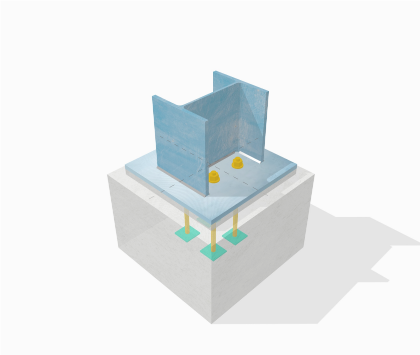
REFERENCES	CALCULATIONS	RESULTS

SkyCiv Base Plate and Anchor Rod Design

t - aisc

Project Information:
Design Code: AISC 360-22/360-16 (LRFD) and ACI 318-19

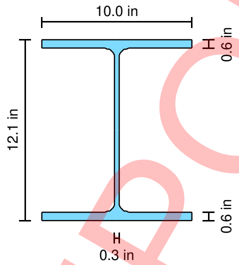


Load Combinations:

Load Combination	Axial Load, Nx (kip)	Strong-axis Shear, Vy (kip)	Weak-axis Shear, Vz (kip)
1	-20.00	0.00	0.00

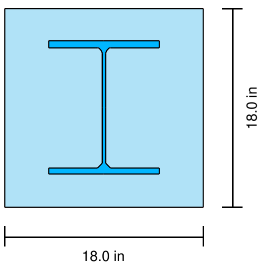
Note: Positive Nx (+) indicates compression; negative Nx (-) indicates tension.

Column Properties:



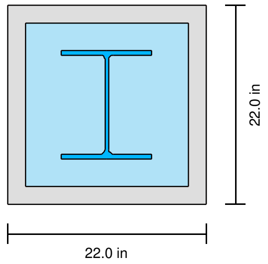
Symbol	Description	Value
$Section$	Column section	W12x53
d_{col}	Column depth	12.100 in
t_w	Column web thickness	0.345 in
b_f	Column flange width	10.000 in
t_f	Column flange thickness	0.575 in
A_{col}	Column area	15.600 in^2
r_{col}	Column root radius	0.605 in
F_{y_col}	Column yield stress (A992)	50.000 ksi
F_{u_col}	Column tensile stress (A992)	65.000 ksi

Base Plate Properties:



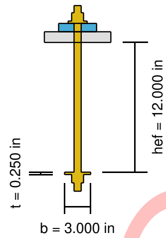
Symbol	Description	Value
B_{bp}	Base plate width	18.000 in
L_{bp}	Base plate length	18.000 in
t_{bp}	Base plate thickness	0.750 in
A_{bp}	Base plate plan area	324.000 in^2
F_{y_bp}	Base plate yield stress (A36)	36.000 ksi
F_{u_bp}	Base plate tensile stress (A36)	58.000 ksi
t_{grout}	Grout thickness	1.000 in

Concrete Properties:



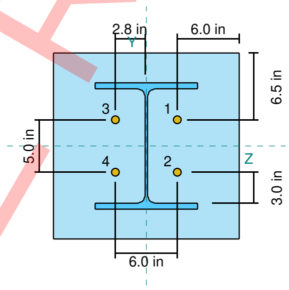
Symbol	Description	Value
B_{conc}	Concrete width	22.000 in
L_{conc}	Concrete length	22.000 in
t_{conc}	Concrete thickness	15.000 in
A_{conc}	Concrete plan area	484.000 in^2
$f_c^{'}$	Concrete compressive strength (4000)	4.000 ksi
λ	Factor for normal-weight concrete	1.000
–	Concrete assumption: cracked or uncracked	Cracked

Anchor Information:



Symbol	Description	Value
d_a	Anchor rod diameter	0.750 in
h_{ef}	Anchor rod effective embedment length	12.000 in
b_{embed_plate}	Anchor embed plate side dimension	3.000 in
t_{embed_plate}	Anchor embed plate thickness	0.250 in
F_{y_anc}	Anchor rod yield stress (A325)	92.000 ksi
F_{u_anc}	Anchor rod tensile stress (A325)	120.000 ksi
F_{y_ep}	Embed plate yield stress (A36)	36.000 ksi

Anchor Layout:



Symbol	Description	Value
n_a	Total number of anchor rods	4.000
s_z	Spacing of anchor rods along Z-axis	6.000 in
s_y	Spacing of anchor rods along Y-axis	5.000 in
$l_{edge,z}$	Base plate edge distance along Z-axis	6.000 in
$l_{edge,y}$	Base plate edge distance along Y-axis	6.500 in

