} = \frac{W_{dt} t^2 F_y}{4e}$$

[EQ. B2.3-1, 2007 AISI STANDARD WALL STUD DESIGN STANDARD]

$$W_{dt} = 0.11 \alpha^2 \left(\frac{e^{0.5}}{t^{1.5}}\right) + 5.5\alpha \leq S$$

$\alpha = 1.0$
e = DESIGN GAP
t = TRACK THICKNESS
W_{dt} = EFFECTIVE BENDING WIDTH
F_y = TRACK YIELD STRESS
P_{ndt} = NOMINAL POINT LOAD
$\Omega = 2.8$
S = STUD SPACING

PART 1: STUD BEARING



USE 33 mil FOR THIS CALCULATION EXAMPLE @ 16" o/c
STUDS SPACED

$e = 0.75"$
$t = 0.0346"$

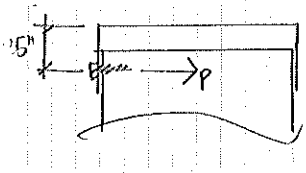
$$W_{dt} = 0.11(1.0)^2 \left(\frac{(0.75)^{0.5}}{(0.0346")^{1.5}}\right) + 5.5(1.0) \leq S$$

$= 20.3" \Rightarrow$ USE 16"

$$\therefore P_{ndt} = \frac{16"(0.0346")^2(33000\ psi)}{4(0.75")} = 210.7\#$$

$P_{ndt}/\Omega = 75.3\#$

PART 2: SCREW PULL OUT



$e = 2"$

$$W_{dt} = 0.11(1.0)^2 \left(\frac{(1.25)^{0.5}}{(0.0346")^{1.5}}\right) + 5.5(1.0) = 24.6" \Rightarrow \text{USE } 16"$$

$$\therefore P_{ndt} = \frac{16"(0.0346")^2(33000\ psi)}{4(1.25")} = 126.1\#$$

$P_{ndt}/\Omega = 45.2\#$

P_{ndt}/Ω, total $= 120\#$

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Slotted Track Allowable Point Loads - At Design Gap (3/4")

Case: 2 1/2" Slotted Track with 1 1/2" Slots Centered in Each Flange - *33* mil

Part 1: Stud Bearing on Track Flange

Coefficient	α	1
Design Gap [in.]	e	0.75
Track Thickness [in.]	t	0.0346
Yield Stress [psi]	F_y	33000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	16
Nominal Point Load [lbs]	P_{ndt}	210.7
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**75.3**

Allowable Point Load in Track

$P_{a\,TOTAL}$ [lbs]	**120**

Part 2: Screw in Tension on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.25
Track Thickness [in.]	t	0.0346
Yield Stress [psi]	F_y	33000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	16
Nominal Point Load [lbs]	P_{ndt}	126.4
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**45.2**

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Slotted Track Allowable Point Loads - At Design Gap (3/4")

Case: 2 1/2" Slotted Track with 1 1/2" Slots Centered in Each Flange - *43* mil

Part 1: Stud Bearing on Track Flange

Coefficient	α	1
Design Gap [in.]	e	0.75
Track Thickness [in.]	t	0.0451
Yield Stress [psi]	F_y	33000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	15.446
Nominal Point Load [lbs]	P_{ndt}	345.6
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**123.4**

Allowable Point Load in Track

$P_{a\ TOTAL}$ [lbs]	**188**

Part 2: Screw in Tension on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.25
Track Thickness [in.]	t	0.0451
Yield Stress [psi]	F_y	33000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	16
Nominal Point Load [lbs]	P_{ndt}	214.8
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**65.0**

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Slotted Track Allowable Point Loads - At Design Gap (3/4")

Case: 2 1/2" Slotted Track with 1 1/2" Slots Centered in Each Flange - *54* mil

Part 1: Stud Bearing on Track Flange

Coefficient	α	1
Design Gap [in.]	e	0.75
Track Thickness [in.]	t	0.0566
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	12.575
Nominal Point Load [lbs]	P_{ndt}	671.4
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**239.8**

Part 2: Screw in Tension on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.25
Track Thickness [in.]	t	0.0566
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	14.633
Nominal Point Load [lbs]	P_{ndt}	468.8
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**109.0**

