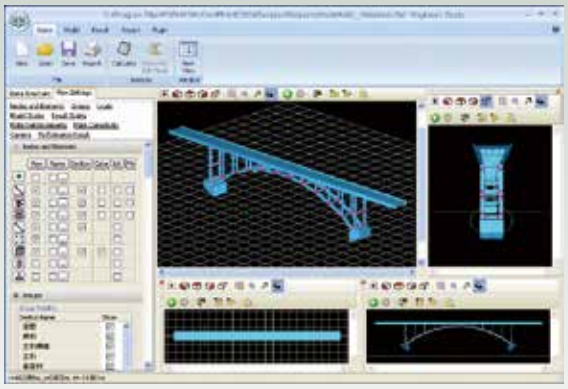
Virtual Reality Design Studio
UC-win/Road
VR/FEM/CAD/Cloud UC-1 Engineer's Studio®

Engineer's Studio® Ver.9

Three-Dimensional Plate Dynamic Nonlinear Analysis Software

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 widely used by Engineers working in some of the world's most earthquake-prone regions to define the geometry, materials and loads for complex structural systems using a variety of element types. With an extensive range of plugin modules available, Engineer's Studio® enables structural engineers to simulate the response of large structures under extreme seismic events.



Main Features

- General 3D FEM analysis package.
- Static, dynamic loading (time history analysis), Eigen analysis.
- Maekawa model. World leading model for nonlinear reinforced concrete 2D analysis.
- Good range of element types including Mindlin plate (6 DOF), fibre element, moment curvature models, rigid elements, true catenary cable elements, nonlinear spring elements (used for elastomeric bearings, soil/structure interactions etc) and viscous damping elements.
- Extensive nonlinear material models for steel, concrete, RC concrete and FRP.
- Large deformation analysis (Corotational method).
- High performance calculation speed.
- Robust 3D graphical user interface.
- Used in new designs and strengthening evaluations.
- Excellent cost performance.

www.forum8.com
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FORUM 8®

Engineer's Studio® Ver.9

Three-Dimensional Plate Dynamic Nonlinear Analysis Software

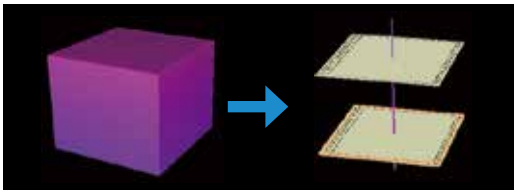
Windows 7/8/10

Software Overview

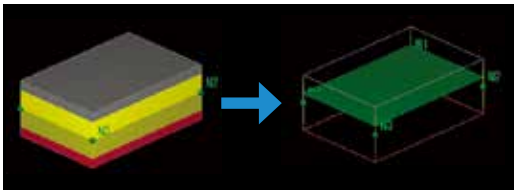
Engineer's Studio® covers the full range of analysis requirements from pre-processing through to post-processing. The program simulates the non-linear response of structures utilizing a variety of FEM element types and nonlinear material models.

The supported element types include 3D fiber beams , moment-curvature beam models, Reissner-Mindlin plates, 6 DOF springs and catenary cables among others. Static and dynamic analysis is supported incorporating material and geometrical non-linearity simultaneously. Plate elements have laminated material definitions. Each layer can have different thicknesses and material models defined. The Maekawa 2D non-linear RC model is applied to layers within a plate element thus giving it both in plane and out of plane nonlinear modelling abilities.

▼Fiber Elements



▼Laminated Plate Elements



Key Features

Category	Contents
Analysis	Static & dynamic analysis (Time history Newmark method)/ Eigen analysis / moving load influence line analysis (beam model)
Nonlinear Analysis	Material nonlinearity / geometric non-linearity (large displacement via corotational method)
Applied Theories	Small scale displacement / large displacement / elastic foundation beam on distributed springs / 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 / p late element (laminated plate)/ cable element / damping element (viscous damper)
Boundary Conditions	Free, fixed or spring for each degree of freedom at nodes / distributed foundation spring for elastoplastic beam element (3 translational components)/ coupling spring (define at node)
Material Types	Concrete / reinforcement bar / prestressed steel (cables and rods) / steel plate / carbon fiber sheet / aramid fiber / elastic material / non-structural material (Weight only to assist mass modeling)
Loading	Nodes : 6 DOF applied loads or forced displacements. Frame elements: Concentrated / distributed / projected loads / internal forces / thermal loads Plate element: Surface distributed load. Cable element: Distributed load / Temperature load
Auto Created Load	Dead load / prestressed load / horizontal static seismic coefficient load
Static Load	Monotonic increasing / cyclic (constant, increasing) / reversible cyclic (constant, increasing)
Dynamic Load	Acceleration wave (three translation components). Multi point acceleration and/or forced displacementtime history analysis Direct integration method by the Newmark- β method(β=1/4)
Damping	Stiffness proportional per element / Rayleigh damping / Rayleigh damping per element / initial stiffness, instantaneous stiffness proportional
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/Origin - Max oriented

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/Origin - Max oriented/ Positive & Negative direction / Positive direction only / 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 at each end. It ignores the effect of shear deformation.
- Linear: 2 node isoparametric element that uses a linear curve for geometry function.
- Quadratic: 3 node isoparametric element that uses quadratic 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 that can access the input functions of Engineer's Studio®. The plug-in binary allows developers to create and edit data within a model. Engineer's Studio® and the plug-in are coupled via COM. Any language compliant to the custom COM interface can be used. C, C++, and Delphi (in particular) can be used. The plugin SDK is a development kit for directly creating input data for 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 models freely. / 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 / Engineer's Studio® is required to calculate the models and display the results.

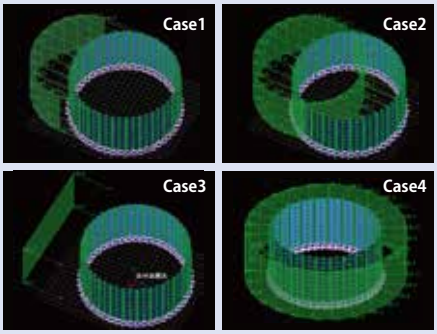
SDK Example Use Cases

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

C ase 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 "Projected".

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 use the elements coordinate system.



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 model the structure and perform the analysis. The results are summarized to illustrate cross sectional strength, etc. Input data and options are documented 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-plane element option Ver.5	$1,180
ES-Maekawa concrete constitutive law option	$6,500
Engineer's Studio ES-Cable element option	$4,400

Engineer's Studio® Module	Price (USD)
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

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

Contact Dr. Brendan Hafferty on +44 203 753 5391 or email: brendan@forum8.com

Multiframe to Engineer's Studio® Converter

Price of program $300

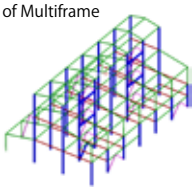
It allows to convert the data file of Multiframe into the format of Engineer's Studio®

Windows 7/8/10

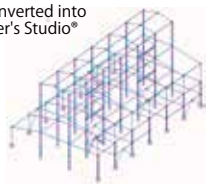
This product is a program to convert the data file of Multiframe which is 3D structural analysis software developed by Bently Systems into the data file format of Engineer's Studio® which is 3D structural calculation program of FORUM8.