Anchor Data Summary:

ID	Z (in)	Y (in)	Anchor in Tension Zone	Breakout (Tension)	Side-Face Blowout (Y-direction)	Side-Face Blowout (Z-direction)
1	3	2.5	✓	BO Group 1	N/A	N/A
2	3	-2.5	✓	BO Group 1	N/A	N/A
3	-3	2.5	✓	BO Group 1	N/A	N/A
4	-3	-2.5	✓	BO Group 1	N/A	N/A

Weld Properties:

Symbol	Description	Value
$Type$	Weld Type	Fillet
W_{top_flange}	Fillet weld size at Top Flange	0.250 in
W_{bottom_flange}	Fillet weld size at Bottom Flange	0.250 in
W_{web}	Fillet weld size at Web	0.250 in
$E_{w\_top\_flange}$	Weld throat at Top Flange	0.177 in
$E_{w\_bottom\_flange}$	Weld throat at Bottom Flange	0.177 in
E_{w_web}	Weld throat at Web	0.177 in
F_{exx}	Filler metal classification strength (E70xx)	70.000 ksi

Summary of Detailing Checks

Check Name	Dimensions (Min/Max/Actual)	Status
Weld Size Requirement (Flange)	Min: 0.25 in, Max: 0.75 in, Actual: 0.25 in	**PASS**
Weld Size Requirement (Web)	Min: 0.19 in, Max: 0.75 in, Actual: 0.25 in	**PASS**
Anchor Clearance	Min: 1.19 in in, Actual: 2.58 in	**PASS**
Base Plate Edge Distance	Min: 1.06 in in, Actual: 6.00 in	**PASS**
Minimum Number of Anchors	Min: 4.00, Actual: 4.00	**PASS**
Embedded Plate Dimension	Min: 2.99 in in, Actual: 3.00 in	**PASS**
Min. Anchor Spacing to Prevent Concrete Splitting	Min: 2.99 in in, Actual: 5.00 in	**PASS**
Min. Concrete Cover to Prevent Concrete Splitting	Min: 2.00 in in, Actual: 8.00 in	**PASS**

The design geometry meets requirements!

REFERENCES	CALCULATIONS	RESULTS

Load Combination No. 1: Tension Load Only

Check No. 1: Weld Capacity

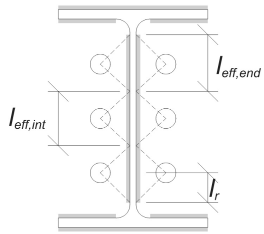


Fig. Effective welds on column to base plate.

Calculate effective weld length on column web

$d_{col} = 12.1$ in - Column depth

$t_f = 0.575$ in - Column flange thickness

$r_{col} = 0.605$ in - Column root radius

$s_y = 5$ in - Spacing of anchor rods along Y-axis

$n_{a,side} = 2$ - Number of anchor rods in tension per side

l_r - Remaining weld length near weld tip

$$l_r = \frac{d_{col} - 2t_f - 2r_{col} - s_y(n_{a,side} - 1)}{2} = \frac{12.1 \text{ in} - 2 \times 0.575 \text{ in} - 2 \times 0.605 \text{ in} - 5 \text{ in} \times (2 - 1)}{2} = 2.37 \text{ in}$$

$d_o = 2.8275$ in - Web offset distance

$s_y = 5$ in - Spacing of anchor rods along Y-axis

$l_{eff,end}$ - Effective weld length on end anchors

$$l_{eff,end} = \min(\mathrm{d_o},\ 0.5\mathrm{s_y}) + \min(\mathrm{d_o},\ \mathrm{l_r})$$

$$l_{eff,end} = \min(2.8275 \text{ in},\ 0.5 \times 5 \text{ in}) + \min(2.8275 \text{ in},\ 2.37 \text{ in}) = 4.87 \text{ in}$$

l_{eff} - Design effective weld length

$$l_{eff} = l_{eff,end} = 4.87 \text{ in}$$

Calculate load per unit length of weld

$N_x = 20$ kip - Tension load

$n_{a,t} = 4$ - Number of anchors in tension

$l_{eff} = 4.87$ in

$T_{u,anchor}$ - Tension load per anchor

$$T_{u,anchor} = \frac{N_x}{n_{a,t}} = \frac{20 \text{ kip}}{4} = 5 \text{ kip}$$

r_u - Required weld strength per unit length

$$r_u = \frac{T_{u,anchor}}{l_{eff}} = \frac{5 \text{ kip}}{4.87 \text{ in}} = 1.0267 \text{ kip/in}$$

