RCDC (SACD) V11.06

Release Notes

RCDC V11.06.00 is herewith now available with the following new features and design capabilities. The newly introduced features are:

No	Module	Description
1	Column	Ductile column & Beam Joint check – Beams with end release have been Ignored – All codes
2	Column	Column PM Interaction curve Presentation – 2D PM curve added– All codes
3	Column	Column and Wall – Option to set maximum diameter for shear links – All codes
4	Beam	The beam is identified as non-Ductile if the beam is released at any one of the ends – All codes
5	Beam	Beam separate input for the side clear cover – All codes
6	General	Enhancements
7	General	Defects Resolved

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Column	Ductile column Beam Joint check – Beams with end release Ignored in the joint check – All codes

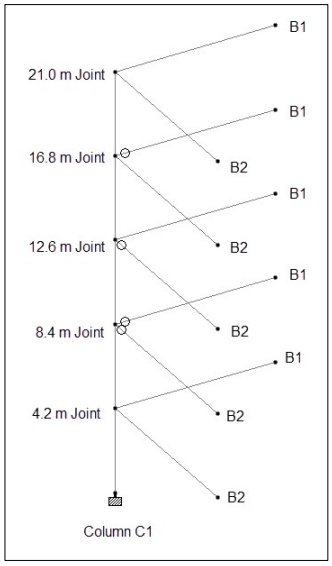
Joint checks (Flexural and shear) are performed for the ductile columns at the junction of column and beams. Beams resting on columns are considered to perform the joint check.

If the beam is released at the end(i.e., Major axis and/or minor axis moment), it is either to be designed as non-ductile or gravity and that beam does not participate as part of lateral force-resisting frames. Thus, If the end moment in the beam connecting column is released (i.e., Major axis and/or minor axis moment) then the section capacity of this beam is not considered in the joint check for that column.

In the case of a joint shear check, the column shear capacity is calculated based on joint confinement. The Joint confinement is based on the beam resting on the column at the beam-column junction. As beams are resting on a column, irrespective of the end releases, it provides confinement to the column joint. Thus, for the joint confinement calculation, all beams resting on the column are considered irrespective of the end releases.

Beam release at the end is also not considered in the shear design to calculate shear-induced on the column due to the beam.

Example:



Joint Level	Beam release status
4.2 m joint	B1 and B2 are not released at the end connecting column C1
8.4 m joint	B1 and B2 are released at the end connecting column C1
12.6m joint	Beam B2 is released at the end connecting column C1
16.8m joint	Beam B1 is released at the end connecting column C1
21.0m joint	B1 and B2 are not released at the end connecting column C1

Beam B1 is connected to the column at 0 degrees with respect to the column Ly axis.
Beam B2 is connected to the column at 270 degrees with respect to the column Ly axis.

RCDC Joint check output at all levels,
Beams connected to columns are shown in the table, however, the beam capacity is not considered in the joint check if it is released at that end.

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General Data:

Column No. : C1
Joint at Level : 4.2 m
Design Code : IS 456 : 2000 + IS 13920 : 2016

	Column Below	Column Above
Member Number	501	4045
Concrete Grade (fck) (Cylindrical)	M30	M30
Steel Grade (fyk)	Fe415	Fe415
Column Size (mm)	850 X 950	850 X 950

Check At Beam-Column Joints:

1. Flexure Strength Of Joint:

Moment Capacity Calculations for Beam

Concrete Grade,fck = M25 N/sqmm
Steel Grade,fy = Fe415 N/sqmm

Both the Beams are considered in Joint check

Beam Size	Beam angle w.r.t. column Ly	Moment Capacity for Top Reinforcement					Moment Capacity for Bottom Reinforcement					Resultant Moment			
(mm)	(deg)	Mu (kNm)	Tu (kNm)	Ast Req (sqmm)	Ast Pro (sqmm)	Mu Cap (kNm)	Mu (kNm)	Tu (kNm)	Ast Req (sqmm)	Ast Pro (sqmm)	Mu Cap (kNm)	Top @ D (kNm)	Top @ B (kNm)	Bot @ D (kNm)	Bot @ B (kNm)
450 x 800	0	686.29	0	2999	3220.12	862.65	2181.49	0	9298.63	10053.12	2441.93	862.65	0	2441.93	0
400 x 900	270	225.85	248.27	1696.03	1809.54	531.03	81.05	248.27	1144.53	1231.5	372.54	0	531.03	0	372.54

General Data:

Column No. : C1
Joint at Level : 8.4 m
Design Code : IS 456 : 2000 + IS 13920 : 2016

	Column Below	Column Above
Member Number	4045	4068
Concrete Grade (fck) (Cylindrical)	M30	M30
Steel Grade (fyk)	Fe415	Fe415
Column Size (mm)	850 X 950	850 X 950

Check At Beam-Column Joints:

1. Flexure Strength Of Joint:

Note:
Since all beams present at this junction are released/have bending moment zero, joint check design is not applicable.

2. Shear Strength of Joint:

Note:
Since all beams present at this junction are released/have bending moment zero, shear design check is not applicable.

General Data:

Column No. : C1
Joint at Level : 12.6 m
Design Code : IS 456 : 2000 + IS 13920 : 2016

	Column Below	Column Above
Member Number	4068	4091
Concrete Grade (fck) (Cylindrical)	M30	M30
Steel Grade (fyk)	Fe415	Fe415
Column Size (mm)	850 X 950	850 X 950

Check At Beam-Column Joints:

1. Flexure Strength Of Joint:

Moment Capacity Calculations for Beam

Concrete Grade,fck = M25 N/sqmm
Steel Grade,fy = Fe415 N/sqmm

Beam Size	Beam angle w.r.t. column Ly	Moment Capacity for Top Reinforcement					Moment Capacity for Bottom Reinforcement					Resultant Moment			
(mm)	(deg)	Mu (kNm)	Tu (kNm)	Ast Req (sqmm)	Ast Pro (sqmm)	Mu Cap (kNm)	Mu (kNm)	Tu (kNm)	Ast Req (sqmm)	Ast Pro (sqmm)	Mu Cap (kNm)	Top @ D (kNm)	Top @ B (kNm)	Bot @ D (kNm)	Bot @ B (kNm)
450 x 800	0	698.59	0	3064.5	3220.12	845.08	1557.5	0	6793.91	6990.04	1656.72	845.08	0	1656.72	0
400 x 900	270	0	224.85	977.35	0	0	0	224.85	977.35	0	0	0	0	0	0

Note:
Beam(s) not considered in joint check (Released or Bending moment zero) at an angle: 270.

