COMMENT ON THE CALCULATION RESULTS

DeepXcav software program (Version 2011)

(ParatiePlus within Italy)

Version 1.0

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Object: COMMENT ON CALCULATION RESULTS

Results Summary Table

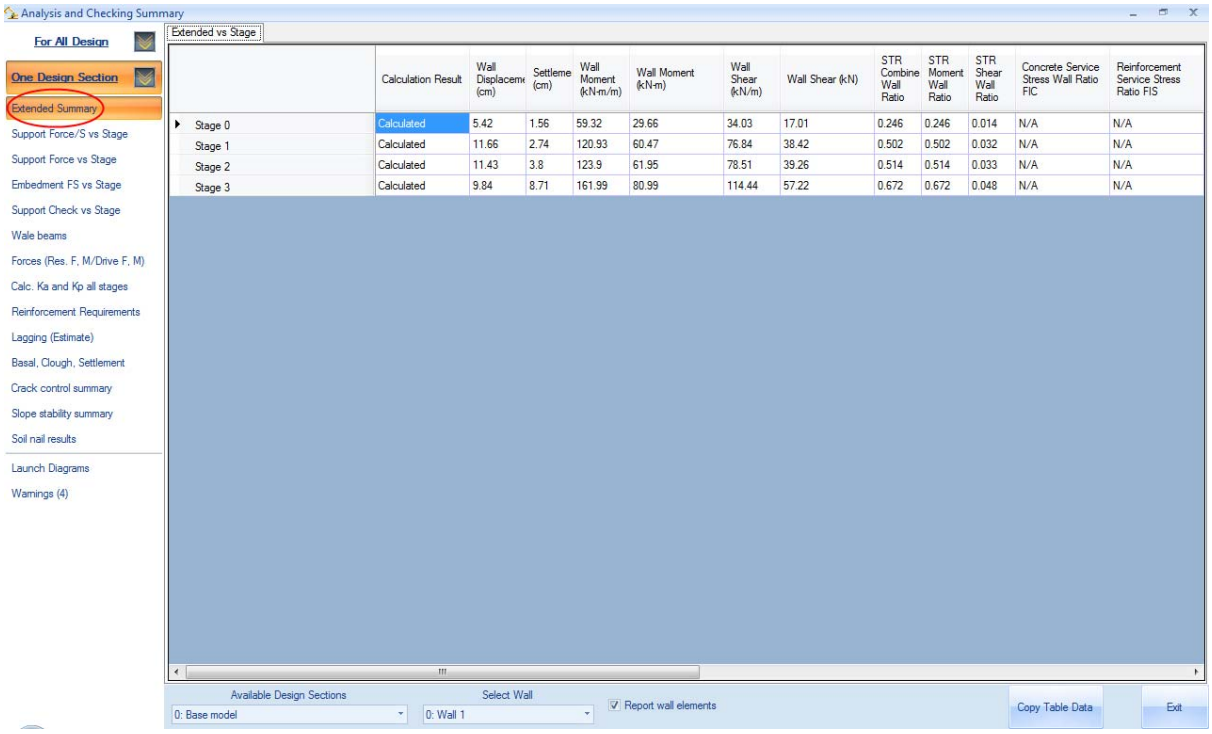


Figure 1: Results Table

The table presented before appears automatically at the end of the calculation and it can be recovered by pressing the Calculation Summary for all DS (all design Sections) or Calculation Summary for Current DS (current Design Section) button at the Reports tab of the main menu. This table shows the main results in the following way:

- Analysis Results: displacements, settlements, internal forces;
- Wall results: Ratio checks, tension checks;
- supports: reactions and checks;
- FS calculations with limit equilibrium analysis;
- FS calculations with non linear analysis.

The table values present the maximum values calculated for each design section. In order to see the results that refer to a specific step of calculations, it is necessary to go on "extensive summary", as marked in Figure 1.

Different situations are checked:

1) In The first column with headline Calculation Result appears the notice: Model collapses. This means that the non linear analysis did not succeed to find a configuration of balance for the wall under the action of the loads, of the ground pressures, of the effect of the water and of the supports. In this case all the results are completely unreliable and the model should be changed. The corresponding design section is marked with a red color in the main window of the program.

2) In The first column with headline Calculation Result appears the notice: *Calculation successful* and no red mark is present in whole table.
This means that, not only the non linear analysis succeeded to find a configuration of balance for the wall under all actions, but also that all the checks are satisfied. In this case, the corresponding design section is marked with a green color in the main window of the program.