Calculate fillet weld capacity

$F_{exx} = 70$ ksi - Filler metal classification strength (E70xx)

$E_{w,web} = 0.177$ in - Design weld throat at web

$\theta = 1.5708$ - Angle of load in radians

$\phi = 0.75$ - Weld resistance factor

AISC 360-22 Chapter J2.4 Eq. (J2-5)

k_{ds} - Directional strength increase factor

$$k_{ds} = 1.0 + 0.5(\sin(\theta))^{1.5} = 1 + 0.5 \times (\sin(1.5708))^{1.5} = 1.5$$

AISC 360-22 Chapter J2.4 Eq. (J2-4)

ϕr_n - Design strength of fillet welds per unit length

$$\phi r_n = \phi 0.6 F_{exx} E_{w,web} k_{ds} = 0.75 \times 0.6 \times 70 \text{ ksi} \times 0.177 \text{ in} \times 1.5 = 8.3633 \text{ kip/in}$$

Result:

PASS = 0.12

DCR - Demand over capacity ratio:

$$DCR = \frac{r_u}{\phi r_n} = \frac{1.0267 \text{ kip/in}}{8.3633 \text{ kip/in}} = 0.12276$$

Check No. 2: Base Plate Yield Capacity (Tension Load)

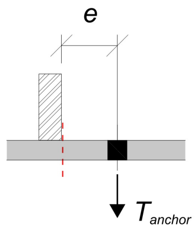


Fig. Bending of base plate from eccentric anchor load.

Calculate applied moment load on effective width of base plate

$T_{u,anchor} = 5\ \text{kip}$

$e = 2.8275\ \text{in}$ - Tensile load eccentricity equal to offset distance

AISC Design Guide 01 3rd Ed. Section 4.3.2

M_u - Required flexural yielding strength of base plate

$$M_u = T_{u,anchor} e = 5\ \text{kip} \times 2.8275\ \text{in} = 14.137\ \text{kip·in}$$

Calculate flexural yielding capacity of base plate

$l_{eff} = 4.87\ \text{in}$

$t_{bp} = 0.75\ \text{in}$ - Base plate thickness

AISC 360-22 Chapter F2

Z_{eff} - Plastic modulus of the effective section

$$Z_{eff} = \frac{l_{eff}(t_{bp})^2}{4} = \frac{4.87\ \text{in} \times (0.75\ \text{in})^2}{4} = 0.68484\ \text{in}^3$$

$F_{y\_bp} = 36\ \text{ksi}$ - Base plate yield stress (A36)

$\phi = 0.9$ - Flexural resistance factor

AISC 360-22 Eq. 2-1

ϕM_n - Design flexural yielding strength of base plate

$$\phi M_n = \phi F_{y\_bp} Z_{eff} = 0.9 \times 36\ \text{ksi} \times 0.68484\ \text{in}^3 = 22.189\ \text{kip·in}$$

Result:

PASS = 0.64

DCR - Demand over capacity ratio:

$$DCR = \frac{M_u}{\phi M_n} = \frac{14.137\ \text{kip·in}}{22.189\ \text{kip·in}} = 0.63714$$

Check No. 3: Anchor Rod Tensile Capacity

Fig. Anchor steel tension failure.

Calculate load per tension anchor

$N_x = 20\ \text{kip}$ - Tension load

$n_{a,t} = 4$ - Number of anchors in tension

N_{ua} - Required tensile strength of anchor

$$N_{ua} = \frac{N_x}{n_{a,t}} = \frac{20\ \text{kip}}{4} = 5\ \text{kip}$$

Calculate specified tensile strength of anchor

$F_{u\_anc} = 120\ \text{ksi}$ - Anchor rod tensile stress (A325)

$F_{y\_anc} = 92\ \text{ksi}$ - Anchor rod yield stress (A325)

AISC 360-22 Table J3.2, ACI 318-19 Clause 17.6.1.2

f_{uta} - Specified tensile strength of anchor steel

$$f_{uta} = \min(0.75\text{F}_{\text{u\_anc}},\ 1.9\text{F}_{\text{y\_anc}},\ 125) = \min(0.75 \times 120\ \text{ksi},\ 1.9 \times 92\ \text{ksi},\ 125.00\ \text{ksi}) = 90\ \text{ksi}$$

Calculate effective cross-sectional area of anchor

$d_a = 0.75\ \text{in}$ - Anchor rod diameter

ASME B1.1-2019 Table 1

$n_t = 10\ \text{in}^{-1}$ - Number of threads per inch

For smaller diameters, anchor rod is assumed to be UNC. For larger diameters (greater than 1"), anchor rod is assumed to be 8UN thread series.

