

Example 6 Masonry Structure Analysis and Design







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• OVERVIEW

SCADA Pro new version is a result of more than 40 years of research and development while containing all the innovative capabilities and top-notch tools for the construction business.

SCADA Pro utilizes a compact and fully adequate platform for constructing new buildings (analysis and design) or existing ones (check, assessment, and retrofitting).

The software employs the Finite Element Method, combining line and plane finite elements in a smooth way. For design purposes, the user is offered all the Eurocodes as well as all the relevant Greek regulations (N.E.A.K, N.K.O.S., E.K.O.S. 2000, E.A.K. 2000, E.A.K. 2003, Old Antiseismic, Method of permissible stresses, KAN.EPE).

There are numerous possibilities offered for the modeling of various kind of structures. Structures made of reinforced concrete, steel, timber, masonry, or composite structures are now fully feasible.

Several smart operations add on to the practicality and usability of the software. The user can produce the model of a structure no matter how complicated it is, work at ease with the 3D model, process through the steps of analysis and design in a convenient way, up to the conclusion of what initially may seem the most demanding project.

SCADA Pro is presented to you as a powerful tool to meet the highest needs of modern civil engineering!

• INTRODUCTION

The current manual comes as an aid for a new user of SCADA Pro, making the interface of the software as familiar as possible. It consists of several chapters, where one after the other, describes the consecutive steps of a simple example of a loadbearing masonry project. The most useful information is presented, in regards to the best possible understanding of the

software commands and logic, as well as the process that has to be followed.

• THE NEW INTERFACE

The new interface of the SCADA Pro software is based on the RIBBON structure, thus, the several commands and tools are reached neatly. The main idea of the RIBBON structure is the grouping of commands that have small differences and work in the same context, in a prominent position different to each group. This converts the use of a command, from a tedious searching procedure through menus and toolbars, into an easy to remember the chain of two or three clicks of the mouse button.

The user can collect his/her most popular commands into a new group, for an even faster access. This group remains as it is for future analyses after the program ends. Different commands can be added to it or removed from it, and its placing in the workspace may be altered through the "Customize Quick Access Toolbar" utility.

| Cus | tomize Quick Access Toolbar |
|-----|-----------------------------|
| V | Quick Print |
| | More Commands |
| | Show Below the Ribbon |
| | Minimize the Ribbon |



| Project Data |
|-------------------|
| 石 - 🥐 |
| |
| 🖧 Arcs |
| Circles |
| Beams |
| Columns |
| 🖶 🛶 Footings |
| 🖶 📥 Nodes |
| 🕂 🖅 Mathbeams |
| 🚊 📲 🖁 MathColumns |
| |
| Surf 3D |
| 🗄 🛶 Slabs |

Apart from the RIBBON structure, all the entities that a structure consists of are presented in a tree structure, at the left side of the SCADA Pro main window, either for the whole structure or at each level of the structure. This categorization enhances the use of each entity. When the tree structure is choosing an entity, it is highlighted at the graphical interface and the level of the structure that contains this entity is isolated. At the same time, at the right side of the window, the entity's properties appear. The user can check or modify any of these properties at once. Conversely, the entity can also be chosen at the graphical interface, and automatically it is presented, at the left side in the tree

structure and at the right side with its properties. The right-click mouse button can be very helpful here, since several commands and features, distinct for each entity, can be activated with it.



The "Properties" list that shows up at the right side of the window, not only shows all the properties of the entity shown but can be used for any quick and easy changes, the user wants to make, too.



1. GENERAL DESCRIPTION

1.1 Geometry

The considered single floor masonry structure consists of 6 views with openings and raft foundation.



1.2 Materials

All walls are of single-leaf type with dimensional natural stone units 20x20x25 and M5 mortar named, "Wall M5 0.50". For the raft, concrete C20/25 and Reinforcing Steel B500C was used.

1.3 Regulations

Eurocode 8 (EC8, EN1998) for seismic loads. Eurocode 2 (EC2, EN1992) for the design of the concrete elements.

1.4 Load and Analysis assumptions

Dynamic Spectrum Analysis with pairs of torsional moment along the same direction. The loads by the method above are:

(1) G (dead)

(2) Q (live)

(3) EX (node loads, seismic forces along XI axes, derived from dynamic analysis).

(4) EZ (node loads, seismic forces along ZII axes, derived from dynamic analysis).

(5) Erx \pm (node torsional moments, derived from node seismic forces along XI axes, offset by the accidental eccentricity $\pm 2e\tau zi$).



(6)Erz±(node torsional moments, derived from node seismic forces along ZII XI axes, offset by the accidental eccentricity ±2etxi.

(7)EY (seismic vertical component –seismic force along y direction- derived from dynamic analysis).

1.5 Notes

All the commands that were used in this example, as well as the rest of the commands, are explained in detail in the manual that accompanies the program.



2. DATA INPUT - MODELING

SCADA Pro is enriched with a masonry library while the user can automatically create the masonry model using only the centered outline of the structure and modify each side through the Templates editor.

1. The **Templates** command can be used in two ways so that it fulfills every modeling demands.



Use the **button** located at the initialization window, or select "New" **w** see as from the menu, to create a new file. In the dialog box that appears define the data of the new project.

| New Project | _ · · | | |
|--|-----------------------------------|---------|--|
| Project Name MASC | DNRY | | |
| Details Masor | nry Structure Analysis and Design | ~ ~ | |
| Location Folders: c:\ Drives: | c: ✓ | Network | |
| C:\ 2015 ACE ERP ACE HELL AS Autodesk | AS FILES | ОК | |
| camtasia_ cusmel cusmel | projects V | Cancel | |

▲ The name of the file can contain up to 8 characters of the Latin alphabet without any symbols (/, -, _) nor spaces. You can add a description or add some information related to the structure, in the "Info" field.





Masonry

2.1 Masonry library – wall definition:

Arbitrary Concrete Section

Libraries

Inside the "Modeling" unit, in "Libraries" group, the "Masonry" command, opens the respective library:

| opertie | s of masonry | | |
|---------|---|-----------------|---|
| Masonry | y Brick blocks wall - M2 25 cm 🗸 🗸 | | Type Existing |
| ame | Masonry Brick blocks wall - M2 25 cm | | Concrete jacket Thickness 0 Single Sided V |
| ype | Load-bearing V Single-leaf wall V ? | | Cocrete Steel |
| | | | C20/25 V S500 V |
| Masonr | ry uni Common brick 6x9x19 | | Φ 8 / 10 cm fRdo,c(MPa)= |
| | Thickness 25 fb=1.6733 fbc=2.0000 ε=15.00 | | Anchorage Without any additional care ~ |
| Mortar | Mortar Cement-M2 V | | |
| | General purpose designed masonry mortar fm=2.0000 | | |
| Wall | ? L1 (cm) 0 t1 (cm) 0 t2 (cm) 0 | | |
| Shell B | edded Wall | | |
| Total v | | | |
| | | + U | Filled vertical joints (3.6.2) |
| | | t1 | Bed join of thickness >15 mm |
| Masonr | y uni | t2 | Thickness (Equivalent) 25 |
| | Thickness 0 | | See 15 |
| Mortar | \sim | | Specific weight (NV/m3) |
| | | Masonry units - | Compressive strength ik 0.794381 |
| Wall | ? L1 (cm) 0 t1 (cm) 0 t2 (cm) 0 | Mortars library | (GPa) Modulus of elasticity 1000 0.794381 |
| | | | Characteristic strength fvk0 (N/mm2) |
| Concre | ete infill fck (N/mm2) Thickness | New | Maximum shear strength fvkmax (N/mm2) 0.108766 |
| ezu/25 | ability level Execution control | Save | Flexural strength fxk1 0.1 (N/mm2) |
| | KL1:Limited V dass 1 V | Exit | Flexural strength fxk2 0.2 (N/mm2) |
| | | | |

Choose a predefined wall, or create a new one. Type a name for the wall, select the "Type" from the drop-down list and define the related properties for the "Masonry Unit", "Mortar", "Piers", "Concrete Infill" and "Concrete Jacket".

- ▲ Depending on the selected TYPE of masonry, in the dialog box, some fields are enabled or disabled.
- 1 The definition for each type is displayed by clicking the 2 button on the right.



EXAMPLE

Name: Wall 1

Type: Grouted Cavity Wall

All fields of the window are active, since this type requires the definition of two single walls and a concrete infill.

| Properties of masonry | \$ | | > |
|---|------------------------------------|---|-----------------------------|
| Masonry Brick blocks wall - M2 25 cm V Name Masonry Brick blocks wall - M2 25 cm Type Load-bearing V Grouted cavity wall V | | ype Existing Concrete jacket Thickness Single Side Cocrete Steel Steel | v ed v |
| Masonry uni Common brick 6x9x19 Thickness 9 fb=1.6733 fbc=2.0000 ε=15.00 Mortar Mortar Cement-M2 General purpose designed masonry mortar fm=2.0000 Wall ? L1 (cm) 0 t1 (cm) Shell Bedded Wall 0 ? Total width of the two mortar strips g (cm) 0 ? | | • 8 / 10 cm fRdo,c(MPa)= Anchorage Without any additional of | 0.00 :are ~ |
| tef=9.00 k=0.45 fk=0.7944 Masonry uni Brick blocks Perforated 6x9x19 Thickness 9 fb=3.3467 fbc=4.0000 ε=15.00 Mortar Mortar Cement-M2 General purpose designed masonry mortar fm=2.0000 Wall ? L1 (cm) 0 t1 (cm) 0 t2 (cm) 0 | Masonry units - Mortars library | Filled vertical joints (3.6.2) Bed join of thickness >15 mm Thickness (Equivalent) 25 Specific weight (KN/m3) 17 Compressive strength fk 0.7 Modulus of elasticity 1000 0.7 | ? .8 '94381 794381 |
| tef=9.00 k=0.45 fk=1.2905 Concrete infill fck (N/mm2) Thickness C20/25 20 7 E=30.00 ε=25.00 3 Data reliability level KL 1:Limited Execution control class 1 ~ | New Save Exit | Characteristic strength fvk0 0.1 (N/mm2) 0.1 Maximum shear strength fvkmax (N/mm2) 0.1 Flexural strength fxk1 0.1 (N/mm2) 0.1 Flexural strength fxk2 0.2 | .506 L |
| Tensile strength fwt (N/mm2) | n (N/mm2) 0 | Mean Compressive strength 0 | |

In Wall1 & Wall2 define

units: the type and thickness **Mortars**: the type and the corresponding factors are updated automatically.

fb=3.3467 fbc=4.0000 ɛ=15.00

Masonry Units -Mortars Libray

In the command "*Masonry Units – Mortars Library*" you will find standard typologies of clay bricks, mortar and masonry. You can enter other bricks and mortar, by simply typing the name and specifying the class and group, for the compressive strength (which is updated automatically). Then select the button "New".



