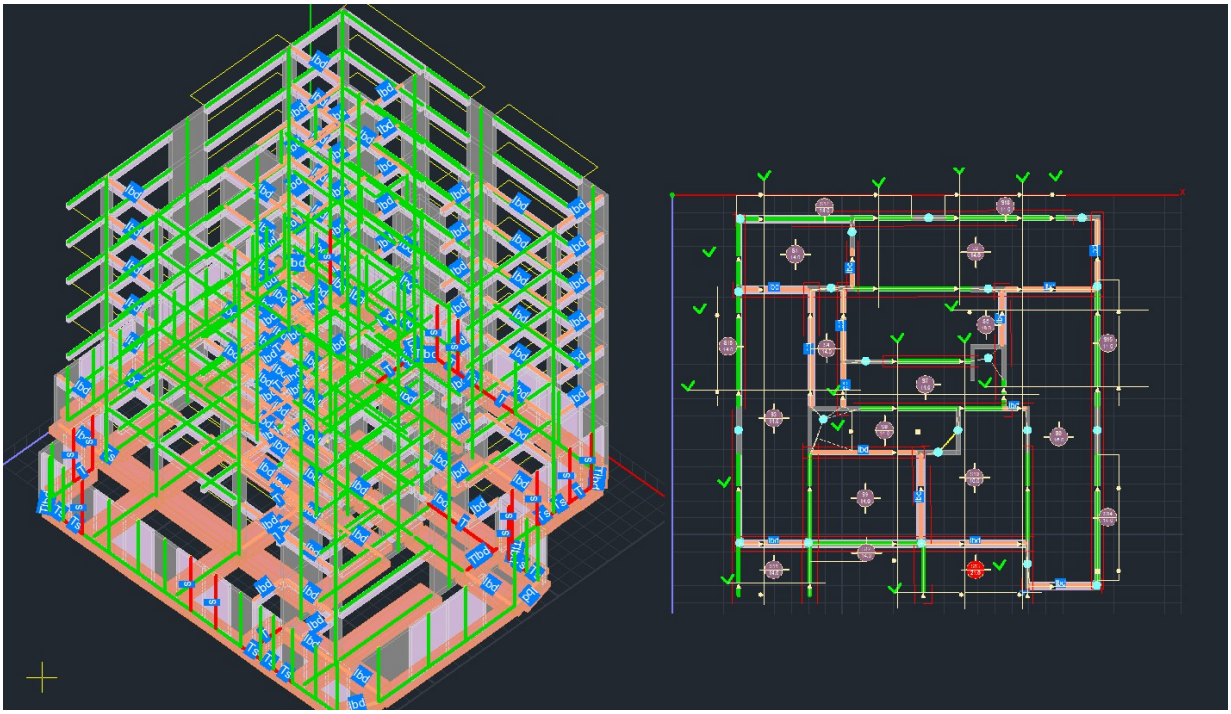
SCADA Pro 25tm
Structural Analysis & Design

User Manual

10B.DIMENSIONING

Part 2/4: Concrete



ACE HELLAS
INTEGRATED SOLUTIONS

CONTENTS

Chapter 10: Dimensioning - Concrete (part 2/4)

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

- Scenarios - GENERAL
- Beams
- Equitable Control
- Pillars
- Sandals
- Slabs-Mesh

  BETTON
- Iron
- Wooden
- Masonry
- Charts GENERAL

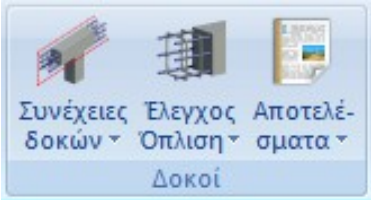
⚠️ After the completion of the model, the input of the loads, the execution of the analysis and the creation of the combinations, the "Dimensioning" of the structural elements of the design follows, where the adequacy check is performed, based on the regulation selected in the "Dimensioning scenario"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

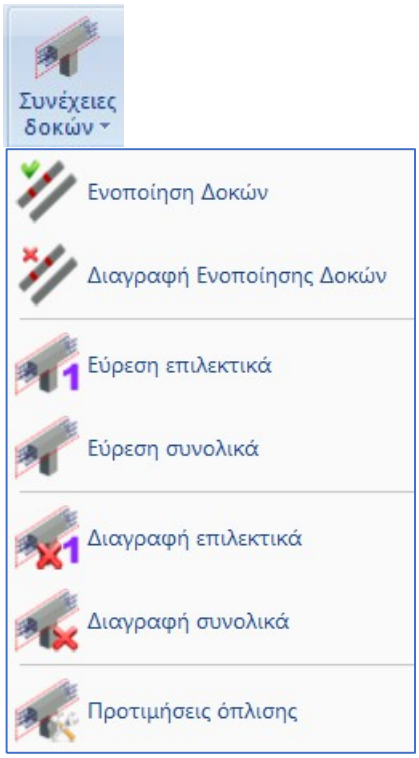
- Part 1/4 GENERAL REQUIREMENTS FOR ALL MATERIALS
- **Part 2/4 COMMANDS FOR BETTING**
- Part 3/4 COMMANDMENTS FOR RAIL AND WOOD
- Part 4/4 REQUIREMENTS FOR WALLING

1. Beams

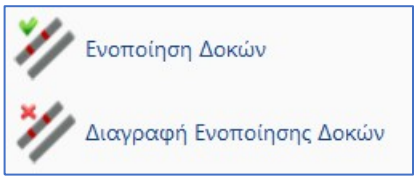


The "Beams" field contains the commands for finding Beam Continuity, Dimensioning, Reinforcement Check and Beam Continuity Results.

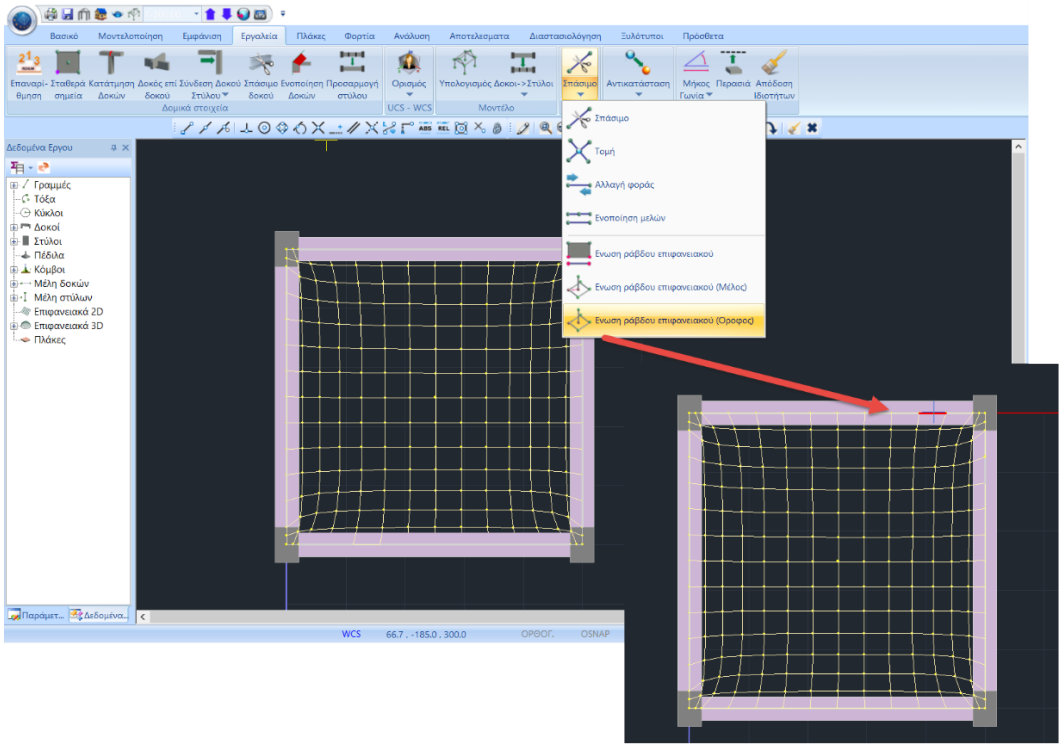
1.1 Beam continuations



1.1.1 Beam Consolidation/Registration of Beam Consolidation



In cases where the beams enclose surface elements, there is a need to break the beam members in order to ensure the necessary connections between the linear and surface members.



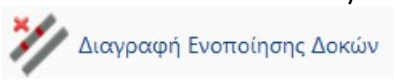
Consequently, breaking the beam into small sections creates the need for Consolidation in order for it to be sized as a single member.

This is achieved by using the Beam Consolidation command. 

Select the command and then:

- Either you show the sections of the beam one by one.
- Either you show the first member and then with the windowed option, all the others.

Continue with Continuity Finding and Arming Check.

If for some reason you wish to delete a previous consolidation, select 

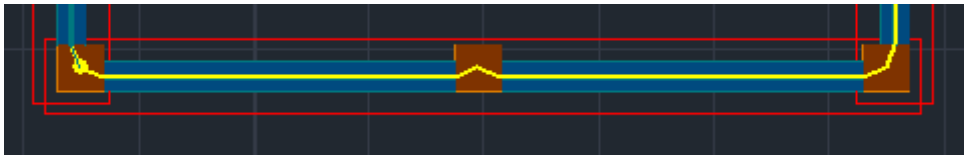
and then the first part of the consolidated beam. Right-click to complete.

OBSERVATION:

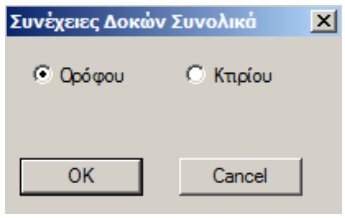
⚠ The maximum number of beam segments that can be consolidated in one consolidation is 60.

1.1.2 Find Selective/ Find Total

Find Selectively: to selectively define the beams that will participate in a pass. You select the beams with the left key and after you have completed the selection by pressing the right key, the program draws a red outline.



Find Total: to automatically determine the continuity of the beams of the floor or the whole building. After selecting the command the following dialog box appears:

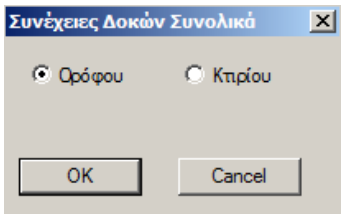


where you choose the automatic definition of either the floor or the whole building.
The program automatically creates all the beam passes.

1.1.3 Deletion Selective/ Total deletion

Delete Selectively: to selectively delete beam sequences that have already been created. Select the command and then point with the mouse to the beams from which you want to delete the continuation. Right-click to complete the command and continuation is deleted.

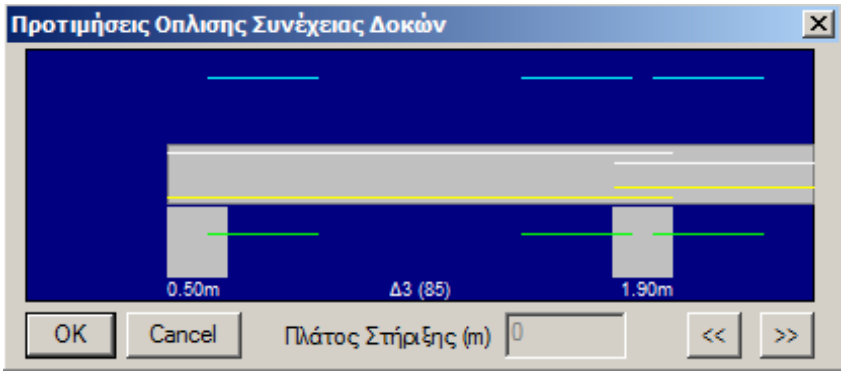
Delete Overall: to delete the continuity of the beams of a level or the whole building in



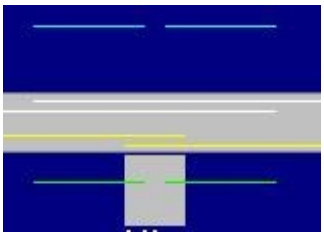
In the dialog box that appears, select the appropriate option.

1.1.4 Arming preferences

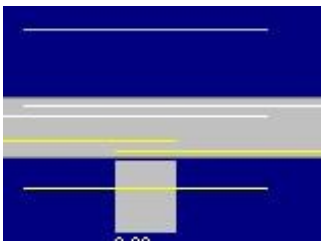
Bracing preferences: to determine whether one or two bars are to be placed as common support reinforcement in the beams, if you wish to take into account the bars both openings in the support reinforcement, as well as the anchorage length by varying, if you wish, the support width of the beam.
By selecting the command, and after pointing to a beam, the dialog box appears:



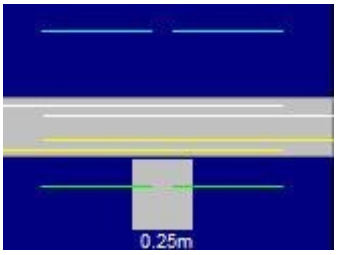
EXAMPLES:



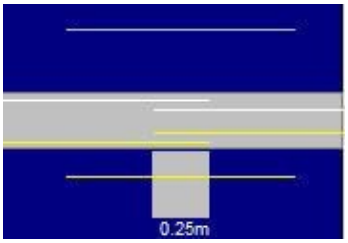
In the common support the irons to be placed, based on the above option, are two separate irons.



By left-clicking on the bars, their status changes and they become a single line which means that the common bars that will be placed will be single.



Here the bars coming from the openings on either side enter the respective openings both above and below the beam.
This means that when calculating the bars placed in the support, the program will take into account the bars from both spans (both up and down in the support).

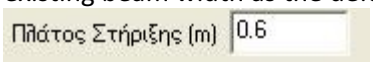


To take into account the bars from only one opening, left-click on the yellow and white lines representing the reinforcement of the opening below and above respectively, so as to obtain the shape shown in the side image

In order to change the bar of the left opening up and down, you have to use the arrow  to switch to that opening.

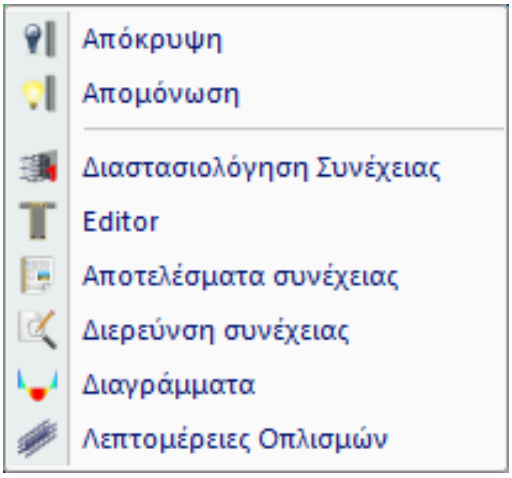
OBSERVATION:
The change must always be made for both the bottom support and top support irons.

Finally, in the "Support Width" field  you can enter a different support width in order to increase the anchorage length of the irons. This change is made after selecting the width you want to change while activating the typing field with the existing beam width as the default value.



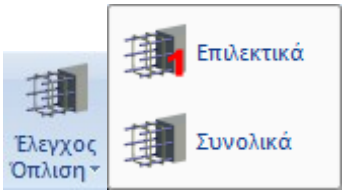
1.1.5 Right key operation in Dimensioning

The right button function over a building block has now been activated. By moving the mouse pointer over a structural element e.g. a beam and pressing the right key, the following menu of options appears:



where you select the command you want to run instead of using the command from the sections in the module.

1.2 Armament Control

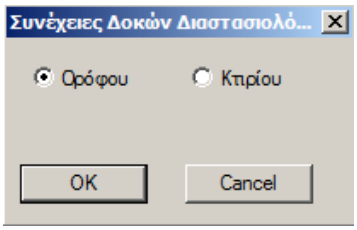


1.2.1 Selectively

Selectively to selectively size a beam or a beam continuum. Select the command and then point the mouse at the continuum or continuums of beams you want to dimension.

1.2.2 Overall

Overall to dimension the beams in total per level or the whole building. Select the command and in the dialog box that appears, select Floor or Building sizing respectively:



1.2.2.1 Miscommunications and Symbols

The beams shall be coloured in the corresponding colour indicating the type of failure and the initials identifying the type of failure shall be marked on their axis.

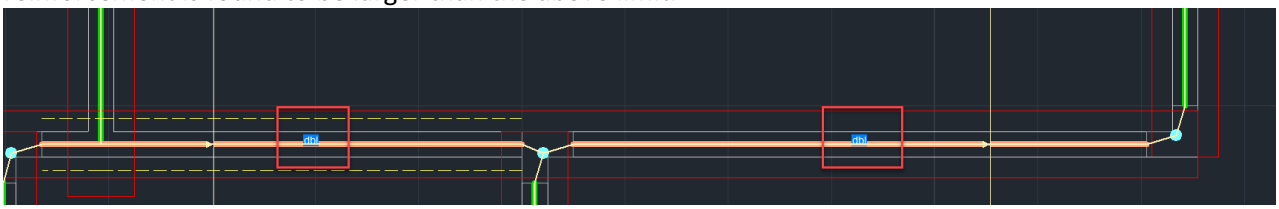
Initials indicating the type of failure also appear on the beam:

BEAMS - FASTENERS - PEDESTALS			
CAMPSY			
K	RED	**ρ(4%)**	MAXIMUM PERCENTAGE OF ARMATURE 4%
ρ	RED	**pmax**	ARMAGH BY REGION
	RED	**AS**	DOES NOT CALCULATE AS1 AND AS2 PER REGION
	RED	**sep**	Shep PEDILODOKOI
	RED	**shtr**	shtr PEDILODOKOI

	RED	**N**	NEW AXIAL CONTROL START - END
	KERAMID	**lbd**	lbd IN THE ARK
dbl	KERAMID	**dbl**	MAXIMUM CALIBRE OF BENDING IRONS
ADVERTISEMENT			
	KERAMID	**VRd2**	VSD>VRD2 OUT
	KERAMID	**(V-T)'2**	SUM OF SQUARED FRACTIONS > 1 CM
	KERAMID	**Vrdmax**	VSD>VRd,max EC2 BY REGION
	KERAMID	**(V-T)**	TRD/TRDMAX+ VSD/VRDMAX>1 EC
	KERAMID	**asw**	asw>aswmax PER REGION
	KERAMID	**Δ**	STEEL JOINTS - CONCRETE JOINTS OLD REGULATION
	KERAMID	**Δ**	TORSION CONTROL OLD REGULATION
REGISTRATION			
	KERAMID	**w**	BEGINNING - MIDDLE - END
ΟΠΛΛΙSMΟΙ			
	KERAMID	**Σ**	CONNECTORS PLACED BY REGION
	KERAMID	**Σ**	BISECTORS PLACED BY REGION
	RED	**Φ**	BENDING REINFORCEMENT MOUNTED

1.2.2.2 Avoiding synergy failure in the beams

The new version of the program incorporated the control of the maximum diameter of the main bending reinforcement of the beams according to paragraph 5.6.2.2.2(A) of EC8-1. A corresponding visual indication "dbl" is displayed when the diameter of the installed reinforcement is found to be larger than the above limit.



1.2.2.3 How to calculate the anchorage lengths lbd

The method of calculating the lbd anchorage lengths for the different regulations is summarised below:

The total lbd is calculated and this is divided into l1 and l2. The l1 is the straight anchor length and l2 is the one that turns inside the node.

OBSERVATIONS:

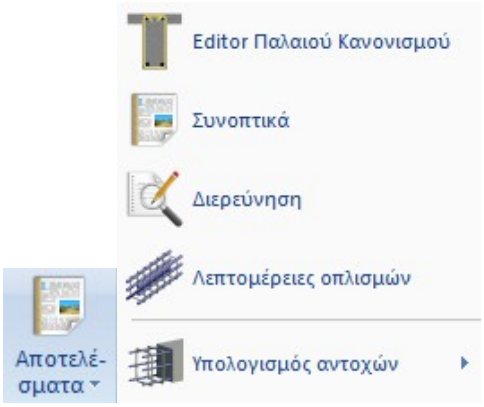
- The ECOS prescribes a minimum WIDE anchorage length (l1) which it calls lb,min.
- EC2 does not provide for a minimum straight anchorage length, but provides for a minimum TOTAL anchorage length (l1+l2) which it also calls lb,min.
- EC8 in paragraph 5.6.2, among other things, provides that ONLY for DCH the anchorage length should be only straight (extra long).

On the basis of the above, the following conclusions can be drawn

- For the EAK-EKOS scenario the minimum linear anchor length is exactly as specified and if it is greater than the width of the support minus the overlap, an error message is displayed
- For the EC2 w/o EC8 scenario as well as for all ECs with DCL and DCM flexibility classes, it does not obey a minimum straight anchorage length of lb, min but the total length lbd is checked against lb, min according to 8.4.4 of EC2. So no error message will ever be displayed here because in case the anchor length is greater than the width of the support minus the overlap, the iron will reach up to the cheek and then turn at the node.
- For EC with high DCH plasticity class, obey the minimum straight anchorage length according to EC8 5.6.2 (as in ECOS). The error message shall be displayed accordingly as in case 1 of ECOS.
- In addition, the relevance regions are now taken into account for calculation of lb. The upper reinforcement is area II while the lower one is area I.

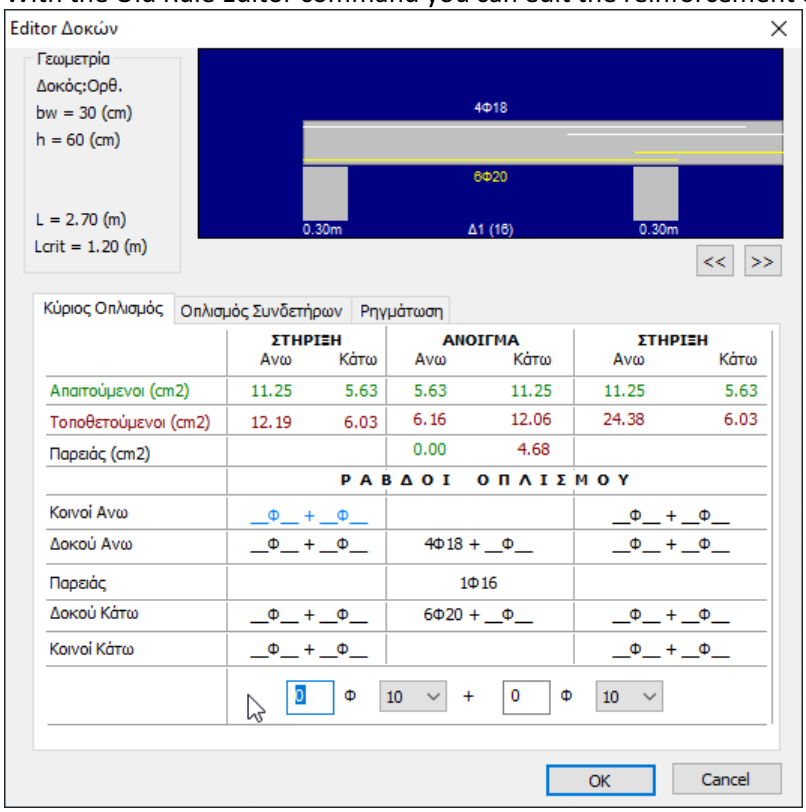
1.3 Results

This command includes the commands for processing and displaying the results of the dimensioning of the columns and walls.



1.3.1 Editor Old Rules of Procedure

This is a command that only applies to sizing with Old Regulations, while for all other regulations it has been completely replaced by the Armament Details command.
With the Old Rule Editor command you can edit the reinforcement of the continuity of the beam.



Select the command and then the member of a beam. The editor opens where you can left click on the field where the bars are listed, at the bottom the field opens where you can enter the number of bars and the desired diameter.

With the arrows  you move from one beam to another within the same continuum and in the same way you process the reinforcements of all the beams of the continuum.

Select OK to save the changes or Cancel to close the window without saving the changes you made.

1.3.2 In summary

Summarize to display the summary results of the dimensioning of a beam continuum. Select the command and then point with the mouse to the continuum whose results you want to see depending on the regulation you have selected for sizing.

E.g. *Old Regulation results:*

Σελίδα : 1

Δ1 Δ0

ΧΑΡΑΚΤΗΡΙΣΤΙΚΑ ΔΟΚΟΥ

Δοκός	Μέλος	Κόμβος αρχής	Κόμβος τέλους	Μήκος L(m)	Είδος	Πλάτος b_w(m)	Ύψος h(m)	Πάχος h_f(m)	Πλάτος b_{eff}(m)
1	16	8	9	2.70	Ορθογων	0.30	0.60		

Σκυροδεμα	B160	Κυριος Οπλισμος	STI	Συνδετηρες	STI	Επικαλυψη c(mm)	25

ΕΛΕΓΧΟΣ ΣΕ ΚΑΜΨΗ

		ΣΤΗΡΙΞΗ ΑΡΧΗΣ		ΑΝΟΙΓΜΑ		ΣΤΗΡΙΞΗ ΤΕΛΟΥΣ	
		Άνω	Κάτω	Άνω	Κάτω	Άνω	Κάτω
Αξονική Υπολογισμού	N (t)						
Ροπή Υπολογισμού	M (tm)	0.55	-0.37	0.03	-0.23	0.82	-0.10
Τάσεις Σκυροδέματος	SB(Kg/cm2)	11.87	9.69	2.55	6.90	14.78	4.86
Υπολογισμός Διατμητικού Οπλισμού	A_s (cm²)	0.58	0.40	0.04	0.29	0.89	0.10
Ποσοστό Οπλισμού	μ(%)	0.63	0.31	0.31	0.63	0.63	0.31
Απαίτηση Διατμητικού Οπλισμού	A_s (cm²)	11.25	5.63	5.63	11.25	11.25	5.63

ΕΛΕΓΧΟΣ ΣΕ ΔΙΑΤΜΗΣΗ

		ΣΤΗΡΙΞΗ ΑΡΧΗΣ	ΑΝΟΙΓΜΑ	ΣΤΗΡΙΞΗ ΤΕΛΟΥΣ
Τέμνουσα Υπολογισμού	Q.Υπ (t)	0.70		-1.04
Διατμητική Τάση Σκυροδέματος	T(Kg/cm2)	0.44		0.66
Υπολογισμός Συνδετήρων	Φ/cm	1Φ 8/10.00	1Φ 8/10.00	1Φ 8/10.00
Εμβαδον Τεμνουσών (εκτος συνδ)		0.00		0.00
Απαίτηση Διατομητικού Λοξού Οπλισμού	FES(cm²)	0.00		0.00

ΕΛΕΓΧΟΣ ΣΕ ΣΤΡΕΨΗ

Ροπή Υπολογισμού	M (tm)	0.11
Τάση	Tt(Kg/cm²)	0.57
Απαίτηση Διατομητικού Οπλισμού Στρέψης	FEt (cm²)	0.31

ΤΕΛΙΚΟΣ ΟΠΛΙΣΜΟΣ

		ΣΤΗΡΙΞΗ ΑΡΧΗΣ		ΑΝΟΙΓΜΑ		ΣΤΗΡΙΞΗ ΤΕΛΟΥΣ	
		Άνω	Κάτω	Άνω	Κάτω	Άνω	Κάτω
Απαιτ. Διατ.Οπλισμού	A_s (cm²)	11.25	5.63	5.63	11.25	11.25	5.63
Τελική Διατ.Οπλισμού	A_s (cm²)	12.19	6.03	6.16	12.06	24.38	6.03

ΤΟΠΟΘΕΤΟΥΜΕΝΟΣ ΟΠΛΙΣΜΟΣ ΚΑΜΨΗΣ - ΔΙΑΤΜΗΣΗΣ

		ΣΤΗΡΙΞΗ ΑΡΧΗΣ		ΑΝΟΙΓΜΑ		ΣΤΗΡΙΞΗ ΤΕΛΟΥΣ	
		Άνω	Κάτω	Άνω	Κάτω	Άνω	Κάτω
Ράβδοι Οπλισμού (Διαμήκεις))	Φ			4Φ14	6Φ16		
Κοινοί Ράβδοι Στηρίξεων							
Πρόσθ. Λοξά Στηρίξεων	Φ						

Σελίδα : 2

ΧΑΡΑΚΤΗΡΙΣΤΙΚΑ ΔΟΚΟΥ

Δοκός	Μέλος	Κόμβος αρχής	Κόμβος τέλους	Μήκος L(m)	Είδος	Πλάτος b_w(m)	Ύψος h(m)	Πάχος h_f(m)	Πλάτος b_{eff}(m)
0	15	9	10	3.70	Ορθογων	0.30	0.60		

Σκυροδεμα	B160	Κυριος Οπλισμος	STI	Συνδετηρες	STI	Επικαλυψη c(mm)	25

ΕΛΕΓΧΟΣ ΣΕ ΚΑΜΨΗ

		ΣΤΗΡΙΞΗ ΑΡΧΗΣ		ΑΝΟΙΓΜΑ		ΣΤΗΡΙΞΗ ΤΕΛΟΥΣ	
		Άνω	Κάτω	Άνω	Κάτω	Άνω	Κάτω
Αξονική Υπολογισμού	N (t)						
Ροπή Υπολογισμού	M (tm)	1.03	-0.24		-0.73	0.28	-0.75
Τάσεις Σκυροδέματος	SB(Kg/cm2)	16.71	7.62	14.86	12.77	8.31	14.11
Υπολογισμός Διατμητικού Οπλισμού	A_s (cm²)	1.11	0.25		0.95	0.29	0.81
Ποσοστό Οπλισμού	μ(%)	0.63	0.31	0.31	0.63	0.63	0.31
Απαίτηση Διατμητικού Οπλισμού	A_s (cm²)	11.25	5.63	5.63	11.25	11.25	5.63

ΕΛΕΓΧΟΣ ΣΕ ΔΙΑΤΜΗΣΗ

		ΣΤΗΡΙΞΗ ΑΡΧΗΣ	ΑΝΟΙΓΜΑ	ΣΤΗΡΙΞΗ ΤΕΛΟΥΣ
Τέμνουσα Υπολογισμού	Q.Υπ (t)	1.27		-1.04
Διατμητική Τάση Σκυροδέματος	T(Kg/cm2)	0.80		0.66
Υπολογισμός Συνδετήρων	Φ/cm	1Φ 8/10.00	1Φ 8/10.00	1Φ 8/10.00
Εμβαδον Τεμνουσών (εκτος συνδ)		0.00		0.00
Απαίτηση Διατομητικού Λοξού Οπλισμού	FES(cm²)	0.00		0.00

ΕΛΕΓΧΟΣ ΣΕ ΣΤΡΕΨΗ

Ροπή Υπολογισμού	M (tm)	0.06
Τάση	Tt(Kg/cm²)	0.29
Απαίτηση Διατομητικού Οπλισμού Στρέψης	FEt (cm²)	0.16

ΤΕΛΙΚΟΣ ΟΠΛΙΣΜΟΣ

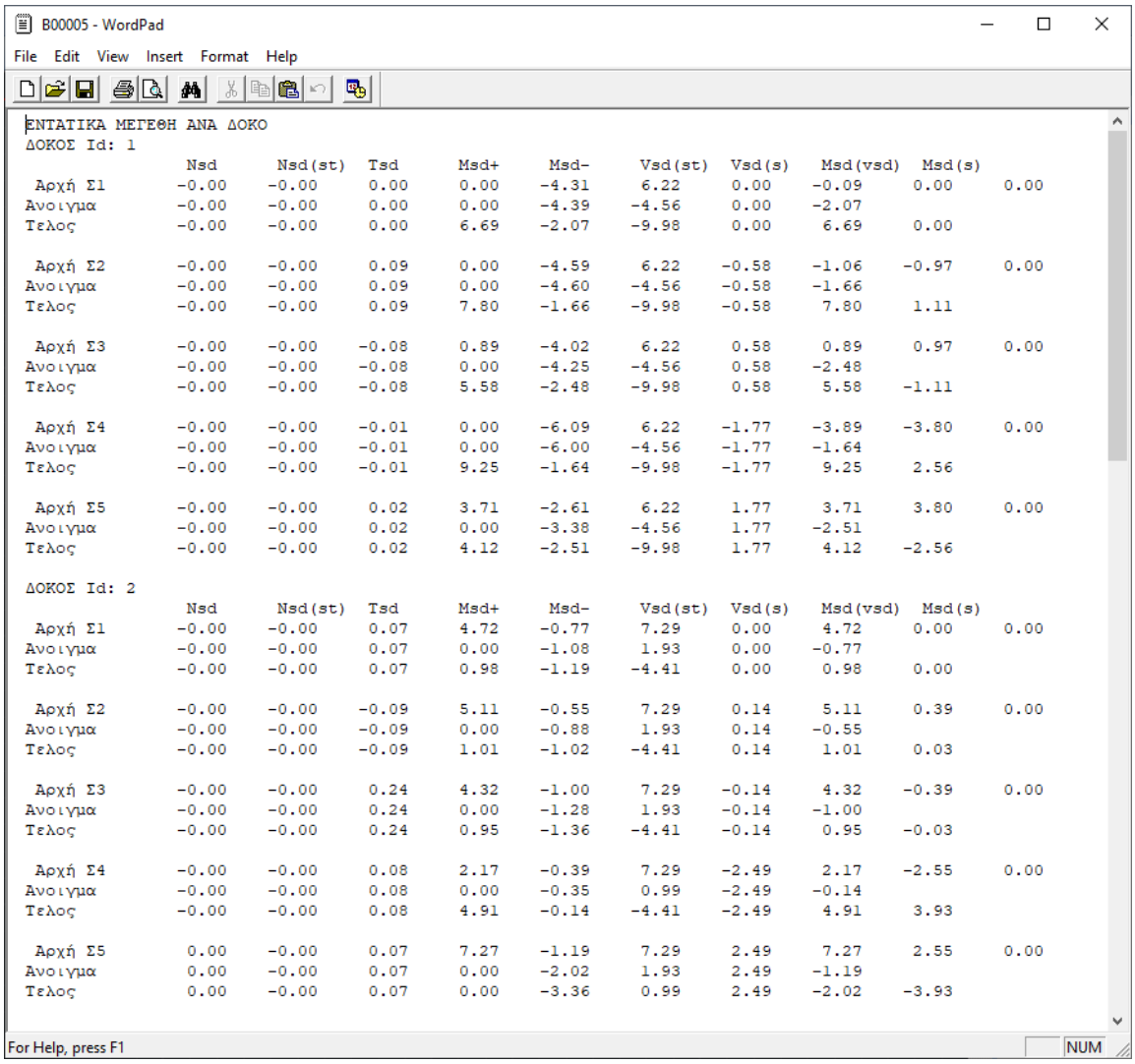
		ΣΤΗΡΙΞΗ ΑΡΧΗΣ		ΑΝΟΙΓΜΑ		ΣΤΗΡΙΞΗ ΤΕΛΟΥΣ	
		Άνω	Κάτω	Άνω	Κάτω	Άνω	Κάτω
Απαιτ. Διατ.Οπλισμού	A_s (cm²)	11.25	5.63	5.63	11.25	11.25	5.63
Τελική Διατ.Οπλισμού	A_s (cm²)	24.38	6.03	6.16	12.06	12.19	6.03

ΤΟΠΟΘΕΤΟΥΜΕΝΟΣ ΟΠΛΙΣΜΟΣ ΚΑΜΨΗΣ - ΔΙΑΤΜΗΣΗΣ

		ΣΤΗΡΙΞΗ ΑΡΧΗΣ		ΑΝΟΙΓΜΑ		ΣΤΗΡΙΞΗ ΤΕΛΟΥΣ	
		Άνω	Κάτω	Άνω	Κάτω	Άνω	Κάτω
Ράβδοι Οπλισμού (Διαμήκεις))	Φ			4Φ14	6Φ16		
Κοινοί Ράβδοι Στηρίξεων							
Πρόσθ. Λοξά Στηρίξεων	Φ						

1.3.3 Investigation

Investigate to display in detail the sizing results of the specific beam. Select the command and then point with the mouse to the continuation of which you want to see the results



B00005 - WordPad

File Edit View Insert Format Help

ΕΝΤΑΤΙΚΑ ΜΕΓΕΘΗ ΑΝΑ ΔΟΚΟ

ΔΟΚΟΣ Id: 1

	Nsd	Nsd(st)	Tsd	Msd+	Msd-	Vsd(st)	Vsd(s)	Msd(vsd)	Msd(s)	
Αρχή Σ1	-0.00	-0.00	0.00	0.00	-4.31	6.22	0.00	-0.09	0.00	0.00
Ανοιγμα	-0.00	-0.00	0.00	0.00	-4.39	-4.56	0.00	-2.07		
Τελος	-0.00	-0.00	0.00	6.69	-2.07	-9.98	0.00	6.69	0.00	
Αρχή Σ2	-0.00	-0.00	0.09	0.00	-4.59	6.22	-0.58	-1.06	-0.97	0.00
Ανοιγμα	-0.00	-0.00	0.09	0.00	-4.60	-4.56	-0.58	-1.66		
Τελος	-0.00	-0.00	0.09	7.80	-1.66	-9.98	-0.58	7.80	1.11	
Αρχή Σ3	-0.00	-0.00	-0.08	0.89	-4.02	6.22	0.58	0.89	0.97	0.00
Ανοιγμα	-0.00	-0.00	-0.08	0.00	-4.25	-4.56	0.58	-2.48		
Τελος	-0.00	-0.00	-0.08	5.58	-2.48	-9.98	0.58	5.58	-1.11	
Αρχή Σ4	-0.00	-0.00	-0.01	0.00	-6.09	6.22	-1.77	-3.89	-3.80	0.00
Ανοιγμα	-0.00	-0.00	-0.01	0.00	-6.00	-4.56	-1.77	-1.64		
Τελος	-0.00	-0.00	-0.01	9.25	-1.64	-9.98	-1.77	9.25	2.56	
Αρχή Σ5	-0.00	-0.00	0.02	3.71	-2.61	6.22	1.77	3.71	3.80	0.00
Ανοιγμα	-0.00	-0.00	0.02	0.00	-3.38	-4.56	1.77	-2.51		
Τελος	-0.00	-0.00	0.02	4.12	-2.51	-9.98	1.77	4.12	-2.56	

ΔΟΚΟΣ Id: 2

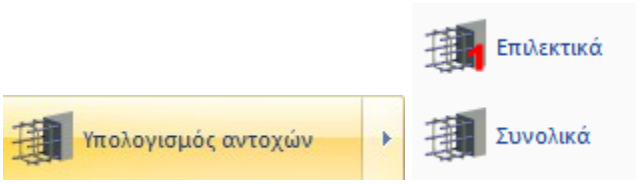
	Nsd	Nsd(st)	Tsd	Msd+	Msd-	Vsd(st)	Vsd(s)	Msd(vsd)	Msd(s)	
Αρχή Σ1	-0.00	-0.00	0.07	4.72	-0.77	7.29	0.00	4.72	0.00	0.00
Ανοιγμα	-0.00	-0.00	0.07	0.00	-1.08	1.93	0.00	-0.77		
Τελος	-0.00	-0.00	0.07	0.98	-1.19	-4.41	0.00	0.98	0.00	
Αρχή Σ2	-0.00	-0.00	-0.09	5.11	-0.55	7.29	0.14	5.11	0.39	0.00
Ανοιγμα	-0.00	-0.00	-0.09	0.00	-0.88	1.93	0.14	-0.55		
Τελος	-0.00	-0.00	-0.09	1.01	-1.02	-4.41	0.14	1.01	0.03	
Αρχή Σ3	-0.00	-0.00	0.24	4.32	-1.00	7.29	-0.14	4.32	-0.39	0.00
Ανοιγμα	-0.00	-0.00	0.24	0.00	-1.28	1.93	-0.14	-1.00		
Τελος	-0.00	-0.00	0.24	0.95	-1.36	-4.41	-0.14	0.95	-0.03	
Αρχή Σ4	-0.00	-0.00	0.08	2.17	-0.39	7.29	-2.49	2.17	-2.55	0.00
Ανοιγμα	-0.00	-0.00	0.08	0.00	-0.35	0.99	-2.49	-0.14		
Τελος	-0.00	-0.00	0.08	4.91	-0.14	-4.41	-2.49	4.91	3.93	
Αρχή Σ5	0.00	-0.00	0.07	7.27	-1.19	7.29	2.49	7.27	2.55	0.00
Ανοιγμα	0.00	-0.00	0.07	0.00	-2.02	1.93	2.49	-1.19		
Τελος	0.00	-0.00	0.07	0.00	-3.36	0.99	2.49	-2.02	-3.93	

For Help, press F1 NUM

1.3.4 Armament details

- With this option you can edit the reinforcement of the beam in an integrated calculation and design environment. You can also perform reinforcements well calculate new moment diagrams.
- Detailed instructions on how to use this command can be found in the corresponding user manual (**Chapter A. Beam Reinforcement Details**)

1.3.5 Strength calculation



EXCEPTION:

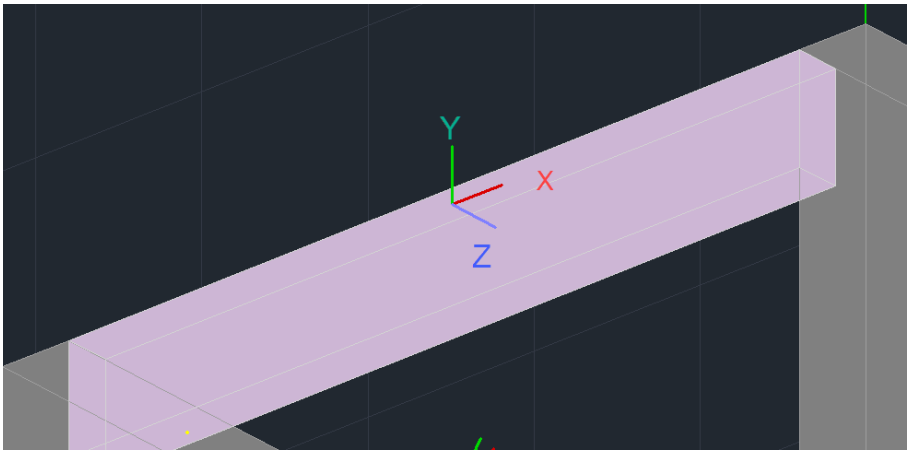
⚠ This command is mainly for existing buildings and allows the recalculation of the strengths of the beams after the manual modification of their reinforcement.

After the pre-estimation process is completed, i.e. the dimensioning of the structure and adaptation of the reinforcements to the existing situation and before the creation of the pushover analysis scenario, it is necessary to precede the "Strength Calculation" by selecting the corresponding command:
"Dimensioning">"Beams">"Strength calculation"
Through this command, the program calculates **the M-N interaction diagrams at the beginning - middle - end (3 points) of the beams.**

1.3.§ Calculation of M-N interaction diagrams

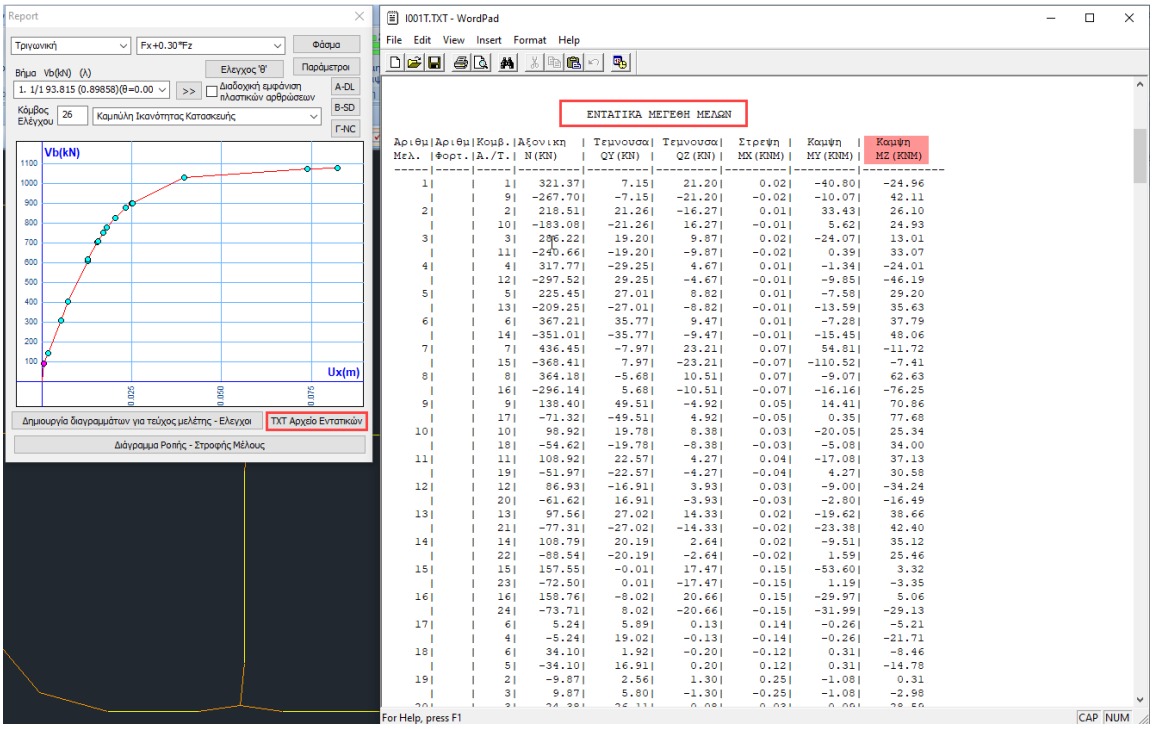
For the calculation of the strength moments with given N-My-Mz

OBSERVATION:
For the Beams the strong axis is Z and therefore the intensive that I check is Mz.



To read the intensives:

-For inelastic analysis, open the TXT Tensors File which includes the intensities of all members.



