

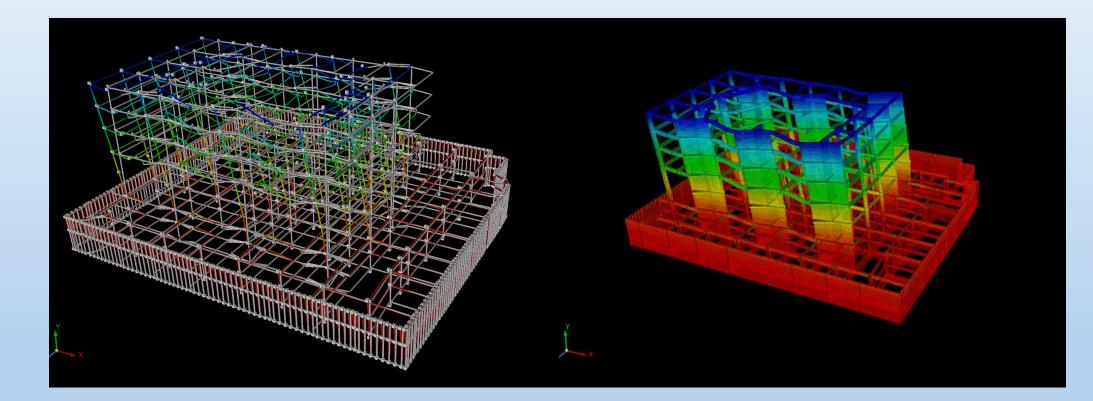
Innovative Intuitive Intelligent

SCADA Pro

Structural Analysis & Design



Structural Analysis & Design

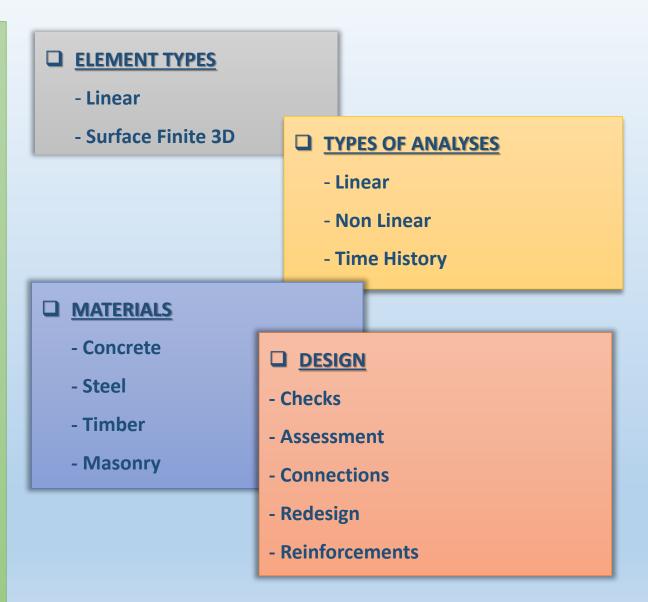




Agenda

- General Features
- Technical Specifications
- Interoperability with leading applications and
- standard file types
- Integrated Interface
- Multilingual environment
- Eurocodes and National Annexes
- Detailing Design
- Add-on MODULES with extra capabilities



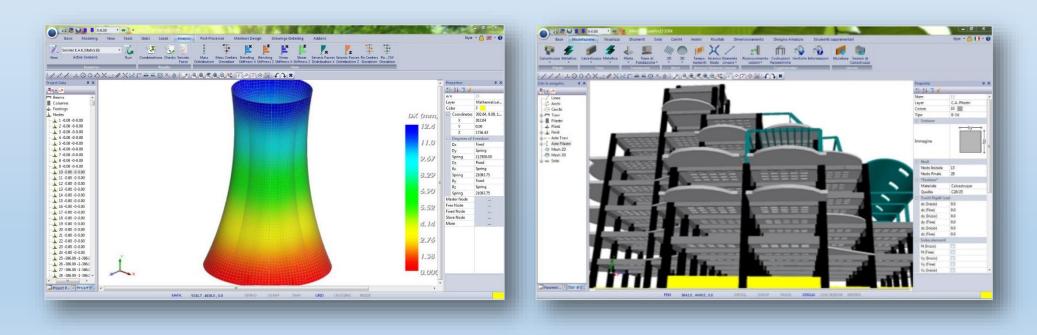




Overview:

1. General Features:

- Software for static dynamic analysis and design of structures
- 35 years of continuous research and development
- Reliable, precise, fast and productive.





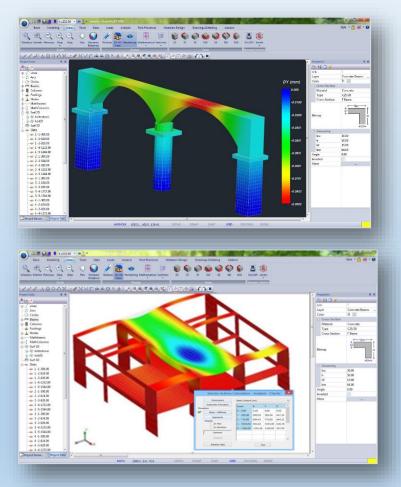
2. Technical Specifications :

□ Follows leading standards (it is certified from Microsoft and Autodesk)



Uses :

