



Flex MSE Retaining Wall

25-6222 New Goetre Primary School

Location Address:	New Goetre Primary School, Merthyr Tydfil
Date:	20.01.26
The retaining wall designer Design Reference Number:	25-6222-F1

Issue purpose	Revision	Designed	Checked	Date
For Comment	0	THZ	AE	17.12.25
For Comment	A	THZ	AE	27.01.26
For Comment	B	THZ	AE	13.02.26

This design is in accordance with the principles set out in current British Standards, Codes of Practice and industry specification. Reference to a particular standard, code of practice or specification does not imply total compliance with the whole of the document only that they are complied with where considered appropriate, in the experience of the designer.

The design remains the copyright and property of the retaining wall designer and is not to be copied or disclosed to any person other than the person for whom it was originally intended.

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1.0 Introduction

1.1 Brief

The retaining wall designer was requested by Gravitas International Ltd. to prepare a design for two Flex MSE retaining walls located at the proposed development known as New Goetre Primary School, Merthyr Tydfil.

Wall 01 is marked in blue on drawing number SK25-6222-F1-01 and predominantly retains a raingarden area followed by a car park. The is to be a 1V:3H slope in front leading down to a road. This wall is to be constructed at a face batter of 20degrees to the vertical with geogrid reinforcement.

Wall 02 is marked in magenta on drawing number SK25-6222-F1-02 and retains a car parking area with a raingarden at the toe. This wall is to be constructed at a face batter of 5degrees with wrap around geogrid reinforcement.

1.2 Scope

This design covers the proposed Flex MSE retaining walls at the proposed development as detailed above. The limit of this element design is from the front face of the base course of Flex MSE bags back to the rear of the geogrid reinforcement and up to proposed ground level on the retained side.

Additional design scope notes follow:

1. Some settlement will occur after construction, depending on the condition and compaction of the subgrade and backfill. The surface of the backfill should be monitored post construction and the installation of the final surfacing to the footpath etc should be delayed until post construction settlement has ceased.
2. This solution is for the permanent works only and is issued on the basis that a safe system of works is provided for construction. Temporary excavations have the potential to fail rapidly and without warning. The Principal Contractor/ Wall Installer must produce a method statement and risk assessment for the works to be approved by the Client's Consulting Engineer. Temporary stability and design of any temporary works is entirely outside our scope and should be confirmed by others.
3. The Flex MSE slopes are flexible and must not be used to support any rigid structures. Any buildings/ structures in the vicinity of the Flex MSE slope must have foundations deep enough to ensure no loading is transferred to the Flex MSE slopes.
4. The Principal Contractor and Client's Consulting Engineer must also confirm the locations of all services prior to construction and ensure that none will be affected by the slope and its installation.
5. A maximum universally distributed live load of 10kPa was assumed to act on the retained side of the wall. Please advise if a higher surcharge load should be considered.
6. The Client/ Client's Consulting Engineer must ensure any statutory approvals such as Approval in Principle are completed prior to construction for the proposed works. Any work in relation to required statutory approvals is currently outside our scope. **If construction proceeds prior to necessary approvals being required, then it does so at the Client's own risk.**
7. Site drainage is outside the scope of this design.
8. There is a proposed raingarden to be located behind Wall 01 and in front of Wall 02. Design and details of these raingardens is outside the scope of this design. They must be lined and be watertight to prevent water saturating the Flex MSE walls which could lead to instability.



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The Principal Contractor and Client's Consulting Engineer must ensure that any excavation required for the proposed retaining slope does not affect the stability of any surrounding existing or proposed roads or structures. Unless the Client's Consulting Engineer accepts this, it is recommended that construction does not proceed. All slope geometry, setting out and required offsets are to be confirmed by the Principal Contractor and Client's Consulting Engineer prior to construction.

Any solution outside this scope is not covered by this design and the retaining wall designer should be informed so that a new design can be advised as necessary.

1.3 Relevant Parties

- Gravitas International is the wall supplier our Client and co-designer.
- The Scheme Client is to be confirmed.
- Cambria Consulting is the Client's Consulting Engineer.
- Principal Contractor and Principal Designer should be confirmed in accordance with CDM 2015.
- The wall installer should be confirmed.

The above parties should all read and check this design document before proceeding. **Please advise us before proceeding with construction if there are any errors in the scope.**



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2.0 Summary

This design proposal and associated drawing have been produced using the methodology detailed above. However, it should be noted that the design proposal has been generated from information provided to the retaining wall designer, which has not been independently verified and may contain assumptions and inaccuracies regarding geotechnical, hydraulic and other parameters.

If any discrepancy is noted between the site conditions and the design assumptions (regarding water levels, soil conditions, proposed loadings etc.), the Principal Contractor and/ or Client's Consulting Engineer must contact the retaining wall designer. immediately to facilitate a review of the design.

The retaining wall designer did not undertake to supervise the construction of the structure, and therefore cannot comment on the standard of workmanship. The main issues to consider are adequate compaction of the foundation soils and imported fill, and adequate drainage.

The retaining wall designer accordingly does not accept responsibility for the accuracy or completeness of information or assumptions from which the design proposal has been produced.

The design proposal remains the copyright and property of The retaining wall designer and is not to be copied or disclosed to any person other than the person to whom it is originally intended.

The material supplier can provide typical health & safety hazards to consider when approaching this work. Designer's hazards include falling from height and the stability of excavated cuttings.

3.0 Construction Supervision Requirements

The following construction supervision requirements should be adhered to by the project team (Client's Consulting Engineer & Principal Contractor). If any issues arise on site which differ from what has been assumed in this design, Gravitas should be contacted immediately so the possible consequences can be assessed.

1. The Principal Contractor and/ or a geotechnical engineer must confirm the ground conditions on site to ensure they comply with the assumptions made in this design
2. The backfill for the slope is to be compacted Class 6I granular fill, compacted in accordance with SFHW Series 600, Table 6/4.
3. The slope to be constructed should be checked for the required geometry and retained height to ensure that they are within the scope of this design.
4. Any excavations should be checked for any flows or seepage that require drainage measures. Any flows, seepage or standing water should be directed to a suitable outfall as soon as they are encountered.
5. The batter of the slopes should be checked with every 1m of construction to ensure it is within the allowed tolerances (+/-2°). It should be ensured that the face batter is not compromised by the use of heavy compaction plant machinery too close to the front face of the slopes. If this occurs, it may be necessary to reconstruct the affected sections.
6. If construction plant is to traffic the crest area of the slopes, a suitable haul road design must be undertaken and be set back and adequate distance from the rear of the slopes (designed by others). If construction plant operates on the unprotected retained material, distortion/ bulging of the slopes may occur.
7. The retaining slope construction should be carried out in accordance with the manufacturer's installation guidelines.
8. The Flex MSE slopes are to be hydro-seeded immediately following construction. The Principal Contractor must accept it will be their responsibility to ensure successful vegetation achieved by careful construction, hydro-seeding and ensuring the Flex MSE bags do not dry out.
9. The Flex MSE solution is a flexible system and will undergo settlement following construction. This depends on the condition of the subgrade and compaction of the backfill. Much of the post construction settlement is expected to occur during construction. The Principal Designer should consider any services/ structures or surfacing installed behind the slope, that would be susceptible to post construction settlement. We recommend that the surface of the backfill is monitored and the installation of any bound surfacing etc is delayed until post construction settlement has decreased to an acceptable level.



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4.0 Maintenance Requirements

Maintenance requirements for the slopes are as follows;

- The slope should be routinely inspected for signs of any faults, vandalism or movement. The batter of the slope should be checked to ensure it remains within the allowed tolerances.
- The ground above and below the embankments should also be inspected for signs of any movement.
- It should be ensured that the front face does not dry out by watering as necessary. The front face should be kept moist.

This requirement should be included in the maintenance regime for the site/development.

5.0 CDM Regulations

The retaining wall designer is not the Principal Designer, however, has considered the risks associated with this element of the works that affect or are affected by the design.

“Designers” are responsible for fulfilling their obligations as defined in the Construction (Design & Management) Regulations 2015.

The retaining wall designer, understands that under the Regulations its duties are generally to;

- Ensure that the client for the project is aware of the duties and responsibilities that they have.
- So far as is reasonably practicable, taking due account of other relevant design considerations, avoid foreseeable risks to the health and safety of any persons carrying out, liable to be affected by such or maintaining the permanent fixtures and fittings of construction work.

In discharging this duty, the designer shall:

- Eliminate hazards that may give rise to risks
- Reduce risks from any remaining hazards and in doing so give collective measures priority over individual measures.

The designer shall also:

- Take all reasonable steps to provide with the design sufficient information about aspects of the design of the structure or its construction or maintenance as will adequately assist clients, other designers and contractors to comply with their duties under the Regulations.

In respect of this particular project, the retaining wall designer hereby draws to the attention of the Principal Designer and the Principal Contractor that they have specific duties under CDM 2015.

The 'Principal Contractor' must be responsible for and fulfil all the contractor’s obligations.

However, since the **Principal Designer** has designated the chosen location and dimensions of the structure on this site, the **Principal Designer** has, in this respect, acted as a ‘designer’ under CDM 2015. The **Principal Designer** is therefore responsible for fulfilling all the obligations that this entails.

The scope of the retaining wall designer, as element ‘designer’, to minimise design risks is therefore limited by those elements of the design pre-determined by the **Principal Designer**. The following significant design risks remain and must therefore be addressed by the **Principal Designer** and **Principal Contractor**:

6.0 SIGNIFICANT DESIGN RISKS REMAINING:

RISK		SUGGESTED REMEDIATION	RESPONSIBLE PARTIES
01	Wall stability compromised and/or excessive settlement due to foundation soils not complying with design assumptions.	To achieve a suitable foundation for the Flex MSE Wall, excavation must take place down to competent bearing stratum assumed to be compacted medium-dense SAND/GRAVEL or firm-stiff CLAY (MADE GROUND) and allow for the placement and compaction of a minimum 0.15m thickness of selected granular material (e.g. Class 6I with assumed properties of $\Phi' = 35^\circ$, $\gamma = 19\text{kN/m}^3$ and $c' = 0\text{ kPa}$). The proposed formation should be inspected by a Geotechnical Engineer and any soft, loose or unsuitable material present (such as topsoil or organics) must be fully excavated out over the full width of the reinforced earth zone and replaced with compacted granular fill. The Principal Contractor must ensure the Flex MSE wall is constructed suitable stratum with a safe bearing resistance of $>60\text{kPa}$. If suitable bearing stratum is not encountered close to formation level then ground improvement works (designed by others) will be required to ensure a safe bearing resistance of 60kPa is achieved.	Principal Contractor/ Scheme Geotechnical Engineer
02	Wall stability compromised due to backfill soils not complying with design assumptions.	The backfill for the wall is to be compacted Class 6I granular fill. This material is assumed to have the following characteristics: $\phi' = 35^\circ$, $\gamma = 19\text{kN/m}^3$ and $c' = 0\text{ kPa}$, compacted in accordance with SFHW Series 600. Quality control testing should follow the principles set out in HA 44/91 and be under the responsibility of the Principal Contractor.	Principal Contractor/ Wall Installer
03	Pedestrian/Vehicular Barriers	It has been assumed it is proposed to install a 1.2m timber post and rail barrier to the top of the wall as pedestrian restraint as per CAMNRIA drawing no. 26CB01 CAM 50 XX D C 1121 (design and details are by others). Where the fence must site within 1m of the Flex MSE slope face, the fence posts must be fully concreted into minimum 0.7m long, 0.3m $\varnothing$ sleeves pre-installed into the walls backfill. The geogrid tails can be locally cut to suit. If a higher fence is to be installed behind the wall, Gravitas must be advised as the foundation detail will need to be revised to cater for increased lateral loading. Vehicle barrier requirements are to be confirmed by others. We have been advised that HB2 kerb and Parking Bay Wheelstops are proposed to be installed to the car park area behind the walls. No impact loads have been assumed to be transferred to the wall, based on the presumption that the barrier is to provide a normal/higher level of containment.	Principal Contractor/ Client's Consulting Engineer
04	Instability of the temporary cut slope.	Temporary excavations have the potential to collapse rapidly and without warning. This retaining slope solution is for permanent works only and is on the basis that a safe system of works is provided for construction. The Principal Contractor should provide a method statement for the works to satisfy the Client's Consulting Engineer. The retaining wall designer. is not responsible for temporary stability or design of any temporary works.	Principal Contractor/ Client's Consulting Engineer
05	Serviceability movement of the services or structures at the crest of the slopes.	Flex MSE slopes/ walls are flexible, and some settlement will occur during and after construction. Some settlement of the subgrade will also occur after construction, depending on the compaction of the foundation soils and backfill. The settlement should be monitored, and all finishes should be delayed until settlement is complete.	Principal Contractor/ Wall Installer

06	Failure to establish vegetation on the Flex MSE slopes.	The Flex MSE slopes are to be hydro-seeded following construction. The Principal Contractor must accept it will be their responsibility to ensure successful vegetation achieved by careful construction, hydro-seeding and ensuring the Flex MSE bags do not dry out.	Principal Contractor/ Wall Installer
07	Construction work compromising the stability of adjacent structures and services.	The Principal Contractor must contact the Client's Consulting Engineer to ensure that the excavation required for the proposed slope does not affect the stability of any surrounding existing or proposed roads, services or structures. Unless the Client's Consulting Engineer accepts this, it is recommended that construction does not proceed. All existing services must be located before the works are carried out and suitable precautions taken to ensure that they are not impacted by the works or clash with Flex MSE wall.	Principal Contractor/ Client's Consulting Engineer
08	Heavy compaction plant used in the vicinity of the slope.	It should be ensured that the face batter is not compromised by the use of heavy compaction plant machinery too close to the front face of the slope. SHW advice (Cl. 610.5) concerning restriction of compaction plant within 2m of the front face shall be followed. If face movement should occur, the next course shall be set back as necessary to ensure that overall face batter remains at or below the permitted maximum. If construction plant is to traffic the crest area of the slope, a suitable haul road design must be undertaken and be set back and adequate distance from the rear of the slope (designed by others). If construction plant operates on the unprotected retained material, distortion/ bulging of the slope may occur.	Principal Contractor/ Wall Installer
09	Surcharge at the crest of the wall	A maximum live load of 10kN/m ² was assumed to act at the crest slope of the wall. Please advise us if the surcharge on the retained side of the wall in the permanent condition is to exceed the assumed loads. The Principal Designer/ Client's Consulting Engineer must inform Retaining Wall Designer prior to construction to allow this design to be reviewed.	Principal Contractor/ Client's Consulting Engineer
10	Softening/ weathering of the soils at formation level due to exposure to rain.	Temporary drainage measures should be installed to direct surface water away from the line of the slope and also to prevent "ponding" at the toe/foundation which could cause this to deteriorate and soften over time.	Principal Contractor/ Wall Installer
11	Inexperienced installer appointed to construct the walls	An experienced installer should be appointed to install the Flex MSE wall. The installer should have experience on work of a similar nature in terms of constructing Flex MSE walls and placing and compacting granular fill to SFHW Series 600 standards.	Principal Contractor/ Wall Installer
13	Toe slope stability	Stability of the proposed toe slope is outside the scope of this design. Due to the significant height, steepness and location of the toe slope, there is the potential for erosion, significant settlement and instability of the proposed slope. The Client's Consulting Engineer or Scheme Geotechnical Engineer must take appropriate measures to address this potential instability. The slope when reinstated will require erosion protection.	Principal Contractor/ Client's Consulting Engineer
14	Typical front face	The maximum front face angle is indicated on the adjacent sections (20°) with a minimum 51mm face steps between each course of bags.	Principal Contractor/ Client's Consulting Engineer

		For Wall 02 (Section C-C): the maximum front face angle is indicated on the adjacent sections (5°) with a minimum 12mm face steps between each course of bags. SHW advice (Cl. 610.5) concerning restriction of compaction plant within 2m of the front face shall be followed. If face movement should occur, the next course shall be set back as necessary to ensure that overall face batter remains at or below the permitted maximum.	
15	Contaminated Land	Any issues relating to contaminated land are outside the scope of the wall design, and should be addressed by the scheme designated environmental consultant.	Principal Contractor/ Client's Consulting Engineer
16	Heavy Construction Traffic Operating close to the wall	It should be ensured that the face batter is not compromised by the use of heavy compaction plant machinery too close to the front face of the wall. If construction plant is to traffic the crest area of the wall, a suitable haul road design must be undertaken and be set back and adequate distance from the rear of the wall (designed by others). If construction plant operates on the unprotected retained material, distortion/ bulging of the wall may occur.	Principal Contractor/ Client's Consulting Engineer
17	Raingardens located close behind Wall 01	There is a proposed raingarden to be located behind Wall 01. Design and details of these raingardens is outside the scope of this design. They must be lined and be watertight to prevent water saturating the Flex MSE walls which could lead to instability. Where there is a clash between the geogrid reinforcement and the raingarden, the upper layer of geogrid can be wrapped along the edge of the raingarden to the back of the backfill as indicated on Section A and Section B.	Principal Contractor/ Client's Consulting Engineer
18	Post construction settlement of the Flex MSE slope.	The Flex MSE solution is a flexible system and will undergo settlement following construction. This depends on the condition of the subgrade and compaction of the backfill. Much of the post construction settlement is expected to occur during construction. The Principal Designer should consider any services/ structures or surfacing installed behind the slope, that would be susceptible to post construction settlement. We recommend that the surface of the backfill is monitored and the installation of any bound surfacing etc is delayed until post construction settlement has decreased to an acceptable level.	Principal Contractor / Designer
19	Excavations through the reinforced zone of the Flex MSE slope impacting stability	The provided drawings show some drainage infrastructure located near the rear of the reinforced zone at shallow depth. Services should remain outside the reinforced zone and excavation through the geogrid reinforcement of the Flex MSE slope is not permitted post construction.	Principal Contractor
15	Instability of Flex MSE slope caused by excavation at the toe.	No unplanned excavation, temporary or permanent, should take place in the vicinity of the toe of the Flex MSE slope after their construction. Any other excavation planned below the toe should be carefully evaluated by an independent geotechnical engineer to assess the effects of such excavations.	Principal Contractor / Client's Consulting Engineer

7.0 Designer Risk Assessment

CONSTRUCTION OF FLEX MSE SLOPE

NOTICE OF HAZARD IDENTIFICATION (GENERIC DESIGNER RISK ASSESSMENT)

CATEGORY C/D/M	ACTIVITY/ELEMENT	POSSIBLE HAZARD	RISK ASSESSMENT Low/Medium/High	ACTION PROPOSED	ACTION BY
C	Working at heights >2m	Falling	H	Wear Harness OR provide access scaffold	Contractor
C/M	Working at heights	Falling	M	Wear Harness OR provide access scaffold	Contractor
C	Cutting mesh, lacing, etc.	Personal Injury	M	Use of suitable PPE (safety goggles, gloves, etc.)	Contractor
C	Placing backfill	Personal Injury	M	Use mini excavator to place stone fill where practicable	Contractor
C	Excavation of embankment prior to installation of slope	Embankment Slip - Personal Injury	H	Excavation of embankment to a safe angle of repose for the short term.	Contractor
M	Steep retaining structures > 2m in height	Falling/Personal Injury	H	Provision of permanent fence/ barrier at crest of retaining structure	Client

