# RCDC (SACD) V09.02.00

**Release Notes**

**RCDC V09.02.00** is here with new features enhancing the design. The newly introduced features are:

| No | Module | Description |
|---|---|---|
| 1 | Column | Gravity Column Design as per IS 13920-2016 & ACI 318 |
| 2 | Column | Euro Code Column Design Enhancements |
| 3 | General | Database Transformation to SQLite |
| 4 | General | Enhancements |
| 5 | General | Defects - Resolved |

# RCDC (SACD) V09.02.00

**Column** **Gravity Column Design as per IS 13920-2016 & ACI 318**

RCDC can now support design of Gravity Columns along with Lateral Columns as per 'Ductile Design (Seismic Detailing)' norms and performs the design accordingly. Gravity column design is conforming to following design codes,

- IS 456+13920-2016
- ACI 318M-2011
- ACI 318M-2014
- ACI318-2011
- ACI 318-2014

RCDC can import three different type of Analysis file i.e. STAAD file, RAM SS File and ETABS File. So, following will be the nature of handling columns for each type of analysis file:

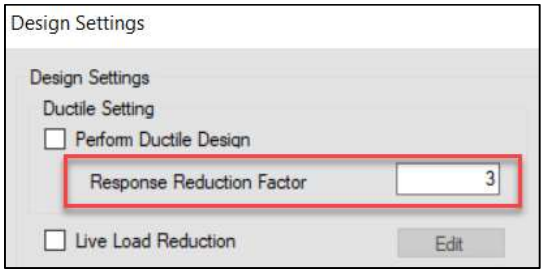
- When a STAAD or an ETABS file is imported in RCDC, and user opts to design for Ductility, by Default all the columns will be set to be designed as Lateral Frame Columns.
- When a RAM SS file is imported in RCDC, and user opts to design for Ductility, the frame type of columns (Gravity or Lateral) that will be defined in RAM File will be automatically assigned to each column.

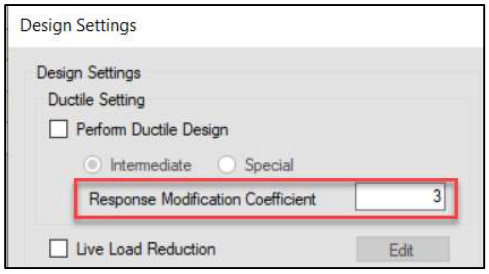
User will be however be allowed to change the Frame type of any column in RCDC itself. For ease of identification, Different types of columns will be represented with different shade of colours in UI.

In case of STAAD and E-Tabs, it may be noted that, effect of 'Gravity Column' intended in analysis must be managed by user with relevant releases etc. In RCDC, the design is handled as per provisions of Gravity Columns for Gravity loads and displacement computability.

An additional input for Response Reduction Factor for Indian code and Response Modification Coefficient for ACI code is required for calculation of additional moment in Gravity column to cater for displacement computability during lateral loads.

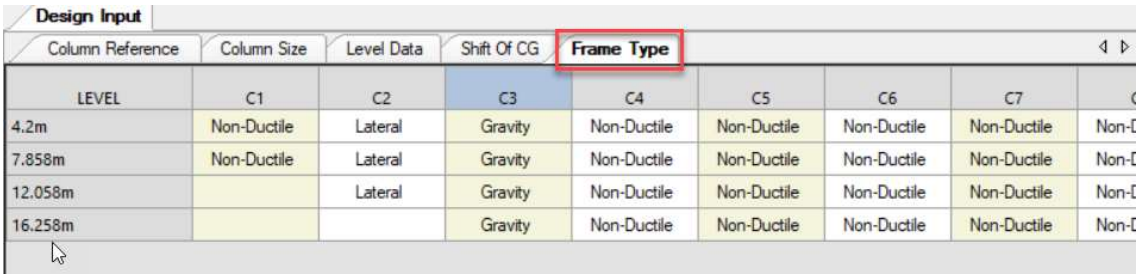
# RCDC (SACD) V09.02.00



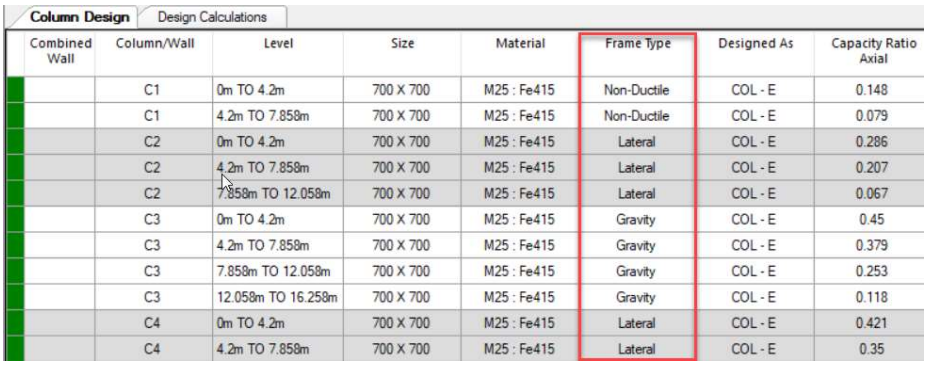

**IS Code** **ACI Code**

New tab is added as Frame type in Design Input, where user can define the type of frame,