ACI 318-19 Clause R17.6.1.2

$A_{se,N}$ - Effective cross-sectional area of anchor in tension

$$A_{se,N} = \frac{\pi}{4}\left(d_a - \frac{0.9743}{n_t}\right)^2 = \frac{\pi}{4} \times \left(0.75\ \text{in} - \frac{0.9743}{10\ \text{in}^{-1}}\right)^2 = 0.33446\ \text{in}^2$$

Calculate anchor steel tensile capacity

$\phi = 0.75$ - Anchor steel tension resistance factor

ACI 318-19 Eq. 17.6.1.2

ϕN_{sa} - Design anchor rod steel strength

$$\phi N_{sa} = \phi A_{se,N} f_{uta} = 0.75 \times 0.33446\ \text{in}^2 \times 90\ \text{ksi} = 22.576\ \text{kip}$$

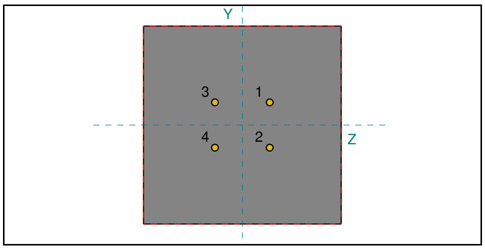
Result:

PASS = 0.22

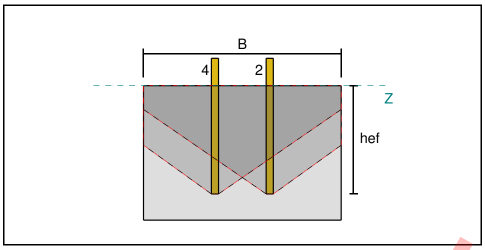
DCR - Demand over capacity ratio:

$$DCR = \frac{N_{ua}}{\phi N_{sa}} = \frac{5\ \text{kip}}{22.576\ \text{kip}} = 0.22147$$

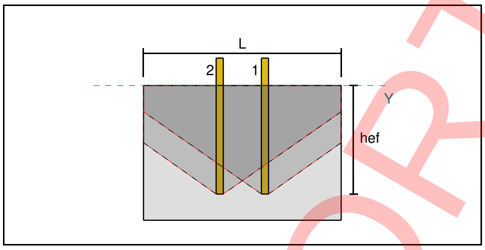
Check No. 4: Concrete Breakout Capacity (Tension Load)



PLAN VIEW



FRONT VIEW



SIDE VIEW

Calculate total tension load on anchor group

$N_x = 20 \text{ kip}$ - Tension load

$n_{a,t} = 4$ - Number of anchors in tension

$n_{a,g1} = 4$ - Number of anchors in anchor group BO 1

N_{ua} - Required concrete breakout tensile strength of an anchor group

$$N_{ua} = \left(\frac{N_x}{n_{a,t}}\right) n_{a,g1} = \left(\frac{20 \text{ kip}}{4}\right) \times 4 = 20 \text{ kip}$$

Determine if the support is a narrow concrete member

ACI 318-19 Clause 17.6.2.1.2

The support is classified as a narrow member. The modified values below will be used throughout the calculations.

Symbol	Description	Value
$c_{left,g1}$	Anchor group BO 1 concrete edge distance (left)	8.000 in
$c_{right,g1}$	Anchor group BO 1 concrete edge distance (right)	8.000 in
$c_{top,g1}$	Anchor group BO 1 concrete edge distance (top)	8.500 in
$c_{bottom,g1}$	Anchor group BO 1 concrete edge distance (bottom)	8.500 in
h_{ef}	Anchor rod effective embedment length	12.000 in
	Narrow Member	TRUE
$h'_{ef,g1}$	Anchor group BO 1 modified effective embedment length	5.667 in

Calculation for critical anchor group: Anchor Group BO 1.