- This tool converts the Multiframe data via COM API of Multiframe.
- The member shape and dimension which are not registered in the database of Engineer's Studio® will be converted as numerical data.
- Convertible Items Unit / Analysis setting : Only for linear material and static analysis / Nodal data / Support condition / Group data / Nodal point weight / Member weight / Nodal point load / Nodal point load / Enforced displacement / Basic load / Extraction load

▼Data of Multiframe



▼Data converted into Engineer's Studio®



Engineer's Studio® SDK

Price of program $4,400

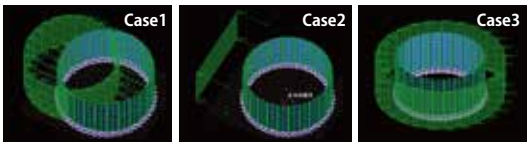
A customize tool for the User Interface of Engineer's Studio®

Windows 7/8/10

This is a tool to customize the Engineer's Studio® GUI. 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.

- 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.
- You can input data on the input window that you created in your development environment, and 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.

▼Samples



WCOMD Studio

Dynamic Non-linear Analytical Program for 2D RC Structures

Price of program $12,000

Windows 7/8/10

Forum8 has produced analytical program WCOMD, developed by the Concrete Materials & Structures Laboratory at the University of Tokyo, for 2D non-linear dynamic analysis/static analysis of reinforced concrete. WCOMD uses high-precision constitutive properties based on the results achieved through numerous experiments and theoretical verifications on concrete. These properties are highly regarded internationally, as well as in Japan, and provide accurate 2D non-linear dynamic/static analysis of various reinforced concrete structures with cracks. The safety and damage level of structures can be evaluated from analytical results so that more rational and appropriate reinforced concrete structures can be designed.

【Program overview】

- Solver: RC non-linear constitutive law developed by the Concrete Laboratory, University of Tokyo
- Input and result display function in Engineer's Studio® is used for the pre post processing
- Pre-processing: Auto-mesh inside complex outline shapes
- Visualization by figures of displacement, displacement, contour, stress contour, and cracking, and animation of displacement figure and cracking
- Functions to output result data in text file format (CSV file) and to output reports
- Analysis objects: Non-linear static and dynamic analysis of RC structures
- Dynamic analysis considering nonlinearity of ground (Osaki model) and nonlinearity of RC structure simultaneously
- The strain based design concepts as specified in the Japan Standard Specifications for Concrete Structures 2012, Design. This involves calculating and checking the deviatoric strain and normalized cumulative strain energy and using these as damage indicators
- Mesh generation function：Create plate elements with mouse operation

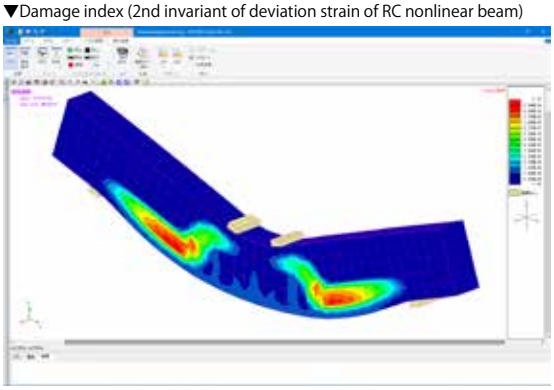
【Analysis contents】

- Non-linear dynamic analysis : Performs non-linear time history response analysis. Vertical acceleration as well as horizontal acceleration can be simultaneously applied as seismic acceleration
- Static analysis : Analyzes weight and conditions where incrementally forced displacement and incremental load are given
- Analyze all loading conditions

【Analysis result】

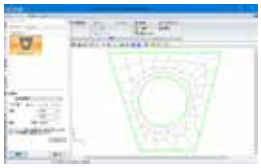
- For all elements and nodes, cracking condition, average stress result, yield results, response displacement, response speed, response acceleration, reaction force, and section force are verified at each calculation step
- Occurrences of cracking, displacement conditions, stress conditions, and so on can be viewed as an animated representation at each step
- Damage level can also be evaluated based on the size of distortions.
- Advanced mode: Designers can change the distortion for determination
- Loading conditions are shown in static analysis results, and input waveforms are displayed in dynamic analysis

▼Damage index (2nd invariant of deviation strain of RC nonlinear beam)

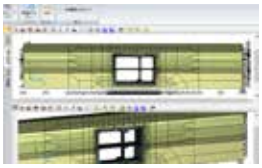


▼Display node / element names and input in table format

▼Mesh and divide automatically inside of complex outline shape



▼Integrated analysis of ground and structure



▼Arrangement of RC joint and universal joint

▼Integrated analysis result of ground and structure

▼Condition of displacement and cracking

Engineer's Studio® (in-plane) Ver.3

Windows 7/8/10

A 2D linear elastic frame/truss structural analysis product

Price of program $2,320

Beam Model Live load Analysis Option **$200**

Japan Civil Codes Uniaxial Section Design Option (Old standard) **$1,001**

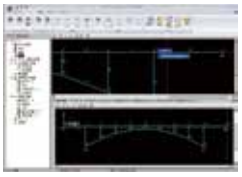
Japan Civil Codes Uniaxial Section Design Option (Partial Factors method) **$143,000**

Engineers Studio® In-plane is a two-dimensional linear elastic analysis program specialized for in-plane loading of plane frames of arbitrary shape. The user interface follows the "Engineer's Studio®" 3D nonlinear analysis program, so you can move to 3D analysis without any discomfort.

【Program Features】

- 2D in-plane analysis program for material and geometrical linear
- Frame calculation can be performed after entering the section shape and auto-calculating section constant.
- Supported section shapes: rectangle, oval, circle, I beam, T beam, W T beam, super structure, super structure circular hole
- Element: Euler beam element, truss element (when both ends are pin), beam element on elastic floor, spring element, rigid element. Combination of beam element and truss element
- Supports: Node supports, multiple node support cases, multiple spring boundary support cases

▼Dockable 2 windows showing a structural map of arch bridge model



【Function comparison with UC-1 FRAME (in-plane)】

*The following functions are not installed in UC-1 FRAME (in-plane)

- Creation of continuous beam elements and positioning of nodes (element resizing), frame elements, spring elements, and rigid body elements
- Calculation of maximum / minimum bending moment for each group, calculation of section force for each structural part
- Supporting points can be changed in the selected state. Loads will be kept even when the element is re-divided
- Calculation of material displacement
- Spring elements can be connected to the main node of rigid element.
- Moment loads can be input to supported beam elements
- Internal force like prestress can be input to beam elements supported by distributed springs
- Section check (Specifications for Highway Bridges, Concrete specification published by Japan Society of Civil Engineers)

Engineer's Studio® Section

A solitary program for section calculation derived from Engineer's Studio®

Price of program $3,000

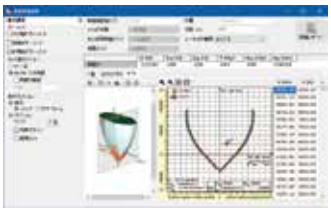
Windows 7/8/10

Engineer's Studio® Section allows users to verify sections by giving specification contents and section forces to freely selected section shape. Settings can be imported from / exported to Engineer's Studio®

