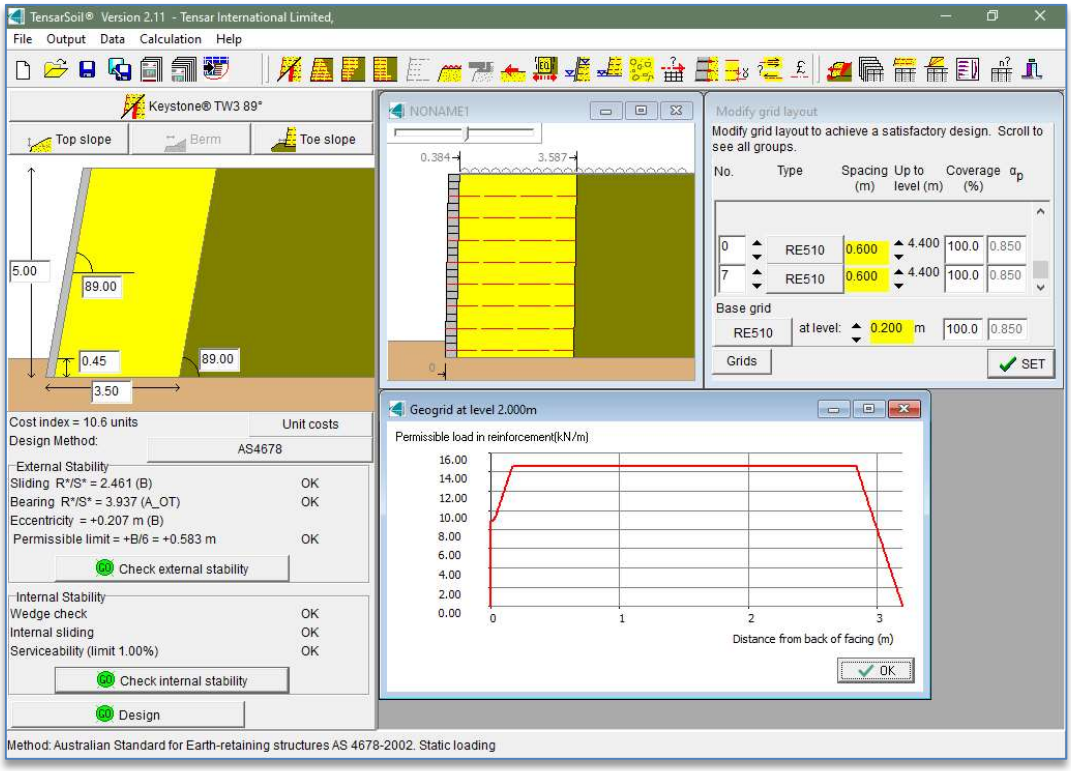
Tensar software

FAQ's (frequently asked questions): Item 25

Program	**TensarSoil**
Topic	**Known issues with TensarSoil** This FAQ document provides information about known issues when using the program **TensarSoil**. Unfortunately, at the current time we are not able to fix these issues, so this FAQ document provides information for users of **TensarSoil** so that they are aware of these issues and provides work-arounds or alternative procedures wherever possible. If any users of **TensarSoil** notice other issues, then please inform: mike.dobie@cmc.com  **Summary of known issues:** Issue 1: Latest version of **TensarSoil** (information) Issue 2: EBGEO method: typographical error in print-out (calculations correct – minor issue) Issue 3: Definition of load factors for horizontal loads in limit state design methods (information) Issue 4: "Zero length" line created by **TensarSoil** on exporting specific geometry to **TensarSlope** (operational issue created in **TensarSlope** with exported files) Issue 5: LRFD (AASHTO 2010) 2-part wedge method: issue with material factor applied to static geogrid design strength on opening a saved file (creates minor error – simple work-around available) Issue 6: LRFD (AASHTO 2010) tie-back wedge and 2-part wedge methods: load factors applied to the vertical components of the earth pressure (creates minor error – no work around) Issue 7: BS 8006 tie-back wedge (and other) methods: problem if surcharge is placed on top of facing (not an error – this situation should be avoided) Issue 8: AS4678 method: user adjusted load factor appearing incorrectly on print-out (calculations correct – typographical error) Details follow below

Issue 1

Make sure that you are using the latest version of **TensarSoil**

Solution 1

Check in **Help → About** for version number. Current version is **2.17.9**

Issue 2

In the EBGEO design method there is a minor typographical error in print-out. The heading of the middle column of this table in the internal stability results should be Z_d rather than E_d.

