

## User Manual 10C. DIMENSIONING Part 3/4: Iron-Wooden





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# Chapter 10C: Sizing -Iron-Wall (part 3/4)

				SCADA Pro 20 3	2Bit - [(0) Scada : 1-260.00 (D:	MELETES\stam15\stam1	5)]
Βασικό Μοντελοποίηση Εμφάν	ιση Εργαλεία Πλάκες	Φορτία Ανάλυσ	ση Αποτελέσματα	Διαστασιολόγηση	Ξυλότυποι Πρόσθετα	Βελτιστοποίηση	
ΕΚΩΣ 2000-ΕΑΚ 1 (ζ ~ ζζζζζζζζζζζζζζζζζζζζζζζζζζζζζζζζ	Συνέχειες Έλεγχος Αποτελέ-	Χαρακτη- Επίλυση Λ	🔰 🕍 🚞 Ιυγισμός Έλεγχος Αποτελέ-	L Ελεγχος Αποτελέ-	👟 🜸 🔭 Επίλυση Επίπεδες Αποτελέ-	Διαστασ. Διαστασ.	Έλεγχος Διαγράμματα
μετροι Μελών.÷ Σενάρια	δοκών τ΄ Όπλιση τ΄ σματα τ Δοκοί	ρισμός * * Ικανοτικός έλεγχος	Όπλιση * σματα * Υποστυλώματα	Όπλιση * σματα * Πέδιλα	Τομών * Πλάκες * σματα * Πλάκες - Πλέγματα	Σιδηρών * Ξύλινων * Σιδηρά - Ξύλινα	Τοιχοποιίας Μέλους *
<b>FENIKA</b>			ΜΠΕΤΟΝ			- 	

The 10th Module is called "DISCUSSION" and includes the following groups of commands:



After the completion of the model, the input of the loads, the execution of the analysis and the creation of the combinations, the "Dimensioning" of the structural elements of the design follows, where the adequacy check is performed, based on the regulation selected in the "Dimensioning scenario" and the reinforcement of the concrete elements is entered.

With SCADA Pro you can dimension projects made of concrete, metal, wood, load-bearing masonry and a combination of these.

The Sizing manual is divided into 4 parts:

- Part 1/4 GENERAL REQUIREMENTS FOR ALL MATERIALS
- Part 2/4 COMMANDS FOR BETTING
- Part 3/4 COMMANDMENTS FOR RAIL AND WOOD
- Part 4/4 REQUIREMENTS FOR WALLING

#### **Sizing of Irons**



The "Iron" field includes the commands related to the solution of the metallic cross-sections with the adequacy check and buckling check for the **Hot Rolled** cross-sections, the **Cold Rolled** cross-sections and the dimensioning of the **Connections**.

• A prerequisite for sizing is that you have called and executed the corresponding combination file in the configuration dialog box

#### **1.1** Cross-sectional inspection (Hot rolled)

<sup>F Έλεγχος διατομών</sup> for checking the adequacy of the metallic sections.

Using the command, the following dialog box appears.

Διαστασιολόγηση Σιδηρών (Layer)						Х
Ονομασία	Διατομη 1	Διατομη 2	Διατομη 3	Διστομη 4	Διατομη 5	^
Πλέγμα 3D						
Πλέγμα 2D						
Πλάκες-Τομές						
Μεταλ.Υποστυλώματα	IPE 450	IPE 220				
Μεταλ.Δοκοί	IPE 330					
Μεταλ.Κεφαλοδοκοί	HEA 180					
Μεταλ.Τεγίδες	IPE 100					
Μεταλ.Μηκίδες	IPE 100					
Μεταλ.Μετωπικοί						
Μεταλ.Αντιαν.Οριζοντια	CHS 114,3X3,6					
Μεταλ.Αντιαν.Κατακόρυφα	CHS 219,1X6,3					
_						
Ξύλινα Υποστυλώματα						
Ξύλινες Δοκοί						
Ξύλινες Κεφαλοδοκοί						
Ξύλινες Τεγίδες						×
<					>	
Επεξεργασία Διαστασ	πολόγηση	Διαστασιολόγηση	Ολων	Cancel	ОК	

The first column is the layers that exist in this study and in the following columns are the types of metallic cross-sections that exist in these layers.

With the "Dimensioning" option and after you have selected a layer, the dimensioning (the check of the cross sections) of the specific layer is done, the program "colors" the specific layer green if all the elements involved in it do not fail and red if some of them fail.

Alternatively, with the "Dimensioning of all" option, the dimensioning (checking of the cross-sections) of all metallic cross-sections is done.

Ονομασία	Διατομη 1	Διατομη 2	Διατομη 3	Διατομη 4	Διατομη 5	1
Πλέγμα 3D						
Πλέγμα 2D						
Πλάκες-Τομές						
Μεταλ.Υποστυλώματα	IPE 450	IPE 220				1
Μεταλ.Δοκοί	IPE 330					
Μεταλ.Κεφαλοδοκοί	HEA 180					
Μεταλ.Τεγίδες	IPE 100					
Μεταλ.Μηκίδες	IPE 100					
Μεταλ.Μετωπικοί						
Μεταλ.Αντιαν.Οριζοντια	CHS 114,3X3,6					
Μεταλ.Αντιαν.Κατακόρυφα	CHS 219,1X6,3					-
- Ξύλινα Υποστυλώματα						
Ξύλινες Δοκοί						
Ξύλινες Κεφαλοδοκοί						
Ξύλινες Τεγίδες						1
<					>	

### EXAMPLE:

In the above example, the layer 'Metal Beams' was selected in which different cross-sections in type and dimensions (HEA, CHS, IPE) have been used, of which the IPE 100 cross-section failed. By selecting the 'Edit' button the following dialog box appears:

Διαστασιολό	γηση Σι	δηρών	- Στοιχεία	Layer								×
Layer: MET	αλ.Μηκί	δες	ΔEN IKA	NOLOION	NTAI OI EN	ELXOI			Π	ροσαύξηση λόγω Ικαν	/οτικού Ελέγχου	
Διαφορετικέα	; Διατομ	ές IP	E 100					$\sim$		ENIAC	ΟΓΗ ΕΛΕΓΧΩΝ	
Περιγραφή	Μέλος	Συνδ.	Ν	Vy	Vz	Mx	Му	Mz	OXI	Auto N M	V Mx M-N	M-V M-V-N
MaxN (kN)	39	105	6.06	0.45	4.22	-0.02	-14.11	-0.10				
MinN (kN)	155	159	-5.63	-0.00	-0.85	-0.00	0.11	0.01				
MaxQY (kN)	89	93	-0.57	0.58	-0.66	0.00	2.02	0.12				
MinQY (kN)	90	167	3.04	-0.47	4.27	0.00	-2.44	0.10				
MaxQZ (kN)	28	128	1.15	-0.17	6.25	0.01	-15.44	0.08				
MinQZ (kN)	157	189	-2.62	0.05	-3.52	-0.00	5.17	0.04				
MaxMX (kNm)	160	77	1.71	-0.39	0.47	0.01	2.25	-0.16				
MinMX (kNm)	39	133	4.57	0.45	2.45	-0.02	-2.77	0.04				
MaxMY (kNm)	157	189	-2.62	0.05	-3.52	-0.00	5.17	0.04				
MinMY (kNm)	90	192	2.09	-0.47	5.63	0.00	-15.62	0.24				
MaxMZ (kNm)	90	167	3.10	-0.47	3.54	0.00	-14.41	0.24				
MinMZ (kNm)	38	101	2.90	-0.39	-0.55	-0.00	2.43	-0.19				
Χρήστης			0	0	0	0	0	0	V			
	Για ό	λα τα μ	έλη που ανή	ικουν σε α	υτό το GRC	UP			V			
ОК		Car	ncel	Δια	αστασιολόγι	ղօղ Layer		Διερ	οεύνηση	Layer	Αποτελέσματο	α Τεύχους

#### 1.1.1 Procedure for sizing a layer

#### **STEP 1**:

For each layer that the designer has created, e.g. Steel Beams, and for each different crosssection used in this layer, the <u>maximum and minimum</u> values <u>of</u> each of the 175 combinations of external loads and for each of the 6 intensive quantities (**Mx**, **My**, **Mz**, **Qx**, **Qy**, **Qz**, 6 columns in the dialogue box) are calculated, as well the values of the other intensive quantities corresponding to this combination (the 12 rows in the above dialogue box).

This results in 2 sextets for each intensive quantity (one for the maximum and one for the minimum value).

In total for all 6 intensities there will be 2x6=12 hexagons of .

In the above example, for the members of the Steel Beams layer in which the IPE 100 crosssection has been used, the maximum axial force (First Column N and first line Max N) developed in member 39 has a value of 6.06 kN, it was obtained from the combination 39 and the other intensive quantities of this combination are those indicated in the first line. Min N was developed in member 155 from combination 159 and the remaining intensive magnitudes, are those shown in the second line. Similarly for the moment My, the max My was developed in member 157 by combination 189 and the remaining intensive magnitudes of this combination are shown in the corresponding line. The min My was developed in member 90 by combination 192 with the corresponding intensive magnitudes shown in the corresponding line. The checks therefore, where axial N plays a decisive role, will be performed with the sixes obtained from combinations 105 and 159. Similarly, the checks where the decisive role is played by the moment My will be carried out with the above hexagons obtained from combinations 189 and 192. The same applies to the other 5 intensive quantities.

#### So there are 12 lines

-Max N ...and the corresponding intensive quantities Mx, My, Mz, Qx, Qy -Min N ...and the corresponding intensive quantities Mx, My, Mz, Qx, Qy -Max Mx...and the corresponding intensive quantities N, My, Mz, Qx, Qy -Min Mx...and the corresponding intensive quantities N, My, Mz, Qx, Qy -Max My...and the corresponding intensive quantities N, Mx, Mz, Qx, Qy -Max My...and the corresponding intensive quantities N, Mx, Mz, Qx, Qy -Max Mz ...and the corresponding intensive quantities N, Mx, Mz, Qx, Qy -Max Mz ...and the corresponding intensive quantities N, Mx, My, Qx, Qy -Max Qy ...and the corresponding intensive quantities N, Mx, My, Qx, Qy -Max Qy ...and the corresponding intensive quantities N, Mx, My, Mz, Qx -Min Qy ...and the corresponding intensive quantities N, Mx, My, Mz, Qx -Min Qy ...and the corresponding intensive quantities N, Mx, My, Mz, Qx -Max Qz ...and the corresponding intensive quantities N, Mx, My, Mz, Qy -Max Qz ...and the corresponding intensive quantities N, Mx, My, Mz, Qy

If for some reason you want to completely exclude one or more intensive sizes from the layer sizing, press the corresponding button of the intensive size column. In the following example:

Διαστασιολό	γηση Σι	δηρών	- Στοιχεία	Layer											×
Layer: Mer	αλ.Μηκί	δες	ΔEN IKA	NOLOION	NTAI OI EA	ELXOI			Πρ	οσαύξηση λόγ	ω Ικα	vотіко	ύ Ελέ	үхои	
Διαφορετικέα	ς Διατομι	ές ΙΡ	E 100					$\sim$			ΕΠΙΛ	огне		2N	
Περιγραφή	Μέλος	Συνδ.	Ν	Vy	Vz	Mx	Му	Mz	OXI	Auto N	М	۷	Mx	M-N M-V	M-V-N
MaxN (kN)	39	105	6,06	0.45	4.22	-0.02	-14.11	-0.10		<b>V</b>	$\Box$				
MinN (kN)	155	159	-5,63	-0.00	-0.85	-0.00	0.11	0.01							
MaxQY (kN)	89	93	-0,57	0.58	-0.66	0.00	2.02	0.12							
MinQY (kN)	90	167	3,04	-0.47	4.27	0.00	-2.44	0.10							
MaxQZ (kN)	28	128	1,15	-0.17	6.25	0.01	-15.44	0.08		<b>V</b>					
MinQZ (kN)	157	189	-2,62	0.05	-3.52	-0.00	5.17	0.04							
MaxMX (kNm)	160	77	1,71	-0.39	0.47	0.01	2.25	-0.16							
MinMX (kNm)	39	133	4,57	0.45	2.45	-0.02	-2.77	0.04							
MaxMY (kNm)	157	189	-2,62	0.05	-3.52	-0.00	5.17	0.04							
MinMY (kNm)	90	192	2,09	-0.47	5.63	0.00	-15.62	0.24							
MaxMZ (kNm)	90	167	3,10	-0.47	3.54	0.00	-14.41	0.24		<b>V</b>					
MinMZ (kNm)	38	101	2,90	-0.39	-0.55	-0.00	2.43	-0.19							
Χρήστης			0	0	0	0	0	0	V			$\square$	$\Box$		
	Για ά	λα τα μ	έλη που ανέ	ίκουν σε αι	υτό το GRC	UP			<b>V</b>			$\square$	$\square$		
ОК		Car	ncel	Δια	ιστασιολόγ	ηση Layer		Διερ	οεύνηση L	.ayer		,	Αποτεί	λέσματα Τε	ύχους

has completely excluded the CT N.

By checking the corresponding options in the "**NO**" column, the program excludes the corresponding minimum or maximum intensive size (the corresponding hex) from the layer checks.

#### In the example below:

Διαστασιολό	γηση Σι	δηρών	ν - Στοιχεία	Layer													>	<
Layer: Mहт	αλ.Μηκί	δες	ΔEN IKA	NOLOION	NTAI OI EA	ELXOI				ροσαύξης	πηλόγ	ω Ικα	ілотіко	ού Ελέ	γχου			
Διαφορετικέα	ς Διατομι	ές ΙΓ	PE 100					$\sim$				ΕΠΙΛ			ΩN			
Περιγραφή	Μέλος	Συνδ.	Ν	Vy	Vz	Mx	Му	Mz	OXI	Auto	N	м	۷	Mx	M-N	M-V	M-V-N	ĺ
MaxN (kN)	39	105	6.06	0.45	4.22	-0.02	-14.11	-0.10		<b>V</b>								
MinN (kN)	155	159	-5.63	-0.00	-0.85	-0.00	0.11	0.01		<b>V</b>								
MaxQY (kN)	89	93	-0.57	0.58	-0.66	0.00	2.02	0.12		<b>V</b>								
MinQY (kN)	90	167	3.04	-0.47	4.27	0.00	-2.44	0.10		<b>V</b>								
MaxQZ (kN)	28	128	1.15	-0.17	6.25	0.01	-15.44	0.08		<b>_</b>								
MinQZ (kN)	157	189	-2.62	0.05	-3.52	-0.00	5.17	0.04		<b>V</b>								
MaxMX (kNm)	160	77	1.71	-0.39	0.47	0.01	2.25	-0.16		<b>V</b>								
MinMX (kNm)	39	133	4.57	0.45	2.45	-0.02	-2.77	0.04										
MaxMY (kNm)	157	189	-2.62	0.05	-3.52	-0.00	5.17	0.04										
MinMY (kNm)	90	192	2.09	-0.47	5.63	0.00	-15.62	0.24		<b>V</b>								
MaxMZ (kNm)	90	167	3,10	-0,47	3,54	0.00	-14,41	0,24	<b>V</b>									
MinMZ (kNm)	38	101	2,90	-0,39	-0,55	-0,00	2,43	-0,19	<b>V</b>									
Χρήστης			0	0	0	0	0	0	V							$\square$		
	Για ά	όλα τα μ	ιέλη που ανέ	κουν σε αι	υτό το GRC	)UP			<b>V</b>									
OK		Car	ncel	Δια	ιστασιολόγ	ηση Layer		Διερ	οεύνηση	Layer				Апотε	λέσματ	τα Τεύ	χους	

The max Mz and min Mz have been excluded. This means that the program will not check for the two extreme values of Mz. In the other checks, however, Mz is normally included in the respective hexagon.