Allowable Point Load in Track

$P_{a\,TOTAL}$ [lbs]	**349**

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Slotted Track Allowable Point Loads - At Design Gap (3/4")

Case: 2 1/2" Slotted Track with 1 1/2" Slots Centered in Each Flange - *68* mil

Part 1: Stud Bearing on Track Flange

Coefficient	α	1
Design Gap [in.]	e	0.75
Track Thickness [in.]	t	0.0713
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	10.504
Nominal Point Load [lbs]	P_{ndt}	890.0
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**317.8**

Part 2: Screw in Tension on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.25
Track Thickness [in.]	t	0.0713
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	11.96
Nominal Point Load [lbs]	P_{ndt}	608.0
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**198.0**

Allowable Point Load in Track

$P_{a\,TOTAL}$ [lbs]	**516**

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Slotted Track Allowable Point Loads - At Design Gap (3/4")

Case: 2 1/2" Slotted Track with 1 1/2" Slots Centered in Each Flange - *97* mil

Part 1: Stud Bearing on Track Flange

Coefficient	α	1
Design Gap [in.]	e	0.75
Track Thickness [in.]	t	0.1017
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	8.4373
Nominal Point Load [lbs]	P_{ndt}	1454.4
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**519.4**

Part 2: Screw in Tension on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.25
Track Thickness [in.]	t	0.1017
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	9.292
Nominal Point Load [lbs]	P_{ndt}	961.1
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**198.0**

Allowable Point Load in Track

$P_{a\ TOTAL}$ [lbs]	**717**

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Slotted Track Allowable Point Loads - At Design Gap (3/4")

Case: 2 1/2" Slotted Track with 1 1/2" Slots Centered in Each Flange - *118* mil

Part 1: Stud Bearing on Track Flange

Coefficient	α	1
Design Gap [in.]	e	0.75
Track Thickness [in.]	t	0.1242
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	7.6764
Nominal Point Load [lbs]	P_{ndt}	1973.6
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**704.8**

Part 2: Screw in Tension on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.25
Track Thickness [in.]	t	0.1242
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	8.3097
Nominal Point Load [lbs]	P_{ndt}	1281.8
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**198.0**

Allowable Point Load in Track

$P_{a\ TOTAL}$ [lbs]	**903**

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Slotted Track Allowable Point Loads - At Design Gap (3/4")

Assumptions
1.) Studs spaced at 16" o/c

2.) 20 gauge stud and heavier assumed for 20 and 18 gauge slotted track. 18 gauge stud and heavier assumed for 16 gauge slotted track. 16 gauge stud and heavier assumed for 14 gauge and heavier slotted track. A thinner gauge of stud can be used with the slotted track other than assumed above, but the allowable point load must be reduced to the corresponding stud gauge (i.e. 18 gauge stud used with 14 gauge slotted track results in an allowable point load of 188 pounds (determined in the final summary of results)).

3.) #8 SMS assumed for 20 and 18 gauge slotted track. #10 SMS assumed for 16 gauge and heavier slotted track. If #8 SMS are to be substituted for #10 SMS, apply a 6% reduction to the allowable point load (i.e. #8 SMS used at 16 gauge slotted track - 6% of 349 pounds is 21 pounds, therefore the allowable load is 328 pounds).

By Calculation

Track Thickness	Allowable Point Loads [lbs]
33 mil	120
43 mil	188
54 mil	349
68 mil	516
97 mil	717
118 mil	903

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Slotted Track Allowable Point Loads - At 1.5 Times Design Gap (1 1/8")

Case: 2 1/2" Slotted Track with 1 1/2" Slots Centered in Each Flange - *33* mil

Part 1: Stud Bearing on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.125
Track Thickness [in.]	t	0.0346
Yield Stress [psi]	F_y	33000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	16
Nominal Point Load [lbs]	P_{ndt}	140.5
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**50.2**

Allowable Point Load in Track

$P_{a\ TOTAL}$ [lbs]	**85**

Part 2: Screw in Tension on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.625
Track Thickness [in.]	t	0.0346
Yield Stress [psi]	F_y	33000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	16
Nominal Point Load [lbs]	P_{ndt}	97.2
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**34.7**

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Slotted Track Allowable Point Loads - At 1.5 Times Design Gap (1 1/8")