-For elastic analysis, open the printout of the l inadequacy indicators

	Σελίδα : 1

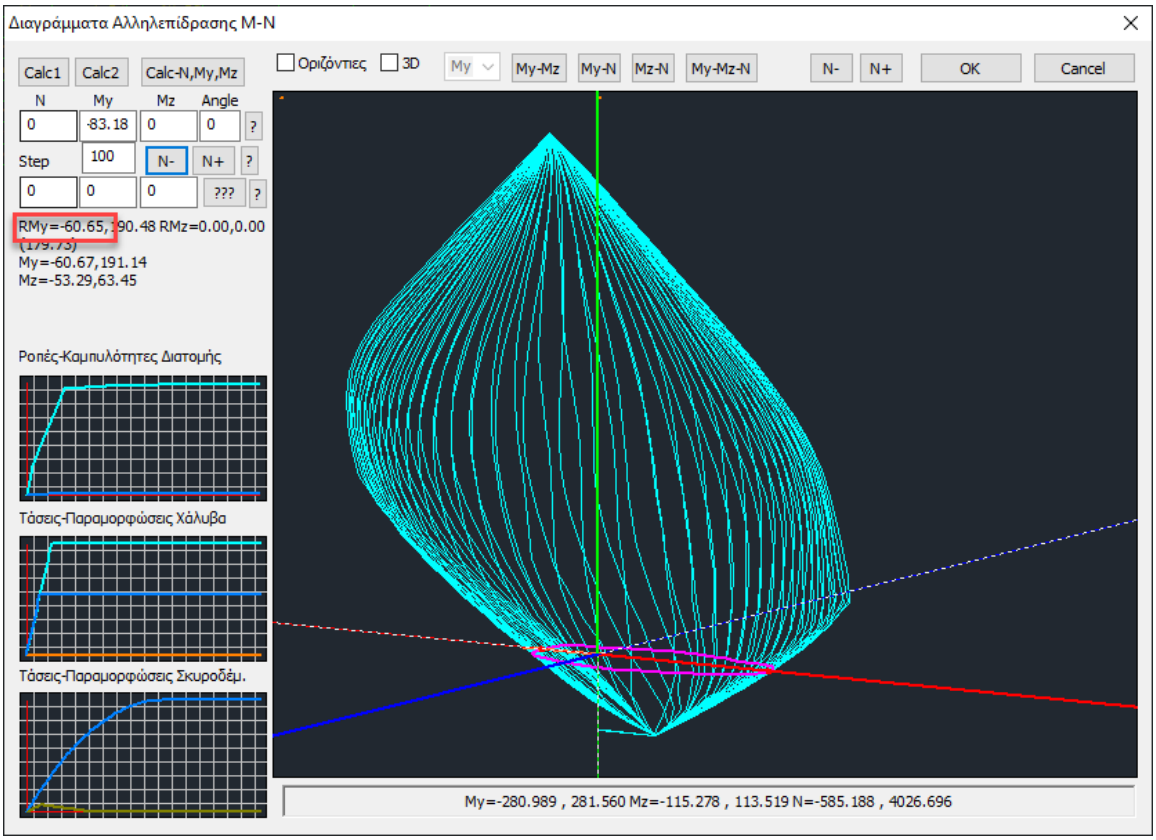
ΑΠΟΤΕΛΕΣΜΑΤΑ ΕΛΑΣΤΙΚΗΣ ΑΝΑΛΥΣΗΣ ΜΕ ΤΗ ΜΕΘΟΔΟ ΤΟΠΙΚΩΝ ΔΕΙΚΤΩΝ ΠΛΑΣΤΙΜΟΤΗΤΑΣ(m)	
Στάθμη Επιτελεστικότητας :	B - SD
Στάθμη Αξιοπιστίας Δεδομένων :	Ικανοποιητική γg=1.35
Εκταση Βλαβών :	Χωρίς Βλάβες & Χωρίς Επεμβάσεις γsd=1.00

ΔΕΙΚΤΕΣ ΑΝΕΠΑΡΚΕΙΑΣ λ ΓΙΑ ΟΛΕΣ ΤΙΣ ΔΟΚΟΥΣ

Μέλος	Κόμβος	Mz+	RMz+	λ	ΕΠΑΡΚΕΙΑ	Mz-	RMz-	λ	ΕΠΑΡΚΕΙΑ
27	14	69.08	98.10	0.70	Ναι				
	12	74.25	82.00	0.91	Ναι				
28	14	52.87	82.00	0.64	Ναι				
	13	31.14	98.10	0.32	Ναι				
29	10	17.01	2118.48	0.01	Ναι				
	11	11.11	74.00	0.15	Ναι				
30	11	37.05	74.00	0.50	Ναι				
	12	39.18	96.70	0.41	Ναι				
31	12	21.57	96.70	0.22	Ναι				
	9	28.42	74.00	0.38	Ναι				
32	15	28.70	74.00	0.39	Ναι				
	9	60.77	74.00	0.82	Ναι				
33	15	34.39	74.00	0.46	Ναι				
	16	42.25	74.00	0.57	Ναι				
34	13	47.35	187.28	0.25	Ναι				
	16	54.81	74.00	0.74	Ναι				
	10	26.35	74.00	0.36	Ναι				

Entering the values of the intensive quantities N, My, Mz in the corresponding fields and clicking Calc-N,My,Mz the program will start:

ATTENTION:
For **beam** members**,** based on contract: enter the value Mz with inverted sign in the My field.



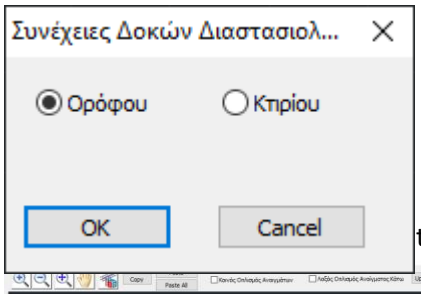
1.3.5.1 Strength Calculation Selectively

Select the command and left-click on the member of a beam.
The program will calculate the M-N interaction diagrams at the ends and midpoint (3 points) of the beams of the selected continuum.

On your screen, during the calculation, dialogue windows open, which are, for each beam, the window of the **Armour Details** command followed by the calculation window of the corresponding **M-N interaction diagram.**

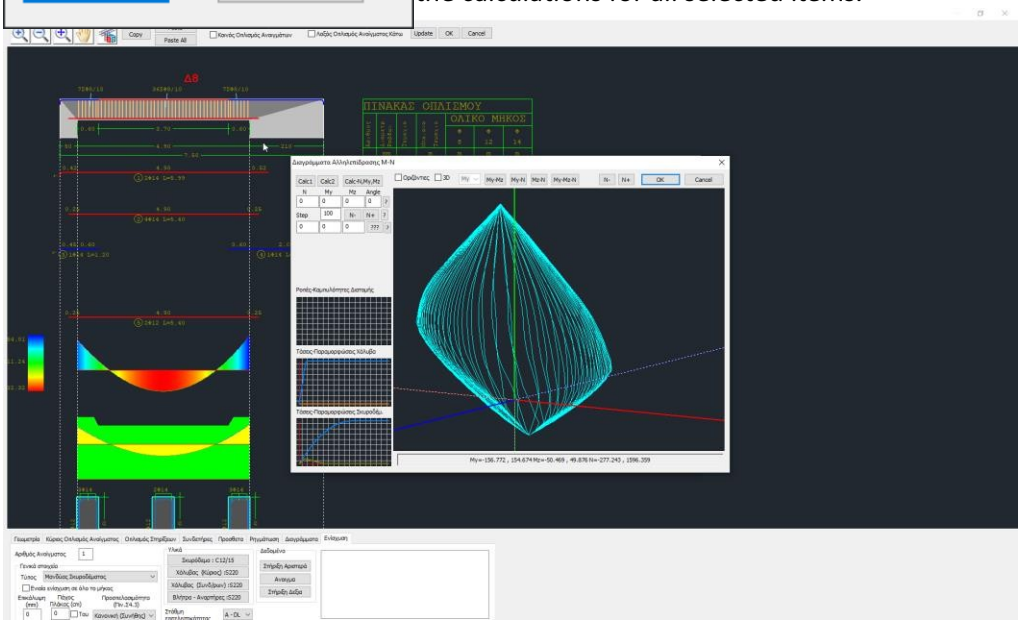
1.3.5.2 Overall strength calculation

Select the command,



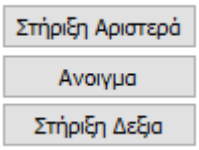
and in the dialog box whether the calculation will be done for the beams of the active floor or for the whole building. Select OK and let the program automatically calculate the new interaction diagrams for the selected elements.

the calculations for all selected items.

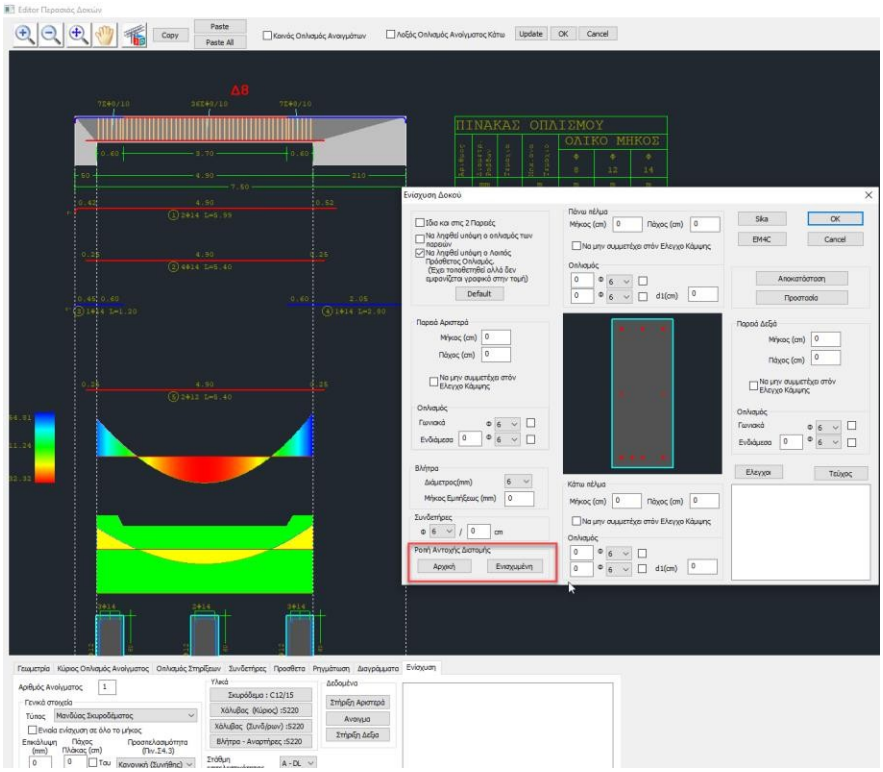


EXCEPTION:

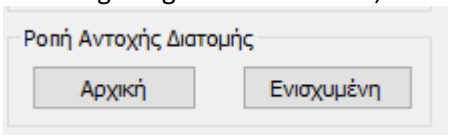
The calculation of the M-N interaction diagram can also be done selectively for each beam, at



, through the "Reinforcement Details" tool of the beams> "Reinforcements":



Selecting: Original or Enhanced, after the enhancement.

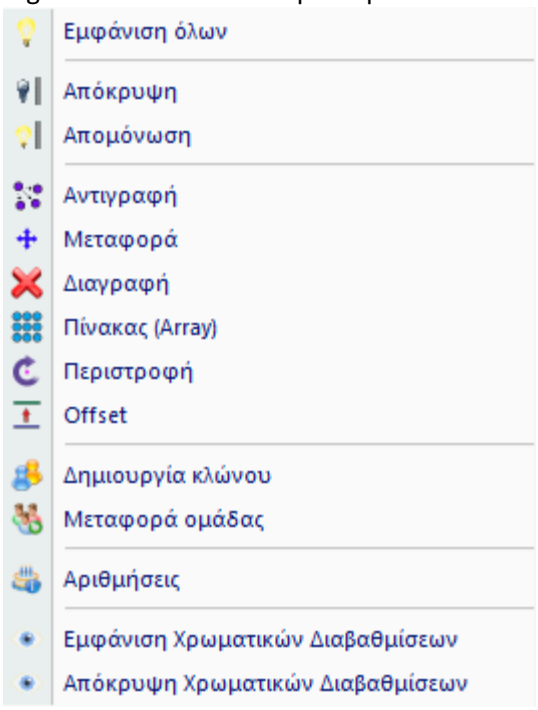


It is the calculation of the moment-axial interaction diagrams, which depends on the geometry of the cross-section, the quality of the materials and its reinforcement, and produces the three-dimensional diagram of the envelope (My, Mz, N).
In addition, the Tension-Deformation diagrams for steel and concrete are shown schematically, and the Stress-Contraction diagram is shown in detail.

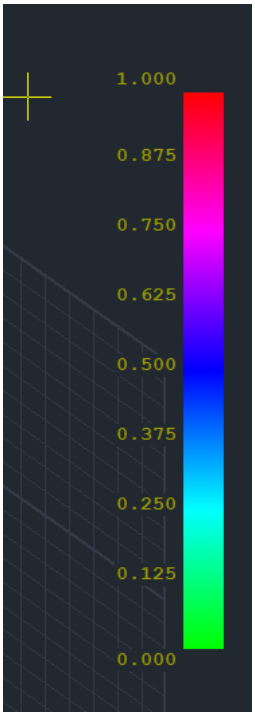
- Detailed instructions on how to use this command can be found in the corresponding user manual (**chapter B. Beam Reinforcement Details**).

1.3. § Display of depletion ratios and other variables with Color Grading

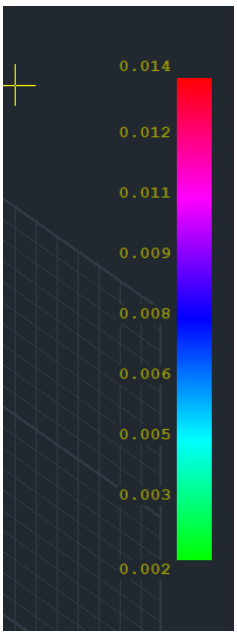
The new versions of SCADA Pro have integrated color grading of depletion ratios and various other controls in sizing.
Right-click on the desktop to open the menu below:



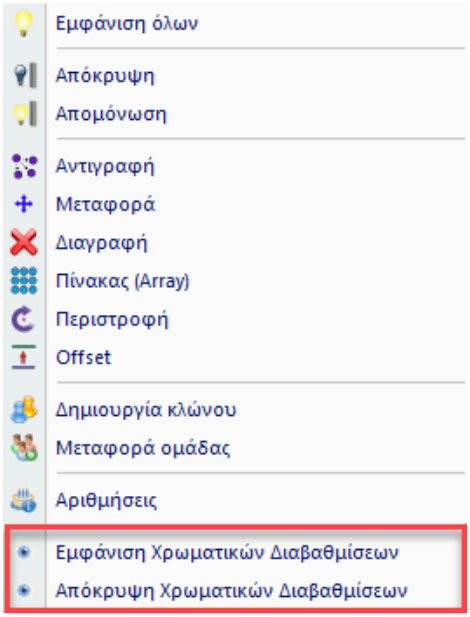
As for the colour scale, it always ranges from green to red with blue in between.
When representing ratio, it always ranges from 0 -1 (green - red) with corresponding coloring of the members. Members with a ratio greater than one are coloured red without further gradation and with the ratio value written on member, as shown in the figure below.



When the scale represents a specific quantity (e.g. reinforcement ratio p) the scale ranges between the minimum and maximum values presented in the vector.



So by pressing the right button on the desktop two new options have been added to the bottom of the menu:



OBSERVATIONS:

- The "Hide Color Gradients" option clears the vector and the desktop of colors and scale
- Because all sizes are only displayed in the 3D vector, selecting the command automatically rotates the vector to 3D.
- Linear members of all kinds have been divided into two categories, Beams - Columns. Each time the sizes are displayed only for each category you select
- In the linear elements, those that are not selected to display size (e.g. the beams when I have chosen to display a size on poles), are all painted in grey (off scale) so that their colour is not confused with that of the others (especially if the values are not displayed)
- The name of the size displayed is shown at the bottom right. If the check box "Show values" is checked, the values are also displayed, otherwise only the colours are shown.
- The "Show only those that miss" option displays the values only for those that have a ratio >1.
- Finally, the "Range of values" option allows you to set a range of values to be displayed on the screen. This is a particularly useful tool especially in the case of large operators.

Regarding the **beams (3 values, start - middle - end)**. You can now see the following values in colour:

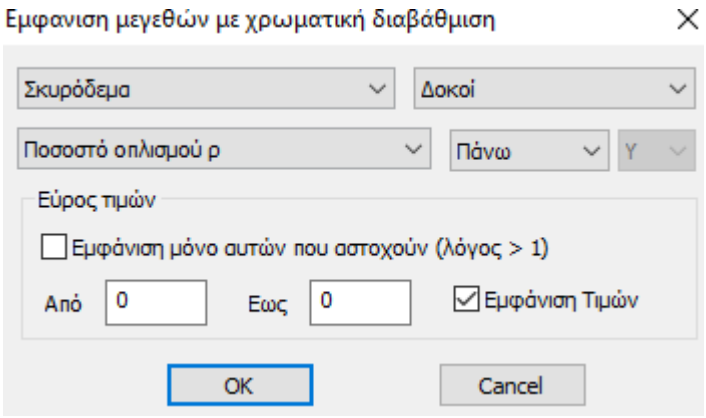
- Percentage of reinforcement r above
- Percentage of reinforcement p down
- Reinforcement ratio ρ max (the maximum of the two above)
- Ratio of over armouring over

- Ratio of armature overshoot below
- Max armature overshoot ratio (the maximum of the two above)
- As bending reinforcement (cm2) over
- As bending reinforcement (cm2) down
- As bending reinforcement (cm2) max (the maximum of the two above)
- Reasons for bending exhaustion over
- Bending down exhaustion reasons
- Bending fatigue reasons max (the maximum of the two above)
- Reasons for shear exhaustion

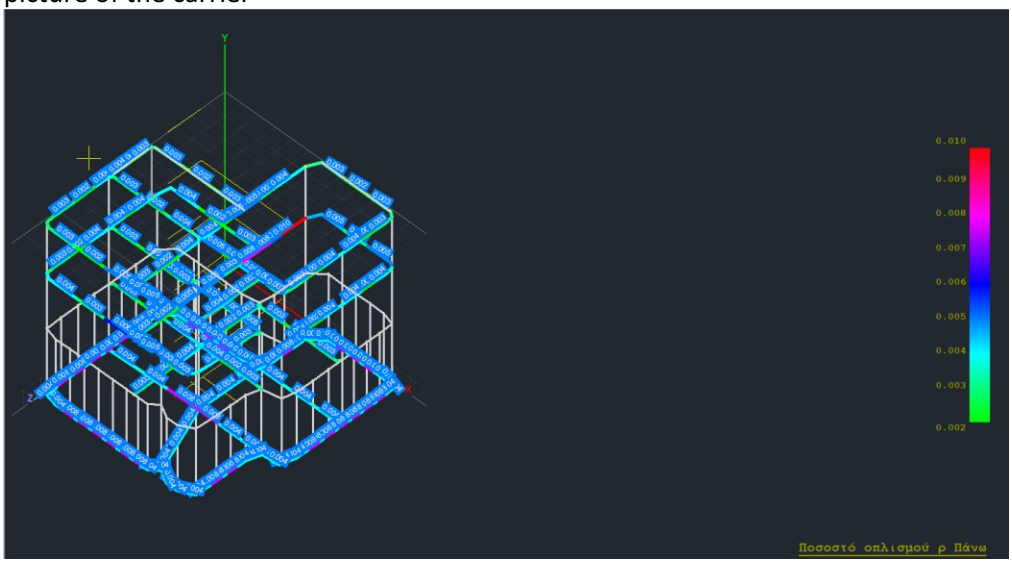
- In shear sizes there is obviously no up and down
- In the beams there is no separation of y and z directions there is only Mz and Vy

- **Percentage of reinforcement p**

Right-clicking on the desktop and selecting "Show Color Gradients" displays the following dialog box:



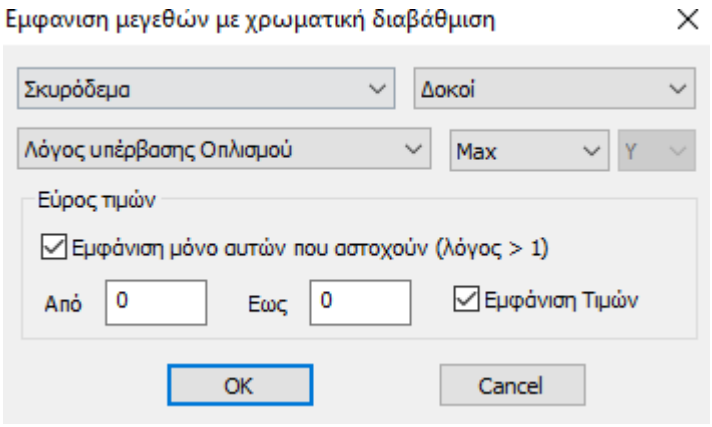
By selecting, Concrete, Beams, Reinforcement Percentage, Up, Show Values I have the following picture of the carrier



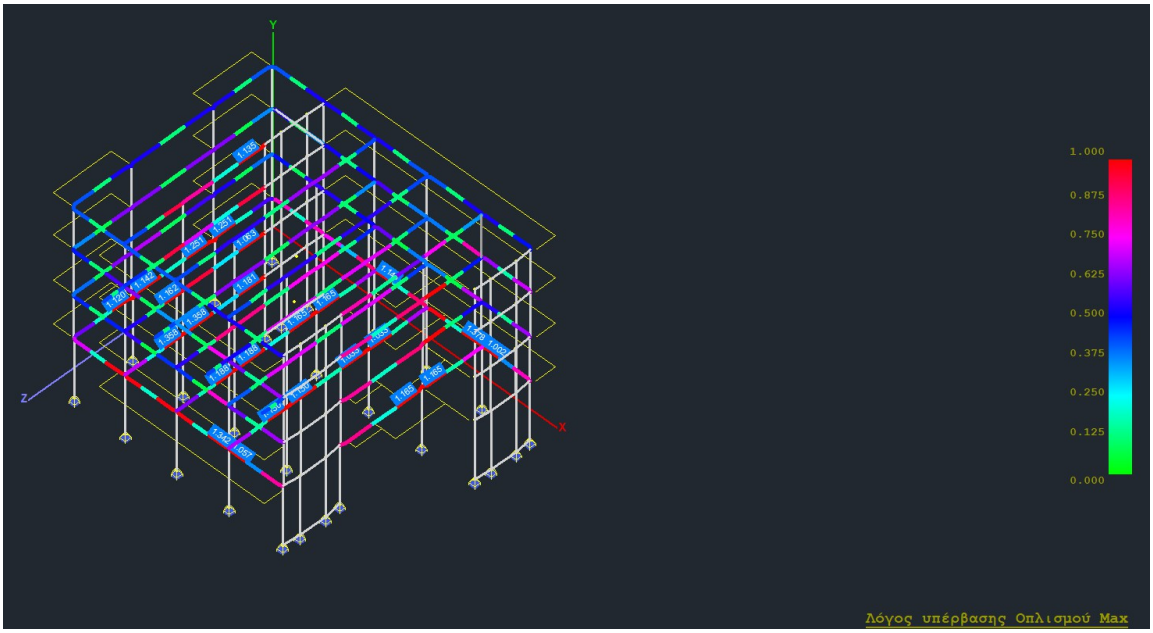
If you select "Show only those that miss" then you will display the sizes that exceed the maximum allowed value of ρ.
In the same way, the reinforcement rate ρ down, ρ down and the reinforcement rate ρ max (the maximum of ρ up and ρ down) is displayed.

- **Reason for overarmouring**

In the same way as indicated above you have the possibility to display the reasons for exceeding reinforcement above, below or the maximum of these two (max).

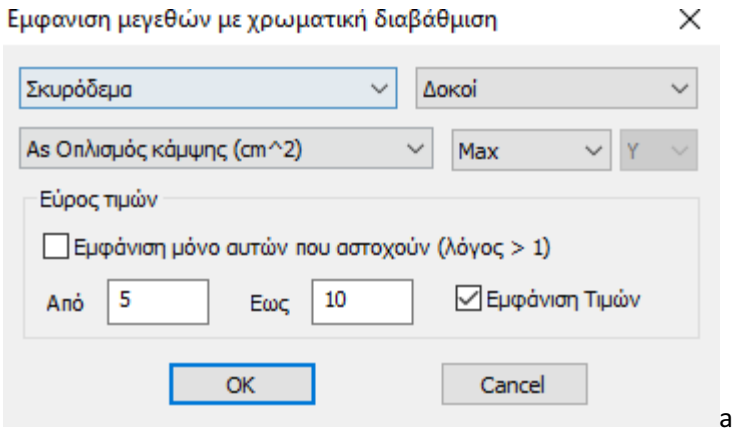


you will get the following vector image, where the values are shown only in the items for the in which the armature overshoot ratios exceed 1.

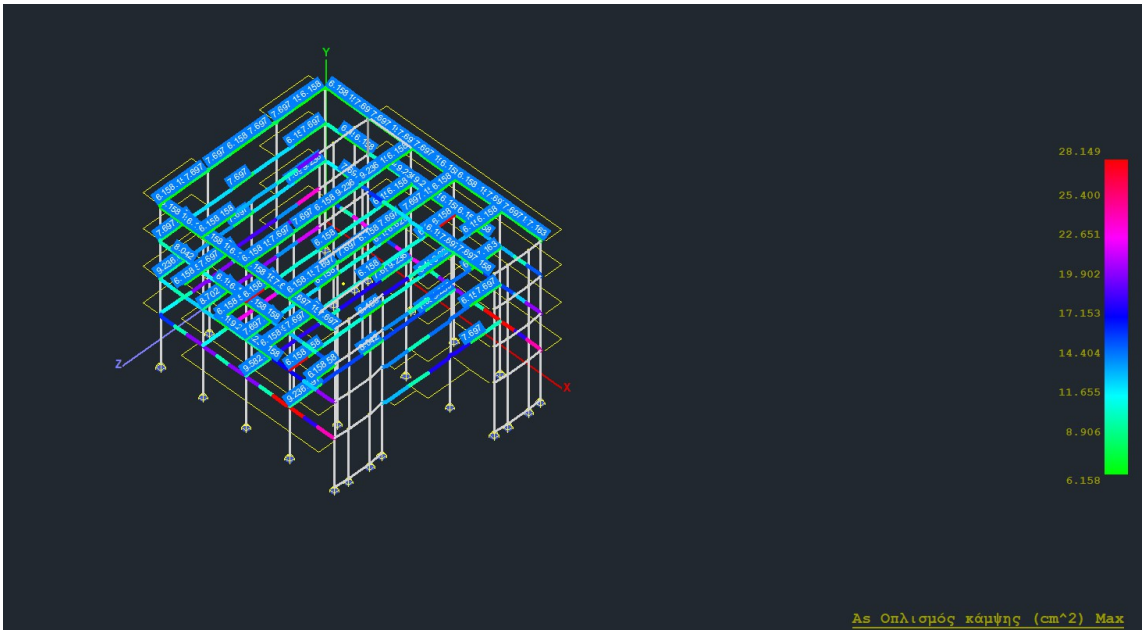


- **As bending reinforcement (cm^2)**

Following the same procedure you can display the As bending armature (cm^2) above, below or the maximum of these two (max):



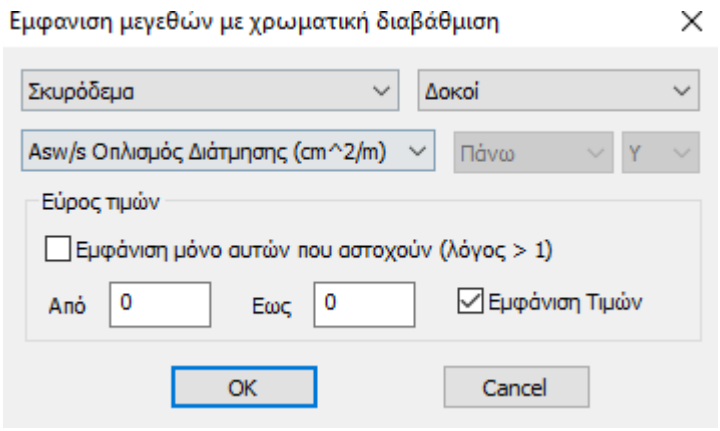
and setting a value range of 5-10 cm^2 you have the following vector image.



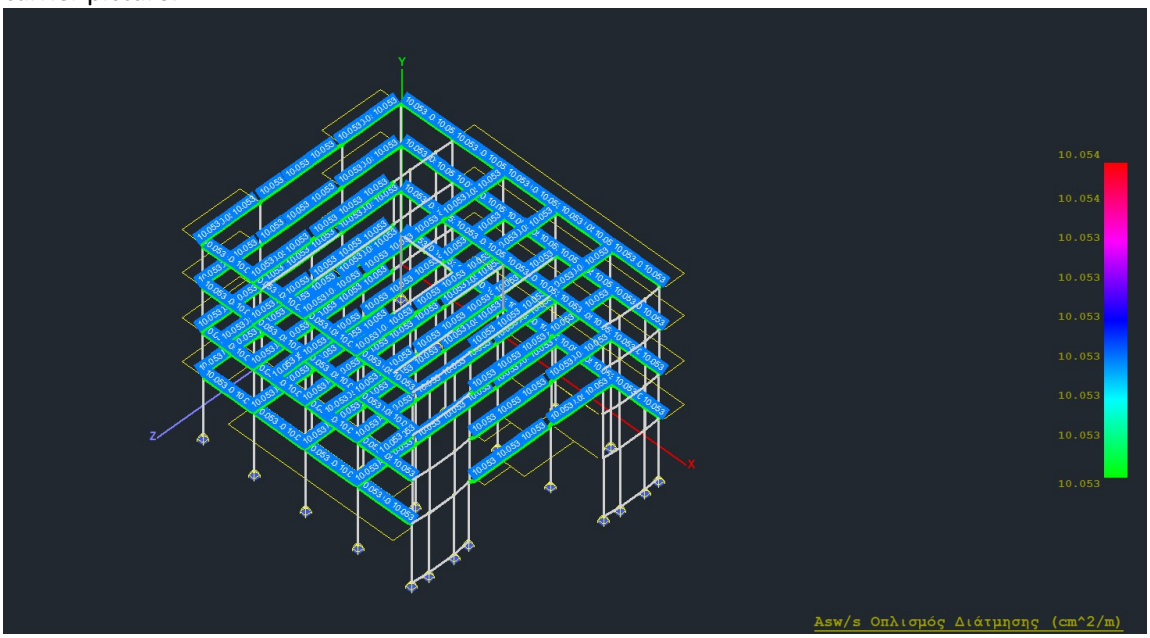
Notice that only the value ranges (5-10 cm^2) that you set in the box are displayed. dialogue.

- **Asw/s Shear reinforcement (cm^2/m)**

In this case, you can display the Asw/s shear reinforcement (cm^2/m)

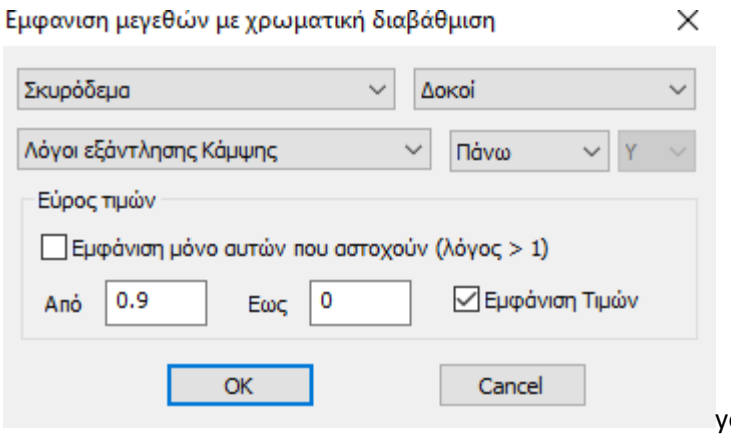


(ATTENTION: there is no up and down in the shear reinforcement) and you have the following carrier picture.

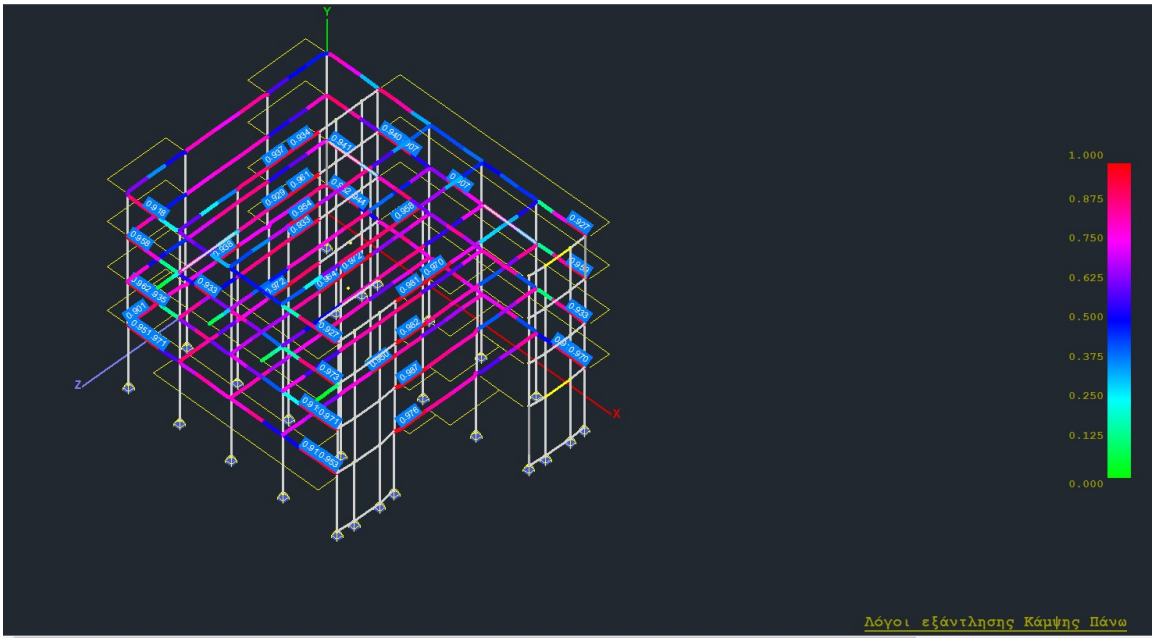


- **Reasons for bending fatigue**

In the same way, the bending exhaustion ratios above, below and the maximum of these two (max) are also shown. For example, if you set the ratios in the range with a value above 0.95

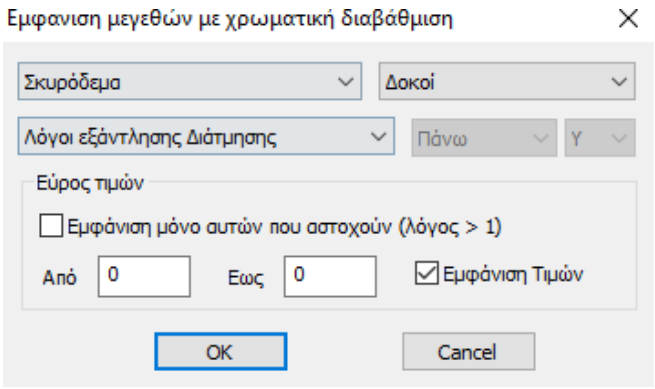


you see the following picture

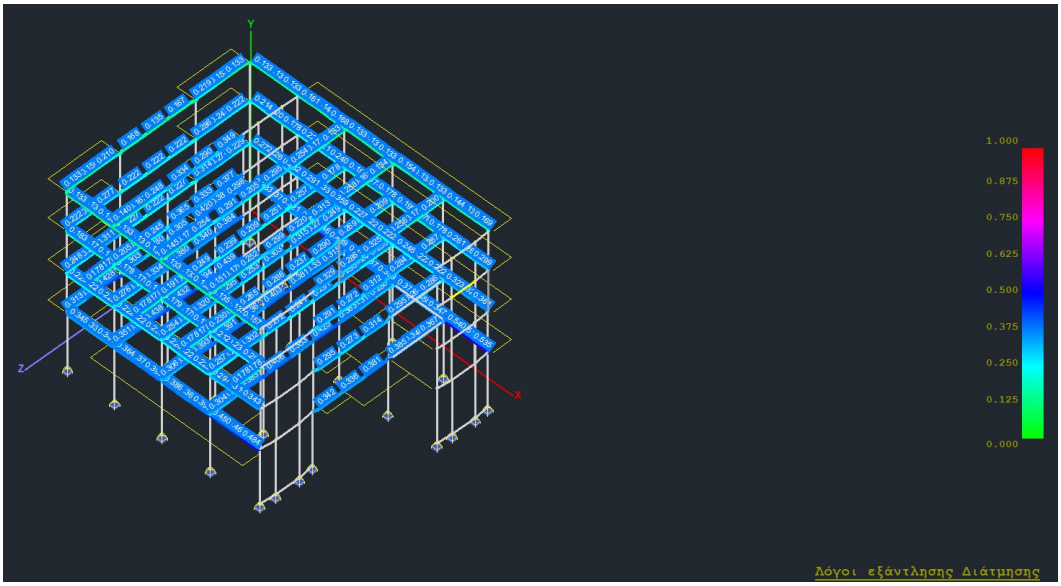


- **Reasons for shear exhaustion**

Finally, you have the option to display the shear exhaustion reasons



(CAUTION: there is no up and down in the shear exhaustion ratios) , taking following picture.



OBSERVATION:
In beams, the depletion ratios for both bending and shear are greater than unity. A value of 1 appears in the bending ratio and the shear ratio only when the cross-section does not contain any of the corresponding reinforcement.

2. Equity Control

The "Satisfactory Check" field contains the commands to run and display the results of the satisfactory check. The satisfaction check is performed on a level-by-level basis.

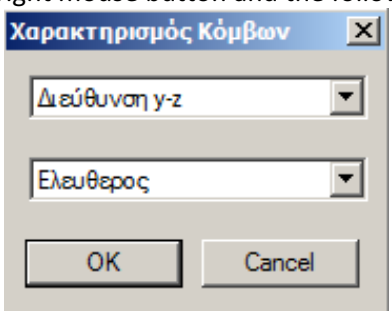
It should be done everywhere where required, and should always precede the dimensioning of the poles and walls.

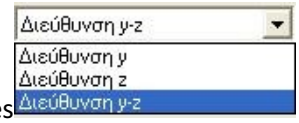
2.1 Characterization

to determine the support conditions of nodes, poles and walls.

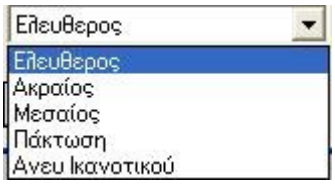
2.1.1 Pillars

With this command, you specify the support conditions of the poles for performing the satisfactory inspection. By selecting the command and after pointing to the node or nodes of the poles that you want to change the support conditions, you complete the selection by pressing the right mouse button and the following dialog box appears:



In the first section there is a list of addresses 

where you select the address of the executable control and then from the next list



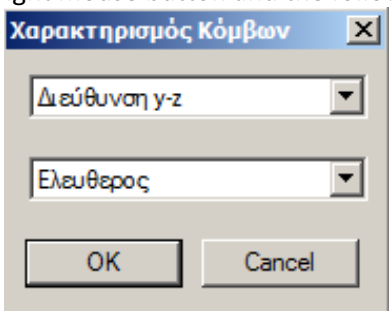
the designation of the node to perform the satisfactory control.

ATTENTION:

- Note that the selection here only applies to the **poles**.

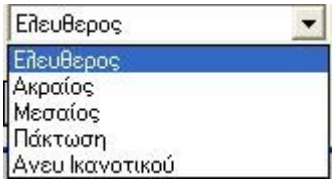
2.1.2 Totes

 With this command, you specify the support conditions of the poles for performing the satisfactory inspection. By selecting the command and after pointing to the node or nodes of the poles that you want to change the support conditions, you complete the selection by pressing the right mouse button and the following dialog box appears:



In the first section there is a list of addresses 

where you select the address of the executable control and then from the next list



the designation of the node to perform the satisfactory control.

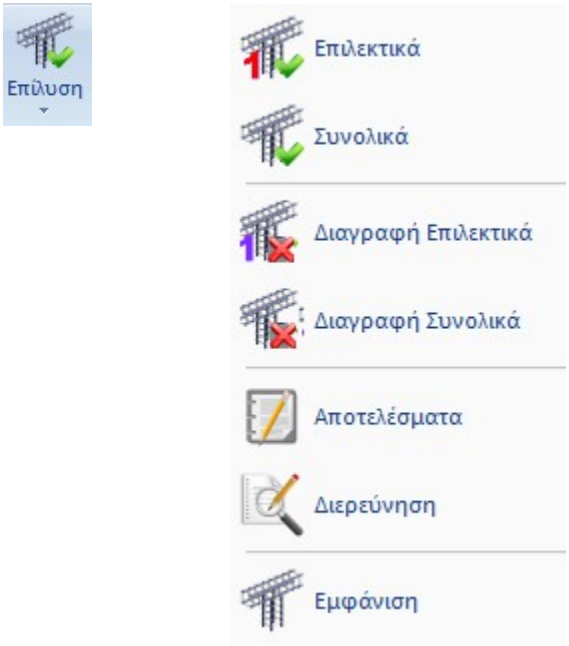
ATTENTION:

- Note that the option here only applies to **walls**.

OBSERVATION:

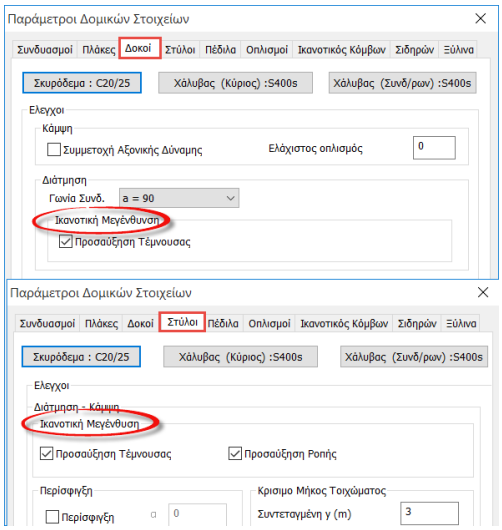
- Node marking is a procedure that if not performed by the user, the program will consider all nodes "Free" at both addresses, except for the packed nodes.
- The parameters of the Iconic are defined in Parameters > Node Inherent (see Sizing General (part 1) &1.3.7 Node Inherent)

2.2 Resolution



for the execution and the display of the results of the satisfactory.

OBSERVATIONS:



- ⚠ A prerequisite for both the selective and the overall node check is that the dimensioning of the beams has been done beforehand, as well as that "Iconic Zoom" is selected in the Beams-Pillars fields in the Dimensioning Parameters window.

- ⚠ Satisfactory inspection should be carried out everywhere, where required, and should always precede the dimensioning of columns and walls.

2.2.1 Selectively

 To perform the satisfaction check on a single node. Select the command and then point to the node whose node you want to perform the satisfactory check.

2.2.2 Overall

 To perform the satisfactory check of all nodes of the active level (the level shown on your screen).

2.2.3 Delete Selectively

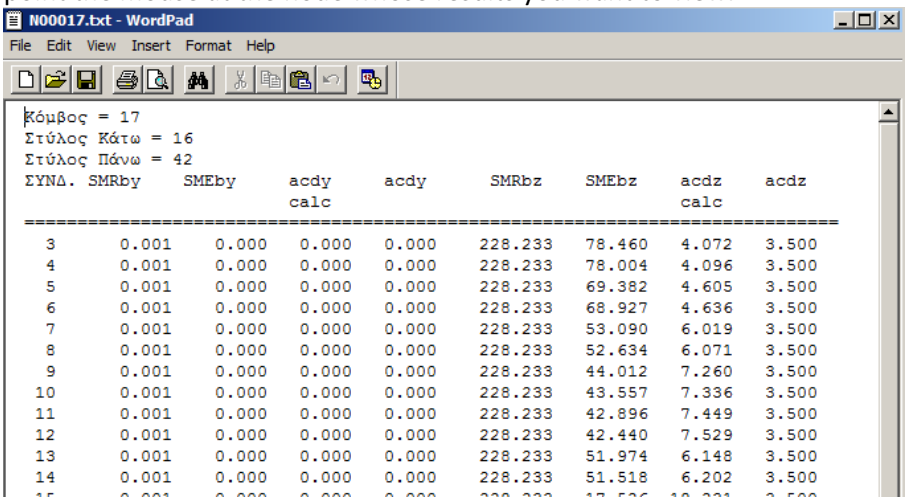
In the new versions of SCADA Pro, the new command of deleting the capacity either Selectively or Overall, for the whole level has been added.
Select Delete Selectively and left-click on a node to delete its content and right-click to close the command.

2.2.4 Deletion Total

Display in 2D the level where the Icahnotic will be deleted. Select Delete Overall.

2.2.5 Results

 To display the summary results of a node's satisfaction check. Select the command and then point the mouse at the node whose results you want to view.



2.2.6 Investigation

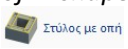
 to display in detail the results of a node's satisfaction check in detail.

3. Pillars

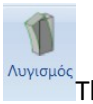
The "Columns" field includes the commands for the Buckling Check, Dimensioning, Reinforcement Check and Column and Wall Results.

OBSERVATIONS:

- Before dimensioning of columns and walls, a satisfactory check should always be preceded by a satisfactory check for all nodes and levels, where required.
- That is, the correct procedure is to first do the satisfactory at all levels required and then to follow the dimensioning of the columns and walls.

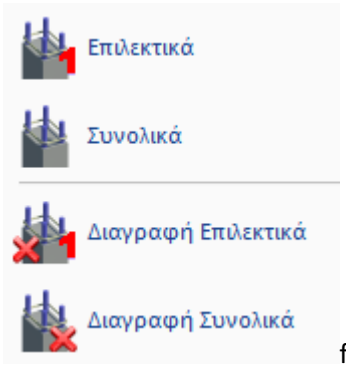
⚠ *The parametric cross-sections C & T are automatically dimensioned by the program. The cases of Z-shaped columns*  *, parametric*  *, cross-shaped*  *and column with hole*  *are not dimensioned by the program.*

3.1 Lament



This section will be completed in the next revision of this manual

3.2 Arming control



for the dimensioning of poles and/or walls

3.2.1 Selectively

 to selectively size the poles or walls.

Select the command and then point the mouse at the post or wall you want to dimension.
The program displays a coloured dot in the centre of the pole. The colour changes according to the type of failure as follows:

- **Red**. Failure from biaxial bending. Exceeding maximum 4% reinforcement percentage. Dense Connectors.
- **Pink**. Failure by shear/torsion or by exceeding the plasticity limit. In the results you can see the failure ratio.
- **Cyan**. The pole was dimensioned without any problem.

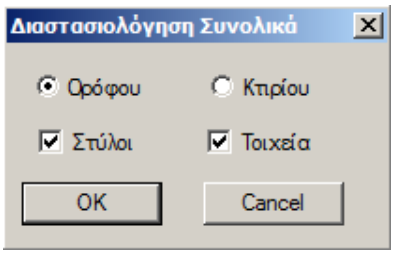
Initials indicating the type of failure also appear on the pole:

Flexion from bending	K
Shear fracture	Δ
Periphrastia by periphyton	ωwd
A misstep of sadness	ν
Torsional stress fracture	T
Crossing of connectors	Σ
Exceeding % of reinforcement	ρ
Exceeding the rising axial	ν

3.2.2 Overall

 to make an overall dimensioning of the poles and/or walls of the study, per floor or for the whole building.

Selecting the command displays the following dialog box:



where you choose whether to dimension the columns and/or the walls of the floor or the whole building.

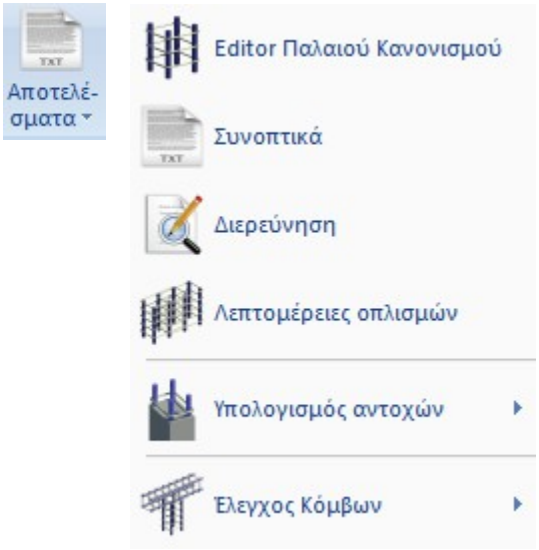
3.2.3 Delete Selectively


to selectively delete the dimensioning of columns and walls. Select the command and then point the mouse at the post or posts whose dimensioning you want to delete.

