New Features

ProtaStructure Suite 2021 – What’s New

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Please contact us for your training and technical support queries

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Connection Grouping and Numbering

Improvement of Weld Drawings (3D Modeling and Hatching of Fillet Welds)

Macro Preset Mapping

AutoSave

ProtaStructure Frame Member End Forces Tables

Automated Dimensioning of Axes in General Arrangement Drawings

Automated Leaders and Annotation of Connection Details

End Release Display in General Arrangement Drawings

Improvements in Sheet and Drawings Module

Bug Fixes and Improvements

Thank You
Introduction

At Prota we are fully committed to providing industry leading, accurate and highly practical structural BIM modeling, analysis, design, and detailing solutions to the consultancy and engineering industry.

ProtaStructure 2021 is a fantastic new release representing a major milestone in the evolution of our vision and commitment to you.

ProtaStructure 2021 takes advantage of the latest technology platforms and 64-bit processing and architecture.

It has been created to provide a more seamless, fluid and optimised experience.

We have carefully redesigned the User Interface from scratch to provide an enhanced user experience whilst preserving what you know and love about ProtaStructure. We have built on our unique open BIM platform which allows you to share, communicate and take advantage of the integrated workflows leading BIM technology provides.

We hope you enjoy the many new features, enhancements, and experiences that are awaiting you in ProtaStructure 2021.

Thank you for choosing ProtaStructure.

Note: Some of the features in this document are originally introduced in ProtaStructure 2019 but further enhanced in 2021.
ProtaStructure 2021 takes the ease of use, productivity and accuracy to a whole new level combining it with an enhanced technology platform, a brand-new user interface and powerful new features.

Technology and the User Experience

The 64-bit Architecture and Enhanced Technology Platform

At Prota we are continuously investing in the latest technologies to provide you with unique, fit for purpose structural engineering solutions. ProtaStructure 2021 is now fully compatible with 64 bit operating systems. We have further optimised this bringing enormous advantages to speed and model management. This means that you will be able to operate, analyse, design and detail any sized model faster than ever before.

With ProtaStructure 2021 we have re-engineered our existing technology to a new and more scalable platform, allowing us to provide you with more improvements, new features, and a fantastic user experience now and into the future.

A Modern Interface with Fluid User Experience

ProtaStructure 2021 welcomes you with a modern user interface designed from scratch for ease of use without compromising efficiency.

Our New User Experience Interface - Everything is in its right place

Check out our new fluid ribbon experience blending the familiar with the new. Logically laid out to guide you though the entire design process – from setout and modelling to seamless BIM collaboration.

Open as many views as you need, including analytical models, reports, 3D rebars, and modeling views. Views can be organized using smart layout options.
Detach, Dock or Float the Windows

Customize your work area by docking and floating views. We also considered engineers using multiple monitors. If you want to make the most of your screenscape, just move one of the views to another screen.
Command Search

Type into new ‘Command Search’ function to access mostly used functions just in seconds. The smart search bar will list the available commands for the current context.

Search the Structure Tree

Looking for a specific member? Type in the member label in the structure tree’s search box and let ProtaStructure find it for you.

Contextual Ribbon Tabs

Commands and functions specific to a member type or group of members are now directly accessible in the New Contextual Tabs in addition to the right click menu. As soon as you select a member, relevant commands will appear in dedicated contextual ribbon tabs.
A Selection of Modern Themes for a Beautiful and Consistent Look and Feel

Whether you like light or dark themes, we have included beautiful brand new themes for ProtaStructure that you will enjoy using. You will experience a far better user experience. You can access the themes at Settings Center > View & Save > Theme Selection. A few of the themes available are:

An example to one of the dark themes in ProtaStructure 2021
Multi-Language User Interface

The new resource infrastructure allows you to use ProtaStructure in different languages. In addition, you can generate the calculation reports in an entirely different language than the UI language. This will bring scalability to your business by enabling you to hire engineers talking different languages and by producing calculation reports in language of preference for project submission.
Faster Learning Curve: In-Product Learning and Help

We value the time you invest in learning all of what's possible with ProtaStructure. To get the most out of ProtaStructure 2021, we are proud to introduce our new in-product learning tools. You will be onboard in no time with this fabulous new interactive help, perfect for both those new to Prota or those wanting to extend their knowledge.

Detailed tooltips with Video Tutorials

Hover over any button and our interactive tooltip appears with useful Descriptions, How To, Tips, and Short Animations/Videos to guide to seamlessly through the features of ProtaStructure.

Contextual links to Prota Help Center

Get instant, relevant information with a key stroke. Whenever you hit F1 on a tooltip or window, you will be taken directly to relevant knowledge base article in our Prota Help Center, providing direct information on what's important to you.
Prota’s Welcome Screen:
The One-Stop-Shop for Training Resources, News and Notifications

Launching ProtaStructure brings you instantly up-to-date with Prota’s world. Access the latest news, software updates and learning resources all from our new all-in-one welcome screen dashboard.

