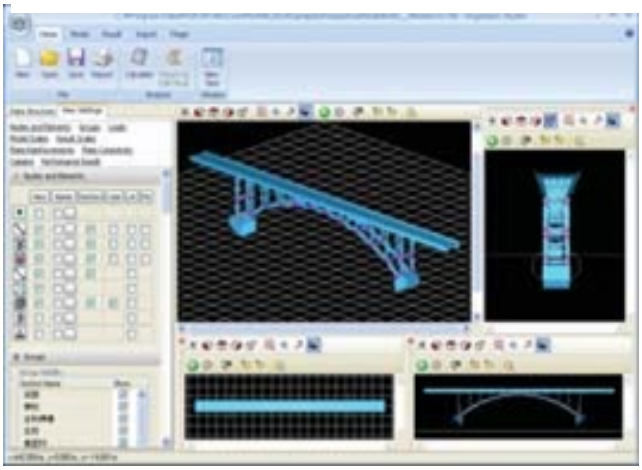
Engineer's Studio® Ver.9

FORUM8's award-winning Engineer's Studio is a powerful 3D Fine Element Analysis program helping structural engineers meet the international requirements in modern civil engineering. Efficient data input and intuitive handling facilitate modeling of simple and large structures.

A modular software system**, Engineer's Studio®** is used to define structures, materials, and loads for planar and spatial structural systems consisting of plates, walls, shells and members to create combined structures as well as model solid and contact elements.

Offering a broad range of plugin modules, the software enables structural engineers to select the program package that best meets their project requirements and specialist areas of interest and research.



Superior Functions of Engineer's Studio®

- Support for the Maekawa model, the world's best standard concrete analytic theory
- Apply back-checks of previously designed structures through the provision of new analyses
- Broad applications in structural analyses including Mindlin Plate, cable elements and large deformation analysis etc.
- Triangular/Rectangular mesh, supports damping element, robust 3D interface

100% in-house developed analysis software.

- Extremely extensible as it supports various analysis theory and nonlinear constitutive equation including the Maekawa Model
- Significant improvement of calculation speed. Plus, it is remarkably versatile and flexible as it can be linked with other AP.
- Excellent cost performance

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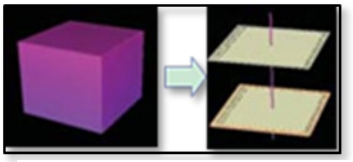
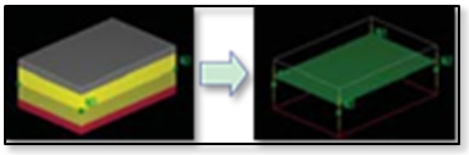
Software Overview

Engineer's Studio® calculation engine covers the full range of analytical requirements from pre-processing through to post-processing. The program analyses non-linear behaviour of structures by modeling with beam elements; considering a part of civil engineering and building structure as one bar or as continuous plate elements.



Fiber Elements

Analysis is performed using 3D filer elements and the plate elements based on the Reissner-Mindlin theory as well as static or dynamic analysis, considering material non-linearity and geometric non-linearity (Large Displacement) simultaneously. Plate elements can have laminated structures consisting of layers with each setting defined for different types and thicknesses of materials between layers or linear/non-linearity. The reinforced concrete non-linear constitutive equation is adopted and applied to the plate elements.