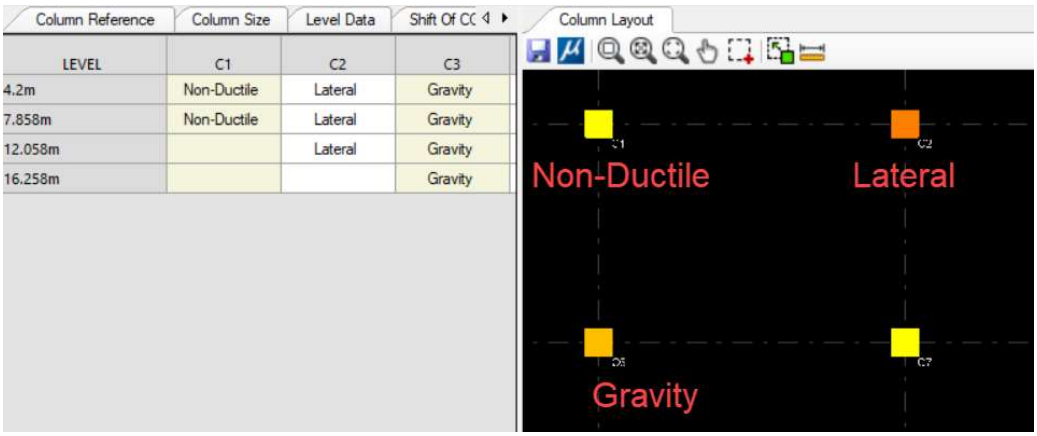



| LEVEL | C1 | C2 | C3 | C4 | C5 | C6 | C7 |
|---|---|---|---|---|---|---|---|
| 4.2m | Non-Ductile | Lateral | Gravity | Non-Ductile | Non-Ductile | Non-Ductile | Non-Ductile |
| 7.858m | Non-Ductile | Lateral | Gravity | Non-Ductile | Non-Ductile | Non-Ductile | Non-Ductile |
| 12.058m | | Lateral | Gravity | Non-Ductile | Non-Ductile | Non-Ductile | Non-Ductile |
| 16.258m | | | Gravity | Non-Ductile | Non-Ductile | Non-Ductile | Non-Ductile |

In output display, new column is added for Frame type,




| Combined Wall | Column/Wall | Level | Size | Material | Frame Type | Designed As | Capacity Ratio Axial |
|---|---|---|---|---|---|---|---|
| | C1 | 0m TO 4.2m | 700 X 700 | M25 : Fe415 | Non-Ductile | COL - E | 0.148 |
| | C1 | 4.2m TO 7.858m | 700 X 700 | M25 : Fe415 | Non-Ductile | COL - E | 0.079 |
| | C2 | 0m TO 4.2m | 700 X 700 | M25 : Fe415 | Lateral | COL - E | 0.286 |
| | C2 | 4.2m TO 7.858m | 700 X 700 | M25 : Fe415 | Lateral | COL - E | 0.207 |
| | C2 | 7.858m TO 12.058m | 700 X 700 | M25 : Fe415 | Lateral | COL - E | 0.067 |
| | C3 | 0m TO 4.2m | 700 X 700 | M25 : Fe415 | Gravity | COL - E | 0.45 |
| | C3 | 4.2m TO 7.858m | 700 X 700 | M25 : Fe415 | Gravity | COL - E | 0.379 |
| | C3 | 7.858m TO 12.058m | 700 X 700 | M25 : Fe415 | Gravity | COL - E | 0.253 |
| | C3 | 12.058m TO 16.258m | 700 X 700 | M25 : Fe415 | Gravity | COL - E | 0.118 |
| | C4 | 0m TO 4.2m | 700 X 700 | M25 : Fe415 | Lateral | COL - E | 0.421 |
| | C4 | 4.2m TO 7.858m | 700 X 700 | M25 : Fe415 | Lateral | COL - E | 0.35 |




Bentley
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# RCDC (SACD) V09.02.00

