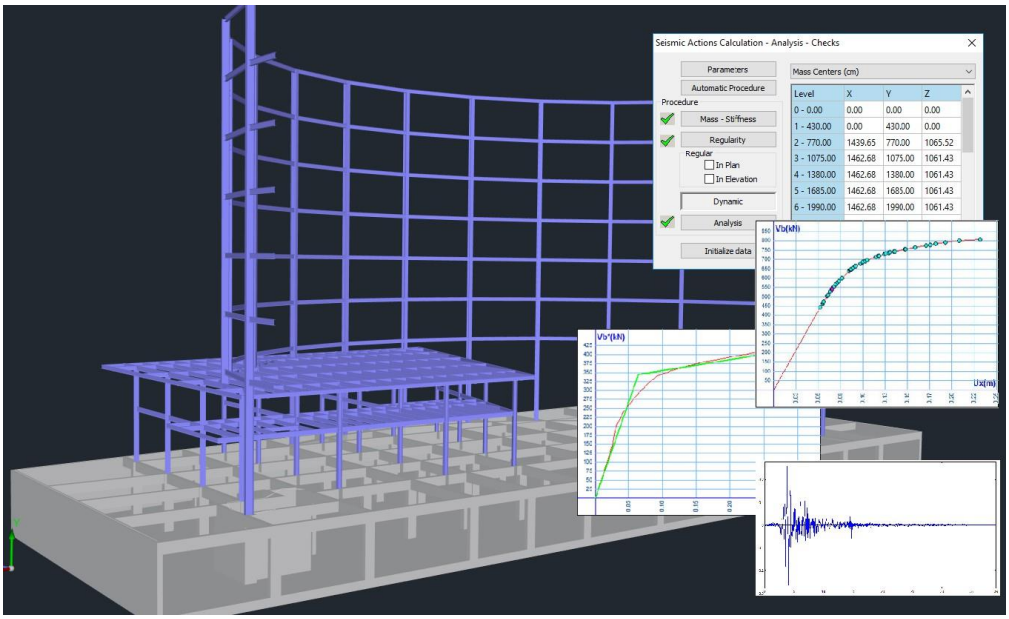
SCADA Pro 25tm
Structural Analysis & Design

User Manual

8B. ANALYSIS

Part 2: Existing buildings from OS (CAN LTD. & 3h revision 2022) and masonry with M.I.P.



ACE HELLAS
INTEGRATED SOLUTIONS

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Chapter 8B: Analysis-

Part 2: Existing buildings from OS and masonry by the Equivalent Frame Method

The 8th Module is called "ANALYSIS" and includes the following 3 groups of commands:

- Script
- Results
- Show

FOREWORD

The analysis methodologies used to evaluate or redesign existing reinforced concrete structures for seismic loads are elastic analyses, static or dynamic, and inelastic analyses (i.e. non-linear due to material), also static or dynamic.

The elastic methods adopt the classical linear stress-strain relationship for the structural elements of the structure, where in approximate ways (e.g. using global or local indices of behaviour or ductility) they indirectly take into account the inelastic behaviour of the structure. These methodologies are simpler to apply, but may lead to less accurate results than their inelastic counterparts.

On the contrary, inelastic analysis methodologies help to better monitor and understand the actual response of the structures, demonstrating both the failure mechanisms and the potential for progressive collapse (it is therefore possible to control the deformations of the ends of the members, the overstrength reserves, as well as the way in which the lateral behaviour of the structure is triggered. In this way, inelastic analyses lead to a more rational and safer design. The inelastic dynamic analysis (i.e., time history analysis with direct numerical

integration of nonlinear differential equations of motion) is the most complete and realistic methodology for the analysis of structures.
In the inelastic dynamic analysis the seismic action is introduced in the form of a history of base accelerations, either from actual recordings or from synthetic accelerograms. However, this analysis encounters problems in simulating the meteoric recurrent behaviour of the members of the structure, which is currently under scientific investigation and experimental verification. In addition, there is also the issue of appropriate selection of seismic accelerations, where the above analysis method is particularly sensitive.
Therefore, the design engineer conducting the assessment or redesign study of an existing structure using inelastic dynamic analysis should have considerable critical ability and experience. Thus, combined with its increased computational complexity, and the fact that the required analysis time even with modern computers is particularly high, especially in spatial analyses of high-rise buildings (note that because the analysis is non-linear, the principle of superposition does not apply), inelastic dynamic analysis is not considered practical for general use.
In contrast, the **static inelastic analysis** gives results that lie between the elastic methods and the inelastic dynamic method. It should be noted that, in the case where the externally applied load is horizontal seismic loads, the inelastic static analysis is also known as pushover analysis. Thus, although Pushover analysis does not have the accuracy of inelastic dynamics, since the seismic loads (which are dynamic) are considered approximately as static, it nevertheless leads to a significantly more accurate estimation of the response of the structure compared to elastic methods, and its application is much simpler than the corresponding inelastic dynamics.
It should be noted that inelastic static analysis is not a new methodology. However, in recent decades, extensive research has led to the development of simulations that allow the behaviour of reinforced concrete structural members after their theoretical failure to be estimated with reasonable accuracy, with the aid of appropriate relationships (analytical or empirical) or tables. This is the reason why, in recent years, inelastic static analysis has been widely applied in the evaluation or redesign of existing buildings.

3rd revision of 2022 EIA.

The new version of SCADA Pro includes the changes provided in 3^{h}
revision of 2022 EIS.
Major interventions should be considered:
α) In Chapter 2, the revision of the foreseen **Assessment and Redesign Objectives** in
conjunction with the definition of the **Seismic Class of** structures,
(b) In Chapter 3, the reported **Data Reliability Levels** and "**In Absentia**" representative material strength values,
c) In Chap. 7, the addition of Annex 7F for the approximate assessment of the influence of
reinforcement corrosion on the mechanical characteristics of structural elements; and
d) In Chapter 8, the revision of paras. 8.2.1.5, para. 8.3.2.1 and para. 8.5.3.

REQUIREMENTS

A prerequisite for the execution of an analysis scenario for the assessment and redesign of an existing structure is the existence of reinforcement in the cross-sections, which results from dimensioning **ONLY with Eurocode 2 scenario** with adaptation of the strengths of Steel and Concrete materials to the strengths of the existing structure.

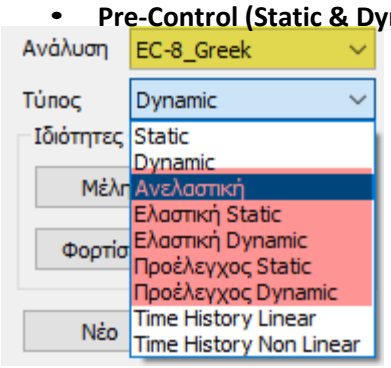
The materials to be used **must NOT be B and STI grade** (old material grades) but the adjustments of strengths and individual safety factors must made based on the new materials.

A prerequisite *for running all analysis scenarios with Type* ***Elastic (Static & Dynamic) & Resilient****, is:*

- the existence of armaments; and
- the calculation of the corresponding strength moments.

The scenarios
EC-8_Greek:

- **Resilient,**
- **Elastic (Static & Dynamic),**
- **Pre-Control (Static & Dynamic),** listed in the **CAN.EPE.**



OBSERVATION:
Any other analysis of **EC-8_(Italia, Cyprus, Austria)**

- **Resilient,**
- **Elastic (Static & Dynamic),** listed in the corresponding appendix of the **EC-8.**

The **EC-8_General** scenario

- **Resilient,**
- **Elastic (Static & Dynamic),** listed in the **GENERAL EC-8 (without the state appendices).**

ATTENTION:

- *The materials must be in accordance with the selected regulation, and when entering data, all cross-sections must have the correct grades* ***(C for EC8 scenarios).***
  It is reminded that the materials to be used must ***NOT*** *be of B and STI quality (old material grades) but the adjustments of strengths and individual safety factors must be made based on the new materials.*

If the structure under inspection has **B** and **STI** quality materials, then in the definition of materials, in the sizing parameters, and before the initial sizing, you must define and modify the parameters of the materials per structural element by adapting them to the characteristics of the new materials and modifying the strengths accordingly, based on the of the CEE.

EXISTING MATERIALS

The CEE prescribes individual safety factors γm (γc and γs for concrete and steel respectively) which for existing materials are differentiated if the check is performed in terms of forces and if it is performed in terms of deformations and depend on the data reliability level (CEE § 4.5.3.)

- √ for the Elastic analyses (checks in terms of forces - intensive) the representative (characteristic) strength value of materials is: the **average value minus one standard deviation**, while
- √ for the Anelastic analyses (checks in terms of deformation) and for the m method, the representative (characteristic) strength value of the materials is **average price**.

(Method m is considered be one of the inelastic methods for the determination of strength).

3h revision of the EIA CIP

The 3th revision of the EIA brings changes that also have to do with the Data Reliability Levels. To be more precise, and until now there were individual SDSs. More specifically there was:

- Material SDS that affected the Resistances (Strengths). It is distinguished into SADIS (Concrete) and SADYX (Steel). In the program there was in the definition of material strength in the dimensioning.
- Geometric data of the structure based on the following table. The table that existed until now and is related to geometry and reinforcements. The geometric data affect the actions. In the program, it is the option in the analysis scenario and affects the coefficient of permanent loads γg.

With the 3h revision of the EIA CIP

- The SDS relating to geometry was named SDG with two subcategories SDG1 and SDG2 and the SDS relating to the layout and reinforcement clamping details was named SDL.
- Until now, only the material's SWD was taken into account for the determination of strengths. In the new revision for the determination of the strength of steel in terms of forces is very logically taken into account and the SADL . Thus the coefficients affecting the strengths of the materials are as follows:

❑ **Έλεγχοι σε όρους δυνάμεων**

- Για Σκυρόδεμα (ΣΑΔΥΣ) - (Υλικό)

ΣΑΔΥΣ	Υψηλή	Ικανοποιητική	Ανεκτή
	γ_m=1.15	γ_m=1.30	γ_m=1.45

(ίσχυε και στη 2η αναθεώρηση)

- Για Χάλυβα (ΣΑΔΥΧ) - (Υλικό & Λεπτομέρειες)

ΣΑΔΥΧ	Υψηλή	Ικανοποιητική	Ανεκτή
	ΣΑΔ$_Λ$: «Υψηλή»		
	γ_m=1.05	γ_m=1.10	γ_m=1.15
	ΣΑΔ$_Λ$: «Ικανοποιητική»		
	γ_m=1.10	γ_m=1.15	γ_m=1.20
	ΣΑΔ$_Λ$: «Ανεκτή»		
	γ_m=1.15	γ_m=1.20	γ_m=1.25

(3η αναθεώρηση)

❑ **Έλεγχοι σε όρους παραμορφώσεων**

συντελεστές σταθεροί ανεξάρτητα από υλικό

ΣΑΔΥ	Υψηλή	Ικανοποιητική	Ανεκτή
	γ_m=1.00	γ_m=1.10	γ_m=1.20

(ίσχυε και στη 2η αναθεώρηση)

The new version of SCADA Pro added the possibility of simultaneous definition of two material qualities for the structural elements: new and existing.

OBSERVATION:

- ⚠ In the existing material, the calculation of the final compressive strength is now done automatically based on the corresponding provisions of the CEE.
- ⚠ Then, the attribution of material quality to the elements is automatically done by dimensioning them and this information is now stored in each member, resulting in the complete separation of new and existing elements, which gives great flexibility to the designer for further processing.

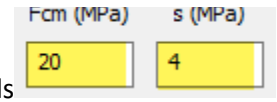
In detail:

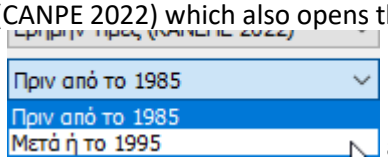
SKYRODEMA

You choose whether a calculation will be made:

- in terms of Forces (Elastic analysis method q)
- in terms of Deformation (Elastic m & Inelastic method)

You choose whether to set:

- Laboratory Values - to be filled in the fields 

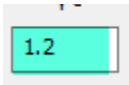
or
- In Absentia Prices (CANPE 2022) which also opens the field of choice of date logging 

and automatically completes the fixed.

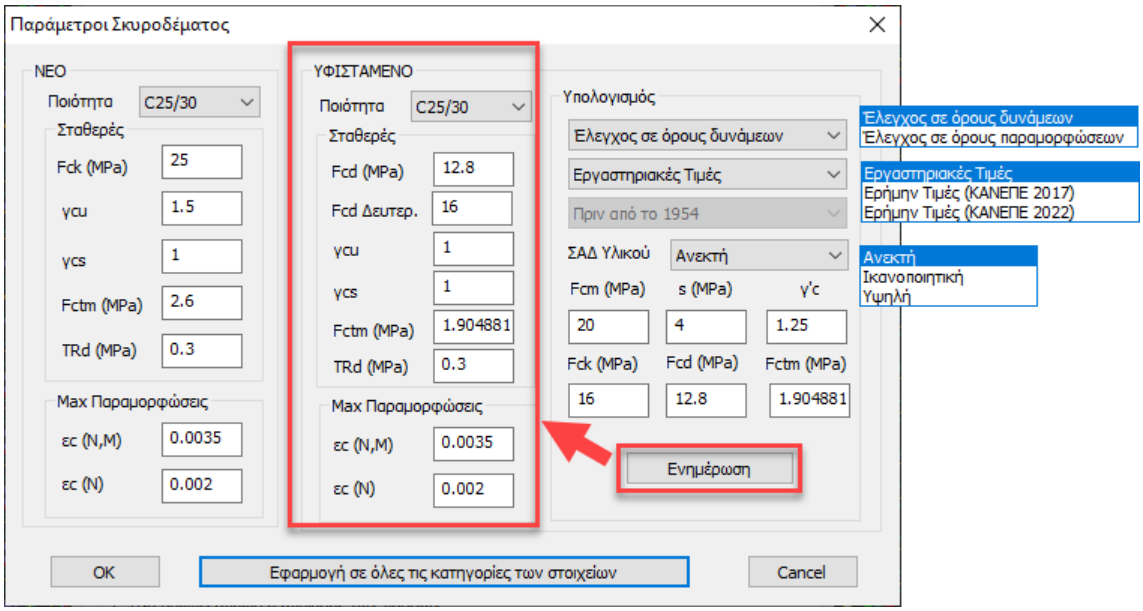
(For compatibility reasons, and the Abandoned Prices of previous revision were retained.)

The last option is the Material SDS:

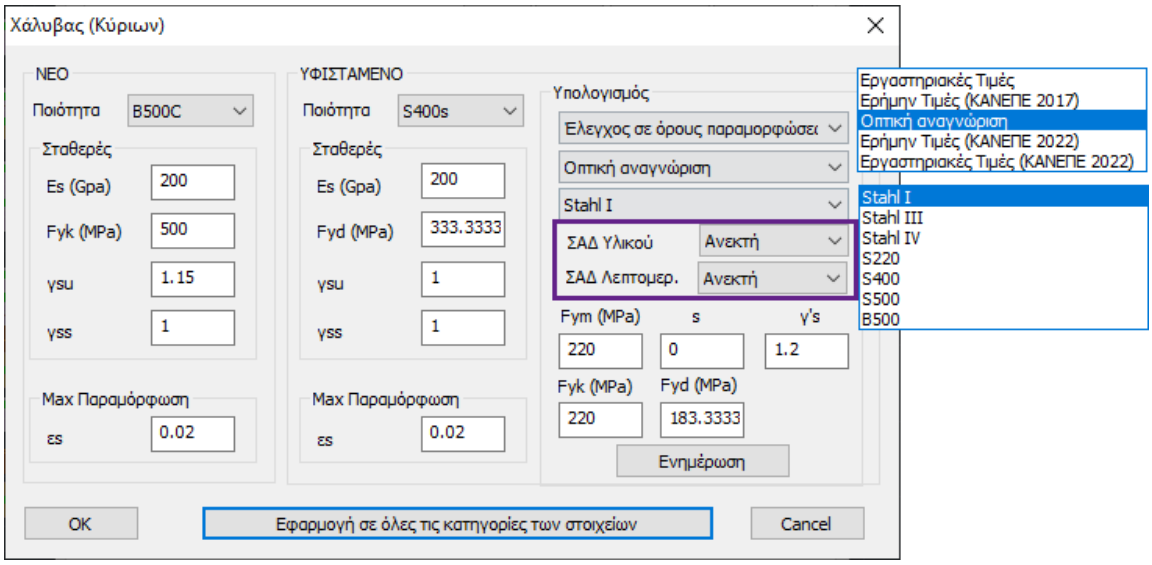
- Windy
- Iconopoeia
- High

And it completes the 

All other values are automatically filled in and the **Update** calculates the Constants for the Existing Concrete.

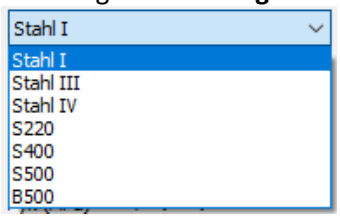


HALYVAS:

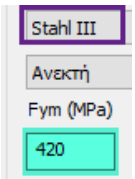


When determining the strengths of Steel (main & fasteners) there is the additional presence of **Optical Recognition**.

Selecting **Visual Recognition** opens the list of steel grades you select



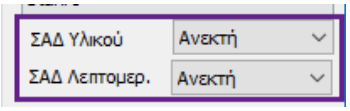
and automatically fills Fym .



All other values are automatically filled in and with the **Update** the Constants for the Existing Steel (main & fasteners) are calculated.

3h revision of the EIA CIP

For steel, the material safety factor γs now depends not only on the material data reliability level but also on the detail data reliability level. These two new options have therefore been introduced:



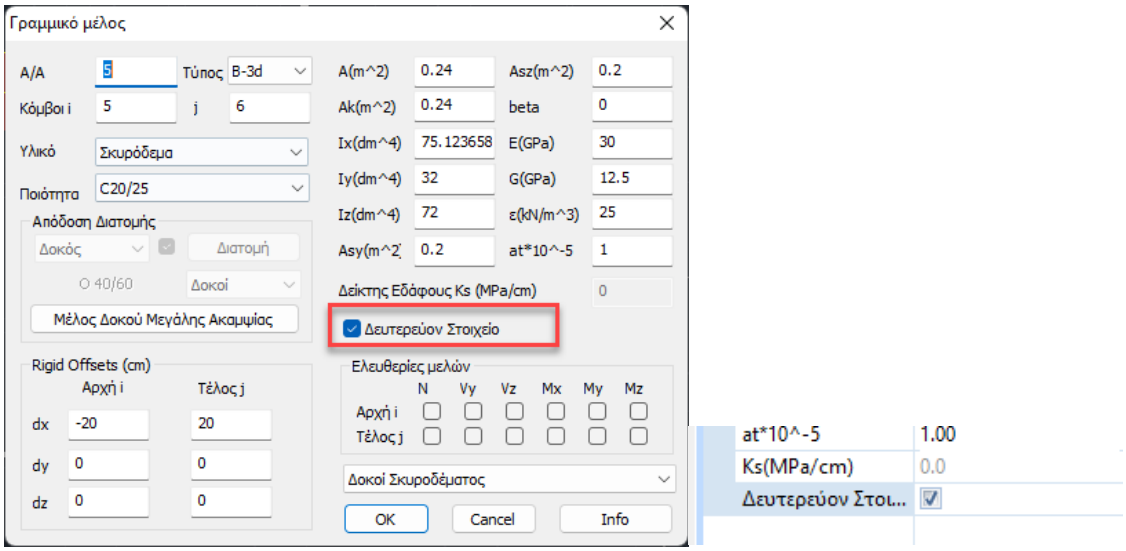
The option Laboratory Values CANEPE 2022 was also introduced, where the cs is derived from a combination of the two SDSs and the option Absent Values CANEPE 2022 was also introduced where the requirement for steel is that the material SDS is satisfactory (rather than tolerable which was in the previous revision).

After defining the above, do your initial sizing and then modify and adjust the reinforcement from the Beam and Column Reinforcement Details respectively.

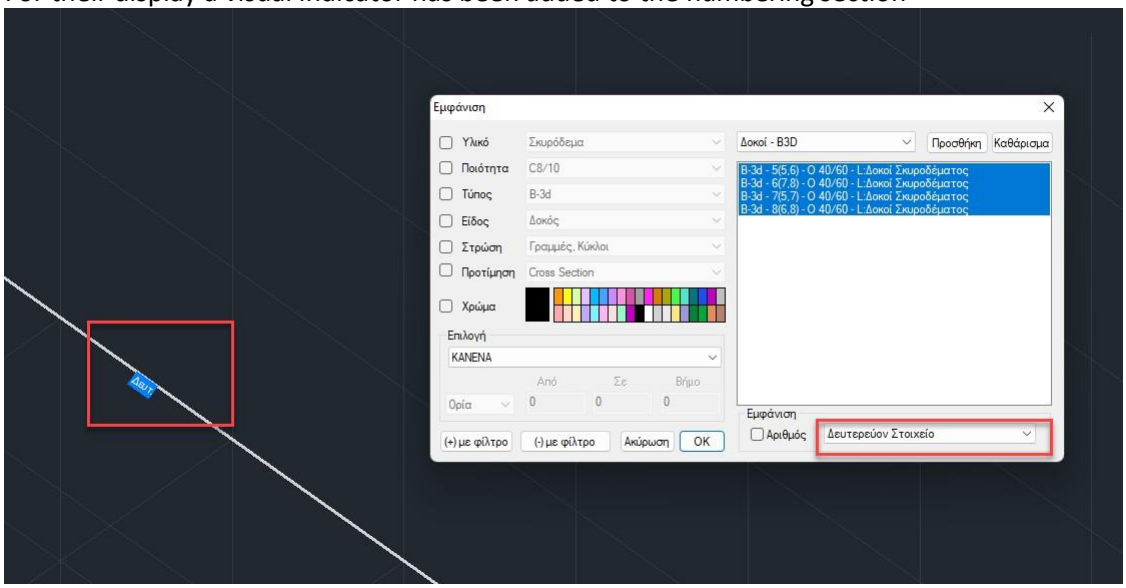
• Secondary data in SCADA Pro

During the process of defining and controlling secondary elements in SCADA Pro, the designer identifies as secondary any horizontal and vertical elements that, in his/her judgment, do not participate in the absorption of horizontal seismic forces.

The characterization is done by activating the corresponding property added for each mathematical member.



For their display a visual indicator has been added to the numbering section



The selection is made only on mathematical members made of reinforced

concrete. ATTENTION!
Separation shall not be permitted for performance level A

Then , the CEFR requires in paragraph 5.4.3 a check of their contribution to the overall stiffness of the building. If this is not complied with, some elements have to be 'reverted' back to the main ones. The check has to be done "manually" for the time being, using the procedure exactly described in this paragraph.

Definitions:

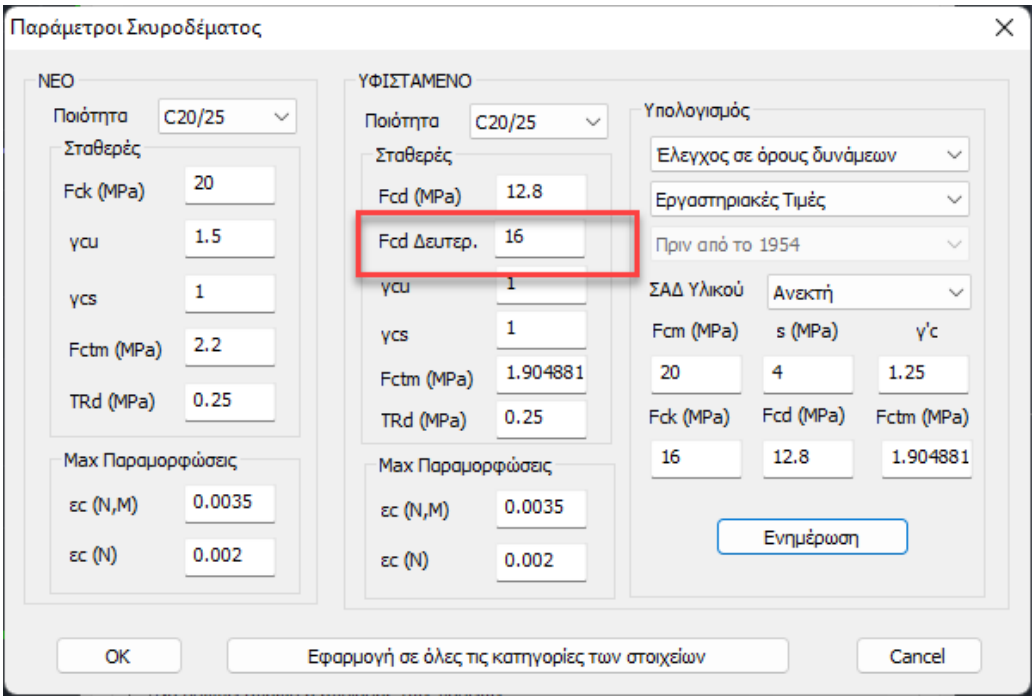
- Inclusion in the simulation of secondary elements means that they function normally as bipartite members and receive seismic forces.
- Not participating in the simulation means that the designer must define them as bifacial at one or both ends. They do not participate in the absorption of seismic forces and should only be tested under vertical loads.

In the program, the secondaries in all cases and for all analyses participate normally in the simulation. However, in some cases discussed below these elements are not checked. If the designer deems and wishes, he or she can manually tweak the degrees of freedom of these members.

How they are dealt with then depends on the type of analysis being performed:

- In the **pre-control** scenarios**:** all secondary members (horizontal and vertical) are not taken into account at all in the calculation of the adequacy ratios λ.
- In the **elastic analysis with method q**, as well as in the corresponding analysis with **method m**: those minor elements that have fishy behavior, which means that it will be done for these elements have a satisfactory shear stress increment, the value of the coefficient γRd involved in this increment does not depend on the SAD but is always unity.
- In the **inelastic pushover analysis:** the EIA allows not to check all the horizontal secondary elements.
  Also for the vertical secondary elements tested, the θpl/γRd limits have been adjusted for performance levels B and C.

Finally, in the section of dimensioning for the existing material, a field has been added with the strength of secondary elements for concrete and steel where the value has been calculated with a factor γm=1, as provided by the CEE.

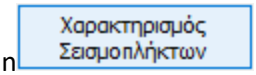


Secondary Pre-seismic Control

The proposed methodology is an approximate procedure for the assessment of the seismic capacity and seismic adequacy of existing buildings of public and utility buildings in relation to the seismic requirement, as defined in the current regulations. The methodology includes some calculations, which are generally approximate, with no requirement for a detailed model of the building as in the full studies required by a tertiary audit.

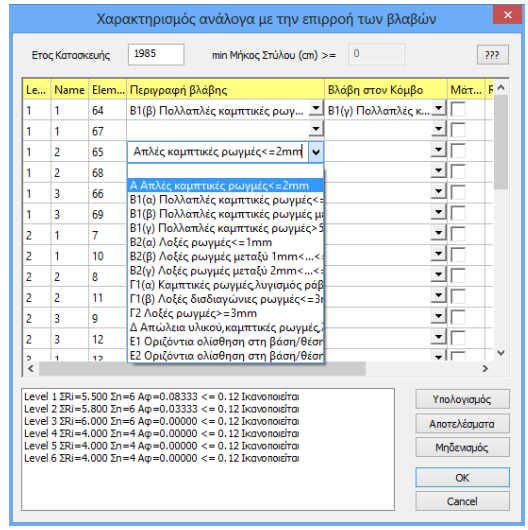
Incorporated the full Secondary Pre-seismic Control procedure in accordance with Government Gazette 3134/21-6-2022. Automatic calculation of the final priority index λ, the coefficient d and the seismic category of the building K, according to the Government Gazette.
(See detailed instructions in chapter 2.4 p.99)

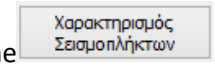
Characterization of earthquake victims (Official Gazette, No. 455, 25.02.20)

In all the scenarios of the analyses of CAN.EPE there is the instruction 

for the definition of minimum mandatory requirements for the preparation of rehabilitation studies of reinforced concrete buildings damaged by earthquake and issuance of the relevant repair permits.

CHARACTERISATION OF EARTHQUAKE VICTIMS



Through the 

command inside the analysis parameters (linear and/or non-linear), you define the classification of buildings according to the influence of the damage on its general stability, and the requirement or not for the preparation of rehabilitation studies for reinforced concrete buildings damaged by earthquake and issuance of the relevant repair permits.
According to the F.E.K., depending on the loss of load-bearing capacity (Af) and the time studied, buildings are classified as follows:

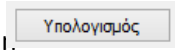
ΚΤΙΡΙΑ ΜΕ ΒΛΑΒΕΣ ΠΕΡΙΟΡΙΣΜΕΝΗΣ ΣΠΟΥΔΑΙΟΤΗΤΑΣ (ΤΟΠΙΚΟΥ ΧΑΡΑΚΤΗΡΑ)	Αφ ≤ 0,12
ΚΤΙΡΙΑ ΜΕ ΒΛΑΒΕΣ ΠΟΥ ΕΠΗΡΕΑΖΟΥΝ ΕΝ ΓΕΝΕΙ ΤΗΝ ΑΣΦΑΛΕΙΑ ΤΟΥ ΚΤΙΡΙΟΥ (ΓΕΝΙΚΟΥ ΧΑΡΑΚΤΗΡΑ)	Αφ > 0,12

- Af≤0,12 No valuation study required
- Af>0,12 Valuation study required

Select the command and in the window "Characterization according to the influence of faults" define the fault in the members and/or nodes.
Enter the date of issue of the construction permit.

Members are displayed by level with their physical and mathematical number and aside, in case of failure, select one of the descriptions as detailed in

the corresponding F.E.K., which opens as a pdf file, by pressing the

After you have finished the description, press the button 

to see the summary results by level, at the bottom of the window

```
Level 1 ΣRi=5.500 Σn=6 Αφ=0.08333 <= 0.12 Ικανοποιείται
Level 2 ΣRi=5.800 Σn=6 Αφ=0.03333 <= 0.12 Ικανοποιείται
Level 3 ΣRi=6.000 Σn=6 Αφ=0.00000 <= 0.12 Ικανοποιείται
Level 4 ΣRi=4.000 Σn=4 Αφ=0.00000 <= 0.12 Ικανοποιείται
Level 5 ΣRi=4.000 Σn=4 Αφ=0.00000 <= 0.12 Ικανοποιείται
Level 6 ΣRi=4.000 Σn=4 Αφ=0.00000 <= 0.12 Ικανοποιείται
```

Selecting the command [Αποτελέσματα] opens the .txt file with detailed results of the tests per floor.

```
check_seism.txt - WordPad
File  Edit  View  Insert  Format  Help

      Ετος Κατασκευής : 1985
  ---------------------------------------------------------------------
   Ορόφος|   ΣRi     |   n   |    Αφ     |  Κριτήριο
  -------+-----------+-------+-----------+-------------------------------
     1   |     5.500 |     6 |    0.0833 |   < 0.12    | Ικανοποιείται
     2   |     5.800 |     6 |    0.0333 |   < 0.12    | Ικανοποιείται
     3   |     6.000 |     6 |    0.0000 |   < 0.12    | Ικανοποιείται
     4   |     4.000 |     4 |    0.0000 |   < 0.12    | Ικανοποιείται
     5   |     4.000 |     4 |    0.0000 |   < 0.12    | Ικανοποιείται
     6   |     4.000 |     4 |    0.0000 |   < 0.12    | Ικανοποιείται
  ---------------------------------------------------------------------
              ΚΤΙΡΙΟ ΜΕ ΒΛΑΒΕΣ ΠΕΡΙΟΡΙΣΜΕΝΗΣ ΣΠΟΥΔΑΙΟΤΗΤΑΣ
                          (ΤΟΠΙΚΟΥ ΧΑΡΑΚΤΗΡΑ)

    Αναλυτικα Αποτελέσματα υπολογισμού απώλειας φέρουσας ικανότητας Αφ
   ====================================================================
Ορόφος :   1
-------------------------------------------------------------------------------
Α/Α|  Περιγραφή Βλάβης στοιχείου  |Ματ| Ri |   Περιγραφή βλάβης κόμβου    | Ri
---+-------------------------------+---+----+-----------------------------+----
  1|Β1(β) Πολλαπλές καμπτικές ρωγ-|ΟΧΙ|0.80|Β1(γ) Πολλαπλές καμπτικές ρωγ-|1.00
   |      μές μεταξύ 2mm<...<=5mm |   |    |      μές>5mm                 |
---+-------------------------------+---+----+-----------------------------+----
  1|                               |ΟΧΙ|1.00|                             |1.00
---+-------------------------------+---+----+-----------------------------+----
  2|Α Απλές καμπτικές ρωγμές<=2mm |ΟΧΙ|0.90|                             |1.00
---+-------------------------------+---+----+-----------------------------+----
  2|                               |ΟΧΙ|1.00|                             |1.00
---+-------------------------------+---+----+-----------------------------+----
  3|Β1(α) Πολλαπλές καμπτικές      |ΟΧΙ|0.90|                             |1.00
   |      ρωγμές<=2mm              |   |    |                             |
---+-------------------------------+---+----+-----------------------------+----
  3|Β1(α) Πολλαπλές καμπτικές      |ΟΧΙ|0.90|                             |1.00
   |      ρωγμές<=2mm              |   |    |                             |
---+-------------------------------+---+----+-----------------------------+----
-------------------------------------------------------------------------------
Ορόφος :   2
For Help, press F1                                                    NUM
```

OBSERVATION:

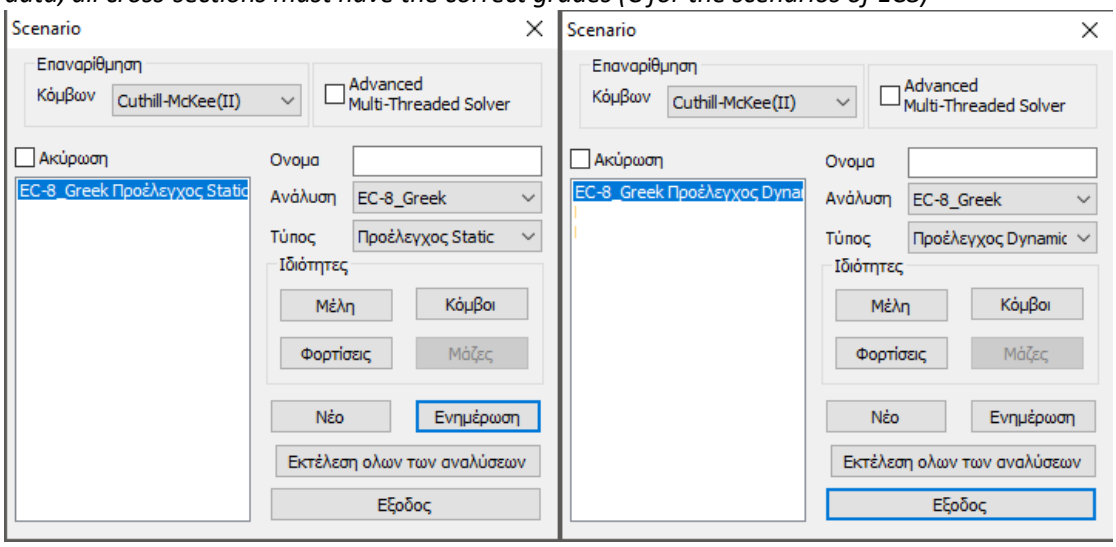
In cases where there is a requirement for the preparation of rehabilitation studies for earthquake-affected buildings (Af>0.12), then the corresponding Acceleration Range for the Design of Repairs should be determined, in accordance with the relevant F.E.K.

Scenarios

Σ1. EC-8_Greek και Τύπο Προέλεγχος Static / Dynamic

Select select Analysis **EC-8_Greek** and **Pre-Check Static** Type and press the *New* button.

ATTENTION: *Materials must be in accordance with the selected regulation, and when entering data, all cross-sections must have the correct grades (C for the scenarios of EC8)*



All of the following applies to **EC-8_Greek** for both the **Static Pre-Control** and **Dynamic Pre-Control** types and is therefore described once for both.

A prerequisite *for running all analysis scenarios with Type* ***Pre-Check (Static & Dynamic)****, are:*

- the existence of armaments; and
- the calculation of the corresponding strength moments.

OBSERVATIONS:

- ⚠ The **EC-8_Greek Pre-Control (Static & Dynamic)** scenario refers to the **CAN.EPE.**
- ⚠ The type Pre-Control (Static & Dynamic) is only meaningful in the EC-8_Greek analysis

The two types of analysis scenarios "**Static Pre-Check**" and "**Dynamic Pre-Check**" are two preliminary elastic analyses in order to examine whether the criteria set by the CEE for the application of **an ELASTIC** (**static or dynamic**) analysis for the assessment and redesign of the structure are met.

Specifically, among other things, the ***inadequacy indices "λ"*** are calculated, which give a first picture of the building's resistance to earthquake (CEE §5.5.1.1). The morphological regularity of the building is also examined (CEE §5.5.1.2):

CEE §5.5.1.1.1 Structural element deficiency index

In order to determine the magnitude and distribution of the inelastic behaviour requirements in the primary load-bearing structures elements of the structure bearing the seismic actions, a preliminary elastic analysis of the building is required in order to calculate for each of its elements the ratios ('indices of inadequacy')

$\lambda = S / {}_{Rm}$, (5.1)

where S is the intensive magnitude (moment) due to the actions of the seismic combination (§4.4.2), where the seismic action is taken without reduction (the elastic spectrum of EC 8-1 is used), while ${}_{Rm}$ *is the corresponding available resistance of the element, calculated the basis of the average values of the strengths of the materials (see §5.1.4).*

The λ ratios will be calculated, both for valuation and for redesign, on each primary load-bearing element. The highest λ ratio for an individual element on a floor (the most overloaded) will be considered a critical λ ratio for the floor.

CAN.EPE §5.5.1.2 Morphological regularity

The scope of each method mentioned in §5.1.1 depends on the morphological characteristics of the building, which influence its behaviour under seismic actions. The building is considered to be morphologically normal when the conditions listed in EC 8-1 are met.

The EIA sets specific requirements for the application of Elastic Static **(EC-8_Greek Elastic Static)** and Elastic Dynamic **(EC-8_Greek Elastic Dynamic)** analysis

In addition, the EIA sets conditions for the application of the pushover analysis, which in order to be applied, the influence of the upper eigenmodes must **not** be significant (EIA §5.7.2 (b) INFLUENCE OF THE UPPER PROPERTIES).

(see ***§Control* of the *influence of the higher idioms***)

§5.5 *For performance level A, the elastic static analysis* ***(EC-8_Greek Elastic Static)*** *may be applied without the conditions in § 5.5.2.*

§5.5.2 Conditions of application (Elastic Static Analysis)(EC-8_Greek Elastic Static)

For the elastic methods there is no question of conditions of application relating to the level of confidence in the data.	***α.*** *The application of the static elastic method is permitted (for performance levels B or C, see § 5.5) when all of the following conditions are met:*
	(i) For all the main elements λ≤2.5, or for one or more of them λ>2.5 and building is morphologically normal.
	(ii) The fundamental eigenperiod of the building ${}_{T0}$ *is less than 4* ${}_{Tc}$ *or 2s, (see EC 8-1).*

As a criterion for this condition, in the case where the bulkhead is not deformable, the rule may be used that the relative floor arrow on either side of the building shall not exceed 150% of through the relative arrow.	*(iii) The ratio of the horizontal dimension on one floor to the corresponding dimension on an adjacent floor does not exceed 1.5 (excluding the top floor and appurtenances).*
As a criterion for this condition, the rule may be used that the average relative arrow of a floor (excluding appendages) shall not exceed 150% of the relative arrow of the underlying or the floor above.	*(iv) The building does not exhibit a strongly asymmetrical distribution of stiffness in plan view on any floor.*

§5.6.1 Conditions of application (Elastic Dynamic Analysis) (EC-8_Greek Elastic Dynamic)

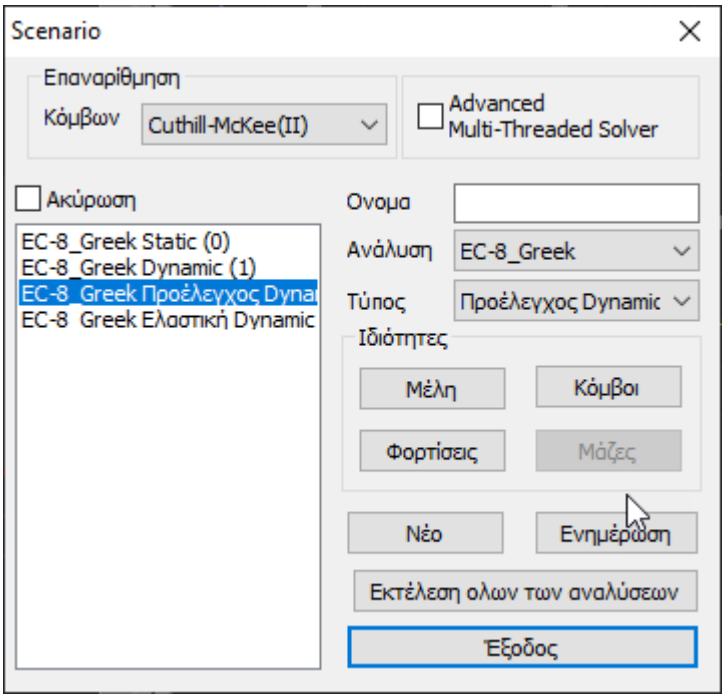
For the elastic methods there is no question of conditions of application relating to the level of confidence in the data.	*α. The scope of the dynamic elastic method is defined by the condition that for all principal elements λ≤ 2.5. or for one or more of them λ > 2.5 and the building is morphologically normal.*
For the reasons for providing for this possibility see the comments of the §5.5.2β.	*β. Notwithstanding the validity of the conditions in the previous paragraph, but provided that there is no substantial damage, the dynamic elastic method may be used for the purposes of valuation (only). In this case the coefficients security simulation $_{cSd}$ provided in § 4.5.1 shall be increased by 0,15.*

IMPORTANT OBSERVATION:

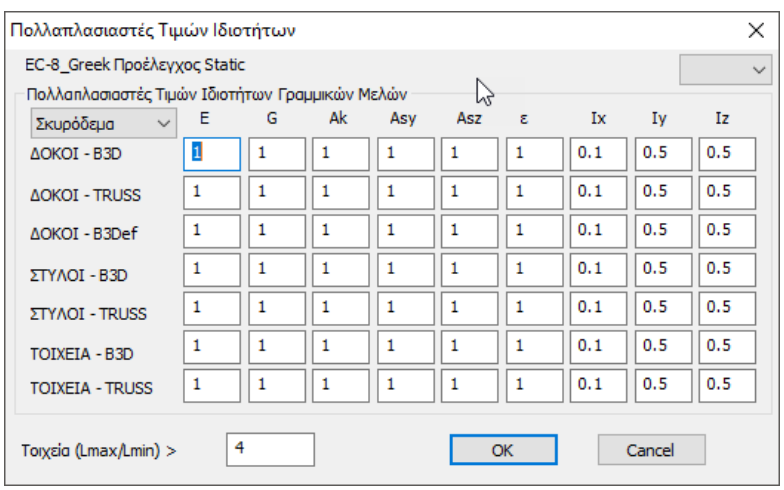
- However, for both methods, it gives the possibility <u>to apply the Elastic methods</u> *only for valuation purposes*, provided that the factor of the permanent loads <u>ysd is increased by 0.15</u>. *(**4.5.1d)** Also, according to Chap. 5, and as far as elastic analysis, static or dynamic, is concerned, its application is permitted, for valuation purposes only, irrespective of the validity of the application conditions (see §§ 5.5.2.b and 5.6.1.b), if the γSd factors in this § 4.5.1 are augmented by 0.15 (i.e. **γSd,ελ.= γSd+ 0.15**).)*

- So in the Analysis section, **New**, define a preliminary analysis scenario (pre-test) either static or dynamic **(EC-8_Greek Elastic Static or Dynamic)**, the

which will be run with an elastic spectrum and will perform all the checks for the analysis selection criteria, based on the above.

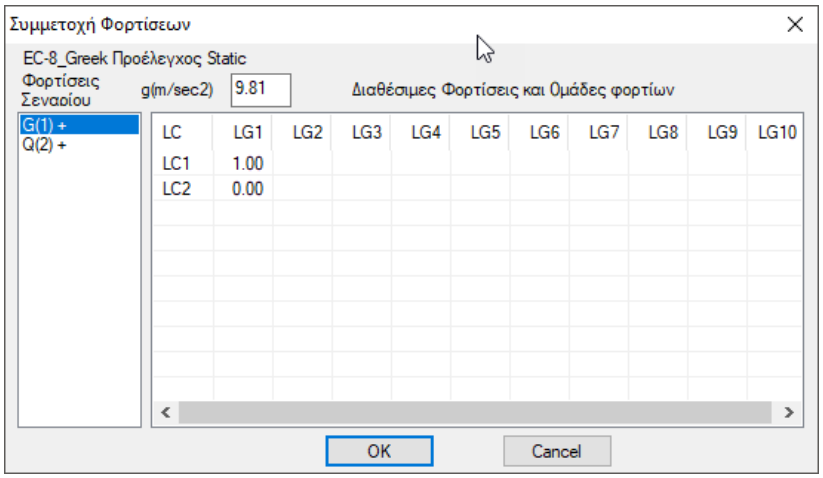


- In **Members** the Multipliers are automatically updated and filled with corresponding coefficients respectively:

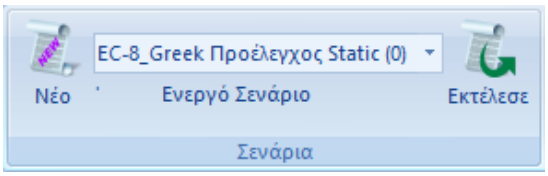


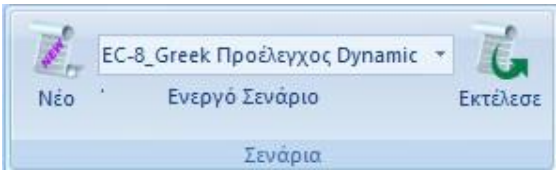
Note that for this scenario, the stiffnesses of the elements are adjusted based on Table C4.1 of CANEPE.

- In the **Loadings**, for G, set the unit to LC1 (permanently) and for Q, set the unit to LC2(mobile) and press the Update button.

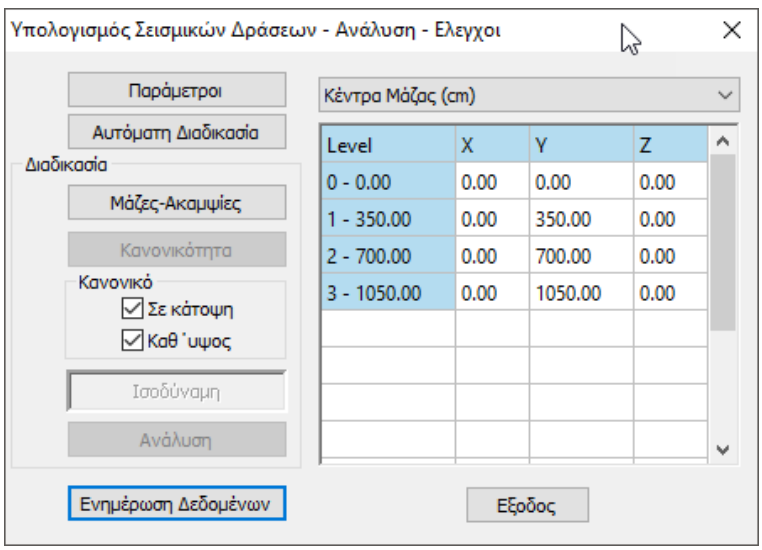


- With either the **EC-8_Greek Static Pre-Check** scenario active**,** or the **EC-8_Greek** scenario **Dynamic Pre-Check**,

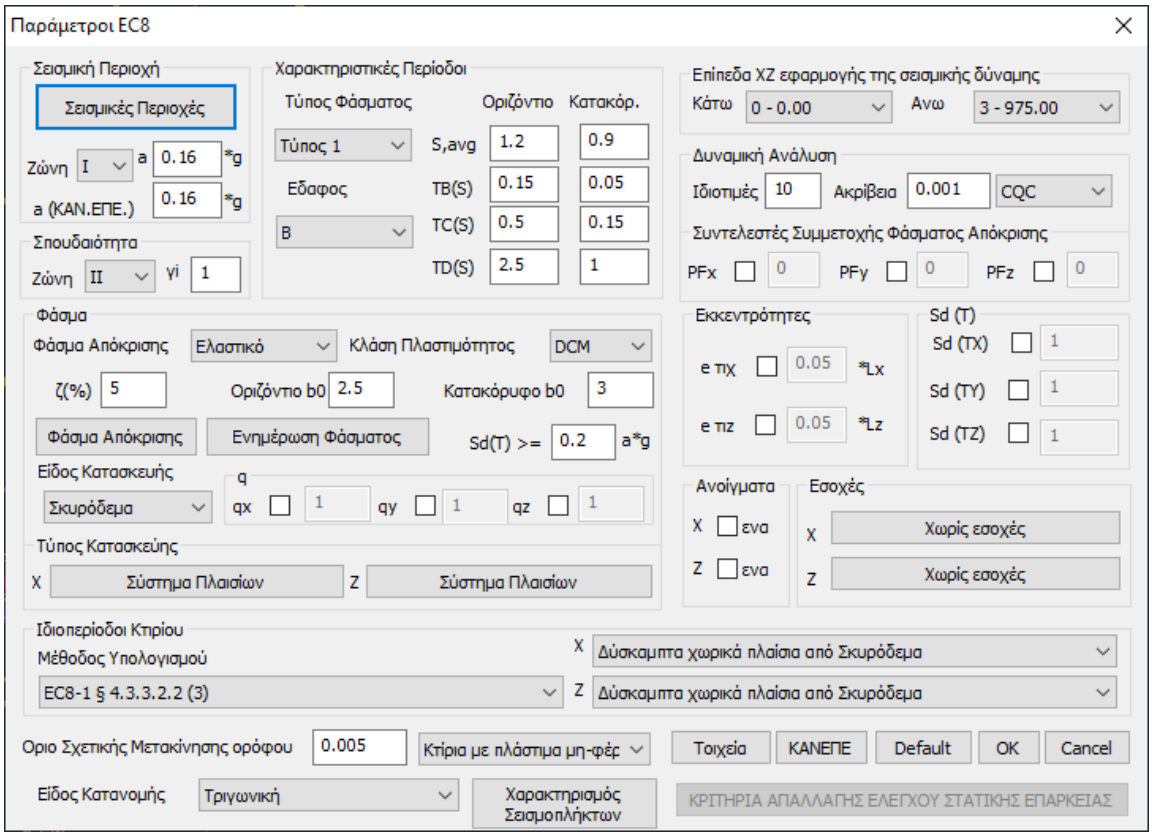




The *Run* command opens the window for running the script and pressing the **Update Data**, the commands are activated:

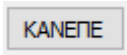


- To set the **parameters** for either the **EC-8_Greek Pre-Check Static** or **EC-8_Greek Pre-Check Dynamic** scenario, the dialog box will have the following format:

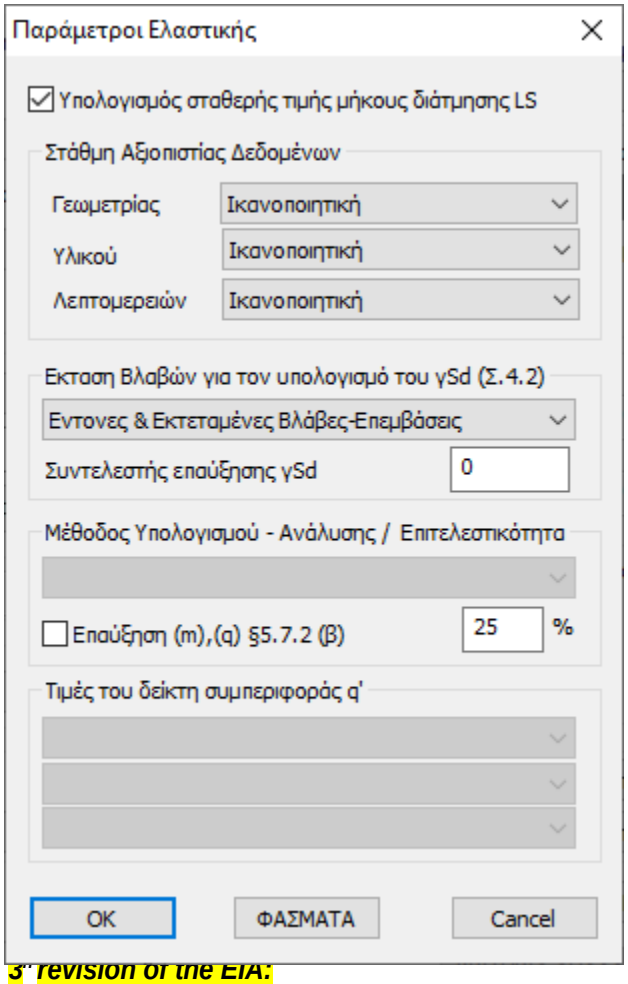


Where you set the parameters as you would for an EC8 scenario.