Category: C = Construction, M = Maintenance/Use, D = Demolition

NOTICE OF HAZARD IDENTIFICATION (SPECIFIC DESIGNER RISK ASSESSMENT)

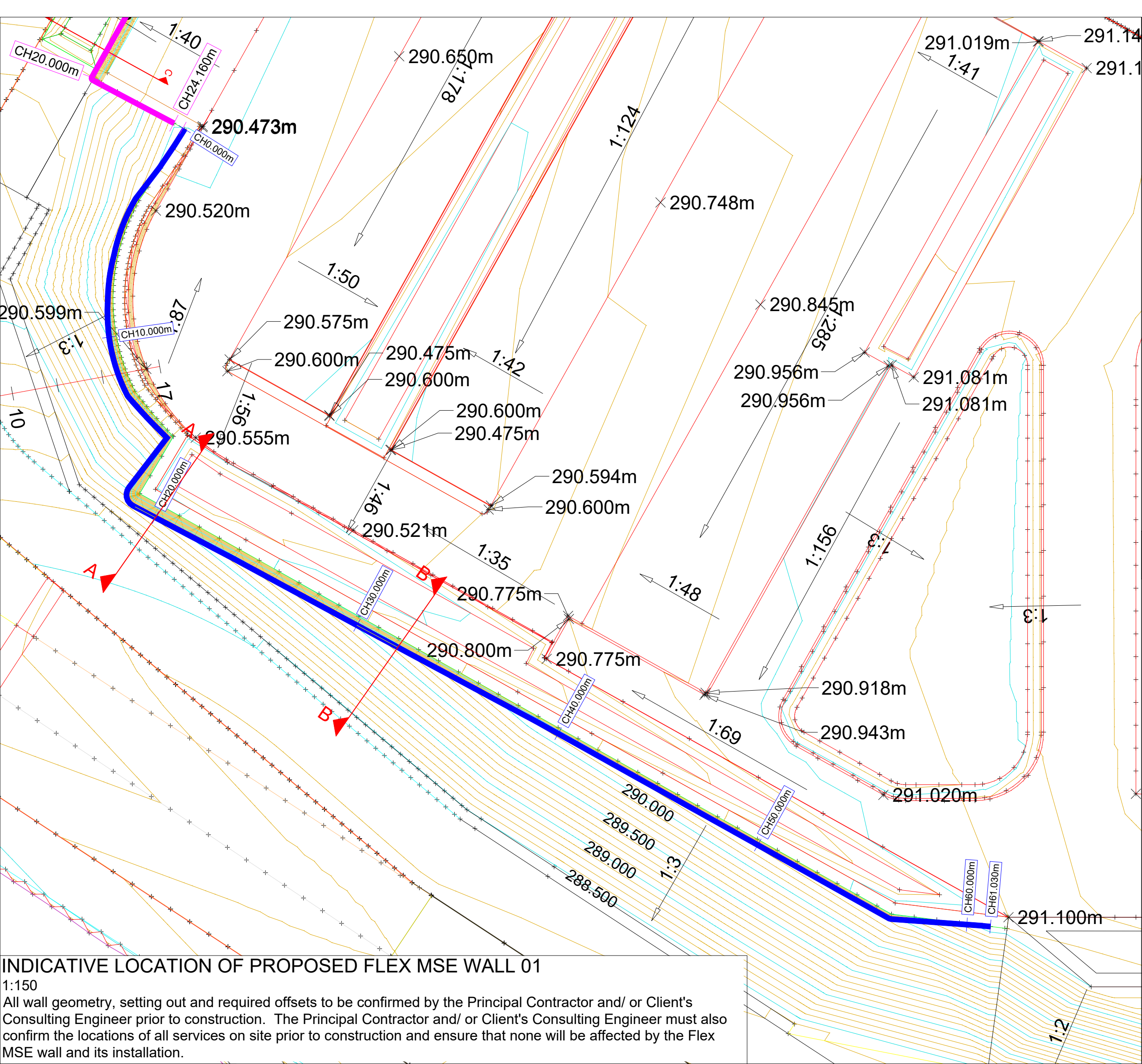
CATEGORY C/D/M	ACTIVITY/ELEMENT	POSSIBLE HAZARD	RISK ASSESSMENT Low/Medium/High	ACTION PROPOSED	ACTION BY
C	Excavation into existing material to foundation level	Bank slip / Personal injury	H	Excavation of ground to a safe angle of repose for the short term and/ or foundation excavation & construction of lower courses carried out in short lengths. Use of granular backfill.	Principal Contractor / Wall Installer
C	Excavation into existing material to foundation level	Striking existing services/ Personal injury	M	Principal Designer to provide details of all existing services in the vicinity of the slope to Contractor. Use of Cable Avoidance Tools (CAT scanners).	Principal Designer / Principal Contractor / Wall Installer
C	Excavation into existing material to foundation level	Striking live cables/ electrocution	M	Principal Designer to provide details of all existing electrical services in the vicinity of the slope to Contractor. Electrical services to be relocated where risk is unacceptable. Use of Cable Avoidance Tools (CAT scanners).	Principal Designer / Principal Contractor / Wall Installer
C	General Installation of slope	Personal Injury	M	Adhere to Supplier Installation Guidelines.	Contractor

Category: C = Construction, M = Maintenance/Use, D = Demolition

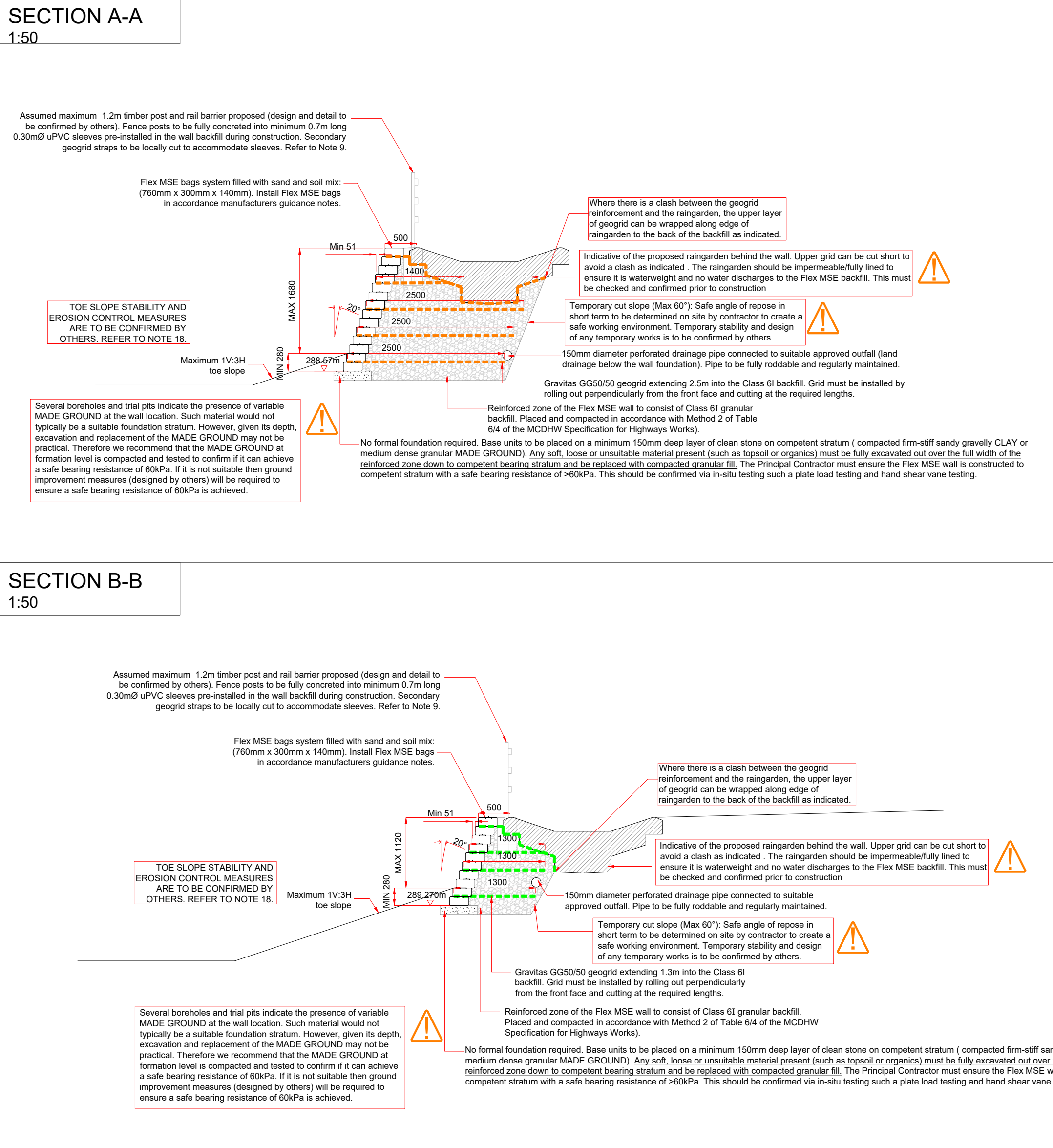
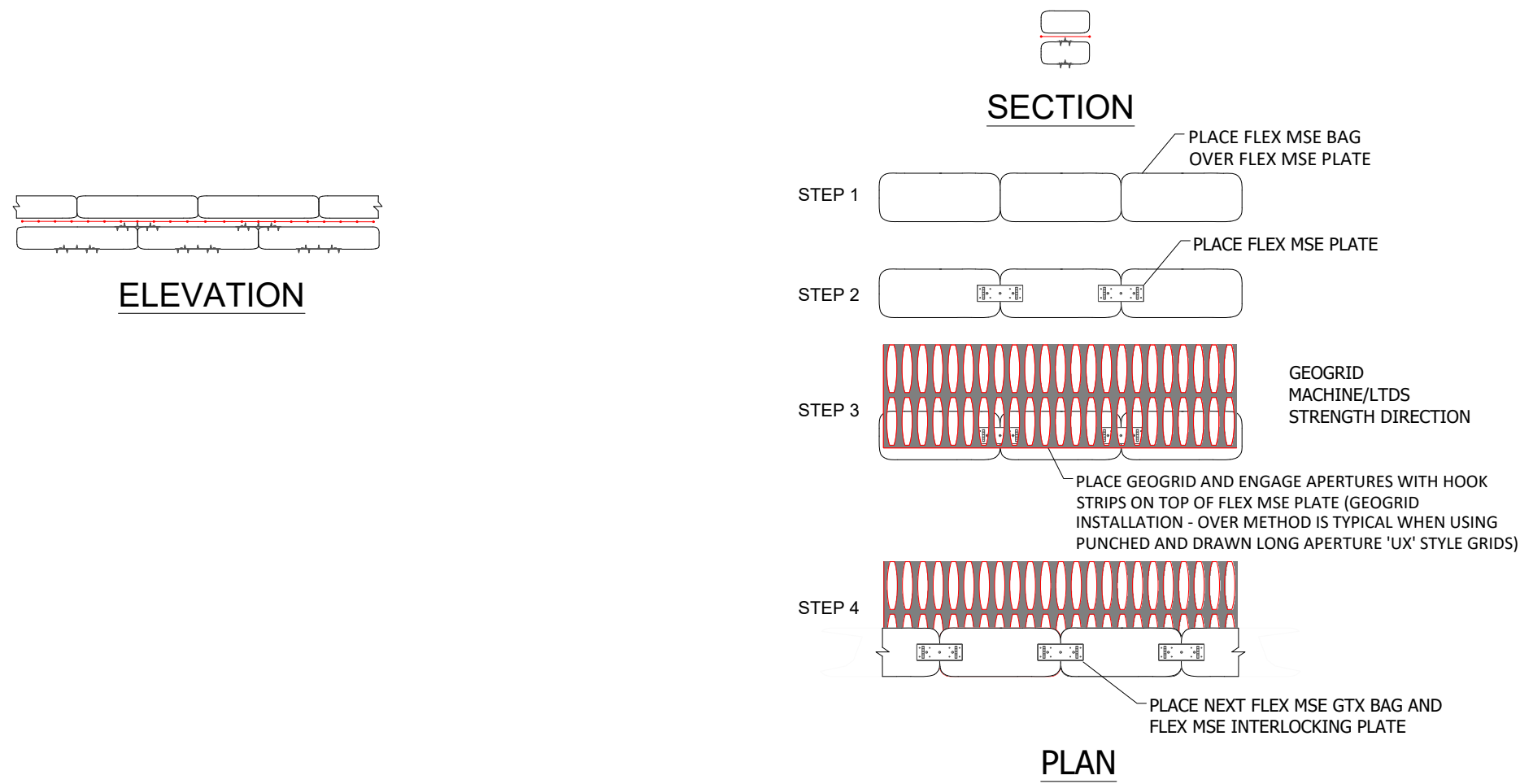
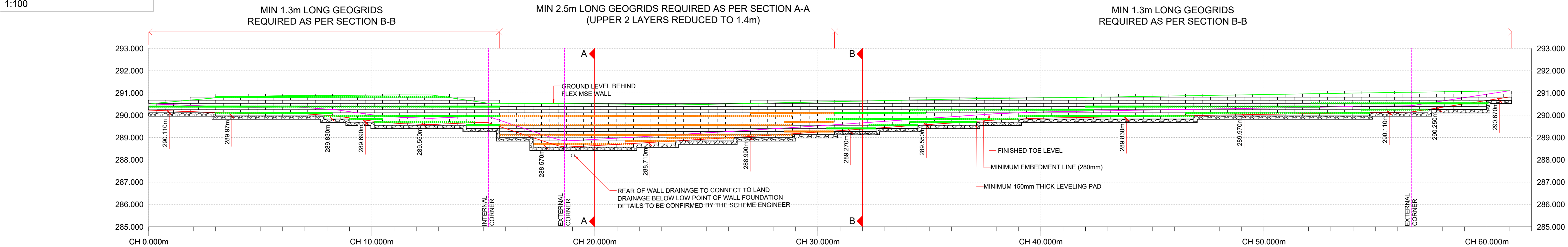


8.0 Appendices

- Drawings
 - SK25-6640-F1-01 – Wall 01
 - SK25-6640-F1-01 – Wall 02
- Flex MSE GEO5 Analysis files
 - GE25-6640-F1-01 to 03
- Flex MSE bag fill specifications



ELEVATION WALL 01
1:100



FOR APPROVAL

D		HM	13.02.26
C		HM	12.02.26
A		THZ	26.01.26
O		THZ	17.12.25

Rev. Issue / Revision: Drawn: Date:

Project Title:
NEW GOETRE PRIMARY SCHOOL



GRAVITAS INTERNATIONAL LTD

Drawing Title: FLEX MSE RETAINING WALL 01 PLAN, SECTION & ELEVATION			
Designed: AD	Date: 13.02.26	Project No: 25-6222-F1	
Drawn: THZ	Date: 13.02.26	Scale: AS INDICATED AT A1	
Checked: AE	Date: 13.02.26		
Drawing No: SK25-6222-F1-01		Revision: D	

Analysis of reinforced slopes

Input data

Project

Task : New Goetre Primary School
 Part : Section A-A
 Description : Flex MSE Wall
 Customer : Gravitas
 Author : THZ
 Date : 11/12/2025
 Project ID : REV 0
 Project number : 25-6222-F1

Settings

BS 8006 - MSE Wall

Materials and standards

Concrete structures : EN 1992-1-1 (EC2)
 Coefficients EN 1992-1-1 : standard

Wall analysis

Active earth pressure calculation : Coulomb
 Passive earth pressure calculation : Caquot-Kerisel
 Earthquake analysis : Mononobe-Okabe
 Shape of earth wedge : Calculate as skew
 Allowable eccentricity : 0.333
 Internal stability : Standard - straight slip surface
 Verification methodology : according to BS 8006

Partial factors of soil properties			
Partial factor on internal friction :	f_{ms}	=	1.00 [-]
Partial factor on effective cohesion :	f_{ms}	=	1.60 [-]
Partial factor on undrained shear strength :	f_{ms}	=	1.00 [-]
Resistance factors			
Resistance factor on sliding :	f_s	=	1.20 [-]
Resistance factor on bearing capacity :	f_{ms}	=	1.35 [-]
Resistance factor for pullout of reinforcement :	f_p	=	1.30 [-]
Partial factors of slip on reinforcement :	f_s	=	1.30 [-]
Partial factors - wall			
		Combination A	Combination B
Dead load of structural components :	f_{fs}	1.50 [-]	1.00 [-]
Earth pressure - active :	f_{fs}	1.50 [-]	1.50 [-]
Permanent load - on the block :	f_f	1.50 [-]	1.00 [-]
Permanent load - behind the block :	f_f	1.50 [-]	1.50 [-]
Variable load - on the block :	f_q	1.50 [-]	0.00 [-]
Variable load - behind the block :	f_q	1.50 [-]	1.50 [-]
Partial factors - slope			
Dead load of structural components :	f_{fs}	=	1.50 [-]

Partial factors - slope

Earth surcharge load (permanent) :	$f_f =$	1.20 [-]
Live load surcharge :	$f_q =$	1.30 [-]

Stability analysis

Verification methodology : according to EN 1997

Design approach : 1 - reduction of actions and soil parameters

Partial factors on actions (A)**Permanent design situation**

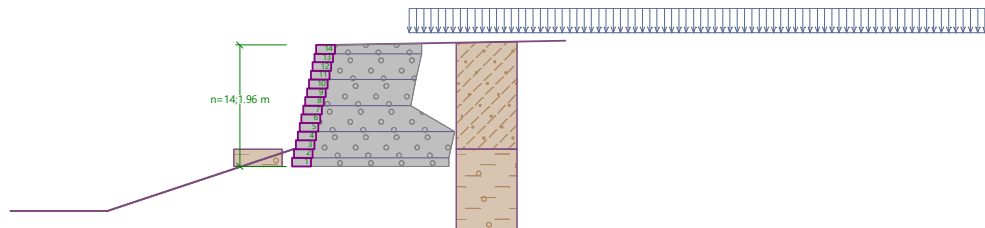
		Combination 1		Combination 2	
		Unfavourable	Favourable	Unfavourable	Favourable
Permanent actions :	$\gamma_G =$	1.35 [-]	1.00 [-]	1.00 [-]	1.00 [-]
Variable actions :	$\gamma_Q =$	1.50 [-]	0.00 [-]	1.30 [-]	0.00 [-]
Water load :	$\gamma_w =$	1.00 [-]		1.00 [-]	

Partial factors for soil parameters (M)**Permanent design situation**

		Combination 1		Combination 2	
Partial factor on internal friction :	$\gamma_\phi =$	1.00 [-]		1.25 [-]	
Partial factor on effective cohesion :	$\gamma_c =$	1.00 [-]		1.25 [-]	
Partial factor on undrained shear strength :	$\gamma_{cu} =$	1.00 [-]		1.40 [-]	

Geometry of structure

Number of blocks $n = 14$
 Block height $h = 0.14$ m
 Block width $b = 0.30$ m
 Block offset $o_1 = 0.03$ m

Name : Geometry**Stage - analysis : 1 - 0****Material****Block material**

Unit weight $\gamma = 12.00$ kN/m³
 Cohesion $c = 0.00$ kPa
 Friction $f = 0.445$

Shear bearing capacity of joint $R_s = 0.00 \text{ kN/m}$

Reinforced soil - Class 6I

Reinforcement

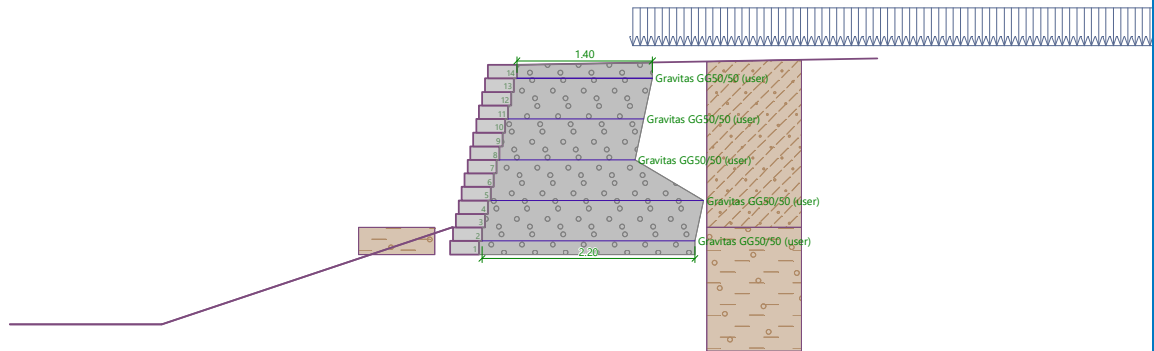
Total number of input reinforcements : 5.