Following are some design Output from RCDC,

Design Summary,

**Load Combinations :**

| | |
|---|---|
| 1 | 1.5 (LOAD 1: LOAD CASE 1) +1.5 (LOAD 2: LOAD CASE 2) |
| 2 | 1.2 (LOAD 1: LOAD CASE 1) +1.2 (LOAD 2: LOAD CASE 2) +1.2 (LOAD 3: LOAD CASE 3 EQ-X) |
| 3 | 1.2 (LOAD 1: LOAD CASE 1) +1.2 (LOAD 2: LOAD CASE 2) -1.2 (LOAD 3: LOAD CASE 3 EQ-X) |
| 4 | 1.2 (LOAD 1: LOAD CASE 1) +1.2 (LOAD 2: LOAD CASE 2) +1.2 (LOAD 4: LOAD CASE 4 EQ-Y) |
| 5 | 1.2 (LOAD 1: LOAD CASE 1) +1.2 (LOAD 2: LOAD CASE 2) -1.2 (LOAD 4: LOAD CASE 4 EQ-Y) |
| 6 | 1.5 (LOAD 1: LOAD CASE 1) +1.5 (LOAD 3: LOAD CASE 3 EQ-X) |
| 7 | 1.5 (LOAD 1: LOAD CASE 1) -1.5 (LOAD 3: LOAD CASE 3 EQ-X) |
| 8 | 1.5 (LOAD 1: LOAD CASE 1) +1.5 (LOAD 4: LOAD CASE 4 EQ-Y) |
| 9 | 1.5 (LOAD 1: LOAD CASE 1) -1.5 (LOAD 4: LOAD CASE 4 EQ-Y) |
| 10 | 0.9 (LOAD 1: LOAD CASE 1) +1.5 (LOAD 3: LOAD CASE 3 EQ-X) |
| 11 | 0.9 (LOAD 1: LOAD CASE 1) -1.5 (LOAD 3: LOAD CASE 3 EQ-X) |
| 12 | 0.9 (LOAD 1: LOAD CASE 1) +1.5 (LOAD 4: LOAD CASE 4 EQ-Y) |
| 13 | 0.9 (LOAD 1: LOAD CASE 1) -1.5 (LOAD 4: LOAD CASE 4 EQ-Y) |
| 14 | 1.5 (LOAD 1: LOAD CASE 1) +1.5 (LOAD 2: LOAD CASE 2) +3 x Drift- (LOAD 3: LOAD CASE 3 EQ-X) |
| 15 | 1.5 (LOAD 1: LOAD CASE 1) +1.5 (LOAD 2: LOAD CASE 2) +3 x Drift- (LOAD 4: LOAD CASE 4 EQ-Y) |
| 16 | 1.5 (LOAD 1: LOAD CASE 1) +1.5 (LOAD 2: LOAD CASE 2) -3 x Drift- (LOAD 3: LOAD CASE 3 EQ-X) |
| 17 | 1.5 (LOAD 1: LOAD CASE 1) +1.5 (LOAD 2: LOAD CASE 2) -3 x Drift- (LOAD 4: LOAD CASE 4 EQ-Y) |

**Levels :**

| | |
|---|---|
| 1 | FOUNDATION |
| 2 | 4.2m |
| 3 | 7.858m |
| 4 | 12.058m |
| 5 | 16.258m |

Column/Wall : **C1** FrameType : **Non-Ductile**

| Level | Size (mm) | Material | LC | P (kN) | Mx (kNm) | My (kNm) | Pt (%) | Interaction Ratio | Main Reinforcement | Links |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 TO 2 | 700 X 700 | M25 : Fe415 | 12 | 275.04 | -28.06 | 205.81 | 0.46 | 0.64 | 20-T12 | T8 @ 175 |
| 2 TO 3 | 700 X 700 | M25 : Fe415 | 7 | 346.52 | 338.51 | 101.27 | 0.53 | 0.93 | 4-T16 + 16-T12 | T8 @ 175 |

# RCDC (SACD) V09.02.00

## All Load Combination Data

### DESIGN DATA FOR ALL LOAD COMBINATIONS

**Load Combinations:**

1 1.5 (LOAD 1: LOAD CASE 1) +1.5 (LOAD 2: LOAD CASE 2)
2 1.2 (LOAD 1: LOAD CASE 1) +1.2 (LOAD 2: LOAD CASE 2) +1.2 (LOAD 3: LOAD CASE 3 EQ-X)
3 1.2 (LOAD 1: LOAD CASE 1) +1.2 (LOAD 2: LOAD CASE 2) -1.2 (LOAD 3: LOAD CASE 3 EQ-X)
4 1.2 (LOAD 1: LOAD CASE 1) +1.2 (LOAD 2: LOAD CASE 2) +1.2 (LOAD 4: LOAD CASE 4 EQ-Y)
5 1.2 (LOAD 1: LOAD CASE 1) +1.2 (LOAD 2: LOAD CASE 2) -1.2 (LOAD 4: LOAD CASE 4 EQ-Y)
6 1.5 (LOAD 1: LOAD CASE 1) +1.5 (LOAD 3: LOAD CASE 3 EQ-X)
7 1.5 (LOAD 1: LOAD CASE 1) -1.5 (LOAD 3: LOAD CASE 3 EQ-X)
8 1.5 (LOAD 1: LOAD CASE 1) +1.5 (LOAD 4: LOAD CASE 4 EQ-Y)
9 1.5 (LOAD 1: LOAD CASE 1) -1.5 (LOAD 4: LOAD CASE 4 EQ-Y)
10 0.9 (LOAD 1: LOAD CASE 1) +1.5 (LOAD 3: LOAD CASE 3 EQ-X)
11 0.9 (LOAD 1: LOAD CASE 1) -1.5 (LOAD 3: LOAD CASE 3 EQ-X)
12 0.9 (LOAD 1: LOAD CASE 1) +1.5 (LOAD 4: LOAD CASE 4 EQ-Y)
13 0.9 (LOAD 1: LOAD CASE 1) -1.5 (LOAD 4: LOAD CASE 4 EQ-Y)
14 1.5 (LOAD 1: LOAD CASE 1) +1.5 (LOAD 2: LOAD CASE 2) +3 x Drift- (LOAD 3: LOAD CASE 3 EQ-X)
15 1.5 (LOAD 1: LOAD CASE 1) +1.5 (LOAD 2: LOAD CASE 2) +3 x Drift- (LOAD 4: LOAD CASE 4 EQ-Y)
16 1.5 (LOAD 1: LOAD CASE 1) +1.5 (LOAD 2: LOAD CASE 2) -3 x Drift- (LOAD 3: LOAD CASE 3 EQ-X)
17 1.5 (LOAD 1: LOAD CASE 1) +1.5 (LOAD 2: LOAD CASE 2) -3 x Drift- (LOAD 4: LOAD CASE 4 EQ-Y)