General Data:

Column No. : C1
Joint at Level : 16.8 m
Design Code : IS 456 : 2000 + IS 13920 : 2016

	Column Below	Column Above
Member Number	4091	4114
Concrete Grade (fck) (Cylindrical)	M30	M30
Steel Grade (fyk)	Fe415	Fe415
Column Size (mm)	850 X 950	850 X 950

Check At Beam-Column Joints:

1. Flexure Strength Of Joint:

Moment Capacity Calculations for Beam

Concrete Grade,fck = M25 N/sqmm
Steel Grade,fy = Fe415 N/sqmm

Beam Size	Beam angle w.r.t. column Ly	Moment Capacity for Top Reinforcement					Moment Capacity for Bottom Reinforcement					Resultant Moment			
(mm)	(deg)	Mu (kNm)	Tu (kNm)	Ast Req (sqmm)	Ast Pro (sqmm)	Mu Cap (kNm)	Mu (kNm)	Tu (kNm)	Ast Req (sqmm)	Ast Pro (sqmm)	Mu Cap (kNm)	Top @ D (kNm)	Top @ B (kNm)	Bot @ D (kNm)	Bot @ B (kNm)
450 x 800	0	0	0	969.4	0	0	0	0	969.4	0	0	0	0	0	0
400 x 900	270	277.68	27.34	1054.69	1131	335.5	208.03	27.34	977.35	1017.9	304	0	335.5	0	304

Note:
Beam(s) not considered in joint check (Released or Bending moment zero) at an angle: 0.

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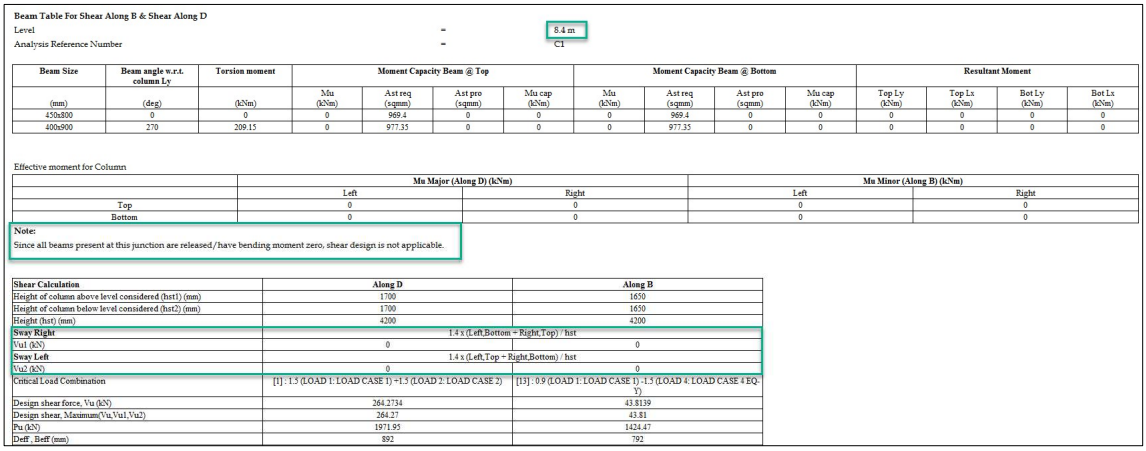
RCDC Design calculation report for 8.4m levels,



Beam Table For Shear Along B & Shear Along D

Level = 8.4 m
Analysis Reference Number = C1

Beam Size	Beam angle w.r.t. column Ly	Torsion moment	Moment Capacity Beam @ Top				Moment Capacity Beam @ 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 Ly (kNm)	Top Lx (kNm)	Bot Ly (kNm)	Bot Lx (kNm)
450x800	0	0	0	969.4	0	0	0	969.4	0	0	0	0	0	0
400x900	270	209.15	0	977.35	0	0	0	977.35	0	0	0	0	0	0

Effective moment for Column

	Mu Major (Along D) (kNm)		Mu Minor (Along B) (kNm)	
	Left	Right	Left	Right
Top	0	0	0	0
Bottom	0	0	0	0

Note:
Since all beams present at this junction are released/have bending moment zero, shear design is not applicable.

Shear Calculation	Along D	Along B
Height of column above level considered (hst1) (mm)	1700	1650
Height of column below level considered (hst2) (mm)	1700	1650
Height (hst) (mm)	4200	4200
Sway Right	1.4 x (Left,Bottom + Right,Top) / hst	
Vu1 (kN)	0	0
Sway Left	1.4 x (Left,Top + Right,Bottom) / hst	
Vu2 (kN)	0	0
Critical Load Combination	[1] : 1.5 (LOAD 1: LOAD CASE 1) +1.5 (LOAD 2: LOAD CASE 2)	[13] : 0.9 (LOAD 1: LOAD CASE 1) -1.5 (LOAD 4: LOAD CASE 4 EQ-Y)
Design shear force, Vu (kN)	264.2734	43.8139
Design shear, Maximum(Vu,Vu1,Vu2)	264.27	43.81
Pu (kN)	1971.95	1424.47
Deff , Beff (mm)	892	792

- Partial release of moments in the beam ends is not considered a release.
- Torsion moment release in the beam is not considered a release.

Ductile Colum Type (Lateral and Gravity) as per beam end release.
Column type lateral or Gravity is identified based on the beam resting on the column and its end releases. If all the beams connecting a column are released at the ends, then RCDC will qualify that column as gravity.

Various cases are considered for identifying column type:
Case:1 (all beams are released connecting column)

level	Beam releases	Column Type as per beam release	RCDC qualification
1	All beams released	Gravity	Gravity
2	All beams released	Gravity	Gravity
3	All beams released	Gravity	Gravity
4	All beams released	Gravity	Gravity
5	All beams released	Gravity	Gravity

Case:2 (upper-level beams are released connecting column)

level	Beam releases	Column Type as per beam release	RCDC qualification
1	All/few beams not released	Lateral	Lateral
2	All/few beams not released	Lateral	Lateral
3	All/few beams not released	Lateral	Lateral
4	All beams released	Gravity	Gravity
5	All beams released	Gravity	Gravity

