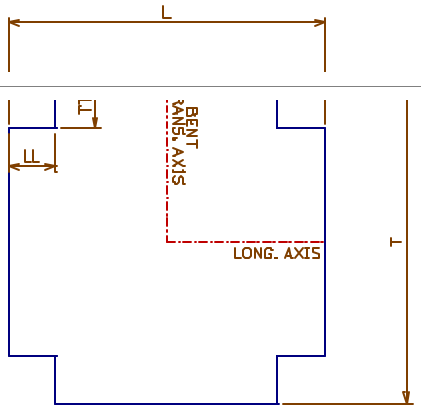
INTERACTION DIAGRAMS FOR SQUARE AND RECTANGULAR COLUMNS

INPUT VALUES



Material Strengths = $fy := 60$ $fc := 3$

$\beta 1 := if[\, fc \le 4, 0.85, if[\, fc \ge 8, 0.65, 0.85 - (fc - 4)\cdot 0.05\,]\,]$ $\beta 1 = 0.85$

Longitudinal column dimension = $L := 60$ $LL := 9$

Transverse column dimension = $T := 60$ $TT := 9$

SIZE OF BAR; AREA OF ONE BAR; AND NUMBER OF EACH REQUIRED FOR 1% STEEL $EA := 0, 1 .. 5$

$$BART := \begin{pmatrix} 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 14 \end{pmatrix} \quad AS\_EACH := \begin{pmatrix} 0.60 \\ 0.79 \\ 1 \\ 1.27 \\ 1.56 \\ 2.25 \end{pmatrix} \quad N\_REQUIRED_{EA} := floor\left[\frac{(L\cdot T - 4\cdot LL\cdot TT)\cdot 0.01}{AS\_EACH_{EA}} + 1\right] \quad N\_REQUIRED = \begin{pmatrix} 55 \\ 42 \\ 33 \\ 26 \\ 22 \\ 15 \end{pmatrix}$$

Note: Program will assume that the bars are spaced evenly and determine the number of bars in each face. If you have a different configuration you may change the configuration manually. This change should be made on page 3.

Number of bars = $nbars := 36$

Size of bars = $sbars := 11$ $in := sbars - 4$

Diameter of bars used (size 4 to 11 supported) $dia := info_{in,2}$ $dia = 1.27$

Distance to CL. reinforcing = $cover := 3.0$ $cover = 3$

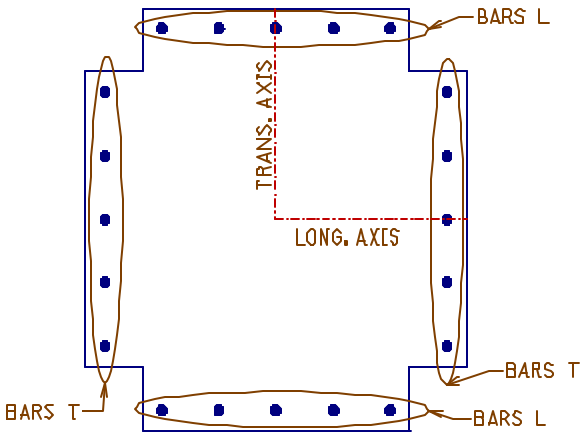
As of one bar = $Asone := info_{in,1}$ $Asone = 1.27$

The user may manually change the number of bars in each face here.

$barsL = 9$ $bspaceL = 4.5$

CHECK

$barsT = 9$ $bspaceT = 4.5$



Modulus for steel= $Es := 29000$

Max strain is steel = $\varepsilon max := \frac{fy}{Es}$ $\varepsilon max = 0.002069$

Number of iteration points = (accuracy of the curve) $ip := 200$

Capacity Reduction Factor = see 8.16.1.2.2 $\phi min := 0.70$

$\phi max := 0.90$

Capacity reduction factor for concrete (usually 0.85) = $\phi concrete := 0.85$

Capacity reduction factor for steel (usually 0.90) = $\phi steel := 0.90$

Theoretical max strain in concrete (ACI suggests 0.003) = $\varepsilon maxconc := 0.003$