Instantly Get Updates with the New Update Delivery Technology

Our new update system notifies you about any software updates instantly. Required files will be replaced without the need to install the software.
Leading BIM Integration – Powered by ProtaHUB

We understand that you don’t always have all the information in the BIM-Rich format you require. So we have developed ProtaHUB, a unique common BIM platform underlying ProtaStructure. This allows us to understand IFC and other common model data definitions (such as 2D and 3D DXF), even if they only have only Solid or Face representations, and seamlessly convert these to intelligent structural models you can use in ProtaStructure.

Import IFC Files from a Wide Range of Sources

Prota continues to deliver industry leading BIM Integration. ProtaStructure can now receive models from a wide range of IFC sources (like architectural or other structural software).

The biggest hurdle that stands in the way of effective BIM Integration today is the different implementations and interpretations of data among the existing software.

ProtaStructure 2021 makes this easy with our unique ProtaHUB allowing you to import IFC 2x3 Coordination View data directly into ProtaStructure to create your models.
Improvements in Revit Integration

Revit Family Mapping

When it comes to BIM, every company has its own unique way of working. From file naming conventions, parameter names, folder structures, to unique family designations and shared parameters, we recognise that each designer needs a flexible approach to creating and sharing project information.

With our dedicated Revit Add-on, you can use any Revit template to start communicating with ProtaStructure. We have developed a new family mapping tool that enables you to use your own families to match your workflow.

Communicate Revit Truss Families to ProtaStructure

If you have truss members in Revit which are inserted using the truss families, you can communicate them to ProtaStructure.
Import from 2D DXF Files - External Reference Drawings

ProtaHUB now allows you to take full advantage of any existing 2D drawing information, like structural and architectural key plans, to rapidly setup and co-ordinate your models.

Have Architectural or Service Plans?

We’ve enhanced further our reference drawing import module. You can assign different DXF drawings for each storey. Manage them all in a single neat environment. Have full control over how the drawings are positioned. Change any property like opacity, scale factor, color-scheme, even the import unit and assigned storey any time you want.

Hide and show reference drawings as you need. Find them the way you left next time you open your project.
Have Structural Key Plans in CAD?

Why stop there? Select a reference drawing and import elements to jump start your structural model.

Take advantage of ProtaStructure’s new 2D DXF import where we’ll extrude and create 3D information directly from your 2D drawings. Create gridlines, columns, walls, beams and slabs instantly and intuitively; greatly enhancing modelling times.

All layers are examined for keywords and relevant layers are automatically assigned to member types immediately upon loading of a DXF file. Entities assigned to multiple layers can be imported at once.

2D DXF > ProtaStructure
Import Beams and Slabs from DXF Files

Bring in the structural members in DXF files such as beams and slabs into ProtaStructure 2021. Beams must be defined by parallel LINE or closed POLYLINE objects, whereas slabs must be defined with closed POLYLINES.

Import from 3D DXF Files

Not all software comes with high-level BIM collaboration skills like IFC and a Bespoke Native Revit Link as ProtaStructure does. Some of them are just bound to low-level data export facilities like 3D DXF. This won’t stop you communicating with them anymore. ProtaStructure’s 3D DXF import feature can make sense of 3D objects such as polyface meshes, solids, 3D solids, blocks and more.

ProtaStructure generates sections, figures eccentricites and even creates grids when necessary to build a physical structural model automatically. Storeys are assigned intelligently by querying all the member positions.

You can even import analytical 3D models made of lines and meshes. ProtaStructure assigns default section material properties. No grid definition is required.
**Poster Quality Image Export**

You can now create poster-quality images out of your model. Model vectors are scaled up before rasterizing and you get a crisp and high resolution image to be used in printed media, presentations, reports or web sites.

**3D PDF Export**

PDF readers on the market are able to interpret 3D information and visualize it. That allows you create better presentation materials and a means to share your model view with your colleagues even on mobile devices. ProtaStructure can help you to achieve this by exporting the structure’s 3D geometry information to 3D PDF format.
Extended Code Coverage

New Codes of Practice

Following new codes of practice are supported and the support for existing ones are enhanced in ProtaStructure 2021:

- Thailand Seismic Code (DPT 1301/1302-61)
- Thailand Wind Code (DPT 1311-50)
- Indonesia Seismic Code SNI1726-2019
- Eurocode 2 and Eurocode 3 Poland National Annex

Separate Wind Code Selection

You can now explicitly select the wind code in Project Parameters dialog. ‘Wind Code’ selection is separated from ‘Loadings Code’ for countries where loading, seismic and wind codes are combination of different other codes.
RSA Results Sign Method

Response Spectrum Analysis calculates and combines the pseudo maximum responses of natural vibration modes against a given design spectrum by assuming each mode as an independent single degree of freedom system. During the combination of modal result vectors, the sign of the displacements and internal forces are lost and hence equilibrium condition is not satisfied anymore. If you check the deflected shape of the structure under response spectrum load cases, you may see weird displaced shapes due to this fact. Also, internal force diagrams will always be positive after the combination. This is the expected behavior and natural output of response spectrum analysis.