#### **STEP 2 :**

If you select the automatic procedure (column **Auto**) then the program calculates for each series (six) of intensive quantities which check it should make based on the values corresponding to each intensive quantity. So if in a hexadecade there are only **N**, **My**, **Mz** values while **Mx=Qy=Qz=0** then the program will perform the checks for Bending, Axial Bending, Compression & Tensile (it will not perform the check against torsion, shear etc.).

So the issue will print the <u>12 worst reasons</u>, one for each intensive size. (12 rows of 6 reasons each).

At this point the following should be emphasised:

If you select the **Auto** column, the program performs the corresponding checks based on the intensities present in the corresponding hex. Thus, the individual ratio of the corresponding intensive size participates in the resulting strength ratio with its sign, which means that some sizes may have a "relieving" effect, so that the total ratio is smaller than if you had manually performed an individual check, e.g. only in axial.

Διαστασιολό	γηση Σιά	δηρών	- Στοιχεία	Layer												×
Layer: Mat	αλ.Μηκίδ	δες	IKANON	OIOYNTAI		DI			Пц	ροσαύξηση λ	όγω Ικα	νοτικα	ού Ελέ	γχου		
Διαφορετικέα	; Διατομέ	ςIP	E 100					$\sim$			ENI/			2N		
Περιγραφή	Μέλος	Συνδ.	Ν	Vy	Vz	Mx	Му	Mz	OXI	Auto N	M	۷	Mx	M-N	M-V	M-V-N
MaxN (kN)	39	105	6.06	0.45	4.22	-0.02	-14.11	-0.10								
MinN (kN)	155	159	-5.63	-0.00	-0.85	-0.00	0.11	0.01								
MaxQY (kN)	89	93	-0.57	0.58	-0.66	0.00	2.02	0.12								
MinQY (kN)	90	167	3.04	-0.47	4.27	0.00	-2.44	0.10								
MaxQZ (kN)	28	128	1.15	-0.17	6.25	0.01	-15.44	0.08		<b>0.28</b>						
MinQZ (kN)	157	189	-2.62	0.05	-3.52	-0.00	5.17	0.04								
MaxMX (kNm)	160	77	1.71	-0.39	0.47	0.01	2.25	-0.16								
MinMX (kNm)	39	133	4.57	0.45	2.45	-0.02	-2.77	0.04								
MaxMY (kNm)	157	189	-2.62	0.05	-3.52	-0.00	5.17	0.04								
MinMY (kNm)	90	192	2.09	-0.47	5.63	0.00	-15.62	0.24								
MaxMZ (kNm)	90	167	3,10	-0,47	3,54	0,00	-14,41	0,24	<b>V</b>							
MinMZ (kNm)	38	101	2,90	-0,39	-0,55	-0,00	2,43	-0,19	<b>V</b>							
Χρήστης			0	0	0	0	0	0	V							
	Για ό	λα τα μ	έλη που αντ	ήκουν σε α	υτό το GRC	)UP			<b>V</b>							
ОК		Car	ncel	Δια	ιστασιολόγ	ηση Layer		Διερ	οεύνηση	Layer		,	Αпотε	λέσματ	τα Τεύ	χους

# has been selected to check only for max Qy. The automatic check gave a strength ratio 0.28 (holding the mouse arrow over the check box, displays the ratio). In this particular hexadecade of intensive sizes, all intensive sizes (except Mx) are present, and the program did the check by taking into account the individual strength ratios from all intensive sizes. The result is the same as if you had manually checked the "M-V-N" column.

Διαστασιολό	γηση Σι	δηρών	- Στοιχεία	Layer													;	×
Layer: Mat	αλ.Μηκί	δες	ΙΚΑΝΟΠ	OIOYNTAI		I				Ιροσαύξησ	η λόγ	ω Ικα	votiko	ού Ελέ	γχου			
Διαφορετικέα	ς Διατομά	ές IP	E 100					$\sim$				ΕΠΙΛ			ΩN			
Περιγραφή	Μέλος	Συνδ.	Ν	Vy	Vz	Mx	Му	Mz	OXI	Auto	Ν	м	V	Mx	M-N	M-V	M-V-N	j
MaxN (kN)	39	105	6.06	0.45	4.22	-0.02	-14.11	-0.10										
MinN (kN)	155	159	-5.63	-0.00	-0.85	-0.00	0.11	0.01										
MaxQY (kN)	89	93	-0.57	0.58	-0.66	0.00	2.02	0.12		<b>V</b>							<b>X</b>	
MinQY (kN)	90	167	3.04	-0.47	4.27	0.00	-2.44	0.10									The	
MaxQZ (kN)	28	128	1.15	-0.17	6.25	0.01	-15.44	0.08			$\Box$						[	28
MinQZ (kN)	157	189	-2.62	0.05	-3.52	-0.00	5.17	0.04										
MaxMX (kNm)	160	77	1.71	-0.39	0.47	0.01	2.25	-0.16										
MinMX (kNm)	39	133	4.57	0.45	2.45	-0.02	-2.77	0.04										
MaxMY (kNm)	157	189	-2.62	0.05	-3.52	-0.00	5.17	0.04			<u> </u>							
MinMY (kNm)	90	192	2.09	-0.47	5.63	0.00	-15.62	0.24										
MaxMZ (kNm)	90	167	3,10	-0,47	3,54	0,00	-14,41	0,24	V									
MinMZ (kNm)	38	101	2,90	-0,39	-0,55	-0,00	2,43	-0,19	<b>X</b>									
Χρήστης			0	0	0	0	0	0	V			$\square$						
	Για ό	ίλα τα μι	έλη που ανέ	ήκουν σε αι	υτό το GRC	UP			4									
ОК		Can	icel	Δια	ιστασιολόγι	ןסק Layer		Διερ	οεύνηση	Layer				Αпотε	λέσμαι	τα Τεύ	χους	

#### In the example below:

If you choose the manual procedure, you have the option check which checks, for each hex, you want to perform. This will print in the issue for each hexadecade the reasons for the respective checks selected.

Finally, in the "User" option you can set your own intensive sizes, in order for the program to dimension the specific cross-section. In the next dialog box:

Layer: Mat	αλ.Μηκίδ	δες	IKANON			I			Ποοσαύξηση λόγω Ικανοτικού Ελέγγου
Διαφορετικέα	; Διατομά	ς IP	E 100					$\sim$	
Περιγραφή	Μέλος	Συνδ.	Ν	Vy	Vz	Mx	My	Mz	OXI Auto N M V Mx M-N M-V M-V-1
MaxN (kN)	39	105	6,06	0,45	4,22	-0,02	-14,11	-0,10	
MinN (kN)	155	159	-5,63	-0,00	-0,85	-0,00	0,11	0,01	
MaxQY (kN)	89	93	-0,57	0,58	-0,66	0,00	2,02	0,12	
MinQY (kN)	90	167	3,04	-0,47	4,27	0,00	-2,44	0,10	
MaxQZ (kN)	28	128	1,15	-0,17	6,25	0,01	-15,44	0,08	
MinQZ (kN)	157	189	-2,62	0.05	-3,52	-0,00	5.17	0.04	
MaxMX (kNm)	160	77	1,71	-0,39	0,47	0,01	2,25	-0.16	
MinMX (kNm)	39	133	4,57	0,45	2,45	-0,02	-2,77	0.04	
MaxMY (kNm)	157	189	-2,62	0.05	-3,52	-0,00	5,17	0.04	
MinMY (kNm)	90	192	2,09	-0,47	5.63	0,00	-15.62	0.24	
MaxMZ (kNm)	90	167	3,10	-0,47	3,54	0,00	-14,41	0,24	
MinMZ (kNm)	38	101	2,90	-0,39	-0.55	-0,00	2,43	-0.19	
Χρήστης			-5.23	1.61	-4.03	0	-10.32	1.11	
	Για ό	λα τα μέ	έλη που ανή	ικουν σε αι	ιτό το GRO	UP			

specific intensities have been given by the designer and the intensities calculated by the program from the analysis have been deactivated.

#### **OBSERVATION:**

In the new versions of SCADA Pro a new feature was added that was activated in the crosssection control of metallic cross-sections. Recall that the cross-section control was previously done at the layer level and at the level of each cross-section but only the <u>worst member for each</u> <u>intensive size</u> was controlled.

Now the check is still done at layer level and for each cross-section but now <u>each member is</u> <u>checked</u> by activating the option at the bottom as shown in the next picture.

Layer: Mat	αλ.Υποσ	πυλώμαι	τα ΔΕΝ		IOYNTAI O	Ι ΕΛΕΓΧΟΙ			Μη	οσαύξησ	η λόγα	ο Ικαι	/0TIK0	ύ Ελέγ	/xou		
Διαφορετικέα	ς Διατομ	ές ΙΡΕ	E 120					$\sim$			E	ΠΙΛΟ	DILH E		2N		
Περιγραφή	Μέλος	Συνδ.	Ν	Vy	Vz	Mx	Му	Mz	OXI	Auto	Ν	м	V	Mx	M-N	M-V	M-V-N
MaxN (kN)	10	199	37.52	0.06	-0.31	-0.01	3.15	0.01									
MinN (kN)	54	125	-26.24	4.28	9.40	0.04	-5.85	-0.91									
MaxQY (kN)	36	93	-14.16	10.77	-10.53	-0.70	-1.43	0.33									
MinQY (kN)	9	93	-14.25	-10.77	-10.92	0.71	-1.61	-0.34									
MaxQZ (kN)	36	207	19.60	-8.90	21.74	0.13	2.76	-0.21									
MinQZ (kN)	72	199	18.74	-8.90	-21.62	-0.14	-2.93	-0.21									
MaxMX (kNm)	9	93	-14.25	-10.77	-10.92	0.71	-1.61	-0.34									
MinMX (kNm)	45	157	-14.39	-10.72	10.81	-0.71	1.57	-0.32									
MaxMY (kNm)	54	199	30.57	-2.47	-7.93	-0.01	10.58	0.51									
MinMY (kNm)	18	207	31.32	-2.30	8.11	0.01	-10.68	0.49									
MaxMZ (kNm)	72	241	19.21	-10.58	-16.93	-0.11	3.33	2.97				$\Box$					
MinMZ (kNm)	9	267	19.65	10.64	16.80	-0.12	-3.37	-2.98									
Χρήστης			0	0	0	0	0	0									
	Για ά	όλα τα μέ	έλη που αν	ήκουν σε α	υτό το GRC	UP		72 / 72		<b>V</b>	V	<b>V</b>	V	<b>V</b>	<b>V</b>		<b>V</b>
OK	_	Can	cel	٨	ιστασιολόν	non Laver		Aisc	ງ ແມ່ນກອງກ	aver			4	DOTE	່ະດາເຕ	το Τεύ	VOLIC
UK		Can	ee.	Δι.	ιστασιολογ	non cayer		Laich	Covior 1	uyer				norci	loopal	u 160)	1005

#### Διαστασιολόγηση Σιδηρών - Στοιχεία Layer

		ELIV		AEDX	ΩN		
Auto	Ν	м	٧	Мх	M-N	M-V	M-V-N

 $\times$ 

## Select one or more controls by pressing the corresponding button

from the list

		ΕΠΙΛΟ	DLHE	ΛΕΓΧΩ	N		
Auto	N	Μ	V	Мх	M-N	м-у	M-V-N
				$\checkmark$	$\boxed{\checkmark}$	V	
<b>V</b>				4	$\checkmark$	$\checkmark$	
<b>V</b>				4	$\checkmark$	$\checkmark$	
<b>V</b>				<b>V</b>	$\checkmark$	$\checkmark$	
				$\checkmark$	$\checkmark$	$\checkmark$	
				$\checkmark$	$\checkmark$	$\checkmark$	
				$\checkmark$	$\checkmark$	$\checkmark$	
				4	V	4	
				$\checkmark$	$\mathbf{A}$	$\overline{\mathbf{A}}$	
				V	$\checkmark$	$\checkmark$	
<b>V</b>				<b>V</b>	$\checkmark$	$\checkmark$	
<b>V</b>				V	$\overline{\checkmark}$	4	
				$\boxed{\checkmark}$	$\boxed{\checkmark}$	$\overline{\mathbf{v}}$	
			$\square$	$\checkmark$	$\boxed{\checkmark}$	$\boxed{\checkmark}$	

Then select Layer Sizing, For all members belonging to this GROUP

Διαστασιολό	Διαστασιολόγηση Σιδηρών - Στοιχεία Layer Χ																
Layer: Mat	Layer: Μεταλ.Υποστυλώματα ΔΕΝ ΙΚΑΝΟΠΟΙΟΥΝΤΑΙ ΟΙ ΕΛΕΓΧΟΙ 🔽 Προσσιύξηση λόγω Ικανοτικού Ελέγχου																
Διαφορετικέα	; Διατομά	ές SH	HS 100x4,0					$\sim$				ΕΠΙΛ	огне		2N		
Περιγραφή	Μέλος	Συνδ.	N	Vy	Vz	Мх	Му	Mz	OXI	Auto	Ν	м	۷	Mx	M-N	M-V	M-V-N
MaxN (kN)	7	16	16.23	-3.15	0.08	0.54	0.00	-5.05		<b>V</b>	<b>V</b>	V	<b>V</b>	<b>•</b>	V	<b>V</b>	
MinN (kN)	8	24	-22.32	-2.38	-0.10	0.54	0.30	3.15		<b>V</b>	<b>V</b>	V	<b>V</b>	V	<b>V</b>	<b>V</b>	<b>V</b>
MaxQY (kN)	11	4	-9.05	4.07	0.05	1.12	0.00	7.12		<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>	V	<b>V</b>	<b>V</b>	<b>V</b>
MinQY (kN)	12	23	-9.01	-4.39	-0.43	-0.05	0.00	-7.93		<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>
MaxQZ (kN)	12	41	-6.65	-1.45	0.72	0.02	0.00	-2.67		<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>	V	<b>V</b>	<b>V</b>	<b>•</b>
MinQZ (kN)	12	36	-11.48	0.80	-1.12	0.03	0.00	1.41		<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>	V	<b>V</b>		<b>V</b>
MaxMX (kNm)	11	45	-10.17	-1.08	0.16	3.10	0.00	-2.48		<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>	V	<b>V</b>	<b>•</b>	<b>V</b>
MinMX (kNm)	11	48	5.12	1.30	-0.10	-3, 19	0.00	2.04		<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>	V	<b>V</b>	<b>V</b>	<b>V</b>
MaxMY (kNm)	12	36	-11.77	0.80	-1.12	0.03	3.74	-1.25			<b>V</b>			V			
MinMY (kNm)	12	41	-6.95	-1.45	0.72	0.02	-2.40	2.14		<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>	V	<b>V</b>	<b>V</b>	
MaxMZ (kNm)	11	14	-4.64	4.05	-0.01	-0.65	0.00	7.13		<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>	
MinMZ (kNm)	12	23	-9.01	-4.39	-0.43	-0.05	0.00	-7.93		<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>	V	<b>V</b>	<b>V</b>	
Χρήστης			0	0	0	0	0	0	$\overline{\mathbf{v}}$			$\square$		$\square$			
	Για ό	λα τα μ	έλη που ανή	κουν σε αι	υτό το GRO	UP		12 / 12			<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>
OK																	
OK	ΟΚ Cancel Διαστοσιολόγηση Layer Διερεύνηση Layer Αποτελέσματα Τεύχους																

In this example all the checks (General (Auto) and individual) have been done.