Case: 2 1/2" Slotted Track with 1 1/2" Slots Centered in Each Flange - *43* mil

Part 1: Stud Bearing on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.125
Track Thickness [in.]	t	0.0451
Yield Stress [psi]	F_y	33000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	16
Nominal Point Load [lbs]	P_{ndt}	238.7
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**85.2**

Allowable Point Load in Track

$P_{a\,TOTAL}$ [lbs]	**144**

Part 2: Screw in Tension on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.625
Track Thickness [in.]	t	0.0451
Yield Stress [psi]	F_y	33000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	16
Nominal Point Load [lbs]	P_{ndt}	165.2
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**59.0**

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Slotted Track Allowable Point Loads - At 1.5 Times Design Gap (1 1/8")

Case: 2 1/2" Slotted Track with 1 1/2" Slots Centered in Each Flange - *54* mil

Part 1: Stud Bearing on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.125
Track Thickness [in.]	t	0.0566
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	14.165
Nominal Point Load [lbs]	P_{ndt}	504.2
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**180.1**

Part 2: Screw in Tension on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.625
Track Thickness [in.]	t	0.0566
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	15.913
Nominal Point Load [lbs]	P_{ndt}	392.2
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**109.0**

Allowable Point Load in Track

$P_{a\,TOTAL}$ [lbs]	**289**

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Slotted Track Allowable Point Loads - At 1.5 Times Design Gap (1 1/8")

Case: 2 1/2" Slotted Track with 1 1/2" Slots Centered in Each Flange - *68* mil

Part 1: Stud Bearing on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.125
Track Thickness [in.]	t	0.0713
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	11.628
Nominal Point Load [lbs]	P_{ndt}	656.8
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**234.6**

Part 2: Screw in Tension on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.625
Track Thickness [in.]	t	0.0713
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	12.865
Nominal Point Load [lbs]	P_{ndt}	503.1
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**179.7**

Allowable Point Load in Track

$P_{a\,TOTAL}$ [lbs]	**414**

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Slotted Track Allowable Point Loads - At 1.5 Times Design Gap (1 1/8")

Case: 2 1/2" Slotted Track with 1 1/2" Slots Centered in Each Flange - 97 mil

Part 1: Stud Bearing on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.125
Track Thickness [in.]	t	0.1017
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	9.0974
Nominal Point Load [lbs]	P_{ndt}	1045.5
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**373.4**

Part 2: Screw in Tension on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.625
Track Thickness [in.]	t	0.1017
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	9.8235
Nominal Point Load [lbs]	P_{ndt}	781.6
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**198.0**

Allowable Point Load in Track

$P_{a\,TOTAL}$ [lbs]	**571**

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Slotted Track Allowable Point Loads - At 1.5 Times Design Gap (1 1/8")

Case: 2 1/2" Slotted Track with 1 1/2" Slots Centered in Each Flange - *118* mil

Part 1: Stud Bearing on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.125
Track Thickness [in.]	t	0.1242
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	8.1655
Nominal Point Load [lbs]	P_{ndt}	1399.5
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**499.8**

Part 2: Screw in Tension on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.625
Track Thickness [in.]	t	0.1242
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	8.7036
Nominal Point Load [lbs]	P_{ndt}	1032.8
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**198.0**

Allowable Point Load in Track

$P_{a\ TOTAL}$ [lbs]	**698**

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Slotted Track Allowable Point Loads - At 1.5 Times the Design Gap (1 1/8")

Assumptions
1.) Studs spaced at 16" o/c

2.) 20 gauge stud and heavier assumed for 20 and 18 gauge slotted track. 18 gauge stud and heavier assumed for 16 gauge slotted track. 16 gauge stud and heavier assumed for 14 gauge and heavier slotted track. A thinner gauge of stud can be used with the slotted track other than assumed above, but the allowable point load must be reduced to the corresponding stud gauge (i.e. 18 gauge stud used with 14 gauge slotted track results in an allowable point load of 188 pounds (determined in the final summary of results)).

3.) #8 SMS assumed for 20 and 18 gauge slotted track. #10 SMS assumed for 16 gauge and heavier slotted track. If #8 SMS are to be substituted for #10 SMS, apply a 6% reduction to the allowable point load (i.e. #8 SMS used at 16 gauge slotted track - 6% of 289 pounds is 17 pounds, therefore the allowable load is 272 pounds).