Most of the time, this is easily overcome during the design by combining RSA load cases with dead and live load cases using both negative and positive coefficients. However, for deflection checks and other structural checks, you may need the signs of the internal forces and deflections.

For this purpose, ProtaStructure hosts a setting to either use the ‘Absolute Values’ or ‘Sign of Dominant Mode’ for RSA result signage.

If dominant mode signs are used for overall RSA results, then the dominant mode will be selected depending on its mass participation in a certain DOF, and the sign of that mode will be used for the particular RSA load case in the relevant direction. This approach may yield unexpected results in highly irregular structures where the dominant mode is a torsional mode or translational mode with high coupling.

Edge Walls Bending Contribution Checks

To assess structural system load distribution within the lateral load resisting system, you may want to mainly review the moments or shear forces carried by edge wall groups to the overall overturning moment or base shear.

The new wall grouping functionality in ProtaStructure allows you to create groups of walls and assess the base shear and moments carried by them against the structural output.
Usage of Different R values for Each Orthogonal Direction

Users can now define different structural system types (different R behavior and overstrength factors) for two different orthogonal directions.

Enhanced Wind Code Calculation to ASCE07

With ProtaStructure, additional load cases are now automatically considered for 4 different wind loading cases described in ASCE07.
Modelling

Our New Flexible Frame Member

ProtaStructure supports practical tools for quick insertion of steel members such as purlins, girts, trusses, braces, sag-rods, and so on.

To provide even more flexibility for you to model steel structures, we have introduced the free “Frame Member” that you can insert anywhere in the model.

Frame member sections can be rotated in any orientation, and local offsets can be assigned without compromising the analytical model. You can assign end releases in the direction of any degrees of freedom.

Custom Truss Editor

ProtaStructure provides an extensive library of parametric truss members. You can easily select truss type and pattern, set the parameters and insert the truss.

To provide you with even more flexibility we have introduced a brand-new Custom Truss Editor to create custom trusses of any shape.
Convert Any Parametric Truss to a Custom Truss

You can also start with any parametric truss in the library and customize it to your needs. As you develop this, you can return back to the parametric truss library and come back to your custom design as needed. Your draft is cached for you, in case you change your mind.

Convert Free Frame Members into Trusses

Create any free geometry in 3D modelling environment using free frame members. Then select and convert them into a single truss element.
Save Your Trusses to the Library and Share

Save any custom truss to the library where you can use it in other projects or simply share it with your colleagues.
New Cladding Member

It is now much more practical to distribute the loads on purlins and girts. You can simply create claddings on top of purlins and girts and assign load values on different regions of the cladding.

Edit Multiple Trusses

ProtaStructure 2021 allows you to edit multiple trusses at once. Selected trusses must be of the same type. This is an extremely efficient tool in case you need to change your design decisions after you have progressed in your model.
Steel Trusses: New Features and Improvements

Bottom Chords Perpendicular to Supports
A new option is added for trusses with sloping bottom chords. “Make Bottom Chord Perpendicular to Support” option can be preferred for ease of constructability.

Slope Angle for Top Chords
In addition to Left Heel, Right Heel, and Apex Height, top chord inclination can also be defined with Slope Angles. For example, if the roof slope is known as a percentage, say A%, the angle can be calculated by the formula $\arctan(A/100)$. After Apex Height is specified, Left and Right Heel heights are automatically calculated using the given angle. Activate “Enter Left Heel by Angle” or “Enter Right Heel by Angle” options to use this feature.

Inverted Truss Types
All truss types now support an “Invert Truss” option.

Specifying Heel Height for Curved Trusses
Left and Right Heel Height can now be specified for curved trusses.

Trusses with Different Number of Joints and Spans
Purlins can now be inserted on trusses with different spans and number of joints. The shorter truss governs the purlin layout.
Inserting Purlins on Bottom Chords

A new option now allows purlins to be inserted on truss bottom chords.

A New Truss Type

A frequently used “Scissors” type truss with different Left Heel, Right Heel, and Apex Height can now be inserted.

Divide Cross-Diagonal Members

To quickly insert gusset plate connections on cross-diagonal members, we have introduced the “Divide Cross-Diagonal Frames” option.