- *The response spectrum for either EC-8_Greek Pre-Control Static or EC-8_Greek Pre-Control Dynamic scenario must be* ***Elastic****.*



Pressing the "**CAN.EPE**" button displays the following dialog box, similar to the one of the Elastic analyses of the CANEEPE described in the previous chapter, except that the fields concerning only the scenarios of the elastic static or dynamic analysis are inactive here.

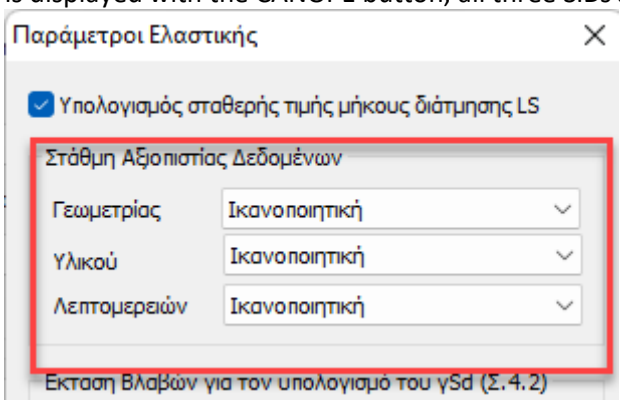


OBSERVATION:
Especially for the pretest scenario, the choice of how to calculate the shear length Ls does not affect the results.

3rd revision of the EIA:

- The gg depends on the geometry and
- The cRd from the worst SDS between material and details.

So in the four scenarios of the CANPE of the elastic analysis, in the context of a dialogue that is displayed with the CANOPE button, all three SIDs are now displayed



- Select:

For each ***Data Reliability Level***

Ικανοποιητική
Ανεκτή
Υψηλή

Extent of Damage

The **γsd** factor is automatically calculated based on the corresponding option,

Εντονες & Εκτεταμένες Βλάβες-Επεμβάσεις
Ελαφρές & Τοπικές Βλάβες-Επεμβάσεις
Χωρίς Βλάβες & Χωρίς Επεμβάσεις

The value 0 in the field

Συντελεστής επαύξησης γSd 0

means that the coefficient will take the value based on **table .4.2.** of the EIA.

If you want your own value, enter a number and it will be added up to the value provided by the table. Calculations are made based on the resulting sum.

Where more precise data are not available, cSd values according to following Table may be used.

Table S 4.2: Values of the cSd coefficient

Intense and extensive damage and/or interventions	Light and localised damage and/or interventions	Without damage and without interventions
γ_{Sd} =1,20	γ_{Sd} =1,10	γ_{Sd} = 1,00

See. See also Annex 7D on damage and deterioration.

Then, select the command **FRAME**

The **EIR** provides a **minimum tolerable target based on the building's significance category** based on the table below:

Πίνακας ΠΑ.2.1. *Ελάχιστοι ανεκτοί στόχοι αποτίμησης ή ανασχεδιασμού υφισταμένων κτιρίων.*

Κατηγορία Σπουδαιότητας	Ελάχιστοι Ανεκτοί Στόχοι
I	Γ2
II	Γ1
III	B1
IV	B1 και A2 (Ικανοποίηση **και** των δύο στόχων)

Σε κάθε περίπτωση να θεωρηθεί ότι ισχύει A1>A2, B1>B2, Γ1>Γ2, A1>B1>Γ1 και A2>B2>Γ2

3h revision of the 2022 EIA.

In the new EIA, more seismic hazard categories are introduced (9 in total from 2 before), the term *seismic class* is introduced, as well as a new method of assessment and redesign (which can be followed as an alternative to the one in force until now).

Seismic class is the maximum rating or redesign target for a given level of performance. It is derived from the combination of performance level and αg rate.
The seismic classes for performance level B are considered as basic seismic classes.

Πίνακας Σ 2.1. **Ενδεικτική** συσχέτιση περιόδου επαναφοράς και πιθανότητας υπέρβασης της σεισμικής δράσης με την αντίστοιχη ανηγμένη οριζόντια εδαφική επιτάχυνση.

Περίοδος Επαναφοράς (έτη)	Πιθανότητα υπέρβασης σεισμικής δράσης εντός του συμβατικού χρόνου ζωής των 50 ετών	$\alpha_g / \alpha_{g,ref}$
2475	2%	1.80
975	5%	1.30
475	**10%**	**1.00**
225	20%	0.75
135	**30%**	**0.60**
70	50%	0.45
40	70%	0.35
20	90%	0.25
<20	>90%	<0.25

Στον Πίνακα 2.1 παρουσιάζεται, η συσχέτιση της στάθμης επιτελεστικότητας του φέροντος οργανισμού με την αντίστοιχη ανηγμένη οριζόντια εδαφική επιτάχυνση. Στον Πίνακα Σ 2.1 παρουσιάζεται, μια **ενδεικτική συσχέτιση** της περιόδου επαναφοράς και της αντίστοιχης πιθανότητας υπέρβασης εντός του συμβατικού χρόνου ζωής των 50 ετών της σεισμικής δράσης με την αντίστοιχη ανηγμένη οριζόντια εδαφική επιτάχυνση.

Πίνακας 2.1. Στόχοι αποτίμησης ή ανασχεδιασμού Φέροντος Οργανισμού.

$\alpha_g / \alpha_{g,ref}$	Στάθμη Επιτελεστικότητας Φέροντος Οργανισμού		
	Α «Περιορισμένες Βλάβες»	Β «Σημαντικές Βλάβες»	Γ «Οιονεί Κατάρρευση»
1.80	**A0**	**B0**	**Γ0**
1.30	**A1+**	**B1+**	**Γ1+**
1.00	**A1**	**B1**	**Γ1**
0.75	**A2+**	**B2+**	**Γ2+**
0.60	**A2**	**B2**	**Γ2**
0.45	**A3+**	**B3+**	**Γ3+**
0.35	**A3**	**B3**	**Γ3**
0.25	**A4+**	**B4+**	**Γ4+**
<0.25	**A4**	**B4**	**Γ4**

- $\alpha_{g,ref}$ είναι η οριζόντια εδαφική επιτάχυνση αναφοράς, που ορίζεται με πιθανότητα υπέρβασης της σεισμικής δράσης 10% στα 50 χρόνια συμβατικής ζωής του έργου.
- α_g είναι η οριζόντια εδαφική επιτάχυνση.

δ. Σεισμική κλάση κτιρίου ορίζεται ως ο μέγιστος στόχος αποτίμησης ή ανασχεδιασμού που μπορεί να εξασφαλίσει ένα κτίριο για μια επιλεγείσα στάθμη επιτελεστικότητας. Η σεισμική κλάση κτιρίου για στάθμη επιτελεστικότητας Β («Σημαντικές Βλάβες») θεωρείται **βασική σεισμική κλάση**.

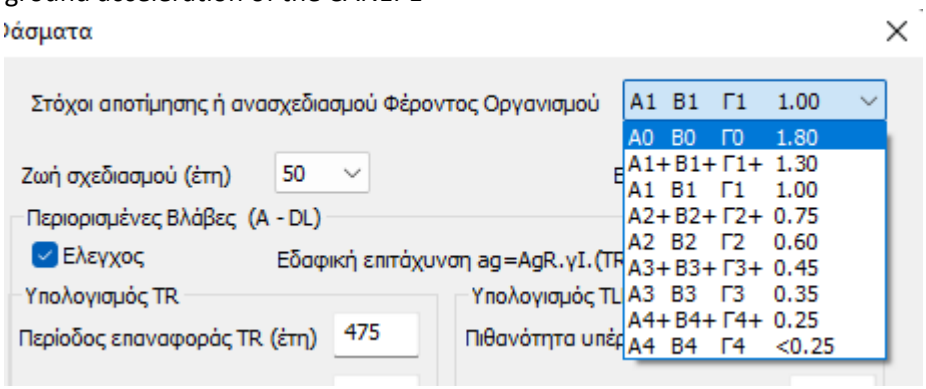
Based on the above table we can summarize that my level of performance determines m, q (elastic) and θu (inelastic) and my return period and exceedance probability determines the seismic acceleration αg.

The three valuation targets (or the three seismic classes) for a 10% earthquake are still called A1, B1, C1 and have a factor of one but the targets for a 50% earthquake are now called A3+, B3+, C3+ and have a factor of 0.45 (from 0.53 previously). Still the two basic seismic hazard categories are no longer 10% and 50% but 10% with a factor of 1 and 30% with a factor of 0.60 (the two lines in bold in the table).

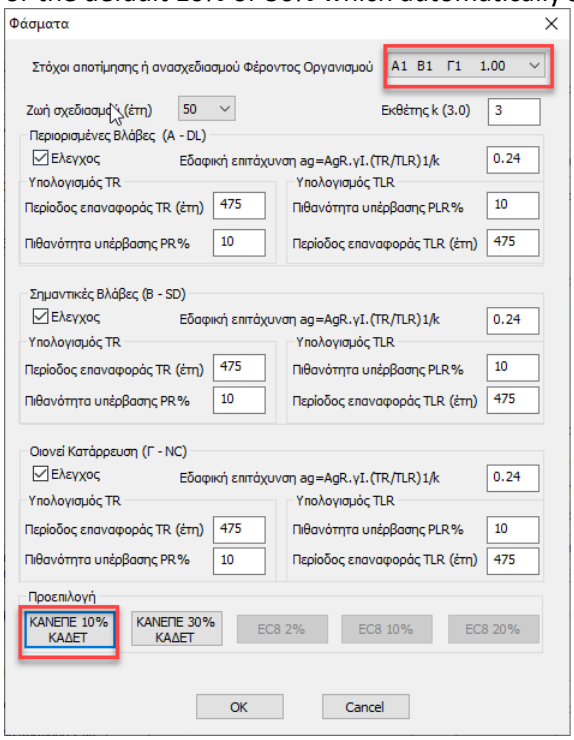
In the parameters of the 5 scenarios related to EIS there is now a new field for the ground acceleration that will be calculated and used based on the above table.

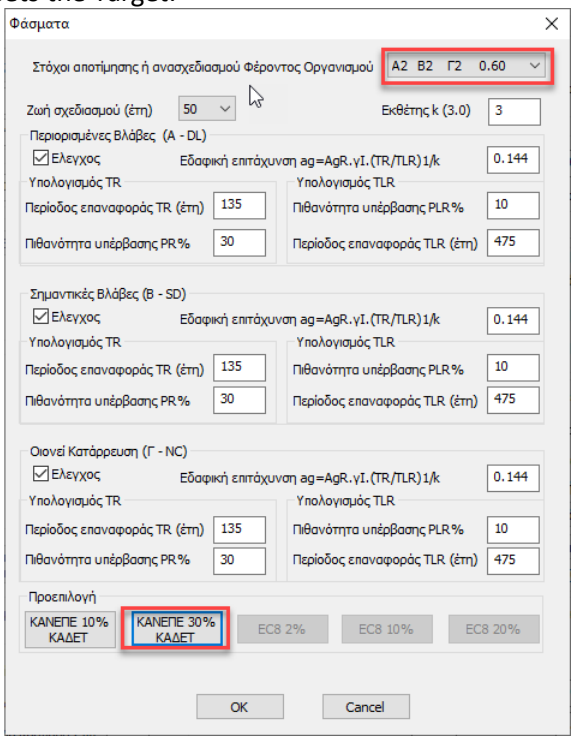
Going to the framework ΦΑΣΜΑΤΑ

We select the seismic hazard category with the corresponding triad of seismic classes and the factor by which the initial reference ground acceleration will be multiplied in order to obtain the ground acceleration of the CANEPE

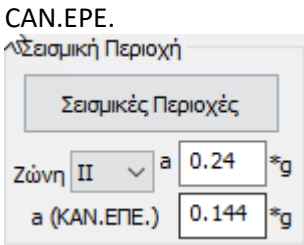


or the default 10% or 30% which automatically sets the Target:



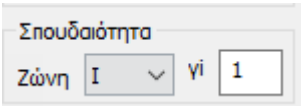


and returning to the initial parameters of the scenario in the field of ground acceleration CAN.EPE.



we see the value of the ground acceleration as it was calculated previously and as it will be used in the execution of the scenario for the calculation of the seismic action.

It is also noted that the γi used for the calculation of the seismic action always becomes 1 (from 0.8 which was before for the specific importance category) based on the following paragraph of the CANEPE.



Για πιθανότητα υπερβάσεως 10% εντός του συμβατικού χρόνου των 50 ετών λαμβάνεται υπόψη η σεισμική δράση του ΕΚ 8-1, ενώ για διαφορετική πιθανότητα υπερβάσεως εντός του συμβατικού χρόνου των 50 ετών λαμβάνεται υπόψη το ποσοστό της παραπάνω σεισμικής δράσεως του ΕΚ 8-1, σύμφωνα με τα διαλαμβανόμενα στην § 2.2. θεωρώντας αντίστοιχα σε όλες τις περιπτώσεις τον συντελεστή σπουδαιότητας γ_I ίσο με τη μονάδα.

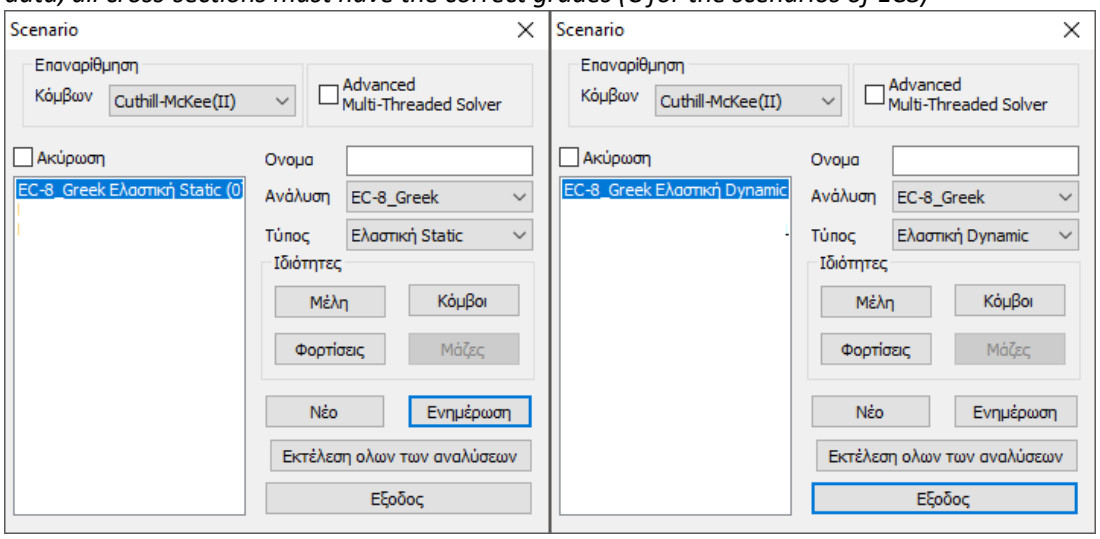
(3η Αναθεώρηση 2022)

The script is now ready to run without even needing a spectrum update.

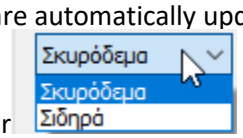
Σ2. Ανάλυση EC-8_Greek και Τύπο Ελαστική Static / Dynamic

Select select Analysis **EC-8_Greek** and Type **Elastic Static** and press the *New* button.

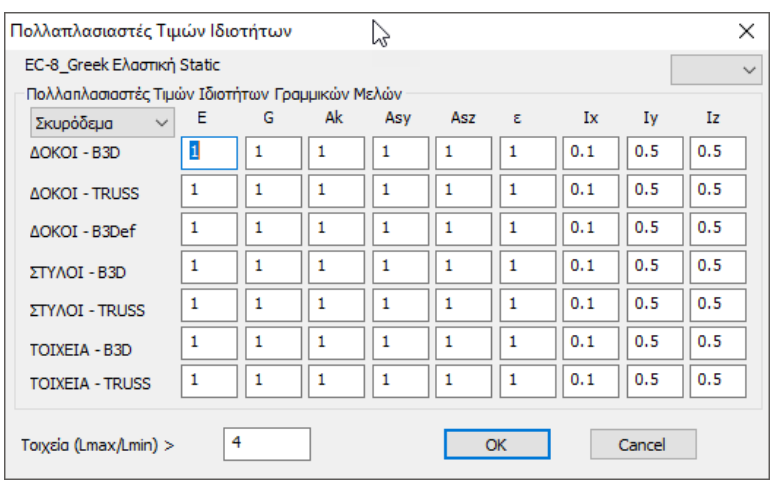
ATTENTION: *Materials must be in accordance with the selected regulation, and when entering data, all cross-sections must have the correct grades (C for the scenarios of EC8)*



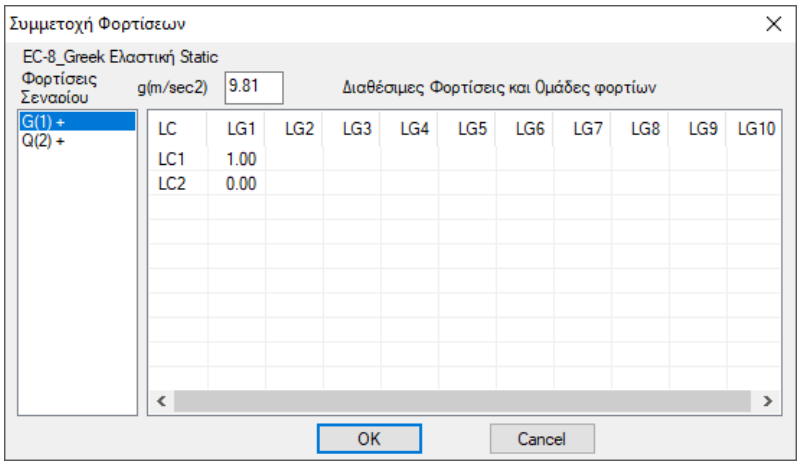
All of the following applies to **EC-8_Greek** for both the **Elastic Static** type and the **Elastic Dynamic** and therefore described once for both.

- In **Members** the Multipliers are automatically updated and filled in with the corresponding coefficients for 

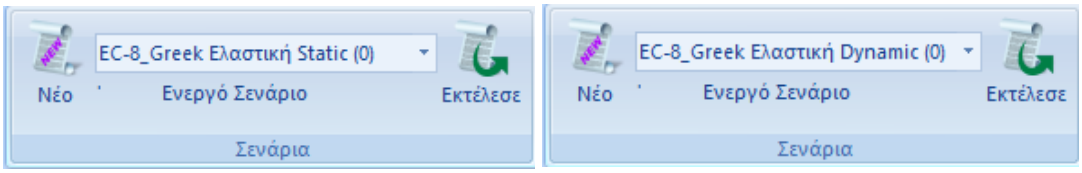
respectively:



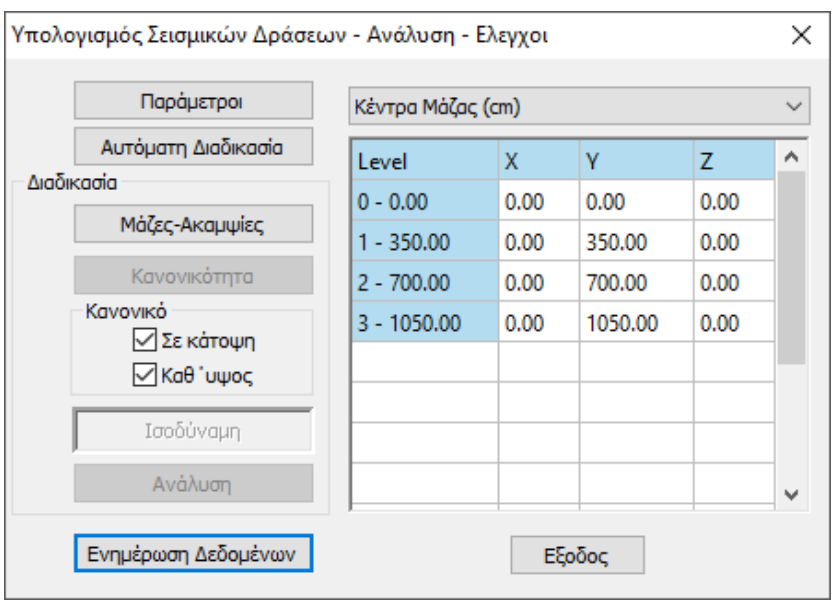
- In the **Loadings**, for G, set the unit to LC1 (permanently) and for Q, set the unit to LC2(mobile) and press the Update button.



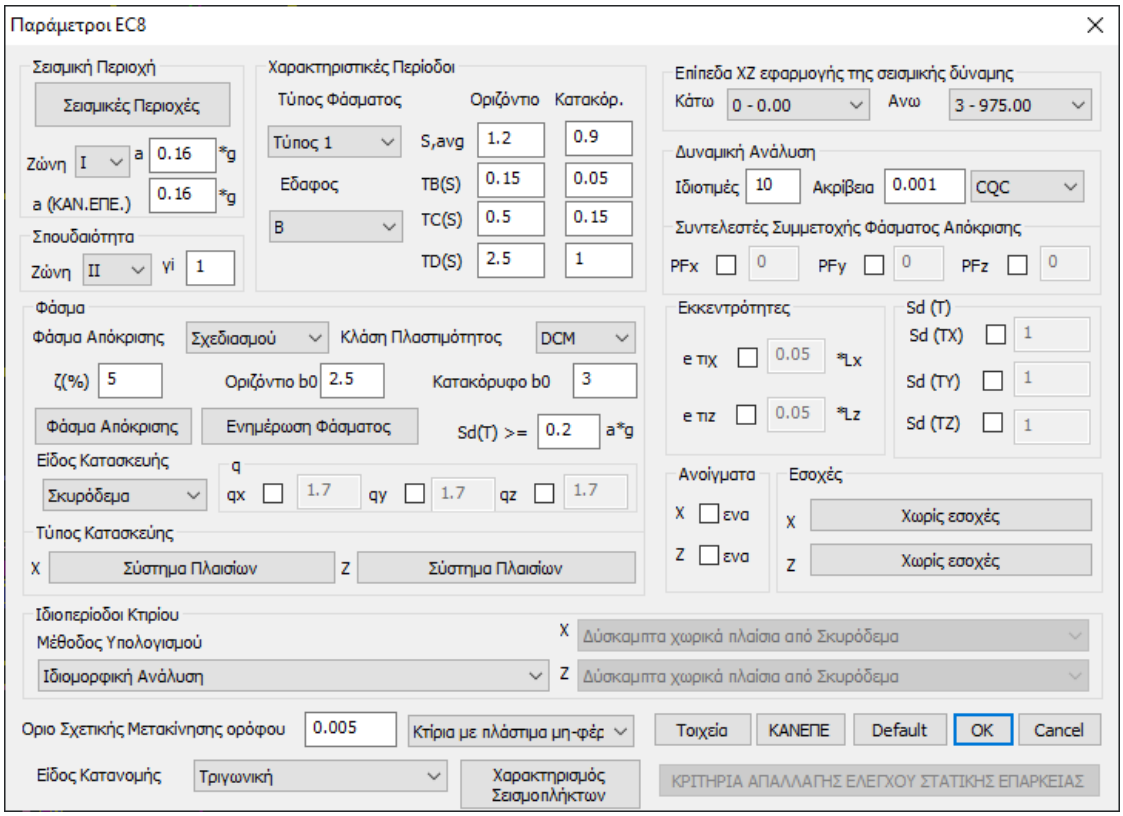
- With either the **EC-8_Greek Elastic Static** scenario active**,** or the **EC-8_Greek** scenario **Elastic Dynamic**,



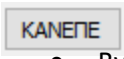
- The **Run** command opens the window for running the script and by pressing **Update Data**, the commands are activated:



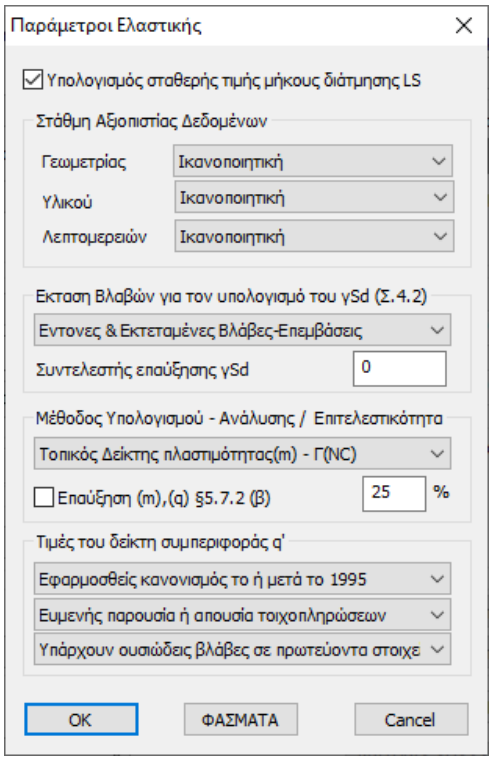
- To set the **parameters** for either the **EC-8_Greek Elastic Static** or **the EC-8_Greek Elastic Dynamic** scenario, the dialog box will have the following format:



Where you set the parameters as you would for an EC8 scenario.



- By pressing the "**CAN.LTD**" button the following dialog box appears



- In the "***Calculate constant LS shear length value***" option you specify:

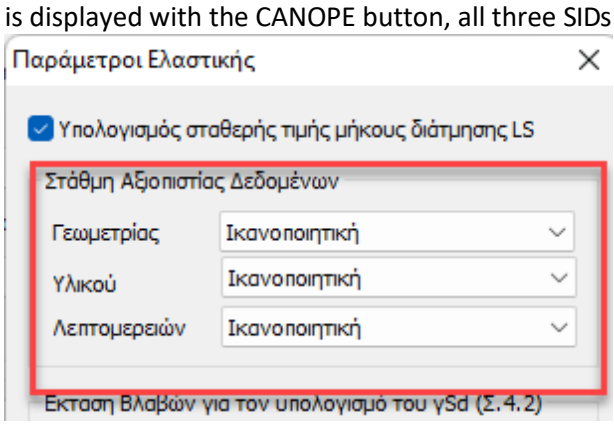
- if the shear length of the elements will be calculated with a fixed value based on the length as provided for by the CANEP* (ticked)
- or whether it will be calculated on the basis of the resulting intensive quantities, where Shear Length = M/V at the end section of the element, i.e. the distance of the end section from the zero point of the moments.

As far as shear length is concerned, the method of calculation is important, both for the classification of the elements into **plastic** and **sandy** and for the method of calculation of local plasticity indices where the calculation of θy and θu is required.

3h revision of the EIA:

- The gg depends on the geometry and
- The cRd from the worst SDS between material and details.

So in the four scenarios of the CANPE of the elastic analysis, in the context of a dialogue that is displayed with the CANOPE button, all three SIDs are now displayed



- ***Select:***

For each ***Data Reliability Level***

Ικανοποιητική
Ανεκτή
Υψηλή

- ***Extent of Damage***

The **γsd** factor is automatically calculated based on the corresponding option,

Εντονες & Εκτεταμένες Βλάβες-Επεμβάσεις
Ελαφρές & Τοπικές Βλάβες-Επεμβάσεις
Χωρίς Βλάβες & Χωρίς Επεμβάσεις

- The value 0 in the field Συντελεστής επαύξησης γSd 0

means that the coefficient will take the value based on ***table .4.2.*** *of the EIA*.
If you want your own value, enter a number and it will be added up to the value provided by the table. Calculations are made based on the resulting sum.
Where more precise data are not available, cSd values according to the following Table may be used.

Πίνακας Σ 4.2: Τιμές του συντελεστή γ_{Sd}

Έντονες και εκτεταμένες βλάβες ή / και επεμβάσεις	Ελαφρές και τοπικές βλάβες ή / και επεμβάσεις	Χωρίς βλάβες και χωρίς επεμβάσεις
γ_{Sd} =1,20	γ_{Sd} =1,10	γ_{Sd} =1,00

Βλ. και Παράρτημα 7Δ και Παράρτημα ΣΤ περί βλαβών και φθορών.

IMPORTANT OBSERVATION:

The csd coefficient is automatically calculated based on the corresponding option, but because the CAN.EPE. gives the possibility to select the elastic analysis regardless of the criteria AND ONLY FOR ASSESSMENT, provided that the csd is increased by 0.15, there is a field "Increment coefficient", where you can enter the value you wish.

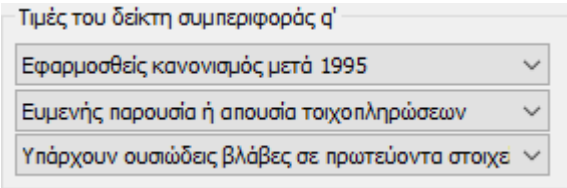
- ***Method of Calculation - Analysis / Performance***

The next field concerns the choice of the type of elastic analysis (global index behaviour (**q**) or local ductility indices (**m**)) for each level of performance.

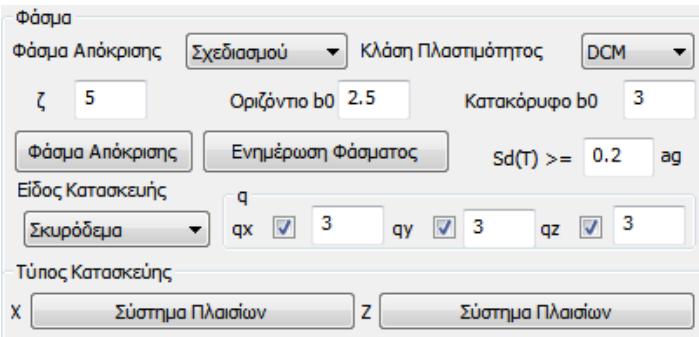
- For performance level A, the m method is not applicable.

Καθολικός Δείκτης συμπεριφοράς(q) - A (DL)
Καθολικός Δείκτης συμπεριφοράς(q) - B (SD)
Καθολικός Δείκτης συμπεριφοράς(q) - Γ (NC)
Τοπικός Δείκτης πλαστιμότητας(m) - B (SD)
Τοπικός Δείκτης πλαστιμότητας(m) - Γ(NC)

- The choice of method (**m**) assumes **an elastic** response spectrum, whereas the method (**q**) assumes a **design** spectrum with modified seismic coefficient behavior (q).
- The following fields relate to parameters for method **q**.



- The following figure of the parameters is shown when the method of the global index of behaviour (**q**) for performance level B is selected.



Then, select the command **FRAME**

The **EIR** provides a **minimum tolerable target on the building's significance category** based on the table below:

Πίνακας ΠΑ.2.1. *Ελάχιστοι ανεκτοί στόχοι αποτίμησης ή ανασχεδιασμού υφισταμένων κτιρίων.*

Κατηγορία Σπουδαιότητας	Ελάχιστοι Ανεκτοί Στόχοι
I	Γ2
II	Γ1
III	B1
IV	B1 και A2 (Ικανοποίηση **και** των δύο στόχων)

Σε κάθε περίπτωση να θεωρηθεί ότι ισχύει A1>A2, B1>B2, Γ1>Γ2, A1>B1>Γ1 και A2>B2>Γ2

3h revision of the 2022 EIA.

In the new EIA, more seismic hazard categories are now introduced (9 in total from two before), the term *seismic class* is introduced, as well as a new

a method of evaluation and redesign (which can be followed as an alternative to the current method).

Seismic class is the maximum rating or redesign target for a given level of performance. It is derived from the combination of performance level and αg rate.
The seismic classes for performance level B are considered as basic seismic classes.

Πίνακας Σ 2.1. **Ενδεικτική** συσχέτιση περιόδου επαναφοράς και πιθανότητας υπέρβασης της σεισμικής δράσης με την αντίστοιχη ανηγμένη οριζόντια εδαφική επιτάχυνση.

Περίοδος Επαναφοράς (έτη)	Πιθανότητα υπέρβασης σεισμικής δράσης εντός του συμβατικού χρόνου ζωής των 50 ετών	$\alpha_g / \alpha_{g,ref}$
2475	2%	1.80
975	5%	1.30
475	**10%**	**1.00**
225	20%	0.75
135	**30%**	**0.60**
70	50%	0.45
40	70%	0.35
20	90%	0.25
<20	>90%	<0.25

Στον Πίνακα 2.1 παρουσιάζεται, η συσχέτιση της στάθμης επιτελεστικότητας του φέροντος οργανισμού με την αντίστοιχη ανηγμένη οριζόντια εδαφική επιτάχυνση. Στον Πίνακα Σ 2.1 παρουσιάζεται, μια **ενδεικτική συσχέτιση** της περιόδου επαναφοράς και της αντίστοιχης πιθανότητας υπέρβασης εντός του συμβατικού χρόνου ζωής των 50 ετών της σεισμικής δράσης με την αντίστοιχη ανηγμένη οριζόντια εδαφική επιτάχυνση.

Πίνακας 2.1. Στόχοι αποτίμησης ή ανασχεδιασμού Φέροντος Οργανισμού.

$\alpha_g / \alpha_{g,ref}$	Στάθμη Επιτελεστικότητας Φέροντος Οργανισμού		
	Α «Περιορισμένες Βλάβες»	Β «Σημαντικές Βλάβες»	Γ «Οιονεί Κατάρρευση»
1.80	**A0**	**B0**	**Γ0**
1.30	**A1+**	**B1+**	**Γ1+**
1.00	**A1**	**B1**	**Γ1**
0.75	**A2+**	**B2+**	**Γ2+**
0.60	**A2**	**B2**	**Γ2**
0.45	**A3+**	**B3+**	**Γ3+**
0.35	**A3**	**B3**	**Γ3**
0.25	**A4+**	**B4+**	**Γ4+**
<0.25	**A4**	**B4**	**Γ4**

- $\alpha_{g,ref}$ είναι η οριζόντια εδαφική επιτάχυνση αναφοράς, που ορίζεται με πιθανότητα υπέρβασης της σεισμικής δράσης 10% στα 50 χρόνια συμβατικής ζωής του έργου.
- α_g είναι η οριζόντια εδαφική επιτάχυνση.

δ. Σεισμική κλάση κτιρίου ορίζεται ως ο μέγιστος στόχος αποτίμησης ή ανασχεδιασμού που μπορεί να εξασφαλίσει ένα κτίριο για μια επιλεγείσα στάθμη επιτελεστικότητας. Η σεισμική κλάση κτιρίου για στάθμη επιτελεστικότητας Β («Σημαντικές Βλάβες») θεωρείται **βασική σεισμική κλάση**.

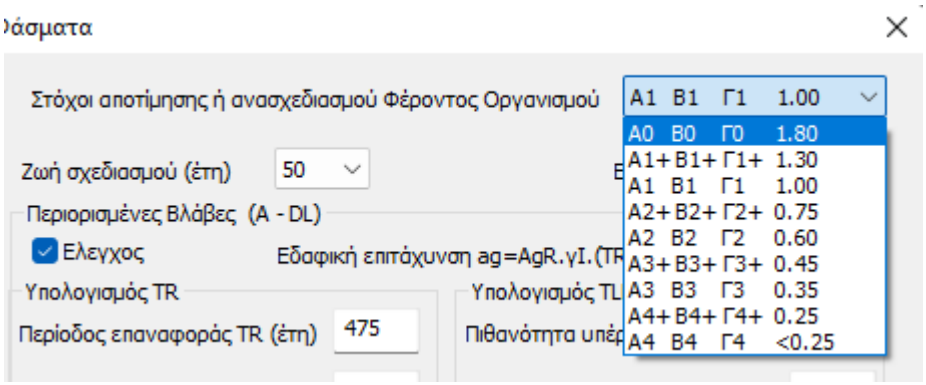
Based on the above table we can summarize that my level of performance determines m, q (elastic) and θu (inelastic) and my return period and exceedance probability determines the seismic acceleration αg.

The three valuation targets (or the three seismic classes) for a 10% earthquake are still called A1, B1, C1 and have a factor of one but the targets for a 50% earthquake are now called A3+, B3+, C3+ and have a factor of 0.45 (from 0.53 previously). Still the two basic seismic hazard categories are no longer 10% and 50% but 10% with a factor of 1 and 30% with a factor of 0.60 (the two lines in bold in the table).

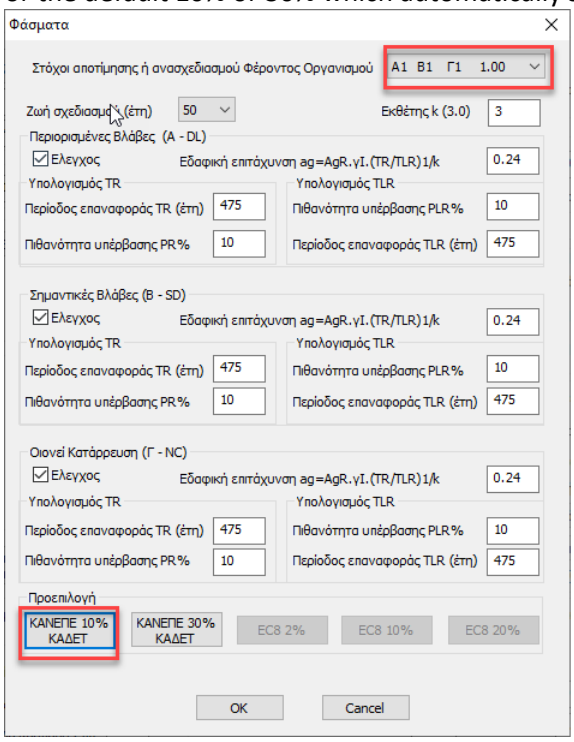
In the parameters of the 5 scenarios related to EIS there is now a new field for the ground acceleration that will be calculated and used based on the above table.

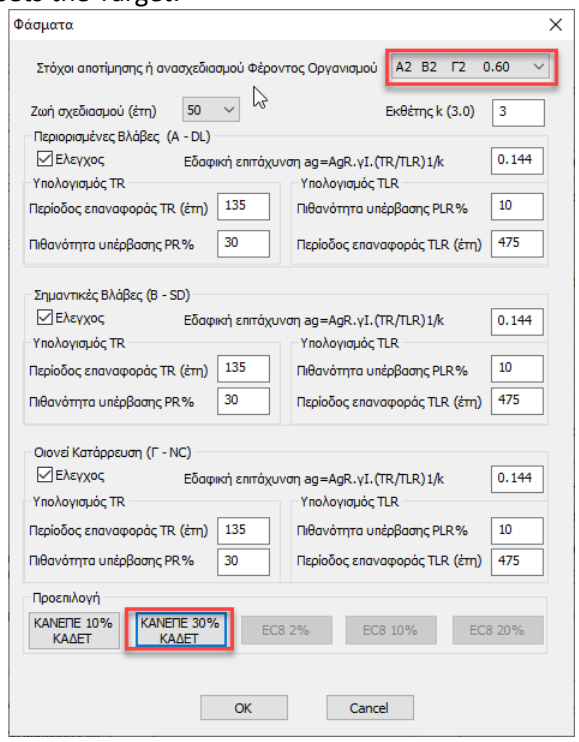
Going to the framework ΦΑΣΜΑΤΑ

We select the seismic hazard category with the corresponding triad of seismic classes and the factor by which the initial reference ground acceleration will be multiplied in order to obtain the ground acceleration of the CANEPE

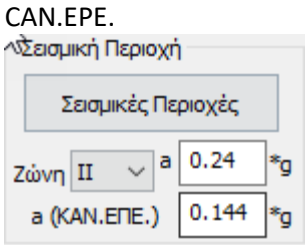


or the default 10% or 30% which automatically sets the Target:



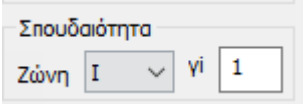


and returning to the initial parameters of the scenario in the field of ground acceleration CAN.EPE.



we see the value of the ground acceleration as it was calculated previously and as it will be used in the execution of the scenario for the calculation of the seismic action.

It is also noted that the γi used for the calculation of the seismic action always becomes 1 (from 0.8 which was before for the specific importance category) based on the following paragraph of the CANEPE.



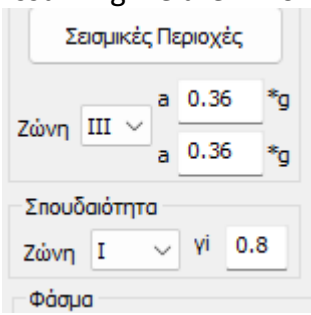
Για πιθανότητα υπερβάσεως 10% εντός του συμβατικού χρόνου των 50 ετών λαμβάνεται υπόψη η σεισμική δράση του ΕΚ 8-1, ενώ για διαφορετική πιθανότητα υπερβάσεως εντός του συμβατικού χρόνου των 50 ετών λαμβάνεται υπόψη το ποσοστό της παραπάνω σεισμικής δράσεως του ΕΚ 8-1, σύμφωνα με τα διαλαμβανόμενα στην § 2.2. θεωρώντας αντίστοιχα σε όλες τις περιπτώσεις τον συντελεστή σπουδαιότητας γ_I ίσο με τη μονάδα.

(3η Αναθεώρηση 2022)

The script is now ready to run without even needing a spectrum update.

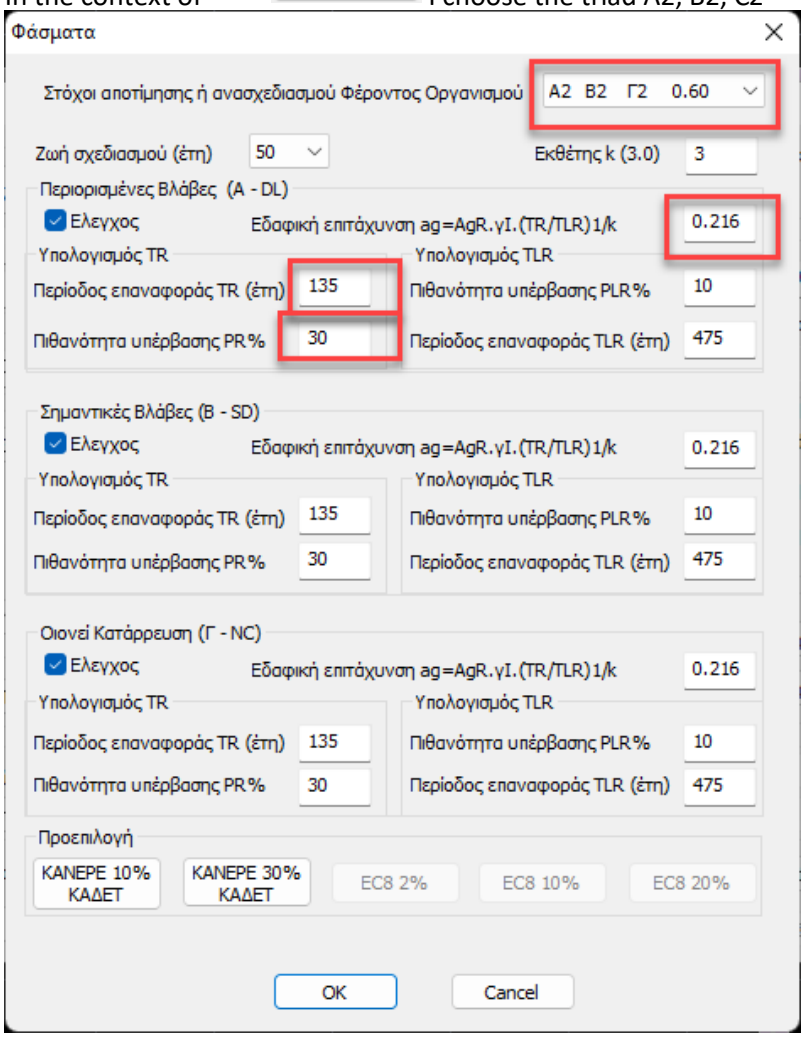
1.2.1 Επεξηγηματικό Παράδειγμα:

Assuming we are in zone III, so 0.36 and importance I



The minimum valuation target, based on the table above, is C2. We then select . ΚΑΝΕΠΕ

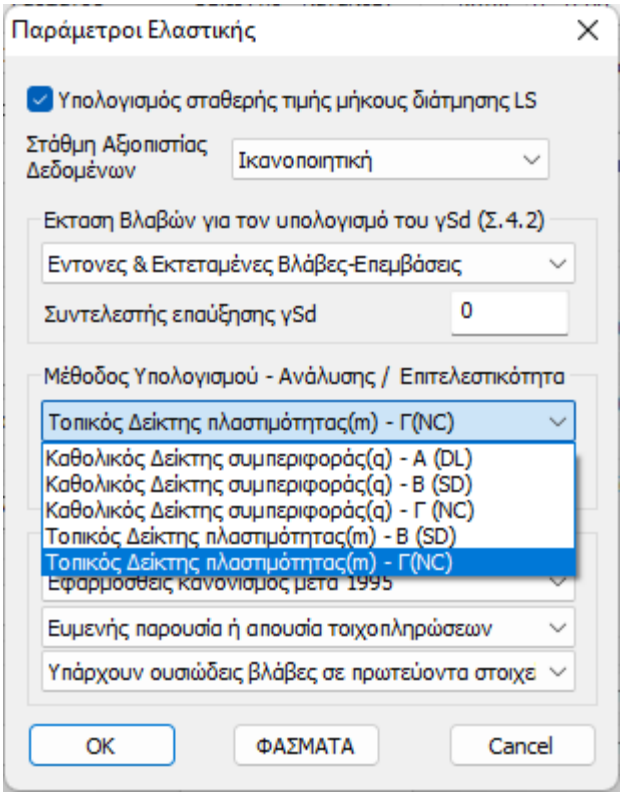
In the context of ΦΑΣΜΑΤΑ I choose the triad A2, B2, C2



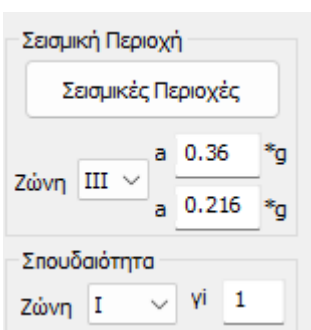
The program calculated the new acceleration 0.36*0.60= 0.216 and in the return period and in the probability of exceedance it wrote the data of the specific seismic hazard category. In this example it is 30% and 135 years.

Method m (for performance levels B & C)

In the parameters I define the usual m calculation method (only for performance levels B & C)



And returning to the initial parameters of the scenario in the field of the ground acceleration CAN.EPE.



I see the value of the ground acceleration 0.216 as it was calculated previously and as it will be used in the scenario run to calculate the seismic action. Note also that the γi used for the calculation of the seismic

action always becomes 1 (up from 0.8 previously for this importance category) based on the following paragraph of the CANEP.

Για πιθανότητα υπερβάσεως 10% εντός του συμβατικού χρόνου των 50 ετών λαμβάνεται υπόψη η σεισμική δράση του ΕΚ 8-1, ενώ για διαφορετική πιθανότητα υπερβάσεως εντός του συμβατικού χρόνου των 50 ετών λαμβάνεται υπόψη το ποσοστό της παραπάνω σεισμικής δράσεως του ΕΚ 8-1, σύμφωνα με τα διαλαμβανόμενα στην § 2.2. θεωρώντας αντίστοιχα σε όλες τις περιπτώσεις τον συντελεστή σπουδαιότητας γ_I ίσο με τη μονάδα.

(3η Αναθεώρηση 2022)

The script is now ready to run without even needing a spectrum update.

Method q (for performance levels A & B & C)

The final value to be used in the spectral acceleration is ag/q*. q* is the coefficient of Table 4.1 times q' .

Πίνακας 4.1 : Τιμές του λόγου q*/q΄ αναλόγως του στόχου επανελέγχου (για τον φέροντα οργανισμό)

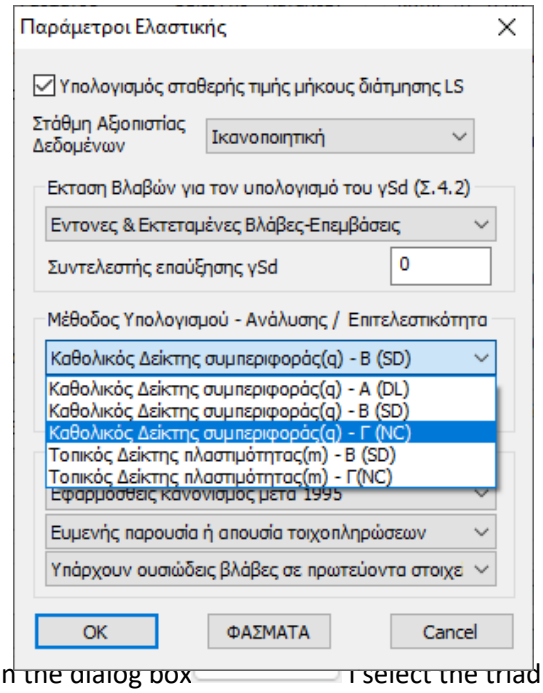
Στάθμη επιτελεστικότητας		
«Περιορισμένες βλάβες» (Α)	«Σημαντικές βλάβες» (Β)	«Οιονεί κατάρρευση» (Γ)
0,6 πάντως δε 1,0<q*<1,5	1,0	1,4

q' is obtained from Table 4.4 :

Πίνακας Σ 4.4: Τιμές του δείκτη συμπεριφοράς q΄ για την στάθμη επιτελεστικότητας Β («Σημαντικές βλάβες»)

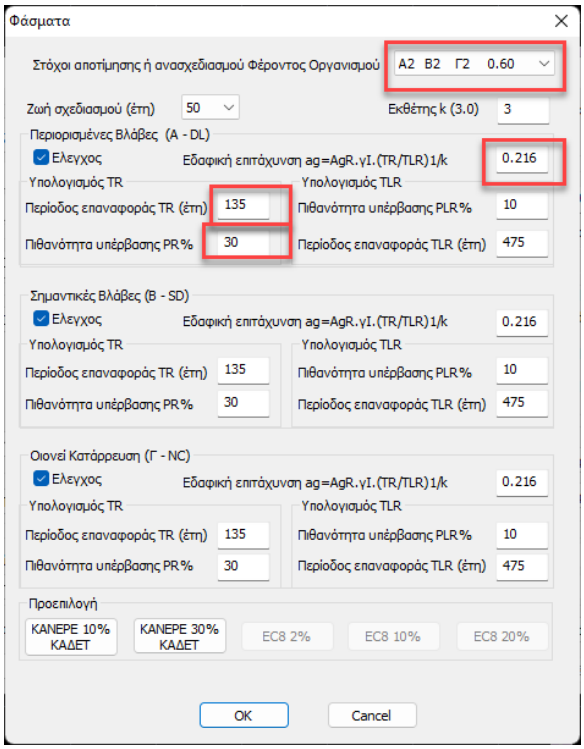
Εφαρμοσθέντες Κανονισμοί μελέτης (και κατασκευής)	Ευμενής παρουσία ή απουσία τοιχοπληρώσεων (1)		Δυσμενής (γενικώς) παρουσία τοιχοπληρώσεων (1)	
	Ουσιώδεις βλάβες σε πρωτεύοντα στοιχεία		Ουσιώδεις βλάβες σε πρωτεύοντα στοιχεία	
	Όχι	Ναι	Όχι	Ναι
1995≤…	3,0	2,3	2,3	1,7
1985≤…<1995(2)	2,3	1,7	1,7	1,3
…<1985	1,7	1,3	1,3	1,1

This gives q*.
Note here that the user does not need to calculate anything.
The program does this on its own when we select CANPE, e.g.



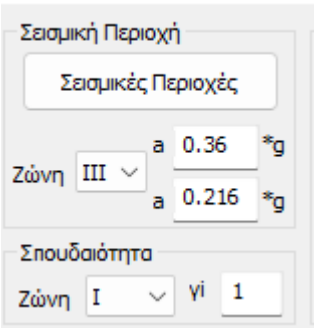
and then set the elastic parameters. Then the program returns the value of q*.
We conclude that the program automatically divides the spectral acceleration by q*.