Reinforcement details

Block No.	Type of reinforcement	Origin I_1 [m]	End I_2 [m]	Height from bottom y [m]	Length l [m]
2	Gravitas GG50/50 (user)	-0.36	1.84	0.14	2.20
5	Gravitas GG50/50 (user)	-0.27	1.93	0.56	2.20
8	Gravitas GG50/50 (user)	-0.18	1.22	0.98	1.40
11	Gravitas GG50/50 (user)	-0.09	1.31	1.40	1.40
14	Gravitas GG50/50 (user)	0.00	1.40	1.82	1.40

Name : Reinforcement

Stage - analysis : 1 - 0



Soil parameters

Class 6I

Unit weight : $\gamma = 19.00 \text{ kN/m}^3$
 Angle of internal friction : $\phi_{ef} = 35.00^\circ$
 Cohesion of soil : $c_{ef} = 0.00 \text{ kPa}$
 Angle of friction struc.-soil : $\delta = 23.33^\circ$
 Saturated unit weight : $\gamma_{sat} = 20.00 \text{ kN/m}^3$

MADE GROUND (firm CLAY or MD SAND)

Unit weight : $\gamma = 19.00 \text{ kN/m}^3$
 Angle of internal friction : $\phi_{ef} = 28.00^\circ$
 Cohesion of soil : $c_{ef} = 0.00 \text{ kPa}$
 Angle of friction struc.-soil : $\delta = 18.67^\circ$
 Saturated unit weight : $\gamma_{sat} = 20.00 \text{ kN/m}^3$

Compacted MADE GROUND

Unit weight : $\gamma = 19.00 \text{ kN/m}^3$
 Angle of internal friction : $\phi_{ef} = 30.00^\circ$
 Cohesion of soil : $c_{ef} = 0.00 \text{ kPa}$
 Angle of friction struc.-soil : $\delta = 20.00^\circ$

Saturated unit weight : $\gamma_{\text{sat}} = 20.00 \text{ kN/m}^3$

Geological profile and assigned soils

Position information

Terrain elevation = 0.00 m

Geological profile and assigned soils

No.	Thickness of layer t [m]	Depth z [m]	Altitude [m]	Assigned soil	Pattern
1	1.68	0.00 .. 1.68	0.00 .. -1.68	MADE GROUND (firm CLAY or MD SAND)	
2	-	1.68 .. ∞	-1.68 .. -	Compacted MADE GROUND	

Terrain profile

Terrain behind construction has the slope 1: 56.00 (slope angle is 1.02 °).

Water influence

Ground water table is located below the structure.

Input surface surcharges

No.	Surcharge new change	Action	Mag.1 [kN/m ²]	Mag.2 [kN/m ²]	Ord.x x [m]	Length l [m]	Depth z [m]
1	Yes	variable	10.00		1.20	10.00	on terrain

No.	Name
1	10kPa

Resistance on front face of the structure

Resistance on front face of the structure: not considered

Soil on front face of the structure - Compacted MADE GROUND

Soil thickness in front of structure h = 0.28 m

Terrain shape in front of structure

No.	Coordinate x[m]	Depth z[m]
1	0.00	0.00
2	0.00	-0.28
3	-0.01	-0.28
4	-3.01	0.72
5	-4.01	0.72

Origin [0,0] is located in bottom left edge of construction.

Positive coordinate +z has downward direction.

Settings of the stage of construction

Coeff. for structure types : slope

Verification No. 1

Forces acting on construction

Name	F _{hor} [kN/m]	App.Pt. z [m]	F _{vert} [kN/m]	App.Pt. x [m]	Coeff. overtur.	Coeff. sliding	Coeff. stress
Weight - reinforced soil	0.00	-0.91	71.86	1.46	1.000	1.000	1.500

Name	F _{hor} [kN/m]	App.Pt. z [m]	F _{vert} [kN/m]	App.Pt. x [m]	Coeff. overtur.	Coeff. sliding	Coeff. stress
Active pressure	10.78	-0.76	8.94	2.46	1.000	1.500	1.500
10kPa	4.58	-0.91	3.81	2.38	0.000	1.300	1.300
Weight - wall	0.00	-0.98	7.06	0.35	1.000	1.000	1.500
10kPa	0.00	-1.98	2.00	1.99	0.000	0.000	1.300

Verification of complete wall

Check for overturning stability

Resisting moment $M_{res} = 129.26$ kNm/m

Overturning moment $M_{ovr} = 8.16$ kNm/m

Wall for overturning is **SATISFACTORY**

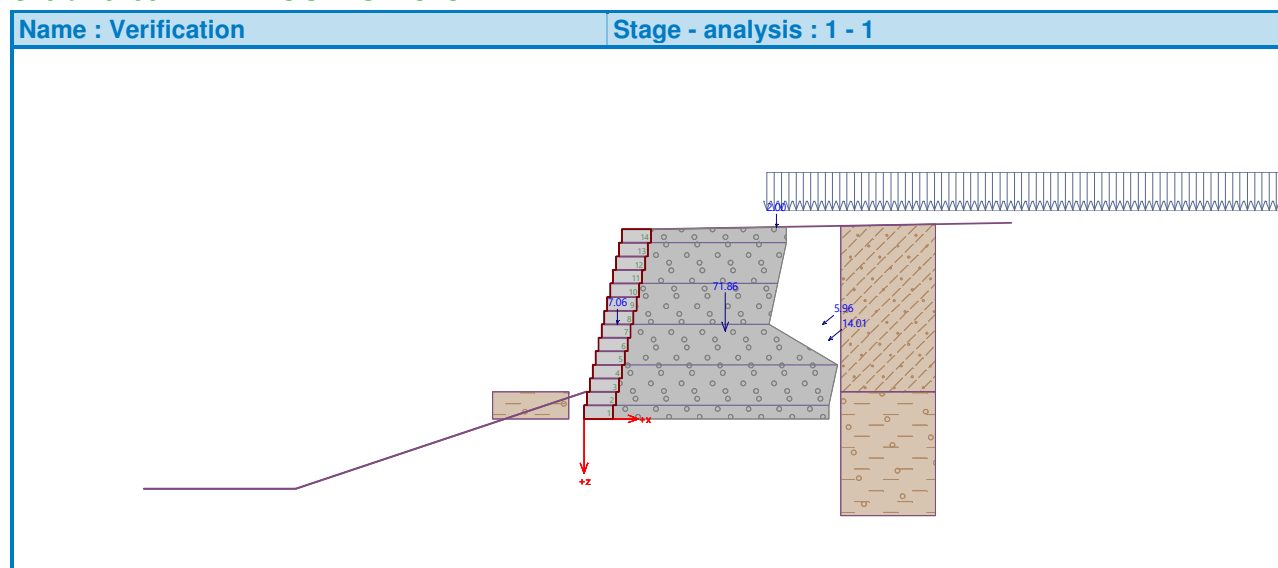
Check for slip

Resisting horizontal force $H_{res} = 46.81$ kN/m

Active horizontal force $H_{act} = 22.13$ kN/m

Wall for slip is **SATISFACTORY**

Overall check - WALL is **SATISFACTORY**



Dimensioning No. 1

Forces acting on construction

Name	F _{hor} [kN/m]	App.Pt. z [m]	F _{vert} [kN/m]	App.Pt. x [m]	Coeff. overtur.	Coeff. sliding	Coeff. stress
Weight - wall	0.00	-0.28	2.02	0.20	1.000	1.000	1.500
Active pressure	0.68	-0.19	0.29	0.33	1.500	1.500	1.500
10kPa	0.00	-0.56	0.00	0.39	0.000	0.000	1.300
Reinforcement	-2.39	-0.42	0.00	1.10	1.000	1.000	1.000

Check of construction joint above the most utilized block No.: 10

Check for overturning stability

Resisting moment $M_{res} = 1.54$ kNm/m

Overturning moment $M_{ovr} = 0.19 \text{ kNm/m}$

Joint for overturning stability is SATISFACTORY

Check for slip

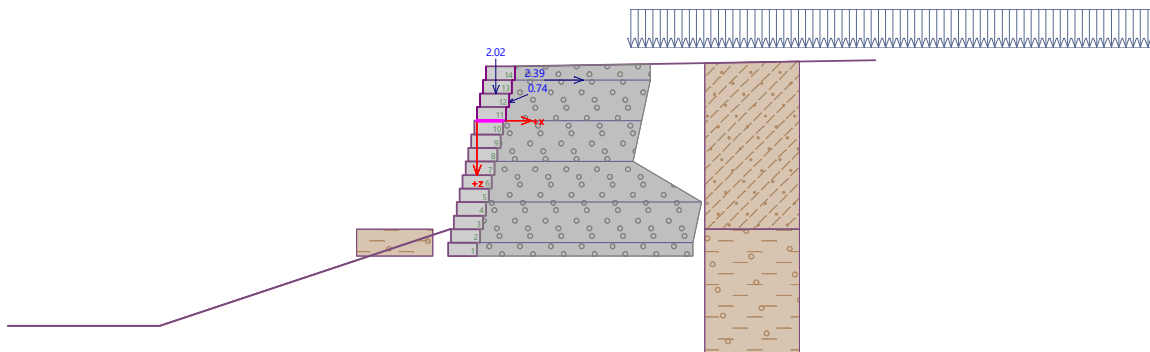
Resisting horizontal force $H_{res} = 2.91 \text{ kN/m}$

Active horizontal force $H_{act} = 1.01 \text{ kN/m}$

Joint for slip is SATISFACTORY

Name : Dimensioning

Stage - analysis : 1 - 1



Bearing capacity of foundation soil

Design load acting at the center of footing bottom

No.	Moment [kNm/m]	Norm. force [kN/m]	Shear Force [kN/m]	Eccentricity [-]	Stress [kPa]
1	-19.01	139.35	22.13	0.000	55.74
2	-11.27	87.86	22.13	0.000	35.15

Service load acting at the center of footing bottom

No.	Moment [kNm/m]	Norm. force [kN/m]	Shear Force [kN/m]
1	-12.89	93.67	15.36

Verification of foundation soil

Stress in the footing bottom : rectangle

Eccentricity verification

Max. eccentricity of normal force $e = 0.000$

Maximum allowable eccentricity $e_{alw} = 0.333$

Eccentricity of the normal force is SATISFACTORY

Verification of bearing capacity

Bearing capacity of foundation soil $R = 100.00 \text{ kPa}$

Partial factor on bearing capacity $\gamma_{Rv} = 1.35$

Max. stress at footing bottom $\sigma = 55.74 \text{ kPa}$

Bearing capacity of foundation soil is SATISFACTORY

[illegible]

Forces acting on construction (verification of most utilized reinforcement)

Name	F_{hor} [kN/m]	App.Pt. z [m]	F_{vert} [kN/m]	App.Pt. x [m]	Design coefficient
Weight - wall	0.00	-0.49	3.53	-0.03	1.000
Active pressure	2.23	-0.33	0.67	1.50	1.500
10kPa	3.00	-0.49	0.88	1.53	1.300
Weight - reinforced soil	0.00	-0.50	26.65	0.80	1.000
10kPa	0.00	-1.00	2.34	1.53	0.000
Reinforcement	-0.03	-0.42	0.00	1.52	1.000
Reinforcement	-0.01	-0.84	0.00	1.61	1.000

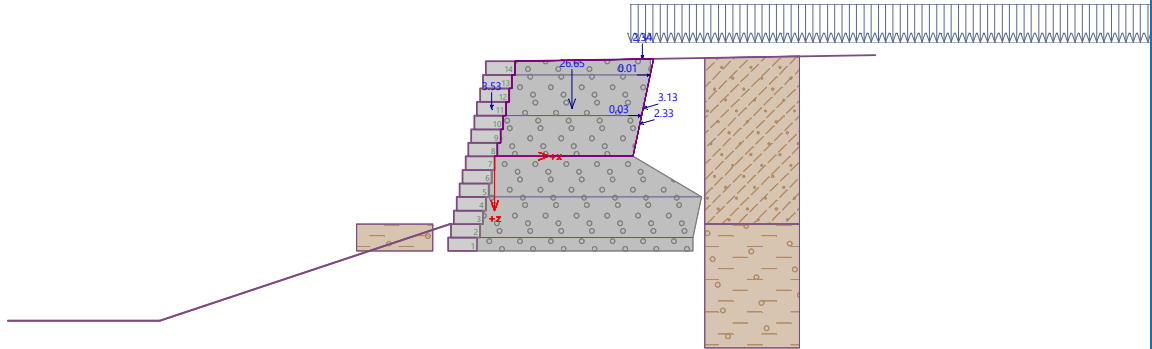
Inclination of slip surface	=	78.00 °
Overall normal force acting on reinforcement	=	28.80 kN/m
Coefficient of reduction of slip along geo-textile	=	0.85
Resistance along geo-reinforcement	=	17.14 kN/m
Wall resistance	=	1.57 kN/m
Overall bearing capacity of reinforcements	=	0.04 kN/m

Resisting horizontal force $H_{\text{res}} = 14.42 \text{ kN/m}$
Active horiz. force $H_{\text{act}} = 7.24 \text{ kN/m}$

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Name : Slip on georeinf.

Stage - analysis : 1 - 1



Calculation of internal stability No. 1

Calculated forces and strength of reinforcements

No.	Name	F_x [kN/m]	Depth z [m]	R_t [kN/m]	Utiliz. [%]	T_p [kN/m]	Utiliz. [%]
1	Gravitas GG50/50 (user)	-4.07	1.82	17.54	23.22	68.18	5.97
2	Gravitas GG50/50 (user)	-4.13	1.40	17.54	23.56	48.04	8.60
3	Gravitas GG50/50 (user)	-3.09	0.98	17.54	17.60	16.59	18.62
4	Gravitas GG50/50 (user)	-1.15	0.56	17.54	6.57	7.74	14.90
5	Gravitas GG50/50 (user)	-0.34	0.14	17.54	1.96	1.62	21.20

Check for tensile strength (reinforcement No.2)

Tension strength $R_t = 17.54$ kN/mForce in reinforcement $F_x = 4.13$ kN/m

Reinforcement for tensile strength is SATISFACTORY

Check for pull out resistance (reinforcement No.5)

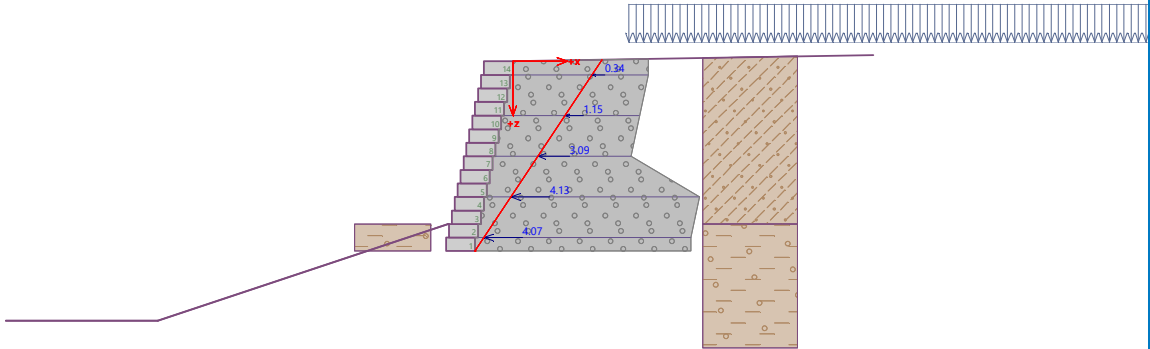
Pull out resistance $T_p = 1.62$ kN/mForce in reinforcement $F_x = 0.34$ kN/m

Reinforcement for pull out resistance is SATISFACTORY

Overall verification - reinforcement is SATISFACTORY

Name : Internal stability

Stage - analysis : 1 - 1



Slope stability analysis

Input data

Project

Settings

BS 8006 - MSE Wall

Wall analysis

Partial factors of soil properties			
Partial factor on internal friction :	$f_{ms} =$	1.00	[-]
Partial factor on effective cohesion :	$f_{ms} =$	1.60	[-]
Partial factor on undrained shear strength :	$f_{ms} =$	1.00	[-]
Resistance factors			
Resistance factor on sliding :	$f_s =$	1.20	[-]
Resistance factor on bearing capacity :	$f_{ms} =$	1.35	[-]
Resistance factor for pullout of reinforcement :	$f_p =$	1.30	[-]
Partial factors of slip on reinforcement :	$f_s =$	1.30	[-]
Partial factors - wall			
		Combination A	Combination B
Dead load of structural components :	$f_{fs} =$	1.50 [-]	1.00 [-]
Earth pressure - active :	$f_{fs} =$	1.50 [-]	1.50 [-]
Permanent load - on the block :	$f_f =$	1.50 [-]	1.00 [-]
Permanent load - behind the block :	$f_f =$	1.50 [-]	1.50 [-]
Variable load - on the block :	$f_q =$	1.50 [-]	0.00 [-]
Variable load - behind the block :	$f_q =$	1.50 [-]	1.50 [-]

Partial factors - slope

Dead load of structural components :	$f_{fs} =$	1.50 [-]
Earth surcharge load (permanent) :	$f_f =$	1.20 [-]
Live load surcharge :	$f_q =$	1.30 [-]

Stability analysis

Earthquake analysis : Standard
 Verification methodology : according to EN 1997
 Design approach : 1 - reduction of actions and soil parameters

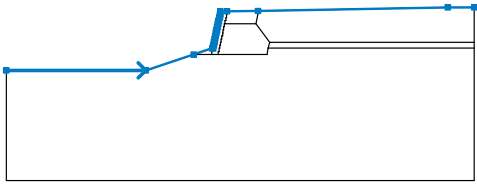
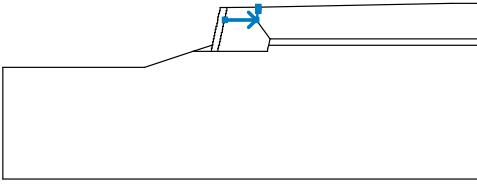
Partial factors on actions (A)**Permanent design situation**