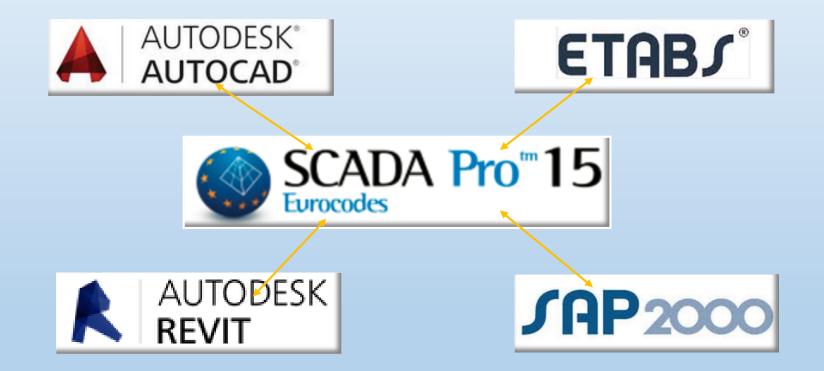
- industry standards (dwg, dxf, ifc4, xml, docx, pdf, excel)
- the most modern technologies (Finite Element Method, Adaptive Mesh Generation, Direct X/Open GL graphics, .NET, C# and more)
- the latest numerical analysis methods
- new optimized algorithms 64-bit to generate large linear and surface finite element models
- high computational performance (HPC) methods for reducing the computational time and very effective for the analysis of big structures
- Automated templates for typical structures





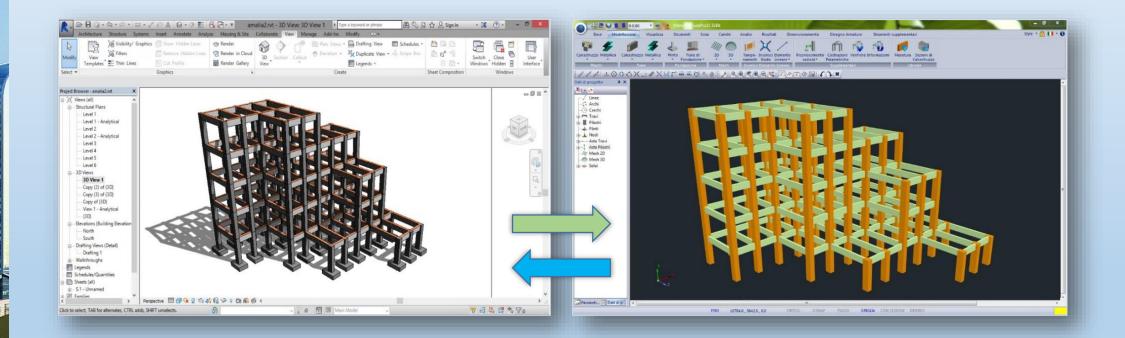
3. Interoperability with leading applications and standard file types:

□ SCADA Pro integrates BIM technology and two-way communication with both architectural applications (Autodesk AutoCAD, Revit Structure) and other structural programs (ETABS, SAP2000).





- **Bidirectional communication** with architectural applications:
 - Imports **ifc** files from Autodesk **Revit** and uses built-in libraries to recognize, automatically, all the structural elements (columns, beams, slabs etc.) with their respective properties, in order to create the model for analysis and design.





Bidirectional communication between **ETABS** and **SAP2000** with **SCADA Pro**:

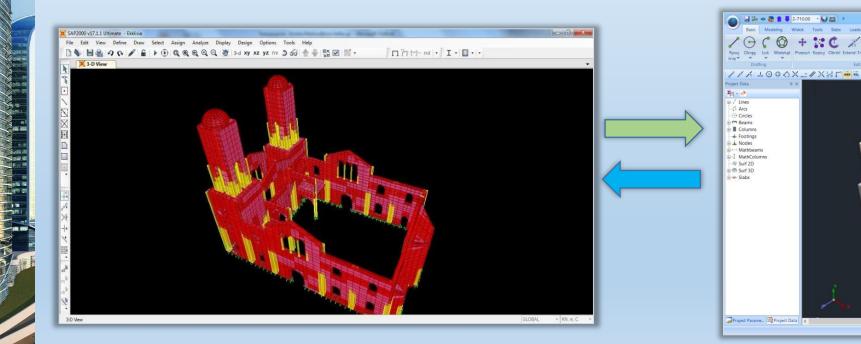
Exporting and importing structures of: - concrete

- steel

- timber

- masonry

to and from **SCADA Pro** for analysis and design

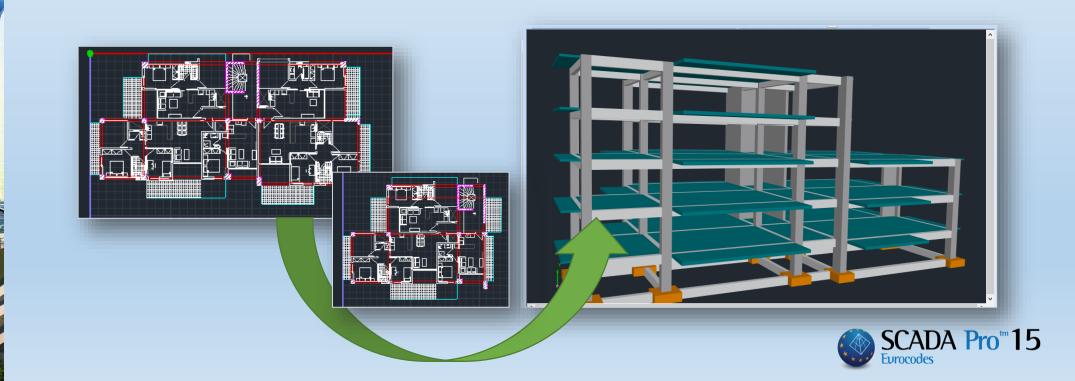




AZON

Enables users to:

- Automatically Recognize Cross Sections from any architectural dxf or dwg design
- Import and rotate different design files (**dwg**, **dxf**) at each level of the building, including:
 - automatic recognition of Structural Elements and creation of the whole structure
 - automatic creation and pre-design of the foundation



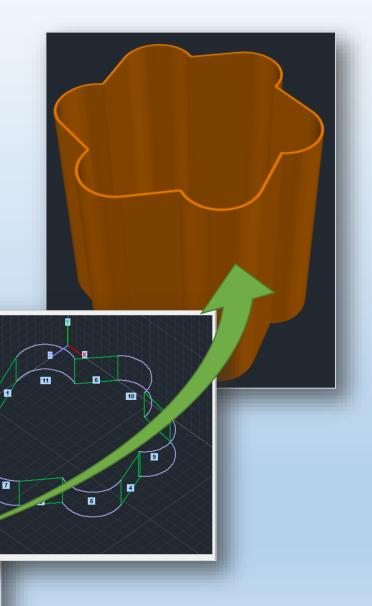
Enables user to:

 Image: The state
 Image: The state

- Automatically Convert lines, arcs and circles to corresponding design objects of SCADA Pro
- Automatically create 3D objects (core, silos) from the outline of any shape through "Front View Identification".