| | | | |
|---|---|---|---|
| Column/Wall | : | **C3** | |
| Level | : | 0m To 4.2m | |
| Frame Type | : | Gravity | |
| Design Code | = | IS 456 + IS 13920 - 2016 | |
| Grade of Concrete | = | 25 | N/sqmm |
| Grade of Steel | = | 415 | N/sqmm |
| Column B | = | 700 | mm |
| Column D | = | 700 | mm |
| Clear Cover | = | 50 | mm |
| Pt | = | 0.82 | % |

**Design Table :**

| Member | LOC | L/C | Pu | Analysis | | Min ECC | | Slenderness | | Design | | | MCap | Capacity Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Mx | My | Mx | My | Mx | My | Mux | Muy | MuRes | | |
| | | | (kN) | (kNm) | (kNm) | (kNm) | (kNm) | (kNm) | (kNm) | (kNm) | (kNm) | (kNm) | (kNm) | |
| 201 | BOT | 1(a) | 2476.25 | 6.24 | -17.21 | 74.62 | - | 0 | 0 | 74.62 | -17.21 | 76.58 | 717.24 | 0.11 |
| 201 | | 1(b) | 2476.25 | 6.24 | -17.21 | - | 74.62 | 0 | 0 | 6.24 | -74.62 | 74.88 | 737.94 | 0.1 |
| 201 | TOP | 8(a) | 1788.48 | 6.34 | -77.43 | 53.89 | - | 0 | 0 | 53.89 | -77.43 | 94.34 | 647.72 | 0.15 |
| 201 | | 8(b) | 1788.48 | 6.34 | -77.43 | - | 53.89 | 0 | 0 | 6.34 | -77.43 | 77.69 | 719.03 | 0.11 |
| 201 | BOT | 9(a) | **2393.85** | 17.89 | -233.57 | 72.13 | - | 0 | 0 | 72.13 | -233.57 | 244.45 | 705.28 | 0.35 |
| 201 | | 9(b) | **2393.85** | 17.89 | -233.57 | - | 72.13 | 0 | 0 | 17.89 | -233.57 | 234.25 | 739.16 | 0.32 |
| 201 | TOP | 9(a) | 2316.65 | -7.52 | 112.14 | 69.81 | - | 0 | 0 | -69.81 | 112.14 | 132.09 | 664.02 | 0.2 |
| 201 | | 9(b) | 2316.65 | -7.52 | 112.14 | - | 69.81 | 0 | 0 | -7.52 | 112.14 | 112.39 | 740.58 | 0.15 |
| 201 | BOT | 13(a) | 1541.95 | 15.76 | -228.38 | 46.46 | - | 0 | 0 | 46.46 | -228.38 | 233.06 | 686.78 | 0.34 |
| 201 | | 13(b) | 1541.95 | 15.76 | -228.38 | - | 46.46 | 0 | 0 | 15.76 | -228.38 | 228.93 | 700.78 | 0.33 |
| 201 | TOP | 13(a) | 1495.62 | -7.29 | 105.2 | 45.07 | - | 0 | 0 | -45.07 | 105.2 | 114.45 | 655.08 | 0.17 |
| 201 | | 13(b) | 1495.62 | -7.29 | 105.2 | - | 45.07 | 0 | 0 | -7.29 | 105.2 | 105.45 | 696.44 | 0.15 |

