ProtaStructure Design Guide

RC Pedestals

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Publisher

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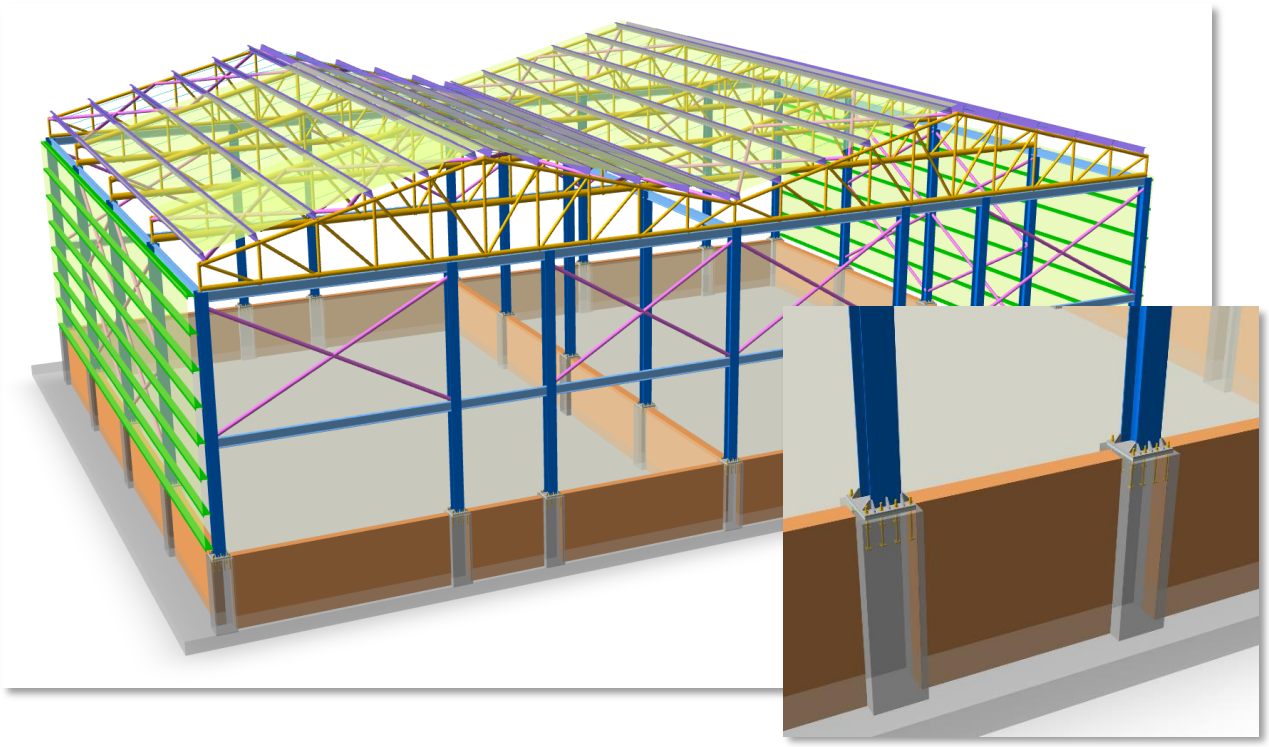
New RC Pedestals

ProtaStructure 2026 introduces a powerful new feature that simplifies the design and analysis of concrete pedestals under steel columns. Users can seamlessly insert pedestals, define their dimensions effortlessly, and integrate them into structural models for optimal design workflows. When a base plate is specified beneath the steel column, the system automatically detects the presence of the pedestal, enabling accurate anchor design and ensuring consistency with structural requirements. Moreover, the column design menu facilitates the design of longitudinal reinforcement and links, streamlining the detailing process further. For users employing merged foundation models or finite element (FE) foundation analysis, pedestals are modeled as finite element frame members, ensuring precise structural representation. This enhancement improves both the efficiency and accuracy of foundation modeling, making it an essential addition to the advanced capabilities of ProtaStructure 2026.

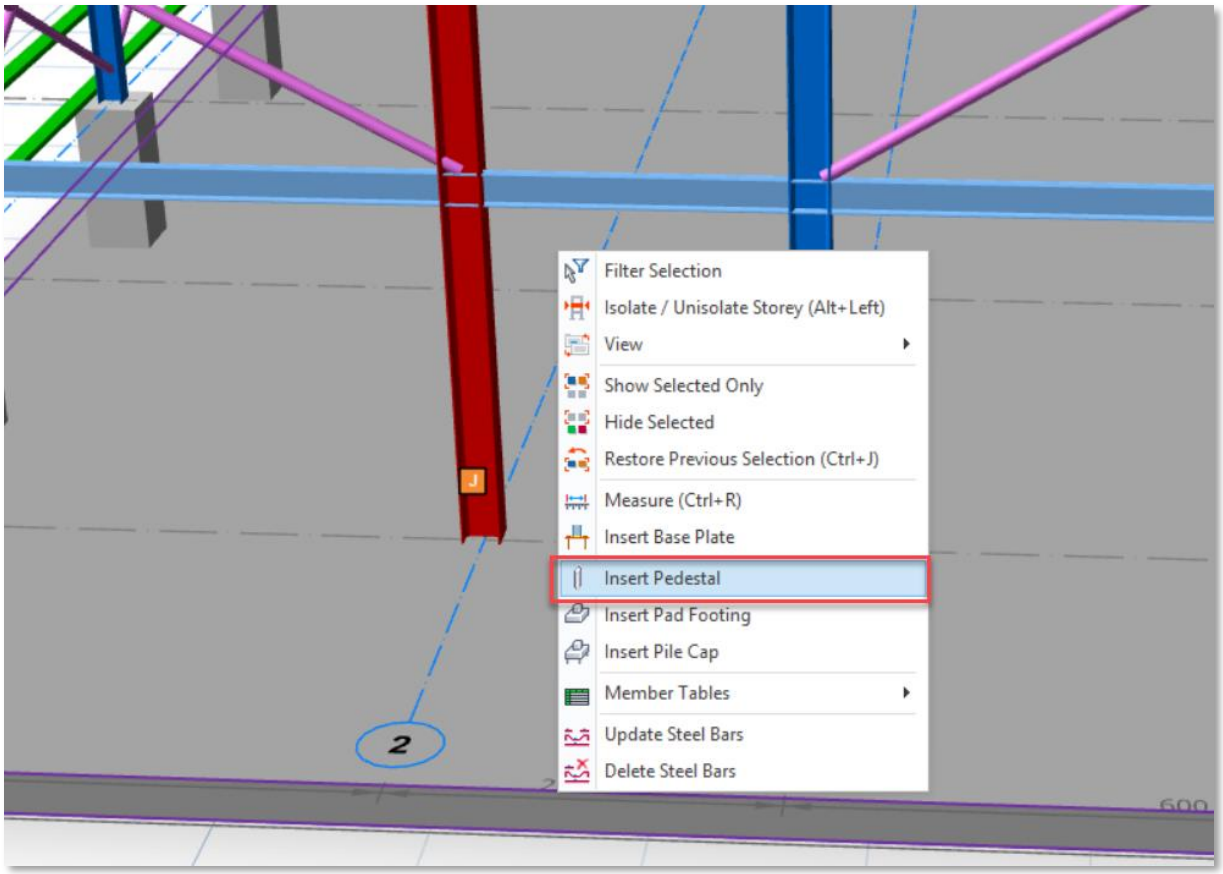
Previously, users had to rely on more manual and less integrated methods for modeling and designing concrete pedestals under steel columns, which could lead to additional effort and potential inconsistencies. Anchor design, reinforcement detailing, and integration with base plates were not automated or seamlessly linked within the workflow.