You can also change the class and group of an existing masonry or mortar and update it by clicking "Submit".

In the field "Masonry Units", select from the drop-down lists the type of bricks and mortar, and create a new type of masonry by clicking "New". The weight and strength are calculated automatically.

| × |
|---|
| Mortars |
| ✓ Mortar Cement-M5 ✓ |
| Name Mortar Cement-M5 |
| Type General purpose designed masonry mortar ? |
| Resistan M5 V Compressive strength fm 5 |
| New Save |
| |

For this example we chose:

1.1.1 Masonry units

| ison y c | inits | | | | | | |
|----------|---------------------------------|----------------------------------|----------------------|--|----------------------------|----------|--|
| Stones 2 | 0x20x25 | | | | × | | |
| ame | Stones 20x20x25 | | | Brick blocks Perfora Brick blocks Perfora | ated 6x9x19 ated 9x9x19 | | |
| ype | Dimensioned natural stone units | | | VTONG 20x25x60 YTONG 25x25x60 | ated 12x14x25 | | |
| lass | п | ~ ? Gr | oup 1 | 1 Stones - stones erratic 20x15x30 Stones - stones drilled 20x20x25 | | | |
| Resistan | ce calculation from o | dimensions | n) d7 (mm) | Ā | Stones 20x20x25 | <u> </u> | |
| dy 📕 | dz M | 200 200 lean compressiv | 250 ve strength f | 1.15 bc 8 | | | |
| dy dy dy | dz M c weight ε (KN/m3) | 200 200 lean compressiv 26 | ve strength f | 1.15 bc 8 New | , | | |

Type: Dimensional natural stone units (select from list) Category: II, Group: 1 (select from list)



▲ For further information regarding the Category and Group of your selection click the button on the right.

? Masonry units may be Category I of II

category I

Units with a declared compressive strength with a probability of failure to reach it not exceeding 5%. This may be determined via the mean or characteristic value

➢ category II

not intended to comply with the level of confidence of Category 1 units (lower confidence level than for I)

| | Materials and limits for Masonry Units | | | | | | | | |
|--|--|-----------------------|--|--|---|--|-------------------------------|-------------------------------|--|
| | Group 1 (all | | Group 2 | | Group 3 | | Group 4 | | |
| | materials) | Units | Vertical holes | | | | Horizontal | holes | |
| Volume of all holes (% of the gross volume) | ≤25 | clay | >25;≤55 | | ≥25;≤70 | | >25;≤70 | | |
| | | calcium silicate | >25;≤55 | | not used | | not used | | |
| | | concrete ^b | >25;≤60 | | >25;≤70 | | >25;≤50 | | |
| Volume of any hole (% of the gross volume) | ≤ 12 ₅ 5 | clay | each of multiple holes of 12,5 | each of multiple holes ≤ 2 gripholes up to a total eac of 12.5 of : | | each of multiple holes ≤ 2 gripholes up to a total of 12.5 | | each of multiple holes ≤30 | |
| | | calcium silicate | each of multiple holes total of 30 | each of multiple holes ≤ 15 gripholes up to a not used total of 30 | | | not used | | |
| | | concrete ^b | each of multiple holes ≤ 30 gripholes up to a total of 30 | | each of multiple holes ≤ 30 gripholes up to a total of 30 | | each of multiple holes ≤25 | | |
| Declared values of thickness of webs and shells (mm) | No requirement | | web | shell | web | shell | web | shell | |
| | | clay | ≥5 | ≥8 | ≥3 | ≥6 | ≥5 | ≥6 | |
| | | calcium silicate | ≥5 | ≥ 10 | not used | | not used | | |
| | | concrete ^b | ≥ 15 | ≥ 18 | ≥ 15 | ≥ 15 | ≥20 | ≥20 | |
| Declared value of combined thickness ^a of webs and shells (% of the | e No requirement | clay | ≥ 16 | | ≥ 12 | | ≥ 12 | | |
| overall width) | | calcium silicate | ≥20 | | not used | | not used | | |
| | | concrete ^b | ≥ 18 | | ≥ 15 | | ≥45 | | |
| a. The combined thickness is the thickness of the webs and shells, design dimensions of units | measured horizontall | ly in the relevant | direction. The check is t | o be seen as a qualification | n test and need only be r | repeated in the case of prin | cipal change | es to the | |

b. In the case of conical holes, or cellular holes, use the mean value of the thickness of the webs and the shells.

For the Strength Calculation from Dimensions, type the dimensions of the masonry unit and the reduction factor δ , is automatically filled.

| Resistance calculation from | n dimensions |
|-----------------------------|---------------------------------|
| | dx (mm) dy (mm) dz (mm) δ |
| dy | 200 200 250 1.15 ? |
| dx dz | Mean compressive strength fbc 8 |
| | Mean compressive su engur Ibc |

Type the "Compressive Strength" fbc, which is the average value of experiments regarding the compressive strength of the masonry units and the "Specific Weight ϵ ".

| Specific weight ε (KN/m3) | 26 |
|---------------------------|-----|
| Compressive strength fb | 9.2 |

The program automatically calculates the "Compressive Strength" fb.



| Compressi | ive strength fb 9.2 | |
|--|---|--|
| Select | New to store in the masonry library this | masonry unit. |
| L Eve | ry time that you save a masonry unit this is st rent and any future project as well. | ored permanently and is available for the |
| 1.1.2 | Vortar | |
| Mortars | | |
| Mortar C | ement-M5 v | |
| Name | Mortar Cement-M5 | |
| Type | General purpose designed masonry mortar 2 | Concert purpose designed processory poster |
| Resistan | M5 Compressive strength fm 5 | General purpose prescribed masonry mortar |
| recorden | | Lightweight mortar of density <=800 Kg/m3 |
| | New Save | Lightweight mortar of density <=1500 kg/m5 |
| | | |
| Name: N Type: Ge Strength | lortar-M5(select from list) neral Purpose Mortar (select from list) : M5 (select from list) | |
| The com | pressive strength Fm is automatically filled in | by the program |
| Select new mas | Save and Exit to return to the return unit, which is now located in the list. | masonry library, where you can select the |
| Masonry un | i Stones 20x20x25 | |
| | Stones 20x20x50 Brick blocks Perforented 6v9x19 | 1 |
| Mortar | Brick blocks Perforated 9x9x19 Brick blocks Perforated 12x14x25 | |
| a contraction of the second se | YTONG 20x25x60 YTONG 25x25x60 | |
| wall | Stones - stones erratic 20x15x30 Stones - stones drilled 20x20x25 | |
| | Concrete blocks Common brick 6x9x19 | |
| | Stones 20x20x25 Stones 20x20x25 | |



| | s of masonry | | × |
|--|--|--|--|
| Masonr | y stone wall - M5 50 cm 🗸 🗸 | | Type Existing V |
| lame | Masonry stone wall - M5 50 cm | | Thickness 0 Single Sided V |
| уре | Load-bearing V Single-leaf wall V ? | | Cocrete Steel |
| Magazz | Stopps 20v20v50 | | C20/25 ~ S500 ~ |
| Masoni | Thickness 50 fb=9 2000 fbc=8 0000 s=26.00 | | Φ 8 / 10 cm fRdo,c(MPa)= |
| Mortar | Mortar Cement-M5 | | Anchorage Without any additional care \checkmark |
| | General purpose designed masonry mortar fm=5.0000 | | |
| Wall | ? L1 (cm) 0 t1 (cm) 0 t2 (cm) 0 | | |
| Shell B | edded Wall | | |
| Total v | vidth of the two mortar strips g (cm) 0 ? | | |
| | | L1 | Filled vertical joints (3.6.2) |
| | | t1 | Bed join of thickness >15 mm |
| Masonr | y uni | | Thickness (Equivalent) 50 |
| | Thickness 0 | | Specific weight (KN/m3) 26 |
| Mortar | ~ ~ | | Compressive strength fk 3.447902 |
| ar_0 | | Masonry units - Mortars library | Modulus of elasticity 1000 3.447902 |
| waii | | | (GPa) |
| | | | (N/mm2) |
| Concre | te infill fck (N/mm2) Thickness | New | Maximum shear strength fykmax (N/mm2) |
| C20/25 | 20 0 | Save | Flexural strength fxk1 0.1 |
| ata reli | ability level KI 1:1 imited Execution control | Evit | (N/mm2) |
| | Class 1 V | EXIC | (N/mm2) |
| Т | ensile strength fwt (N/mm2) 0 Equal biaxial compr. strengt | h (N/mm2) 0 | Mean Compressive strength 0 fm (N/mm2) |
| ame: pe: S ason idth: Th ar | Wall M5 0.50 (type) Single-leaf (select from list) Try unit: Dimensional natural stone units (prev 50 cm (type) he total masonry results are calculated by the re transferred to the summary table on the rig | riously defined e program bas ght. fb=9.2000 | d) and sed on the input data and the formula ϵ and the formula |
| | r: Mortar-M5 | | |
| ortai | | | |
| ortai Peneral | rescribed Masonry Unit fm is automatically up I purpose designed masonry mortar fm=5.0000 | odated. | |



In case you had selected **Cavity Wall**, the second field regarding the masonry units and mortar for the second part of the wall will be enabled for editing as you did for the first wall. For **Shell Bedded Wall**, the field regarding the total width of the two mortar strips g will be enabled (see

3.6.1.4 for the calculation of the Specific Strength []). For struts, type the dimensions



according to the image 5.10 (see. 5.5.1.3)

to calculate the active thickness according to equation

| Thickness (Equivalent) | 50 |
|--|----------|
| Specific weight (KN/m3) | 26 |
| Compressive strength fk | 3.447902 |
| Modulus of elasticity 1000 (GPa) | 3.447902 |
| Characteristic strength fvk0 (N/mm2) | 0.1 |
| Maximum shear strength fvkmax (N/mm2) | 0.598 |
| Flexural strength fxk1 (N/mm2) | 0.1 |
| Flexural strength fxk2 (N/mm2) | 0.4 |
| Mean Compressive strength fm (N/mm2) | 0 |

The total masonry results are calculated by the program based on the input data and they are transferred to the summary table. If the user knows the values of the equivalent wall, these can be defined manually.



