SELECT A DOUBLE ANGLE TENSION MEMBER TO RESIST A DEAD LOAD OF 20K AND A LIVE LOAD OF 60K

FIVE 7/8" DIA BOLTS → $d_{hole} = 7/8" + 1/8" = 1"$
3/8" GUSSET PLATE
A36 → $F_y = 36$ KSI, $F_u = 58$ KSI
$P_u = 1.2 D_L + 1.6 L_L = 1.2(20K) + 1.6(60K) = 120K$

MIN SPACING OF BOLTS → AISC J3.3 → $3d = 2.625"$

START DESIGN BY SELECTING A SECTION BASED ON YIELDING

$$\phi P_n = (0.9)(A_g)(F_y) > P_u = 120K$$
$$(0.9) A_g (36\,KSI) > 120K$$
$$A_g > 3.704\,in^2$$

MOST EFFICIENT SECTION IS $\boxed{2L\ 3 \times 2\tfrac{1}{2} \times 3/8}$

$A_g = 3.86\,in^2$, $t = 3/8"$, $\bar{y} = 0.949"$ OR $\bar{x} = 0.701"$

YIELDING → $\phi P_n = 0.9(3.86\,in^2)(36\,KSI) = \underline{125K}$

BASE BOLT SPACING ON NET SECTION FRACTURE AND BLOCK SHEAR

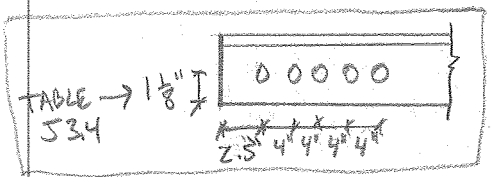
$$A_n = A_g - 2(d_{hole})t = 3.86\,in^2 - 2(1")(0.375") = 3.11\,in^2$$
$$A_e = U A_n$$

$$\phi P_n = (0.75)(A_e)(F_u) > P_u = 120K$$
$$(0.75)\left(1 - \frac{\bar{x}}{L}\right)(A_n)(F_u) > 120K$$
$$1 - \frac{\bar{x}}{L} > 0.887$$

FOR $L = 2" + 4 \times 2.625" = 12.5"$ (EDGE TO BOLT, BOLT SPACING) → $1 - \frac{\bar{x}}{L} = 0.924$

NSF → $\phi P_n = (\phi)(U)(A_n)(F_u) = (0.75)(0.924)(3.11\,in^2)(58\,KSI) = \underline{125K}$
MIN BOLT SPACING OK FOR NSF

BLOCK SHEAR → CREATE AN EXCEL SHEET, ADJUST SPACING



$A_{gv} = (3/8")(18.5") = 6.94\,in^2$
$A_{nv} = (3/8")(18.5" - 4.5 \times 1") = 5.25\,in^2$
$A_{nt} = (3/8")(1.125" - 0.5 \times 1") = 0.234\,in^2$

BLOCK SHEAR

$$\phi P_n = (0.75)[0.6 F_u A_{nv} + F_u A_{nt}] = 147K$$
OR
$$\phi P_n = (0.75)[0.6 F_y A_{gv} + F_u A_{nt}] = \underline{122.6K}$$ CONTROLS AND GOOD.