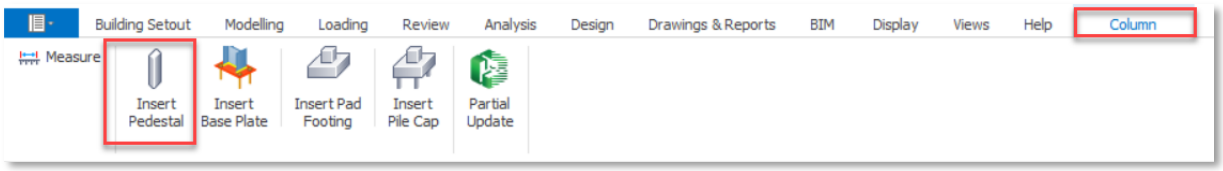


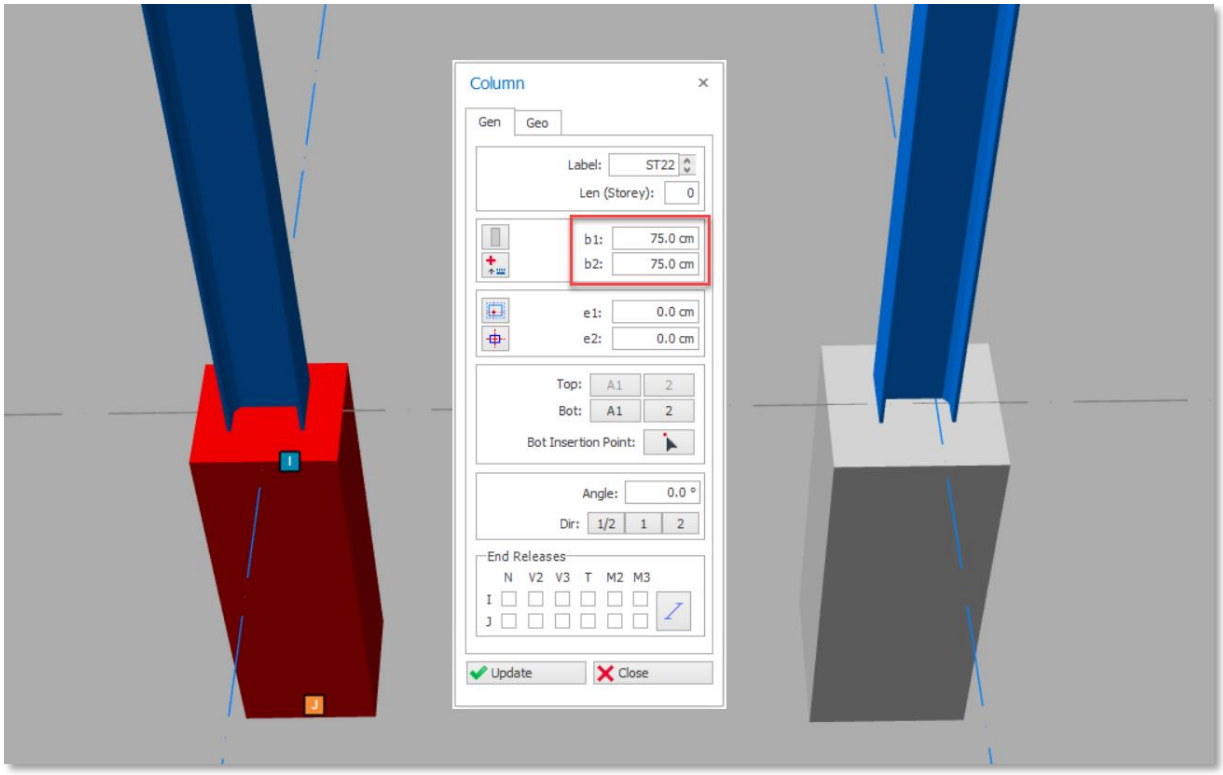
Modeling Pedestals

To insert a pedestal:

1. Switch to Foundation Storey (St: 0)
2. Select a steel column or steel columns that you want to insert a pedestal.
3. Right click and pick "**Insert Pedestal**" command. Alternatively, you can use the same command in **Column contextual ribbon menu**.
4. ProtaStructure will automatically insert a pedestal using default dimensions based on selected columns.
5. The height of the pedestal will be equal to the **height of the foundation storey**.







Note:
Pedestals are **RC columns that are defined on foundation storey**. In the previous versions of ProtaStructure, we did not allow our users to insert any columns in foundation storey. You can consider pedestals as columns automatically inserted at foundation level.

Tip:
You can select all columns and insert pedestals under all of them with a single click.

Pedestal Dimensions

Since the pedestals are like regular columns, you can apply the column operations on them, such as changing their properties. To change pedestal dimensions:

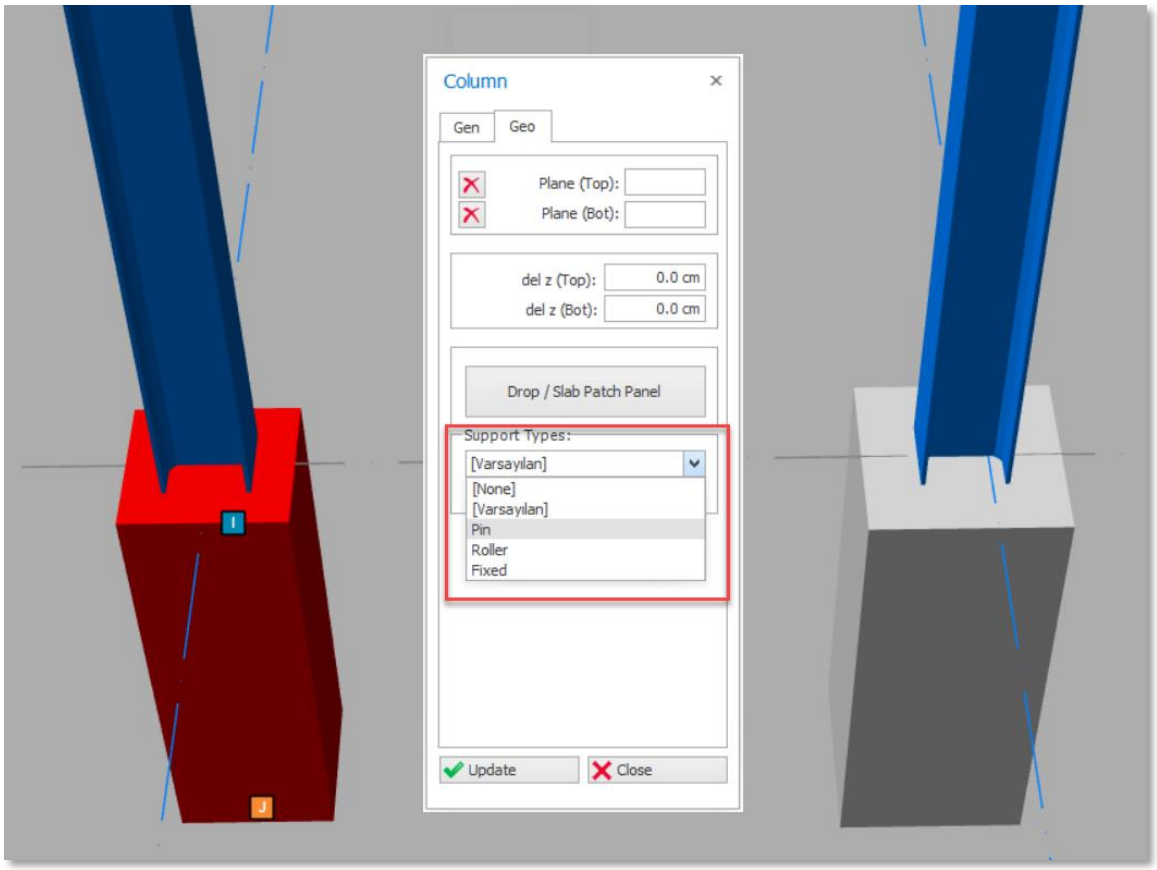
1. Select a pedestal
2. **Right click** and pick **Properties**
3. On the Properties window, change the **dimensions** and **eccentricities** using **b1, b2, e1** and **e2** fields as you see fit.
4. Click Update button for the changes to take effect.
5. You can also select **multiple pedestals** and update their properties using the **member tables**.

