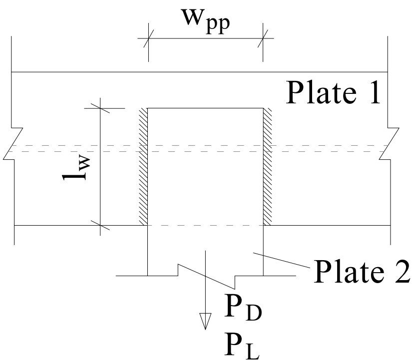
Design of Fillet Weld Subjected to Longitudinal Shear Force



Details of The Connected Plates

Grade:	SEL("Material/ASTM"; NAME;)	=	A992
F_y=	TAB("Material/ASTM";F_y;NAME=Grade)	=	50 ksi
Thickness of the first plate, t_{p1}=			0.2500 in
Thickness of the second plate, t_{p2}=			0.3750 in
Width of the perpendicular part, w_{pp}=			18.0 in

Loads

Force:	SEL ("AISC/force"; type;)	=	Tension
Dead load, P_D=			33.0 kips
Live load, P_L=			100.0 kips

From Chapter 2 of ASCE/SEI 7, the required strength is:

P_u=	$1.2*P_D+1.6*P_L$	=	199.6 kips

Preliminary Welding Details

Electrode classification number, F_{EXX}=	70 ksi
Length of weld on each side, l_w=	27.00 in
Thickness of weld, t_w=	0.1875 in

Design of Weld

- Check the maximum and minimum Weld Size (AISC Specification Section J2.2b)

Minimum thickness of the connected parts (t_{pmin}):

t_{pmin}=	MIN(t_{p1}; t_{p2})	=	0.2500 in
$t_{w,max}$=	IF(t_{pmin}<1/4; t_{pmin}; (t_{pmin}-1/16))	=	0.1875 in
$t_{w,min1}$=	IF(t_{pmin}≤1/4; 1/8; IF((t_{pmin}>1/4 AND t_{pmin}≤1/2); 3/16; 0))	=	0.1250 in
$t_{w,min2}$=	IF((t_{pmin}>1/2 AND t_{pmin}≤3/4); 1/4; 5/16)	=	0.3125 in
$t_{w,min}$=	IF($t_{w,min1}$=0;$t_{w,min2}$; MIN($t_{w,min1}$;$t_{w,min2}$))	=	0.1250 in
Check_1=	IF((t_w ≥$t_{w,min}$ AND tw ≤ $t_{w,max}$);"O.K."; "Increase t_w")	=	O.K.

- Minimum required length:

$l_{w,min} = \dfrac{P_u}{0.60 * F_{EXX} * t_w / \sqrt{2} * 0.75 * 2}$ = 23.9 in

- Check length for perpendicular plate width:

Check1= IF(F="C"; "O.K."; IF($l_{w,min} \geq w_{pp}$; "O.K."; "increase l_w")) = O.K.

- Calculate the effective weld length:

λ_w= l_w/t_w = 144.0 in

β_w= MIN(1.2-0.002*λ_w;1) = 0.91 in

$l_{w,eff}$= $\beta_w * l_w$ = 24.57 in

-Recheck the weld at its reduced strength:

ΦR_n= 0.75 * 2 * $l_{w,eff}$ * t_w /√(2) * 0.6*F_{EXX} = 205.2 kips

Check_2= IF($\Phi R_n > P_u$;"Safe"; "Unsafe") = Safe

Design Summary

Electrode=	F_{EXX}	=	70.0 ksi
Size=	t_w	=	0.1875 in
length=	l_w	=	27.00 in
P_u=	1.2*P_D+1.6*P_L	=	199.6 kips
ΦR_n=	0.75 * 2 * $l_{w,eff}$ * t_w /√(2) * 0.6*F_{EXX}	=	205.2 kips
Check_1=	IF(($t_w \geq t_{w,min}$ AND $t_w \leq t_{w,max}$);"O.K."; "Increase t_w")	=	O.K.
Check_2=	IF($\Phi R_n > P_u$;"Safe"; "Increase weld size/length")	=	Safe