3) In The first column with headline Calculation Result appears the notice: *Calculation successful* but a specific sell of the table is marked with red.
This means that the non linear analysis succeeded to find a configuration of balance for the wall under all actions, but a specific check was not satisfied.

The header of each column is explained looking from left to right:

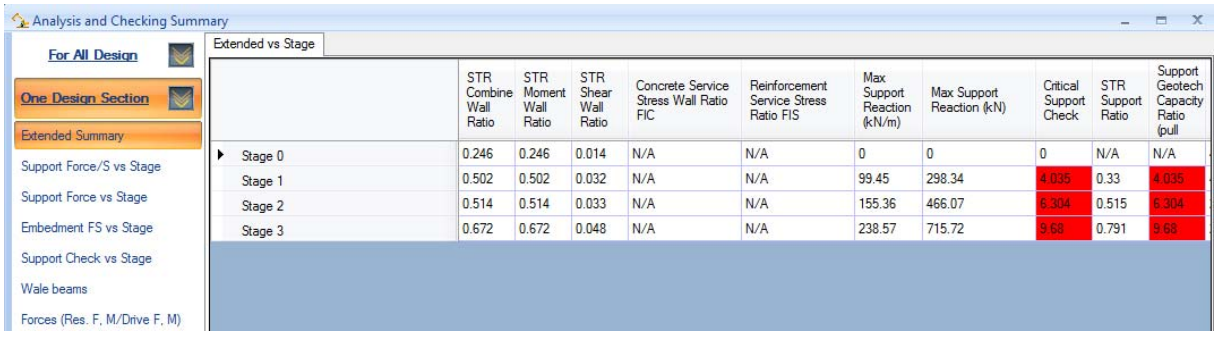
- Wall Displacement: Maximum displacement on the head of the wall. These cells never become red. The program doesn't ever "judge" the value of displacement obtained. It is designer's obligation to verify the result.
- Settlements: value of the maximum superficial settlement. These cells never become red. The program doesn't ever "judge" the value of displacement obtained. It is designer's obligation to verify the result.
- Wall moment (kNm/m). This value represents the value of the maximum moment calculated for a specific pile, distributed in length. In case of diaphragm walls, sheet pile walls and custom walls,

this value coincides with that explained in the next step. These cells never become red. The program doesn't ever "judge" the value of displacement obtained. It is designer's obligation to verify the moment result, using the wall ratio.

- Wall moment (kNm). In case of pile walls, this value represents the value of the maximum moment calculated for a single pile. In case of diaphragm walls, sheet pile walls and custom walls, this coincides with that discussed to the previous point. These cells never become red. The program doesn't ever "judge" the value of displacement obtained. It is designer's obligation to verify the moment result, using the wall ratio.

- Wall shear (kN/m). This value makes sense in case of pile walls. This value represents the value of the maximum shear force calculated for a specific pile, distributed in length. In case of diaphragm walls, sheet pile walls and custom walls, this coincides with that discussed to the previous point. These cells never become red. The program doesn't ever "judge" the value of displacement obtained. It is designer's obligation to verify the moment result, using the wall ratio.

- Wall shears (KN). In case of pile walls, this value represents the value of the maximum moment calculated for a single pile. In case of diaphragm walls, sheet pile walls and custom walls, this coincides with that discussed to the previous point. These cells never become red. The program doesn't ever "judge" the value of displacement obtained. It is designer's obligation to verify the moment result, using the wall ratio.



	STR Combine Wall Ratio	STR Moment Wall Ratio	STR Shear Wall Ratio	Concrete Service Stress Wall Ratio FIC	Reinforcement Service Stress Ratio FIS	Max Support Reaction (kN/m)	Max Support Reaction (kN)	Critical Support Check	STR Support Ratio	Support Geotech Capacity Ratio (pull
Stage 0	0.246	0.246	0.014	N/A	N/A	0	0	0	N/A	N/A
Stage 1	0.502	0.502	0.032	N/A	N/A	99.45	298.34	4.035	0.33	4.035
Stage 2	0.514	0.514	0.033	N/A	N/A	155.36	466.07	6.304	0.515	6.304
Stage 3	0.672	0.672	0.048	N/A	N/A	238.57	715.72	9.68	0.791	9.68

Figure 2: Results Table

- STR Combine Wall Ratio: Ratio of exploitation of the wall subjected to pressure - bending moment; the most unfavorable values between N and eccentricity for diaphragm and pile walls. These cells become red when STR M+N >= 1.

