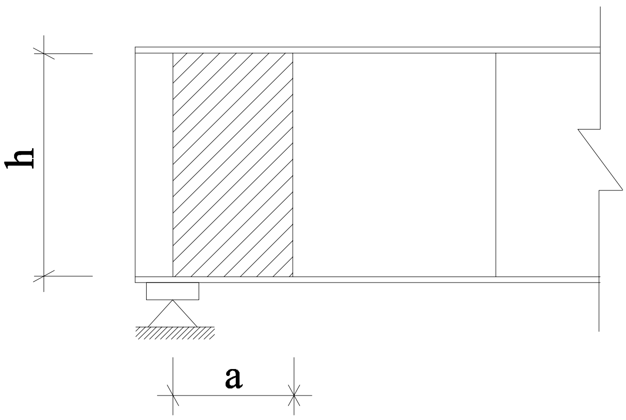
Design of End Panel of Built-Up Girder with Transverse Stiffeners Subjected to Shear Force



Materials

Grade:	SEL("Material/ASTM"; NAME;)	=	A36
F_y=	TAB("Material/ASTM";F_y;NAME=Grade)	=	36 ksi
E=			29000 ksi

Loads

Reaction at support, R_v=	154.0 kips

Section Details

depth, d=	36 in
Web thickness, t_w=	0.3125 in
clear distance between stiffeners, a=	60.00 in
Upper flange width, b_{fc}=	12 in
Upper flange thickness, t_{fc}=	1.50 in
Lower flange width, b_{ft}=	12.00 in
Lower flange thickness, t_{ft}=	1.50 in

Shear Strength for End Panel

h=	$d-t_{fc}-t_{ft}$	=	33.00 in
ψ=	a/h	=	1.82
k_{v1}=	$5+(5/\psi^2)$	=	6.51

Based on AISC Specification Section G2.1, kv=5 when a/h>3 or a/h>[260/(h/tw)]^2

λ_w=	h/tw	=	106
ψ_1=	$(260/\lambda_w)^2$	=	6.02
Therefore, use k_v=	IF(ψ>3 AND ψ>ψ_1;5;k_{v1})	=	6.51

Tension field action is not allowed because the panel is an end panel.

λ_{w1}=	$1.10*\sqrt{(k_v*E/F_y)}$	=	80
λ_{w2}=	$1.37*\sqrt{(k_v*E/F_y)}$	=	99

Calculate C_v according to Eqns. G2-2, G2-3, G2-4 and G2-5:

C_v=	$IF(\lambda_w \leq \lambda_{w1};1;IF(\lambda_w > \lambda_{w1}\ AND\ \lambda_w \leq \lambda_{w2};\lambda_{w1}/\lambda_w;1.51*k_v*E/(F_y*\lambda_w^2)))$	=	0.705
A_w=	$d*t_w$	=	11.3 in^2

Calculate Vn using Eqn. G2-1:

Nominal shear strength, V_n=	$0.6*F_y*A_w*C_v$	=	172 kips
Φ_v=			0.90
$\Phi_v V_n$=	Φ_v*V_n	=	155 kips
Shear_safety=	IF(Φ_v*V_n>R_v;"Safe";"Unsafe")	=	Safe
Force_ratio=	$R_v/\Phi_v V_n$	=	0.99

Design Summary

Reaction at support, R_v=			154.0 kips
$\Phi_v V_n$=	Φ_v*V_n	=	154.8 kips
Force_ratio=	$Rv/\Phi_v V_n$	=	0.99