Internal stability results

Level:	Tensar geogrid	Inclined wedges				Sliding between geogrids		Sliding on geogrids
		$\theta\ c_{rit}$	R_d	E_d	Λ_{GEO-3}	θ_u	Λ_{GEO-3}	Λ_{GEO-3}
(m)		(°)	(kN/m)	(kN/m)	≤ 1.0	(°)	≤ 1.0	≤ 1.0
4.2	RE510	59.0	19.1	1.8	0.093	7.727	0.19	0.054
3.75	RE510	56.0	32.5	4.3	0.134	7.727	0.237	0.09
3.3	RE510	56.0	45.3	8.0	0.177	7.727	0.275	0.126
2.85	RE510	56.0	58.2	12.9	0.221	7.727	0.309	0.162
2.4	RE510	56.0	71.0	18.8	0.265	7.727	0.342	0.198
1.95	RE510	53.0	81.1	25.4	0.314	7.727	0.374	0.233
1.5	RE510	53.0	91.8	33.5	0.365	7.727	0.405	0.269
1.05	RE510	53.0	101.9	42.7	0.418	7.727	0.437	0.305
0.6	RE510	44.0	90.1	44.1	0.49	7.727	0.468	0.34
0.15	RE510	44.0	92.1	53.9	0.585	7.727	0.499	0.376
0.0	-	44.0	99.7	57.4	0.576	-	-	-
Requirement					≤ 1.0		≤ 1.00	≤ 1.00

Solution 2

The PDF file created by **TensarSoil** may edited using appropriate PDF programs. This error may be adjusted manually if required.

Issue 3

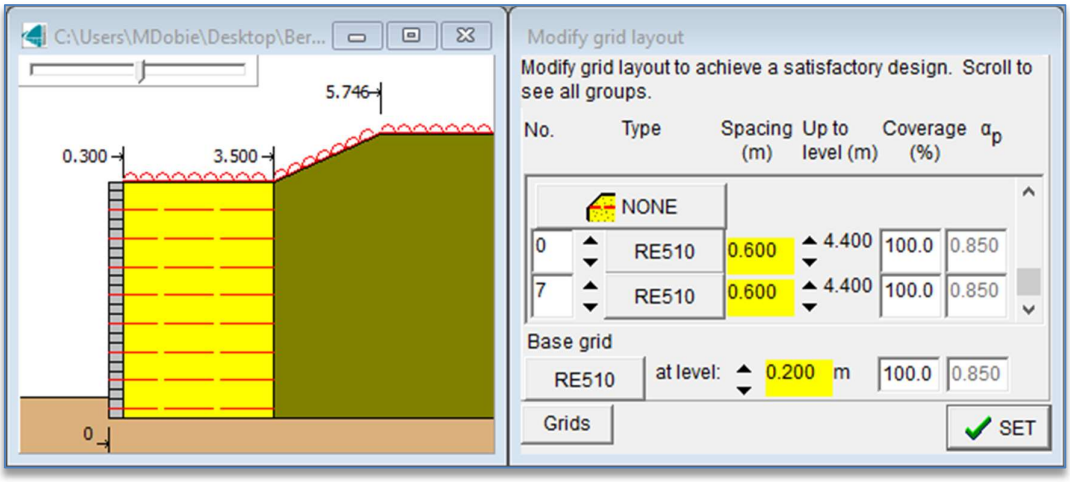
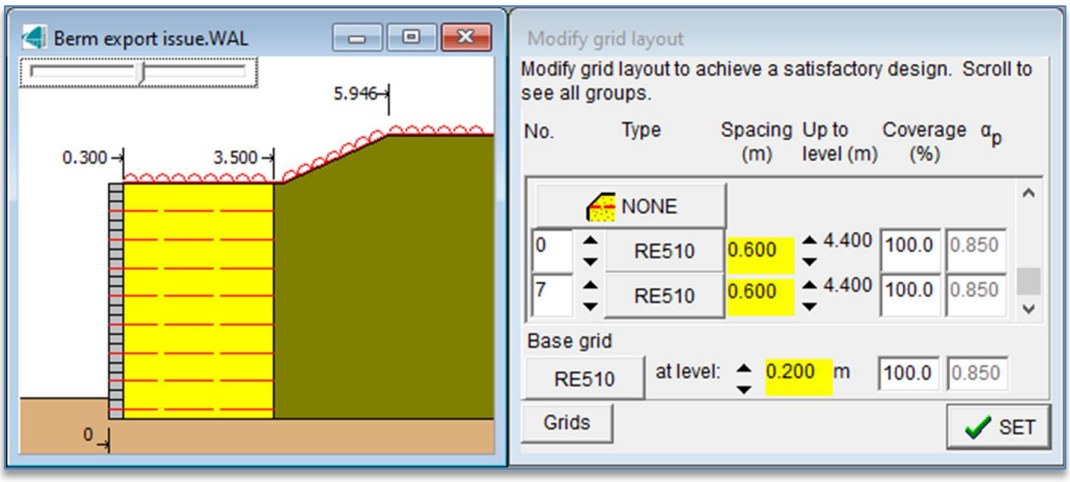
In all limit state design methods horizontal loads are now defined as either temporary or permanent which affects the partial load factor applied in limit state methods. This needs to be indicated in the table of load factors given in the print-out.