Calculate maximum projected area for a single anchor

ACI 318-19 Clause 17.6.2.1.2

$h'_{ef,g1} = 5.6667 \text{ in}$ - Anchor group BO 1 modified effective embedment length

ACI 318-19 Clause 17.6.2

A_{Nco} - Maximum projected area for a single anchor

$$A_{Nco} = 9\left(h'_{ef,g1}\right)^2 = 9 \times (5.6667 \text{ in})^2 = 289 \text{ in}^2$$

Calculate length of actual projected cone area (along Z-direction)

$n_{z,g1} = 2$ - Number of anchors along Z-axis for anchor group BO 1

ACI 318-19 Clause 17.6.2

L_{Nc} - Actual length of concrete cone for an anchor group

$$L_{Nc} = \min\left(\mathrm{c_{left,g1}},\ 1.5\mathrm{h'_{ef,g1}}\right) + \left(\min\left(\mathrm{s_{sum,z,g1}},\ 3\mathrm{h'_{ef,g1}}\left(\mathrm{n_{z,g1}} - 1\right)\right)\right) + \min\left(\mathrm{c_{right,g1}},\ 1.5\mathrm{h'_{ef,g1}}\right)$$

$$L_{Nc} = \min(8 \text{ in},\ 1.5 \times 5.6667 \text{ in}) + (\min(6 \text{ in},\ 3 \times 5.6667 \text{ in} \times (2-1))) + \min(8 \text{ in},\ 1.5 \times 5.6667 \text{ in})$$

$$L_{Nc} = 22 \text{ in}$$

Calculate width of actual projected cone area (along Y-direction)

$n_{y,g1} = 2$ - Number of anchors along Y-axis for anchor group BO 1

ACI 318-19 Clause 17.6.2

B_{Nc} - Actual width of concrete cone for an anchor group

$$B_{Nc} = \min\left(c_{top,g1},\ 1.5h'_{ef,g1}\right) + \left(\min\left(s_{sum,y,g1},\ 3h'_{ef,g1}\left(n_{y,g1} - 1\right)\right)\right) + \min\left(c_{bottom,g1},\ 1.5h'_{ef,g1}\right)$$

$$B_{Nc} = \min\left(8.5\text{ in},\ 1.5 \times 5.6667\text{ in}\right) + \left(\min\left(5\text{ in},\ 3 \times 5.6667\text{ in} \times (2 - 1)\right)\right) + \min\left(8.5\text{ in},\ 1.5 \times 5.6667\text{ in}\right)$$

$$B_{Nc} = 22\text{ in}$$

Calculate actual projected area of the anchor group

$n_{a,g1} = 4$ - Number of anchors in anchor group BO 1

ACI 318-19 Clause 17.6.2

A_{Nc} - Actual projected area for an anchor group

$$A_{Nc} = \min\left(n_{a,g1}A_{Nco},\ L_{Nc}B_{Nc}\right) = \min\left(4 \times 289\text{ in}^2,\ 22\text{ in} \times 22\text{ in}\right) = 484\text{ in}^2$$

Calculate modification factor for lightweight concrete

$\lambda = 1$ - Factor for normal-weight concrete

ACI 318-19 Table 17.2.4.1

λ_a - Modification factor for lightweight concrete

$$\lambda_a = 1.0\lambda = 1 \times 1 = 1$$

Calculate basic single anchor breakout strength

$f_c' = 4\text{ ksi}$ - Concrete compressive strength (4000)

ACI 318-19 Clause 17.6.2.2.1

$k_c = 24$ - Factor for cast-in anchors breakout strength

ACI 318-19 Eq. 17.6.2.2.1

N_b - Basic single anchor breakout strength

$$N_b = k_c\lambda_a\sqrt{\frac{f_c'}{psi}}\left(\frac{h'_{ef,g1}}{in}\right)^{1.5} lbf$$

$$N_b = 24 \times 1 \times \sqrt{\frac{4\text{ ksi}}{0.001\text{ ksi}}} \times \left(\frac{5.6667\text{ in}}{1\text{ in}}\right)^{1.5} \times 0.001\text{ kip} = 20.475\text{ kip}$$

Calculate minimum edge distance of anchor

$c_{a,min}$ - Shortest edge distance

$$c_{a,min} = \min\left(c_{left,g1},\ c_{right,g1},\ c_{top,g1},\ c_{bottom,g1}\right) = \min\left(8\text{ in},\ 8\text{ in},\ 8.5\text{ in},\ 8.5\text{ in}\right) = 8\text{ in}$$