2.2 Modeling:

2.2.1 Templates:

1st **MODE:** The Templates tool, includes a standard masonry structure, which can be modified accordingly, so that it can match the demands of a simple project.

Select the insertion point and choose from the drop-down list "Masonry"

| sonry | - |
|-------|---|
| | |

| L | y1 | | | | |
|---|-----|----------|-------------------|--------|---|
| | G | 201 | netry | | * |
| | Nu | ımb | er of front views | 4 | |
| | Alo | ong | У | 1 | |
| | Dis | star | nce y | 300,00 | |
| | Wi | tdh | 1 (cm) | 30,00 | |
| | Th | ickr | ness (cm) | 20,00 | = |
| | Po | siti | on Angle | 0,00 | |
| Ξ | Di | sta | ance along y | | |
| | Ly | 1 (0 | cm) | 300,00 | |
| Ξ | Fr | on | t Views | | |
| | Bre | еак | | NO NO | |
| | | FR Ch | | 0.00 | |
| | | Ste | art x (cm) | 0,00 | |
| | | Le | nath(cm) | 400.00 | |
| | | Δn | ale | -90.00 | |
| | | Wi | tdh (cm) | 30.00 | |
| | | Th | ickness (cm) | 20.00 | |
| | | Op | ening | 2 | |
| | | Ξ | Opening 1 | | |
| | | | Start x (cm) | 50,00 | |
| | | | Start y (cm) | 100,00 | |
| | | | Width(cm) | 100,00 | |
| | | | Height(cm) | 100,00 | |
| | | Ξ | Opening 2 | | |
| | | | Start x (cm) | 250,00 | |
| | | | Start y (cm) | 100,00 | |
| | | | Width(cm) | 100,00 | Ļ |
| | | | Hoight(cm) | 100.00 | • |

Define the geometry; the number of views, the repetitions on y direction (number of floors) and the distance between them (floor height). Type the values of the width, the thickness of the walls and the angle position according to X, Z global axes to define the direction of the surface in the interface.

If there are more than one floors, you can change the floor height in the field "Distance along Y".

The activation of the checkbox "Division", regarding the front views is optional. With this command, each front view is slivered in more than one surfaces, with limits in the middle of the opening, so, each view is simulated from continuous surfaces without holes. Otherwise, in the simulation process each view contains one surface with its existing holes.

For each view define: (i) the coordinates of the start point and the angle for the rotation of the structure according to X, Z global axes (see the drawing) counterclockwise, (ii) the length and the thickness of the wall and (iii) the number of the openings.

Similarly, define the geometry and the position of each opening.



Click the button "OK" to import the defined structure in the interface.

Proceed to calculate the mesh, as described above.



command

2.2.2 Front View Identification:

2nd MODE: SCADA Pro gives you the possibility to create a masonry structure on any external boundary, by using the tool "Templates", quickly and easily.

The process is the following:

- 1. Enter a plan view in DXF or DWG file format by using the
- 2. Use the command "Layers" to open the list of the design layers.

| Layers |
|---------------|
| DW Bwe Move |
| Delete |
| Layers |
| Freeze Layers |
| DEF Rotate |

Import

3. Select from the list the layer containing the walls and click on "Convert Lines, Arcs".

| Import File Layers | | | × |
|---|-----------------------------|---|---|
| Number o-prov-5 s-scala s-scala-kagelo s-scala-lept | Visible Q Q Q Q | ^ | Select All Cancel Option Visible Non Visible |
| s-walls s-wc s-ypost-hatch TOIXOS | | | Convert Lines - Arcs OK |
| top-oria oik. | <u>×</u> | ~ | Cancel |

▲ In case that you do not have a .dxf or .dwg file, you can design the plan level directly to the XZ level of the SCADA environment.







| Masonry V | Ly (| | | | |
|-----------|---------|-----------------|---------|--------|---|
| | Pro | perty | Value | | |
| | - | Geometry | | | |
| | | Number of front | 6 | | |
| | | Along y | 1 | | |
| | | Distance y | 300.00 | | |
| | | Width (cm) | 30.00 | | |
| | | Thickness (cm) | 50.00 | | |
| | _ | Position Angle | 0.0 | | \times |
| | | Ustance along j | 200.00 | | |
| | | Eyr (cill) | 300.00 | | |
| | | Divide | | | |
| | | E Front View 1 | | | |
| | | Start x (cm) | 1400.00 | | |
| | | | | | |
| Open Save | | | OK | Cancel | |

The program identifies automatically the geometry of the floor plan view. By default the height is defined and the views are created versus the global axes.

5. The user has to define the number of the floors and the corresponding heights, as well as the openings on each view by following the 1st MODE procedure.



Since you have completed the process for each side and each opening, insert the project on the desktop by selecting the button "OK".



You can save the formed model as an .stp file, by clicking the Save button, creating in this way your very own template library. Click Open to call a saved file and load the model at any point.

WARNING: Make sure that the Equivalent Thickness of the wall defined to the library has the same value as the Thickness defined in the Templates.

| Property | Value | | Properties of masonry X |
|--|------------------------------------|---|---|
| Geometry | | ^ | Masonry stone wall - M5 50 cm Vipe Existing Concrete joolet |
| Number of front Along y Distance y Width (cm) Thickness (cm) | 6 1 300.00 30.00 50.00 | | Type Load-bearing Single-leaf wall ? Masony un (\$50mes 20x20x25 ~ ~ Trichness 50 fb=-9.2000 fbc=8.0000 c=26.00 ~ Mortar Matrix Cement M5 ~ ~ Masony un (\$50mes 20x20x25 ~ ~ ~ Trichness 50 fb=-9.2000 fbc=8.0000 c=26.00 ~ ~ Mortar Matrix Cement M5 ~ ~ ~ ~ Shell Bedded Wall 1 t (m) 0 12 (m) 0 . <t< th=""></t<> |
| Position Angle Distance along Ly1 (cm) | 0.0 y 300.00 | | Thickness (Equivalent) 50 |
| Divide Front Views 1 Start x (cm) | 1400.00 | ~ | Wall 2 L1 (cm) 0 t2 (cm) 0 Modular of elasticity Modular of elasticity ID00 3-447902 Concrete Infili fdx. 0µ/mm2) Tricdness Modular of elasticity 0 |

WARNING: In the templates field you can define a single value of thickness for all walls. To edit the thickness of some walls, you open the "Plate Elements Creation" form and you modify the values respectively.

As soon as you have completed the process for each side and each opening, insert the project on the desktop by selecting the button "OK".



Inside SCADA environment, you can see the outlines for each view and its openings in 3D presentation.



2.3 Mesh Group Definition:

As soon as the model is imported in SCADA environment, select the 3D "Mesh" command inside "Surface Elements" group.



In the dialog window that opens, the Mesh Groups list, contains the 1 PLATE mesh, with its corresponding surfaces (one for each view). By selecting the 1 PLATE the fields regarding the Density, Width, Thickness etc (previously defined at Templates) values, are automatically filled in.

| Plate Elemen | ts Creati | on | | | | | | | × |
|--------------|---|--|--------------|----------------|-----|--------------------|------------------------|---------|--------------|
| Description | PLATE | | | Material Mason | ry | ~ | Туре | Mase | onry stone 🗸 |
| Elem | ent | | Ks (Mpa/cm) | Isotropic | | Orthotr | opic | Angl | e 0 |
| Plate | | ~ | 300 | | _ | | | | |
| Density | Widt | h (cm) | Thickness | Exx (GPa) | 3.4 | 47902642 | Gxy (GPa) |) 1 | .379161056 |
| 0.20 ~ | 30 | | 50 | Eyy (GPa) | 3.4 | 47902642 | ε <mark>(kN/m3)</mark> | 2 | 6 |
| Descrip | Descriptions Mesh Mesh Groups Flat Surface | | sh | Ezz (GPa) | 3.4 | 147902642 atx*10-5 | | 1 | |
| Mesh Group | | | Flat Surface | vxy(0.1-0.3) | 0 | | aty*10-5 | 1 | |
| | | 2P S1/2/3(2) 3P S1/2/3(2) 4P S1/3/2(2) 4P S1/4/2 5P S1/5/2 | | vxz(0.1-0.3) 0 | | | atxy*10- | 5 1 | |
| | | | | vyz(0.1-0.3) | 0 | | Exx * | vxz = E | yy * vxy |
| | | 6P S | 51/6/2(2) | Redefinitio | n | Steel Rei | nforcement | | |
| | | | | Del From Lis | | S220 | ~ | : | OK |
| | | | | Derromus | | Cover | _ | - | 5-0 |
| | | | | New | | 20 | mm | | Exit |

In the type, select from the list the previously defined wall from the library, and the respective fields Exx, Gxy and special weight ε are automatically updated.