#### **ATTENTION:**

The convention followed for the sign of the axial force is as follows: In SCADA Pro intensive axial force magnitude:

- with a **negative** sign means **Tensile** and
- with a **positive** sign means **Sadness**.

But in the investigation and in the results issue

File Edit View Insert Format	Help
Courier New (Greek)	
Υ ΚΔ (Από το Κέντρο	$B\alpha_{pouc}) = 0.00 (cm)$
Ζ ΚΔ (Από το Κέντρο	$B\alpha poug) = 0.00 (cm)$
ΣΤΑΤΙΚΕΣ ΡΟΠΕΣ ΑΔΡΑΝ	<b>ΤΕΙΑΣ</b> (11)
1 Sv=0.0000000 Sz=	=0.000000
2 Sy=116.0816250 S	z=30.0937500
3 Sy=116.0816250 5	z=30.0937500
4 Sy=0.0000000 Sz=	≠0.000000
5 Sy=116.0816250 5	z=0.0000000
6 Sy=-116.0816250	Sz=0.0000000
7 Sy=0.0000000 Sz=	≠0.000000
8 Sy=-116.0816250	5z=-30.0937500
9 Sy=-116.0816250	Sz=-30.0937500
10 Sy=0.0000000 Sz=	=0.0000000
11 Sy=306.4421099 3	z=0.000000
13: N=15.23 QY=20.61	. QZ=-37.03 MX=0.00 MY=-43.32 MZ=38.11
ЕЛІ	ΓΧΟΣ ΣΕ ΚΑΜΨΗ ΔΙΑΤΜΗΣΗ & ΑΞΟΝΙΚΗ
Έλεγχος σε κάμψη-διά	(τμηση-αξονική {prEN 1993-1-1: 2004(Ε) 6.2.10}
Κατάταξη διατομής γι	α κάμψη
Κατάταξη κορμού σε ι	τότμψη
e1 (d/tw) = 35.01	
Κατάταξη κορμού = 1	(d/tw=35.01<=66.56=72ε)
Κατάταξη εξωτερικού	πέλματος σε κάμψη
e1 (d/tw) = 5.28	
Κατάταξη πελμάτων εξ	;ωτερικών = 1 (c/tf=5.28<=8.32=9ε)
Κατάταξη διατομής =	1. 3
MplyRd = 172.7978	
MplzRd = 34.4352	
McyRd = 172.7978	
MczRd = 34.4352	
NplRd = 1479.8300	
Ο λόγος της αξονικής της ολικής διατομής	; δύναμης σχεδιασμού προς την πλαστική αντοχή σε αξονική δύναμη n = 0.0103
Διατομές Ι ή Η {prEl	1 1993-1-1: 2004(E) 6.2.9.1(5)}

the axial is shown with a positive sign. Of course it is still tensile but here the classical convention is followed:

- (+) Tensile
- (-) Sadness

#### In the section "Different Cross-sections"

Διαστασιολό	Διαστασιολόγηση Σιδηρών - Στοιχεία Layer Χ																	
Layer: Mate	Layer: Μεταλ.Υποστυλώματα ΙΚΑΝΟΠΟΙΟΥΝΤΑΙ ΟΙ ΕΛΕΓΧΟΙ Προσαύξηση λόγω Ικανοτικού Ελέγχου																	
Διαφορετικέα	Διαφορετικές Διατομές ΙΡΕ 450 Υ ΕΠΙΛΟΓΗ ΕΛΕΓΧΩΝ																	
Περιγραφή	Μέλος	IPE Συν IPE	450 220					_	OXI	Auto	N	М	V	Mx	M-N	M-V	M-V-N	
MaxN (kN)	11	199	23.67	0.04	-4.42	-0.00	-1.10	-0.06		<b>V</b>								
MinN (kN)	56	125	-8.05	-0.83	10.93	-0.06	-4.27	0.38		<b>V</b>								
MaxQY (kN)	44	103	9.43	4.37	3.46	0.06	-7.09	-1.54		V								
MinQY (kN)	19	160	3.58	-3.91	0.57	0.06	0.66	-0.96		<b>V</b>								
MaxQZ (kN)	56	125	-7.73	-0.83	10.93	-0.06	-0.99	0.13		<b>•</b>								
MinQZ (kN)	68	189	-4.65	0.75	-10.48	-0.07	0.17	-0.10		<b>V</b>								
MaxMX (kNm)	48	127	2.53	1.10	3.04	0.27	2.06	-0.19		<b>V</b>								
MinMX (kNm)	44	127	-0.45	1.38	-3.97	-0.28	-1.41	-0.18		<b>V</b>								
MaxMY (kNm)	64	199	18.92	-0.47	-7.14	0.01	16.16	0.34		<b>•</b>								
MinMY (kNm)	60	135	17.43	0.02	8.65	0.00	-17.10	-0.02		<b>•</b>								
MaxMZ (kNm)	80	169	6.31	-3.43	-1.39	0.07	1.35	1.23		<b>•</b>								
MinMZ (kNm)	44	103	9.43	4.37	3.46	0.06	-7.09	-1.54		<b>•</b>								
Χρήστης			0	0	0	0	0	0	$\overline{\mathbf{v}}$					$\square$				
	Για όλα τα μέλη που ανήκουν σε αυτό το GROUP																	
ОК	ΟΚ Cancel Διαστασιολόγηση Layer Διερεύνηση Layer Αποτελέσματα Τεύχους																	

shows the different cross-sections included in the "Metal Beams" layer.

The same procedures described above can be followed in order to manually dimension the remaining cross-sections or see the results booklet and the investigation.

Προσαύξηση λόγω Ικανοτικού Ελέγχου Activate the Capability Check surcharge and then select the command Διαστασιολόγηση Layer, to take into account the surcharges foreseen by the Eurocode for the Capability Check.

#### **1.2 Bending control (Hot rolled)**

#### Έλεγχος λυγισμού

The use of this command is used to check for bending. That is, the checks are performed for each member belonging to the given layer:

#### Limit State of Failure

- Check for bending (lateral) buckling due to axial compressive force
- Torsional buckling check due to bending moment.
- Check for torsional bending due to the simultaneous presence of axial compressive force and bending moment.

#### **Limit State of Functionality**

- Member deformation control
- Edge (node) movement control

#### **OBSERVATION:**

A prerequisite sizing is that you called and executed the corresponding combination file in the configuration dialog box

Using the command, the following dialog box appears.

Διαστασιολόγηση Μελών 🛛 🗙									
Layer	Μεταλ.Δοκοί	Ý							
Μέλος	75 IPE 100	- Παράμετροι							
Ομάδα	Ομάδα Δοκοί 🗸								
Εφαρμογή σε ολα τα μέλη του Layer									
Ελεγχ	ος με το Min , Ma	αχ όλων των συνδυασμών							
Ελεγχο	ç Layer								
Διερ	Διερεύνηση Μέλους Λυγισμός								
Διερεύνηση Μέλους Λειτουργικότητα									
Αποτελέ	Αποτελέσματα Μέλους Αποτελέσματα Layer								
	ОК	Cancel							

The check is done per layer. So first select from the list

Μεταλ.Υποστυλώματα	
Μεταλ.Δοκοί	
Μεταλ.Κεφαλοδοκοί	
Μεταλ.Τεγίδες	
Μεταλ.Μηκίδες	
Μεταλ.Μετωπικοί	
Μεταλ.Αντιαν.Οριζοντια	
Μεταλ.Αντιαν.Κατακόρυφα	
_ =ύλινα Υποστυλώματα	
Ξύλινες Δοκοί	
Ξύλινες Κεφαλοδοκοί	
Ξύλινες Τεγίδες	
Ξύλινες Μηκίδες	
Ξύλινοι Μετωπικοί	
Ξύλινα Αντιαν.Οριζοντια	
Ξύλινα Αντιαν.Κατακόρυφα	$\mathbf{\mathbf{v}}$

the layer (e.g. Metal Beams) you want to dimension.

By selecting the layer, all the members of this layer and their cross-section are displayed in the "Member" list.

Διαστασιολ	όγηση Μελών		×
Layer	Μεταλ.Δοκοί		~
Μέλος	75 IPE 100	~	Παράμετροι
Ομάδα	75 IPE 100 10 76 IPE 100 77 IPE 100	^	~
Εφα	78 IPE 100 79 IPE 100		тоu Layer
Ελεγχο	80 IPE 100 81 IPE 100		ν των συνδυασμών
Ελεγχος	82 IPE 100 83 IPE 100		
Διερα	84 IPE 100 85 IPE 100		ός
Διερεύνη	86 IPE 100 87 IPE 100		ότητα
Αποτελέσ	88 IPE 100 89 IPE 100		τελέσματα Layer
	90 IPE 100 91 IPE 100		Cancel

The first step in dimensioning the layer is to define the dimensioning parameters. Because it is possible that for some of the layer members you may want to define different parameters, it is possible that within the same layer you can define different groups of parameters to which the layer members belong.

The program has two predefined groups of parameters: 'Beams' and 'Columns'.

If you want to have the same parameters for all members of the layer, you set them once with the procedure we will see below, keep the default name "Beams" and press the "Apply to all members of the layer" button.

The checks will be done with the same parameters for all members of the layer.

In the different case that you want to set different parameters for some of members of the layer, you will set another set of parameters using the procedure explained below.

But first we will look at how the parameters are defined.

Selecting the "Parameters" button will display the following dialog box:

Διαστασιολόγηση Μέλους	×
Ονομασία Ομάδας Δοκοί	Δημιουργία Νέας Ομάδας
Συντελεστής Ασφάλειας 1 Καμπτικός Λυγισμός	Οριο Εντατικών 0.1
Μήκος Μέλους Ο Πραγματικό Ο Συντελεστής	Μήκος Μέλους Ο Πραγματικό Ο Συντελεστής
Μήκη Λυγισμού	Μήκη Λυγισμού
Πλευρικός Λυγισμός Δέσμευση Ακρων	Ελεγχος Λειτουργικότητας Ορια παραμορφόσεων Μέλους
Φόρτιση Μέλους γ	<ul> <li>Υ 200 Z 200</li> <li>Ορια μετακινήσεων κόμβου</li> </ul>
Επίπεδο Φόρτισης	x 150 Z 150
Στρεπτοκαμπτικός Λυγισμός	OK Cancel

The "Group Name" field contains the name of the parameter group. If you want to create your own group, enter a new name and press the "Create New Group" button.

In the "Safety factor" field you can set the threshold against which the program checks the ratio of the design value (the intensive value) to the corresponding strength of the member. The default value is 1. In the field "Intensity limit" there is the limit of the intensive sizes below which the program does not take the intensive sizes into account.

The rest of the dialog box is divided into three parts, each of which deals with the parameters of the **Flexural Bending**, **Lateral Bending** and **Functionality Checks**.

In the **Flexural Bending** section you first define whether you want to check the flexural bending by ticking the corresponding option.

Διεύθυνση Υ	Διεύθυνση Ζ
Μήκος Μέλους	Μήκος Μέλους
Ο Πραγματικό	Ο Πραγματικό
<ul> <li>Συντελεστής</li> </ul>	Συντελεστής

#### **OBSERVATION**

In earlier versions of SCADA Pro and prior to the creation of the

command, the user was prompted to set the member length and the buckling length in both the Y and Z directions respectively, following the procedure below:

#### In "Length of Membership":

Ενοποίηση Μελών

- if you select "*Actual*" you must enter in the field the actual length of the member in m.
- if you select "*Coefficient*" you must enter a coefficient by which the different lengths of the members belonging to this parameter group will be multiplied.

If you want the program to take the actual lengths of the members into account when checking the bending bend, select "Coefficient" with a value of 1.

If you have some members with different or equal lengths that are laterally secured at the same distances (e.g. at 1/3), then you give the value 0.33 and of course create a separate parameter group to which these members belong.

In the new versions of SCADA Pro the definition of the bend length is done through the "**Consolidate Members**" command (see Sizing-General) and no action is required in this field. Having therefore followed the procedure of Member Consolidation, in the Parameter field, specifically Member Length, leave as is and proceed with the definition of the remaining parameters.

The next parameter is the member's **buckling length** which depends on the support conditions of the nodes of the member ends always within the buckling plane.

#### **OBSERVATION**

*If there has been a Consolidation, then the Bending Length refers to the Consolidated Member.* 

Pressing the button displays the following dialog box



where you select the icon with the support conditions of the member and the program enters the corresponding coefficient for the buckling length. The icons are divided into two groups:

1) The first group includes the icons with a specific coefficient depending on the support conditions of the member



By selecting the icon you can set the positions of the lateral securing, if any, for the specific member so that the corresponding reduced bending lengths are obtained. This feature will be enabled in a later version of the program.





includes the member cases in multi-storey steel structure franconcurrent members in the node.



icon (the most complex case) you define for the vertical member the 6 By selecting the members (2 vertical and 4 horizontal) that are present in it (3 at the beginning and 3 at end). Selecting the icon displays the following dialog box:

Παράμετροι Μελών Πλαισίου							
Συ	ντρέχοντα Μέλη		IH	┇ ┇	Τύπος		
Στύλος Ανω	1300		$\odot$ $\bigcirc$				
Δ ανω αριστερ	858		$\odot$ $\bigcirc$	${\color{black} \bullet} {\color{black} \circ} {\color{black} \circ} {\color{black} \circ}$	Πλάκες Beton	$\sim$	
Δ ανω δεξιά	859		$\odot$ $\bigcirc$		Πλάκες Beton	$\sim$	
Δ κάτω αριστερ	858		$\odot$ $\bigcirc$		Πλάκες Beton	$\sim$	
Δ κάτω δεξιά	859		$\odot$ $\bigcirc$	$\odot \circ \circ$	Πλάκες Beton	$\sim$	
Στύλος Κάτω	965		$\odot$ $\bigcirc$				
		ОК	]	Cance	el		

where for the respective fields you DRAW graphically with the mouse the respective members that occur at the start and end nodes of the member you are specifying the bending length.