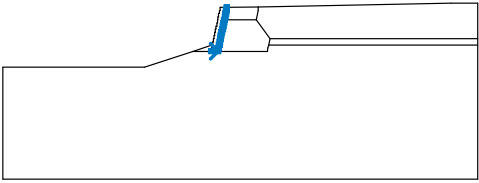
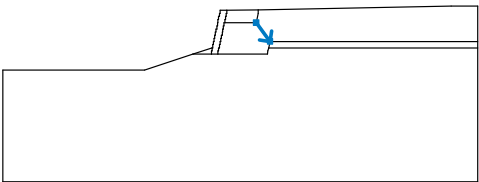
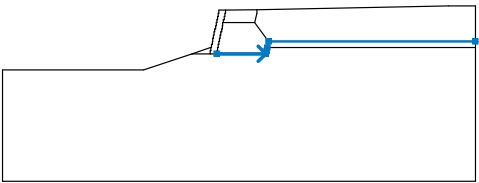
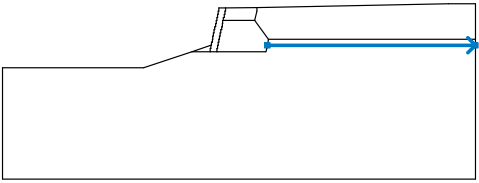
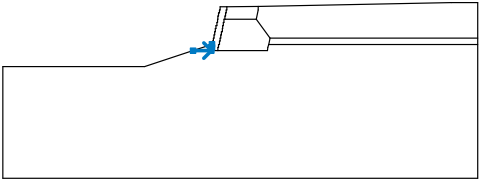
		Combination 1		Combination 2	
		Unfavourable	Favourable	Unfavourable	Favourable
Permanent actions :	$\gamma_G =$	1.35 [-]	1.00 [-]	1.00 [-]	1.00 [-]
Variable actions :	$\gamma_Q =$	1.50 [-]	0.00 [-]	1.30 [-]	0.00 [-]
Water load :	$\gamma_w =$	1.00 [-]		1.00 [-]	

Partial factors for soil parameters (M)**Permanent design situation**

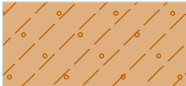
		Combination 1	Combination 2
Partial factor on internal friction :	$\gamma_\phi =$	1.00 [-]	1.25 [-]
Partial factor on effective cohesion :	$\gamma_c =$	1.00 [-]	1.25 [-]
Partial factor on undrained shear strength :	$\gamma_{cu} =$	1.00 [-]	1.40 [-]

Interface

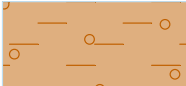
No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		-10.00	-2.68	-3.67	-2.68	-1.51	-1.96
		-0.67	-1.68	-0.66	-1.68	-0.63	-1.68
		-0.63	-1.54	-0.60	-1.54	-0.60	-1.40
		-0.57	-1.40	-0.57	-1.26	-0.54	-1.26
		-0.54	-1.12	-0.51	-1.12	-0.51	-0.98
		-0.48	-0.98	-0.48	-0.84	-0.45	-0.84
		-0.45	-0.70	-0.42	-0.70	-0.42	-0.56
		-0.39	-0.56	-0.39	-0.42	-0.36	-0.42
		-0.36	-0.28	-0.33	-0.28	-0.33	-0.14
		-0.30	-0.14	-0.30	0.00	0.00	0.00
		1.40	0.02	10.00	0.18	11.20	0.18
2		-0.09	-0.56	1.31	-0.56	1.40	-0.14
		1.40	0.02				

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
3		-0.69	-1.96	-0.39	-1.96	-0.39	-1.82
		-0.36	-1.82	-0.36	-1.68	-0.33	-1.68
		-0.33	-1.54	-0.30	-1.54	-0.30	-1.40
		-0.27	-1.40	-0.27	-1.26	-0.24	-1.26
		-0.24	-1.12	-0.21	-1.12	-0.21	-0.98
		-0.18	-0.98	-0.18	-0.84	-0.15	-0.84
		-0.15	-0.70	-0.12	-0.70	-0.12	-0.56
		-0.09	-0.56	-0.09	-0.42	-0.06	-0.42
		-0.06	-0.28	-0.03	-0.28	-0.03	-0.14
		0.00	-0.14	0.00	0.00		
4		1.31	-0.56	1.93	-1.40		
5		-0.39	-1.96	1.81	-1.96	1.84	-1.82
		1.87	-1.68	1.93	-1.40	11.20	-1.40
6		1.87	-1.68	11.20	-1.68		
7		-1.51	-1.96	-0.69	-1.96	-0.69	-1.82
		-0.66	-1.82	-0.66	-1.68		

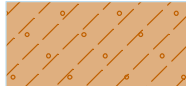
Soil parameters - effective stress state

No.	Name	Pattern	Φ_{ef} [°]	c_{ef} [kPa]	γ [kN/m ³]
1	Class 6I		35.00	0.00	19.00
2	MADE GROUND (firm CLAY or MD SAND)		28.00	0.00	19.00

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No.	Name	Pattern	ϕ_{ef} [°]	c_{ef} [kPa]	γ [kN/m³]
3	Compacted MADE GROUND		30.00	0.00	19.00

Soil parameters - uplift

No.	Name	Pattern	γ_{sat} [kN/m³]	γ_s [kN/m³]	n [-]
1	Class 6I		20.00		
2	MADE GROUND (firm CLAY or MD SAND)		20.00		
3	Compacted MADE GROUND		20.00		

Soil parameters

Class 6I

Unit weight : $\gamma = 19.00 \text{ kN/m}^3$
 Stress-state : effective
 Angle of internal friction : $\phi_{ef} = 35.00^\circ$
 Cohesion of soil : $c_{ef} = 0.00 \text{ kPa}$
 Saturated unit weight : $\gamma_{sat} = 20.00 \text{ kN/m}^3$

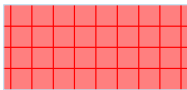
MADE GROUND (firm CLAY or MD SAND)

Unit weight : $\gamma = 19.00 \text{ kN/m}^3$
 Stress-state : effective
 Angle of internal friction : $\phi_{ef} = 28.00^\circ$
 Cohesion of soil : $c_{ef} = 0.00 \text{ kPa}$
 Saturated unit weight : $\gamma_{sat} = 20.00 \text{ kN/m}^3$

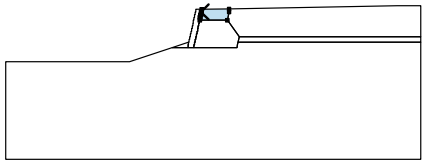
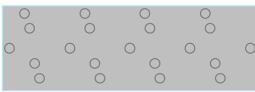
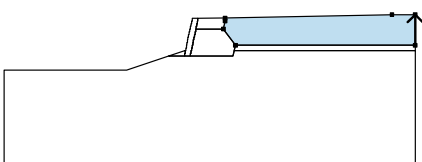
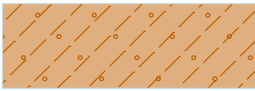
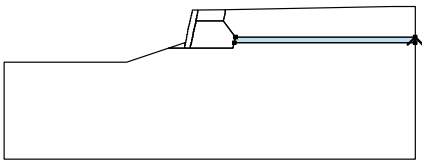
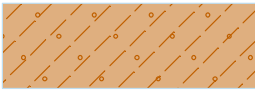
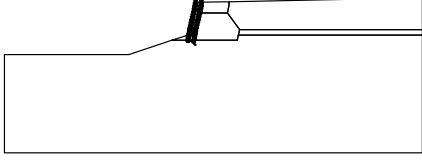
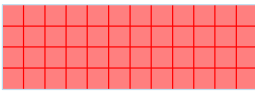
Compacted MADE GROUND

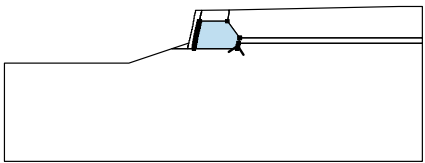
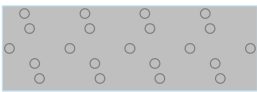
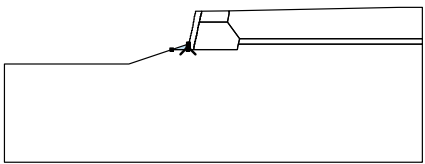
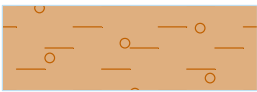
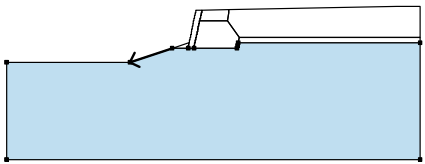
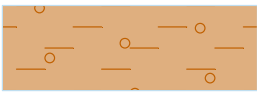
Unit weight : $\gamma = 19.00 \text{ kN/m}^3$
 Stress-state : effective
 Angle of internal friction : $\phi_{ef} = 30.00^\circ$
 Cohesion of soil : $c_{ef} = 0.00 \text{ kPa}$
 Saturated unit weight : $\gamma_{sat} = 20.00 \text{ kN/m}^3$

Rigid Bodies

No.	Name	Sample	Y [kN/m ³]
1	Material of structure		12.00

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		0.00	-0.14	-0.03	-0.14	Class 6l 
		-0.03	-0.28	-0.06	-0.28	
		-0.06	-0.42	-0.09	-0.42	
		-0.09	-0.56	1.31	-0.56	
		1.40	-0.14	1.40	0.02	
		0.00	0.00			
2		11.20	-1.40	11.20	0.18	MADE GROUND (firm CLAY or MD SAND) 
		10.00	0.18	1.40	0.02	
		1.40	-0.14	1.31	-0.56	
		1.93	-1.40			
3		11.20	-1.68	11.20	-1.40	MADE GROUND (firm CLAY or MD SAND) 
		1.93	-1.40	1.87	-1.68	
4		-0.66	-1.82	-0.69	-1.82	Material of structure 
		-0.69	-1.96	-0.39	-1.96	
		-0.39	-1.82	-0.36	-1.82	
		-0.36	-1.68	-0.33	-1.68	
		-0.33	-1.54	-0.30	-1.54	
		-0.30	-1.40	-0.27	-1.40	
		-0.27	-1.26	-0.24	-1.26	
		-0.24	-1.12	-0.21	-1.12	
		-0.21	-0.98	-0.18	-0.98	
		-0.18	-0.84	-0.15	-0.84	
		-0.15	-0.70	-0.12	-0.70	
		-0.12	-0.56	-0.09	-0.56	
		-0.09	-0.42	-0.06	-0.42	
		-0.06	-0.28	-0.03	-0.28	
		-0.03	-0.14	0.00	-0.14	
		0.00	0.00	-0.30	0.00	
		-0.30	-0.14	-0.33	-0.14	
		-0.33	-0.28	-0.36	-0.28	
		-0.36	-0.42	-0.39	-0.42	
		-0.39	-0.56	-0.42	-0.56	

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
5		-0.42	-0.70	-0.45	-0.70	Class 6I 
		-0.45	-0.84	-0.48	-0.84	
		-0.48	-0.98	-0.51	-0.98	
		-0.51	-1.12	-0.54	-1.12	
		-0.54	-1.26	-0.57	-1.26	
		-0.57	-1.40	-0.60	-1.40	
		-0.60	-1.54	-0.63	-1.54	
		-0.63	-1.68	-0.66	-1.68	
		1.81	-1.96	1.84	-1.82	
		1.87	-1.68	1.93	-1.40	
		1.31	-0.56	-0.09	-0.56	
		-0.12	-0.56	-0.12	-0.70	
		-0.15	-0.70	-0.15	-0.84	
		-0.18	-0.84	-0.18	-0.98	
		-0.21	-0.98	-0.21	-1.12	
6		-0.24	-1.12	-0.24	-1.26	Compacted MADE GROUND 
		-0.27	-1.26	-0.27	-1.40	
		-0.30	-1.40	-0.30	-1.54	
		-0.33	-1.54	-0.33	-1.68	
7		-0.36	-1.68	-0.36	-1.82	Compacted MADE GROUND 
		-0.39	-1.82	-0.39	-1.96	
		-0.69	-1.96	-0.69	-1.82	
		-0.66	-1.82	-0.66	-1.68	
		-0.67	-1.68	-1.51	-1.96	
		-1.51	-1.96	-3.67	-2.68	
		-10.00	-2.68	-10.00	-7.68	
		11.20	-7.68	11.20	-1.68	
		1.87	-1.68	1.84	-1.82	
		1.81	-1.96	-0.39	-1.96	
		-0.69	-1.96			

Reinforcements

No.	Point to the left		Point to the right		Length L [m]	Strength R_t [kN/m]	Pull out resist.	End of reinf.
	x [m]	z [m]	x [m]	z [m]				
1	0.00	-0.14	1.40	-0.14	1.40	17.54	$T_p = 2.40 \text{ kN/m}^2$	Fixed
2	-0.09	-0.56	1.31	-0.56	1.40	17.54	$T_p = 9.62 \text{ kN/m}^2$	Fixed
3	-0.18	-0.98	1.22	-0.98	1.40	17.54	$T_p = 16.83 \text{ kN/m}^2$	Fixed
4	-0.27	-1.40	1.93	-1.40	2.20	17.54	$T_p = 24.04 \text{ kN/m}^2$	Fixed
5	-0.36	-1.82	1.84	-1.82	2.20	17.54	$T_p = 33.94 \text{ kN/m}^2$	Fixed

Surcharge

No.	Type	Type of action	Location z [m]	Origin x [m]	Length l [m]	Width b [m]	Slope α [°]	Magnitude		
								q, q ₁ , f, F, x	q ₂ , z	unit
1	strip	variable	on terrain	x = 1.20	l = 10.00		0.00	10.00		kN/m ²

Surcharges

No.	Name
1	10kPa

Water

Water type : No water

Tensile crack

Tensile crack not input.

Earthquake

Earthquake not included.

Settings of the stage of construction

Design situation : permanent

Results (Stage of construction 1)

Analysis 1

Circular slip surface

Slip surface parameters					
Center :	x =	-1.85 [m]	Angles :	α_1 =	-18.57 [°]
	z =	3.33 [m]		α_2 =	58.96 [°]
Radius :	R =	6.34 [m]			
The slip surface after optimization.					

Reinforcement bearing capacity

Combination 1

Reinforcement Bearing capacity [kN/m]

1	0.00
2	0.00
3	0.00
4	0.00
5	0.13

Combination 2

Reinforcement Bearing capacity [kN/m]

1	0.00
2	0.00
3	0.00
4	0.00
5	0.00

Slope stability verification (Bishop)

Combination 1

Sum of active forces : $F_a = 102.90$ kN/m

Sum of passive forces : $F_p = 133.64 \text{ kN/m}$

Sliding moment : $M_a = 624.59 \text{ kNm/m}$

Resisting moment : $M_p = 811.18 \text{ kNm/m}$

Utilization : 77.0 %

Slope stability ACCEPTABLE

Combination 2

Sum of active forces : $F_a = 86.07 \text{ kN/m}$

Sum of passive forces : $F_p = 95.80 \text{ kN/m}$

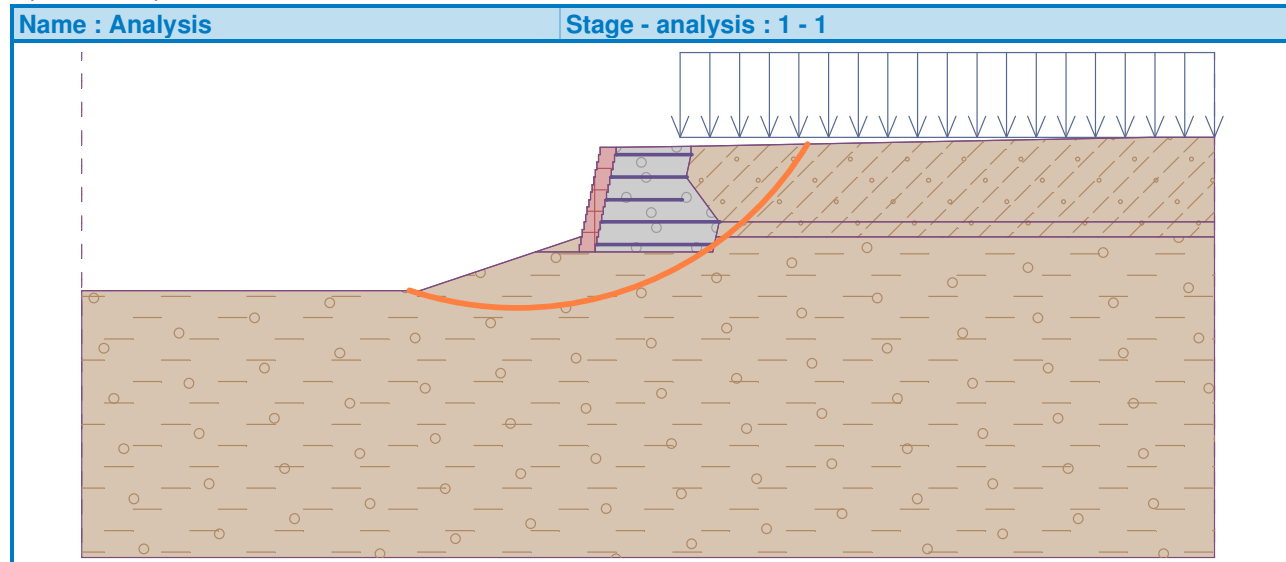
Sliding moment : $M_a = 545.67 \text{ kNm/m}$

Resisting moment : $M_p = 607.39 \text{ kNm/m}$

Utilization : 89.8 %

Slope stability ACCEPTABLE

Optimized slip surface for : Combination 2



Analysis of reinforced slopes

Input data

Project

Task : New Goetre Primary School
 Part : Section B-B
 Description : Flex MSE Wall
 Customer : Gravitas
 Author : THZ
 Date : 11/12/2025
 Project ID : REV 0
 Project number : 25-6222-F1

Settings

BS 8006 - MSE Wall

Materials and standards

Concrete structures : EN 1992-1-1 (EC2)
 Coefficients EN 1992-1-1 : standard

Wall analysis

Active earth pressure calculation : Coulomb
 Passive earth pressure calculation : Caquot-Kerisel
 Earthquake analysis : Mononobe-Okabe
 Shape of earth wedge : Calculate as skew
 Allowable eccentricity : 0.333
 Internal stability : Standard - straight slip surface
 Verification methodology : according to BS 8006