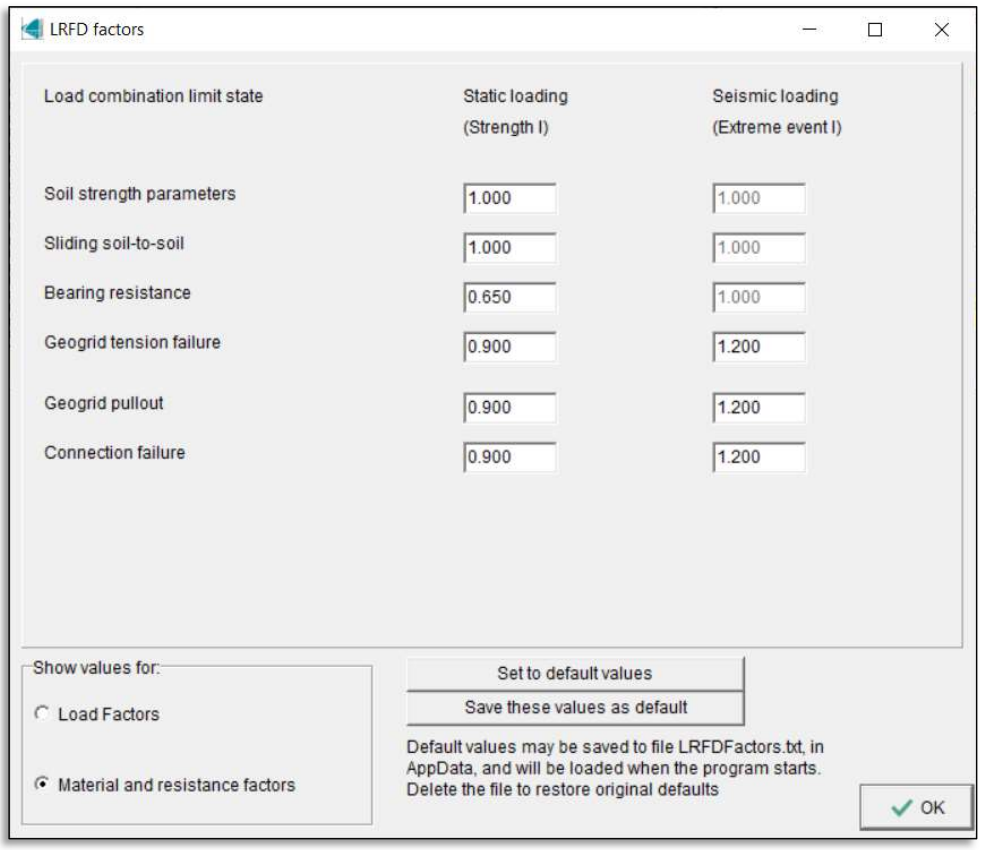
This is an example of the table of load factors in AASHTO/LRFD. There is no specific mention of horizontal applied loads apart from earth pressure, however the partial load factors given for traffic or surcharge would be applied in the case that the horizontal load is a live load. In the case of a permanent horizontal load, the load factor used would be the same as applied to vertical dead loads.

Applied partial load factors As given in Section 3.4, Tables 3.4.1-1 and 3.4.1-2	Load combination limit state	Static loading (Strength I)	
	Minimum or maximum	Max	Min
	DC (dead load of facing)	1.25	0.90
	EH (horizontal and vertical components of force on back of MSEW)	1.50	0.90
	EV (vertical load of MSEW)	1.35	1.00
	ES (vertical dead loads above or behind MSEW)	1.50	0.75
	WA (water load)	1.00	1.00
	LL (live traffic load)	1.75	0.00
	LS (live surcharge)	1.75	0.00