Steel reinforcement and Cover





| 2.3.1 Mesh | i sub-Group Definit | ion: |
|-----------------------------|--|------|
| Descriptions Mesh Groups | Mesh Flat Surface 1P S1/1/3(2) 2P S1/2/3(2) 3P S1/3/2(2) 4P S1/4/2 5P S1/5/2 6P S1/6/2(2) | |

The derived from templates mesh model comes along with the Mesh group (1 PLATE) and a surface for each view.

1P S1/1/3(2) In the Surface name

- The first number is the number of the view, •
- The P letter stands for flatness •
- The number inside the parenthesis, defines the number of holes in the respective view. •

Activate the Mesh and select a surface. The fields are updated accordingly by the defined values of the selected surface, ×

| Plate Elements Creat | stion |
|----------------------|-------|
|----------------------|-------|

| Description | S1/1/3 | | Material Mason | ry | ~ | Туре | Masonry stone 🗸 |
|-------------|------------------|-------------------------------------|-------------------------------|------|----------|------------------------|-----------------|
| Eleme | nt | Ks (Mpa/cm) | Isotropic | (| Orthotr | opic | Angle 0 |
| Plate | ~ | 300 | | | | | |
| Density | Width (cm) | Thickness | Exx (GPa) | 3.44 | 17902642 | Gxy (GPa) | 1.379161056 |
| 0.20 ~ | 30 | 50 | Eyy (GPa) | 3.44 | 17902642 | ε <mark>(kN/m3)</mark> | 26 |
| Descripti | ons 🗹 M | lesh | Ezz (GPa) | 0 | | atx*10-5 | 1 |
| Mesh Groups | F | lat Surface | vxy(0.1-0.3) | 0 | | aty*10-5 | 1 |
| 1 PLA | E 1P 2P 3P | S1/1/3(2) S1/2/3(2) S1/3/2(2) | vxz(0.1-0.3) | 0 | | atxy*10-5 | 1 |
| | 4P 5P | S1/4/2 S1/5/2 | vyz(0.1-0.3) | 0 | | Exx * v | xz = Eyy * vxy |
| | 6P | S1/6/2(2) | - 10.00 | | Steel Re | inforcement | |
| | | | Redefinitio | n | S220 | ~ | ОК |
| | | | Del From Lis | st | Cover | | |
| | | | New | | 20 | mm | Exit |

Enabling in this way the modification of any parameter (name, density, width, thickness type etc.) Redefinition regarding the selected surface. Finally, click to apply the modifications.



2.3.2 Raft and mesh areas external boundary definition:

From the command group "Basic" select "Line" to draw the closed contour of the arbitrary cross section. Use snap tools for help.





| Description | RAFT | | | Material Co | ncrete | ~ | Туре | C20/25 | |
|----------------------------------|------|----------------------|----------------------------------|--------------|--------|---------------|-------------------|----------|------|
| Eleme | ent | | Ks (Mpa/cm) | Isotropic | (| Orthot | ropic | Angle | 0 |
| Plate O.E.F | Widt | ~ (cm) | 0.5 Thickness | Exx (GPa) | 30 | | Gxy (GPa) | 12.5 | |
| 0.20 ~ | 30 | | 50 | Eyy (GPa) | 30 | | ε (kN/m3) | 25 | |
| Descript | ions | ⊠ Me | sh | Ezz (GPa) | 30 | | atx*10-5 | 1 | |
| Mesh Group: | I | Fla | t Surface | vxy(0.1-0. | 3) 0.2 | | aty*10-5 | 1 | |
| 1 PLA | IE | 1P S 2P S 3P S | 1/1/3(2) 1/2/3(2) 1/3/2(2) | vxz(0.1-0. | 3) 0.2 | | atxy*10-5 | 1 | |
| 4 P S 5 P S 6 P S 7 P S | | 4P S 5P S | 1/4/2 1/5/2 | vyz(0.1-0.3) | | | Exx * v | xz = Eyy | *vxy |
| | | 6P S | 1/6/2(2) AFT | Redefin | tion | Steel R | einforcement | | |
| | | | | Del Fron | List | S220 Cover | ~ | C | Ж |
| | | | | Nev | 6 | 20 | mm | E | xit |

2.3.3 Surface Calculation:



Select the Calculation command. In the dialog box that opens, the mesh list contains the 1PLATE group and its respective surfaces.

| 1 PLATE | | | | ~ | Calculation | |
|-------------|---------|--------|---|---|--|-----|
| Number | Visible | Colour | σ | | Change Direction Auto | |
| 1 S1/1/3(2) | Ø | 36 | Х | | | |
| 2 S1/2/3(2) | Ø | 36 | Х | | X Y Z LINE | |
| 3 S1/3/2(2) | Ø | 36 | Х | | Start End | |
| 4 S1/4/2 | Ø | 36 | Х | | X 0 0 | |
| 5 S1/5/2 | Ø | 36 | Х | | Y O | i 🗌 |
| 6 S1/6/2(2) | Ø | 36 | Х | | | |
| 7 RAFT | Ø | 36 | Х | | Z 0 0 | |
| | | | | | Select All | |
| | | | | | Visible Non Visible | |
| | | | | | Creating Holes in the Column's location | |
| | | | | | Cancel - Delete | |
| | | | | | Holes Lines | |
| | | | | | Point Properties | |
| | _ | | | | Mach Math Made | |

23





To create the mathematical model of the structure, from "Tools" unit select "Calculation" and click OK on the dialog window that opens:









Finally, for views of which the local axis is <u>parallel to the global axes X or Z</u>, select them and click or respectively, to define the main direction of the steel reinforcement (direction X or Z). For surfaces that run along X direction (vertical to Z axis) click X, while for surfaces that run along Z direction (vertical to X axis) click Z.



• For views that are not parallel or perpendicular to the global axes, the main reinforcement direction is automatically defined.

In this example, for views 2,3,4,6,7 the x local axis is parallel to global X







3. LOADS DEFINITION

3.1 Manually imported:



"Member Loads" commands' group contains the commands for insert, edit, view and copy the loads of members, nodes and surfaces finite elements.

For this example, to apply the loads regarding the slab that shelters the structure, to the top nodes of the perimeter, follow the procedure described next:





| Click: In sert Loads Load Case Load Proper Load Type | sert Kινητά Φορτία | .1 |
|--|---|---------------|
| Description Fx (kN) Fy (kN) | O Value j (kN/m) O -1.4 Dist.j (cm) O | +FZ , |
| Fz (kN) Apply To | 0 Predefined Global x.y.x V Description | FX i +FY |
| 1 1 2 1 < | F 0.00/-5.15/0.00 F 0.00/-1.40/0.00 | Clear by Sele |
| Click: C | K to apply the defined loads | |



| Basic Modeling View LIC LIG Sees Groups Load Load Cases Groups Line t Edit Vield Lines t | Image: Signed participation For the second participation Analysis Post-Processor Members Design Drawings-Detailing Addons Image: Signed participation Image: | |
|---|---|----------------------|
| Definition Slab Loads | Member Loads Display Loads | × |
| 8 | | Level XZ |
| Project Data | LC LG1 LG2 LG3 LG4 LG5 LG6 LG7 LG8 LG9 LG10 LC1 ON LC2 ON | A/A ^ ^ 0 ON 1 ON |
| Columns Footings Nodes Mathbeams I MathColumns Surf 2D Surf 3D Slabs | Image: Second | |

3.2 Load Destribution on the Surface

The new version of SCADA Pro comes with a new tool for the automatic distribution and application of loads on mesh areas.

Load distribution on the surface

Tools

Analytical description on how to use this command can be found in chapter 6 "LOADS" on page 21.



4. ANALYSIS

Proceed?

Yes

4.1 Masonry structure analysis by Eurocode:

As soon as you complete the modeling and load definition processes, move on to analysis. For masonry structures analysis, create an Eurocode analysis scenario, so that SCADA Pro will perform the analysis by the provisions of the Eurocodes.

| 1 | EC8_General Dynamic (2) * | T. |
|-----|---------------------------|-----|
| New | Active Scenario | Run |
| | Scenarios | |

Move to "Analysis" unit and from the "Scenarios" command group, click "New" to create an Eurocode scenario for masonry structures analysis.

Click "New" and in the dialog window that opens:

-select Nodes Renumbering according to Cuthill-McKee(II) method

-create a new scenario by selecting the type and the respective annex -> EC-8_ Dynamic

| Scenario | × |
|--|--|
| Renumbering Nodes Cuthill-McKee(II) | Advanced Multi-Threaded Solver |
| Disable | Name |
| Seismic E.A.K.(Static) (0) Seismic E.A.K. (Dynamic-eti) (| Analysis EC8_General ~ |
| EC8_General Dynamic (2) | Type Dynamic ~ |
| | Properties |
| | Elements Nodes |
| | Load Cases Masses |
| | New Update |
| | Exit |
| | Run |
| select from the list the Ei n the dialog box that ope | urocode scenario and click sectors . Ins, accept the warning regarding the diaphragm absence and c |
| Attention! | od is Incompatible |