3.2.4 Deletion Total


to make a total deletion of the dimensioning of the columns and walls of the given level (active level).
Select the command and the sizing is automatically deleted.

3.3 Results

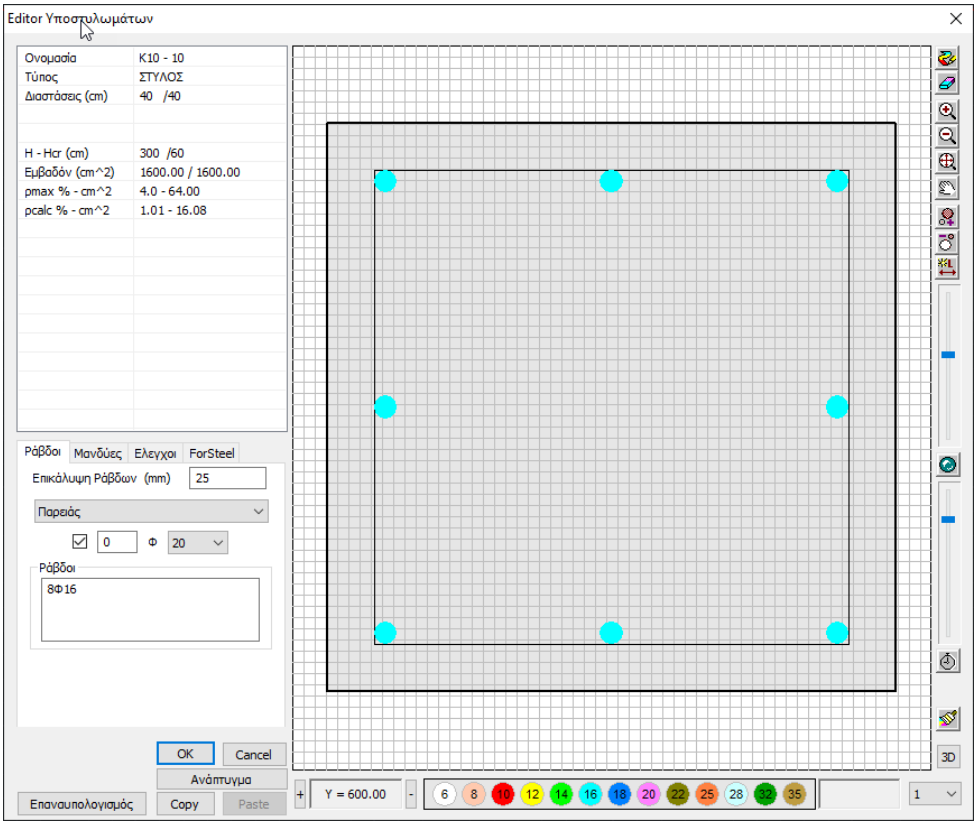


includes the commands relating to the processing and the display the results of the dimensioning of the columns and walls.

3.3.1 Editor Old Rules Editor

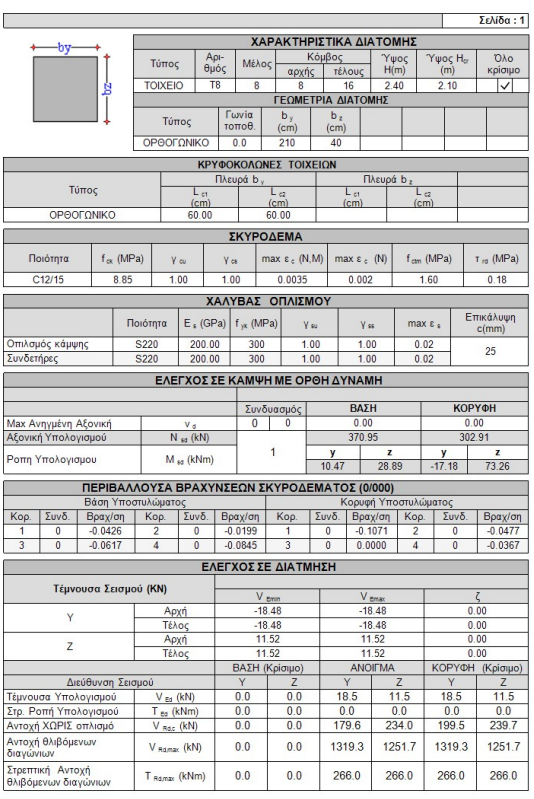

This is a command that only applies to sizing with Old Regulations, while for all other regulations it has been completely replaced by the *Armament Details* command.
With the Old Rules Editor command you can edit the reinforcement of columns and walls.

CHAPTER 10B 'DIMENSIONING'



3.3.2 Results

to display the summary results of the post or wall sizing. Select the command and then point with the mouse to the post or wall whose results you want to see that are in accordance with the regulation you selected for the dimensioning.



Σελίδα : 1

ΧΑΡΑΚΤΗΡΙΣΤΙΚΑ ΔΙΑΤΟΜΗΣ

Τύπος	Αριθμός	Μέλος	Κόμβος αρχής	Κόμβος τέλος	Ύψος Η(m)	Ύψος $H_{το}$ (m)	Όλο κρισιμο
ΤΟΙΧΕΙΟ	Τ8	8	8	16	2.40	2.10	✓

ΓΕΩΜΕΤΡΙΑ ΔΙΑΤΟΜΗΣ

Τύπος	Γωνία τοποθ.	b_y (cm)	b_z (cm)				
ΟΡΘΟΓΩΝΙΚΟ	0.0	210	40				

ΚΡΥΦΟΚΟΛΟΝΕΣ ΤΟΙΧΕΙΩΝ

Τύπος	Πλευρά b_y		Πλευρά b_z		
	L_{c1} (cm)	L_{c2} (cm)	L_{c1} (cm)	L_{c2} (cm)	
ΟΡΘΟΓΩΝΙΚΟ	60.00	60.00			

ΣΚΥΡΟΔΕΜΑ

Ποιότητα	f_{ck} (MPa)	γ_{cu}	γ_{cs}	max ε_c (N,M)	max ε_c (N)	f_{ctm} (MPa)	τ_{rd} (MPa)
C12/15	8.85	1.00	1.00	0.0035	0.002	1.60	0.18

ΧΑΛΥΒΑΣ ΟΠΛΙΣΜΟΥ

	Ποιότητα	E_s (GPa)	f_{yk} (MPa)	γ_{su}	γ_{ss}	max ε_s	Επικάλυψη c(mm)
Οπλισμός κάμψης	S220	200.00	300	1.00	1.00	0.02	25
Συνδετήρες	S220	200.00	300	1.00	1.00	0.02	

ΕΛΕΓΧΟΣ ΣΕ ΚΑΜΨΗ ΜΕ ΟΡΘΗ ΔΥΝΑΜΗ

		Συνδυασμός		ΒΑΣΗ		ΚΟΡΥΦΗ	
Max Ανηγμένη Αξονική	ν_{sd}	0	0	0.00		0.00	
Αξονική Υπολογισμού	N_{sd} (kN)	1		370.95		302.91	
Ροπη Υπολογισμου	M_{sd} (kNm)			y	z	y	z
				10.47	28.89	-17.18	73.26

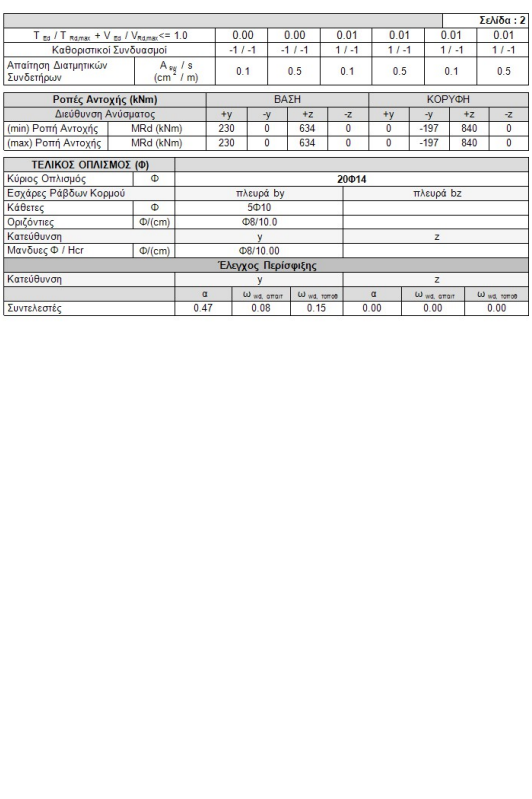
ΠΕΡΙΒΑΛΛΟΥΣΑ ΒΡΑΧΥΝΣΕΩΝ ΣΚΥΡΟΔΕΜΑΤΟΣ (0/000)

Βάση Υποστυλώματος						Κορυφή Υποστυλώματος					
Κορ.	Συνδ.	Βραχ/ση	Κορ.	Συνδ.	Βραχ/ση	Κορ.	Συνδ.	Βραχ/ση	Κορ.	Συνδ.	Βραχ/ση
1	0	-0.0426	2	0	-0.0199	1	0	-0.1071	2	0	-0.0477
3	0	-0.0617	4	0	-0.0845	3	0	0.0000	4	0	-0.0367

ΕΛΕΓΧΟΣ ΣΕ ΔΙΑΤΜΗΣΗ

Τέμνουσα Σεισμού (KN)		$V_{\pi\mu\nu}$	$V_{\pi\mu\alpha}$	ζ
Y	Αρχή	-18.48	-18.48	0.00
	Τέλος	-18.48	-18.48	0.00
Z	Αρχή	11.52	11.52	0.00
	Τέλος	11.52	11.52	0.00

		ΒΑΣΗ (Κρίσιμο)		ΑΝΟΙΓΜΑ		ΚΟΡΥΦΗ (Κρίσιμο)	
Διεύθυνση Σεισμού		Y	Z	Y	Z	Y	Z
Τέμνουσα Υπολογισμού	V_{sd} (kN)	0.0	0.0	18.5	11.5	18.5	11.5
Στρ. Ροπή Υπολογισμού	T_{sd} (kNm)	0.0	0.0	0.0	0.0	0.0	0.0
Αντοχή ΧΩΡΙΣ οπλισμό	$V_{Rd,c}$ (kN)	0.0	0.0	179.6	234.0	199.5	239.7
Αντοχή θλιβόμενων διαγώνιων	$V_{Rd,max}$ (kN)	0.0	0.0	1319.3	1251.7	1319.3	1251.7
Στρεπτική Αντοχή θλιβόμενων διαγώνιων	$T_{Rd,max}$ (kNm)	0.0	0.0	266.0	266.0	266.0	266.0



Σελίδα : 2

T_{sd} / $T_{Rd,max}$ + V_{sd} / $V_{Rd,max}$ <= 1.0		0.00	0.00	0.01	0.01	0.01	0.01
Καθοριστικοί Συνδυασμοί		-1 / -1	-1 / -1	1 / -1	1 / -1	1 / -1	1 / -1
Απαίτηση Διατμητικών Συνδετήρων	A_{sw} / s (cm² / m)	0.1	0.5	0.1	0.5	0.1	0.5

Ροπές Αντοχής (kNm)		ΒΑΣΗ				ΚΟΡΥΦΗ			
Διεύθυνση Ανύσματος		+y	-y	+z	-z	+y	-y	+z	-z
(min) Ροπή Αντοχής	MRd (kNm)	230	0	634	0	0	-197	840	0
(max) Ροπή Αντοχής	MRd (kNm)	230	0	634	0	0	-197	840	0

ΤΕΛΙΚΟΣ ΟΠΛΙΣΜΟΣ (Φ)			
Κύριος Οπλισμός	Φ	20Φ14	
Εσχάρες Ράβδων Κορμού		πλευρά by	πλευρά bz
Κάθετες	Φ	5Φ10	
Οριζόντιες	Φ/(cm)	Φ8/10.0	
Κατεύθυνση		y	z
Μανδυες Φ / Hcr	Φ/(cm)	Φ8/10.00	
Έλεγχος Περίσφιξης			
Κατεύθυνση		y	z
		α	$\omega_{wd,απαιτ}$	$\omega_{wd,τοπoθ}$	α	$\omega_{wd,απαιτ}$	$\omega_{wd,τοπoθ}$
Συντελεστές		0.47	0.08	0.15	0.00	0.00	0.00

3.3.3 Investigation

to display in detail the results of the dimensioning of the post or wall.

Column Id: 54 (53)

	ΣΥΝ	N	My	Mz	Vy	Vz	Mx
Αρχή	1	1143.03	-89.57	-51.02	-67.43	118.94	0.25
Τέλος	1	1102.53	267.25	151.28	-67.43	118.94	0.25
Αρχή	2	-0.13	-2.82	-4.60	-6.09	2.05	-0.04
Τέλος	2	-0.13	3.32	13.67	-6.09	2.05	-0.04
Αρχή	3	0.13	2.82	4.60	6.09	-2.05	0.04
Τέλος	3	0.13	-3.32	-13.67	6.09	-2.05	0.04
Αρχή	4	-1143.03	89.57	51.02	67.43	-118.94	-0.25
Τέλος	4	-1102.53	-267.25	-151.28	67.43	-118.94	-0.25

Γεωμετρία: u=2.10 Ak=0.15 AkT=0.02

Στρέψη : maxTsd=0.25 (1) Asl=0.04

Λυγισμός:
Rhy=0.60 Rhz=0.45
Iz=81.00 Iy=45.56
Διεύθυνση yy
Μεταθετο Πλαίσιο ka=6.52 kb=4.77 b=2.28
lolyg=6.83 llyg=39.42
Column Id: 54 (53)

	ΣΥΝ	N	My	Mz	Vy	Vz	Mx
Αρχή	1	1143.03	-89.57	-51.02	-67.43	118.94	0.25
Τέλος	1	1102.53	267.25	151.28	-67.43	118.94	0.25
Αρχή	2	-0.13	-2.82	-4.60	-6.09	2.05	-0.04
Τέλος	2	-0.13	3.32	13.67	-6.09	2.05	-0.04
Αρχή	3	0.13	2.82	4.60	6.09	-2.05	0.04
Τέλος	3	0.13	-3.32	-13.67	6.09	-2.05	0.04
Αρχή	4	-1143.03	89.57	51.02	67.43	-118.94	-0.25
Τέλος	4	-1102.53	-267.25	-151.28	67.43	-118.94	-0.25

Column Id: 54 (53)

	ΣΥΝ	N	My	Mz	Vy	Vz	Mx
Αρχή	1	1143.03	-89.57	-51.02	-67.43	118.94	0.25
Τέλος	1	1102.53	267.25	151.28	-67.43	118.94	0.25
Αρχή	2	-0.13	-2.82	-4.60	-6.09	2.05	-0.04
Τέλος	2	-0.13	3.32	13.67	-6.09	2.05	-0.04
Αρχή	3	0.13	2.82	4.60	6.09	-2.05	0.04
Τέλος	3	0.13	-3.32	-13.67	6.09	-2.05	0.04
Αρχή	4	-1143.03	89.57	51.02	67.43	-118.94	-0.25
Τέλος	4	-1102.53	-267.25	-151.28	67.43	-118.94	-0.25

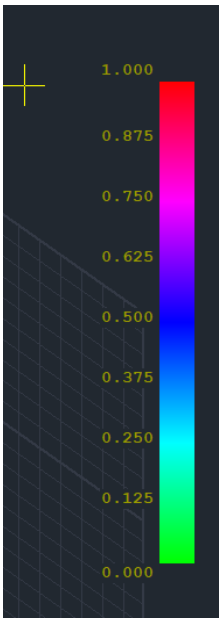
Column Id: 54 (53)

	ΣΥΝ	N	My	Mz	Vy	Vz	Mx
Αρχή	1	1143.03	-89.57	-51.02	-67.43	118.94	0.25
Τέλος	1	1102.53	267.25	151.28	-67.43	118.94	0.25
Αρχή	2	-0.13	-2.82	-4.60	-6.09	2.05	-0.04
Τέλος	2	-0.13	3.32	13.67	-6.09	2.05	-0.04
Αρχή	3	0.13	2.82	4.60	6.09	-2.05	0.04
Τέλος	3	0.13	-3.32	-13.67	6.09	-2.05	0.04
Αρχή	4	-1143.03	89.57	51.02	67.43	-118.94	-0.25
Τέλος	4	-1102.53	-267.25	-151.28	67.43	-118.94	-0.25

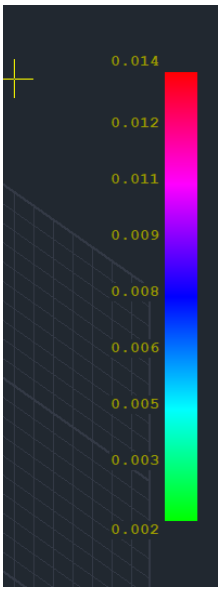
Συνδ.=1 llyg=39.42 lcrit=58.13 etot=0.18 (eo=0.06,ea=0.02,e2=0.09)
Διεύθυνση zz
Μεταθετο Πλαίσιο ka=1.84 kb=3.06 b=1.60

3.3. § Display of depletion ratios and other variables with Color Gradation

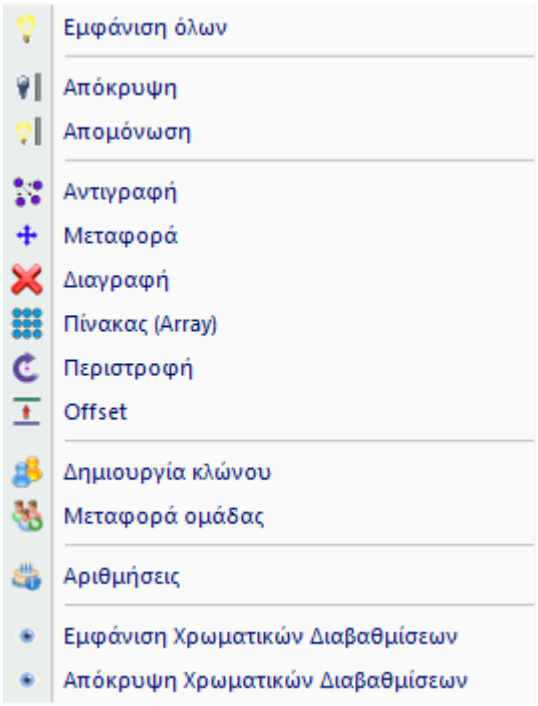
The new versions of SCADA Pro have integrated color grading of depletion ratios and various other controls in sizing. As far as the color scale is concerned, it always ranges from green to red with blue as an intermediate gradation. When representing ratio, it always ranges from 0 -1 (green - red) with corresponding coloration of the members. Members with a ratio greater than one shall be coloured red without further gradation and with the ratio value written on member, as shown in the figure below.



When the scale represents a specific quantity (e.g. reinforcement ratio p) the scale ranges between the minimum and maximum values presented in the vector.



So by pressing the right button on the desktop two new options have been added to the bottom of the menu:



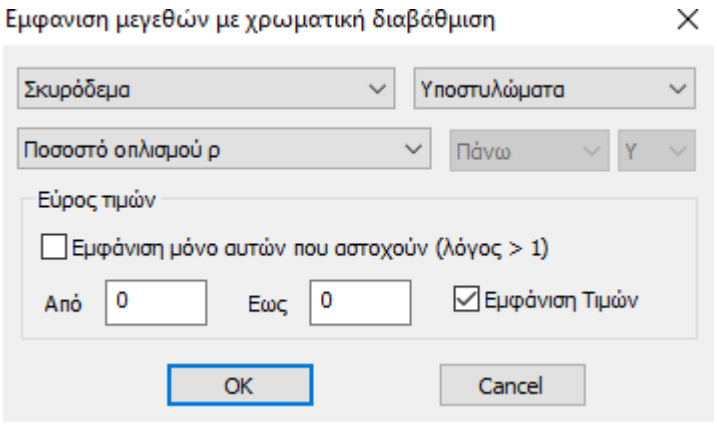
NOTES

- The "Hide Color Gradients" option clears the vector and desktop of colors and scale
- Because all sizes are only displayed in the 3D vector, selecting the command automatically rotates the vector to 3D.
- Linear members of all species have been divided into two categories
  Beams - Columns. Each time the sizes are displayed only for each category you select
- In the linear elements, those that are not selected to display size (e.g. the beams when I have chosen to display a size on poles), are all painted in grey (off scale) so that their colour is not confused with that of the others (especially if the values are not displayed)
- The name of the size displayed is shown at the bottom right. If the check box "Show values" is checked, the values are also displayed, otherwise only the colours are shown.
- The "Show only those that miss" option displays the values only for those that have a ratio >1.
- Finally, the "Range of values" option allows you to set a range of values to be displayed on the screen. This is a particularly useful tool especially in the case of large operators.

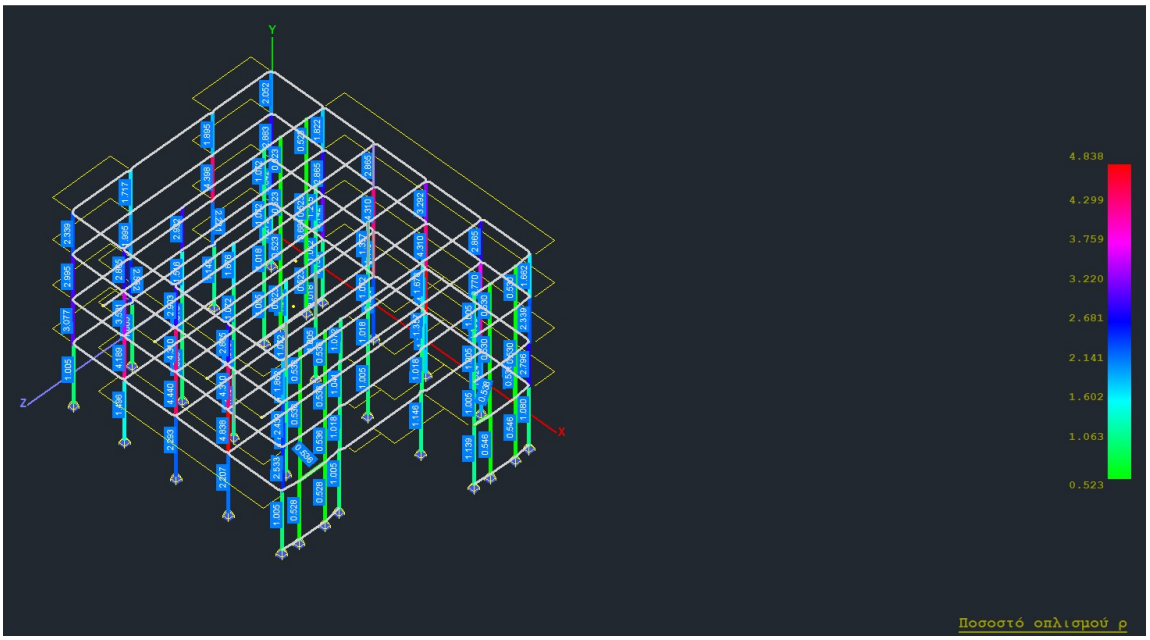
- As far as the **columns** are concerned, the following sizes are shown:
  - Percentage of reinforcement p
  - Reason for overarmouring
  - As bending reinforcement (cm2)
  - Reasons for bending exhaustion by y
  - Reasons for exhaustion of bending at z

- **<u>Percentage of reinforcement p</u>**

There is a single price for the whole pole. For example if you choose:

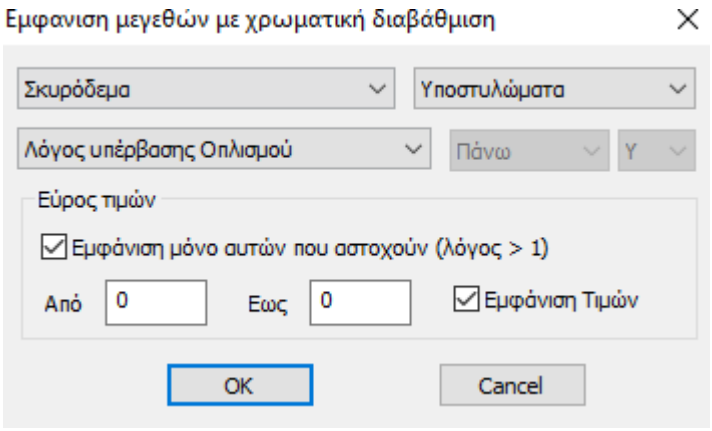


you will get the following picture:

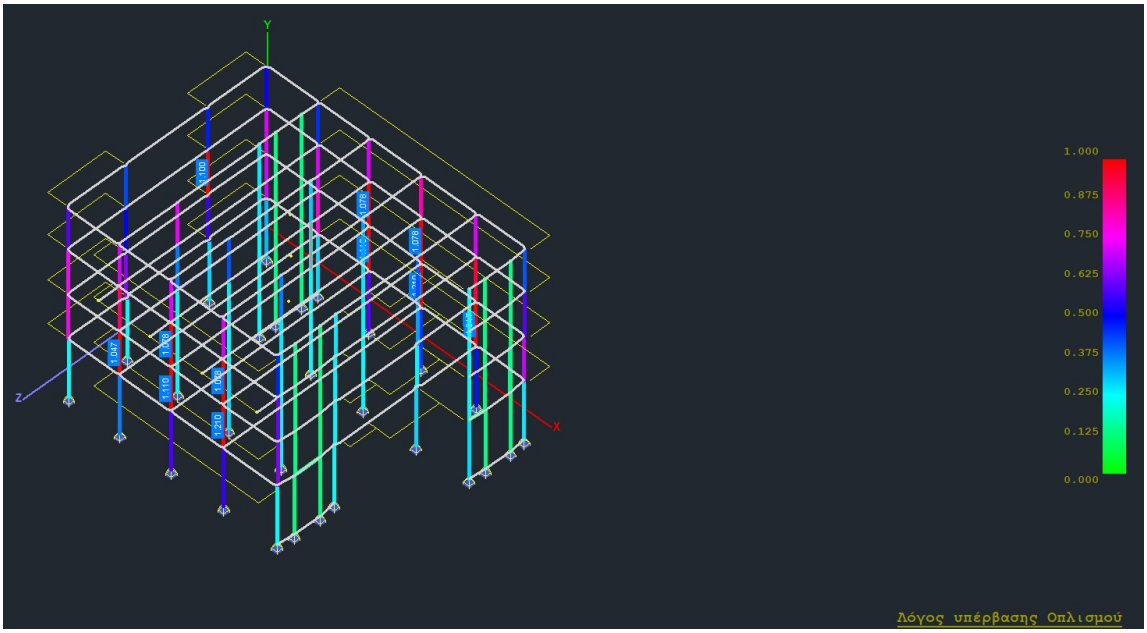


- **Reason for overarmouring**

Similarly there is a single price for the whole pole. For example if you choose:



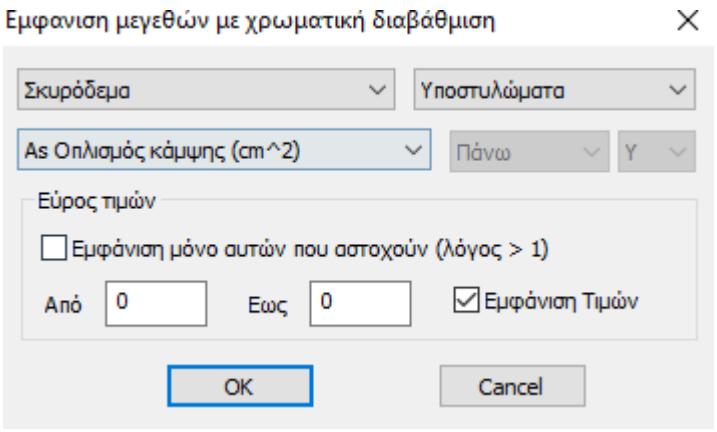
you will get the following picture:



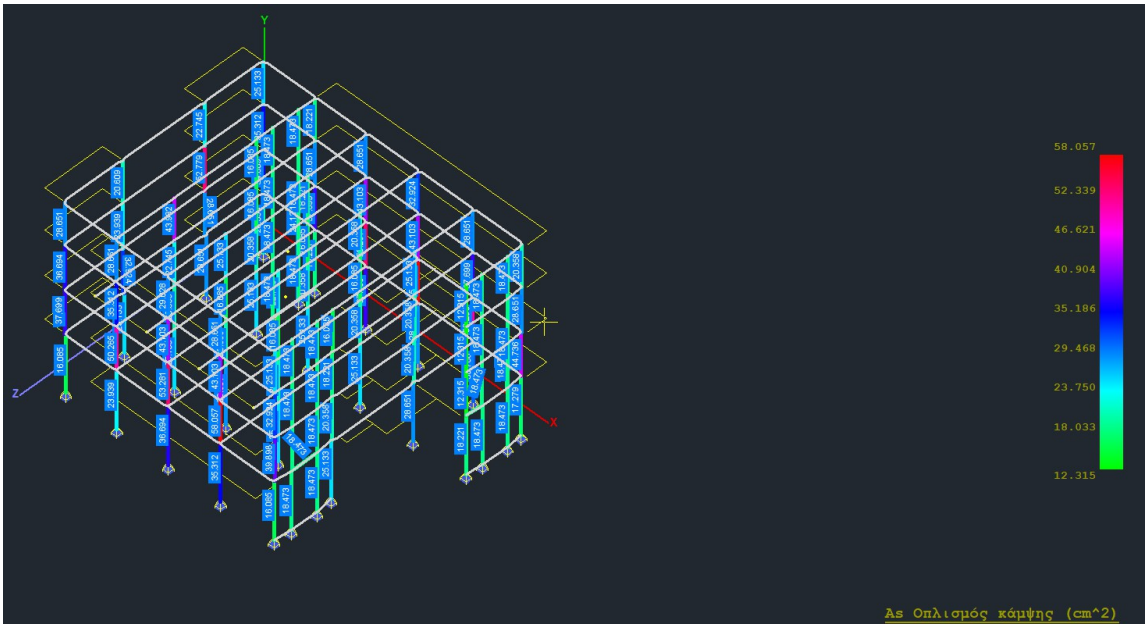
- **As bending reinforcement (cm^2)**

Similarly there is a single price for the whole pole. For

example if you choose:



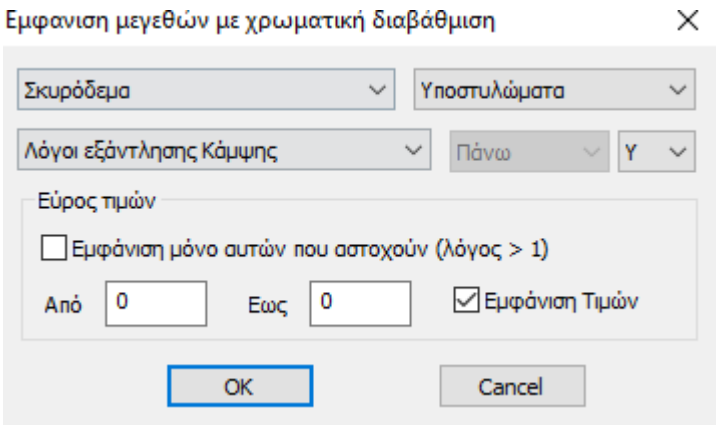
you will get the following picture:



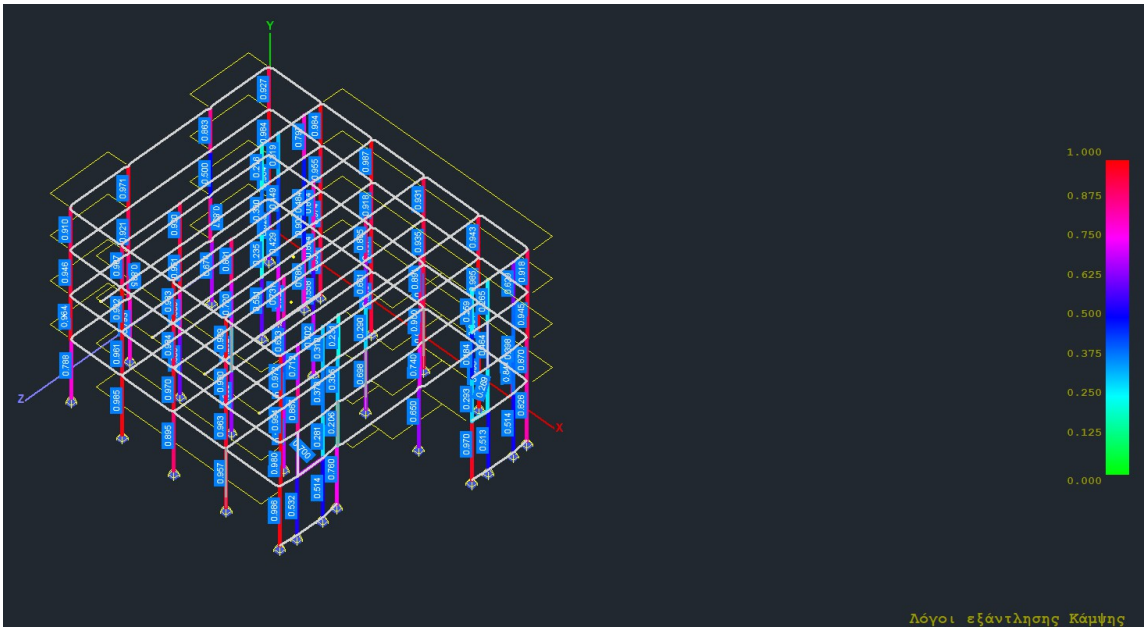
It is observed that there is only one value along the length of the column, as the bending reinforcement along the height of the column does not change.

- **Reasons for bending fatigue**

In the same way you display the y or z bending fatigue ratios for the columns.



and you have the following picture:



Notes:

When you see the value = 1 it means that the subcolumn has an overrun that can be much larger than one. That is, a value of 1 does not mean limiting strength. The same happens when the post has no reinforcement at all.

3.3.4 Armament details

-  With this option you can edit the reinforcement of column or wall in an integrated calculation and design environment. You can also perform reinforcements as well as calculate new moment diagrams.
- Detailed instructions on how to use this command can be found in the corresponding user manual (**chapter B. Details of Pillar Reinforcement**)

3.3.5 Strength calculation

After the pre-estimation process is completed, i.e. the dimensioning of the structure and adaptation of the reinforcements to the existing situation and before the creation of the pushover analysis scenario, it is necessary to precede the "Strength Calculation" by selecting the corresponding command:
"Sizing">"Supporting columns">"Strength calculation"

3.3.§ Calculation of M-N interaction diagrams

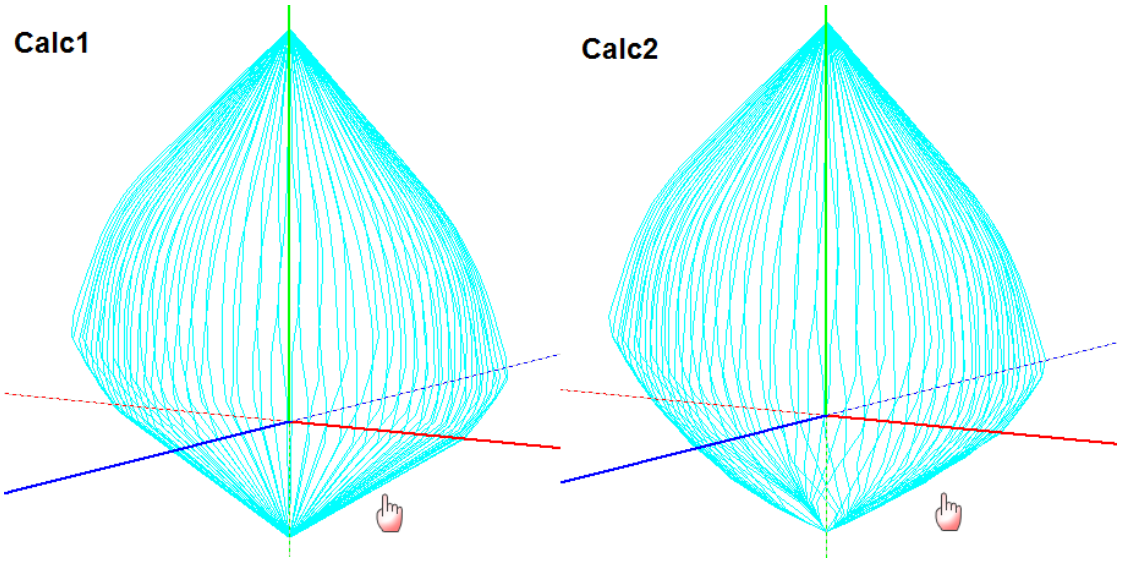
It involves the calculation and display of the moment-axial interaction diagrams, based on the geometry of the cross-section, the quality of the materials and the reinforcement. The three-dimensional diagram of the strength envelope (My, Mz, N) is produced. In addition, the Tension-Deformation diagrams for steel and concrete are displayed schematically, and the Stress-Curvature diagram is shown in detail.
The following section discusses the process of generating the charts and the presentation of all the necessary information that you can see in this dialog box.

- **CHART CALCULATION**

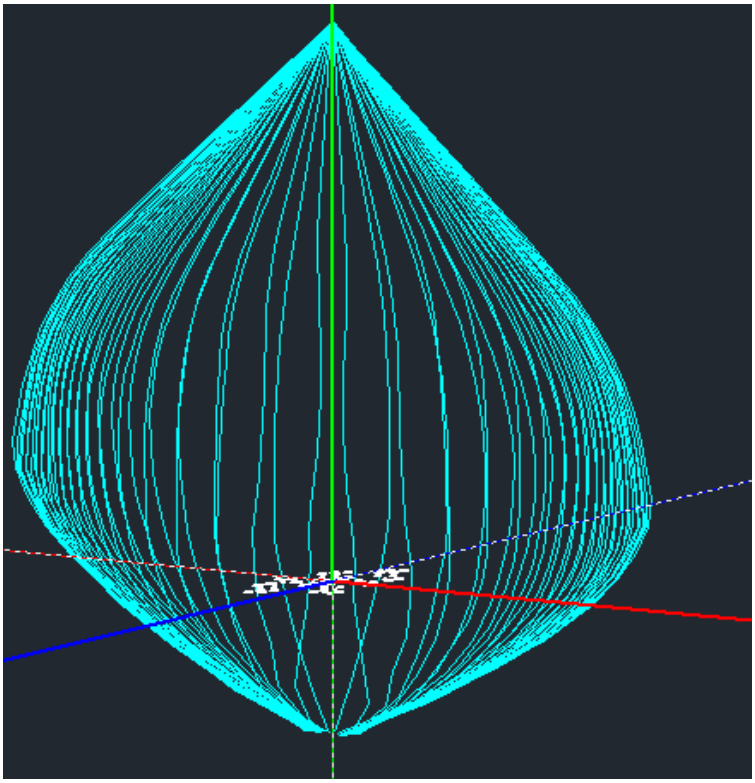
To create the interaction diagram of the selected cross-section, select either the "Calc1" or "Calc2" button.
The difference between the two diagrams concerns the part of the diagram with negative axial (-N) representing the tensile.

-Calc1**:** produces a linear tensile diagram, which means→ lower tensile strengths, hence→ less favourable conditions.
-Calc2: also calculates the intermediate values of the tensile, resulting in a curved diagram→ and more accurate tensile results.

Observation: The upper part of the chart (Sadness) is not affected by the above option. Both calculation modes ("Calc1" and "Calc2") produce exactly the same diagrams during compression.

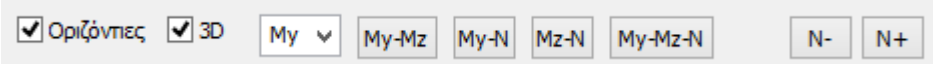


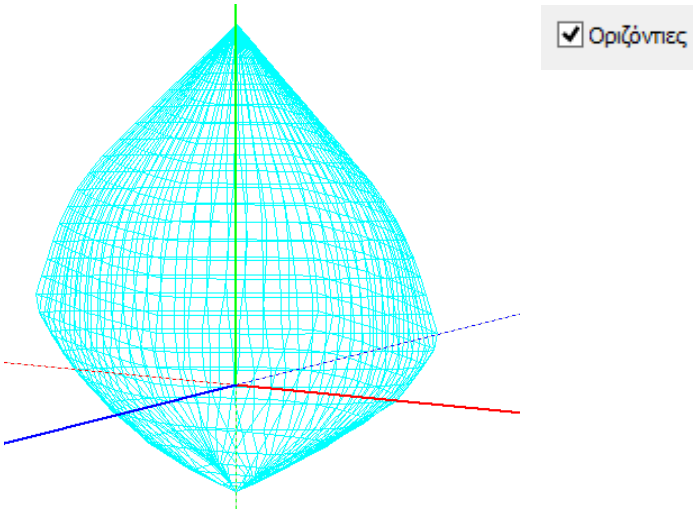
- **SCHEMATIC ILLUSTRATION**



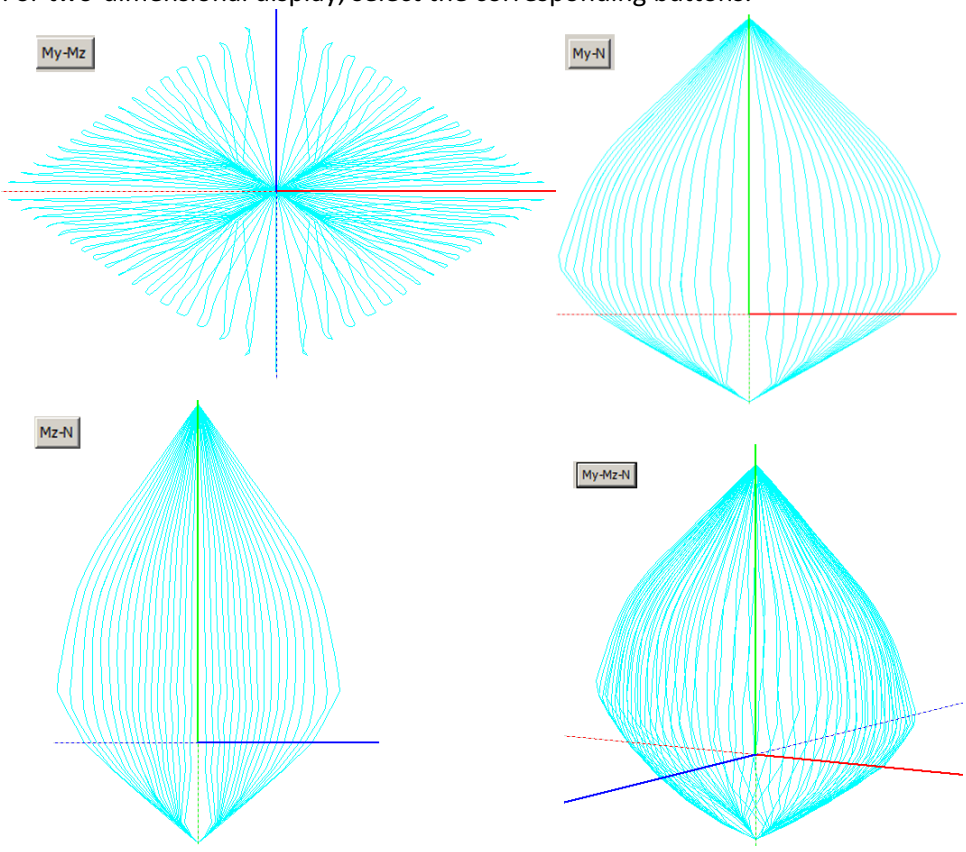
⚠ OBSERVATION

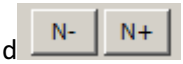
The points inside the diagram are the N-My-Mz points for each combination.



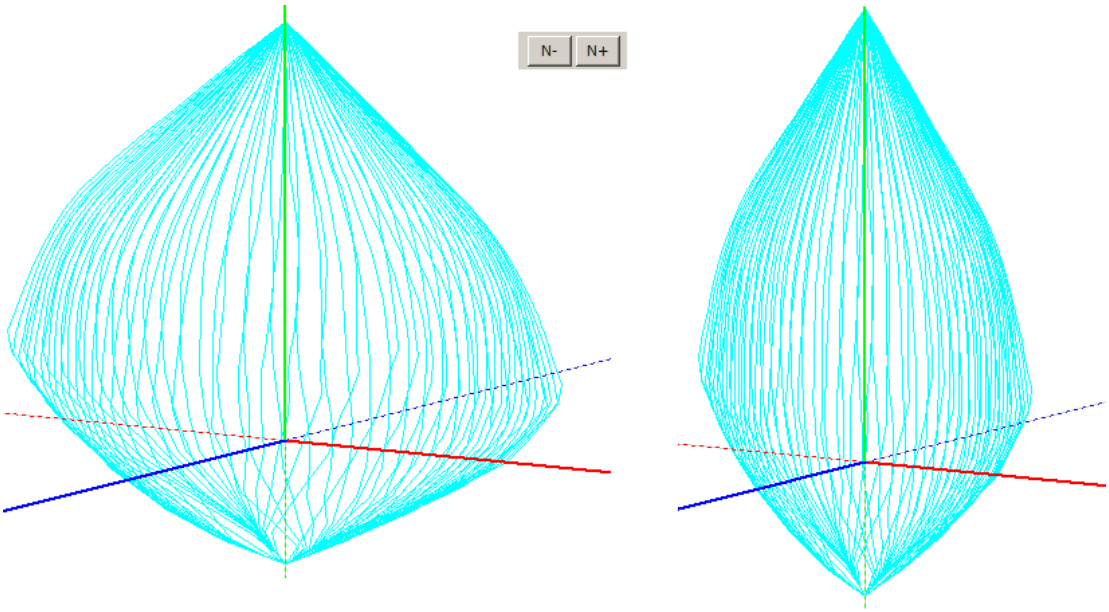


For two-dimensional display, select the corresponding buttons:

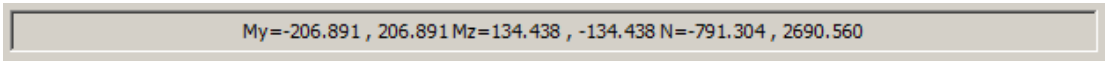


and 

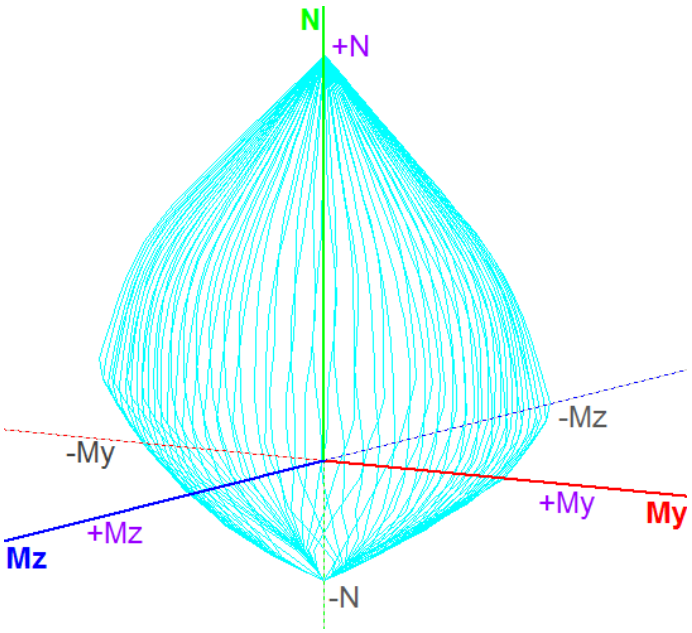
to display the resulting diagram by decreasing and increasing the scale of the axial force display.