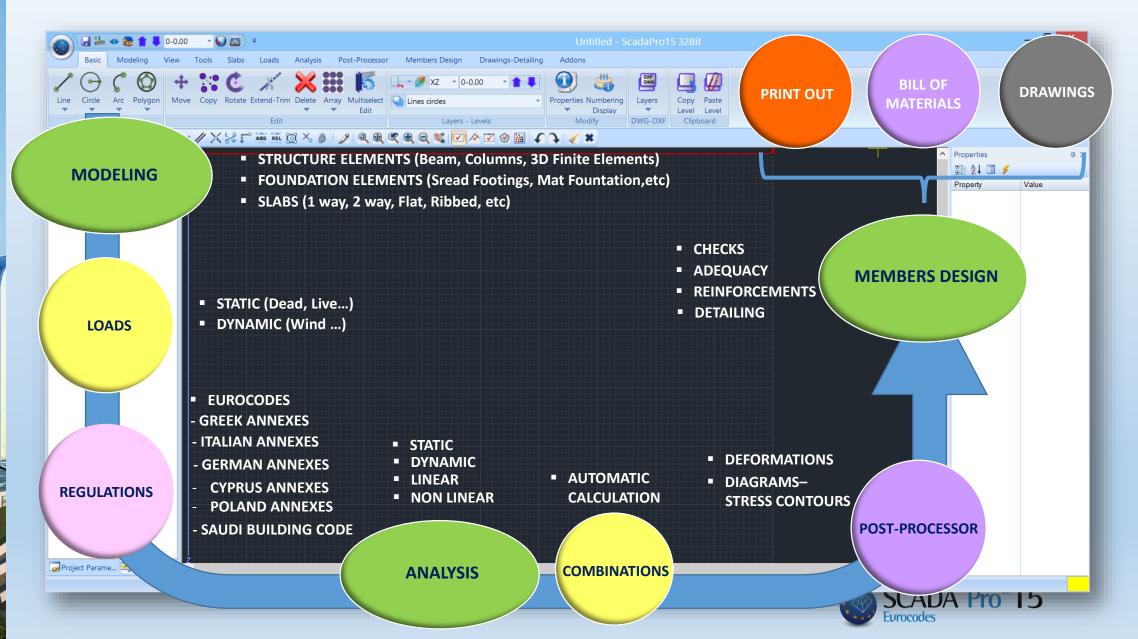
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Columns Columns Columns Nodes Mathbea I MathColu Surf 2D Surf 3D Slabs 2 @ @ @ @ @ % 🔽 🖉 🖉 🖉 🖌 🖌 🎸





4. Integrated Interface



5. Multilingual environment

• Multilingual environment with automatic language switching



FURTHERMORE :

- Analysis design and checks according to country regulations and national annexes
- Printouts in the respective language
- Integration of Arab regulations (Saudi Building Code) regarding loads and design of concrete, steel and masonry buildings.







6. Eurocodes and National Annexes



Regulations- Combinations



Loads EN 1991

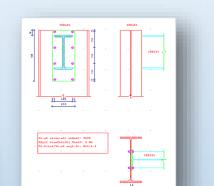
Design	EN 1992	EN 1993	EN 1994	EN 1995	EN 1996
	Concrete	Steel	Composite	Timber	Masonry
Soil			EN 1997		
Seismic			EN 1998		
Aluminum			EN 1999		
(Yes	P	artly		

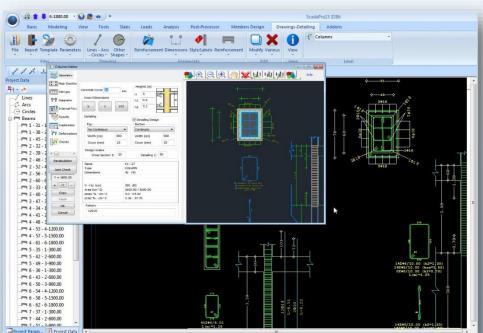


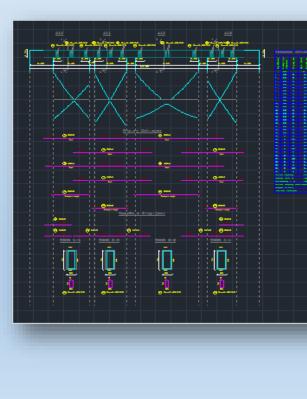
Length (cm)

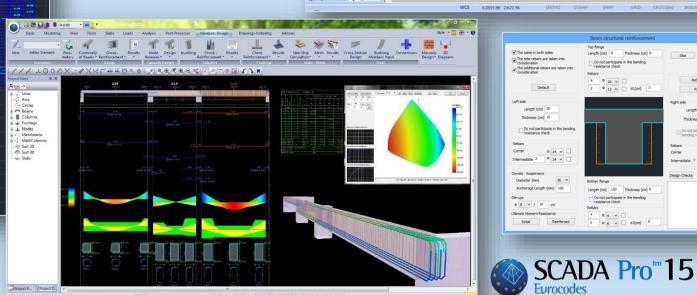
7. Design - Detailing

- Interaction between design & detailing
- Layout of beams and columns
- Connection detailing
- Reinforcement detailing