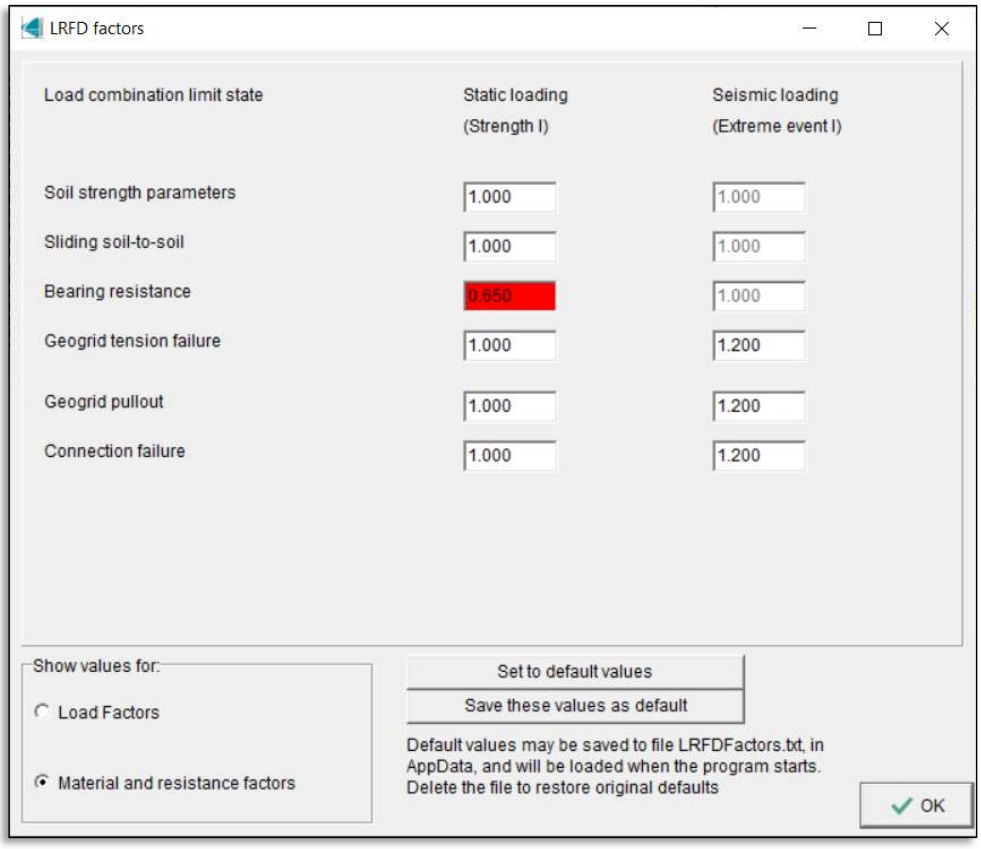
Solution 3

If it is important to clarify this point for a specific design case, then it can be mentioned in the print-out notes section or elsewhere in the supporting documentation for the design or application suggestion.

Issue 4	Geometry export issue to **TensarSlope**. If the geometry in **TensarSoil** is set up as shown below such that the right-hand end of the berm is at exactly the same point as the start of the backfill and toe of the top slope (x = 3.5m as shown below), then on export to **TensarSlope** there will be two points at that location, creating what is referred to as a "zero length line".  This issue has no effect on the calculations carried out by **TensarSoil**, it only affects the geometry created in **TensarSlope** after importing the file.
Solution 4	If the **TensarSoil** geometry is to be exported to **TensarSlope**, then this issue can be avoided by making sure that the right-hand end of the berm does not coincide with the start of the backfill, for example as shown below:  If this adjustment is not acceptable, then the geometry may be adjusted within **TensarSlope**, as described in "Issue and Solution 4" in FAQ24 (Known issues with **TensarSlope**).
Issue 5	In the LRFD (AASHTO 2010) 2-part wedge method, material factors are applied to various resistances, following the requirements of AASHTO. The values of the material factors may be viewed by clicking on the icon "Load factors" in **TensarSoil**:  The default view of this form is shown below after selecting "Material and resistance factors" by checking the appropriate radio button in the lower left part of the form. The factor values displayed on the "LRFD factors" form below are the default values recommended by AASHTO. For most design situations, these default values would be used for all external and internal stability calculations which include resistances based on material properties. An issue arises with the factor values for "geogrid tension failure", "geogrid pullout" and "connection failure" for the static case. As can be seen below, all three factors have a default value of 0.9, in accordance with AASHTO. If a design is carried out using these values as displayed, then the resulting calculations will use these values as required. The issue comes when the file is saved, as shown on the second image of the "LRFD factors" form below.