Partial factors of soil properties			
Partial factor on internal friction :	f_{ms}	=	1.00 [-]
Partial factor on effective cohesion :	f_{ms}	=	1.60 [-]
Partial factor on undrained shear strength :	f_{ms}	=	1.00 [-]
Resistance factors			
Resistance factor on sliding :	f_s	=	1.20 [-]
Resistance factor on bearing capacity :	f_{ms}	=	1.35 [-]
Resistance factor for pullout of reinforcement :	f_p	=	1.30 [-]
Partial factors of slip on reinforcement :	f_s	=	1.30 [-]
Partial factors - wall			
		Combination A	Combination B
Dead load of structural components :	f_{fs}	1.50 [-]	1.00 [-]
Earth pressure - active :	f_{fs}	1.50 [-]	1.50 [-]
Permanent load - on the block :	f_f	1.50 [-]	1.00 [-]
Permanent load - behind the block :	f_f	1.50 [-]	1.50 [-]
Variable load - on the block :	f_q	1.50 [-]	0.00 [-]
Variable load - behind the block :	f_q	1.50 [-]	1.50 [-]
Partial factors - slope			
Dead load of structural components :	f_{fs}	=	1.50 [-]

Partial factors - slope

Earth surcharge load (permanent) :	$f_f =$	1.20 [-]
Live load surcharge :	$f_q =$	1.30 [-]

Stability analysis

Verification methodology : according to EN 1997

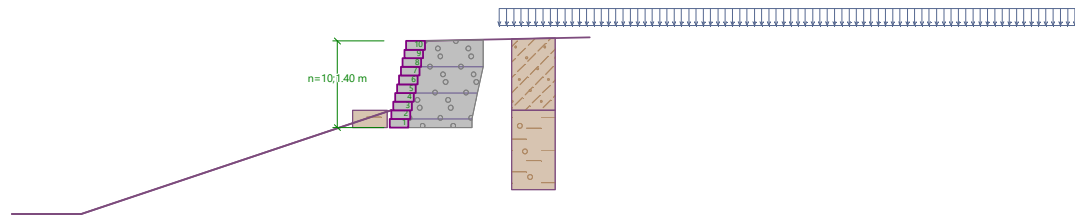
Design approach : 1 - reduction of actions and soil parameters

Partial factors on actions (A)**Permanent design situation**

		Combination 1		Combination 2	
		Unfavourable	Favourable	Unfavourable	Favourable
Permanent actions :	$\gamma_G =$	1.35 [-]	1.00 [-]	1.00 [-]	1.00 [-]
Variable actions :	$\gamma_Q =$	1.50 [-]	0.00 [-]	1.30 [-]	0.00 [-]
Water load :	$\gamma_w =$	1.00 [-]		1.00 [-]	

Partial factors for soil parameters (M)**Permanent design situation**

		Combination 1		Combination 2	
Partial factor on internal friction :	$\gamma_\phi =$	1.00 [-]		1.25 [-]	
Partial factor on effective cohesion :	$\gamma_c =$	1.00 [-]		1.25 [-]	
Partial factor on undrained shear strength :	$\gamma_{cu} =$	1.00 [-]		1.40 [-]	

Geometry of structureNumber of blocks $n = 10$ Block height $h = 0.14$ mBlock width $b = 0.30$ mBlock offset $o_1 = 0.03$ m**Name : Geometry****Stage - analysis : 1 - 0****Material****Block material**Unit weight $\gamma = 12.00$ kN/m³Cohesion $c = 0.00$ kPaFriction $f = 0.445$

Shear bearing capacity of joint $R_s = 0.00$ kN/m

Reinforced soil - Class 6I

Reinforcement

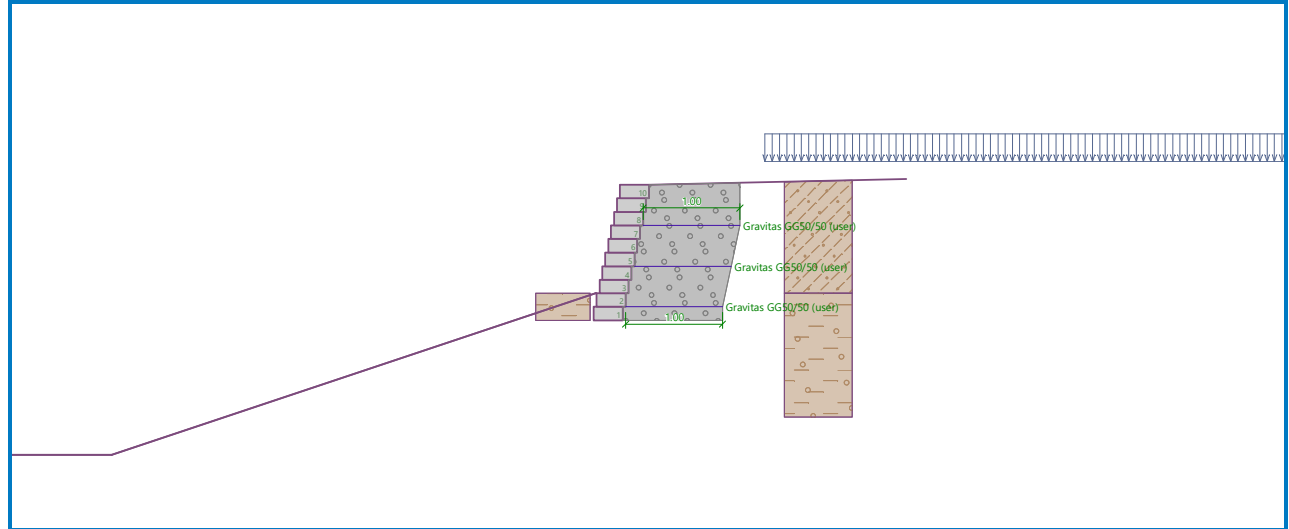
Total number of input reinforcements : 3.

Reinforcement details

Block No.	Type of reinforcement	Origin I_1 [m]	End I_2 [m]	Height from bottom y [m]	Length l [m]
2	Gravitas GG50/50 (user)	-0.24	0.76	0.14	1.00
5	Gravitas GG50/50 (user)	-0.15	0.85	0.56	1.00
8	Gravitas GG50/50 (user)	-0.06	0.94	0.98	1.00

Name : Reinforcement

Stage - analysis : 1 - 0



Soil parameters

Class 6I

Unit weight : $\gamma = 19.00$ kN/m³
 Angle of internal friction : $\phi_{ef} = 35.00^\circ$
 Cohesion of soil : $c_{ef} = 0.00$ kPa
 Angle of friction struc.-soil : $\delta = 23.33^\circ$
 Saturated unit weight : $\gamma_{sat} = 20.00$ kN/m³

MADE GROUND (firm CLAY or MD SAND)

Unit weight : $\gamma = 19.00$ kN/m³
 Angle of internal friction : $\phi_{ef} = 28.00^\circ$
 Cohesion of soil : $c_{ef} = 0.00$ kPa
 Angle of friction struc.-soil : $\delta = 18.67^\circ$
 Saturated unit weight : $\gamma_{sat} = 20.00$ kN/m³

Compacted MADE GROUND

Unit weight : $\gamma = 19.00$ kN/m³
 Angle of internal friction : $\phi_{ef} = 30.00^\circ$
 Cohesion of soil : $c_{ef} = 0.00$ kPa
 Angle of friction struc.-soil : $\delta = 20.00^\circ$
 Saturated unit weight : $\gamma_{sat} = 20.00$ kN/m³

Geological profile and assigned soils**Position information**

Terrain elevation = 0.00 m

Geological profile and assigned soils

No.	Thickness of layer t [m]	Depth z [m]	Altitude [m]	Assigned soil	Pattern
1	1.12	0.00 .. 1.12	0.00 .. -1.12	MADE GROUND (firm CLAY or MD SAND)	
2	-	1.12 .. ∞	-1.12 .. -	Compacted MADE GROUND	

Terrain profile

Terrain behind construction has the slope 1: 46.00 (slope angle is 1.25 °).

Water influence

Ground water table is located below the structure.

Input surface surcharges

No.	Surcharge new	Surcharge change	Action	Mag.1 [kN/m ²]	Mag.2 [kN/m ²]	Ord.x x [m]	Length l [m]	Depth z [m]
1	Yes		variable	10.00		1.20	10.00	on terrain

No.	Name
1	10kPa

Resistance on front face of the structure

Resistance on front face of the structure: not considered

Soil on front face of the structure - Compacted MADE GROUND

Soil thickness in front of structure h = 0.28 m

Terrain shape in front of structure

No.	Coordinate x[m]	Depth z[m]
1	0.00	0.00
2	0.00	-0.28
3	-0.01	-0.28
4	-5.01	1.39
5	-6.01	1.39

Origin [0,0] is located in bottom left edge of construction.

Positive coordinate +z has downward direction.

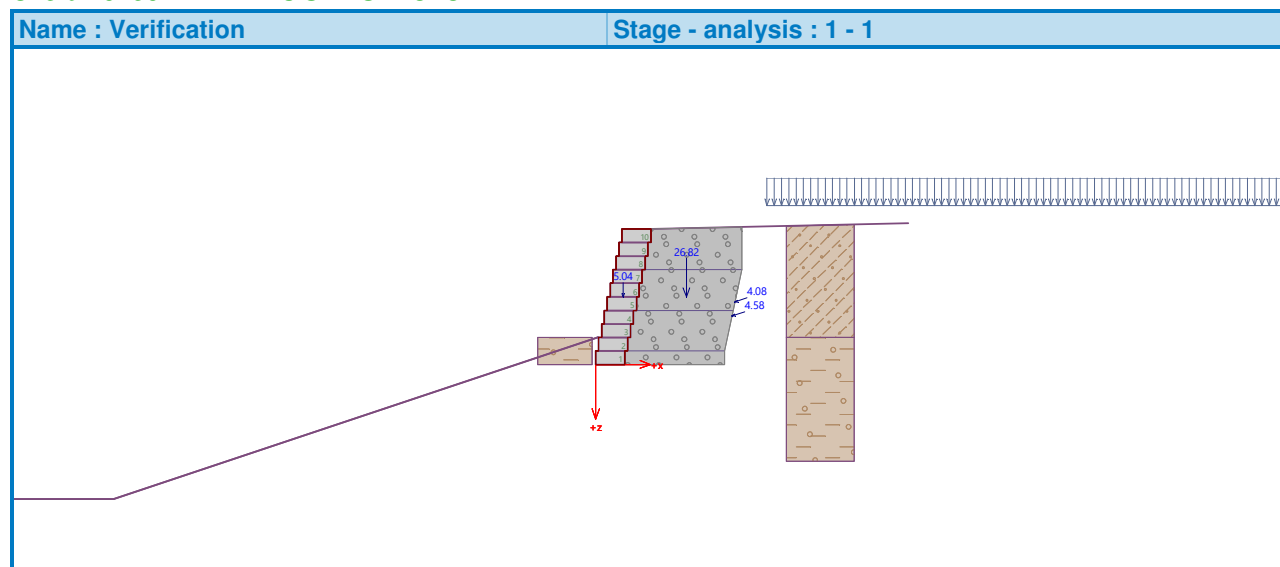
Settings of the stage of construction

Coeff. for structure types : slope

Verification No. 1**Forces acting on construction**

Name	F _{hor} [kN/m]	App.Pt. z [m]	F _{vert} [kN/m]	App.Pt. x [m]	Coeff. overtur.	Coeff. sliding	Coeff. stress
Weight - reinforced soil	0.00	-0.70	26.82	0.94	1.000	1.000	1.500
Active pressure	4.35	-0.50	1.42	1.41	1.500	1.500	1.500
10kPa	3.85	-0.65	1.35	1.44	1.300	1.300	1.300

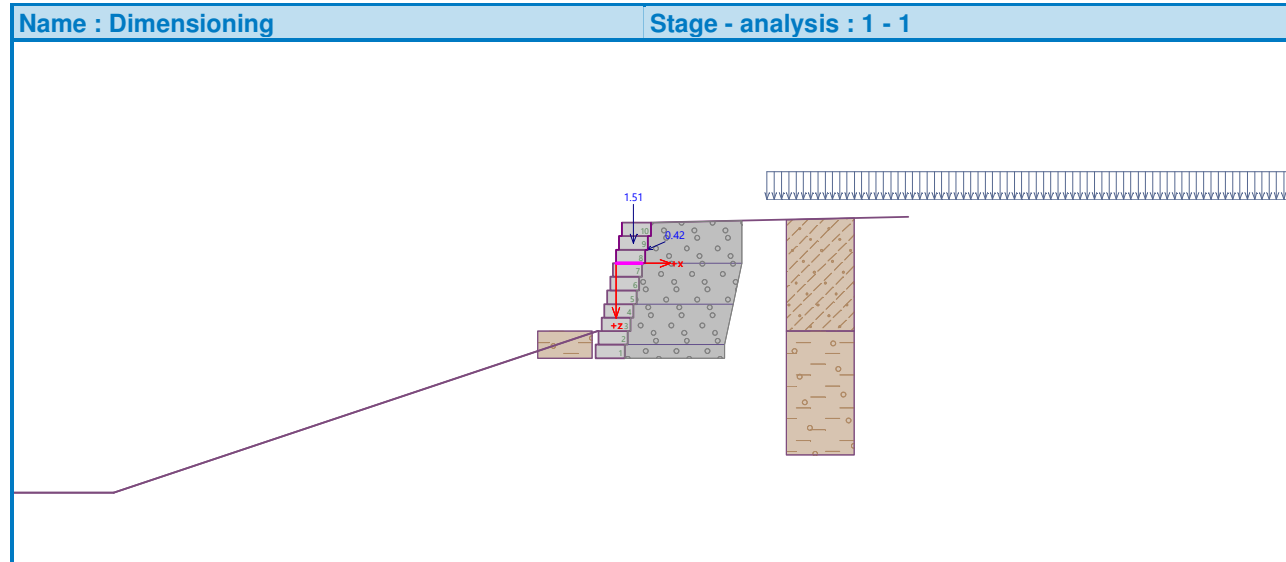
Name	F _{hor} [kN/m]	App.Pt. z [m]	F _{vert} [kN/m]	App.Pt. x [m]	Coeff. overtur.	Coeff. sliding	Coeff. stress
Weight - wall	0.00	-0.70	5.04	0.29	1.000	1.000	1.500

Verification of complete wall**Check for overturning stability**Resisting moment $M_{res} = 32.09$ kNm/mOverturning moment $M_{ovr} = 6.50$ kNm/m**Wall for overturning is SATISFACTORY****Check for slip**Resisting horizontal force $H_{res} = 17.20$ kN/mActive horizontal force $H_{act} = 11.53$ kN/m**Wall for slip is SATISFACTORY****Overall check - WALL is SATISFACTORY****Dimensioning No. 1****Forces acting on construction**

Name	F _{hor} [kN/m]	App.Pt. z [m]	F _{vert} [kN/m]	App.Pt. x [m]	Coeff. overtur.	Coeff. sliding	Coeff. stress
Weight - wall	0.00	-0.21	1.51	0.18	1.000	1.000	1.500
Active pressure	0.38	-0.14	0.16	0.32	1.500	1.500	1.500
10kPa	0.00	-0.42	0.00	0.36	0.000	0.000	1.300

Check of construction joint above the most utilized block No.: 7**Check for overturning stability**Resisting moment $M_{res} = 0.35$ kNm/mOverturning moment $M_{ovr} = 0.08$ kNm/m**Joint for overturning stability is SATISFACTORY****Check for slip**

Joint for slip is SATISFACTORY



Design load acting at the center of footing bottom

No.	Moment [kNm/m]	Norm. force [kN/m]	Shear Force [kN/m]	Eccentricity [-]	Stress [kPa]
1	-5.27	51.68	11.53	0.000	39.75
2	-2.35	35.75	11.53	0.000	27.50

No.	Moment [kNm/m]	Norm. force [kN/m]	Shear Force [kN/m]
1	-3.32	34.63	8.20

Stress in the footing bottom : rectangle

Max. eccentricity of normal force $e = 0.000$
Maximum allowable eccentricity $e_{alw} = 0.333$

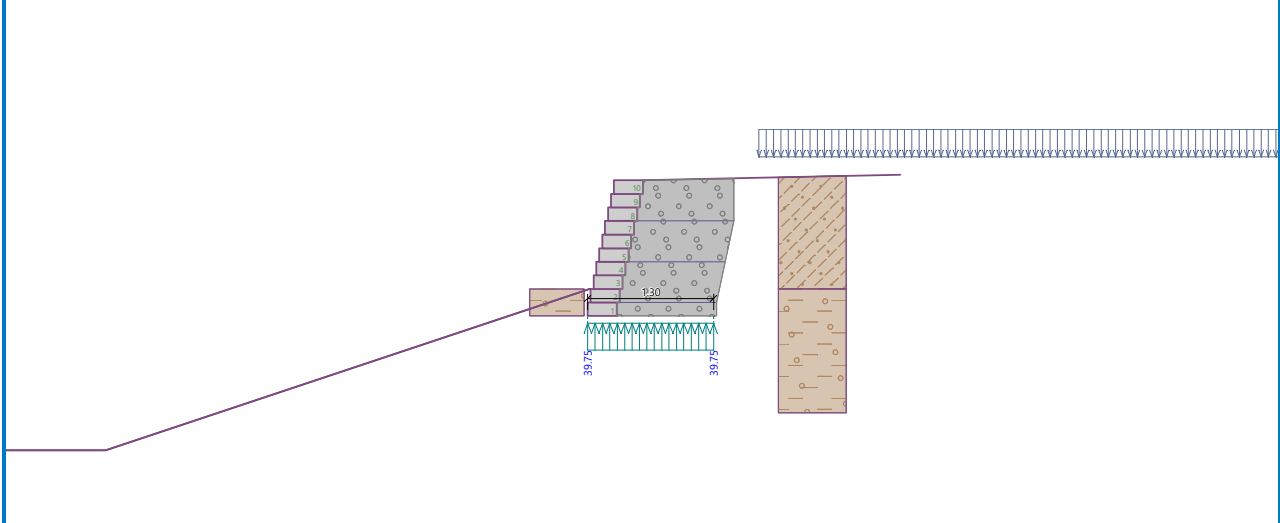
Verification of bearing capacity

Bearing capacity of foundation soil	R	$= 80.00 \text{ kPa}$
Partial factor on bearing capacity	γ_{Rv}	$= 1.35$
Max. stress at footing bottom	σ	$= 39.75 \text{ kPa}$
Bearing capacity of foundation soil	R_d	$= 59.26 \text{ kPa}$

Overall verification - bearing capacity of found. soil is SATISFACTORY

Name : Bearing cap.