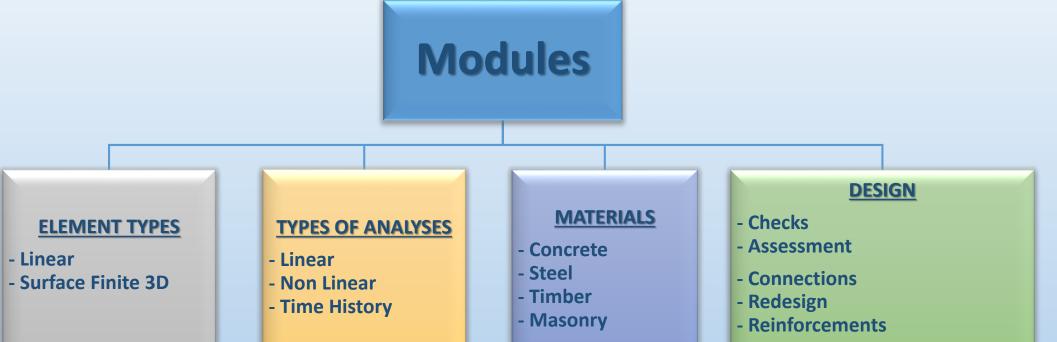










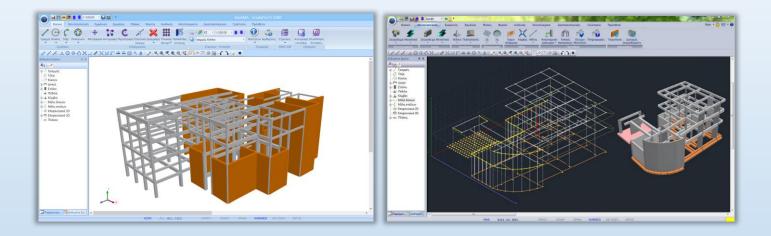


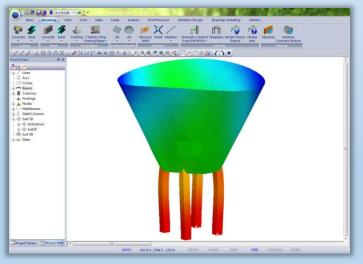


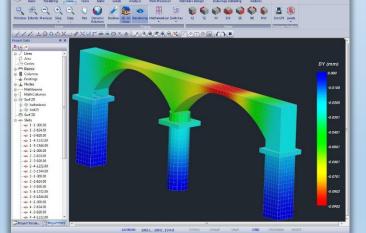
8. MODULES

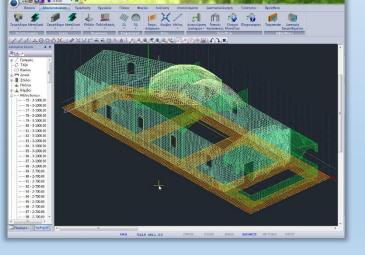
ELEMENT TYPES

- Modeling Structures with linear or / and 3D finite surface elements
- Interaction between linear and surface elements





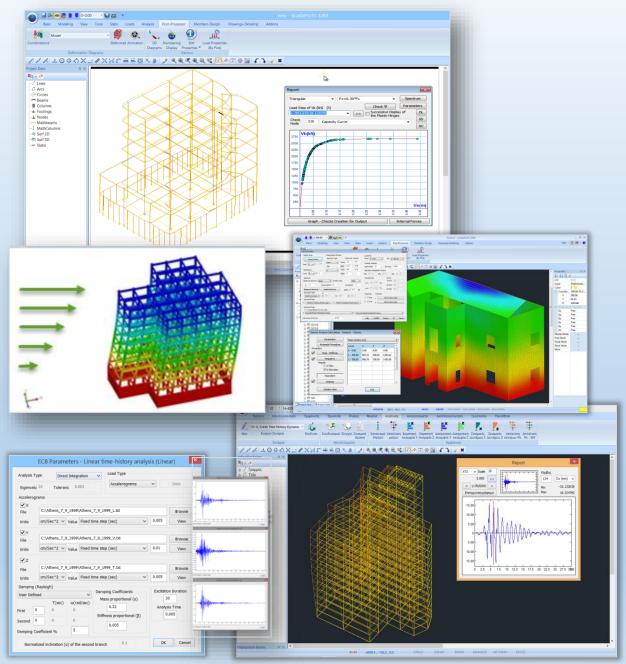






TYPES OF ANALYSIS

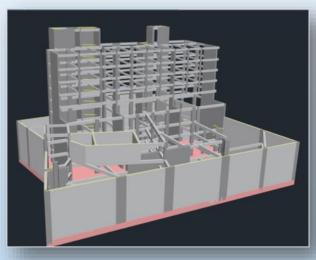
CALCULATION METHODS	REGULATIONS
Static	EC 8 - SBC
Linear Calculation of Seismic Response:	
α) Linear Static Analysis	EC 8
β) Linear Dynamic Analysis	EC 8
Pushover Analysis	EC 8
Linear Time History Analysis	EC 8
Non Linear Time History Analysis	EC 8