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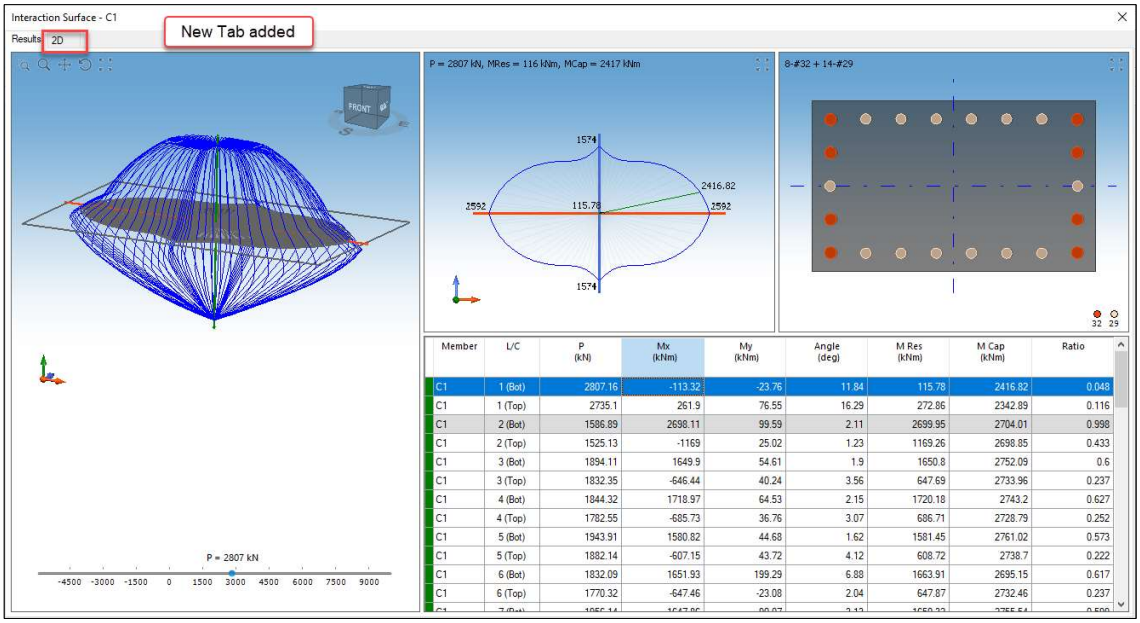
Case:2 (Intermediate level beams are released connecting column)

level	Beam releases	Column Type as per beam release	RCDC qualification
1	All/few beams not released	Lateral	Lateral
2	All/few beams not released	Lateral	Lateral
3	All beams released	Gravity	Lateral
4	All/few beams not released	Lateral	Lateral
5	All beams released	Gravity	Gravity

Column — Column PM Interaction curve Presentation – 2D PM curve added – All codes

A New tab is added on the Interaction surface screen for the 2D image of the PM curve along with the 3D PM curve. Users can select the load angle available from the list available to generate a 2D PM curve. Various values of axial forces and corresponding moment capacity for selected load angle are available in table format. Users can save the image of the 2D PM curve in JPEG, GIF, PNG, Bitmap, and TIFF formats. The table of Axial force and Moment can be saved in excel format



Member	L/C	P (kN)	Mx (kNm)	My (kNm)	Angle (deg)	M Res (kNm)	M Cap (kNm)	Ratio
C1	1 (Bot)	2807.16	-113.32	-23.76	11.84	115.78	2416.82	0.048
C1	1 (Top)	2735.1	261.9	76.55	16.29	272.86	2342.89	0.116
C1	2 (Bot)	1586.89	2698.11	99.59	2.11	2699.95	2704.01	0.998
C1	2 (Top)	1525.13	-1169	25.02	1.23	1169.26	2698.85	0.433
C1	3 (Bot)	1894.11	1649.9	54.61	1.9	1650.8	2752.09	0.6
C1	3 (Top)	1832.35	-646.44	40.24	3.56	647.69	2733.96	0.237
C1	4 (Bot)	1844.32	1718.97	64.53	2.15	1720.18	2743.2	0.627
C1	4 (Top)	1782.55	-685.73	36.76	3.07	686.71	2728.79	0.252
C1	5 (Bot)	1943.91	1580.82	44.68	1.62	1581.45	2761.02	0.573
C1	5 (Top)	1882.14	-607.15	43.72	4.12	608.72	2738.7	0.222
C1	6 (Bot)	1832.09	1651.93	199.29	6.88	1663.91	2695.15	0.617
C1	6 (Top)	1770.32	-647.46	-23.08	2.04	647.87	2732.46	0.237

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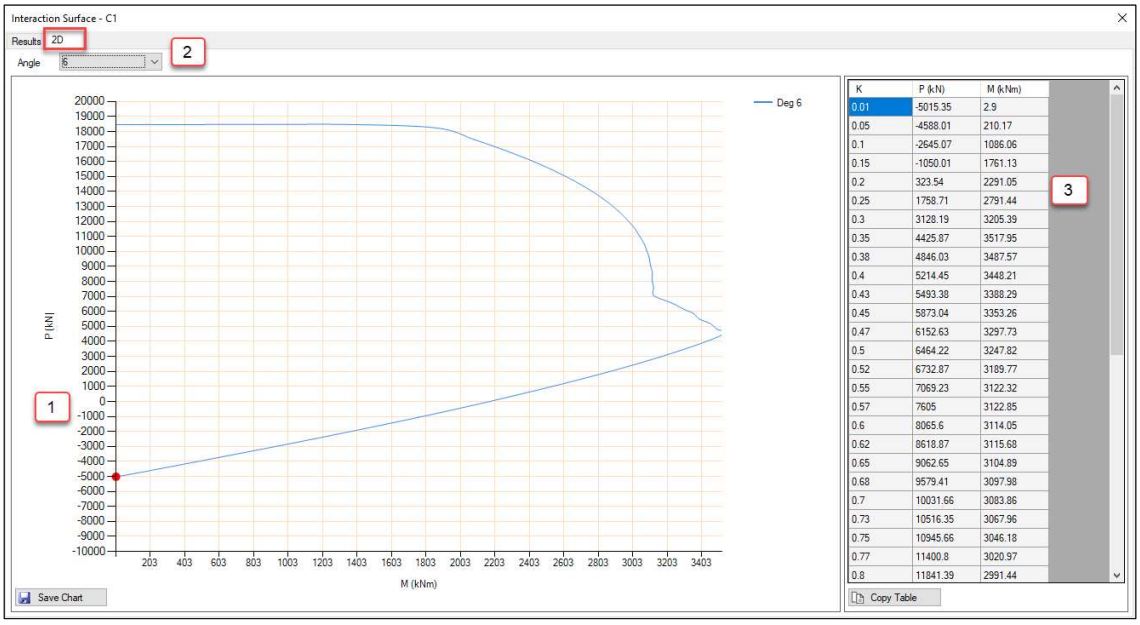
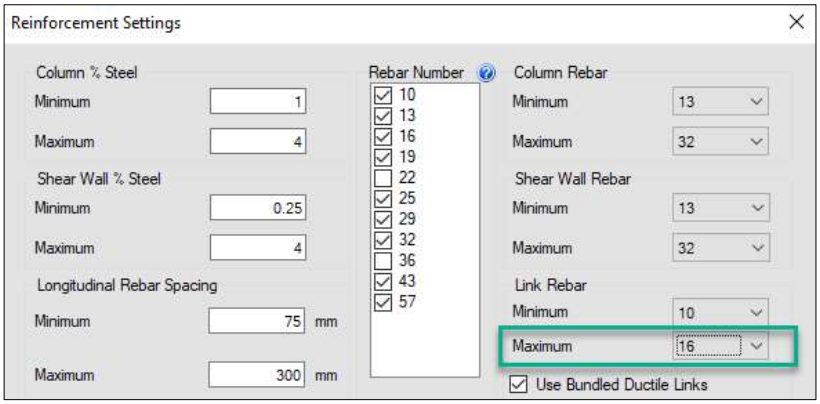