Delete First and Last Verticals

The deletion of first and last verticals is now an option rather than an automated operation. If this option is checked, the first and last vertical members are never generated in case of any parameter change. Additionally, if truss placement is set to “Top Chord,” then first and last verticals are automatically deleted for convenience.
Insert Multiple Braces In One Go

Horizontal, inclined, or vertical braces with correct offsets, correct rotation, and orientation can be tricky and time-consuming to insert. Our new brace tool allows you to insert multiple braces with a few clicks to truss top and bottom chords, beams, and columns.

In the editor, you can select and change multiple brace properties at once. Moreover, you can delete or reposition individual brace offsets to further customize your brace pattern design.

Braces Between Truss Top and Bottom Chords

With ProtaStructure 2021, you can insert braces between truss top chords and bottom chords. Previous versions of ProtaStructure was only supporting brace insertion between columns and beams.

Extended Steel Profile Library: Thailand and Philippines Profiles

Commonly used Thailand profiles of RHS, SHS, CHS, I, H, C, T and CWL extends our ever growing profile database.
Transfer Columns and Walls with Rigid Links

You can now mark walls and columns as “Transfer”. Once marked this way, there won’t be any discontinuity message issued during the analysis. Additionally, if transfer columns are inserted on different gridlines, ProtaStructure will create rigid links automatically. Additionally, the design of beams supporting these transfer members is improved.

Since column S2 not marked as ‘Transfer’ it is not automatically connected with a rigid link.

Since column S2 marked as ‘Transfer’ it is automatically connected with a rigid link.
The New Settings Center

All project and system settings under one UI

Creating simple seamless user experiences is at the core of ProtaStructure 2021. We have now categorized and collected all settings and parameters under a single unified 'Settings Center’ that will enable you to tweak and fine-tune your design decisions easily.

Search to access desired settings

You can perform keyword searches to find the parameter you need. It can be as simple as Concrete Cover, Column, Splice, Foundation, etc.

Graphics Performance Optimization Options

New graphics optimization options will bring you faster modeling ability in case you like to play it big and have a really huge model with a really huge floor plan. Especially, use of vector fonts will drastically increase graphics refresh times.

A new ‘Performance Mode’ toggle is introduced to switch on/off the settings to increase responsiveness of graphical user interface and analysis post processor for larger projects.
Merge All Vertical Members

You can now merge all connected walls in the structure to create corewalls easily. Unmerging is also possible with the ‘Separate All Merged Members’ option.

Retrofit Walls

A new wall type is introduced: The retrofit wall.

First and foremost, this wall type is displayed with a different color in graphical editor. Dowel calculations are automatically done in ‘Wall Reinforcement Design Dialog’. These type of walls are also specially handled in performance assessment reports. Detail drawings are specially created through all storeys including dowel details.
Extend Column Ends to Another Member

It is now very easy to extend a wind column to a portal rafter or a truss top chord. Right click and choose the “Extend Column to Member” command.

Adjust Steel Beam and Frame Member Angles

If you have a steel beam framing into a sloping beam, it can be tricky to adjust the local axis angle to the supporting beam. With the new ‘Section Angle’ parameter for steel beams, you can easily adjust the angle to be compatible with supporting sloping beam. Manually enter the angle value or simply pick the reference beam from the model.
Insert Rib Slabs Automatically

Similar to slabs, ribbed slabs can also be inserted automatically to all available beam regions.
Analysis

New Analysis Post Processor

A Faster, Integrated Experience

The new integrated 64-bit Analysis Post Processor provides significantly superior performance with the help of the latest graphics technologies and methodologies. Displacement animations, diagrams, and contouring are now much faster. Switch instantly between analysis and model displays or tile them for concurrent viewing.

Solid Analytical Model View

See results in our new Solid Analytical model. Enjoy the harmony of physical members dressed in color-coded analytical results.
Pushover and Time-History Analysis Results Display

If you have performed a nonlinear Pushover or Time-History Analysis, the new analysis post-processor will allow you to visualize the results.

Display of Selected Results

It can be hard to navigate analytical views through complex models. ProtaStructure allows you to show labels for selected members only to allow you focus on what you are working on.

Connectivity Helper

*Connectivity issues* function lists all the frames with suspicious support and connectivity conditions. You can revise and highlight any frame from that list.
Diaphragms
Visibility of each diaphragm can be set independently

Grid Layout
Analytical views can show model positioned on the actual grid system

Improved FE Model for Beams Connecting to Walls
Significant improvements are for finite element modeling of beams spanning into walls. The beam connectivity is handled much better for the cases where walls are skipping storeys or beams have positive DelZ values.
Automatic Shell Model for Corewalls

Corewalls are now always modeled with shell members regardless of default wall modeling option.