Laminated Plate Elements

Key Features

Category	Contents
Analysis	static analysis / dynamic analysis / eigenvalue analysis /influence line (single bar)
Nonlinear Analysis	material nonlinearity / geometric non-linearity (large displacement) / composite nonlinearity considering both material nonlinearity and geometric nonlinearity at the same time
Applied Theories	infinitesimal displacement / large displacement / elastic foundation beam theory / Euler-Bernoulli beam theory / Timoshenko beam theory (considering shear deformation) / Reissner-Mindlin theory
Elements	elastic beam element / rigid element / spring element / M-φ element / fiber element / plate element (laminated plate)/ cable element / damping element (velocity-exponentiation type of cohesive damper)
Boundary Conditions	locking condition: six degree of freedom for the nodal point (free or fixed or spring) / distributed spring for elastoplastic beam element(two way of axial member direction and axial member)/ coupling spring (define at node)
Material Types	concrete / reinforcement bar / prestressed steel (line and steel bar rather than steel) / steel plate / carbon fiber sheet / aramid fiber / elastic material(by input any young module) / non-structural material(considering only weight per unit volume)
Definable Load	The following loads can be applied against frame elements: nodal load / material load (concentrated / distributed / projection) / thermal load / forced load The following loads can be applied to plate element: Plate surface load (distributed load) / Plate volume force (acting force proportional to mass) Plate Ground response displacement (Applicable to cylindrical water tank. Ground response displacement is applied as load) Plate dynamic water pressure (Applicable to cylindrical water tank. Housner approximate method) / The following loads can be applied against cable element: Distributed load (Load to be distributed throughout the entire length of cable) / Temperature load
Auto Created Load	dead load / prestressed load / horizontal seismic coefficient load
Static Load	monotone increasing / cyclic (constant, increasing) / reversible cyclic (constant, increasing)
Dynamic Load	acceleration wave (individual or simultaneous input of two components, vertical and horizontal)
Dynamic Load	direct integration method by the Newmark-β method(β=1/4)
Damping	stiffness proportional pattern by element / Rayleigh damping / Rayleigh damping by element / (initial stiffness, instantaneous stiffness)
Mass Matrix	consistent mass matrix / lumped mass matrix

Non-Linear Properties

M-ϕ Properties

- Skeletal structure: Bilinear (Symmetrical, non-symmetrical) / Trilinear (Symmetrical, non-symmetrical) / Tetra linear (Symmetrical, non-symmetrical)
- Internal hysteresis: Normal/Takeda/Elastic/Origin-oriented/Oriented towards maximum point of the origin/Seismic resistant railway that meets the 1999 criteria

Spring properties

- Skeletal structure: Bilinear (Symmetrical, non-symmetrical) / Trilinear (Symmetrical, non-symmetrical) / Tetra linear (Symmetrical, non-symmetrical) Nagoya Expressway Public Corporation's rubber bearing / BMR damper
- Internal hysteresis: Normal/Takeda/Elastic/Origin-oriented/Oriented towards maximum point of the origin/Seismic resistant railway that meets the 1999 criteria/Positive & Negative direction / Positive direction / Shock absorber / Clough / Slip type / Gap or Hook type

Hysteresis (stress strain curve for fiber element)

- Concrete：Secondary curve／Hoshikuma／COM3／JSCE／Mander
- Reinforcement, steel plate, prestressing steel
- Skeletal structure: Bilinear (symmetrical, non-symmetrical), trilinear (symmetrical, non-symmetrical)
- Carbon fiber, aramid fiber: Skeletal structure: Linear (tensile side only)

Fiber element

- Original: Non-linear beam element that uses rigid link / distributed spring element. It ignores the effect of shear deformation.
- Primary: 2 node isoparametric element that uses a primary curve for geometry function.
- Secondary: 3 node isoparametric element that uses secondary curve for geometry function.

Engineer's Studio® **Support Services**

Software Development Kit SDK

A tool for software developers to customize the Graphical User Interface of Engineer's Studio®. Developers can create an independent binary at will and connect it to Engineer's Studio®. The plug-in binary allows developers to create, edit, and delete the data within a model.WindowsXP/Vista/7/8

Engineer's Studio® and the plug-in are coupled via COM. Custom COM interface is supported. Any language compliant to the custom COM interface can be used. C, C++, and Delphi (in particular) can be used.

Plugin SDK is a development kit for creating directly the input data of Engineer's Studio® / API is COM（ Component Object Model） / As long as you have access to a development environment that supports COM (C, C++,VBA, Delphi, etc.), you can create your model at will. / DLL is created within the development environment, and after registering it to the OS, it can be run on Engineer's Studio® / You can input data on the input window that you created in your development environment as well save your original file / As calculation are performed and result window is displayed on the Engineer's Studio®, the program itself, Engineer's Studio® is required in addition.