Z := READPRN("col_rect.prn")

APPLIED LOADS

Pu (k) MuT (k*ft) MuL (k*ft)

Count the number of data points

G := for j3 ∈ 0.. 100
  F ← 0 on error | B ← j3 if $Z_{j3,0} > 0$
  break otherwise
B

G = 4

n := 0.. G

Z =

	0	1	2
0	1415	1189	4023
1	1300	951.9	3103
2	910.6	1612	548.9
3	1043	164.4	0
4	1300	1737	3400
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0

PL := $Z^{\langle 0 \rangle}$ MT := $Z^{\langle 1 \rangle}$ ML := $Z^{\langle 2 \rangle}$ PT := $Z^{\langle 0 \rangle}$

Capacity reduction factors $\phi min = 0.7$ $\phi max = 0.9$

Max tension force = $Pt := -Pten \cdot \phi max$ $Pt = -2221.992$

Max compression force = $Pc := Pcomp \cdot \phi min$ $Pc = 7494.266$

$barsL = 9$

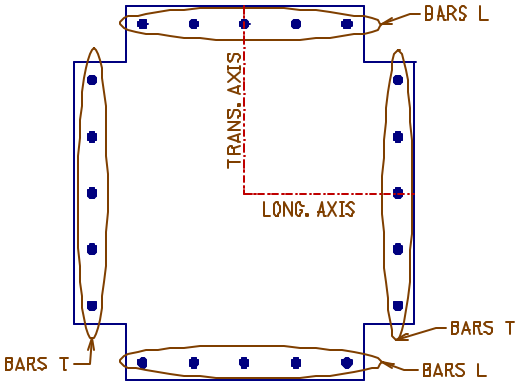
$barsT = 9$

$L = 60$ $f'c = 3$ $sbars = 11$

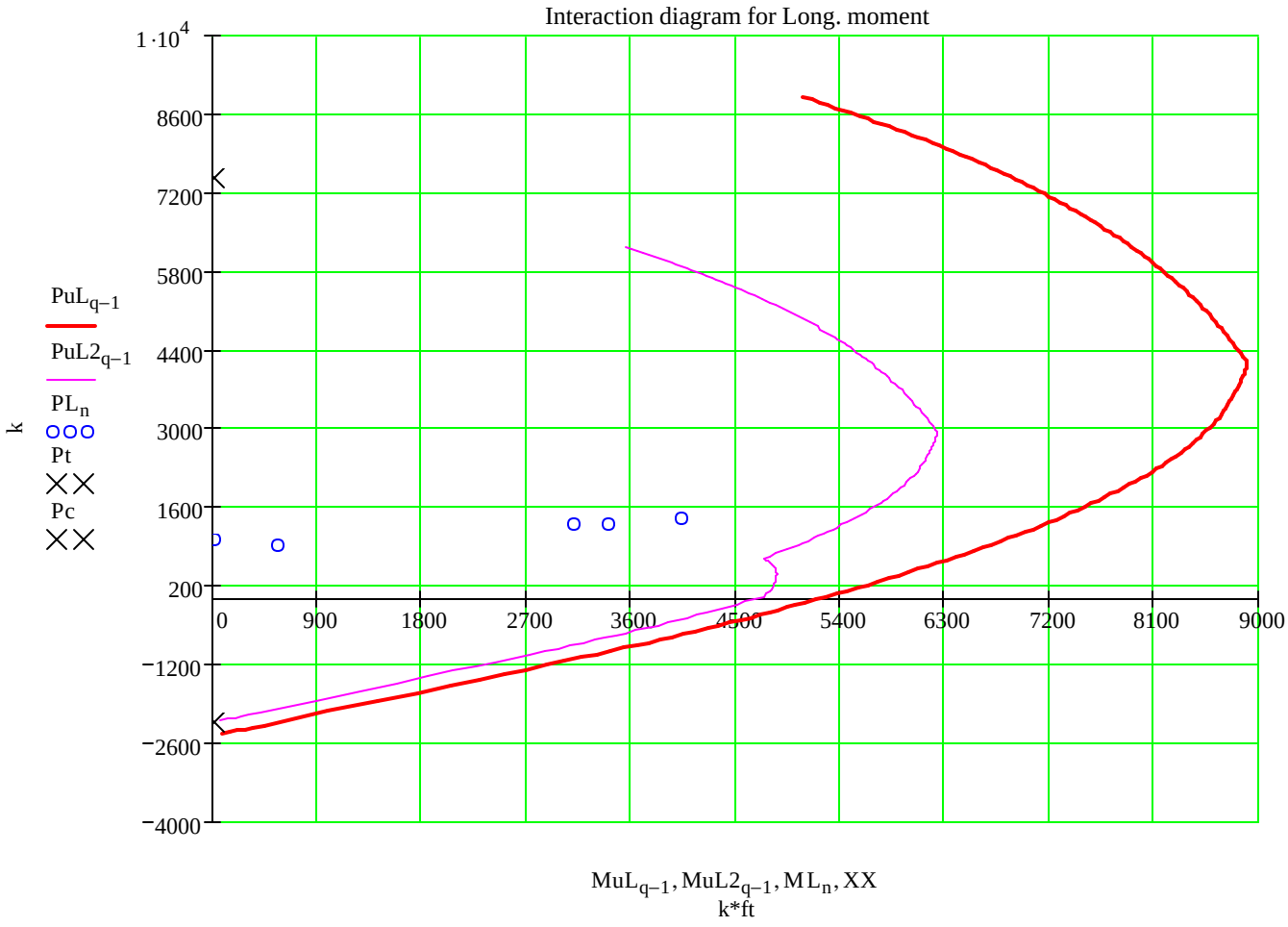
$T = 60$ $Ast = 45.72$ $nbars = 36$

$cover = 3$ $Ag = 3276$ $fy = 60$

$barsL = 9$ $barsT = 9$



Percent steel = $\%steel := 100 \cdot \frac{Ast}{Ag}$ $\%steel = 1.396$



SAFETY FACTOR

$\min(SF) = 1.374$

$$\min\left(\begin{pmatrix} SF1_n \\ SF2_n \end{pmatrix}\right) =$$

1.374
1.747
8.23
7.185
1.595

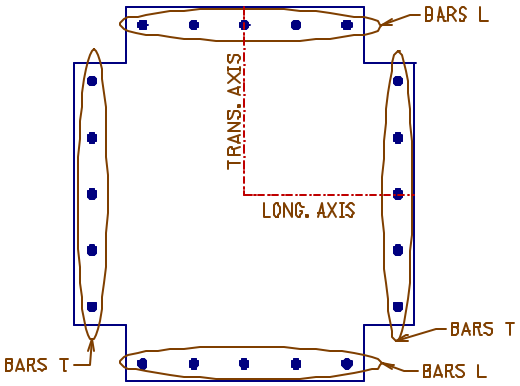
Capacity reduction factors $\phi min = 0.7$ $\phi max = 0.9$