Calculate edge effect factor

ACI 318-19 Clause 17.6.2.4.1

$\Psi_{ed,N}$ - Breakout edge effect factor

$$\Psi_{ed,N} = \min\left(1.0,\ 0.7 + 0.3\left(\frac{c_{a,min}}{1.5h'_{ef,g1}}\right)\right) = \min\left(1,\ 0.7 + 0.3 \times \left(\frac{8\text{ in}}{1.5 \times 5.6667\text{ in}}\right)\right) = 0.98235$$

Calculate eccentricity factor

$e'_N = 0$ - Eccentricity of the resultant tensile force (assumed 0 for tension)

ACI 318-19 Clause 17.6.2.4.1

$\Psi_{ec,N}$ - Breakout eccentricity factor

$$\Psi_{ec,N} = \min\left(1.0,\ \frac{1}{1 + \frac{2e'_N}{3h'_{ef,g1}}}\right) = \min\left(1,\ \frac{1}{1 + \frac{2\times0}{3\times5.6667\text{ in}}}\right) = 1$$

Calculate concrete breakout capacity of the anchor group

ACI 318-19 Clause 17.6.2.4.1

$\Psi_{ed,N} = 0.98235$

ACI 318-19 Clause 17.6.2.5(b)

$\Psi_{c,N} = 1$ - Breakout cracking factor

ACI 318-19 Clause 17.6.2.6.2

$\Psi_{cp,N} = 1$ - Breakout concrete splitting factor

ACI 318-19 Clause 17.6.2.4.1

$\Psi_{ec,N} = 1$

ACI 318-19 Eq. 17.6.2.1b

ϕN_{cbg} - Design concrete breakout strength in tension of an anchor group

$$\phi N_{cbg} = \phi\left(\frac{A_{Nc}}{A_{Nco}}\right)\Psi_{ec,N}\Psi_{ed,N}\Psi_{c,N}\Psi_{cp,N}N_b$$

$$\phi N_{cbg} = 0.7 \times \left(\frac{484\text{ in}^2}{289\text{ in}^2}\right) \times 1 \times 0.98235 \times 1 \times 1 \times 20.475\text{ kip} = 23.58\text{ kip}$$

Result:

DCR - Demand over capacity ratio:

PASS = 0.85

$$DCR = \frac{N_{ua}}{\phi N_{cbg}} = \frac{20\text{ kip}}{23.58\text{ kip}} = 0.84817$$

Check No. 5: Anchor Pullout Capacity

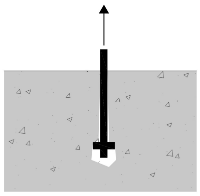


Fig. Headed anchor concrete pullout failure.

Calculate load per tension anchor

$N_x = 20\ \text{kip}$ - Tension load

$n_{a,t} = 4$ - Number of anchors in tension

N_{ua} - Required pull-out strength of cast-in anchor

$$N_{ua} = \frac{N_x}{n_{a,t}} = \frac{20\ \text{kip}}{4} = 5\ \text{kip}$$

Calculate area of bearing on embedded head

$d_a = 0.75\ \text{in}$ - Anchor rod diameter

A_{rod} - Area of anchor rod

$$A_{rod} = \frac{\pi}{4}(d_a)^2 = \frac{\pi}{4} \times (0.75\ \text{in})^2 = 0.44179\ \text{in}^2$$

$b_{embed\_plate} = 3\ \text{in}$ - Anchor embed plate side dimension

A_{brg} - Net area of bearing for rectangular end

$$A_{brg} = \left((b_{embed\_plate})^2\right) - A_{rod} = \left((3\ \text{in})^2\right) - 0.44179\ \text{in}^2 = 8.5582\ \text{in}^2$$

Calculate basic anchor pullout strength

$f_c' = 4\ \text{ksi}$ - Concrete compressive strength (4000)

ACI 318-19 Eq. 17.6.3.2.2a N_b - Basic single anchor pullout strength for cast-in headed anchors

$$N_b = 8A_{brg}\left(f_c'\right) = 8 \times 8.5582\ \text{in}^2 \times (4\ \text{ksi}) = 273.86\ \text{kip}$$