Every time you select a member with the mouse, number, cross-section and length are automatically displayed in the corresponding field. You must indicate the concurrent members by the title (Pillar Upper, D upper left, etc.) indicated in the corresponding row. Once you have completed the process of defining the members, you must define for these members their orientation and especially for the beams the type of support at their other end and the type of load imposed on them. By pressing "OK" button, in the buckling length the corresponding icon and the coefficient -1 is displayed, which generally means that the program, based on the data you have provided, automatically calculates the buckling length for the given member.



option you have the possibility to enter your own value in the

Мєта

corresponding field of the bending length, while with the  $e^{i\theta \epsilon \tau \delta}$  option you define whether the frame to which the member belongs is transposable or not transposable.



In the **Side Bending** section you first define whether you want to check the side bending by checking the corresponding option.

You then set the type of binding of the element's edges by selecting the appropriate icon. You choose from three types of supports Amphipact, Amphibious and Protrusive.



The edge binding formula is used to calculate the lateral buckling coefficient.

The next parameter concerns the type of loading of the member along its local y and z axis respectively.

By selecting the corresponding icon, the following options are displayed



Where you select the corresponding type of Charge.

Finally, the last parameter concerns the determination of the loading level of the member. By selecting the icon, the following 5 options are displayed.

Επίπεδο Φόρτισης	×
<b>I I I I</b>	I

Το πρώτο εικονίδιο αφορά επίπεδο φόρτισης στο άνω πέλμα του στοιχείου, το δεύτερο αφορά επίπεδο φόρτισης κοντά και προς τα πάνω από τον άξονα συμμετρίας του στοιχείου, το τρίτο αφορά επίπεδο φόρτισης στον άξονα συμμετρίας του στοιχείου, το τέταρτο αφορά επίπεδο

loading level near and below the symmetry axis of the element and finally the fifth option is a loading level at the lower foot of the element.

3) The third set of parameters concerns the parameters of functionality

🗹 Ελεγχος Λειτουργικότητας									
🗸 Ορια παραμορφόσεων Μέλους									
Y	200	Z	200						
<ul> <li>Ορια μετακινήσεων κόμβου</li> <li>χ 150 Z 150</li> </ul>									

where you specify whether you want to perform the functionality check, the individual Member Deformation and Node Displacement checks, and the respective upper limits (I/220 and I/150 where I is the length of the element) for these checks.

Finally, check the "Torsion bending" option if you want to do this check.

When the configuration settings are complete, press the "OK" button and return to the previous dialog box

Διαστασιο	λόγηση Μελών	, ×								
Layer	Μεταλ.Δοκοί	~								
Μέλος	75 IPE 100	75 IPE 100 Παράμετροι								
Ομάδα	Ομάδα Δοκοί 🗸									
Εφαρμογή σε ολα τα μέλη του Layer										
Ελεγχα	ος με το Min , Ma	αχ όλων των συνδυασμών								
Ελεγχος	Layer									
Διερ	εύνηση Μέλους	Λυγισμός								
Διερεύν	ηση Μέλους Λει	τουργικότητα								
Αποτελέ	σματα Μέλους	Αποτελέσματα Layer								
	OK	Cancel								

By pressing the "<u>Apply to all members of the Layer</u>" button, the program applies the parameter group you just defined with the default name "Beams" to all members of the "Metal Beams" Layer you had selected. Then you press the "Check Layer" button and the program starts the process of executing the layer for the specified layer "Metal Beams".

By activating the option Eλεγχος με τα Min, Max όλων των συνδυασμών , the check will be performed taking into account only the maximum and minimum values of the intensities obtained from all combinations, excluding intermediate values, so that the process is completed in significantly shorter times.

## ` **¿ EXAMPLE**:

If you would now like to specify another group of parameters to which some of the members of the layer belong, follow the procedure below:

Press the "Parameters" button and open the configuration dialog box again. In the "Group Name" field, enter a name for the new parameter group you will create e.g. "Beams\_1" and press the "Create New Group" button. Then you set the parameters based on what was mentioned before and press the "OK" button.

Ονομασία Ομάδας Δοκοί_1	
Συντελεστής Ασφάλειας 1	Διεύθυνση Ζ Μήκος Μέλους Ο Πραγματικό Ο Συντελεστής 1 Μήκη Λυγισμού
Πλευρικός Λυγισμός       Δέσμευση Ακρων       Φόρτιση Μέλους γ       Επίπεδο Φόρτισης	<ul> <li>Ελεγχος Λειτουργικότητας</li> <li>Ορια παραμορφόσεων Μέλους</li> <li>Υ 200 z 200</li> <li>Ορια μετακινήσεων κόμβου</li> <li>χ 150 z 150</li> </ul>

The next step is to define which members from the layer will belong to this group of "Structures\_1" parameters.

Returning to the original dialog box, the only member that gets the parameters automatically is the current member in the list of members

Διαστασιολόγηση Μελών 🛛 🗙 🗙								
Layer	Μεταλλικές Δοκοί	~						
Μέλος	37 HEA 200 ν Παράμετροι							
Ομάδα	∆окоі_1	~						
Εφαρμογή σε ολα τα μέλη του Layer								
🗹 Ελεγχ	ος με τα Min , Max όλων των συνδυασμ	vώu						

That is the 37 HEA 200 member. All other members have the parameters of the "Beams" group. To change the members you want from one group to another, select them one by one from the list and from the list of the "Group" section select the "Beams\_1" group. For example, you select from the list the member 37 HEA 200

Διαστασιο	λόγηση Μελών	×								
Layer	Μεταλλικές Δοκοί	\$~~								
Μέλος	37 HEA 200 V	Παράμετροι								
Ομάδα	Δοκοί	~								
Eφ	Εφαρμογή σε ολα τα μέλη του Layer									

and shows you that he already belongs to the "Beams" group. Open the list of groups and select the group "Beams\_1"

Διαστασι	ολόγηση Μελών	×							
Layer	Μεταλλικές Δοκοί	$\sim$							
Μέλος	37 HEA 200 🗸 Пара́µа	троі							
Ομάδα	Докоі_1	$\sim$							
Eq	Εφορμογή σε ολα τα μέλη του Layer								

Now member 37 HEA 200 belongs to the group "Doctors\_1". Follow the same procedure for the other members that you want to change their parameter group.

Upon completion of the testing process for the specific layer the icon next to the "Investigate Bending Member" and "Investigate Functionality Member" buttons



is coloured in a corresponding colour:

- Red if there is a failure and
- Green if there is none.

By double-clicking on this coloured icon, the following dialogue box appears

Μέλος	Διατομη	Καμπτικός	Πλευρικός	Στρεπροκ.	Λειτ.Παραμ	Λειτ.Μετακ	
1103	IPE 140	2/0.01	2/0.42	2/0.56	1/0.84	1/1.70	
1110	IPE 140	2/0.00	2/0.42	2/0.56	1/0.42	1/1.11	
1117	<b>IPE 140</b>	2/0.02	2/0.42	2/0.56	1/0.10	1/0.60	
1124	IPE 140	Δεν Απαιτ.	2/0.42	Δεν Απαιτ.	1/0.29	1/0.21	
1131	IPE 140	Δεν Απαιτ.	2/0.21	Δεν Απαιτ.	1/0.24	1/0.00	

with the summary results of the audit of the members.

1: In the first column is the number of the member, 2: In

the second column is the cross-section, and

3-7: In the next 5 columns the worst strength ratio and the number of the combination from which this ratio was derived.

Green are ratios below the unit and red are ratios above the unit. Where the phrase 'not required' is shown, it means that the corresponding intensive magnitude was not available or that the axial force was tensile and not compressive.

By selecting the button "Layer Bending" the program displays the summary results of the check in Bending (i.e. for each member the results from the worst combination) while by selecting the button "Investigation Layer Bending" the program displays a complete but very large file with the results of the checks for each member from all combinations. Similar applies to the "Functionality Issue" and "Investigate Layer Functionality" buttons.

The check for the three types of buckling is carried out for each member and for all combinations. However, for each combination, i.e. for each triad N, My and Mz the checks are carried out 4 times based on the following combinations:

- N with min My and min Mz
- N with min My and max Mz
- N with max My and Min Mz
- N with max My and max Mz

That is why both in the results of the issue and in the investigation, two numbers are mentioned in the combination number: The first refers to the number of the combination and the second refers to the number for each of the 4 previous cases.

Διαστασιολόγηση Μελών 🛛 🗙											
Layer	Μεταλ.Δοκοί	Μεταλ. Δοκοί 🗸 🗸									
Μέλος	75 IPE 100	ν Παράμετροι									
Ομάδα	Δοκοί										
Εφαρμογή σε ολα τα μέλη του Layer											
Ελεγχ	ος με τα Min , Ma	ιχ όλων των συνδυασμών									
Ελεγχο	ç Layer 🛛 🕅	Ιἑλ:54/54 Συνδ:8/8									
Διερ Διερεύ	Διερεύνηση Μέλους Λυγισμός Διερεύνηση Μέλους Λειτουργικότητα										
Αποτελέ	σματα Μέλους	Αποτελέσματα Layer									
	ОК	Cancel									

Choosing the Member Investigation (Bending / Functionality) open files containing the detailed results of all checks for all combinations for the active member

Selecting Results opens the files containing the summary results of the checks for the active member Anoτελέσματα Mέλους and for all members of the active layer. Anoτελέσματα Layer

												Σελίδα : 1	
	ΔΙΑΣΤΑΣ	IOVOLH	ΣΗ ΣΙ	ΔΗΡΩ	<u>N K</u>	ΑΤΑΣΚΕΥ	ΩN	- EVEL	χοχ	ΜΕΛΩ	2N		
Layer :	I	Μεταλ.Δο	коі		757	76 77 78 79	80.8	1 82 83					
Μέλος 75		IPE	100		1						Y		
Κόμβος Αρχής	716 К	όμβος Τέλο	υς	767	1	← − 1							
Ενοποίηση y-y	1	Nai 31	6.23	cm								z	
Ενοποίηση z-z	:			cm							1		
KAN		ΠΛΕΥΡΙΚΟΣ ΛΥΓΙΣΜΟΣ ΛΟΓΩ ΚΑΜΨΗΣ											
Τελική Κατάταξ		(ΣΤΡΕΠΤΟΚΑΜΠΤΙΚΟΣ ΛΥΓΙΣΜΟΣ)											
Κορμού 1	Πελμάτ	ων	(	0 1	Διεί	μεύθυνση γ-γ Συνδυασμός: 1/3							
Συνδυασμός			1/1		Evt	Εντατικά Μεγέθη Ν (kN) =			=	-4.70			
Εντατικά Μεγέθ	θη	N (kN) =	-4	1.70	My(	(kNm)=	-0.4	8 M:	z(kNm	1)=	0.06		
My(kNm) =	-0.26	Mz(kNm)	)= (	0.06		Μέγεθ	ος			Τιμή		Νονάδες	
Μένεθος		Τιμή		Μονά	Lcr,	у			3	16.23		cm	
	у-у	2	-Z	οες	Συν	τελεστής Κ				0.50			
Lor	316.2	3 30	).00	cm	Συν	τελεστής ο	1 (Mo	r)		1.48			
Καμπύλη	a		b		Συν	τελεστής c	2 (Mo	r)		0.00			
Συντ.ατελειών α	0.210	0.	340		Συν	τελεστής c	3 (Mo	r)		2.27			
lamda1		93.900			zg (	Mcr)				5.00		cm	
lamda*	77.69	5 24	.159		Mcr					538		kNm	
lamdaT	0.827	0.	257		lam	daLT_bar*	H#		(	0.131			
NEd		4.70		kN	FLT				(	0.501			
Ncr	354	- 36	666	kN	XLT				1	1.000			
NEd/Ncr**	0.0132	5 0.0	0128		MyE	ED			-0.478				
Х	1.000	0.	980		MyE	D/Mcr****			-	0.001			
Nb,Rd	189.14	2 237	.646	kN	Mbf	Rd			_സ്	9.261		kNm	
NEd/Nb,Rd	0.025	0.	020		MyE	ED/MbRd				0.052			
ΕΠΑΡΚΕΙΑ	Ναι	N	αι		EU/	APKEIA			Ναι				
		ΛΥΓΙΣΜΟ	ολ 3α	ΓΩ ΚΑ	MΨI	ΜΨΗΣ ΚΑΙ ΑΞΟΝΙΚΗΣ ΘΛΙΨΗΣ							
Τελική Κατάταξ	η διατομι	15			_	1 Συνά	ουασι	μος: 4	1/3	N (kh	4) =	-3.87	
Κορμού	1	Πελμά	πων		0	1 My(k	(Nm)	= -(	0.37	Mz(k	Nm)=	0.14	
Μέγεθα	c		Tip	η		Μονάδες		Y		πολογισμός Ν			
	-	<u>y-y</u>		Z-Z		-	Mé		Μέγεθος		η	Μοναδες	
LCr Keymidder der		316.4	23	30.0	0	cm	200	τελεστη	<u>ις κ</u>	0.5	00		
καμπυλη λυγια	<u>100</u>	a	_	0.24			200	TEAEOTI	15 01	1.4	12		
20ντελεστης α	ελείων α	0.21	0	0.34	U		200	TEAEOTI	<u>ης c2</u>	0.00	70		
lamdal		77.00	93.9	24.45			200	1103731	ης ασ	2.2	13		
lamdaT		0.82	7	24.10	7			29		5.00	7	CIII kNm	
X		0.02	<del>6</del>	0.25	0		lamo	laLT b	ar***	0.1	7 31	NINIII	
Ratio (1) EE 6.6	51		0.08	11	-	kN	FLT			0.5	01		
Ratio (2) EE.6.6	52		0.08	11		kN	XLT			1.0	00		
ЕПАРК	EIA		Να	1									
*Av lamda <= 0.	2 ο έλεγχο	ς αγνοείτα	1			***Av lam	daLT	_bar <=	0.2 o	έλεγχος	αγνοεί	ται	
**Av NEd/Nor <	= 0.04 o ź	λεγχος αγ	νοείται			•••••Av My	ED/M	cr <= 0.	04 o á	λεγχος ο	αγνοείτ	ai	
ΠΑΡΑΜΟΡΦΩ	ΩΣΕΙΣ ΜΕ.	ΛΩΝ (ΤΟΙ	IKOI /	AEONE	Σ)	METAKI	ΝΗΣΕ	ΙΣ ΚΟΜ	BΩN (	(KA00/	VIKOI /	AEONES)	
Μένεθος	Ti	μή	Mov	ά Συ	νδυ	Μένεθο	c		Τιμή		Mov	ά Συνδυ	
πεγεύος	у-у	Z-Z	δε	ς ασ	μός	incycou	2	у-у		Z-Z	δες	ασμός	
δmax	0.003	0.001	cm	99		∆umax		0.001		0.000	cm	99	
Lor	316.23	316.23	cm			Lor		316.2	3 3	16.23	cm		
Συντελεστής	150.00	150.00				Συντελεσ	τής	150.0	0 1	50.00			
Ratio	0.002	0.000		_		Ratio		0.000	) (	0.000			
ELIAPKEIA	Ναι	Ναι				EIIAPKE	AI:	Ναι		Ναι			

#### Show reasons for exhaustion with Color Gradation

In the case of steel structures the checks are common for beams and columns and represent a single value. More specifically, the following depletion ratios are calculated. :