- **HORIZONTAL MAXIMUM PRICE BAR**



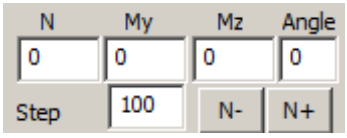
The horizontal bar shows the six maximum values obtained from the three-dimensional interaction diagram:



These values represent the maxima for each intensive quantity and are the extreme values of the curves

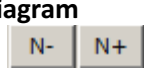
The axis system of the strength moments coincides with the local system of the column, with the provided, however, that you have not changed the default beta angle that program calculates for each column when the mathematical model of the vector is created.
The dotted line of the axes represents the negative values.

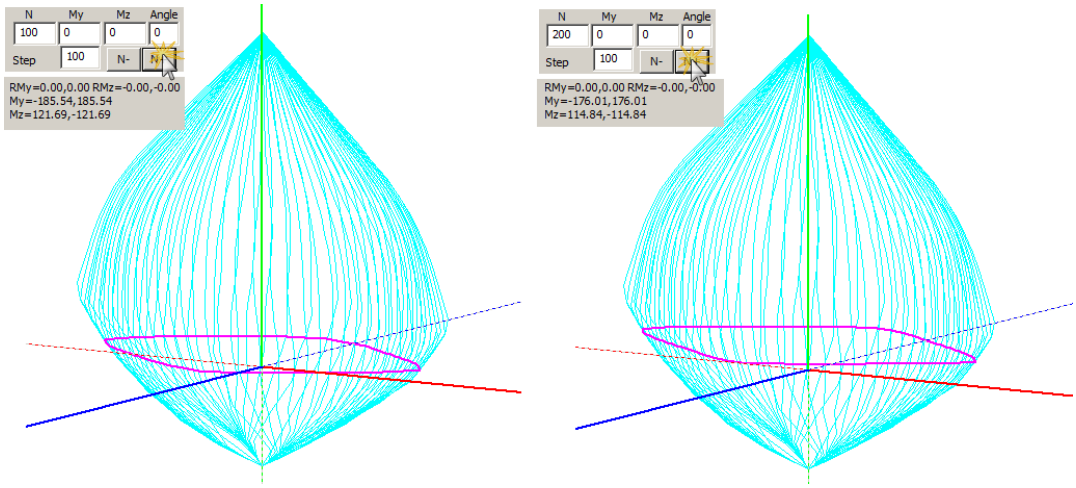
- **SEARCH FOR POINTS ON THE DIAGRAM**



This field can be used in several ways:

1. **To display the horizontal curves of the diagram**

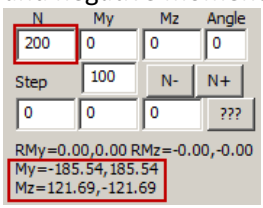
By typing a value only in the Step field and clicking 



at each 'click' the horizontal curve representing the values of the strength moments for a given value of the axial force and different values of the neutral axis angle is formed.
The "Step" field represents the step of increasing or decreasing the movement to form horizontal curves.

- By selecting N+ the curves are drawn with the direction upwards.
- By selecting N- the curves are drawn with the direction .

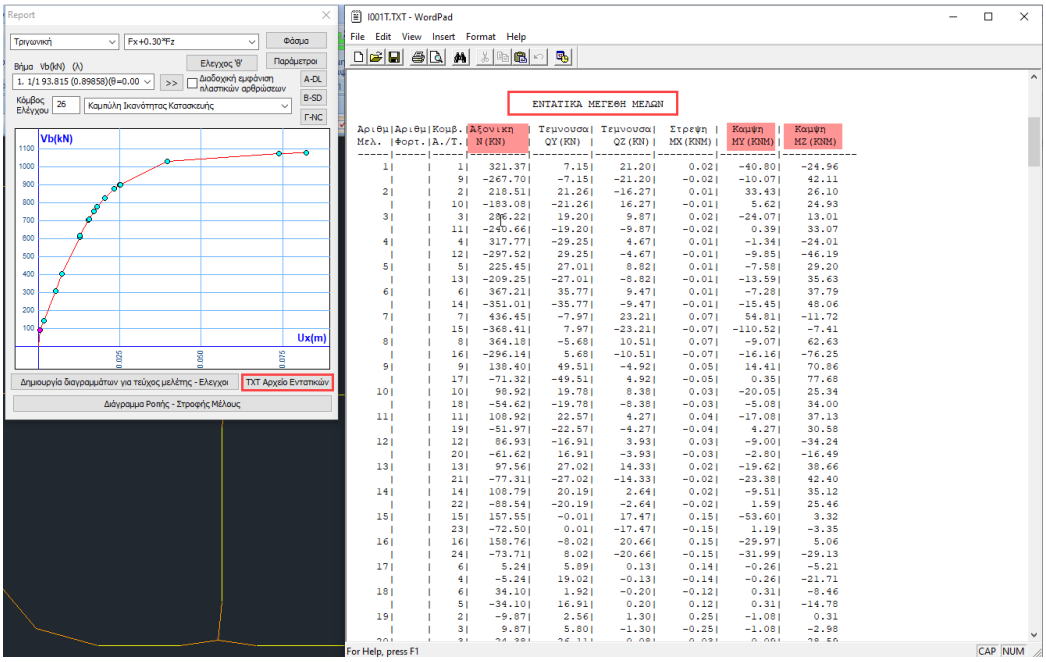
In addition, for each horizontal curve, the corresponding maximum positive and negative values of maximum positive and negative My and Mz of the diagram representing the maximum positive and negative moments of strength for that axial are given.



2. For the calculation of the strength moments with given N-My-Mz

To read the intensives:

-For inelastic analysis, open the TXT Tensors File which includes the intensities of all members.



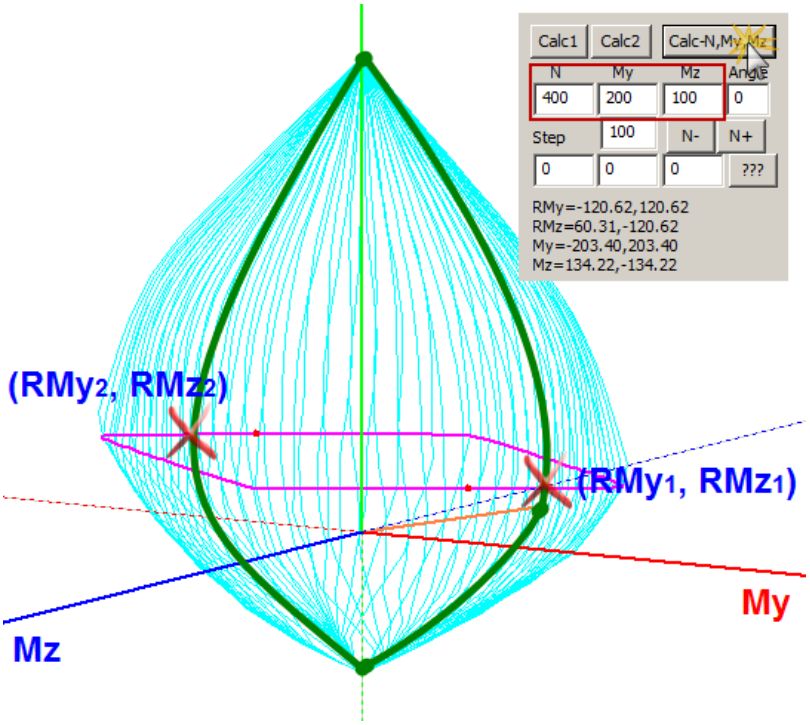
-For elastic analysis, open the printout of the l inadequacy indicators

Σελίδα : 2

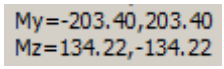
ΔΕΙΚΤΕΣ ΑΝΕΠΑΡΚΕΙΑΣ λ ΓΙΑ ΟΛΕΣ ΤΑ ΥΠΟΣΤΥΛΩΜΑΤΑ

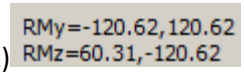
Μέλος	Κόμβος	My	RMy	λ	ΕΠΑΡΚΕΙΑ	Mz	RMz	λ	ΕΠΑΡΚΕΙΑ
1	1								
		-2.36	-425.98	0.01	Ναι	-23.40	-180.82	0.13	Ναι
	9	0.88	426.50	0.00	Ναι				
						-42.43	-122.72	0.35	Ναι
2	2					16.63	144.93	0.11	Ναι
		-18.09	-191.79	0.09	Ναι				
	10	0.25	19.78	0.01	Ναι				
						-18.30	-179.71	0.10	Ναι
3	3	32.27	83.17	0.39	Ναι	5.41	778.09	0.01	Ναι
	11	1.20	205.15	0.01	Ναι				
						-27.61	-3.29	8.39	Όχι
4	4	12.65	78.73	0.16	Ναι				
						-22.83	-142.07	0.16	Ναι
	12					45.60	151.14	0.30	Ναι
		-19.35	-64.12	0.30	Ναι				
5	5	12.44	93.33	0.13	Ναι	18.38	137.93	0.13	Ναι
	13								
		-16.19	-79.15	0.20	Ναι	-30.69	-150.00	0.20	Ναι
6	6	9.29	50.26	0.18	Ναι	25.76	139.30	0.18	Ναι
	14								
		-17.28	-61.10	0.28	Ναι	-36.23	-128.07	0.28	Ναι
7	7								
		-25.90	-765.05	0.03	Ναι	-7.65	-225.93	0.03	Ναι
	15					4.21	45.51	0.09	Ναι
		-121.57	-1315.39	0.09	Ναι				

Entering the values of the intensive quantities N, My, Mz in the corresponding fields and clicking Calc-N,My,Mz the program will start:



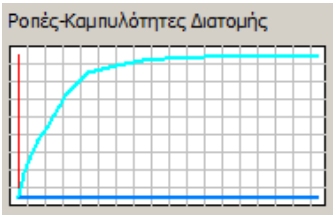
- finds the point (N,My,Mz) in the diagram
- draws the line segment joining (0,0,0) and (N,My,Mz) (orange section)
- plot the N* curve and calculate the corresponding My,max and Mz,max



- calculates the flexural strengths (RMy, RMz) 

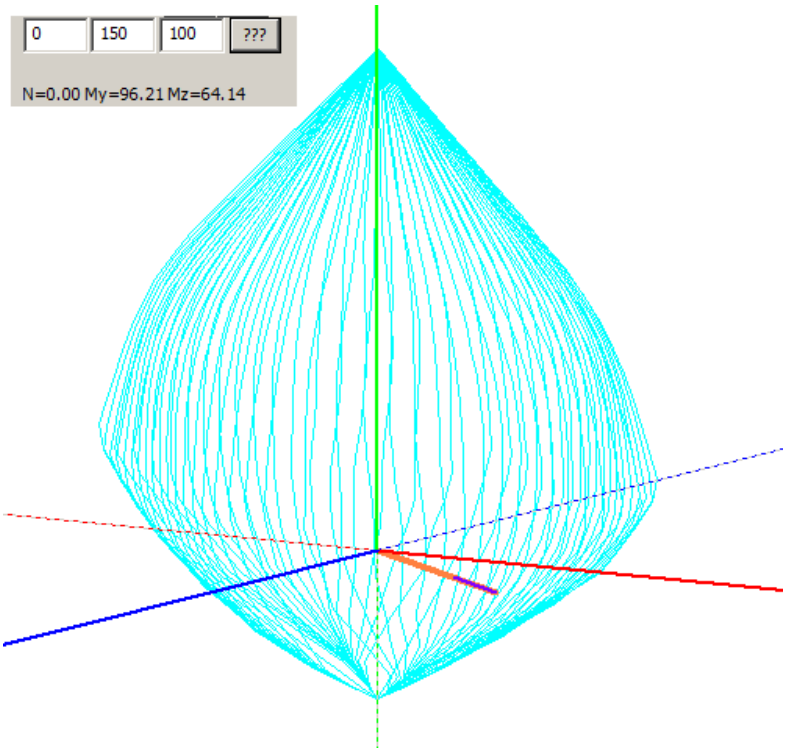
for the specific intensive quantities (N,My,Mz). They are the red dots on the horizontal curve.
- forms the "torque-curvature diagram"

The curvature moment diagram is defined for a specific angle of the neutral axis.
So by defining in the field 

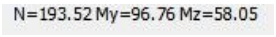


an angle with a value different from 0,90,180,270 degrees, the negative torque curve will also appear on the diagram.

- **EXTENSION OF POINTS ABOVE THE DIAGRAM**



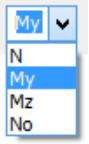
By entering values of intensive quantities in the corresponding fields and clicking 

, the program finds the point with the given coordinates, draws the straight line segment that connects it to the origin of the axes (orange section) and extends it until it meets the envelope (blue section), indicating the corresponding values of the strengths N, My 

and Mz of the intersection point (values useful for Pushover).

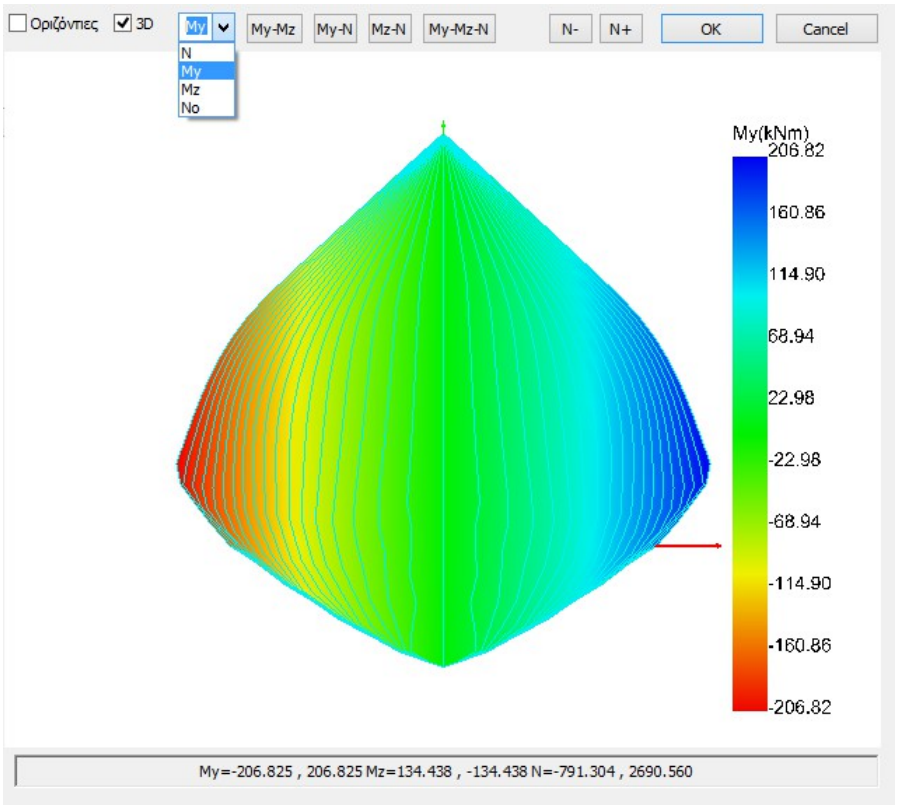
- **THREE-DIMENSIONAL REPRESENTATION OF THE INTERACTION DIAGRAM**

Activate the checkbox 

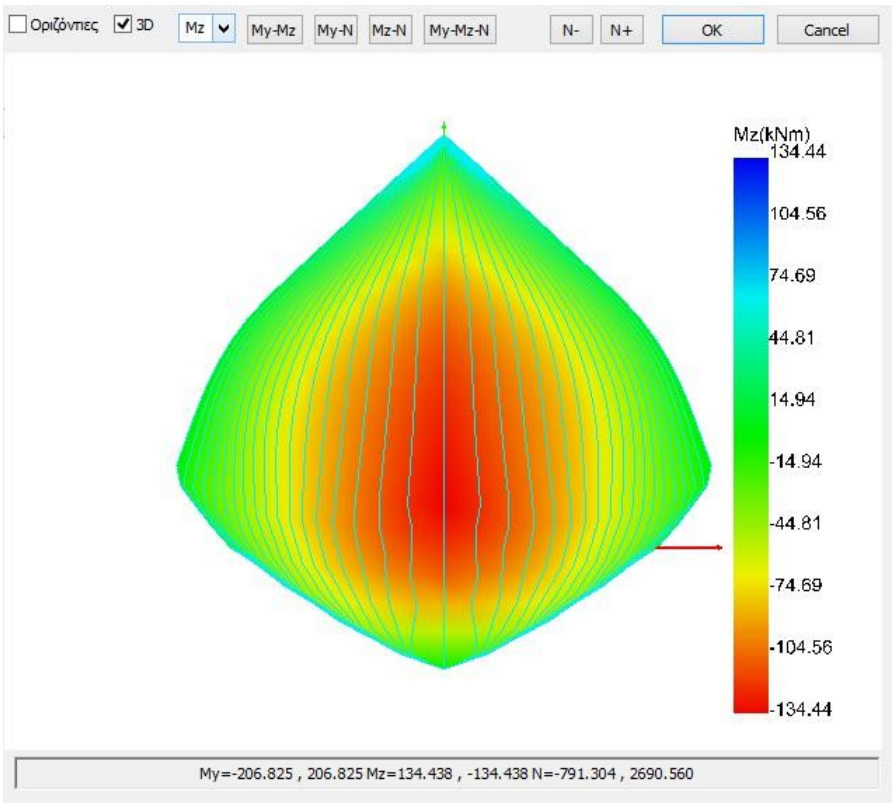
and select an intensive size 

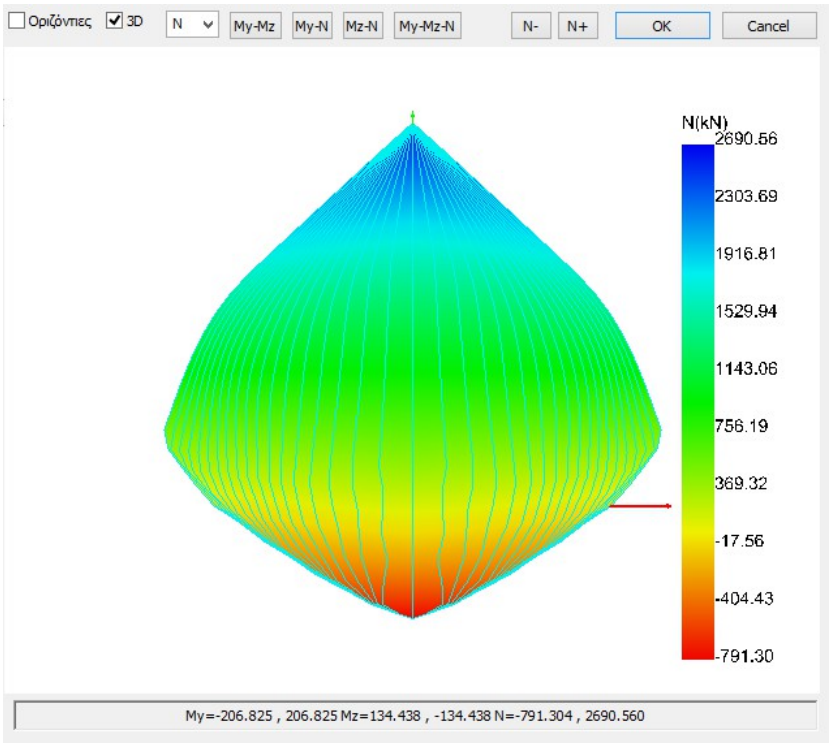
for for the color display.

By selecting My, the diagram is coloured along the y-axis. The colour gradient defines the range of the intersections, according to the bar on the right. The horizontal bar at bottom indicates the maximum and minimum values of all three intensities.

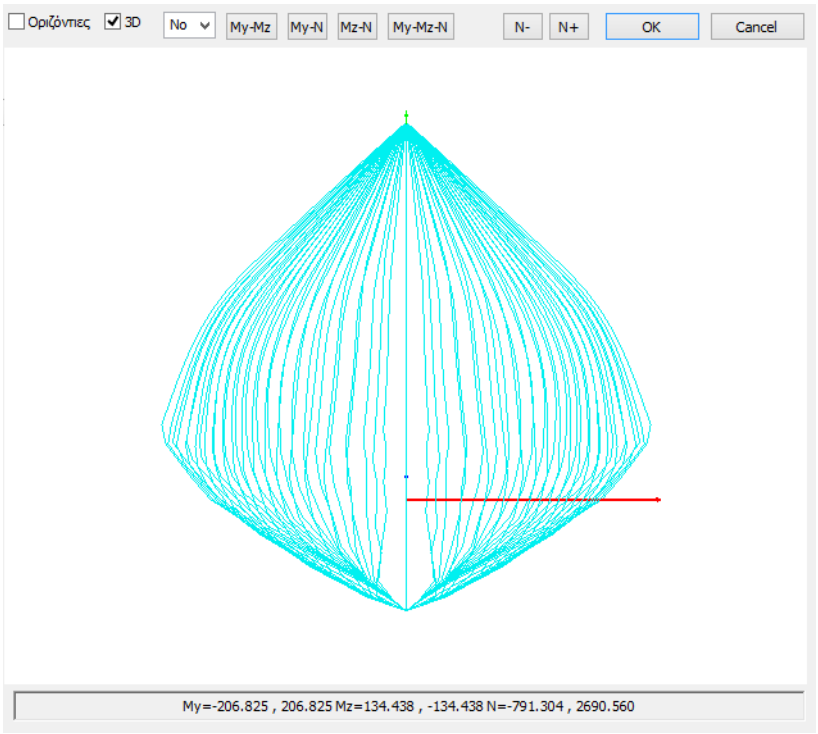


Similarly for Mz and N.

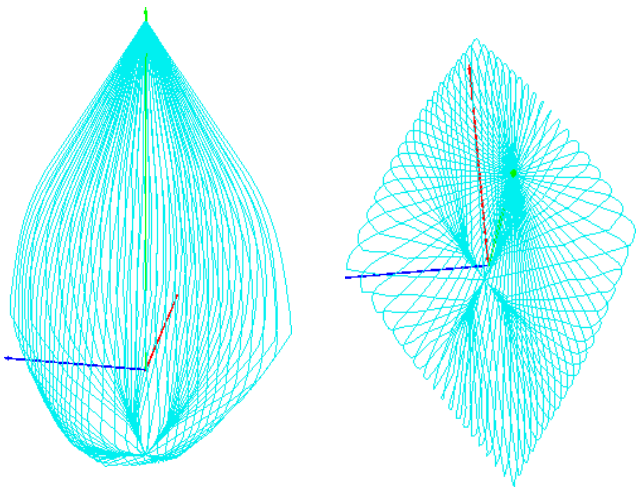




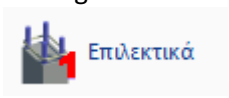
Selecting No displays the interaction diagram in a more accurate 3D representation, without colour rendering



By continuously pressing the left mouse button and moving it, you can rotate the diagram.

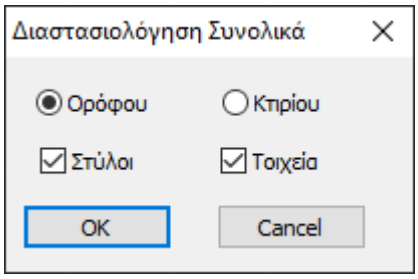


Through this command, the program calculates **the M-N interaction diagrams, either for the**



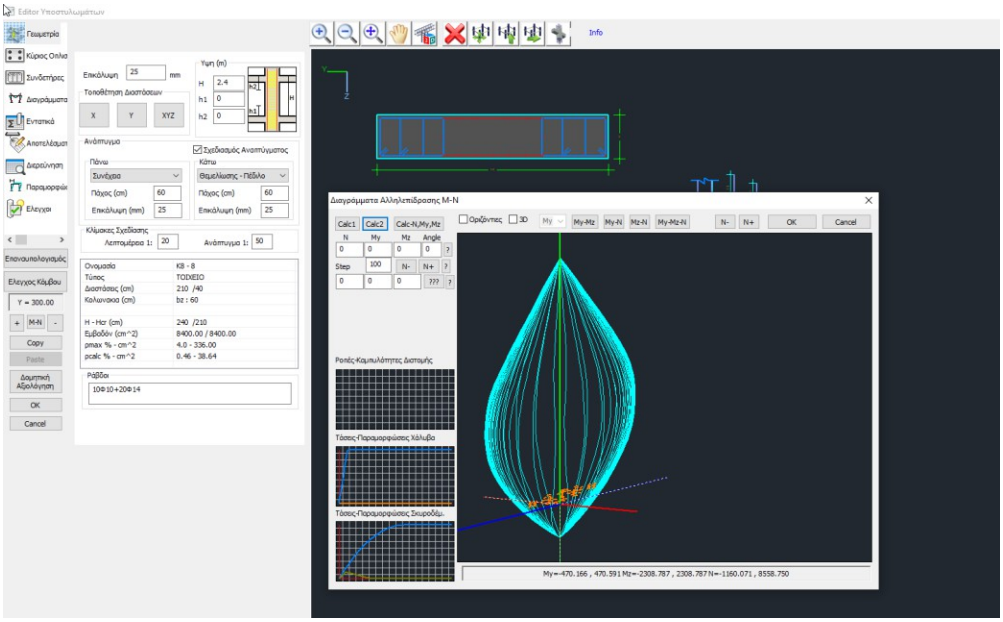
post or wall you select, or

for all columns of the structure and all levels.



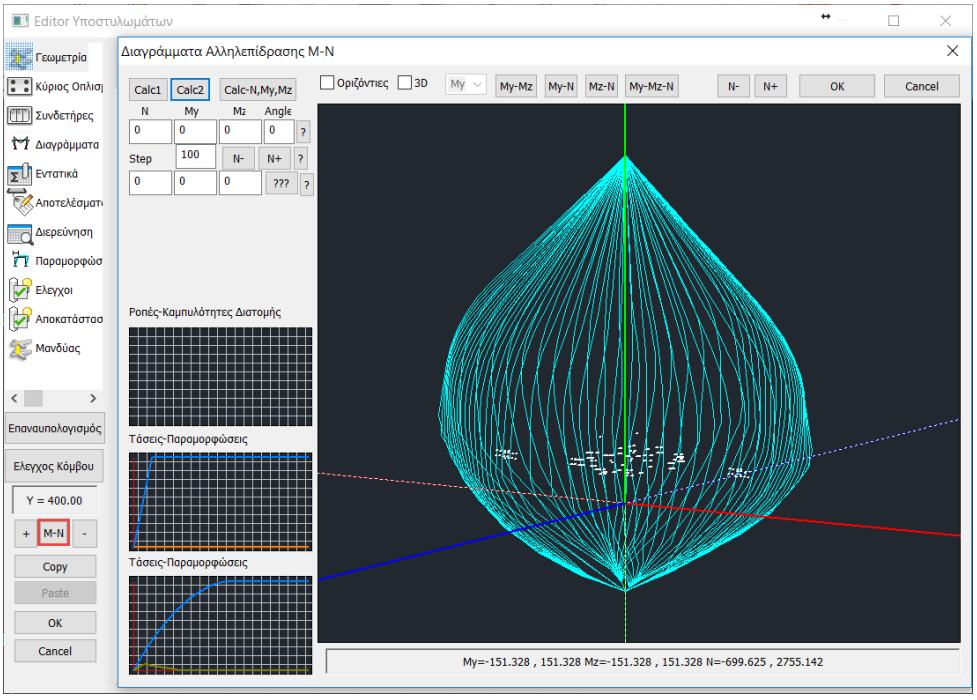
Select the Total command and from the dialog box whether the calculation will be done for the active floor or for the whole building, and whether the diagrams will be calculated only for the columns, or only for the walls, or both at the same time.
Select OK and let the program automatically calculate the new interaction diagrams for the selected elements.

On your screen, during the calculation, dialogue windows open, which are, for each column and/or wall of the level or building (depending on the selection), the window of the **Reinforcement Details** command followed by the calculation window of the corresponding **M-N Interaction Diagram.**
Wait for the program to complete the calculations for all selected items.



As mentioned above, the calculation of the M-N interaction diagram can also be done selectively for an individual column or wall, through the "Reinforcement Details" tool of the columns, which opens the corresponding window.

For the interaction diagram click  to open the window:



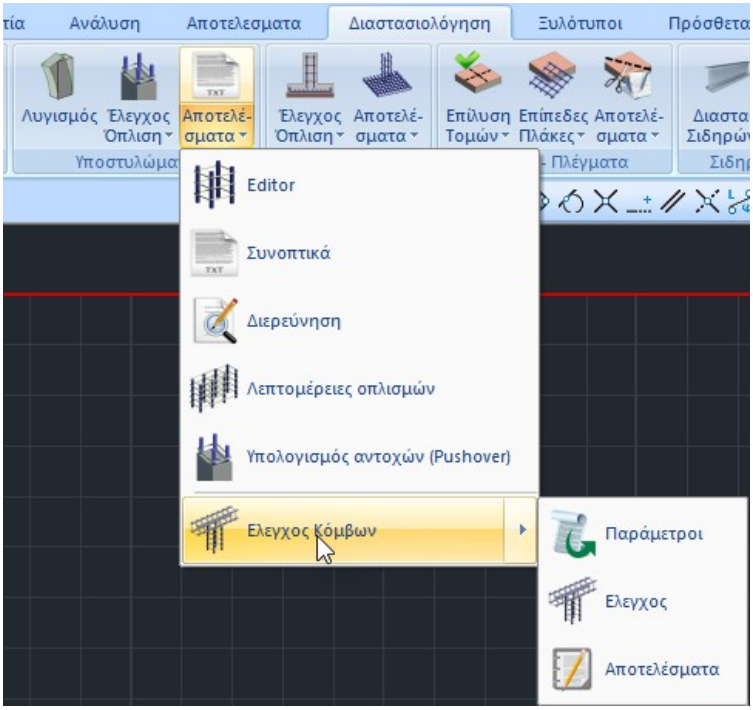
It is the calculation of the moment-axial interaction diagrams, which depends on the geometry of the cross-section, the quality of the materials and its reinforcement, and produces the three-dimensional diagram of the envelope (My, Mz, N).
In addition, the Tension-Deformation diagrams for steel and concrete are shown schematically, and the Stress-Contraction diagram is shown in detail.

3.3.6 Node control


In the new versions of SCADA Pro was added the check of the shear strength of the node according to paragraph 7.2.5. of the CEE.
The two prescribed checks are carried out on:

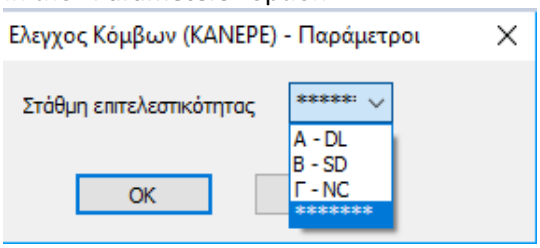
- Diagonal tensile cracking
- Failure in diagonal grief

The control option has been placed in the menu of the Subframe solution.



3.4 Parameters

In the **"Parameters"** option



The choice is made of the type of analysis from which the intensities are derived.

- If the analysis is pushover, you select the performance level against which to perform the checks. The intensive quantities correspond to the inelastic step for which the displacement of the control node is equal to
  targeted movement of the S.E. (A-DL , B-SD , C-NC).
- If the analysis is elastic, select the asterisks (****) (the selection of the performance level for the elastic analysis has already been done in the parameters of the analysis scenario). The check is done for all combinations of the analysis and the result is the worst depletion ratio.

3.5 Check

Then, **the "Check"** option checks the nodes as a whole, but only for the current level.

The planned checks are carried out:

Diagonal tensile cracking

Under the combination of: a) the average shear stress **τj** , b) the normal stress **σc=vtopfc** caused by the axial load of the overlying column, the tensile cracking strength is calculated:

$$\tau_j \geq \tau_c = f_{ct}\sqrt{\left(1+\frac{\rho_{jh} f_{yw}}{f_{ct}}\right)\left(1+\frac{\nu_{top} f_c}{f_{ct}}\right)}$$

Where $\rho_{jh} = A_{sh}/b_j h_{jb}$, the percentage of horizontal connectors parallel to the vertical plane of the stress tj, reduced to the surface of the vertical cross-section of the node.

Failure from diagonal grief

The compressive strength of the concrete, as reduced by any transverse tensile deformations, is calculated:

$$\tau_j \geq \tau_{ju} = nf_c\sqrt{1-\frac{\nu_{top}}{n}}$$

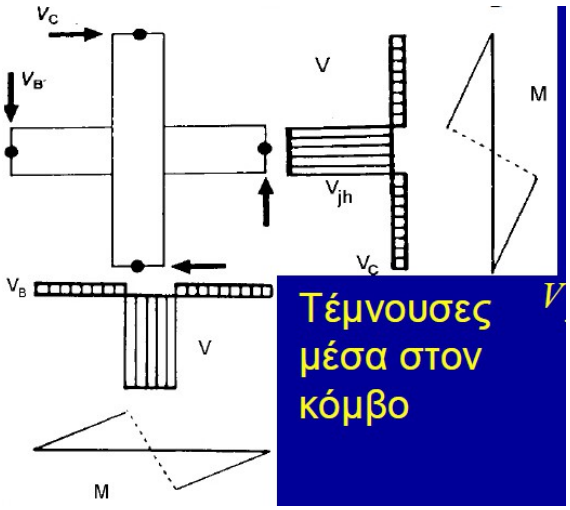
Where n= 0.6(1-fc/250), the reduction factor of the uniaxial compressive strength due to transverse tensile deformations.

3.6 Results

The "Results" option displays the results of the checks:

													Σελίδα : 1
ΕΛΕΓΧΟΣ ΔΙΑΤΜΗΤΙΚΗΣ ΑΝΤΟΧΗΣ ΚΟΜΒΟΥ (ΚΑΝ.ΕΠΕ. παρ.7.2.5)													
Στάθμη:	2 - 600.00 b						Στάθμη επιτελεστικότητας		***				
Κόμβος	Στύλος Άνω/Κάτω	Διεύθυνση	Δοκοί αριστ.	Δοκοί δεξιά	ΣMyb (kNm)	ΣMyc (kNm)	Vjh (kN)	Vjv (kN)	τj (MPa)	τc (MPa)	τju (MPa)	τj / τc τj / τju
7	13	y-y		39	72.4	71.9		205.5	0.86	2.26		0.38
					72.4	71.9		205.5	0.86		15.97	0.05
	7	z-z	43		72.4	72.0		204.7	0.85	2.25		0.38
					72.4	72.0		204.7	0.85		15.99	0.05
8	14	y-y	39	38	275.2	228.5		647.0	2.70	2.73		0.99
					275.2	228.5		647.0	2.70		15.52	0.17
	8	z-z	44		137.6	153.8	222.8		1.39	2.79		0.50
					137.6	180.2	222.8		1.39		15.49	0.09
9	15	y-y	38		72.4	204.3	117.0		0.73	2.42		0.30
					72.4	149.0	117.0		0.73		15.85	0.05
	9	z-z	40		137.6	136.4		382.5	1.59	2.34		0.68
					137.6	136.4		382.5	1.59		15.91	0.10
10	16	y-y		41	137.6	136.3		384.0	1.60	2.69		0.59
					137.6	136.3		384.0	1.60		15.56	0.10
	10	z-z		43	72.4	71.4		202.8	0.84	2.65		0.32
					72.4	72.0		204.4	0.85		15.55	0.05
11	17	y-y	41	42	275.2	229.4		653.4	2.72	2.70		1.01
					275.2	229.4		653.4	2.72		8.53	0.32
	11	z-z		44	137.6	134.2		376.3	1.57	2.72		0.58
					137.6	134.5		377.1	1.57		15.47	0.10
12	18	y-y	42		72.4	72.4		208.3	0.87	2.36		0.37
					72.4	72.3		208.3	0.87		15.87	0.05
	12	z-z		40	137.6	102.8		289.7	1.21	2.34		0.51
					137.6	102.8		289.7	1.21		15.90	0.08

- In the first column is the node number (7)
- The second column shows the upper pole (13) and the lower pole (7)
- Then, by direction (yy and zz), we have beams (first by yy) running from the left (not present here, the post is angular) and from the right (39)
- Then we have separately for each check, the sum of the coincident beam strength moments (**SMyb**) and the sum of the column strength moments (**SMyc**). Which of the two quantities is larger determines which of the two shear forces is the critical one according to the diagram below.



If **SMyb< SMyc** then the beams are weaker than the columns, then the beams introduce a cutting force **Vjh** into the node,

$$V_{jh} \approx \sum M_{yb}\left(\frac{1}{z_b}-\frac{1}{h_{st}}\frac{L_b}{L_{bn}}\right) \quad (\Sigma.10) \longrightarrow \tau_j=V_{jh}/b_j h_c$$

Whereas, if **SMyb> SMyc** then the beams are stronger than the columns, then the columns determine the shear stress **Vjv**.

$$V_{jv} \approx \sum M_{yc}\left(\frac{1}{z_c}-\frac{1}{L_b}\frac{h_{st}}{h_{st,n}}\right)+\frac{1}{2}\left|\left[V_{g+\psi q,b}\right]_l-\left[V_{g+\psi q,b}\right]_r\right| \quad (\Sigma.\ 11) \longrightarrow \tau_j=V_{jv}/b_j h_b$$

The stress **τj** developed at the interface is then calculated and the ratios are calculated:

- for the first type of failure : tj/τc
- for the second type of failure : tj/τju.

Reasons greater than one are shown in red.

OBSERVATIONS:

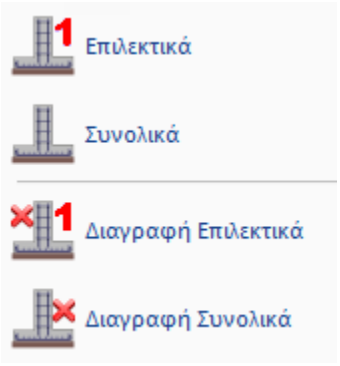
Checks are being done:

- for the **inelastic** analysis for the specific intensities of the chosen performance level,
- and for the **elastic** analysis the test is performed for each combination and the final result is the worst ratio.
- **Required** **A prerequisite for performing the node checks is the creation of the M-N interaction diagrams.**

4. Sandals

The field "Peds" contains the commands related to the sizing of the peds and the corresponding results.

4.1 Arming control



4.1.1. Selectively


to selectively size the pedestals selectively.
Select the command and click on the skirt you want to size. The node of the pedestal, depending on the type of failure, is painted in the corresponding color according to the following


The skirt was sized and armed without any problems.


The skirt missed. The type of failure is also indicated as a symbol above the failure indication. Initials indicating the type of failure also appear on the shoe:

Bending discrepancy	M
Shear fracture	V
Perforation failure	np
Ground shaking	pulse
Damage to data carriers	D/I
Eccentricity	E

ATTENTION:
A prerequisite for the dimensioning of the pedestals is the dimensioning of the level 1 poles.
OBSERVATION:

- *In some cases it is suggested that the dimensioning of the footings be done with combinations of statics because the dynamic quantities are unmarked and not suitable for the dimensioning of the foundation.*

As is well known, seismic intensities derived from dynamic analysis are unlabeled because they result from the superposition of the eigenmodal responses. In the diagrams and wherever there is a necessity to superimpose them, they are always used with positive values. And for the dimensioning of the elements there is no problem because the combinations include them with both signs but in cases such as the dimensioning of the pedestal where magnitudes are used for each combination from each element the situation may turn out unfavourable.
For this reason I recommended you to solve the sandals with static combinations.

4.1.2. Overall

 to make a total sizing of the level pedestals. Select the command and all the level pedestals are sized

4.1.3. Delete Selectively

 to selectively delete the dimensioning of a pedestal. You select the command and then click on the petal whose sizing you want to delete. The colored sizing node turns yellow and the "Redesign" command clears it completely

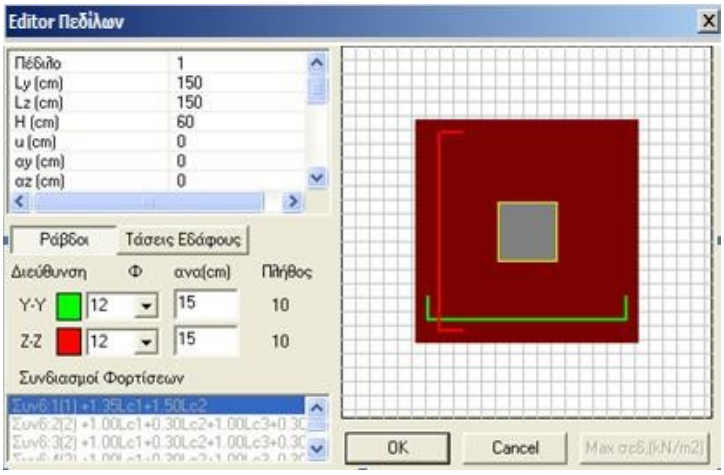
4.1.4. Deletion Total

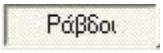
 to make a total deletion of the level pedestal dimensioning. Select the command and all colored sizing nodes are automatically deleted.

4.2. Results

4.2.1. Editor


to see all the results graphically and to view and edit the reinforcements of the pediment. With this option and after selecting a skirt that you have already sized, the following dialog box appears:

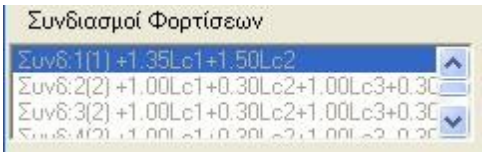


The two main options are the "Barsbutton 

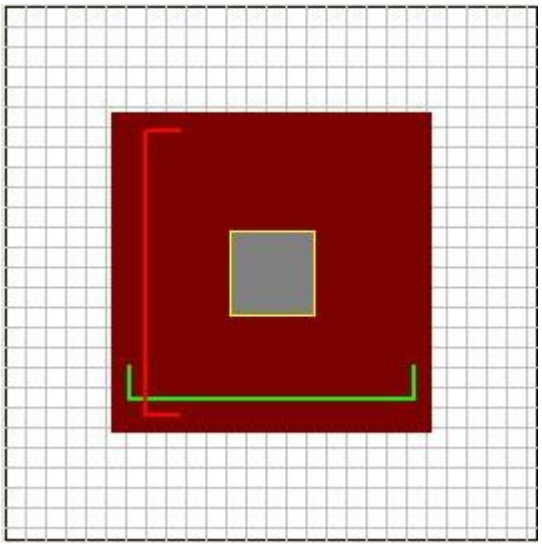
and "Ground Trends" 

. The "Bars" option activates the section of the dialog box concerning reinforcement.

while the lower section of the load combinations is disabled respectively



which relates to the ground stresses developed at the 4 peaks of the pediment.
Here you can see and modify the reinforcement bars of this particular pedestal. You select, if you wish, the new diameter and the distance per reinforcement direction. The colours correspond to the corresponding irons shown in the side sketch.

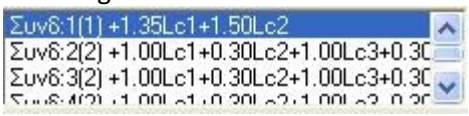


The total "Number" of bars will automatically change depending on the new distance you select. In the upper left section a table is displayed with the name, the geometric data of the pediment, as well as the other elements of the pediment.

Πέδιλο	1
Ly (cm)	150
Lz (cm)	150
H (cm)	60
u (cm)	0
αy (cm)	0
αz (cm)	0

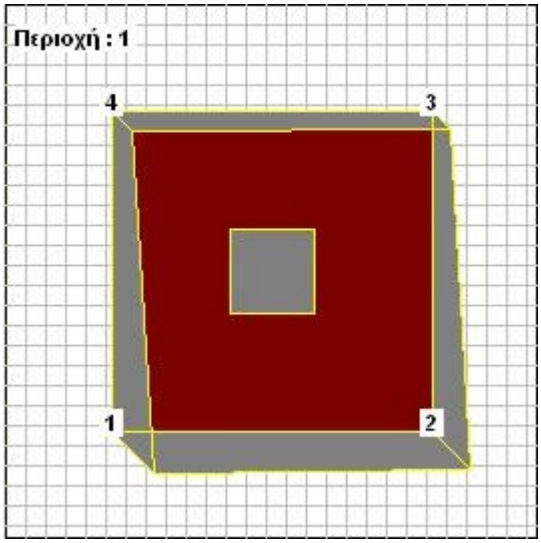
dy (cm)	40
dz (cm)	40
ηεδάφους (cm)	0
Βάρος Πεδίλου.(KN)	33.75
Βάρος Υπερκ.Γαιων...	0.00
σεη.(kN/m2) (0)	0.000
σθρ.(kN/m2) (64)	49.688

Selecting the "Soil Trends" button activates the section of load combinations

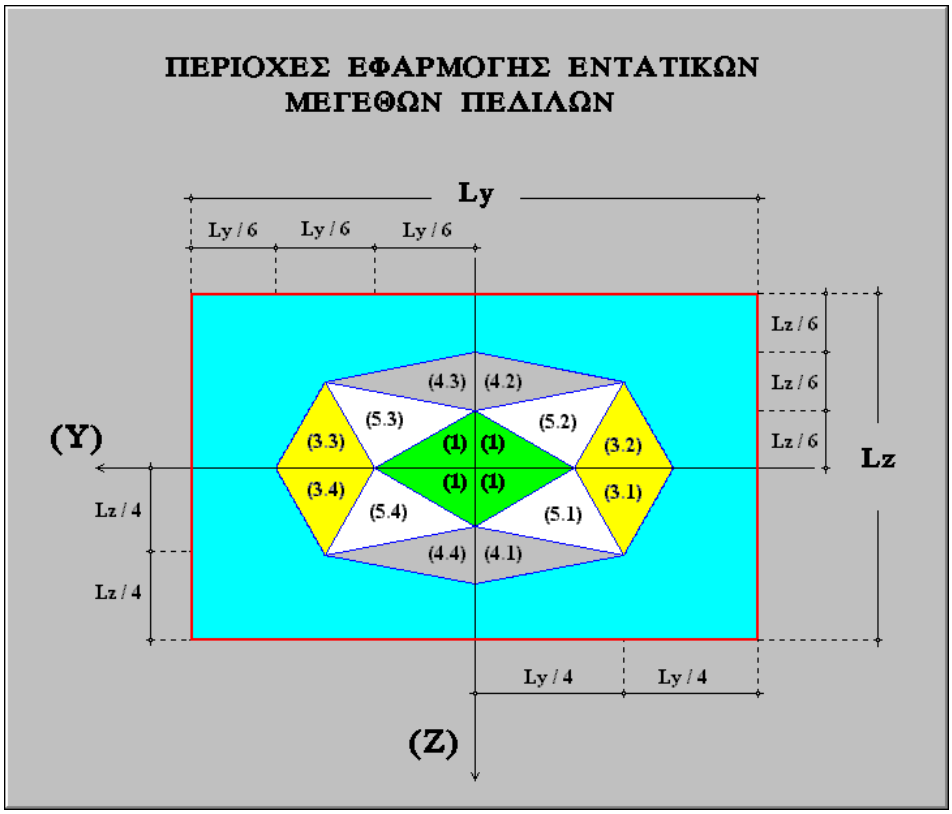


and the armature module shall be deactivated accordingly

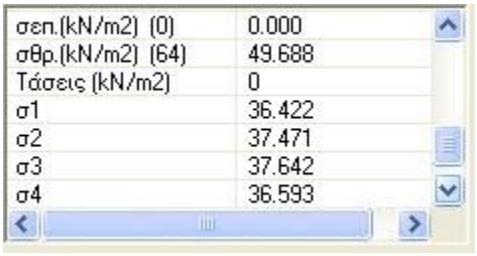
Also the sketch on the right, no longer shows you the reinforcements, but the solid of the stresses of the pedestal.