Automatic Diagrams for Walls Modeled with Shells

With ProtaStructure 2021, it is now possible to display the internal force diagrams of walls modeled with shells. Group sums are automatically calculated for the corewalls and a single diagram is displayed.
Nonlinear Analyses with ProtaStructure- OpenSees Integration

What is OpenSees?

The Open System for Earthquake Engineering Simulation (OpenSees) is a software framework for simulating the seismic response of structural and geotechnical systems. OpenSees has been developed as the computational platform for research in performance-based earthquake engineering at the Pacific Earthquake Engineering Research Center.

OpenSees has advanced capabilities for modeling and analyzing the nonlinear response of systems using a wide range of material models, elements, and solution algorithms. The software is designed for parallel computing to allow scalable simulations on high-end computers or for parameter studies.

OpenSees provides beam-column elements and continuum elements for structural and geotechnical models. A wide range of uniaxial materials and section models are available for beam-columns.

Nonlinear analysis requires a wide range of algorithms and solution methods. OpenSees provides nonlinear static and dynamic methods, equation solvers, and methods for handling constraints.

OpenSees is open-source. The open-source movement allows earthquake engineering researchers and users to build upon each others accomplishments using OpenSees as community-based software.

(Source: https://opensees.berkeley.edu/OpenSees/home/about.php)

Automatic Transfer of Analysis Model and Nonlinear Material Properties

ProtaStructure analytical model is communicated to OpenSees via TCL files. In addition to the detailed analytical model, nonlinear material properties are also automatically calculated and added on top of this model. The entire structure is then ready for performance analysis.

Due to license rules, we are not distributing OpenSees.exe with ProtaStructure. You can download it from https://opensees.berkeley.edu/OpenSees/user/download.php and copy to the ProtaStructure installation folder (default C:\Program Files (x86)\Prota\ProtaStructure2019EN).

TCL/TK libraries must also be downloaded.

Nonlinear Fiber Analysis of Sections

Column, beam, and Wall sections can be modeled with fiber elements and analyzed with state-of-the-art numerical techniques to derive the Moment-Curvature relationships. Confined and unconfined concrete regions can be specified. Strain hardening is taken into consideration. For more accurate analysis, you can create the fiber mesh around rebars.

The user interface for fiber section analysis is not released yet, however, the underlying technology is used to derive the force-deformation relationships of the members for pushover and Time-history analysis. The meshed picture below is provided to give you an idea.
For column and wall members, a ‘Finite Length Hinge Zone’ model with 6 integration points is used. Shearwall members are modeled with a distributed plasticity model, again with 6 integration points. Force-deformation relationships for integration points are obtained from fiber section analysis.

![Finite Length Hinge Zone model](image)

Nonlinear Static Pushover

Single Mode Static Pushover analysis is performed using ProtaStructure - OpenSees integration. Plasticity models are used as described above. Parameters such as the number of steps and target displacements can be controlled by the user.

After the analysis, the Capacity Curve is obtained. Users can specify the monitored node for which the curve will be generated. Results can be examined at any desired step. A detailed performance assessment report is generated after. Nonlinear static pushover is accessible at Analysis > Building Assessment menu.

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</tbody>
</table>

![Column Table](image)
Nonlinear Time-History Analysis

A nonlinear Time-History analysis can be performed using ProtaStructure - OpenSees integration. Plasticity models are used as described above.

A set of multiple ground motions can be applied simultaneously in X and Y directions. As specified by the earthquake codes, the ground motion application direction is rotated by 90 degrees, and analyses are repeated. The selection of suitable ground motions is up to the user. Parameters like fault mechanism, soil properties, magnitude are of importance. Nonlinear time-history analysis is accessible at Analysis > Building Assessment menu.

The selected ground motion records are automatically scaled by ProtaStructure using the simple scaling method between 0.2T and 1.5T.
The analysis results from multiple ground motion sets are automatically post-processed. The average values of absolute maximum responses are extracted and used in performance assessment.

A detailed performance assessment report is presented. Additionally, the analysis results for a specific ground motion at a specific time-step can be looked up by the user.
New RC Beam Design Module

RC beam design module is remastered and improved with better usability, visualization and new features.

Beam Design Editor: Familiar Interface, Better Technology

You can see beams of design axis in 3D and manipulate the geometry easily with visual feedback. More detailed information is available on design parameters for selected concrete code.

Copy/Paste Rebars to the Neighboring Beams

Selected rebars can be copied to the clipboard using right click or simply Ctrl+C combination. Then you can paste them multiple times to different targets using Ctrl+V.