1. This image indicates the 2D PM curve generated for the selected column at a specified Neutral axial angle.
2. List of neutral axis angles available to the user.
3. This table indicates values of axial force and corresponding moment capacity.
    - K = it is a neutral axis depth multiplying factor to get the maximum axial tension and compression capacity
    - P (kN) = It is the axial load capacity for the selected neutral axis depth.
    - M (kNm) = it is the moment capacity corresponding to axial capacity (P).

Column — Column and Wall – Option to set maximum diameter for shear links – All codes

The option to set a minimum rebar diameter for shear links was available for the column module. In addition to this, users can now set the maximum rebar diameter to be provided as a shear link for the column module.



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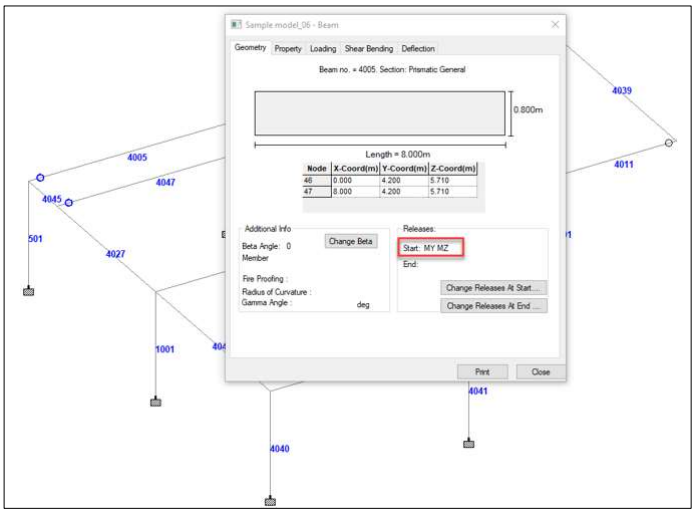
Beam	The beam is identified as non-Ductile if the beam is released at any one of the ends – All codes

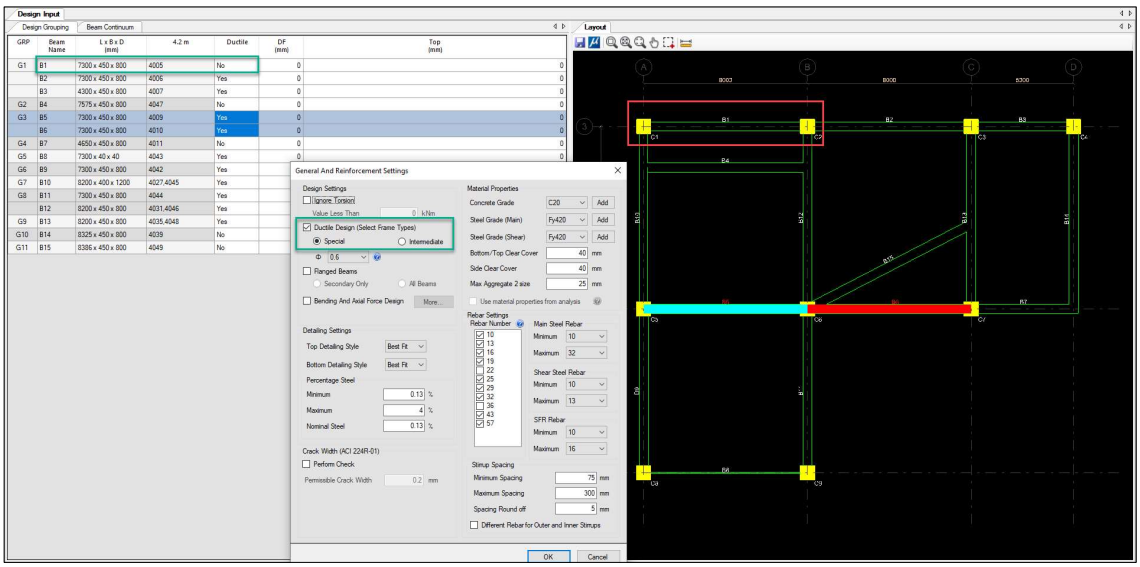
The beam is identified as non-Ductile if the beam is released (Major axis and/or minor axis moment) at any one of the ends.

If the beam is released at any one of the ends, it is either to be designed as non-ductile or gravity. From this version, if the beam is released at any one of the ends RCDC will auto-identify this beam as non-Ductile in case of ductile design option is selected. The user has the choice to change the beam type in RCDC and override the type identified by RCDC.

Example:



Beam B1 (member 4005) is released at the start node. When the user selects the ductile design, RCDC will auto-identify this beam as non-ductile as one of the ends is released.



The user has the option to change the beam type in RCDC and override the type identified by RCDC.

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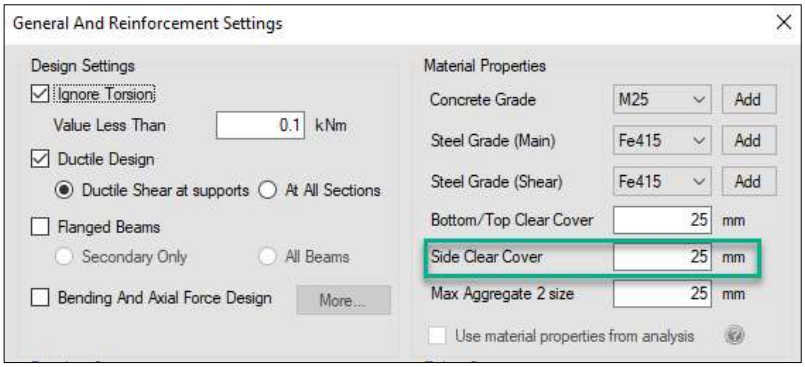
Beam — Beam separate input for the side clear cover – All codes

