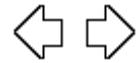




## Update Design - Column and Walls



Update Design is a feature available in RCDC which will help users to check the existing design against forces from revised analysis. The change in analysis file can be related to geometry of structure or members or it can be change in Loading data.

Currently, once the user revises the analysis, there is no method where he can use existing design and check against new forces. Rather, one needs to create new design file and manually compare old and new design. With this feature, user will be able to get design based on earlier analysis and check sufficiency with forces from new analysis.

The main purpose of this feature is to allow user to check the 'Sufficiency' of earlier design with respect to new forces from revised analysis. This feature can be used when columns / walls of structure are already designed in RCDC and design is finalized. After the design is finalized there may be possibility that configuration of structure may change or there may be some variation in loading.

While comparing the design with revised analysis file, following cases are encountered:

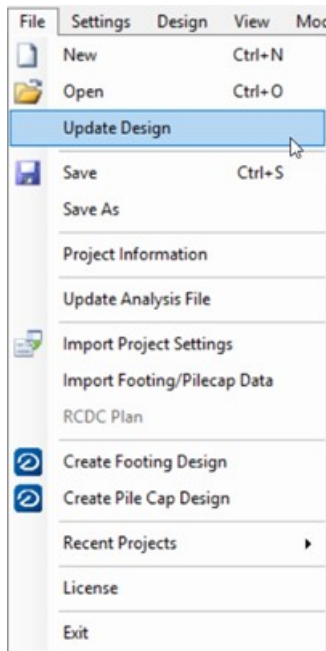
- a. Existing reinforcement has more capacity than that required for revised analysis forces – In this case RCDC will maintain design as per original RCDC file.
- b. Existing reinforcement does not have sufficient capacity revised analysis forces – In this case RCDC will modify the reinforcement to match the required capacity.

Following are the steps involved in using this feature:

Users are advised to save old file for future reference.

Note: RCDC will not create one more RCDC file for Update Design function.

Once the file is opened, under File Menu, Select the "Update Design" option.



After opting to Update Design, RCDC will ask to select the revised analysis file. Once the data from that file is read, a wizard will be available for making basic changes related to:

1. Level Merging / Demerging:

This setting will help user to map geometry changes in terms of levels.

2. Zone Bar Settings:

If there are changes in Column size, the user can set number of rebars along each face for new size of columns.

3. Load Cases & Load Combinations:

If user has introduced any new load case or removed some load cases, then he can manage it here. Load combinations to be considered can also be modified based on load cases considered.

Note: Design Settings set in Original RCDC file will be maintained while updating forces and checking the design for revised analysis file.

RCDC considers following to manage modifications (if any) in the revised analysis file:

- i. Modification in Analysis file: A column / wall is shifted from its original location.

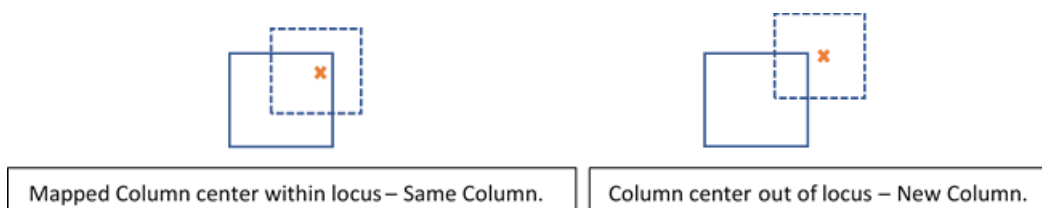
Consideration in RCDC:

Based on the distance by which Column / Wall has shifted, it will be identified as a new column if the shifted center of Column / Wall lies outside the periphery or locus of original section of member.

- When the shift in location of column is within the locus, then it will be mapped against existing column at that location. The name of the section will also be maintained.
- For Columns that get mapped with same size and material, original design will be used

to compare.

- For new columns that don't get mapped with old columns, the design will be treated as new design.
- For old columns that remain unmapped, the design will be "Dropped" and the column will not be seen. That column name will remain unused.



*Note: Any Column / Wall that is newly introduced will be designed based on Settings inherited from existing RCDC file.*

ii. Modification in Analysis file: Sectional properties like Size, orientation of Column / wall, or Material Property changes.

Consideration in RCDC:

Changing such parameters has impact on the Section design part. So, RCDC will perform "**New Design**" considering the Design settings. The Old design will be dropped.

iii. Modification in Analysis file: Level configuration changes.

- A Primary level is introduced – This will be treated as added on Top. RCDC will perform new design for all the members that are extended on the newly added level.
- A Primary Level is removed – This will be treated as removed from Top. RCDC will discard the design of all those members that were present on the Level that was removed.
- 1 or more Secondary levels are introduced.  
Option to perform Merging / De-merging of the levels before continuing to Update design is provided. Here user can choose to merge / demerge the secondary levels based on the configuration.

iv. Modification in Analysis file: Live Load Reduction has been considered. This will get affected due to change in level configuration of structure.