In the dialog box I select the triad A2, B2, C2



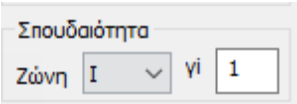
The program calculated the new acceleration 0.36*0.60= 0.216 and in the return period and in the probability of exceedance it wrote the data of the specific seismic hazard category. In this example it is 30% and 135 years.

And returning to the initial parameters of the scenario in the field of the ground acceleration CAN.EPE.



I see the value of the ground acceleration 0.216 as it was calculated previously and as it will be used in the scenario run to calculate the seismic action.

It is also noted that the γi used for the calculation of the seismic action always becomes 1 (from 0.8 which was before for this importance category).



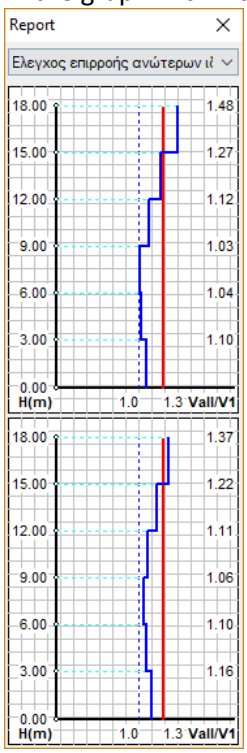
1.2.2 Έλεγχος επιρροής των ανώτερων ιδιομορφών

CAN §5.7.2 (b) INFLUENCE OF THE HIGHER IDIOMORITIES

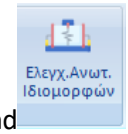
A further check is contained in paragraph 5.7.2(b) of the EIA and concerns **the influence of the higher eigenmodes**.

The CAN states that for pushover to apply, the influence of the higher eigenmodes must be insignificant.
The criterion for assessing how significant the influence is is as follows:
In order to check this condition, an initial dynamic elastic analysis is required where the seismic shear stress is calculated, for each floor and for each direction of the earthquake, once for those eigenmodes that activate at least 90% of the building mass and once for the fundamental (per direction) eigenmodes.

OBSERVATIONS
The influence is considered significant when, even on one floor and in one direction, the ratio of the intersection of several eigenmodes (Vall) to the intersection of one eigenmodes (V1) is greater than 1.3.
This criterion was only incorporated in the Dynamic analysis scenarios. The
results are shown in three locations:
In the graph within the analysis by selecting "Upper Eigenmode Influence Check"



As tabulated results by selecting "Seismic Action"

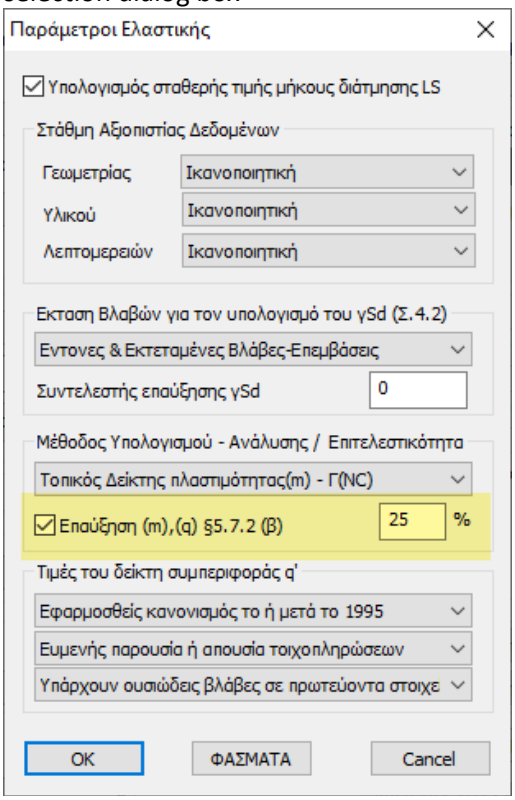
Selecting the command 

displays the results of the upper eigenmodes influence test.

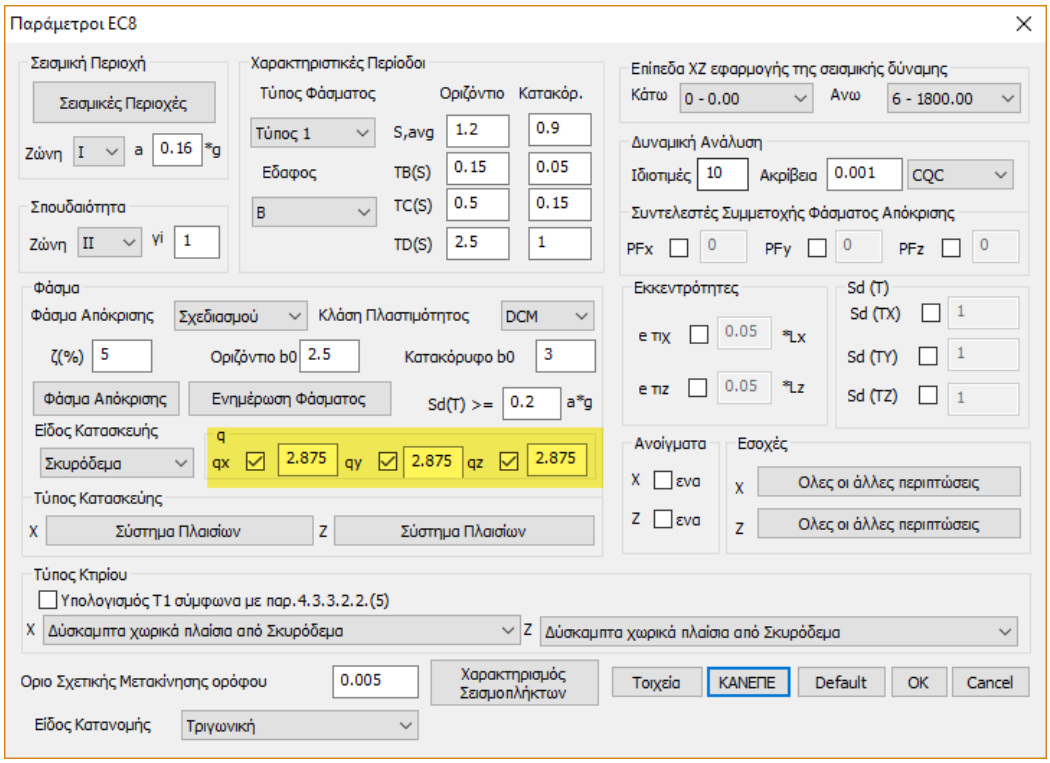
Έλεγχος Επιρροής Ανωτέρων Ιδιομορφών							(ΚΑΝ.ΕΠΕ. παρ.5.7.2)
α/α Στάθμ.	Συνολικό Ύψος (m)	Χ Διεύθυνση			Υ Διεύθυνση		
		Vall (Kn)	V1 (Kn)	Λόγος	Vall (Kn)	V1 (Kn)	Λόγος
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	3.00	722.27	481.43	1.50	929.23	565.81	1.64
3	6.00	320.92	243.47	1.32	331.70	166.03	2.00
ΣΗΜΕΙΩΣΗ:		*Οι λόγοι δεν πρέπει να υπερβαίνουν την τιμή 1.3*					

So if this ratio is **greater than 1.3**, even at one level and in one direction, pushover can still be performed, but an elastic dynamic analysis (with seismic action calculated either from the EC8 design spectrum or from acceleration time histories) must be performed in parallel, using either method (m) or method (q).

In this scenario, an increase of these rates by 25% is allowed.
So of the two scenarios that will be run (pushover and dynamic) the worst-case outcomes should be taken.
This increase of the coefficients is done by user through the new parameter in the method selection dialog box



By checking the corresponding box. For method (q) the result is immediately shown in the q shown in the parameters



while for (m) the augmentation is internal.

To summarize for the influence check of the upper eigenmodes the procedure is to check the influence criterion and when it is not met (ratio > 1.3) then in addition to the pushover an elastic dynamic should be performed by checking the 25% increment.

Based on the above criteria, therefore, inelastic (pushover) or elastic (static or dynamic) is applied.

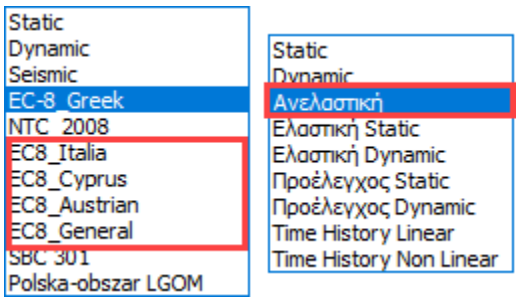
Σ3. Ανάλυση EC-8_Greek και Τύπο Ανελαστική (Pushover)

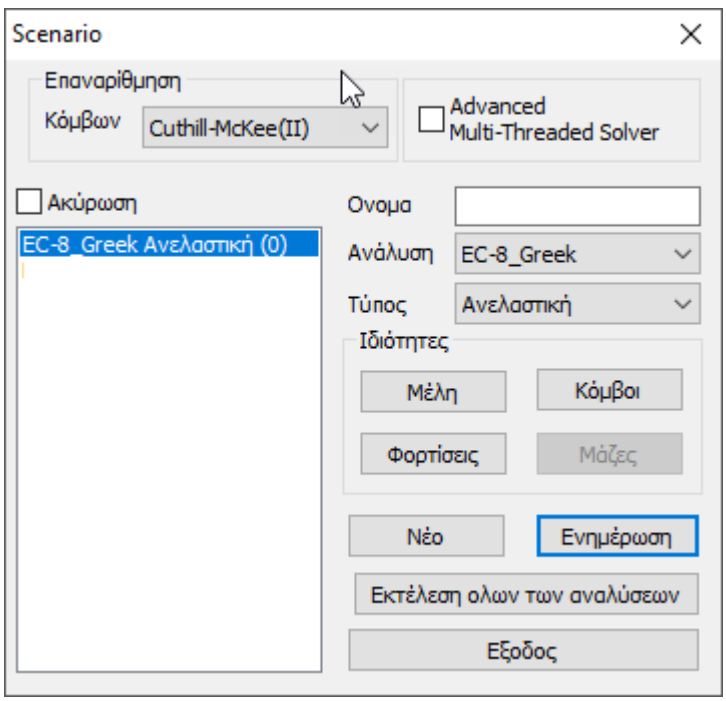
Select select Analysis **EC-8_Greek** and Type **Elastic** and press the *New* button.

A prerequisite for running all analysis scenarios with Type **Inelastic**,
is:

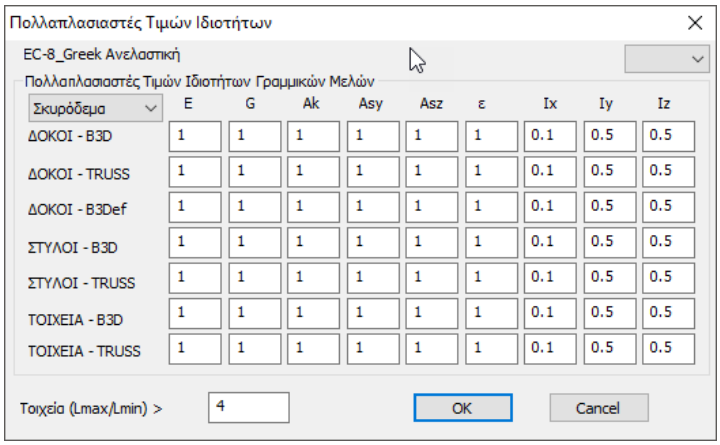
- **the existence of armaments; and**
- **the calculation of the corresponding strength moments.**

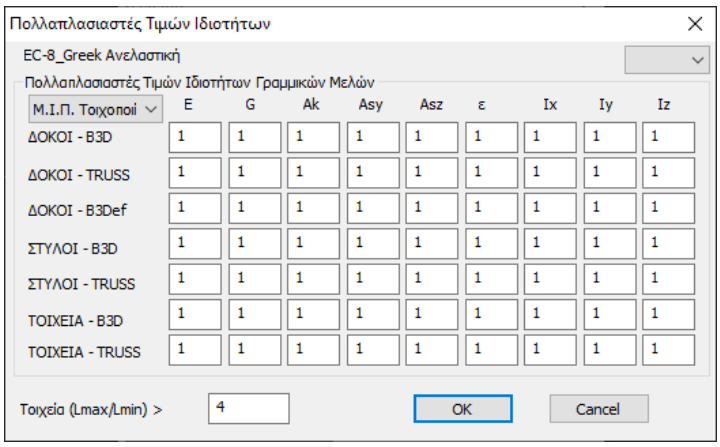
The **EC-8_Greek Anelastic** scenario refers to the **EIA.**
Any other analysis of the **EC-8_(Italia, Cyprus, Austria)** and type **Anelastic** refers to the corresponding appendix of the **EC-8**.
The **EC-8_General Anelastic** scenario refers to the **GENERAL EC-8 (without the state appendices).**



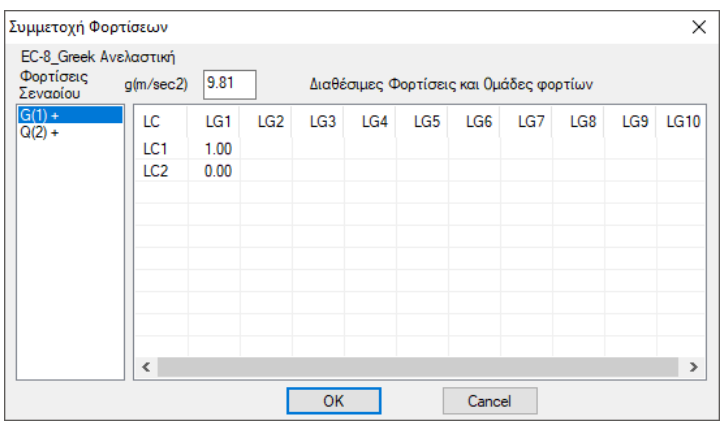


- In **Members** the Multipliers are automatically updated and filled in with the corresponding coefficients

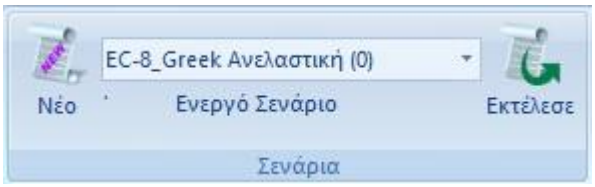




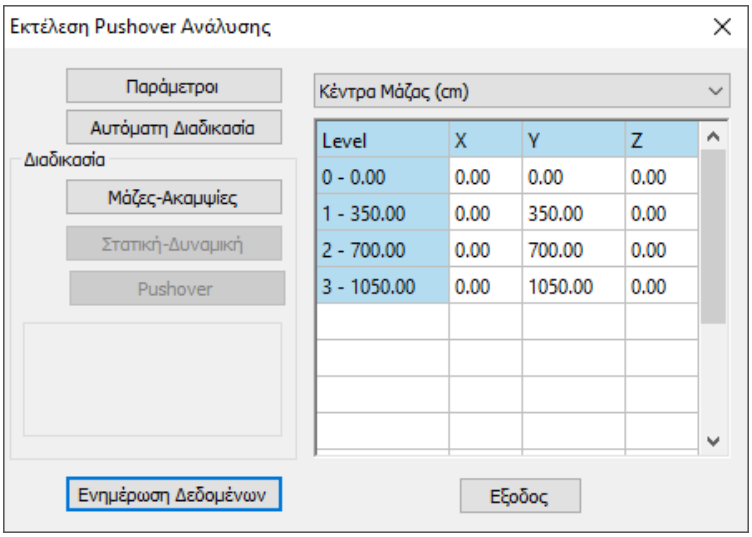
- In the **Loadings**, for G, set the unit to LC1 (permanently) and for Q, set the unit to LC2(mobile) and press the Update button.



With the **EC-8_Greek Elastic** script active ,



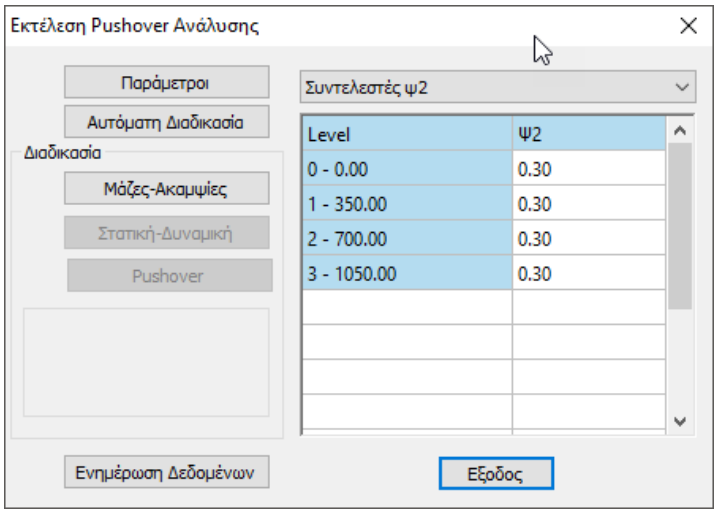
- The **Run** command opens the window for running the script and by pressing ***Update Data***, the commands are activated:



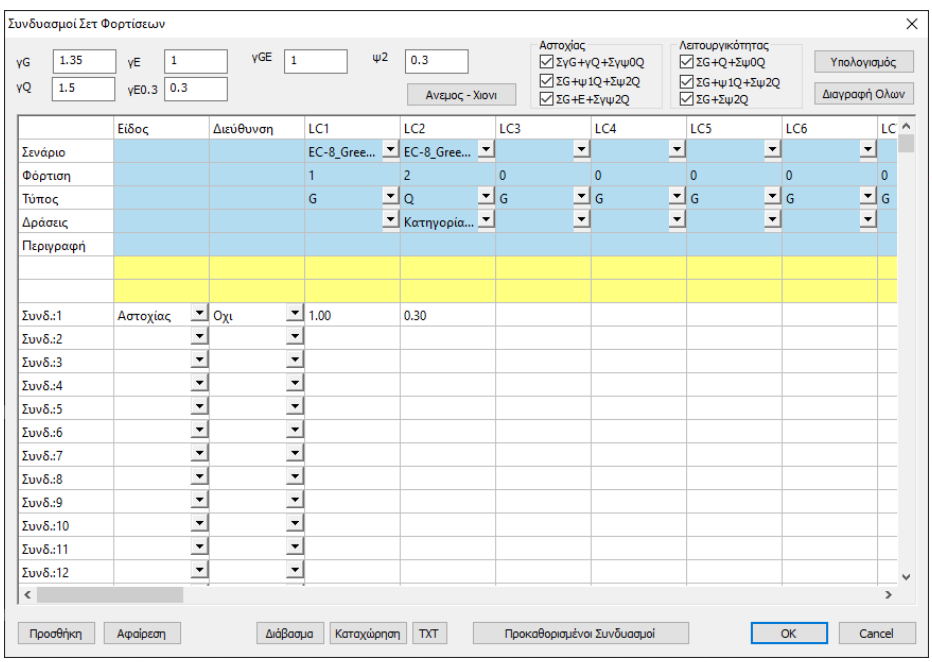
The process is executed sequentially, either automatically with the Automatic Process or selectively by choosing the keys one by one.
In summary, the procedure is carried out as follows:

- Calculation of masses and stiffnesses.
- Performing a static analysis to calculate the intensities of permanent and mobile loads required to start the successive analyses of the pushover.
- Performing a corresponding dynamic with the EC8 elastic design spectrum to calculate the eigenmodes and target displacement.
- Performance of Pushover analyses

Before performing the procedure, the value of the coefficient of the mobile loads ψ2 must be set.
⚠️ The default value is ψ2=0.30.

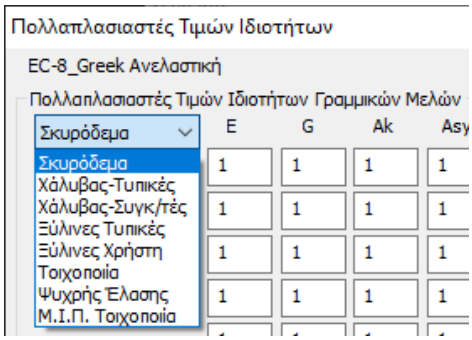


In the 'Procedure' only the vertical loads, i.e. the permanent G and the mobile Q loads for the combination γ_G $G+\psi 2Q$ (where **<u>γG depends on the SWD</u>**), are applied in order to determine the initial stress of the structure.
The coefficients of the vertical loads are shown in the following combination (where γG depends on the SWD).

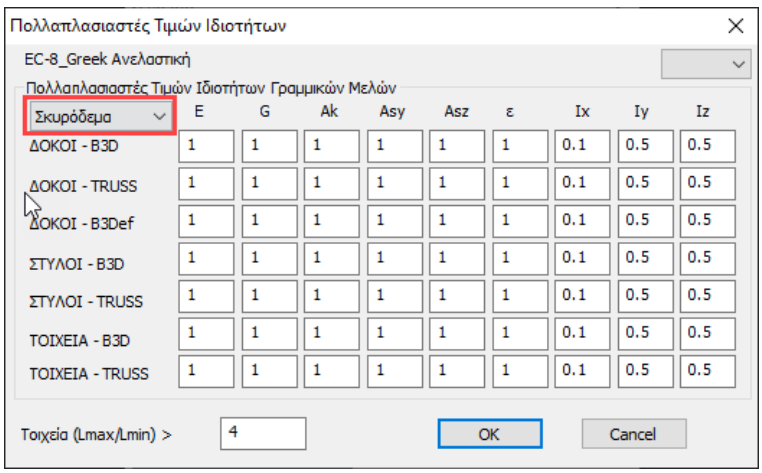


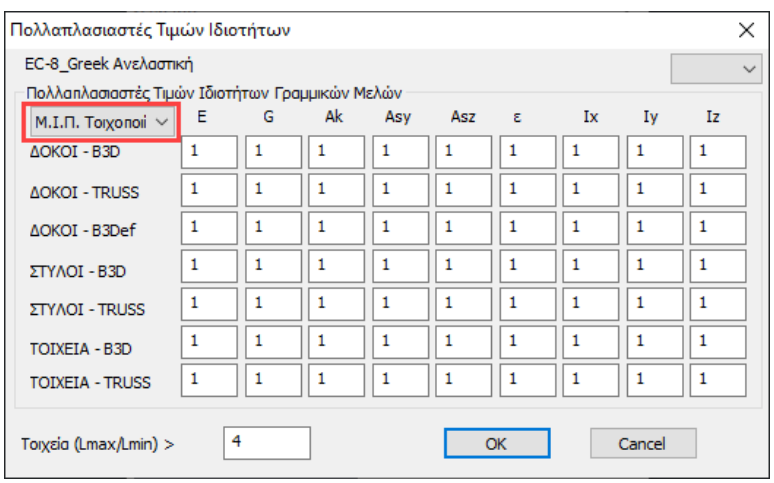
Subsequently, successive elastic analyses are performed where at each step the external horizontal seismic loads are imposed, which it is emphasized that they remain constant (i.e. their value does not change) in all analyses in the case of the orthogonal or inverted triangular distribution. Thus, according to the acting flexural stress and the corresponding available flexural strength in the members, the degree of static indeterminacy of the beam is continuously reduced by the creation of plastic joints, until finally the beam is transformed into a mechanism.

Especially for a Static Inelastic analysis scenario, whether **EC-8_General** or **EC-8_Greek Inelastic** (**EC-8_Greek Inelastic**), the inertial multipliers (Members) defined here will be taken into account in the first Pushover analysis concerning the permanent and mobile loads with default values those provided by EC8.



There are separate options within the "Members" for Concrete and M.I.P.



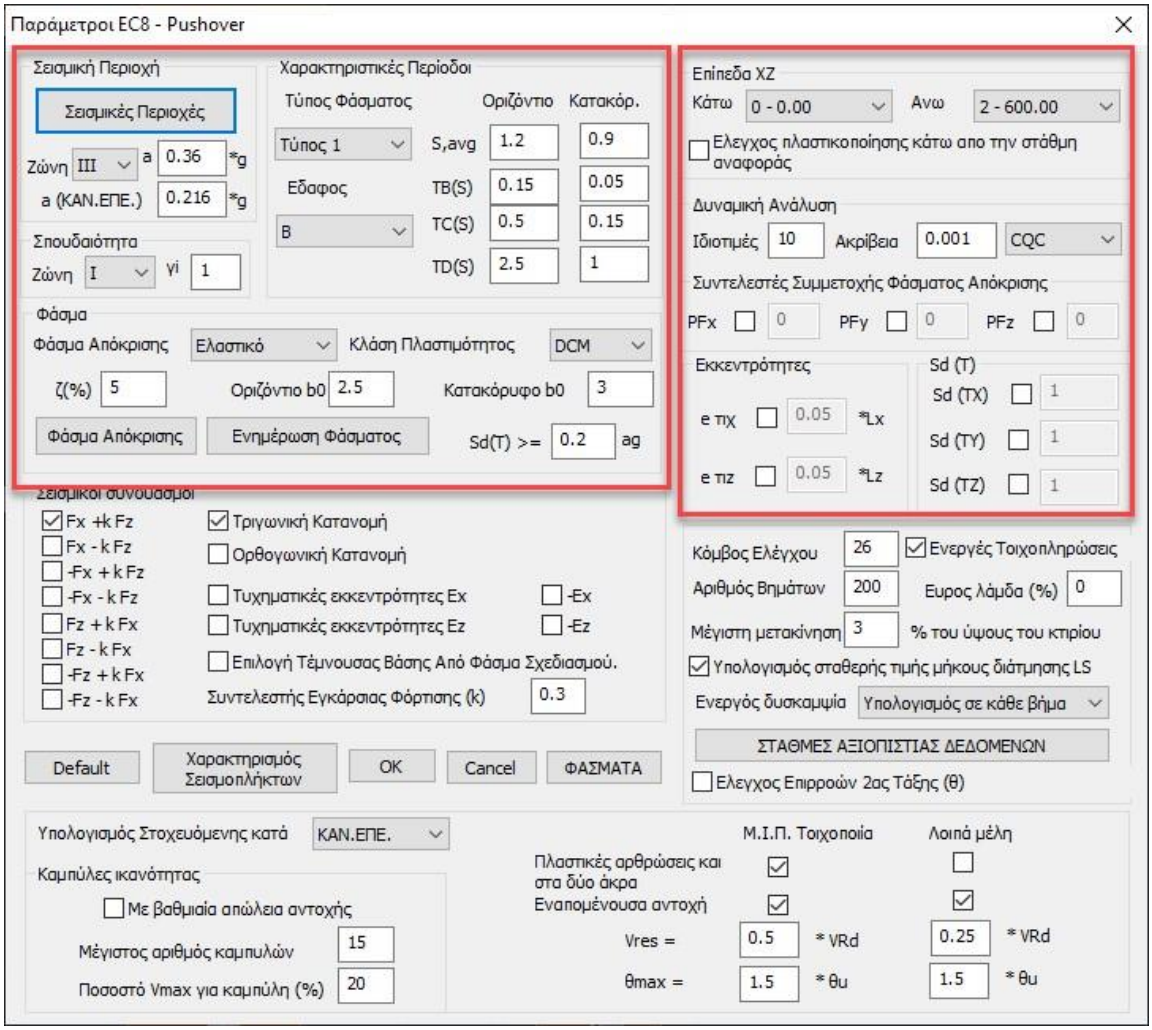


OBSERVATION:

⚠️ Then, in the **parameters of** the inelastic analysis, you can specify whether these values will be maintained with unit coefficients at all stages of the process or whether they will be reduced at each step, starting of course from

the whole original values. Impairment can be done either at the beginning of each step, or after the plastic joint has been created.
For the M.I.P. masonry, the Home is always taken regardless of the from option.

To set the *parameters* of the **EC-8_Greek Anelastic** scenario, the dialog box will have the following format:

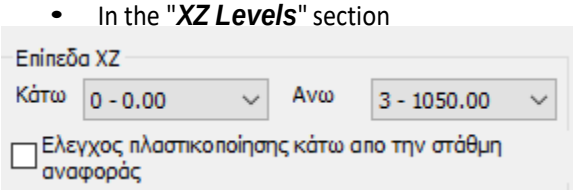


In the above **EC-8 - Pushover** configuration dialog box, the definition of the parameters in the two red rectangular boxes is the same as in the **EC-8** elastic scenarios.

OBSERVATION:

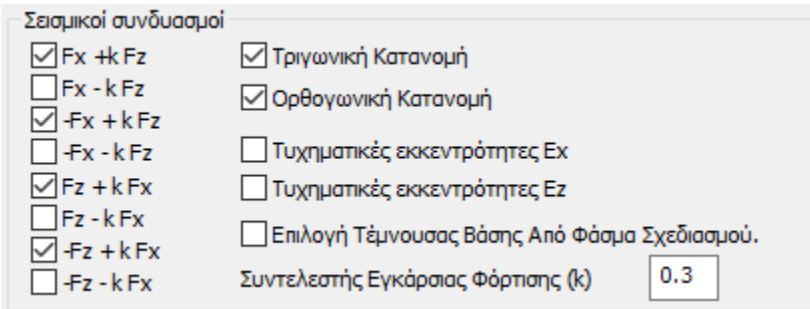
- It is important to note that, according to CAN.EPE, the response spectrum be **Elastic**.

- In the "***XZ Levels***" section



We define from which level to which level the horizontal seismic load will be applied. It is proposed that the upper level be defined as the last full level (not staircase ends). This level will include the control node, which will be either the bulkhead node or another node on the outer perimeter of the building. The option '*Check for plasticisation below the reference level*', when ticked, takes into account as possible locations for plastic joints also elements below the reference level.

- In the section "***Seismic Combinations***"



We define the combinations for which inelastic analyses will be performed. Each combination means that a seismic force will be applied in the specific direction (x or z) with a factor of 1 and a seismic force in the transverse direction with a factor that you specify in the "*Transverse load factor*" field.
The default value is 0.3.

We also determine the type of distribution of the seismic force along the height of the building (triangular or rectangular). <u>The CANPE requires both seismic distributions.</u>

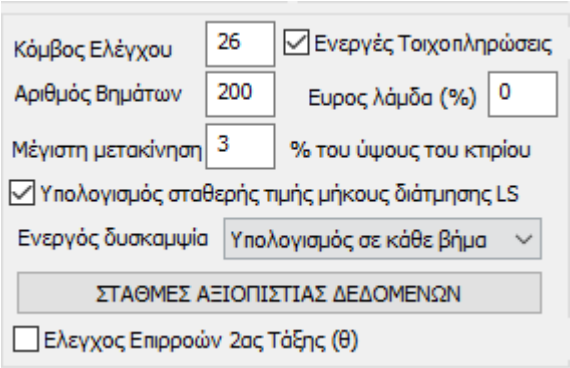
Also, if we want to take into account, in addition to the seismic forces, moments resulting from the accidental eccentricities, then we activate the fields "*Accidental eccentricities Eh and Ez*".

- "***Select Base Cutting Force from Design Spectrum***" when checked, uses as base cutting force the one calculated by the dynamic analysis.

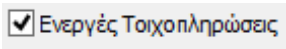
OBSERVATION:

⚠ Selecting all combinations with the random eccentricities produces a total of 64 combinations which means 64 inelastic analyses resulting an increase in vector resolution time.

In the section:



- Where "***Control node***", we define the number of the control node on the basis of which the resistance curve will be calculated.

- 

In the option "***Active Wall Fillings***" we select whether we want to take into account in the analysis the wall fillings that we have included in our construction.

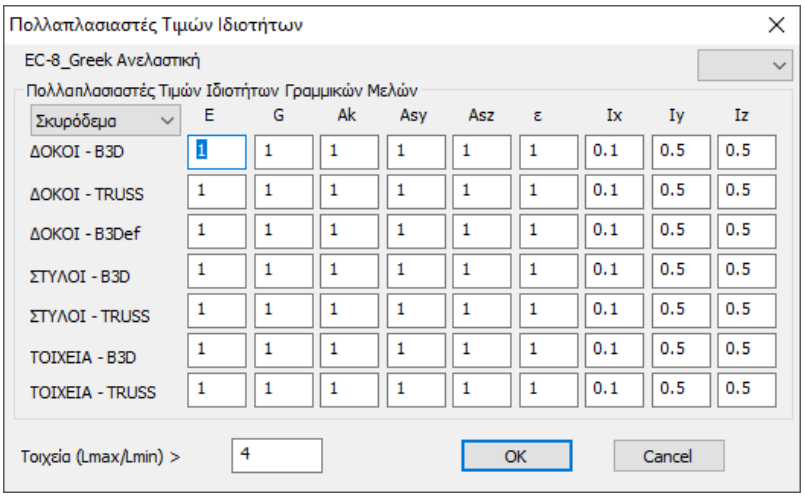
- In "***Number of steps***", we specify the maximum number of steps (analyses) that each inelastic analysis will perform. Pushover is an iterative process that is terminated, when no other limit is set, as soon as the operator
turned into a mechanism. The number of steps is an upper maximum limit in order to avoid too many steps before the vector becomes a mechanism. The default value is 200.

- The "***Maximum movement***" option as a percentage (%) of the total height of the building is second way set an upper limit on the number of steps before the carrier becomes a mechanism. The process stops as soon as the maximum movement
of the control node exceeds this percentage. The default value is 3% of the total height of the building.

- The next parameter "***Lambda range (%)***" refers to the load factor λ. At each step, the load factor λ and the minimum value shall be calculated for each element
of all the structural elements determines the one on which the plastic joint will be created. With a default value of 0 in this parameter, the program selects a minimum value, i.e. only one element, even if there are values from other elements that are very close to it. Setting a value other than 0 e.g. 10% means that any λ values that are less than or equal to the minimum value λ plus 10% will be taken into account in this step, resulting in more than one plastic joint being created at the same time.
- Assume that in the first step of the pushover the minimum value λ is 1 and corresponds to a the specific structural element on which the plastic joint will be created. By
setting a value of 10% in this parameter, in elements with λ values from 1 to 1.1, plastic joints will also be created in them, simultaneously with the first element.

- In the "***Calculate constant LS shear length value***" option you specify:
  if the shear length of the elements will be calculated with a fixed value based on the their length in all steps, as prescribed by the CANEP* (ticked)
  or whether it will be calculated at each step of the inelastic analysis on the basis of the resulting intensive quantities, where Shear Length = M/V at the end section of the element, i.e. the distance of the end section from the zero point of the moments.

- The parameter "***Active stiffness***" concerns the way of calculating the stiffnesses of the elements of the structure. The first step of the inelastic analysis calculates the intensive quantities from the permanent and mobile loads of the structure. The stiffnesses that taken into account for these quantities are multiplied by the coefficients specified in the scenario parameters in the "**Members**" option.



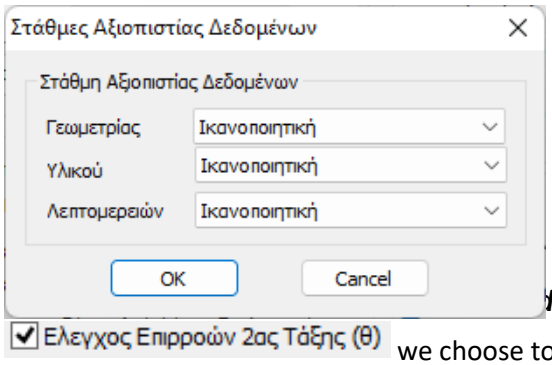
In the second step of the inelastic analysis where the seismic load is applied, the program now gives three possibilities for this calculation:

- **Home** : The stiffnesses of the elements will be maintained with unit factors in all steps of the process.
- **Calculation at each step** : The CANEE provides at each step of the pushover one reduction of stiffness. This option recalculates at each step, regardless of whether or not a plastic joint has been created, the stiffnesses based on the provisions of the CANEPE. The value of the stiffnesses to which the impairment is applied is the original value and not the impaired value applied only in the first step.
- **After the plastic joint** : This option is the same as the previous one with the difference that the impairment takes place after the plastic joint has been created. Until the step this element retains the rigidity of the first step.

OBSERVATION:

⚠ For the M.I.P. masonry, the **Home** is always taken regardless of the from option.

- In the "***Data Reliability Level***" option, you select the corresponding SDSs.



for the existing building according to the provisions of the CEE. This choice affects the coefficient of permanent loads **γg** on the basis of which the building will be solved.

der Influence Check (i)" we choose to perform the relevant check.

Then, select the command **FRAME**

The **EIR** provides a **minimum tolerable target on the building's significance category** based on the table below:

Πίνακας ΠΑ.2.1. *Ελάχιστοι ανεκτοί στόχοι αποτίμησης ή ανασχεδιασμού υφισταμένων κτιρίων.*

Κατηγορία Σπουδαιότητας	Ελάχιστοι Ανεκτοί Στόχοι
I	Γ2
II	Γ1
III	B1
IV	B1 και A2 (Ικανοποίηση **και** των δύο στόχων)

Σε κάθε περίπτωση να θεωρηθεί ότι ισχύει A1>A2, B1>B2, Γ1>Γ2, A1>B1>Γ1 και A2>B2>Γ2

3h revision of the 2022 EIA.

In the new EIA, more seismic hazard categories are introduced (9 in total from 2 before), the term *seismic class* is introduced, as well as a new method of assessment and redesign (which can be followed as an alternative to the one in force until now).

Seismic class is the maximum rating or redesign target for a given level of performance. It is derived from the combination of performance level and αg rate.
The seismic classes for performance level B are considered as basic seismic classes.

Πίνακας Σ 2.1. **Ενδεικτική** συσχέτιση περιόδου επαναφοράς και πιθανότητας υπέρβασης της σεισμικής δράσης με την αντίστοιχη ανηγμένη οριζόντια εδαφική επιτάχυνση.

Περίοδος Επαναφοράς (έτη)	Πιθανότητα υπέρβασης σεισμικής δράσης εντός του συμβατικού χρόνου ζωής των 50 ετών	$\alpha_g / \alpha_{g,ref}$
2475	2%	1.80
975	5%	1.30
475	**10%**	**1.00**
225	20%	0.75
135	**30%**	**0.60**
70	50%	0.45
40	70%	0.35
20	90%	0.25
<20	>90%	<0.25

Στον Πίνακα 2.1 παρουσιάζεται, η συσχέτιση της στάθμης επιτελεστικότητας του φέροντος οργανισμού με την αντίστοιχη ανηγμένη οριζόντια εδαφική επιτάχυνση. Στον Πίνακα Σ 2.1 παρουσιάζεται, μια **ενδεικτική συσχέτιση** της περιόδου επαναφοράς και της αντίστοιχης πιθανότητας υπέρβασης εντός του συμβατικού χρόνου ζωής των 50 ετών της σεισμικής δράσης με την αντίστοιχη ανηγμένη οριζόντια εδαφική επιτάχυνση.

Πίνακας 2.1. Στόχοι αποτίμησης ή ανασχεδιασμού Φέροντος Οργανισμού.

$\alpha_g / \alpha_{g,ref}$	Στάθμη Επιτελεστικότητας Φέροντος Οργανισμού		
	Α «Περιορισμένες Βλάβες»	Β «Σημαντικές Βλάβες»	Γ «Οιονεί Κατάρρευση»
1.80	**A0**	**B0**	**Γ0**
1.30	**A1+**	**B1+**	**Γ1+**
1.00	**A1**	**B1**	**Γ1**
0.75	**A2+**	**B2+**	**Γ2+**
0.60	**A2**	**B2**	**Γ2**
0.45	**A3+**	**B3+**	**Γ3+**
0.35	**A3**	**B3**	**Γ3**
0.25	**A4+**	**B4+**	**Γ4+**
<0.25	**A4**	**B4**	**Γ4**

- $\alpha_{g,ref}$ είναι η οριζόντια εδαφική επιτάχυνση αναφοράς, που ορίζεται με πιθανότητα υπέρβασης της σεισμικής δράσης 10% στα 50 χρόνια συμβατικής ζωής του έργου.
- α_g είναι η οριζόντια εδαφική επιτάχυνση.

δ. Σεισμική κλάση κτιρίου ορίζεται ως ο μέγιστος στόχος αποτίμησης ή ανασχεδιασμού που μπορεί να εξασφαλίσει ένα κτίριο για μια επιλεγείσα στάθμη επιτελεστικότητας. Η σεισμική κλάση κτιρίου για στάθμη επιτελεστικότητας Β («Σημαντικές Βλάβες») θεωρείται **βασική σεισμική κλάση**.

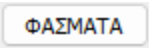
Based on the above table we can summarize that my level of performance determines m, q (elastic) and θu (inelastic) and my return period and exceedance probability determines the seismic acceleration αg.

The three valuation targets (or the three seismic classes) for a 10% earthquake are still called A1, B1, C1 and have a factor of one but the targets for a 50% earthquake are now called A3+, B3+, C3+ and have a factor of 0.45 (from 0.53 previously). Still the two basic seismic hazard categories are no longer 10% and 50% but 10% with a factor of 1 and 30% with a factor of 0.60 (the two lines in bold in the table).

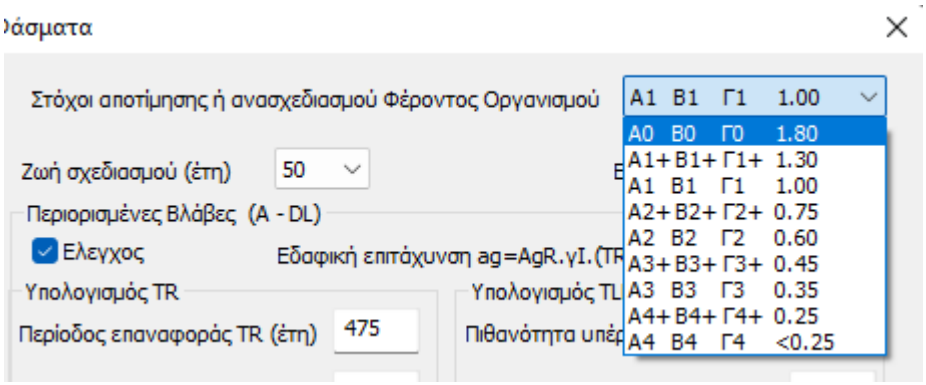
In the parameters of the 5 scenarios related to EIS there is now a new field for the ground acceleration that will be calculated and used based on the above table.

To start with, this field always has the same value as the initial ground acceleration of EC8- 1 to be used as the reference acceleration (ag,ref).

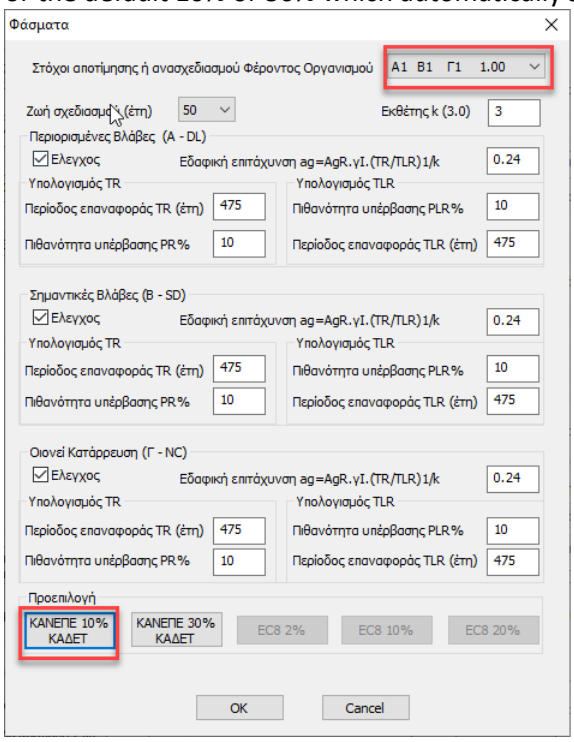
For the pushover:

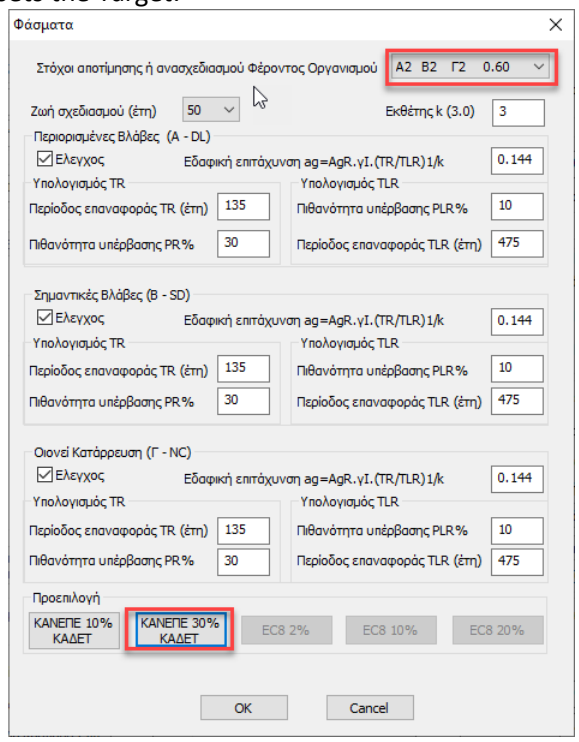
Going to the framework 

We select the seismic hazard category with the corresponding triad of seismic classes and the factor by which the initial reference ground acceleration will be multiplied in order to obtain the ground acceleration of the CANEPE

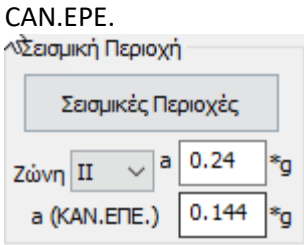


or the default 10% or 30% which automatically sets the Target:



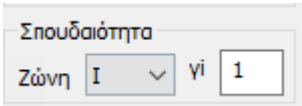


and returning to the initial parameters of the scenario in the field of ground acceleration CAN.EPE.



we see the value of the ground acceleration as it was calculated previously and as it will be used in the execution of the scenario for the calculation of the seismic action.

It is also noted that the γi used for the calculation of the seismic action always becomes 1 (from 0.8 which was before for the specific importance category) based on the following paragraph of the CANEPE.



Για πιθανότητα υπερβάσεως 10% εντός του συμβατικού χρόνου των 50 ετών λαμβάνεται υπόψη η σεισμική δράση του ΕΚ 8-1, ενώ για διαφορετική πιθανότητα υπερβάσεως εντός του συμβατικού χρόνου των 50 ετών λαμβάνεται υπόψη το ποσοστό της παραπάνω σεισμικής δράσεως του ΕΚ 8-1, σύμφωνα με τα διαλαμβανόμενα στην § 2.2. θεωρώντας αντίστοιχα σε όλες τις περιπτώσεις τον συντελεστή σπουδαιότητας γ_I ίσο με τη μονάδα.

(3η Αναθεώρηση 2022)

The script is now ready to run without even needing a spectrum update.

1.3.1 ΝΕΑ ΜΕΘΟΔΟΣ ΑΠΟΤΙΜΗΣΗΣ ΚΑΙ ΑΝΑΣΧΕΔΙΑΣΜΟΥ (ΚΑΝ.ΕΠΕ. 3η Αναθεώρηση 2022)

The new method of valuation and redesign that can be followed as an alternative to the one analysed above and applicable until now. This method applies only to buildings of importance I and II and only for the basic seismic class B.

Thus for buildings of importance I and II it follows:

1. wasuntil now with the PA2.1 table, i.e., whatever class your building belongs to, you must meet the minimum requirements of the table.

Πίνακας ΠΑ.2.1. *Ελάχιστοι ανεκτοί στόχοι αποτίμησης ή ανασχεδιασμού υφισταμένων κτιρίων.*

Κατηγορία Σπουδαιότητας	Ελάχιστοι Ανεκτοί Στόχοι
I	Γ2
II	Γ1
III	B1
IV	B1 και A2 (Ικανοποίηση **και** των δύο στόχων)

Σε κάθε περίπτωση να θεωρηθεί ότι ισχύει A1>A2, B1>B2, Γ1>Γ2, A1>B1>Γ1 και A2>B2>Γ2

2. The new possibility given to you by the PA2.2 table where, after determining the basic seismic class to which your building belongs, it is enough to go up one basic seismic class and this class must be **higher or at least equal to** the minimum of the PA2.2 table, <u>but after going up one class</u>.

Πίνακας ΠΑ.2.2. *Ελάχιστες βασικές σεισμικές κλάσεις υφισταμένων κτιρίων σπουδαιότητας I και II.*

Εφαρμοσθέντες Κανονισμοί Μελέτης και Κατασκευής	Ελάχιστη Βασική Σεισμική Κλάση Κτιρίου
…<1985	B3
1985≤…<1995	$B3^+$
1995≤…	$B2^+$

The above will be understood with an example

EXAMPLE
Building after 1995 Significance II

1. I do not specify its seismic class (I am not interested) and I am pursuing the minimum evaluation or redesign target C1 (as it was until now)

Πίνακας ΠΑ.2.1. *Ελάχιστοι ανεκτοί στόχοι αποτίμησης ή ανασχεδιασμού υφισταμένων κτιρίων.*

Κατηγορία Σπουδαιότητας	Ελάχιστοι Ανεκτοί Στόχοι
I	Γ2
II	Γ1
III	B1
IV	B1 και A2 (Ικανοποίηση **και** των δύο στόχων)

Σε κάθε περίπτωση να θεωρηθεί ότι ισχύει A1>A2, B1>B2, Γ1>Γ2, A1>B1>Γ1 και A2>B2>Γ2

2. I identify the existing basic seismic class which is, for example, B2.
I need to move up at least one class, i.e. go to B2+ and I need to
is higher than minimum of table PA2.2, which for our example is B2+ but improved by one class, i.e. B1. So the target is B1.

Πίνακας ΠΑ.2.2. *Ελάχιστες βασικές σεισμικές κλάσεις υφισταμένων κτιρίων σπουδαιότητας I και II.*

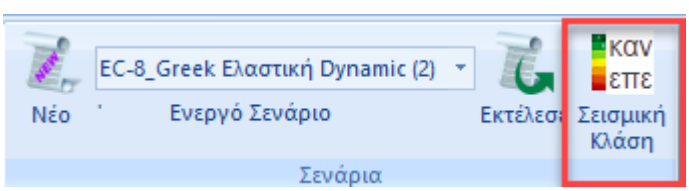
Εφαρμοσθέντες Κανονισμοί Μελέτης και Κατασκευής	Ελάχιστη Βασική Σεισμική Κλάση Κτιρίου
…<1985	B3
1985≤…<1995	B3+
1995≤…	B2+

Πίνακας 2.1. Στόχοι αποτίμησης ή ανασχεδιασμού Φέροντος Οργανισμού.

$\alpha_g / \alpha_{g,ref}$	Στάθμη Επιτελεστικότητας Φέροντος Οργανισμού		
	Α «Περιορισμένες Βλάβες»	Β «Σημαντικές Βλάβες»	Γ «Οιονεί Κατάρρευση»
1.80	**A0**	**B0**	**Γ0**
1.30	**A1+**	**B1+**	**Γ1+**
1.00	**A1**	**B1**	**Γ1**
0.75	**A2+**	**B2+**	**Γ2+**
0.60	**A2**	**B2**	**Γ2**
0.45	**A3+**	**B3+**	**Γ3+**
0.35	**A3**	**B3**	**Γ3**
0.25	**A4+**	**B4+**	**Γ4+**
<0.25	**A4**	**B4**	**Γ4**

Comparing the two cases and assuming approximately that B and C classes diagonally are approximately the same, C1 corresponds approximately to B2+. So the second method will give me less favourable results than the first.
In general, the second, new method favours older and weaker buildings while the existing method favours newer ones.

