Moment at the face of the column (ANSI/AISC 358-10, 6.10)

Step 1. Determine the moment at the face of the column, M_f.

$$M_f = M_{pr} + V_u S_h$$ M_f : 1771.00 kN·m

where:

M_{pr}: Probable maximum moment at plastic hinge. M_{pr} : 1483.35 kN·m

$$M_{pr} = C_{pr} R_y F_y Z_e$$

where:

C_{pr}: Factor to account for the peak connection strength, including strain hardening, local restraint, additional reinforcement, and other connection conditions. C_{pr} : 1.13

$$C_{pr} = \frac{F_y + F_u}{2F_y} \leq 1.2$$

F_y: Specified minimum yield stress. F_y : 413.00 MPa

F_u: Specified minimum tensile strength. F_u : 520.00 MPa

R_y: Ratio of the expected yield stress to the specified minimum yield stress. R_y : 1.10

Z_e: Effective plastic section modulus of the section (or connection) at the location of the plastic hinge. Z_e : 2890675 mm³

V_u: Shear force at end of beam. V_u : 897.77 kN

$$V_u = \frac{2M_{pr}}{L_h} + V_{gravity}$$

where:

L_h: Distance between plastic hinge locations. L_h : 3735.2 mm

$$= L - 2 \cdot S_h$$

$V_{gravity}$: Factored beam shear force due to gravity loads. $V_{gravity}$: 103.52 kN

S_h: Distance from face of column to plastic hinge. S_h : 320.4 mm

= L_{st} + t_p for a stiffened connection (4ES, 8ES)

L_{st}: Length of end-plate the stiffener. L_{st} : 295 mm

t_p: Thickness of end-plate. t_p : 25.4 mm