The whole rebars of a selected beam can be copied to multiple neighbours using Copy Bars, Paste Bars and Paste Bars to All buttons. The support bars will be copied intelligently taking level differences into account.
Beam section dimensions can be changed without leaving the rebar selection. Simply click on the dimensions text and amend.
Steel Deflection Checks

The deflection of steel members can now be checked to EC3, BS5950, AISC360 and TSC2016 codes. You can modify the deflection limits for different member groups using the “Settings > Steel Design Settings and Parameters” menu. Additionally, you can override ‘Deflection Span’ and ‘Deflection Limits’ for each member.

Improvements in Steel Beam and Truss Design

Significant improvements are made in buckling length calculations of steel beams, top and bottom chords. Detection of connecting members such as horizontal braces, purlins and beams are significantly enhanced. Additionally, a new option is introduced to consider the effect of purlins on beam buckling length calculations.
Foundation Design

New Pad Footing Module

ProtaStructure 2021 introduces a new pad footing design which brings new functionalities:

- Automated design for depth.
- Top and Bottom bars can be separately edited and introduced.
- More transparent and interactive design experience.
- 3D rebar are visualized and used in detailing.

Batch Design of Pad Bases

When multiple vertical members are selected to insert pad footing a batch interface is opened to allow you to design all at once. You can group selected items or import a set of pad footings from CSV or Excel files. Batch reports can be prepared or design can be revised any time from the same interface.
Design All

A single intuitive interface is available for fast access to design all members in the model at once.

Drawings & Reports

Detail Drawing Preview

Preview your RC detail drawings and make sure that everything is in place before switching to ProtaDetails.
Embedded Reports

Analysis and design reports can be displayed in a separate docking panel just like a regular view. It is more integrated and convenient this way for you to review the reports while reviewing the models at the same time. You can even tear out the docking panel and place it on your second screen.

3D Rebar View

Detail drawings are extracted from a central 3D model in ProtaStructure. Now rebar detailing can be viewed in 3D as well. See how containment is conducted precisely in 3D.
ProtaDetails 2021

ProtaDetails 2021 enhances and refines productivity with automated reinforced concrete detailing, drawing management and dwg drafting, together with our growing library of element design and detailing macros.

New 3D Pool Analysis, Design and Detailing Macro

A new pool macro is introduced. Setting the shape of the pool is very simple. You can use preset geometries from the library or just edit the plan coordinates. Moreover, you can define different soil models for each wall stem according to US and European standards. Stability checks, seismic, and RC design under design and service scenarios are done automatically, and rebars are visualized in 3D.
A Glimpse to the Future of ProtaDetails: 2D Details from 3D Information

3D visualization of the rebars is not just a static display. All the 2D drawings are automatically generated from 3D rebar definitions. This yields much more efficient and accurate detail production as well as quantity take-off.

New Pad Footing Module

ProtaDetails 2021 introduces a new pad footing design library which brings new functionalities. This is the exact same design module used in ProtaStructure. You can use it independent of ProtaStructure using your own analysis results and prepare the documentation.

- Automated design for depth.
- Top and Bottom bars can be separately edited and introduced.
- More transparent and interactive design experience.
- 3D rebars are visualized and used in detailing.
**RC Slab Cross-Sections with Reinforcement Detailing**

Reinforced slab cross section can be created with reinforcement detailing. In ProtaDetails, cut sections anywhere along the layout plan drawing and position it anywhere within the drawing sheet.

**How to Use**

- In ProtaStructure, ensure that all the slabs reinforcement has been designed using slab strips.
- Go to Concrete Design > Load ProtaDetails
- Generate the Form Plan drawing ensuring options to Show Rebars are checked

**Tip**: More slab detailing options are available in the Options 2 tab.

- Go to Detail Library (top menu) > Pick Plan Sections
- Alternatively, in the Command line at the bottom, type “FormSection”
- In the Section dialog, input / select the preferred options
- Draw a “section cut” line by clicking on 2 points on the plan view

**Tip**: Click (orthogonal) icon right at the bottom to ensure the line is exactly horizontal/vertical.
New Rebar Label Settings

Rebar label settings has been enhanced to allow for more user-defined options for arrow leaders (pointing to rebars) and dimensions arrows. This offers greater flexibility for users to produce high quality drawings to their company standards. This is are accessible to Settings (top menu dropdown) > Rebar > Rebar Label.

Enhanced Column & Beam Detailing Settings & Drawings

Numerous new column and beam detailing options are introduced to enhance the quality of drawings. For column elevations drawings, longitudinal bars can be lapped in the mid-span of the column (requirement of some code of practice) & bending of bars (BOB) can be controlled.

These new options are accessible to Settings (top menu dropdown) > Column Settings > Details Drawings > General tab.

The beam elevation detail is also enhanced significantly. Cantilever top rebar extension lengths can be adjusted based on a user-defined factor multiplied by the cantilever length. This feature is implemented to cater for some user’s preference for this manner of cantilever beam detailing.
This feature accessible via **Settings** (top menu dropdown) ➔ **Beam Settings** ➔ **Steel Bars** tab.