Above the stress solid you see a message indicating the area of application of the pedestal's stresses according to the following diagram.



This section is only concerned with the display of the developed ground trends at the 4 peaks of the field from the combination you choose. Using the scroll bars, move to the corresponding part of the table where the soil stresses are shown



and by selecting a combination from the table, you can see the corresponding voltages σ1, σ2, σ3,σ4. You also see the maximum developing voltage sep. developed by a Functional combination, as well as the maximum voltage σθρ. developed by a Failure combination. When you have not defined a functionality combination, the voltage sep. is zero. Finally, pressing the 

key displays the maximum ground stresses developed, as well as the combination from which they are derived.

4.2.2. In summary


to display the summary results of the pedestal sizing. Select it and after pointing to the pencil you want to view the results, the following page appears

```
---------Πεδιλο Π1  Κεντρικο Ειδος:Πλακα-Εδραση υπ/των Κ1------------------------
|Γεωμετρια Πεδ.(cm):Ly=150   Lz=150   H=60    υ=0    -Εκ/τες αy=0     αz=0      |
|Υψος Υπερκ.Γαιων t(cm)=0    γεδ(KN/M3)=18.0 σεπ(KN/M2)=250.0 Ks(MPa/cm)=0.30  |
|Βαρος Πεδ.(KN)=33.75    Βαρος Υπερκ.Γαιων(KN)=0.00    Ιδ.Υποστ.(cm)=  40x40   |
|---------------Σ Τ Ο Ι Χ Ε Ι Α    Ε Δ Α Φ Ο Υ Σ -- (Mh Σεισμικά Ευπαθές)------|
|Γωνία εσωτ.τριβής φ: 0.00 Γωνία Τριβής Εδ-Θεμ.δ: 0.00 Συνοχή Εδ.C (Kn/m2): 0.0|
|Ειδ.Βάρ.δ.γw(kN/m3): 0.00 Τιμή Υδραυλ.Κλίσης  j: 0.00 Ειδ.βαρ.Εδ.γ(Kn/m3): 0.0|
|----------------------- Υ Α Ι Κ Α - Ε Π Ι Κ Α Λ Υ Ψ Η -------------------------|
|----------ΕΛΕΓΧΟΣ ΣΕ ΚΑΜΨΗ ΜΕ ΟΡΘΗ ΔΥΝΑΜΗ & ΥΠΟΛΟΓΙΣΜΟΣ ΤΑΣΕΩΝ ΕΔΑΦΟΥΣ--------|
|Συν|αcd |   Nsd |  MSdy | ez/Lz  | MSdz  | ey/Ly  |  σ1  |  σ2  |  σ3  |  σ4  |
|---+----+--(KN)-+-(KNM)-+--------+-(KNM)-+--------+------(KN/M2)--------------|
| 64| 3.5|     81|     -7|  0.0556|      1| -0.0072|  49.7|  46.6|  22.5|  25.6|
|--Οπλισμοι: κατα Y(38)=Φ12/15 (10Φ12)------------- κατα Z(18)=Φ12/15 (10Φ12)--|
|-----ΕΛΕΓΧΟΣ ΣΕ  Δ Ι Α Τ Μ Η Σ Η  &  Δ Ι Α Τ Ρ Η Σ Η (ΜΕΓΙΣΤΕΣ ΤΕΜΝΟΥΣΕΣ)-----|
|Διατμηση:VSDy=  40.7 VRD1y= 241.0 Συν.:  1   VSDz=  40.7 VRD1z= 238.8 Συν.:  1|
|Διατρηση:vSD =   0.2 vRD1 = 229.5 Συν.:  1    As Διατρ.=0.00                  |
|---ΑΣΤΟΧΙΑ ΛΟΓΩ ΥΠΕΡΒΑΣΗΣ ΤΗΣ ΦΕΡΟΥΣΑΣ ΙΚΑΝΟΤΗΤΑΣ ΕΔΡΑΣΗΣ (ΟΡΙΑΚΟΥ ΦΟΡΤΙΟΥ)---|
|----------Z.6 ΕΚΤΙΜΗΣΗ ΦΕΡΟΥΣΑΣ ΙΚΑΝΟΤΗΤΑΣ ΑΠΟ ΠΡΟΥΠΑΡΧΟΥΣΑ ΕΜΠΕΙΡΙΑ----------|
|Επιτρεπόμενη Τάση σεπ (kN/m2) :  250.00                                      |
|Συν| ey  | ez  | Ly' | Lz' |  A'  | Vsdy | Vsdz |     q     | Nsd   <>   RNd   |
|---+-(m)-+-(m)-+-(m)-+-(m)-+-(m2)-+-(kN)-+-(kN)-+-(kN/m2)--+--(kN)------(kN)--|
| 57| 0.01| 0.09| 1.48| 1.33|  1.96|-25.22| 24.01|     0.000|  77.52 <  425.36 |
-------------------------------------------------------------------------------
```

4.2.3. Investigation

 to see the full data on which the calculations for the lapel were based. Select the command, point to the lapel and the following page appears

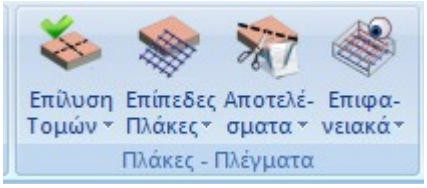
ΕΛΕΓΧΟΣ ΣΕ ΚΑΜΨΗ

Ογκος = 1.35
Βάρος = 33.75
Βάρος Γαιών = 0.00
Foot Id: 1 (1)

	ΣΥΝ	N	My	Mz	Vy	Vz	Mx
ΣΤΑΤ.	1	83.32	0.05	-0.29	-28.57	9.52	
ΣΕΙΣ.	1	0.00	0.00	0.00	0.00	0.00	
ΣΤΑΤ.	2	61.72	0.04	-0.22	-21.16	7.05	
ΣΕΙΣ.	2	-11.85	0.57	-1.03	4.99	-1.06	
ΣΤΑΤ.	3	61.72	0.04	-0.22	-21.16	7.05	
ΣΕΙΣ.	3	-15.45	0.57	-1.03	4.99	-1.06	
ΣΤΑΤ.	4	61.72	0.04	-0.22	-21.16	7.05	
ΣΕΙΣ.	4	-2.74	-0.62	-1.02	5.43	2.10	
ΣΤΑΤ.	5	61.72	0.04	-0.22	-21.16	7.05	
ΣΕΙΣ.	5	-6.35	-0.62	-1.02	5.43	2.10	
ΣΤΑΤ.	6	61.72	0.04	-0.22	-21.16	7.05	
ΣΕΙΣ.	6	6.35	0.62	1.02	-5.43	-2.10	
ΣΤΑΤ.	7	61.72	0.04	-0.22	-21.16	7.05	
ΣΕΙΣ.	7	2.74	0.62	1.02	-5.43	-2.10	
ΣΤΑΤ.	8	61.72	0.04	-0.22	-21.16	7.05	
ΣΕΙΣ.	8	15.45	-0.57	1.03	-4.99	1.06	
ΣΤΑΤ.	9	61.72	0.04	-0.22	-21.16	7.05	
ΣΕΙΣ.	9	11.85	-0.57	1.03	-4.99	1.06	
ΣΤΑΤ.	10	61.72	0.04	-0.22	-21.16	7.05	
ΣΕΙΣ.	10	-11.76	0.56	-1.03	5.09	-0.98	
ΣΤΑΤ.	11	61.72	0.04	-0.22	-21.16	7.05	
ΣΕΙΣ.	11	-15.36	0.56	-1.03	5.09	-0.98	
ΣΤΑΤ.	12	61.72	0.04	-0.22	-21.16	7.05	
ΣΕΙΣ.	12	-2.83	-0.61	-1.02	5.33	2.02	
ΣΤΑΤ.	13	61.72	0.04	-0.22	-21.16	7.05	
ΣΕΙΣ.	13	-6.44	-0.61	-1.02	5.33	2.02	
ΣΤΑΤ.	14	61.72	0.04	-0.22	-21.16	7.05	
ΣΕΙΣ.	14	6.44	0.61	1.02	-5.33	-2.02	
ΣΤΑΤ.	15	61.72	0.04	-0.22	-21.16	7.05	
ΣΕΙΣ.	15	2.83	0.61	1.02	-5.33	-2.02	
ΣΤΑΤ.	16	61.72	0.04	-0.22	-21.16	7.05	
ΣΕΙΣ.	16	15.36	-0.56	1.03	-5.09	0.98	
ΣΤΑΤ.	17	61.72	0.04	-0.22	-21.16	7.05	
ΣΕΙΣ.	17	11.76	-0.56	1.03	-5.09	0.98	
ΣΤΑΤ.	18	61.72	0.04	-0.22	-21.16	7.05	
ΣΕΙΣ.	18	-12.22	0.62	-1.03	4.57	-1.38	
ΣΤΑΤ.	19	61.72	0.04	-0.22	-21.16	7.05	
ΣΕΙΣ.	19	-15.82	0.62	-1.03	4.57	-1.38	
ΣΤΑΤ.	20	61.72	0.04	-0.22	-21.16	7.05	
ΣΕΙΣ.	20	-3.11	-0.57	-1.03	5.02	1.78	
ΣΤΑΤ.	21	61.72	0.04	-0.22	-21.16	7.05	
ΣΕΙΣ.	21	-6.72	-0.57	-1.03	5.02	1.78	
ΣΤΑΤ.	22	61.72	0.04	-0.22	-21.16	7.05	
ΣΕΙΣ.	22	6.72	0.57	1.03	-5.02	-1.78	
ΣΤΑΤ.	23	61.72	0.04	-0.22	-21.16	7.05	
ΣΕΙΣ.	23	3.11	0.57	1.03	-5.02	-1.78	
ΣΤΑΤ.	24	61.72	0.04	-0.22	-21.16	7.05	

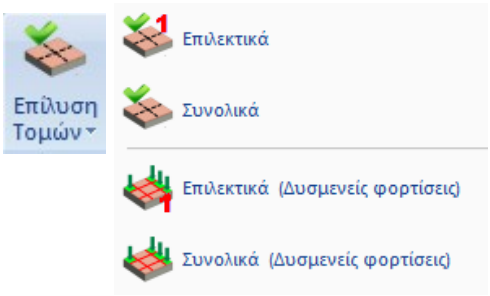
4 The first section deals with the 6 intensive quantities from the static and seismic combinations separately.

5. Slabs-Mesh



The "Plates-Grids" field contains the commands related to the solution of the intersections of the plates and the corresponding results, as well as the insertion, deletion, editing, sizing and grading of the plates' grids.

5.1 Solving Intersections



to make the resolution of the cuts of the plates. The solution is done in two ways: Overall and Selective.

5.1.1 Selectively

for selective sizing of the plates, by pointing them with the mouse at the specific section. By solving the sections, the intensive quantities are calculated and the plates are dimensioned. The program calculates tensile (E) reinforcement (Fe), compressive (TH) reinforcement (Fe') in $cm^{(2)}$. Similarly, it calculates reinforcement bars in the spans, distribution reinforcement in the amphibious slabs, separation reinforcement, additives in the supports and connectors if the slabs are ribbed beams.

5.1.2 Overall

for total resolution of all sections of the given level

5.1.3 Selectively (Adverse loadings)

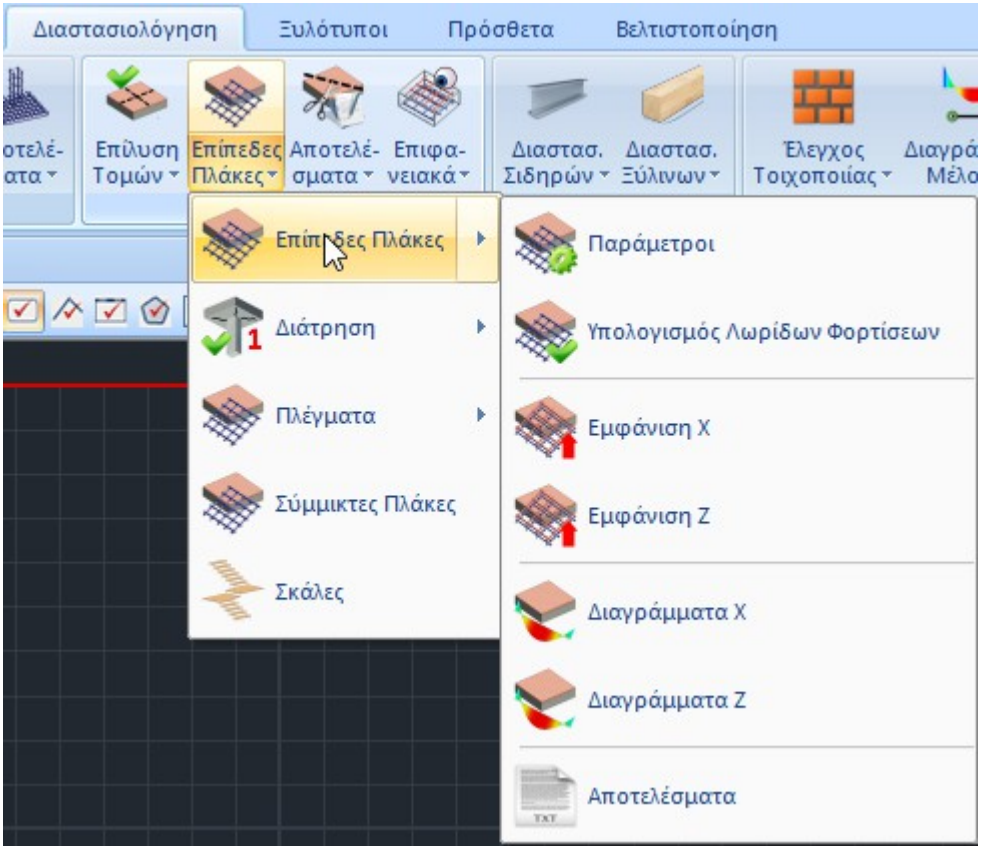
for selective sizing of the plates, by pointing them with the mouse at the specific section, taking into account the adverse loads for the calculation.

5.1.4 Total (Adverse loadings)

 for a total solution of all sections of the given level taking into account the adverse loads for the calculation.

5.2 Flat (Fungoid) Plates

5.2.1 Flat Slabs

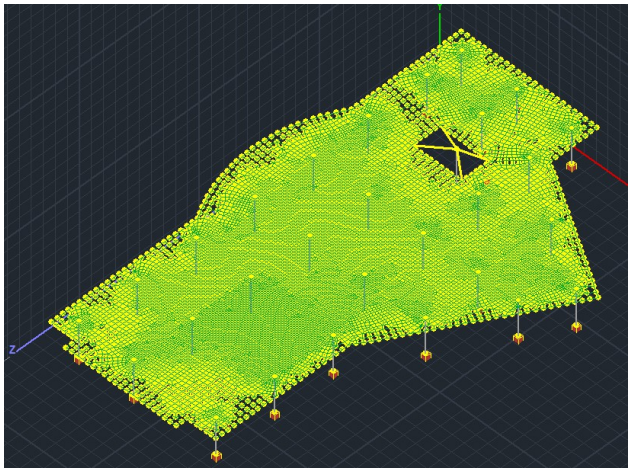


The new versions of SCADA Pro offer the ability to create Flat Plates (Plates without the presence of beams) with the method of finite elements.

The procedure for the Modelling of Flat Plates requires:

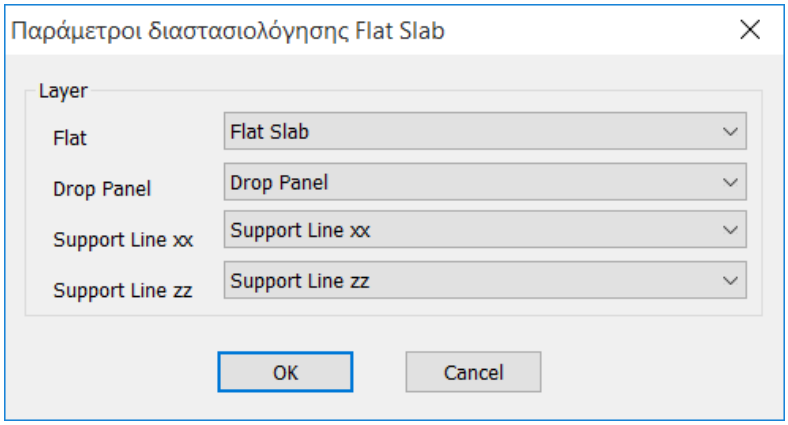
- the creation of 3D Finite Element Mesh,
- the determination of the External Limit,

- the Automatic Creation of Holes in place of Pillars,
- the calculation of the grid and the mathematical model.

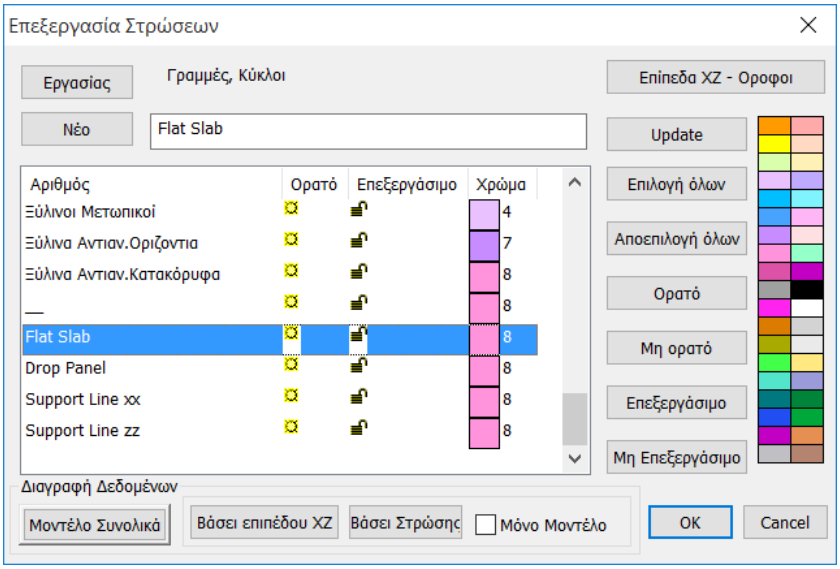


In the Dimensioning field, the "Flat Plates" command includes the commands:

5.2.1.1 Parameters

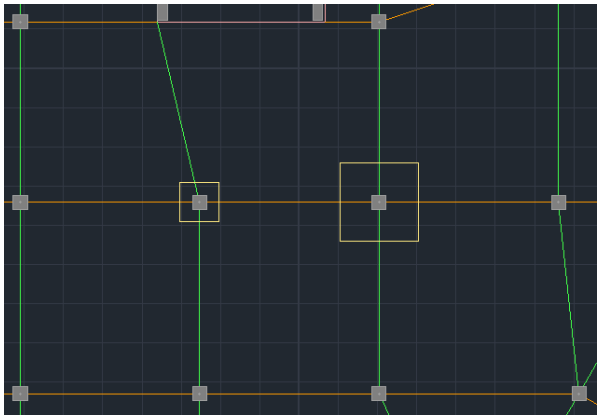


In the dialog box you set the correspondence of the Layers.



Scada's default list of Layers includes the layers related to the Flat Plates.

- In the "Flat Slab" layer, transfer the outline of the slab and correspond to the "Flat" layer
- In the "Drop Panel" layer drag the Lines that define the area around the poles where you will increase the thickness of the panel locally. "Drop Panels" are optionally inserted around the poles of the slab relieving it to shear stress.
- In the Layers "Support Lines xx" and "Support Lines zz" drag the Lines that define the Support Lines. These are lines that you insert in both the X and Z directions between successive points on the plate. They usually connect column nodes and end at the contour of the slab.



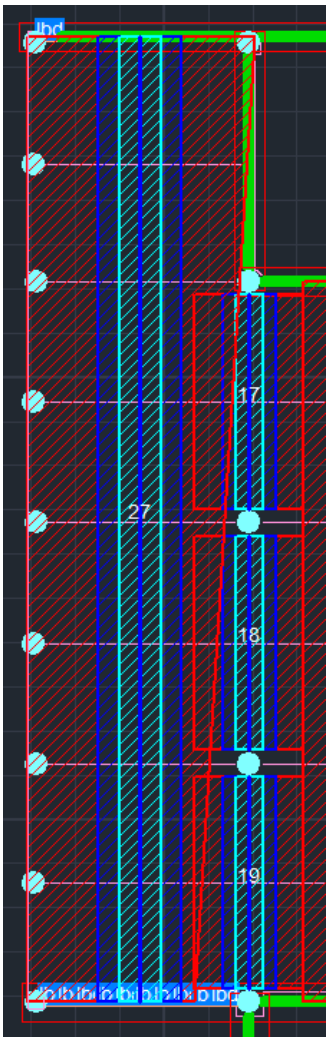
Drop Panels and Support Lines

Based on the Support Lines you define, the corresponding Loading Lanes will be created (design strips).

5.2.1.1.1 Instructions for inserting support lines on flat slabs

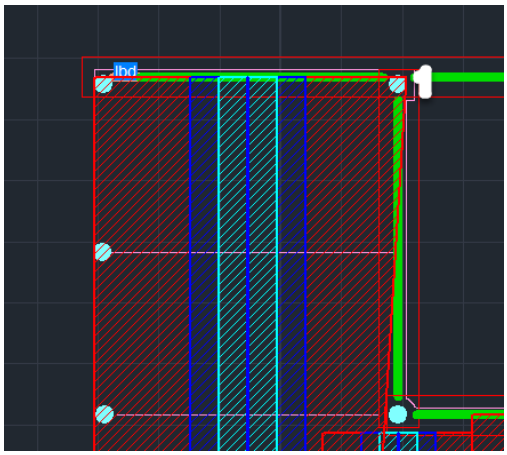
- Support lines should start from a support post and end at a support post (or free end). In all cases they must include at least one support post.
- The support line should only reach the contour of the plate when it is free edge. Otherwise it may stop at the contour or at the node of the column.
- When the boundary conditions (i.e. what lies to the right and left of the support line) change along its length, the line must break at these points.

For example in the following case



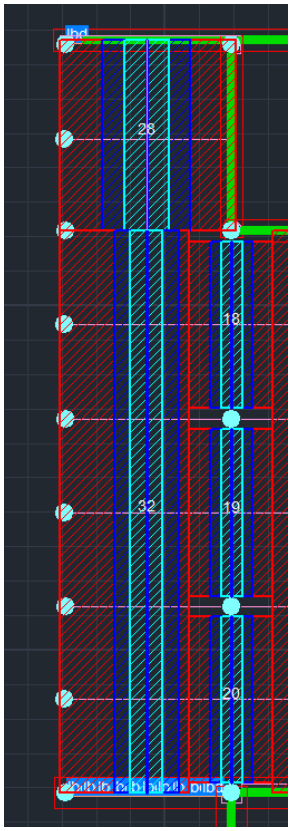
on support Line 27, its red right area was not formed correctly (it is the red sloping line). This happened because a support line was inserted that:

At the top of the right side it is bordered by a beam, i.e. the boundary of the slab, so the program has defined the red outer area at the boundary of the slab (point 1).



But at the bottom where the border on the right is another support line (the 19) calculate another red area length (point 2)

For this reason, the oblique boundary of the red area was obtained.
But if we had entered two support lines, one for the upper part (with the boundary of the plate) and one for the lower part (border with support lines 17,18,19) the result is the following which is the correct one.
In general, the above algorithm and based on the latest improvements, works on slabs with regular rectangular shapes and cannabolic column arrangement. In slabs with odd shapes, overlapping loading strips as well as gaps between them may result.



Two support lines have now been formed, 28 and 32.

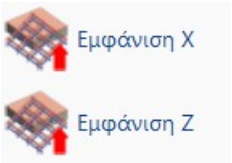
5.2.1.2 Calculation of Loading Lanes

According to Annex I of EC2 the flat plate is divided into Loading Lanes. These are the areas automatically created by the program on either side of the Support Lines , according to Figure I.1 of EC2.

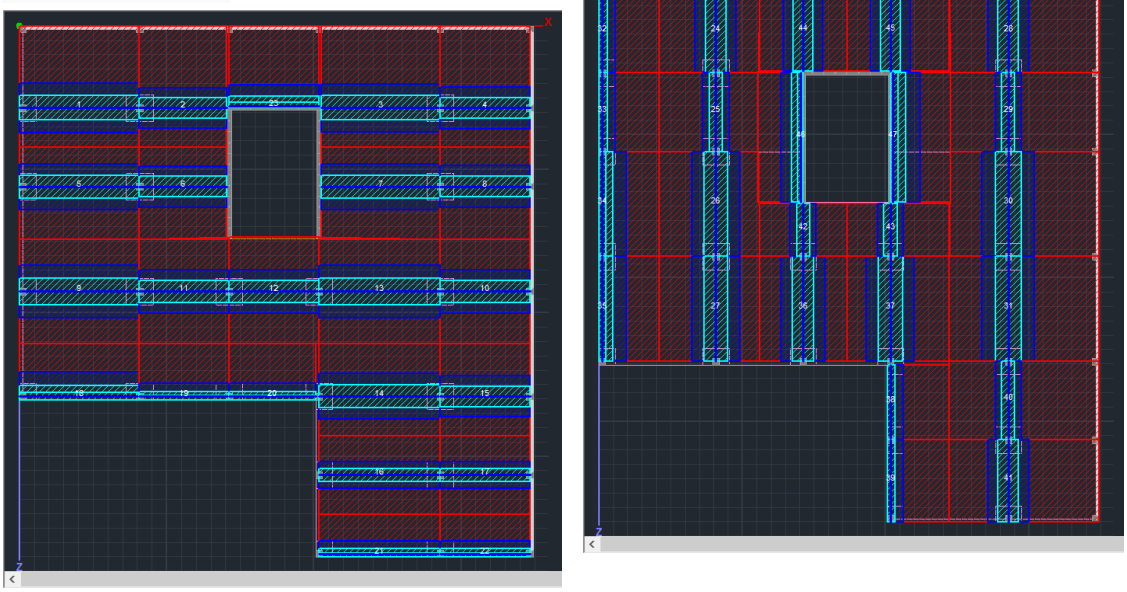
You select the Calculate Load Strips command and the program automatically creates them.

Each Loading Strip is divided into sections along its length perpendicular to the Support Line. In each section, Scada integrates the internal forces of the finite surface elements it intersects. This integration yields the bending moment about the axis of the section. This intensive quantity is used to calculate the reinforcement in each individual section.

5.2.1.3 Display X, Z

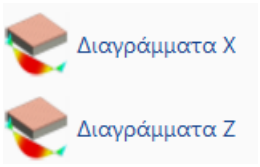


You choose to display the Charge Strips in both directions to display them.

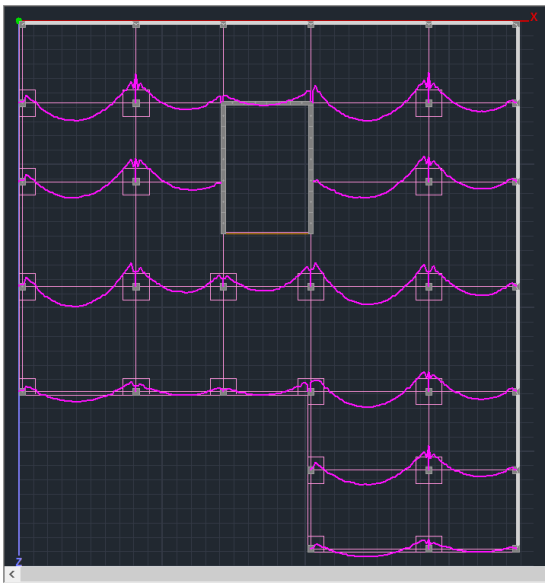


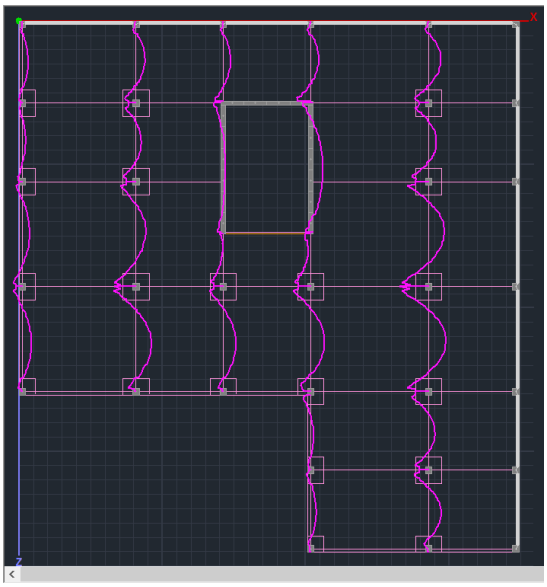
Loading strips along the X and Z axis

5.2.1.4 Diagrams X, Z



You choose to display the Charts in both directions for their display.





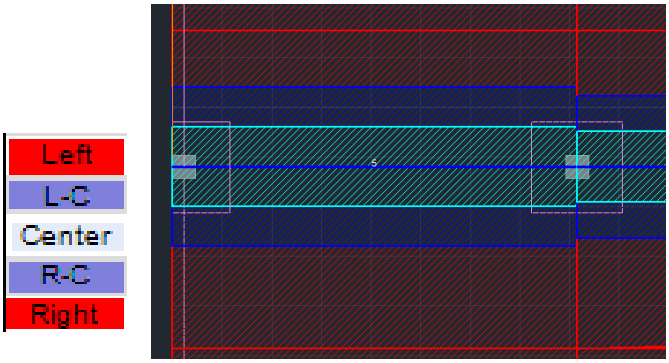
5.2.1.5 Results

The Results command opens the results file from within the Report.
Each page is for one Charging Lane.
First, the characteristics of the Strip are described.

							Page : 1
Strip Calculations							
Description	**Value**	**Units**	**Code**	**Description**	**Value**	**Units**	**Code**
Floor	1			Starting point	corner column		9.4.1&2
# of strip	1			Drop panel	Yes		
Orientation	x-x			*Thickness*	182.88	(cm)	
Length	815.48	(cm)		*Width*		(cm)	
Concrete	C20/25			Finishing point	internal column		9.4.1&2
f_{ck}	20	(MPa)	Table 3.1	Drop panel	Yes		
f_{ctm}	2.20	(MPa)	Table 3.1	*Thickness*	182.88	(cm)	
Steel	S400s			*Width*		(cm)	
f_{yk}	400	(MPa)		Minimum reinforcement			
Cover	20	(mm)		*Tension reinf.*	0.00143	(cm^2/m)	9.2.1.1(1)
Slab thickness	0.25	(cm)		*Compression reinf. (% of span reinf.)*	25	%	9.3.1.2

Then the results of the upper and lower arming are shown in detail for each zone, dividing them into sub-zones.

Left-Right -> red zone L-C
R-C-> blue zone Center->
blue zone



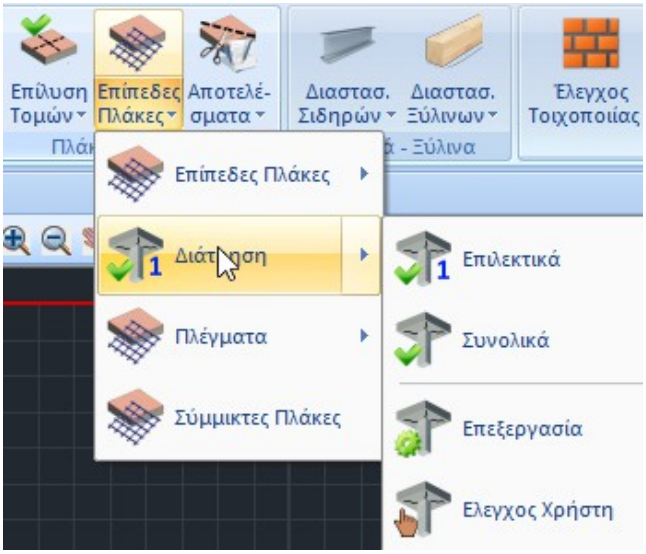
Analysis Results and Reinforcement										Top
	203.87 cm (L_{start})					407.74 cm (L_{centre})				
Zone	M (kNm)	Width (cm)	$A_{s,rqd}$ (cm^2/m)	$A_{s,prvd}$ (cm^2/m)	Φ/s	M (kNm)	Width (cm)	$A_{s,rqd}$ (cm^2/m)	$A_{s,prvd}$ (cm^2/m)	Φ/s
Left		400.0		3.246	8/15		401.1		0.812	8/20
L-C		400.0		3.246	8/15		85.3		1.763	8/20
Center	-80.283	46.0	27.271	27.271	14/5		170.5		6.818	8/7
R-C							85.3		2.043	8/20
Right							103.8		1.471	8/20

	203.87 cm (L_{end})				
Zone	M (kNm)	Width (cm)	$A_{s,rqd}$ (cm^2/m)	$A_{s,prvd}$ (cm^2/m)	Φ/s
Left	-88.070	401.1	2.873	3.246	8/15
L-C	-44.824	85.3	7.054	7.054	8/7
Center	-152.524	170.5	12.422	12.422	10/6
R-C	-51.588	85.3	8.172	8.172	8/6
Right	-45.848	103.8	5.886	5.886	8/8

Analysis Results and Reinforcement										Bottom
	203.87 cm (L_{start})					407.74 cm (L_{centre})				
Zone	M (kNm)	Width (cm)	$A_{s,rqd}$ (cm^2/m)	$A_{s,prvd}$ (cm^2/m)	Φ/s	M (kNm)	Width (cm)	$A_{s,rqd}$ (cm^2/m)	$A_{s,prvd}$ (cm^2/m)	Φ/s
Left	9.207	400.0	0.294	0.812	8/20	70.543	401.1	2.293	3.246	8/15
L-C	9.207	400.0	0.294	0.844	8/20	21.929	85.3	3.377	3.377	8/14
Center	80.591	46.0	27.408	27.408	14/5	43.857	170.5	3.377	3.377	8/14
R-C						21.929	85.3	3.377	3.377	8/14
Right						25.982	103.8	3.284	3.284	8/15

	203.87 cm (L_{end})				
Zone	M (kNm)	Width (cm)	$A_{s,rqd}$ (cm^2/m)	$A_{s,prvd}$ (cm^2/m)	Φ/s
Left	17.335	401.1	0.555	0.812	8/20
L-C	6.505	85.3	0.984	0.984	8/20
Center	23.135	170.5	1.762	1.762	8/20
R-C	3.583	85.3	0.539	0.844	8/20
Right	3.311	103.8	0.409	0.821	8/20

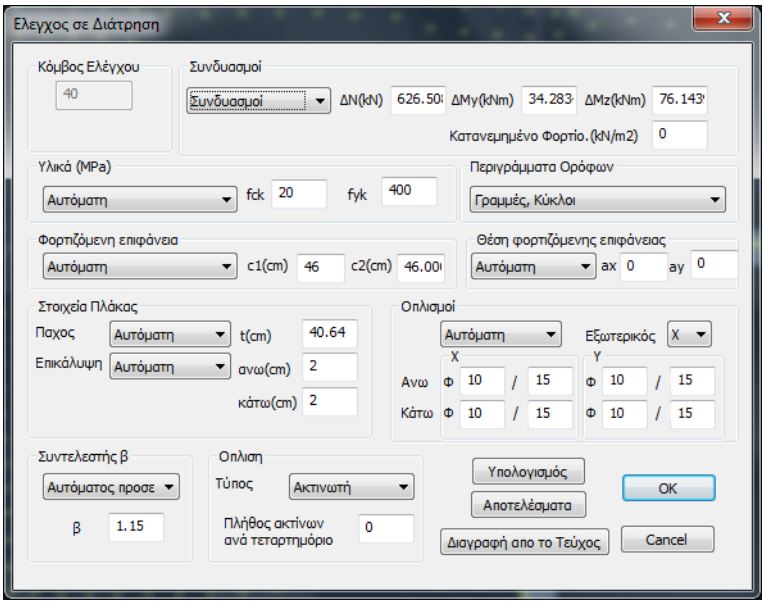
5.2.2 Perforation

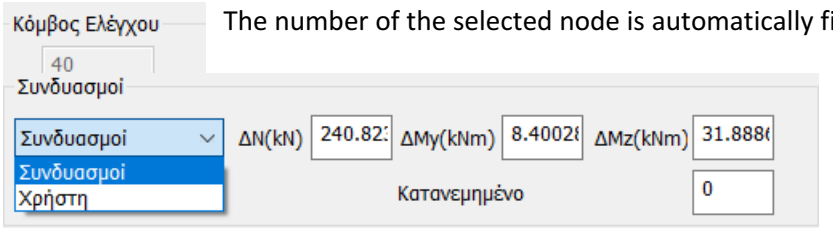


The perforation test can be performed selectively for each pole or overall on all poles in the plan view.

5.2.2.1 Selectively

Select the command Selectively, left-click to point to the node of a pole and right-click to open the dialog box where you will set all the necessary parameters.

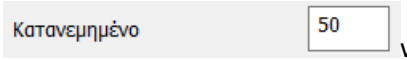




The number of the selected node is automatically filled in and is not editable.

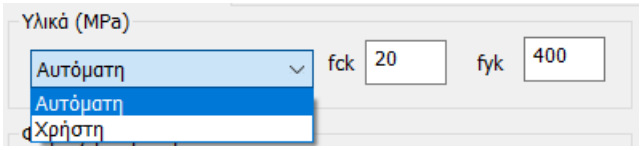
In the Combinations field:

- The Combinations option, makes the program automatically find the combination that results in the worst Axial Dn, and displays its value along with the corresponding moments.
- The User option, allows to set user values for axial and moments in the respective fields, as well as to set a distributed load

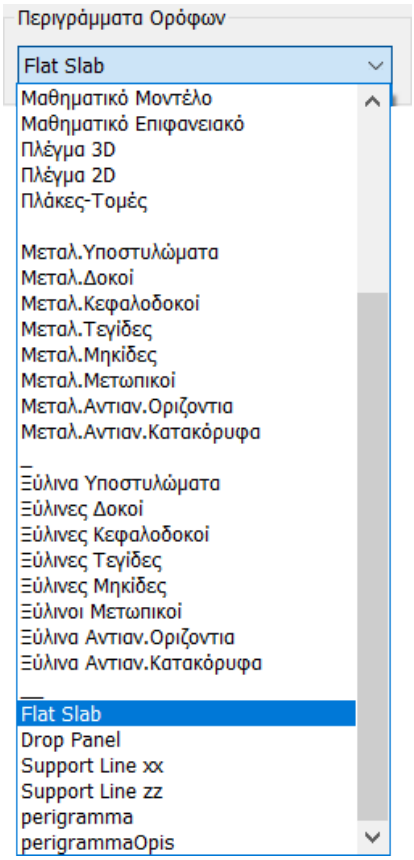


which works by "relieving" the plate at that point, resulting in a reduced calculation cutting force compared to the original one.

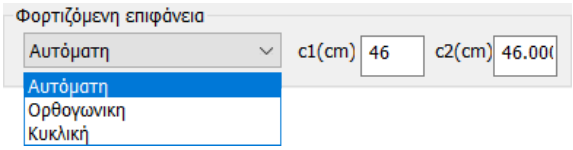
Αρχική τέμνουσα ($V_{Ed,αρχ.}$)	626.5	(kN)
Κατανεμημένο φορτίο (p)	50.0	(kN/m^2)
Απομειωμένη τέμνουσα ($V_{Ed,τελ.}$)	478.8	(kN)



In the Material field the coefficients fck and fyk are filled in automatically with the Automatic option or defined by the user with the User option.



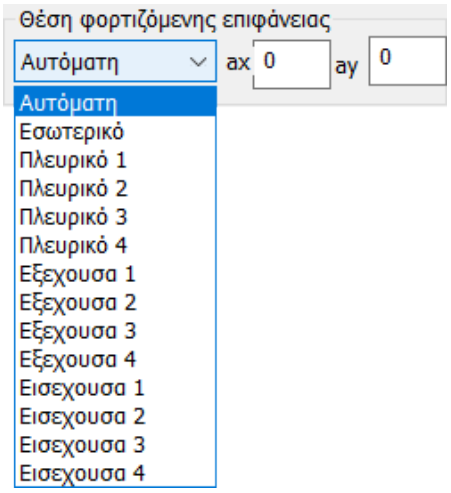
In Floor Contours you select the Layer that contains the outline of the slab including the columns that are in the outline.
So we select the Flat Slab layer which contains exactly the lines that define the overall outline of the slab.



The Loadable Area is defined as the equivalent surface area of the selected pole.

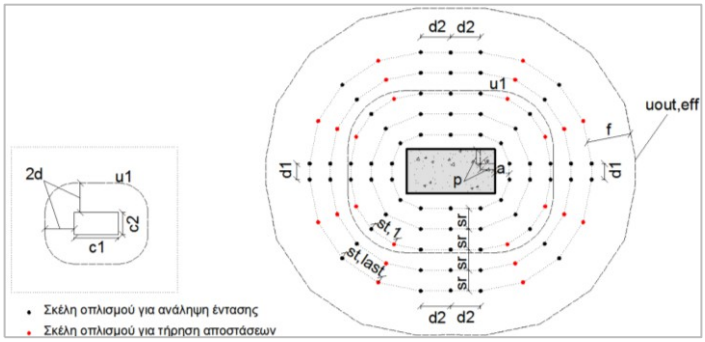
Select:

- Automatic so that the program can calculate the surface area of any type of column by reducing it to an equivalent rectangular one and calculating the corresponding dimensions c1 and c2.
- Rectangular so that the user can define his own dimensions c1 and c2 to calculate the loaded rectangular surface
- Circular in order to calculate a circular loading surface of diameter equal to the value c1 set by the user

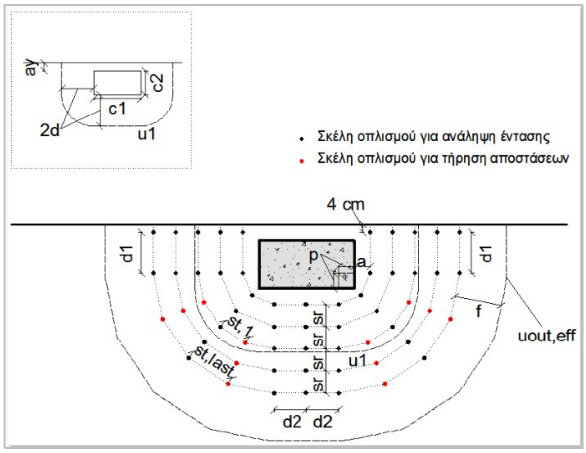


The Load Surface Position can be set either automatically or selectively. It depends on the contour of the plate and the position of the selected post on it.
The proposed positions are:
- Internal
  - Lateral in 4 directions
- Prominent in the 4 directions
  - Importance in 4 directions

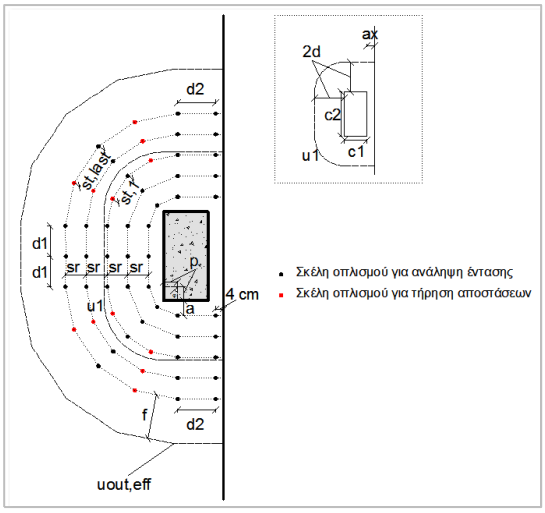
Select the position of the selected post and set the distances from the perimeter ax and ay (except the inner one) according to the following figures:



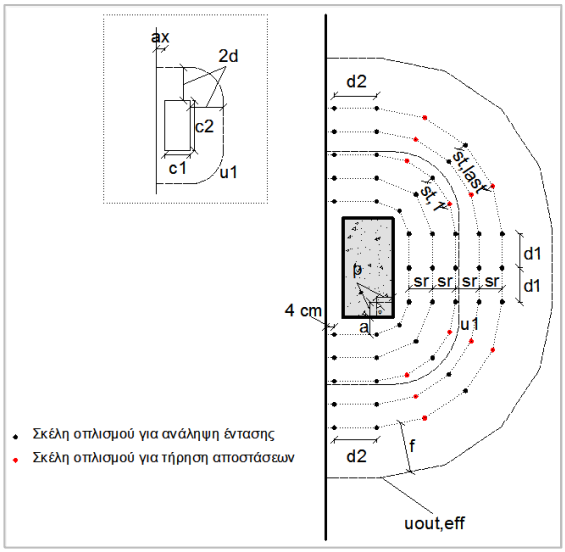
INTERNAL



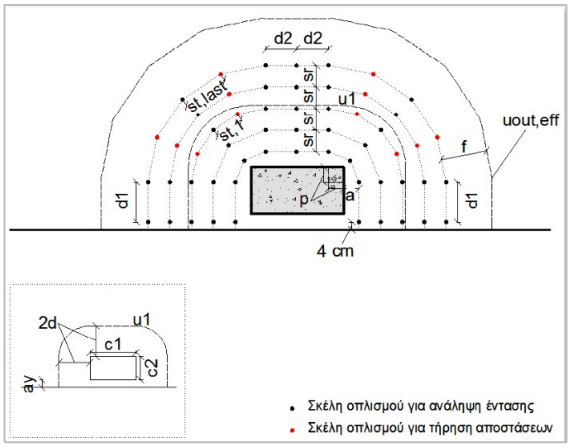
PLEYRIC 1



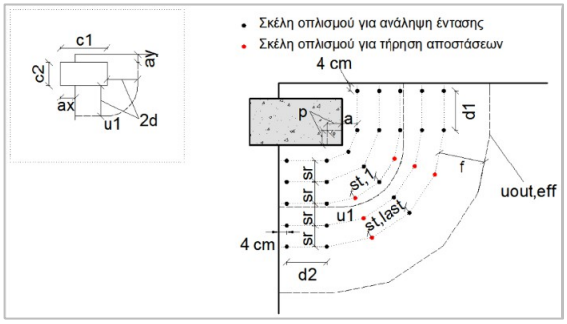
PLEYRICO 2



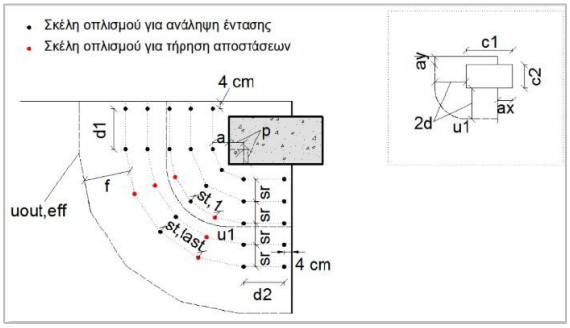
PLEYRICO 4



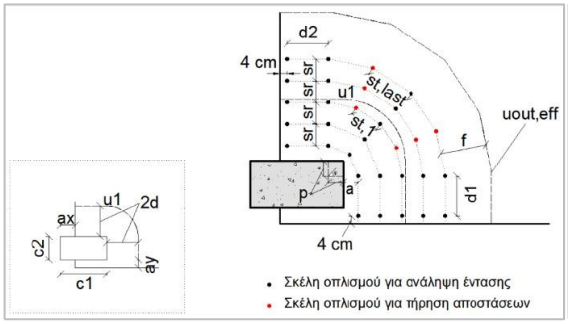
PLEYRICO 3



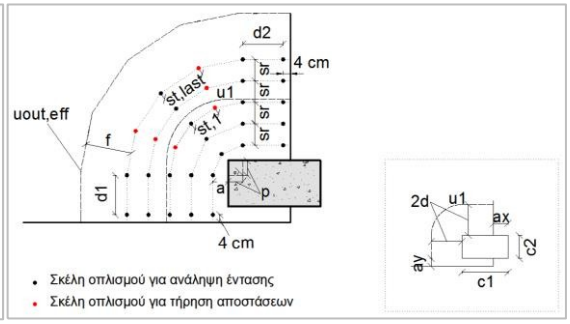
EXECUTIVE 1



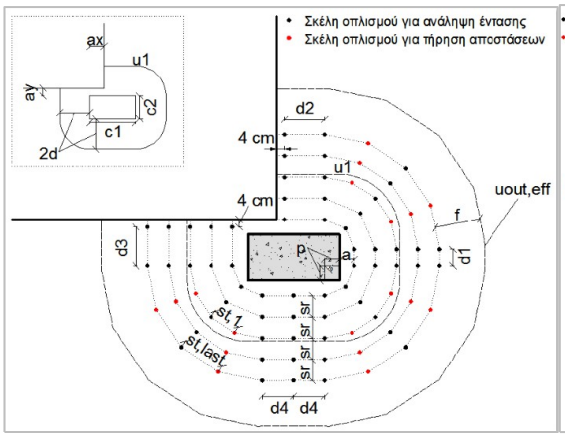
EXPERIENCE 2



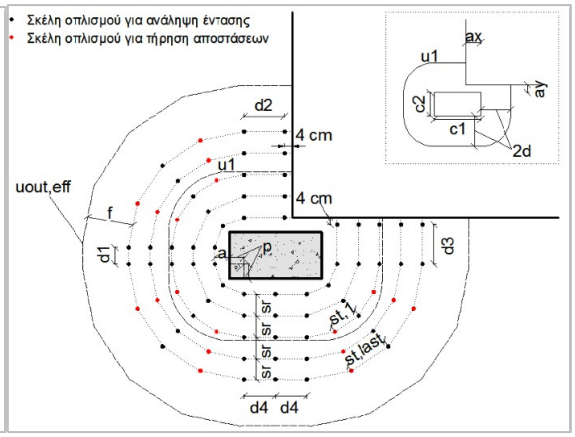
EXECUTIVE 4



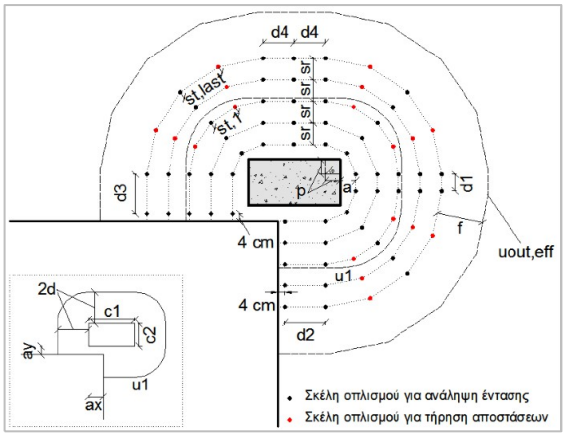
EXPERIENCE 3



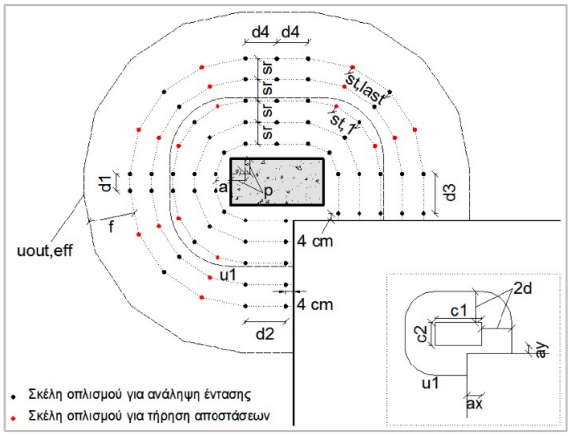
INCOMING 1



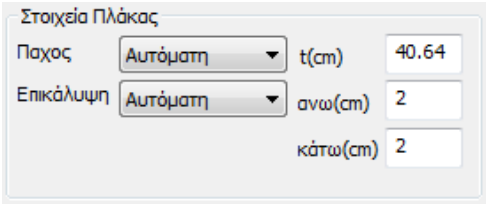
REGISTRANT 2



INCOMING 4



REGISTERED 3

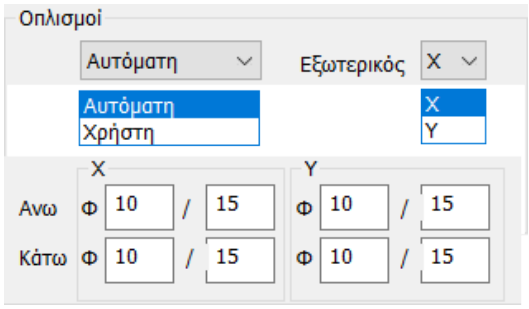


The Thickness and Coating of the panel are either taken into account automatically or modified by the User by selecting the corresponding option and defining the corresponding values for the thickness and coating of the upper and lower panel (here the thickness of the drop panel is taken).