No



| 2 | Paramete | ers | Mass Center | s (cm) | | | \sim | |
|--|--|--|---|---|--|--|---|---|
| 3 | Automatic Pro | cedure | Level | Х | Y | Z | ^ | |
| Proce | edure | | 0 - 0.00 | 0.00 | 0.00 | 0.00 | | |
| | Mass - Stiff | ness | 1 - 300.00 | 0.00 | 300.00 | 0.00 | | |
| | Regularit | ty | | | | _ | | |
| | Regular In Plan In Eleve | ation | | | | | | |
| | Equivaler | nt | | | _ | _ | | |
| | Analysis | S | | | | | ~ | |
| 1 | Initialize d | ata | | I | Exit | | | |
| wo | Parameters | to to | update the p define the a | oaramete nalysis p | ers of the or arameters | current s | cenario | |
| NO Rara | Parameters | to | update the p define the a | oaramete nalysis p | ers of the o | current s | scenario | |
| NO NO Seismic | Parameters meters c Area | Characteristic | update the p define the a Periods | paramete nalysis p | ers of the carameters | current s | scenario | |
| WO C8 Para Seismic | Parameters umeters c Area Seismic Areas | Characteristic Spectrum Typ | update the p define the a Periods De Horizont | aramete nalysis p | Apply seism Down 0 - | ic actions on I | Levels XZ | 300.00 ~ |
| XO XO XO XO XO XO XO XO XO XO | Parameters imeters c Area Seismic Areas | Characteristic Spectrum Typ Type 1 | Periods S,avg 1.2 | al Vertical | Apply seism Down 0 -1 Dynamic Arr | ic actions on I | Levels XZ | 300.00 ~ |
| VO Seismic Zone | Parameters imeters c Area Seismic Areas I v a 0.16 *g | Characteristic Spectrum Typ Type 1 Soil | Periods S,avg 1.2 TB(S) 0.15 | al vertical | Apply seism Down 0 -1 Dynamic Ar Eigenvalk | ic actions on I 0.00 ~ alysis | Levels XZ Up 1-3 | 300.00 ~ |
| VO 8 Para Seismic Zone | Parameters | Characteristic Spectrum Type 1 Soil B | Periods S,avg 1.2 TB(S) 0.15 TC(S) 0.5 TD(C) 2.5 | al Vertical | Apply seism Down 0 - 1 Dynamic Ar Eigenvall | ic actions on I 0.00 v alysis 0 Accura articipation fa | Levels XZ Up 1-3 acy 0.001 ctors | 300.00 ~ |
| XO XO XO XO XO XO XO XO XO XO | Parameters | Characteristic Spectrum Typ Type 1 Soil B | Periods S,avg 1.2 TB(S) 0.15 TC(S) 0.5 TD(S) 2.5 | al Vertical 0.9 0.05 0.15 1 | Apply seism Down 0 -1 Dynamic Ar Eigenvalu | ic actions on I 0.00 ~ alysis 0 Accura articipation fa 0 PFy | Levels XZ Up 1-3 acy 0.001 ctors Q PF2 | 300.00 ~ z |
| VO 8 Para Seismic Zone [Import Zone Spectr Respon | Parameters | Characteristic Spectrum Type 1 Soil B | update the p o define the a Periods De Horizont V S,avg 1.2 TB(S) 0.15 TC(S) 0.5 TD(S) 2.5 | al vertical 0.9 0.05 0.15 1 DCM ~ | Apply seism Down 0 Dynamic An Eigenval 2 Spectrum P PFx 2 Acc.Eccent | ic actions on I 0.00 v alysis articipation fa 0 PFy ricities | Levels XZ Up 1-3 acy 0.001 ctors Sd (T) Sd (TX) | x00.00 ~ |
| IR Para Seismic Zone [Import Zone Spectr Respoi Z(% | Parameters | Characteristic Spectrum Typ Type 1 Soil B Duct zontal b0 2.5 | Periods Periods Periods → S,avg 1.2 TB(S) 0.15 → TC(S) 0.5 TD(S) 2.5 ality Class Vertical | al Vertical 0.9 0.05 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.9 | Apply seism Down 0 - 1 Dynamic Ar Eigenval 3 Spectrum P PFx 1 Acc.Eccent e Tix 1 | ic actions on I alysis articipation fa PFy ricities 0.05 *Lx | Levels XZ Up 1-3 acy 0.001 ctors 0 Sd (T) Sd (TX) Sd (TY) | xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx |
| XVO XVO XVO XVO XVO XVO XVO XVO XVO XVO | Parameters | Characteristic Spectrum Typ Type 1 Soil B Duct zontal b0 2.5 | update the p o define the a Periods De Horizont ✓ S,avg 1.2 TB(S) 0.15 TC(S) 0.5 TD(S) 2.5 ality Class ↓ Vertical | paramete nalysis p al Vertical 0.9 0.05 0.15 1 DCM b0 3 0.2 | Apply seism Down 0 Dynamic Ar Eigenvak 1 Spectrum P PFx 1 Acc.Eccent e TIX 1 | ic actions on I 0.00 alysis 10 Accura articipation fa 0.05 *Lx 0.05 *Lz | Levels XZ Up 1-3 acy 0.001 ctors Sd (T) Sd (TY) [Sd (TZ) [| x 00.00 ~ |
| 2000 2000 2000 2000 2000 2000 2000 200 | Parameters | Characteristic Spectrum Typ Type 1 Soil B Update Spectrum | update the p o define the a Periods pe Horizont ▼ S,avg 1.2 TB(S) 0.15 ▼ TC(S) 0.5 TD(S) 2.5 tilty Class Vertical Sd(T) >= | al Vertical 0.9 0.05 0.15 0.15 0.2 0.2 0.2 0.2 | Apply seism Down 0 Dynamic Ar Eigenval Spectrum P PFx 0 Acc.Eccent e Tix 0 Bays | ic actions on I 0.00 ~ alysis 0 Accura articipation fa 0 PFy ricities 0.05 *Lx 0.05 *Lz | Levels XZ Up 1 - 3 acy 0.001 ctors 0 PFz Sd (T) Sd (TX) sd (TY) sd (TZ) [| 300.00 ∨ : □ 0 □ 1 □ 1 □ 1 |
| Zone [Zone] Zone] Zo | Parameters | Characteristic Spectrum Typ Type 1 Soil B Update Spectrum 3.5 | update the p o define the a Periods > S,avg I.2 TB(S) 0.15 TC(S) II(ty Class) Vertical Sd(T) >= ay 3.5 az | aramete nalysis p al vertical 0.9 0.05 0.15 1 0.15 1 0.2 a*g 0.2 a*g 0.2 a*g | Apply seism Down 0 -1 Dynamic Arr Eigenvalk 3 Spectrum P PFx 1 Acc.Eccent e TIX 1 Bays X 0ne | ic actions on I 0.00 ~ alysis 10 Accura articipation fa 0.05 *Lx 0.05 *Lz Setbacks X | Levels XZ Up 1-3 acy 0.001 ctors Sd (TX) Sd (TX) Sd (TY) [Sd (TZ) [All the other c | 300.00 ✓ : □ 0 □ 1 □ 1 □ 1 □ ases |
| Zone Spectra Zone (% Respond Struct Cont Struct Cont Struct Cont Struct Cont Struct Cont Struct | Parameters | Characteristic Spectrum Typ Type 1 Soil B Duct zontal b0 2.5 Jpdate Spectrum 3.5 stype a Z | update the p o define the a Periods pe Horizont S,avg 1.2 TB(S) 0.15 TC(S) 0.5 TD(S) 2.5 bilty Class Vertical Sd(T) >= 3.5 qz Moment resisting frame Moment resisting frame | al Vertical 0.9 0.05 0.15 0.15 0.15 0.15 0.2 a*g 0.2 a*g mes type a | Apply seism Down 0 -1 Dynamic Ar Eigenval 2 Spectrum P PFx 0 Acc.Eccent e TIX 0 ETIX 0 Bays X 0 One Z 0 One | ic actions on I 0.00 ~ alysis 0 Accura articipation fa 0 PFy ricities 0.05 *Lz Setbacks x z (| Levels XZ Up 1-3 acy 0.001 ctors 0 PFz Sd (TX) Sd (TX) Sd (TX) Sd (TZ) [All the other c | 300.00 ~ 2 0 0 1 1 1 1 ases ases |
| VO VO VO VO VO VO VO VO VO VO | Parameters | Characteristic Spectrum Typ Type 1 Soil B Duct zontal b0 2.5 Jpdate Spectrum 3.5 stype a Z | update the p o define the a Periods De Horizont S,avg 1.2 TB(S) 0.15 TC(S) 2.5 slity Class Vertical Sd(T) >= 3.5 Ay 3.5 qz | al Vertical 0.9 0.05 0.15 1 DCM bo 3 0.2 a*g 0.2 a*g 0.2 a*g | Apply seism Down 0- Dynamic Arr Eigenval 1 Spectrum P PFx 1 PFx 1 Eigenval 1 Spectrum P PFx 1 Eigenval 2 Spectrum P Spectrum P Spec | ic actions on I 0.00 alysis 0 Accura articipation fa 0.05 %Lx 0.05 %Lz Setbacks X Z | Levels XZ Up 1-3 acy 0.001 ctors Sd (T) Sd (TX) Sd (TY) [Sd (TZ) [All the other c | x 00.00 x 0 0 1 1 1 ases ases |
| IP Para Seismic Zone I Import Zone Spectr Cone Struct Conf Struct Conf Struct Conf Struct Conf Struct Conf Struct Conf Struct Conf Conf Conf Conf Struct Conf Conf Conf Conf Conf Conf Conf Conf | Parameters ameters c Area Seismic Areas I v a 0.16 *g tance II v i 1 rum nse Spectrum Design b) 5 Horiz onse Spectrum Utural Type fined masonry frames inforced masonry seismity masonry.3.2.2 treete Moment Resisting | Characteristic Spectrum Typ Type 1 Soil B Duct zontal b0 2.5 Jpdate Spectrum 3.5 stype a Z 2.(5) Frames | update the p o define the a Periods pe Horizont S,avg 1.2 TB(S) 0.15 TC(S) 0.5 TD(S) 2.5 tilty Class Vertical Sd(T) >= az Moment resisiting frame Moment resisiting frame | al Vertical 0.9 0.05 0.15 0.15 0.15 0.15 0.2 a*g 0.2 a*g mes type a | Apply seism Down 0 -1 Dynamic Ar Eigenval 2 Spectrum P PFx 0 Acc.Eccent e TIX 0 e TIZ 0 Bays X 0 One Z 0 One | ic actions on I 0.00 ~ alysis 0 Accura articipation fa 0 PFy ricities 0.05 *Lx 0.05 *Lz Setbacks X _ z _ ting Frames | Levels XZ Up 1-3 acy 0.001 ctors 0 PFz Sd (TY) [Sd (TY) [Sd (TZ)] All the other c | 300.00 ~ 2 0 0 1 1 1 1 ases ases |

-Define "Zone", "Importance" and "Soil". -select "Design" spectrum and



-at the type of structure field select "Confined Masonry" -Click OK to update the parameters and close the window.