**Gravity Load Combination :**

| Member | LOC | L/C | Pu | Analysis | | Storey Drift | | Addtional Moment | | Design | | | Mcap | Capacity Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Mx | My | Δx | Δy | Mx | My | Mux | Muy | MuRes | | |
| | | | (kN) | (kNm) | (kNm) | (mm) | (mm) | (kNm) | (kNm) | (kNm) | (kNm) | (kNm) | (kNm) | |
| 201 | BOT | 14(a) | 2476.25 | 6.24 | -17.21 | 1.14 | 0.02 | 8.49 | 0.18 | 14.73 | -17.03 | 22.52 | 649.01 | 0.03 |
| 201 | TOP | 14(a) | 2399.04 | -0.66 | 21.74 | 1.14 | 0.02 | 8.23 | 0.18 | 7.57 | 21.92 | 23.19 | 699.66 | 0.03 |
| 201 | BOT | 15(a) | 2476.25 | 6.24 | -17.21 | 0 | 0.95 | 0.03 | 7.05 | 6.28 | -10.17 | 11.95 | 663.67 | 0.02 |
| 201 | TOP | 15(a) | **2399.04** | -0.66 | 21.74 | 0 | 0.95 | 0.03 | 6.83 | -0.63 | 28.57 | 28.58 | 745.59 | 0.04 |
| 201 | BOT | 16(a) | 2476.25 | 6.24 | -17.21 | 1.14 | 0.02 | -8.49 | -0.18 | -2.25 | -17.4 | 17.54 | 731.88 | 0.02 |
| 201 | TOP | 16(a) | 2399.04 | -0.66 | 21.74 | 1.14 | 0.02 | -8.23 | -0.18 | -8.89 | 21.56 | 23.32 | 689.48 | 0.03 |
| 201 | BOT | 17(a) | 2476.25 | 6.24 | -17.21 | 0 | 0.95 | -0.03 | -7.05 | 6.21 | -24.26 | 25.04 | 713.16 | 0.04 |
| 201 | TOP | 17(a) | 2399.04 | -0.66 | 21.74 | 0 | 0.95 | -0.03 | -6.83 | -0.7 | 14.91 | 14.93 | 742.78 | 0.02 |

# RCDC (SACD) V09.02.00

## Design Calculation, Flexural Check

**Flexure Design (Displacement Compatibility)**

| | | | |
|---|---|---|---|
| Load Combination | = | [15] : 1.5 (LOAD 1: LOAD CASE 1) +1.5 (LOAD 2: LOAD CASE 2) +3 x Drift- (LOAD 4: LOAD CASE 4 EQ-Y) | |
| Critical Location | = | Top Joint | |
| Pu | = | 2399.04 | kN |
| Mx | = | -0.66 | kNm |
| My | = | 21.74 | kNm |
| Drift Along X (Δx) | = | 0 | mm |
| Drift Along Y (Δy) | = | 0.95 | mm |
| Additional Moment along X ($Mux_{add}$) | = | 0.03 | kNm |
| Additional Moment along Y ($Muy_{add}$) | = | 6.83 | kNm |
| Mux | = | -0.63 | kNm |
| Muy | = | 28.57 | kNm |

**Resultant Moment (Combined Action)**

**Moment Capacity Check**

| | | | |
|---|---|---|---|
| Pt Calculated | = | 0.46 | |
| Reinforcement Provided | = | 20-T12 | |
| Load Angle | = | $Tan^{-1}$(Muy/Mux) | |
| | = | 88.74 | deg |
| MRes | = | 28.58 | kNm |
| MCap | = | 621.44 | kNm |
| Capacity Ratio | = | MRes/ MCap | |
| | = | 0.05 <= 1 | |

## Design Calculation, Shear Check

**Shear Design (Displacement Compatibility)**

**Design for shear along D**

| | | | |
|---|---|---|---|
| Critical Load Combination | = | [15] : 1.5 (LOAD 1: LOAD CASE 1) +1.5 (LOAD 2: LOAD CASE 2) +3 x Drift- (LOAD 4: LOAD CASE 4 EQ-Y) | |
| Design shear force, Vuy | = | 1.6442 | kN |
| Pu | = | 2476.25 | kN |
| Drift Along X (Δx) | = | 0 | mm |
| Drift Along Y (Δy) | = | 0.95 | mm |
| Additional Moment along Y ($Muy_{add}$) | = | 7.05 | kNm |
| Additional Shear Y | = | 1.68 | kN |
| Total Shear, Vuy | = | 3.32 | kN |
| Deff | = | 644 | mm |
| Design shear stress, Tvy | = | Vuy / (Bx Deff) | N/sqmm |
| | = | 0.0074 | N/sqmm |
| Pt | = | 0.231 | % |
| Design shear strength, Tc | = | 0.3523 | N/sqmm |
| Shear Strength Enhancement Factor | = | 1 + 3 x Pu / ( B x D x Fck) | |
| | = | 1.6064 | |
| Shear Strength Enhancement Factor (max) | = | 1.5 | |
| Shear Strength Enhancement Factor | = | 1.5 | |
| Enhanced shear strength, Tc-e | = | 0.5284 | N/sqmm |
| Design shear check | = | Tvy < Tc x Enhancement factor | |

**Link for Shear Design along D are not required**

# RCDC (SACD) V09.02.00

Design of Links as per stress level for Gravity Load combinations,

**Design Of Links**

Links in the zone where special confining links are not required

Normal Links

| | | | |
|---|---|---|---|
| Diameter of link | = | 8 | mm |
| | > | Max. longitudinal bar dia / 4 | |
| | = | 4 | mm |

Criterion for spacing of normal links

| | | | |
|---|---|---|---|
| Min. Longitudinal Bar dia X 16 | = | 256 | mm |
| Min. dimension of column | = | 700 | mm |
| Max. 300 mm | = | 300 | mm |
| Least lateral edge dimension/2 | = | 350 | |