**Note**: A minimum length of **Inner & External support** will be applied if the resultant cantilever support length is less than the former.

The dimension options of lap & extension (or anchorage) are separated for top and bottom bars to cater for different users’ preference. These options are accessible via the **Detailing** ➔ **Dimensioning** tab.

- The column & beam detailing settings are directly inherited from ProtaStructure where the exact same settings exist.
- Any changes to the settings in ProtaDetails will only affect new details; existing beam details remains unchanged.
- Changes in settings in ProtaDetails cannot be saved; it will be discarded when ProtaDetails is closed.
- If you want to save changes, please update the same settings in ProtaStructure.
- We strongly recommend you review these settings before producing any drawings.
Enhanced Precision and Seismic Detailing

Slanting Columns and Varying Column Section Sizes

Column elevation detailing is greatly enhanced to include slanting (angled) columns and columns with varying section sizes. Longitudinal bar detailing including intelligent curtailment and bar cranking follows Eurocode and ACI recommendations for columns with changing dimensions. Any beams connected to the columns will be drawn in the elevation as well.

Ensure to tick “General Column Through Storeys” in Options tab of the Column Elevation dialog box.

Sloping Beams

There is significant enhancement in slanting beam detailing; details are more precise and accurate in beam elevation drawings.
Automatic Wall Opening Detailing

The reinforcement details are automatically created around the shear wall openings in the wall elevation details. The shear wall openings are displayed in both the sections as well as schedules.

The reinforcement detailing around the opening are only suggested rebars; no actual design is performed by the program.

The details can easily be amended by selecting any rebar > the Rebar dialog will appear where changes to size, length & shape can be done.
Automatic Column Elevation Detail Grouping Through Storeys

Column elevation details can be grouped through storeys. ProtaStructure automatically detects the similarities between the column sections and rebar layout and draws them once in column elevation. This setting can be accessed in **Batch Drawing Manager > Column Elevations**
Enhanced Retaining Wall Module

The retaining wall module is greatly enhanced and now supports the American ACI318 & ASCE7 code. In addition, Eurocode is expanded to cover EC2, EC7 and EC8 with all three design approaches. There are numerous other improvements:

Enhanced Visualization of Loads

Generated loads can be inspected separately for all parts of the wall for long term and short term analysis. Go to Loads > Select a Load > Selected load will be colored in red.

Effect of Shelves on Earth Pressure

Effect of shelves on lateral earth pressure and fill weights are now applied and is shown in detailed loading scheme.

New Methods in Total Failure Check

Two different approaches to total failure are introduced; namely Fellenius and Bishop’s methods. Go to Total Failure > Analysis Method > Select Fellenius / Bishop’s Method

Multiple Layers of Rebars in Design

New option is introduced to have multiple layers of rebars at base plate. Go to Design Settings > Number of Top Rebar Layers at Base Plate > Select 1/2/3
Improved Section Design Methodology

Design approach is changed to be accurately based on reaction/forces at specified sections. Detailed loadings and design forces at each section can be further inspected. Go to Design > Pick Section Analysis Detail > Select Position to reveal detail checks.

Easy Identification and Visualization of Rebars

New Design interface allows easy visual identification of various rebars. Go to Design > Pick a Rebar > the rebar will be highlighted in blue in the diagram.

New Detailing interface allows easy visualization and edit of rebars interactively. Go to Stem / Base Plate > Pick a Reinforcement > Edit number / diameter / spacing.
New Options in Retaining Wall Stability Checks

New options are introduced to consider the weights of wall stem, base plate, and backfill in dynamic stability checks. You can access these settings in Analysis Settings > Dynamic Effects of Self Weights.

Unlimited UNDO/REDO Operations

Previous versions of ProtaDetails supported Undo / Redo operations only on primitive CAD entities. With the new version, you can undo or redo unlimited number of operations on smart objects and macros.
ProtaSteel 2021

ProtaSteel 2021 redefines what's possible with automated connection design, steel work detailing and shop drawing production.

New Connection Design Reports

ProtaSteel 2021 introduces additional new connection design with comprehensive check reports to EC3, AISC (LRFD and ASD) and BS5950 with full code clause referencing including:

- Haunch Connection
- All bracing and truss connections:
  - Bolted Gusset Plate
  - Corner Bolted Gusset Plate
  - Welded Gusset Plate
  - Corner Welded Gusset Plate
- Purlin/Girt Connections
- Splice Connections
- Apex Haunch Connections
This adds to the extensive list of designed macros including:

- Fin Plate Connection
- End Plate Connection
- Stiffened End Plate Connection
- Flange-Plate Moment Connection
- Beam-Column welded connection
- Simple Base plate with stiffeners (Stiffeners can be inserted with the “Add Stiffener” option.)
New Macro: Wind Column Connection

Wind columns can now be connected to portal frame using Wind Column Connection macro.