Stage - analysis : 1 - -1



Verification of slip on georeinforcement No. 1

Forces acting on construction (verification of most utilized reinforcement)

Name	F _{hor} [kN/m]	App.Pt. z [m]	F _{vert} [kN/m]	App.Pt. x [m]	Design coefficient
Weight - wall	0.00	-0.63	4.54	0.00	1.000
Active pressure	3.54	-0.43	1.08	1.12	1.500
10kPa	3.66	-0.61	1.08	1.16	1.300
Weight - reinforced soil	0.00	-0.64	24.47	0.63	1.000
Reinforcement	-0.01	0.00	0.00	1.03	1.000
Reinforcement	-0.02	-0.42	0.00	1.12	1.000
Reinforcement	-0.02	-0.84	0.00	1.21	1.000

Check for slip along geo-reinforcement with the maximal utilization (Reinforc. No.: 1)

Inclination of slip surface = 78.00 °
 Overall normal force acting on reinforcement = 27.50 kN/m
 Coefficient of reduction of slip along geo-textile = 0.85
 Resistance along geo-reinforcement = 16.36 kN/m
 Wall resistance = 2.02 kN/m
 Overall bearing capacity of reinforcements = 0.04 kN/m

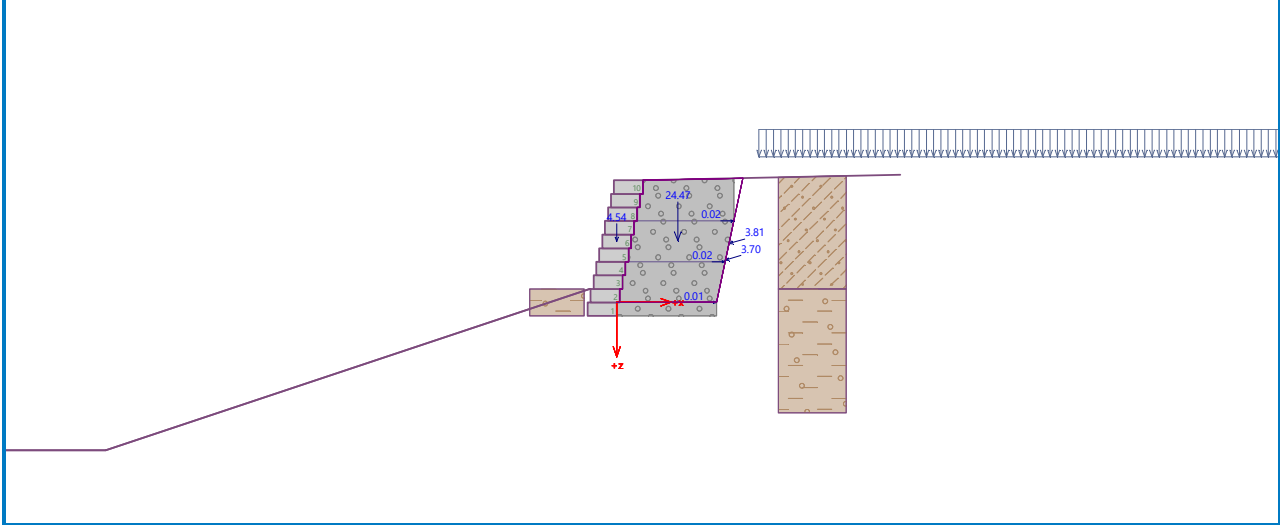
Check for slip:

Resisting horizontal force $H_{res} = 14.17$ kN/m
 Active horiz. force $H_{act} = 10.06$ kN/m

Slip along geotextile is SATISFACTORY

Name : Slip on georeinf.

Stage - analysis : 1 - 1



Calculation of internal stability No. 1

Calculated forces and strength of reinforcements

No.	Name	F_x [kN/m]	Depth z [m]	R_t [kN/m]	Utiliz. [%]	T_p [kN/m]	Utiliz. [%]
1	Gravitas GG50/50 (user)	-3.15	1.26	17.54	17.93	20.65	15.23
2	Gravitas GG50/50 (user)	-2.35	0.84	17.54	13.42	11.08	21.26
3	Gravitas GG50/50 (user)	-1.00	0.42	17.54	5.68	4.23	23.54

Check for tensile strength (reinforcement No.1)

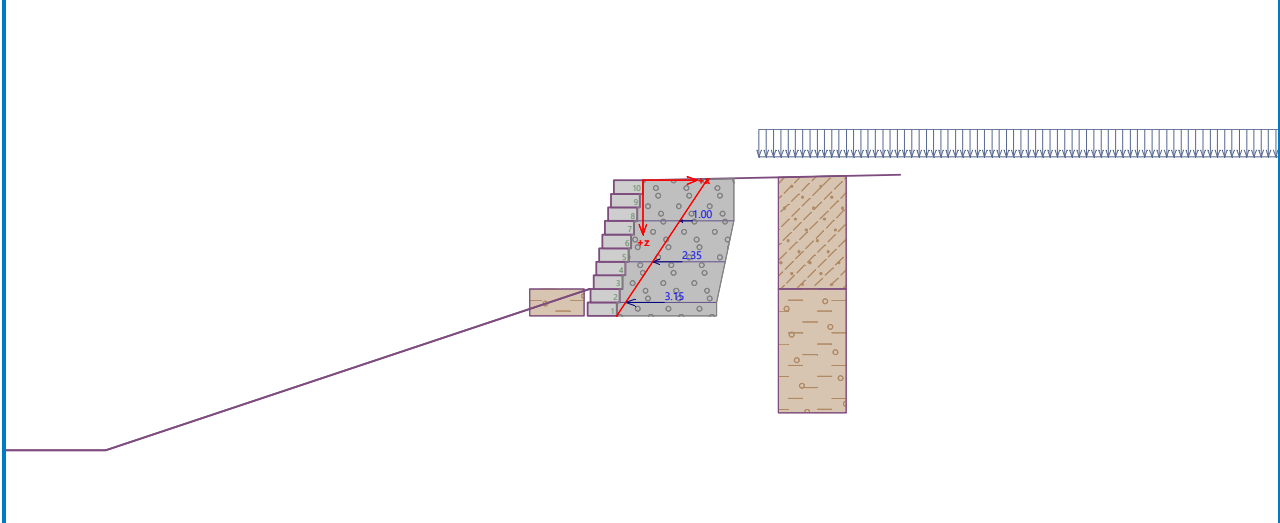
Tension strength $R_t = 17.54$ kN/mForce in reinforcement $F_x = 3.15$ kN/mReinforcement for tensile strength is **SATISFACTORY**

Check for pull out resistance (reinforcement No.3)

Pull out resistance $T_p = 4.23$ kN/mForce in reinforcement $F_x = 1.00$ kN/mReinforcement for pull out resistance is **SATISFACTORY**Overall verification - reinforcement is **SATISFACTORY**

Name : Internal stability

Stage - analysis : 1 - 1



Slope stability analysis

Input data

Project

Settings

BS 8006 - MSE Wall

Wall analysis

Partial factors of soil properties			
Partial factor on internal friction :	$f_{ms} =$	1.00	[-]
Partial factor on effective cohesion :	$f_{ms} =$	1.60	[-]
Partial factor on undrained shear strength :	$f_{ms} =$	1.00	[-]
Resistance factors			
Resistance factor on sliding :	$f_s =$	1.20	[-]
Resistance factor on bearing capacity :	$f_{ms} =$	1.35	[-]
Resistance factor for pullout of reinforcement :	$f_p =$	1.30	[-]
Partial factors of slip on reinforcement :	$f_s =$	1.30	[-]
Partial factors - wall			
		Combination A	Combination B
Dead load of structural components :	$f_{fs} =$	1.50 [-]	1.00 [-]
Earth pressure - active :	$f_{fs} =$	1.50 [-]	1.50 [-]
Permanent load - on the block :	$f_f =$	1.50 [-]	1.00 [-]
Permanent load - behind the block :	$f_f =$	1.50 [-]	1.50 [-]
Variable load - on the block :	$f_q =$	1.50 [-]	0.00 [-]
Variable load - behind the block :	$f_q =$	1.50 [-]	1.50 [-]

Partial factors - slope

Dead load of structural components :	$f_{fs} =$	1.50 [-]
Earth surcharge load (permanent) :	$f_f =$	1.20 [-]
Live load surcharge :	$f_q =$	1.30 [-]

Stability analysis

Earthquake analysis : Standard
 Verification methodology : according to EN 1997
 Design approach : 1 - reduction of actions and soil parameters

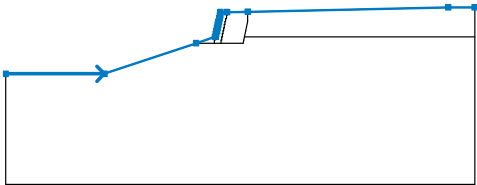
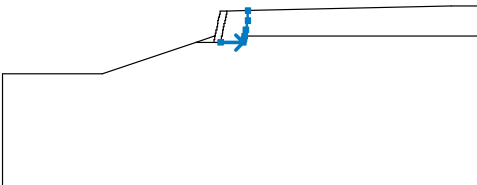
Partial factors on actions (A)**Permanent design situation**

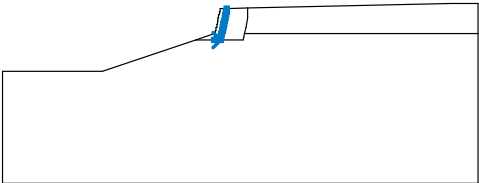
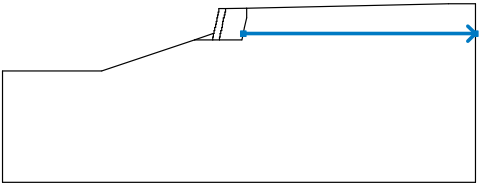
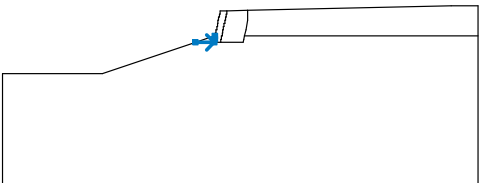
		Combination 1		Combination 2	
		Unfavourable	Favourable	Unfavourable	Favourable
Permanent actions :	$\gamma_G =$	1.35 [-]	1.00 [-]	1.00 [-]	1.00 [-]
Variable actions :	$\gamma_Q =$	1.50 [-]	0.00 [-]	1.30 [-]	0.00 [-]
Water load :	$\gamma_w =$	1.00 [-]		1.00 [-]	

Partial factors for soil parameters (M)**Permanent design situation**

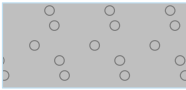
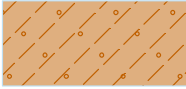
		Combination 1	Combination 2
Partial factor on internal friction :	$\gamma_\phi =$	1.00 [-]	1.25 [-]
Partial factor on effective cohesion :	$\gamma_c =$	1.00 [-]	1.25 [-]
Partial factor on undrained shear strength :	$\gamma_{cu} =$	1.00 [-]	1.40 [-]

Interface

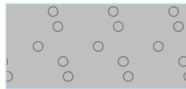
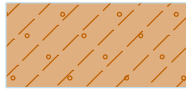
No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		-10.00	-2.79	-5.55	-2.79	-1.39	-1.40
		-0.55	-1.12	-0.54	-1.12	-0.51	-1.12
		-0.51	-0.98	-0.48	-0.98	-0.48	-0.84
		-0.45	-0.84	-0.45	-0.70	-0.42	-0.70
		-0.42	-0.56	-0.39	-0.56	-0.39	-0.42
		-0.36	-0.42	-0.36	-0.28	-0.33	-0.28
		-0.33	-0.14	-0.30	-0.14	-0.30	0.00
		0.00	0.00	0.94	0.02	10.00	0.22
		11.20	0.22				
2		-0.27	-1.40	0.73	-1.40	0.76	-1.26
		0.79	-1.12	0.85	-0.84	0.94	-0.42
		0.94	0.02				

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
3		-0.57	-1.40	-0.27	-1.40	-0.27	-1.26
		-0.24	-1.26	-0.24	-1.12	-0.21	-1.12
		-0.21	-0.98	-0.18	-0.98	-0.18	-0.84
		-0.15	-0.84	-0.15	-0.70	-0.12	-0.70
		-0.12	-0.56	-0.09	-0.56	-0.09	-0.42
		-0.06	-0.42	-0.06	-0.28	-0.03	-0.28
		-0.03	-0.14	0.00	-0.14	0.00	0.00
4		0.79	-1.12	11.20	-1.12		
5		-1.39	-1.40	-0.57	-1.40	-0.57	-1.26
		-0.54	-1.26	-0.54	-1.12		

Soil parameters - effective stress state

No.	Name	Pattern	Φ_{ef} [°]	C_{ef} [kPa]	γ [kN/m ³]
1	Class 6I		35.00	0.00	19.00
2	MADE GROUND (firm CLAY or MD SAND)		28.00	0.00	19.00
3	Compacted MADE GROUND		30.00	0.00	19.00

Soil parameters - uplift

No.	Name	Pattern	γ_{sat} [kN/m ³]	γ_s [kN/m ³]	n [—]
1	Class 6I		20.00		
2	MADE GROUND (firm CLAY or MD SAND)		20.00		

No.	Name	Pattern	Y _{sat} [kN/m ³]	Y _s [kN/m ³]	n [–]
3	Compacted MADE GROUND		20.00		

Soil parameters

Class 6I

Unit weight : $\gamma = 19.00 \text{ kN/m}^3$
 Stress-state : effective
 Angle of internal friction : $\varphi_{ef} = 35.00^\circ$
 Cohesion of soil : $c_{ef} = 0.00 \text{ kPa}$
 Saturated unit weight : $\gamma_{sat} = 20.00 \text{ kN/m}^3$

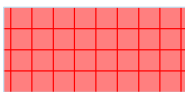
MADE GROUND (firm CLAY or MD SAND)

Unit weight : $\gamma = 19.00 \text{ kN/m}^3$
 Stress-state : effective
 Angle of internal friction : $\varphi_{ef} = 28.00^\circ$
 Cohesion of soil : $c_{ef} = 0.00 \text{ kPa}$
 Saturated unit weight : $\gamma_{sat} = 20.00 \text{ kN/m}^3$

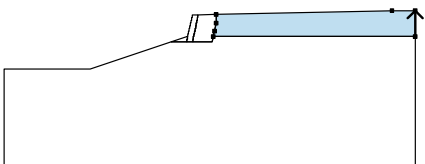
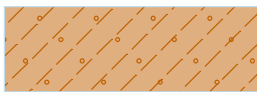
Compacted MADE GROUND

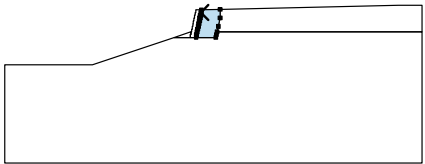
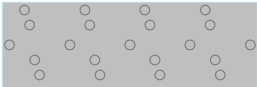
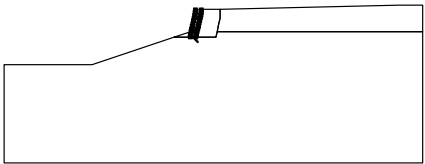
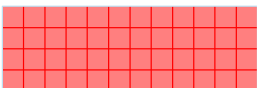
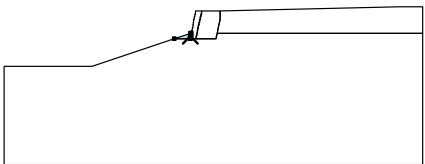
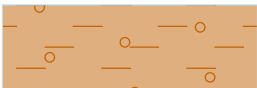
Unit weight : $\gamma = 19.00 \text{ kN/m}^3$
 Stress-state : effective
 Angle of internal friction : $\varphi_{ef} = 30.00^\circ$
 Cohesion of soil : $c_{ef} = 0.00 \text{ kPa}$
 Saturated unit weight : $\gamma_{sat} = 20.00 \text{ kN/m}^3$

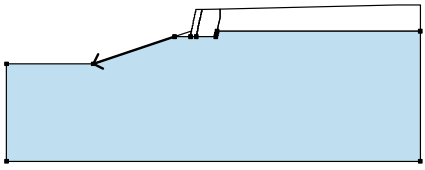
Rigid Bodies

No.	Name	Sample	Y [kN/m ³]
1	Material of structure		12.00

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		11.20	-1.12	11.20	0.22	MADE GROUND (firm CLAY or MD SAND) 
		10.00	0.22	0.94	0.02	
		0.94	-0.42	0.85	-0.84	
		0.79	-1.12			

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
2		0.00	-0.14	-0.03	-0.14	Class 6I 
		-0.03	-0.28	-0.06	-0.28	
		-0.06	-0.42	-0.09	-0.42	
		-0.09	-0.56	-0.12	-0.56	
		-0.12	-0.70	-0.15	-0.70	
		-0.15	-0.84	-0.18	-0.84	
		-0.18	-0.98	-0.21	-0.98	
		-0.21	-1.12	-0.24	-1.12	
		-0.24	-1.26	-0.27	-1.26	
		-0.27	-1.40	0.73	-1.40	
		0.76	-1.26	0.79	-1.12	
		0.85	-0.84	0.94	-0.42	
		0.94	0.02	0.00	0.00	
3		-0.54	-1.26	-0.57	-1.26	Material of structure 
		-0.57	-1.40	-0.27	-1.40	
		-0.27	-1.26	-0.24	-1.26	
		-0.24	-1.12	-0.21	-1.12	
		-0.21	-0.98	-0.18	-0.98	
		-0.18	-0.84	-0.15	-0.84	
		-0.15	-0.70	-0.12	-0.70	
		-0.12	-0.56	-0.09	-0.56	
		-0.09	-0.42	-0.06	-0.42	
		-0.06	-0.28	-0.03	-0.28	
		-0.03	-0.14	0.00	-0.14	
		0.00	0.00	-0.30	0.00	
		-0.30	-0.14	-0.33	-0.14	
		-0.33	-0.28	-0.36	-0.28	
		-0.36	-0.42	-0.39	-0.42	
		-0.39	-0.56	-0.42	-0.56	
		-0.42	-0.70	-0.45	-0.70	
4		-0.57	-1.40	-0.57	-1.26	Compacted MADE GROUND 
		-0.54	-1.26	-0.54	-1.12	
		-0.55	-1.12	-1.39	-1.40	

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
5		-1.39	-1.40	-5.55	-2.79	Compacted MADE GROUND 
		-10.00	-2.79	-10.00	-7.79	
		11.20	-7.79	11.20	-1.12	
		0.79	-1.12	0.76	-1.26	
		0.73	-1.40	-0.27	-1.40	
		-0.57	-1.40			

Reinforcements

No.	Point to the left		Point to the right		Length L [m]	Strength R_t [kN/m]	Pull out resist.	End of reinf.
	x [m]	z [m]	x [m]	z [m]				
1	-0.06	-0.42	0.94	-0.42	1.00	17.54	$T_p = 7.21$ kN/m ²	Fixed
2	-0.15	-0.84	0.85	-0.84	1.00	17.54	$T_p = 14.43$ kN/m ²	Fixed
3	-0.24	-1.26	0.76	-1.26	1.00	17.54	$T_p = 23.50$ kN/m ²	Fixed

Surcharge

No.	Type	Type of action	Location z [m]	Origin x [m]	Length l [m]	Width b [m]	Slope α [°]	Magnitude		
								q, q ₁ , f, F, x	q ₂ , z	unit
1	strip	variable	on terrain	x = 1.20	l = 10.00		0.00	10.00		kN/m ²

Surcharges

No.	Name
1	10kPa

Water

Water type : No water

Tensile crack

Tensile crack not input.

Earthquake

Earthquake not included.

Settings of the stage of construction

Design situation : permanent

Results (Stage of construction 1)

Analysis 1

Circular slip surface

Slip surface parameters					
Center :	x =	-1.65	[m]	Angles :	$\alpha_1 =$
	z =	2.56	[m]		$\alpha_2 =$
					-13.40 [°]
					56.20 [°]

Slip surface parameters

Radius : R = 4.52 [m]

The slip surface after optimization.