**Check for Links**

| | | | |
|---|---|---|---|
| Critical Load Combination | = | [14] : 1.5 (LOAD 1: LOAD CASE 1) +1.5 (LOAD 2: LOAD CASE 2) +3 | |
| Pu | = | 2476.25 | kN |
| Actual Axial Stress | = | Pu /(B x D) | |
| | = | 5.05 | N/sqmm |
| Threshold Axial Stress | = | 0.4 x fck | |
| | = | 10 | N/sqmm |
| | = | 5.05 < 10 Non Ductile links are applicable | |

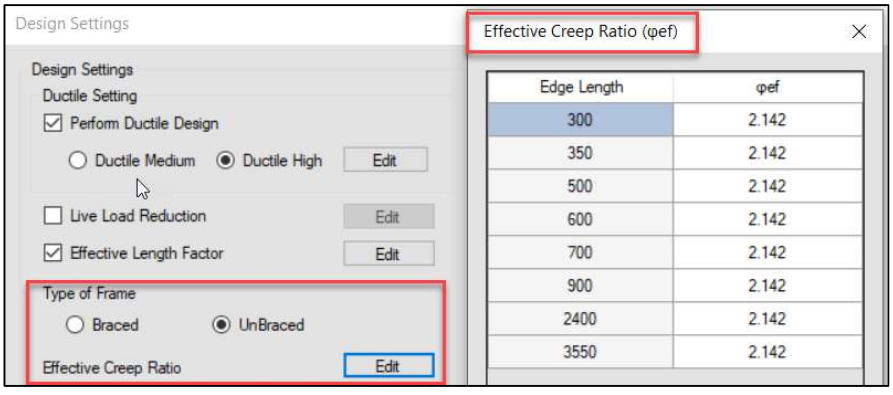
**Criterion for spacing**

| | | | |
|---|---|---|---|
| 6 x Smallest Longitudinal Bar Dia | = | 96 | mm |
| Maximum Spacing | = | 150 | mm |
| Provided spacing | = | 75 | mm |

Links to be Provided along full height of Column

## Column — Euro Code Column Design Enhancements

Column design as per Euro Code has been updated with some additional inputs from users. In the earlier version's effective length factor and some constant required for slenderness check had been assumed. Now the values for øef and the input for 'Type of frame' could be modified by user in RCDC.




Presentation of calculations in the report is improved. Sample design calculation report is as below,

# RCDC (SACD) V09.02.00

**Calculation of SLENDERNESS CHECK**

| | Along D | Along B |
|---|---|---|
| Crtical Load Combination | [5] : 1.35 (LOAD 1: LOAD CASE 1) +1.5 (LOAD 2: LOAD CASE 2) -(LOAD 4: LOAD CASE 4 EQ-Y) | [5] : 1.35 (LOAD 1: LOAD CASE 1) +1.5 (LOAD 2: LOAD CASE 2) -(LOAD 4: LOAD CASE 4 EQ-Y) |
| Ned (kN) | 2439.33 | 2439.33 |
| Mo1 (kNm) | 5.23 | 83.2 |
| Mo2 (kNm) | 14.07 | 162.99 |
| Radius of Gyration (i) (mm) | 173.41 | 173.41 |
| Φef | 2.14 | 2.14 |
| A = 1 / ( 1 + 0.2 x Φ ef) | 0.7 | 0.7 |
| B = Sqrt (1 + 2 ω) | 1.12 | 1.12 |
| rm = Mo1 / Mo2 | -0.37 | -0.51 |
| C = 1.7 - rm | 2.07 | 2.21 |
| n = Ned / (B x D x fcd) | 0.4066 | 0.4066 |
| Slenderness ratio ( λ ) = lo / i | 52.76 | 52.76 |
| Permissible Limits ( λ lim ) = A x B x C / sqrt (n) | 50.9 | 54.35 |
| | Hence, Column is Slender | Hence, Column is not Slender |

**Calculation of Slenderness Moment**

| | Along D | Along B |
|---|---|---|
| nu = 1 + ω | 1.13 | --- |
| nbal | 0.4 | --- |
| Kr = Min ((nu - n)/(nu - nbal), 1) | 0.99 | --- |
| c (Constant) | 10 | --- |
| Is (mm) | 173.41 | --- |
| deff, slenderness = (D' / 2) + Is (mm) | 274.58 | --- |
| β = 0.35 + fck / 200 - λ / 150 | 0.098 | --- |
| 1 / ro = fyd /Es x (0.45 x deff, slenderness) x 10 ^ - 5 | 1.7 | --- |
| K φ = Max ((1 + β x Φ ef) , 1) | 1.21 | --- |
| 1 / r = Kr x k φ x ( 1 / ro ) x 10 ^ - 5 | 2.04 | --- |
| e2 = (1 / r) x (lo ^ 2 / c) (mm) | 170.68 | --- |
| Moe = 0.4 x Min (top, bottom) + 0.6 x Max (top, bottom) (kNm) | 64.37 | --- |
| M2 = e2 x Ned (kNm) | 416.34 | --- |
| Mid Moment = Moe + M2 (kNm) | 480.71 | --- |

## General *Database Transformation to SQLite*

RCDC used PostgreSQL as Database to save the entire Project Data / information.
We have now enhanced the Database type from Postgres to SQLite.
This would help stabilize the installation related issues and eliminate need of external database.
The internal Design and Detail Functionalities remain same as the earlier versions of RCDC. This transformation has NO Impact on any Design or Detail for any Module in RCDC other than enhancements in this release.