By Calculation

Track Thickness	Allowable Point Loads [lbs]
33 mil	85
43 mil	144
54 mil	289
68 mil	414
97 mil	571
118 mil	698

*NOTE: See Final Summary of Results for Allowable Point Loads. These loads have not been divided by 0.75 as explained on the summary page.

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SUMMARY OF RESULTS - 2 1/2" TRACK FLANGE

- ALLOWABLE POINT LOADS @ 1.5 TIMES THE DESIGN GAP (1 1/8") ARE LESS THAN THAT OF THE ALLOWABLE LOADS AT THE DESIGN GAP (3/4"). PER LOAD COMBINATION EQN 16-13 OF THE 2009 IBC WHEN WIND AND LIVE LOAD ARE TO BE COMBINED, 75% OF EACH LOAD IS TO BE USED. ∴ FOR THE FINAL ALLOWABLE LOAD DETERMINATION, COMPARE THE POINT LOADS DETERMINED AT THE DESIGN GAP TO THE ONES AT 1 1/2 TIMES THE DESIGN GAP DIVIDED BY 0.75. DIVIDING BY 0.75 WILL MAKE BOTH CASES HAVE EQUIVALENT WIND LOADING. CHOOSE THE LOWER NUMBER.

@ 3/4" GAP

TRACK THICKNESS	LOAD	
33 mil	120#	
43 mil	188#	●
54 mil	349#	●
68 mil	516#	●
97 mil	717#	●
118 mil	903#	●

@ 1 1/8" GAP DIVIDED BY 0.75

TRACK THICKNESS	LOAD/0.75	
33 mil	85/0.75 = 113#	●
43 mil	144/0.75 = 192#	
54 mil	289/0.75 = 385#	
68 mil	414/0.75 = 552#	
97 mil	571/0.75 = 762#	
118 mil	698/0.75 = 930#	

● = GOVERNS

FINAL ALLOWABLE LOADS

TRACK THICKNESS	ALLOWABLE POINT LOAD
33 mil	113#
43 mil	188#
54 mil	349#
68 mil	516#
97 mil	717#
118 mil	903#

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Slotted Track Allowable Point Loads - At Design Gap (1")

Case: 3" Slotted Track with 2" Slots Centered in Each Flange - *33* mil

Part 1: Stud Bearing on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1
Track Thickness [in.]	t	0.0346
Yield Stress [psi]	F_y	33000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	16
Nominal Point Load [lbs]	P_{ndt}	158.0
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**56.4**

Allowable Point Load in Track

$P_{a\,TOTAL}$ [lbs]	**94**

Part 2: Screw in Tension on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.5
Track Thickness [in.]	t	0.0346
Yield Stress [psi]	F_y	33000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	16
Nominal Point Load [lbs]	P_{ndt}	105.4
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**37.6**

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Slotted Track Allowable Point Loads - At Design Gap (1")

Case: 3" Slotted Track with 2" Slots Centered in Each Flange - 43 mil

Part 1: Stud Bearing on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1
Track Thickness [in.]	t	0.0451
Yield Stress [psi]	F_y	33000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	16
Nominal Point Load [lbs]	P_{ndt}	268.5
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**95.9**

Allowable Point Load in Track

$P_{a\,TOTAL}$ [lbs]	**160**

Part 2: Screw in Tension on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.5
Track Thickness [in.]	t	0.0451
Yield Stress [psi]	F_y	33000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	16
Nominal Point Load [lbs]	P_{ndt}	179.0
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**63.9**

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Slotted Track Allowable Point Loads - At Design Gap (1")

Case: 3" Slotted Track with 2" Slots Centered in Each Flange - *54* mil

Part 1: Stud Bearing on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1
Track Thickness [in.]	t	0.0566
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	13.669
Nominal Point Load [lbs]	P_{ndt}	547.4
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**195.5**

Part 2: Screw in Tension on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.5
Track Thickness [in.]	t	0.0566
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	15.505
Nominal Point Load [lbs]	P_{ndt}	413.9
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**109.0**

Allowable Point Load in Track

$P_{a\,TOTAL}$ [lbs]	**304**

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Slotted Track Allowable Point Loads - At Design Gap (1")