RCDC will allow users to provide top/bottom and side clear cover to reinforcement separately. This is applicable to all design codes available in RCDC. This option is also available on the re-design forms. Design, Drawings, Bill of quantities, and Bar bending schedule have been updated for the effect of a separate side cover

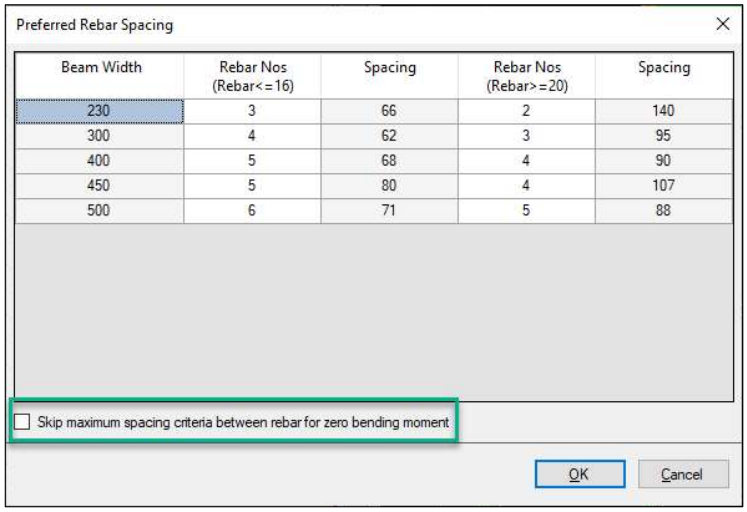


General — Enhancements

The following are the enhancements made in this release to existing features.

- **ADO ID – 577199 – Cantilever beam bottom reinforcement detailing without maximum spacing check if the bending moment is zero.**

  At locations where there is no bending moment in any load combination, the user can choose to provide minimum rebars disregarding the maximum bar spacing criteria. In the Earlier RCDC version, this criterion was used for the Top mid-zone of a beam supported on a column or beam (simply supported). Now onwards, this criterion is also applicable to the Cantilever beam bottom reinforcement locations of the beams.



On the preferred Rebar spacing screen, the user can select this option to skip maximum spacing criteria if the bending moment is zero.

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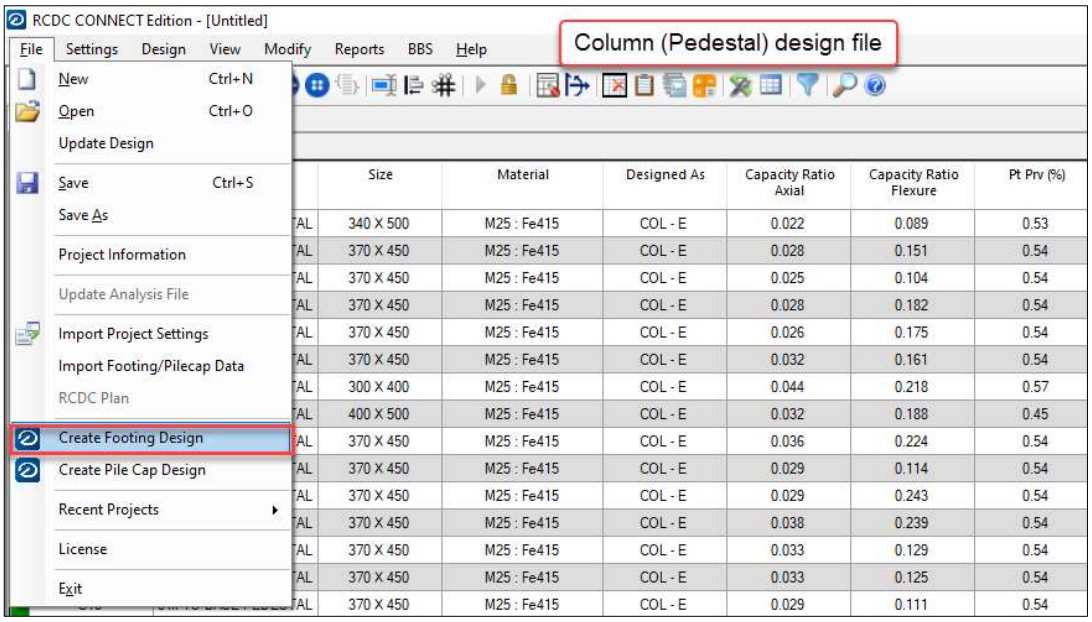
- **ADO ID – 829516_Update design if the Footing Design file is created through pedestal design**

  RCDC allows the user to design pedestals (columns) for the steel building where no RC columns are present in the analysis file. Through pedestal (columns) design, RCDC allows users to design footings. Refer to the below snap,



	Size	Material	Designed As	Capacity Ratio Axial	Capacity Ratio Flexure	Pt Prv (%)
TAL	340 X 500	M25 : Fe415	COL - E	0.022	0.089	0.53
TAL	370 X 450	M25 : Fe415	COL - E	0.028	0.151	0.54
TAL	370 X 450	M25 : Fe415	COL - E	0.025	0.104	0.54
TAL	370 X 450	M25 : Fe415	COL - E	0.028	0.182	0.54
TAL	370 X 450	M25 : Fe415	COL - E	0.026	0.175	0.54
TAL	370 X 450	M25 : Fe415	COL - E	0.032	0.161	0.54
TAL	300 X 400	M25 : Fe415	COL - E	0.044	0.218	0.57
TAL	400 X 500	M25 : Fe415	COL - E	0.032	0.188	0.45
TAL	370 X 450	M25 : Fe415	COL - E	0.036	0.224	0.54
TAL	370 X 450	M25 : Fe415	COL - E	0.029	0.114	0.54
TAL	370 X 450	M25 : Fe415	COL - E	0.029	0.243	0.54
TAL	370 X 450	M25 : Fe415	COL - E	0.038	0.239	0.54
TAL	370 X 450	M25 : Fe415	COL - E	0.033	0.129	0.54
TAL	370 X 450	M25 : Fe415	COL - E	0.033	0.125	0.54
TAL	370 X 450	M25 : Fe415	COL - E	0.029	0.111	0.54

RCDC is allowed to perform the Update design to the footing design if the footing design is created through the pedestal (columns) design file as explained above. As the existing footing design is through the pedestal (columns) (.rcdx) file, RCDC will allow reading the new pedestal (columns) design (.rcdx) file only. If there are any changes done in the steel building file, then it is mandatory that the user update the pedestal (column) design file first and then use the same RCDC file for the update footing design. RCDC will auto-identify whether the footing design file is created through STAAD or RCDC file. Based on this file, RCDC will allow the user to select the corresponding file.