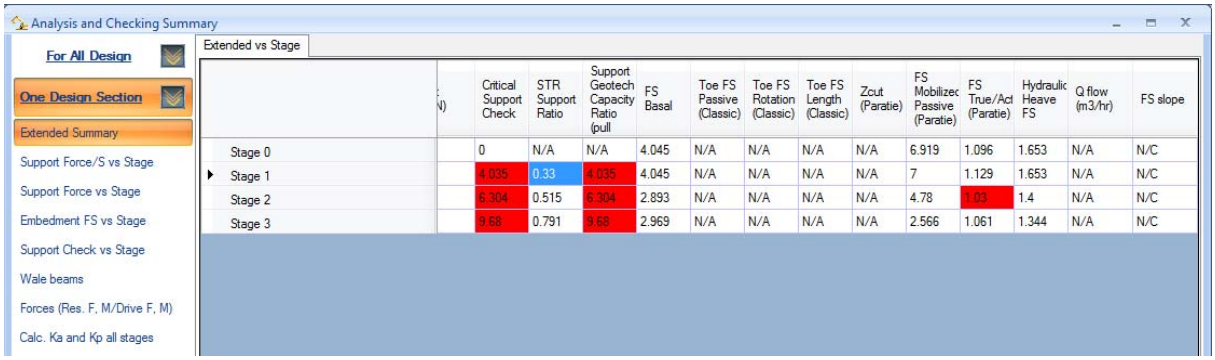
- STR Moment Wall Ratio: Ratio of exploitation of the wall subjected to pressure - bending moment. These cells become red when STR M >= 1. The calculation of the resisting moment can be seen in the examples, present in the folder DOC in the program's installation folder.

- STR Shear Wall Ratio: Ratio of exploitation of the wall subjected to shear. These cells become red when STR V >= 1. The calculation of the shear can be seen in the examples, present in the folder DOC in the program's installation folder.

- Concrete Service Stress wall Ratio: It represents the relation between the normal maximum force applied on the concrete section and the acceptable value of this force for concrete. These cells become red when the ratio of exploitation is >= 1, but Fc, max >= $F_{, nom}$.

- Reinforcement Service Stress Ratio: It represents the relation between the normal maximum force applied on the steel section and the acceptable value of this force for steel. These cells become red when the ratio of exploitation is >= 1, but Fc, max >= $F_{, nom}$.

- Max Support Reaction (kN/m): Maximum support reaction per m of wall (out of plane). These cells never become red. The program doesn't ever "judge" the value of displacement obtained. It is designer's obligation to verify the moment result, using the wall ratio.



	Critical Support Check	STR Support Ratio	Support Geotech Capacity Ratio (pull	FS Basal	Toe FS Passive (Classic)	Toe FS Rotation (Classic)	Toe FS Length (Classic)	Zcut (Paratie)	FS Mobilizec Passive (Paratie)	FS True/Act (Paratie)	Hydraulic Heave FS	Q flow (m3/hr)	FS slope
Stage 0	0	N/A	N/A	4.045	N/A	N/A	N/A	N/A	6.919	1.096	1.653	N/A	N/C
Stage 1	4.035	0.33	4.035	4.045	N/A	N/A	N/A	N/A	7	1.129	1.653	N/A	N/C
Stage 2	6.304	0.515	6.304	2.893	N/A	N/A	N/A	N/A	4.78	1.03	1.4	N/A	N/C
Stage 3	9.68	0.791	9.68	2.969	N/A	N/A	N/A	N/A	2.566	1.061	1.344	N/A	N/C

Figure 3: Results Table

- Critical support check: It represents the most unfavorable values restored in two successive cells. It appears red when the restrained value is greater than the unity.

- STR Support Ratio. In case of braces, these cells contain the STR of the constituent strands of the free part of the same braces. In detail, it represents the relation between the bind reaction and the resistance action that is less than the normative coefficients. All these can be seen in the examples in the installation folder of the program.
  These cells never become red. The check is the same as the previous column *Critical Support Ratio.*

- STR Support Ratio. In case of braces, these cells contain the STR of the constituent strands of the free part of the same braces. In detail, it represents the relation between the bind reaction and the resistance action that is less than the normative coefficients. All these can be seen in the examples in the installation folder of the program.

