Moment-Rotation Worksheet for Semi-Rigid Connections:

All values for input and output are in kips and inches.

Beam Properties:

Length of Beam (in)	L :=600
Modulus of Elasticity (ksi)	E :=29000
Moment of Inertia (in^4)	I :=15600
Depth of Beam (in)	d_{beam} :=17.7

Beam Loading Conditions:

Beam_Load :=
- ○ Midspan Point Load
- ◉ Uniform Load
- ○ Other (Manual Input Req'd)

Beam_Load = 2

Beam Load Magnitude:

Point load (kip) or Uniform load (kip-in) Load :=0.375

Manual Input for Other Beam Loading Conditions (Optional):

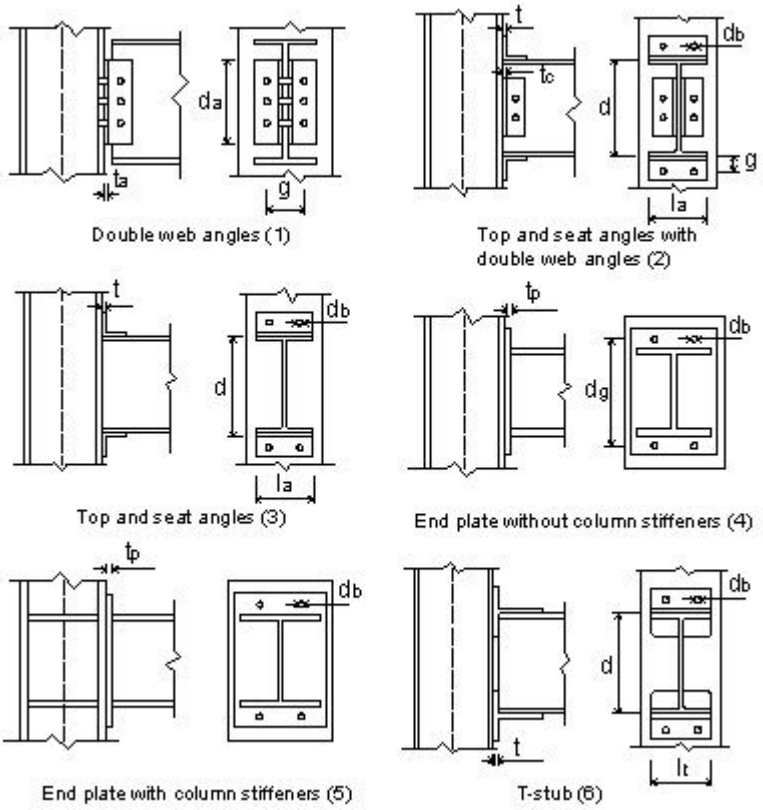
Fixed-end Beam Moment (kip-in)	M_{FEM} :=0
Simply-Supported Beam Rotation (radians)	Θ_{SS} :=0

Beam Line Calculations

Frye-Morris Beam Rotation Model

User Defined Input Parameters:

Connection Type:



Connection_Type :=

- (•) Double Web Angles
- ( ) Top & Seat with Double Angles
- ( ) Top & Seat Angles
- ( ) End Plate w/o Column Stiffeners
- ( ) End Plate with Colum Stiffeners
- ( ) T-stub

Connection_Type = 1

Connection Variables:

(refer to figure for applicable variable definitions, all other variables remain zero)

$t_a := 0.3125$	$d_a := 23.5$	$g := 7.8850$
$t_c := 0$	$d_b := 0$	$l_a := 0$
$t_p := 0$	$d_g := 0$	$l_t := 0$
$t := 0$	$d := 0$	

All dimensions specified in inches.