New Macro: Beam to Beam Fix Connection

ProtaSteel 2021 introduces another frequently used connection type, especially for continuous beams. Two continuous beams are connected to the main girder with endplate or stiffened end plate connection. An additional top plate is used to ensure the moment fixity.
New Macro: Castellated Beams and Beam Openings With Stiffeners

ProtaSteel now supports both castellated steel sections detailing and beam openings and any associated stiffeners. You can define a circular, hexagonal or rectangular opening or series of openings anywhere along the beam web. Optional stiffeners with flexible arrangements can be introduced.

New Macro: 2D Fitting Macro

2D Fitting macro creates a cut object from the selected plane to the selected end of a profile.

Please watch the following video for the usage of this command in detail:

How to Fit Profiles in 3D
New Macro: Chequered Plate and Grating

Chequered plate and grating can be now created in ProtaSteel. These can be included in material lists and detail drawings.

New Macro: Automatic Stair Treads

A new macro named **Stringer Holes Macro** is developed in order to be able to automatically create the step treads between I, U and C sectioned beams. This macro will open the step holes inside the selected profiles and create the steps.
New Macro: Handrail Connection Macro

“Handrail Connection Macro” can be used to automatically weld two neighboring rails.

New IntelliConnect Cases

IntelliConnect is now able to connect joints where:

- Steel beam frames into an RC beam
- Steel beam frames into an RC column
- Truss top chord to column connections
- Truss bottom chord to column connections
- Addition of Simple Base Plate Connection to Column Support IntelliConnect case

Connection Grouping and Numbering

Connections can be grouped and annotated in drawing module.
Improvement of Weld Drawings (3D Modeling and Hatching of Fillet Welds)

Fillet welds are now modelled as 3D objects in the model and this enables drawing of these welds to be hatched in shop drawings.

Macro Preset Mapping

ProtaSteel now allows you to create macro presets for any connection or modeling macro using your favorite settings and company standards.

Creating presets is only half of the job. With ProtaSteel 2021, you can now map your preferred macro presets to distinct profile types. Creating a custom connection experience where you can dictate your connection preferences for any given sections. This powerful feature brings unparalleled productivity in connection design and standardization. Moreover, Intelliconnect also honors the preset maps you have specified.
AutoSave

ProtaSteel 2021 supports an Auto Save option now. By default, model is saved in every 20 minutes and the auto saved model can be restored next time the user loads the model. Auto Save interval can be adjusted in General Settings Window (if the interval is set to “0”, Auto Save is disabled).

ProtaStructure Frame Member End Forces Tables

Internal forces of a frame element for all load combinations obtained from analysis in ProtaStructure is now displayed in Frame Element Property Editor.

Automated Dimensioning of Axes in General Arrangement Drawings

Floor plans which are automatically transferred from ProtaStructure are now automatically dimensioned in general arrangement drawings.
Automated Leaders and Annotation of Connection Details

Typical connection details in general arrangement drawings are now automatically annotated, and a leader is automatically placed on the view.

End Release Display in General Arrangement Drawings

Members with end releases can now be indicated in general arrangement drawings.

Improvements in Sheet and Drawings Module

- Rotation functionality is introduced for Text and TextType2 objects.
- Coordinate system option is introduced for Regions.
- Underline, and leaders are added to Generic Solid label text.
- Viewport names can now occupy 2 lines.
- Section marker is preserved when Section Symbol object is exploded.
- Drawing regions can now be copied.
- Weld hatchung is optimized according to scale.
- Drawing collapse feature is improved. Now, collapse gap can be set by the user, and drawing module objects (as opposed to model objects) can be excluded from collapse.
- Created regions were previously placed outside of the paper area. They are now placed automatically in a suitable position in paper area.
- It is now possible to automatically zoom fit to a parent region of a detail or section region via "Zoom to Parent View" button.
- TextWidth factor used in DXF export of drawings can now be adjusted via ini file settings.
- Drawing Document creation parameters are now controllable from DrawingModule.ini file.
- Several minor bug fixes.
Bug Fixes and Improvements

During the course of ProtaStructure 2021 development, reported issues inherited from previous versions are fixed and significant improvements are made.
Thank You

Thank you for choosing the ProtaStructure Suite product family.

At Prota it is our continual aim to provide you with user-friendly, industry-leading technology for building design and documentation.

Should you have any technical support requests or questions, please do not hesitate to contact us at all times through globalsupport@protasoftware.com or asiasupport@protasoftware.com (Asia Pacific).

Our dedicated online support center together with our responsive technical support team is available to help you get the most out of Prota’s technology solutions.

The Prota Team