# RCDC (SACD) V09.02.00

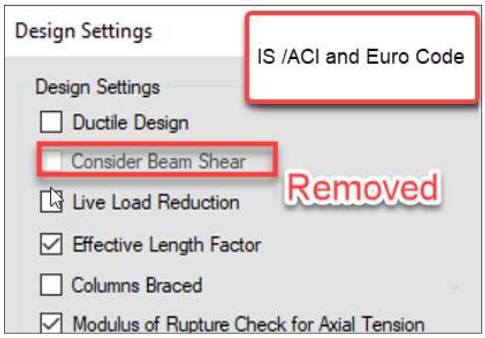
## General Enhancements

Following are the Enhancements are done in this release.

- **TFS ID – 1050918**

  Consider beam shear option for ductile design is now mandatory in IS, ACI and Euro codes.

  The option of Beam shear is now removed from design settings of column design. As per codes, it is part of Ductile design, thus now onwards the check related to beam shear will be performed in RCDC.




- **TFS ID – 1063418**

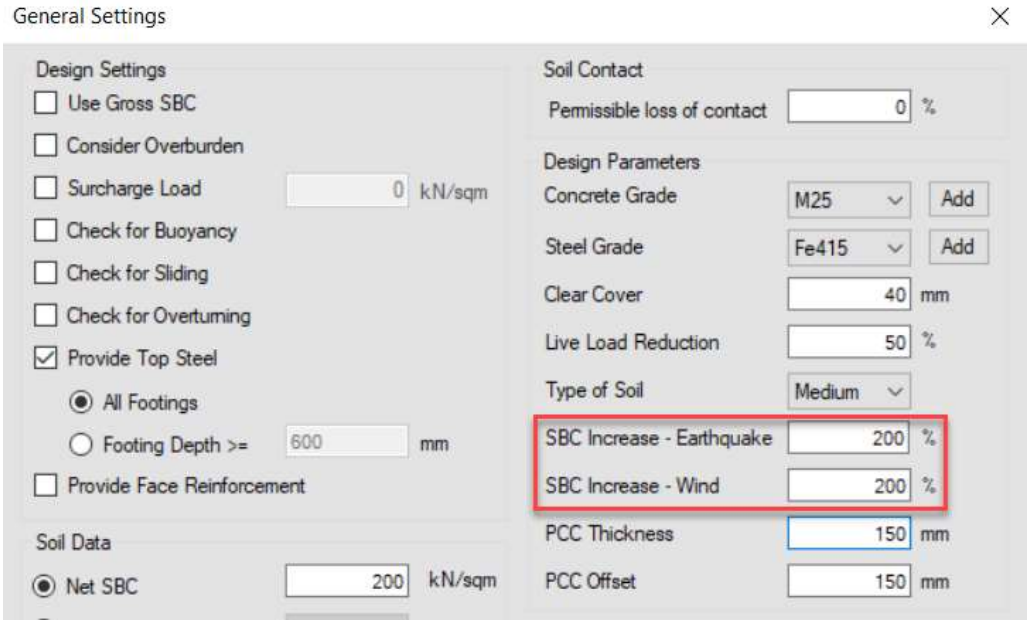
  φVc in ACI Beam design for special frame type has been considered as Zero. The capacity of the concrete in case of Special frame has been ignored.

| For Transverse Reinf | | | |
|---|---|---|---|
| | Left | Mid | Right |
| Critical L/C - RCDC | 5 | 4 | 4 |
| PtPrv (%) | 0.694 | 0.174 | 0.694 |
| Vu (kN) | 215.69 | 156.22 | 235.41 |
| Mu-Sect (kNm) | 355.79 | 30.03 | 432.53 |
| $V^{D+L}$ (kN) | 163.47 | 0 | 161.83 |
| Mh (kNm) | 693.53 | 0 | 693.53 |
| Ms (kNm) | 234.62 | 0 | 367.59 |
| Sway-Right (kN) | 36.32 | 0 | 288.98 |
| Sway-Left (kN) | 308.82 | 0 | 16.48 |
| Vu-Sway (kN) | 308.82 | 0 | 288.98 |
| Vud (kN) | 308.82 | 0 | 288.98 |
| Φ Vc (kN) | 0 | 0 | 0 |
| Vs (kN) | 359.48 | 260.37 | 392.35 |
| Av (sqmm/m) | 1172.46 | 849.2 | 1279.68 |
| Tu (kNm) | 1.41 | 1.46 | 1.46 |
| Aoh (sqmm) | - | - | - |
| At (sqmm/m) | - | - | - |
| Legs | 2 | 2 | 2 |
| Stirrup Rebar | 10 | 10 | 10 |
| At Torsion (sqmm/m) | 0 | 0 | 0 |
| Av Total Reqd (sqmm/m) | 1172.46 | 849.2 | 1279.68 |
| Asv Reqd (sqmm/m) | 1678.76 | 849.2 | 1570.87 |
| SCalc (mm) | 75 | 165 | 75 |
| SPrv (mm) | 75 | 165 | 75 |
| Av Total Prv (sqmm/m) | 1890.13 | 859.15 | 1890.13 |

# RCDC (SACD) V09.02.00

- **TFS ID – 1077894**

  Option of Providing SBC increased up to 200% for Earthquake and Wind load combinations. This is applicable to all design codes and applicable for Footing and pile-cap design.