Pedestal Support (Restraint) Conditions

When you insert a pedestal under a steel column, the support (restraint) applied to that column is ignored and a default restraint is assigned under the pedestal. The pedestal and the column are connected at a common node.

Just like regular columns, you can assign a restraint under the pedestals different than the default support definition. To assign a support at the bottom of a pedestal:

1. Select a pedestal
2. **Right click** and open the **Properties** window.
3. Switch to the **Geo** tab on the **Properties** window.
4. Select a support type from the "**Support Types**" list. You must have defined the support types using the **Support Definitions** library beforehand.

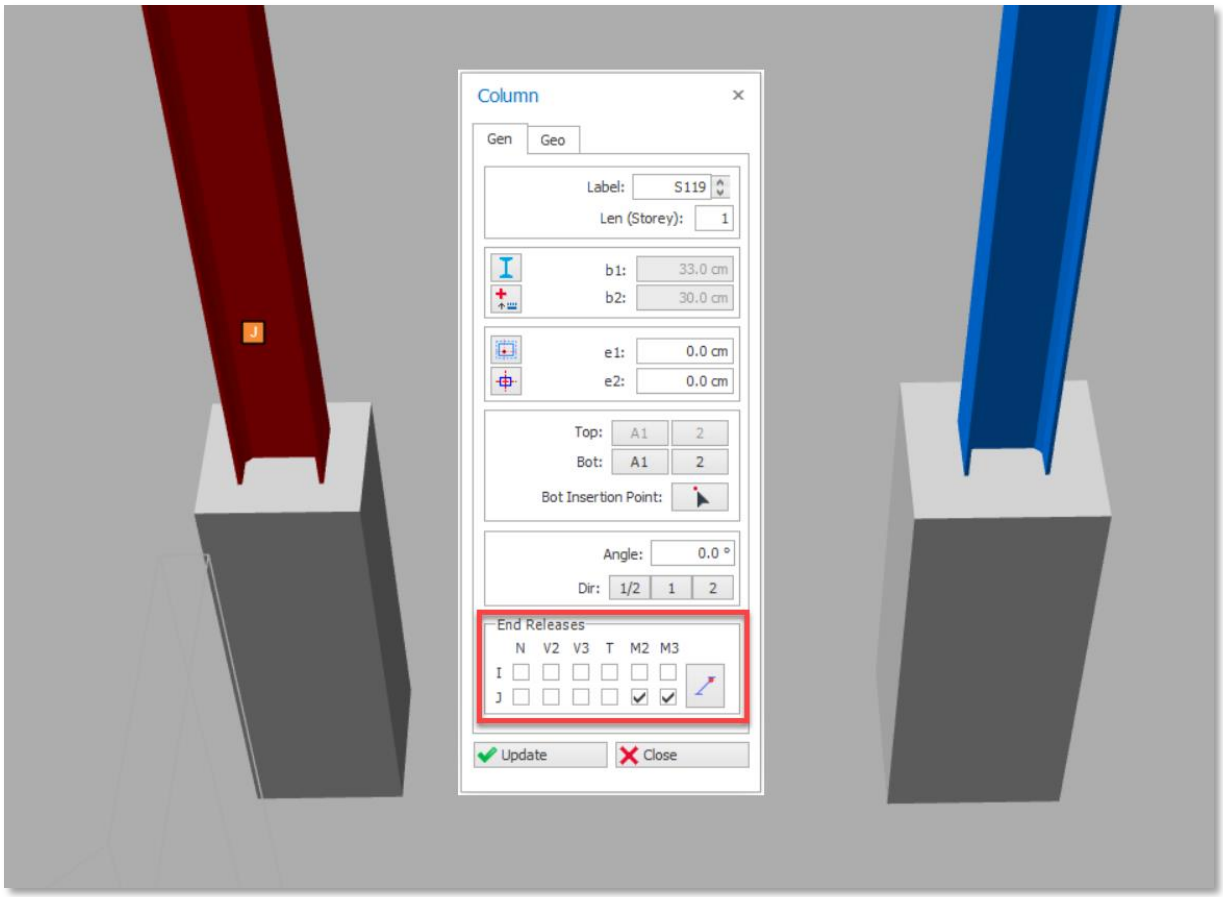


Changing Column End Releases

You may want to change the support conditions of the steel column sitting on the pedestal. In this case, instead of assigning a support to this column, we recommend changing the **End Release Conditions**.

To change the column end release conditions:

1. Select the **steel column** sitting on the **pedestal**.
2. **Right click** and open the **Properties** window.
3. On the **End Releases** field, adjust the end release checkboxes to reflect the support condition that you want to impose on the steel column. This will be governed by the **base plate connection type** and the **structural system** that you employ. You must assign the end releases accordingly.



Analysis of Pedestals

ProtaStructure will always consider the pedestals in the building analysis and foundation analytical models.

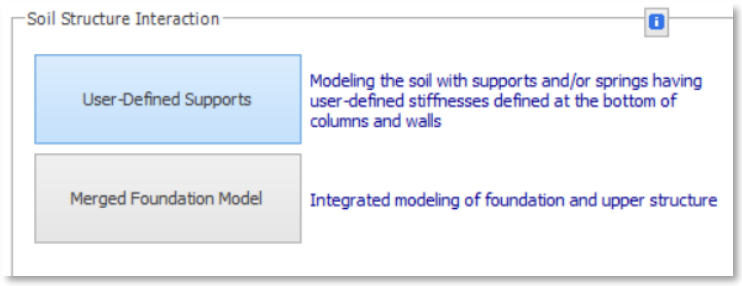
Pedestals will be represented with a frame member under the steel column connected at a common node.