OBSERVATION:

In drilling there is no single way of implementation. There are solutions which are all acceptable but not all equally economical. There are two parameters: the diameter of the reinforcement and the distance between the bars.

Regarding the automatic way of finding the boundary conditions of the loaded surface, the algorithm does not always succeed in finding the correct determination, so there is also a manual way of selection by the user.

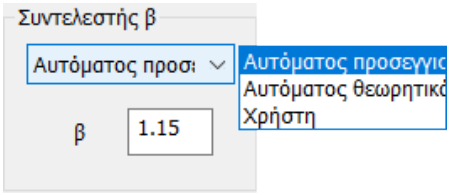


In the Reinforcements field, the longitudinal reinforcement resulting from the calculation of the Flat Plates in the area of the selected column is specified.

With the Automatic selection the longitudinal reinforcement is taken into account:

- Upper for positive (+DN) (e.g. top floor slab)
- Down for DN negative (-DN) (e.g. foundation)

The External X or Y option determines the direction of the external reinforcement in the longitudinal reinforcement grid the slab (either upper or lower grid).

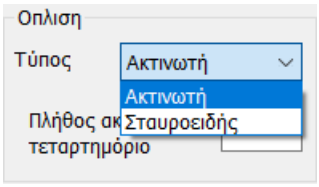


The Coefficient b for the calculation of Perforation can be calculated automatically in two ways:

- Automatic approximate or
- Automatic theorist.

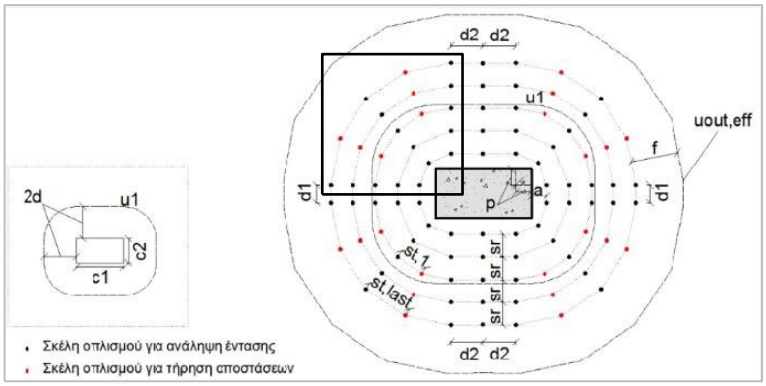
The Approach mode is a function of the position of the loaded surface and ax, ay.
The Theoretical mode is a function of Torques My, Mz.

The User option allows you to enter any value for Coefficient b.

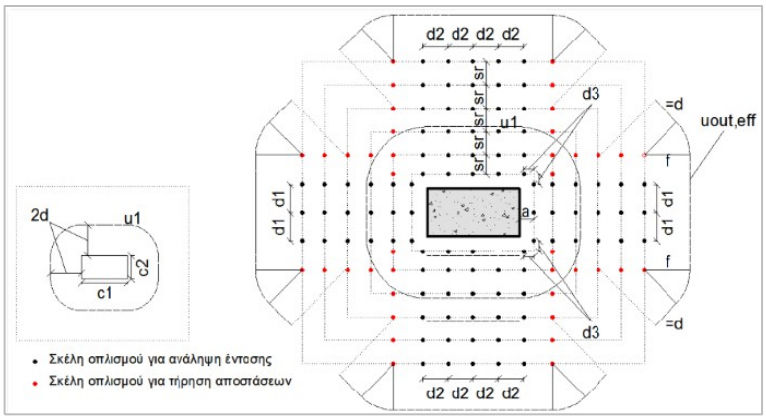


Finally, in the Arborization field you define the type of arrangement of the perforation reinforcement by choosing between Radial and Cruciform.
For the Radial array you also set the Number of rays per quadrant.

The figure below shows a quadrant of the radial array in the black box. The initial perimeter has 3 armature spokes, while the third perimeter becomes
thickening to 5 spokes due to restrictions on the distances between the reinforcement strands. ScadaPro automatically checks whether the spacing constraints are met at the first perimeter and increases the number of reinforcement spars where required (even at the first perimeter if the number of spars selected by the user is not sufficient).



Radial Armature Arrangement



Cross Armature Arrangement

Υπολογισμός The Calculate command performs all the necessary checks on perforation, taking into account all the above parameters.

Αποτελέσματα The Results command displays the results file:

Page : 1

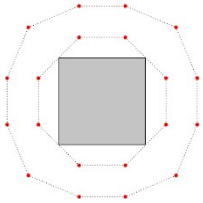
Δεδομένα

Περιγραφή	Τιμή	Μονάδες	Περιγραφή	Τιμή	Μονάδες
Όροφος	1		Συντελεστής (β) (EC2-6.4.3)	1.150	
# του κόμβου	40		Πάχος πλάκας	40.6	(cm)
Συνδυασμός	1		Επικάλυψη οπλισμού	2.0	(cm)
Αρχική τέμνουσα ($V_{\text{εσαρχ.}}$)	626.5	(kN)	Διάμετρος εξωτερικού διαμήκη οπλισμού	10	(mm)
Κατανεμημένο φορτίο (p)	0.0	(kN/m^2)			
Απομειωμένη τέμνουσα ($V_{\text{εσ,τελ.}}$)	626.5	(kN)	Απόσταση εξωτ. διαμήκη οπλ.	15.0	(cm)
Καμπτική Ροπή (M_x)	34.3	(kNm)	Διάμετρος εσωτερικού διαμήκη οπλισμού	10	(mm)
Καμπτική Ροπή (M_y)	76.1	(kNm)			
Σχήμα φορτιζόμενης περιοχής	Ορθογωνικη		Απόσταση εσωτερικού διαμήκη οπλισμού	15.0	(cm)
Μήκος c_1 (κατά τον άξονα x)	46.0	(cm)			
Μήκος c_2 (κατά τον άξονα y)	46.0	(cm)	Σκυρόδεμα (f_{ck})	20.0	(MPa)
Διάμετρος c		(cm)	Χάλυβας (f_{yk})	400.0	(MPa)
Θέση φορτιζόμενης περιοχής	Εσωτερικό		Διάταξη οπλισμού	Ακτινωτή	
Απόσταση πλάκας κατά x (a_x)		(cm)	Αριθμ. γραμμών οπλισμού ανά τεταρτημόριο	2	
Απόσταση πλάκας κατά y (a_y)		(cm)			

Data: list of all items specified in the previous window and required for the control on perforation.

Schematic arrangement of perforation reinforcement: according to the predefined parameters and if a requirement for perforation reinforcement arises.

When there is no requirement for reinforcement in perforation: no schematic reinforcement layout is shown



When there is a requirement for reinforcement in perforation: the required reinforcement layout, according to the layout options, the areas and strands are displayed in red.

Αποτελέσματα ελέγχων

Περιγραφή	Τιμή	Μονάδες	EC2	Περιγραφή	Τιμή	Μονάδες	EC2
Ενεργό πάχος πλάκας (d)	37.6	(cm)	(eq6.32)	Βασική περίμετρος ελέγχου (u_1)	657.0	(cm)	(fig6.15)
Περίμετρος φορτιζόμενης περιοχής (u_0)	184.0	(cm)	(eq6.53)	Διατμητική τάση στην περίμετρο u_1 ($v_{Ed,1}$)	0.291	(MPa)	(eq6.38)
Διατμητική τάση στην περίμετρο u_0 ($v_{Ed,0}$)	1.040	(MPa)	(eq6.38)	Διατμητική αντοχή άοπλου σκυροδέματος ($v_{Rd,c}$)	0.356	(MPa)	(eq6.47)
Μέγιστη διατμητική αντοχή ($v_{Rd,max}$)	3.680	(MPa)	(eq6.53)	Σταθερά (v_{min})	0.356	(MPa)	(eq6.3)
1ος έλεγχος: $v_{Ed,0} \le v_{Rd,max}$	Επάρκεια			2ος έλεγχος: $v_{Ed,1} \le v_{Rd,c}$	Δεν απαιτείται οπλισμός		

In the **Results of** the **checks** included two checks.

If the 1th check shows *Adequacy*, then the 2th check determines the requirement or not of the perforation reinforcement.

Αποτελέσματα ελέγχων

Περιγραφή	Τιμή	Μονάδες	EC2	Περιγραφή	Τιμή	Μονάδες	EC2
Ενεργό πάχος πλάκας (d)	37.6	(cm)	(eq6.32)	Βασική περίμετρος ελέγχου (u_1)	657.0	(cm)	(fig6.15)
Περίμετρος φορτιζόμενης περιοχής (u_0)	184.0	(cm)	(eq6.53)	Διατμητική τάση στην περίμετρο u_1 ($v_{Ed,1}$)	0.372	(MPa)	(eq6.38)
Διατμητική τάση στην περίμετρο u_0 ($v_{Ed,0}$)	1.328	(MPa)	(eq6.38)	Διατμητική αντοχή άοπλου σκυροδέματος ($v_{Rd,c}$)	0.356	(MPa)	(eq6.47)
Μέγιστη διατμητική αντοχή ($v_{Rd,max}$)	3.680	(MPa)	(eq6.53)	Σταθερά (v_{min})	0.356	(MPa)	(eq6.3)
1ος έλεγχος: $v_{Ed,0} \le v_{Rd,max}$	Επάρκεια			2ος έλεγχος: $v_{Ed,1} \le v_{Rd,c}$	Απαιτείται οπλισμός: - προσθήκη οπλισμού διάτρησης - αύξηση διαμήκη οπλισμού πλάκας		

In the reinforcement requirement it is proposed to add either drilling reinforcement, or the reinforcement increase of the plate

Αποτελέσματα ελέγχων

Περιγραφή	Τιμή	Μονάδες	EC2	Περιγραφή	Τιμή	Μονάδες	EC2
Ενεργό πάχος πλάκας (d)	37.6	(cm)	(eq6.32)	Βασική περίμετρος ελέγχου (u_1)	657.0	(cm)	(fig6.15)
Περίμετρος φορτιζόμενης περιοχής (u_0)	184.0	(cm)	(eq6.53)	Διατμητική τάση στην περίμετρο u_1 ($v_{Ed,1}$)	1.395	(MPa)	(eq6.38)
Διατμητική τάση στην περίμετρο u_0 ($v_{Ed,0}$)	4.981	(MPa)	(eq6.38)	Διατμητική αντοχή άοπλου σκυροδέματος ($v_{Rd,c}$)	0.356	(MPa)	(eq6.47)
Μέγιστη διατμητική αντοχή ($v_{Rd,max}$)	3.680	(MPa)	(eq6.53)	Σταθερά (v_{min})	0.356	(MPa)	(eq6.3)
1ος έλεγχος: $v_{Ed,0} \le v_{Rd,max}$	Μη επάρκεια. - αύξηση διαστάσεων φορτιζόμενης περιοχής - αύξηση πάχους πλάκας - χρήση ανώτερης ποιότητας σκυροδέματος			2ος έλεγχος: $v_{Ed,1} \le v_{Rd,c}$			

If the 1st (1st)check shows *Non-adequacy*, then the 2nd (2nd) check is not performed and some interventions are suggested for the plaque.

Αποτελέσματα οπλισμού διάτρησης							
Περιγραφή	Τιμή	Μονάδες	EC2	Περιγραφή	Τιμή	Μονάδες	EC2
Περίμετρος u_{out}	1365.5	(cm)	(eq6.54)	Απόσταση (d_2)	50.7	(cm)	
Περίμετρος $u_{out,ef}$	1580.5	(cm)		Απόσταση (d_3)		(cm)	
Απόσταση 1ης περιμέτρου οπλισμού από φορτιζόμενη επιφάνεια (a)	19.5	(cm)		Απόσταση (d_4)		(cm)	
				Γωνία (φ)		°	
Οριακή απόσταση: $0.3 \cdot d \le a \le 0.5 \cdot d$	16.7<=a<=27.9		(9.4.3)	Εφαπτομενική απόσταση των σκελών οπλ. στην τελευταία περίμετρο όπλισης ($s_{r,last}$)		(cm)	
Απόσταση τελευταίας περιμέτρου οπλισμού από την περίμετρο $u_{out,ef}$ (f)	83.7	(cm)		Οριακή απόσταση $2 \cdot d$	111.6	(cm)	
Οριακή απόσταση: $k \cdot d = 1.5 \cdot d$	83.7	(cm)	(6.4.5)	Δρώσα τιμή σχεδιασμού αντοχής οπλ. διάτρησης ($f_{ywd,ef}$)	389.5	(MPa)	(eq6.52)
Ακτινική απόσταση των περιμέτρων οπλισμού (s_r)	41.5	(cm)		Απαιτούμενη διατομή σκέλους οπλισμού διάτρησης ($A_{sw,1}$)	1.766	(cm^2)	
Οριακή απόσταση: $0.75 \cdot d$	41.8	(cm)	(9.4.3)	Ελάχιστη διατομή σκέλους ($A_{sw,min}$)	1.868	(cm^2)	(eq9.11)
Εφαπτομενική απόσταση των σκελών οπλισμού στην περίμετρο u_1 ($s_{r,1}$)		(cm)		Διάμετρος σκέλους που χρησιμοποιείται	16	(mm)	
Οριακή απόσταση: $1.5 \cdot d$	83.7	(cm)	(9.4.3)				
Μήκος (p)	9.2	(cm)		Διατομή σκέλους που χρησιμοποιείται	2.011	(cm^2)	
Απόσταση (d_1)	42.8	(cm)					

Διάταξη οπλισμού διάτρησης						
Ομάδα	Αριθμός γραμμών	Φ (mm)	Αριθμός σκελών ανά γραμμή	Ύψος σκέλους (cm)	Περίμετρος όπου βρίσκεται το 1ο σκέλος της γραμμής	Απόσταση 1ου σκέλους από φορτιζόμ. επιφάνεια
1	10	16	4	54.0	1	19.53
2	4	16	3	54.0	2	61.03
3	4	16	2	54.0	3	102.53

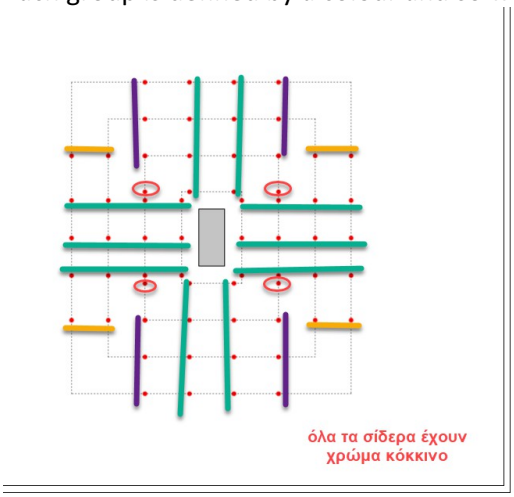
In the **Perforation Reinforcement Results** the results obtained from the two tests are detailed according to the respective formulas and chapters of EC2.

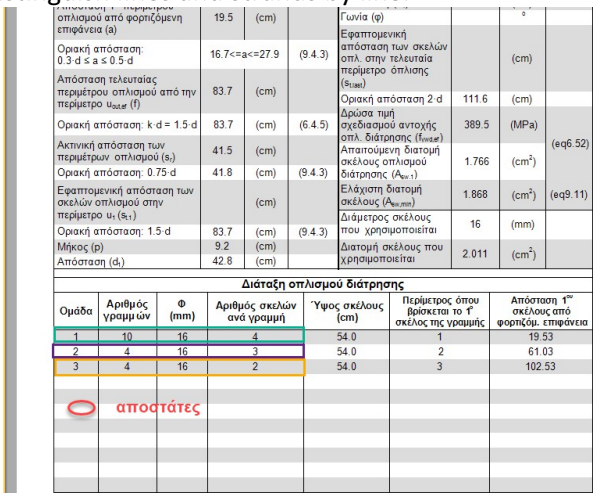
In the table **Arrangement of perforation reinforcement**, the following are indicated perforation reinforcements resulting from the above testsas well as the characteristics of their arrangement.

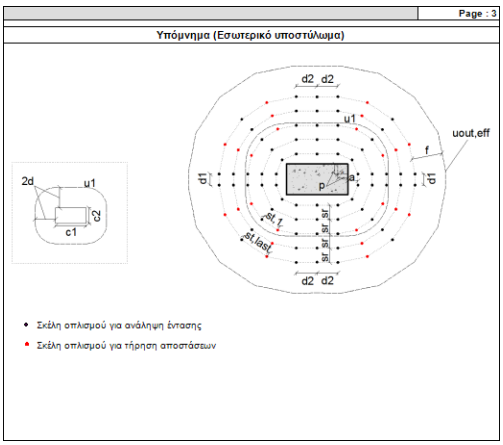
ILLUSTRATIVE SCHEMATIC OF PERFORATION REINFORCEMENT:

Starting from each area (dotted line) draw lines of the same colour and measure the reinforcement strands.

Each group is defined by a colour and so we distinguish lines and strands by line:

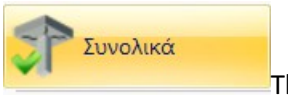






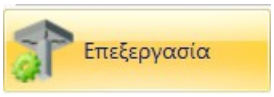
On page 3h, the Memo is displayed that carries the characteristics according to the Position of the Surface to be loaded.

5.2.2.2 Overall



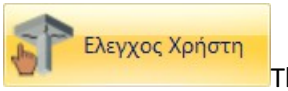
This is the command with which you can carry out punching checks on all the poles included in the outline of the
flat plate, automatically, using the parameters automatically obtained from program. The same parameters shall be used for the set of columns where the perforation test will be carried out.

5.2.2.3 Edit



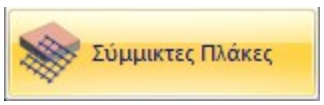
The Edit command allows you to modify parameters specified in the Selective or Overall check.
Select the command and left-click on the node of the column to be edited and the window of the parameters you had originally set for the drilling check on the selected column opens automatically. You can make the modifications that
and repeat the check using the Calculate command.

5.2.2.4 User Control



The user is given the ability to test different data on different nodes for a visual overview of results. This is a "clipboard" that is not saved in the issue, but allows the user to run tests in order arrive at the desired solution.

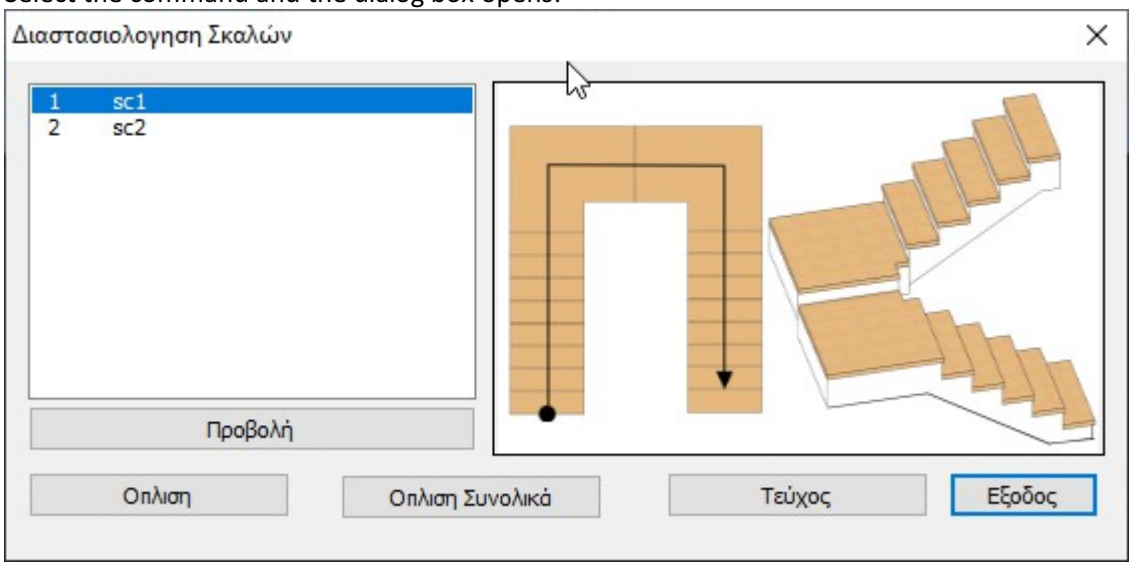
5.2.4 Composite Plates



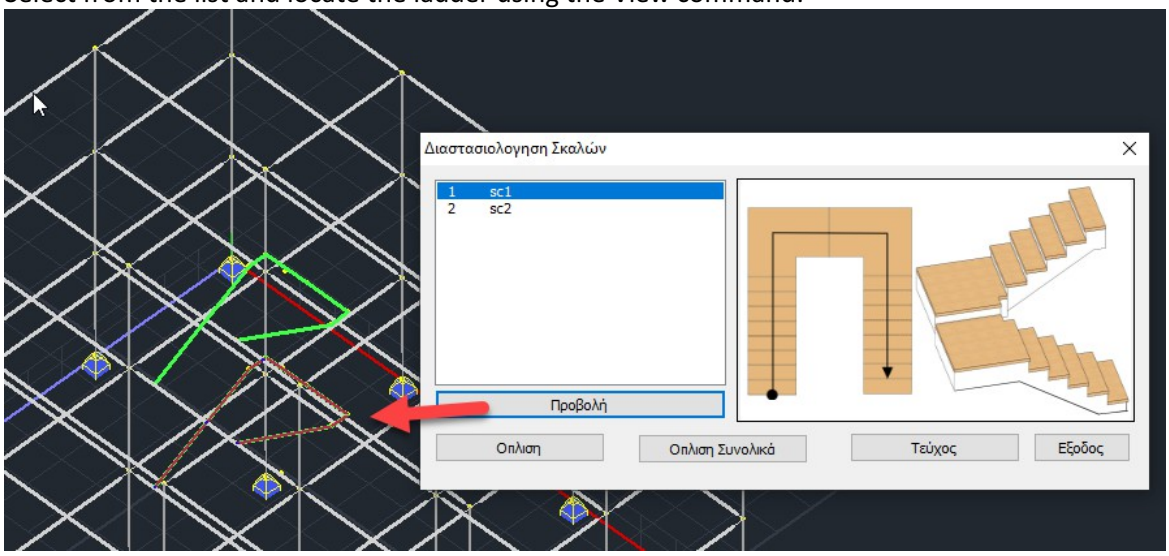
(See User Manual "Composite Plates")

5.2.5 Stairs

The Stairs command allows you to dimension the stairs that you have entered in the vector with the Stairs command in the Modeling field.
Select the command and the dialog box opens:

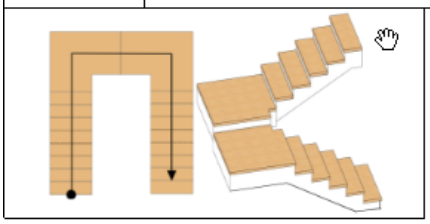


Here is the list of stairs you have defined.
Select from the list and locate the ladder using the View command:



With the Scaling command, the program will scale the selected ladder, while with the Total Scaling command, all the ladders in the list are scaled.
With the Sheet command, you can see the results of the sizing:

	Σελίδα : 1
ΟΝΟΜΑΣΙΑ :	sc1



ΔΙΑΣΤΑΣΕΙΣ (cm)	
Πάχος h (cm)	20
Πλάτος b (cm)	100

Φορτία (kN/m2)		
		Ανήκει στη Φόρτιση
Επικάλυψη	1.0	1
Κινητό	2.0	2

ΣΥΝΔΥΑΣΜΟΙ	
1	1.35xΦ1 + 1.50xΦ2
2	1.00xΦ1 + 0.50xΦ2
99	1.00xΦ1 + 1.00xΦ2
100	1.00xΦ1 + 0.50xΦ2
101	1.00xΦ1 + 0.30xΦ2

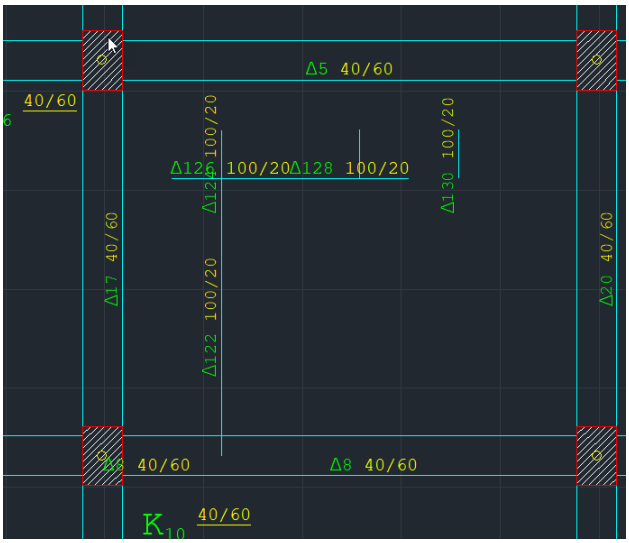
ΥΛΙΚΑ			
Σκυροδεμα	C25/30	Χάλυβας	B500C

ΕΛΕΓΧΟΣ ΣΕ ΚΑΜΨΗ / ΟΠΛΙΣΜΟΙ			
		Άνω	Κάτω
Αξονική Δύναμη	Nsd (kN)	-93.92	-95.52
Ροπή Υπολογισμού	M_{sd} (kNm)	-0.00	3.96
Συνδυασμός		1	1
Απιτούμενη Διατομή Οπλισμού	A_s (cm²)/m	2.38	2.38
Τελικός οπλισμός κάμψης		Φ8/20	Φ8/20
Οπλισμός Διανομής			Φ8/25
Οπλισμός Απόσχισης		Φ8/25	

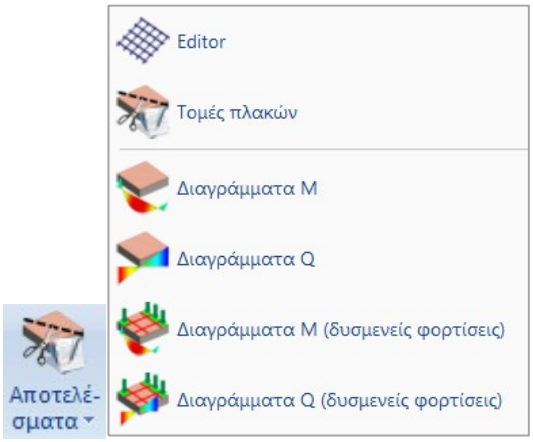
ΕΛΕΓΧΟΣ ΣΕ ΔΙΑΤΜΗΣΗ		
Τέμνουσα Υπολογισμού	V_{Ed} (kN)	19.26
Αντοχή χωρίς οπλισμό	$V_{Rd,c}$ (kN)	92.73
Αντοχή θλιβ. διαγων.	V_{Rdmax} (kN)	703.81

ΥΠΟΛΟΓΙΣΜΟΣ ΠΑΡΑΜΟΡΦΩΣΕΩΝ (EC2 παρ.7.4.2 & παρ.7.4.3)									
l/d	l/d επιτρ.	Επάρκεια	Προτειν.ελάχ. πάχος h_s (mm)		Max M (kNm)	d_u (mm)	a	l/a επιτρ.	Επάρκεια
17.65	170.43	ΝΑΙ	38.6		5.78	0.00	250	12.71	

After the dimensioning you can also get the drawing with the reinforcements in the Wooden formwork field:

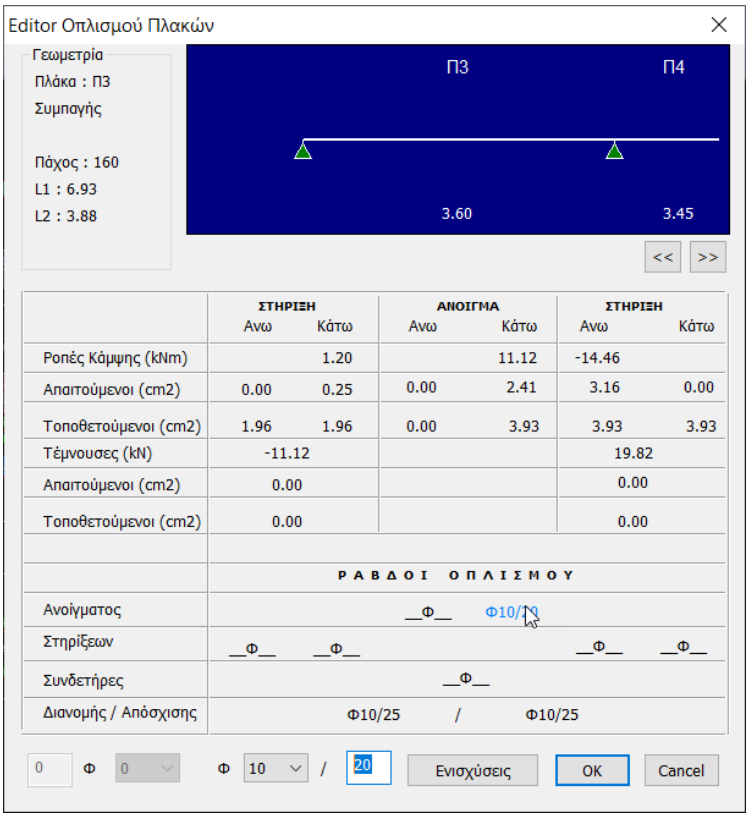


5.2 Results



5.3.1 Editor


to view and modify the reinforcements of a plate. After selecting it, point the mouse at a section and the following dialog box appears:



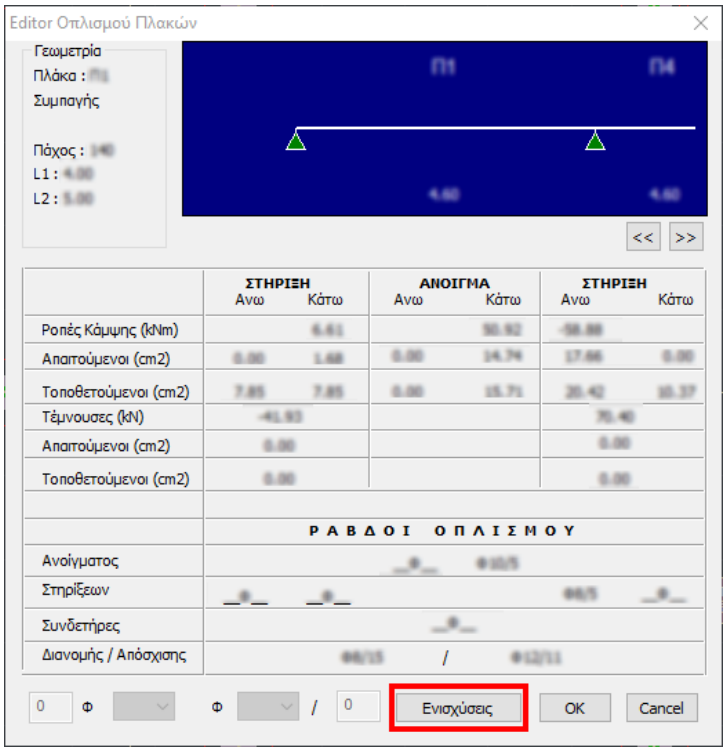
To modify the reinforcements, you select the corresponding field, either for the bars or the connectors, and at the bottom of the window you set the diameter and distance.

5.3.1.1 Reinforcements - Valuation and reinforcement of plates

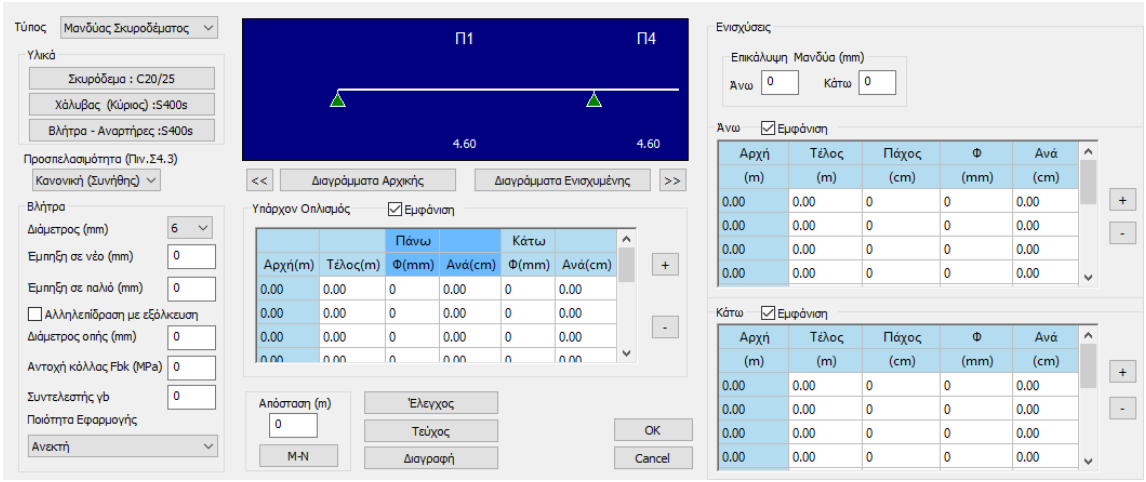
The new versions of SCADA Pro have fully integrated the evaluation and reinforcement of plates. The new feature is located in the Marcus slabs command group within the **DIMENSION** menu and specifically in the **Slab Arming Editor.** The input process follows the logic of the **TOMES** and is done **PER OPENING.**

It is recalled that prior notification is required:

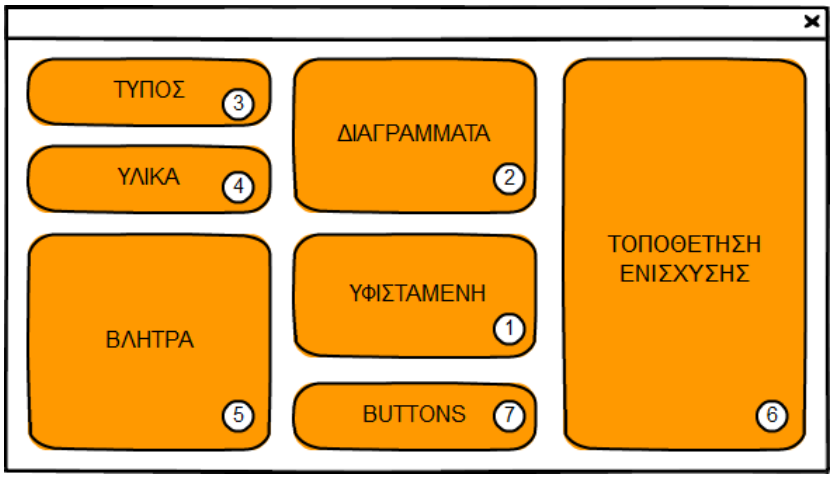
- Definition of plate properties (geometry, overlap Marcus coefficients)
- Definition of section properties (support conditions)
- Definition of Dimensioning Parameters (materials and combinations)
- Solving the intersection



The window that appears is generic and depending on the user's options the active fields are defined.



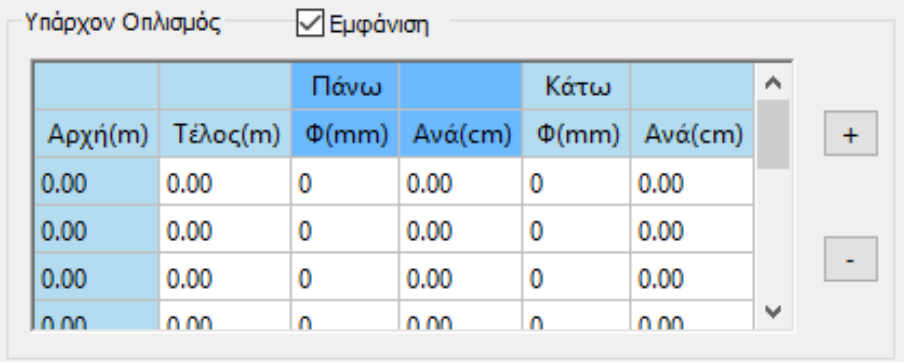
The functions are divided into 7 zones, each of which performs a different role. Depending on the desired action we select different zones or skip some.



ZONE	DESCRIPTION
1. EXISTING	Placement of reinforcement of existing slab
2. DIAGRAMS	Show initial and final volume charts
3. TYPE	Choice of reinforcement type
4. MATERIALS	Choice of reinforcing material
5. VLITRA	Set projectile parameters
6. MOUNTING OF REINFORCEMENT	Installation of IOP/steel cladding or laminate
7. BUTTONS	Checking and Creating an Issue

ZONE 1

ZONE 1 refers to the **ACTIVE OPENING** of the section and includes the field of the existing longitudinal reinforcement of the upper and lower footing. Each line represents an area within the opening defined by the start and end coordinates.

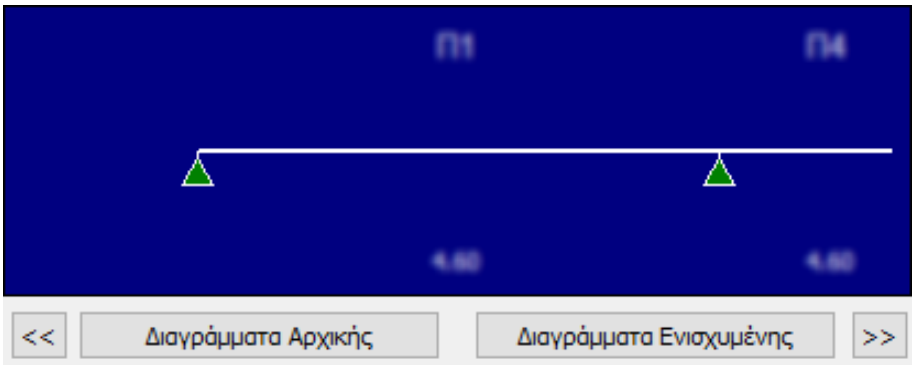


The commands for ZONE 1 are as follows:

Αρχή(m)	Coordinate of the beginning of the arming area. The value is automatically filled in based on the end value of the previous range.
Τέλος(m)	Coordinate of the end of the arming area. The value must be less than the total length of the plate opening.
Φ(mm)	Diameter of longitudinal reinforcement bars.
Ανά(cm)	Distance between the bars
Εμφάνιση	Update the graphical representation of the arming areas on the sectional sketch (see ZONE 2).
+ -	Add or remove a new arming area.

ZONE 2

ZONE 2 concerns the **ACTIVE OPENING** of the section and includes the sketch of the opening of the section and the alternation between the openings. In addition, a key element of this zone is the display of the bending moment and shear moment diagrams of the original section (pre-reinforced) and the reinforced section.

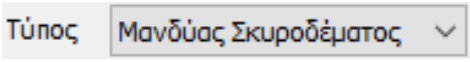


The commands in ZONE 2 are as follows:

<< >>	Switch between the openings of the section. The active opening is the one shown in the sketch.
Διαγράμματα Αρχικής	Diagrams of bending moment and shear moment of the original section (before reinforcement).
Διαγράμματα Ενισχυμένης	Diagrams of bending moment and shear moment of the reinforced section. In the case of reinforcement with IOP or Steel plates the diagrams are the same as the original section.

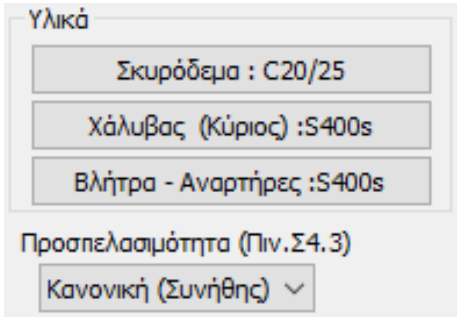
ZONE 3

ZONE 3 applies to the **ENTIRE** section and determines the type of reinforcement (Concrete Sheathing, IOP or Steel Plate).



ZONE 4

ZONE 4 refers to the **ENTIRE** section and includes the definition of the reinforcement materials and the degree of accessibility of the locations where the reinforcement is carried out (KANEPE §4.5.3.2).

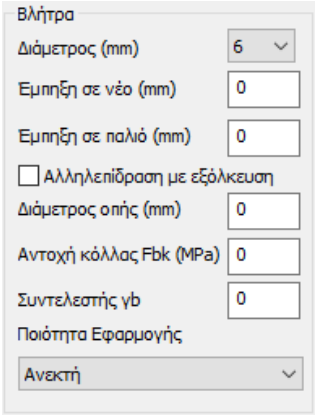


The commands in ZONE 4 are as follows:

Σκυρόδεμα :	Concrete quality in the case of reinforcement with concrete sheathing.
Χάλυβας (Κύριος) :	Quality of longitudinal reinforcement steel in the case of reinforcement with concrete sheathing. Laminate quality in case of reinforcement with IOP or Steel laminate.
Βλήτρα - Αναρτήρες :	Quality of bolts in the case of reinforcement with concrete sheathing.
Προσπελασιμότητα (Πιν.Σ4.3) Κανονική (Συνήθης)	Accessibility grade according to KANEPE §4.5.3.2.

ZONE 5

ZONE 5 applies to the **ENTIRE** section and is active when the reinforcement is made with concrete sheathing. The fields included are related to the placement of the bolts at the interface.