- **Reasons for Auto Exhaustion** 1)
- 2) Reasons for depletion N
- 3) Reasons for exhaustion M
- 4) Reasons for exhaustion V
- 5) Reasons for Mx exhaustion
- Reasons for M-N depletion 6)
- 7) Reasons for M-V exhaustion
- 8) Reasons for exhaustion M-V-N
- **Reasons for Flexural Bending Exhaustion** 9)
- 10) Lateral Flexion Exhaustion Reasons
- 11) **Reasons for Torsion Flexure Exhaustion**
- Reasons for deformation exhaustion 12)
- **Reasons for Travel Exhaustion** 13)

#### **IT IS RECALLED THAT:**

9 new

In the new versions of SCADA Pro a new feature was added that was activated in the crosssection control of metallic cross-sections. Recall that the cross-section control was previously done at the layer level and at the level of each cross-section but only the worst member each intensive size was controlled. Now now the check is still done at layer level and for each crosssection but now each member is checked by activating the option at the bottom as shown in the next figure.  $\times$ 

Layer: Mat	Layer: Μεταλ.Υποστυλώματα ΔΕΝ ΙΚΑΝΟΠΟΙΟΥΝΤΑΙ ΟΙ ΕΛΕΓΧΟΙ										πη λόγ	ω Ικαι	vотіко	ύ Ελέ	үхои		
Διαφορετικέα	; Διστομέ	S IP	E 120					$\sim$				ΕΠΙΛ	огне		ΩN		
Περιγραφή	Μέλος	Συνδ.	Ν	Vy	Vz	Mx	Му	Mz	OXI	Auto	N	М	V	Mx	M-N	M-V	M-V-N
MaxN (kN)	10	199	37.52	0.06	-0.31	-0.01	3.15	0.01									
MinN (kN)	54	125	-26.24	4.28	9.40	0.04	-5.85	-0.91									
MaxQY (kN)	36	93	-14.16	10.77	-10.53	-0.70	-1.43	0.33									
MinQY (kN)	9	93	-14.25	-10.77	-10.92	0.71	-1.61	-0.34									
MaxQZ (kN)	36	207	19.60	-8.90	21.74	0.13	2.76	-0.21									
MinQZ (kN)	72	199	18.74	-8.90	-21.62	-0.14	-2.93	-0.21									
MaxMX (kNm)	9	93	-14.25	-10.77	-10.92	0.71	-1.61	-0.34									
MinMX (kNm)	45	157	-14.39	-10.72	10.81	-0.71	1.57	-0.32									
MaxMY (kNm)	54	199	30.57	-2.47	-7.93	-0.01	10.58	0.51									
MinMY (kNm)	18	207	31.32	-2.30	8.11	0.01	-10.68	0.49									
MaxMZ (kNm)	72	241	19.21	-10.58	-16.93	-0.11	3.33	2.97									
MinMZ (kNm)	9	267	19.65	10.64	16.80	-0.12	-3.37	-2.98									
Χρήστης			0	0	0	0	0	0									
	Για ό	λα τα μέ	λη που αν	ήκουν σε α	υτό το GRO	UP		72 / 72		<b>V</b>	<b>•</b>	V	<b>V</b>	<b>•</b>	<b>V</b>	<b>V</b>	
ОК		Can	cel	Δı	οστασιολόγ	ηση Layer		Διερ	εύνηση	Layer			1	Апоте	λέσματ	τα Τεύ	χους

Διαστασιολόγηση Σιδηρών - Στοιχεία Layer

## Select one or more controls by pressing the corresponding button

from the list

		ELIV		AEDX	ΩN		
Auto	Ν	м	٧	Мх	M-N	M-V	M-V-N

	ΕΠΙΛΟΓΗ ΕΛΕΓΧΩΝ											
Auto	Ν	М	V	Mx	M-N	м-и	M-V-N					
<b>V</b>				$\overline{\checkmark}$	$\overline{\mathbf{v}}$	V						
<b>V</b>				$\checkmark$	$\checkmark$	4						
<b>V</b>				$\checkmark$	$\checkmark$	$\overline{\mathbf{A}}$						
<b>V</b>				4	4	4						
				$\checkmark$	$\checkmark$	4						
<b>V</b>				4	4	4						
<b>•</b>				$\checkmark$	4	4						
<b>V</b>				$\checkmark$	4	4						
<b>•</b>				$\checkmark$	$\checkmark$	4						
				$\checkmark$	$\checkmark$	4						
<b>V</b>				$\checkmark$	$\checkmark$	4						
<b>V</b>				$\checkmark$	$\checkmark$	V						
				$\boxed{\mathbf{v}}$	$\boxed{\mathbf{v}}$	4						
				$\overline{\checkmark}$	$\boxed{\checkmark}$	$\overline{\checkmark}$						

#### Then select Layer Sizing, For all members belonging to this GROUP

Διαστασιολό	λιαστασιολόγηση Σιδηρών - Στοιχεία Layer Χ												
Layer: Мहт	αλ.Υποσ	τυλώμα	τα ΔΕΝ		OYNTAL O	Ι ΕΛΕΓΧΟΙ			🗹 Προσαύξηση λόγω Ικανοτικού Ελέγχου				
Διαφορετικές	αφορετικές Διατομές SHS 100x4,0								ΕΠΙΛΟΓΗ ΕΛΕΓΧΩΝ				
Περιγραφή	Μέλος	Συνδ.	Ν	Vy	Vz	Mx	Му	Mz	OXI Auto N M V Mx M-N M-V M-V-N				
MaxN (kN)	7	16	16.23	-3.15	0.08	0.54	0.00	-5.05					
MinN (kN)	8	24	-22.32	-2.38	-0.10	0.54	0.30	3.15					
MaxQY (kN)	11	4	-9.05	4.07	0.05	1.12	0.00	7.12					
MinQY (kN)	12	23	-9.01	-4.39	-0.43	-0.05	0.00	-7.93					
MaxQZ (kN)	12	41	-6.65	-1.45	0.72	0.02	0.00	-2.67					
MinQZ (kN)	12	36	-11.48	0.80	-1.12	0.03	0.00	1.41					
MaxMX (kNm)	11	45	-10.17	-1.08	0.16	3.10	0.00	-2.48					
MinMX (kNm)	11	48	5.12	1.30	-0.10	-3, 19	0.00	2.04					
MaxMY (kNm)	12	36	-11.77	0.80	-1.12	0.03	3.74	-1.25					
MinMY (kNm)	12	41	-6.95	-1.45	0.72	0.02	-2.40	2.14					
MaxMZ (kNm)	11	14	-4.64	4.05	-0.01	-0.65	0.00	7.13					
MinMZ (kNm)	12	23	-9.01	-4.39	-0.43	-0.05	0.00	-7.93					
Χρήστης			0	0	0	0	0	0					
	Για ό	λα τα μ	έλη που αντ	ήκουν σε αι	υτό το GRC	UP		12 / 12					
OK		Car	icel	Διο	ιστασιολόγι	ηση Layer		Διερ	οεύνηση Layer Αποτελέσματα Τεύχους				

In this example all the checks (General (Auto) and individual) have been done. Right-clicking on the desktop

2	Εμφάνιση όλων
Ŷ١	Απόκρυψη
<b>?</b>	Απομόνωση
11	Αντιγραφή
+	Μεταφορά
×	Διαγραφή
***	Πίνακας (Array)
¢	Περιστροφή
t	Offset
8	Δημιουργία κλώνου
-	Μεταφορά ομάδας
4	Αριθμήσεις
۲	Εμφάνιση Χρωματικών Διαβαθμίσεων
٠	Απόκρυψη Χρωματικών Διαβαθμίσεων

#### and selecting "Show Color Gradients" opens the dialog box:

Εμφανιση μεγεθών με χρωματική διαβάθμιση

Σιδηρά 🗸	Υποστυλώματα 🗸 🗸
Λόγοι εξάντλησης Auto	$\sim$ Πάνω $\sim$ Y $\sim$
Εύρος τιμών Εμφάνιση μόνο αυτών που αστοχ	ούν (λόγος > 1)
Από 0 Εως 0	🗹 Εμφάνιση Τιμών
ОК	Cancel

by selecting 'Iron', 'Pillars' and 'Auto Exhaustion Reasons' the following picture appears:

Х



Other reasons for exhaustion (cases 2-8) appear in the same way

#### **OBSERVATIONS**

- The ratios for all elements that are pillars and belong to this layer are displayed.
- If you had run the checks the old way, <u>only the members with the worst sizes</u> would appear in the display.

In the checks (9-13) for bending, deformation and movement there are cases where this check is not required. In this case, in order to separate the member, the value entered is -1. Let's look at control 12 for example. Reasons for deformation exhaustion.



Similarly, you display the exhaustion reasons (1-13) for the beams.

#### NEW!

In the new version of the program the possibility of selection and per layer in the display of various strength ratios in steel structures was added



#### 1.3 Cold Rolled Sections

Διατομές Ψυχρής Έλασης

This instruction is for Cold Rolled cross-sectional checks.

- The sizing of cold-rolled components involves:
- Strength check at section level
- Strength check at member level
- Functionality check

The procedure for selecting the members and the checks to follow is similar to that of bending for hot rolled products.

The main difference with hot rolled elements is that now the checks at section and member level are done with a <u>common command</u> (see picture) and not separately. Another important feature is that all members and their cross-sections are checked for <u>all combinations</u>.

οόσθετα	Βελτιστοποίηση		Διαστασιο	λόγηση Μελών	×				
Tar		-	Layer	Μεταλ.Τεγίδες ~	^				
Αποτελέ- σματα *	Διαστασ. Σιδηρών - Ξύλινων -	Έλεγχος Διαγ Τοιχοποιίας Μ	Μέλος	87 METSEC C 142 🗸 Παράμετροι	]				
ιατα	-		Ομάδα	∆окоі ∨	•				
×	Έλεγχος διατο	μών	Εφαρμογή σε ολα τα μέλη του Layer						
	Έλεγχος λυγισι		Ελεγχ	ος με τα Min , Max όλων των συνδυασμά	νc				
			Ελεγχος	;Layer					
	Διατομές Ψυχρ	οής Έλασης	Διερ	οεύνηση Μέλους Λυγισμός					
			Διερεύν	/ηση Μέλους Λειτουργικότητα					
	Συνδέσεις		Αποτελέ	σματα Μέλους Αποτελέσματα Layer					
				OK Cancel					

Otherwise, the sizing steps are the same as for hot rolled elements (per layer, member consolidation, bending parameters, etc.).

#### DIMENSIONING DOCUMENT

The results of the sizing are displayed either per member or per layer. In the second and more general case the structure of the issue is as follows:

- Page 1: General cross-section data 1 Dimensional and property information of the original and ideal cross-section
- Page 2: Active cross-section of cross-section 1 (Part A) Active cross-sectional dimension information of N, My and Mz ratios
- Page 3: Active cross-section of cross-section 1 (Part B) Active cross-section properties information of N, My and Mz ratios
- Page 4: Cross-section level check for the 1<sup>th</sup> member with cross-section 1 Endurance tests according to §6.1
- Page 5: Member level check for the 1<sup>th</sup> member with cross-section 1 Durability checks according to §6.2 & 6.3 and functionality check §7
- **Repeat steps 4 & 5 :** In case of several members of the same cross-section within the layer.
- **Repeat steps 1 to 6:** In case of several cross-sections within the layer.

The issue per layer can also be extracted when creating the **<u>Study Sheet.</u>** (See in the User Manual the chapter "Cold rolled sections")

#### 1.4 Links

μ Συνδέσεις

The last chapter of dimensioning for steel structures is the dimensioning of the connections of the structure. Select the command and you have two options to proceed with the sizing of the connections:

A) Click on the "Connections" command and then right-click on the space () to display the library with all the available connections

Συνδέσεις Σιδηρών X Επόμενη Ομάδα Συνδέσεων Ονομασία Σύνδεσης Δοκών-Στύλων Η-Ι Δοκών-Στύλων Η-Ι Αποκατάσταση Αποκατάσταση Διατομής Διατομής τύπου Β (Ισχυρός) Γ (Ισχυρός) Τ Ορισμός Ομάδων Μελών (Κόμβος) Επεξεργασία σύνδεσης (Γεωμετρία/Ελεγχος) Δοκών-Στύλων Η-Ι Δοκών-Στύλων Η-Ι Δοκών-Στύλων Η-Ι Δοκών-Στύλων Η-Ι (Ισχυρός) -Τ (Ισχυρός) + (Ασθενής) Γ (Ασθενής) Τ Δοκών-Στύλων Η-Ι Δοκών-Στύλων Η-Ι Δοκός Επί Δοκού Τ Δοκός Επί Δοκού + Cancel (Ασθενής) -Τ (Ασθενής) +  $\times$ Συνδέσεις Σιδηρών Επόμενη Ομάδα Συνδέσεων Ονομασία Σύνδεσης Σύνδεση Γωνιακών Σύνδεση Γωνιακών Ν Σύνδεση Γωνιακών Τ Σύνδεση Γωνιακών Κ кт Ορισμός Ομάδων Μελών (Κόμβος) Επεξεργασία σύνδεσης (Γεωμετρία/Ελεγχος) Σύνδεση Κοιλοδοκών Σύνδεση Κοιλοδοκών Σύνδεση Κοιλοδοκών Σύνδεση Γωνιακών Υ KT Σύνδεση Κοιλοδοκών Σύνδεση Κοιλοδοκών Σύνδεση Κοιλοδοκών Σύνδεση Εδραση Cancel Х

from where you can choose the one you want.

Συνδέσεις Σιδηρών				×
				Επόμενη Ομάδα Συνδέσεων Ονομασία Σύνδεσης
Δοκών-Στύλων Κοίλων Γ	Δοκών-Στύλων Κοίλων Τ	Δοκών-Στύλων Κοίλων -Τ	Δοκών-Στύλων Κοίλων +	
Συνδεσμων Δυσκαμψίας				Ορισμός Ομάδων Μελών (Κόμβος) Επεξεργασία σύνδεσης (Γεωμετρία/Ελεγχος)
				Cancel



#### **New Metal Connections**

New connections have been added to the rich library of metal connections in SCADA Pro:

• The new Beam Seating Connection to Subframe with cavity beam or double tee sections, for which all the necessary EC3 part 8 checks are performed.

ραση Δοκού σε Υποστύλωμα				×
	EArryse reads EArryse charry Earryse charry Earryse charry Earryse charry Earryse charry Earryse charry Earryse charry Earryse charry	οιχού πλάκας καρμού Ικανοποισται ς άνταψης της δοικού Ικανοποισται της Αναρωφιζκης δοιταγή δοισού Ισανοπ ς απορωφιζκης δοιταγή δοισού Ισανοπ ς απορωφιζκης δοιταγή δοισού Ισανοπ μητή ποχνών καρμού Δεν Ισανοποι τη ότητγα καχιλιών καρμού Ισανοποι τη ότητγα καχιλιών καρμού Ισανοποι του Διάτους καιταγή διασφιζου Ισανοπ στοι Διάτους καιταγή Ισανοποιστάτα.	nacha nacha ta ta cha cha cha	l
Προσανατολισμός Ράβδων	Ynoloyiaudc (ໃນເດີມດາວ)	Υπολογισμός Οκρήστης Συγκαντρωπικά	Διερούνηση Τεύχος	Καταγώρηση Εξοδος
n (iii)			~	1
A1 1			1	2
62 1				3
Ehaqua (nm) b 500 t 20 Yilwa h 460	5279( ~ .		6	æ
Everyclenc (mm) b <u>87</u> 1 152 Vnokovezulo 4 15	5279( ~ )	l s		
Kasolies (mm) Kasolies (mm)		[1]		
Y)xú 4.8 ~			1	
Imphag 6 el 75 el	1 200			
rpasser 2 p1 70 p1	95			
Zuyebkhop (mm) r Notoc s s	ladmyra 275(Fr ~			

• The new beam - column connection with cavity beam sections, for all the necessary EC3 part 8 checks are carried out.