After saving and re-opening a file, the three material factors mentioned above have all changed to a value of 1.0. The static factor for "bearing resistance" has a red background, indicating that it is outside the permitted range, however this warning is incorrect and can be ignored.



If these new factor values of 1.0 are left as shown above, then they will be used in any internal stability calculations which use these resistances, resulting in CDR values slightly too high.

Solution 5

There is a bug in **TensarSoil** related to the material factors for the static design case mentioned above, which cannot be fixed at the current time.

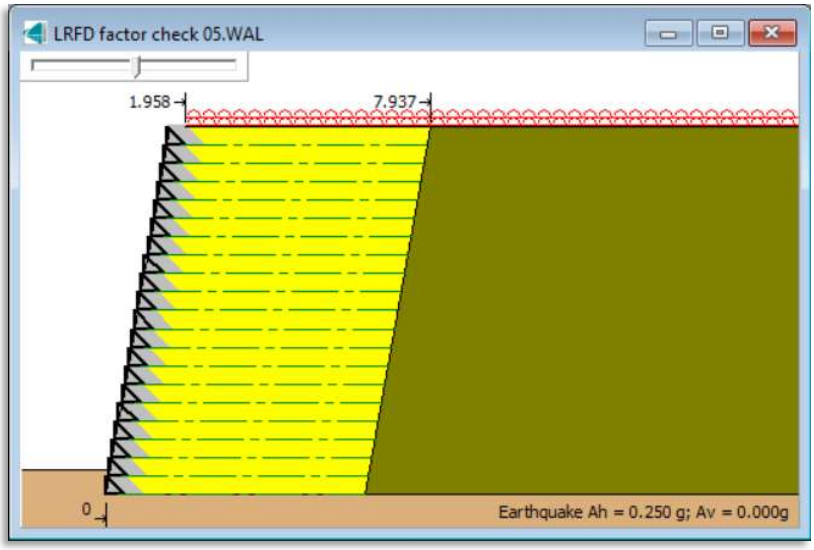
The work-around is simple: on opening a saved file which was created using the "LRFD (AASHTO) 2PW" design method, and assuming that the default partial material factors are required, then the "LRFD factors" form should be opened, selecting "material and resistance factors". The control "Set to default values" should be clicked, which will revert these three material factors back to values of 0.9, after which calculations will be carried out using these values.

There is a second control "save these values as default", which will save the current set of all load and material factors to a file "LRFDFactors.txt" in the AppData folder for **TensarSoil**. Unfortunately this does not resolve the problem, and on opening a saved file these values will have reverted back to 1.0 again.

This issue does not happen in the case of using the "LRFD (AASHTO)" tie-back wedge method.

Issue6

In the LRFD (AASHTO 2010) (tie-back wedge and 2-part wedge) methods, factors are applied to various loads, following the requirements of AASHTO. There is a minor issue related to the load factor applied to the vertical components of the earth pressure load applied to the back of the reinforced soil block by a superimposed dead load and the soil load. In the case shown below, the wall has a significant backward inclination, and because the wall friction angle $\delta = 0$ in this case, there is an upward component of earth pressure applied to the wall back