□ MATERIAL

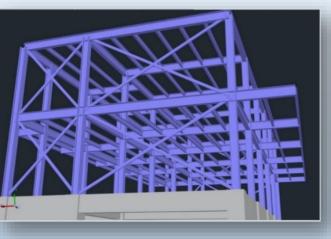
• Concrete



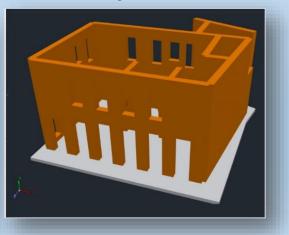
• Timber



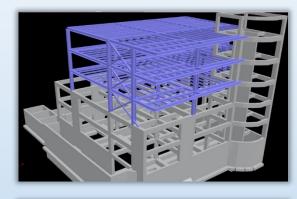
• Steel

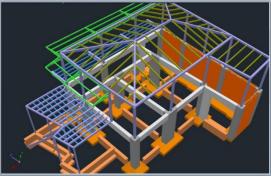


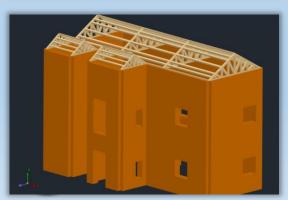
• Masonry



• Composite

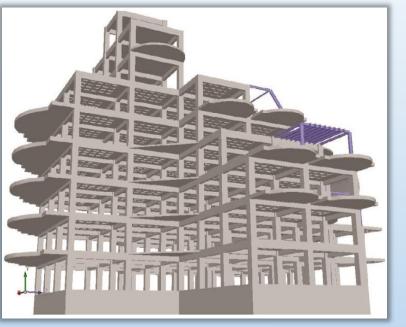




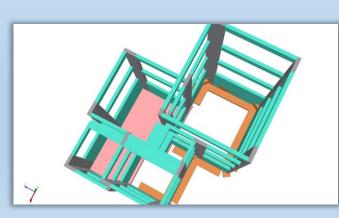






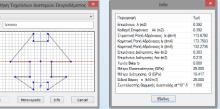


CONCRETE





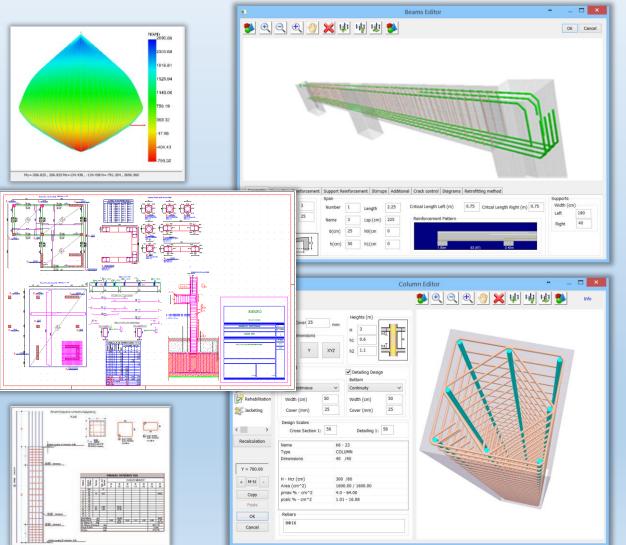
- Rich library of standard and arbitrary (user defined) cross
 - sections



- Infinite modeling capabilities for inclined beams, columns arbitrary sections, slabs of any shape and type, shells, masonry infills
- Combined and multilevel foundations with footings, connecting beams, strip footing beams, mat foundations

DESIGN: Checks

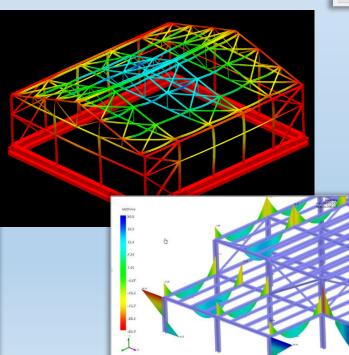
- Members of Reinforced Concrete of upper structure and foundation-EUROCODE 2
- Automatic design of all structural members
- Calculation of moments of resistance by the M-N interaction diagrams
- 3D color display of the diagrams
- New powerful reinforcement editor for easy editing and modification
- 3D display of the layout of the reinforcement
- Automatic bending shear rechecking and moment resistant recalculation
- Automatic creation of the report and the structural drawings – detailing of the reinforcement, in dwg or dxf files.

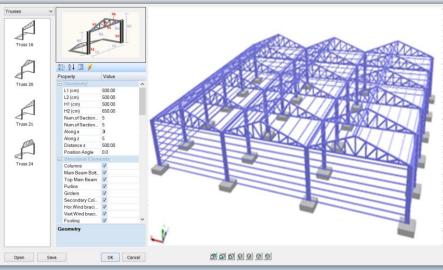


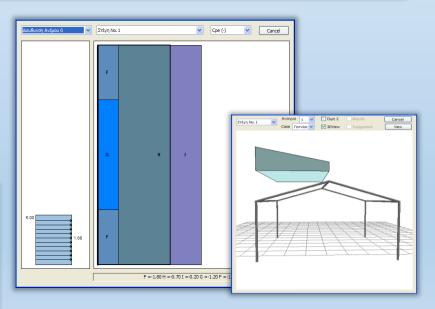
STEEL

- Rich library of typical sections
- Automated templates for typical structures (trusses, frames)
- Automatic calculation and distribution of wind and snow loads (EC 1 – SBC 301)
- Automatic calculation of combinations (EC 0 SBC 301)

EC1	WIND PARA	AMETERS ×						
Zone Islands until 10Km	from the coast	¥						
Altitude fro	om sea level (m)	? A 500						
Me	ean Wind Velocity	(m/sec) Vb,0 33						
	Snow Density ((Kg/m3) ? ρ 1.25						
	Directiona	al Factor Cdir 1						
	Seasor	n Factor Cseason 1						
Soil Type		EC1 SNOW PAR	RAMETERS					
0 Sea or coastal area	exposed to the o							
	Distance from	Regulation	~					
Action and	Z0(m) 0.0	Topography Normal						
Orthography Factor	Kr 0.1	Exposure Factor Ce Thermal factor Ct						
Cliffs and escarpments	s 🗸 Upwind	Snow De	ensity γ kN/m3					
H site	downwind slope <	Zone III (The Rest Greece)						
wind > still L	_	Snow Load (at sea level) Sk,0 kN/m2						
x- *	→ _{X+}	Altitude (from sea level) A m	? 50					
Roughness Factor	_	Snow Load (at Altitude A) Sk kN/m2	1.0					
Automatic Calculatio	on Cr(z)	Accidental Snow Load						
Automatic Calculation		Design State Case A (No exception	al falls/No exceptional					
	_	Exceptional Loads Factor Cesl	1					
		ОК	Cancel					