The flow is explained with the example:

Step-1: Read the STAAD steel building file into the RCDC column module. Perform pedestal (column) design.

Step-2: Create footing design file through pedestal (column) file and perform design.

Step-3: Take the revised STAAD steel building analyzed file

Step-4: Take the pedestal (column) available in step 1 and Update the design of the pedestal (column) for the revised analysis file

Step-5: Take the footing design file available in step 2. Update the footing design file by reading the updated column (pedestal) design file from step 4

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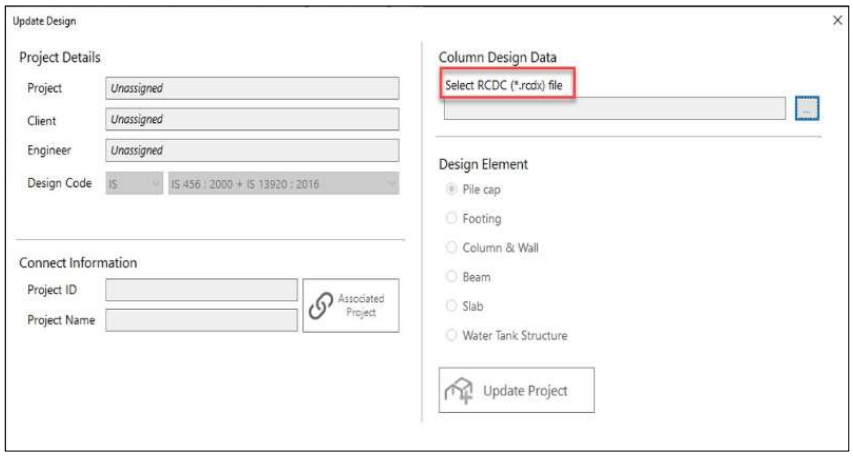

The pedestal (column) design file of the RCDC version 11.6 or later is allowed to be read the in update footing design. It is suggested to the user update or opens an earlier version pedestal file in the current version and use it for the update footing design.

- **ADO ID – 975248 – ACI Column sway calculation – enhancement for irregular load combinations**

  In the column design, sway calculation is performed along the X and Y direction. As per ACI code requirements, load combinations consisting of lateral loads are used to perform Sway calculations.
  Regular combinations consist of single-direction Earthquake (Lateral) load. And irregular combinations consist of two directional Earthquake (Lateral) loads.
  If any regular combination consists of the Eq-X load case, then it is considered along X direction sway calculation only. The same logic is applicable to the Y-direction Sway calculation.

  if there are irregular combinations available in the analysis file, then as per the weightage of the Eq-load direction the load combination is considered along that direction Sway calculation only.
  Example:
  1.2 DL + 1.6 LL + 1.4 Eq-X + 0.42 Eq-Y.
  In this case, the Eq-X is a primary load case, thus this load combination is considered along X direction sway calculation only.

- **ADO ID – 804169 –Optimizing the shear reinforcement provided in the beam if ductile, torsion and other spacing criteria are governing**

  Beam stirrups (links) spacing is calculated based on the shear design requirement, spacing criteria like torsion, beam size specified by the design code, and ductility requirement. In the earlier version, RCDC was used to calculate stirrups spacing for shear design first, and then spacing criteria like torsion and ductility were used. This was leads to providing more shear reinforcement provided in the beam. The

detailing of shear stirrups logic has been improved which gives the optimized output.

Example:

If for the shear design 2L-T10@175c/c (Asv= 897 sqmm) links are required and the maximum spacing criterion for ductility is 100mm then RCDC was used to provide final shear stirrups as 2L-T10@100c/c (Asv= 1570 sqmm) which was on the conservative side.

Now onwards, RCDC is calculating the spacing for torsion and ductility first and then the same spacing is used for the shear design. This is giving now optimized shear stirrups in the beam. In the above example, RCDC will now provide the stirrups as 2L-T8 @100c/c (Asv= 1000 sqmm) satisfying shear design and ductility spacing criteria.

General Defects Resolved

Following is the list of Defects resolved in this release.

- **ADO ID - 736428 – Beam – Design Summary report - Display final area of reinforcement (Ast) required if it is governed by crack width check**

  RCDC performs the design of flexural reinforcement for the given forces. Reinforcement provided for flexural design is used for the crack width check. If the provided reinforcement is not satisfying the crack width check requirements, RCDC increases the reinforcement till it is satisfied.

  Issue:

  If the flexural reinforcement is governed by the crack width check, then RCDC was not showing the final Ast calculated in the design summary report. It was showing the Ast required for flexural design.

  Solution:

  Now, the final Ast calculated from flexural, crack width, and other checks are presented in the design summary report.

Beam No	:	B3
Group No	:	G1
Analysis Reference(Member) 12.058 m	:	6004
Breadth	:	400 mm
Depth	:	800 mm
Concrete Grade	:	M25 N/sqmm
Grade Of Steel (Main)	:	Fe415 N/sqmm
Grade Of Steel (Shear)	:	Fe415 N/sqmm
Top/Bottom Clear Cover	:	25 mm
Side Clear Cover	:	25 mm
Design Code	:	IS 456 : 2000 + IS 13920 : 2016
Beam Type	:	Regular Beam

Flexure Design

	Beam Bottom			Beam Top		
	Left	Mid	Right	Left	Mid	Right
Mud (kNm)	59.96	203.76	109.96	484.54	66.96	397.24
PtClc (%)	0.205	0.266	0.205	0.682	0.205	0.545
AstCalc (sqmm)	610.36	1816.87	610.36	3650.41	610.36	2520.23
Ast Prv (sqmm)	1005.3	2010.6	1005.3	3926.96	804.24	3217
Reinforcement	5-T16	5-T16 5-T16	5-T16	4-T25 4-T25	4-T16	4-T32
Crack Width (mm)	-	0.1156	-	0.1582	-	0.1239
Stress In Steel (N/sqmm)	-	202.15	-	212.42	-	180.66

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- **ADO ID - 885318 – EURO Code- Column Design Update - Frame type is not re-stored when the Update design function is used**

  In the Euro code column design, effective length factors are calculated based on the Braced and Un-braced frame type. The default effective length factor for Braced and Un-braced columns are 0.59 and 1.22 respectively.

Effective Length Factor

LEVEL	Frame Type		C1		C2		C3	
	Along X	Along Y	Major	Minor	Major	Minor	Major	Minor
2.2 m	Un-Braced	Braced	1.22	0.59	1.22	0.59	1.22	0.59
4.2 m	Braced	Braced	0.59	0.59	0.59	0.59	0.59	0.59
7.858 m	Braced	Un-Braced	0.59	1.22	0.59	1.22	0.59	1.22
12.058 m	Braced	Braced			0.59	0.59	0.59	0.59
16.258 m	Braced	Braced			0.59	0.59	0.59	0.59

  In the update design function, RCDC maintains the design settings of the old design file into an updated design file and performs the design. Design settings like material grades, list of rebar diameter, column frame type, etc. are maintained in the updated design file.