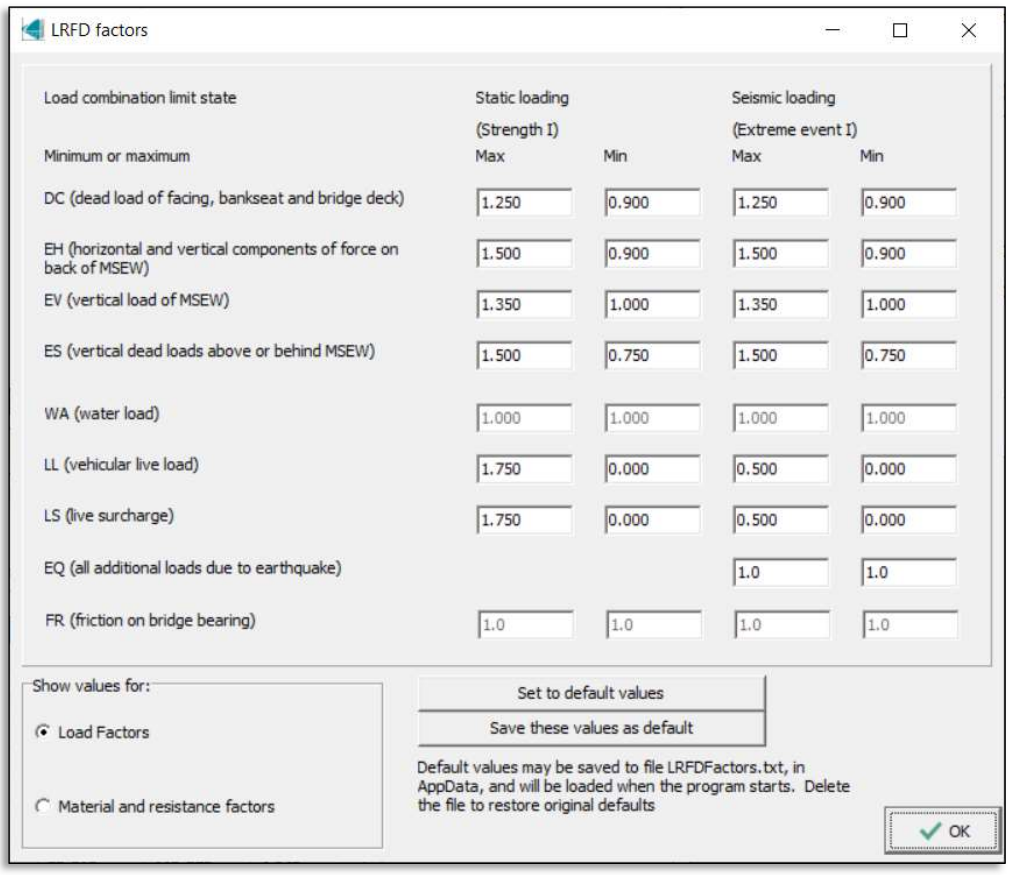
The magnitudes of unfactored and factored loads may be examined in the form "Detailed forces and moments for external stability" which is accessed using this icon:

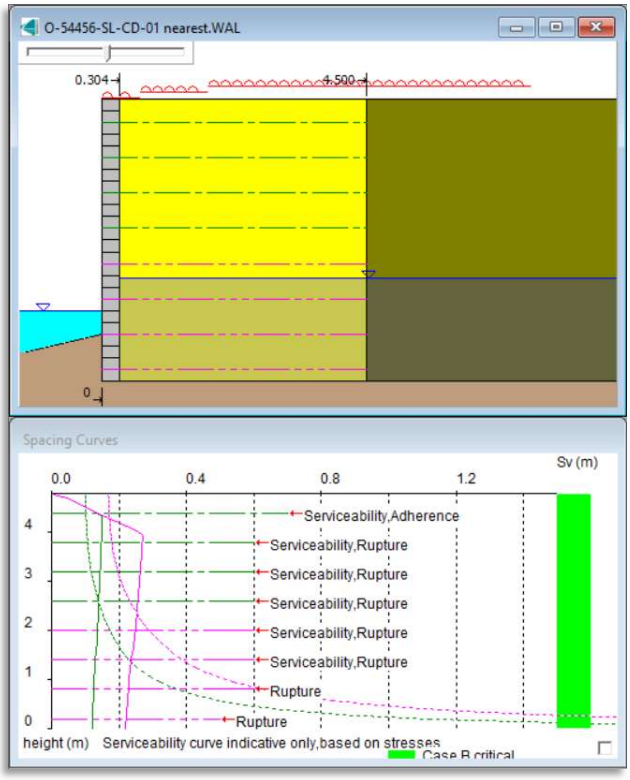
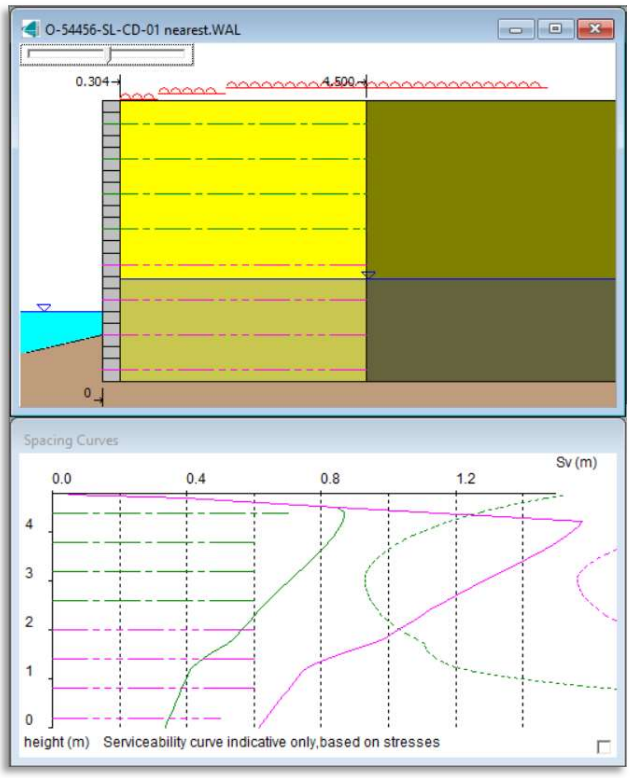
The following tables give all forces and moments used in the external stability calculations for all load cases

Forces and moments required for external stability calculations for static conditions
Calculation of forces, and moments about centre of base of reinforced soil block.