• The new connection of stiffness connectors (Cross-connection of anti-vibration connectors) with cavity cross-sections,



for which all necessary EC3 Part 8 checks are carried out.

B) Alternatively, you can click on the "Links" command and then left-click on the members you wish to link. Right-clicking then displays a window in which only possible connections consisting of only two members are included.

Συνδέσεις Σιδηρών	×
Αποκατάσταση Διατομής τύπου Β Δοκών-Στύλων ΗΙ (βσυρός) Γ	Επόμενη Ομάδα Συνδέσεων Ονομασία
	Ορι σμός Ομάδων Μελών (Κόμβος) Επεξεργασία αύνδεσης (Γεωμετρία/Ελεγχος)
	Cancel

## È EXAMPLE:

For example, select member 30 (column) and member 154 (beam) in sequence. Right-click to display the window with the 4 possible connection types. Select the last (to the right) connection which corresponds to a Beam - Column connection of cross-section type H or I on the weak axis. You will then enter a name for this connection (e.g. dok\_styl\_asthenis).

#### **ATTENTION:**

• The name should be in Latin and there should be no spaces between the words.

Then select the "Define member groups" command and in the dialog box you can add other similar cross-section pairs (column - beam) or add your own values for the N,M,V intensive sizes to the existing pair. To add other similar pairs, click on the "Column Bottom" field and then select Subcolumn 24 on the desktop. Similarly then click on "Beam Right" field and select beam 153 (or just type in the corresponding member numbers in the fields if and when you know them). To add your selections click on add.

Μέλη Σ	Συνδέσε	εων Ομάδας				Þ
				N(kN)	M(kNm)	V(kN)
ετύλος Ιάτω	24	IPE 450	0.30	0	0	0
ιοκός εξιά	153	IPE 330	6.80	0	0	0
	0	Ī		0	0	0
	0	1		0	0	0
	0	-		0	0	0
30: 30,	154,				Про	σθήκη
18: 18,	152,				Evŋ	μέρωση
					Δισ	γραφή
					1	Exit

Essentially this way you can massively size all of the

connections of the beam members of the girder which are connected to the weak axis in the same way (bolts or welds, plate geometry, etc.) and which have common cross-sections (IPE 450 - IPE 330 beam). The program will automatically calculate the intensive sizes of each pair and proceed to the dimensioning of the connection based on the most unfavourable combination. This way you will not have to guess where in your construction the most unfavourable beam - post connection will be developed in the patient axis, while if one connection is satisfied, all other connections of the same type will automatically satisfied.

Then select "exit" and then "Edit Link-Geometry Check".

The window appears automatically, through which you can set the number of the the type and geometry of the specific connection. Give the characteristic values shown in the figure or try to create your own connection.

To then check the adequacy of the connection with the combinations of

analysis select the "Calculate (Combinations)" command. Initially the program will perform a geometric check of the connection (e.g. if the bones are too close to the edge of the plates). If there is a problem an error message is displayed accordingly in the top right field. In this particular connection change the distance e1 from to 15 cm and click again on "Calculation (Combinations)".

úπος	Δοκός - Στύλος (Γ)	- Hanào	aon e1 = 14.00 (mm) no	έτει να είναι μεγάλυτερη α	nó 1.2×d0 = 14.40 (m	im)
οίαογητα	Με Μετωπική Πλάκα	H anóo H anóo H anóo H anóo	αση e1 = 14.00 (mm) ηρ αση e1 = 14.00 (mm) ηρ αση e1 = 14.00 (mm) ηρ αση e1 = 14.00 (mm) ηρ	έπει να είναι μεγάλιστερή α έπει να είναι μεγάλιστερη α έπει να είναι μεγάλιστερη α	nó 1.2°d0 = 14.40 (m nó 1.2°d0 = 14.40 (m nó 1.2°d0 = 14.40 (m nó 1.2°d0 = 14.40 (m	im) im) im)
ιλος οπτλ		H anào H anào H anào H anào	αση e1 = 14.00 (mm) ηρ αση e1 = 14.00 (mm) ηρ αση e1 = 14.00 (mm) ηρ αση e1 = 14.00 (mm) ηρ	έποι να είναι μεγάλυτερη α έποι να είναι μεγάλυτερη α έποι να είναι μεγάλυτερη έποι να είναι μεγάλυτερη α	nó 1.2°d0 = 14.40 (n nó 1.2°d0 = 14.40 (n nó 1.2°d0 = 14.40 (n nó 1.2°d0 = 14.40 (n	im) im) im)
		Υπολα (Συνδι	νισμός Υπολογισμός ασμοί) (Χρήστης)	Συγκεντριστικά	Διερεύνηση Τεύχος	Καταχώρηση Εξοδος
ετωτική Γ	λάκα (mm)					1
Προεξι	byouaa			4	_	2
500	b 200 t 12 hup	50				3
αχός 20γι οχλίες	konnone 1-					
xhiac h	112 • YAKÓ 4.6 • По	Γενικές αράμετροι				2/6
ayyelç 📑 (mm)	4 Iv Iõisc Anoordosic 14 e2 (mm) 20	2				
ωνιακά (L	KoxNiec (mm)					
ατομή –	M12 * YAsó	463D01				
EQ	Στύλος:2 Δακός	- 10				
	e1 10 p1 20	ez		1	_	
100x10		and a support of the				
100x10	80 evi 10 pv1 20	20 20 20				
100к10 Ь [ иуколата	ev1 10 pv1 20	20				

If you click on the 3D command (bottom right) you will see a three-dimensional representation of the connection which is dynamically updated as you make changes to the parameters. Buttons 1, 2, 3 correspond to side view -1, side view -2 and plan view -3 and via the S/C command you can display the welds and bolts in the 3D view.



If the geometry errors are overcome, the program will perform the calculations and display all the checks required by Eurocode 3 for the specific connection. In summary you can see the results in the corresponding field. There, in green font, the adequacies will be displayed while in red font the failures of the connection will be displayed. If all checks are sufficient the program will be able to proceed to the registration of the connection as well as the automatic generation of the drawings. Otherwise the process is interrupted and then you will have to change some values of the connection to continue. In the investigation as well as in the issue you can see in text format the results of the checks in detail or in summary.

Finally, click on the entry and exit to return to the connection types window.

## Graphical display on the 3D vector of the metal connections that have already been dimensioned

In the new versions of SCADA Pro a very useful tool has also been added, which allows you to see graphically on your metal carrier which connections you have dimensioned.

You can see them all in total, or by group of connections, and you can also see which members are participating in each connection! This way you can therefore have a better overview as to which links you have sized, whether you have correctly grouped similar links and finally whether you have correctly selected the members participating in those links.

Let's see in detail how the command works:

In the edit connections dialog box where all the groups connections I have created are displayed



At the bottom of the dialogue box, the commands :



If you select "By Group" in the vector, the nodes where connections have been defined and belong to this group are displayed in red. The members connected to this node are displayed in red.



If you select AND "Total", <u>all</u> connections are displayed in the operator regardless of the group, but for the connections that do not belong to the selected group, the members connected to them are not displayed.



If you select only "Total" <u>all</u> connections are displayed without showing the connected members. The display remains on the screen even after you close the connections dialog box if one or both of the checkboxes are checked. This makes it easier when you want to see where you haven't created links so you can fill them in. Displaying also the members connected to the link prevents possible errors.

Plans of the registered connections are in the study file, specifically on the route:

#### C:\scadapro\ "Study" \scades\_Synd\sxedia

And you open them within the scada drawing environment with the command:



And in the dialog box:

- in Files of Type select Scada Connection
- press the **Find** button

🌑 Open				×
		2		
Look in:	1.dwg	~	🎯 🤌 📂 🖽 🗸	
=1	Name	^	Date modified	Туре
		No items match your s	search.	
Quick access				
Desktop				
- comop				
<b>—</b>				
Libraries				
This PC				
<b></b>				
Network	<			>
	File name:		~	Open
	Files of type:	Scada connection(*.con)	$\sim$	Cancel
Συντελε	εστής 1.0	Οροφος 1 Find		
			2	

In the Search File window that opens, you select the link and open its drawing that includes two views, a cross-section and the detailed table of the elements of the link.



#### Wooden



The "Wooden" field includes the commands related to the resolution of wooden sections with the adequacy check, the buckling check and the dimensioning of the connections.

• A prerequisite for sizing is that you have called and executed the corresponding combination file in configuration dialog box.

#### **OBSERVATION:**

The dimensioning process of wooden cross-sections is similar to that of metal cross-sections.

#### 2.1 Cross section control

🕖 Έλεγχος διατομών

to check the adequacy of the wooden sections.

Using the command, the following dialog box appears.

Ονομασία	Διατομη 1	Διατομη 2	Διατομη 3	Διατομη 4	Διατομη 5	Διατομη 6	Διατομη 7	^
Μεταλ.Τεγίδες								
Μεταλ.Μηκίδες								
Μεταλ.Μετωπικοί								
Μεταλ.Αντιαν.Οριζοντια								
Μεταλ.Αντιαν.Κατακόρυφα								
-								
Ξύλινα Υποστυλώματα	200x200							
Ξύλινες Δοκοί	100x100	100x100						
Ξύλινες Κεφαλοδοκοί	140x140							
Ξύλινες Τεγίδες	100x100							
Ξύλινες Μηκίδες	100x100							
Ξύλινοι Μετωπικοί	150x150							
Ξύλινα Αντιαν.Οριζοντια								
Ξύλινα Αντιαν.Κατακόρυφα								
tegides	100x100							
columns	200x200							
								$\sim$
<							>	•

The first column is the layers that exist in this study and in the following columns are the types of wooden sections that exist in these layers.

With the "Dimensioning" option and after you have selected a layer, the dimensioning (the check of the cross sections) of the specific layer is done, the program "colors" the specific layer green if all the elements involved in it do not fail and red if some of them fail.

		Διαστασ	ιολόγηση Ξύ	ολινων (Laye	r)			×
Ονομασία	Διατομη 1	Διατομη 2	Διατομη 3	Διατομη 4	Διατομη 5	Διατομη 6	Διατομη 7	^
Μεταλ.Τεγίδες								
Μεταλ.Μηκίδες								
Μεταλ.Μετωπικοί								
Μεταλ.Αντιαν.Οριζοντια								
Μεταλ.Αντιαν.Κατακόρυφα								
-								
Ξύλινα Υποστυλώματα	200x200							
Ξύλινες Δοκοί	100x100	100x100						
Ξύλινες Κεφαλοδοκοί	140x140							1
Ξύλινες Τεγίδες	100x100							
Ξύλινες Μηκίδες	100x100							
Ξύλινοι Μετωπικοί	150x150							
Ξύλινα Αντιαν.Οριζοντια								
Ξύλινα Αντιαν.Κατακόρυφα								
tegides	100x100							
columns	200x200							
								$\checkmark$
<							>	+
Επεξεργασία	Διαστασιολόγ	ηση	Διαστασιολό	γηση Ολων	]	Cancel	ОК	

Selecting the "Edit" button will display the following dialog box:

					Διαστ	ασιολόγ	γηση Ξύ	ολινων (	Layer)								×
Layer: Ξύλινα Υποστυλώματα ΙΚΑΝΟΠΟΙΟΥΝΤΑΙ ΟΙ ΕΛΕΓΧΟΙ 🗌 Προσαύξηση λόγω Ικανοτικού Ελέγχου																	
Διαφορετικέ	ές Διατομ	ές 20	0x200					$\sim$				ΕΠΙΛ	огн е		2N		
Περιγραφή	Μέλος	Συνδ.	Ν	Vy	Vz	Mx	Му	Mz	N IXO	Auto	N	м	v	Мх	M-N	M-V	M-V-N
Max N	327	1	33.84	0.98	-0.31	0.04	-0.49	0.47		<b>•</b>				$\Box$			
Min N	371	66	-12.44	-0.50	2.23	-0.00	-1.28	0.46		<b>•</b>							
Max QY	218	21	27.81	4.11	1.03	-0.11	0.44	-0.14		V							
Min QY	10	33	14.26	-6.36	0.39	-0.30	-0.13	-0.45		<b>V</b>							
Max QZ	308	65	26.13	-0.02	3.67	-0.01	0.16	0.81		<b>V</b>							
Min QZ	328	59	26.88	1.52	-3.58	0.08	-0.17	0.46		<b>V</b>							
Max MX	210	47	17.52	2.86	2.21	0.59	-0.56	1.11		<b>V</b>							
Min MX	10	65	18.10	-5.58	1.42	-0.55	-0.30	0.23		<b>V</b>							
Max MY	371	60	17.27	0.63	-2.23	0.03	1.98	-0.74		<b>V</b>							
Min MY	371	65	-12.06	-0.49	2.23	0.00	-2.04	0.63		<b>V</b>							
Max MZ	31	23	18.78	-3.04	-0.95	0.00	0.64	6.35		<b>V</b>							
Min MZ	1	21	19.32	2.84	0.93	0.06	-0.80	-6.41		V							
Χρήστης			0	0	0	0	0	0	<b>V</b>								
Για όλα τα μέλη που ανήκουν σε αυτό το GROUP																	
ОК		Car	icel	Δια	ιστασιολόγ	ηση Layer		Διερ	εύνηση Lay	er			1	Αποτελ	έσματ	τα Τεύ	χους

#### **OBSERVATION**

The detailed procedure followed for the dimensioning of a layer is described in the corresponding paragraph of the metallic sections (See Iron>> Iron Sizing> Cross-sectional Check)

#### 2.2 Bending control



This mandate is used to control the members. That is, checks are performed for each member belonging to the specified layer:

#### **Limit State of Failure**

- Check for bending (lateral) buckling due to axial compressive force
- Torsional buckling check due to bending moment.
- Check for torsional bending due to the simultaneous presence of axial compressive force and bending moment.

#### **Limit State of Functionality**

- Member deformation control
- Edge (node) movement control
- A prerequisite for sizing is that you called and executed the corresponding combination file in the configuration dialog box

Using the command, the following dialog box appears.