Case: 3" Slotted Track with 2" Slots Centered in Each Flange - *68* mil

Part 1: Stud Bearing on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1
Track Thickness [in.]	t	0.0713
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	11.278
Nominal Point Load [lbs]	P_{ndt}	716.7
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**255.9**

Allowable Point Load in Track

$P_{a\ TOTAL}$ [lbs]	**446**

Part 2: Screw in Tension on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.5
Track Thickness [in.]	t	0.0713
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	12.576
Nominal Point Load [lbs]	P_{ndt}	532.8
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**190.3**

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Slotted Track Allowable Point Loads - At Design Gap (1")

Case: 3" Slotted Track with 2" Slots Centered in Each Flange - 97 mil

Part 1: Stud Bearing on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1
Track Thickness [in.]	t	0.1017
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	8.8917
Nominal Point Load [lbs]	P_{ndt}	1149.6
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**410.6**

Part 2: Screw in Tension on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.5
Track Thickness [in.]	t	0.1017
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	9.6539
Nominal Point Load [lbs]	P_{ndt}	832.1
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**198.0**

Allowable Point Load in Track

$P_{a\ TOTAL}$ [lbs]	**609**

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Slotted Track Allowable Point Loads - At Design Gap (1")

Case: 3" Slotted Track with 2" Slots Centered in Each Flange - *118* mil

Part 1: Stud Bearing on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1
Track Thickness [in.]	t	0.1242
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	8.0131
Nominal Point Load [lbs]	P_{ndt}	1545.1
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**551.8**

Part 2: Screw in Tension on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.5
Track Thickness [in.]	t	0.1242
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	8.5779
Nominal Point Load [lbs]	P_{ndt}	1102.7
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**198.0**

Allowable Point Load in Track

$P_{a\,TOTAL}$ [lbs]	**750**

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Slotted Track Allowable Point Loads - At Design Gap (1")

Assumptions
1.) Studs spaced at 16" o/c

2.) 20 gauge stud and heavier assumed for 20 and 18 gauge slotted track. 18 gauge stud and heavier assumed for 16 gauge slotted track. 16 gauge stud and heavier assumed for 14 gauge and heavier slotted track. A thinner gauge of stud can be used with the slotted track other than assumed above, but the allowable point load must be reduced to the corresponding stud gauge (i.e. 18 gauge stud used with 14 gauge slotted track results in an allowable point load of 149 pounds (determined in the final summary of results)).

3.) #8 SMS assumed for 20 and 18 gauge slotted track. #10 SMS assumed for 16 gauge and heavier slotted track. If #8 SMS are to be substituted for #10 SMS, apply a 6% reduction to the allowable point load (i.e. #8 SMS used at 16 gauge slotted track - 6% of 304 pounds is 18 pounds, therefore the allowable load is 286 pounds).

By Calculation

Track Thickness	Allowable Point Loads [lbs]
33 mil	94
43 mil	160
54 mil	304
68 mil	446
97 mil	609
118 mil	750

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Slotted Track Allowable Point Loads - At 1.5 Times the Design Gap

Case: 3" Slotted Track with 2" Slots Centered in Each Flange - *33* mil

Part 1: Stud Bearing on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.5
Track Thickness [in.]	t	0.0346
Yield Stress [psi]	F_y	33000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	16
Nominal Point Load [lbs]	P_{ndt}	105.4
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**37.6**

Allowable Point Load in Track

$P_{a\ TOTAL}$ [lbs]	**66**

Part 2: Screw in Tension on Track Flange

Coefficient	α	1
Design Gap [in.]	e	2
Track Thickness [in.]	t	0.0346
Yield Stress [psi]	F_y	33000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	16
Nominal Point Load [lbs]	P_{ndt}	79.0
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**28.2**

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Slotted Track Allowable Point Loads - At 1.5 Times the Design Gap

Case: 3" Slotted Track with 2" Slots Centered in Each Flange - 43 mil

Part 1: Stud Bearing on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.5
Track Thickness [in.]	t	0.0451
Yield Stress [psi]	F_y	33000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	16
Nominal Point Load [lbs]	P_{ndt}	179.0
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**63.9**