Reinforcement bearing capacity

Combination 1

Reinforcement Bearing capacity [kN/m]

1	0.00
2	0.00
3	0.00

Combination 2

Reinforcement Bearing capacity [kN/m]

1	0.00
2	0.00
3	0.00

Slope stability verification (Bishop)

Combination 1

Sum of active forces : $F_a = 39.60$ kN/mSum of passive forces : $F_p = 46.91$ kN/mSliding moment : $M_a = 164.72$ kNm/mResisting moment : $M_p = 195.13$ kNm/m

Utilization : 84.4 %

Slope stability ACCEPTABLE

Combination 2

Sum of active forces : $F_a = 35.03$ kN/mSum of passive forces : $F_p = 35.47$ kN/mSliding moment : $M_a = 158.33$ kNm/mResisting moment : $M_p = 160.33$ kNm/m

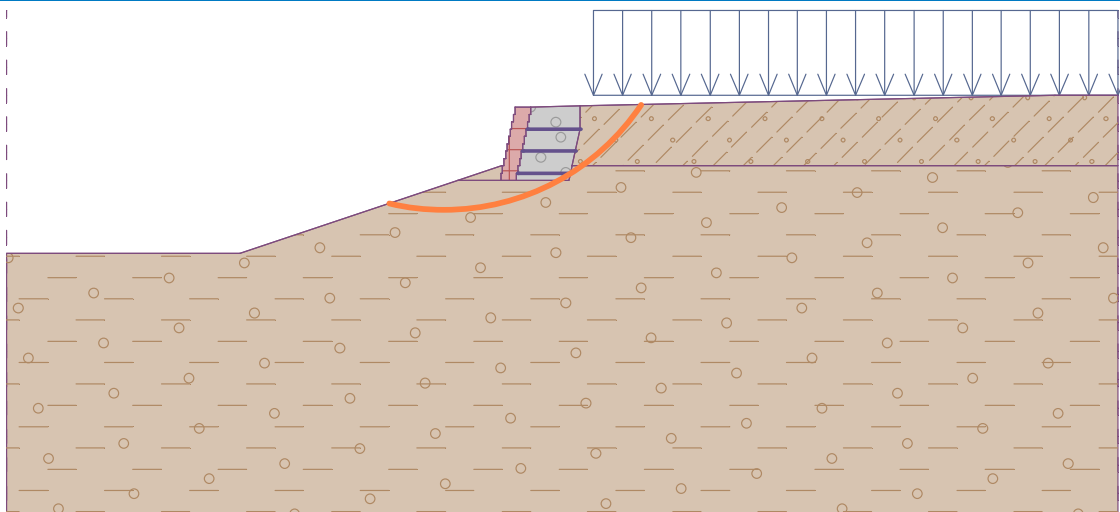
Utilization : 98.8 %

Slope stability ACCEPTABLE

Optimized slip surface for : Combination 2

Name : Analysis

Stage - analysis : 1 - 1



Analysis of reinforced slopes

Input data

Project

Task : New Goetre Primary School
 Part : Section C-C
 Description : Flex MSE Wall
 Customer : Gravitas
 Author : THZ
 Date : 11/12/2025
 Project ID : REV 0
 Project number : 25-6222-F1

Settings

BS 8006 - MSE Wall

Materials and standards

Concrete structures : EN 1992-1-1 (EC2)
 Coefficients EN 1992-1-1 : standard

Wall analysis

Active earth pressure calculation : Coulomb
 Passive earth pressure calculation : Caquot-Kerisel
 Earthquake analysis : Mononobe-Okabe
 Shape of earth wedge : Calculate as skew
 Allowable eccentricity : 0.333
 Internal stability : Standard - straight slip surface
 Verification methodology : according to BS 8006

Partial factors of soil properties			
Partial factor on internal friction :	f_{ms}	=	1.00 [-]
Partial factor on effective cohesion :	f_{ms}	=	1.60 [-]
Partial factor on undrained shear strength :	f_{ms}	=	1.00 [-]
Resistance factors			
Resistance factor on sliding :	f_s	=	1.20 [-]
Resistance factor on bearing capacity :	f_{ms}	=	1.35 [-]
Resistance factor for pullout of reinforcement :	f_p	=	1.30 [-]
Partial factors of slip on reinforcement :	f_s	=	1.30 [-]
Partial factors - wall			
		Combination A	Combination B
Dead load of structural components :	f_{fs}	1.50 [-]	1.00 [-]
Earth pressure - active :	f_{fs}	1.50 [-]	1.50 [-]
Permanent load - on the block :	f_f	1.50 [-]	1.00 [-]
Permanent load - behind the block :	f_f	1.50 [-]	1.50 [-]
Variable load - on the block :	f_q	1.50 [-]	0.00 [-]
Variable load - behind the block :	f_q	1.50 [-]	1.50 [-]
Partial factors - slope			
Dead load of structural components :	f_{fs}	=	1.50 [-]

Partial factors - slope

Earth surcharge load (permanent) :	$f_f =$	1.20 [-]
Live load surcharge :	$f_q =$	1.30 [-]

Stability analysis

Verification methodology : according to EN 1997

Design approach : 1 - reduction of actions and soil parameters

Partial factors on actions (A)**Permanent design situation**

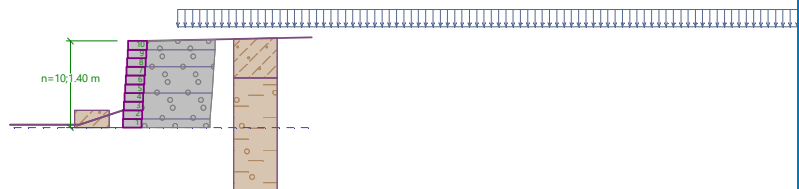
		Combination 1		Combination 2	
		Unfavourable	Favourable	Unfavourable	Favourable
Permanent actions :	$\gamma_G =$	1.35 [-]	1.00 [-]	1.00 [-]	1.00 [-]
Variable actions :	$\gamma_Q =$	1.50 [-]	0.00 [-]	1.30 [-]	0.00 [-]
Water load :	$\gamma_w =$	1.00 [-]		1.00 [-]	

Partial factors for soil parameters (M)**Permanent design situation**

		Combination 1		Combination 2	
Partial factor on internal friction :	$\gamma_\phi =$	1.00 [-]		1.25 [-]	
Partial factor on effective cohesion :	$\gamma_c =$	1.00 [-]		1.25 [-]	
Partial factor on undrained shear strength :	$\gamma_{cu} =$	1.00 [-]		1.40 [-]	

Geometry of structure

Number of blocks $n = 10$
 Block height $h = 0.14$ m
 Block width $b = 0.30$ m
 Block offset $o_1 = 0.01$ m

Name : Geometry**Stage - analysis : 1 - 0****Material****Block material**

Unit weight $\gamma = 12.00$ kN/m³
 Cohesion $c = 0.00$ kPa
 Friction $f = 0.445$

Shear bearing capacity of joint $R_s = 0.00$ kN/m

Reinforced soil - Class 6I

Reinforcement

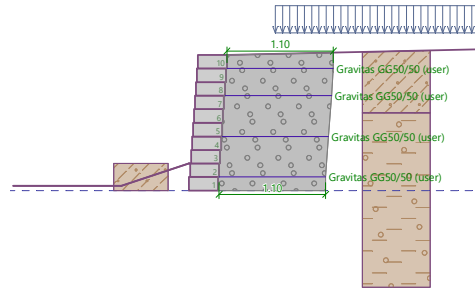
Total number of input reinforcements : 4.

Reinforcement details

Block No.	Type of reinforcement	Origin I_1 [m]	End I_2 [m]	Height from bottom y [m]	Length l [m]
2	Gravitas GG50/50 (user)	-0.08	1.02	0.14	1.10
5	Gravitas GG50/50 (user)	-0.05	1.05	0.56	1.10
8	Gravitas GG50/50 (user)	-0.02	1.08	0.98	1.10
10	Gravitas GG50/50 (user)	0.00	1.10	1.26	1.10

Name : Reinforcement

Stage - analysis : 1 - 0



Soil parameters

Class 6I

Unit weight : $\gamma = 19.00$ kN/m³
 Angle of internal friction : $\phi_{ef} = 35.00^\circ$
 Cohesion of soil : $c_{ef} = 0.00$ kPa
 Angle of friction struc.-soil : $\delta = 23.33^\circ$
 Saturated unit weight : $\gamma_{sat} = 20.00$ kN/m³

Firm CLAY/ MD SAND (MADE GROUND)

Unit weight : $\gamma = 19.00$ kN/m³
 Angle of internal friction : $\phi_{ef} = 28.00^\circ$
 Cohesion of soil : $c_{ef} = 0.00$ kPa
 Angle of friction struc.-soil : $\delta = 18.67^\circ$
 Saturated unit weight : $\gamma_{sat} = 20.00$ kN/m³

Compacted MADE GROUND

Unit weight : $\gamma = 19.00$ kN/m³
 Angle of internal friction : $\phi_{ef} = 30.00^\circ$
 Cohesion of soil : $c_{ef} = 0.00$ kPa
 Angle of friction struc.-soil : $\delta = 20.00^\circ$
 Saturated unit weight : $\gamma_{sat} = 20.00$ kN/m³

Geological profile and assigned soils**Position information**

Terrain elevation = 0.00 m

Geological profile and assigned soils

No.	Thickness of layer t [m]	Depth z [m]	Altitude [m]	Assigned soil	Pattern
1	0.60	0.00 .. 0.60	0.00 .. -0.60	Firm CLAY/ MD SAND (MADE GROUND)	
2	-	0.60 .. ∞	-0.60 .. -	Compacted MADE GROUND	

Terrain profile

Terrain behind construction has the slope 1: 46.00 (slope angle is 1.25 °).

Water influence

GWT behind the structure lies at a depth of 1.40 m

GWT in front of the structure lies at a depth of 1.40 m

Subgrade at the heel is not permeable.

Uplift in foot. bottom due to different pressures is not considered.

Input surface surcharges

No.	Surcharge new	change	Action	Mag.1 [kN/m ²]	Mag.2 [kN/m ²]	Ord.x x [m]	Length l [m]	Depth z [m]
1	Yes		variable	10.00		0.50	10.00	on terrain

No.	Name
1	10kPa

Resistance on front face of the structure

Resistance on front face of the structure: not considered

Soil on front face of the structure - Firm CLAY/ MD SAND (MADE GROUND)

Soil thickness in front of structure h = 0.28 m

Terrain shape in front of structure

No.	Coordinate x[m]	Depth z[m]
1	0.00	0.00
2	0.00	-0.28
3	-0.01	-0.28
4	-0.71	-0.05
5	-1.71	-0.05

Origin [0,0] is located in bottom left edge of construction.

Positive coordinate +z has downward direction.

Settings of the stage of construction

Coeff. for structure types : slope

Verification No. 1**Forces acting on construction**

Name	F _{hor} [kN/m]	App.Pt. z [m]	F _{vert} [kN/m]	App.Pt. x [m]	Coeff. overtur.	Coeff. sliding	Coeff. stress
Weight - reinforced soil	0.00	-0.71	29.63	0.90	1.000	1.000	1.500
Active pressure	4.79	-0.49	2.29	1.43	1.500	1.500	1.500
Water pressure	0.00	-1.42	0.00	2.50	1.000	1.000	1.200
10kPa	3.93	-0.71	1.87	1.45	1.300	1.300	1.300
Weight - wall	0.00	-0.70	5.04	0.20	1.000	1.000	1.500
10kPa	0.00	-1.42	6.00	1.19	0.000	0.000	1.300

Verification of complete wall

Check for overturning stability

Resisting moment $M_{res} = 36.08 \text{ kNm/m}$

Overturning moment $M_{ovr} = 7.13 \text{ kNm/m}$

Wall for overturning is SATISFACTORY

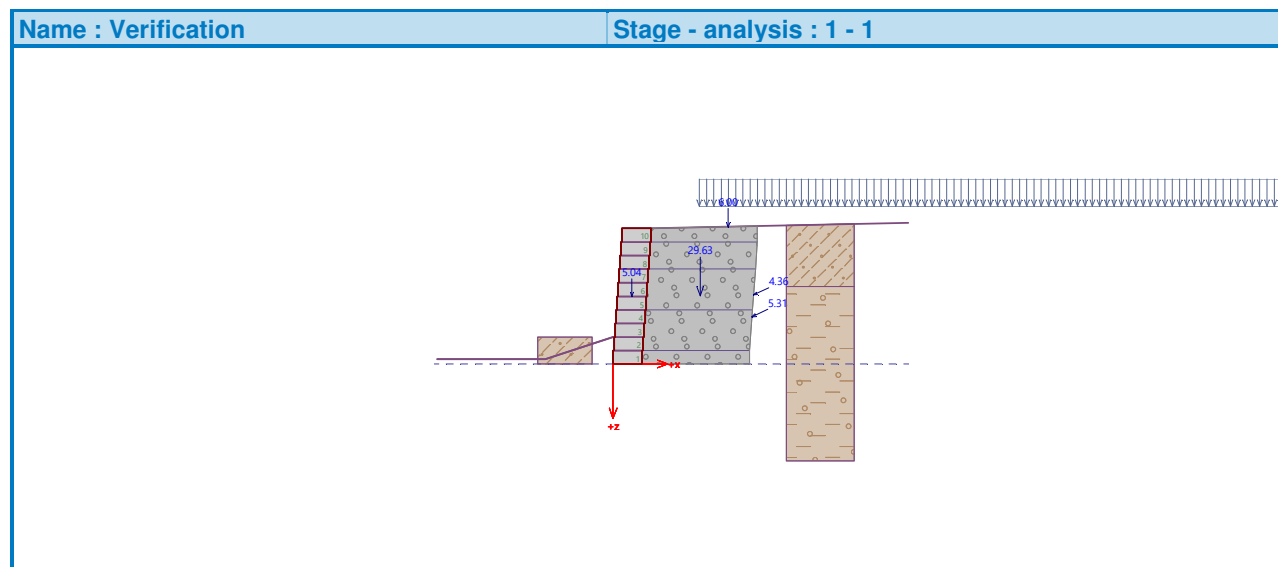
Check for slip

Resisting horizontal force $H_{res} = 19.51 \text{ kN/m}$

Active horizontal force $H_{act} = 12.30 \text{ kN/m}$

Wall for slip is SATISFACTORY

Overall check - WALL is SATISFACTORY



Dimensioning No. 1

Forces acting on construction

Name	F _{hor} [kN/m]	App.Pt. z [m]	F _{vert} [kN/m]	App.Pt. x [m]	Coeff. overtur.	Coeff. sliding	Coeff. stress
Weight - wall	0.00	-0.42	3.02	0.18	1.000	1.000	1.500
Active pressure	1.52	-0.28	0.66	0.32	1.500	1.500	1.500
Water pressure	0.00	-0.84	0.00	0.35	1.000	1.000	1.200
10kPa	1.16	-0.25	0.50	0.31	1.300	1.300	1.300
Reinforcement	-5.65	-0.42	0.00	0.85	1.000	1.000	1.000

Name	F_{hor} [kN/m]	App.Pt. z [m]	F_{vert} [kN/m]	App.Pt. x [m]	Coeff. overtur.	Coeff. sliding	Coeff. stress
Reinforcement	-1.51	-0.70	0.00	1.02	1.000	1.000	1.000

Check of construction joint above the most utilized block No.: 4

Check for overturning stability

Resisting moment $M_{res} = 4.47$ kNm/m

Overturning moment $M_{ovr} = 1.02$ kNm/m

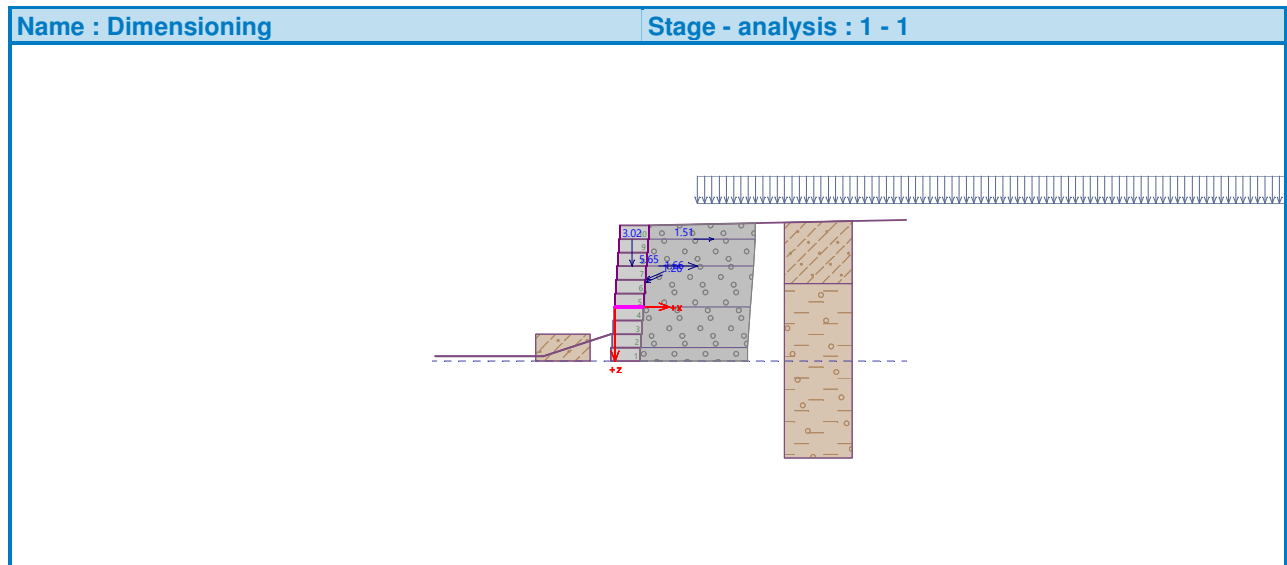
Joint for overturning stability is SATISFACTORY

Check for slip

Resisting horizontal force $H_{res} = 7.69$ kN/m

Active horizontal force $H_{act} = 3.79$ kN/m

Joint for slip is SATISFACTORY



Bearing capacity of foundation soil

Design load acting at the center of footing bottom

No.	Moment [kNm/m]	Norm. force [kN/m]	Shear Force [kN/m]	Eccentricity [-]	Stress [kPa]
1	-6.07	65.68	12.30	0.000	46.91
2	-0.57	40.54	12.30	0.000	28.96

Service load acting at the center of footing bottom

No.	Moment [kNm/m]	Norm. force [kN/m]	Shear Force [kN/m]
1	-4.25	44.83	8.72

Verification of foundation soil

Stress in the footing bottom : rectangle

Eccentricity verification

Max. eccentricity of normal force $e = 0.000$

Maximum allowable eccentricity $e_{alw} = 0.333$

Eccentricity of the normal force is SATISFACTORY

Verification of bearing capacity

Bearing capacity of foundation soil $R = 80.00 \text{ kPa}$

Partial factor on bearing capacity $\gamma_{Rv} = 1.35$

Max. stress at footing bottom $\sigma = 46.91 \text{ kPa}$

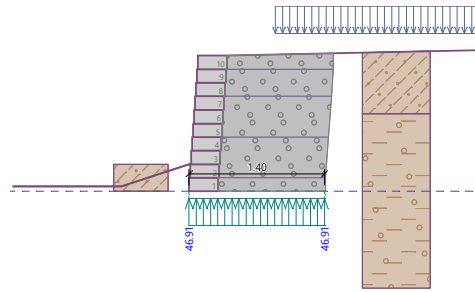
Bearing capacity of foundation soil $R_d = 59.26 \text{ kPa}$

Bearing capacity of foundation soil is SATISFACTORY

Overall verification - bearing capacity of found. soil is SATISFACTORY

Name : Bearing cap.