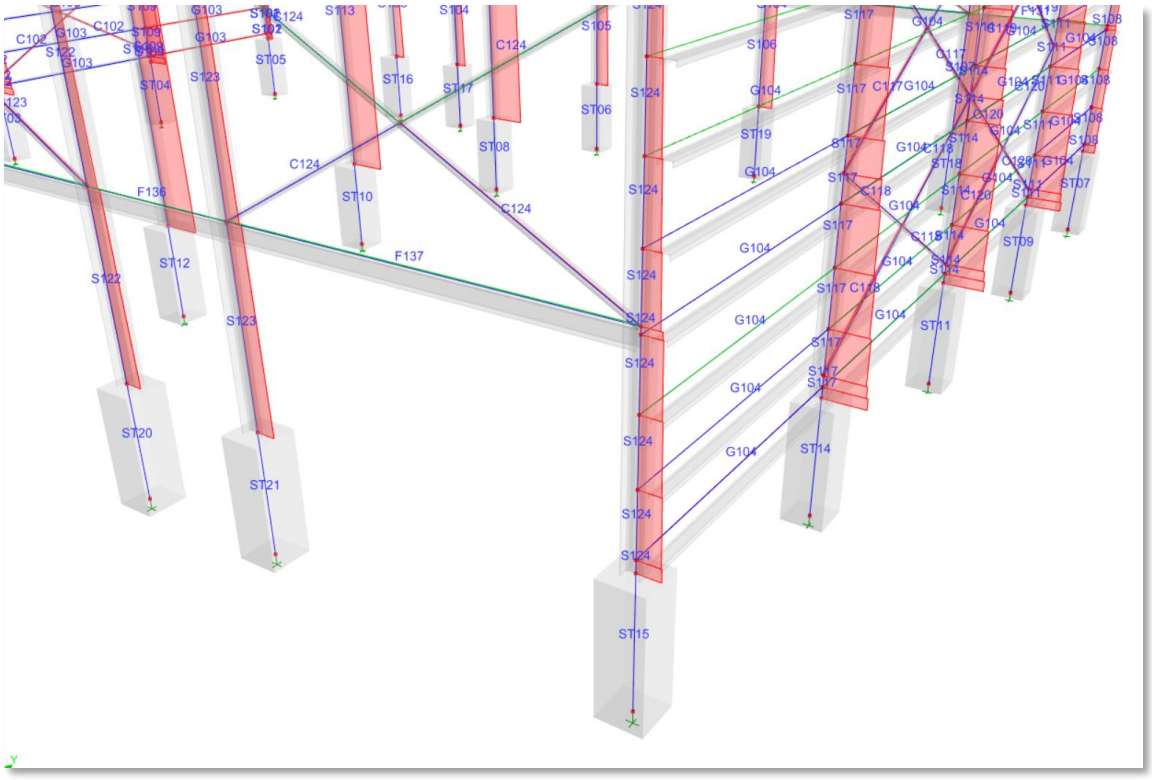
ProtaStructure has two modeling options for building analysis:

1. User-Defined Supports
2. Merged Foundation Model

Building Analysis with User-Defined Supports

In this model approach, support assignments under the columns are considered in the building analysis. Foundation members are ignored and are not analytically included in the building analysis model. If pedestals are present, then they are included in the analytical model. Support definitions assigned to pedestals are considered.

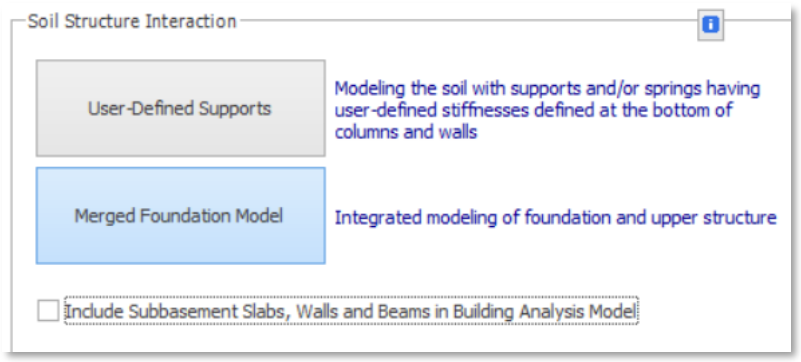


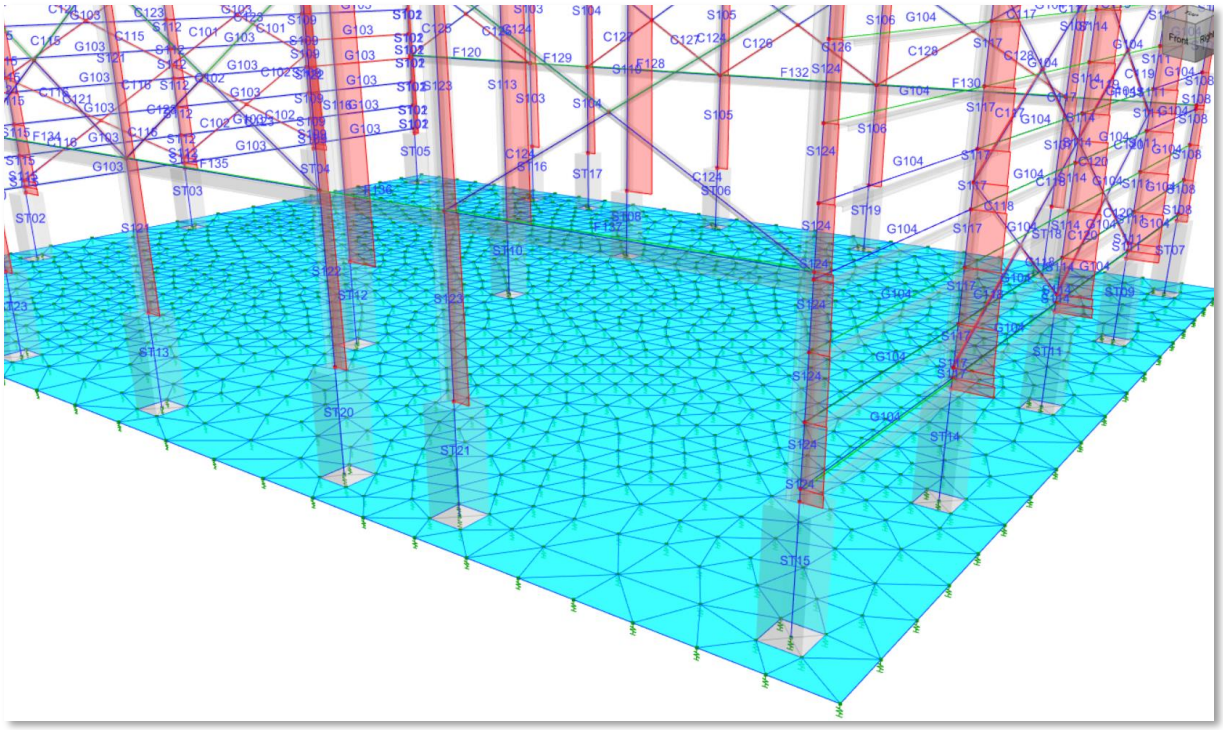


Building Analysis with Merged Foundation Model

With this approach, user-defined supports under the columns are ignored and all the foundation members are included in the analytical model. Structure is supported by **lateral and vertical soil springs**. Raft foundations, pad footings, pile caps, strip footings are meshed and appended under the structure.

Warning:
This approach can be preferred to capture the effect of the elastic foundation under the structure or to predict the drifts/periods with the effect of soil and foundation. However, it must be used cautiously since the springs are linear elastic (acting both in tension and compression) and the upper structure design results may be significantly reduced due to the soil springs compared to conventional fixed-base analysis.