- FS Basal. This safety factor is a result of the non linear analysis and represents the stability of the excavation (it can be seen in the Theory manual). These cells become red, which signs that check is not satisfied, for a smaller value than 1.

- Toe FS passive (classic). This safety factor is a result of the conventional limit equilibrium analysis and represents the relation between the horizontal and the resisting forces (it can be seen in the Theory manual). These cells become red, which signs that check is not satisfied, for a smaller value than 1.

- Toe FS rotation (classic). This safety factor is a result of the limit equilibrium analysis and represents the relation between the resistance and the overturn moment (it can be seen in the Theory manual). These cells become red, which signs that check is not satisfied, for a smaller value than 1.

- Toe FS Length (classic). This safety factor is a result of the limit equilibrium analysis and represents the effectiveness of the drive depth (it can be seen in the Theory manual). These cells become red, which signs that check is not satisfied, for a smaller value than 1.

- Zcut: this function is active since the version 8.0.9.37. It is an iterative process that allows finding the smaller necessary drive depth to the convergence of the analysis.

- FS Mobilized Passive. This safety factor represents the relation between the passive and the really mobilized push. These cells become red for unity close values, which appear when the passive push is almost totally mobilized. This relation is the opposite of that supplied from the old versions of DeepXcav.

- FS true/active. This safety factor represents the relation between the soil and the active push. These cells become red for unity close values, which appear when the wall has such immediate deformations, that the push of the soil has reduced almost to the profitable value of push.

- Hydraulic Heave FS. This safety factor is calculated only when the option of calculation of the flow-net is selected. It represents the safety of the hydraulic heave (it can be seen in the Theory manual). The red color represents that check is not satisfied, so FS < 1.

It is possible in the cells to be present the note N/A (Not Available). This can be explained in every case:

- Wall displacement: the symbol N/A does not ever appear.

- Settlements: the symbol N/A indicates that the superficial settlement calculation is not active.

- Wall moment (kNm/m): symbol N/A does not ever appear.

- Wall moment (kNm): symbol N/A does not ever appear.

- Wall shear (kN/m): the symbol N/A does not ever appear.

- Wall shear (KN): the symbol N/A does not ever appear.

- STR Combine Wall Ratio: the symbol N/A indicates that the wall check is not active, or that a custom wall is being used.

- STR Moment Wall Ratio: the symbol N/A indicates that the wall check is not active, or that a custom wall is being used.

- STR Shear Wall Ratio: the symbol N/A indicates that the wall check is not active, or that a custom wall is being used.

- Concrete Service Stress wall Ratio: the symbol N/A indicates that the wall check is not active, or that the results are relative to the closest last limit, or that a custom wall is being used.

- Max Support Reaction (kN/m): the symbol N/A indicates that the wall check is not active, or that the results are relative to the closest last limit, or that a custom wall is being used.

- Max Support Reaction (KN): the symbol N/A indicates that there is no support to the model.

- Critical support check: the symbol N/A indicates that there is no support to the model.

- STR Support Ratio: the symbol N/A indicates that there is no support to the model.

- STR Support Ratio: the symbol N/A indicates that there is no support to the model.

- FS Basal: the symbol N/A indicates that there is performed only conventional analysis.

- Toe FS passive (classic): the symbol N/A indicates that there is performed only non linear analysis.

- Toe FS rotation (classic): the symbol N/A indicates that there is performed only non linear analysis.

- Toe FS length (classic): the symbol N/A indicates that there is performed only non linear analysis.

- Zcut: because of a small bug, the presentation of the procedure results was not able. Results always N/A.

- FS Mobilized Passive: the symbol N/A indicates that there is performed only conventional analysis.

- FS true/active: the symbol N/A indicates that there is performed only conventional analysis.

- Hydraulic Heave FS: the symbol N/A indicates that the option of calculation of the flow-net was not selected.

It is possible to find the value 100 in some positions of the Report Table. In particular, where the Ratio checks can be found. This generally indicates the scarcity of data for the calculation of such values. For example, the appearance of value 100 in the column STR Combine Wall Ratio could mean that there is lacking of the value of the bulb-ground adhesion.

Please lend caution to the following:

When just conventional analysis is performed, the program produces always a solution. In fact, unlike to the non linear analysis, that always balances the limit converges. That does not mean however that the calculation is performed successfully. It is necessary in this case to check the Factors of safety and to verify them yourself.