- Material: Concrete, reinforcement bars, PC steel (stranded wire, steel bar), steel plate, carbon fiber sheet, aramid fiber sheet, elastic material (Young modulus can be entered arbitrarily), non-structural material (material considering only weight per unit volume)
- M-φ characteristics (for curvature verification): skeleton, bilinear (symmetric, asymmetric), trilinear (symmetric, asymmetric), tetra linear (symmetric, asymmetric)
- pported checks: Bending stress, shear stress, bending strength, shear strength, bending strength of steel pier, bond unit stress, minimum reinforcement, curvature checks, Limit State checks, Partial Factor Design

▼Section shape setting

▼The figure showing the interaction between axis force and bending moment



FEM Engineer's Suite

Set version of each FEM analysis series product. Cloud support, enhanced CIM functions

Windows 7/8/10

Electronic delivery SXF3.1 IFC 3D PDF

FEM analysis suite product structure

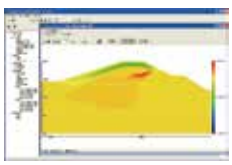
Advanced Suite	price
Engineer's Studio® Advanced	~~Normal price : $15,500~~ S $10,500 F $12,600
Engineer's Studio® Section	
Geo Engineer's Studio (Lite)	
Senior Suite	**price**
Engineer's Studio® Ultimate (not including the Maekawa model)	~~Normal price : $44,700~~ S $26,400 F $29,800
Engineer's Studio® Section	
Geo Engineer's Studio (Lite)	
FEMLEEG Advanced	
VGFlow2D	
GeoFEAS2D	
UWLC	

S:Subscription license
F:floating license

A set of UC-1 series products for civil engineering design support system. Including optional functions of a single product. Upgrades and revisions are reflected as needed.

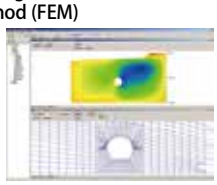
● VGFlow2D

Saturated / unsaturated seepage FEM analysis program



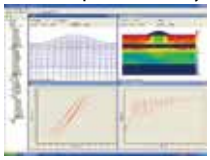
●GeoFEAS2D

Stress deformation analysis program of the ground with Finite Element Method (FEM)



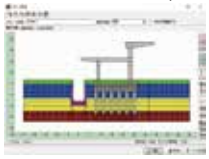
●UWLC

Analysis of elementary stress/dynamic analysis of the total stress / dynamic analysis of effective stress (liquefaction analysis) program



●Geo Engineer's Studio (Lite)

2D elasto-plastic geotechnical analysis program for static ground stress and deformation analysis



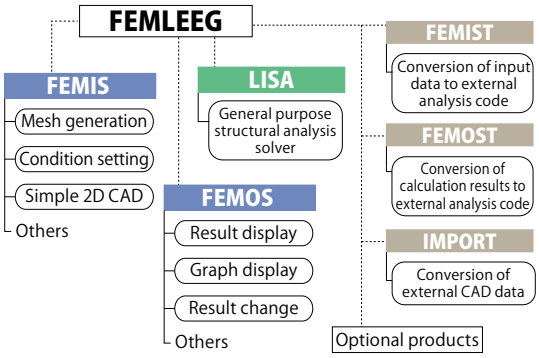
FEMLEEG Ver.9

Comprehensive Finite Element Analysis system

Advanced $15,900
Standard $11,800
Lite $5,500
LAPack Option $3,360
Windows 7/8/10

FEMLEEG, a full-fledged domestic CAE system, can perform from model creation to analysis evaluation. It can convert input data and output data of other solvers and can also be used for pre-post of self-developed solvers by using open file specifications. The basic configuration is FEMIS (preprocessor), FEMOS (postprocessor), LISA (solver), translator (external interface), and LApack (external interface).

【Basic configuration of FEMLEEG】



product name	module		LISA restrictions	Nodal limit
	FEMIS、FEMOS LISA、IMPORT	FEMIST FEMOST		
Advanced	○	○	No	No
Standard	○	×	Yes※	No
Lite	○	×	Yes※	Yes(10,000 points)

* No Tension analysis, CAP analysis, and construction analysis cannot be used.
No Tension analysis: A function that automatically releases when a contact spring installed on the surface between different types of structures has a tension.
CAP analysis: A function that divides the model conveniently, meshes both parts independently, and then recombines and analyzes
Construction analysis: A function to perform the structural analysis at each stage of a structure that has several stages of construction process

【Corresponding element】

- 1D: Truss, embedded rebar, beam, spring, link
- 2D: Plane stress, plane strain, axis, plate shell, laminate
- 3D: Solid

【FEMIS (Preprocessor)】

- Mesh generator with excellent operability
- The product allows users to create mesh data for analysis, set loads, restraints, physical properties, etc., create both of element and shape, and mesh like CAD.
- 3D Auto Meshing Function: ADVENTURE System developed by University of Tokyo used as the base engine
- Element division by specifying an arbitrary plane: Elements can be divided at any position by specifying an arbitrary plane
- element surface area calculation function possible

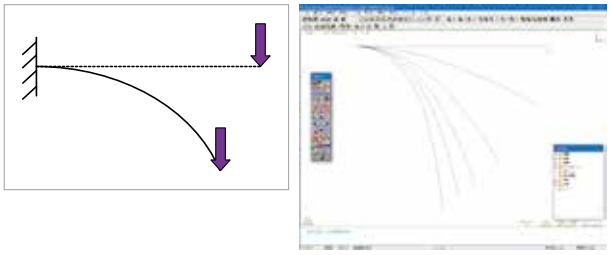
【FEMOS (postprocessor)】

- Result evaluations and output results are displayed in contour, vector, numerical, graph, etc
- Drawing type: Line / surface contour, vector diagram, circle diagram, numerical diagram, arrow distribution diagram, mode diagram, sectional force diagram, pseudo deformation diagram, distribution / history / correlation graph, 3D graph, bird's eye view

【LISA (solver)】

- General-purpose structural analysis system, static analysis, eigenvalue analysis, thermal analysis, etc
- Having the excellent operability, running smoothly, and corresponding to tens of thousands of mesh models
- Analysis type: Linear static elastic analysis, natural vibration analysis (including free body analysis function), response spectrum analysis (maximum response analysis), time history response analysis, buckling analysis, steady / unsteady / heat transfer and thermal stress linked analysis, NO TENSION analysis, CAP analysis, radiation analysis, construction analysis

▼Large deformation analysis of a cantilever beam



【Translator (external interface)】

- Data exchange between FEMLEEG and external software. FEMIS converts created data into other solver data and converts analysis results into a FEMOS input file
- Convert CAD data (wire frame) to FEMIS input file