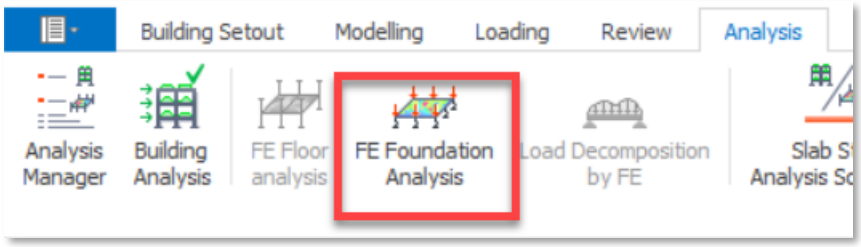


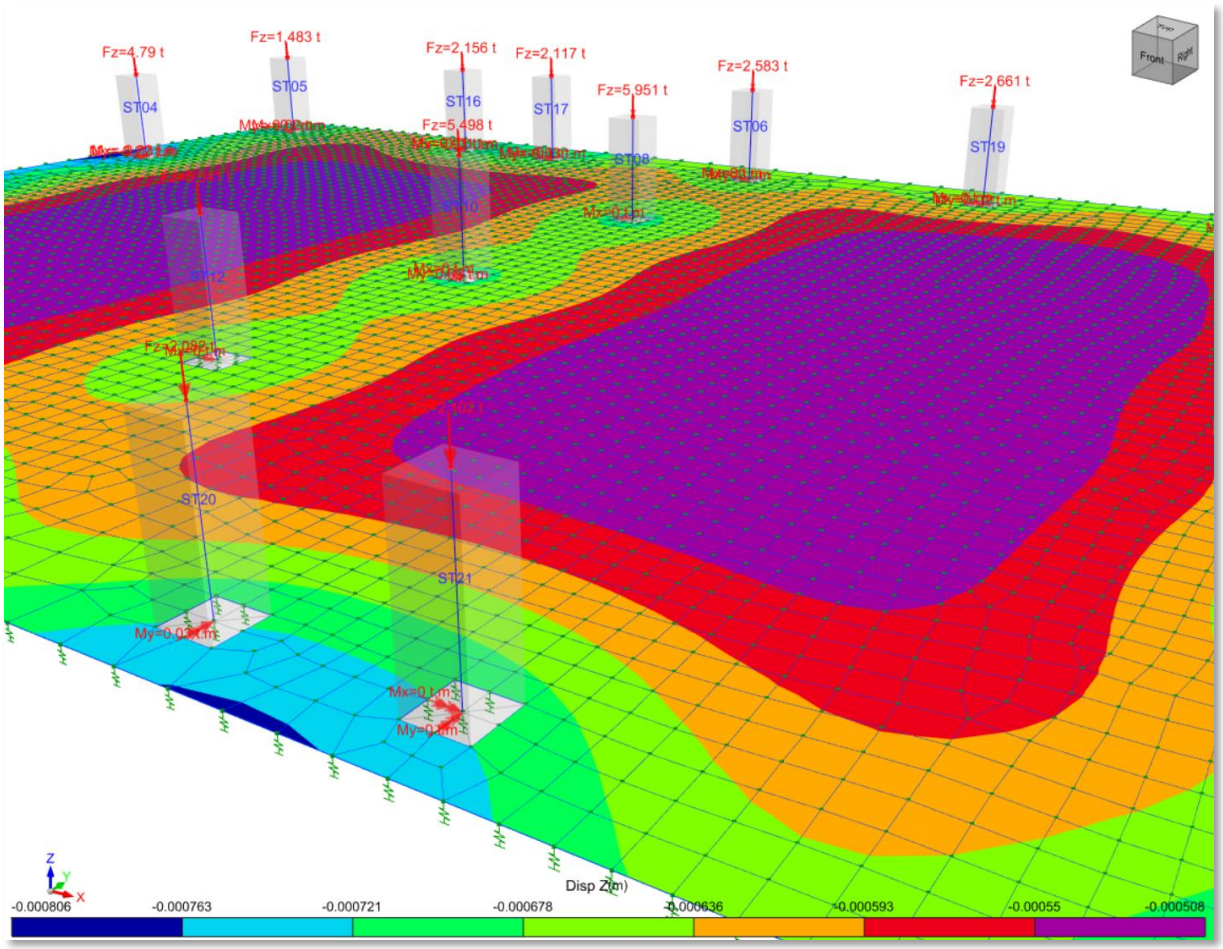


Pedestals in FE Foundation Analysis

In ProtaStructure, you can perform a **Finite Element Foundation Analysis** by isolating the foundation storey from the rest of the structure and applying the column/wall reactions to the foundation nodes.

Pedestals are automatically included in FE foundation analysis, represented with frame members having a height equal to the foundation storey height.

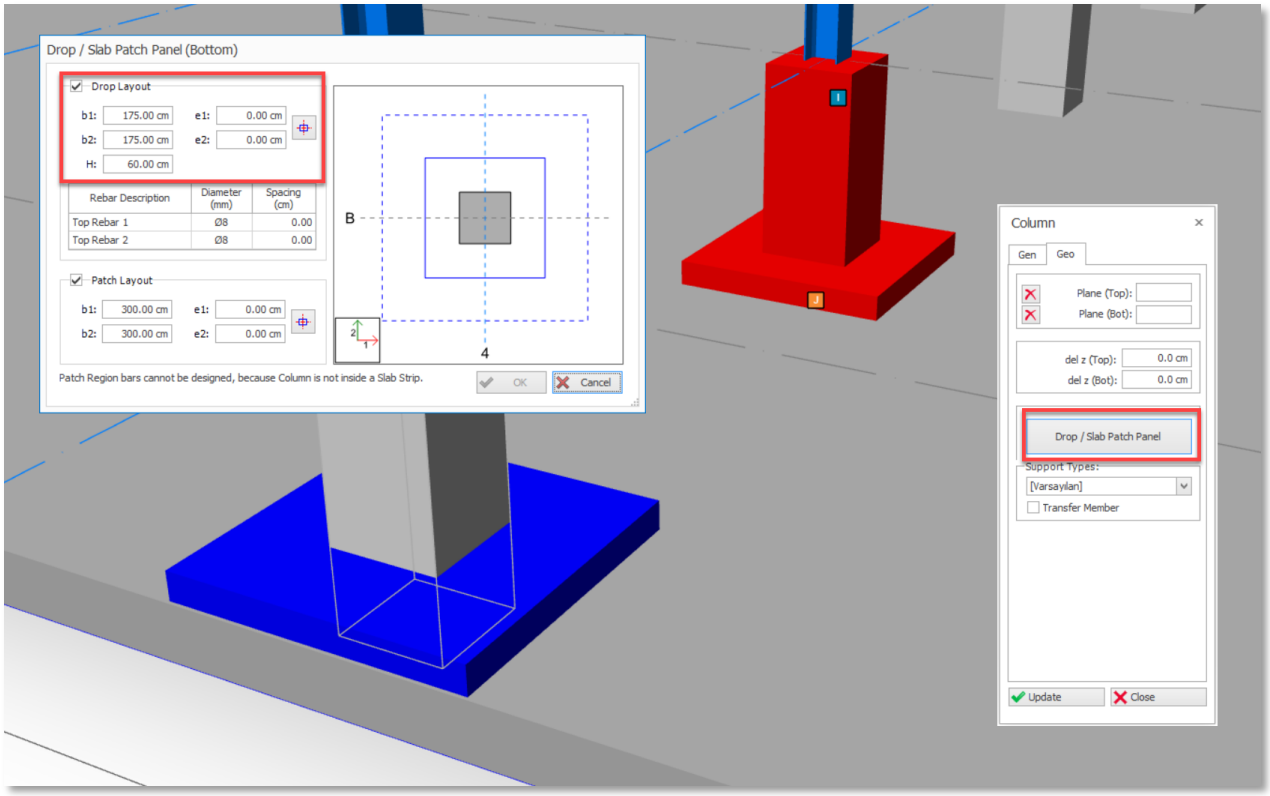




Drop Panels Under Pedestals

You can employ drop panels under pedestals to increase the punching resistance similar to the regular columns. To achieve this:

1. Select the pedestal.
2. **Right click** and open the **Properties** window.
3. Switch to the **Geo** tab on the properties window.
4. Click "**Drop/Slab Patch Panel**" button to open the drop editor.
5. Check the "**Drop Layout**" option. Enter the dimensions, eccentricities and the hieght of the drop.
6. Click **OK** to close the drop panel editor.
7. Click **Update** to reflect the changes to the pedestal.