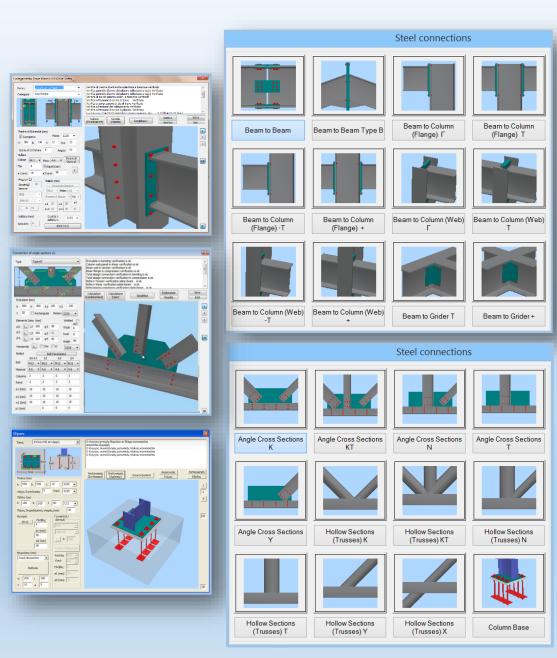




STEEL CONNECTIONS

- Beam to Column on the strong or on the weak axis with bolts and end-plate, bolted or welded
- Hollow Sections
- Angle Cross Sections
- Beam to Beam
- Column Base
- Flange and Web Stiffeners and Brackets
- Beam continuity rehabilitation
- 3D display of the Connection
- Detailed check results
- Detailed drawings

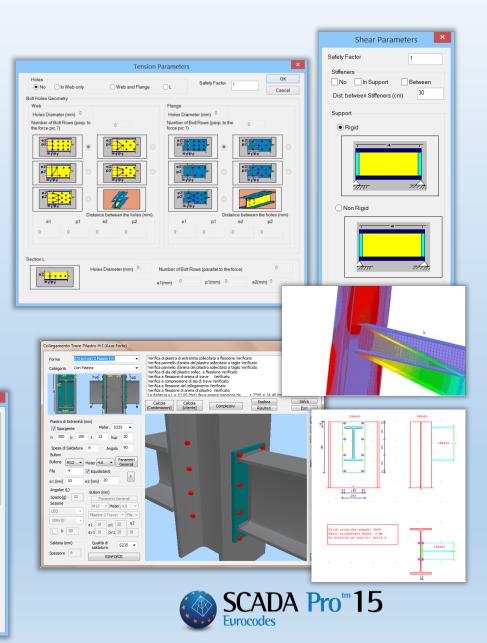
More than 120 Connection types



DESIGN: Checks

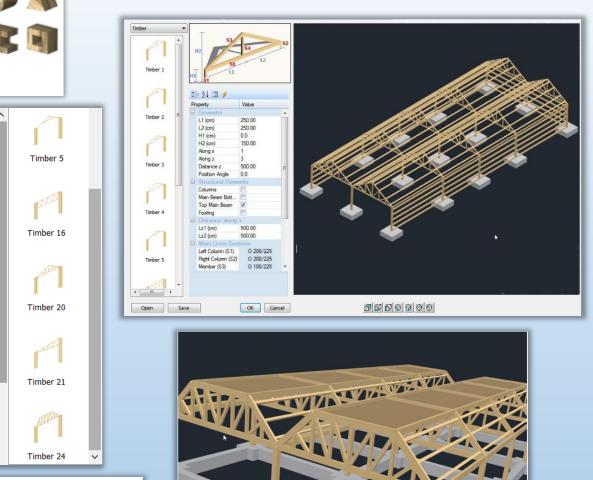
- Steel members and connections EUROCODE 3
- Checking of all structural members in bending and torsional buckling.
- All necessary checks for the ultimate and serviceability limit states
- Analysis and design of composite construction (steel and reinforced concrete)
- Design of more than 120 types of steel connections (welded or bolted) with 3D visualization of the connection detailing
- Plan, elevation and section view connection detailing with capability of exporting and saving in DWG file format

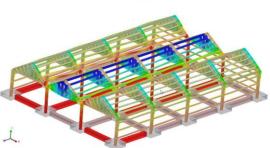
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		l	Description	Mer	nb C	comb.	N	Vy	Vz	Mx	Му	Mz	NO	Auto	N	мv	Mx	M-N	M-V	N-V-N	L	L				
		L	Max N	49		1	26.03	-0.01	-7.15	0.00	-18.78	-0.00		V	X	v	V					L				
			Min N	6		62	5.64	3.23	10.87	0.14	-11.25	-2.04		V	V	v	•		V	V						
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-							9.78	-4.46	15.67	0.02	-8.26	1.29		•	•	v	•									
							9.78	-4.46	-15.67	-0.02	8.26	1.29											_			_
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	Buckling N	M	embers	s In	pu	t	8.39	3.38	12.34	-0.17	-7.95	-1.84											1	0.00	1.00	
11							16.25	4.29	-7.17	0.00	27.75	-1.85							_				2	0.00	1.00	
							16.25 9.47	4.29	7.17	-0.00	-27.75	-1.85											2	0.00	1.00	
							9.47	-4.40	-15.67	-0.02	12.96	-2.62														
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intermediat

OK Cancel





Timber 1

Timber 2

Timber 3

Timber 4

Timber 5

TIMBER

- Rich library of typical sections
- Automated templates for typical structures
- Design and checks of all members according to Eurocode 5 and the respective national annexes







TIMBER CONNECTIONS

- Connections with metal dowel type fasteners (nails, bolts, screws, dowels, staples)
- Steel and timber plates
- Placements angle and fasteners arrangement
- 3D display of the details
- Detailed check results



DESIGN: Checks

- Timber members and connections EUROCODE 5
- Design of a cross-section for the ultimate limit state
- Design checks of a cross section under tension/compression parallel/vertical to the fibers
- Check of a cross section under bending/shear/torsion
- Check of a cross section under combined stress
- Design of a structural member for the ultimate limit state (member stability)