1.3.1 Σεισμική Κλάση

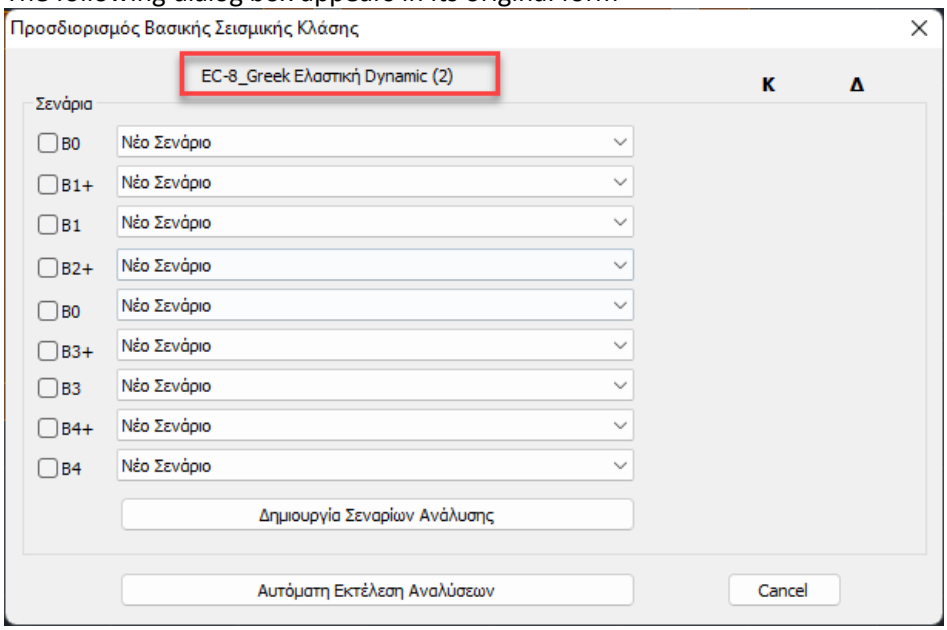


For the second method in which the determination of the basic seismic class is initially required, the designer can initially by testing and selecting one by one the basic seismic classes (those corresponding to the B level of performance) to determine the class of the building, i.e. the seismic action for which the existing reinforcement is sufficient and all the checks according to CEE.EPE.

An automatic procedure was therefore created in the program, during which the designer first selects as active the scenario on the basis of which analysis scenarios corresponding to the basic seismic classes will be automatically reproduced, i.e. scenarios which will have the same parameters as the basic scenario and with the only difference from it being the spectral acceleration, which varies depending on the seismic class.
The dialog box for this function is opened by pressing the "Seismic Class" button

Warning: before using the command you must ensure that the scenario is active, which will form the basis of the automatic generation of the scenarios for the basic seismic classes that we will see later.

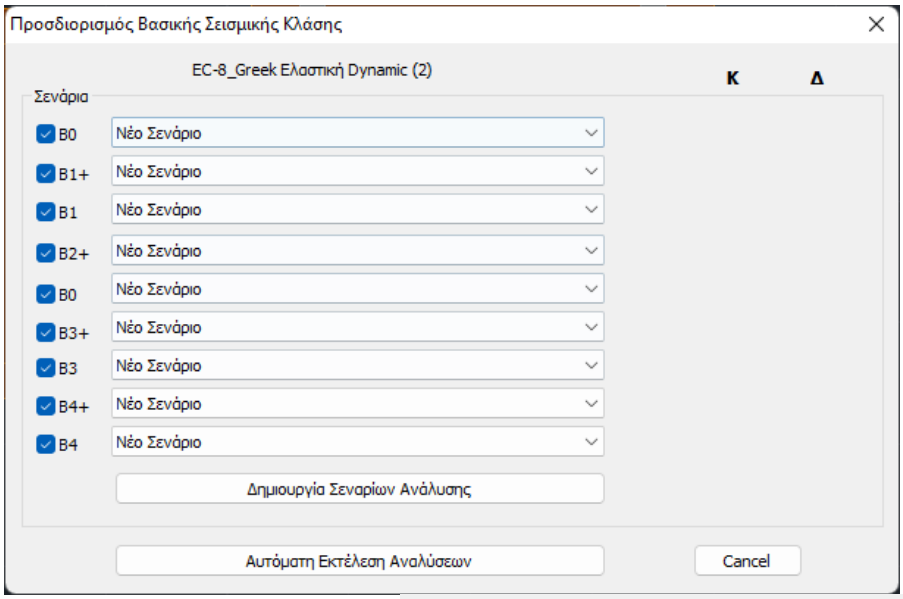
The following dialog box appears in its original form

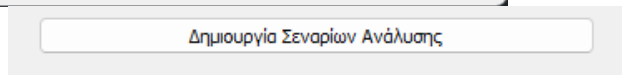


The red box shows the name of the scenario that will be the basis for the creation of the scenarios.
The function of the dialogue window is twofold: **Automatic** and "**manual**".

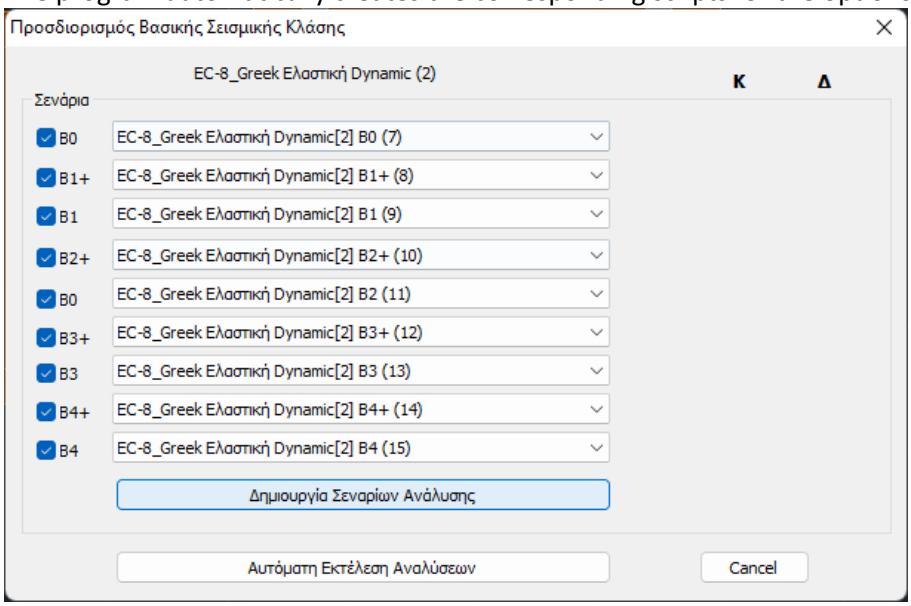
- Let's first look at the **Automatic mode:**

You choose for which basic seismic class(es) you want to create scenarios
by checking the corresponding options (one, several or all)

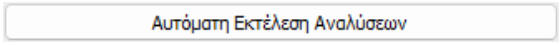


Then press the button 

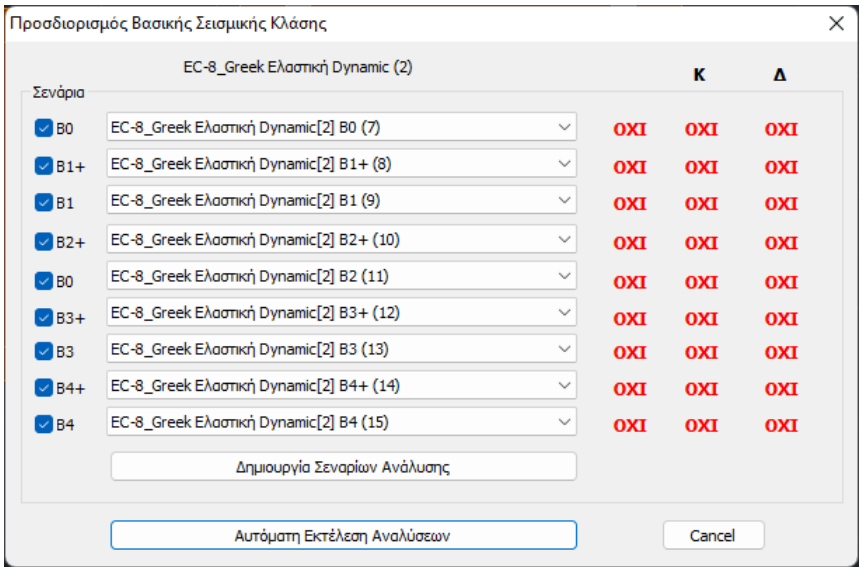
The program automatically creates the corresponding scripts for the options you have checked.



The name of each scenario is the name of the base scenario with the addition of the respective base seismic class at the end.

Then selecting the button 

the program automatically runs the scenarios and displays next to each scenario with "YES" or "NO" the capacity of the beam in bending "K", shear "D" and overall (first column, untitled).



OBSERVATIONS:

- If you do not want to run all scenarios from the beginning, start by running only the scenario of the lowest seismic class B4, and if this scenario is sufficient, you start to climb. If B4 is not sufficient, there is no point in performing the rest.
- In the above example there is no adequacy for any basic seismic class so that its basic seismic class is determined on the basis of the minimum basic seismic class seismic class of the building in the following table

Πίνακας ΠΑ.2.2. *Ελάχιστες βασικές σεισμικές κλάσεις υφισταμένων κτιρίων σπουδαιότητας Ι και ΙΙ.*

Εφαρμοσθέντες Κανονισμοί Μελέτης και Κατασκευής	Ελάχιστη Βασική Σεισμική Κλάση Κτιρίου
…<1985	B3
1985≤…<1995	$B3^+$
1995≤…	$B2^+$

That is, depending on the year of manufacture, one class above the one indicated. In our example, if the building is built after 1995, the table indicates B2+ so the redesign of the building will be for B1+.

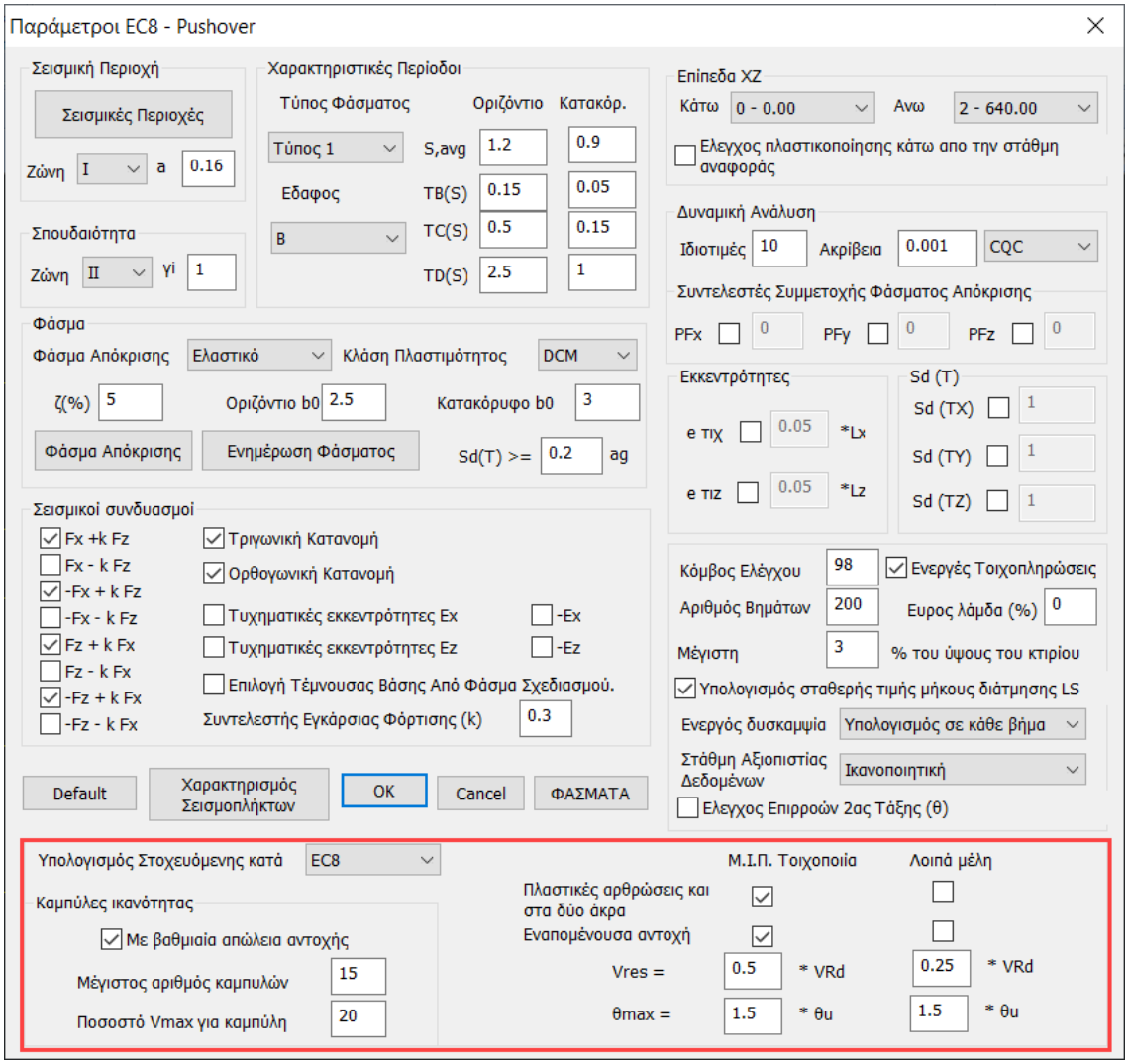
- The above procedure can be used for elastic static and dynamic scenarios as well as for inelastic analysis.

- Finally, the **manual way of using** this feature is that you have the option, from the list of scenarios that appear in any basic seismic class to select any CAN.EPE. scenario of elastic or inelastic analysis, run it and see briefly if there are failures in bending and/or shear without having to refer to the detailed printout of the adequacy ratios or the colour gradations.

1.3.2 Μέθοδος του Ισοδύναμου Πλαισίου

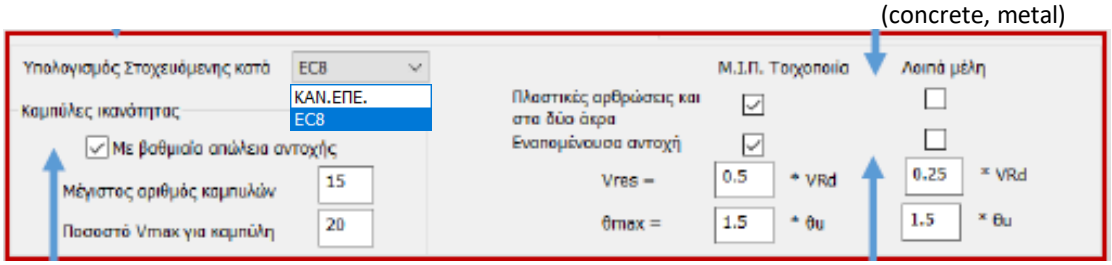
1.3.2.1 Elements of Resilient Structural Analysis in load-bearing masonry buildings simulated by the Equivalent Frame Method

The simulation of load-bearing masonry with finite surface elements is the most accurate method but it is not suitable for the inelastic analysis of the structure. In this case, the MIP simulation method is recommended.



Calculation of Targeted v:

The field refers to : Masonry members / Other members (concrete, metal)



Selection of Capacity Curves with Branches

Residual strength after lamination Falling

The following concepts are mainly related to masonry using the Equivalent Frame Method

- **With gradual loss of strength**

It means the creation of "descending branches" (necessary for masonry)

Explanation: The 1st curve starts and stops when a limb becomes Red Then, a hinge is applied to the limb and the 2nd curve starts.

- **Maximum number of curves**

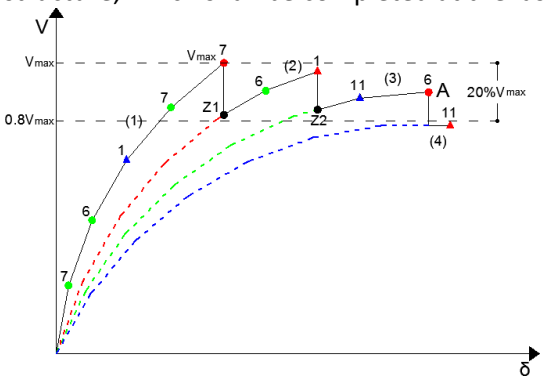
The maximum number of downward branches to be created is set

- **Percentage Vmax for curve**

The range for calculating the final curve is defined.

Explanation: Gradually branches (2), (3) and (4) arise and the girder reaches the limit state in which the reduction of the base shear is greater than 20% of the maximum base shear that had developed in the girder, Vmax It is noted that branch

(4) which is entirely below the 20 % limit shall not be included in the final capacity curve of the structure, which shall be completed at the last point of curve (3).



- **Plastic joints at both ends** Means the creation of a plastic joint at the other end of the member (necessary for masonry)

-Remaining strength:

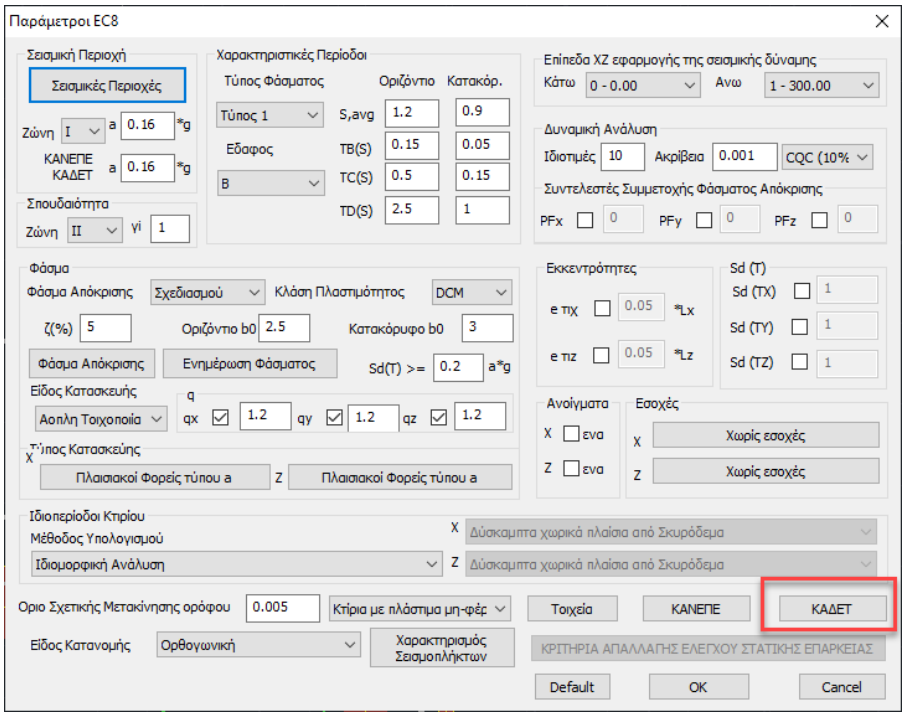
It means that a residual strength at the end of the failed member will be taken into account,

-with lower resistance Vres, but

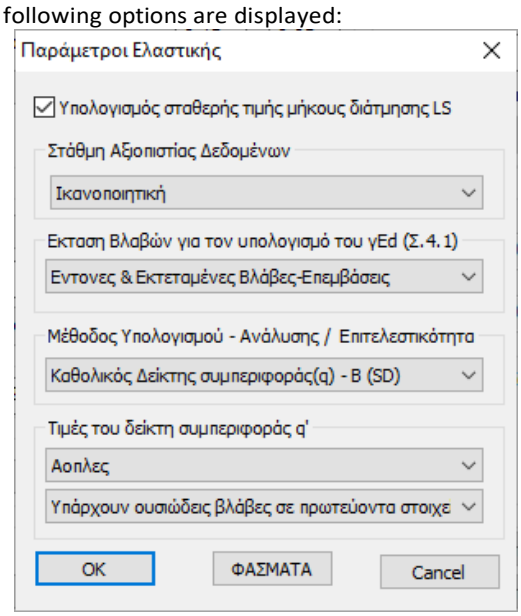
-with a larger θmax

More about the Equivalent Frame Method in Manual ***F. Masonry with the Equivalent Frame Method***

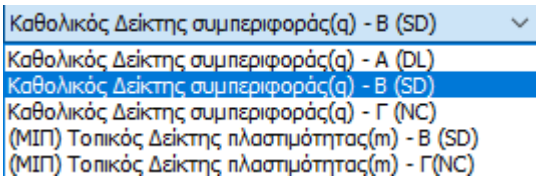
1.3.2.2 Elastic Dynamic Analysis of load-bearing masonry using the Equivalent Frame Method



In the analysis parameters of an EC8 - Greek Elastic Dynamic scenario the parameters of the KADET can be set by pressing the corresponding button.
The following options are displayed:



There you set the data confidence level, as well as the extent of the damage for the calculation of gEd.
In the calculation method of the analysis you have the options of global behaviour index q with performance levels A-C, as well as local ductility index m for levels B and C.



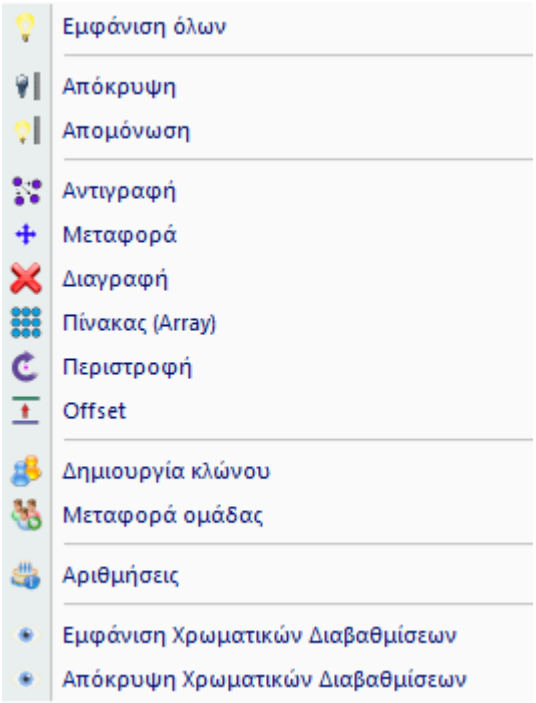
Notes: Local plasticity index options can ONLY be applied to MIP and not to finite surface element modeling.

Once the above is completed, then the spectrum and the q-indices are automatically updated.

Note that in order to update the analysis data in the sizing, it is necessary, in addition to saving the combinations, to press the "Check" button.

1.3.3 Εμφάνιση Χρωματικών Διαβαθμίσεων

In SCADA Pro the color gradation has been added to the Analysis for the adequacy purposes related to the valuation according to CAN.EPE.
Right-clicking on the desktop displays the following menu:



and selecting Show Color Gradients depending on the analysis scenario that is active displays the corresponding sizes. These sizes are then analysed divided into two categories:
Elastic analysis scenarios
Elastic Static
Elastic Dynamic

Static pre-testing
Dynamic pre-testing

Anelastic analysis scenario
All the ratios shown in the illustrations below are corresponding ratios printed in the issue.
Let's take a closer look at the above cases:

1.3.3 (Σ2) Σενάρια Ελαστικής ανάλυσης

- **Beams**

As regards the beams, two values shall be calculated for the deficiency indices λ at the beginning and at the end of the beam member:

- Inadequacy indicators λ (Bending) for positive torque **(+)**
- Inadequacy indicators λ (Bending) for negative torque **(-)**
- Deficiency indices λ (Bending) **Max** (the maximum of the two above)

Data behaviour

- Indicators of inadequacy λ (Shear) for **Ved/Vrdmax** ratio
- Indicators of inadequacy λ (Shear) for **Ved/Vrd** ratio
- Indicators of inadequacy λ (Shear) **Max**

- **Pillars**

For columns, two values shall be calculated for the deficiency indices λ in the beginning and end of the member of the pillar:

- Inadequacy indicators λ (Bending) for positive torque **(+) y**
- Inadequacy indices λ (Bending) for negative torque **(-) y**
- Inadequacy indicators λ (Bending) **Max y** (the maximum of the two above)
- Inadequacy indicators λ (Bending) for positive torque **(+) z**
- Inadequacy indices λ (Bending) for negative torque **(-) z**
- Deficiency indices λ (Bending) **Max z** (the maximum of the two above)
- Inadequacy indicators λ (Shear) for **Ved/Vrdmax y** ratio
- Inadequacy indicators λ (Shear) for **Ved/Vrd y** ratio
- Inadequacy indicators λ (Shear) **Max y** (the maximum of the two above)
- Inadequacy indicators λ (Shear) for **Ved/Vrdmax** ratio **z**
- Inadequacy indicators λ (Shear) for **Ved/Vrd** ratio **z**
- Deficiency indices λ (Shear) **Max z** (the maximum of the two above)

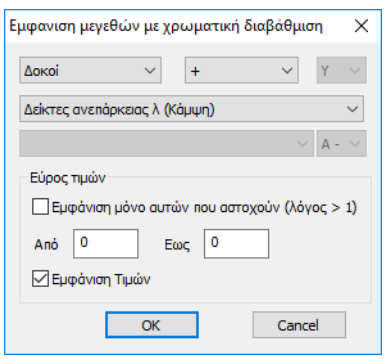
Data behaviour

OBSERVATION:

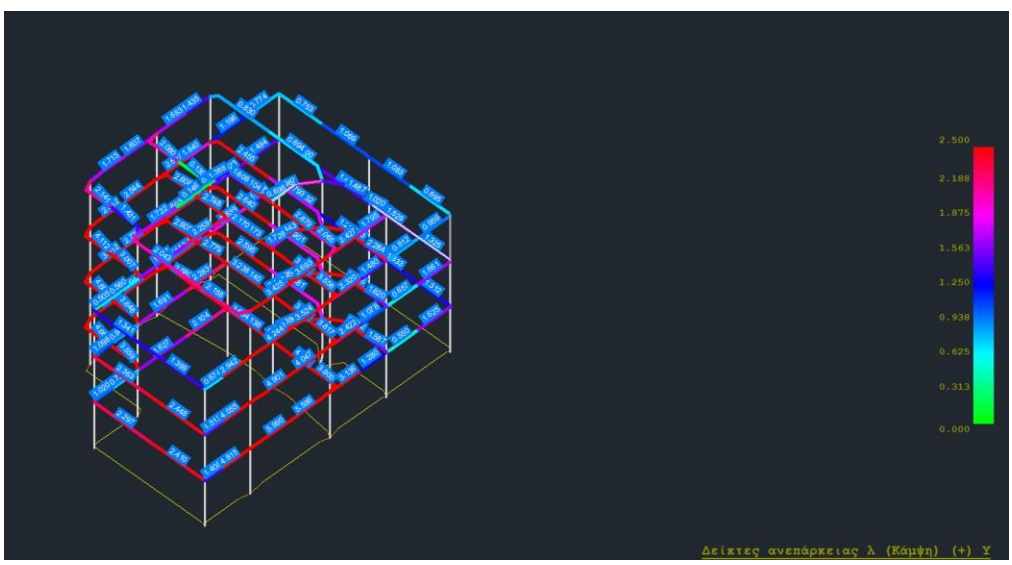
⚠️ A prerequisite for the above reasons to occur is that you have called the Controls after the script has been run. When switching between scripts you must always press the Combinations button and then "Default".

EXAMPLE:

In the example below with the **Dynamic Pre-Check** script active, on the desktop and select:



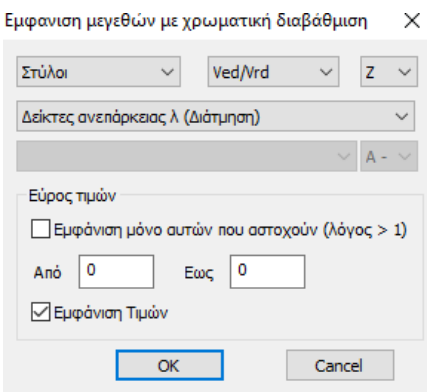
the image of the operator is as follows:



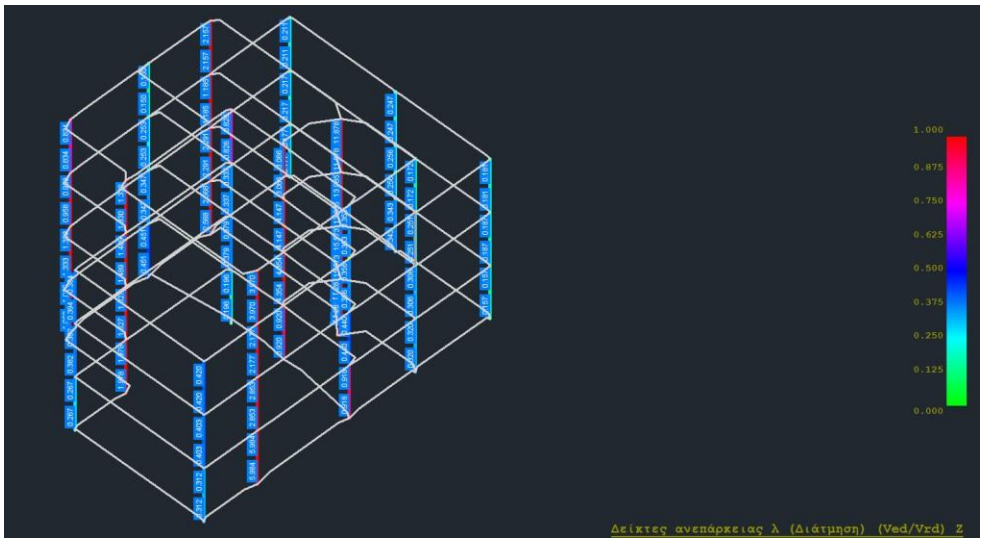
It should be noted at this point that in the preliminary test scenarios (Pretest Static and Pretest Dynamic) the limit of λ is 2.5.

With the **Elastic Dynamic** scenario active, let's say you want to display for the columns the inadequacy indices λ (Shear) for **Ved/Vrd** ratio **z.**

Selecting:



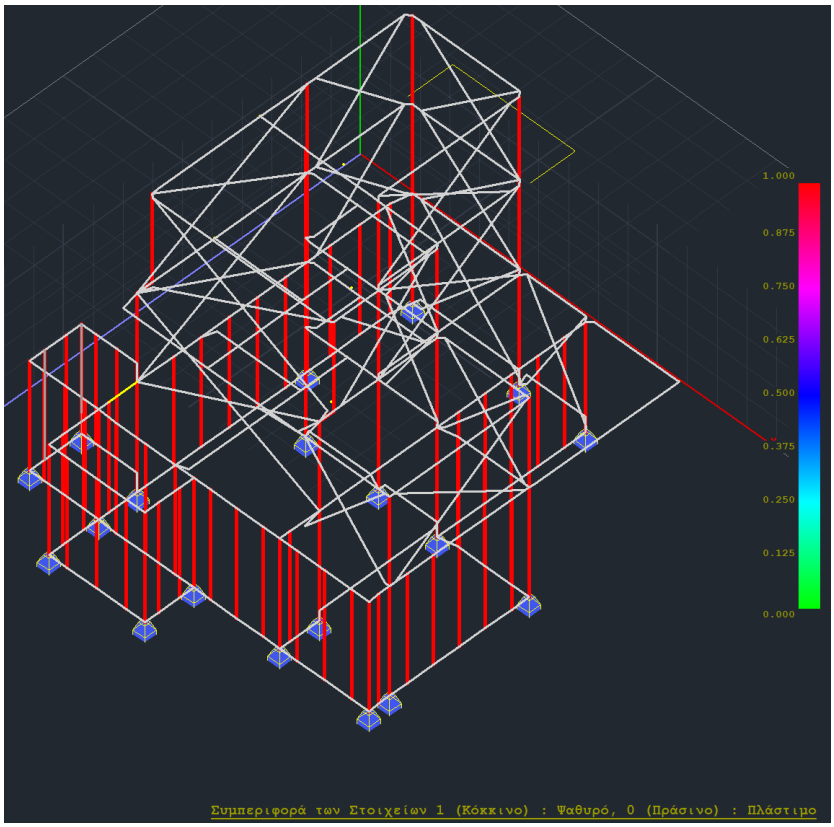
you will get the following picture :



It should be noted that in the Elastic Static and Elastic Dynamic scenarios the limit of λ is 1.

In the new version of SCADA Pro, a new dimension, the behavior of beams and columns, has been added to the display of color gradients.

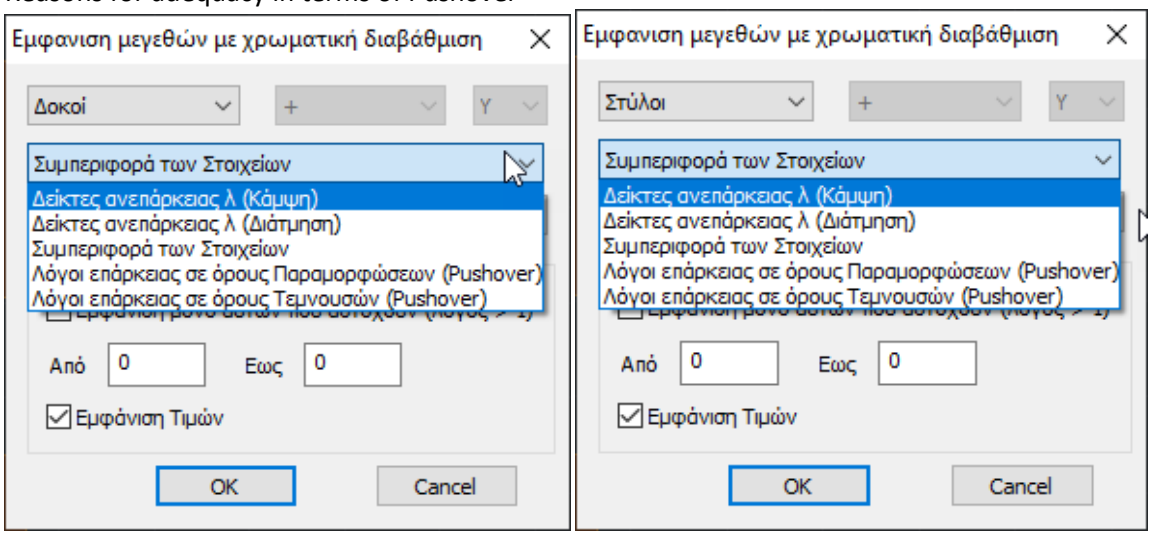
Each end of the beam or the substructure is now painted in red or green depending on whether it fails laterally (dominant size is bending) or laterally (dominant size is shearing) according to the criteria for the behaviour of the elements provided by the CEE.



1.3.3 (Σ3) Σενάριο Ανελαστικής Ανάλυσης

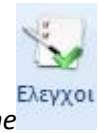
For the pushover scenario both beams and columns, two values are calculated for the capacity ratios at the beginning and at the end of member:
Sufficiency ratios in terms of Pushover (2 values, start - end) Element behaviour

Reasons for adequacy in terms of Pushover

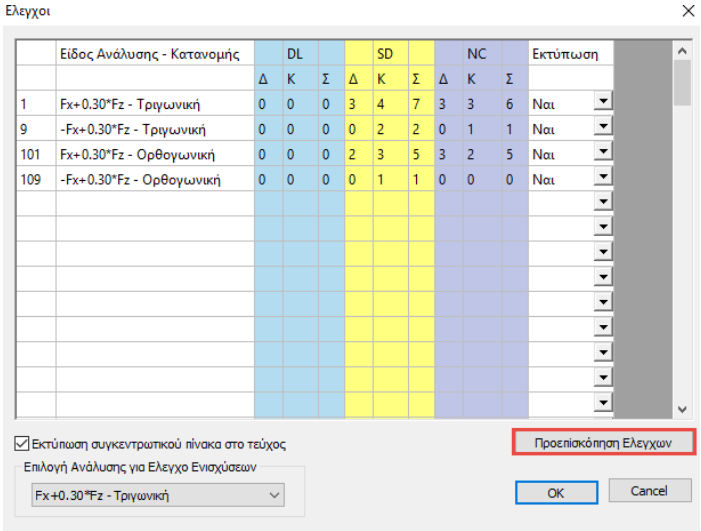


OBSERVATION:

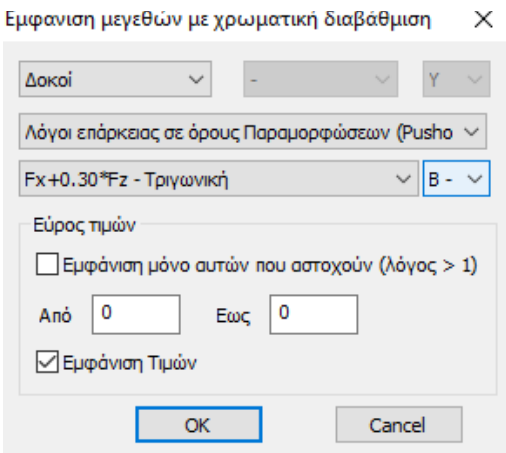
A prerequisite for the above reasons to appear is that you have gone through Controls Preview

located by clicking on the 

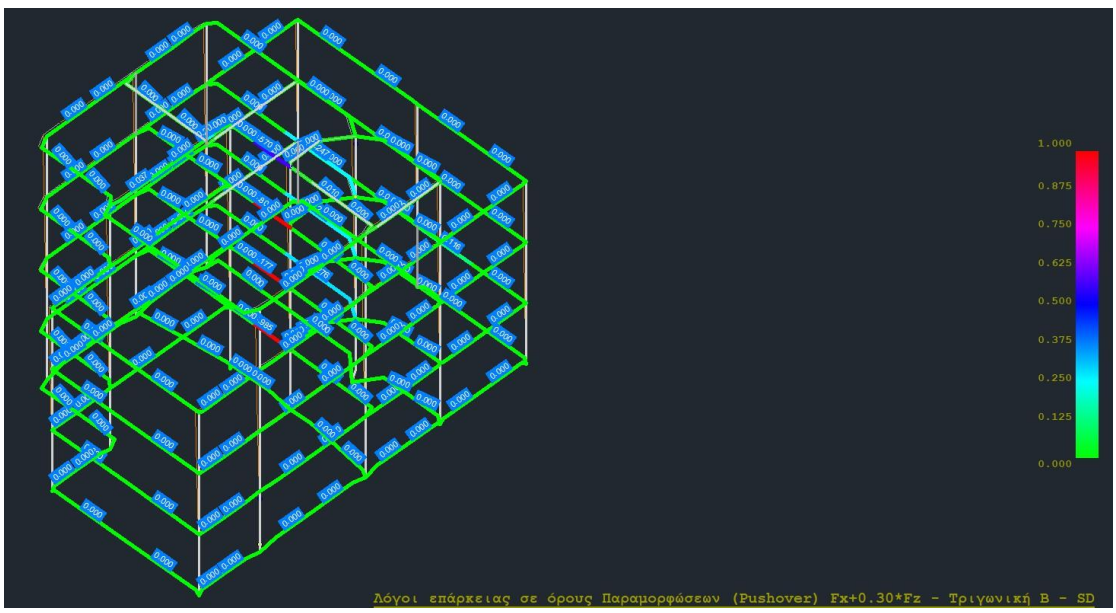
button:



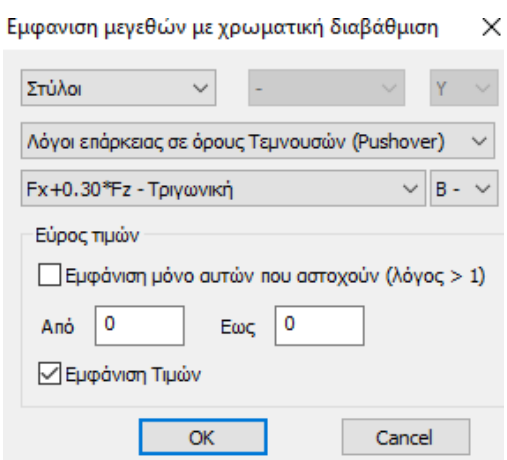
So having the inelastic analysis scenario active, in the familiar dialogue box by selecting:



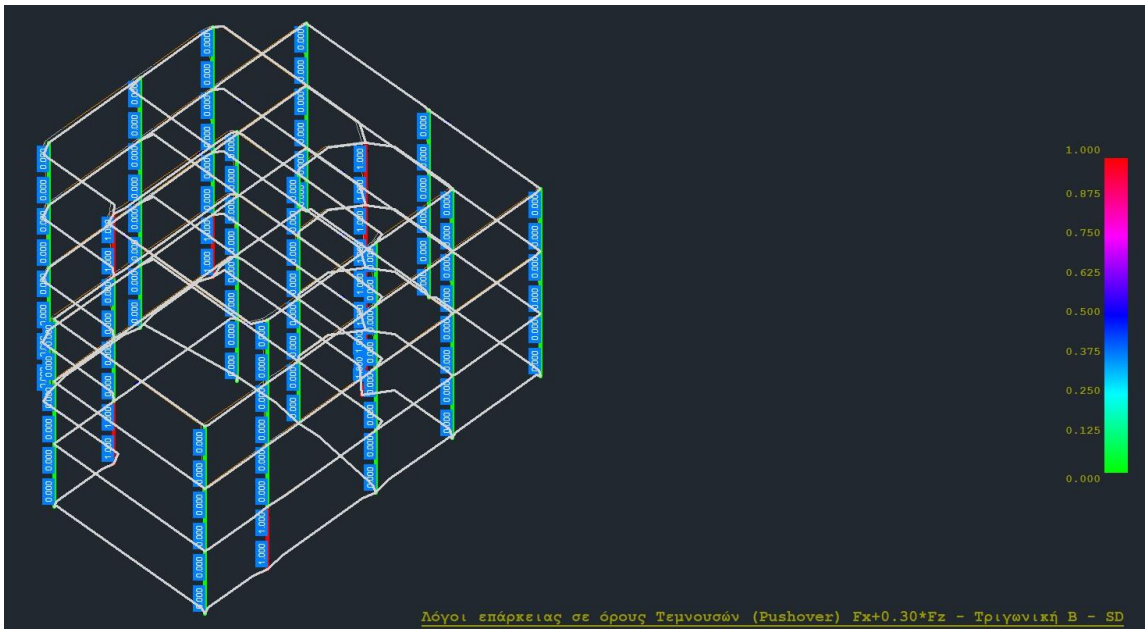
you will get the following picture:



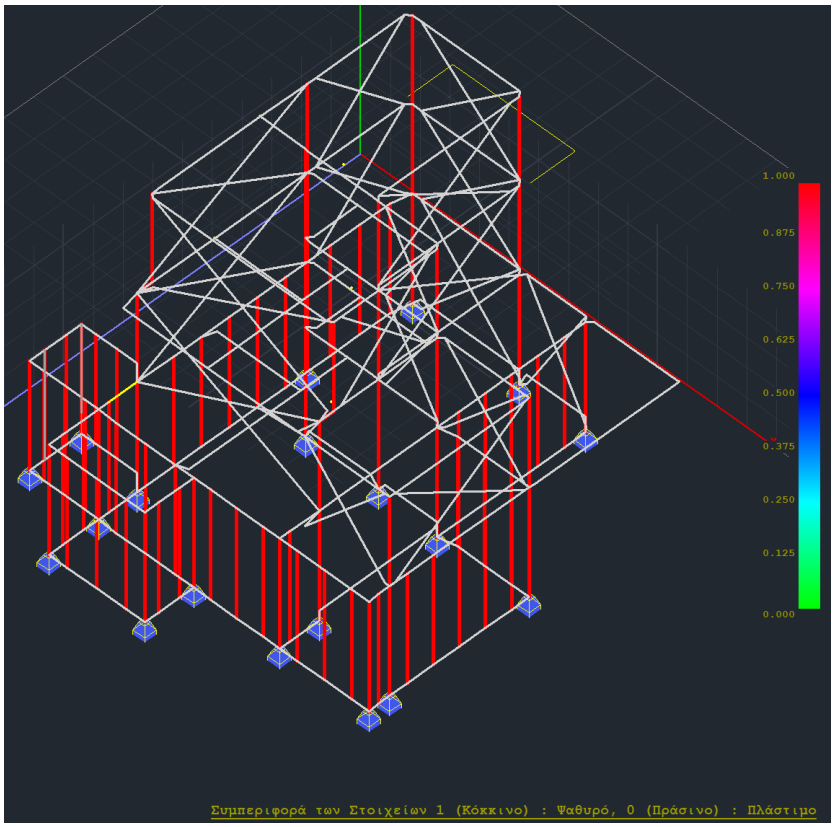
Follow the same procedure for the columns:



and you will get the following picture :



In the new version of SCADA pro, a new dimension, the behaviour of beams and columns, has been added to the display of colour gradients. Each end of a beam or column is now painted in red or green depending on whether it fails laterally (dominant magnitude is bending) or laterally (dominant magnitude is shearing) according to the criteria for the behaviour of the elements provided by the CEE.



OBSERVATIONS :

The direction is disabled which means you cannot select it. However, the ratios are calculated internally for each direction and the highest one is taken into account and displayed (as in the corresponding printout)

For performance level A you will not see a reason as a result. You will see either the value 0 (green) or the value 1 (red). This is because, as is well known, failure at A means a non-zero value of the rotation angle of the plastic joint.

As for the cutting capacity check, here too you do not have reasons but two values, the value 0 (green) which means that for the given level of performance the cutting capacity has not exceeded any of the strengths according to CAN.EPE and the value 1 (red) which means that one of the reasons is greater than one.

Σ4. Ανάλυση EC-8_Greek και Τύπο Time History Linear

The dynamic analysis using time histories refers to the stepwise solution of the equations of motion of the structure and takes into account the variation of the response of the structure over time. A load is imposed on the structure, which results from the movement of the ground during seismic excitation. This load is usually imposed in the form of an acceleration at the base of the structure. For this purpose, accelerograms of recorded seismic events are used, which contain the value of the ground acceleration at each moment in time.

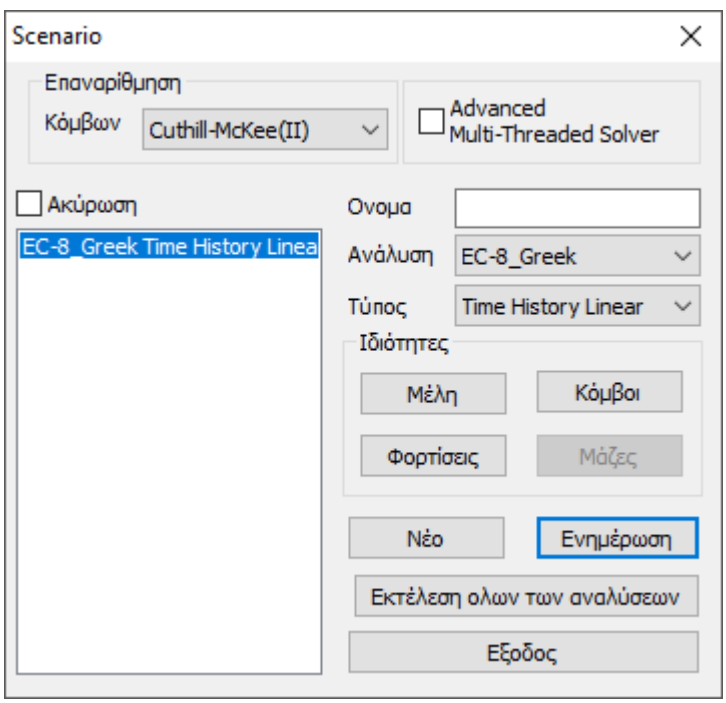
The implementation of linear dynamic analysis with time histories in SCADA Pro starts with the definition of the Analysis Scenarios for the current construction design regulations implemented in SCADA Pro (e.g. EC8, CEE 2012).

Select **EC-8_Greek** Analysis and **Time History Linear** Type and press the *New* button.

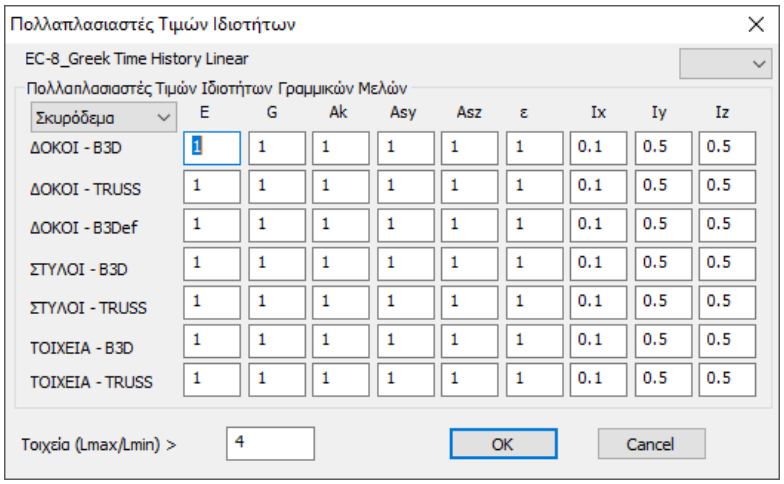
A prerequisite *for running all analysis scenarios with* ***Time History Linear*** *Type is:*

- ***the existence of armaments; and***
- ***the calculation of the corresponding strength moments.***

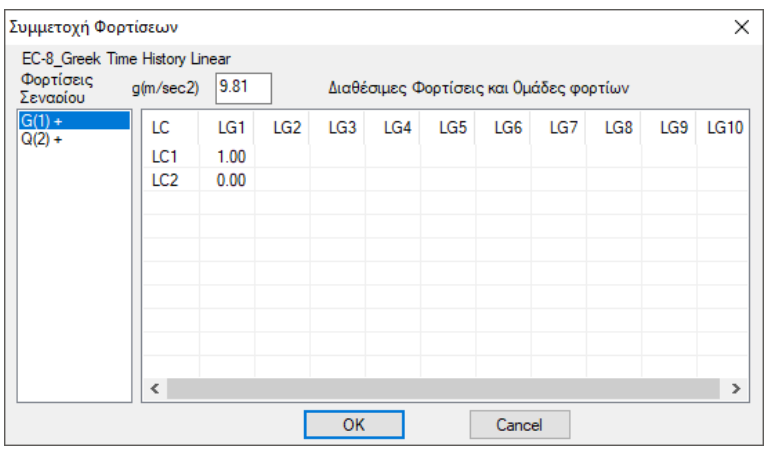
The **EC-8_Greek Time History Linear** scenario is no different from the **EC-8_(Italia, Cyprus, Austria, General) Time History Linear.**



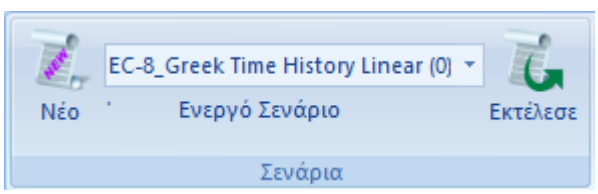
- In **Members** the Multipliers are automatically updated and populated with the EC8 coefficients.



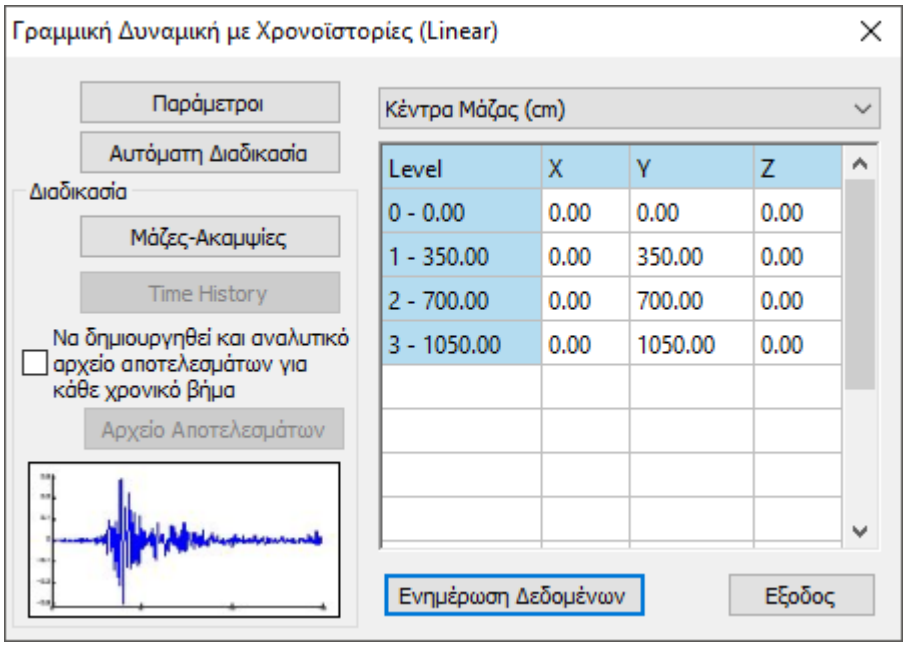
- In the **Loadings**, for G, set the unit to LC1 (permanently) and for Q, set the unit to LC2(mobile) and press the Update button.



With the **EC-8_Greek Time History Linear** script active,



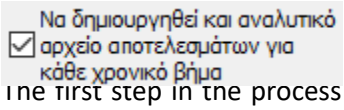
- The **Run** command opens the window for running the script and by pressing ***Update Data***, the commands are activated:



The process shown in the above window includes 3 steps:

- Definition of the parameters of the analysis.
- Calculation of the masses and stiffnesses of the members of the carrier.
- Perform dynamic analysis for the selected accelerograms.