【LApack (external interface)】

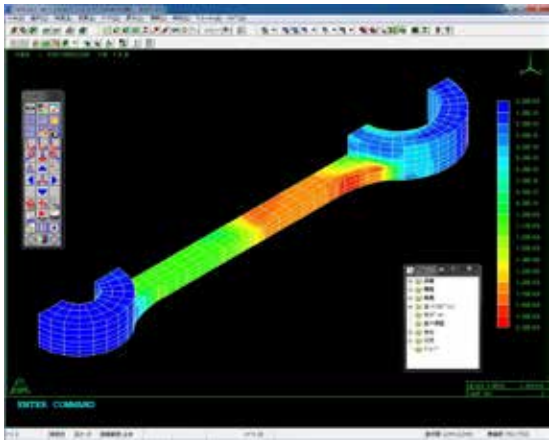
- Optional product for loading support "LoadHelper" and analysis result overlay "AddCase"
- LApack compatible load: Element surface / internal element direction load, rectangular surface load (with / without circular holes, full load type), circular surface load, linear load, linear moment load, abdominal pressure load (with or without considering friction) , Spiral load

【Data linkage】

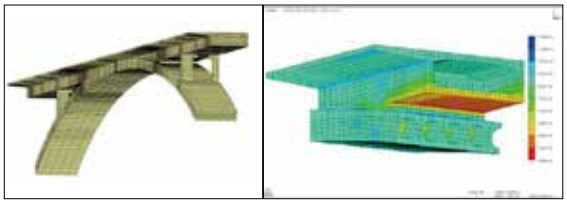
- Import / Export with Engineer's Studio®

FEMLEEG analysis support service ≫P.8
Supports model input and analysis of FEMLEEG, the comprehensive FEM analysis system

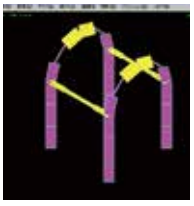
▼Connecting rod shade map



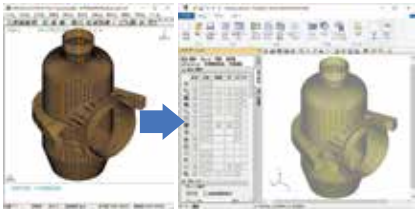
▼Stress check near arch crown joint



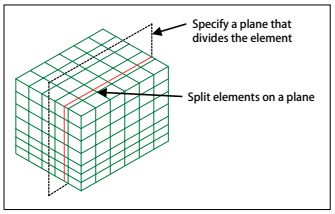
▼Member force diagram



▼Export to Engineer's Studio®



▼Element division by arbitrary edited surface



Engineer's Studio® Analysis Support Service

3D laminated plate, distributed crack model input data support service

software. The service helps users create an initial model designed by dynamic verification method in line with the "Japan Specifications for Highway Bridges, Seismic design" (2012, 2017). This is a technical service that supports users who design not only bridges but also various structures in static, dynamic, linear and nonlinear states. We have registered as a consultant (steel structure and concrete / soil quality and foundation) to improve the service quality.

3 span PC hollow floor slab 5 pillar type rocking pier

Nonlinear analysis and M-φ element are used.
Number of nodes=98 Number of cross sectional elements=61
Number of plate elements=0
Node/element data does not exist. Data is created from design drawing / design calculation report instead.
Predefined bearing and foundation's spring constant

Analysis support service fee	¥661,241

5 span girder bridge

Nonlinear analysis and M-φ element are used.
Number of nodes=98 Number of cross sectional elements=61
Number of plate elements=0
Node/element data does not exist. Data is created from design drawing / design calculation report instead.
Predefined bearing and foundation's spring constant

Analysis support service fee	¥469,487

RC arch bridge

Nonlinear analysis and plate element (model with distributed cracks) are used.
Number of nodes=272 Number of cross sectional elements=14
Number of plate elements=10
Node/element data does not exist. Data is created from design drawing / design calculation report instead.
Predefined bearing and foundation's spring constant

Analysis support service fee	¥932,017

Sluice (vertical direction)

Nonlinear analysis and M-φ element are used.
Number of nodes=200 Number of cross sectional elements=30
Number of plate elements=0
Node/element data does not exist. Data is created from design drawing / design calculation report instead.
Foundation's spring constant

Analysis support service fee	¥1,173,716

Weir column / Gate pier

Nonlinear analysis, M-φ element and M-θ element are used
Number of nodes=180 Number of cross sectional elements=40
Number of plate elements=0
Node/element data does not exist. Data is created from design drawing / design calculation report instead.
Foundation's spring constant

Analysis support service fee	¥1,521,483

RC distributing reservoir

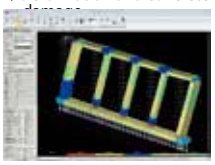
Nonlinear analysis and plate element (model with distributed cracks) are used.
Number of nodes=921 Number of cross sectional elements=15
Number of plate elements=5
Node/element data does not exist. Data is created from design drawing / design calculation report instead.
Foundation's spring constant

Analysis support service fee	¥2,371,002

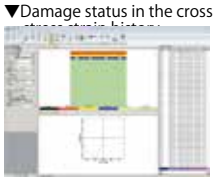
Analysis support service for distributing reservoir

This is a pushover analysis corresponding to the "Static Nonlinear Analysis for Pond Structures" in the 2009 Guidelines for Water Supply Facilities Seismic Construction Method and Explanation (Japan Water Works Association).

▼Deformation and concrete

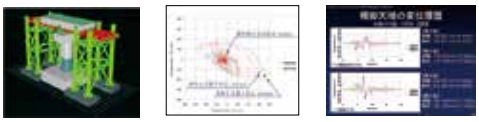


▼Damage status in the cross section



Champion of Blind Analysis Contest!

On July 8, 2010, the FORUM8 analysis support team members won the championship with Engineer's Studio® at the "Destruction analysis and blind analysis contest for seismic resistance experiment on full size bridge made of nature mortar" sponsored by National Research Institute for Earth Science and Disaster Resilience.



Analysis support service option

■Explanation service: A service that helps create comments on modeling and element used.
■Result summarization: A service that summarizes the analysis result into a table
■Report Option: A service that adds comments regarding analysis condition, explanation on the use of element, and modeling on top of the summarized result

WEB Quotation service

By inputting structural form, number of spans, etc., a rough quotation is calculated, and cost breakdown is shown which can then be printed out.

詳細：http://www2.forum8.co.jp/es_estimate/input/

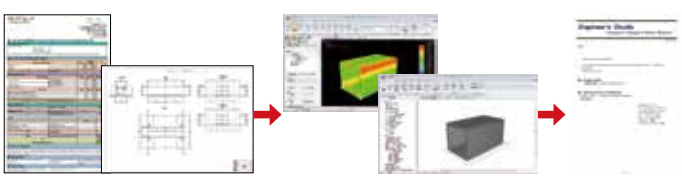
Analysis of the collapse of equipments / racks within the building is also feasible. Analysis is performed whilst taking into account material linear, large displacement analysis, friction between surfaces in contact with each other, etc.

International version of analysis support service

This 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, this service has been provided to more than 1400 users.

