

Detailed Joint Calculations

Units: N&mm

Regulation: ASCE 41-17

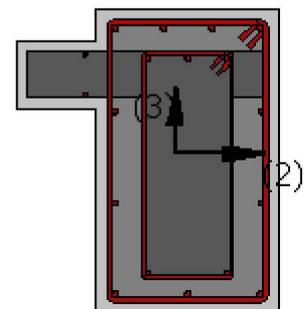
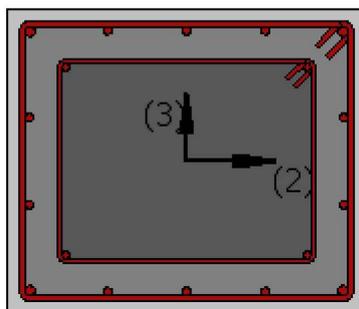
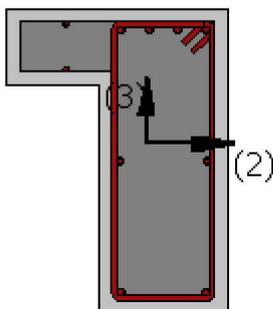
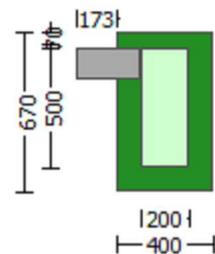
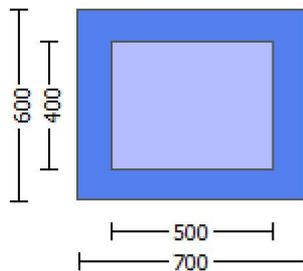
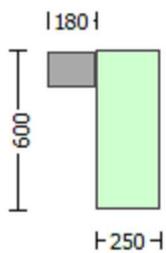
Calculation No. 1

Col. C2 - Beam B1 - Beam B2, Floor : 1

Limit State: Life Safety (data interpolation between analysis steps 3 and 4)

Analysis: Uniform +X

Check: Shear Force



Demanded Shear Force: $V_{jhd} = \text{Max}(V_{jhd1}, V_{jhd2}) = 937442.195$, where V_{jhd1}, V_{jhd2} are calculated for beam 1 and beam 2, respectively, using TBDY, (7.11) and ACI 318-14, 18.8.2.1.

Beam 1:

$V_{jhd1} = 443034.051$

with

$V_{kol} = \text{Min}(V_{kol, \text{above_joint}}, V_{kol, \text{below_joint}}) = 18780.069$

$A_{s1} = 615.7522$

$A_{s2} = 307.8761$

Existing Material: $f_{yd} = f_{s_Lower_bound} = 400.00$

Beam 2:

$V_{jhd2} = 937442.195$

with

$V_{kol} = \text{Min}(V_{kol,above_joint}, V_{kol,below_joint}) = 18780.069$

$(A_{s1} + A_{s2}) * f_{yd} = (A_{s1_jacket} + A_{s2_jacket}) * f_{yd_jacket} + (A_{s1_core} + A_{s2_core}) * f_{yd_core}$

$A_{s1_jacket} = 615.7522$

$A_{s2_jacket} = 461.8141$

$A_{s1_core} = 339.292$

$A_{s2_core} = 226.1947$

New Material: $f_{yd_jacket} = f_{s_Lower_bound_jacket} = 500.00$

Existing Material: $f_{yd_core} = f_{s_Lower_bound_core} = 400.00$

knowledge factor, $= 1.00$

$V_n = \text{Min}(V_{n1}, V_{n2}) = 2.0926E+006$, where

provided Shear Forces are calculated for beam 1 and beam 2, respectively

Beam 1:

Existing Joint: From table 7-7, ASCE 41-17: Final value $V_{n1,R} = *V_{n1} = 2.0926E+006$

$V_{n1} = 2.0926E+006$ from (10.4) ASCE 41-17

with

$f_c = \text{Min}(f_{c_beam}, f_{c_Column}) = 16.00$

Existing Material: $f_{c_column} = f_{c_lower_bound_column} = 16.00$

Existing Material: $f_{c_beam} = f_{c_lower_bound_beam} = 16.00$

$A_j = = 315000.00$

$h_c = 700.00$

$b_j = 450.00$

column width = 600.00

beam width plus joint depth = 950.00

Min perpendicular distance of beam axis to column sides = 225.00

= 20.00, from table 10-12, ASCE 41-17)

column hoops spacing = 100.00

Beam 2:

Existing Joint: From table 7-7, ASCE 41-17: Final value $V_{n1,R} = *V_{n1} = 2.7901E+006$