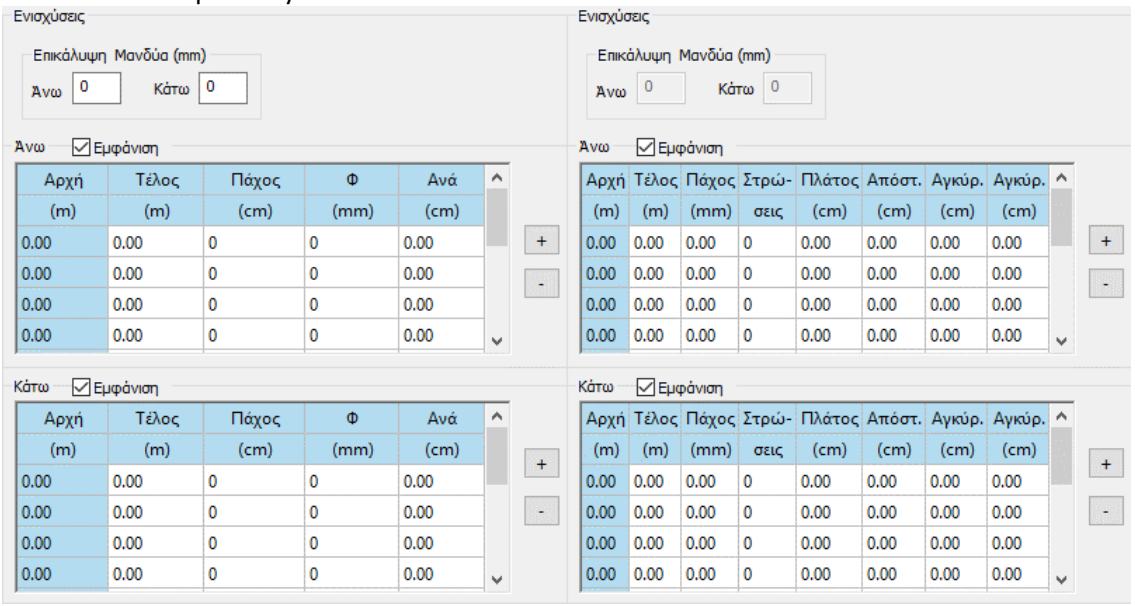


The commands in ZONE 5 are as follows:

Διάμετρος (mm) 6	Projectile diameter.
Εμπηξη σε νέο (mm) 0	Length of insertion of the bolt in the new concrete.
Εμπηξη σε παλιό (mm) 0	Length of insertion of the bolt in old concrete
☐ Αλληλεπίδραση με εξόλκευση	Interaction of the bolt mechanism - hammering mechanism. If from checkbox is enabled then the interaction is taken into account.
Διάμετρος οπής (mm) 0	Diameter of the hole in the new concrete in which the plug is placed. The Field is active only on case of interaction projectile - rigging.
Αντοχή κόλλας Fbk (MPa) 0	Characteristic affinity strength between bolt and binder. The Field is active only on case of interaction projectile - rigging.
Συντελεστής γb 0	Individual safety factor for relevance. The Field is active only on case of interaction projectile - rigging.
Ποιότητα Εφαρμογής Ανεκτή	Quality of application of the bolt at the construction site. The Field is active only on case of interaction projectile - rigging.

ZONE 6

ZONE 6 relates to the **ACTIVE OPENING** of the section and includes the field of longitudinal reinforcement of the concrete sheathing placed at the top and/or bottom tread of the slab. In the case of reinforcement with IOP or Steel plate, the reinforcement spans are replaced by those of the IOP or Steel plate layers.



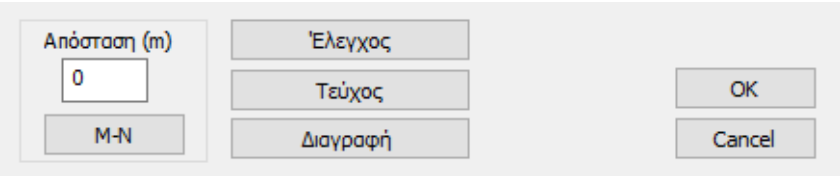
(α) (β)

Άνω 0 Κάτω 0	Pure reinforcement reinforcement overlay with concrete sheathing on the Upper and Lower Tread.
Εμφάνιση	Update the graphic depiction of the concrete sheathing reinforcement areas at the Upper and Lower Treads on the section sketch (see ZONE 2).
Αρχή (m)	Coordinate of the beginning of the reinforcement area of the concrete mantle. The value is automatically filled in based on the End value of the previous area.
Τέλος (m)	Coordinate of the end of the reinforcement area of the concrete jacket. The value shall be less than the total length of the slab opening.
Πάχος (cm)	Thickness of additional layer of concrete mantle.
Φ (mm)	Diameter of longitudinal reinforcement bars.
Ανά (cm)	Distance between the bars.

+ -	Add or remove a new arming area.
Αρχή (m)	Coordinate of the beginning of the reinforcement area with IOP or Steel plate. The value is automatically filled in based on the End value of the previous area.
Τέλος (m)	Coordinated end of the reinforcement area with IOP or Steel plate. The value must be less than the total length of the plate opening.
Πάχος (mm)	Thickness per layer of IOP or Steel laminate.
Στρώ-σεις	Number of layers of IOP or Steel laminate.
Πλάτος (cm)	IOP or Steel laminate strip width.
Απόστ. (cm)	IOP or Steel laminate strip spacing.
Αγκύρ. (cm)	Anchor length of left and right end of IOP or Steel laminate.

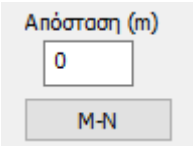
ZONE 7

ZONE 7 refers to the ENTIRE section and this is where the checks and the printing of the results are done.



The commands in ZONE 7 are as follows:

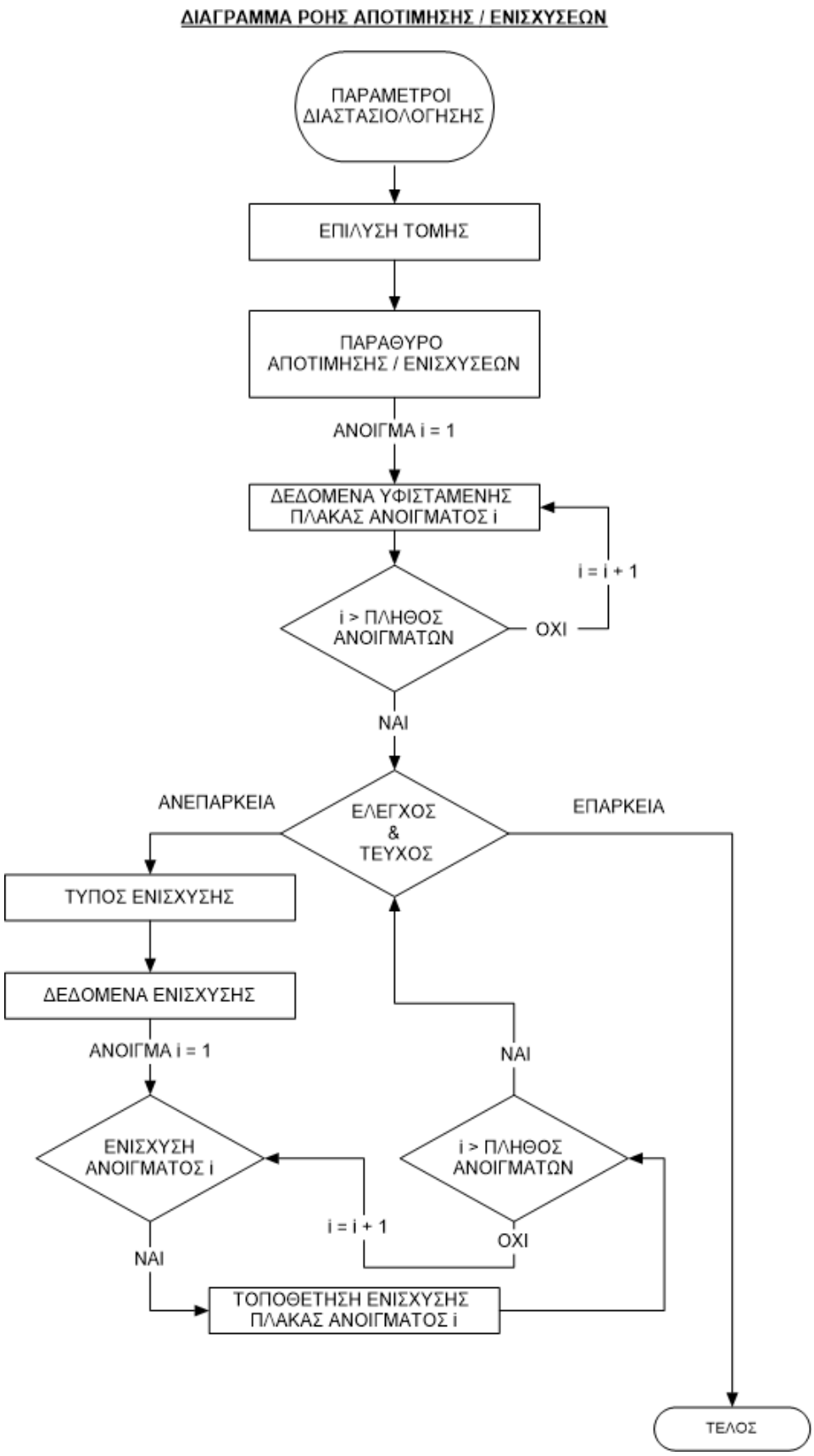
Έλεγχος	Carrying out checks.
Τεύχος	Issue creation.
Διαγραφή	Deletion of previous checks and issue.
OK	Confirm input data and exit aid window.
Cancel	Cancel input data and exit aid window.

	Show of chart interaction diagram at a distance x from the beginning of the opening (x=0m). The mandate is purely supplementary in nature and is not required for the process of valuation / subsidies.

5.3.1.1.1 Working course

The process followed to evaluate and then enhance the section under consideration is as follows:

1. The Sizing Parameters are defined.
2. The intersection is solved.
3. We open the Valuation / Grants window for the section we are interested in.
4. In all openings we insert the longitudinal reinforcements of the existing slab.
5. We carry out the checks.
6. We examine the results of the audits by reading the issue.
7. If there is Sufficiency in all openings then the process ends.
8. If there is an opening with SURPLUS we have to introduce aid.
9. Select the type of aid.
10. We select materials and other data (e.g. missile properties).
11. In one or more openings we place the reinforcements.
12. We carry out the checks.
13. We examine the results of the audits by reading the issue.
14. If there is Sufficiency in all openings then the process ends.
15. If there is an opening with a DEFICIENCY repeat the procedure from step 9.
16. Below is a flow chart of the process of valuing the existing slab and introducing reinforcement.


ΔΙΑΓΡΑΜΜΑ ΡΟΗΣ ΑΠΟΤΙΜΗΣΗΣ / ΕΝΙΣΧΥΣΕΩΝ
ΠΑΡΑΜΕΤΡΟΙ ΔΙΑΣΤΑΣΙΟΛΟΓΗΣΗΣ
ΕΠΙΛΥΣΗ ΤΟΜΗΣ
ΠΑΡΑΘΥΡΟ ΑΠΟΤΙΜΗΣΗΣ / ΕΝΙΣΧΥΣΕΩΝ
ΑΝΟΙΓΜΑ i = 1
ΔΕΔΟΜΕΝΑ ΥΦΙΣΤΑΜΕΝΗΣ ΠΛΑΚΑΣ ΑΝΟΙΓΜΑΤΟΣ i
i = i + 1
i > ΠΛΗΘΟΣ ΑΝΟΙΓΜΑΤΩΝ
ΟΧΙ
ΝΑΙ
ΑΝΕΠΑΡΚΕΙΑ
ΕΛΕΓΧΟΣ & ΤΕΥΧΟΣ
ΕΠΑΡΚΕΙΑ
ΤΥΠΟΣ ΕΝΙΣΧΥΣΗΣ
ΔΕΔΟΜΕΝΑ ΕΝΙΣΧΥΣΗΣ
ΑΝΟΙΓΜΑ i = 1
ΝΑΙ
ΕΝΙΣΧΥΣΗ ΑΝΟΙΓΜΑΤΟΣ i
i > ΠΛΗΘΟΣ ΑΝΟΙΓΜΑΤΩΝ
i = i + 1
ΟΧΙ
ΝΑΙ
ΤΟΠΟΘΕΤΗΣΗ ΕΝΙΣΧΥΣΗΣ ΠΛΑΚΑΣ ΑΝΟΙΓΜΑΤΟΣ i
ΤΕΛΟΣ

5.3.1.1.2 Issue

The issue is produced section by section, presenting the results of each plate in sequence.
The first page is for the **EVALUATION** of the existing slab and includes both the slab data and the controls. The second page is about the **ENHANCEMENT** data and finally the third page shows the results of the controls. It is worth noting that in addition to the result on adequacy or not, the prints have incorporated OBSERVATIONS and ERRORS.

Below are the results of an inadequate plate reinforced by considering **Concrete Sheathing** and alternatively **IOP Plate**.

5.3.1.1.3 Comments

The OBSERVATIONS on the second page record data entry errors while the third page lists broader issues that the engineer should take into account during design or construction. The list of OBSERVATIONS is as follows:

MANDYAS O.S.

1. There is a zero value for the length of the impingement.
2. There is an incorrect value for the Arms Zone Start or End coordinate.
3. There is a zero value of reinforcement spacing.
4. There is a zero value of sheath reinforcement diameter.
5. There is a zero value in the parameters for anchor action.
6. Reinforcement shall be placed in the transverse direction of the plate.
7. The loads of the sleeves shall be assigned to the beams.
8. The complete anchoring of the sleeve reinforcement must be ensured.

IOP / CARPENTER'S TIRE

1. There is an incorrect value for the Arms Zone Start or End coordinate.
2. There is a zero value of reinforcement spacing.
3. There is a zero value for the number of reinforcement layers.
4. There is a zero value for the reinforcement strip width.
5. There is an incorrect reinforcement lane spacing value.
6. The distance between the strips shall not exceed 3 times the thickness of the element.
7. There is a zero reinforcement anchorage value.
8. There are parts of the reinforcement that are in an area under compression.
9. The number of layers of fibre-reinforced polymer should not exceed 3.
10. The number of layers of steel plate should not exceed 5.
11. The thickness of the laminates should not 4 mm. or 2% of the width of the laminate.

5.3.1.1.4 Errors

FAULTS verbally describe the inadequacy or violation of basic principles of the regulation. The list of FAULTS is as follows:

1. The final value of the flexural strength lags behind the action.
2. The final value of shear strength lags behind the action. Reinforcement is required.
3. The required number of bolts exceeds the maximum possible. Data modification required.
4. The final value of the flexural strength exceeds twice the original value.

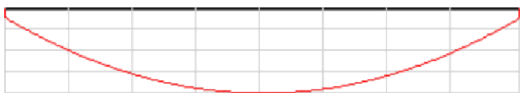
	ZcAí6a : 1

AFIOTIMHZH FIAAK£žN - YØIZTAMENH UAAKA

ONOMA f1AAKAZ:	Fl3	APIÓMOZ TOMHZ:	7

aArPAMMA PonnN KAuTHE (kNm)

(max M_{Ed} = 21.78 KNm, min M_{Ed} = 0.00 KNm)

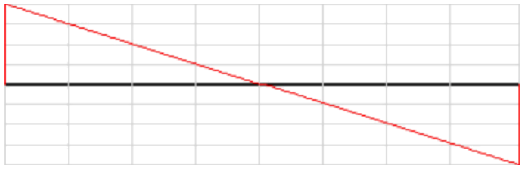


XAPAKTHPIZTIKA II/ΛAKAZ	
Μήκος L (m)	4.60
nóyoę h (mm)	180
ETfixóAuiji q (mm)	20
£Tjpl(q AploTzpó	ép0pwoq
Z ñpiŁn óEšió	Ap p on

ZKYPOAEMA		XAAYBAZ	
FloioTriTa	C16/20	Floiówpa	S400s
Ποιότητα	C16/20	**Ποιότητα**	S400s
f_{ck} (MPa)	18.00	E_s (GPa)	200.00
f_{ck} (MPa)	18.00	**E_s (GPa)**	200.00
f_{ctm} (MPa)	1.90	**f'_{yk} (MPa)**	350.00
¥c	1.00	**¥s**	1.00

aiArPAM MA TEMNOYECtN (kN)

(max V_{Ed} = 16.86 KN, min V_{Ed} = -16.97 KN)



AIAMHKHE Of1AIZMOE

Ζώνη	Zuv ETaypźvq Apyğç (m)	ZuvTEToypúvg TčÀOUÇ tWt	Aióрc poç nn W Wt	AwóoTacrq S,øø (cm)	AióрETpoç 4iptø (mm)	ATTóoTaoq s "tø (cm)
1	0.00	1.00	8	50.00	8	50.00
2	1.00	3.60			8	25.00
3	3.60	4.60	8	50.00	8	50.00
4						
5						
6						
7						
8						
9						
10						

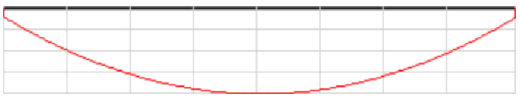
EaErxoz xAMBTIKHZ & AIATMH TIKHZ ANTOXHZ

ZuJVĘ	KAMTH - AN£I FIAPEIA			CAMTH - KAT£ž FIAPEIA			AIATMH£H			EFIAPKE IA
	Mea (kNm)	Med (kNm)	hÕyOÇ	Mea (kNm)	Mea (kNm)	SÕyOÇ	Ved (kN)	VRa (kN)		
1	0.00	-5.14	0.00	15.51	5.14	3.02	16.97	65.52	0.26	Ox
2	0.00	-0.38	0.00	21.78	9.93	2.19	9.50	65.52	0.15	x
3	0.00	-5.14	0.00	15.51	5.14	3.02	16.86	65.52	0.26	Ox
5										
6										
7										
9										
10										

Print Valuation (1st page).

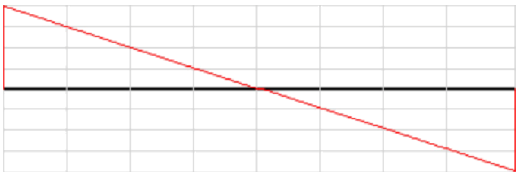
	ZEXí6a : 2
ENIZXYZH FIAAKCtN - MANAYAZ ZKYPOAEMATOZ)	
ONOMA rIAAKAz: n3	APIÕMOZ TOMHZ: 15

aiArPAMuA onnN KAMTHE (kNm)	ZKYPOAEMA		XAAYBAZ	
lmax Mo' 25.39 KNm, mln Mca= 0.OO CCŁTI}	floio rj+a	C25/30	Floio ij+a	BSOOC
	fl(MPa)	25.00	E,(GPa)	200.00
	f, (MPa)	260	f t(MPa)	50000
	y<	1.50	y	1.15



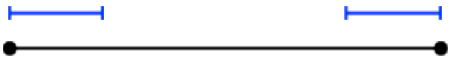
B HTPA	
f1oióTq+a| BSOOC| AiópcTpoç (mm)	8
E, (GPa)| 200.00| L ,tm t" , (mm)	30
f,r (MPa)| 500.00|L \" (mm)	30
y 1.15	

aiAri AMMA TEMNOY£££IN (kN)	AAAHAEFIIAPAZH EzOAKETZHZ	Oyi
(max V # 19 65 KN, min V- - 19 r 9 KN;	8+óyz*poçowjç (mm)	
	AvToyfj <óMoç frx (MPa)	
	Συντελεστής γb	
	*°lóTA'° Ep°P€°Yj3	
	FIPOZFIEAAZIMOTHTA Kovovihú (Zuvq0qç)	



Enixókuqiq Mov6úo (mm	ANO	25
	KAT£3	25

MANAYAZ ANO FIAPEIAZ						MANAYAZ KATIE FIAPEIAZ					
Ζώνη	Αρχή (m)	Τέλος (m)	Πάχος (cm)	$\Phi_{ANΩ}$ (mm)	$s_{ANΩ}$ (cm)	Ζώνη	Apyq (+)	T@oç (+)	nóyoç (*+)	e" (* +)	s, mcm)
1							0.00	4.60	8.00	10	15.00
2						2					
3						S					
4						4					
'						5					
6						6					
7						7					
8						8					
9						9					
10						10					

ÕEEEIZ TPOFIOFIOFIOIHMENHZ AIATOMHZ	ZKAPI9H MA ENIZXYMENHZ FIAAKAZ
0.00 1.00 3.60 4.60	

N/\ P/\ THPH?FI?

Print Reinforcement with Concrete Sheathing (2nd page).

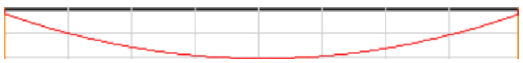
Σελίδα : 3

ENIZXYZH FIAAK¢3N - MANAYAZ ZKYPOAEMATOZ (2)

ONOMA FIAAKAE:	f13	APIΘMOZ TOMHE:	15

ctiArPAuMA PonnN KAM'ł'Hz & ANTOXHZ (l'Nm)

(max Mø,= 25.39 KNm, min Mø,= 0 OD KNŁTły

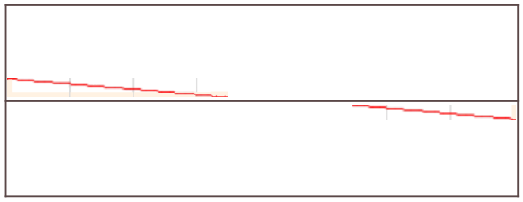


EaErxoz wMNTlKriZ ANTOXHZ

	AN£ž	KATEŽ
Euv6uaoyóç	2	2
Kpíoipq Bcpioyij	1	2
Mø, (kNm)	0.00	25.39
Mø (kNm)	-10.72	48.73
Mea / M	0.00	0.52
EFIAPKE IA	Nai	Nai
NÂğ6oç "pioX" ANENAPKEIAZ	0	0

aiArpAMMA TEMNOYZ¢žN & ANTOXHZ (kN)

(max Vø,= 19.65 KN, mlrl Vøą= -19.79 KN)



EaErxoz aiATMHTlKHZ ANTOXHZ

Euvöuaopöç	2
Kpíaiyq Flcpioyğ	1
Vø (kN)	-19.79
VRd(kN)	91.95
V" / V"	0.22
EFIAPKEIA	Nai
n Ą8oçwzpo tuv ANAPeCe to	0

AIATMHTIKH AYNAMH ANCt AIEFIIØANEIAZ (kN)

(max Fş",= 0.00 KN, mm Fş",= 0.00 KN)

AIATMHTIKH AYNAMH ETH AlEnieANEIA

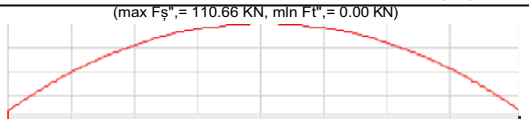
	AN£I	KAT¢ž
EuvbuaopÓç	-	2
F"" (kN)	-	99.02
Mğxoç L", " (m)		2.18

ANTOXH BAHTPOY - ArxvPioy

Apóoq Bńqîpou F" (kN)	3.89
ApÖoq Ayxupíou Noa (kN)	

AIATMHTIKH AYNAMH KAT£ž AIEBIOANEIAZ (kN)

(max Fş",= 110.66 KN, mln Ft",= 0.00 KN)



vnoaorizMOZ BAHTPCIN

		AN£3	KAT£ž
μήκος	TEpvouoa (n,)		35
	AĘovicğ (nt)		
a	AÄÄqAcwí6pooq (n)		
Open at	EÄ x - a (n ")		26
	Mśyioto (n"",)		625
	Towo6cToú ycva		26

Z¢PAAMATA

1 H ïEiKrj riprj Tqç KapTrîiKqç avToyńç uTrcpŞaívE i ïo biTrĂóoio îqç opgi<qç

nAPATHPnzEiz

1 ZïqV Cy KÖp ŒIQ ÖICúB JVOq Tn Ç Tr XÖKQÇ Trp ÊETCI VQ TOTTOO CTŗBCÍ OTrJ\ IO MÓÇ
2. He ţooiïa rev pavöucúv Trpfuci va oTroõo0oúv ma õoxópia.
3. Πρέπει να εξασφαλιστεί η πλήρης αγκύρωση του οπλισμού των μανδυών

Print Reinforcement with Concrete Sheathing (3rd page).

	Σελίδα : 2

ΕΝΙΣΧΥΣΗ ΠΛΑΚΩΝ - ΙΟΠ ή ΧΑΛΥΒΔΙΝΑ ΕΛΑΣΜΑΤΑ (1)

ΟΝΟΜΑ ΠΛΑΚΑΣ:	Π3	ΑΡΙΘΜΟΣ ΤΟΜΗΣ:	7
ΥΛΙΚΟ ΕΝΙΣΧΥΣΗΣ:	ΙΝΟΠΛΙΣΜΕΝΟ ΠΟΛΥΜΕΡΕΣ		ΧΑΛΥΒΔΙΝΟ ΕΛΑΣΜΑ ✓

ΙΔΙΟΤΗΤΕΣ			
E_j (GPa)	f_j (MPa)	γ_j	ε_j
210.00	355.00	1.15	0.020

ΠΡΟΣΠΕΛΑΣΙΜΟΤΗΤΑ	ανονική (Συνήθη

ΕΝΙΣΧΥΣΗ ΑΝΩ ΠΑΡΕΙΑΣ

Ζώνη	Αρχή (m)	Τέλος (m)	Πάχος στρώσης (mm)	Πλήθος Στρώσεων	Λωρίδες		Αγκύρωση (cm)	
					Πλάτος (cm)	Απόσταση (cm)	Αριστερά	Δεξιά
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

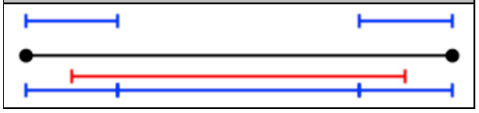
ΕΝΙΣΧΥΣΗ ΚΑΤΩ ΠΑΡΕΙΑΣ

Ζώνη	Αρχή (m)	Τέλος (m)	Πάχος στρώσης (mm)	Πλήθος Στρώσεων	Λωρίδες		Αγκύρωση (cm)	
					Πλάτος (cm)	Απόσταση (cm)	Αριστερά	Δεξιά
1	0.00	0.50	-	-	-	-	-	-
2	0.50	4.10	0.17	3	20.00	25.00	40.00	40.00
3	4.10	4.60	-	-	-	-	-	-
4								
5								
6								
7								
8								
9								
10								

ΘΕΣΕΙΣ ΤΡΟΠΟΠΟΙΗΜΕΝΗΣ ΔΙΑΤΟΜΗΣ

0.00 0.50 1.00 3.60 4.10 4.60

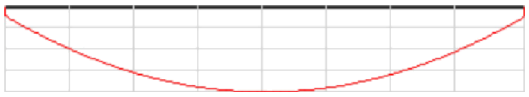
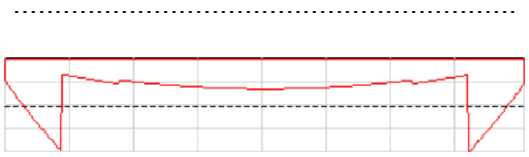
ΣΚΑΡΙΦΗΜΑ ΕΝΙΣΧΥΜΕΝΗΣ ΠΛΑΚΑΣ



ΠΑΡΑΤΗΡΗΣΕΙΣ

Printing Enhancement with IOP Plate (2nd page).

				Σελίδα : 3
ENIZXYZH FIAAKEžN - IOFI ή XAAYBAINA EAAEMATA (2)				
ONOMA FIAAKAZ:	f13	APIOMOZ TOMHZ:	7	
YAIKO ENIZXYZHZ:	INOFìAI ZMENO PIOAYMEPEZ	XAAYBAINO EAAZMA		

aiArpAMMA PonnN tAns (kNm)
(max M¿ą= 21.78 KNm, mm Mçq= 0.00 KNm)

aiAr AMMA aorov EnAPKEIAE KAMTHZ
(AND FIAPEIA 0.00, KAT0 FIAPEIA 1.93)


EaErxxoz xAMnTiKHE ANTOXHE		
	ANEt	KATCt
EUvbuaoyóç		2
Κρίσιμη θέση (m)		2.31
L" (mm)		2192
L, (mm)		168
β_w		084
p,		1.00
p		0.84
o,,, "t (MPa)		524.98
a, '=f,x/ym (MPa)		294.00
o"=o,,",/yø, (MPa)		437.48
oj ;,,,, (MPa)		294.00
cj, i (@)		1.40
Møø (kNm)		34.68
Mea (kNm)		21.78
M''_{Ed} / $M\phi_{Rd}$		0.63
EnAPKEIA		Nai

EaErxoz AnOAHüHZ ENISXYSHZ	
KPITHPIO KAMVHZ	
Euvöuoopóç	2
Kpïoipq FlapEió	vTn
AysupoupEvo	0.500 - 4.100
Kpíoipo kxpo	TEAO Z
Ôšoq EAcýyou (m)	4.50
Mea (kNm)	5.14
M3a (kNm)	4.29
Mea / (2/3) "Mna	1.25
EBAPKEIA	Ojg

EaErxoz AnoaHüHZ ENIZXYZHS	
KPITHPIO AIATMHZHZ	
Euvbuaoyóç	2
Kpiolpq Flapció	KAT0
A'ÿ'ltU@OU ØEVO	0.TOO - 4.100
Kpíoipo A "po	APXH
Ocoq EA*yx-- <T	0.10
Vet (kNm)	65.52
Vet (kNm)	-16.29
Veul"	0.25
Ef1APKEIA	Nai

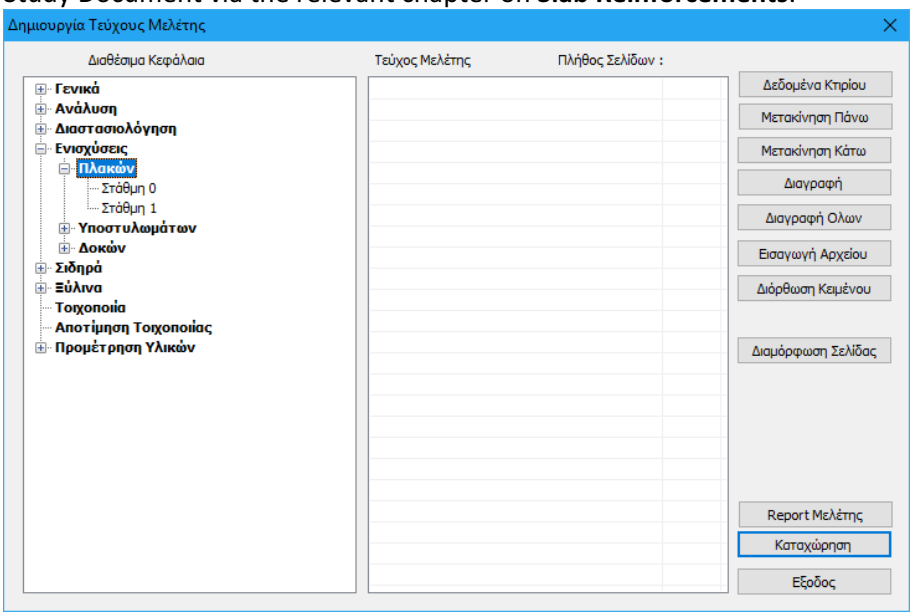
EaErxoz MH ENIEXYMENGN FIEPIOXOhI									
rAu+n - ANn nA EiA			KAMTH - KATG NAPEIA			AIATMHZH			Evo ia
Mø (kNm)	Mø, (kNm)	ßõɣoç	Mtø (kNm)	Mø (kNm)	Aóyoç	Vø (kN)	Vø (kN)	Ao	
0.00	-5.14	0.00	9.91	5.14	1.93	16.97	65.52	0.26	Oyi

EØAAMATA
1. Η τελική τιμή της καμπτικής αντοχής υστερεί έναντι της δράσης. 2. Η τελική τιμή της καμπτικής αντοχής υπερβαίνει το διπλάσιο της αρχικής

Printing Enhancement with IOP Plate (3rd page).

5.3.1.1.5 Study Issue

The results of the tests for all sections that have been assessed or Reinforced can incorporated into the Study Document via the relevant chapter on **Slab Reinforcements**.



Slab Reinforcements chapter in the study booklet.

5.3.2 Sections of plates


to display the results of any intersection resolved at the level you are editing. After selecting it, you click with the mouse on a section, it becomes dashed, sign that it has been selected, and then the table of its results (materials, plate geometry data, loads, intensive sizes, reinforcements, etc.) opens.

ΕΛΕΓΧΟΣ ΣΕ Κ Α Μ Ψ Η	-Π1(ΑΚΡΟ)		Π1 (ΑΝΟΙΓΜΑ)		Π1-Π2(ΑΚΡΟ)	
	ΠΑΝΩ	ΚΑΤΩ	ΠΑΝΩ	ΚΑΤΩ	ΠΑΝΩ	ΚΑΤΩ
Ροπη Υπολογισμου MSd(KNM)	0.81		5.80		-10.31	
ΑΠΑΙΤ. ΔΙΑΤ.ΟΠΛΙΣΜΟΥ As (CM2)	0.00	0.18	0.00	1.84	2.39	0.00
ΕΛΕΓΧΟΣ ΣΕ Δ Ι Α Τ Μ Η Σ Η						
Τεμνουσα Υπολογισμου VEd (KN)	4.99	1			9.83	1
Αντοχή χωρίς οπλισμό VRd,c(KN)	69.15				69.15	
Αντοχή θλιβ. διαγων.VRdmax(KN)	880.99				880.99	
ΑΠΑΙΤ. ΠΡΟΣΘ. ΣΤΗΡΙΞΕΩΝ (CM2)	0.00				0.00	
ΤΕΛΙΚΗ ΔΙΑΤ.ΟΠΛΙΣΜΟΥ As (CM2)	1.26	1.26	0.00	2.51	2.51	2.51
ΤΕΛΙΚΟΙ ΡΑΒΔΟΙ ΟΠΛΙΣΜΟΥ				Φ8 /20		

OBSERVATIONS:

Compared to the older versions, changes have been made in the way the results of the reinforcements are presented
The titles above "Tensile" - "Compression" have been changed to "Up" - "Down" and identify the position of the reinforcements in the plate. Only one torque value is now written, the sign of which determines whether the reinforcement is to be placed on top or underneath

- For a positive torque value, the tensile force is lower and the reinforcement enters accordingly.
- For a negative torque value, the tensile force is higher and the reinforcement is introduced accordingly.
- It is possible to have a positive value, mainly in the support, and a requirement for compressive reinforcement, in which case required reinforcements are indicated both above and below.
- *Especially for the poles dimensioning scenario, the reinforcement of the plates is considered equal, i.e. half of the reinforcement on the support is not taken into account, and where required, more support reinforcement is placed.*

5.3.2.1 Deformation Control

In the new versions of SCADA Pro has been added the Deformation Control on the plates.

The deformation check is based on 7.4.2 and 7.4.3 of EC2 and is presented at the end of the results of each plate and if the scenario is not ECOS.
The results of the two tests are shown separately.

ΥΠΟΛΟΓΙΣΜΟΣ ΠΑΡΑΜΟΡΦΩΣΕΩΝ (EC2 παρ.7.4.2 & παρ.7.4.3)									
l/d	l/d επιτρ.	Επάρκεια	Προτειν.ελάχ. πάχος h_s (mm)		Max M (kNm)	d_u (mm)	a	l/a επιτρ	Επάρκεια
38.33	140.17	ΝΑΙ	52.8		-19.04	20.14	250	18.40	ΟΧΙ

In the first check, a minimum proposed thickness is obtained, but it cannot be proposed in the initial identification of the plate because its calculation requires its reinforcements.

In the calculation of the first check, no intensive quantities are used, while the second check is carried out with the functional combination(s).

1. In the deformation check there are 2 checks and to have proficiency I need to satisfy both 2
2. There is one case where the 2nd check cannot be performed and in this case we write d=0 and nothing in the sufficiency. In that case alone we are satisfied with the result of the 1st check
3. Manually changing the placed reinforcement affects the results if the fg is not 500 (something we added in the latest versions of SCADA Pro)
   in accordance with the regulation where indicated:

$$\frac{l}{d} = K\left[11 + 1{,}5\sqrt{f_{ck}}\frac{\rho_0}{\rho - \rho'} + \frac{1}{12}\sqrt{f_{ck}}\sqrt{\frac{\rho'}{\rho_0}}\right] \quad \text{εάν } \rho > \rho_0 \qquad (7.16.\beta)$$

όπου:

l/d είναι ο επιτρεπόμενος λόγος άνοιγμα/ύψος

K είναι συντελεστής που εξαρτάται από τα διάφορα δομικά συστήματα

ρ_0 είναι το ποσοστό οπλισμού αναφοράς = $\sqrt{f_{ck}}\ 10^{-3}$

ρ είναι το απαιτούμενο ποσοστό εφελκυόμενου οπλισμού για την παραλαβή της ροπής λόγω φορτίων σχεδιασμού στο κέντρο του ανοίγματος (για προβόλους, στη στήριξη)

ρ' είναι το απαιτούμενο ποσοστό θλιβόμενου οπλισμού για την παραλαβή της ροπής λόγω φορτίων σχεδιασμού στο κέντρο του ανοίγματος (για προβόλους, στη στήριξη)

f_{ck} σε MPa

Οι Σχέσεις (7.16.α) και (7.16.β) έχουν εξαχθεί με την παραδοχή ότι, υπό τα κατάλληλα φορτία σχεδιασμού για την ΟΚΛ, η τάση του χάλυβα σε μια ρηγματωμένη διατομή στο κέντρο του ανοίγματος μιας δοκού ή πλάκας, ή στη στήριξη ενός προβόλου, είναι 310 MPa, (αντιστοιχεί περίπου σε f_{yk} = 500 MPa). Όταν χρησιμοποιούνται άλλες στάθμες τάσεων, οι τιμές που προκύπτουν από τη σχέση (7.16) θα πρέπει να πολλαπλασιάζονται επί $310/\sigma_s$. Εν γένει είναι συντηρητικό να γίνεται η παραδοχή:

$$310 / \sigma_s \leq 500\ A_{s,req} / (f_{yk}\ A_{s,prov}) \qquad (7.17)$$

όπου:

σ_s είναι η εφελκυστική τάση του χάλυβα στο μέσον του ανοίγματος (για προβόλους, στη στήριξη) υπό τα φορτία σχεδιασμού για την Ο.Κ.Λειτουργικότητας

$A_{s,prov}$ είναι το εμβαδόν του οπλισμού που τοποθετείται στην ανωτέρω διατομή

$A_{s,req}$ είναι το εμβαδόν του οπλισμού που απαιτείται στη διατομή για την Ο.Κ. Αστοχίας.

While when the fg= 500 then only the REQUIRED is entered in the formula and as a result the change of the armature does not affect the result.

OBSERVATION:

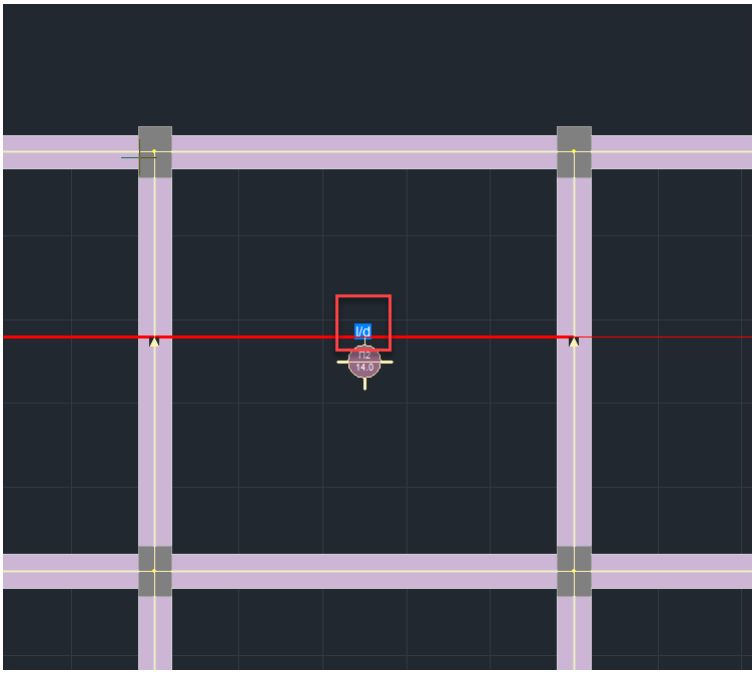
The results of the deformation test on the plates based on EC2,
are automatically updated based on the subsequent modification of their reinforcement.

Also in the printout of the results, the section showing the load of the section

```
|Φορτία:ΙΒ:1.35x3.82
|Φ.Τομης(KN/M):    3.6884
```

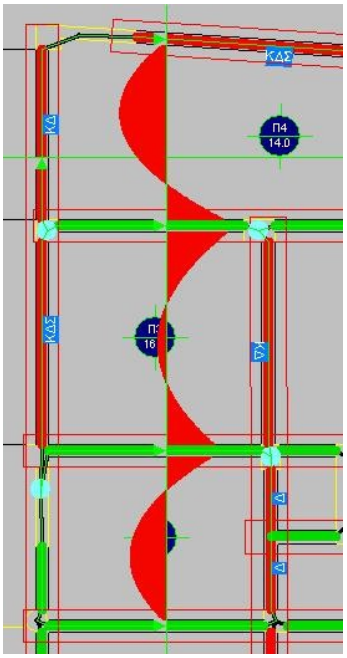
It now appears ONLY when a combination is set

In the new version of the software, a new warning message has been added concerning the calculation of plate deformations. In particular, when there is no sufficiency, the symbol "l/d" appears on the corresponding plate.



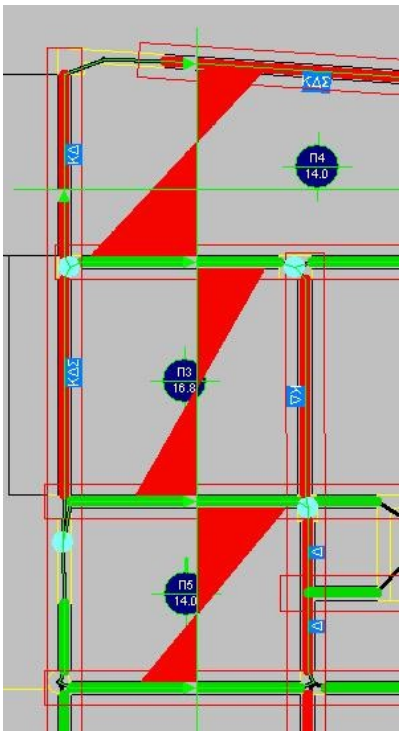
5.3.3 M diagrams


to draw on the section indicated with the mouse, the diagram of the moments (M) resulting from the loadings 1.35G+1.50Q, after multiplication by the coefficients qx or qz, for sections parallel to the x or z axes respectively. The sections shall be drawn qualitatively (with no values for the intensities indicated on them).

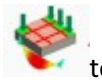


5.3.4 Diagrams Q


to draw on the section indicated with the mouse, the diagram of the intersections (Q) resulting from the loadings 1.35G+1.50Q, after multiplication by the coefficients qx or qz, for sections parallel to the x or z axes respectively. The sections shall be drawn qualitatively (with no values for the intensities indicated on them).



5.3.5 M diagrams (adverse loads)


to draw on the section indicated with the mouse, the diagram of the moments (M) resulting from the adverse loads.

5.3.6 Q charts (adverse loads)


to draw on the section indicated with the mouse, the intersection diagram of the intersections (Q) resulting from the unfavourable loadings.

6. Surface

The tool of dimensioning plates modeled with surface elements has the following philosophy:
The reinforcement of these plates can be mounted,

- or uniform over the entire surface,
- either by separating the plate into regions and

can be,

- either of the form minimum additional reinforcement to be fitted +
- or as a total final reinforcement.

The program can automatically calculate the reinforcement to be placed in either of the above two formats. The reinforcement can also be placed "manually" by the designer with an automatic graphical adequacy check.

Attention!
The process is executed per level and the commands work ONLY in plan view and not in the 3D vector.

In summary, the path to completion is as follows:

1. Parameters

This defines the basic reinforcement, which will be used as a foundation, which will be placed in both directions, both above and below. The maximum and minimum reinforcement to be placed in the automatic dimensioning mode (distances, diameters) are also defined and the combination with which the required reinforcement will be calculated is also selected.

2. Show Required Armament (Combinations)

With this option we can see the required reinforcement in cm2/m per direction (X or Z) and per reinforcement layer (Top - Bottom) from any load, combination or envelope, in order to decide with which combination we will reinforce our plate. This choice is the same as the one in the results section (*see use 9. Results*).

3. Calculation of the final required armament

This option is required whenever you wish to use the surface sizing tool. Essentially it calculates the reinforcement required by regulations and compares it to the reinforcement required by the intensives.

4. Show Minimum Required by Regulation

With this option the program displays the minimum required reinforcement for the whole surface.

5. Basic Armament Adequacy Check against Minimum

With this option the user can check if the basic reinforcement set covers the minimum required by the regulation. If the value is non-zero and positive, then the basic reinforcement does not meet the minimum required.

6. Arming areas

Here we graphically define one or more reinforcement areas, i.e. areas where there is a requirement for reinforcement thickening. We have two options:

α. Place additional reinforcement beyond the minimum calculated in the previous step.

β. To place a total final reinforcement, ignoring the minimum.

7. Calculation - Updating Area Armaments

With this option, the program calculates automatically and only for the reinforcement areas that we defined in the previous step, the reinforcement to be placed, so that there is sufficiency, i.e. it is greater than the required one. In addition to the automatic calculation, we can also manually meet the requirement by selecting the appropriate reinforcement ourselves.

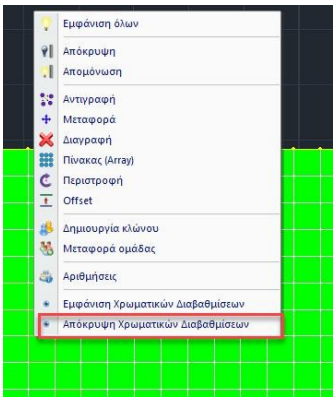
8. Show Final Required Armament (As)

9. Show Mounted Armament (As)

10. Armament Adequacy Check

Each of these three options shows in colour gradation in cm2/m respectively the Required, the Installed and, in adequacy option, the difference between Installed minus Required reinforcement. If this difference is 0 or positive, it is displayed in green, while if it is negative, the areas where the installed reinforcement is not sufficient are displayed in colour.

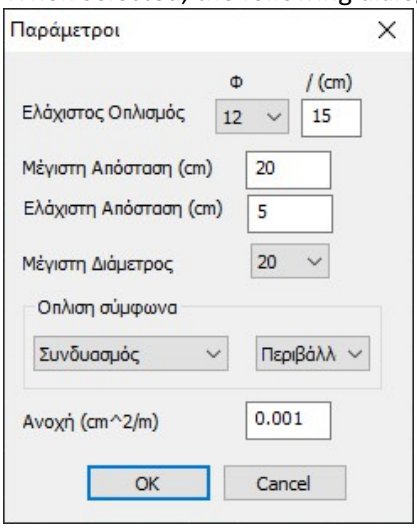
Attention!
All color gradations appearances are hidden by right-clicking on the desktop and from the menu that appears, selecting "Hide Color Gradients"



Let's now look in detail at the operation of the commands

6.1 Parameters

When selected, the following dialog box appears



NOTE: Please note that all the parameters mentioned here refer to all the reinforcements (horizontal, vertical, upper, lower).