Διαστασιο	λόγηση Μελώ	v ×
Layer	Ξύλινες Δοκοί	~
Μέλος	481 100x100	~ Παράμετροι
Ομάδα	Докоі	~
Eφ	αρμογή σε ολα τ	το μέλη του Layer
Ελεγχα	ος με το Min , Μα	αχ όλων των συνδυασμών
Ελεγχος	Layer	3
Διει	ρεύνηση Layer /	Λυγισμός
Διερεύν	νηση Layer Λειτ	ουργικότητα
Τεύχος La	ayer Λυγισμός	Τεύχος Λειτουργικότητα
	ОК	Cancel

The check is done per layer. So first select from the list

Δια	αστασιολόγηση Μελών	×
Layer	Ξύλινα Υποστυλώματα	~
Μέλος	Συνδετήριοι Δοκοί Πέδιλα Μεταλλικα Υπ/τα	^
Ομάδα	Μεταλλικές Δοκοί Πλέγμα Επιφάνειας	
Εφα	Μαθηματικό Μοντέλο Μαθηματικό Επιφανειακό Πλάτικα 20	
Ελεγχος	Πλέγμα 3D Πλέγμα 2D Πλάκες-Τομές	
Διερ	Μεταλ.Υποστυλώματα	
Διερεύν	Μεταλ.Δοκοί Μεταλ.Κεφαλοδοκοί	
Τεύχος La	Μεταλ.Τεγίδες Μεταλ.Μηκίδες	
	Μεταλ.Μετωπικοί Μεταλ.Αντιαν.Οριζοντια	
	Μεταλ.Αντιαν.Κατακόρυφα	
	Ξύλινα Υποστυλώματα	
	Ξύλινες Δοκοί	
	=υλινες Κεφαλοδοκοι	
	Ξυλινες Τεγίδες Ξύλινες Μακίδες	
	Ξύλινοι Μετωπικοί	
	Ξύλινα Αντιαν.Οριζοντια	
	Ξύλινα Αντιαν.Κατακόρυφα	
	tegides	
	columns	$\sim$

the layer (e.g. Wooden Lodges) you want to dimension.

By selecting the layer, all the members of this layer and their cross-section are displayed in the "Member" list.

Δια	αστασιολόγ	ηση	Μελών 🗙
Layer	Ξύλινα Υποστυλ	ώματο	• •
Μέλος	1 200x200	~	Παράμετροι
Ομάδα	1 200x200 3 200x200 4 200x200	^	×
Εφα	5 200x200 6 200x200		тои Layer
Ελεγχος	7 200x200 8 200x200 9 200x200		
Διερ	10 200x200 11 200x200		ις
Διερεύν	13 200x200 14 200x200		τητα
Τεύχος La	15 200x200		ς Λειτουργικότητα
	17 200x200 18 200x200		Cancel
1	19 200x200		

The first step in dimensioning the layer is to define the dimensioning parameters. Because it is possible that for some of the layer members you may want to define different parameters, it is possible that within the same layer you can define different groups of parameters to which the layer members belong. The program has two default parameter groups.

If you want to have the same parameters for all members of the layer, you set them once with the procedure we will see below, keep the default name "Beams" and press the "Apply to all members of the layer" button. The checks will be done with the same parameters for all members of the layer.

In the different case that you want to set different parameters for some of members of the layer, you will set another set of parameters using the procedure explained below. But first we will look at how to define the parameters.

Διαστασιολό	γηση Μέλους
Ονομασία Ομάδας Στύλοι	Δημιουργία Νέας Ομάδας
Συντελεστής Ασφάλειας 1 ✓ Καμπτικός Λυγισμός Διεύθυνση Υ Μήκος Μέλους Πραγματικό Ξυντελεστής	Οριο Εντατικών 0.1 Διεύθυνση Ζ Μήκος Μέλους Πραγματικό 3 Συντελεστής
Μήκη Λυγισμού	Μήκη Λυγισμού
<ul> <li>Πλευρικός Λυγισμός</li> <li>Δέσμευση Ακρων</li> <li>φόρτιση Μέλους</li> <li>Επίπεδο</li> </ul>	<ul> <li>✓ Ελεγχος Λειτουργικότητας</li> <li>✓ Ορια παραμορφόσεων Μέλους</li> <li>Υ 200 Z 200</li> <li>✓ Ορια μετακινήσεων κόμβου</li> <li>χ 150 Z 150</li> </ul>
Στρεπτοκαμητικός Λυγισμός	OK Cancel

Selecting the "Parameters" button will display the following dialog box:

The "Group Name" field contains the name of the parameter group. If you want to create your own group, enter a new name and press the "Create New Group" button.

In the "Safety factor" field you can set the threshold against which the program checks the ratio of the design value (the intensive value) to the corresponding strength of the member. The default value is 1.

In the field "Intensity Limit" there is the limit of the intensities below which the program does not take into account the intensities.

The rest of the dialog box is divided into three parts, each of which deals with the parameters of the Flexural Bending, Lateral Bending and Functionality Checks.

In the Flexural Bending section you first define whether you want to check the flexural bending by ticking the corresponding option. Then you define the length of the member and the buckling length in both Y and Z directions respectively.

#### OBSERVATION

In earlier versions of SCADA Pro and prior to the creation of the



command, the user was prompted to set the member length and the buckling length in both the Y and Z directions respectively, following the procedure below:

#### In "Length of Membership":

- if you select "*Actual*" you must enter in the field the actual length of the member in m.
- if you select "*Coefficient*" you must enter a coefficient by which the different lengths of the members belonging to this parameter group will be multiplied.

If you want the program to take the actual lengths of the members into account when checking the bending bend, select "Coefficient" with a value of 1.

If you have some members with different or equal lengths that are laterally secured at the same distances (e.g. at 1/3), then you give the value 0.33 and of course create a separate parameter group to which these members belong.

In the new versions of SCADA Pro the definition of the bending length is done through the command "**Consolidate Members**" (see the section Sizing - General) and no action is required in this field. Having therefore followed the procedure of Member Consolidation, in the Parameters field and specifically in the Member Length field, leave as is and proceed with the definition of the remaining parameters.

The next parameter is the member's buckling length which depends on the support conditions of

the nodes of the member ends always within the buckling plane. By pressing the key the following dialog box appears



where you select the icon with the support conditions of the member and the program enters the corresponding coefficient for the buckling length.

#### **OBSERVATION**

The icons are divided into two groups which are described in detail in the corresponding chapter for metallic cross-sections (See Ferrous>>Sizing of Ferrous>Bending Control).

The third set of parameters concerns the parameters of functionality



where you specify whether you want to perform the functionality check, the individual Member Deformation and Node Displacement checks, and the respective upper limits (I/220 and I/150 where I is the length of the element) for these checks.

Finally, check the "Torsion bending" option if you want to do this check.

When the configuration settings are complete, press the "OK" button and return to the previous dialog box

Διαστασιο	λόγηση Μελώ	v	×
Layer	Ξύλινα Υποστι	ιλώματα	$\sim$
Μέλος	1 200x200	~ Пара	истроі
Ομάδα	Στύλοι		$\sim$
Εφ	αρμογή σε ολα τ	ro μέλη του Lay	er
Ελεγχα	ος με τα Min , Ma	αχ όλων των συ	νδυασμών
Ελεγχ	Layer		
Διε	ρεύνηση Layer /	Λυγισμός	
Διερεύ	νηση Layer Λειτ	ουργικότητα	
Τεύχος L	ayer Λυγισμός	Τεύχος Λειτου	ργικότητα
	ОК	Cancel	

By pressing the "Apply to all members of the Layer" button, the program applies the group of parameters you just defined with the default name "Pillars" to all members of the "Wooden Lumberyard" Layer you had selected. Then you press the "Check Layer" button and the program starts the layer execution process for specified "Wooden Lumber Yards" layer.

By activating the option  $\mathbb{Z} E \lambda \epsilon_{YXOC} \mu \epsilon$  to Min, Max  $\delta \lambda \omega v \tau \omega v \sigma u v \delta u \sigma \sigma \mu \omega v$ , the check will be performed taking into account only the maximum and minimum values of the intensities obtained from all combinations, excluding intermediate values, so that the process is completed in significantly shorter times.

#### `Ç´EXAMPLE:

If you would now like to specify another group of parameters to which some of the members of the layer belong, follow the procedure below:

Press the "Parameters" button and open the configuration dialog box again. In the "Group Name" field, enter a name for the new parameter group you are going to create e.g. "L/D\_1" and press the "Create New Group" button. Then you define the parameters based on what was mentioned before and press the "OK" button.

The next step is to define which members from the layer will belong to this group of parameters "Sub\_1".

Upon completion of the testing process for the specific layer the icon next to the buttons "Investigate Layer Bending" and "Investigate Layer Functionality"

Διερεύνηση Layer Λυγισμός Διερεύνηση Layer Λειτουργικότητα

is coloured in a corresponding colour: Red if there is a failure and Green if there is no failure. Double-clicking on this colored icon displays the following dialog box

Μέλος	Διατομη	Καμπτικός	Πλευρικός	Στρεπροκ.	Λειτ.Παραμ	Λειτ.Μετακ	
91	200x200	46/0.35	55/0.10	33/0.54	Δεν Απαιτ.	Δεν Απαιτ.	
193	200x200	46/0.27	55/0.10	33/0.45	Δεν Απαιτ.	Δεν Απαιτ.	
194	200x200	46/0.17	55/0.10	21/0.39	Δεν Απαιτ.	Δεν Απαιτ.	
95	200x200	46/0.13	55/0.09	21/0.32	Δεν Απαιτ.	Δεν Απαιτ.	
196	200x200	46/0.09	55/0.08	21/0.26	Δεν Απαιτ.	Δεν Απαιτ.	
97	200x200	35/0.00	55/0.08	21/0.20	Δεν Απαιτ.	Δεν Απαιτ.	
198	200x200	36/0.00	55/0.07	21/0.14	Δεν Απαιτ.	Δεν Απαιτ.	
99	200x200	38/0.00	55/0.06	21/0.13	Δεν Απαιτ.	Δεν Απαιτ.	
200	200x200	Δεν Απαιτ.	Δεν Απαιτ.	21/0.19	Δεν Απαιτ.	Δεν Απαιτ.	

Μέλος	Διατομη	Καμπτικός	Πλευρικός	Στρεπροκ.	Λειτ.Παραμ	Λειτ.Μετακ	
615	100x100	Δεν Απαιτ.	65/0.93	Δεν Απαιτ.	Δεν Απαιτ.	Δεν Απαιτ.	
616	100×100	Δεν Απαιτ.	55/1.32	Δεν Απαιτ.	Δεν Απαιτ.	Δεν Απαιτ.	
617	100×100	Δεν Απαιτ.	1/1.05	Δεν Απαιτ.	Δεν Απαιτ.	Δεν Απαιτ.	
618	100×100	Δεν Απαιτ.	1/0.91	Δεν Απαιτ.	Δεν Απαιτ.	Δεν Απαιτ.	
619	100×100	Δεν Απαιτ.	1/0.45	Δεν Απαιτ.	Δεν Απαιτ.	Δεν Απαιτ.	
620	100×100	Δεν Απαιτ.	1/0.13	Δεν Απαιτ.	Δεν Απαιτ.	Δεν Απαιτ.	
623	100x100	Δεν Απαιτ.	1/1.51	Δεν Απαιτ.	Δεν Απαιτ.	Δεν Απαιτ.	
624	100×100	Δεν Απαιτ.	1/1.34	Δεν Απαιτ.	Δεν Απαιτ.	Δεν Απαιτ.	

with the summary results of the audit of the members.

In the first column the number of the member, in the second column its cross-section and in the next 5 columns the worst strength ratio and the number of the combination from which this ratio was derived. Green are ratios below the unit and red are ratios above the unit. Where the words 'not required' are shown, this means that the corresponding intensive magnitude was not available or that the axial force was tensile and not compressive.

By selecting the button "Layer Bending" the program displays the summary results of the check in Bending (i.e. for each member the results from the worst combination) while by selecting the button "Investigation Layer Bending" the program displays a complete but very large file with the results of the checks for each member from all combinations. Similar applies to the "Functionality Issue" and "Investigate Layer Functionality" buttons.

The check for the three types of buckling is carried out for each member and for all combinations. However, for each combination, i.e. for each triad N, My and Mz the checks are carried out 4 times based on the following combinations:

- N with min My and min Mz
- N with min My and max Mz
- N with max My and Min Mz
- N with max My and max Mz

That is why both in the results of the issue and in the investigation, two numbers are mentioned in the combination number: The first refers to the number of the combination and the second refers to the number for each of the 4 previous cases.

#### 2.3 Links



The last chapter of dimensioning for wooden structures is the dimensioning of the connections of the structure.

Select the command and the dialog box opens:

πεξεργασία Συνδέσεων	×
	Υ Ονομασία Ορισμός Ομάδων Μελών (Κόμβος)
	Επεξεργασία σύνδεσης (Γεωμετρία/Ελεγχος)
	Διαγραφή
	Αντίγραφο
	Νέα Σύνδεση
	Έξοδος
Γραφική Απεικόνιση	
🗌 Ανά Ομάδα 🔛 Συνολικά	

**EXCEPTION:** Before the first connection is defined the dialog box is empty, then it is filled with the created connections and in addition the possibility has been added to visually display on the vector, the connections that have been defined either by group or in total.



Select the command and in the dialog box that opens, specify a name (the name should be in Latin and there should be no spaces between the words) and select New Connection:

Επεξεργασία Συνδέσεων	×
	Ονομασία Ονομασία τοπ 1 Ορισμός Ομάδων Μελών (Κόμβος) Επεξεργασία σύνδεσης (Γεωμετρία/Ελεγχος) Διαγραφή Αντίγραφο Νέα Σύνδεση
Γραφική Απεικόνιση	

and show the connected ones in sequence.



Right-click to close the option and open the dialog box below:

Ξύλινες Συνδέσεις	×
Ονομα Παράμετροι Συνδεσμολογία Μελών Στοιχεία Σύνδεσης Μέλους 986 V Επεξεργασία 2D/3D Ελεγχος Καταχώρηση Διερεύνηση Αποτελέσματα	
OK Cancel	

The right part of the window shows the connected members with b and h randomly given by the program. Through the command **Linking Members** the designer defines the actual dimensions of the members.

Give the connection a name and select the Membership Link command.

Συ	νδε	σμολογ	ία Μελών						
				Kó	μβος κ	χι Ι	Λέλη (Συνδεσμολογία)		×
0	ι/α	Ονομα	Τύπος Φορά	Προτερ.	Επιπ.	^			
1		986	Συνδεόμενο 💌 0		xy 💌				
2		1158	Συνεχόμενο 💻 1	1	xy 💌				
3		987	Συνδεόμενο 🗾 2		ху 💌	1			
4		470	Κύριο Μέλος 💌 3	3	xy 💌				
5			Ανενεργό 💻 0		xy 💌				
6			Δυευεονό 🔻 በ		vv <b>v</b>	~			_
0\	юµа	470	Ποιότητα C20	~					
b(	mm)	100	h(mm) 200 Fwvia	269.9	0	4			
E	Ξκκει	πρότητα Σ	ύνδεσης Μέλους (mm)		1 24				
	x	0	(i) xi (i) (i)	zi	1	2			
	Z	0	Xi=0 Zi=0		2	1			
	(	ОК	Cancel	View					

In the first field you set the **type** of membership.

Select graphically by left-clicking on the member to be designated as the Master Member (each connection has only one Master Member). The selected member is automatically highlighted in the list on the left.