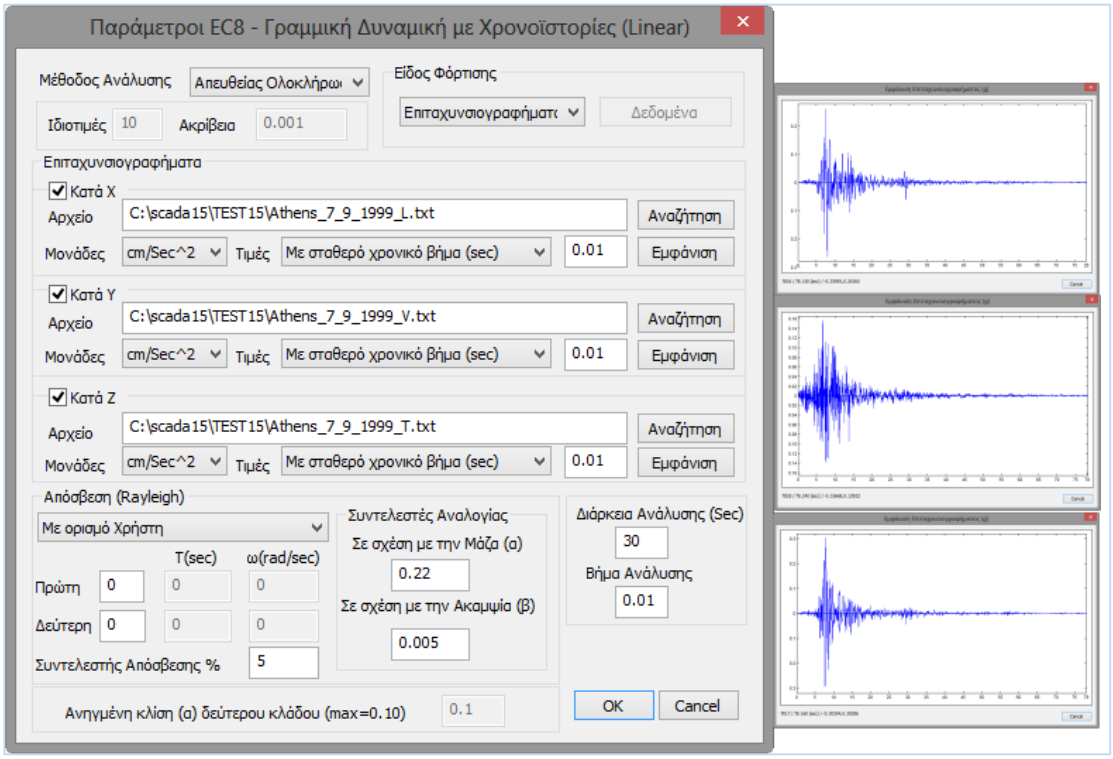
Steps 2 and 3 are performed either sequentially by selecting one by one the keys, "Masses - Rigidities" and "Time History", or automatically by selecting the "Automatic Process" button.



Select to create the detailed results file in the study analysis folder.

The first step in the process that precedes the analysis is the definition of its parameters. The definition of the parameters is done through the following window of the SCADA Pro application:

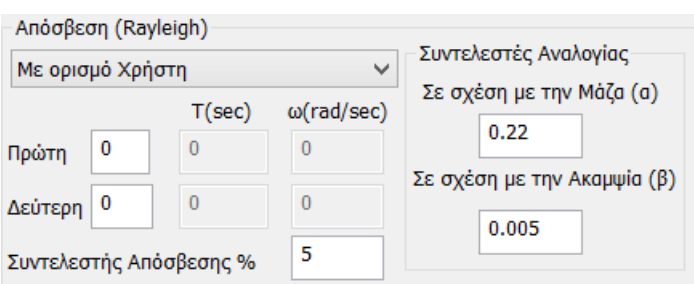
The implementation of linear dynamic analysis with time histories in SCADA Pro starts with the definition of the Analysis Scenarios for the current construction design regulations implemented in SCADA Pro (e.g. EC8, CEE 2012).



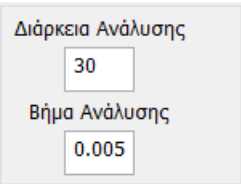
More specifically, in the "**Accelerograms**" section, the designer selects the directions in which the seismic excitation acts, having the possibility to choose from one to three directions by selecting the corresponding icon "X", "Y" or "Z".

The user must then enter the corresponding seismic excitation log file through the "Search" function. This file must be in .txt format and contain in one column the ground acceleration values for each time step. The user must also select the units of measurement of the ground acceleration and the time step of the recording.

Finally, it is possible to display each accelerogram via the "Show" button.



In the next section "Rayleigh damping" the designer is asked to select the parameter values for the Rayleigh damping register. In particular, the damping coefficient must be defined, as well as the two eigenmodes on which this coefficient will be imposed.
Using these parameters the program calculates the values of the coefficients a and b for the Reyleigh damping register.



Finally, the duration of the analysis and the time step to be used must be defined.

OBSERVATIONS:
It should be noted that the time duration and the time step of the analysis do not necessarily have to be the same as in the accelerogram.
In the case where the time step of the analysis is shorter than the step of the accelerogram then linear interpolation is performed between the two closest points.
In the case in which the time duration of the analysis is longer than the time duration of the accelerogram, then the vector will perform free oscillation for the remaining time.

After completing the input of the parameters, the user is returned to the original analysis run window where he can proceed to the next steps.

Results

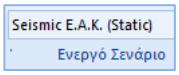
The commands in the "Results" field are very different whether they are Elastic Analysis scenarios or Inelastic Analysis scenarios.

2.1 Συνδυασμοί

The SCADA Pro includes inside it all the files of combinations for all Static and Dynamic scenarios of Elastic Analyses and Inelastic Analyses, as "**Predefined Combinations**".

Name	Date modified	Type	Size
eak-dyn.cmb	23/3/2010 1:27 μμ	CMB File	55 KB
eak-dyn-et.cmb	11/1/2010 5:12 μμ	CMB File	48 KB
eak-static.cmb	11/1/2010 5:11 μμ	CMB File	53 KB
Ec8-dyn.cmb	23/3/2010 1:22 μμ	CMB File	48 KB
Ec8-dyn-cypr.cmb	23/3/2010 1:22 μμ	CMB File	48 KB
Ec8-PushOver.cmb	13/5/2013 11:44 πμ	CMB File	7 KB
Ec8-static.cmb	23/3/2010 1:21 μμ	CMB File	53 KB
Ec8-static-cypr.cmb	23/3/2010 1:21 μμ	CMB File	53 KB
ita-dyn.cmb	23/3/2010 1:09 μμ	CMB File	48 KB
itaEc8-dyn.cmb	23/3/2010 1:18 μμ	CMB File	48 KB
itaEc8-static.cmb	23/3/2010 3:12 μμ	CMB File	53 KB
ita-static.cmb	23/3/2010 1:06 μμ	CMB File	53 KB
pal-static.cmb	27/2/2018 11:35 πμ	CMB File	3 KB
sbc-000.cmb	5/5/2017 4:35 μμ	CMB File	91 KB
sbc-001.cmb	5/5/2017 4:35 μμ	CMB File	91 KB
sbc-002.cmb	5/5/2017 4:15 μμ	CMB File	91 KB
sbc-003.cmb	5/5/2017 4:25 μμ	CMB File	91 KB

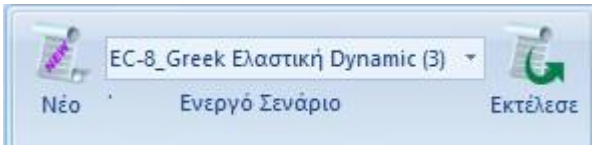
The predefined combinations refer to seismic scenarios. To create combinations of scenarios that do not contain an earthquake, both **automatic** and **manual** modes are available.

After running a seismic analysis scenario, its combinations are automatically generated by the program. By calling the command "Combinations" the table with the combinations of the active seismic scenario is opened.
The same is achieved by selecting the "Predefined Combinations" command, as the program will enter the combinations related to the active scenario of the seismic analysis 

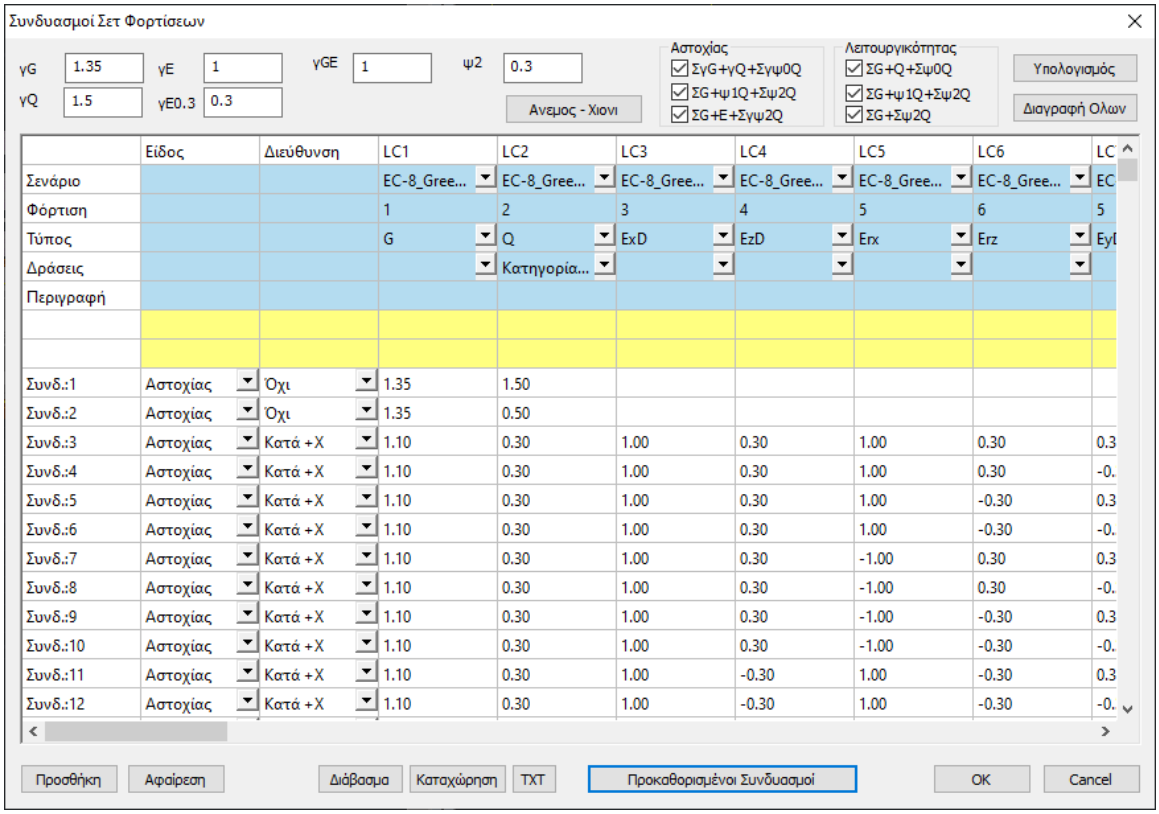
.
The predefined combinations of the "running" seismic scenarios of the analysis are automatically entered by the program.

2.1.1 Συνδυασμοί Σεναρίων σεισμικών Ελαστικών αναλύσεων

With the **Elastic** scenario active



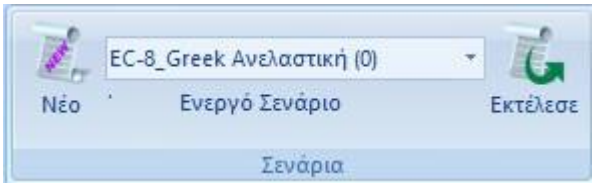
Press the command **Combinations** to open the Combinations window and Predefined Combinations to create the load combinations.



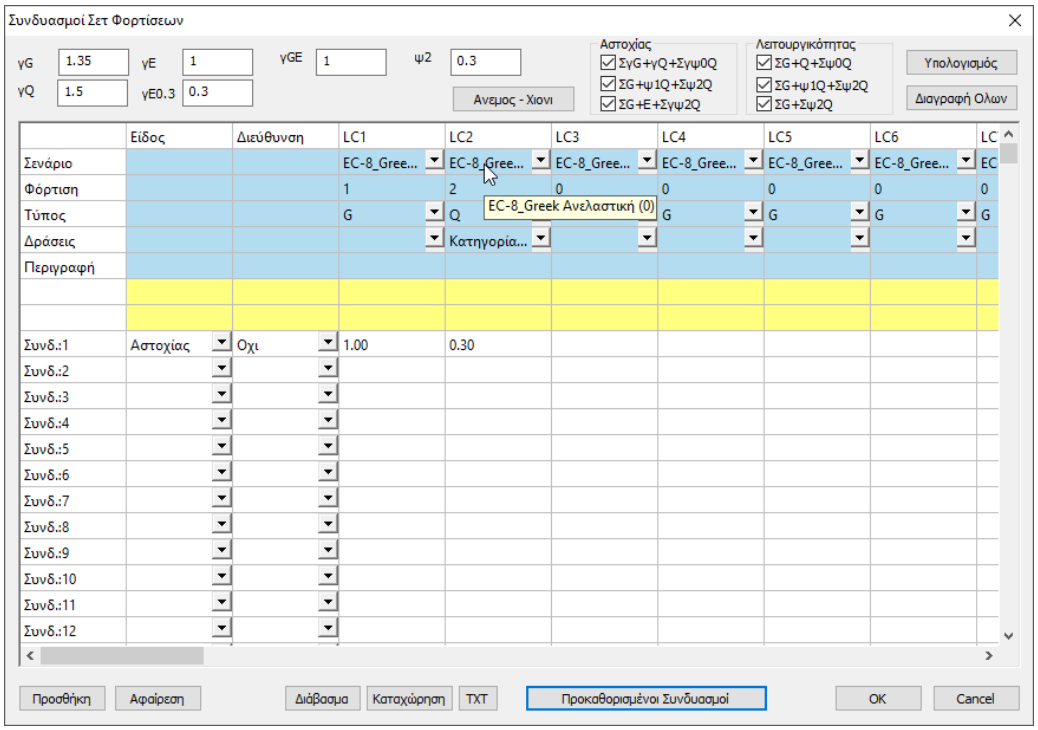
	Είδος	Διεύθυνση	LC1	LC2	LC3	LC4	LC5	LC6	LC
Σενάριο			EC-8_Gree...	EC-8_Gree...	EC-8_Gree...	EC-8_Gree...	EC-8_Gree...	EC-8_Gree...	EC
Φόρτιση			1	2	3	4	5	6	5
Τύπος			G	Q	ExD	EzD	Erx	Erz	Ey
Δράσεις				Κατηγορία...					
Περιγραφή									
Συνδ.:1	Αστοχίας	Όχι	1.35	1.50					
Συνδ.:2	Αστοχίας	Όχι	1.35	0.50					
Συνδ.:3	Αστοχίας	Κατά +X	1.10	0.30	1.00	0.30	1.00	0.30	0.3
Συνδ.:4	Αστοχίας	Κατά +X	1.10	0.30	1.00	0.30	1.00	0.30	-0.
Συνδ.:5	Αστοχίας	Κατά +X	1.10	0.30	1.00	0.30	1.00	-0.30	0.3
Συνδ.:6	Αστοχίας	Κατά +X	1.10	0.30	1.00	0.30	1.00	-0.30	-0.
Συνδ.:7	Αστοχίας	Κατά +X	1.10	0.30	1.00	0.30	-1.00	0.30	0.3
Συνδ.:8	Αστοχίας	Κατά +X	1.10	0.30	1.00	0.30	-1.00	0.30	-0.
Συνδ.:9	Αστοχίας	Κατά +X	1.10	0.30	1.00	0.30	-1.00	-0.30	0.3
Συνδ.:10	Αστοχίας	Κατά +X	1.10	0.30	1.00	0.30	-1.00	-0.30	-0.
Συνδ.:11	Αστοχίας	Κατά +X	1.10	0.30	1.00	-0.30	1.00	-0.30	0.3
Συνδ.:12	Αστοχίας	Κατά +X	1.10	0.30	1.00	-0.30	1.00	-0.30	-0.

2.4.1 Combinations of seismic anelastic analysis scenarios

With the **Resilient** scenario active and therefore the pushover,



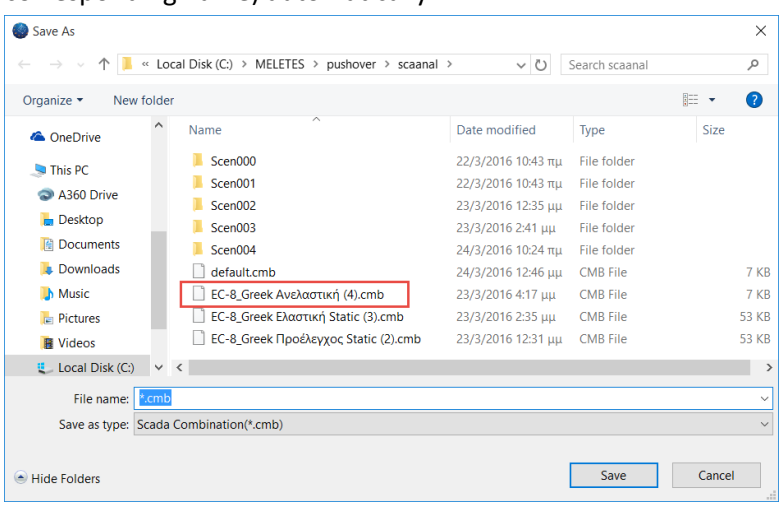
Press the ***Combinations*** command to open the combinations window, to create the combinations of loadings for fixed and mobile only <u>(2 loadings).</u>



OBSERVATION:

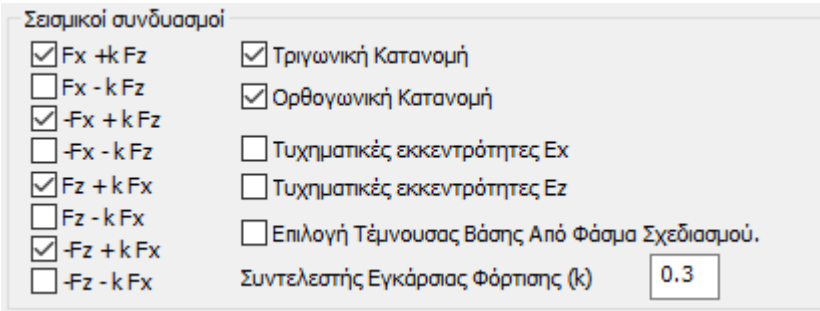
The coefficients of G and Q are automatically filled in according to the Data Reliability Level selected in Parameters, as long as you select Predefined Combinations.

The coefficients of the required failure combination are filled in and entered (with the corresponding name) automatically.



Then through the parameters of the Anelastic scenario in the section

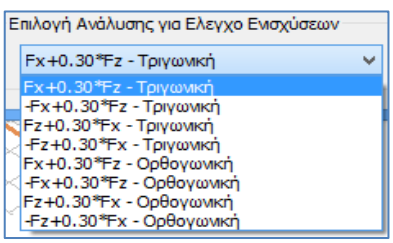
"***Seismic Combinations***"



We define the combinations for which inelastic analyses will be performed. Each combination means that a seismic force will be applied in the specific direction (x or z) with a factor of 1 and a seismic force in the transverse direction with a factor that you specify in the "*Transverse load factor*" field.
The default value is 0.3.

We also determine the type of distribution of the seismic force along the height of the building (triangular or rectangular). The CANPE requires both seismic distributions.
Also, if we want to take into account, in addition to the seismic forces, moments resulting from the accidental eccentricities, then we activate the fields "*Accidental eccentricities Eh and Ez*".

Then, for the sizing of aid, you should also define the combination and distribution in the "***Select analysis for aid control***" field of the "**Controls**" command (see **2.2 "Controls"**)



2.2 'Ελεγχοι

2.2.1 Έλεγχοι Σεναρίων σεισμικών Ελαστικών αναλύσεων EC-8 και Τύπο Static & Dynamic

EC-8_Greek Ελαστική Static (2)

EC-8_Greek Ελαστική Dynamic (3)

FROM RESULTS OF ELASTIC ANALYSIS
BY THE METHOD OF CATHOLIC CONDENSITY INDEX (q) BY
THE METHOD OF LOCAL FLATNESS INDEX (m)

It automatically opens a file that, for the "active analysis", contains the results of the checks:

Checking the Difference of Masses and Rigidity of Building Stations
(par.4.2.3.3.3.) 5.1.2.
Check average relative movement between floor nodes (par.5.5.2a(iii)) Check average relative movement by X between floors (par.5.5.2a(iv)) Check average relative movement by Z between floors (par.5.5.2a(iv)) And at the end the:
Critical indicators of structural failure l (paragraph 5.5.2(a)(i))

Κρίσιμοι Δείκτες Ανεπάρκειας λ δομικών στοιχείων (& 5.5.2α (i) ΚΑΝ.ΕΠΕ)

α/α Στάθμης	Συν/κο Υψός (m)	Δοκοί				Υποστυλώματα				Σύνολο			
		λ<=1.0		λ>1.0		λ<=1.0		λ>1.0		λ<=1.0		λ>1.0	
0	*0.000*	*0*	*0%*	0	0%	0	0%	0	0%	0	0%	0	0%
1	3.000	10	50%	0	0%	7	44%	1	6%	17	47%	1	3%
2	6.000	10	50%	0	0%	6	38%	2	13%	16	44%	2	6%
ΣΥΝΟΛΟ		20	100%	0	0%	13	81%	3	19%	33	92%	3	8%
ΣΗΜΕΙΩΣΗ: Για όλα τα στοιχεία πρέπει λ<=1.0.						Ο έλεγχος :				**Δεν Ικανοποιείτ.**			

This table summarises the elements that fail and need to be strengthened.
The above check of the indicators of inadequacy is done in terms of intensive quantities (bending moments).
The program calculates the bending indices λ for all structural elements (flat and flattened). At the same time, however, the categorisation of the elements into flat and loose elements is done. Based on the CEE, 3 criteria of fishiness are applied and if even one of the 3 is valid, the element is defined as fishy and the corresponding inadequacy index λ is calculated based on the shear forces.
This calculation is done regardless of whether the method of analysis is (m) or (q).

A detailed presentation of the failing elements and the analytical results of the sandy elements and the flat elements are presented in the prints section below.

Σελίδα : 1

ΑΠΟΤΕΛΕΣΜΑΤΑ ΕΛΑΣΤΙΚΗΣ ΑΝΑΛΥΣΗΣ

ΣΕΝΑΡΙΟ : ΜΕ ΤΗ ΜΕΘΟΔΟ ΤΟΠΙΚΩΝ ΔΕΙΚΤΩΝ ΠΛΑΣΤΙΜΟΤΗΤΑΣ(m)

Έλεγχος Διαφοράς Μαζών και Ακαμψιών Σταθμών Κτιρίου (παρ.4.2.3.3.)

α/α Στάθμης	Συν/κο Υψός (m)	Συν.Μάζα KN/g	Συνολικες Ακαμψιες Ki*10^3 (KNm)		Διαφορές Μαζών - Ακαμψιων (Mi+1-Mi)/Mi - (Ki+1-Ki)/Ki		
			(Ki-X)	(Ki-Z)	(ΔMi)	(ΔKi-X)	(ΔKi-Z)
1	3.000	135.516	4867.198	2168.954			
2	6.000	62.919	3893.758	1735.163	ελ. 0.53	ελ. 0.19	ελ. 0.19

Ο Έλεγχος ικανοποιεί τα Κριτήρια Κανονικότητας	
	ΝΑΙ
	ΟΧΙ

ΣΗΜΕΙΩΣΕΙΣ: *Μάζες : Η Αύξηση πρέπει <= 0.35 - Η Ελάττωση πρέπει <= 0.50*
Ακαμψίες : Η Αύξηση πρέπει <= 0.35 - Η Ελάττωση πρέπει <= 0.50

Σεισμική Τέμνουσα Τοιχωμάτων (Παρ. 5.1.2.)

Σεισμική Τέμνουσα Τοιχωμάτων — **Στάθμη Αναφοράς** 0 0.000(m)

α/α Στάθμης	Συνδ/μος	Τέμνουσα Τοιχ./Συνολική Τέμν. = nvx			ΕΠ./ΑΠ.	Συνδ/μος	Τέμνουσα Τοιχ./Συνολική Τέμν. = nvz			ΕΠ./ΑΠ.
		Τέμνουσα Τοιχωμάτων	Συνολική Τέμνουσα	nvx			Τέμνουσα Τοιχωμάτων	Συνολική Τέμνουσα	nvz	
1 ***	0	0.000	0.000	0.00	ΑΠ.	0	0.000	0.000	0.00	ΑΠ.
2	0	0.000	0.000	0.00	ΑΠ.	0	0.000	0.000	0.00	ΑΠ.

ΣΗΜΕΙΩΣΕΙΣ: **** = Στάθμη ελέγχου nv από κανονισμό*

Καθορισμός Συστήματος Κτιρίου

Διεύθυνση X:	Σύστημα Πλαισίων
Διεύθυνση Z:	Σύστημα Πλαισίων

Έλεγχος Μέσης Σχετικής Μετακίνησης μεταξύ κόμβων ορόφου (& 5.5.3.2α (iii) ΚΑΝ.ΕΠΕ)

α/α Στάθμης	Συνδ/μός		Σχετική Μετ/ση		Λόγοι Μετακινήσεων		Αποτελέσματα	
	x	z	x (mm)	z (mm)	x	z	x	z
1	0	0	0.00	0.00			Ικανοποιείται	Ικανοποιείται
2	0	0	0.00	0.00			Ικανοποιείται	Ικανοποιείται

ΣΗΜΕΙΩΣΗ *Οι λόγοι δε πρέπει να υπερβαίνουν το 1,5* — Ο έλεγχος : **Ικανοποιείται**

Έλεγχος Μέσης Σχετικής Μετακίνησης κατά X μεταξύ ορόφων (& 5.5.2α (iv) ΚΑΝ.ΕΠΕ)

α/α Στάθμης	Υπερκείμενος			Υποκείμενος			Λόγος	Λόγος	Αποτελέσματα
	Συνδ.	Σχετ. Μετ/ση (mm)		Συνδ.	Σχετ. Μετ/ση (mm)		di/di+1	di/di-1	
1	1	0.00	0.00	0	0.00	0.00			Ικανοποιείται
2	0	0.00	0.00	1	0.00	0.00			Ικανοποιείται

ΣΗΜΕΙΩΣΗ: *Οι λόγοι δε πρέπει να υπερβαίνουν το 1,5* — Ο έλεγχος : **Ικανοποιείται**

Έλεγχος Μέσης Σχετικής Μετακίνησης κατά Z μεταξύ ορόφων (& 5.5.2α (iv) ΚΑΝ.ΕΠΕ)

α/α Στάθμης	Υπερκείμενος			Υποκείμενος			Λόγος	Λόγος	Αποτελέσματα
	Συνδ.	Σχετ. Μετ/ση (mm)		Συνδ.	Σχετ. Μετ/ση (mm)		di/di+1	di/di-1	
1	1	0.00	0.00	0	0.00	0.00			Ικανοποιείται
2	0	0.00	0.00	1	0.00	0.00			Ικανοποιείται

ΣΗΜΕΙΩΣΗ: *Οι λόγοι δε πρέπει να υπερβαίνουν το 1,5* — Ο έλεγχος : **Ικανοποιείται**

Κρίσιμοι Δείκτες Ανεπάρκειας λ δομικών στοιχείων (& 5.5.2α (i) ΚΑΝ.ΕΠΕ)

α/α Στάθμης	Συν/κο Υψός (m)	Δοκοί				Υποστυλώματα				Σύνολο			
		λ<=1.0		λ>1.0		λ<=1.0		λ>1.0		λ<=1.0		λ>1.0	
0	*0.000*	*0*	*0%*	0	0%	0	0%	0	0%	0	0%	0	0%
1	3.000	10	50%	0	0%	7	44%	1	6%	17	47%	1	3%
2	6.000	10	50%	0	0%	6	38%	2	13%	16	44%	2	6%
ΣΥΝΟΛΟ		20	100%	0	0%	13	81%	3	19%	33	92%	3	8%

ΣΗΜΕΙΩΣΗ: *Για όλα τα στοιχεία πρέπει λ<=1.0.* — Ο έλεγχος : **Δεν Ικανοποιείτ.**

CHAPTER 8B 'ANALYSIS'

EC-8_Greek Προέλεγχος Static (4)

EC-8_Greek Προέλεγχος Dynamic (5)

RESULTS OF THE PRELIMINARY ANALYSIS FOR THE SELECTION OF THE TYPE OF ANALYSIS FOR THE VALUATION OF THE CONSTRUCTION

It automatically opens a for "active analysis". includes the results of the checks:

Checking the Difference of Masses and Rigidity of Building Stations
(par.4.2.3.3.3.) 5.1.2.
Average relative movement check between floor nodes (paragraph
5.5.5.2a(iii)) Average relative movement check by X between floors (paragraph
5.5.5.2a(iv)) Average relative movement check by Z between floors (paragraph
5.5.5.2a(iv)) Critical indicators of structural element failure l (paragraph 5.5.2
a(i)) Morphological Normality (paragraph 5.5.1.2)
Average floor area deficiency index per direction (paragraph 5.5.5.1.2(c))

								Σελίδα : 1
ΑΠΟΤΕΛΕΣΜΑΤΑ ΠΡΟΚΑΤΑΡΚΤΙΚΗΣ ΑΝΑΛΥΣΗΣ ΓΙΑ ΤΗΝ ΕΠΙΛΟΓΗ								
ΣΕΝΑΡΙΟ :	**ΤΟΥ ΕΙΔΟΥΣ ΤΗΣ ΑΝΑΛΥΣΗΣ ΓΙΑ ΤΗΝ ΑΠΟΤΙΜΗΣΗ ΤΗΣ ΚΑΤΑΣΚΕΥΗΣ**							
Έλεγχος Διαφοράς Μαζών και Ακαμψιών Σταθμών Κτιρίου								**(παρ.4.2.3.3.)**
α/α Στάθμης	Συν/κο Υψός (m)	Συν.Μάζα KN/g	Συνολικες Ακαμψιες Ki*10^3 (KNm)		Διαφορές Μαζών - Ακαμψιων (Mi+1-Mi)/Mi - (Ki+1-Ki)/Ki			
			(Ki-X)	(Ki-Z)	(ΔMi)	(ΔKi-X)	(ΔKi-Z)	
1	3.000	135.516	4867.198	2168.954				
2	6.000	62.919	3893.758	1735.163	ελ. 0.53	ελ. 0.19	ελ. 0.20	
Ο Έλεγχος ικανοποιεί τα Κριτήρια Κανονικότητας						ΝΑΙ		
						ΟΧΙ		
ΣΗΜΕΙΩΣΕΙΣ:	*Μάζες : Η Αύξηση πρέπει <= 0.35 - Η Ελάττωση πρέπει <= 0.50*							
	Ακαμψίες : Η Αύξηση πρέπει <= 0.35 - Η Ελάττωση πρέπει <= 0.50							

Σεισμική Τέμνουσα Τοιχωμάτων										**Παρ. 5.1.2.**
Σεισμική Τέμνουσα Τοιχωμάτων						**Στάθμη Αναφοράς**			**0 0.000(m)**	
α/α Στάθμης	Συνδ /μος	Τέμνουσα Τοιχ./Συνολική Τέμν. = nvx			ΕΠ./ ΑΠ.	Συνδ /μος	Τέμνουσα Τοιχ./Συνολική Τέμν. = nvz			ΕΠ./ΑΠ.
		Τέμνουσα Τοιχωμάτων	Συνολική Τέμνουσα	nvx			Τέμνουσα Τοιχωμάτων	Συνολική Τέμνουσα	nvz	
1 ***	0	0.000	0.000	0.00	ΑΠ.	0	0.000	0.000	0.00	ΑΠ.
2	0	0.000	0.000	0.00	ΑΠ.	0	0.000	0.000	0.00	ΑΠ.
ΣΗΜΕΙΩΣΕΙΣ:	**** = Στάθμη ελέγχου nv από κανονισμό*									

Καθορισμός Συστήματος Κτιρίου	
Διεύθυνση X:	Σύστημα Πλαισίων
Διεύθυνση Z:	Σύστημα Πλαισίων

Έλεγχος Μέσης Σχετικής Μετακίνησης μεταξύ κόμβων ορόφου (& 5.5.3.2α (iii) ΚΑΝ.ΕΠΕ)

α/α Στάθμης	Συνδ/μός		Σχετική Μετ/ση		Λόγοι Μετακινήσεων		Αποτελέσματα	
	x	z	x (mm)	z (mm)	x	z	x	z
1	0	0	0.00	0.00			Ικανοποιείται	Ικανοποιείται
2	0	0	0.00	0.00			Ικανοποιείται	Ικανοποιείται
ΣΗΜΕΙΩΣΗ	*Οι λόγοι δε πρέπει να υπερβαίνουν το 1,5*				Ο έλεγχος :		**Ικανοποιείται**	

Έλεγχος Μέσης Σχετικής Μετακίνησης κατά X μεταξύ ορόφων (& 5.5.2α (iv) ΚΑΝ.ΕΠΕ)

α/α Στάθμης	Υπερκείμενος			Υποκείμενος			Λόγος	Λόγος	Αποτελέσματα
	Συνδ.	Σχετ. Μετ/ση (mm)		Συνδ.	Σχετ. Μετ/ση (mm)		di/di+1	di/di-1	
1	1	0.00	0.00	0	0.00	0.00			Ικανοποιείται
2	0	0.00	0.00	1	0.00	0.00			Ικανοποιείται
ΣΗΜΕΙΩΣΗ:	*Οι λόγοι δε πρέπει να υπερβαίνουν το 1,5*					Ο έλεγχος :		**Ικανοποιείται**	

Έλεγχος Μέσης Σχετικής Μετακίνησης κατά Z μεταξύ ορόφων (& 5.5.2α (iv) ΚΑΝ.ΕΠΕ)

α/α Στάθμης	Υπερκείμενος			Υποκείμενος			Λόγος	Λόγος	Αποτελέσματα
	Συνδ.	Σχετ. Μετ/ση (mm)		Συνδ.	Σχετ. Μετ/ση (mm)		di/di+1	di/di-1	
1	1	0.00	0.00	0	0.00	0.00			Ικανοποιείται
2	0	0.00	0.00	1	0.00	0.00			Ικανοποιείται
ΣΗΜΕΙΩΣΗ:	*Οι λόγοι δε πρέπει να υπερβαίνουν το 1,5*					Ο έλεγχος :		**Ικανοποιείται**	

Έλεγχος Ιδιοπεριόδων Κτιρίου (& 5.5.2α (ii) ΚΑΝ.ΕΠΕ)

Διεύθυνση Ix : TIx (sec)=	0.1973	4*Tc (sec)=	2.00	Ικανοποιείται
Διεύθυνση Iz : TIIz (sec)=	0.2359	4*Tc (sec)=	2.00	Ικανοποιείται
ΣΗΜΕΙΩΣΗ:	*Πρέπει: Tx,Tz<min(4Tc,2s)*		Ο έλεγχος :	Ικανοποιείται

Κρίσιμοι Δείκτες Ανεπάρκειας λ δομικών στοιχείων (& 5.5.2α (i) ΚΑΝ.ΕΠΕ)

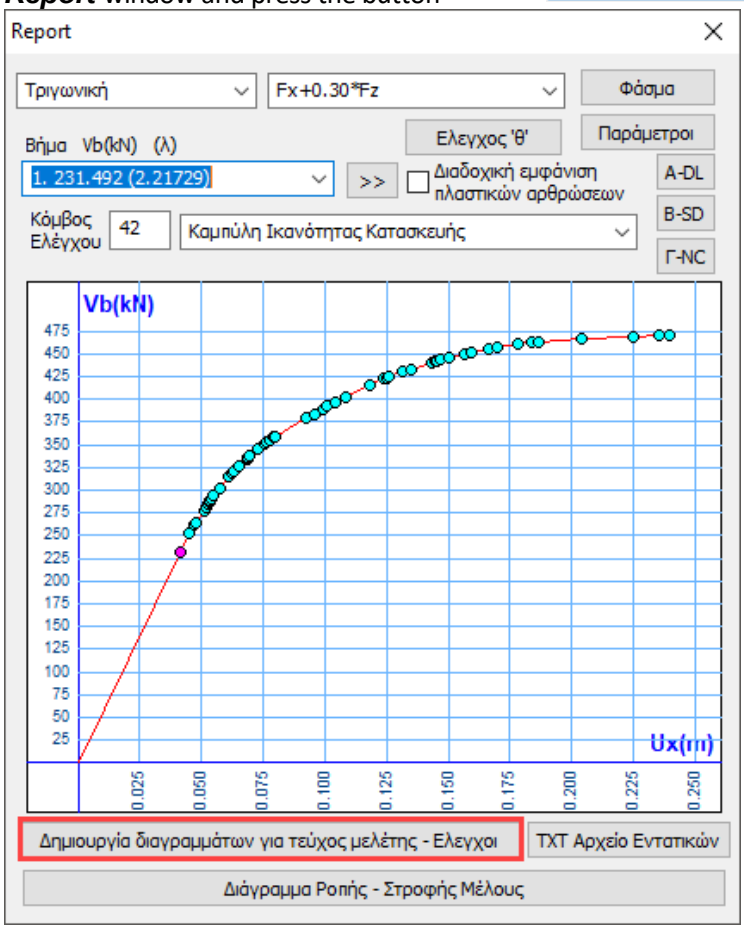
α/α Στάθμης	Συν/κο Υψός (m)	Δοκοί				Υποστυλώματα				Σύνολο			
		λ<=2.5		λ>2.5		λ<=2.5		λ>2.5		λ<=2.5		λ>2.5	
0	*0.000*	*0*	*0%*	0	0%	0	0%	0	0%	0	0%	0	0%
1	3.000	10	50%	0	0%	8	50%	0	0%	18	50%	0	0%
2	6.000	10	50%	0	0%	8	50%	0	0%	18	50%	0	0%
ΣΥΝΟΛΟ		20	100%	0	0%	16	100%	0	0%	36	100%	0	0%
ΣΗΜΕΙΩΣΗ:	*Για όλα τα στοιχεία πρέπει λ<=2.5.*						Ο έλεγχος :			**Ικανοποιείται**			
Εάν λ>2.5 το κτίριο πρέπει να είναι μορφολογικά κανονικό.													

Μορφολογική Κανονικότητα (& 5.5.1.2 ΚΑΝ.ΕΠΕ)
Μέσος Δείκτης Ανεπάρκειας λκ ορόφου ανά κατεύθυνση (& 5.5.1.2 (γ) ΚΑΝ.ΕΠΕ)

α/α Στάθμης	Συν/κο Υψός (m)	λxκi	λx,κi / λx,κi+1	λx,κi / λx,κi-1	λzκi	λz,κi / λz,κi+1	λz,κi / λz,κi-1
1	*3.000*	*0.11*	*1.10*		0.22	1.01	
2	6.000	0.12		1.10	0.22		1.01
ΣΗΜΕΙΩΣΗ:	*Οι λόγοι δε πρέπει να υπερβαίνουν*			Ο έλεγχος :		**Ικανοποιείται**	

2.2.2 Έλεγχοι Σεναρίων σεισμικών Ανελαστικών αναλύσεων EC-8

In order to open the Anelastic analysis checks, the basic requirement is to select the Mass Distribution command after completing the analysis to open the ***Report*** window and press the button Δημιουργία διαγραμμάτων για τεύχος μελέτης - Ελεγχοι.



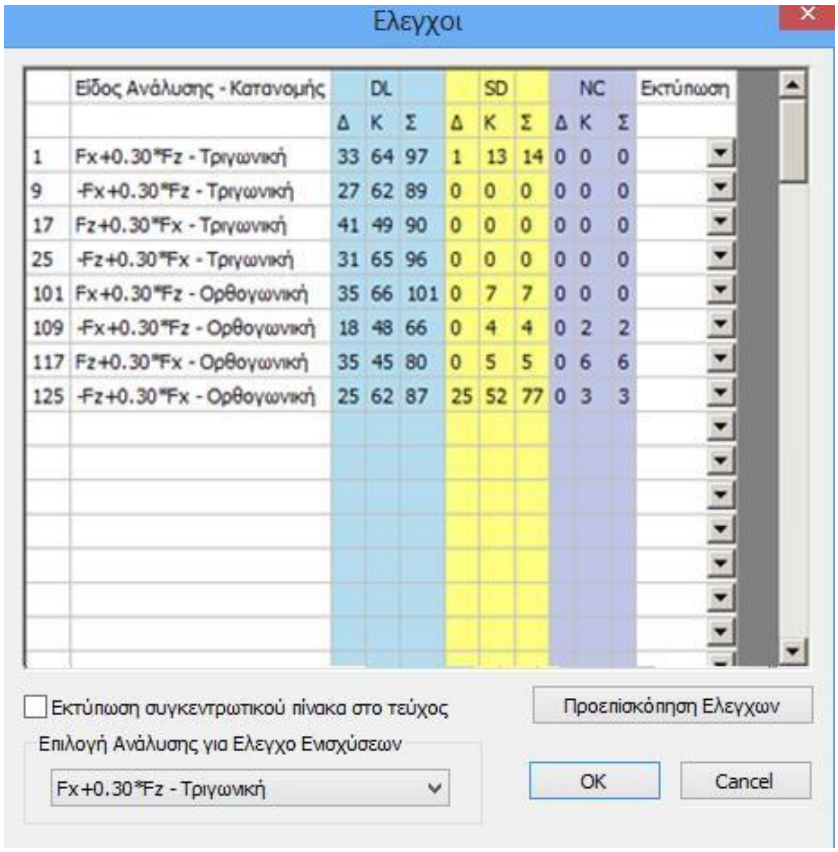
OBSERVATION:

The choice of the button

Δημιουργία διαγραμμάτων για τεύχος μελέτης - Ελεγχοι

is **necessary** to create the necessary prints and controls and to update them after possible changes (e.g. bilinearization method, change of spectra, change of parameters, etc.)

Then, select the "Checks" command and the following dialog box appears:



	Είδος Ανάλυσης - Κατανομής	DL			SD			NC			Εκτύπωση
		Δ	Κ	Σ	Δ	Κ	Σ	Δ	Κ	Σ	
1	Fx+0.30*Fz - Τριγωνική	33	64	97	1	13	14	0	0	0	
9	-Fx+0.30*Fz - Τριγωνική	27	62	89	0	0	0	0	0	0	
17	Fz+0.30*Fx - Τριγωνική	41	49	90	0	0	0	0	0	0	
25	-Fz+0.30*Fx - Τριγωνική	31	65	96	0	0	0	0	0	0	
101	Fx+0.30*Fz - Ορθογωνική	35	66	101	0	7	7	0	0	0	
109	-Fx+0.30*Fz - Ορθογωνική	18	48	66	0	4	4	0	2	2	
117	Fz+0.30*Fx - Ορθογωνική	35	45	80	0	5	5	0	6	6	
125	-Fz+0.30*Fx - Ορθογωνική	25	62	87	25	52	77	0	3	3	

This table gives you, each inelastic analysis that has been performed, the total number of beams and columns that are not sufficient IN LIMITS OF LIMITATION, for each performance level.
In the above example for all inelastic analyses, elements (D: Beams, K: Columns, S: Total) have failed in all distributions and combinations for the first performance level (DL), for some combinations in the second (SD) and even less in the third (NC).
In the "Print" column you select which inelastic analysis(s) to include in the study booklet.

By selecting a line with the mouse and pressing the "Preview Controls" button, the results f e specific analysis are displayed in detail.
Automatically opens a file that, for "active analysis". includes the results of the checks:

- VERIFICATION OF CARRIER ADEQUACY IN TERMS OF DEFORMATIONS
- CONTROL OF DIAGRAMMING EFFICIENCY IN LIMITS OF INTERFERENCE for:
  Beams (Type of Analysis - Distribution)
  Poles (Type of Analysis - Distribution)
- CONTROL OF THE SUFFICIENCY OF THE CUTTING TOOLS
  Beams (Type of Analysis - Distribution)
  Poles (Type of Analysis - Distribution)
- CHECKING THE ADEQUACY OF WALL FILLINGS IN TERMS OF DEFORMATIONS

	Σελίδα : 1
AFIOTEAEEMATA EaErxnN	
ZENAPIO :	ANEAAZTIKH

Eióoç AvaAuoqç - Korovopqç :	*Fx+0.fi0*Fz - TpiymVlKQ (1)*
Kavoviopóç yia nov uwaAoyiopó yqç oxoycúop'vqç pcyaxívqoqç :	KAN.EFIE.

EaErxoz EBAPKEIAE OOPEA ZE OPOYZ FIAPAMOPOO£EON

	C0	CI	C2	C3	Sem (mfsecf)	Te (sec)
FlEpiopiopzvEç Bàó§Eç (A-DL)	**1.20**	**1.17**	**1.00**	**1.00**	7 06	0.33
ZqgOVTIK Eç Bàó§zç (B-SD}	**1.20**	**1.17**	**1.24**	**1.00**	7 06	0.33
OIov EI TOTÓ|D|DEUOQ (F-NC)	**1.20**	**1.17**	**1.41**	**1.00**	7 06	0.33

	Στοχευομενη METO KII Og dt(cm}	Συνολικη METOKIV Night OF| dm(cm)	Àóyoç à=dtdm	EFIAPKEIA
DEpiopiopzvEç Bàó§Eç (A-DL)	2 69	8 24	0.33	Noi
Zq#ovTixíç Bàó§zç (B-SD}	3.33	824	0.40	Noi
Oiovzi KoTopzuoq (F-NC)	378	8.24	0.46	Noi

EaErxoz EFIAPKEIAE AIATOMCiN EE OPOYE FlAPAMor enzEGN (brad)

AOKOI — *dx+0.30 "Fz - Tpiymvi "fi (J)*

		N z piopiopívzç BàÓ§EÇ (A - D L)			Z ggOVTIK Eç Bàó§zç (B - SD)			Oiavci KoT óppzuoq (F -NC)		
Mzàoç	Kóp§oç	ysd*Bsd	Bpl/yrd	E opxci	ysd*8sd	8pl/yrd	Enopxci	ysd*8sd	8pl/yrd	E-oopxci
27	14	0. 00	0. 00	Noi	0. 00	10. PB	Noi	0. 00	21. 17	Noi
					0. 000			0. 000		
	12	0. 00	0. 00	BYi	0. 00	10. 58	Nai	0. 00	21. 17	Nai
					0. 000			0. 000		
30	**11**	**1.8 1**	**0. 00**	**Byi**	1.81	8. 94	Nai	1.8 1	U. 88	Nai
					0.202			0. 101		
	12	0. 00	0. 00	Noi	0. 00	8. 94	Nai	0. 00	17.88	Nai
					0. 0 01			0. 000		
32	15	0. 00	0. 00	Noi	0. 00	10. 03	Nai	0. 00	20.05	Nai
					0. 0 00			0. 000		
	9	-0.00	0.00	By'	-0. 00	10. 03	Nai	-0.00	20.05	Nai
					0. 0 00			0. 000		
33	15	0. 00	0. 00	BYi	0. 00	9.70	Nai	0. 00	19.40	Nai
					0. 000			0. 000		
	16	0. 00	0. 00	Noi	0. 00	9.70	Nai	0. 00	19.40	Nai
					0.000			0.000		
35	10	1. 50	0. 00	Byi	1.50	8. 10	Nai	1. 50	16.21	Nai
					0. 185			0. 093		
	14	0. 00	0. 00	Well	0. 00	8.75	Nai	0. 00	17.50	Nai
					0. 0 00			0. 000		

EAEFXOE EFIAPKEIAE AIATOM€IN EE OPOYE FIAPAMOPO£IEE£IN (mrad}

OSCE — *dx+0.30*Fz - Tpiymvn'fi (J)*

		F!E piopiopEvEvEç BÀó§Eç (A - DL)			Z qpovTix: Eç BÀó§Eç (B - SD)			OiavEi CoT oppEuoq (F - NC)		
Míàoç	Kóp§oç	ysd "Bsd	Bpl/yrd	E opxEi	ysd "Bsd	Bpl/yrd	EwopxEi	ysd "Bsd	Bpl/yrd	EvopxEi
1	1	-ó. 80	0. 00	Bye	-5. 80	0.67	Bri	-ó. 80	1.3ó	x
					8.600			4.300		
	9	-6.06	0.00	Byi	-6.06	0.67	Bri	-6.06	1.3ó	Oxi
					8. 984			4.492		

2	2	0.00	0.00	Noi	0.00	6.36	Noi	0.00	12.72	Nou
					0.006			0.003		
	10	-3.S4	0.00	Oyi	-3.S4	6.57	Noi	-3.S4	13.15	Nou
					0.53B			0.269		
3	3	-5.52	0.00	Oyi	-5.52	0.46	Byi	-5.52	0.93	Dp
					11.92B			5.964		
	11	-4.33	0.00	Oyi	-4.33	5.37	Byi	4.33	10.74	Oyi
					0.805			0.403		
4	4	-5.B1	0.00	@yi	-5.B1	6.55	Noi	-5.81	13.09	Nou
					0.B8B			0.444		
	12	-5.13	0.00	Byi	-5.13	6.59	Noi	-5.13	13.1B	Nou
					0.77B			**0.3B9**		
6	6	-3.07	0.00	Oyi	-3.07	5.B5	**Noi**	**-3.07**	**11.71**	Nou
					0.525			**0.262**		
	14	-3.33	0.00	By	-3.33	5.94	**Noi**	**-3.33**	**11.BB**	Nou
					0.561			**0.2B1**		
7	7	-3.23	0.00	Oyi	-3.23	5.91	**Noi**	**-3.23**	**11.B2**	**Nou**
					0.546			**0.273**		
	15	-2.15	0.00	x	-2.15	6.00	Noi	-2.15	12.00	Nou
					0.35B			0.179		
9	9	-1.4B	0.00	Byi	-1.4B	4.57	Byi	-1.4B	9.11	Oxi
					0.323			0.161		
	17	-1.53	0.00	Oyi	-1.53	4.75	Byi	-1.53	9.49	Dp
					0.322			0.161		
11	11	0.00	0.00	Noi	0.00	6.B1	Noi	0.00	13.B2	Nou
					0.155			0.077		
	19	-1.5B	0.00	Oyi	-1.58	6.93	Byi	-1.5B	13.B6	Oyi
					0.22B			0.114		
14	14	0.00	0.00	Noi	0.00	8.75	Noi	0.00	17.49	Nou
					0.121			0.060		
	22	-Z.33	0.00	Oyi	-2.33	8.30	Noi	-2.33	16.60	Nαι
					0.281			0.141		
16	16	1.05	0.00	Oyi	1.05	5.20	Noi	1.05	10.40	Nou
					0.203			0.101		
	26	0.00	0.00	Noi	0.00	5.29	Noi	0.00	10.5B	Nou
					0.209			0.104		

ΕΛΕΓΧΟΣ ΕΠΑΡΚΕΙΑΣ ΤΕΜΝΟΥΣΩΝ											
ZTYA€fl	*Fx+0.30*Fz* - Tp/yzuva:*fi (1)*				*BHk1A* . [A-DL=15.1/15 B-so-1s.11s re1s.1/15]						
M oÇ	KòygaÇ		VR.SLS	Vrd.max	Vr	Ved	Brjyo	Aóyaç	A-DL	B-SD	F-NC
1	1	z	0.00	399.86	79.76	96.03	1/4	1.2040	OXI	OXI	OXI
			Cf.= 152.6B								
1	9	z	0.00	399.8B	77.BB	9B.03	1/4	1.23B5	OXI	OXI	OXI
			Vrd,s - 152.6B								
2	2	y	0.00	IBM.30	74.10	83.14	1/15	1.1220	NAI	NAI	NAI
			Vrd,s - 152.6B								
2	10	y	0.00	1B5.30	72.67	83.14	1/15	1.1440	NAI	NAI	NAI
			Cf.= 152.6B								
3	3	y	0.00	175.55	B9.53	90.3B	1/10	1.009B	OXI	OXI	OXI
			Cf.= 152.6B								
8	8	z	0.00	122B.84	123.52	126.00	1/15	1.0201	NAI	NAI	NAI
			Cf.= 254.47								
8	4fi	z	0.00	122B.84	119.34	12B.00	1/15	1.055B	NAI	NAI	NAI

OBSERVATION:

At the bottom of the file, the Sectional Adequacy Check is also displayed only for shear-failing elements.