Part 2: Screw in Tension on Track Flange

Coefficient	α	1
Design Gap [in.]	e	2
Track Thickness [in.]	t	0.0451
Yield Stress [psi]	F_y	33000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	16
Nominal Point Load [lbs]	P_{ndt}	134.2
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**47.9**

Allowable Point Load in Track

$P_{a\ TOTAL}$ [lbs]	**112**

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Slotted Track Allowable Point Loads - At 1.5 Times the Design Gap

Case: 3" Slotted Track with 2" Slots Centered in Each Flange - *54* mil

Part 1: Stud Bearing on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.5
Track Thickness [in.]	t	0.0566
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	15.505
Nominal Point Load [lbs]	P_{ndt}	413.9
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**147.8**

Part 2: Screw in Tension on Track Flange

Coefficient	α	1
Design Gap [in.]	e	2
Track Thickness [in.]	t	0.0566
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	16
Nominal Point Load [lbs]	P_{ndt}	320.4
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**109.0**

Allowable Point Load in Track

$P_{a\,TOTAL}$ [lbs]	**257**

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Slotted Track Allowable Point Loads - At 1.5 Times the Design Gap

Case: 3" Slotted Track with 2" Slots Centered in Each Flange - *68* mil

Part 1: Stud Bearing on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.5
Track Thickness [in.]	t	0.0713
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	12.576
Nominal Point Load [lbs]	P_{ndt}	532.8
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**190.3**

Part 2: Screw in Tension on Track Flange

Coefficient	α	1
Design Gap [in.]	e	2
Track Thickness [in.]	t	0.0713
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	13.671
Nominal Point Load [lbs]	P_{ndt}	434.4
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**155.1**

Allowable Point Load in Track

$P_{a\ TOTAL}$ [lbs]	**345**

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Slotted Track Allowable Point Loads - At 1.5 Times the Design Gap

Case: 3" Slotted Track with 2" Slots Centered in Each Flange - *97* mil

Part 1: Stud Bearing on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.5
Track Thickness [in.]	t	0.1017
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	9.6539
Nominal Point Load [lbs]	P_{ndt}	832.1
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**297.2**

Part 2: Screw in Tension on Track Flange

Coefficient	α	1
Design Gap [in.]	e	2
Track Thickness [in.]	t	0.1017
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	10.297
Nominal Point Load [lbs]	P_{ndt}	665.6
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**198.0**

Allowable Point Load in Track

$P_{a\ TOTAL}$ [lbs]	**495**

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Slotted Track Allowable Point Loads - At 1.5 Times the Design Gap

Case: 3" Slotted Track with 2" Slots Centered in Each Flange - *118* mil

Part 1: Stud Bearing on Track Flange

Coefficient	α	1
Design Gap [in.]	e	1.5
Track Thickness [in.]	t	0.1242
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	8.5779
Nominal Point Load [lbs]	P_{ndt}	1102.7
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**393.8**

Part 2: Screw in Tension on Track Flange

Coefficient	α	1
Design Gap [in.]	e	2
Track Thickness [in.]	t	0.1242
Yield Stress [psi]	F_y	50000
Stud Spacing [in.]	S	16
Effective Bending Width [in.]	w_{dt}	9.0541
Nominal Point Load [lbs]	P_{ndt}	872.9
Factor of Safety	Ω	2.8
Allowable Point Load [lbs.]	P_a	**198.0**

Allowable Point Load in Track

$P_{a\ TOTAL}$ [lbs]	**592**

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Slotted Track Allowable Point Loads - At 1.5 Times the Design Gap (1.5")

Assumptions

1.) Studs spaced at 16" o/c

2.) 20 gauge stud and heavier assumed for 20 and 18 gauge slotted track. 18 gauge stud and heavier assumed for 16 gauge slotted track. 16 gauge stud and heavier assumed for 14 gauge and heavier slotted track. A thinner gauge of stud can be used with the slotted track other than assumed above, but the allowable point load must be reduced to the corresponding stud gauge (i.e. 18 gauge stud used with 14 gauge slotted track results in an allowable point load of 149 pounds (determined in the final summary of results)).

3.) #8 SMS assumed for 20 and 18 gauge slotted track. #10 SMS assumed for 16 gauge and heavier slotted track. If #8 SMS are to be substituted for #10 SMS, apply a 6% reduction to the allowable point load (i.e. #8 SMS used at 16 gauge slotted track - 6% of 257 pounds is 15 pounds, therefore the allowable point load is 242 pounds).