Three Automatic Procedure to run the analysis.

Let the program to complete the process and click Exit.

| | Parameters | Mass Center | rs (cm) | | | \sim |
|-------|---------------------|-------------|---------|------------|------------|--------|
| - 1 | Automatic Procedure | Level | х | Y | Z | ^ |
| cedur | e | 0 - 0.00 | 0.00 | 0.00 | 0.00 | |
| | Mass - Stiffness | 1 - 300.00 | 848.50 | 300.00 | 448.92 | |
| | Regularity | | | | | |
| Re | egular | | | | | |
| | In Plan | | | | | - 11 |
| | In Elevation | | | | | - |
| Γ | Equivalent | | | | | - |
| | Analysis | | | | | ~ |
| | Initialize data | | ł | Exit | | |
| | | | | | | |
| | EC8_General Dynam | nic (2) | - | | | |
| | Active Scena | rio | | | | |
| he | Active Scena | 110 | scena | rio activa | ited, sele | ct "C |

coefficients of the dynamic analysis according to Eurocode.

Click "Save", to store the combinations file inside the folder of your project to use it later on during the "Post-Processor" and "Member Design" process.



| G 1.35 | VE | | γG | E] | | | μ2 | 0.3 | | | timate | (Ω+Σ\000) | S | erviceability | 2 | | Calcula | tic |
|--|--|--|----------------------------------|----------------|--------------|------|--------|--|---|--|---|----------------------------------|---|------------------------|----------|----------------------|---------|-----|
| 0 15 | | | | - | | | | | | ¥ |]ΣG+ψ | 1Q+Σψ2Q | 5 | ZG+Q+2φ00 ΣG+ψ1Q+Σι | γ μ2Q | | Calcula | iut |
| Q 1.5 | γευ.5 | | | | | | | Wind - Sn | now | | ΣG+E· | +Σγψ2Q | | ZG+Σψ2Q | | | Delete | . A |
| | Туре | | Direction | | LC1 | | _ | LC2 | _ | LC3 | | LC4 | | LC5 | | LC6 | | |
| Scenario | | | | | EC-8_0 | Gree | - | EC-8_Gree | - | EC-8_Gre | e 💻 | EC-8_Gree. | | EC-8_Gree | - | EC-8_G | ree 🗵 | |
| Load Case | | | | | 1 | | _ | 2 | _ | 3 | | 4 | | 5 | _ | 6 | | |
| Load Type | | | | | G | | - | Q | - | ExD | <u> </u> | EzD | - | Erx | - | Erz | - | 1 |
| Actions | | | | | | | - | Category A | - | | <u> </u> | | - | | - | | - | 1 |
| Description | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| Comb.:1 | Ultimate | - | No | • | 1.35 | | | 1.50 | | | | | | | | | | |
| Comb.:2 | Ultimate | - | No | - | 1.00 | | | 0.50 | | | | | | | | | | |
| Comb.:3 | Ultimate | - | Dir. +X | - | 1.00 | | | 0.30 | | 1.00 | | 0.30 | | 1.00 | | 0.30 | | + |
| Comb.:4 | Ultimate | - | Dir. +X | - | 1.00 | | | 0.30 | | 1.00 | | 0.30 | | 1.00 | | 0.30 | | + |
| Comb.:5 | Ultimate | - | Dir. +X | - | 1.00 | | | 0.30 | | 1.00 | | 0.30 | | 1.00 | | -0.30 | | |
| Comb.:6 | Ultimate | - | Dir. +X | - | 1.00 | | | 0.30 | | 1.00 | | 0.30 | | 1.00 | | -0.30 | | |
| Comb.:7 | Ultimate | - | Dir. +X | - | 1.00 | | | 0.30 | | 1.00 | | 0.30 | | -1.00 | | 0.30 | | |
| Comb.:8 | Ultimate | - | Dir. +X | - | 1.00 | | | 0.30 | | 1.00 | | 0.30 | | -1.00 | | 0.30 | | |
| Comb.:9 | Ultimate | • | Dir. +X | - | 1.00 | | | 0.30 | | 1.00 | | 0.30 | | -1.00 | | -0.30 | | |
| a 1.40 | Ultimate | - | Dir. +X | - | 1.00 | | | 0.30 | | 1.00 | | 0.30 | | -1.00 | | -0.30 | | 1 |
| Comb.:10 | Ultimate | | | | | | | | | | | | | | | | | - |
| Comb.:10 Comb.:11 | Ultimate | • | Dir. +X | - | 1.00 | | | 0.30 | | 1.00 | | -0.30 | | 1.00 | | -0.30 | | |
| Comb.:10 Comb.:11 Comb.:12 | Ultimate Ultimate | • | Dir. +X Dir. +X | • • | 1.00 1.00 | | | 0.30 0.30 | | 1.00 1.00 | | -0.30 -0.30 | | 1.00 1.00 | | -0.30 -0.30 | | |
| Comb.:10 Comb.:11 Comb.:12 | Ultimate Ultimate | • | Dir. +X Dir. +X | * * | 1.00 1.00 | | | 0.30 0.30 | | 1.00 | | -0.30 -0.30 | | 1.00 | | -0.30 -0.30 | | |
| Comb.:10 Comb.:11 Comb.:12 < Add | Ultimate Ultimate Remove | | Dir. +X Dir. +X | ▼ ▼ Read | 1.00 | Save | e | 0.30 0.30 TXT | | 1.00 1.00 Defa | ult Com | -0.30 -0.30 binations | | 1.00 | (| -0.30 -0.30 DK | Ca | ar |
| Comb.:10 Comb.:11 Comb.:12 < Add | Ultimate Ultimate Remove | | Dir. +X Dir. +X | ▼ ▼ Read | 1.00 | Save | e | 0.30 0.30 TXT | | 1.00 1.00 Defa | ult Com | -0.30 -0.30 binations | | 1.00 | (| -0.30 -0.30 DK | Ca | ar |
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| Comb.:10 Comb.:11 Comb.:12 Add Save As Save As Corganize \checkmark Organize \checkmark | Remove | Disk (C: | Dir. +X Dir. +X | Read | 1.00 | Save | e ~ | 0.30 0.30 TXT | caar | 1.00 1.00 Defa | ult Com | -0.30 -0.30 binations × | | 1.00 | (| -0.30 -0.30 | Ca | an |
| Comb.:10 Comb.:11 Comb.:12 | Remove | Disk (C: | Dir. +X Dir. +X | Read | 1.00 | Save | e | 0.30 0.30 TXT [7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 | caar d 00 PN | 1.00 1.00 Defa hal Type VI File for VI File for | ult Com | -0.30 -0.30 ibinations | | 1.00 1.00 | (| -0.30 -0.30 | Ca | an |
| Comb.:10 Comb.:11 Comb.:12 < Add Save As ← → ~ ↑ Organize ▼ This PC ⇒ A360 Drive ■ Desktop Desktop | Remove | Disk (C: Scer Certification Scer | Dir. +X Dir. +X | Read | 1.00 | Save | e V | 0.30 0.30 TXT © Search so Date modifie 2/23/2016 4:0 2/23/2016 4:0 | caar d 00 PN 60 PN | 1.00 1.00 Defa Type M File fc M File fc M CMB | older File | -0.30 -0.30 ibinations | | 1.00 1.00 | (| -0.30 -0.30 | Ca | 317 |
| Comb.:10 Comb.:11 Comb.:12 Add Save As Save As Organize This PC A360 Drive Document | Remove | Disk (C; Scer defa EC-8 | Dir. +X Dir. +X Dir. +X | Read | 1.00 1.00 | Save | e | 0.30 0.30 TXT 5 Search su 5 Date modifie 2/23/2016 4:0 2/23/2016 4:0 2/23/2016 4:0 2/23/2016 4:0 | caar d 00 PN 60 PN 06 PN 06 PN | 1.00 1.00 Defa nal Type M File for M CMB M CMB | ult Com E ▼ older File File | -0.30 -0.30 ibinations | | 1.00 | (| -0.30 -0.30 DK | Ca | an |
| Comb.:10 Comb.:11 Comb.:12 Add Save As Save As Save As Crganize ~ This PC A360 Drive Desktop E Document Document Document | Remove VItimate Ultimate Remove | Disk (C: Scer defa EC-5 | Dir. + X Dir. + X Dir. + X | Read | 1.00 1.00 | Save | e ~ | 0.30 0.30 TXT 5 Search se 5 Date modifie 2/23/2016 4:0 2/23/2016 4:0 2/23/2016 4:0 | caar d 00 Ph 60 Ph 66 Ph | 1.00 1.00 Defa aal Type M File for M CMB M CMB | ult Com E ▼ older File File | -0.30 -0.30 ibinations | | 1.00 1.00 | | -0.30 -0.30 | Ca | an |
| Comb.:10 Comb.:11 Comb.:12 Add Save As Save As Corganize This PC A360 Drive Desktop E Document Document Document Document Document Document Document Document Document | Remove VItimate Ultimate Remove | Disk (C: Scer defa EC-8 | Dir. + X Dir. + X Dir. + X | Read | 1.00 1.00 | Save | e ~ | 0.30 0.30 TXT Search so Date modifie 2/23/2016 4:0 2/23/2016 4:0 2/23/2016 4:0 | caar d 00 PN 60 PN 06 PN | 1.00 1.00 Defa aal Type M File fo M CMB M CMB | ult Com E ▼ older File File | -0.30 -0.30 ibinations | | 1.00 1.00 | (| -0.30 -0.30 | Ca | an |
| Comb.:10 Comb.:11 Comb.:12 Add Save As Granize \rightarrow This PC Ad60 Drive Desktop Document Documen | Remove Remove Remove | Disk (C; Disk (C; Scer defa EC-C | Dir. + X Dir. + X Dir. + X | Read | 1.00 1.00 | Save | e ~ | 0.30 0.30 TXT Search sub- Date modifie 2/23/2016 4:0 2/23/2016 4:0 2/23/2016 4:0 | caar d 00 PN 60 PN 66 PN | 1.00 1.00 Defa nal Type V File fo V File fo V CMB | ult Com E ▼ older File File | -0.30 -0.30 ibinations | | 1.00 1.00 | | -0.30 -0.30 | Ca | an |
| Comb.:10 Comb.:11 Comb.:12 Add Save As Save As This PC This PC Ad60 Drive Desktop Document Document Document Document Document Local Disk Local Disk | Remove | Disk (C:) | Dir. +X Dir. +X | Read | 1.00 1.00 | Save | e ~ | 0.30 0.30 TXT Search set Date modifie 2/23/2016 4:0 2/23/2016 4:0 2/23/2016 4:0 | caar d 00 PN 60 PN 96 PN | 1.00 1.00 1.00 Topefa 1.00 | ult Com E ▼ older File File | -0.30 -0.30 | | 1.00 | | 0.30 -0.30 X | Ca | 31 |
| Comb.:10 Comb.:11 Comb.:12 < Add Save As → ~ ↑ Organize ~ This PC → A360 Drive Desktop → Download → Music = Pictures ₩ Videos ↓ Local Disk → Network | Vitimate Ultimate Ultimate Remove Remove Image: second | Disk (C: Scer Certon Ce | Dir. +X Dir. +X Dir. +X | Read | 1.00 1.00 | Save | e ~ | 0.30 0.30 TXT 5 Date modifie 2/23/2016 4:0 2/23/2016 4:0 2/23/2016 4:0 | caar d 00 PN 06 PN 06 PN | 1.00 1.00 Defa mal Type M File for M File for M CMB | ult Com | -0.30 -0.30 | | 1.00 | | -0.30 -0.30 | Cz | ar |
| Comb.:10 Comb.:11 Comb.:12 Add Save As Save As Save As Crganize This PC A360 Drive Desktop Download Music Pictures Videos Network File nan | Continuate Ultimate Ultimate Remove Remove Continuate Remove Remove (C:) Continuate Continuate Remove Remo | Disk (C: Jame Scer Gefa EC-S | Dir. +X Dir. +X Dir. +X | Read | 1.00 1.00 | Save | e ~ | 0.30 0.30 TXT 5 Search su 5 Date modifie 2/23/2016 4:0 2/23/2016 4:0 2/23/2016 4:0 | caar d 00 Pf 50 Pf 56 Pf | 1.00 1.00 Defa nal Type M File for M CMB M CMB | ult Com | -0.30 -0.30 | | 1.00 1.00 | | -0.30 -0.30 | Cz | an |