This has been added to cater for specific cases reported by user, where permissible SBC for gravity loads is very low compared to the same for Load combinations with lateral loads.

## General Defects

- **TFS ID – 1069329**

  Joint check In Column design - Beam orientation with respect to column major axis was not considered correctly in a few cases.

  Issue has been resolved and correct orientation is considered in design for all possible conditions.

**Check At Beam-Column Joints:**

**1. Flexure Strength Of Joint:**

**Moment Capacity Calculations for Beam**

| Beam Size | Beam angle w.r.t. column Ly | Torsion moment | Moment Capacity Beam at Top | | | | Moment Capacity Beam at Bottom | | | | Resultant Moment | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | (deg) | (kNm) | Mu (kNm) | Ast Req (sqmm) | Ast Pro (sqmm) | Mu Cap (kNm) | Mu (kNm) | Ast Req (sqmm) | Ast Pro (sqmm) | Mu Cap (kNm) | Top @ D (kNm) | Top @ B (kNm) | Bot @ D (kNm) | Bot @ B (kNm) |
| 400 x 700 | 0 | 0 | 313.47 | 1489.55 | 1570.8 | 328.64 | 62.44 | 746.02 | 804.24 | 177.55 | 328.64 | 0 | 177.55 | 0 |
| 400 x 700 | 90 | 0 | 310.21 | 1472.23 | 1570.8 | 328.64 | 177.54 | 804.19 | 804.24 | 177.55 | 0 | 328.64 | 0 | 177.55 |
| 400 x 700 | 180 | 0 | 313.47 | 1489.55 | 1570.8 | 328.64 | 62.44 | 746.02 | 804.24 | 177.55 | 328.64 | 0 | 177.55 | 0 |
| 400 x 700 | 270 | 0 | 310.21 | 1472.23 | 1570.8 | 328.64 | 177.54 | 804.19 | 804.24 | 177.55 | 0 | 328.64 | 0 | 177.55 |

# RCDC (SACD) V09.02.00

- **TFS ID – 1069337**

  Joint check In Column design - beam top end moment was incorrectly considered only if beam consists of more than one member in STAAD.

  Now the correct top moment is considered in the calculation of Ast required and Beam capacity is calculated accordingly.

**Check At Beam-Column Joints:**

**1. Flexure Strength Of Joint:**

**Moment Capacity Calculations for Beam**

| Beam Size | Beam angle w.r.t. column Ly | Torsion moment | Moment Capacity Beam at Top | | | | Moment Capacity Beam at Bottom | | | | Resultant Moment | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | (deg) | (kNm) | Mu (kNm) | Ast Req (sqmm) | Ast Pro (sqmm) | Mu Cap (kNm) | Mu (kNm) | Ast Req (sqmm) | Ast Pro (sqmm) | Mu Cap (kNm) | Top @ D (kNm) | Top @ B (kNm) | Bot @ D (kNm) | Bot @ B (kNm) |
| 400 x 700 | 0 | 0 | 313.47 | 1489.55 | 1570.8 | 328.64 | 62.44 | 746.02 | 804.24 | 177.55 | 328.64 | 0 | 177.55 | 0 |
| 400 x 700 | 270 | 0 | 310.21 | 1472.23 | 1570.8 | 328.64 | 177.54 | 804.19 | 804.24 | 177.55 | 0 | 328.64 | 0 | 177.55 |

- **TFS ID – 1070763**

  ACI code Column Design - Effective length calculation in column design was not supported if only wind load cases are considered in the design. (No Earthquake loads)

  Issue has been resolved.

**Sway Calculation (Stability Index)**

**For Global-X Direction**

| Level | Load Combination | Story Height (m) | Gravity Load P (kN) | Relative Displacements (mm) | Story Shear (kN) | Stability Index (Q) | Sway Condition |
|---|---|---|---|---|---|---|---|
| | | A | B | C | D | B x C / (A x D) | |
| 0m to 4.2m | 8 | 4.2 | 65936 | 1.84 | 2807.52 | 0.01 | Non Sway |
| 4.2m to 7.858m | 9 | 3.66 | 57493.68 | 2.22 | 2705.08 | 0.013 | Non Sway |
| 7.858m to 12.058m | 9 | 4.2 | 34863.97 | 2.7 | 2320.93 | 0.01 | Non Sway |
| 12.058m to 16.258m | 8 | 4.2 | 14317.6 | 1.99 | 1624.65 | 0.004 | Non Sway |

- **TFS ID – 1077204**

  Software was crashing if design was performed using ACI English unit design codes if there was Shear wall with parametric surface in the (STAAD Analysis) file.

  Issue has been resolved related to parametric surface for English unit ACI design codes.