Note:
Drop panels will be a part of FE Foundation Model. They are represented by **thicker shells**. Drop panels will also be considered in the punching checks.

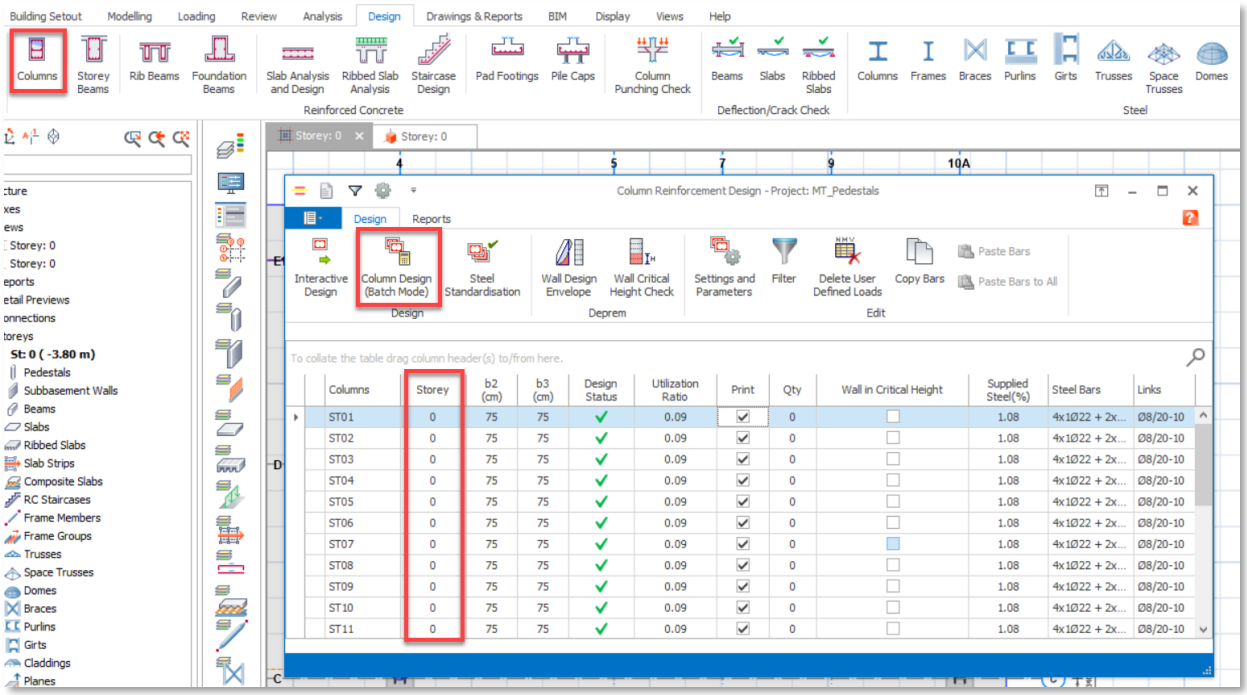
Design of Pedestals

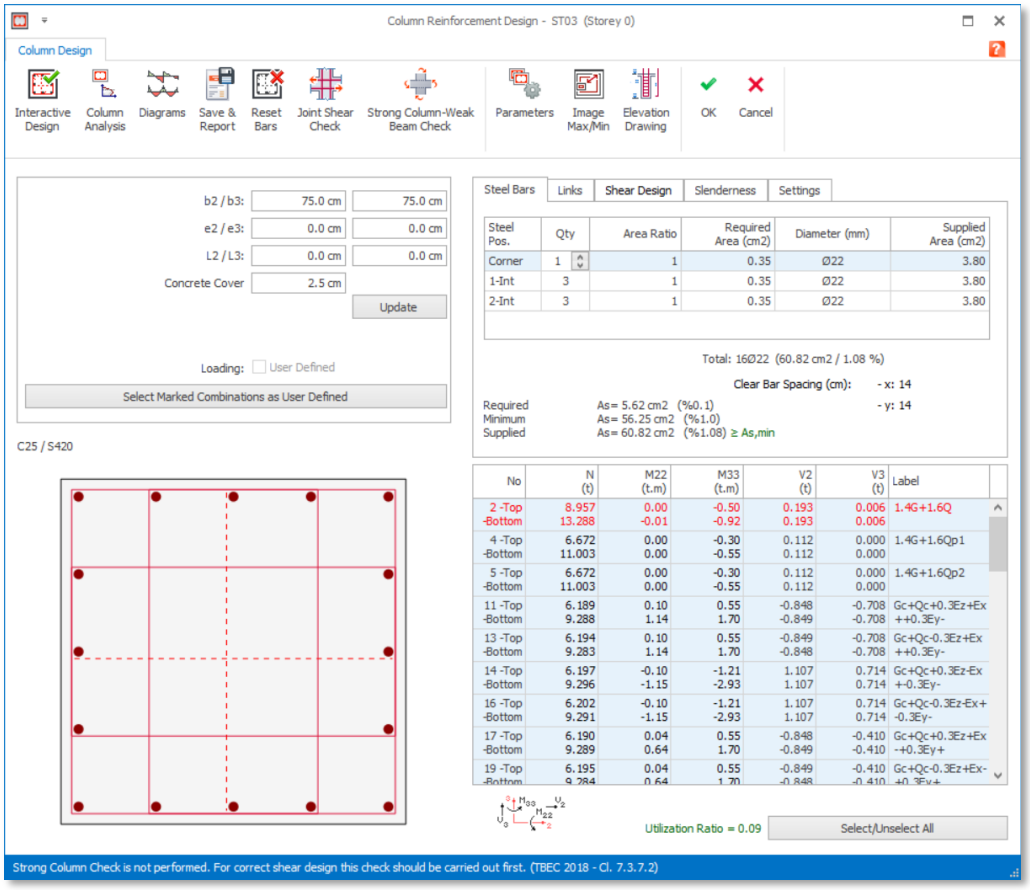
Since the pedestals are always included in the finite element building analysis, they can be designed against the calculated internal forces.

The design effects are automatically extracted and the reinforcement design of pedestals can be performed just like any other column using the "**Column Reinforcement Design**" menu.

Since the reinforcement design of pedestals is identical to regular columns, the details will not be given in this document. Simple steps are:

1. Run the **Design > Reinforced Concrete > Columns** command on the ribbon to open the **Column Reinforcement Design** window.
2. The pedestals will be listed on this window with **Storey Number = 0** along with all other columns in the structure.
3. Perform **Batch Column Design** to design all pedestals.
4. Alternatively, you can **double click** and design one of the pedestals.
5. You can modify the reinforcement selected by ProtaStructure and apply it to other similar pedestals using the **copy/paste** functionality.