5. RESULTS 5.1 Deformed shape of Model: Move to "Results" unit and check the deformation of the model. Combinations Select and calculate (click Calculation) the combinations that you previously saved (Select the File). Load Combinations × Load Combinations × C:\a5\scaanal\EC-8_Greek Load Load 7 Load Load 101 EC-8_Greek Dynamic (2).cmb \sim \sim default.cmb Combinations Select _Greek Dynamic (2).cmb Calculation Calculation End Calc Cancel OK OK Cancel Diagrams-Stress Contours Model **Diagrams-Stress Contours** Select from the list and in the dialog window, select to view "Plate Elements" -> "DY Deformations" caused by "Load Case 1" for all model (Select All): Select Magnitude × Plate Element ~ Deformations ✓ 3D Member ∨ 1: 10 ?? ✓ DY ✓ Load Case ✓ 1 Pick Select All Clear All At the bottom bar activate: VALUES LIMITS COL. LOGNITUDINAL PHYSICAL BAR Color representation and Values bar, to view the next image:









6. DESIGN

6.1 Design Scenario Creation in accordance to Eurocode provisions:

For masonry structures, SCADA Pro embeds the checks of the Eurocode 6. Thus it is necessary to create a Eurocode design scenario to perform the respective checks with the "Masonry Design" command.

| Scenario | | | | | | | × | |
|---|--|--|---|--|--|------------------------|----------------------|--|
| 1 | | | | Name Type | 1 EC6-E | C8(3) | ~ | Move to "Design" unit and click |
| | | | | New | | Upd | late | New to create the desired |
| | | | | Design De | lete ete | Conn | ections | name and click "New". |
| | Exi | t | | Steel | | Apply | | |
| | | | | | | EC6-EC8(i | 3) 1 (0) Scenario | • Para- |
| Select | the | consi | dered | scenario | 0 | | | and and click meters. |
| | Insert | Combin | ations | | that o | pens the | e folder v | vith the registered .cmb files. Select |
| the file combinati | and ons a | press nd by (| clickin | Combir g OK the w | indow | Calculation | n | . The program calculates the |
| Structural Compo | nent Para | meters | | | | × | | |
| Steel Reinfor Combination | cement s | Capac Slabs | city Design Beam | Steel s Column | Timber s | structures Footings | | |
| Combinations of | Load Sets | (101) | Ult. S | erv. +XX | +Z | -Z No | | |
| Combinations 1(5) +1.35Lc1 2(1) +1.00Lc1 3(2) +1.00Lc1 4(2) +1.00Lc1 5(2) +1.00Lc1 7(2) +1.00Lc1 8(2) +1.00Lc1 9(2) +1.00Lc1 10(2) +1.00Lc2 < | +1.50Lc2 +0.50Lc2 +0.30Lc2+1 +0.30Lc2+1 +0.30Lc2+1 +0.30Lc2+1 +0.30Lc2+1 +0.30Lc2+1 1+0.30Lc2+ | 1.00Lc3+0.30 1.00Lc3+0.30 1.00Lc3+0.30 1.00Lc3+0.30 1.00Lc3+0.30 1.00Lc3+0.30 1.00Lc3+0.30 +1.00Lc3+0.3 | Lc4+1.00Lc5 Lc4+1.00Lc5 Lc4+1.00Lc5 Lc4+1.00Lc5 Lc4-1.00Lc5 Lc4-1.00Lc5 Lc4-1.00Lc5 0Lc4-1.00Lc5 | 5+0.30Lc6+0.30Lc7 5+0.30Lc6-0.30Lc7 5-0.30Lc6+0.30Lc7 5+0.30Lc6+0.30Lc7 5+0.30Lc6+0.30Lc7 5+0.30Lc6+0.30Lc7 5-0.30Lc6+0.30Lc7 5-0.30Lc6-0.30Lc7 | ULS/SLS ULS ULS ULS ULS ULS ULS ULS ULS ULS | Dir. | | |
| Level Multipliers | | 17 | · (1-θ) | EC-8_Greek Dynan | nic (2).cmb | ~ | | |
| Level | Х | γ | Z | default.cmb EC-8_Greek Dynan | nic (2).cmb | | | |
| 0 - 0.00 | 1.000 | 1.000 | 1.000 | Combinatio | ons Calculati | on | | |
| 1 - 300.00 | 1.000 | 1.000 | 1.000 | Combination C | nd Calc G+ψ2Q [1 utomatic Des | l01 | | |
| | | | | | OK | Cancel | | |



6.2 Masonry structure checks according to Eurocode 6:



2.

4.

Masonry design according to Eurocode 6 includes seven checks:



Wall subjected to in-plane bending



Wall subjected to out-of-plane bending across an axis parallel to the bed joints



Wall subjected to out-of-plane bending across an axis perpendicular to 3. the bed joints

- Wall subjected to shear loading
- 5. Wall subjected to mainly vertical loading, top
- Wall subjected to mainly vertical loading, middle 6.
- 7. Wall subjected to mainly vertical loading, bottom
- These seven adequacy checks are defined for each wall or each wall section (spandrel), according to the user defined division.

A Buildings that meet the requirements to be identified as "Simple" are excluded from all the above adequacy checks.

In the dialog box that opens, the user must identify the parts of the walls to make the required checks:



| Maria I. S. Maria I. | 111-00 | | ~ | 1 |
|--|--|--|--|--|
| Masonry design: New masonry b | fullaing (ECO) | | Berformanco | |
| | | ~ | Objective | |
| Description | | | A - DL 🛛 🗠 | |
| l(cm) 0 Pick | | | | |
| h(cm) 0 Pick | | | | |
| Support: 4 Sides \sim | | | | |
| New Update | | | | |
| Delete le Masonry Buil | | | | |
| Check Total Check | Results | Total Results | Exit | |
| Description 1_1 In "Description under the second se | ription" field, ty Use these fie | ype a name (at least fou | ur characters) f netry of the co | for the considered |
| I(cm) 0 Pick h(cm) 0 Pick | spandrel): Click the first at the end po | "Pick" to define the looints. | ength of the w | all by left clicking |
| | Pres start defin chor poin In th the f | s the button " Pick " ting and ending po- nition). After the star ed emerges from it, w t (second click). e same manner, press first one), to define the part (i.e. height definit | (the first one) ints of the ting point is o aiting to link i the second bur e y starting and ion). |) to define the x part (i.e. length clicked, an elastic t with the ending tton "Pick" (under d ending points of |
| | | | | |
| l(cm) 1000 Pick h(cm) 300 Pick | The values ar | e automatically assign | ed to the field | s "l" and "h". |







| Au | tom | atic Data | a Calcula | tion | | | SIM | PLE | | | Ex |
|---------------|-----|-----------|-----------|--------|--------------|---|---|---------------------------------|----------------------------|---------------|----|
| | | | | | Crit | teria | | | | | |
| | | | | | | The Perpend - Joints fully - Ungrouted - Ungrouted masonry unit | l Joint grout joints joints ts. | s are: ed with m with med | nortar. Hanical interlo | cking between | I |
| | | | | | | Previous | | | 1/37 | Ne | xt |
| Building Data | _ | | | | | | | | 1 | | |
| Level | | Lx(m) | Lz(m) | Recess | es Area (m2) | Mass(KN/g |) n | ΣL(m) | Awtot(m2) | ΣL>2m(m) | F |
| 0 - 0.00 | х | 0.00 | 0.00 | | | 0.000 | | | | | |
| | z | | | | | | | | | | |
| 1 - 300.00 | x | | | | | | | | | | |
| | z | | | | | | | | | | |
| Walls Data | | | | | | | | | | | |
| Leve | ł | L(m) | h(m) | t(m) | hανοιγμ.(m) | hef(m) | fb(N | /mm2) | fm(N/mm2 |) | |
| 1_1 0 | | 9.00 | 3.00 | 0.50 | 2.00 | 2.70 | 9.20 | | 5.00 | NOT SIM | PL |
| | | | | | | | | | | | |

The field "Criteria" presents one by one, the 37 requirements according to EC8, in order a building to be defined as "Simple". The user should see a tick next to any of the requirements that is satisfied, and move on to the next one.