#### For this example, the Principal Member is 470.



In case there is an associated member (e.g. 1158 of the example) this can be defined either as **Associated** or as **Conjoined** All other members of the association are **Online** 

#### **Definitions:**

- Main member: can be any member of the association
- **Continuous**: a member that is a continuation of the Master member without interruption. It is a single member and cannot have dimensions different from the main member.
- **Connected**: is a member that is connected to other members and may have different dimensions from those it is connected to.

Therefore, you define the press of all members in the same way. The

next step is to set the dimensions of each member. You choose

from what list and set the values of **b** and **h**. **b**= the thickness of the member (dimension perpendicular to the screen) **h**= is the height of the cross-section (dimension at screen level)

				Kó	μβος κα
α/α	Ονομα	Τύπος	Φορά	Προτερ.	Επιπ. ^
1	986	Συνδεόμενο 💌	0		xy 💌
2	1158	Συνεχόμενο 💌	1	1	xy 💌
3	987	Συνδεόμενο 💌	2		xy 💌
4	470	Κύριο Μέλος 💻	3	3	xy 💌
5		Ανενεργό 💌	0		xy 💌
6		Δυευεουό 🔻	n		vv • •
Ονομα	1158	Ποιότητα C20		~	
b(mm)	100	h(mm) 200	Γωνία	90	4
Εκκεν	πρότητα Σ	ύνδεσης Μέλους (mm	ı)		1 2 3
×	0	(i) (i)	(i)		
~		XI.	T	a	1 2
Z		Xi=0			-
	L	21=0			2 1
	ОК	Cancel		View	

Corner: It is the angle of the member with respect to the connection. Angles are defined anticlockwise by C



at	+x
uι	· ^

(right of the link)

C14 C16

C18 C2( C22 C24 C27

C50 D18 D24 D30 D35 D40 D50 D60

D70 GL24h GL28h GL32h GL36h GL24c GL28c GL32c GL36c

Quality: to set the quality of each member, select the member and its quality

#### **ATTENTION:** •

• ATTENTION: The Principal Member and the Continuum cannot have different dimensions. Th are the same element! C40 C45

The View command displays the total link with the lengths of the members



**Wear:** The time of each member is defined according to the plan . Therefore, start by selecting the left member and setting its direction to 0 and continue by defining the direction of the other members of the link.



**Priority:** With the priority you define the Connected Member that "dominates" the connection. This is the "truncation" of a Connected Member that encounters another Connected Member.



In the priority column you set a number only for connected members.

α/α	Ονομα	Τύπος	Φορά	Προτερ.	Επιπ.	^
1	986	Συνδεόμενο 💌	2	1	xy 💌	
2	1158	Συνεχόμενο 💌	3		ху 💌	
3	987	Συνδεόμενο 💌	0	2	ху 💌	
4	470	Κύριο Μέλος 💌	1		ху 💌	
5		Ανενεργό 💌	0		ху 💌	
6		Δυενεονό 🔻	0		vv <b>v</b>	1

Levels:



Connection A is in the XY plane which means that the metal connection plate will be inserted in this plane (vertical).

Connection B is in plane XZ and therefore members 1,2 will be connected with a horizontal metal plate.

Only members belonging to the same level can be connected to each other. Therefore, in connection B, for example, the members of the poles cannot be connected.

#### **OBSERVATIONS:**

- The level of the connection defines the level of bending of the members to be taken into account according to the local axes of each member.
- Therefore, of the 6 intensive quantities (N,Mz,Vy,My,Vz,Mx) of each member, at the connection node, 3 of them, N,Mz,Vy in the xy plane, and N,My,Vz in the xz plane, will be taken into account.



The selection of the correct level of each member based on its local axes is defined in the Levels column.

#### Member Connection Eligibility:

Through the eccentricity of a Connecting Member, the end of a connecting member can moved from the connecting node during eccentricity.

In this way, construction eccentricities are covered.

(i)	Xi (i)	(i)
Xi=0		
	) (i) Xi=0 Zi=0	) (i) xi (i) Xi=0 Zi=0

Select the member and according to the figure define the eccentricities by X and Z.

After completing the Membership Association, select the **Parameters** command to set the general parameters of the association. In the dialog box that opens, set:

31	νικοι παραμετρ	001
Σύνδεσμος Είδος Βλήτρα Υ Ποιότητα S235 Υ Fuk(MPa) 360	Τρόπος τμήσης μελών Βασικό μέλος	Συνδεόμενα μέλη
Ελάσματα Είδος Μεταλλικό ✓ S235 Αριθμός 3 Πάχος Γωνία ινών / άξονα ξυλόπλακας ✓ Πάχος σχισμής ίδιο με το πάχος εί Πάχος σχισμής 20 ✓ Πλευρικές πλάκες ✓ Ουοιόμορφη τοποθέτηση ελασμάτ	20 0 λάσματος	⊢ei⊣
Απόσταση μεταξύ ελασμάτων e1	0 Παράμ	ετροι Κοχλιών ΟΚ Cancel

Σύνδεσμος			
Είδος	Κοχλίες	~	
	Βλήτρα		
Ποιότη	Κοχλίες		
	Καρφιά		
Fuk(MF	a) 300	_	

In the **Connector** field you define the **type** of connector by selecting from the list Bolts or Screws or Nails, the corresponding **Quality** and the value of the **Fuk** breakage limit is automatically updated. Alternatively, the designer can enter his own value for the breakage limit to be taken into account in the checks.

E

In the **Lamellae** field you set the parameters for the lamellae to be used in the connection by choosing between metal and wooden lamellae. In each case you select from the corresponding list the quality of the material, the *number* of plates and their *thickness*.

Ελάσματα	Ελάσματα		
Είδος Μεταλλικό 🗸 S235 🗸	Είδος Ξυλόπλακα 🗸 Finnish birch plyw 🗸		
Αριθμός 3 5235 5275 5355	Αριθμός 3 Finnish birch plywood Finnish softwood plyw OSB/2		
Γωνία ινών / άξονα ξυλόι <sub>S450</sub>	Γωνία ινών / άξονα ξυλόι OSB/3		
Πάχος σχισμής ίδιο με το πάχος ελάσματος	OSB/4 ΟSB/4 Πάχος σχισμής ίδιο με Particleboard P4 Particleboard P5		
Πάχος σχισμής 20	Πάχος σχισμής		
Πλευρικές πλάκες	Πλευρικές πλάκες		
🗹 Ομοιόμορφη τοποθέτηση ελασμάτων	🗹 Ομοιόμορφη τοποθέτηση ελασμάτων		
Απόσταση μεταξύ ελασμάτων e1 0	Απόσταση μεταξύ ελασμάτων e1 0		

 In the case of the Wood Slab, the parameter Fiber Angle/wood slab axis is activated where the user defines the angle that the fibers of the wood slab have in relation to the axis of the main member.

λάσματα					
Είδος	Ξυ	λόπλακα	1 V	Finnish birch	plyw 🗸
Αριθμό	5	3		Πάχος	20
Γωνία ινών / άξονα ξυλόπλακας 0			0		

• In case the *Slit Thickness* is greater than the thickness of the laminate, uncheck the checkbox and set the Slit Thickness.

Αριθμός	3	Πάχος	$\langle$	20
Γωνία ινών	/ àξov	α ξυλόπλακας		0
Πάχος ο	σχισμής	; ίδιο με το πάχι	ος ελά	σματος
Πάχος σχια	σμής	EU	2	

Ελάσματα Εἰδος Ξυλόηλακα ✓ Finnish birch plyw ✓ Αριθμός 3 Πάχος 20 Γωνία ινών / άξονα ξυλόηλακας 0 ✓ Πάχος σχισμής ίδιο με το πάχος ελάσματος Πάχος σχισμής 20 ✓ Πλευριθές πλάκες ✓ Ομοιόμορφη τοποθέτηση ελασμάτων Απόσταση μεταξύ ελασμάτων e1 0	Παράμετροι Κοχλιών ΟΚ Cancel	Checking the <i>Side Plates</i> checkbox activates the insertion of the side plates.
Ελάσματα Είδος Ξυλόηλακα ♥ Finnish birch plyw ♥ Αριθμός 3 Πάχος 20 Γωνία ινών / άξονα ξυλόηλακας 0 ♥ Πάχος σχισμής ίδιο με το πόχος ελάσματος Πάχος σχισμής 20 ♥ Πλευφιές πλάκες ♥ Ομοιόμορφη τοποθέτηση ελασμάτων Απόσταση μεταξύ ελασμάτων e1 0		Otherwise there are only the intermediate plates.

🗸 Ομοιόμορφη τοποθέτηση ελασμάτων		
Απόσταση μεταξύ ελασμάτων e1 0		
Ομοιόμορφη τοποθέτηση ελασμάτω	v	
Απόσταση μεταξύ ελασμάτων e1	35	

The placement of the laminates within the cross-section of the wooden member (by its thickness) can be *uniform*, i.e. dividing the cross-section into equal parts (active checkbox) or not.



In the second case turn off the check and set the distance ei as defined in the figure.

• Connections with side plates require evenly spaced plates.



In the **Member segmentation mode** field you select the mode of segmentation of the member cross-sections.



The first 2 options involve trimming the Master member with the linked member having priority 1:

- the Main member is cut in half with the connected member
- the Principal Member shall prevail over the Associate Member.



The other 2 options involve trimming the connected members between priority based:

- the connected members shall be cut in half
- the linked member with the highest priority prevails.

Παράμετροι Κοχλιών to set additional parame	eters related to bolts in a metal plate.
Γενικοί Παράμετροι Κοχλιών 🛛 🗙	
<ul> <li>Λοξή Διάταξη στόν Κορμό</li> <li>Κοχλίες βυθισμένης κεφαλής</li> <li>Διέρχονται απο σπείρωμα Υπερμεγέθης</li> <li>Κατηγορίες Συνδέσεων Διάτμησης</li> </ul>	
Τιμές του ks (Πίνακας 3.6) Συντελεστής Ολίσθισης μ για προενταταμένους κοχλίες (Πίνακας 3.7)	
Επιψήκης       e3(mm)       e3(mm)       e4(mm)       d0(mm)	
OK Cancel	

Member Connection/Edit De	etails	ργασία
	Ξύλινες Συνδέσεις	×
Ονομα νεα συνδεση Παράμετροι Συνδεσμολογία Μελών Στοιχεία Σύνδεσης Μέλους 470 · Επεξεργασία 2D/3D Ελεγχος Κατοχώρηση Διερεύνηση Αποτελέσματα		
ОК Сапсеі		

After linking the members and defining the parameters, the next step is to Edit the link. You select the member, starting from the *Main*, or graphically, by pointing to it in the image on the left,

	470	~
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	987	
	470	

either from the list

and the Edit command.

Λεπτομέρειες σύνδεσης Μέλους													
								Μέλος 470	Σύνδεσμος	Κοχλίες	Απόδοση σε όλα τα μέλη	ОК	Cancel
Στοιχεί Διάμετ Κενό γ βλήτρα Ανοχή Διάταξη Ορθογο Γραμμ Στήλεα [] Ζιι Γωνία 1 Παρά)	α Συνδέσμω (poς poδέλα la τάπα εκα ου Οπής η Συνδέσμω ονική (mm) ές 0 ξ 0 κ-Ζακ Γοποθέτηση Μηλη στις m φ1 0	v (mm) M12    [ ς μέρωθεν Απόσταση Απόσταση ς εες φ2 0		>	α3,t Δια 1 2 3 4 5 6		•		zυνοσιμής	κυχίως,			Canter
ala	Διστίμισ	Λοιθικός	Funda	^	7								
α/α 1 2 3	Ακτινα           0.00           0.00           0.00	Αριθμος           0           0           0           0	0.00 0.00	•	8 9 10		~						
Απόσταση ακροίου κοχλία a3t 0 ? Εκκεντρότητα (mm) 0 Απόσταση άκρου ελάσματος από το κέντρο του συνδέσμου (mm) Παράληληλα στις ίνες 0 Κάθετα στις 0													

Στοιχεία Συνδέσμων (mm)         Διάμετρος       M12          Διάμετρος ροδέλας       14         Κενό για τάπα εκατέρωθεν       0         βλήτρου       1	<ul> <li>Select the diameter of the screw (or set the diameter of the screw)</li> <li>Set diameter for the washer (only in case of screw)</li> <li>Set gap for plug (only in case of a screw)</li> <li>Give the tolerance of the hole in mm.</li> </ul>				
	Λεπτομέρειες σύνδεσης Μέλους	×			
	Μέλος 470 Σύνδεσμος Κοχλίες	Απόδοση σε όλα τα μέλη ΟΚ Cancel			
Στοιχεία Συνδέσμων (mm)         Διάμετρος       M12       12         Διάμετρος ροδέλας       14         Κονό για τάπα εκατέρωθεν       0         Ανοχή Οπής       1         Διάμτος ροδέλας       14         Κονό για τάπα εκατέρωθεν       0         Ανοχή Οπής       1         Διάμτος γολόσμων       0         Ορθογωνική (mm)       Διάταξη Σινιδέσμων         Ορθογωνική (mm)       Διάταση 55         Στήλες       4         Απόσταση 100       2         Ζικ-Ζακ       Γωνία Τοποθέτησης         Γωνία Τοποθέτησης       4         Γαράλληλη στις ινες       3         φ1       φ2         Κυκλική (mm)       6         Διο       0.00         2       0.00       0.00         2       0.00       0.00         2       0.00       0.00         2       0.00       0.00         2       0.00       0.00         2       0.00       0.00         2       0.00       0.00         2       0.00       0.00         2       0.00       0.00         2       0.00 <t< td=""><td></td><td></td></t<>					

In the Liaison Order field

• With the *rectangular arrangement* active:

You define the number of Lines (parallel to the wood fibres) and Poles (perpendicular to the wood fibres) and the corresponding distances. The shape on the right is updated showing the links as well as the outline of the laminate.





In the Liaison Order field

• With the *Circular Arrangement* active:

Complete the table by defining for each link circle the radius and the number of links. The angle rotates the corresponding circle from +x anticlockwise.

At the bottom of the remaining window you can choose to :

• Define the distance a3t (the distance from the end of the member the nearest link, parallel to the fibres of the member)







By pressing **?** the centre of the fastening is automatically moved to the end of the member.



It carries the connectivity during eccentricity, perpendicular to the fibers of the member.

It modifies the distances perpendicular and parallel to the fibres of the two ends of the laminate from the centre of the ligament.



Aπόδοση σε όλα τα μέλη by selecting this command, all the above member connection details are also attributed to the other members of the connection. OK to save the options and close the window.

You can create complex links with a large number of members and display them in 3D with the 2D/3D option.

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Παράμετροι Συνδεσμολογία Μελών
Στοιχεία Σύνδεσης Μέλους
990 Υ Επεξεργασία 2D/3D
Ελεγχος Καταχώρηση
Διερεύνηση Αποτελέσματα
Kαταχώρηση · saves the connection
Eλεγχος : performs the required checks according to EC5 (for wood) EC3 (for steel)
: displays the results of the checks in detail
Aποτελέσματα : displays the results of the checks in tabular form

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