Name

Structural Component Parameters

Steel Reinforcement

Timber structures

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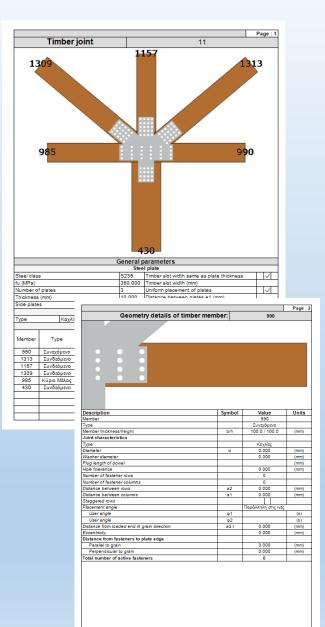
vs (&6.6.)

kshape computation (& 6.1.8

km computation (8.6.1)

- Column design check in compression buckling
- Beam design check lateral-torsional buckling
- Design for the serviceability limit state
- Deflection control, vibration control

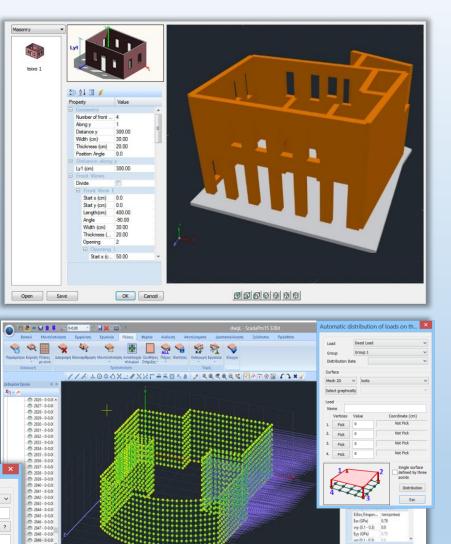
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Cross-Section Design	¢QY	495	23	23.87	3.01	-0.41	-0.01	-0.08	1.50								V	<u> </u>
Cross-Section Design	QY	628	21	25.47	-3.37	-0.84	0.01	0.25	1.57		V						V	
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connections	r			0	0	0	0	0	0	V								
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MASONRY

- Rich library of masonry units, mortars and walls
- Automated templates for typical structures
- Modeling with 3D finite surface elements
- Automatic "Front View Identification" from dwg file
- Unreinforced Reinforced Confined masonry
- Automatic load distribution tool on surface elements

Properties of m	asonry			
Masonry Brick blocks wall - M2 25 cm V Anne Masonry Brick blocks wall - M2 25 cm Type Load-bearing V Single-leaf wall V ? Masonry uni Common brick 6x9x19 Thickness 25 fb=1.6733 fbc=2.0000 c=15.00 Mortar Mortar Cement-M2 General purpose designed masonry mortar fm=2.0000 Wall 2 L1 0 t1 (cm) 0 t2 (cm) 0 Shell Bedded Wall Total width of the two mortar strips g (cm) 0 ?		Type Existing Concrete jacket Thickness 0 Single-Leaf Cocrete Steel C20/25 V S500 Φ 8 / 10 cm fkd,c (MPa)= 0 Anchorage Without any additional co		
Masonry un V Thickness 0 Mortar V Wali ? L1 0 t1 (cm) 0 t2 (cm) 0 Concrete infill fck (N/mm2) Thickness 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 <	Masony units - Mortars library New Save Exit	Image: Section of the section of t	Instantial scone units V Y ? Group 1 Y ? m dimensions dx dy dz δ 200 200 500 1.15 ? Mean compressive strength fbc 8	its - Mortars Mortars Mortar Cement-M1 Name Mortar Cement-M1 Type General purpose designed masonry mortar V Resistar M1 V Compressive strength fm 1 New Save Est

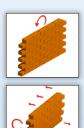




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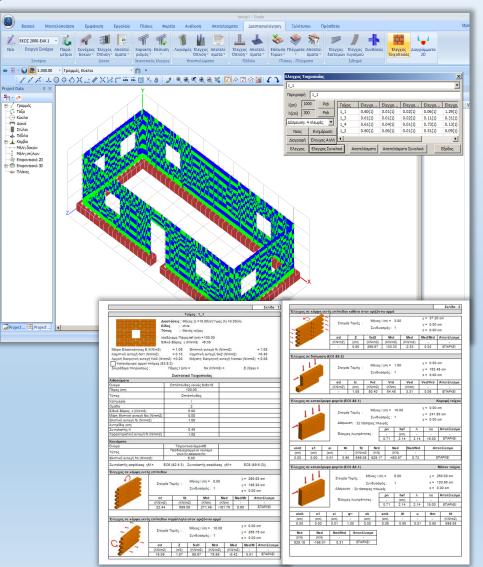
DESIGN: Checks

Piers and the spandrels of a masonry wall – EUROCODE 6



- Check in plane bending
- Check out of plane bending parallel to the horizontal joint
- Check out of plane bending perpendicular to the horizontal joint
- Shear verification
- Testing to vertical loads on the top, middle, and bottom of the wall
- Automatic creation of detailed report



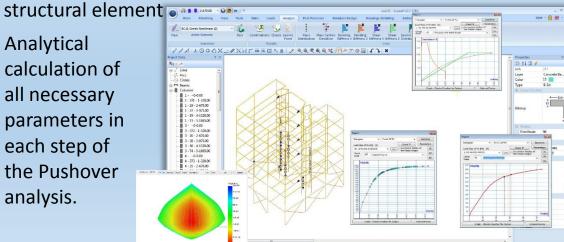




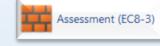
□ ASSESSMENT

Reinforced Concrete Structures

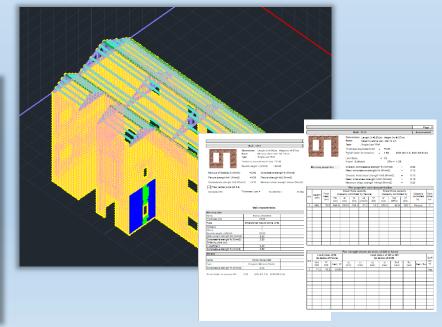
- Contains the Eurocode 8, Part 3 (EN1998-3) provisions and design checks for the assessment of existing buildings
- Nonlinear static analysis method (Pushover) and Linear static analysis considering the uniform behavior factor **q** and the local ductility factors **m** methods
- Accurate derivation of the stress resultants and the deformed shape of the structure
- Direct location of the "weak" regions on the structure •
- Definition of the nonlinear relation of the bending moment versus the plastic hinge rotation of each end of the
- Analytical calculation of all necessary parameters in each step of the Pushover analysis.