All the requirements must be satisfied or the building cannot be characterized as "Simple". As said previously, only in case of a "Simple building", the design checks of EC6 are optional.

| NOT SIN | 1PLE | Exit |
|---|---|--|
| Criteria | | |
| The area of project is not greater than above the level con | ions of recesses from t a percentage pmax of sidered. | he rectangular shape the total floor area |
| Previous | 7 / 37 | Next |



The 37 criteria of the previous stage are the initial step of the "simple building" characterization procedure. It must also conform to the demands in Table 9.3 of EC8, in order the characterization to be finalized. These demands concern both the building in total and each wall consecutively, and the design check process starts with the command "Automatic Data Calculation" Automatic Data Calculation

(per Level/Wall).

Δ Again, a failed check means that the building cannot be characterized as "Simple"

| Building Data | | | | | | | | | | | |
|---------------|---|-------|-------|--------------------|------------|---|-------|-----------|----------|---|--|
| Level | | Lx(m) | Lz(m) | Recesses Area (m2) | Mass(KN/g) | n | ΣL(m) | Awtot(m2) | ΣL>2m(m) | к | |
| 0 - 0.00 | x | 0.00 | 0.00 | | 0.000 | 5 | 10.72 | 5.36 | 4.72 | | |
| | z | | | | | 7 | 10.02 | 5.01 | 3.00 | | |
| 1 - 300.00 | x | | | | | 0 | 0 | 0 | 0 | | |
| | z | | | | | 0 | 0 | 0 | 0 | | |

Walls Data

| | Level | L(m) | h(m) | t(m) | hανοιγμ.(m) | hef(m) | fb(N/mm2) | fm(N/mm2) | |
|-----|-------|------|------|------|-------------|--------|-----------|-----------|------------|
| 1_1 | 0 | 9.00 | 3.00 | 0.50 | 2.00 | 2.70 | 9.20 | 5.00 | NOT SIMPLE |
| 1_2 | 0 | 9.00 | 3.00 | 0.50 | 2.20 | 2.70 | 9.20 | 5.00 | NOT SIMPLE |
| 1_3 | 0 | 6.02 | 3.00 | 0.50 | 1.00 | 2.40 | 9.20 | 5.00 | NOT SIMPLE |
| 1_4 | 0 | 4.72 | 3.00 | 0.50 | 0.00 | 2.14 | 9.20 | 5.00 | NOT SIMPLE |

In case of "NOT SIMPLE" structures, the adequacy checks by EC6 provisions must be performed.

Check Automatic application of the seven design checks for a selected part of the wall.



| Masonry design: Nev | v masonry b | uilding (EC6) | | | | | Х |
|---------------------|-------------|---------------|------------|--------------|--------|-----------|-----------|
| 1_1 | | | | | \sim | Performan | nce /e |
| Description 1_1 | | | | | | A - DL | \sim |
| l(cm) 900 F | Pick Che | eck Ratio | Strengt | th Load | σδ/Φ | 1 | ^ |
| h(cm) 300 F | Pick Che | eck 1 0.81(| 30) 61.92 | 50.25 | 9.95 | 5.00 | |
| Support: 4 Sides | Che | eck 2 10.31 | (37) 10.00 | 103.10 | 13.33 | 3.00 | |
| | Che | eck 3 2.23(| 54) 11.11 | -24.82 | 0.00 | 1.00 | - 1 |
| New Upda | ate Che | eck 4 3.53(| 1) 25.34 | -89.39 | 57.48 | 1.50 | × |
| Delete le Masor | nry Buil < | | | | | > | |
| Check Tota | al Check | Results | Т | otal Results | | Exit | |

Total Check Automatic application of the seven checks in the structure in total.

| Masonry des | ign: New maso | nry buildi | ng (EC6) | | | | Х |
|--------------|-----------------|------------|----------|-----------|----------|----------|-----------|
| 1_1 | | | | | | ✓ Pe | rformance |
| Description | 1_1 | | | | | | A - DL 🗸 |
| l(cm) 900 |) Pick | Wall | Check 1 | Check 2 | Check 3 | Check 4 | Chec ^ |
| h(cm) 300 |) Pick | 1_1 | 0.81(30) | 10.31(37) | 2.23(64) | 3.53(1) | 1028 |
| Support: 4 S | ides 🗸 | 1_2 | 0.86(62) | 214.17 | 2.31(64) | 2.54(1) | 1947 |
| | | 1_3 | 0.53(39) | 5.90(32) | 1.18(30) | 0.99(37) | 6873 |
| New | Update | 1_4 | 0.25(32) | 2.78(39) | 0.96(1) | 0.31(64) | 0.19 🗡 |
| Delete | le Masonry Buil | < | | | | | > |
| Check | Total Check | | Results | Total | Results | | Exit |

The design checks are applied on sections (horizontal and vertical) concerning the EC6 design code.

▲ SCADA Pro scans each selected wall, at first horizontally and then vertically, the wall sections (strips of finite elements) are detected, and all the checks are applied in each section.

▲ During the scan, each strip of finite elements is colored according to the results of the design checks; blue-green (all design checks of the section are satisfied) or red (one or more design checks of the sections are not satisfied.

Since the design checks' procedure has been completed, the user can elaborate on the results.



| The comm selected wa | and "Results" all or part of w | Result | bs pres | ents the i | results of | all the c | lesign che | cks for the |
|----------------------|-----------------------------------|------------|-----------|------------|-------------|----------------|-------------------------|-------------|
| 1_1 | | | | | | ~ P | erformance Objective | |
| Description | 1_1 | | | | | | A - DL V | |
| l(cm) 900 | Pick | Check | Ratio | Strength | Load | σδ/Φ 130.54 | 4.72 | |
| Support: 4 S | ides 🗸 | Check 2 | 2.78(39) | 15.72 | 43.73 | 13.33 | 4.72 | |
| Support 10 | | Check 3 | 0.96(1) | 33.33 | 32.16 | 0.00 | 3.00 | |
| New | Update | Check 4 | 0.31(64) | 219.00 | -68.86 | 471.70 | 4.72 🗸 | |
| Delete | le Masonry Buil | < | | | | | > | |
| Check | Total Check | | Results | Tota | Results | | Exit | |
| building | | | | | | ~ Pe | erformance | |
| Description | 1 1 | | | | | | | |
| l(cm) 900 |) Pick | Wall | Check 1 | Check 2 | Check 3 | Check 4 | Cher ^ | |
| h(cm) 300 | D Pick | 1_1 | 0.81(30) | 10.31(37) | 2.23(64) | 3.53(1) | 1028 | |
| Support: 4 S | ides 🗸 | 1_2 | 0.86(62) | 214.17 | 2.31(64) | 2.54(1) | 1947 | |
| | | 1_3 | 0.53(39) | 5.90(32) | 1.18(30) | 0.99(37) | 687: | |
| New | Update | 1_4 | 0.25(32) | 2.78(39) | 0.96(1) | 0.31(64) | 0.19 🗡 | |
| Delete | le Masonry Buil | < | | | | | > | |
| Check | Total Check | | Results | Tota | Results | | Exit | |
| For better a | and more deta | ailed appe | arance of | these resu | lts view th | ne "Printo | ut" | |

app



7. PRINTING

Through the "Addons" unit select the "Print" command and in the dialog box select Masonry, to expand the wall list.

| Availiable Chapters | Printout | Number of Pages | | | | | | |
|--|--|--|---|---|---|-------|-----|-----|
| • General | Wall:1_1 | | Bu | ilding Data | | | | |
| Analysis | Wall:1_2 | | | Move Up | | | | |
| Reinforcement | Wall:1_3 Wall:1_4 | | M | ove Down | | | | |
| ⊡ Steel ⊡ Timber | | | | Delete | | | | |
| Masonry | | | | elete All | | | | |
| | | | T | osert File | | | | |
| | | | Erro | Correction | | | | |
| Masonry Assessment | | | Eno | Correction | | | | |
| Bill of Materials | | | - Fa | mat Dage | | | | |
| | | | FO | | | | | |
| | | | Pagi | ing U | | | | |
| | | | Evo | ort Printout | | | | |
| | | | Exp | ortPrintout | | | | |
| | | | | Print | | | | |
| | | | Pro | ject Report | | | | |
| | | | | Save | | | | |
| | | | | Cancel | | | | |
| uble click in each Project Report to e | wall, to tran xport the Proje | nsfer the r ct Report. | espective | data to | the re | eport | and | cl |
| uble click in each Project Report to e | wall, to tran | nsfer the r ct Report. | espective | data to | the re | eport | and | cl |
| Uble click in each Project Report to e Save - M R C C C | wall, to tran | Isfer the r ct Report. | espective | data to | | eport | and | cli |
| uble click in each Project Report to e Save ~ W A C O C O C O C O C O C O C O C O C O C | wall, to tran xport the Proje | Insfer the r ct Report. | espective | data to | Page 72 000 cm 000 cm 13 cm | eport | and | cli |
| uble click in each Project Report to e Save • • • • • • • • • • • • • • • • • • • | wall, to tran xport the Proje | Isfer the r ct Report. | espective gene bending sorse an axis err Rection property: Comman Rection property: Rection property: | data to mrd5ular 16 Pre Sed point | Page : 2 200 00 cm 300 00 cm 300 cm 300 cm 300 cm | eport | and | cli |
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