$V_{n1} = 2.7901E+006$ from (10.4) ASCE 41-17

with

$f_c = \text{Min}(f_{c_beam}, f_{c_Column}) = 16.00$

Existing Material: $f_{c_column} = f_{c_lower_bound_column} = 16.00$

Existing Material: $f_{c_beam} = f_{c_lower_bound_beam} = 16.00$

$A_j = = 419999.999$

$h_c = 700.00$

$b_j = 600.00$

column width = 600.00

beam width plus joint depth = 1100.00

Min perpendicular distance of beam axis to column sides = 300.00

= 20.00, from table 10-12, ASCE 41-17)

column hoops spacing = 100.00

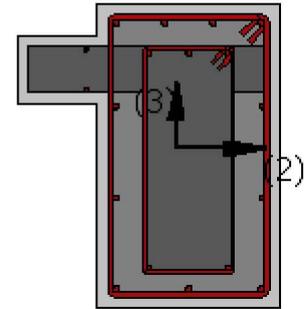
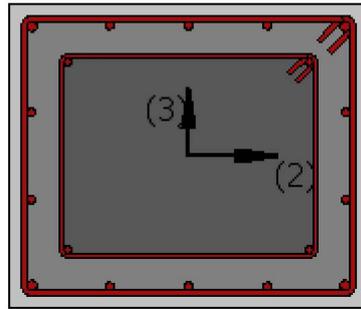
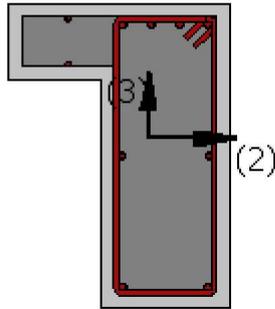
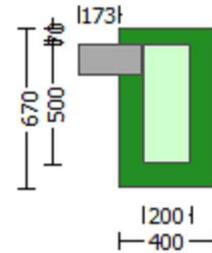
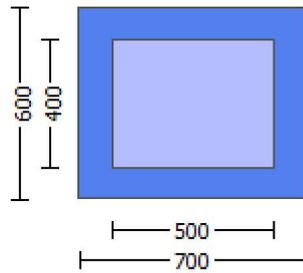
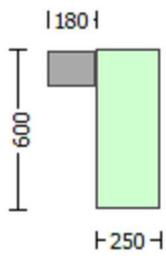
Calculation No. 2

Col. C2 - Beam B1 - Beam B2, Floor : 1

Limit State: Collapse Prevention (data interpolation between analysis steps 4 and 5)

Analysis: Uniform +X

Check: Shear Force



Demanded Shear Force: $V_{jhd} = \text{Max}(V_{jhd1}, V_{jhd2}) = 933580.149$, where V_{jhd1}, V_{jhd2} are calculated for beam 1 and beam 2, respectively, using TBDY, (7.11) and ACI 318-14, 18.8.2.1.

Beam 1:

$$V_{jhd1} = 439172.005$$

with

$$V_{kol} = \text{Min}(V_{kol, \text{above_joint}}, V_{kol, \text{below_joint}}) = 22642.115$$

$$A_{s1} = 615.7522$$

$$A_{s2} = 307.8761$$

$$\text{Existing Material: } f_{yd} = f_{s_Lower_bound} = 400.00$$

Beam 2:

$$V_{jhd2} = 933580.149$$

with

$$V_{kol} = \text{Min}(V_{kol, \text{above_joint}}, V_{kol, \text{below_joint}}) = 22642.115$$

$$(A_{s1} + A_{s2}) * f_{yd} = (A_{s1_jacket} + A_{s2_jacket}) * f_{yd_jacket} + (A_{s1_core} + A_{s2_core}) * f_{yd_core}$$

$$A_{s1_jacket} = 615.7522$$

$$A_{s2_jacket} = 461.8141$$

$$A_{s1_core} = 339.292$$

$$A_{s2_core} = 226.1947$$

$$\text{New Material: } f_{yd_jacket} = f_{s_Lower_bound_jacket} = 500.00$$

$$\text{Existing Material: } f_{yd_core} = f_{s_Lower_bound_core} = 400.00$$

 knowledge factor, $\phi = 1.00$

$V_n = \text{Min}(V_{n1}, V_{n2}) = 2.0926E+006$, where provided Shear Forces are calculated for beam 1 and beam 2, respectively

Beam 1:

Existing Joint: From table 7-7, ASCE 41-17: Final value $V_{n1,R} = \phi V_{n1} = 2.0926E+006$

$$V_{n1} = 2.0926E+006 \text{ from (10.4) ASCE 41-17}$$

with

$$f_c = \text{Min}(f_{c_beam}, f_{c_Column}) = 16.00$$

$$\text{Existing Material: } f_{c_column} = f_{c_lower_bound_column} = 16.00$$

$$\text{Existing Material: } f_{c_beam} = f_{c_lower_bound_beam} = 16.00$$

$$A_j = 315000.00$$

$$h_c = 700.00$$

$$b_j = 450.00$$

$$\text{column width} = 600.00$$

$$\text{beam width plus joint depth} = 950.00$$

$$\text{Min perpendicular distance of beam axis to column sides} = 225.00$$

$$= 20.00, \text{ from table 10-12, ASCE 41-17}$$

$$\text{column hoops spacing} = 100.00$$

Beam 2:

Existing Joint: From table 7-7, ASCE 41-17: Final value $V_{n1,R} = *V_{n1} = 2.7901E+006$

$V_{n1} = 2.7901E+006$ from (10.4) ASCE 41-17

with

$f_c = \text{Min}(f_{c_beam}, f_{c_Column}) = 16.00$

Existing Material: $f_{c_column} = f_{c_lower_bound_column} = 16.00$

Existing Material: $f_{c_beam} = f_{c_lower_bound_beam} = 16.00$

$A_j = 419999.999$

$h_c = 700.00$

$b_j = 600.00$

column width = 600.00

beam width plus joint depth = 1100.00

Min perpendicular distance of beam axis to column sides = 300.00

= 20.00, from table 10-12, ASCE 41-17)

column hoops spacing = 100.00