【Overview and results of used software】

- Engineer's Studio®: Engineer's Studio®, which supports the nonlinear flat plate elements, was released in 2009 and supports advanced analysis functions such as 64-bit solvers.
- Geotechnical FEM analysis series: Helps evaluation and countermeasures for such as the impact of liquefaction after earthquake, rise of groundwater due to heavy rain, and deterioration of ground stability. The slope stability evaluation and quantitative evaluation of stability after countermeasure construction. Support of basic capacity evaluation and 3D countermeasure work examination.



1.Creation of estimations 2.Creation of analysis data 3.Delivery

FEMLEEG Analysis Support Service

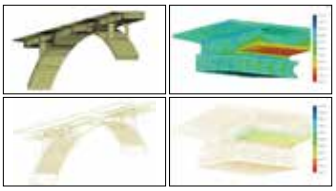
Supports model input and analysis of the comprehensive finite element analysis system FEMLEEG

In addition to selling FEMLEEG software products, FORUM8 technical support staff and development staff provide various analysis support services to assist your model creation and analysis work.

Stress check near arch crown joint

Number of nodes=68,000 Number of models=1
Number of analysis cases=7

Analysis support service fee	¥1,188,205



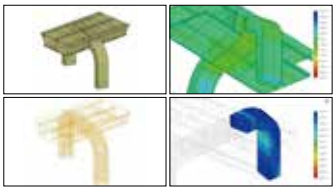
Creates a half-section model by using symmetry conditions

Max principal stress distribution diagram / vector diagram

Stress verification of superstructure and steel pier

Number of nodes=75,000 Number of models=1
Number of analysis cases=5

Analysis support service fee	¥1,342,768



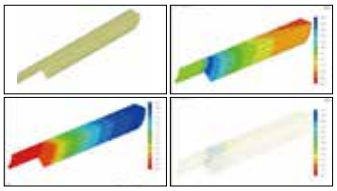
Corrugated web bridge / concrete filled steel pier

Max principal stress of concrete / von Mises stress distribution map of steel pier

Analysis example of steady heat conduction analysis and linked thermoelastic analysis of heat exchanger

Number of nodes=10,000 Number of models=1
Number of analysis cases=1

Analysis support service fee	¥415,389



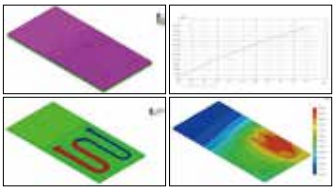
Modeling 1/8 of the heat exchanger

Temperature distribution in steady state

Unsteady heat conduction analysis of heating elements

Number of nodes=10,000 Number of models=1
Number of analysis cases=1

Analysis support service fee	¥396,069



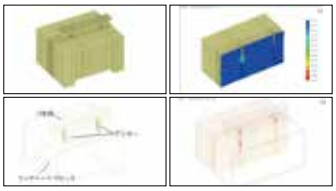
Applying voltage to the heating element, and the generated heat is transferred to the substrate.

Temperature distribution on the top surface of the substrate after 1 second / Temperature history

No Tension analysis of attachment

Number of nodes Number of models=1
Number of analysis cases=1

Analysis support service fee	¥637,574



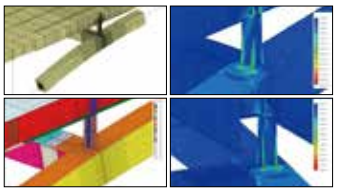
H block steel is connected to concrete block with anchor

Max principal stress distribution diagram of cut surface of concrete part

Stress check of steel arch bridge trusses and arch members

Number of nodes=50,000 Number of models=1
Number of analysis case=1

Analysis support service fee	¥1,111,845



H-type plate thickness color map

von Mises stress distribution map

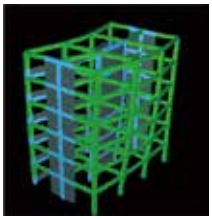
Architecture structural analysis service

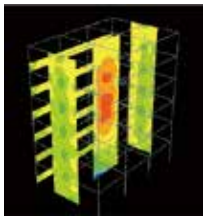
- Analysis Support Service via Multiframe and Engineer's Studio®
- We ask for a structural image and load conditions, both of which are required to create a quotation, then we will give you the quotation
- Our technical staffs will create an analysis data, and run an analysis
- We will submit a summarized result that illustrate cross sectional strength, etc. as an input data and options that you can use

RC School Building

The number of nodal points = 626 ・
The number of cross-section element =24 1 case of load

Estimation example	¥1,470,670





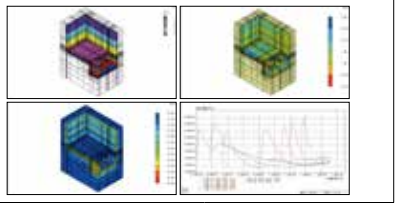
JCMAC3 analysis support service

FORUM8 will respond to diverse needs with well-managed services by taking advantage of being the developer of JCMAC3 pre-post. This is a three-dimensional thermal stress analysis program developed by the JCI Committee on Computer Code Development for Crack Control in Massive Concrete. This program helps the comprehensive analysis of stress, deformation, and the probability and width of cracks due to the initial strain in concrete.

Pump room in water purification plant (1/4 scale model)

Number of nodes = 17,908 Number of placing lifts = 7
Number of stages = 14

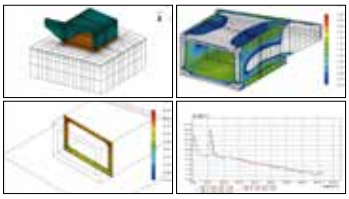
Analysis support service fee	¥1,212,357



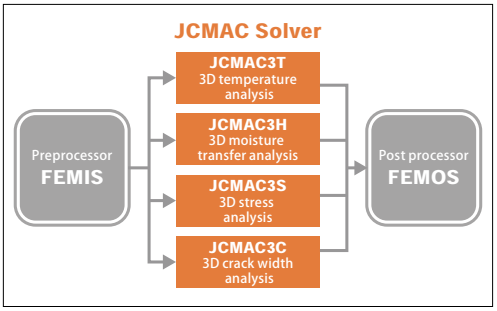
Box culvert with bevel

Number of nodes=39,539 Number of placing lifts=2
Number of stages=6

Analysis support service fee	¥1,270,318



▼JCMAC3 Product Overview



Design・Analysis

FORUM8 Design Conference report on the special lecture

Venue　Shinagawa Inter City Hall

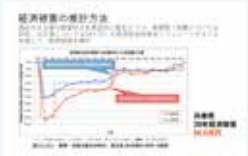
CIM and i-Construction promoted by the MLIT is being introduced to a variety of scenes of civil engineering in recent years. With the view of CIM utilization in various phases from performance design to maintenance, FORUM8 invites specialists of seismic, disaster mitigation, information construction, etc. as lecturer.