Connection Calculations

Connection Strength Calculations

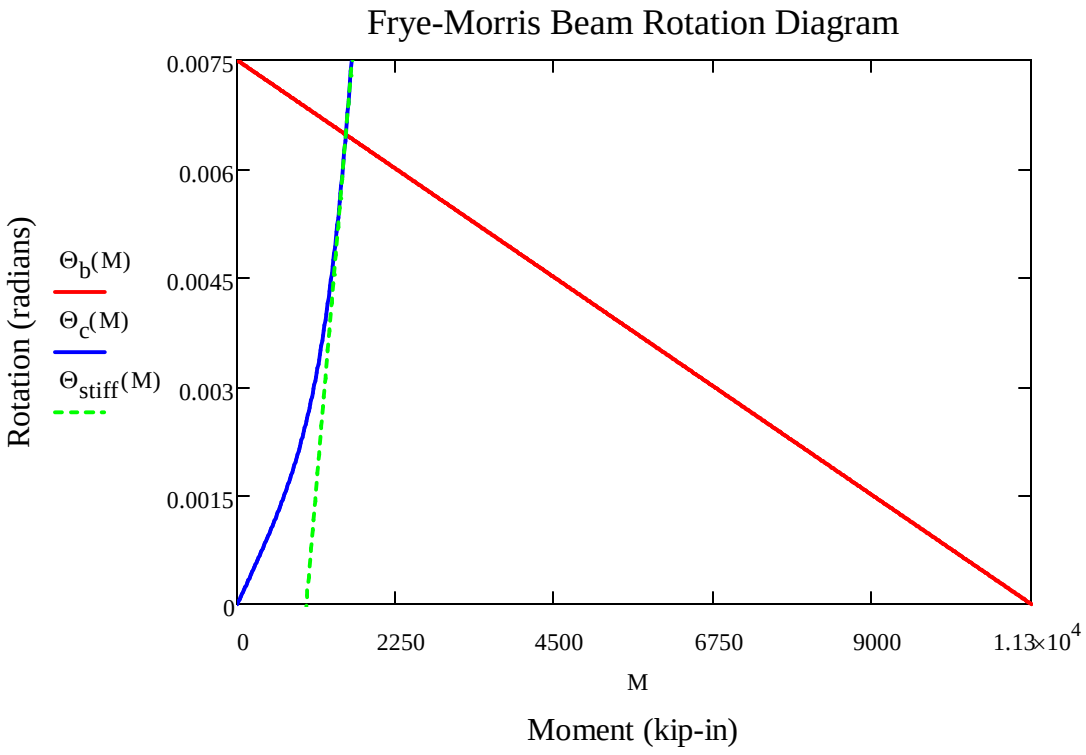
Results of Frye-Morris Analysis

Connection Design Values:

Connection Moment Capacity (kip-in): $M_{int} = 1537.5$

Connection Maximum Rotation (radians): $\Theta_{int} = 6.441 \times 10^{-3}$

Connection Design Stiffness (kip-in): $R_k = 86722.9$



Chen-Kishi Three-Parameter Power Model

User Defined Input Parameters:

Angle Material Properties:

Yield Stress (ksi): $F_y := 36$

Modulus of Elasticity (ksi): $E := 29000$

All dimensions specified in kips and inches.

Distance from Angle Heel to Center of Bolt Holes (in):

Top and Seat: $g_{ct} := 3$

Web: $g_{cw} := 3$

Thickness of Angle Legs (in):

Top and Seat: $t_t := 0.375$

Web: $t_w := 0.25$

Distance from Angle Heel to Toe of the Fillet (in):

Top and Seat: $k_t := 0.875$

Web: $k_w := 0.688$

Length of Angle (in):

Top and Seat: $l_t := 7$

Web: $l_w := 8$

Fastener Nut Diameter (in):