ΕΛΕΓΧΟΣ ΕΠΑΡΚΕΙΑΣ ΤΕΜΝΟΥΣΩΝ											
ΣΤΥΛΟΙ	*Fx+0.30*Fz - Τριγωνική (1)*					BHMA : [A-DL=15:1/15 B-SD=15:1/15 Γ-NC=15:1/15]					
Μέλος	Κόμβος		VR,SLS	Vrd,max	Vr	Ved	Βήμα	Λόγος	A-DL	B-SD	Γ-NC
1	1	z	0.00	399.86	79.76	96.03	1/4	1.2040	ΟΧΙ	ΟΧΙ	ΟΧΙ
			Vrd,s =	152.68							
1	9	z	0.00	399.86	77.66	96.03	1/4	1.2365	ΟΧΙ	ΟΧΙ	ΟΧΙ
			Vrd,s =	152.68							
2	2	y	0.00	185.30	74.10	83.14	1/15	1.1220	ΝΑΙ	ΝΑΙ	ΝΑΙ
			Vrd,s =	152.68							
2	10	y	0.00	185.30	72.67	83.14	1/15	1.1440	ΝΑΙ	ΝΑΙ	ΝΑΙ
			Vrd,s =	152.68							
3	3	y	0.00	175.55	89.53	90.38	1/10	1.0096	ΟΧΙ	ΟΧΙ	ΟΧΙ
			Vrd,s =	152.68							
8	8	z	0.00	1228.84	123.52	126.00	1/15	1.0201	ΝΑΙ	ΝΑΙ	ΝΑΙ
			Vrd,s =	254.47							
8	16	z	0.00	1228.84	119.34	126.00	1/15	1.0558	ΝΑΙ	ΝΑΙ	ΝΑΙ

IMPORTANT OBSERVATION:

For the beams and for the poles we have the following strengths

- **Vrd,s**
- **Vrdmax**
- **Vr**

Especially for the poles we also have the

- **Vr,sls**

- For an element to be classified as sandy, the ratio of the shear stress to the lower of the above strengths must exceed unity. Then the program
  the square shall be taken as a marker and the procedure shall be followed to modify the parameters determined by considering a flexural failure, so that they are effectively reduced from a plagiform failure to a slip failure (reduction θy, etc.).

- *In the checks (in the printout), those elements are shown whose ratio is greater than unity and come from all strengths, except Vrd,s which is the strength of the fasteners. However, in the graphical representation the squares*
  are also shown for this failure (from Vrd,s).

So when squares appear in the graphical representation and the corresponding elements do not appear in the controls, it is an excess of Vrd,s. However, it should be noted that also from exceeding Vrd,s the procedure for reducing the bending failure normally follows

In addition, SCADA Pro incorporates the new KANEPE check, included in the latest revision of the KAN.EPE (2nd Revision 2017) and concerns the possibility of slippage due to shear at the base or other random wall sections.

The check is for pushover only and has been incorporated into the printout of the pushover checks in the corresponding section for intersections:

ΕΛΕΓΧΟΣ ΕΠΑΡΚΕΙΑΣ ΤΕΜΝΟΥΣΩΝ

Δοκοί (Fx+0.30*Fz - Τριγωνική) (1) ΒΗΜΑ : [A-DL=35 B-SD=36 Γ-NC=36]

Μέλος	Κόμβ.	Vrd,s	Vrd,max	Vr	Ved	Βήμα	Λόγος	A-DL	B-SD	Γ-NC
37	2	y: 565.49	328.34	209.51	226.79	1	1.0825	OXI	OXI	OXI
37	5	y: 565.49	328.34	209.51	232.08	1	1.1077	OXI	OXI	OXI
44	8	y: 565.49	328.34	211.26	226.02	1	1.0699	OXI	OXI	OXI
44	11	y: 565.49	328.34	211.26	232.85	1	1.1022	OXI	OXI	OXI
51	14	y: 565.49	328.34	211.26	226.56	1	1.0725	OXI	OXI	OXI
51	17	y: 565.49	328.34	211.26	232.31	1	1.0997	OXI	OXI	OXI

Στύλοι (Fx+0.30*Fz - Τριγωνική) (1) ΒΗΜΑ : [A-DL=35 B-SD=36 Γ-NC=36]

Μέλος	Κόμβ.	VR,SLS	Vrd,max	Vr	Ved	Βήμα	Λόγος	A-DL	B-SD	Γ-NC
4	31	y: 5.41	10.41	30.92	6.29	1	1.1612	OXI	OXI	OXI
		Vrd,s = 97.36								
4	4	y: 5.41	10.41	30.92	6.29	1	1.1612	OXI	OXI	OXI
		Vrd,s = 97.36								

The value is **the slip resistance cutting torque VR,SLS** and the corresponding paragraph of the UNECE is Annex 7C. Two methods are provided for its calculation. The second one, the alternative (equation C.14), has been incorporated in the program.

OBSERVATION:

Two points are highlighted:

1. A prerequisite for the calculation of this strength and for the performance of the test respectively, is that a bending failure has occurred, i.e. a plastic joint has been created in the limb under test.
2. The second condition for performing the check is that the shear failure of the flexure has not preceded the bending failure (i.e. the end must not have a "square" lit). <u>If the shear failure has preceded the bending failure, the test is not performed at all.</u>

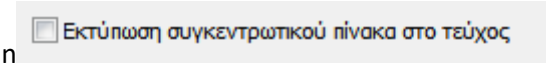
So when you do not see a value in the corresponding field, it means that the above conditions do not apply.

At the end of this file and if you have selected to include the wall infills in the scenario parameters, the results of the adequacy check in terms of deformations for each wall infill are displayed. No results are shown for the tension bars because they are not taken into account in the construction model.

ΕΛΕΓΧΟΣ ΕΠΑΡΚΕΙΑΣ ΤΟΙΧΟΠΛΗΡΩΣΕΩΝ ΣΕ ΟΡΟΥΣ ΠΑΡΑΜΟΡΦΩΣΕΩΝ										
		Περιορισμένες Βλάβες (A - DL)			Σημαντικές Βλάβες (B - SD)			Οιονεί Κατάρρευση (Γ - NC)		
Μέλος		γsd*εf	εy	Επαρκεί	γsd*εf	εu/γrd	Επαρκεί	γsd*εf	εu	Επαρκεί
47	Εφελκ									
48	Θλιβ.	0.00271	0.00150	Όχι	0.00271	0.00308	Ναι	0.00271	0.00400	Ναι
49	Θλιβ.	0.00374	0.00150	Όχι	0.00374	0.00308	Όχι	0.00374	0.00400	Ναι
50	Εφελκ									
51	Εφελκ									
52	Θλιβ.	0.00067	0.00150	Ναι	0.00067	0.00308	Ναι	0.00067	0.00400	Ναι
53	Θλιβ.	0.00332	0.00150	Όχι	0.00332	0.00308	Όχι	0.00332	0.00400	Ναι
54	Εφελκ									
55	Εφελκ									
56	Εφελκ									
57	Θλιβ.	0.00154	0.00150	Όχι	0.00154	0.00308	Ναι	0.00154	0.00400	Ναι
58	Εφελκ									
59	Εφελκ									
60	Θλιβ.	0.00090	0.00150	Ναι	0.00090	0.00308	Ναι	0.00090	0.00400	Ναι
63	Θλιβ.	0.00329	0.00150	Όχι	0.00329	0.00308	Όχι	0.00329	0.00400	Ναι
64	Εφελκ									

In addition to the above printout, a file named "TOIXPL_DAT.txt" is created in the analysis scenario folder, which contains the data of the types wall fillings that have been used and then the data of the wall fillings per facet. The general folder for the analysis scripts is the subfolder named "scaanal" within your study folder and the script is identified by its serial number.

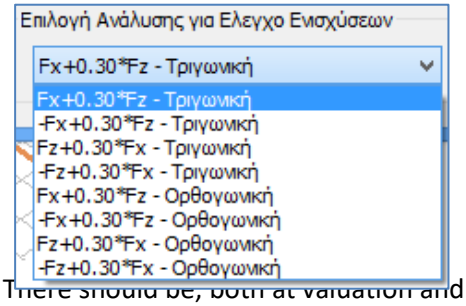
```
|                          ΤΥΠΟΙ ΤΟΙΧΟΠΛΗΡΩΣΕΩΝ
-------------------------------------------------------------------------------
Ονομα     : Μπατική οπτοπλινθοδομή
Είδος     : Υφιστάμενη      ΣΑΔ: Ικανοποιητική  ΣΠΕ: 1    γm=2.00
Κονίαμα   : Τσιμεντοκονίαμα-Μ5 (fm(MPa)=5.000)
            Πάχος(cm)=50.00 fk(Mpa)=3.44790 E(GPa)=3.45
Αρμοί     : Κατακόρυφοι πλήρεις: ΟΧΙ   Οριζόντιοι πάχους > 15mm: ΟΧΙ
-------------------------------------------------------------------------------


                        ΔΕΔΟΜΕΝΑ ΤΟΙΧΟΠΛΗΡΩΣΕΩΝ
-------------------------------------------------------------------------------
Μέλος          : 94 Κόμβος Αρχής:24 Κόμβος Τέλους:30   L(cm)=688.77
Τοιχοποιία     : Μπατική οπτοπλινθοδομή
Γεωμετρία(cm): Παχος t=50.00 Μήκος l=620.00 Υψος h=300.00 Πλάτος h=0.00
Οπλισμένη      : Αοπλη   fwc,k(MPa)=3.45    E(GPa)=3.45
Ανοίγματα      : Χωρίς ή 1 μικρό περίπου στο κέντρο (n1=1.00)
Στάθμη Βλαβών: Χωρίς βλάβες (rR=1.00 rk=1.00)
Λυγηρότητα     : Περιμετρική Επαφή (n3=1.00[1.00,1.00])
Αρμοί          : Κατακόρυφοι Αρμοί πλήρεις       : ΝΑΙ (n4=0.75)
               : Οριζόντιος Αρμός πάχους > 15mm : ΟΧΙ (n5=1.00)
Παραμορφώσεις: εy=0.0006250   εu=0.0025000  ε΄u=0.0037500
Θλιπτική αντοχή fwc,s(MPa)=0.517     Μέτρο Ελαστικότητας : E'(GPa)=2.607

Μέλος          : 95 Κόμβος Αρχής:26 Κόμβος Τέλους:28   L(cm)=688.77
Τοιχοποιία     : Μπατική οπτοπλινθοδομή
Γεωμετρία(cm): Παχος t=50.00 Μήκος l=620.00 Υψος h=300.00 Πλάτος h=0.00
Οπλισμένη      : Αοπλη   fwc,k(MPa)=3.45    E(GPa)=3.45
Ανοίγματα      : Χωρίς ή 1 μικρό περίπου στο κέντρο (n1=1.00)
Στάθμη Βλαβών: Χωρίς βλάβες (rR=1.00 rk=1.00)
Λυγηρότητα     : Περιμετρική Επαφή (n3=1.00[1.00,1.00])
Αρμοί          : Κατακόρυφοι Αρμοί πλήρεις       : ΝΑΙ (n4=0.75)
               : Οριζόντιος Αρμός πάχους > 15mm : ΟΧΙ (n5=1.00)
Παραμορφώσεις: εy=0.0006250   εu=0.0025000  ε΄u=0.0037500
Θλιπτική αντοχή fwc,s(MPa)=0.517     Μέτρο Ελαστικότητας : E'(GPa)=2.607

Μέλος          : 96 Κόμβος Αρχής:25 Κόμβος Τέλους:30   L(cm)=724.98
Τοιχοποιία     : Μπατική οπτοπλινθοδομή
Γεωμετρία(cm): Παχος t=50.00 Μήκος l=660.00 Υψος h=300.00 Πλάτος h=0.00
Οπλισμένη      : Αοπλη   fwc,k(MPa)=3.45    E(GPa)=3.45
Ανοίγματα      : Χωρίς ή 1 μικρό περίπου στο κέντρο (n1=1.00)
Στάθμη Βλαβών: Χωρίς βλάβες (rR=1.00 rk=1.00)
Λυγηρότητα     : Περιμετρική Επαφή (n3=1.00[1.00,1.00])
```

Finally, the option 

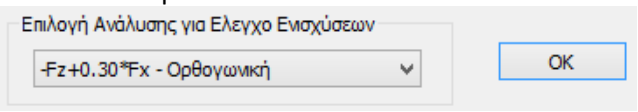
when checked includes in the study booklet the printing of this summary table.

OBSERVATION:

- *It should be noted that the results of this table are **ONLY** one **INDICATION**. It is at the discretion of the designer what the final choice will be, which shall be defined by selecting from the list the <u>type of distribution to be used for checking and sizing the aids:</u>*



"Select Analysis for Aid Control" and "ok" to enter. For this example it was chosen:



There should be, both at validation and at the reinforcement stage, no failing data for all the inelastic analyses for the chosen EIS.

2.3 Σεισμική δράση

2.3.1 Σεισμική δράση Σεναρίων Ελαστικών αναλύσεων

Which, in addition to other things, includes the results of the test for Superior Idioms.

Έλεγχος Επιρροής Ανωτέρων Ιδιομορφών							(ΚΑΝ.ΕΠΕ. παρ.5.7.2)
α/α Στάθμ.	Συνολικό Ύψος (m)	X Διεύθυνση			Y Διεύθυνση		
		Vall (Kn)	V1 (Kn)	Λόγος	Vall (Kn)	V1 (Kn)	Λόγος
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	3.00	715.49	631.15	1.13	833.53	710.93	1.17
3	6.00	217.49	190.39	1.14	213.96	167.66	1.28
ΣΗΜΕΙΩΣΗ:		*Οι λόγοι δεν πρέπει να υπερβαίνουν την τιμή 1.3*					

	Σελίδα : 1
ΔΕΔΟΜΕΝΑ ΚΑΙ ΑΠΟΤΕΛΕΣΜΑΤΑ ΣΕΙΣΜΙΚΗΣ ΔΡΑΣΗΣ	
ΣΕΝΑΡΙΟ :	

ΠΑΡΑΜΕΤΡΟΙ ΥΠΟΛΟΓΙΣΜΟΥ	
Κλάση Πλαστιμότητας	DCM
Τύπος Φάσματος	Τύπος 1
Ζωνη Σεισμικής επικινδυνότητας	II
Επιτάχυνση Βαρύτητος g (m/sec2)	9.810
Σεισμική Επιτάχυνση εδάφους agR	0.24 * 9.810 = 2.3544
Σύστημα κτιρίου κατά X	Σύστημα Πλαισίων
Σύστημα κτιρίου κατά Z	Σύστημα Πλαισίων
Κατηγορία Εδάφους	B
Χαρακτηριστικές Περίοδοι Φάσματος	TB=0.15 TC=0.50 TD=2.50(sec)
Συντελεστής-Κατηγορία Σπουδαιότητας	γι=1.000 - Σ2
Συντελεστής Σεισμικής Συμπεριφοράς	
Συντελεστής Φασματικής Ενίσχυσης	βο=2.50
Ποσοστό κρίσιμης απόσβεσης	ξ=5.000%

α/α Στάθμης	Υψόμετρο (m)	Διαστάσεις Κατόψεων		Συντ.ψ2 Φορτ.2	Τυχηματικές Εκκ/τες	
		Llx (m)	Llz (m)		etix(m)	etiz(m)
0	0.000	11.100	10.900	0.300	0.555	0.545
1	3.000	11.100	10.900	0.300	0.555	0.545
2	6.000	11.100	10.900	0.300	0.555	0.545
ΣΗΜΕΙΩΣΕΙΣ:		*etix = 0.050 * Llx,*	*etiz = 0.050 * Llz*			

Ιδιοπερίοδοι Κτιρίου με τον προσεγγιστικό τύπο του Rayleigh				
Διεύθυνση Ix	TIx (sec) =	0.3033	Rd(T) = 7.0632	
Διεύθυνση IIz	TIIz (sec) =	0.3595	Rd(T) = 7.0632	
Διεύθυνση y	Tv (sec) =	0.0859	Rd(T) = 6.3569	

Καθ'ύψος Κατανομή Σεισμικής Δύναμης (Τέμνουσα-Ροπή)							
α/α Στάθμ.	Υψόμ. (m)	ΤΕΜΝΟΥΣΕΣ ΦΟΡΤΙΣΕΩΝ		ΣΤΡΕΠΤΙΚΕΣ ΡΟΠΕΣ (KNm)			
		ΦΟΡΤ. 3-I (Kn)	ΦΟΡΤ. 4-II (Kn)	ΦΟΡΤ.5-I Από maxez	ΦΟΡΤ. 6-I Από minez	ΦΟΡΤ. 7-I Από maxex	ΦΟΡΤ. 8-I Από minex
0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1	3.000	617.732	617.732	336.664	-336.664	342.841	-342.841
2	6.000	573.612	573.612	312.619	-312.619	318.355	-318.355

Ιδιοπερίοδοι Κτιρίου απο Δυναμικη Ανάλυση			
α/α Ιδιομορφής	Κυκλική Συχνότητα w (Rad/sec)	Συχνότητα v (Cycles/sec)	Περίοδος T (sec)
1	1.7480E+001	2.7820E+000	3.5945E-001
2	2.0719E+001	3.2975E+000	3.0326E-001
3	2.2544E+001	3.5879E+000	2.7871E-001
4	6.1450E+001	9.7801E+000	1.0225E-001
5	7.3181E+001	1.1647E+001	8.5858E-002
6	7.7746E+001	1.2374E+001	8.0817E-002
7	7.9255E+001	1.2614E+001	7.9279E-002
8	8.2702E+001	1.3162E+001	7.5974E-002
9	8.4205E+001	1.3402E+001	7.4618E-002
10	9.4917E+001	1.5107E+001	6.6196E-002

Συντελεστές Συμμετοχής Ιδιομορφών

Σελίδα : 2

α/α Ιδιομορφής	Διευθύνσεις στο Κύριο Σύστημα Συντεταγμένων		
	Κατά X	Κατά Z	Κατά Y
1	2.9818E+000	1.1435E-001	-1.2695E+001
2	1.2780E+001	7.1138E-002	3.3683E+000
3	-1.8437E+000	4.6652E-002	2.3115E+000
4	-8.5922E-002	3.5616E-001	-4.4057E+000
5	4.6208E-001	-8.9593E+000	1.8551E-002
6	-4.3800E-001	4.9361E+000	5.2581E-002
7	2.3701E+000	1.4915E+000	-5.9736E-001
8	-1.3419E-001	-4.1471E+000	1.6482E-001
9	3.1614E-002	-5.7221E+000	-4.3806E-001
10	-3.9849E-001	-2.9188E+000	-3.1533E-002

Συντελεστές Συμμετοχής Μαζών ανά Διεύθυνση		
Κατά X = 1.0	Κατά Y = 1.0	Κατά Z = 1.0

Δρώσες Ιδιομορφικές Μάζες — Συνολική Μάζα = 198.434 (kN/gr)

α/α Ιδιομορφής	ΜΕΤΑΦΟΡΙΚΕΣ ΜΑΖΕΣ					
	Κατά X	%	Κατά Y	%	Κατά Z	%
1	8.89	4.48	0.01	0.01	161.15	81.21
2	163.33	82.31	0.01	0.00	11.35	5.72
3	3.40	1.71	0.00	0.00	5.34	2.69
4	0.01	0.00	0.13	0.06	19.41	9.78
5	0.21	0.11	80.27	40.45	0.00	0.00
6	0.19	0.10	24.37	12.28	0.00	0.00
7	5.62	2.83	2.22	1.12	0.49	0.25
8	0.02	0.01	17.20	8.67	0.03	0.01
9	0.00	0.00	32.74	16.50	0.19	0.10
10	0.16	0.08	8.52	4.29	0.00	0.00
ΣΥΝΟΛΑ:	181.83	91.63	165.47	83.39	197.96	99.76

Πίνακας Τιμών Φάσματος Απόκρισης Επιταχύνσεων		Αριθμός Σημείων = 39		
α/α Σημείου Εισαγωγής	Περίοδος (sec)	ΤΙΜΕΣ ΦΑΣΜΑΤΟΣ		
		Τιμή x	Τιμή y	Τιμή z
1	0.00	2.83	2.12	2.83
2	0.05	4.24	6.36	4.24
3	0.10	5.65	6.36	5.65
4	0.15	7.06	6.36	7.06
5	0.20	7.06	4.77	7.06
6	0.25	7.06	3.81	7.06
7	0.30	7.06	3.18	7.06
8	0.35	7.06	2.72	7.06
9	0.40	7.06	2.38	7.06
10	0.45	7.06	2.12	7.06
11	0.50	7.06	1.91	7.06
12	0.55	6.42	1.73	6.42
13	0.60	5.89	1.59	5.89
14	0.65	5.43	1.47	5.43
15	0.70	5.05	1.36	5.05
16	0.75	4.71	1.27	4.71
17	0.80	4.41	1.19	4.41
18	0.85	4.15	1.12	4.15
19	0.90	3.92	1.06	3.92
20	0.95	3.72	1.00	3.72
21	1.00	3.53	0.95	3.53
22	1.10	3.21	0.79	3.21
23	1.20	2.94	0.66	2.94
24	1.30	2.72	0.56	2.72
25	1.40	2.52	0.49	2.52
26	1.50	2.35	0.42	2.35
27	1.60	2.21	0.37	2.21
28	1.70	2.08	0.33	2.08
29	1.80	1.96	0.29	1.96
30	1.90	1.86	0.26	1.86
31	2.00	1.77	0.24	1.77
32	2.25	1.57	0.19	1.57
33	2.50	1.41	0.15	1.41
34	2.75	1.17	0.13	1.17
35	3.00	0.98	0.11	0.98
36	3.25	0.84	0.09	0.84
37	3.50	0.72	0.08	0.72
38	3.75	0.63	0.07	0.63
39	4.00	0.55	0.06	0.55

Έλεγχος Επιρροής Ανωτέρων Ιδιομορφών							(ΚΑΝ.ΕΠΕ. παρ.5.7.2)
α/α Στάθμ.	Συνολικό Ύψος (m)	Χ Διεύθυνση			Y Διεύθυνση		
		Vall (Kn)	V1 (Kn)	Λόγος	Vall (Kn)	V1 (Kn)	Λόγος
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	3.00	715.49	631.15	1.13	833.53	710.93	1.17
3	6.00	217.49	190.39	1.14	213.96	167.66	1.28
ΣΗΜΕΙΩΣΗ:		*Οι λόγοι δεν πρέπει να υπερβαίνουν την τιμή 1.3*					

2.3.2 Σεισμική δράση Σεναρίων Ανελαστικών αναλύσεων

Finally, with the inelastic scenario always active and by selecting the Seismic Action command, the data for the spectra, the level of performance and the extent of the damage are displayed and then, for each analysis, the maximum base shear, the corresponding maximum displacement and the overstrength ratio, the minimum overstrength ratios per direction:

	Σελίδα : 1
ΔΕΔΟΜΕΝΑ ΚΑΙ ΑΠΟΤΕΛΕΣΜΑΤΑ ΣΕΙΣΜΙΚΗΣ ΔΡΑΣΗΣ	
ΣΕΝΑΡΙΟ :	

ΠΑΡΑΜΕΤΡΟΙ ΥΠΟΛΟΓΙΣΜΟΥ	
Κλάση Πλαστιμότητας	DCM
Τύπος Φάσματος	Τύπος 1
Ζωνη Σεισμικής επικινδυνότητας	II
Επιτάχυνση Βαρύτητος g (m/sec2)	9.810
Σεισμική Επιτάχυνση εδάφους agR	0.24 * 9.810 = 2.3544
Σύστημα κτιρίου κατά X	Σύστημα Πλαισίων
Σύστημα κτιρίου κατά Z	Σύστημα Πλαισίων
Κατηγορία Εδάφους	B
Χαρακτηριστικές Περίοδοι Φάσματος	TB=0.15 TC=0.50 TD=2.50(sec)
Συντελεστής-Κατηγορία Σπουδαιότητας	γι=1.000 - Σ2
Συντελεστής Σεισμικής Συμπεριφοράς	
Συντελεστής Φασματικής Ενίσχυσης	βo=2.50
Ποσοστό κρίσιμης απόσβεσης	ξ=5.000%

α/α Στάθμης	Υψόμετρο (m)	Διαστάσεις Κατόψεων Llx (m)	Llz (m)	Συντ.ψ2 Φορτ.2	Τυχηματικές Εκκ/τες etix(m)	etiz(m)
0	0.000	11.100	10.900	0.300	0.555	0.545
1	3.000	11.100	10.900	0.300	0.555	0.545
2	6.000	11.100	10.900	0.300	0.555	0.545
ΣΗΜΕΙΩΣΕΙΣ:		*etix = 0.050 * Llx,*	*etiz = 0.050 * Llz*			

Ιδιοπερίοδοι Κτιρίου απο Δυναμικη Ανάλυση			
α/α Ιδιομορφής	Κυκλική Συχνότητα w (Rad/sec)	Συχνότητα v (Cycles/sec)	Περίοδος T (sec)
1	2.7213E+001	4.3310E+000	2.3089E-001
2	3.2778E+001	5.2168E+000	1.9169E-001
3	4.2029E+001	6.6892E+000	1.4950E-001
4	7.3910E+001	1.1763E+001	8.5012E-002
5	8.7438E+001	1.3916E+001	7.1859E-002
6	8.9343E+001	1.4219E+001	7.0326E-002
7	9.6998E+001	1.5438E+001	6.4776E-002
8	1.0517E+002	1.6738E+001	5.9745E-002
9	1.1140E+002	1.7730E+001	5.6401E-002
10	1.1827E+002	1.8824E+001	5.3124E-002

Συντελεστές Συμμετοχής Ιδιομορφών			
α/α Ιδιομορφής	Διευθύνσεις στο Κύριο Σύστημα Συντεταγμένων		
	Κατά X	Κατά Z	Κατά Y
1	5.6200E+000	2.1600E-001	-1.1092E+001
2	1.1731E+001	2.7028E-001	6.3198E+000
3	3.0924E+000	-9.3368E-002	-3.9702E+000
4	1.1547E+000	-1.2010E+001	4.1088E-001
5	-1.4111E+000	-2.6788E+000	-8.4702E-001
6	1.4063E+000	5.6468E+000	-6.2074E-001
7	-3.2455E-001	3.8721E+000	1.1932E+000
8	1.2092E-001	-2.3365E+000	-3.8021E-001
9	-8.4249E-001	-1.5293E+000	-4.8330E-001
10	1.6906E-001	-2.3933E-001	-4.4673E+000

	Σελίδα : 2

Συντελεστές Συμμετοχής Μαζών ανά Διεύθυνση					
Κατά X =	1.0	Κατά Y =	1.0	Κατά Z =	1.0

Δρώσες Ιδιομορφικές Μάζες				Συνολική Μάζα = 209.536		(kN/gr)
α/α Ιδιομορφής	ΜΕΤΑΦΟΡΙΚΕΣ ΜΑΖΕΣ					
	Κατά X	%	Κατά Y	%	Κατά Z	%
1	31.58	15.07	0.05	0.02	123.03	58.72
2	137.62	65.68	0.07	0.03	39.94	19.06
3	9.56	4.56	0.01	0.00	15.76	7.52
4	1.33	0.64	144.25	68.84	0.17	0.08
5	1.99	0.95	7.18	3.42	0.72	0.34
6	1.98	0.94	31.89	15.22	0.39	0.18
7	0.11	0.05	14.99	7.16	1.42	0.68
8	0.01	0.01	5.46	2.61	0.14	0.07
9	0.71	0.34	2.34	1.12	0.23	0.11
10	0.03	0.01	0.06	0.03	19.96	9.52
ΣΥΝΟΛΑ:	184.92	88.25	206.29	98.45	201.76	96.29

Πίνακας Τιμών Φάσματος Απόκρισης Επιταχύνσεων		Αριθμός Σημείων = 39		
α/α Σημείου Εισαγωγής	Περίοδος (sec)	ΤΙΜΕΣ ΦΑΣΜΑΤΟΣ		
		Τιμή x	Τιμή y	Τιμή z
1	0.00	1.88	1.41	1.88
2	0.05	2.83	4.24	2.83
3	0.10	3.77	4.24	3.77
4	0.15	4.71	4.24	4.71
5	0.20	4.71	3.18	4.71
6	0.25	4.71	2.54	4.71
7	0.30	4.71	2.12	4.71
8	0.35	4.71	1.82	4.71
9	0.40	4.71	1.59	4.71
10	0.45	4.71	1.41	4.71
11	0.50	4.71	1.27	4.71
12	0.55	4.28	1.16	4.28
13	0.60	3.92	1.06	3.92
14	0.65	3.62	0.98	3.62
15	0.70	3.36	0.91	3.36
16	0.75	3.14	0.85	3.14
17	0.80	2.94	0.79	2.94
18	0.85	2.77	0.75	2.77
19	0.90	2.62	0.71	2.62
20	0.95	2.48	0.67	2.48
21	1.00	2.35	0.64	2.35
22	1.10	2.14	0.53	2.14
23	1.20	1.96	0.44	1.96
24	1.30	1.81	0.38	1.81
25	1.40	1.68	0.32	1.68
26	1.50	1.57	0.28	1.57
27	1.60	1.47	0.25	1.47
28	1.70	1.38	0.22	1.38
29	1.80	1.31	0.20	1.31
30	1.90	1.24	0.18	1.24
31	2.00	1.18	0.16	1.18
32	2.25	1.05	0.13	1.05

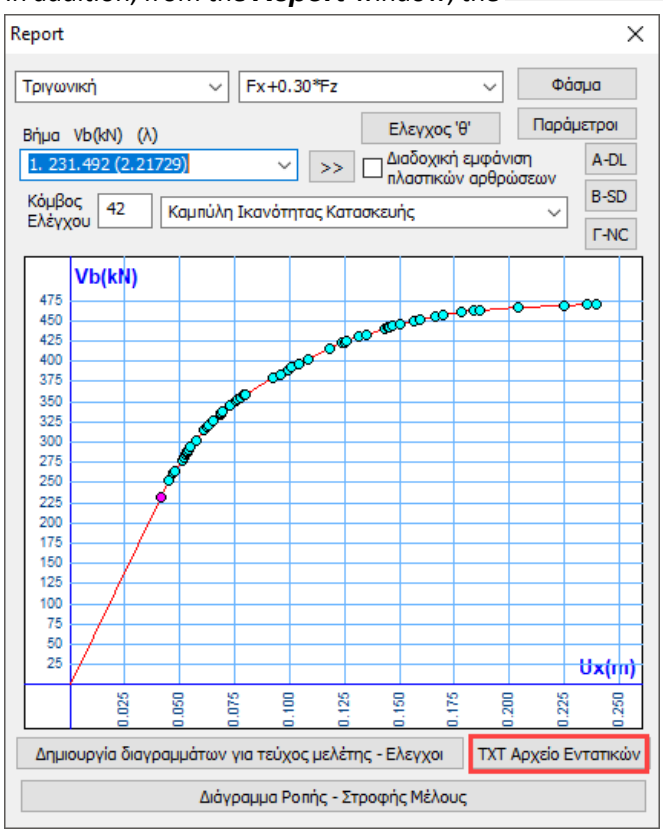
				Σελίδα : 3
33	2.50	0.94	0.10	0.94
34	2.75	0.78	0.08	0.78
35	3.00	0.65	0.07	0.65
36	3.25	0.56	0.06	0.56
37	3.50	0.48	0.05	0.48
38	3.75	0.42	0.05	0.42
39	4.00	0.37	0.04	0.37

Στάθμες Επιτελεστικότητας - Ελαστικά Φάσματα					
Ζωή σχεδιασμού (έτη)	50		Εκθέτης κ	3.00	
	Περίοδοι Επαναφοράς		Πιθανότητα Υπέρβασης		ag
	TR(έτη)	TLR(έτη)	PR(έτη)	PLR((έτη)	
Περιορισμένες Βλάβες (A-DL)	475	475	10	10	0.24000
Σημαντικές Βλάβες (B-SD)	475	475	10	10	0.24000
Οιονεί Κατάρρευση (Γ-NC)	475	475	10	10	0.24000

Στάθμη Αξιοπιστίας Δεδομένων :	Ικανοποιητική	γg=	1.35
Εκταση Βλαβών :	Χωρίς Βλάβες & Χωρίς Επεμβάσεις	γsd=	1.00

Κόμβος Ελέγχου :		26	6.00m	
A/A Ανάλυση	Είδος Ανάλυσης - Κατανομής	Τέμνουσα Βάσης (KN)	Μέγιστη Μετακίνηση (m)	Λόγος Υπεραντοχής
1	Τριγωνική Fx+0.30*Fz	1081.526	0.082	11.528
Ελάχιστος Λόγος Υπεραντοχής X			(1)	11.528
Ελάχιστος Λόγος Υπεραντοχής Z				

In addition, from the ***Report*** window, the TXT Αρχείο Εντατικών



and the following file appears, containing the lists with : Shifts and Node Rotations for all nodes per direction Intensive Member sizes at the beginning and end of each member Active stiffnesses for each Pillar and each Beam

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ΜΕΤΑΤΟΠΙΣΕΙΣ / ΠΕΡΙΣΤΡΟΦΕΣ ΚΟΜΒΩΝ

Αριθμ Κομβ.	Αριθμ Φορτ.	Μ Ε Τ Α Τ Ο Π Ι Σ Ε Ι Σ δx(mm)	δy(mm)	δz(mm)	Π Ε Ρ Ι Σ Τ Ρ Ο Φ Ε Σ θx(rad)	θy(rad)	θz(rad)
1		0.000E+000	-1.352E+000	0.000E+000	9.45E-005	0.00E+000	-7.07E-005
2		0.000E+000	-1.584E+000	0.000E+000	4.18E-005	0.00E+000	4.06E-005
3		0.000E+000	-1.767E+000	0.000E+000	5.53E-005	0.00E+000	-1.19E-004
4		0.000E+000	-1.905E+000	0.000E+000	2.37E-005	0.00E+000	-6.86E-005
5		0.000E+000	-1.638E+000	0.000E+000	1.11E-004	0.00E+000	-2.71E-005
6		0.000E+000	-2.257E+000	0.000E+000	3.85E-005	0.00E+000	6.51E-005
7		0.000E+000	-2.498E+000	0.000E+000	1.19E-007	0.00E+000	-9.21E-005
8		0.000E+000	-2.123E+000	0.000E+000	4.01E-005	0.00E+000	-9.76E-005
9		2.990E-001	-1.398E+000	1.099E-001	-7.29E-005	0.00E+000	-1.34E-004
10		3.178E-001	-1.617E+000	1.410E-001	6.64E-005	0.00E+000	1.66E-005
11		3.013E-001	-1.826E+000	1.410E-001	2.61E-005	0.00E+000	1.94E-004
12		2.989E-001	-2.014E+000	1.262E-001	-3.55E-004	0.00E+000	-2.14E-004
13		3.373E-001	-1.734E+000	1.269E-001	2.51E-004	0.00E+000	1.84E-004
14		3.200E-001	-2.416E+000	1.269E-001	3.11E-004	0.00E+000	2.84E-004
15		3.200E-001	-2.541E+000	1.046E-001	3.43E-005	0.00E+000	-1.40E-004
16		3.373E-001	-2.158E+000	1.046E-001	9.63E-005	0.00E+000	-1.38E-004
17		6.118E-001	-1.415E+000	1.293E-001	-9.65E-005	0.00E+000	-1.35E-004
18		6.850E-001	-1.637E+000	2.503E-001	6.78E-005	0.00E+000	2.17E-004
19		6.205E-001	-1.842E+000	2.504E-001	2.25E-005	0.00E+000	6.54E-005
20		6.114E-001	-2.047E+000	1.928E-001	2.39E-005	0.00E+000	-8.17E-005
21		7.610E-001	-1.783E+000	1.956E-001	4.08E-004	0.00E+000	2.83E-004
22		6.936E-001	-2.471E+000	1.956E-001	-1.52E-004	0.00E+000	2.67E-005
23		6.936E-001	-2.556E+000	1.085E-001	-3.19E-005	0.00E+000	-1.20E-004
24		7.610E-001	-2.174E+000	1.085E-001	1.16E-004	0.00E+000	-1.50E-004
25		3.166E-001	0.000E+000	1.202E-001	0.00E+000	-3.61E-006	0.00E+000
26		6.847E-001	0.000E+000	1.682E-001	0.00E+000	-1.41E-005	0.00E+000

ΕΝΤΑΤΙΚΑ ΜΕΓΕΘΗ ΜΕΛΩΝ

Αριθμ Μελ.	Αριθμ Φορτ.	Κομβ. Α./Τ.	Αξονικη N(KN)	Τεμνουσα QY(KN)	Τεμνουσα QZ(KN)	Στρεψη MX(KNM)	Καμψη MY(KNM)	Καμψη MZ(KNM)
1		1	321.37	7.15	21.20	0.02	-40.80	-24.96
		9	-267.70	-7.15	-21.20	-0.02	-10.07	42.11
2		2	218.51	21.26	-16.27	0.01	33.43	26.10
		10	-183.08	-21.26	16.27	-0.01	5.62	24.93
3		3	286.22	19.20	9.87	0.02	-24.07	13.01
		11	-240.66	-19.20	-9.87	-0.02	0.39	33.07
4		4	317.77	-29.25	4.67	0.01	-1.34	-24.01
		12	-297.52	29.25	-4.67	-0.01	-9.85	-46.19
5		5	225.45	27.01	8.82	0.01	-7.58	29.20

For Help, press F1 NUM

2.4 Δευτεροβάθμιος Προσεισμικός έλεγχος (ΦΕΚ 3134/21-6-2022)

Secondary pre-seismic control in public and utility buildings with reinforced concrete load-bearing structure

2.4.1Εισαγ push

According to international practice, the inventory and hierarchical valuation of buildings is carried out in three successive phases, which have come to be called:

α. Rapid visual or primary pre-seismic testing
β. Secondary pre-seismic control
c. Tertiary pre-seismic control

Rapid Visual Inspection is a simplified methodology applied to large sets of buildings and is therefore by nature of limited reliability.
The scope of the secondary pre-seismic inspection is the buildings that, from the macro primary inspection, received a rating below a predicted threshold.

The aim of the secondary pre-seismic inspection is to re-calibrate hierarchical calibration of these buildings based on the mapping and evaluation of technical characteristics. This check is more detailed and requires access to all areas of the building, the drawing up of geometric and pathology mapping drawings, visual assessment and some on-site checks of the building materials, as well as elementary calculations for the quantitative assessment of characteristic indicators, without simulation of the load-bearing structure.

The secondary pre-seismic inspection is more detailed than the primary inspection (rapid visual inspection), but faster than the tertiary inspection, which requires a full seismic capacity assessment study of the building according to the principles and methods of seismic engineering and the latest developments in regulatory manuals (KAN.EPE., as applicable).

The proposed methodology is an **approximate procedure for the assessment of the seismic capacity and seismic adequacy of existing buildings from O.S. in relation to the seismic requirement**, as defined in current regulations. The methodology includes some calculations, which are generally approximate, without the requirement to construct a detailed model of the building as in the full studies required by a tertiary audit.

The end result of this check is an "index" called the building's "**Control Priority Index λ**". This index does not have an entirely objective meaning but indicates the order of priority for the third phase of the whole project, i.e. the preparation of assessment and redesign (strengthening) studies for a limited number of buildings according to the financial possibilities of the competent body.

2.4.2Ορισμοί

BUILDING CONTROL PRIORITY INDICATOR

The **Building Control Priority Index (λ)** is defined as the ratio of the required seismic resistance to the available seismic resistance in terms of base shear multiplied by 100.
The Building Inspection Priority Index determines the degree of priority of each building for further inspection, compared to the other buildings in the group that are similarly subject to the same inspection. The higher Control Priority Index identifies a higher priority for further inspection.

SEISMIC CATEGORY

The seismic category (K) of secondary pre-seismic control of a building is defined as the maximum assessment target that a building can secure for performance level B ("Significant Damage" according to CEE), applying the methodology of secondary pre-seismic control.

Πίνακας Π1. Κατάταξη κτιρίου σε Σεισμική Κατηγορία.

Περίοδος Επαναφοράς (έτη)	Πιθανότητα υπέρβασης σεισμικής δράσης εντός του συμβατικού χρόνου ζωής των 50 ετών	δ	**ΣΕΙΣΜΙΚΗ ΚΑΤΗΓΟΡΙΑ (Κ)**
2475	2%	$1.80 \leq \delta$	**K0**
975	5%	$1.30 \leq \delta < 1.80$	**K1⁺**
475	10%	$1.00 \leq \delta < 1.30$	**K1**
225	20%	$0.75 \leq \delta < 1.00$	**K2⁺**
135	30%	$0.60 \leq \delta < 0.75$	**K2**
70	50%	$0.45 \leq \delta < 0.60$	**K3⁺**
40	70%	$0.35 \leq \delta < 0.45$	**K3**
20	90%	$0.25 \leq \delta < 0.35$	**K4⁺**
<20	>90%	$\delta < 0.25$	**K4**

2.4.3Κριτήρια

The criteria describe **vulnerability factors** that have a decisive influence (individually and/or in combination) on the seismic behaviour of a building. In this methodology 13 criteria are considered, numbered K1 to K13.

CALIBRATION OF CRITERIA

The criteria are rated on a whole number on a 5/level scale, where 1 corresponds to the highest load (= reduction of seismic resistance) of the building and 5 to the lowest. ($1 \leq \beta i \leq 5$)
The calibration of the criteria aims to assess the degree of burden of each vulnerability factor by examining their intensity and extent in the whole building.

OVERRIDING CRITERION

A criterion is considered to be exceeded when its intensity and extent exceeds a threshold beyond which the general stability of the building is affected.
In the proposed methodology, only three criteria can be considered supercritical, under the conditions set out in their description.

These are the first 3 criteria: Static failure damage, oxidation of the reinforcement and the magnitude of the reduced axial load of the columns, which can also take a zero value $\beta i=0$.

If even one of the criteria is identified as supercritical, then the building is classified in a special category entitled "buildings with supercritical vulnerability elements". It should be noted that in these cases the B-Section Pre-Seismic Check will be completed (by determining the seismic capacity index) by scoring the criterion with $\beta i=0$.

☑ Κτίριο με Υπερκρίσιμα Στοιχεία Τρωτότητας

Buildings founded on soils of class S1 or S2 are also classified in the same category (see below on soil factor S).

2.4.4Εφαρμογή

In the latest version of SCADA Pro, the Secondary Pre-Earthquake Control has been integrated (Government Gazette 3134/21-6-2022).
The programme applies to:

- only for the **Elastic Static** and **Elastic Dynamic** scenarios and
- only for **method q** for **performance level B**.

 A summary of the process:

- Introduction of the carrier and its loads
- * Execution of a Eurocode scenario to do the sizing
- *Dimensioning as "Existing" and adjustment of reinforcements only of the poles level down. For example, if there is a basement, the bottom level is 1^{h} level and therefore the poles starting from level 1 and ending at level 2 will be dimensioned, i.e. the poles of level 2 will be dimensioned in plan view.
- *Calculation of interaction diagrams of only these poles
- Running the **Elastic Static** and **Elastic Dynamic** scenario and only for the **method q** for **performance level B**
- Execution of the "Secondary Control" command

OBSERVATION:

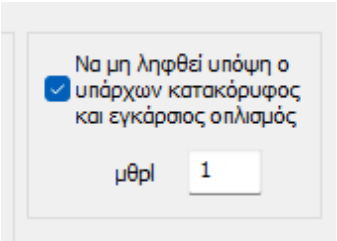
*It is also possible to perform the DPE without taking into account at all the vertical and transverse reinforcements of the columns when no data is available for them.

In this case, there are two possibilities for calculating the strengths:

1. No sizing to be performed: where the strengths to be taken as those of the data input

2. Perform a dimensioning with Existing Material : where the strengths will be those of the existing material

and then check the following option:



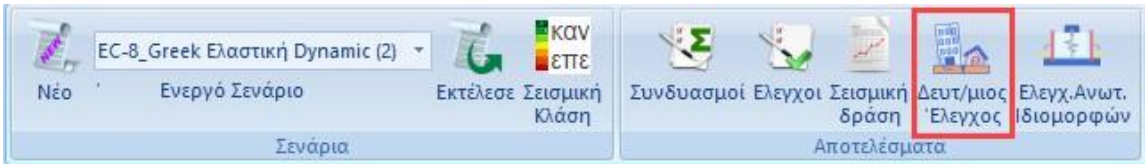
In the above option, the value mthpl must be entered by the designer. For the range of values of mθpl, the following is mentioned in the regulation:

The calculation of the shear strengths of vertical elements can be obtained from the relations proposed in Annex 7C of CEE.EPE, ignoring the contribution of the vertical reinforcement and assuming:

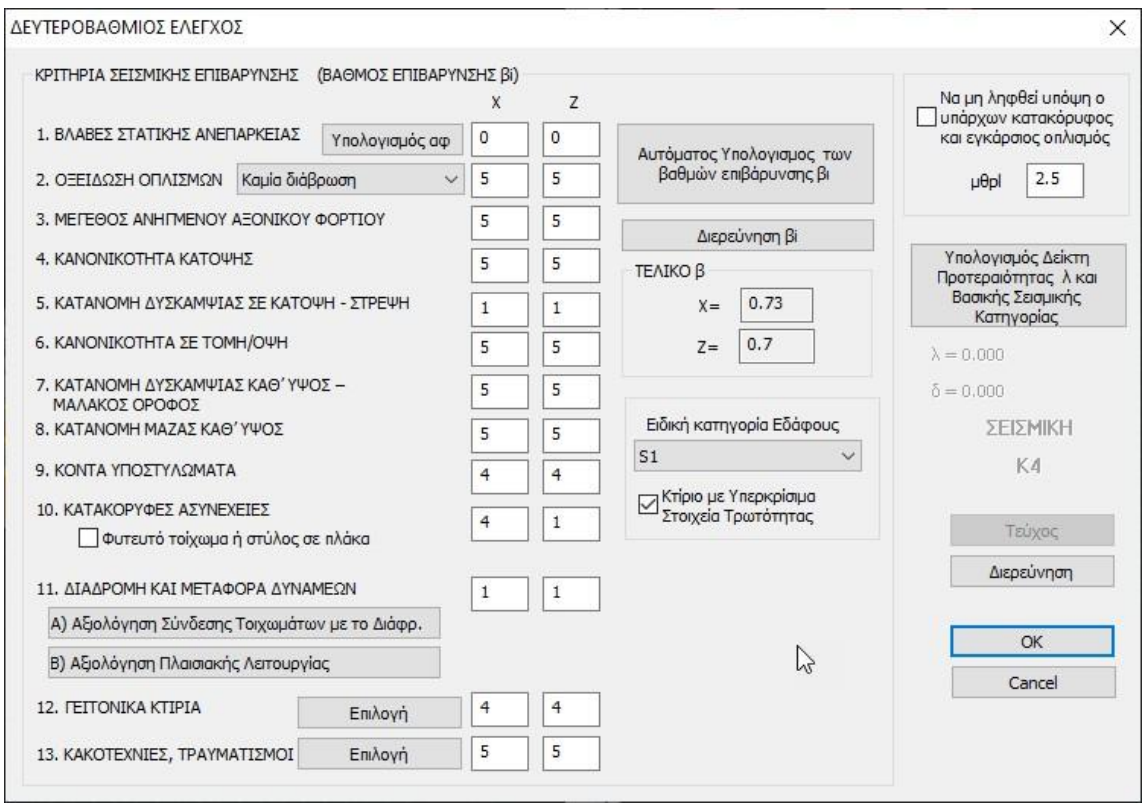
$\mu_{\theta}^{pl} = 0{,}5 - 5{,}0$ *(prices at the discretion of the Engineer)*

Indicatively, for old structures (e.g. pre-1985), with sparse fasteners e.g. less than Φ8/200, S220 could be taken , while for new structures (e.g. post-2000 construction), with dense fasteners e.g. more than Φ8/125, S500 can be considered to have values perhaps exceeding 5.

By selecting the command

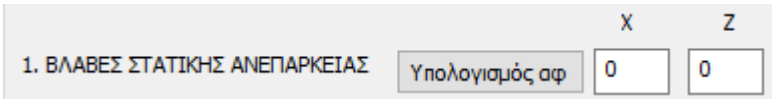


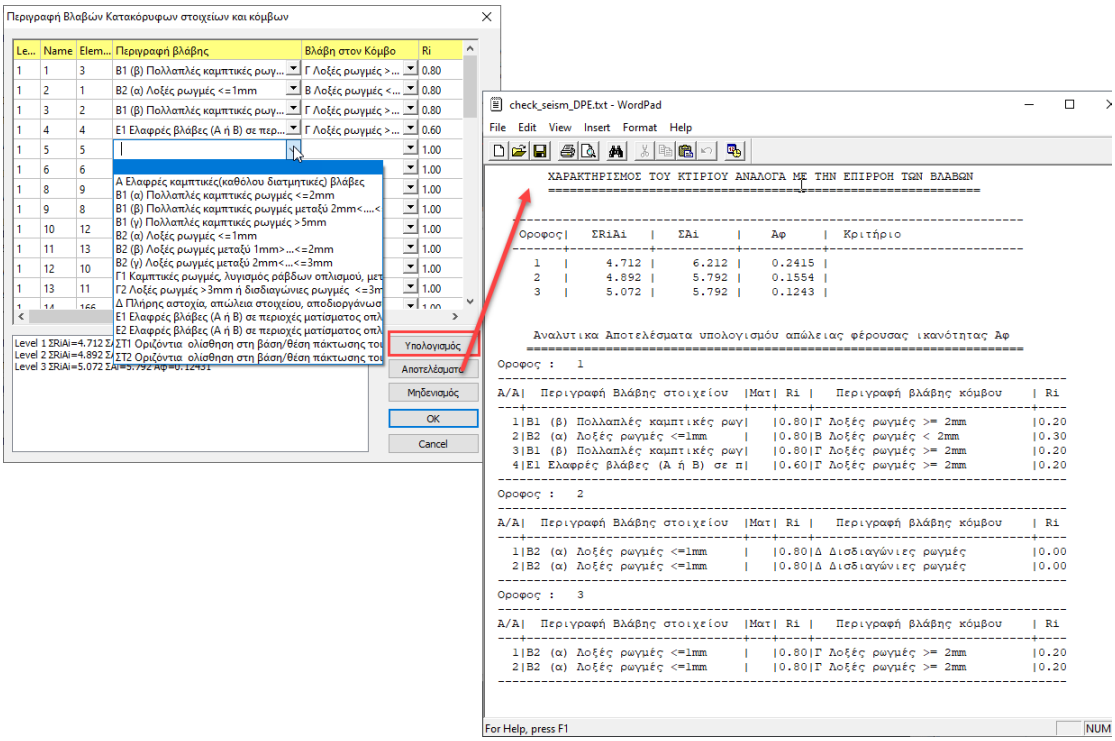
The following dialog box appears

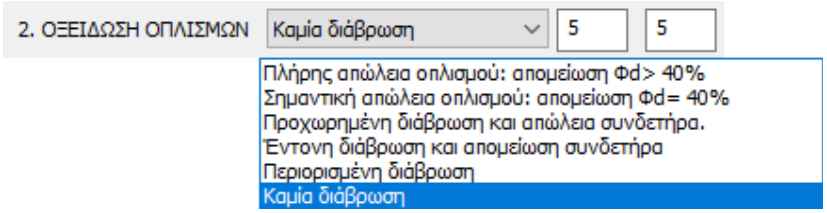


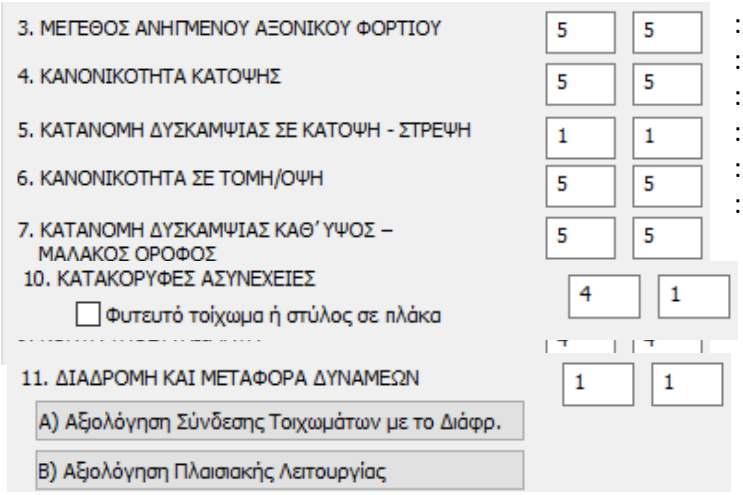
The left section includes the 13 seismic loading criteria in order to determine the *degree of loading b* per direction.
For all criteria, the *degree of burden b is* automatically calculated by the program as long as the corresponding data is entered in the fields provided (alternatively, "manual" values can be entered).