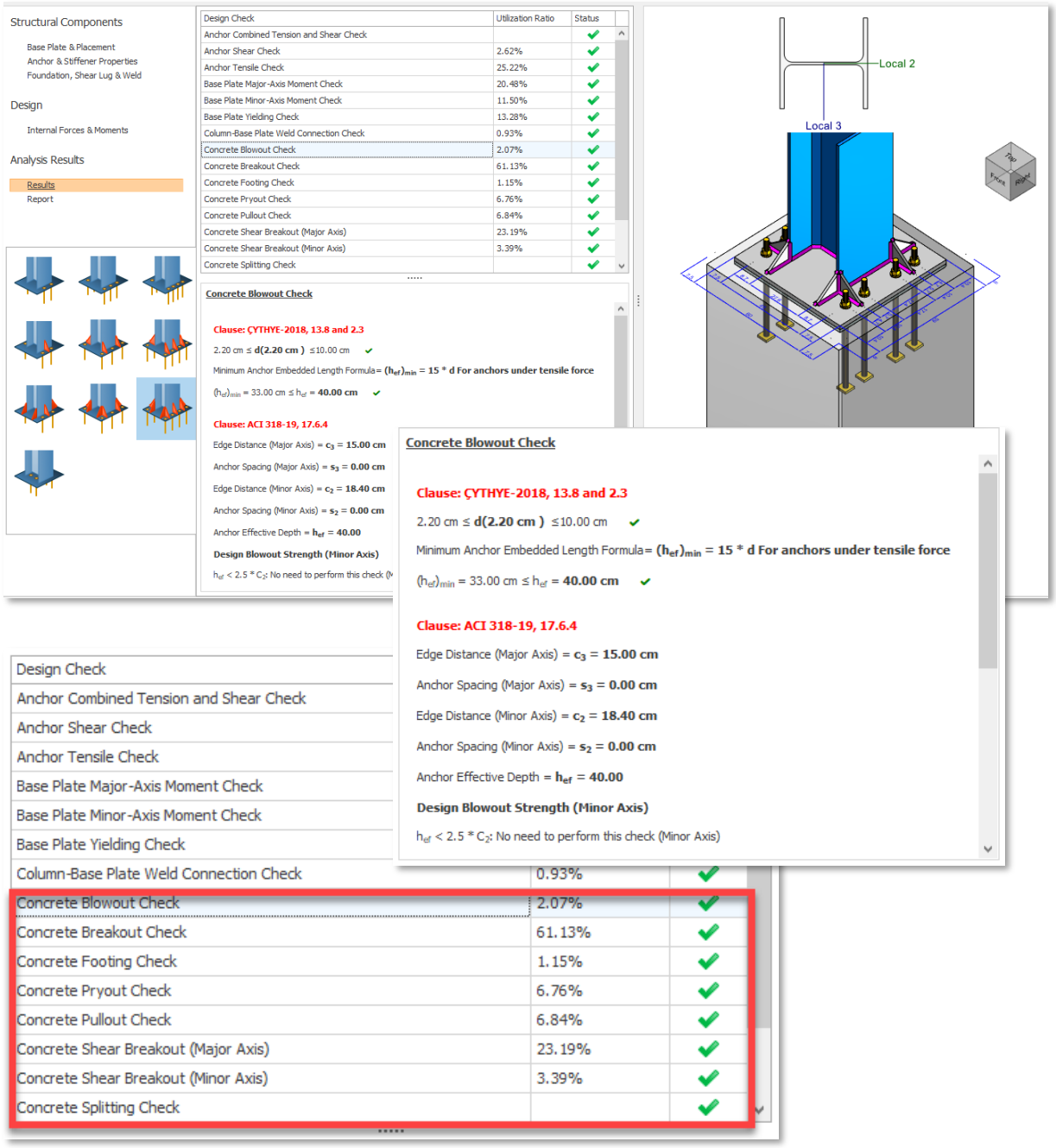
Design of Base Plate Anchors inside the Pedestal

When you insert a base plate under a steel column, ProtaStructure will automatically recognize any existing pedestals and capture its dimensions and other properties.

Important Note:

ProtaStructure performs the checks such as **Anchor Checks, Concrete Blowout, Breakout, Footing, Pryout, Pullout, Shear Breakout, and Splitting checks** as a part of the steel base plate design.

If one of these checks require the modification of the pedestal, you have to **update the pedestal dimensions, repeat the analysis and base plate design.**


Structural Components
Base Plate & Placement
Anchor & Stiffener Properties
Foundation, Shear Lug & Weld
Design
Internal Forces & Moments
Analysis Results
Results
Report
Design Check | Utilization Ratio | Status
Anchor Combined Tension and Shear Check
Anchor Shear Check 2.62%
Anchor Tensile Check 25.22%
Base Plate Major-Axis Moment Check 20.48%
Base Plate Minor-Axis Moment Check 11.50%
Base Plate Yielding Check 13.28%
Column-Base Plate Weld Connection Check 0.93%
Concrete Blowout Check 2.07%
Concrete Breakout Check 61.13%
Concrete Footing Check 1.15%
Concrete Pryout Check 6.76%
Concrete Pullout Check 6.84%
Concrete Shear Breakout (Major Axis) 23.19%
Concrete Shear Breakout (Minor Axis) 3.39%
Concrete Splitting Check
Concrete Blowout Check
Clause: ÇYTHYE-2018, 13.8 and 2.3
2.20 cm ≤ d(2.20 cm) ≤10.00 cm
Minimum Anchor Embedded Length Formula= (hef)min = 15 * d For anchors under tensile force
(hef)min = 33.00 cm ≤ hef = 40.00 cm
Clause: ACI 318-19, 17.6.4
Edge Distance (Major Axis) = c3 = 15.00 cm
Anchor Spacing (Major Axis) = s3 = 0.00 cm
Edge Distance (Minor Axis) = c2 = 18.40 cm
Anchor Spacing (Minor Axis) = s2 = 0.00 cm
Anchor Effective Depth = hef = 40.00
Design Blowout Strength (Minor Axis)
hef < 2.5 * C2: No need to perform this check (Minor Axis)
Local 2
Local 3