	Vertical			Horizontal		
Forces (kN/m)	un-factored	Load CaseA	Load CaseB	un-factored	Load CaseA	Load CaseB
Earth pressures on the back of reinforced soil block due to self weight of soil and loads on backfill:						
Soil	-26.5	-39.7	-35.7	150.1	225.2	225.2
Dead loads	-6.2	-9.3	-8.4	35.1	52.7	52.7
Live loads	-6.2	-10.8	-10.8	35.1	61.5	61.5
Self weight of the reinforced block and loads applied above and within it:						
Soil	1015.7	1371.2	1015.7	0.0	0.0	0.0
Facing	71.6	89.5	64.4	0.0	0.0	0.0
Dead loads	119.6	179.4	89.7	0.0	0.0	0.0
Live loads	119.6	209.3	0.0	0.0	0.0	0.0
Totals	1287.6	1789.5	1114.9	220.4	339.4	339.4

The vertical load components due to earth pressure on the back of the reinforced soil block are given in the upper middle section of the table above. The issue relates to the soil and dead load components. The unfactored soil load is -26.5 kN/m (negative due to being upwards). For both Load Case A and Load Case B, the partial load factor is 1.5, resulting in a factored load of -

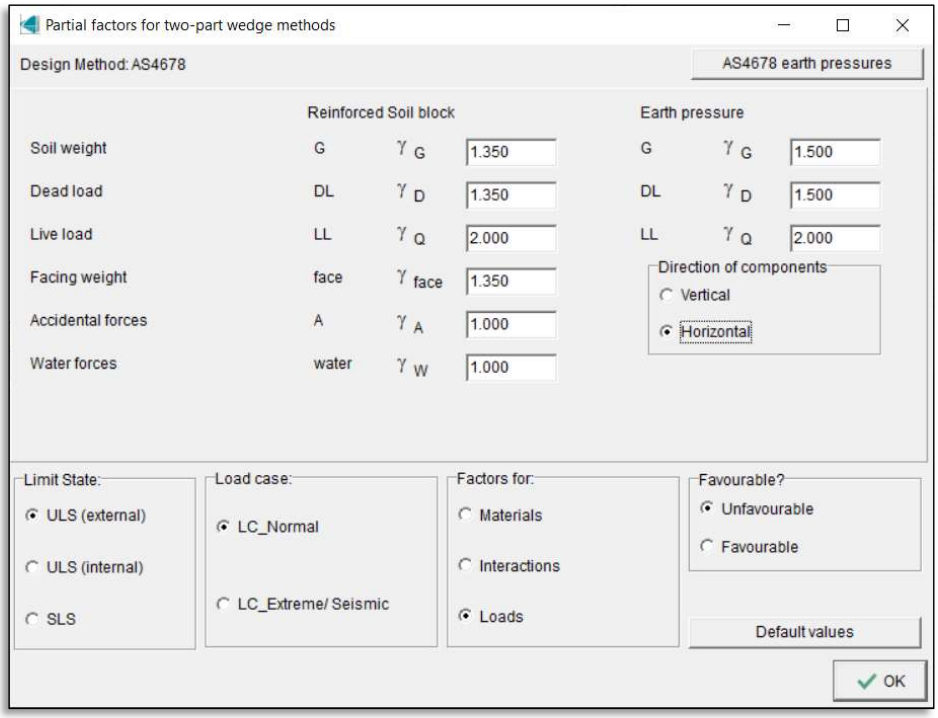
	39.7 kN/m. However for Load Case B, the factored load is -35.7 kN/m, due to using a load factor of 1.35 instead of the required 1.5. A similar issue arises with the dead loads. This results in a small error in the total factored vertical load used subsequently in the sliding and eccentricity calculations. The values of the load factors may be viewed by clicking on the icon "Load factors" in **TensarSoil**:  
Solution 6	There is no work-round for the issue described above. However examining a number of design cases has confirmed that the effect on the calculated eccentricity and CDR for sliding is small to negligible. The effect is reduced as the wall back becomes steeper, and in the case of the vertical component of earth pressure being downwards, the error becomes conservative. It is recommended that no action is required with regards to this issue.