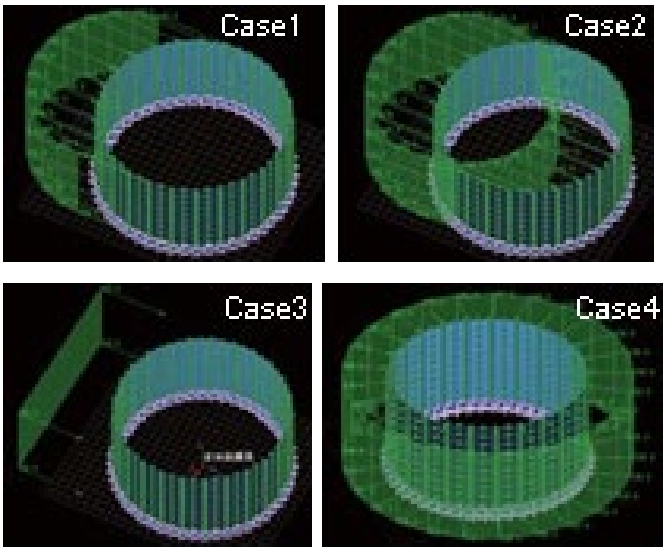
SDK Example Use Cases

Case 1 : A structure having a shape of a cylinder. The top and bottom surface of the cylinder are open. It is modeled using 1 mesh element.

Case 2 : Same as case 1 except that the "Load on back -side" switch is turned on.

Case 3 : Same as case 1 and 2, including the "The direction of distribution". The only difference being the load type which is changed to "Whole projection".

Case 4 : Same as case 1, 2, and 3, including the "The direction of distribution". The only difference being the load type which is changed to "Element distribution".



Engineer's Studio® Analysis and Geo Technical Analysis -International Support Service.

The international version of the " Engineer's Studio® Analysis Support Service" and" Geo Technical Analysis Support Service" (available in English, Chinese, and Korean) is for users outside Japan that are using Engineer's Studio® and users in Japan that are taking orders for the work to be conducted outside Japan. Since the service commenced in 2004, it has been provided to more than 500 world-wide users. FORUM8 provides a high-quality service by using the advanced analysis method such as the Dynamic Nonlinear analysis and Geo Technical Dynamic FEM Analysis on various types of civil works and architectural structures. The products targeted for this service are Engineer's Studio®, and Geo Technical Analysis series (GeoFEAS3D, UWLC, LEM3D, VG-Flow have been localized in English and other languages for the worldwide market.

Analysis Support Service via Multiframe and Engineer's Studio®

The support service uses Multiframe, UC-win/FRAME(3D), and Engineer's Studio®. FORUM8 first requires a structural image and load conditions, which are required to create an acceptable quotation before commencing work. The technical team works closely with the client throughout the project to create and run an analysis. The results will be summarized to illustrate cross sectional strength, etc. as an input data and options for use by the client. Technical staff will be available to answer any questions regarding the data that may arise post-delivery.

Engineer's Studio® Price List

Engineer's Studio® Module	Price (USD)
ES-Advanced License	$11,000
ES-eigenvalue analysis option	$200
ES-dynamic analysis option	$200
ES-M-ϕ element option	$700
ES-non-linear spring element option	$700
ES-fiber element option	$200
ES-geometric nonlinear option	$200
ES-plane element option Ver.5	$1,180
ES-Maekawa concrete constitutive law option	$6,500
Engineer's Studio ES-Cable element option	$4,400

About FORUM8

FORUM8 is the leading Japanese producer of state-of-the-art 3D Simulation software.

Its premier product, VR-Design Studio (formerly known as UC-win/Road), is at the forefront of Interactive 3D VR simulation and modelling technology.

Established in 1987, this award-winning company has offices and partners on every continent and is a member of the ITE and an associate of the TRB visualization group.

VR-Design Studio is the ideal solution for all urban and transport planning/design projects, as well as driving simulation, interactive visualisation of rail, road and pedestrian-based events, and in the development of emergency planning/training scenarios including seismic impact analysis.

Enquires from Europe, the Middle East, Africa, North & South America should be directed to the Western Regional office team

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