Concrete Blowout Check
Clause: ÇYTHYE-2018, 13.8 and 2.3
2.20 cm ≤ d(2.20 cm) ≤10.00 cm
Minimum Anchor Embedded Length Formula= (hef)min = 15 * d For anchors under tensile force
(hef)min = 33.00 cm ≤ hef = 40.00 cm
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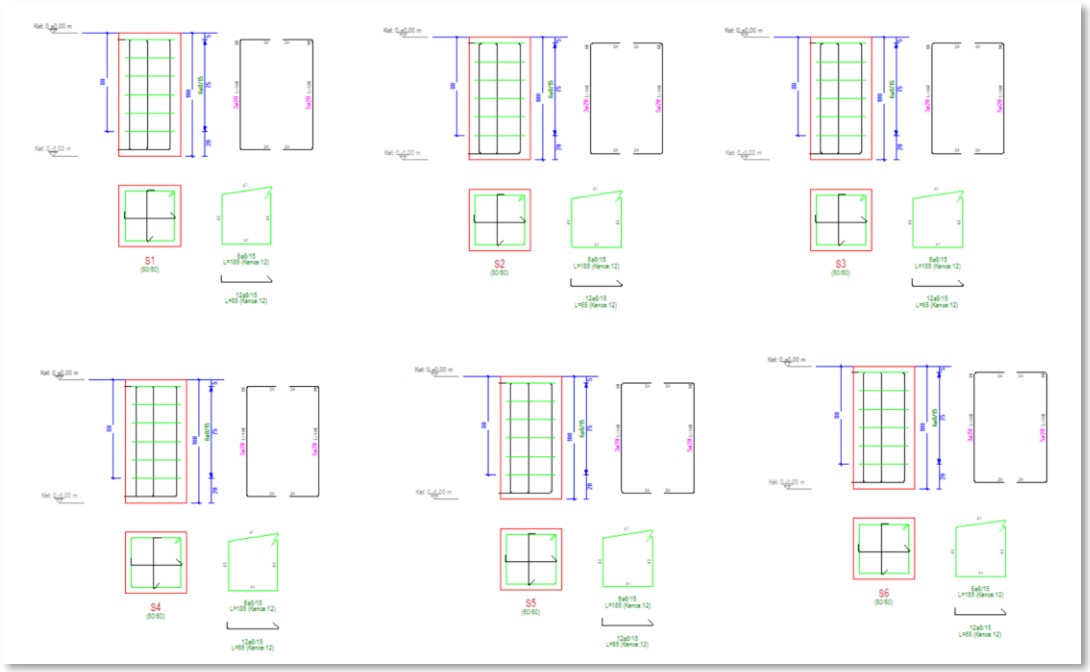
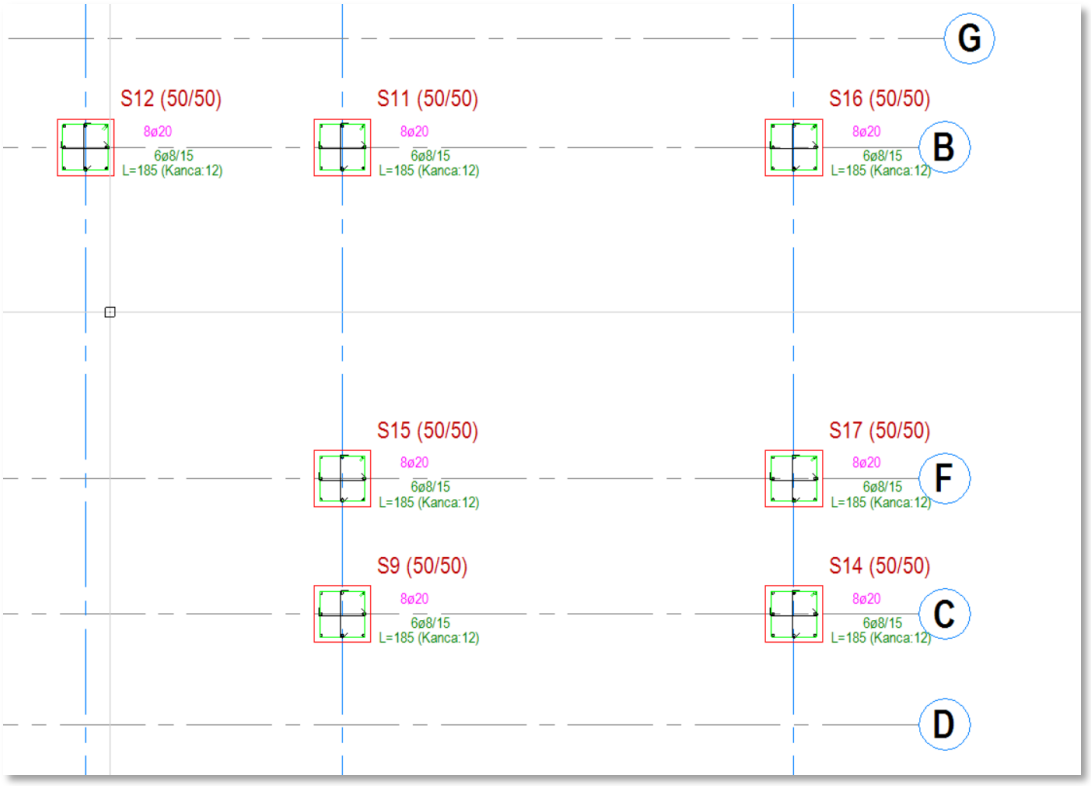
Edge Distance (Major Axis) = c3 = 15.00 cm
Anchor Spacing (Major Axis) = s3 = 0.00 cm
Edge Distance (Minor Axis) = c2 = 18.40 cm
Anchor Spacing (Minor Axis) = s2 = 0.00 cm
Anchor Effective Depth = hef = 40.00
Design Blowout Strength (Minor Axis)
hef < 2.5 * C2: No need to perform this check (Minor Axis)

Design Check
Anchor Combined Tension and Shear Check
Anchor Shear Check
Anchor Tensile Check
Base Plate Major-Axis Moment Check
Base Plate Minor-Axis Moment Check
Base Plate Yielding Check
Column-Base Plate Weld Connection Check 0.93%
Concrete Blowout Check 2.07%
Concrete Breakout Check 61.13%
Concrete Footing Check 1.15%
Concrete Pryout Check 6.76%
Concrete Pullout Check 6.84%
Concrete Shear Breakout (Major Axis) 23.19%
Concrete Shear Breakout (Minor Axis) 3.39%
Concrete Splitting Check

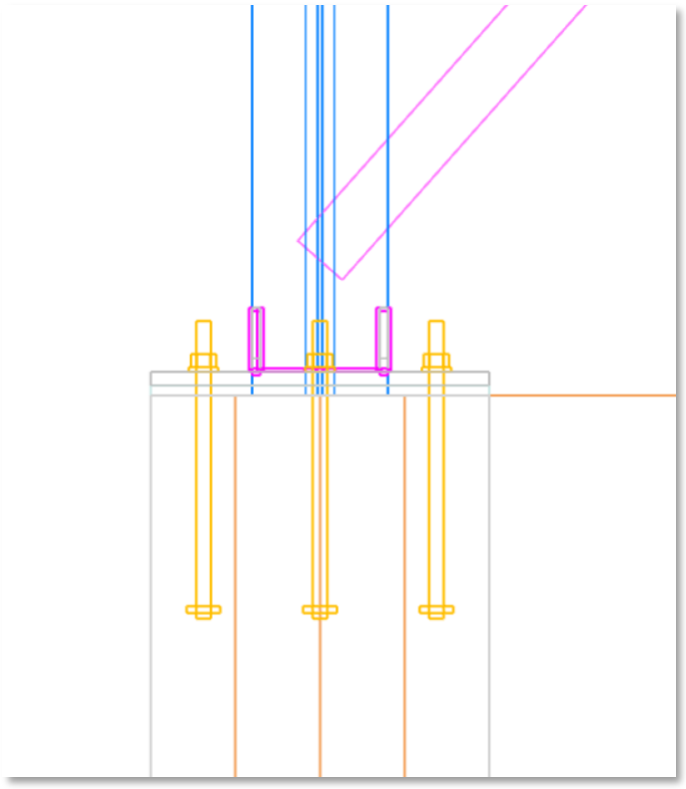
Pedestal Details

After you have designed pedestals in ProtaStructure, you can push them down to ProtaDetails for RC detailing just like other reinforced concrete members. You can use the Column Elevations and Column Application Details for generating the pedestal details. The **Foundation Storey** is added to these categories for this purpose.





You can use ProtaSteel to obtain the anchor detail drawings of pedestals with steel base plates defined on top of them.



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