The 12th (2018)　Design Conference IM&VR i-Construction Session

Damage brought by huge disasters and measures to reduce it

Prof. Satoshi Fujii, Unit Manager, Resilience Research Unit, Graduate School of Engineering, Kyoto University

He gave a commentary on "Technological examination report for countermeasures against catastrophic disasters that bring about 'crisis for the nation'" released by Japan Society of Civil Engineers (JSCE) in May 2018, which he approached JSCE to work on from a sense of crisis that the public people are aware of almost nothing about what will actually happen when Nankai Trough earthquake occurs. In his opinion, Japan has already lost force in its economic power, having a large number of infrastructures such as bridges built decades ago are left deteriorated, if a catastrophic disaster occurs, Japan may become the poorest nation in Asia. Then he and others examined measures for avoiding fatal situations and limit the damage within a recoverable range when huge disasters occur. As part of this, firstly they simulated economic stagnation effect that continue for a long time (20 years for an earthquake and 14 months for a water disaster) based on the transition of Gross Regional Product (GRP) after the past occurrence catastrophic disasters such as the Great Hanshin-Awaji Earthquake (1995). At the same time, using the estimation method developed by JSCE, they estimated economic damages and asset damages caused by each of assumed catastrophic disasters. For example, the economic damage caused by Nankai Trough earthquake for 20 years amounts to at worst 1410 trillion Yen. He said investment in resilience yields even greater financial benefit in his opinion.

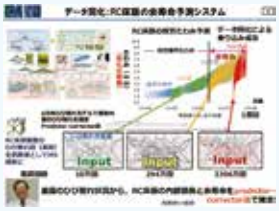


The 11th (2017)　Design Conference IM&VR i-Construction Session

Data assimilation of performance verification of new structures and inspection data of existing structures

Prof. Koichi Maekawa, Concrete Lab., Department of Civil Engineering, Graduate School of Engineering, the University of Tokyo

As inspection data of existing structures increased rapidly, their effective use was required. On the contrary, there were some structural problems that made nonlinear analysis unable to treat them. He expressed his thoughts about this process of trial and error. Regarding this, he talked about his attempt of data simulation for uniting inspection information and numerical analysis (data assimilation), which he and others had been working on in "The Cross-ministerial Strategic Innovation Promotion Program (SIP)" (Cabinet Office, Government of Japan). He also explained possibility of its utilization in maintenance by mutual complement of advantages and disadvantages of each of inspection data and nonlinear analysis. In addition, he mentioned constrains that had emerged through the current SIP project. In working out countermeasures for them, an approach was devised, in which artificial intelligence (AI) is trained with the results of numerical analysis as training data. Based on their results, he introduced an attempt to obtain the inspection data of bridges automatically while driving on expressways and actually connect them to numerical analysis.



The 10th (2016) Design Conference　Seismic, Geotechnical and Water Works Sessions

Transition of bridge technology

Prof. Hiroshi Mutsuyoshi, Graduate School of Science and Engineering / Director of International Institute for Resilient Society, Saitama University

First, he explained the definition of external cable structure (external prestressing) and the difference from internal cables, and their characteristics based on the results of experiments and analyses etc. Then he developed his discussion into the structural advantage of a 2-span prestressed concrete girder bridge with external tendons of large eccentricity, the results of experiments and analyses about flexibility of its design, application of the structure to an actual bridge (Torisaki River Park Bridge) by joint study, and the construction process to completion of the bridge. Furthermore, he expounded the requirements for providing the bridges newly constructed or renewed in the future with high durability from the following points of view: 1) Structural rationality, 2) Multilayer protection, and 3) Easy inspection. Finally, he mentioned the process of modification of new Specifications for Highway Bridges, as well as the related points in the current modification.

The 9th (2015)　Design Conference Design and Analysis Session

Repair example for long-lasting structure

Tadayoshi Ishibashi, Chairman of JR East Consultants Company / Advisor of East Japan Railway Company / Visiting professor of Waseda University

Focusing on an upcoming problem about the delamination of concrete fragments, he explained its cause and measures to improve quality of newly constructed structures and repair existing buildings, including damages caused by alkali-aggregate reaction, salt damage, and frost damage and various repair methods, earthquake and its countermeasure. Based on this, he mentioned as following. 1) Design and construction standards should be changed early by using maintenance trouble data. 2) Causes and countermeasures can be determined by only looking at structure. 3) Demerits of construction in each era can be assumed from the construction method and design standard at that time. In his opinion, the data cooperation from design to maintenance is important for long-lasting structure.

NaRDA
National Resilience Design Award

National Resilience Design Award

"National Resilience Design Award" is the place to provide information and to improve skills by assembling concrete cases and results which is helping to strengthen the national land. Various brilliant works for strengthening of national land in the field of structural analysis (civil engineering and construction), ground and water engineering, and disaster prevention will be introduced.

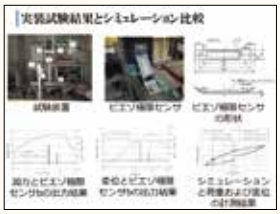
the 6th NaRDA Award Winning Works (2019)

Grand Prix

Development of simple measurement technology for steel structures

—Constructing a convenient soundness monitoring system for structures using piezo limit sensors—

Akita Prefectural University Faculty of Systems Science and Technology



Program Engineer's Studio

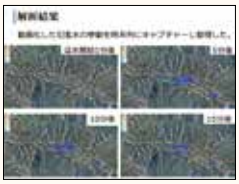
The joining method of structures used in many steel structures in Japan is generally a fastening method using welding or bolts. In case of welded joint, there are few accidents due to the vibration or loosening of nuts compared to the bolt fastening, but brittleness occurs at the same time as hardening around the joints due to the thermal effect of welding. The non-destructive inspection technique and visual inspection are used for the weld joint inspection. However, in countries that have experienced major earthquakes, it is required to design buildings with the method that makes the entire building plasticized without collapsing and absorbs the earthquake energy to prevent the collapse and save human life, if a large earthquake with a seismic intensity of 6 or more based on the building design standards occurs. In other developed countries, there is currently no report of monitoring the soundness of only connecting part for a long period. In order to evaluate the soundness of steel structures after large earthquakes, there is a demand for the construction of a monitoring system that enables long-term, inexpensive, and simple measurement using an autonomous limit sensor. This report says the test result of analysis technology that enables the prediction of displacement and load from the output of the new sensor.

Excellent Award

Flood analysis of rivers in mountain area

—Reproducing the dynamic behavior of flood water—

F-tech Inc.



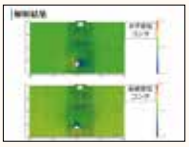
Program xpswmm

Nomination Award

JR Kagoshima Main Line track underlay propulsion impact analysis

—Ground deformation analysis and evaluation during propulsion pipe construction—

JR Kyushu Consultants Company

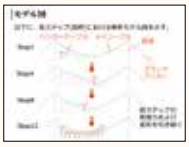


Program Geo Engineer's Studio

Verification of installation method by cable erection method

—Proposal of load loading method for each installation step—

Namura Shipbuilding Co., Ltd.

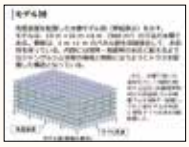


Program Engineer's Studio

Proposal of water tank with seismic isolation device for huge earthquakes

—Dynamic nonlinear analysis of aquarium structure with or without seismic isolation device—

Morimatsu Industry Co., Ltd.