By Calculation

Track Thickness	Allowable Point Loads [lbs]
33 mil	66
43 mil	112
54 mil	257
68 mil	345
97 mil	495
118 mil	592

*NOTE: See Final Summary of Results for Allowable Point Loads. These loads have not been divided by 0.75 as explained on the summary page.

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SUMMARY OF RESULTS – 3" TRACK FLANGE

- ALLOWABLE POINT LOADS @ 1.5 TIMES THE DESIGN GAP (1½") ARE LESS THAN THAT OF THE ALLOWABLE LOADS AT THE DESIGN GAP (1"). PER LOAD COMBINATION EQN 16-13 OF THE 2007 IBC WHEN WIND AND LIVE LOAD ARE TO BE COMBINED, 75% OF EACH LOAD IS TO BE USED. ∴ FOR THE FINAL ALLOWABLE LOAD DETERMINATION, COMPARE THE POINT LOADS DETERMINED AT THE DESIGN GAP TO THE ONES AT 1½ TIMES THE DESIGN GAP DIVIDED BY 0.75. DIVIDING BY 0.75 WILL MAKE BOTH CASES HAVE EQUIVALENT WIND LOADING. CHOOSE THE LOWER NUMBER.

@ 1" GAP

TRACK THICKNESS	LOAD	
33 mil	94#	
43 mil	160#	
54 mil	304#	●
68 mil	446#	●
97 mil	609#	●
118 mil	750#	●

@ 1½" GAP DIVIDED BY 0.75

TRACK THICKNESS	LOAD/0.75	
33 mil	66/0.75 = 88#	●
43 mil	112/0.75 = 149#	●
54 mil	257/0.75 = 343#	
68 mil	345/0.75 = 460#	
97 mil	495/0.75 = 660#	
118 mil	592/0.75 = 789#	

FINAL ALLOWABLE LOADS

● = GOVERNS

TRACK THICKNESS	ALLOWABLE POINT LOAD
33 mil	88#
43 mil	149#
54 mil	304#
68 mil	446#
97 mil	609#
118 mil	750#

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SLOTTED TRACK DESIGN

REDUCTION OF ALLOWABLE POINT LOADS BY USING A #8 SMS WHEN A #10 SMS IS ASSUMED

PART 2 OF THE ALLOWABLE POINT LOAD CALCULATION IS THE CONTRIBUTION FOR THE SCREW IN TENSION. IT IS ASSUMED THAT 16 GAUGE MINIMUM STUDS ARE TO BE USED W/ 16 GAUGE AND HEAVIER TRACK. THE ALLOWABLE PULLOUT FOR A #10 SMS IS CAPPED @ 109 #.

$$P_{not} = 0.85 t d F_u / \Omega \quad \text{[AISI EQ E4.4.1-1]}$$

$$= 0.85(0.0451")(0.19")(45000\,psi)/3$$

$$= 109\,\#$$

B/C A #8 SMS HAS A SMALLER DIAMETER THAN A #10 SMS, THERE IS A REDUCTION IN THE PULLOUT VALUE.

$$P_{not} = 109\,\#\left(0.164"/0.19"\right) = 94\,\#$$

↑ RATIO DIAMETERS

B/C OF THIS REDUCED VALUE, COMPARE THE BEARING VALUE + THE NEW TENSION PULLOUT VALUE TO A REDUCED VALUE OF THE ALLOWABLE LOAD W/ A #10 SMS.

CHOOSE A 6% REDUCTION IN CAPACITY OF THE ALLOWABLE CAPACITY IF A #8 SMS IS SUBSTITUTED FOR A #10 SMS. THE CAPACITY W/ A 6% REDUCTION IS ALWAYS LESS THAN THE CAPACITY W/ #8 SMS ∴ OK TO USE 94% OF CAPACITY WHEN #8 SMS ARE SUBSTITUTED FOR #10 SMS

AT CONDITIONS WHERE A 16 GAUGE STUD IS ASSUMED, THE TENSION VALUE IN PART 2 OF THE CALCULATIONS IS CAPPED @ 198 #.

$$P_{not} = 0.85(0.0566")(0.19")(65000\,psi)/3$$

$$= 198\,\#$$

REDUCED VALUE FOR A #8 SMS IS: $198\,\#\left(0.164"/0.19"\right) = 171\,\#$

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SLOTTED TRACK DESIGN

SIMILARLY AS BEFORE W/ THE 18 GAUGE STUD, COMPARE THE BEARING VALUE + THE NEW TENSION PULLOUT VALUE TO 94% OF THE VALUE W/ A #10 SMS.