Issue 7	Using the BS 8006 tie-back wedge method, for the case below it was reported that the design failed due to rupture for Load Case B, which did not make sense. The value for T_{sj} appeared to be much too high: 
Solution 7	The issue in the case above is that the first surcharge has been placed on top of the facing. Although this situation could occur, **TensarSoil** has not been set up to take this loading arrangement into account. If the surcharge is removed from the top of the facing, as shown below, then the design result is as expected.  In this case, there is no issue with **TensarSoil**. It is important that surcharge loads are not placed on the top of the facing.

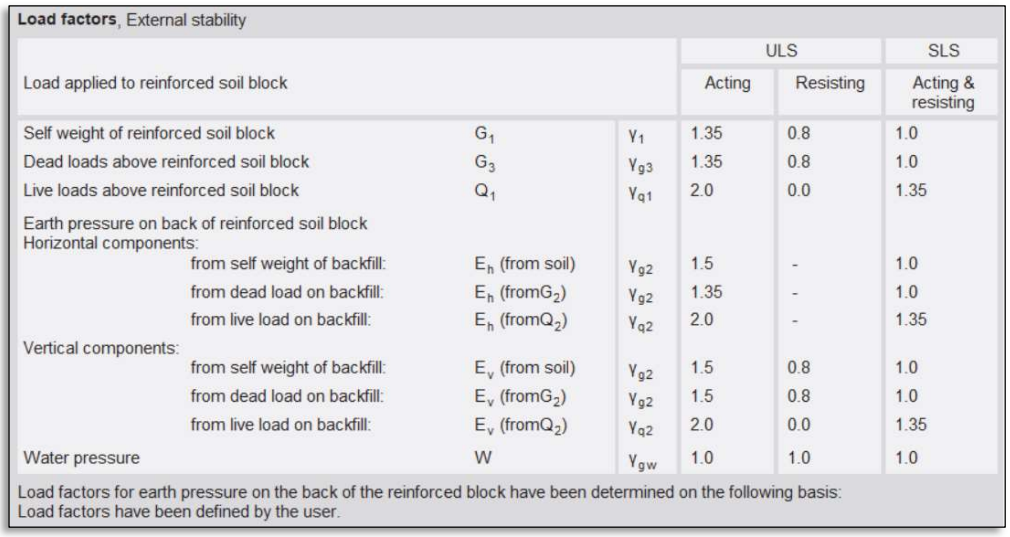
Issue 8

The AS4678 method in **TensarSoil** is a limit state method, with partial factors applied to loads and material properties. The values of these factors may be viewed by clicking on the icon "Load factors" in **TensarSoil** and may be user adjusted.

In the view below, the majority of the load factors have been changed from the default values:



There is a slight issue that the value for the load factor applied to the horizontal component of the load generated by earth pressure from dead loads on the surface of the backfill is shown as 1.35 in the view below, whereas it should be 1.5 according to the input form above.



Load factors, External stability

Load applied to reinforced soil block			ULS Acting	ULS Resisting	SLS Acting & resisting
Self weight of reinforced soil block	G_1	γ_1	1.35	0.8	1.0
Dead loads above reinforced soil block	G_3	γ_{g3}	1.35	0.8	1.0
Live loads above reinforced soil block	Q_1	γ_{q1}	2.0	0.0	1.35
Earth pressure on back of reinforced soil block					
Horizontal components:					
from self weight of backfill:	E_h (from soil)	γ_{g2}	1.5	-	1.0
from dead load on backfill:	E_h (from G_2)	γ_{g2}	1.35	-	1.0
from live load on backfill:	E_h (from Q_2)	γ_{q2}	2.0	-	1.35
Vertical components:					
from self weight of backfill:	E_v (from soil)	γ_{g2}	1.5	0.8	1.0
from dead load on backfill:	E_v (from G_2)	γ_{g2}	1.5	0.8	1.0
from live load on backfill:	E_v (from Q_2)	γ_{q2}	2.0	0.0	1.35
Water pressure	W	γ_{gw}	1.0	1.0	1.0

Load factors for earth pressure on the back of the reinforced block have been determined on the following basis:
Load factors have been defined by the user.

Based on an investigation into the results of calculations, it has been confirmed that the value of 1.35 shown in the table above is a typographical error, and that the calculations are carried out using the adjusted load factor of 1.5.

Solution 8

There is no work-round for the issue described above. However the text on the PDF output may be edited to show a value of 1.5 rather than 1.35.

FAQ 25
Issue date: 12th March 2021
Updated: 6th May 2024