Program Engineer's Studio

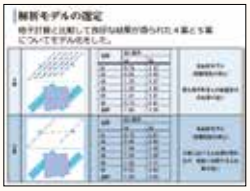
Elaborated Bridge Design Award

Honorable Judge Award — Prof. Hiromichi Yoshikawa (Chief of the judging committee) Professor Emeritus, Tokyo City University

Validity evaluation of reaction force for bearing design by difference of analysis model

—Verification of dead load analysis by plane grid and dynamic analysis by 3D frame—

SHO-BOND CORPORATION Nagoya Branch



Program Engineer's Studio Grid analysis

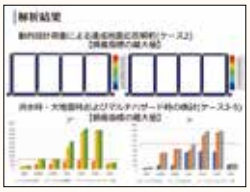
Water Supply Resilience Award

Honorable Judge Award — Prof. Masaru Morita, Vice-president of Shibaura Institute of Technology Professor of Urban Environmental Engineering Laboratory,Civil Engineering Department, Shibaura Institute of Technology

Disaster countermeasures for water supply facilities considering multi-hazards

—Approach to streamlined design by sophistication of analysis model and verification index—

Knowledge Fusion Co., Ltd.



Program Engineer's Studio / WCOMD Studio

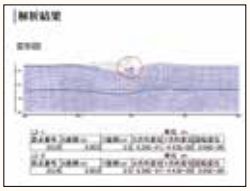
Performance-based Design Award

Honorable Judge Award — Prof. Akihiko Wakai Professor of Science and Engineering Department, Gunma University

Dike ground analysis

—Liquefaction judgment and deformation analysis of dyke during earthquake—

Kyushu Civil Engineering



Program GeoFEAS2D

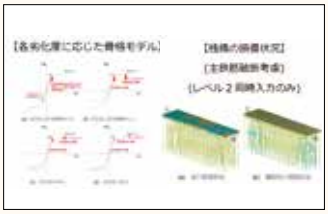
the 5th NaRDA Award Winning Works (2018)

Grand Prix

Applying the residual strength evaluation method using degradation level check to jetties

—Proposal of a new strength evaluation method using a loading experiment and general regular check results—

Institute of Technology, PENTA-OCEAN CONSTRUCTION CO., LTD.



Program Engineer's Studio

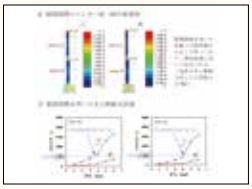
Among harbor structures, jetties are especially in severe environments against salt damage and need more appropriate maintenance than other structures. However, there are not so many studies on residual strength and seismic performance of degenerate jetties. In addition, an evaluation of jetties' remaining strength normally requires a detailed constant check and diagnosis that takes a lot of cost and time. That is why companies need simple strength evaluation methods. This research is an suggestion of a simple residual strength evaluation method that performs a loading experiment for each degradation level to reveal the relationship between the degree of degeneration and the remaining strength and export the results to general structure analysis software programs.

Excellent Award

Seismic performance evaluation according to damage on material

—Proposing a reasonable shear strength evaluation method for underground structures—

Knowledge Fusion Co.,Ltd.



Program WCOMD Studio

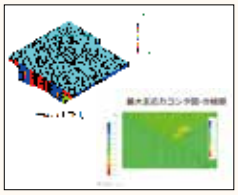
Full 3D Design Award

Honorable Judge Award — Prof. Hiromichi Yoshikawa (Chief of the judging committee) Professor Emeritus, Tokyo City University

Stress analysis on the branch point of steel deck box girder bridge

—Stereoscopic FEM model analysis by using plate and shell—

KATAHIRA & ENGINEERS INC.



Program FEMLEEG

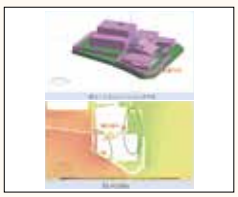
Amenity Design Award

Honorable Judge Award — Prof. Masaru Morita, Vice-president of Shibaura Institute of Technology Professor of Urban Environmental Engineering Laboratory,Civil Engineering Department, Shibaura Institute of Technology

CFD analysis simulation of traditional architecture

—Wind speed analysis outside "Futatsuya"—

Kagoshima University



Program DesignBuilder

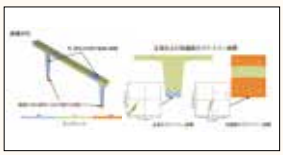
Performance-based Design Award

Honorable Judge Award — Prof. Akihiko Wakai Professor of Science and Engineering Department, Gunma University

Seismic performance verification for PC snow shed against L2 earthquake

—Towards making a snow shed to withstand a large earthquake—

NIHON SAMICON CO., LTD.



Program Engineer's Studio

the 4th NaRDA Award Winning Works (2017)

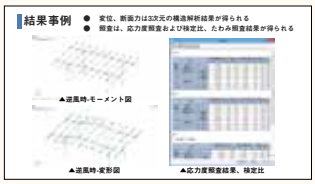
Grand Prix

Design of solar cell support structure

—Detail design by
3D skeleton structure analysis—

Next Energy & Resources Co., Ltd.

Program Engineer's Studio®



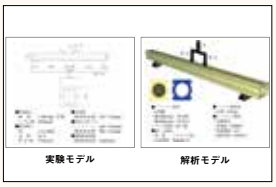
Excellent Award

Examination of consistency by full scale experiment and nonlinear pushover analysis for PC-wall

—Review on applicability of fiber element and M-φ model—

Nippon Concrete Industries Co., Ltd.

Program Engineer's Studio®



Performance-based Design Award

Honorable Judge Award — Prof. Hiromichi Yoshikawa (Chief of the judging committee) Professor Emeritus, Tokyo City University

Seismic performance evaluation of eight-continuous water gate —Seismic verification design by the frame analysis of the specially structured eight-continuous sluiceway —

CIVIC ARTS Consulting Inc.

Program Engineer's Studio®

Hydrosystem Risk Management Award

Honorable Judge Award — Prof. Masaru Morita, Vice-president of Shibaura Institute of Technology Professor of Urban Environmental Engineering Laboratory,Civil Engineering Department, Shibaura Institute of Technology

Seismic performance check of hydraulic steel pipe for power generation—Time history response analysis by frame model—

APPLIED TECHNOLOGY CO., LTD.

Program Engineer's Studio®

Integrated Design Award

Honorable Judge Award — Prof. Akihiko Wakai Professor of Science and Engineering Department, Gunma University

Strength test analysis by steel diaphragm wall method-II —Consider an evaluation way of bending strength and rigidity by analysis numeric experiment—

Japan Association of Diaphragm Wall

Program Engineer's Studio®

the 3rd NaRDA Award Winning Works (2016)

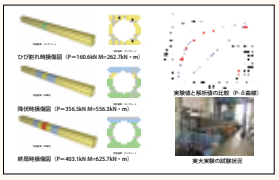
Grand Prix

High seismic retrofitting of freestanding retaining wall by using PC-Wall and reasonable performance verification type seismic design method

—Actual-size experiment and verification by using high performance FEM fiber model—

Nippon Concrete Industries Co., Ltd.