Details for each criterion:





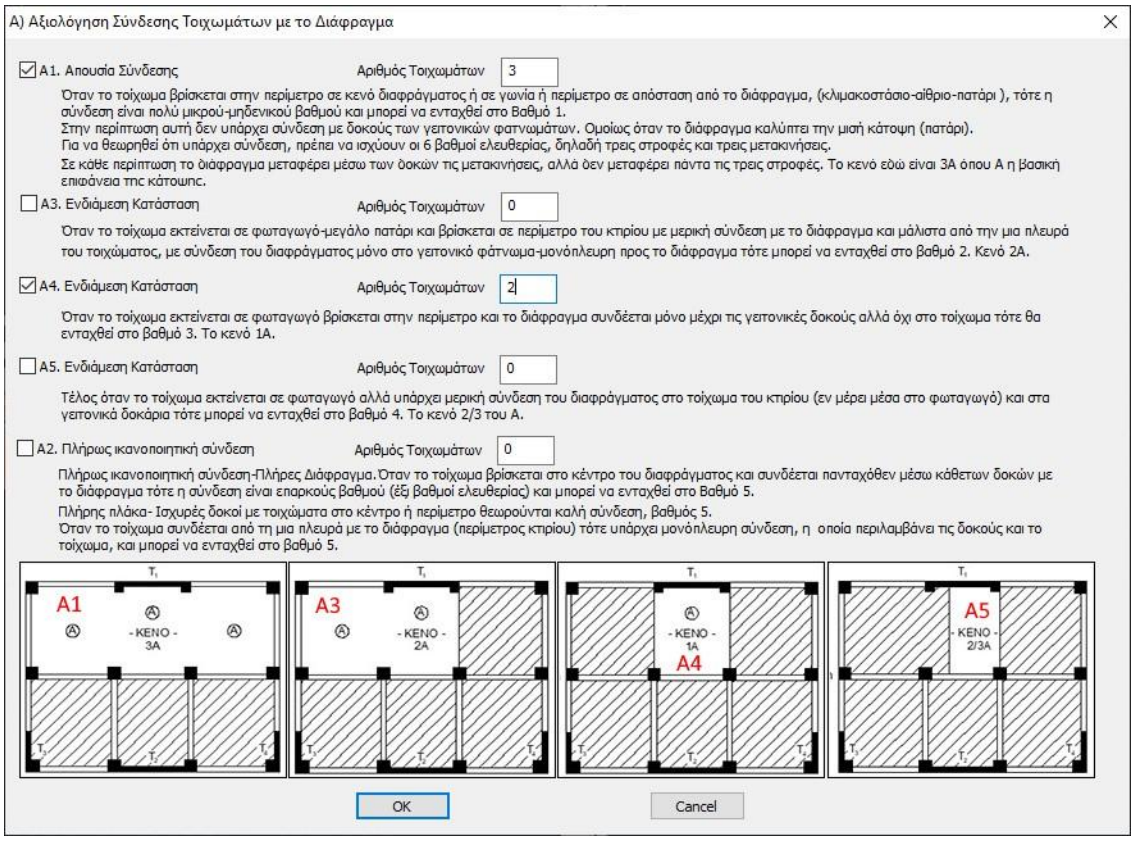


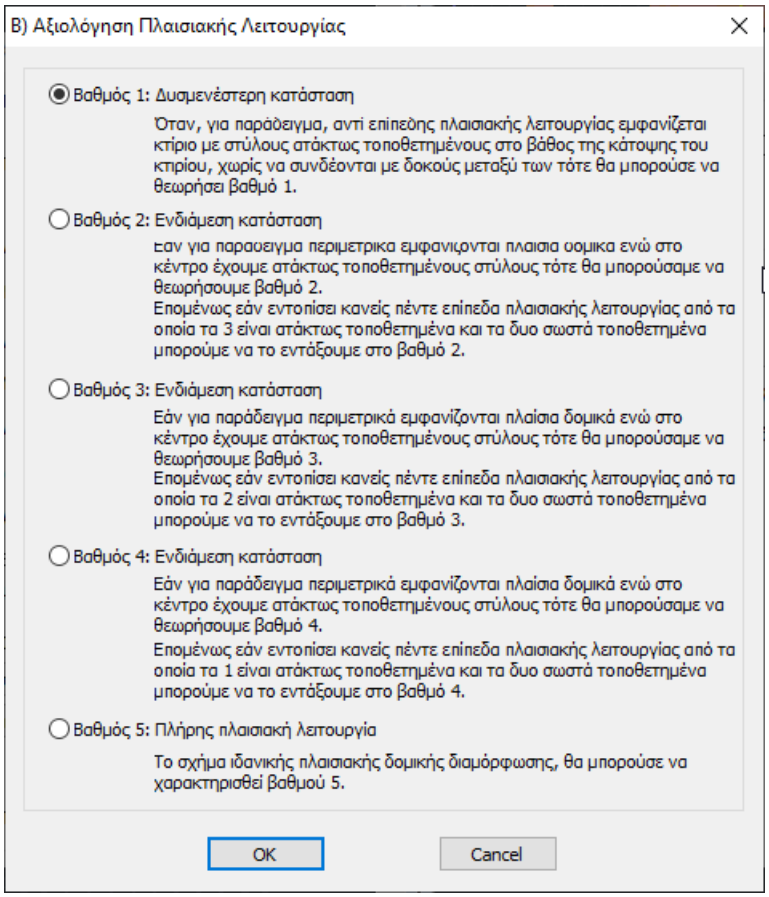


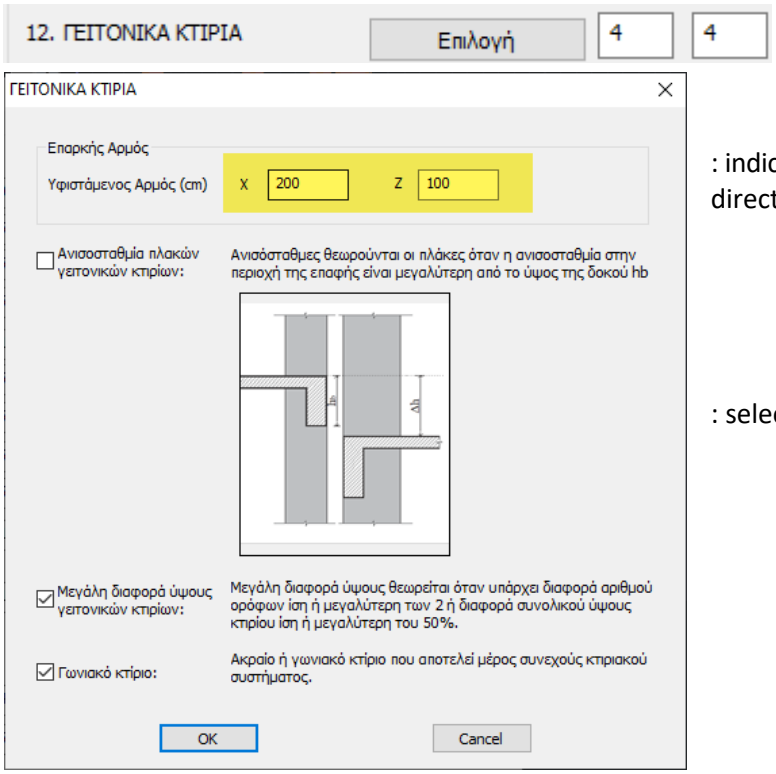
: Calculation of b according to vd
: Resulting from the analysis checks
: Resulting from the analysis checks
: Resulting from the analysis checks
: Resulting from the analysis checks
: Calculation of b according to l/h

: You select it when there is a planted element on a plate

: Definition connection and number of walls
: Status determination

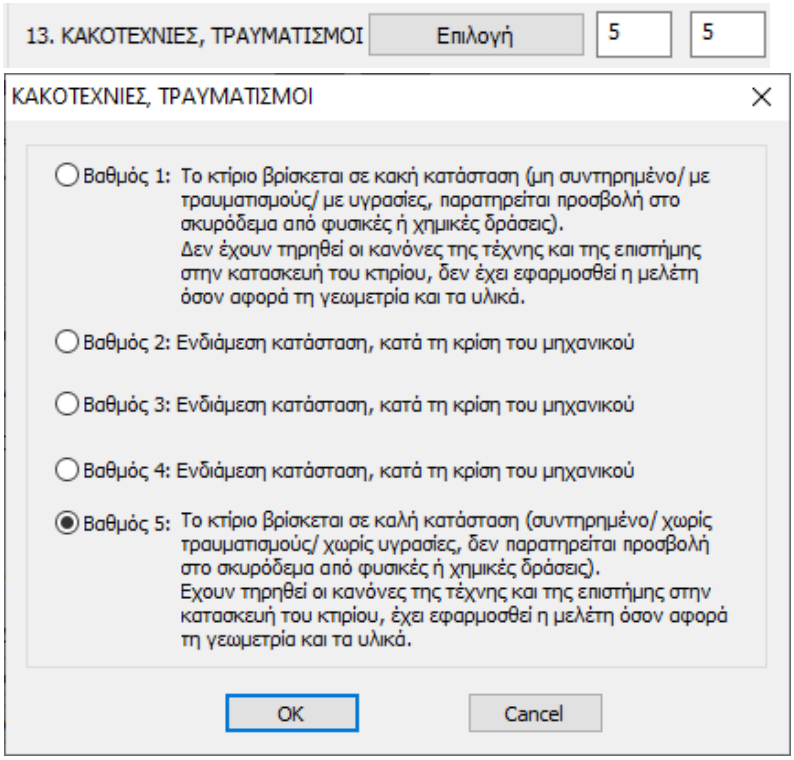




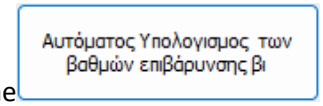


: indication of the existing joint per direction

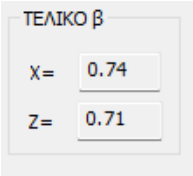
: selection of one or more cases

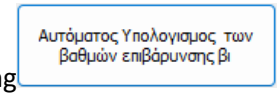


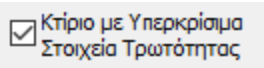
: choice of a grade depending on the condition of the building

Then by selecting the 

button the values in the criteria are automatically calculated and the program calculates the final β per seismic direction.



If even one of the criteria is classified as supercritical, then by selecting 

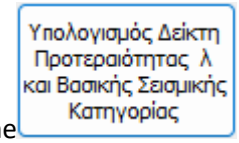
the building is categorised in a special category entitled "**buildings with supercritical vulnerability elements**". 

It should be noted that in these cases the 2nd Pre-seismic Check will be completed (determining the seismic capacity index), by calibrating the criterion with βi=0.

Buildings founded on soils of class S1 or S2 are also classified in the same category (see below on soil factor S).

By selecting the "Investigation" button, the b (Burden Level) of each criterion is displayed in detail.

```
Προσδιορισμός των β
1. ΒΛΑΒΕΣ ΣΤΑΤΙΚΗΣ ΑΝΕΠΑΡΚΕΙΑΣ
        αφ=0.425 Βαθμός x =0  Βαθμός z =0
2. ΟΞΕΙΔΩΣΗ ΟΠΛΙΣΜΩΝ
        Καμία διάβρωση Βαθμός x =5  Βαθμός z =5
3. ΜΕΓΕΘΟΣ ΑΝΗΓΜΕΝΟΥ ΑΞΟΝΙΚΟΥ ΦΟΡΤΙΟΥ
Μέλος  :     1 Nsd=    168.00 fck=50000.00 Vd=      0.01 Βαθμός=5
Μέλος  :     2 Nsd=    168.00 fck=50000.00 Vd=      0.01 Βαθμός=5
Μέλος  :     3 Nsd=    168.00 fck=50000.00 Vd=      0.01 Βαθμός=5
Μέλος  :     4 Nsd=    168.00 fck=50000.00 Vd=      0.01 Βαθμός=5
Σύνολο : ΣVd=      0.06 / 4 = 0.014 Βαθμός=5
Τελική επιλογή  : Βαθμός x =5  Βαθμός z =5
4. ΚΑΝΟΝΙΚΟΤΗΤΑ ΚΑΤΟΨΗΣ
Οροφος 1       3.000 Lmax=  8.000 Lmin=  5.000 λ=  1.600 Βαθμός=5
Οροφος 1       3.000 ΣΑΕ=  0.000 Atot= 40.000 Βαθμός=5
Οροφος 1       3.000 AE,max=  0.000 Atot= 40.000 Βαθμός=5
Οροφος 2       6.000 Lmax=  8.000 Lmin=  5.000 λ=  1.600 Βαθμός=5
Οροφος 2       6.000 ΣΑΕ=  0.000 Atot= 40.000 Βαθμός=5
Οροφος 2       6.000 AE,max=  0.000 Atot= 40.000 Βαθμός=5
Οροφος 3      10.000 Lmax=  8.000 Lmin=  5.000 λ=  1.600 Βαθμός=5
Οροφος 3      10.000 ΣΑΕ=  0.000 Atot= 40.000 Βαθμός=5
Οροφος 3      10.000 AE,max=  0.000 Atot= 40.000 Βαθμός=5
Τελική επιλογή  : Βαθμός x =5  Βαθμός z =5
5. ΚΑΤΑΝΟΜΗ ΔΥΣΚΑΜΨΙΑΣ ΣΕ ΚΑΤΟΨΗ - ΣΤΡΕΨΗ
Οροφος 1       3.000 ε=  0.000 Lx=  5.000 λ=  0.000 Βαθμός x =5
Οροφος 1       3.000 ε=  0.000 Lz=  8.000 λ=  0.000 Βαθμός z =5
Τελική επιλογή  : Βαθμός x =5  Βαθμός z =5
6. ΚΑΝΟΝΙΚΟΤΗΤΑ ΣΕ ΤΟΜΗ/ΟΨΗ
Τελική επιλογή  : Βαθμός x =5  Βαθμός z =5
7. ΚΑΤΑΝΟΜΗ ΔΥΣΚΑΜΨΙΑΣ ΚΑΘ' ΥΨΟΣ - ΜΑΛΑΚΟΣ ΟΡΟΦΟΣ
Οροφος 2       6.000 ΔΚΙ_X=  0.000 ΔΚΙ_Z=  0.000 Βαθμός x =5  Βαθμός z =5
Οροφος 3      10.000 ΔΚΙ_X= 25.000 ΔΚΙ_Z= 25.000 Βαθμός x =5  Βαθμός z =5
Τελική επιλογή  : Βαθμός x =5  Βαθμός z =5
8. ΚΑΤΑΝΟΜΗ ΜΑΖΑΣ ΚΑΘ' ΥΨΟΣ
Οροφος 2       6.000 ΔΜΙ=  5.555 Βαθμός =5
Οροφος 3      10.000 ΔΜΙ= 15.789 Βαθμός =5
Τελική επιλογή  : Βαθμός x =5  Βαθμός z =5
9. ΚΟΝΤΑ ΥΠΟΣΤΥΛΩΜΑΤΑ
Μέλος  :     1 z: l=    300.00 h=60.00 l/h=      5.00 Βαθμός=4
Μέλος  :     2 z: l=    300.00 h=60.00 l/h=      5.00 Βαθμός=4
Μέλος  :     3 z: l=    300.00 h=60.00 l/h=      5.00 Βαθμός=4
Μέλος  :     4 z: l=    300.00 h=60.00 l/h=      5.00 Βαθμός=4
Οροφος 0       0.000 z: n1=  0 n2=  0 n3=  0 n4=  4 n5=  0 β'= 4.00 Βαθμός=4
Μέλος  :     5 z: l=    300.00 h=60.00 l/h=      5.00 Βαθμός=4
Μέλος  :     6 z: l=    300.00 h=60.00 l/h=      5.00 Βαθμός=4
Μέλος  :     7 z: l=    300.00 h=60.00 l/h=      5.00 Βαθμός=4
Μέλος  :     8 z: l=    300.00 h=60.00 l/h=      5.00 Βαθμός=4
Οροφος 1       3.000 z: n1=  0 n2=  0 n3=  0 n4=  4 n5=  0 β'= 4.00 Βαθμός=4
Τελική επιλογή  : Βαθμός x =5  Βαθμός z =4
10. ΚΑΤΑΚΟΡΥΦΕΣ ΑΣΥΝΕΧΕΙΕΣ
11. ΔΙΑΔΡΟΜΗ ΚΑΙ ΜΕΤΑΦΟΡΑ ΔΥΝΑΜΕΩΝ
12. ΓΕΙΤΟΝΙΚΑ ΚΤΙΡΙΑ
13. ΚΑΚΟΤΕΧΝΙΕΣ, ΤΡΑΥΜΑΤΙΣΜΟΙ
```

Then, by selecting the 

button, the program calculates automatically:

- the final **Priority Index λ**,
- the **Seismic Category Coefficient d** and
- the **seismic category of building K**, according to the Government Gazette.

λ = 84.033

δ = 1.190

ΣΕΙΣΜΙΚΗ ΚΑΤΗΓΟΡΙΑ

K1

Similarly, by selecting the "Investigate" button you can see in detail the calculation of the quantities needed to calculate λ

```
Μεθοδολογία υλοποίησης ΔΠΕ
Προσδιορισμός Σεισμικής Απαίτησης Vreq (Vreq,x , Vreq,z)
H = 10.000 (Ορόφος αναφοράς 1000.000 - 0.000)
T0 = 0.413 ag = 1.570
TB = 0.150 TC = 0.500 TD = 2.500
Εφαρμοσθείς κανονισμός το ή μετά το 1995
Ευμενής παρουσία ή απουσία τοιχοπληρώσεων
q=1.500 q1=3.000 q2=0.600
Συντελεστής Εδάφους S = 1.00 B
SdT = 2.616
M = 64.832
V_reqx = 169.601  V_reqz = 169.601
Μέλος  :     1 l=300.00 X:0, 40.00x60.00 Z:2, 60.00x40.00 (0=στύλος,1=τοιχείο,2=κοντό)
               N=    168.00 My=     -6.70 Mz=     -2.21 My'=   -260.26 Mz'=    -85.94 VRd=   1504.71 VM=    -57.30 LS=      1.50
               N=    168.00 My=     -6.70 Mz=     -2.21 My'=   -260.26 Mz'=    -85.94 VRd=   1538.15 VM=   -173.50 LS=      1.50
Μέλος  :     2 l=300.00 X:0, 40.00x60.00 Z:2, 60.00x40.00 (0=στύλος,1=τοιχείο,2=κοντό)
               N=    168.00 My=     -6.70 Mz=      2.21 My'=   -260.26 Mz'=     85.94 VRd=   1504.71 VM=     57.30 LS=      1.50
               N=    168.00 My=     -6.70 Mz=      2.21 My'=   -260.26 Mz'=     85.94 VRd=   1538.15 VM=   -173.50 LS=      1.50
Μέλος  :     3 l=300.00 X:0, 40.00x60.00 Z:2, 60.00x40.00 (0=στύλος,1=τοιχείο,2=κοντό)
               N=    168.00 My=      6.70 Mz=     -2.21 My'=    260.26 Mz'=    -85.94 VRd=   1504.71 VM=    -57.30 LS=      1.50
               N=    168.00 My=      6.70 Mz=     -2.21 My'=    260.26 Mz'=    -85.94 VRd=   1538.15 VM=    173.50 LS=      1.50
Μέλος  :     4 l=300.00 X:0, 40.00x60.00 Z:2, 60.00x40.00 (0=στύλος,1=τοιχείο,2=κοντό)
               N=    168.00 My=      6.70 Mz=      2.21 My'=    260.25 Mz'=     85.94 VRd=   1504.71 VM=     57.30 LS=      1.50
               N=    168.00 My=      6.70 Mz=      2.21 My'=    260.25 Mz'=     85.94 VRd=   1538.15 VM=    173.50 LS=      1.50
Τοιχοπληρώσεις
Προσδιορισμός Σεισμικής Αντίστασης VR (VR,x - VR,z)
αTx = 0.00000 αTz = 0.00000
V_Rox =    194.807 (0.85x229.18 + 0.85x0.00 + 0.85x0.00 + 0.00)
V_Roz =    589.915 (0.85x0.00 + 0.85x0.00 + 0.85x694.02 + 0.00)
Υπολογισμός Δείκτη Προτεραιότητας  Ελέγχου των κτιρίων λ
τελικά β x = 0.72000 z = 0.69000
λx = 0.84033 λz = 0.49092
τελικός Δείκτης Προτεραιότητας Ελέγχου λ = 84.03317 * 1.00000 = 84.03317
ο συντελεστής δ = 1.19001
Βασική σεισμική κατηγορία : K1
Περίοδος Επαναφοράς (έτη)     : 475
Πιθανότητα υπέρβασης σεισμικής δράσης εντός του συμβατικού χρόνου ζωής των 50 ετών : 10%
```

Finally, the "Issue" option presents a summary of the data and the results of the audit

AEYTEPOBAOMIOE FIPOZEIEMixoz mErxoz

NPOZAIOP1ZMOE ZEIZMIKHZ AOAEZHZ V {V , V .,) V =MWd{f}

Zuv.Nlja Id (kN/)	614.51	q,	1.50	£d{T). {m/sec2)	2.62	Vj,	(kNj	1607.57
T (sec)	0.432	q,	1.50	sa{T), (mGec2}	2.62	Vj,	{kNj	16 07.57

n zaior'izvoE ZEIZ MIKHZ ANTIZTAZHZ V ,{V p, V p) V =#W

α/α		KPITHPIA ZEIZMIKHZ EFIIBAPYNZHZ	§	§ ę		TMIKA i$		
1	MÁ	BAABEZ ZTATIKHZ ANEEAPKEIA£	0	0	§ ,	0.76	{I,	0.73
2		OEEJADZH OFIAIZMCN	5	5	TEMNOYZA ANTOXH Z V no			
3		Ę MErEooz ANHFMENOY AEONIKOY 6OPTIOY	**5**	**5**	$V_{R0,x}$ (kN)	609.6 6	$V_{R0,z}$ (kN)	67499
4		CANONIKOTHTA £	5	5	EEIZMIKH ANTIZTAEH		V	
5		KATANOMH AYZKAM MIAŁ EE KATOTH - ZTPETH	1	1	$V_{R,x}$ (kN)	463.34	$V_{R,z}$ (kN)	4 92.74
6		CANONICOTHY ZE TOMHf0^I'H	5	5				
7		KATANOMH AYZKAMTIAZ KAO' YTOE - MAAAKOE OPO6OE	5	5				
8		KATANOfdHŃIAZAZKAO'WOZ	5	5				
9		KONTAYEOZTYMMATA	5	5				
10		CATACOPY6EEAZY'NEXEIEZ	4	1				
11		AIAAPOMH KAI META6OPA AYNAMEON	1	1				
12		FEITONIKAKTIRA	4	4				
13		KAKOTEXNIEZ, TPAYMATIZMOI	5	5				

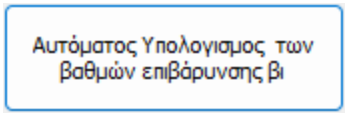
K+fpio pz Ywzpxpfoiyo Eroiyzio Tpcuzó q+og ☑

Δείκτης Προτεραιότητας Ελέγχου ($\lambda_{τελ.}$) Συντελεστής Σεισμικής Κατηγορίας (δ)					
λ_x	3.42	$\lambda_{τελ.}$ 100*max(λ_x, λ_z)*γ_I	341.94	δ min(1/λ_x, 1/λ_z)	0.292
λ_z	3.31				
Σεισμική Κατηγορία					K4+

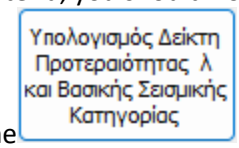
ZZS	20%	0.75 ≤ δ < 1.00
70	50%	0.*Ss S*0.6O
−20	>90%	d - 0.25

ATTENTION!

If you enter even one manual value in the criteria, you should not press the

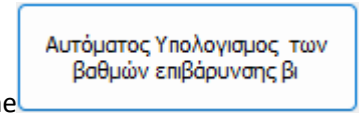


but directly the



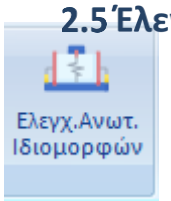
button which, apart from the final calculation of λ, recalculates the b factor based on the values displayed at that time in the fields.

The



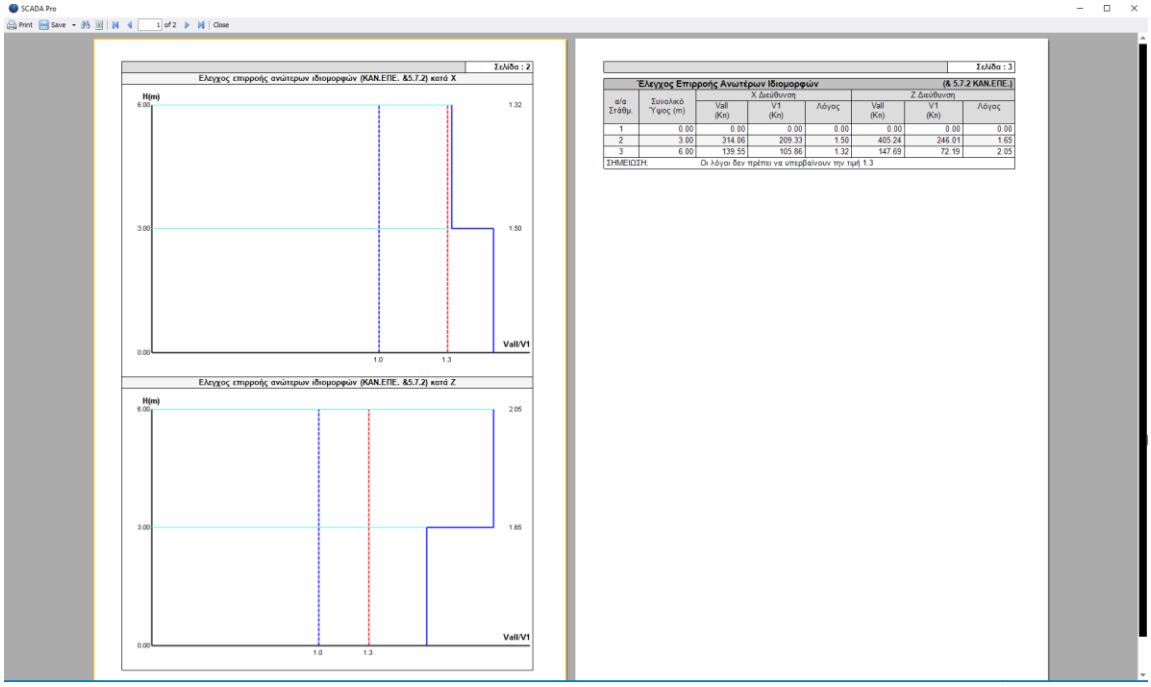
button overrides the manual values and always performs an automatic calculation for these criteria.

2.5 Έλεγχος Ανώτερων Ιδιομορφών



Select the command to display the results of the upper Idioms check CAN §5.7.2 (b) INFLUENCE OF THE HIGHER IDIOMORITIES

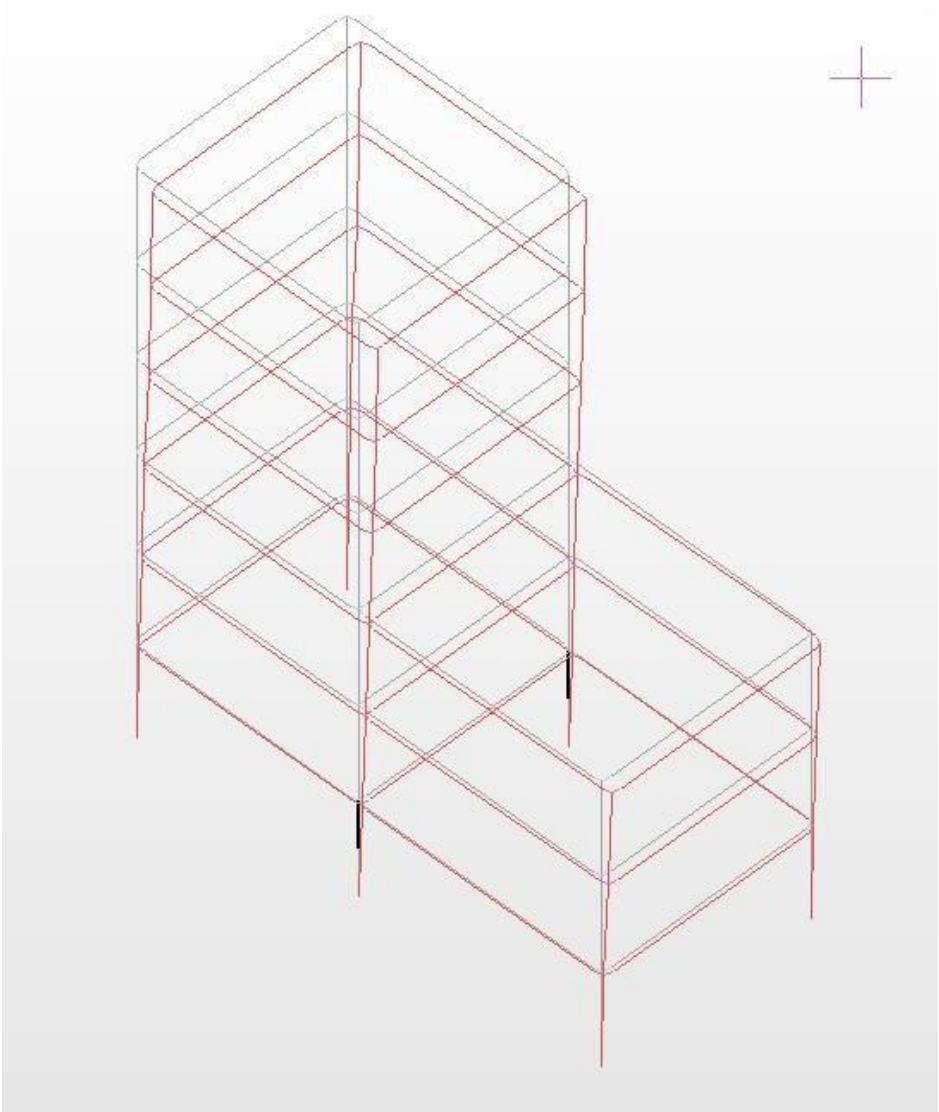
A further check is contained in paragraph 5.7.2 (b) of the EIA and relates to the influence of the higher eigenmodes (see chapter 1.2.2 p. 38).



Show

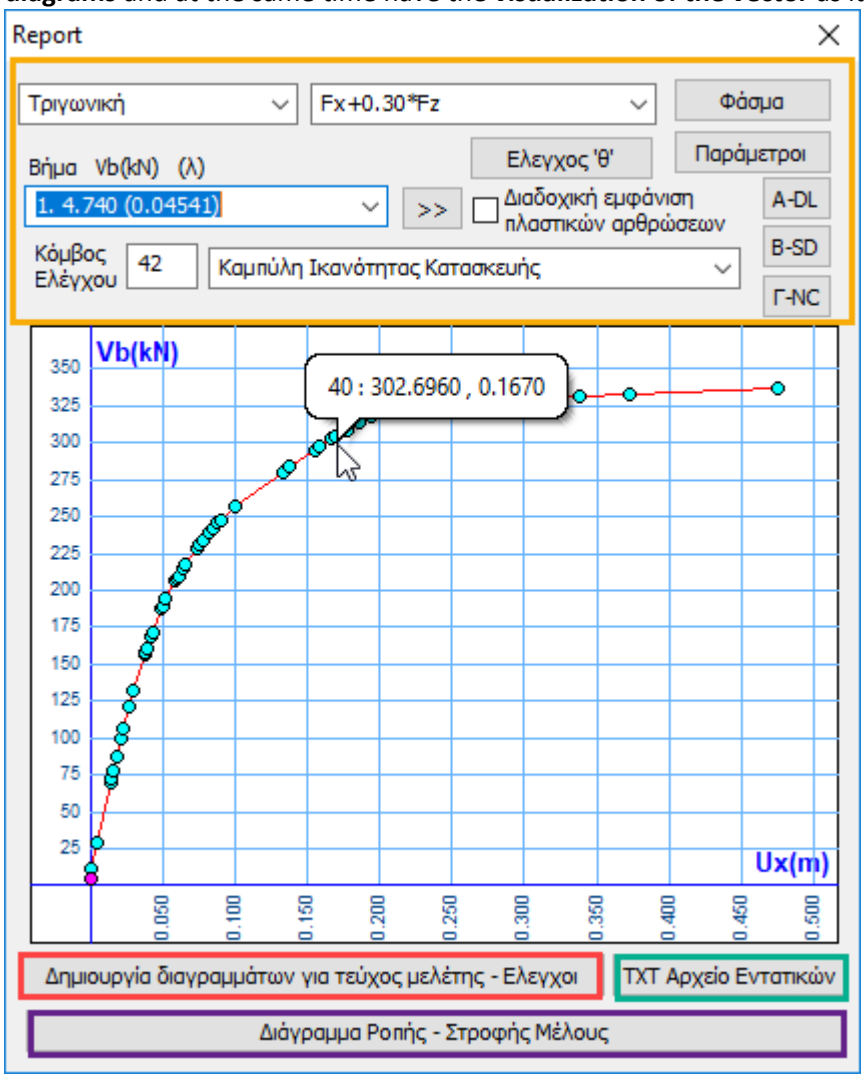
3.1 Εμφάνιση Σεναρίων σεισμικών Ανελαστικών αναλύσεων

With an active Elastic Analysis script: by selecting one of the "Display" commands (e.g. "Mass Distribution") the vector is converted to this format in a 3D display

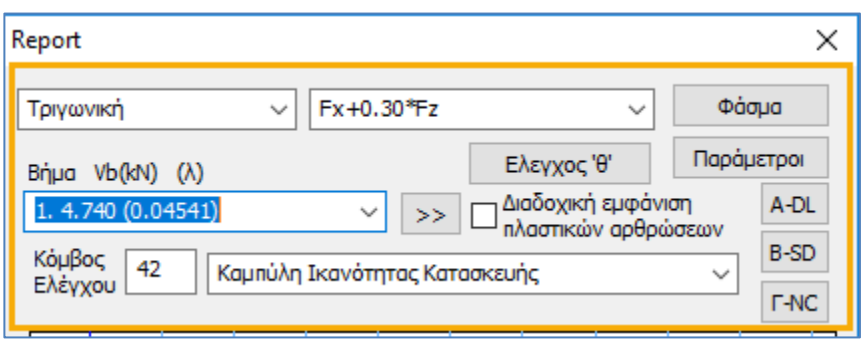


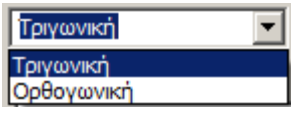
and the relevant dialogue box appears:

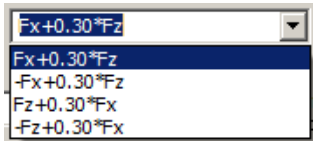
It is a new tool that allows us to receive the results of all Pushover analyses in the form of **diagrams** and at the same time have the **visualization of the vector** as it responds to Pushover.

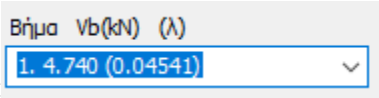


At the top of the window



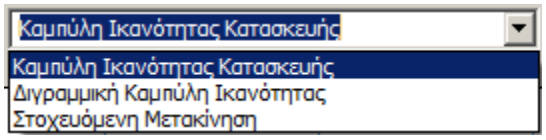
we select one of the distributions, which we had previously set to be included in the parameter window, 

and respectively one of the default combination 

and in the list 

the steps of the specific anelastic analysis are displayed and for each step the cutting force Vb(kN) and the corresponding minimum load factor (λ) are shown, while at the same time they are formed:

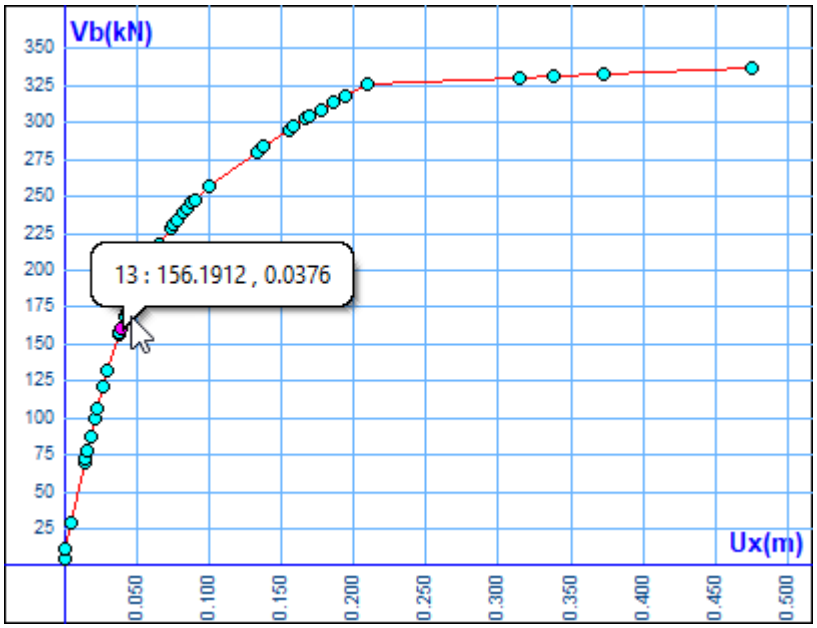
Construction Capacity Curve Bilinear Capacity Curve Targeted Movement



3.1.1 Καμπύλη Ικανότητας (Αντίστασης) της κατασκευής

It expresses the non-linear relationship between the imposed horizontal load and the displacement of the Control Node.
On the Resistance Curve, the "Steps" of the pushover analysis are formed in the form of points. The selected step is shown in pink and represents the creation of a plastic joint (i.e. when the cutting force at Control Node X has a value of Vb of about 156 (kN) then the first plastic joint is created).

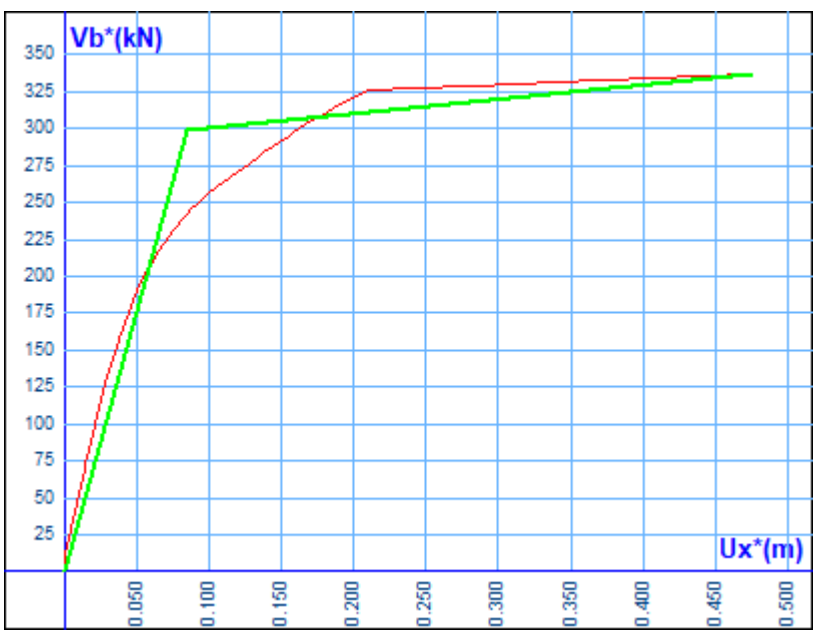
Moving the mouse to the step points displays the step number and the corresponding Vb and Ux values.

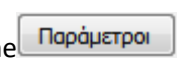


*In the "**Control Node**" field we can select another control node to see the results without having to run the analysis script again. The results are updated automatically.*

3.1.2 Γραμμική Καμπύλη Ικανότητας

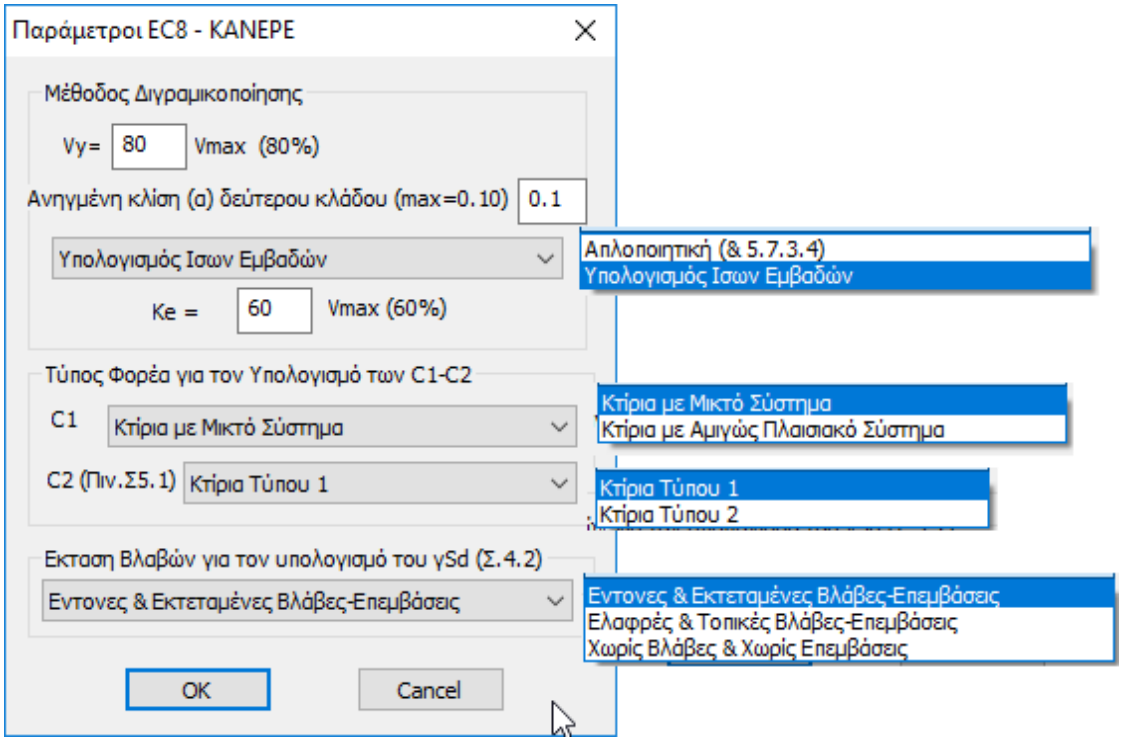
This is the corresponding bilinear curve calculated either in the simplified way provided for by the KANEPE, or by calculating equal areas.



The 

button in the definition of the parameters for the bilinearization of the capacity curve of the structure. This bilinear curve is necessary

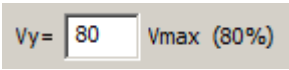
in order to use the slopes of its two branches to calculate the eigenperiod and the corresponding spectral acceleration.
Selecting it displays the following dialog box



There are two methods for calculating the bilinear curve:

- The "***simplifying***" one, with values as provided by the CANEE and entered in the parameters discussed below
- ***The*** "***equal area method***", where these parameters are used as the starting positions to determine the bilinear.

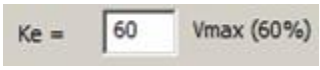
The first parameter concerns the slope of the second branch, with the



- simplifying method: fixed
- method of equal areas: as a starting slope.

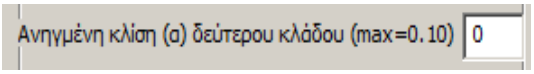
With a value of 0 the second branch will be drawn horizontally in both methods.

Option ***Ke*** refers to the starting slope of the first branch, with the



- simplifying method: fixed
- method of equal areas: as a starting slope.

The "***Negative gradient (a)***" refers to the second branch:



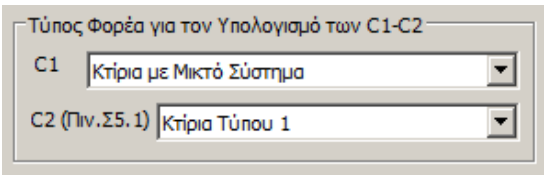
with a value of 0, is automatically calculated with a threshold of

0.10 as provided for in the CANEP, while

with a user value, is plotted fixed at that slope.

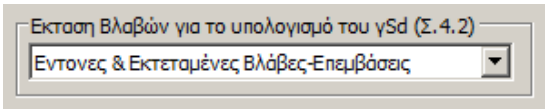
For the CANEP the default values of these parameters, for either method, are the default values.

In the section "***Type of Carrier for the calculation of C1-C2***"



select your building type to calculate the above coefficients which are used for the calculation of the targeted movement.

Finally, in the section "***Extent of damage for the calculation of gSd***"



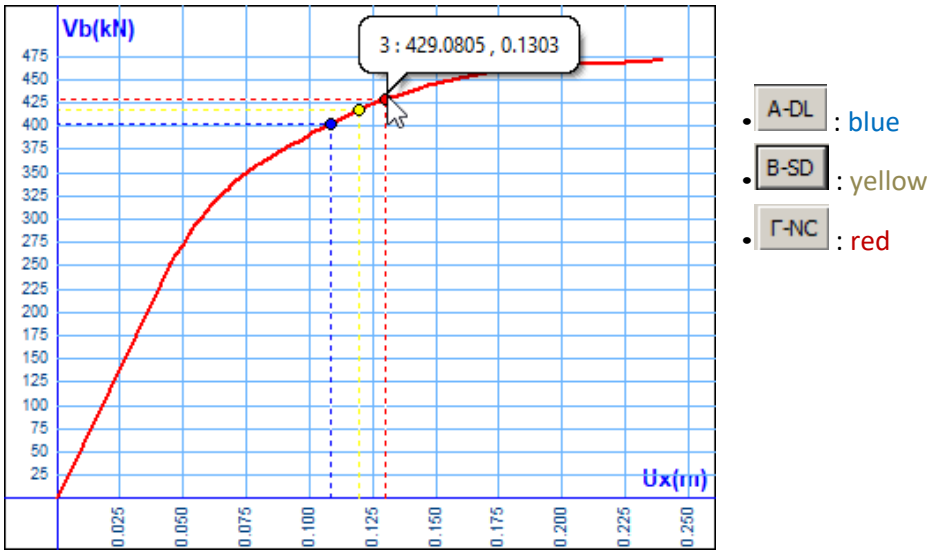
you choose the extent of the damage to your building in order to take into account the appropriate safety factor γSd.

OBSERVATION:

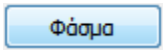
- It should be noted that any changes you make to the "Spectra" and "Parameters" options do not require you to run the analysis script again. The results are updated automatically.

3.1.3 Στοχευόμενη Μετακίνηση

Three target movements are calculated, one for each performance level.



Moving the mouse to the points Displays the values for the three targeted movements, one for each performance level and the corresponding intersections at the Control Node.

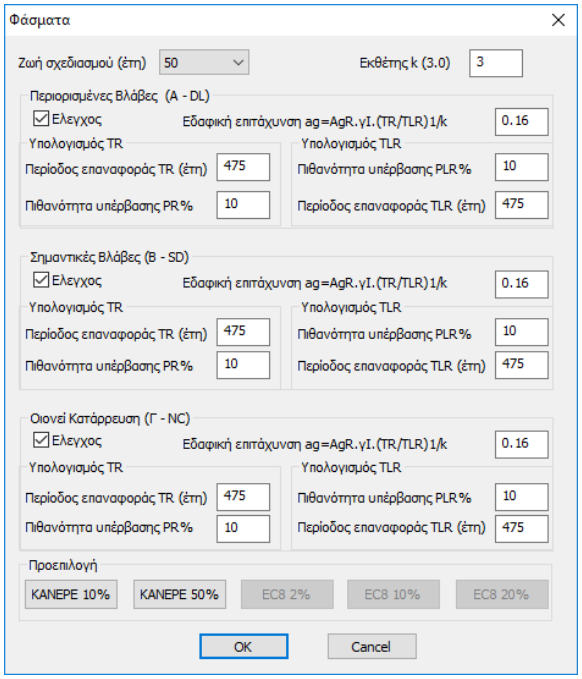


button displays the same dialog box as the one in the original script parameters.

OBSERVATION:

- *It should noted that these parameters, because they relate to the calculation of the targeted movement, can be set or modified <u>and after</u>*
  run the inelastic analysis without the need to re-run it. The same applies to the control node.

You can select another control node here without having to run the analysis again. The program automatically displays the results for this node.



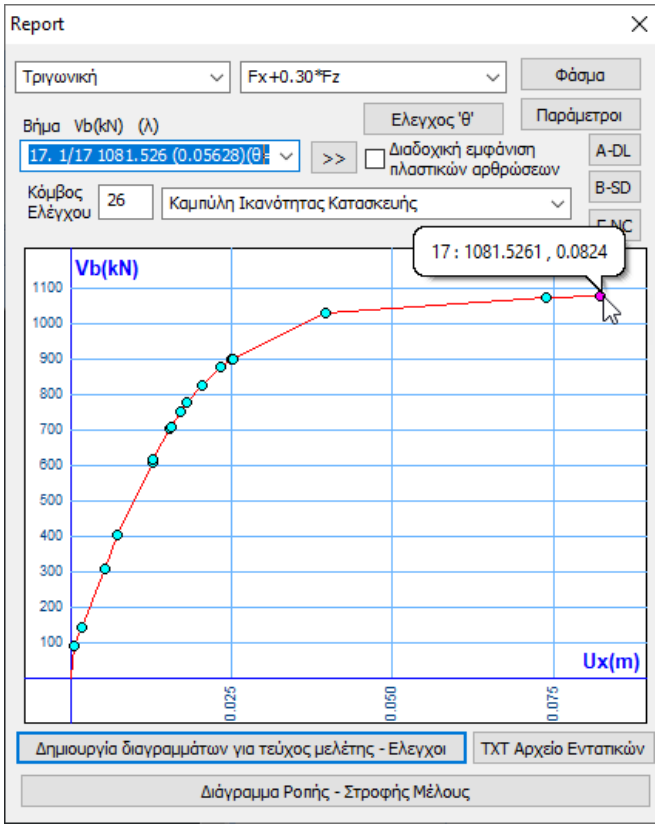
OBSERVATION:
The printout of the section adequacy checks in terms of deformation now shows in detail the quantities (Ci and the rest) used for the calculation of the targeted displacement and the check at the level of the girder:

ΕΛΕΓΧΟΣ ΕΠΑΡΚΕΙΑΣ ΦΟΡΕΑ ΣΕ ΟΡΟΥΣ ΠΑΡΑΜΟΡΦΩΣΕΩΝ						
	C0	C1	C2	C3	Se(T) (m/sec2)	Te (sec)
Περιορισμένες Βλάβες (A-DL)	1.20	1.17	1.00	1.00	7.06	0.33
Σημαντικές Βλάβες (B-SD)	1.20	1.17	1.24	1.00	7.06	0.33
Οιονεί Κατάρρευση (Γ-NC)	1.20	1.17	1.41	1.00	7.06	0.33

	Στοχευόμενη Μετακινήση dt(cm)	Συνολική Μετακινήση dm(cm)	λόγος λ=dt/dm	ΕΠΑΡΚΕΙΑ
Περιορισμένες Βλάβες (A-DL)	2.69	8.24	0.33	Ναι
Σημαντικές Βλάβες (B-SD)	3.33	8.24	0.40	Ναι
Οιονεί Κατάρρευση (Γ-NC)	3.78	8.24	0.46	Ναι

- **Control at operator level**

This check is for the whole carrier and compares the movement dm which is the movement corresponding to the last step of the pushover



With the targeted movements corresponding to the performance levels.