New Level in a structure is introduced or a level is removed. This changes the 'Number of Levels' supported by stories below.

Consideration in RCDC:

- When there is no change in number of levels, the final number of levels from original RCDC file will be considered while Updating the design.
- When a level is introduced above the top level → Reduction percentage of the earlier top level will be applied to newly introduced level.
- When the top level is removed → Reduction percentage of the top level will not be considered. Reduction percent applied to lower levels will remain as it is.
- When an intermediate / secondary level is introduced → Reduction percentage of the level above the newly added level will be considered. Further, reduction percent applied to lower levels will remain as it is.

v. Modification in Analysis file: Floor height or Lateral Loading for a structure is modified:Consideration in RCDC:

When the story height or Lateral loading changes, it impacts the Effective Length Factor for columns.

In RCDC there are different options available for setting the Effective Length Factor. The method adopted in the existing file will be taken into consideration while 'Updating' the design for revised analysis.

Following are the actions based on settings in existing RCDC file:

- Program calculated – RCDC will re-calculate the Effective Length Factor for all columns.
- Set a fix value – Value that was set in existing RCDC file will be considered while Updating Design.
- Set Min and Max limit for restraining the calculated value – The Min and Max range that was initially set will be maintained. The revised Effective Length Factor are calculated, and the final value is worked out as per min / max range.
- Manually entering the value for any column – All those columns for which Effective Length Factor was manually entered in existing RCDC file will be maintained and used while updating the design.

vi. Modification in Analysis file: Load Cases or Load CombinationsConsideration in RCDC:

- When there is no change in the Load cases and Load combinations, RCDC will complete the 'Update Design' with no action required from user.

- In case if any load case is newly added, user will have to assign the load type for that load case and modify / add the load combinations.
- If any load case has been removed from revised analysis file, the load case will also be removed from RCDC and user will have to recreate load combinations.

vii. Modification in Analysis file: Material Specification, Grid Data, Level Description:

When the analysis file is an ETAB file or RAM file, then there could be changes in any of the following - Grid Data, Material Grades or Level Description.

Consideration in RCDC:

- When Material grade from revised analysis does not match with existing design, it will be treated as new design.
- When Grid Data changes, revised grids will be imported in Updated RCDC file as per revised analysis file.
- When Level Description or Story Label changes, revised Level Description or Story Label will be imported in Updated RCDC file as per revised analysis file.

RCDC considers following to manage changes, arrangements from old RCDC file:

- Column Grouping:
  - The same group of Columns from Existing RCDC file will be maintained for those columns whose geometry is same in Updated file too.
- Level Grouping:
  - Grouping of Levels will be maintained for those levels where there is no intermediate level identified in between the grouped levels.
  - Level grouping will not be maintained if there change in merging of levels which were grouped in Existing file.
- Ignore Column:
  - Column which was ignored in Existing RCDC file will be ignored in update RCDC file also if it is identified as same column.
- Ignore Level:
  - Column at that level which was ignored in Existing RCDC file will be ignored in update RCDC file also if it is identified as same level.
- New column Numbering in RCDC:
  - For STAAD files read in RCDC, column numbering is done by RCDC itself. User can modify these.  
So, when new columns are identified, RCDC will name it with 'NC' series of Column. This

will help to differentiate between existing and new added columns.

- For ETABS and RAM file, the column numbering from source file is followed. So, any new columns identified in RCDC will have same name as that from Analysis file.

vi. Zone bar settings:

- For Columns / Walls, whose size has been modified in revised analysis file, the number of bars to be detailed for the c/s of such columns can be modified in Zone Bar settings.
- This setting is available in the Update Design Wizard.

‘Design Change’ report:

RCDC will show the ‘Design Change’ report after the update design process is completed. Users can save this report to the desired location. By default, RCDC saves the changed report to the location where the RCDC file is saved.

The title of the saved report file would be “ABC\_column\_2022-07-03\_1”

Where,

ABC = Name of the RCDC file.

column = Element for which this report is generated.

2022-17-06 = Date at which the Update design feature is used

1 = This is the revision number that indicates the no of times the ‘Update Column’ or ‘Update Beam’ feature is used for that RCDC file in a day.

This report will cover the following,

1. Level mapping of old and new analysis files
  2. Details of entire column/wall added or removed
  3. Details of column/wall add or missing at level
  4. Details of geometry (location) and dimensions changes (sizes) of the column/wall
  5. Details of reinforcement changed
  6. Support type (Pinned or Fixed) for pedestal design.
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