94% OF THE ALLOWABLE POINT LOAD IS ALWAYS LESS THAN THE VALUE FOR CONDITIONS WHERE A #8 SMS IS SUBSTITUTED FOR A #10 SMS.

EXAMPLE CALCS

@ 18 GAUGE STUD – 3/4" GAP, 54 MIL TRACK W/ 2½" FLANGES

BEARING CAPACITY = 239.8 #
TENSION CAPACITY = 109 # (W/ #10 SMS)

REDUCTION FOR A #8 SMS:

TENSION CAPACITY = 94# ∴ POINT LOAD = 334#

TAKE A 6% REDUCTION IN ORIGINAL LOAD:

349#(0.94) = 328#
↑ < 334# ∴ OK ✓

@ 16 GAUGE STUD – 1" GAP, 97 MIL TRACK W/ 3" FLANGES

BEARING CAPACITY = 410.6#
TENSION CAPACITY = 193# (W/ #10 SMS)

REDUCTION FOR A #8 SMS:

TENSION CAPACITY = 171# ∴ POINT LOAD = 582#

TAKE A 6% REDUCTION IN ORIGINAL LOAD:

609#(0.94) = 572#
↑ < 582# ∴ OK ✓

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Reduced Track Allowable Point Loads

Case: 2 1/2" Slotted Track with 1 1/2" Slots Centered In Each Flange

54 Mil Track

	Allowable Loads w/ #10 SMS	Allowable Loads w/ #8 SMS	Allowable Loads w/ 6% Reduction
P_a (Bearing)	239.8	239.8	225.4
P_a (Tension)	109	94	102.5
P_a (Total)	349	334	**328**

68 Mil Track

	Allowable Loads w/ #10 SMS	Allowable Loads w/ #8 SMS	Allowable Loads w/ 6% Reduction
P_a (Bearing)	317.8	317.8	298.7
P_a (Tension)	198	171	186.1
P_a (Total)	516	489	**485**

97 Mil Track

	Allowable Loads w/ #10 SMS	Allowable Loads w/ #8 SMS	Allowable Loads w/ 6% Reduction
P_a (Bearing)	519.4	519.4	488.2
P_a (Tension)	198	171	186.1
P_a (Total)	717	690	**674**

118 Mil Track

	Allowable Loads w/ #10 SMS	Allowable Loads w/ #8 SMS	Allowable Loads w/ 6% Reduction
P_a (Bearing)	704.8	704.8	662.5
P_a (Tension)	198	171	186.1
P_a (Total)	903	876	**849**

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Project:
Date:
Designer: EMB
Page:

Reduced Track Allowable Point Loads

Case: 3" Slotted Track with 2" Slots Centered In Each Flange

54 Mil Track

	Allowable Loads w/ #10 SMS	Allowable Loads w/ #8 SMS	Allowable Loads w/ 6% Reduction
P_a (Bearing)	195.5	195.5	183.8
P_a (Tension)	109	94	102.5
P_a (Total)	304	289	**286**

68 Mil Track

	Allowable Loads w/ #10 SMS	Allowable Loads w/ #8 SMS	Allowable Loads w/ 6% Reduction
P_a (Bearing)	255.9	255.9	240.5
P_a (Tension)	190.3	171	178.9
P_a (Total)	446	427	**419**

97 Mil Track

	Allowable Loads w/ #10 SMS	Allowable Loads w/ #8 SMS	Allowable Loads w/ 6% Reduction
P_a (Bearing)	410.6	410.6	386.0
P_a (Tension)	198	171	186.1
P_a (Total)	609	582	**572**

118 Mil Track

	Allowable Loads w/ #10 SMS	Allowable Loads w/ #8 SMS	Allowable Loads w/ 6% Reduction
P_a (Bearing)	551.8	551.8	518.7
P_a (Tension)	198	171	186.1
P_a (Total)	750	723	**705**