Masonry Structures

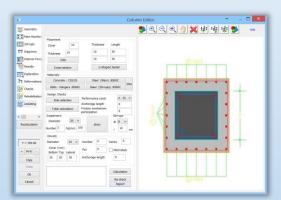


- Contains the provisions of EC8, Part 3 about the assessment of bearing masonry structures under seismic loading.
- The design code recommendations are applied on masonry structural elements that resist against inplane lateral forces.
- The corresponding structural elements are the piers and the spandrels of a masonry wall.



REDESIGN

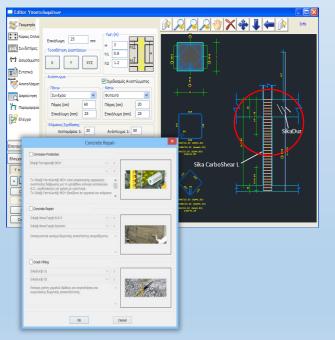
- Reinforced Concrete Structures
- Columns reinforced cast concrete jacket and shotcrete jacket
- Fiber reinforced polymers (FRPs)



Beams reinforcement choosing material and side

	Bear	n st	ruct	ural	rei	ntoro	ement					
	Top fl	ange								ST.		
The same in both sides	Lengt	h	54	0	Thic	kness	0	Si			OK	
The side-rebars are taken into consideration The additional rebars are taken in consideration		o not esista	partic nce ch	ipate ieck	in the	bendir	9	3	ua		Cano	el
consideration	Rebar											
	4	Ø	14	a r	1				Rehal	bilitation		
Default	4		-			f1(cm)	20					
			6	× L	1	ii(an)			Prot	ection		
Left side								Right sid	e			
Length 540				-			1		Length	0		
Thickness 10										0		
									Thickness	1		
Do not participate in the bend resistance check	ling					E		⊡ b	lo not parti ending res	cipate il istarice	the check	
Rebars	-							Rebars				
Corner								Corner		Φ 6	÷	
Intermediate 0 • 6 •			L					Internet	siate 0	Φ 6		
Dowels - Suspensors							·	Design C	hecks		Rep	ort
Diameter 6 Y	Botton	n flan	ge									
Anchorage Length 0	Lengt	h	54)	Thic	kness	10					
Stirrups		o not	partic	ipate	in the	e bendir	g					
Ф 6 🗸 / 0 cm	Rebar		nce ch	eck								
Ultimate Moment Resistance	4	Φ	14	1	1							
Initial Reinforced	4					1(cm)	20					

Integration of the Sika products and the calculating program for chemical and mechanical anchors of Fischer company



Why SCADA Pro

Masonry Structures

The reinforcing method of a masonry structural element is modeled by applying single or double leaf reinforced concrete jacket

				Prop	perties of r	nasonry			
Masonry	y Brick blocks wall -	M2 25 c	m			/	Туре	Existing	~
Name	Masonry Brick blo	cks wall	- M2 25 cm				Concrete jacket Thickness 0	Sing	le-Leaf 🗸
Туре	Load-bearing	~	Single-leaf wall		√ ?		Cocrete	Steel	
	Common halal	0.0.10					C20/25	· \$500	o ~
Masonr	y uni Common brick Thickness	25	fb=1.6733 fb	c=2.0000 s	×=15.00		Φ 8 / 10 cm		·
Mortar	Mortar Cemen	t-M2			~		Anchorage Witho	ut any addit	ional car 🗸
	General purpos	se desig	ned masonry mor	tar fm=2.0	000			ALL ALL	
Wall	? L1	0	t1 (cm) 0	t2	(cm) 0				
	edded Wall width of the two mo	rtar strij	ps g (cm)		0 ?				
							1		
							Filled vertical jo		
Masonr					~			ness >15 m	
	y uni Thickness	0					Bed join of thick	ness >15 m	ım
Masonr Mortar		0			× ×		Bed join of thick	ness >15 m lent)	25
		0	ti (cm) 0	t2		Masonry units - Mortars library	Bed join of thick Thickness (Equiva Specific weight	ness >15 m lent) ngth fk	1m 25 15
Mortar	Thickness		t1 (cm) 0	t2	~		Bed join of thick Thickness (Equiva Specific weight Compressive strer Modulus of elastic (GPa) Characteristic stro (N/mm2)	ness >15 m lent) igth fk ity 1000 ength fvk0	25 15 0.794381
Mortar	Thickness ? L1	0	t1 (cm) 0	t2	~		Bed join of thick Thickness (Equiva Specific weight Compressive strer Modulus of elastic (GPa) Characteristic stre	ness >15 m lent) igth fk ity 1000 ength fvk0	100 25 15 0.794381 0.794381
Mortar Wall	Thickness ? L1 tte infill fo	0 :k (N/mr		t2	~	Mortars library	Bed join of thick Thickness (Equiva Specific weight Compressive strer Modulus of elastic (GPa) Characteristic stre (N/mm2) Maximum shear s	ness >15 m lent) igth fk ity 1000 ength fvk0 trength	1000 1000 1000 1000 1000 1000 1000 100



Thank you for the attention

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