  Issue:

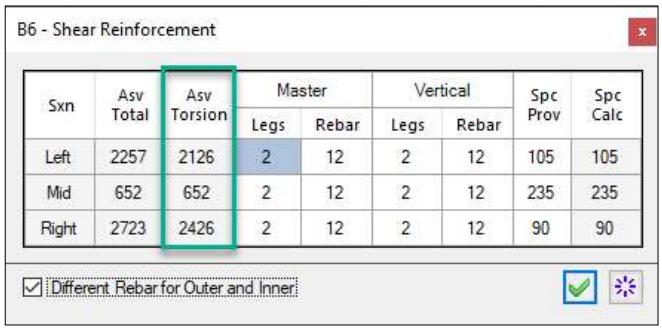
  The frame type (Braced or Un-Braced) changed in the old design file was not maintained in the updated design file. If the User has changed the frame type of any of the levels to un-Braced then after using the update design function, the frame type was changed to Braced. So, the effective length factor of a Braced frame (0.59) was used instead of Un-braced (1.22) frame in the update column design.

  Solution:

  Now the frame type available in the old file maintains for the update design function and accordingly the effective length factors are used in the column design.

- **ADO ID – 1028242 – Issue in using area of shear reinforcement on the detail section screen if the area required for torsion is governing case**

  In the beam design, the area of shear reinforcement is governed by the shear and torsion design. The area of reinforcement required for torsion is provided on the outer legs of shear links and, the area of reinforcement required for shear design is provided on all legs available in the beam. The minimum spacing calculated for torsion and shear design is provided as the final link spacing.



Issue:

On the design section screen, the area of shear reinforcement required for torsion was not passed correctly. thus, if the link spacing was governed by the torsion design, RCDC was accepting higher link spacing than the required in auto design on the section design screen.

Solution:

The correct area of shear reinforcement required for torsion is passed on to the section design screen.

- **ADO ID – 1034887 – ACI code - Issue in presenting the Vu (2*Eq) value for the Design of Beams of Intermediate Ductile Frame**

  Design shear for intermediate ductile frame beam design is considered the maximum of the following criteria,

  1. Design shear from analysis - Vu
  2. Shear due to sway left and Sway right condition (reverse curvature bending)- Vu sway
  3. Shear obtained from design load combinations that include E, with E taken as twice that prescribed by the general building code. Vu (2*Eq comb)

  Issue:

  RCDC was taking the maximum value of shear from the above criteria for the design, however, in the design calculation report values of the third criterion were presented as zero.

  Solution:

  The issue of value presentation is now resolved and the shear force value due to the third criterion is now presented in the design calculation report.

For Transverse Reinf			
	Left	Mid	Right
Critical L/C - RCDC	1	1	1
PtPrv (%)	0.495	0.349	0.998
Vu (kN)	65.97	269.29	343.18
Mu-Sect (kNm)	339.84	142.55	768.69
Φ Vc (kN)	296.16	296.16	296.16
Vs (kN)	-	-	62.69
Aoh (sqmm)	277400	277400	277400
At (sqmm/m)	2639.24	1319.62	2639.24
Av (sqmm/m)	469.72	469.72	469.72
Tu (kNm)	196.03	98.01	196.03
At Torsion (sqmm/m)	2639.24	1319.62	2639.24
Av Total Reqd (sqmm/m)	2639.24	1319.62	2843.7
Asv Reqd (sqmm/m)	2639.24	1319.62	2843.7
For Sway Shear			
V^{D+L} (kN)	209.72	117.26	187.03
Mh (kNm)	285.77	0	1126.11
Ms (kNm)	576.28	0	444.7
Sway-Right (kN)	23.48	350.46	420.23
Sway-Left (kN)	309.79	17.19	86.96
Vu-Sway (kN)	309.79	350.46	420.23
Vu (2*Eq Comb) (kN)	107.13	274.77	344.54
Vud (kN)	309.79	350.46	420.23
Φ Vc Sway(kN)	296.16	296.16	296.16
Vs Sway(kN)	18.17	72.4	165.43
Asv Reqd Sway(sqmm/m)	469.72	469.72	539.55
Asv Reqd Final = max (Asv Reqd , Asv Reqd Sway) (sqmm/m)	2639.24	1319.62	2843.7
Legs	4	4	4
Stirrup Rebar	10	10	10
SCalc (mm)	100	210	50
SPrv (mm)	100	210	50
Av Total Prv (sqmm/m)	2835.2	1350.1	5670.4

- **ADO ID – 1037815 – Pilecap- Capacity and sizing check report- presentation issue**

Issue:

On the capacity and sizing check report, the maximum tensile load on a group of piles and permissible tensile load on one pile's values were presented wrongly. Even When there was no tensile force in the column, RCDC was showing the values in the column of maximum tensile load on a group of piles. Also, for the Dead load and live load combinations, the value for the permissible tensile load on one pile was missing in the report.

All the correct values of design forces and pile capacities were considered for the design of the pile cap however the issue was in the report presentation only.

Solution:

Correct values are now passed to capacity and sizing check reports.

Design Table (C1):

Load Combination	Analysis Forces			P total (kN)	Max. Compressive Load on One Pile (kN)	Max. Compressive Load on Group of Pile (kN)	Shear Load on Group of Pile (kN)	Max.Tensile Load on One Pile (kN)	Max.Tensile Load on Group of Pile (kN)	Permissible Shear Capacity (kN)	Pile Capacity (kN)	Pile Capacity Increase Factor (%)	Permissible Compressive Load on one Pile (kN)	Permissible Tensile Load on one Pile (kN)
	P (kN)	Mx (kNm)	My (kNm)											
1	566.11	-18.93	-26.92	621.63	221.78	621.63	33.59	-	-	375	600	1.1	660	110
2	518.09	113.11	-28.15	573.6	253.5	0	43.96	-	-	468.75	600	1.25	750	125
3	614.14	-150.96	-25.69	669.65	339.43	0	62.81	-	-	468.75	600	1.25	750	125
4	441.92	-25.22	114.21	497.44	232.24	0	46.69	-	-	468.75	600	1.25	750	125
5	690.3	-12.63	-168.04	745.82	355.77	0	107.5	-	-	468.75	600	1.25	750	125

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- **ADO ID – 1038068 – ACI column - Wrong calculation of Ψ factor in effective length factor**