Max tension force = $Pt := -Pten \cdot \phi max$ $Pt = -2221.992$ barsT = 9

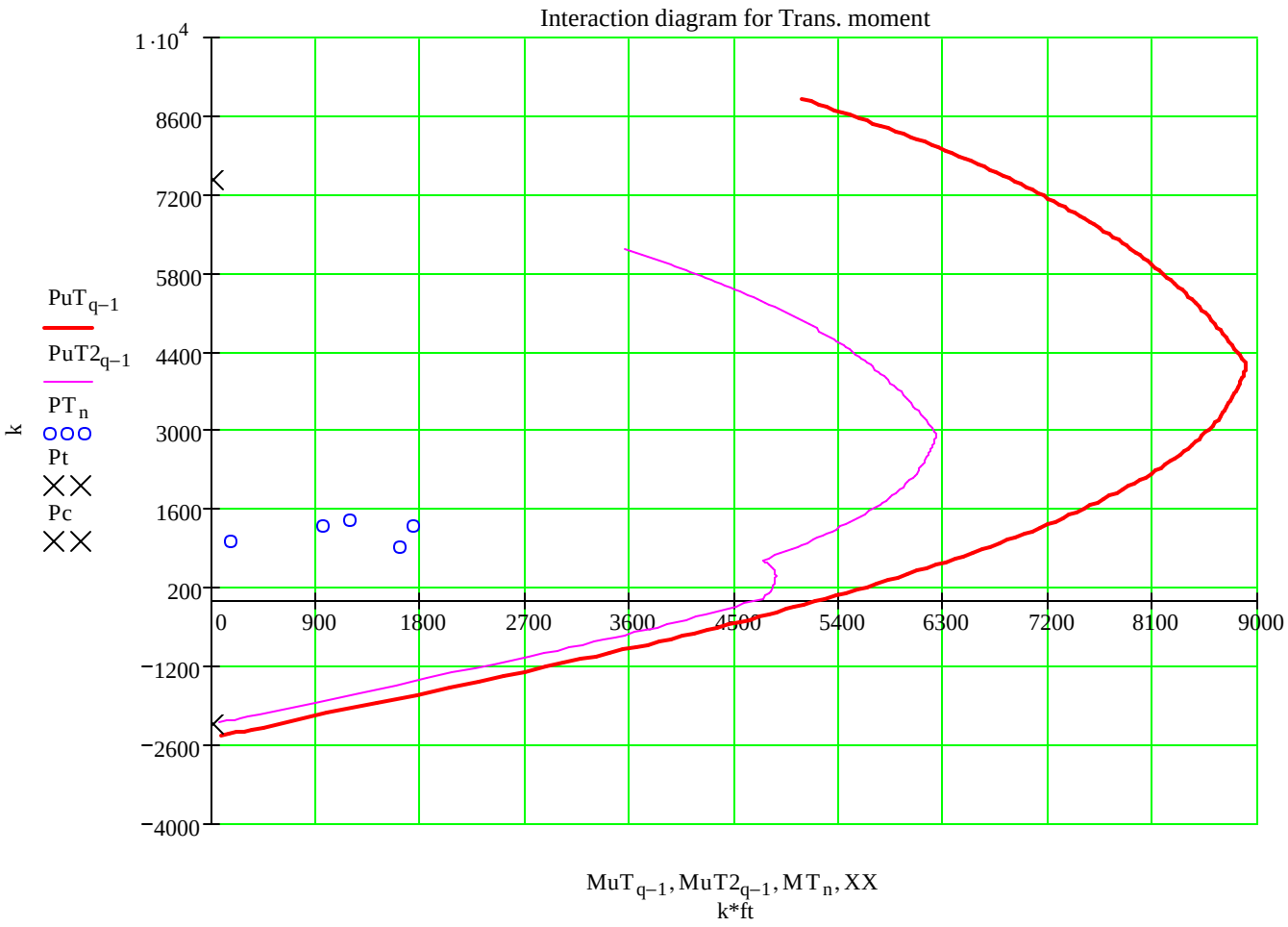
Max compression force = $Pc := Pcomp \cdot \phi min$ $Pc = 7494.266$ barsT = 9

L = 60	f'c = 3	sbars = 11
T = 60	Ast = 45.72	nbars = 36
cover = 3	Ag = 3276	fy = 60
barsL = 9	barsT = 9	

Percent steel = $\%steel := 100 \cdot \frac{Ast}{Ag}$ $\%steel = 1.396$



LRFD



SAFETY FACTOR

$\min(SF) = 3.107$

$$\min\left(\begin{pmatrix} SF1_n \\ SF2_n \end{pmatrix}\right) =$$

4.649
5.696
3.107
7.185
3.121