Top and Seat: $W_t := 1.4375$

Web: $W_w := 1.4375$

Nondimensional Parameters

Stiffness and Strength Parameters

Single Web-Angle Connections

Initial Stiffness Calculations

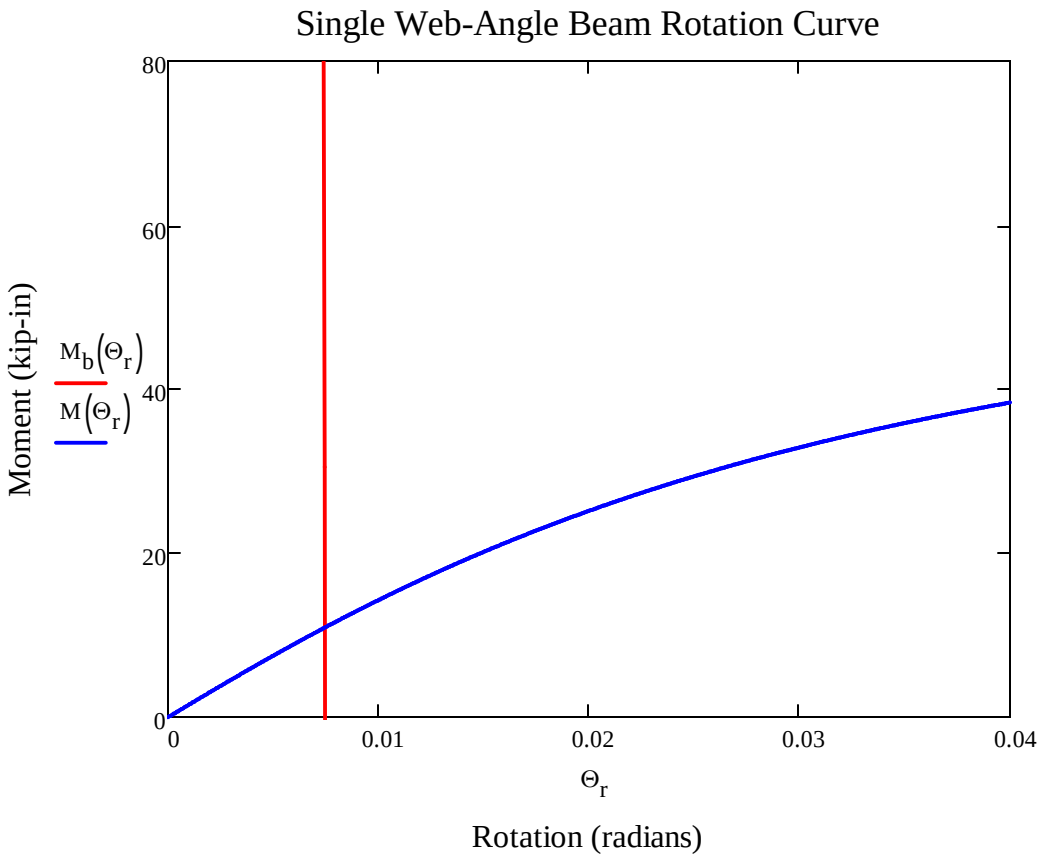
Ultimate Moment Capacity Calculations

Shape Parameter Calculations

Connection Curve and Beam Line Functions

Output for Single Web-Angle Connections:

Initial Connection Stiffness, R_{ki} (kip-in/rad):	$R_{ki} := R_{kiw} = 1.544 \times 10^3$
Ultimate Moment Capacity, M_u (kip-in):	$M_u := M_{uw} = 58.379$
Shape Parameter, n:	$n = 1.551$
Reference Plastic Rotation, θ_0 (radians):	$\Theta_0 = 0.038$



Double Web-Angle Connections

Initial Stiffness Calculations

Ultimate Moment Capacity Calculations

Shape Parameter Calculations

Connection Curve and Beam Line Functions

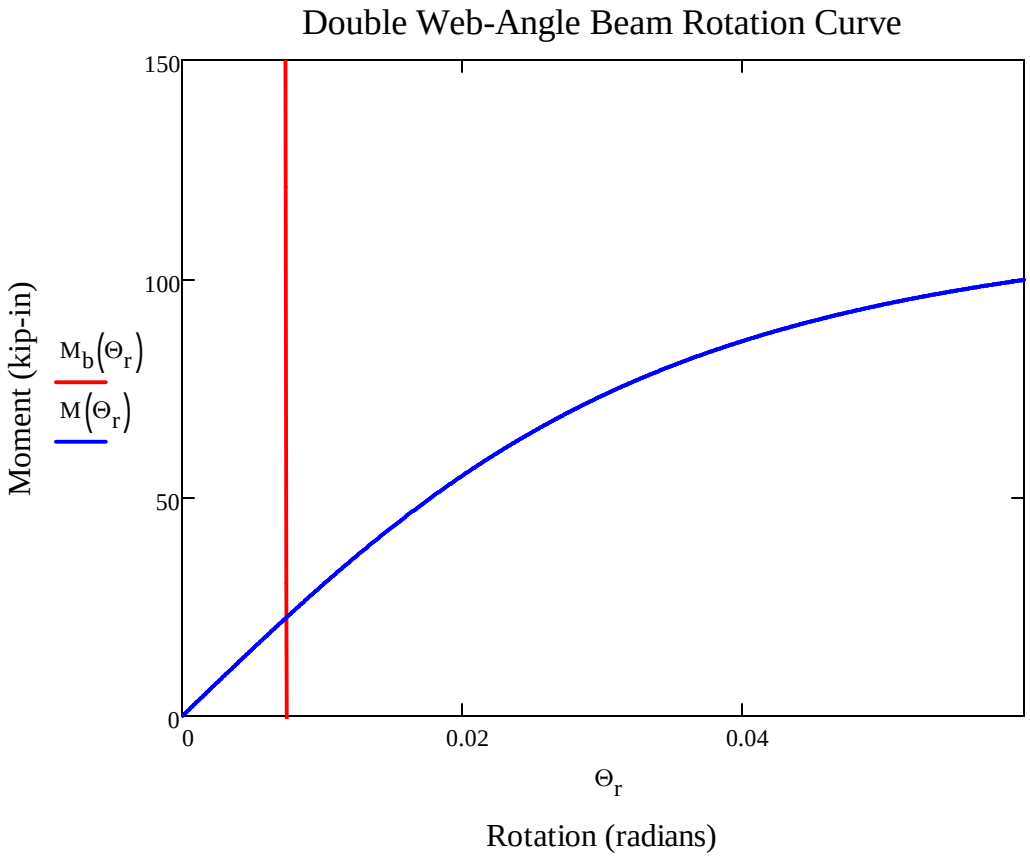
Output for Double Web-Angle Connections:

Initial Connection Stiffness, R_{ki} (kip-in/rad): $R_{ki} := R_{kiw} = 3.088 \times 10^{3}$

Ultimate Moment Capacity, M_u (kip-in): $M_u := M_{uw} = 116.758$

Shape Parameter, n: $n = 2.072$

Reference Plastic Rotation, θ_0 (radians): $\Theta_0 = 0.038$



Top- and Seat-Angle Connections

Initial Stiffness Calculations

Ultimate Moment Capacity Calculations

Shape Parameter Calculations

Connection Curve and Beam Line Functions

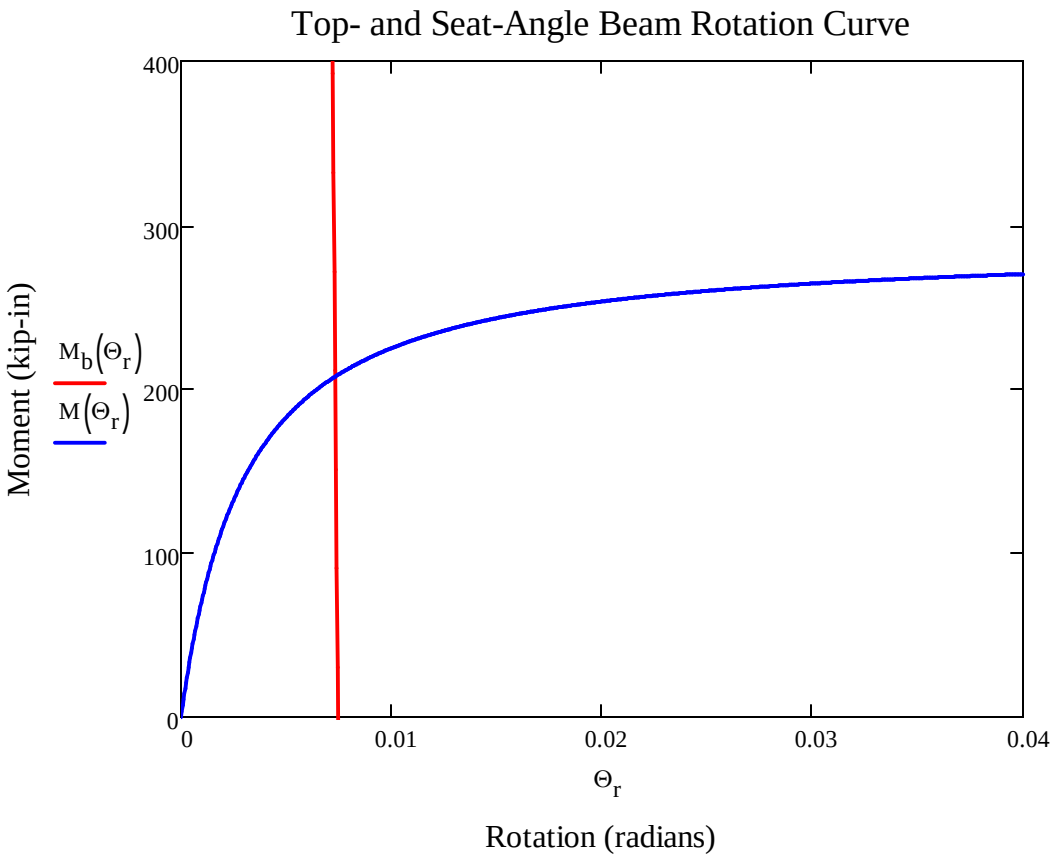
Output for Top- and Seat-Angle Connections:

Initial Connection Stiffness, R_{ki} (kip-in/rad): $R_{ki} := R_{kit} = 9.293 \times 10^{4}$

Ultimate Moment Capacity, M_u (kip-in): $M_u := M_{ut} = 288.059$

Shape Parameter, n: $n = 1.045$

Reference Plastic Rotation, θ_0 (radians): $\Theta_0 = 3.1 \times 10^{-3}$



Top- and Seat- with Double Web-Angle Connections

Initial Stiffness Calculations

Ultimate Moment Capacity Calculations

Shape Parameter Calculations

Connection Curve and Beam Line Functions

Output for Top- and Seat- with Double Web-Angle Connections:

Initial Connection Stiffness, R_{ki} (kip-in/rad): $R_{ki} = 1.075 \times 10^{5}$

Ultimate Moment Capacity, M_u (kip-in): $M_u = 605.774$

Shape Parameter, n: $n = 2.412$

Reference Plastic Rotation, θ_0 (radians): $\Theta_0 = 5.633 \times 10^{-3}$