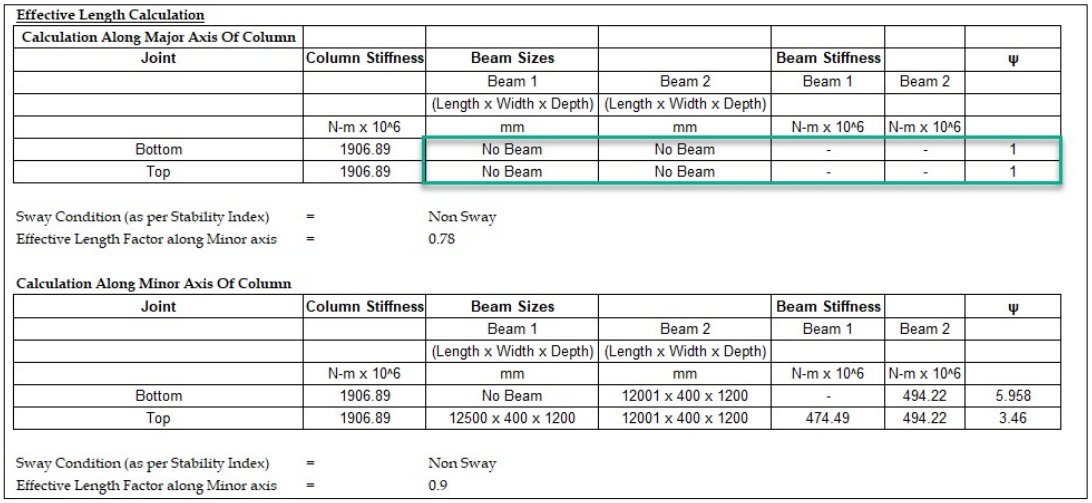
  The effective length of the column is calculated based on the Ψ factor. Ψ is the ratio of the column stiffness to the beam stiffness in a plane at one end of the column.

  Issue:

  In case there are no beams present at a particular level, the value of Ψ should be considered as 1. In the recent version of RCDC, the wrong value of Ψ is used to calculate the effective length factor.

  Solution:

  The correct value of Ψ is used and presented for the calculation of the effective length factor if beams are not present at that level.



Effective Length Calculation

Calculation Along Major Axis Of Column						
Joint	Column Stiffness	Beam Sizes		Beam Stiffness		ψ
		Beam 1	Beam 2	Beam 1	Beam 2	
		(Length x Width x Depth)	(Length x Width x Depth)			
	N-m x 10^6	mm	mm	N-m x 10^6	N-m x 10^6	
Bottom	1906.89	No Beam	No Beam	-	-	1
Top	1906.89	No Beam	No Beam	-	-	1

Sway Condition (as per Stability Index) = Non Sway
Effective Length Factor along Minor axis = 0.78

Calculation Along Minor Axis Of Column

Joint	Column Stiffness	Beam Sizes		Beam Stiffness		ψ
		Beam 1	Beam 2	Beam 1	Beam 2	
		(Length x Width x Depth)	(Length x Width x Depth)			
	N-m x 10^6	mm	mm	N-m x 10^6	N-m x 10^6	
Bottom	1906.89	No Beam	12001 x 400 x 1200	-	494.22	5.958
Top	1906.89	12500 x 400 x 1200	12001 x 400 x 1200	474.49	494.22	3.46

Sway Condition (as per Stability Index) = Non Sway
Effective Length Factor along Minor axis = 0.9

- **ADO ID – 1044994 – RCDC showing an error importing STAAD file if STAAD file is created with Physical members.**

  Issue:

  If the STAAD file was created using Physical (P) Members, RCDC was showing the error in the reading file. The coordinates and properties of P members were not available to RCDC. This issue occurred in the recent release of STAAD due to changes made in the Open STAAD OEM.

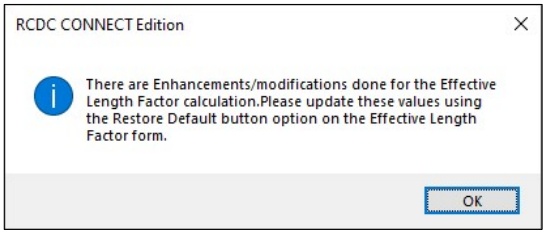
  Solution:

  All the data from Open STAAD OEM is now available to RCDC and STAAD files can be imported to RCDC without any errors.

- **ADO ID – 1046488 – Show message to restore default value for effective length factor for ACI, NSCP, and IS code.**

  A few enhancements/modifications regarding the calculation of the effective length factor in IS, ACI, and NSCP design codes have been done in the 11.6 and earlier versions of RCDC. If the user opens the old version RCDC file to the 11.6 version, RCDC will show a message to restore the default value of effective length

factors. This is to inform the user that values need to be corrected for effective length factor to get the correct design.



- **ADO ID – 1056935 – BS Code - Beam Design - Issue in the shear link Spacing Calculation when Torsion is Zero**

  Issue:

  In the beam design of BS code, the spacing criteria of torsion was used even when there was no torsion in the beam. The Spacing required for the shear links was 250mm however RCDC had provided the spacing of 140mm which is calculated from the torsion links detailing requirements.

  Solution:

  Correct spacing criteria are used in the beam design. If there is no torsion in the beam, spacing criteria of torsion are not used in the design and detailing.

Shear Design

	Left	Mid	Right
Critical L/C - Analysis	4	4	4
Critical L/C - RCDC	2	2	2
PtPrv (%)	1.193	0.859	2.628
Bending Shear			
V (kN)	105.218	41.727	109.37
v (N/sqmm)	1.33	0.53	1.38
Vc (N/sqmm)	0.67	0.6	0.87
V > Vc + 0.4	Yes	No	Yes
Vc (kN)	53.12	47.61	69.11
Vus=V-Vc (kN)	52.1	5.88	40.26
Asv Reqd (Bending) (sqmm)	301.82	183.07	233.22
Torsional Shear			
T (kNm)	0	0	0
Vt (N/sqmm)	-	-	-
Vt,min (N/sqmm)	-	-	-
Asv Torsion (sqmm)	-	-	-
Asv Reqd (Total) (sqmm)	301.816	183.066	233.224
Min Legs Req	2	2	2
Legs	2	2	2
Stirrup	8	8	8
SvCalc (mm)	295	295	295
SvPrv (mm)	295	295	295
Asv Torsion Prv (sqmm)	-	-	-
Asv Total Prv (sqmm)	340.81	340.81	340.81

Maximum Spacing Criteria

Basic

Spc1 =0.75d	=	296 mm
Spc2	=	300 mm