Calculate anchor pullout strength in tension

$\phi = 0.7$ - Concrete tension resistance factor

ACI 318-19 Clause 17.6.3.3 $\Psi_{c,P} = 1$ - Pullout cracking factor

ACI 318-19 Eq. 17.6.3.2.2a $N_b = 273.86\ \text{kip}$

ACI 318-19 Eq. 17.6.3.1 ϕN_{pn} - Design pull-out strength of cast-in anchor in tension

$$\phi N_{pn} = \phi \Psi_{c,P} N_b = 0.7 \times 1 \times 273.86\ \text{kip} = 191.7\ \text{kip}$$

Result: **PASS = 0.03**

DCR - Demand over capacity ratio:

$$DCR = \frac{N_{ua}}{\phi N_{pn}} = \frac{5\ \text{kip}}{191.7\ \text{kip}} = 0.026082$$

Check No. 6: Embed Plate Flexural Capacity

This additional check is to confirm the embed plate has enough thickness to resist flexural yielding.

Calculate load per tension anchor

T_a - Load per anchor

$$T_a = \frac{N_x}{n_{a,t}} = \frac{20\ \text{kip}}{4} = 5\ \text{kip}$$

Calculate one side width of embed plate

$b_{embed\_plate} = 3\ \text{in}$ - Anchor embed plate side dimension

$d_a = 0.75\ \text{in}$ - Anchor rod diameter

b' - Remaining embed plate dimension

$$b' = \frac{b_{embed\_plate} - d_a}{2} = \frac{3\ \text{in} - 0.75\ \text{in}}{2} = 1.125\ \text{in}$$

Calculate flexural demand on embed plate (taken as moment per unit length)

$A_{brg} = 8.5582\ \text{in}^2$

m_f - Moment force from uniform pressure

$$m_f = \frac{\left(\frac{T_a}{A_{brg}}\right)(b')^2}{2} = \frac{\left(\frac{5\ \text{kip}}{8.5582\ \text{in}^2}\right) \times (1.125\ \text{in})^2}{2} = 0.36971\ \text{kip}$$

Calculate the minimum embed plate thickness for flexural yielding

The embed plate yield grade is assumed to match the base plate grade.

$F_{y\_ep} = 36\ \text{ksi}$ - Embed plate yield stress (A36)

$\phi = 0.9$ - Flexural resistance factor

t_{min} - Required thickness of embed plate

$$t_{min} = \sqrt{\frac{4m_f}{\phi F_{y\_ep}}} = \sqrt{\frac{4 \times 0.36971\ \text{kip}}{0.9 \times 36\ \text{ksi}}} = 0.21364\ \text{in}$$

Check actual embed plate thickness

t_{actual} - Provided embed plate thickness

$$t_{actual} = t_{embed\_plate} = 0.25\ \text{in}$$

	Result: DCR - Demand over capacity ratio: $$DCR = \frac{t_{min}}{t_{actual}} = \frac{0.21364 \text{ in}}{0.25 \text{ in}} = 0.85457$$	**PASS = 0.85**
	Check No. 7: Concrete Side-Face Blowout Capacity (Y-Direction) **Calculation Note:** Check is not applicable because the effective embedment length (12 in) is less than or equal to 2.5 times the edge distance (20 in).	**N/A = 0.00**
	Check No. 8: Concrete Side-Face Blowout Capacity (Z-Direction) **Calculation Note:** Check is not applicable because the effective embedment length (12 in) is less than or equal to 2.5 times the edge distance (21.25 in).	**N/A = 0.00**

REFERENCES	CALCULATIONS	RESULTS

Summary of Design Checks

Load Combination	Design Check	Demand	Capacity	DCR	Result
1	Weld Capacity	1.03	8.36	0.12	PASS
1	Base Plate Yield Capacity (Tension Load)	14.14	22.19	0.64	PASS
1	Anchor Rod Tensile Capacity	5.00	22.58	0.22	PASS
1	Concrete Breakout Capacity (Tension Load)	20.00	23.58	0.85	PASS
1	Anchor Pullout Capacity	5.00	191.70	0.03	PASS
1	Embed Plate Flexural Capacity	0.21	0.25	0.85	PASS
1	Concrete Side-Face Blowout Capacity (Y-Direction)	0.00	0.00	0.00	N/A
1	Concrete Side-Face Blowout Capacity (Z-Direction)	0.00	0.00	0.00	N/A

The design is adequate!

The governing combination is Load Combination 1.