With the "**Minimum Armament**" option we set:
a minimum reinforcement to be installed, regardless of the requirement.

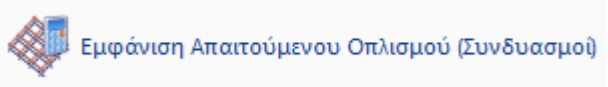
With the options "**Maximum Distance**", "**Minimum Distance**" and "**Maximum Diameter**" we set the respective minimum and maximum distances between the irons and the maximum diameter to be used.
The minimum diameter is that specified in the minimum reinforcement.

Then we define the combination, load or envelope according to the calculation of the required reinforcement will be made.

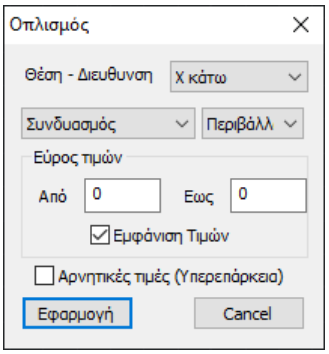
In the "Tolerance" option we have the possibility to set a tolerance margin of the value of the calculated minimum reinforcement so that, when the calculation of the required reinforcement of each area is made, a single minimum reinforcement is calculated in the range of values defined by the tolerance and the initial minimum reinforcement.
That is, the value of the tolerance is added to the As of the minimum reinforcement and those values of required reinforcement that are within this range are taken into account as a requirement, not with their actual value, but with the value corresponding to the As of the minimum required reinforcement.

EXAMPLE:
For example, if we have placed a minimum reinforcement F12/15 corresponding to 7.53 cm2/m and we have set a tolerance of 0 cm2/m, then all quadrilateral elements with a reinforcement requirement less than or equal to 7.53 cm2/m will be shown in the corresponding colour gradient to be sufficient.
If we now, for the same case, set a tolerance of 2 cm2/m then, to the previous four-sided elements that seemed to be sufficient (for an As requirement of less than or equal to 7.53 cm2/m) will be added those elements that have a reinforcement requirement value up to 7.53 cm2/m + 2 cm2/m = 9.53 cm2/m. In fact, these elements will not be shown in the corresponding colour graduation of the required reinforcement not with their actual value but with the minimum reinforcement value of 7.53 cm2/m.

6.2 Show Required Armament (Combinations)

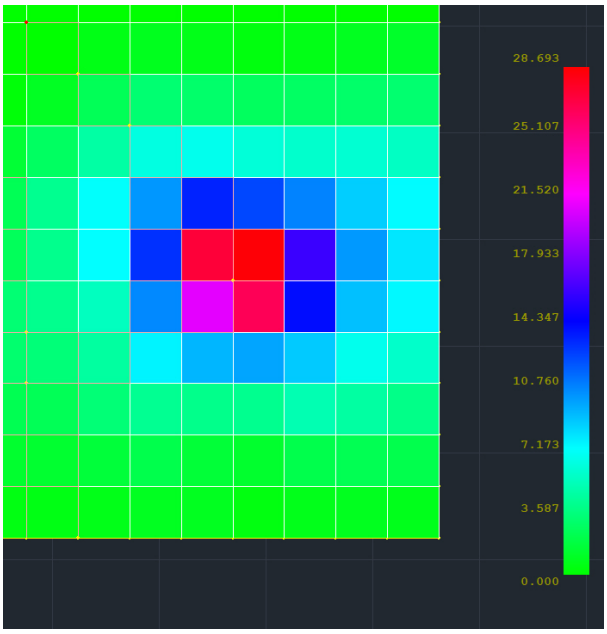


When selected, the following dialog box appears



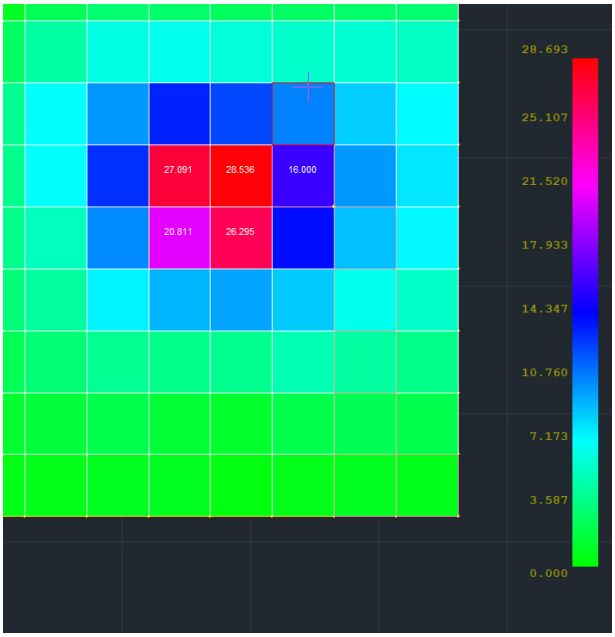
Here we can see the required reinforcement from whichever of the combinations, loading or envelope we chose.
The reinforcement is shown either X (horizontal) or Z (vertical) above and below and the directions refer to the universal axes.

The "**Show Values**" option also displays the numeric value within each quadrilateral element, while the "**Range of Values**" option, with numeric values enabled, only displays values in the elements within the range of values that we specified.



Reinforcement required without displaying values

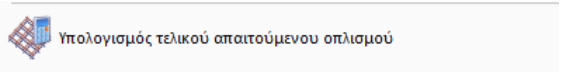
Required reinforcement with displayed values



Required reinforcement with a value range of 15 - 30 cm2/m.

In addition, there is the option

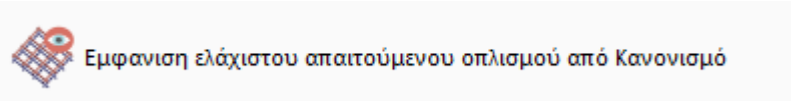
6.3 Calculation of the final required armament



With this option the program calculates the minimum reinforcement for the whole surface, the same everywhere (top - bottom, X and Z direction) and compares it with the required reinforcement from the intensive sizes, thus the final required reinforcement is obtained. This command is necessary whenever you want to use the next commands in the sequence.

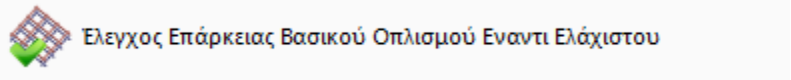
NOTE: The minimum reinforcement is calculated from the minimum reinforcement of the parameters and the corresponding regulations and the worst (largest) of the two is taken.

6.4 Show Minimum Required Armament by Regulation



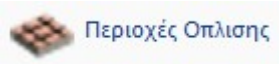
With this option you can see the reinforcement requirement from the regulation

6.5 Basic Armament Adequacy Check against Minimum



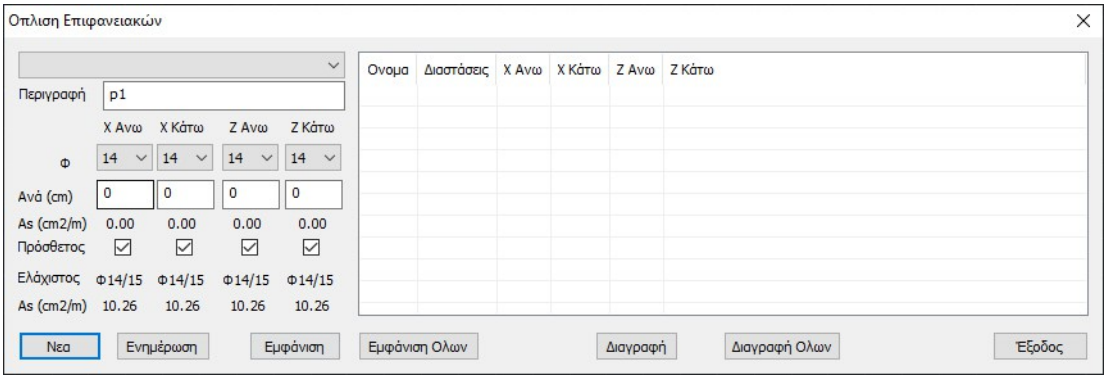
With this option you can check whether the basic reinforcement is sufficient against either the minimum or the requirement against the intensive sizes (the worst of the two).

6.6 Arming areas



With this option it is possible to graphically define one or more arming areas.
If we define an area, a reinforcement will be placed in the whole area, which can obviously be differentiated by direction (X and Z) and by layer of placement (top - bottom). This reinforcement can also be either total final reinforcement (ignoring the minimum reinforcement), or original minimum reinforcement + additional reinforcement.

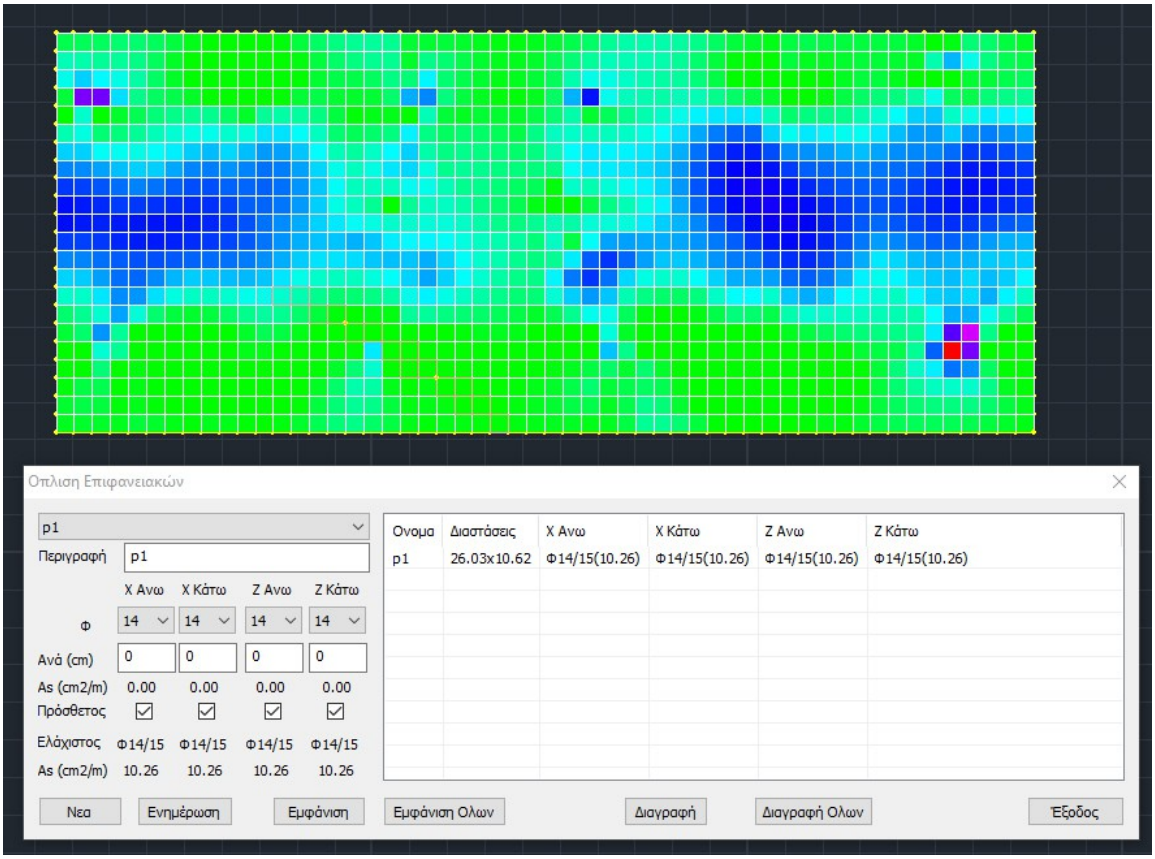
Let's look at the functions in detail:
Selecting the command displays the following dialog box:



NOTE: Note that all other menu commands work dynamically and simultaneously with this window open, which is very useful and instructive.

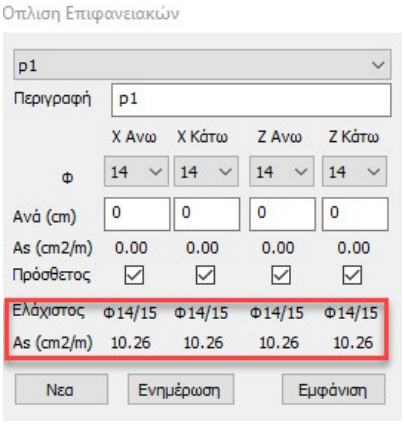
To define a new area, we press the "**New**" button and graphically define the arming area with a window.

EXAMPLE:
In the example below, the entire surface of the pavement has been defined as one surface of the pavement.

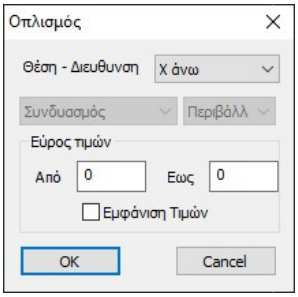


The area is automatically named p1 and on the right are shown its dimensions and, for each of the four reinforcement cases, the corresponding reinforcement.

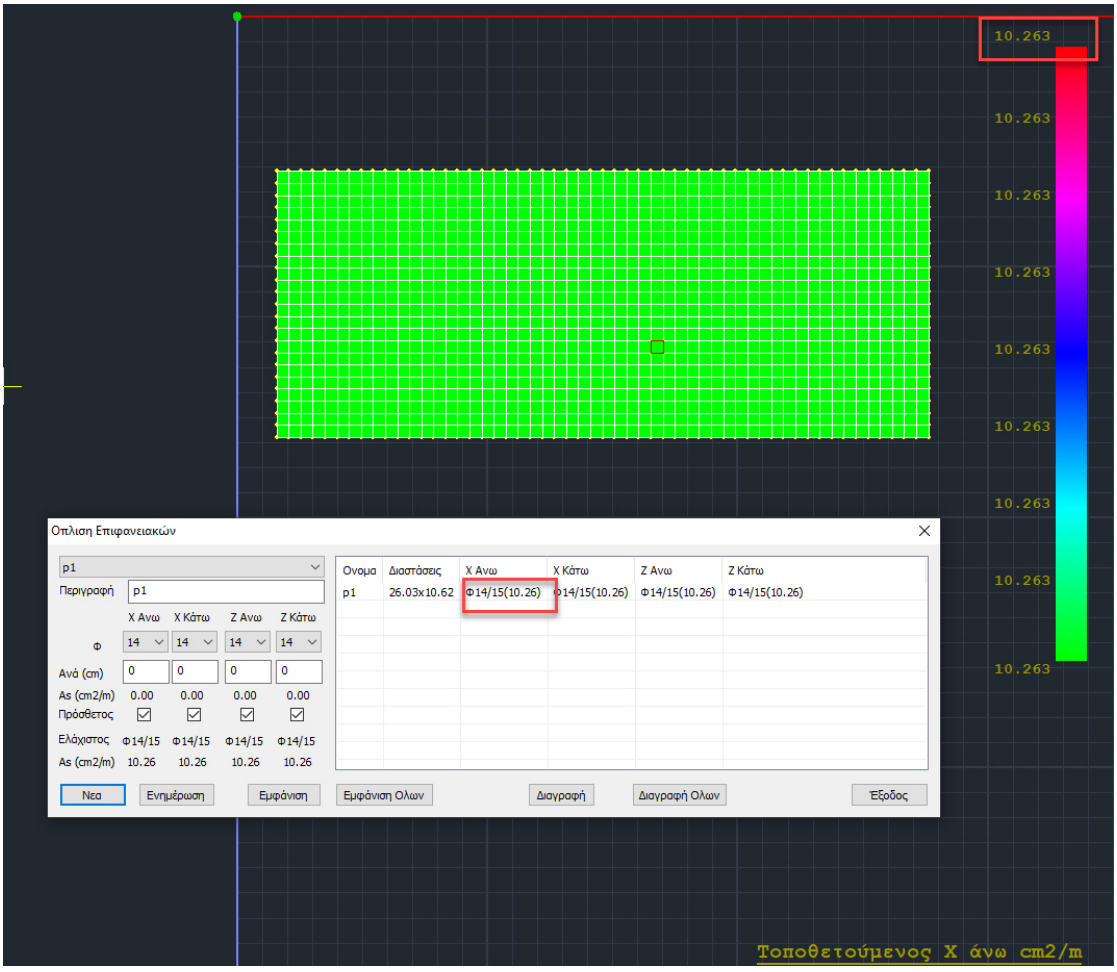
In this example, the minimum reinforcement calculated in a previous step is indicated, which, as already mentioned, is the same for all four cases of armouring and is displayed in the left part of the window for information.



With this window open and selecting from the menu the appearance of the mounted reinforcement, for example X upper

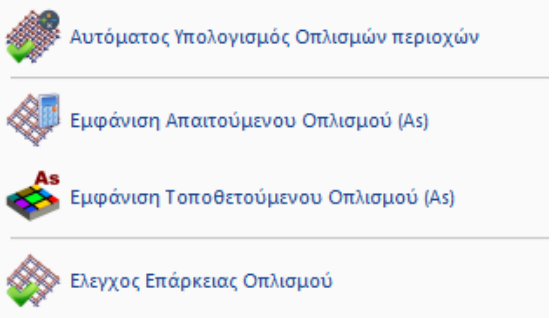


we can see the minimum reinforcement to be installed *(Φ14/15= 10.26 cm2/m)*



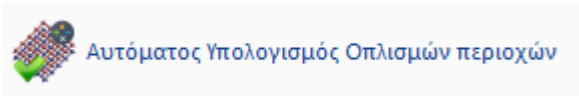
There are two ways of calculating the reinforcement to be placed:

I. Automatic mode

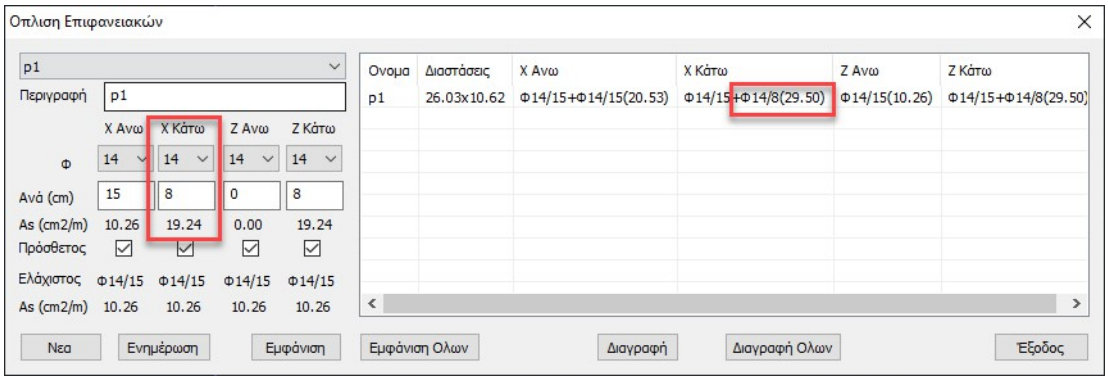


6.7 Automatic calculation of Area Armaments

With the window open, select from the menu "**Automatic calculation of Area Armaments**"



the program calculates the additional placed reinforcement required to cover the required reinforcement, always for each area defined.

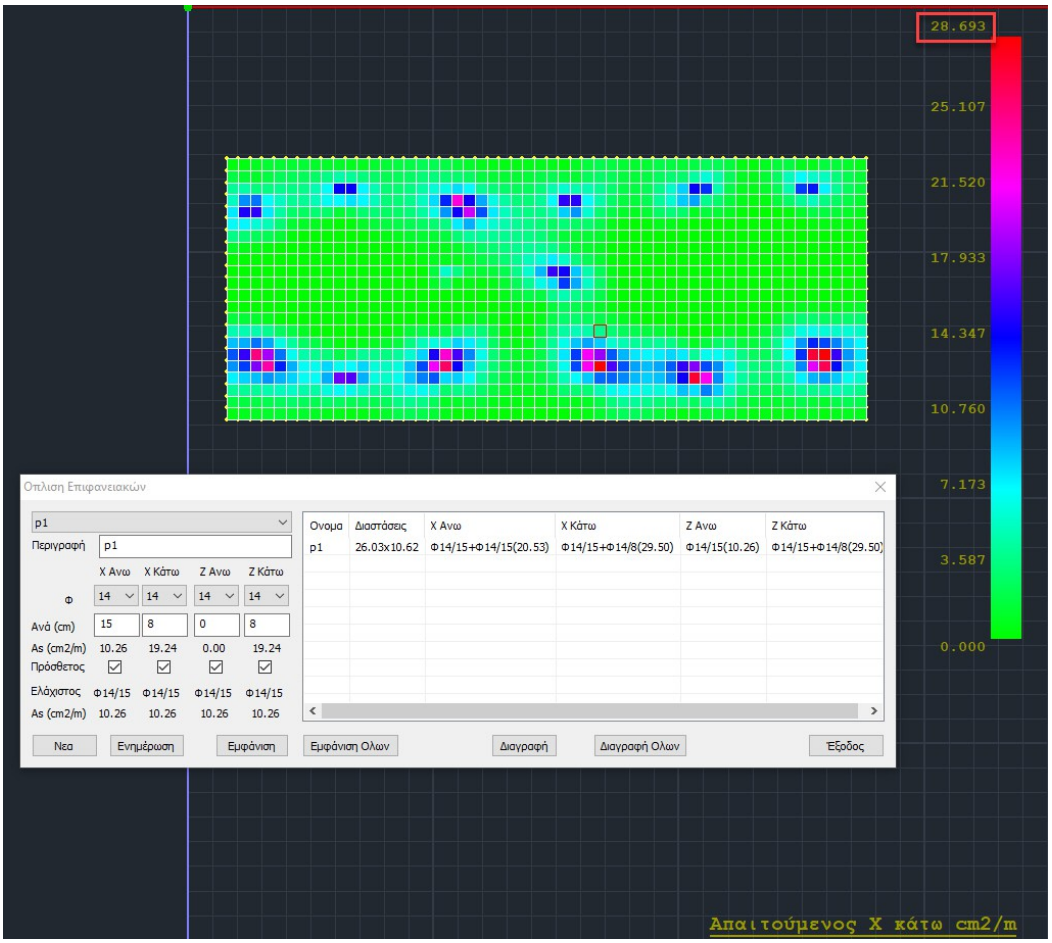


EXAMPLE:

For example, for X Down additional Φ14/8 were required which is 19.24 cm2/m with a fitting set of Φ14/15 (10.26) (minimum) + Φ14/8 (19.24) (additional) = 29.5 cm2/m. Obviously the maximum required X Lower reinforcement, always for this particular area, is something less than 29.5 cm2/m. The choice of the additive was based on the original reinforcement parameters (minimum, maximum diameter and corresponding spacings).

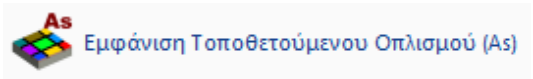
6.8 Showing Required Armament (As)

To see the required reinforcement, with the window open select the corresponding display option "**Show required reinforcement**"

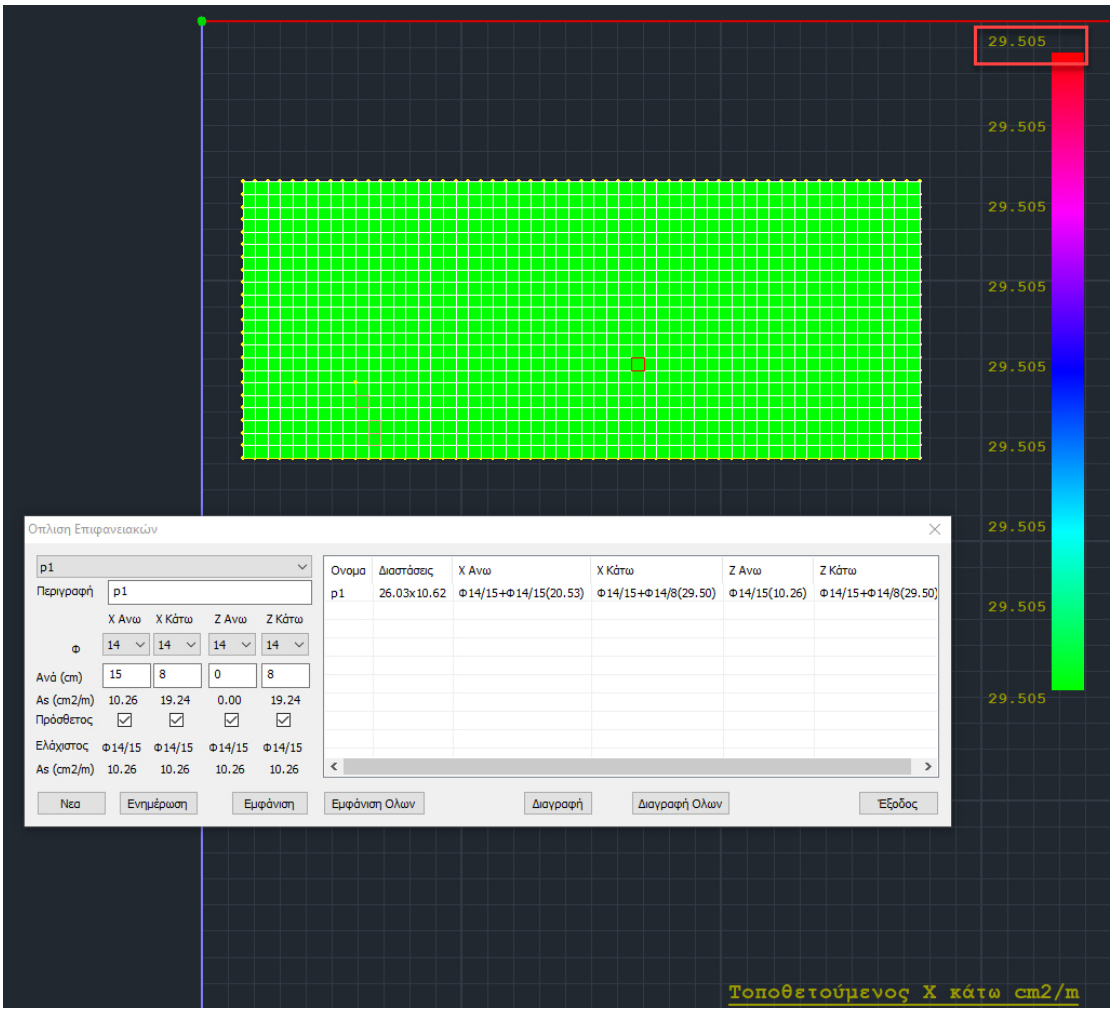


We see that the maximum requirement for X Down is 28.69 cm2/m.

6.9 Show Mounted Armament (As)



Selecting *the* "**Show Placed Reinforcement**" for X Down, *we see 29.5 cm2/m that have been installed.*

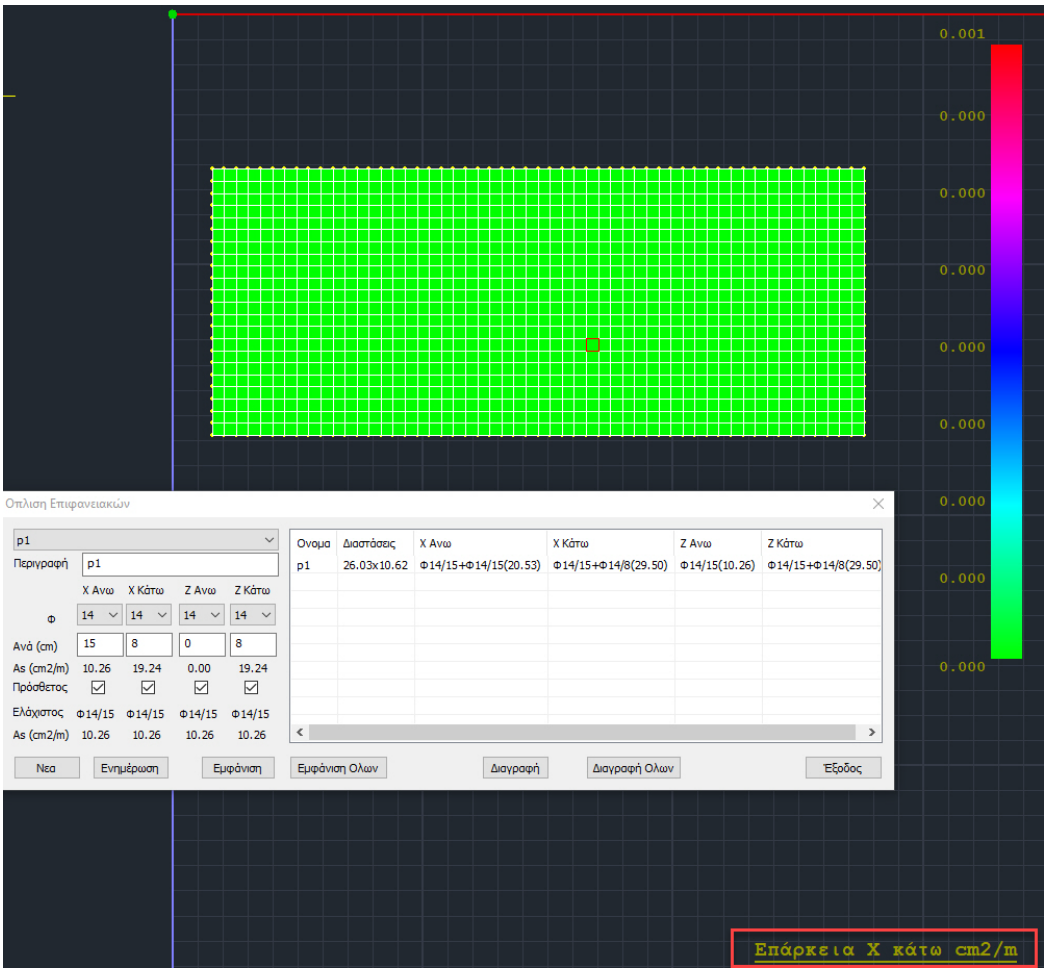


6.10 Armament Adequacy Check

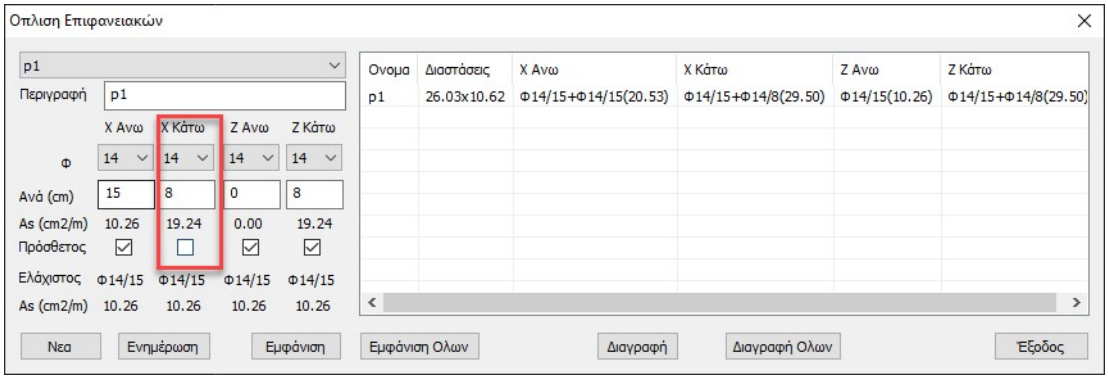
Finally, with the "**Reinforcement Adequacy Check**" option, we can see the difference between the difference between the Installed minus the Required reinforcement, with a color gradation.

If this difference is 0 or positive, it is shown in green, while if it is negative, the areas where the reinforcement is not sufficient are shown in a colour gradient.

In this example the difference is almost zero

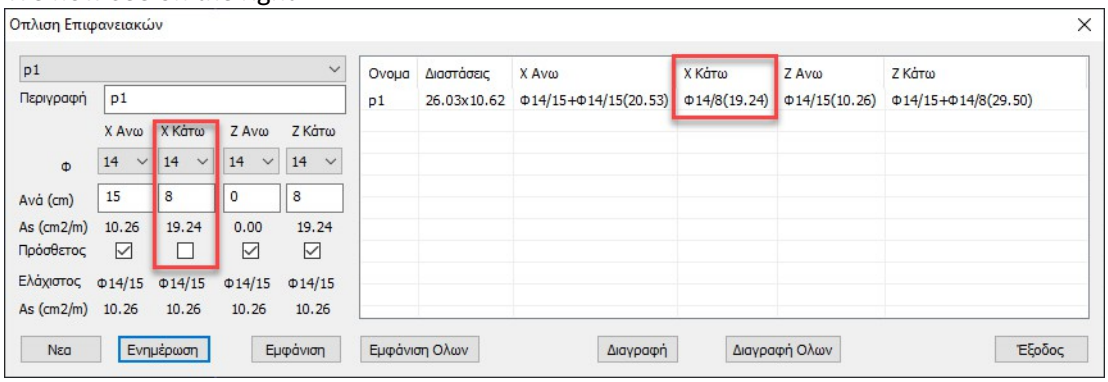


Now, if we wanted to ar+additional armament, but with total, final armament, ignoring the initial minimum armament, uncheck the option "**Additional**" in the corresponding section X Lower



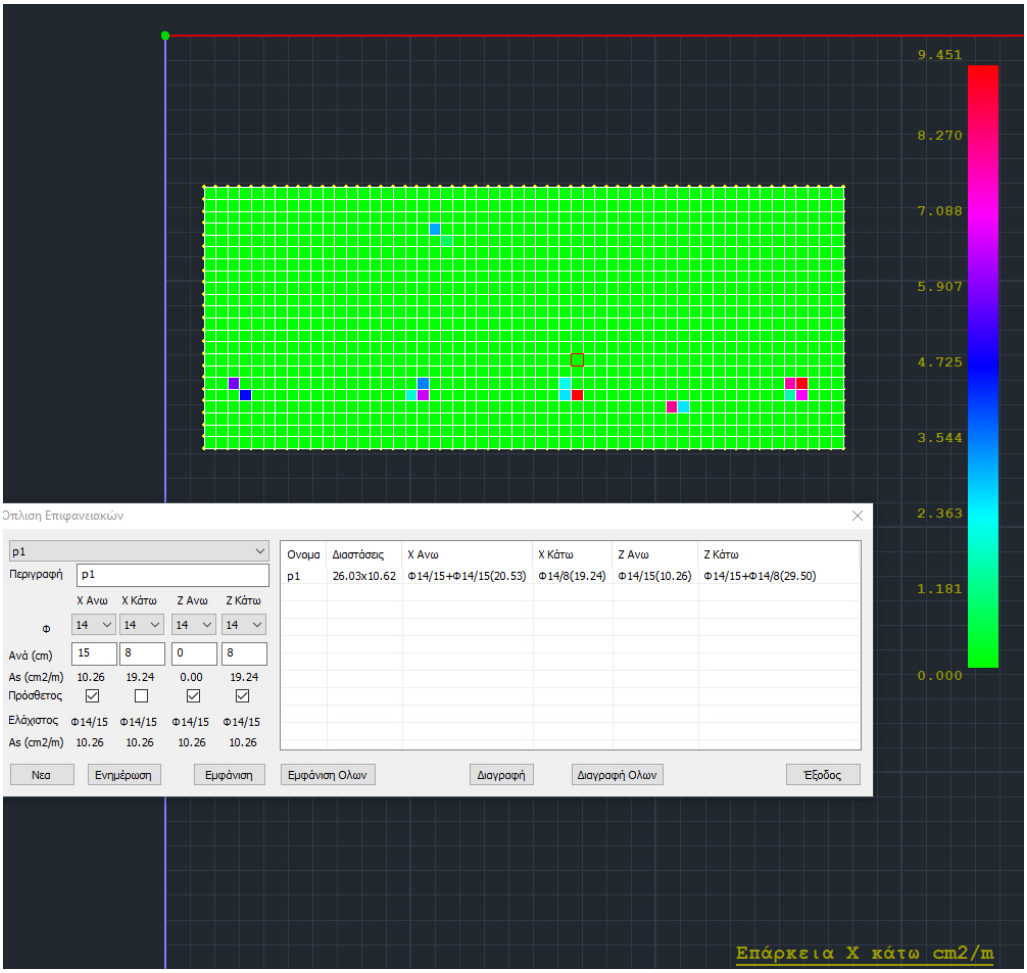
and press the "**Update**" button in order to update this area with this option.

We now see on the right



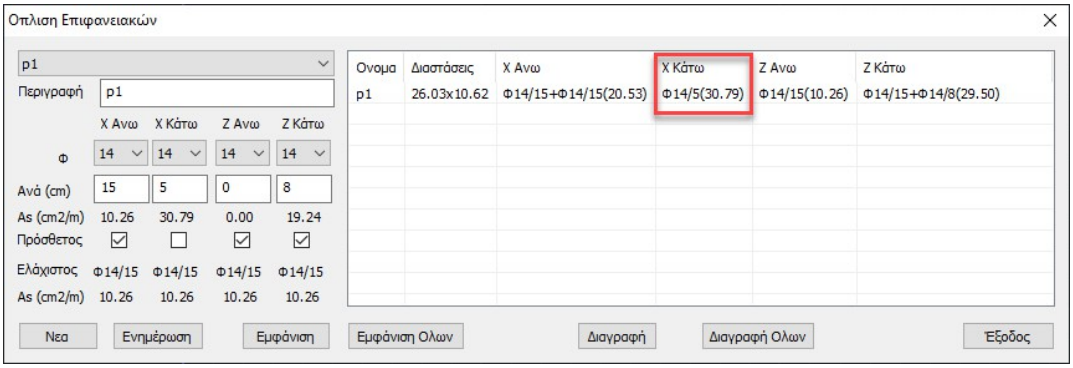
that as reinforcement there is left as total, final reinforcement, the additional reinforcement that was previously calculated and which is obviously no longer sufficient.

We can see this with the "**Armament Adequacy Check**"



where in the areas concerned the required is greater than the installed (*the maximum requirement is 9.45 cm2/m*).

By re-selecting the "**Automatic Area Arms Calculation**" option, the program calculates a new total, final armature



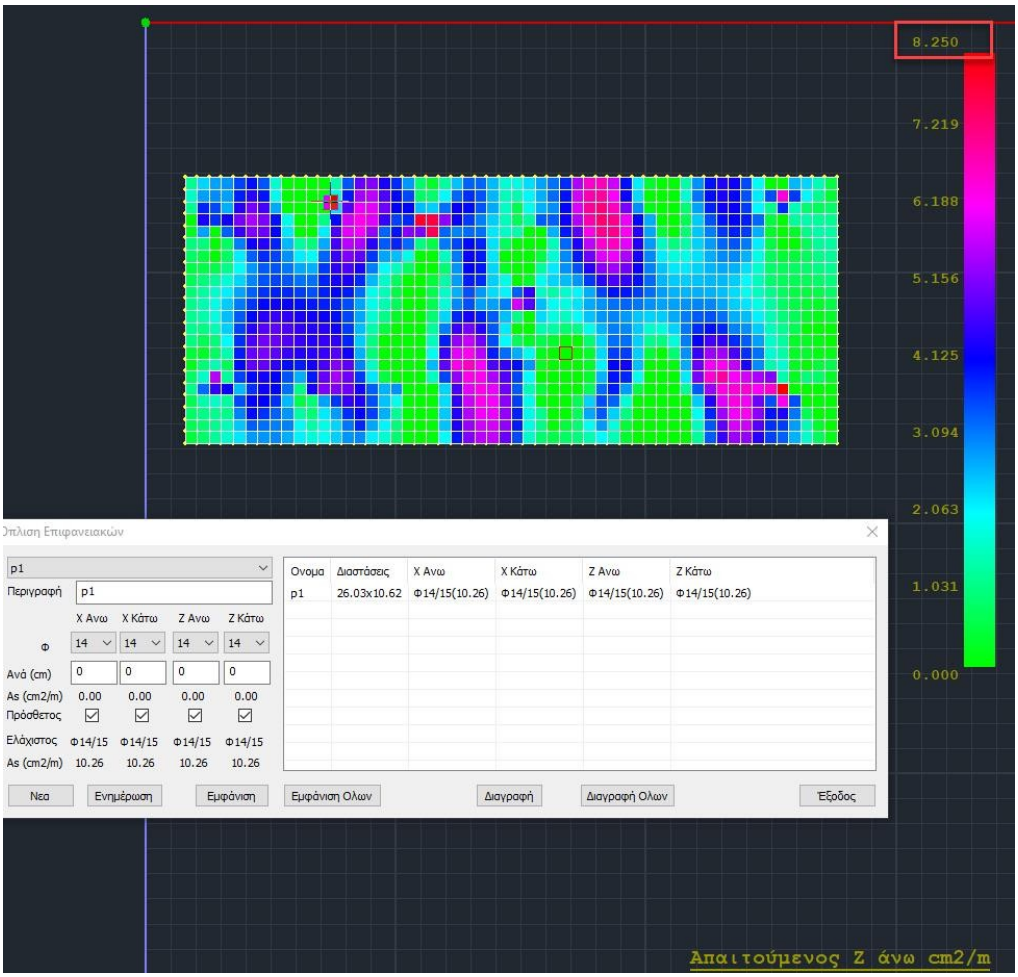
F14/5 (30.79 cm2/m) in order to meet the maximum requirement of 28.69 cm2/m.

II. Manual mode

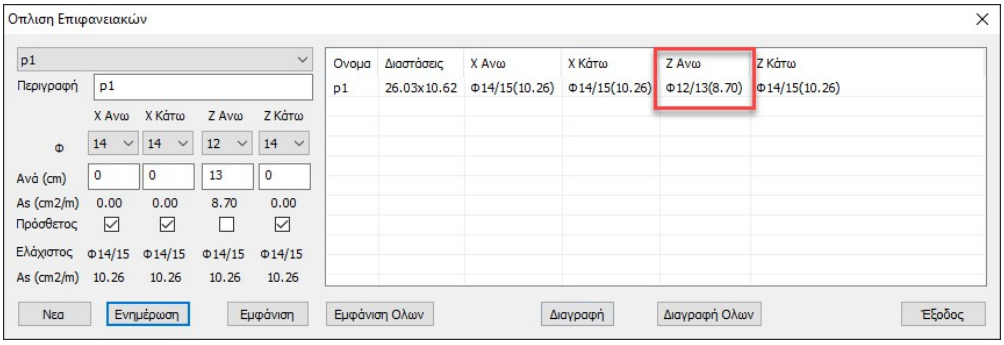
The other way of calculating the reinforcement to be placed, either in the form of a minimum + additional, or in the form of total, final reinforcement is to place the desired reinforcement in each of the four cases, based on the adequacy check.

Let's look at it with an example:

EXAMPLE:
For Z Upper reinforcement, the maximum requirement for the whole area is 8.25 cm2/m.



- Uncheck the additive for Z Upper and place such an armature, so as to cover 8.25 cm2/m, *for example Φ12/13 (8.70 cm2/m)* and press the button "**Update**."

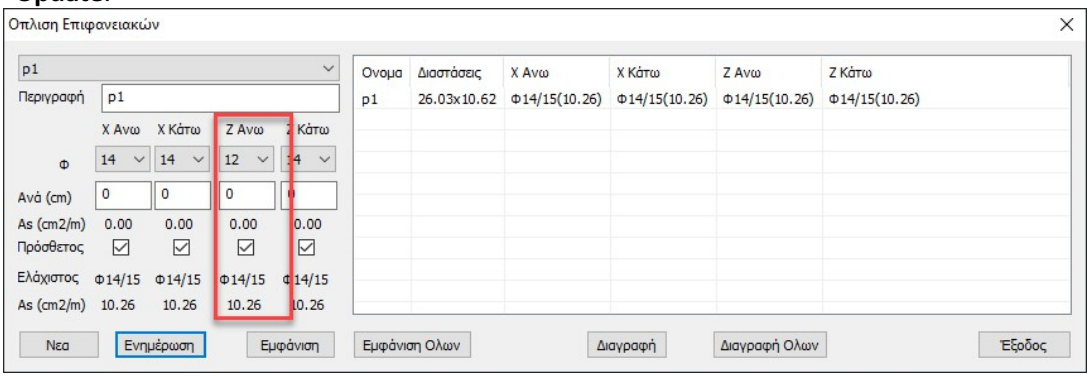


Now, apparently the proficiency check comes up with zero and we have met our requirement.

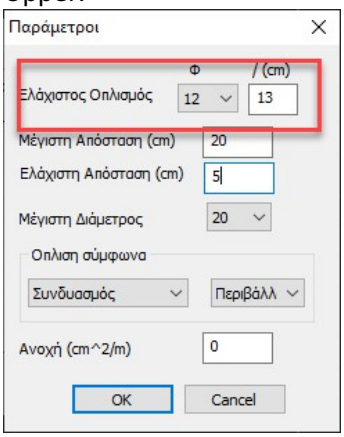
- Also, another way to implement the Z Upper placed reinforcement would be to change the minimum reinforcement to meet the 8.26 cm2/m requirement.

Recall that in this way the minimum armament, because it is uniform, will change for all four cases (X, Z, Upper, Lower)

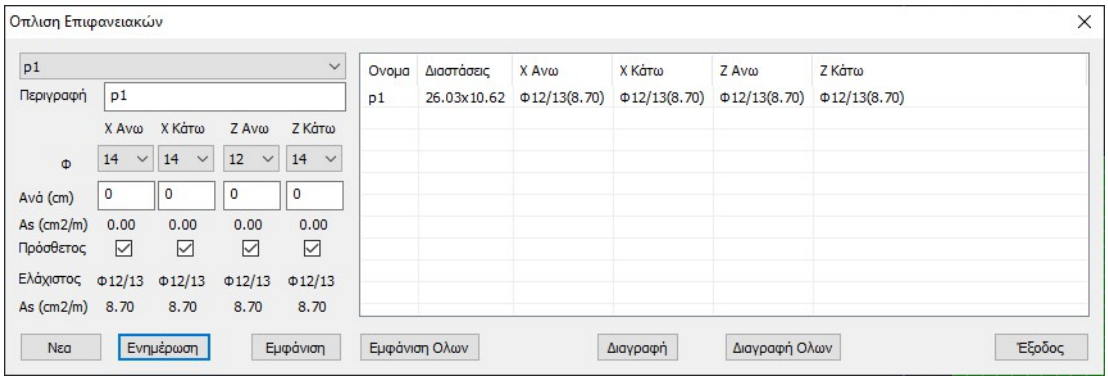
Check the "**Additive**" option for Z Upper, reset the "Per" and press the "**Update**."



Now and at Z Ano the minimum armament that was originally calculated F14/15 has been reintroduced. With the window open we select from the "**Parameters**" menu and set the minimum reinforcement everywhere to F12/13 which we know covers the requirement for Z Upper.



Then we select "**Calculate Minimum Armament**".
The arming areas window is automatically updated with the new minimum reinforcement f12/13 that now covers Z Upper.



With the "**Show**" option we see graphically the area we have defined, while with the "**Show All**" option we see all areas at the same time.

The "**Delete**" button deletes the selected region, while the "Delete All" option deletes all regions simultaneously.

OBSERVATION:
If no areas are defined at all, the program will place the minimum reinforcement everywhere. Recall that the "Automatic Area Armament Calculation" does not work as long as there are no areas. Also, in the formwork, as we will see below, no reinforcement is planned in areas that are not defined.