	Στοχευόμενη Μετακινήση dt(cm)	Συνολική Μετακινήση dm(cm)	λόγος λ=dt/dm	ΕΠΑΡΚΕΙΑ
Περιορισμένες Βλάβες (A-DL)	2.69	8.24	0.33	Ναι
Σημαντικές Βλάβες (B-SD)	3.33	8.24	0.40	Ναι
Οιονεί Κατάρρευση (Γ-NC)	3.78	8.24	0.46	Ναι

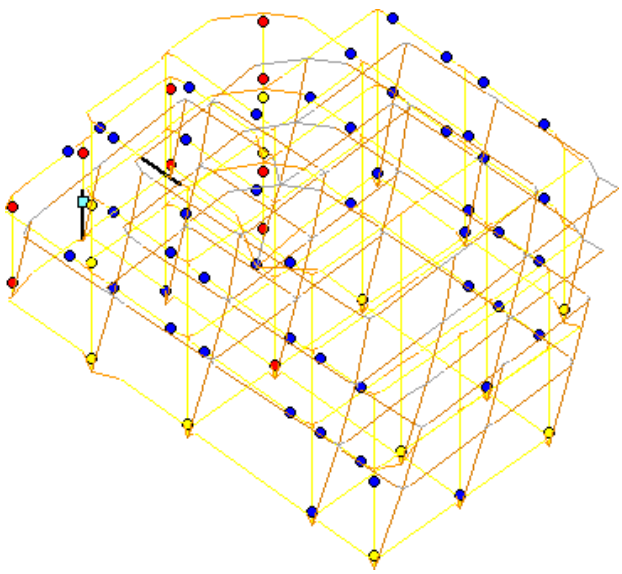
EXAMPLE: In this example the value is dm=8.24 cm. This is the maximum displacement that the carrier can withstand before it collapses. This is compared to the target displacement of each performance level dt and must of course be greater, i.e. the requirement (target) must be less than the "resistance".

3.1.4 Απεικόνιση του φορέα

The program also allows us to see in real time the deformation state of the beam and the edges of the cross-sections where the plastic joints are created, for each step of the analysis.
There are two methods of imaging the vector.
The first way is by selecting a step from the list

(the selection becomes blue) and you will see for this step the state of the carrier and the points of plastic joints.

The original, undeformed state of the carrier is shown in grey. The deformed carrier is shown in red and the coloured dot shows the edge of the plastic joint.



This dot, depending on the size of the turning angle of the plastic joint, is coloured in three colours.

Blue when

$$S_d \le R_d = \theta_d^{pl} = \frac{\theta_{pl}}{\gamma_{Rd}} = 0.5\,\frac{\theta_{pl}^{cr}}{\gamma_{Rd}}$$

Yellow when

$$0.5\,\frac{\theta_{pl}}{\gamma_{Rd}} = 0.5\,\frac{\theta_{pl}^{cr}}{\gamma_{Rd}} \le S_d \le R_d = \theta_d^{pl} = \frac{\theta_{pl}}{\gamma_{Rd}} = \frac{\theta_{pl}^{cr}}{\gamma_{Rd}}$$

$$S_d \ge R_d = \theta_d^{pl} = \frac{\theta_{pl}}{\gamma_{Rd}} = \frac{\theta_{pl}^{cr}}{\gamma_{Rd}}$$

In addition, the sea blue squares that appear at the ends of the elements indicate shear failure. At the end of the member that fails by shear, the box appears, while in the next step the program creates a plastic joint at this point with simultaneous reduction of θy as provided by the CEE for the elements that fail first by shear, and continues the process of completing the pushover analysis.

IMPORTANT OBSERVATION:

For the beams and for the poles we have the following strengths

- ***Vrd,s***
- ***Vrdmax***
- ***Vr***

Especially for the poles we also have the

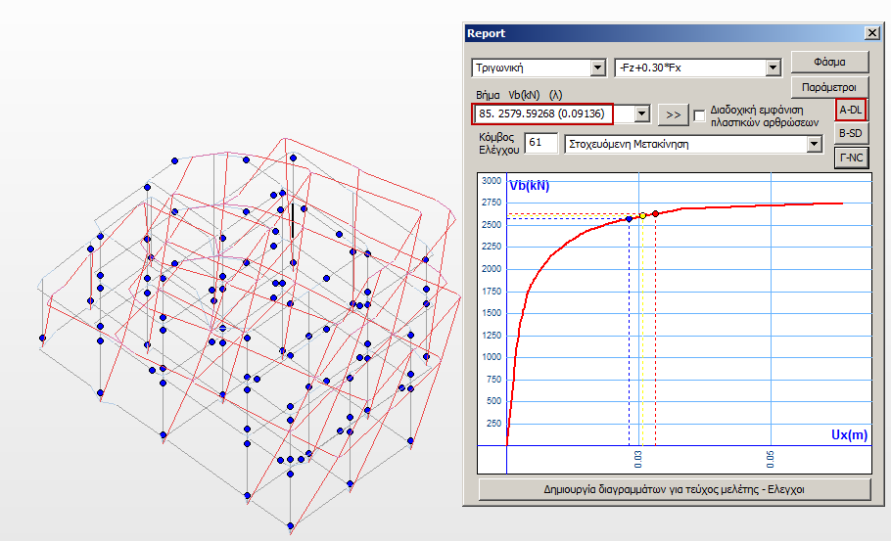
- ***Vr,sls***

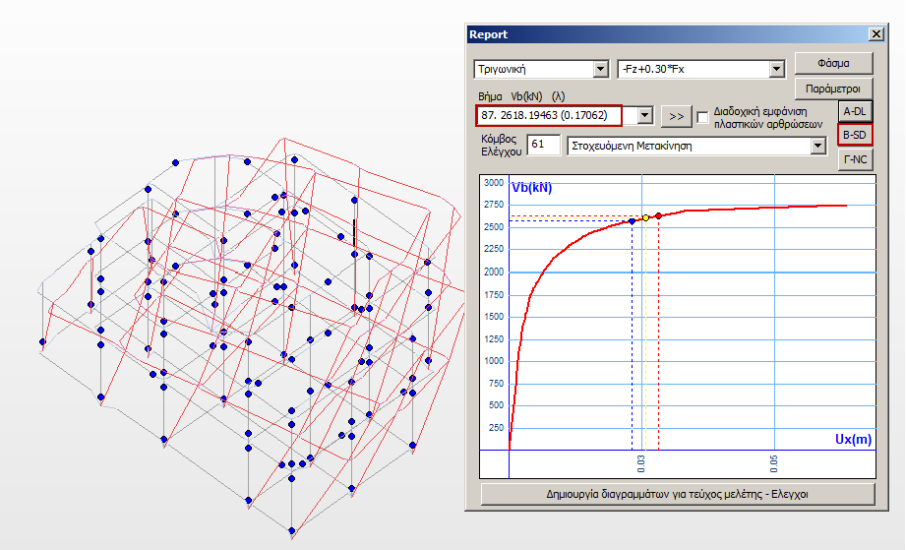
- *For an element to be classified as sandy, the ratio of the shear stress to the lower of the above strengths must exceed unity. Then the program*
  the square shall be taken as a marker and the procedure shall be followed to modify the parameters determined by considering a flexural failure, so that they are effectively reduced from a plagiform failure to a slip failure (reduction ϑy, etc.).
- *In the controls (on the printout), those items are shown whose reason is*
  greater than unity and is derived from all strengths, except Vrd,s which
  is the strength of the fasteners. In the graphical representation, however, the squares are also shown for this failure (from Vrd,s).
  So when squares appear in the graph and the corresponding elements do not appear in the controls, it is an excess of Vrd,s. It is noted, however, that also by exceeding Vrd,s the procedure for reducing the flexural failure normally follows.

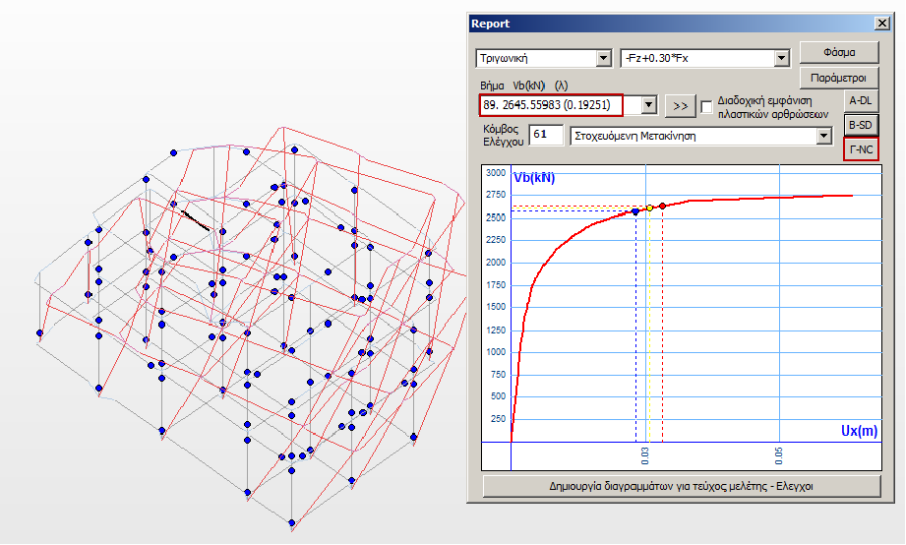
The second way of visualization is to select the first step and by pressing the button >> you can see the vector in motion with the creation of the plastic joints. You end the command by selecting the same key again. The same effect can be achieved by selecting a step and turning the mouse wheel.

The options , A-DL B-SD , and Γ-NC give the deformation state of the vector for the three performance levels respectively, i.e., they show the vector at analysis step where the control node movement is equal to the corresponding target movement. The coloured points above on curve correspond to to three performance levels:

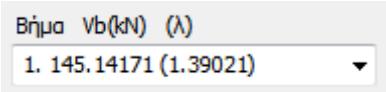
- Station staff A-DL : blue
- Staff station B-SD : yellow
- Stopping point Γ-NC : red


Report
Τριγωνική
-Fz+0.30*Fx
Φάσμα
Παράμετροι
Βήμα Vb(kN) (λ)
85. 2579.59268 (0.09136)
>>
Διαδοχική εμφάνιση πλαστικών αρθρώσεων
A-DL
B-SD
Γ-NC
Κόμβος Ελέγχου
61
Στοχευόμενη Μετακίνηση
Vb(kN)
Ux(m)
0.03
0.05
Δημιουργία διαγραμμάτων για τεύχος μελέτης - Ελεγχοι


Report
Τριγωνική
-Fz+0.30*Fx
Φάσμα
Παράμετροι
Βήμα Vb(kN) (λ)
87. 2618.19463 (0.17062)
>>
Διαδοχική εμφάνιση πλαστικών αρθρώσεων
A-DL
B-SD
Γ-NC
Κόμβος Ελέγχου
61
Στοχευόμενη Μετακίνηση
Vb(kN)
Ux(m)
0.03
0.05
Δημιουργία διαγραμμάτων για τεύχος μελέτης - Ελεγχοι

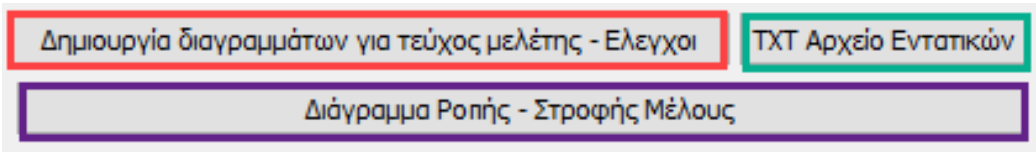

Report
Τριγωνική
-Fz+0.30*Fx
Φάσμα
Παράμετροι
Βήμα Vb(kN) (λ)
89. 2645.55983 (0.19251)
>>
Διαδοχική εμφάνιση πλαστικών αρθρώσεων
A-DL
B-SD
Γ-NC
Κόμβος Ελέγχου
61
Στοχευόμενη Μετακίνηση
Vb(kN)
Ux(m)
0.03
0.05
Δημιουργία διαγραμμάτων για τεύχος μελέτης - Ελεγχοι

All the above graphs are per distribution (Orthogonal, Triangular) and per seismic combination. So by selecting a distribution type and a seismic combination, in the list

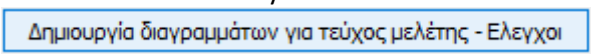


the steps of the specific inelastic analysis are displayed and for each step the cutting force Vb(kN) and the corresponding minimum load factor (λ) are shown. The corresponding point on the capacity curve is also shown in pink.

At the bottom of the window

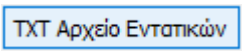


the selection of the key



is **necessary** to create the necessary prints and controls and to update them after possible changes (e.g. bilinearization method, change of spectra, change of parameters, etc.).

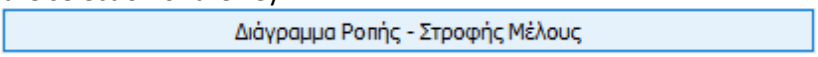
the selection of the key



displays the file containing the lists with :

- Displacements and Junction Rotations for all junctions per direction
- Intensive Member sizes at the beginning and end of each member
- Active stiffnesses for each Pillar and each Beam

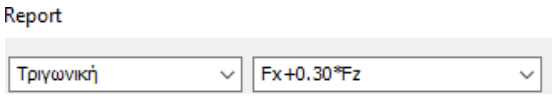
the selection of the key



displays the torque-torque diagram of the member which is shown by member (start - end) and by direction.

3.1.5 Διάγραμμα ροπής – στροφής μέλους

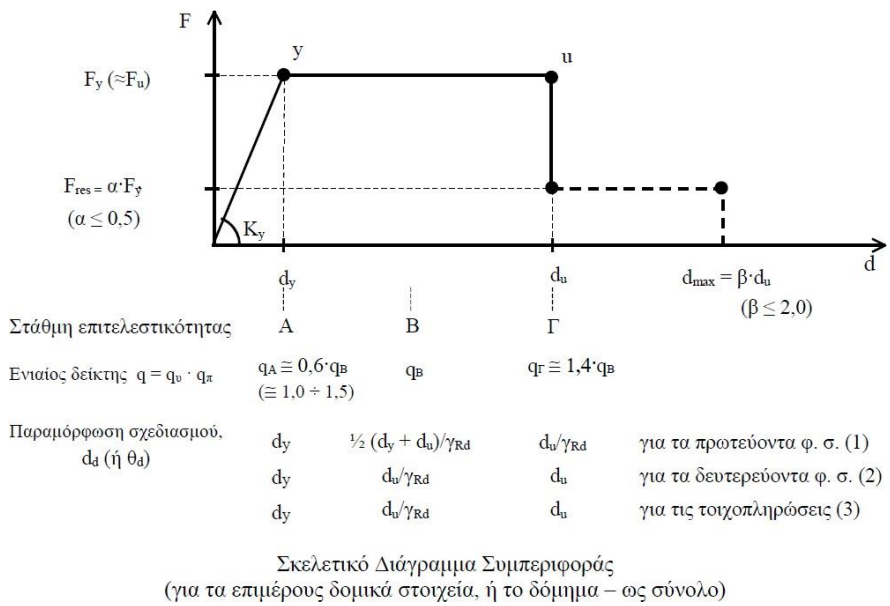
By selecting the command Διάγραμμα Ροπής - Στροφής Μέλους and then pointing with the left mouse button to a member of a column or beam, the torque - rotation diagram of the member is opened, which is displayed per member (start - end) and per address for the selected distribution



A prerequisite for the display of the torque - rotation diagrams of a member is that the Checks have been previously performed, i.e. the command has been selected:

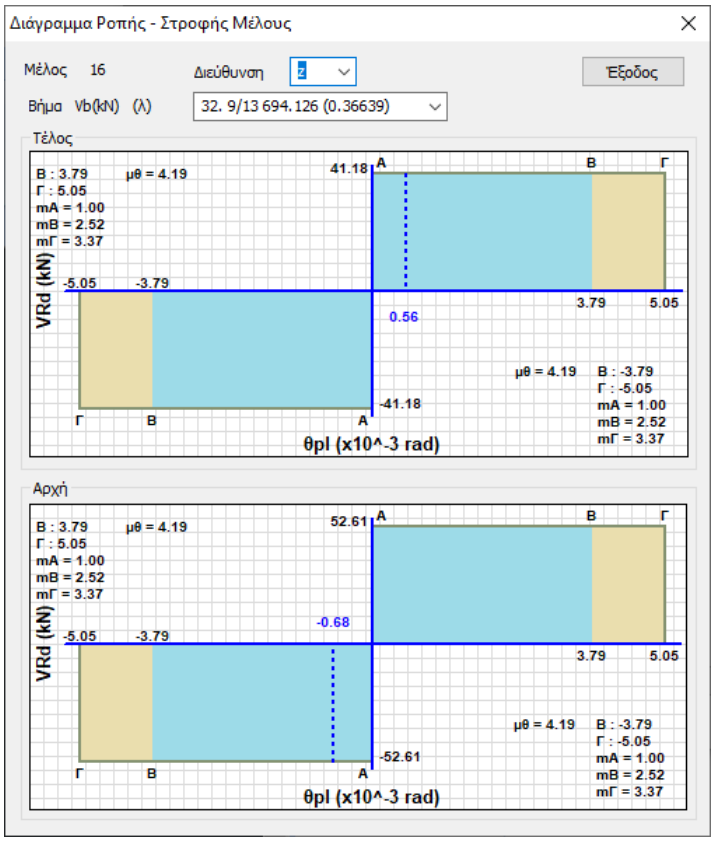
Δημιουργία διαγραμμάτων για τεύχος μελέτης - Ελεγχοι

The skeletal diagram is a strength diagram of the end of the member. The critical quantities to be drawn are Fy, θy and θu.



Σκελετικό Διάγραμμα Συμπεριφοράς
(για τα επιμέρους δομικά στοιχεία, ή το δόμημα – ως σύνολο)

In SCADA θy or dy is 0. What is shown is :



It has no sloping anionic elastic branch so θy=dy=0 but you do NOT show the value of θu or du on the diagram. It was preferred to show, for better overview, the boundaries of the B and C performance stations.

OBSERVATION:

⚠ Note that the printout now includes (for concrete & M.I.P.) ONLY those elements that have developed a plastic joint at one or both ends up to the step corresponding to performance level C.

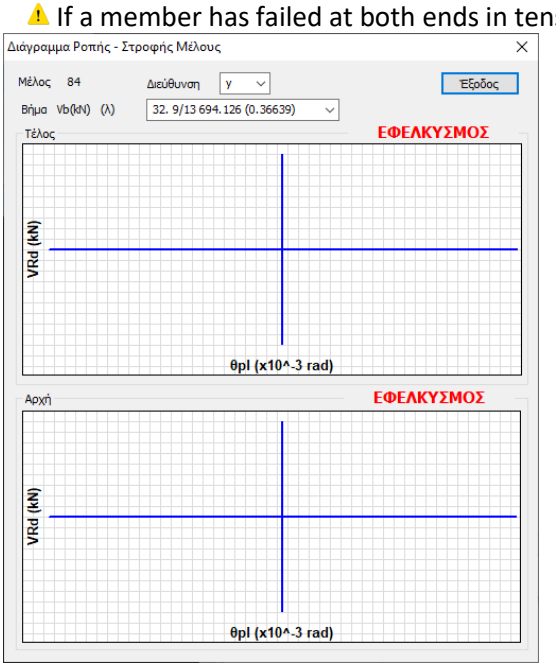
<u>That is, those which in all steps do NOT develop a plastic joint at any of their ends and those which do, but at a step larger than the step corresponding to the C level of performance are NOT printed.</u>

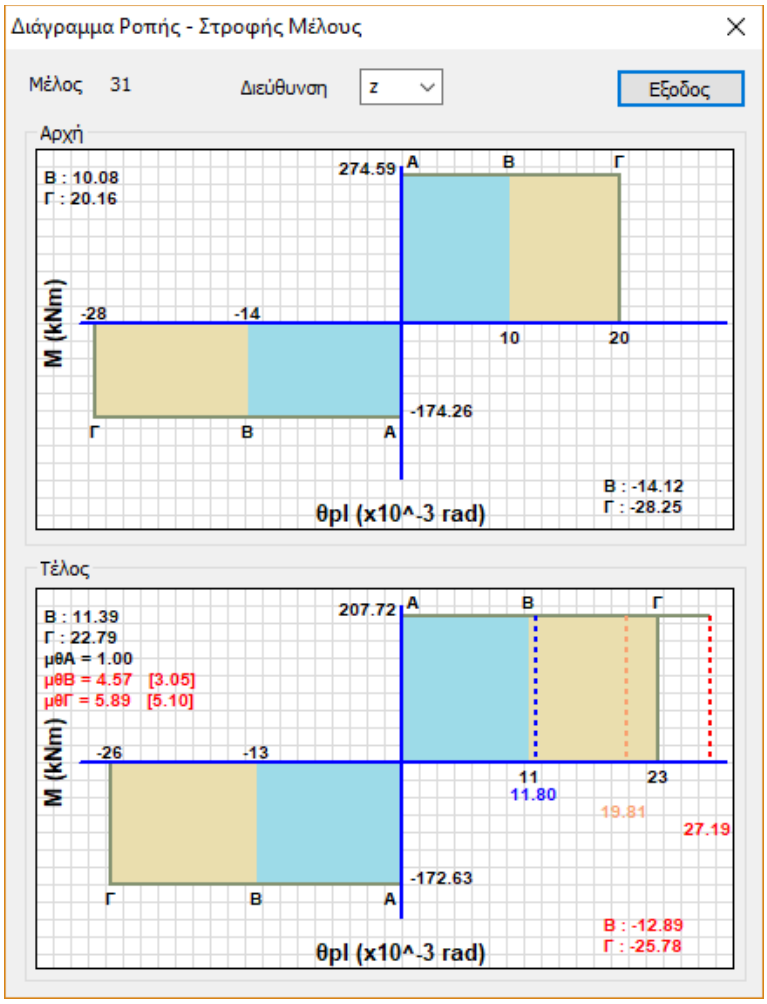
OBSERVATION:

⚠ For M.I.P.: If the indication is "No" the fact that the ratio is <1. The reason is that its indication in 3D is a red square which means that it failed in **tension.** This is the reason why there is no number under "No" indicating the type of failure.

Μέλος	Κόμβ.	Περιορισμένες Βλάβες (A - DL) θd	θc=θy		Σημαντικές Βλάβες (B - SD) θd	θc=θu/γRd		Οιονεί Κατάρρευση (Γ - NC) θd	θc= 4/3*θu/γRd	
16	8	-0.59	0.00	Οχι (1)	-0.70	4.64	Ναι (1)	-0.68	5.05	Ναι (1)
	11	0.58	0.00	Οχι (1)	0.50	4.64	Ναι (1)	0.56	5.05	Ναι (1)
18	14	-0.86	0.00	Οχι (1)	-0.94	2.79	Ναι (1)	-0.94	3.69	Ναι (1)
	17	-0.47	0.00	Οχι	-0.52	3.79	Οχι	-0.52	5.03	Οχι
58	35	-0.77	0.00	Οχι	-0.96	2.28	Οχι	-0.96	3.04	Οχι
	37	-0.99	0.00	Οχι	-1.05	2.28	Οχι	-1.07	3.04	Οχι
60	40	0.00	0.00	Ναι	-0.63	2.76	Ναι	-0.63	3.60	Ναι
	43	0.81	0.00	Οχι (1)	0.50	2.76	Ναι (1)	0.49	3.60	Ναι (1)
80	51	-0.64	0.00	Οχι (4)	-0.80	4.02	Ναι (4)	-0.80	3.05	Ναι (1)
	53	0.27	0.00	Οχι	0.27	3.27	Οχι	0.32	4.38	Οχι
82	56	0.00	0.00	Ναι	0.00	0.00	Ναι	0.00	5.33	Ναι
	59	0.00	0.00	Ναι	0.00	0.00	Ναι	0.64	4.79	Ναι (4)
84	62	-0.76	0.00	Οχι	-0.86	2.28	Οχι	-0.86	3.04	Οχι
	64	0.24	0.00	Οχι	0.24	2.28	Οχι	0.28	3.04	Οχι
106	17	-1.04	0.00	Οχι (1)	-1.04	2.33	Ναι (1)	-1.07	3.11	Ναι (1)
	72	-0.89	0.00	Οχι (1)	-0.93	2.33	Ναι (1)	-0.94	3.11	Ναι (1)
146	37	-1.59	0.00	Οχι (1)	-1.67	2.48	Ναι (1)	-1.68	3.13	Ναι (1)
	82	-1.74	0.00	Οχι	-1.74	3.48	Οχι	-1.70	4.46	Οχι
168	53	-0.24	0.00	Οχι (1)	-0.16	1.67	Ναι (1)	-0.15	2.13	Ναι (1)
	90	0.11	0.00	Οχι (1)	0.07	1.67	Ναι (1)	0.10	2.13	Ναι (1)
172	64	-0.21	0.00	Οχι (1)	-0.21	3.13	Οχι	-0.28	3.57	Οχι
	96	-0.08	0.00	Οχι	-0.12	3.13	Οχι	0.11	3.57	Οχι

⚠ If a member has failed at both ends in tension. Its skeletal diagram is this:





This diagram is based on the following assumptions:

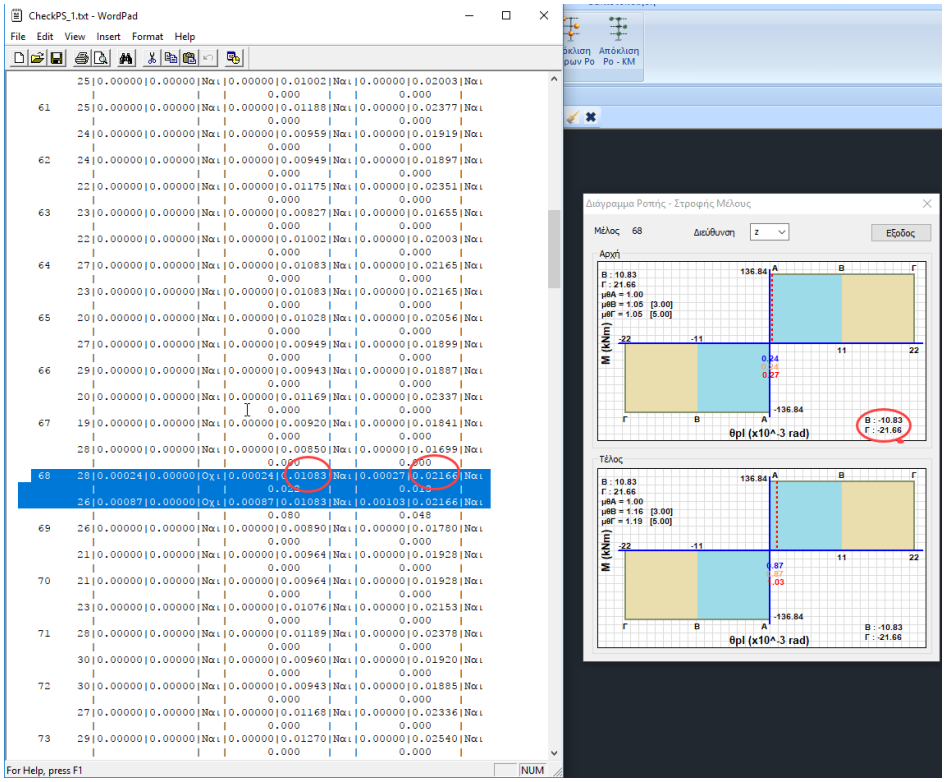
The calculation of the moment My is based on relation (A.6) of Annex 7A of CEE/CNR.

- The value of My is different for each step, due to the axonal input in its calculation. In the skeletons of the members of the masonry and in the skeletons for concrete members the skeleton is calculated with the axial of each step.
- Two values of My (positive and negative) are calculated and two regions with (different) boundaries for the performance levels are drawn respectively.

For poles, due to the existence of symmetrical reinforcement, the two values will always be the same. As is known, the diagram does not have an elastic branch and only shows the corresponding plastic region.

- The values of θ have been divided by the corresponding safety factors. The limits θpl corresponding to the performance levels have been divided by the coefficient γrd=1.8 and the turning angles θsd have been multiplied by the factor γsd.

This was done to ensure compatibility with the corresponding print results.



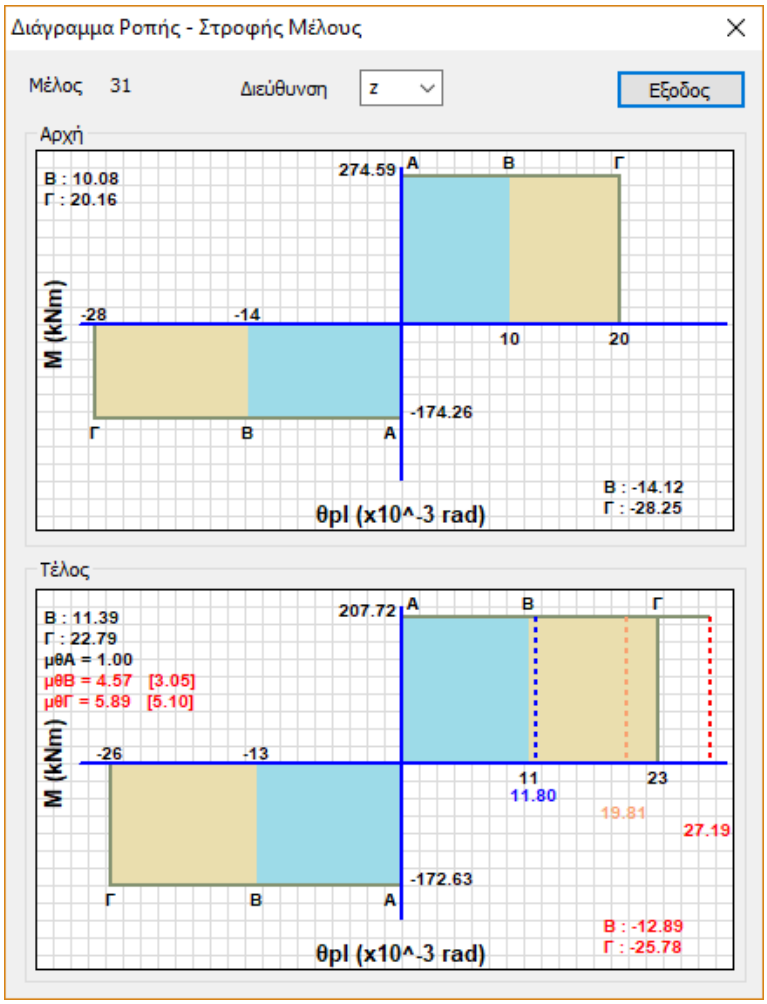
The diagram shows the angle of rotation of the plastic joint (requirement) for the three steps of the analysis corresponding to the three levels of performance:

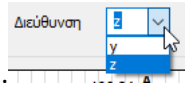
A:blue **B**:orange **C**:red

The values are displayed, depending on the sign of the angle, in the corresponding area.

In the dialog box that appears:

The corresponding diagram is shown for each end (Start-End).



The address is selected from the corresponding field . 

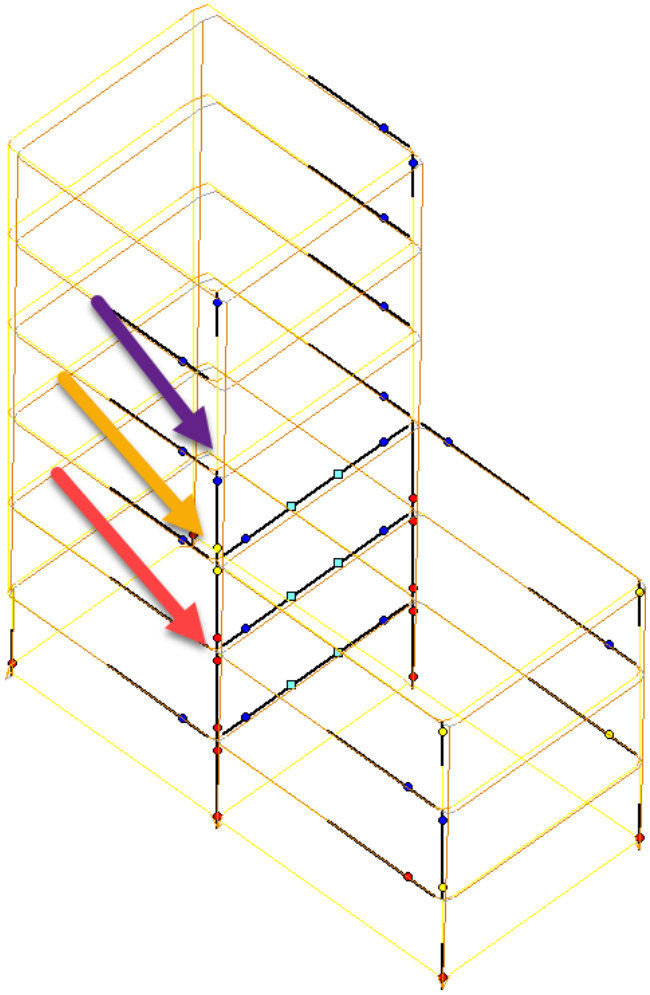
For beams in particular, the default direction is the principal direction z, but with the assumption that the angle of rotation of the plastic joint is the worst case both directions.

Two coloured areas appear, one positive and one for negative values of the axis, where **blue** represents the **B** level of performance and **brown** the **C** level respectively.

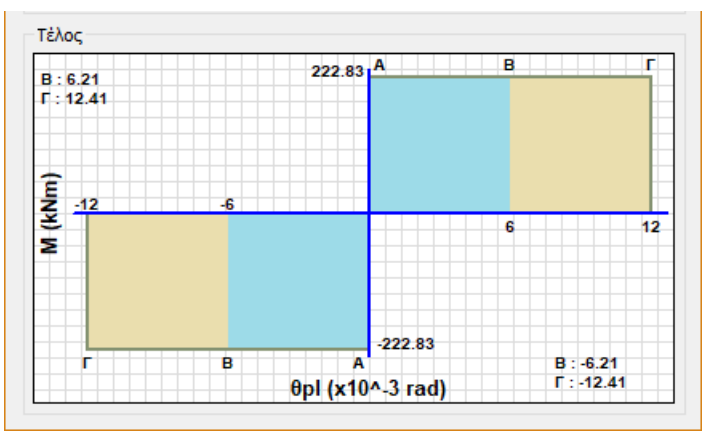
The values in **black** are the **limits** for each performance level.
In the diagram they are shown as integers, but in the bottom right-hand part for negatives and in the top left-hand part for positives, they are written with their decimal places.

The colours that appear in the circles at the ends of each member in the 3D vector depend on where the corresponding angle of rotation of the plastic joint is located.

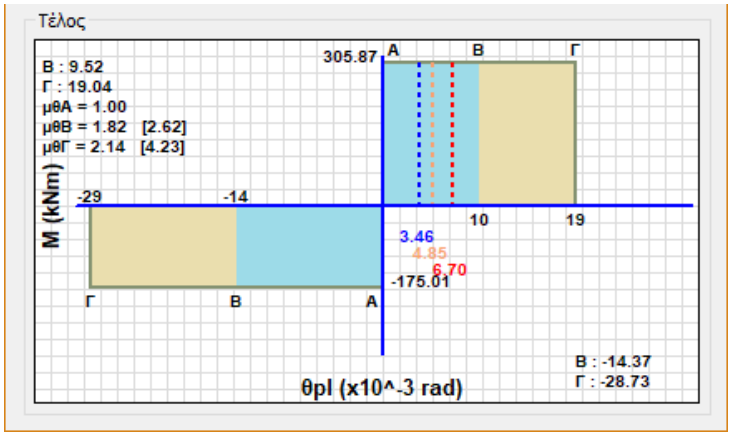
More specifically:



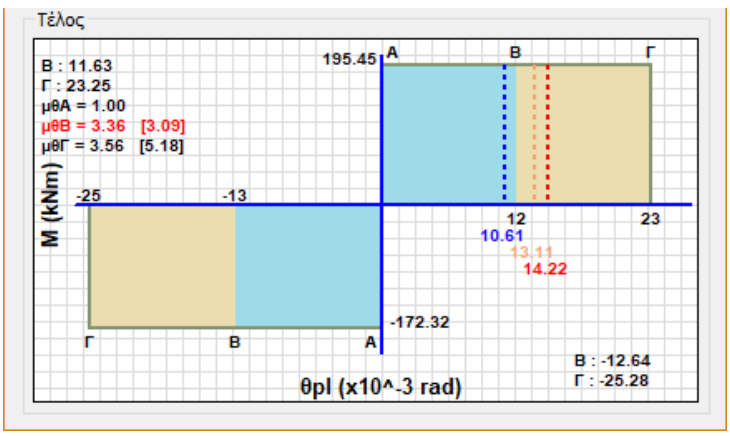
No value means that: the limb has not developed a plastic joint.



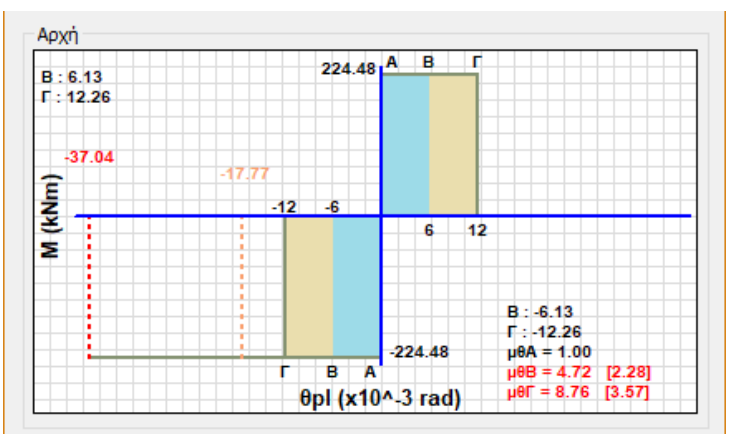
The **blue** colour means that: the corresponding blue line is within the blue area, i.e. the limit of A (which is 0) has been exceeded, but both it and the other two values have not exceeded the limit of B (blue area).



The yellow colour means that the corresponding value (orange line) has entered the brown area and the corresponding red one has not left the brown area.



Finally, the **red** colour means that the corresponding red value is outside the brown area.



OBSERVATION

All of the above is valid provided that the actor is at the step corresponding to the C level of performance, so that all of the above has been developed.

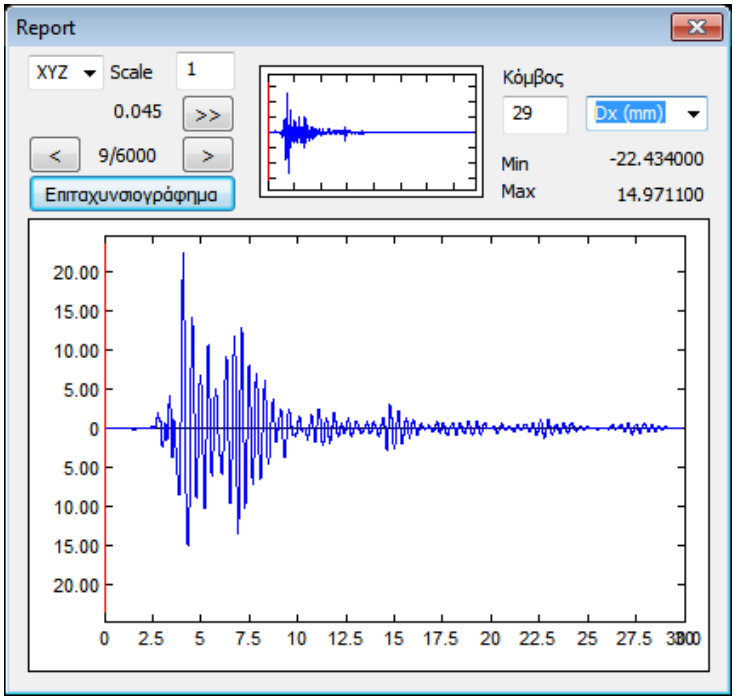
The ductility indices in terms of the angle of twist $\mu\theta$ for each level of performance are also given. The required one is given first, followed by the available one in brackets.
The sizes are displayed in red when the first value is greater than the second. For the first performance level is mthA=1.

For checks and skeletal diagrams for masonry with the Equivalent Frame Method refer to Manual ***F. Masonry by the Equivalent Frame Method***

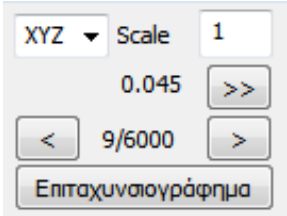
3.2 Εμφάνιση Σεναρίων Γραμμικών αναλύσεων με χρονοιστορίες

In the "Show" field with an active Linear Analysis scenario with time histories:

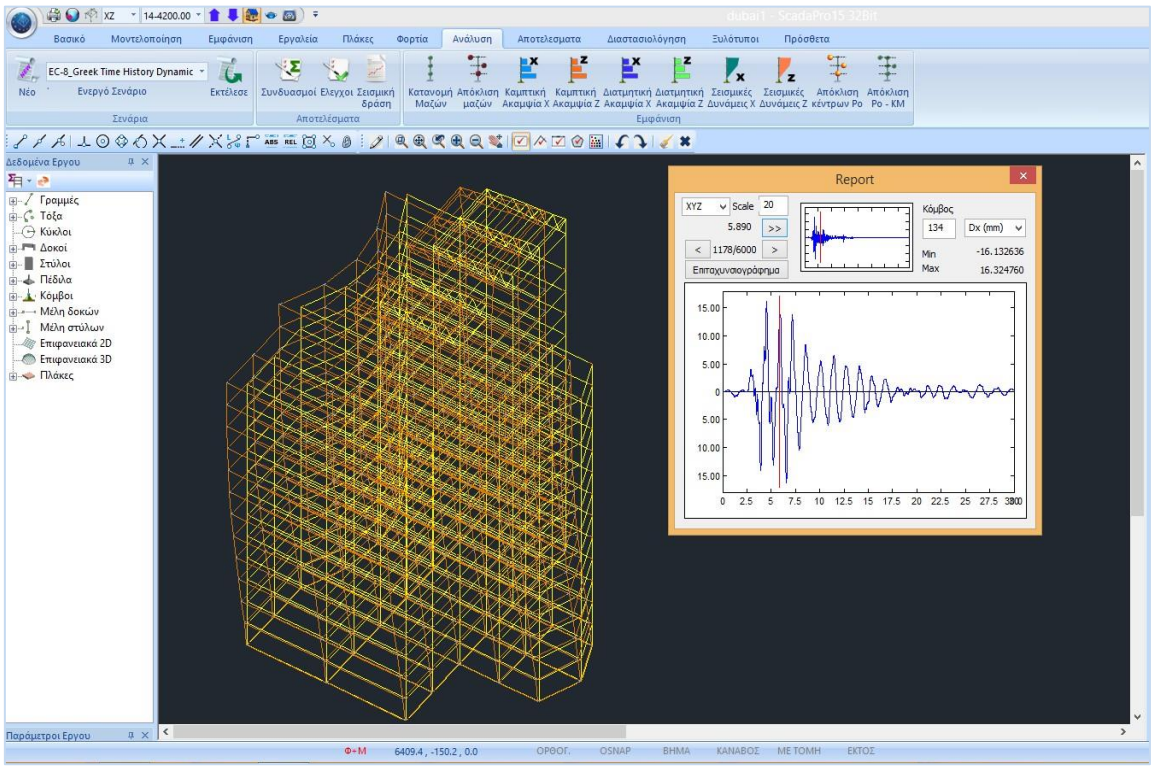
After the analysis is completed, the user can select a command from the "Display" menu to display the results graphically. This option displays the following window.



In this window the user can select the direction of the earthquake (X, Y, Z or XYZ) and the scale according to which the earthquake will be visualized.



the result of the analysis on the operator. It can also select a node whose response it wishes to see. Automatically the graph of the response of the selected node versus time, as well as its maximum and minimum values, is displayed at the bottom. At the same time, the selected accelerogram of the seismic excitation is displayed at the top of the window. Finally the possibility of displaying the deformed state of the carrier for each time step of the analysis. For this purpose, the model is shown in the following three-dimensional illustration, where the undeformed carrier is shown alongside the motion of the deformed carrier.



3.2 1 Σεισμική Δράση

Finally s, with the inelastic scenario always active and by selecting the Seismic Action command, the data for the spectra, the level of performance and the extent of the damage are displayed first and then, for each analysis, the maximum base shear, the corresponding maximum displacement and the overstrength ratio, the minimum overstrength ratios per direction, as well as the Upper Eigenmodes Influence check of the KAN.EPE:

Σελίδα : 1

ΔΕΔΟΜΕΝΑ ΚΑΙ ΑΠΟΤΕΛΕΣΜΑΤΑ ΣΕΙΣΜΙΚΗΣ ΔΡΑΣΗΣ

ΣΕΝΑΡΙΟ :

ΠΑΡΑΜΕΤΡΟΙ ΥΠΟΛΟΓΙΣΜΟΥ	
Κλάση Πλαστιμότητας	DCM
Τύπος Φάσματος	Τύπος 1
Ζώνη Σεισμικής επικινδυνότητας	II
Επιβράνση Βαρύτητας g (m/sec2)	9.810
Σεισμική Επιτάχυνση εδάφους ag/g	0.24 * 9.810 = 2.3544
Σύστημα κτιρίου κατά X	Σύστημα Πλαισίων
Σύστημα κτιρίου κατά Z	Σύστημα Πλαισίων
Κατηγορία Εδάφους	B
Χαρακτηριστικές Περίοδοι Φάσματος	TB=0.15 TC=0.50 TD=2.50(sec)
Συντελεστής-Κλιπτογράμμα Σπουδαιότητας	γι=1.000 - Σ2
Συντελεστής Σεισμικής Συμπεριφοράς	
Συντελεστής Φασματικής Ενίσχυσης	βo=2.50
Ποσοστό κρίσιμης απόσβεσης	ξ=5.000%

α/α Στάθμης	Υψόμετρο (m)	Διαστάσεις Κατόψεων Lix (m)	Liz (m)	Συντ.φ2 Φορτ.Δ	Τυχηματικές Εκκέντρ. εθx(m)	εθz(m)
0	0.000	11.100	10.900	0.300	0.555	0.545
1	3.000	11.100	10.900	0.300	0.555	0.545
2	6.000	11.100	10.900	0.300	0.555	0.545

ΣΗΜΕΙΩΣΕΙΣ εθx = 0.050 * Lix εθz = 0.050 * Liz

Ιδιοπεριόδοι Κτιρίου από Δυναμική Ανάλυση			
α/α Ιδιομορφής	Κυκλική Συχνότητα w (Rad/sec)	Συχνότητα v (Cycle/sec)	Περίοδος T (sec)
1	2.7213E+001	4.3310E+000	2.3089E-001
2	3.2778E+001	5.2168E+000	1.9169E-001
3	4.2029E+001	6.6892E+000	1.4950E-001
4	7.3910E+001	1.1763E+001	8.5012E-002
5	8.7438E+001	1.3916E+001	7.1859E-002
6	8.9343E+001	1.4219E+001	7.0326E-002
7	9.6999E+001	1.5439E+001	6.4776E-002
8	1.0517E+002	1.6738E+001	5.9745E-002
9	1.1140E+002	1.7730E+001	5.6401E-002
10	1.1827E+002	1.8824E+001	5.3124E-002

Συντελεστές Συμμετοχής Ιδιομορφών			
α/α Ιδιομορφής	Διευθύνσεις στο Κύριο Σύστημα Συντεταγμένων		
	Κατά X	Κατά Z	Κατά Y
1	5.6200E+000	2.1600E-001	-1.1092E+001
2	1.1731E+001	2.7029E-001	-5.3198E+000
3	3.0924E+000	-9.3358E-002	-3.9702E+000
4	1.1547E+000	-1.2019E+001	4.1088E-001
5	-1.4111E+000	-2.6785E+000	-8.4732E-001
6	1.4063E+000	5.6463E+000	-6.2074E-001
7	-3.2456E-001	3.8721E+000	-1.1932E+000
8	1.3092E-001	-2.3366E+000	-3.8021E-001
9	-8.4249E-001	-1.5293E+000	-4.6330E-001
10	1.6906E-001	-2.3933E-001	-4.4673E+000

Σελίδα : 2

Συντελεστές Συμμετοχής Μαζών ανά Διεύθυνση		
Κατά X = 1.0	Κατά Y = 1.0	Κατά Z = 1.0

Δρώσες Ιδιομορφικές Μάζες				Συνολική Μάζα = 209.536 (kN/g*)			
α/α	ΜΕΤΑΦΟΡΙΚΕΣ ΜΑΖΕΣ						
Ιδιομορφής	Κατά X	%	Κατά Y	%	Κατά Z	%
1	31.58	15.07	0.05	0.02	123.03	58.72
2	137.62	65.68	0.07	0.03	39.94	19.06
3	9.55	4.56	0.01	0.00	15.75	7.52
4	1.33	0.64	144.25	68.84	0.17	0.08
5	1.99	0.95	7.19	3.42	0.72	0.34
6	1.98	0.94	31.89	15.22	0.39	0.18
7	0.11	0.05	14.99	7.16	1.42	0.68
8	0.01	0.01	5.40	2.61	0.14	0.07
9	0.71	0.34	2.34	1.12	0.23	0.11
10	0.03	0.01	0.06	0.03	19.95	9.52
ΣΥΝΟΛΑ:	184.92	88.25	206.25	98.45	201.75	96.25

Πίνακας Τιμών Φάσματος Απόκρισης Επιταχύνσεων		Αριθμός Σημείων = 39		
α/α Σημείου Εισαγωγής	Περίοδος (sec)	ΤΙΜΕΣ ΦΑΣΜΑΤΟΣ Τιμή x	Τιμή y	Τιμή z
1	0.00	1.88	1.41	1.88
2	0.05	2.83	4.24	2.83
3	0.10	3.77	4.24	3.77
4	0.15	4.71	4.24	4.71
5	0.20	4.71	3.18	4.71
6	0.25	4.71	2.54	4.71
7	0.30	4.71	2.12	4.71
8	0.35	4.71	1.82	4.71
9	0.40	4.71	1.59	4.71
10	0.45	4.71	1.41	4.71
11	0.50	4.71	1.27	4.71
12	0.55	4.28	1.16	4.28
13	0.60	3.92	1.06	3.92
14	0.65	3.62	0.98	3.62
15	0.70	3.36	0.91	3.36
16	0.75	3.14	0.85	3.14
17	0.80	2.94	0.79	2.94
18	0.85	2.77	0.75	2.77
19	0.90	2.62	0.71	2.62
20	0.95	2.48	0.67	2.48
21	1.00	2.35	0.64	2.35
22	1.10	2.14	0.53	2.14
23	1.20	1.96	0.44	1.96
24	1.30	1.81	0.38	1.81
25	1.40	1.68	0.32	1.68
26	1.50	1.57	0.28	1.57
27	1.60	1.47	0.25	1.47
28	1.70	1.38	0.22	1.38
29	1.80	1.31	0.20	1.31
30	1.90	1.24	0.18	1.24
31	2.00	1.18	0.16	1.18
32	2.25	1.05	0.13	1.05

Σελίδα : 3

33	2.50	0.94	0.10	0.94
34	2.75	0.78	0.08	0.78
35	3.00	0.65	0.07	0.65
36	3.25	0.55	0.06	0.55
37	3.50	0.48	0.05	0.48
38	3.75	0.42	0.05	0.42
39	4.00	0.37	0.04	0.37

Στάθμες Επιτελεστικότητας - Ελαστικά Φάσματα					
Ζωή σχεδιασμού (έτη)	50		Εκθέτης κ	3.00	
	Περίοδοι Επαναφοράς		Πιθανότητα Υπέρβασης		ag
	TR(έτη)	TLR(έτη)	PR(έτη)	PLR(((έτη)	
Περιορισμένες Βλάβες (A-DL)	475	475	10	10	0.24000
Σημαντικές Βλάβες (B-SD)	475	475	10	10	0.24000
Οιονεί Κατάρρευση (Γ-NC)	475	475	10	10	0.24000

Στάθμη Αξιοπιστίας Δεδομένων :	Ικανοποιητική	γg=	1.35
Εκταση Βλαβών :	Χωρίς Βλάβες & Χωρίς Επεμβάσεις	γsd=	1.00

Κόμβος Ελέγχου :		26	6.00m	
Α/Α Ανάλυση	Είδος Ανάλυσης - Κατανομής	Τέμνουσα Βάσης (KN)	Μέγιστη Μετακίνηση (m)	Λόγος Υπεραντοχής
1	Τριγωνική Fx+0.30*Fz	1081.526	0.082	11.528
Ελάχιστος Λόγος Υπεραντοχής X			(1)	11.528
Ελάχιστος Λόγος Υπεραντοχής Z				