Program Engineer's Studio®



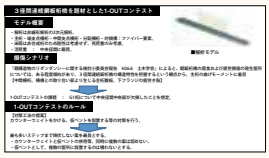
Excellent Award

Utilize Engineer's Studio® for personnel training

—For understanding of structure features of triple span steel plate girder bridge—

Association of road and bridge structure, Ministry of Land, Infrastructure, Transport and Tourism. Central Regional Development Bureau

Program Engineer's Studio®



Performance-based Design Award

Honorable Judge Award — Prof. Hiromichi Yoshikawa (Chief of the judging committee) Professor Emeritus, Tokyo City University

Experimental result about sewerage facilities if applying non-linear FEM analysis, and limit value based on the result.

A×C：Architecture×Civil engineering

Program Engineer's Studio®

Tsunami Risk Management Award

Honorable Judge Award — Prof. Masaru Morita, Vice-president of Shibaura Institute of Technology Professor of Urban Environmental Engineering Laboratory,Civil Engineering Department, Shibaura Institute of Technology

Shallow water equations based tsunami attack simulation with the idea of disaster prevention on software

—Influence of building modeling on tsunami attack simulation result—

Oita National College of Technology

Program xpswmm

Tsunami Protection Award

Honorable Judge Award — Science and Engineering Department, Gunma University Prof. Akihiko Wakai

Verification of tsunami load against shell-type roller gate by using FEM —For more detailed study about door structure against tsunami attack—

APPLIED TECHNOLOGY CO.,LTD.

Program Engineer's Studio®

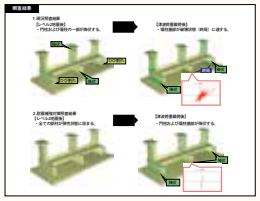
the 2nd NaRDA Award Winning Works (2015)

Grand Prix

Seismic performance verification considering the level 2 earthquake and tsunami load

—Series of analysis of earthquake and tsunami against coastal sluice gate—

Program Engineer's Studio® **RATECH Co., Ltd.**



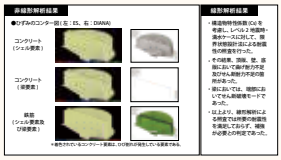
Excellent Award

Reasonable seismic reinforcement design method for sewer institutes to contribute to the national resilience

—Nonlinear FEM analysis of sludge concentration tank—

A×C:Architecture×Civil engineering

Program Engineer's Studio®



Seismic Resilience Design Award

Honorable Judge Award — Prof. Hiromichi Yoshikawa (Chief of the judging committee) Professor Emeritus, Tokyo City University

Verification of current state of steel langer truss bridge constructed in 1953 by complex nonlinear analysis

—Toward economic and logical selection of best repair and reinforcement method—

Doboku Giken

Program Engineer's Studio®

Coastal Resilience Design Award

Honorable Judge Award — Prof. Emeritus Keizo Ukai, Graduate School of Engineering, Gunma University

Dynamic effective stress analysis and seismic verification of coastal reclamation dike

—Considering the reduction of rigidity of marine soft soil layer at the time of earthquake—

Sanyu Consultants Inc.

Program UWLC

Integrated Design Award

Honorable Judge Award — Prof. Masaru Morita, Vice-president of Shibaura Institute of Technology Professor of Urban Environmental Engineering Laboratory,Civil Engineering Department, Shibaura Institute of Technology

FEM analysis of RC water tank

—3D plate model time history response analysis using L2 seismic motion considering liquefaction—

Bulld Geotechno

Program Engineer's Studio® /UWLC

the 1st NaRDA Award Winning Works (2014)

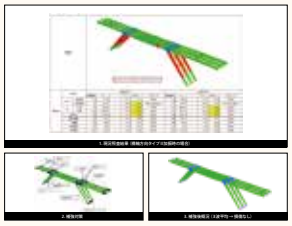
Grand Prix

Seismic verification and review of reinforcement by using Specifications for Highway Bridges for the steel strutted beam rigid frame bridge constructed for 40 years ago

—Application of optimum construction method among seismic isolation dampers, buckling-restrained brace, etc. from the viewpoint of effectiveness and economy—

Tonichi Sekkei Consultant

Program Engineer's Studio®



Excellent Award

Study on the effect of buckling-restrained brace against transverse seismic motion

—A suggestion for the reinforcement using damping damper for girder bridge—

Yokogawa Sumikin Bridge Corp.

Program Engineer's Studio®

Environmental Sustainability Analysis Award

Honorable Judge Award — Prof. Hiromichi Yoshikawa、Prof. Emeritus Keizo Ukai 、Prof. Masaru Morita

N project CFD simulation

—Review of air condition by the heat and wind analysis for house designing and BIM&VR cooperation—

atelier DoN

Program DesignBuilder/ ALL >LAN

Seismic Performance Evaluation Award

Honorable Judge Award — Prof. Hiromichi Yoshikawa (Chief of the judging committee)

Seismic performance check of arch bridge by dynamic analysis

—Example of dynamic analysis by using multi-point input—

JAPAN-CHINA CONSULTANT CO., LTD.

Program Engineer's Studio®

Geotechnical Construction Method Assessment Award

Honorable Judge Award — Prof. Emeritus Keizo Ukai

Seismic effect analysis of piers placed in levee body

—Confirmation of shielding effect by sheath pipe structure—

Shin Nippon Giken Engineering Co., Ltd.

Program UWLC

Flood Risk Management Award

Honorable Judge Award — Prof. Masaru Morita

Flood analysis over factory premise taking into consideration river levee break

—To understand the immersion around factory premise assuming the break of levee at the time of flooding due to rainfall by performing the flood analysis—

Azbil Corporation

Program xpswmm

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■Author Tatsuoki Inagaki President of Pave & Road How-To Way Technology Association (Paroway Tec)
■Price JPY3,800 (+tax)
■Publisher FORUM8 Publishing Group

Small talk about FEM

I.Math essay
II.Miscellany essay

Published in Nov 2018

This book handles Finite Element Method (FEM), the representative numerical analysis method in engineering. This is not a so-called manual but a unique mathematical essay by the author who is the last generation knowing of the "FEM story". Another characteristics of this book is interesting stories about mathematical history. This book consists of two separate books: I. Math essay and II. Miscellany essay.

■Author Yoshiaki Harada (Advisor, FORUM8)
■Price 【I. Math essay】JPY2,200 (+tax)
【II. Miscellany essay】JPY1,600 (+tax)
■Publisher FORUM8 Publishing Group

Introduction to Earthquake Disaster Mitigation (Japanese)

Published in 2013

This is a textbook / manual for entry level scholars and engineers to learn the fundamental technologies of tsunami engineering, seismic engineering, and urban disaster.

■Editor Hiromichi Yoshikawa (Prof. of Tokyo City University)
■Author Harumi Yashiro/Seiichiro Fukusima/Hideto Omine
■Price JPY3,000 (+tax)
■Publisher FORUM8 Publishing Group

STRUCTURAL ANALYSIS

— Case Studies and Numerical Simulation —(Japanese)

Published in 2009

Explains wide variety of case studies from structural analysis basics to parametric simulation of real structures. Contains advanced analysis cases using fiber elements.

■Author Hiromichi Yoshikawa, Hiroto Aoto, Yoshitaka Kai
■Price JPY2,800 (+tax)
■Publisher Kentsu Shinbun

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