Stage - analysis : 1 - -1



Verification of slip on georeinforcement No. 1

Forces acting on construction (verification of most utilized reinforcement)

Name	F_{hor} [kN/m]	App.Pt. z [m]	F_{vert} [kN/m]	App.Pt. x [m]	Design coefficient
Weight - wall	0.00	-0.63	4.54	-0.10	1.000
Active pressure	3.91	-0.44	1.88	1.14	1.500
10kPa	3.56	-0.64	1.67	1.15	1.300
Weight - reinforced soil	0.00	-0.64	26.66	0.59	1.000
10kPa	0.00	-1.28	6.10	0.89	0.000
Reinforcement	-0.01	0.00	0.00	1.11	1.000
Reinforcement	-0.02	-0.42	0.00	1.14	1.000
Reinforcement	-0.01	-0.84	0.00	1.17	1.000
Reinforcement	-0.01	-1.12	0.00	1.19	1.000

Check for slip along geo-reinforcement with the maximal utilization (Reinforc. No.: 1)

Inclination of slip surface = 86.00°
 Overall normal force acting on reinforcement = 31.66 kN/m
 Coefficient of reduction of slip along geo-textile = 0.85
 Resistance along geo-reinforcement = 18.84 kN/m
 Wall resistance = 2.02 kN/m

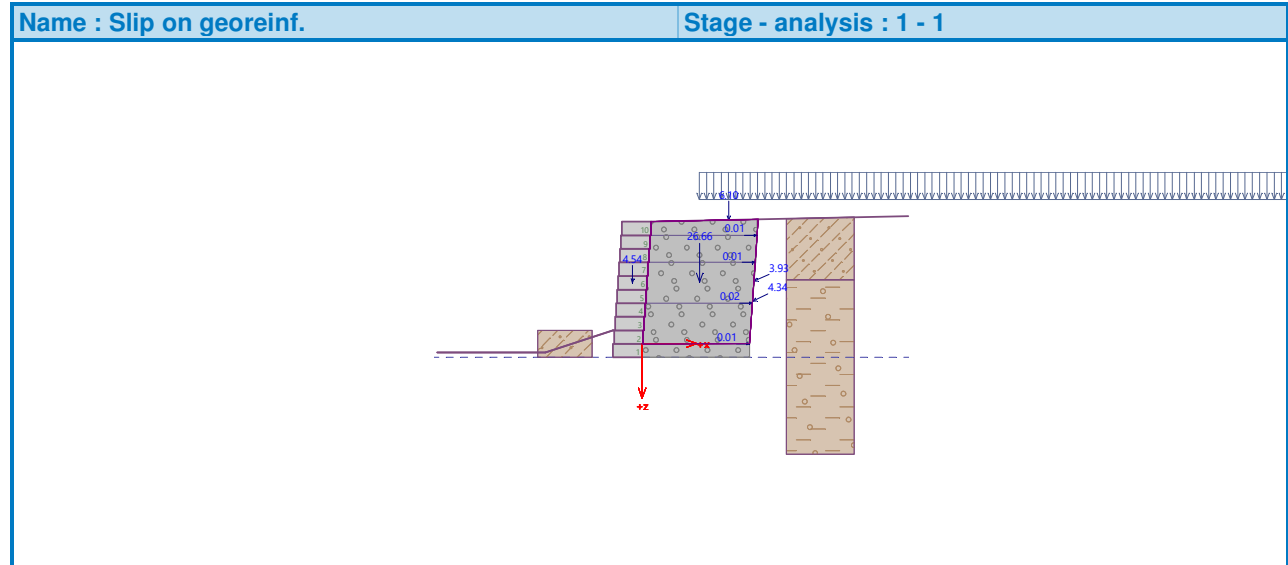
Overall bearing capacity of reinforcements = 0.04 kN/m

Check for slip:

Resisting horizontal force $H_{res} = 16.08 \text{ kN/m}$

Active horiz. force $H_{act} = 10.49 \text{ kN/m}$

Slip along geotextile is SATISFACTORY



Calculation of internal stability No. 1

Calculated forces and strength of reinforcements

No.	Name	F _x [kN/m]	Depth z[m]	R _t [kN/m]	Utiliz. [%]	T _p [kN/m]	Utiliz. [%]
1	Gravitas GG50/50 (user)	-3.59	1.26	17.54	20.47	22.79	15.76
2	Gravitas GG50/50 (user)	-3.37	0.84	17.54	19.20	12.22	27.56
3	Gravitas GG50/50 (user)	-1.81	0.42	17.54	10.32	4.67	38.74
4	Gravitas GG50/50 (user)	-0.26	0.14	17.54	1.46	1.31	19.52

Check for tensile strength (reinforcement No.1)

Tension strength $R_t = 17.54 \text{ kN/m}$

Force in reinforcement $F_x = 3.59 \text{ kN/m}$

Reinforcement for tensile strength is SATISFACTORY

Check for pull out resistance (reinforcement No.3)

Pull out resistance $T_p = 4.67 \text{ kN/m}$

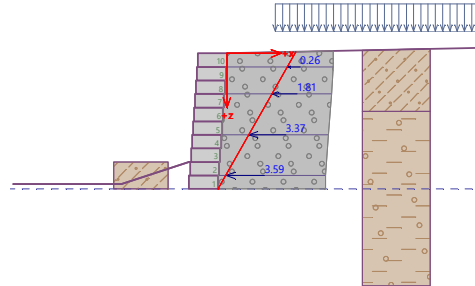
Force in reinforcement $F_x = 1.81 \text{ kN/m}$

Reinforcement for pull out resistance is SATISFACTORY

Overall verification - reinforcement is SATISFACTORY

Name : Internal stability

Stage - analysis : 1 - 1



Slope stability analysis

Input data

Project

Settings

BS 8006 - MSE Wall

Wall analysis

Partial factors of soil properties			
Partial factor on internal friction :	f_{ms} =	1.00	[-]
Partial factor on effective cohesion :	f_{ms} =	1.60	[-]
Partial factor on undrained shear strength :	f_{ms} =	1.00	[-]
Resistance factors			
Resistance factor on sliding :	f_s =	1.20	[-]
Resistance factor on bearing capacity :	f_{ms} =	1.35	[-]
Resistance factor for pullout of reinforcement :	f_p =	1.30	[-]
Partial factors of slip on reinforcement :	f_s =	1.30	[-]
Partial factors - wall			
		Combination A	Combination B
Dead load of structural components :	f_{fs} =	1.50 [-]	1.00 [-]
Earth pressure - active :	f_{fs} =	1.50 [-]	1.50 [-]
Permanent load - on the block :	f_f =	1.50 [-]	1.00 [-]
Permanent load - behind the block :	f_f =	1.50 [-]	1.50 [-]
Variable load - on the block :	f_q =	1.50 [-]	0.00 [-]
Variable load - behind the block :	f_q =	1.50 [-]	1.50 [-]

Partial factors - slope

Dead load of structural components :	$f_{fs} =$	1.50 [-]
Earth surcharge load (permanent) :	$f_f =$	1.20 [-]
Live load surcharge :	$f_q =$	1.30 [-]

Stability analysis

Earthquake analysis : Standard
 Verification methodology : according to EN 1997
 Design approach : 1 - reduction of actions and soil parameters

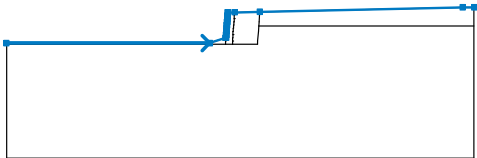
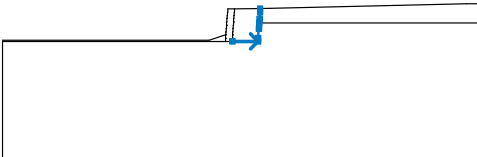
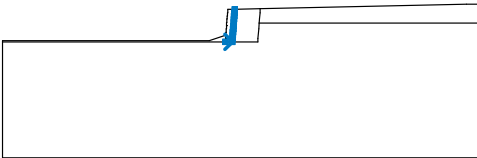
Partial factors on actions (A)**Permanent design situation**

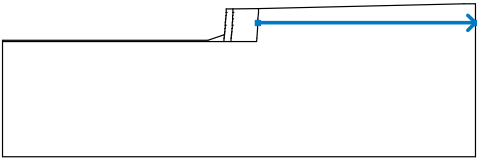
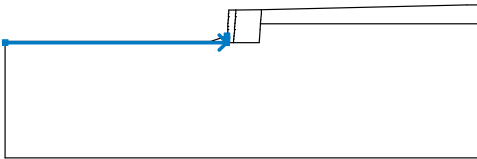
		Combination 1		Combination 2	
		Unfavourable	Favourable	Unfavourable	Favourable
Permanent actions :	$\gamma_G =$	1.35 [-]	1.00 [-]	1.00 [-]	1.00 [-]
Variable actions :	$\gamma_Q =$	1.50 [-]	0.00 [-]	1.30 [-]	0.00 [-]
Water load :	$\gamma_w =$	1.00 [-]		1.00 [-]	

Partial factors for soil parameters (M)**Permanent design situation**

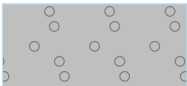
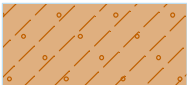
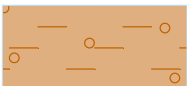
		Combination 1	Combination 2
Partial factor on internal friction :	$\gamma_\phi =$	1.00 [-]	1.25 [-]
Partial factor on effective cohesion :	$\gamma_c =$	1.00 [-]	1.25 [-]
Partial factor on undrained shear strength :	$\gamma_{cu} =$	1.00 [-]	1.40 [-]

Interface

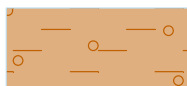
No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		-10.00	-1.35	-1.09	-1.35	-0.39	-1.12
		-0.38	-1.12	-0.37	-1.12	-0.37	-0.98
		-0.36	-0.98	-0.36	-0.84	-0.35	-0.84
		-0.35	-0.70	-0.34	-0.70	-0.34	-0.56
		-0.33	-0.56	-0.33	-0.42	-0.32	-0.42
		-0.32	-0.28	-0.31	-0.28	-0.31	-0.14
		-0.30	-0.14	-0.30	0.00	0.00	0.00
		1.10	0.02	10.00	0.22	10.50	0.22
2		-0.09	-1.40	1.01	-1.40	1.02	-1.26
		1.05	-0.84	1.07	-0.60	1.08	-0.42
		1.10	-0.14	1.10	0.02		
3		-0.39	-1.40	-0.09	-1.40	-0.09	-1.26
		-0.08	-1.26	-0.08	-1.12	-0.07	-1.12
		-0.07	-0.98	-0.06	-0.98	-0.06	-0.84
		-0.05	-0.84	-0.05	-0.70	-0.04	-0.70
		-0.04	-0.56	-0.03	-0.56	-0.03	-0.42
		-0.02	-0.42	-0.02	-0.28	-0.01	-0.28
		-0.01	-0.14	0.00	-0.14	0.00	0.00

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
4		1.07	-0.60	10.50	-0.60		
5		-10.00	-1.40	-0.39	-1.40	-0.39	-1.26
		-0.38	-1.26	-0.38	-1.12		

Soil parameters - effective stress state

No.	Name	Pattern	Φ_{ef} [°]	C_{ef} [kPa]	γ [kN/m ³]
1	Class 6I		35.00	0.00	19.00
2	Firm CLAY/ MD SAND (MADE GROUND)		28.00	0.00	19.00
3	Compacted MADE GROUND		30.00	0.00	19.00

Soil parameters - uplift

No.	Name	Pattern	γ_{sat} [kN/m ³]	γ_s [kN/m ³]	n [-]
1	Class 6I		20.00		
2	Firm CLAY/ MD SAND (MADE GROUND)		20.00		
3	Compacted MADE GROUND		20.00		

Soil parameters

Class 6I

Unit weight : $\gamma = 19.00$ kN/m³

Stress-state : effective

Angle of internal friction : $\Phi_{ef} = 35.00^\circ$ Cohesion of soil : $C_{ef} = 0.00$ kPa

Saturated unit weight : $\gamma_{\text{sat}} = 20.00 \text{ kN/m}^3$

Firm CLAY/ MD SAND (MADE GROUND)

Unit weight : $\gamma = 19.00 \text{ kN/m}^3$

Stress-state : effective

Angle of internal friction : $\phi_{\text{ef}} = 28.00^\circ$

Cohesion of soil : $c_{\text{ef}} = 0.00 \text{ kPa}$

Saturated unit weight : $\gamma_{\text{sat}} = 20.00 \text{ kN/m}^3$

Compacted MADE GROUND

Unit weight : $\gamma = 19.00 \text{ kN/m}^3$

Stress-state : effective

Angle of internal friction : $\phi_{\text{ef}} = 30.00^\circ$

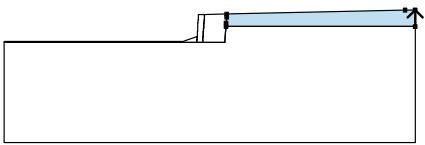
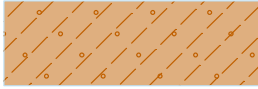
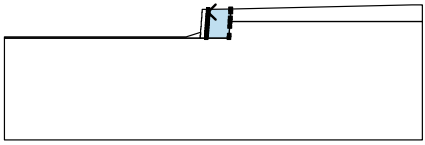
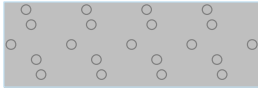
Cohesion of soil : $c_{\text{ef}} = 0.00 \text{ kPa}$

Saturated unit weight : $\gamma_{\text{sat}} = 20.00 \text{ kN/m}^3$

Rigid Bodies

No.	Name	Sample	γ [kN/m ³]
1	Material of structure		12.00

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		10.50	-0.60	10.50	0.22	Firm CLAY/ MD SAND (MADE GROUND) 
		10.00	0.22	1.10	0.02	
		1.10	-0.14	1.08	-0.42	
		1.07	-0.60			
2		0.00	-0.14	-0.01	-0.14	Class 6l 
		-0.01	-0.28	-0.02	-0.28	
		-0.02	-0.42	-0.03	-0.42	
		-0.03	-0.56	-0.04	-0.56	
		-0.04	-0.70	-0.05	-0.70	
		-0.05	-0.84	-0.06	-0.84	
		-0.06	-0.98	-0.07	-0.98	
		-0.07	-1.12	-0.08	-1.12	
		-0.08	-1.26	-0.09	-1.26	
		-0.09	-1.40	1.01	-1.40	
		1.02	-1.26	1.05	-0.84	
		1.07	-0.60	1.08	-0.42	
		1.10	-0.14	1.10	0.02	
		0.00	0.00			

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
3		-0.38	-1.26	-0.39	-1.26	Material of structure
		-0.39	-1.40	-0.09	-1.40	
		-0.09	-1.26	-0.08	-1.26	
		-0.08	-1.12	-0.07	-1.12	
		-0.07	-0.98	-0.06	-0.98	
		-0.06	-0.84	-0.05	-0.84	
		-0.05	-0.70	-0.04	-0.70	
		-0.04	-0.56	-0.03	-0.56	
		-0.03	-0.42	-0.02	-0.42	
		-0.02	-0.28	-0.01	-0.28	
		-0.01	-0.14	0.00	-0.14	
		0.00	0.00	-0.30	0.00	
		-0.30	-0.14	-0.31	-0.14	
		-0.31	-0.28	-0.32	-0.28	
		-0.32	-0.42	-0.33	-0.42	
		-0.33	-0.56	-0.34	-0.56	
		-0.34	-0.70	-0.35	-0.70	
		-0.35	-0.84	-0.36	-0.84	
		-0.36	-0.98	-0.37	-0.98	
		-0.37	-1.12	-0.38	-1.12	
4		-0.39	-1.40	-0.39	-1.26	Firm CLAY/ MD SAND (MADE GROUND)
		-0.38	-1.26	-0.38	-1.12	
		-0.39	-1.12	-1.09	-1.35	
		-10.00	-1.35	-10.00	-1.40	
5		-10.00	-1.40	-10.00	-6.40	Compacted MADE GROUND
		10.50	-6.40	10.50	-0.60	
		1.07	-0.60	1.05	-0.84	
		1.02	-1.26	1.01	-1.40	
		-0.09	-1.40	-0.39	-1.40	

Reinforcements

No.	Point to the left		Point to the right		Length L [m]	Strength R _t [kN/m]	Pull out resist.	End of reinf.
	x [m]	z [m]	x [m]	z [m]				
1	0.00	-0.14	1.10	-0.14	1.10	17.54	T _p = 2.40 kN/m ²	Fixed
2	-0.02	-0.42	1.08	-0.42	1.10	17.54	T _p = 7.21 kN/m ²	Fixed
3	-0.05	-0.84	1.05	-0.84	1.10	17.54	T _p = 15.66 kN/m ²	Fixed
4	-0.08	-1.26	1.02	-1.26	1.10	17.54	T _p = 23.50 kN/m ²	Fixed

Surcharge

THZ	REV 0 Section C-C 25-6222-F1
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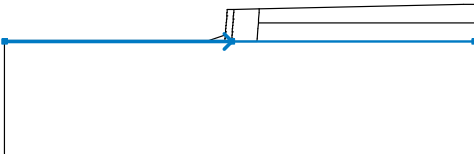
No.	Type	Type of action	Location z [m]	Origin x [m]	Length l [m]	Width b [m]	Slope α [°]	Magnitude q, q ₁ , f, F, x	q ₂ , z	unit
1	strip	variable	on terrain	x = 0.50	l = 10.00		0.00	10.00		kN/m ²

Surcharges

No.	Name
1	10kPa

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		-10.00	-1.40	-0.09	-1.40	10.50	-1.40

Tensile crack

Tensile crack not input.

Earthquake

Earthquake not included.

Settings of the stage of construction

Design situation : permanent

Results (Stage of construction 1)

Analysis 1

Circular slip surface

Slip surface parameters					
Center :	x =	-0.62 [m]	Angles :	α_1 =	-34.32 [°]
	z =	0.88 [m]		α_2 =	71.85 [°]
Radius :	R =	2.70 [m]			
The slip surface after optimization.					

Reinforcement bearing capacity

Combination 1

Reinforcement Bearing capacity [kN/m]

1	0.00
2	0.00
3	0.00
4	0.05

Combination 2

Reinforcement Bearing capacity [kN/m]

1	0.00
---	------

2	0.00
3	0.00
4	0.00

Slope stability verification (Bishop)**Combination 1**Sum of active forces : $F_a = 41.67 \text{ kN/m}$ Sum of passive forces : $F_p = 48.82 \text{ kN/m}$ Sliding moment : $M_a = 107.93 \text{ kNm/m}$ Resisting moment : $M_p = 126.44 \text{ kNm/m}$

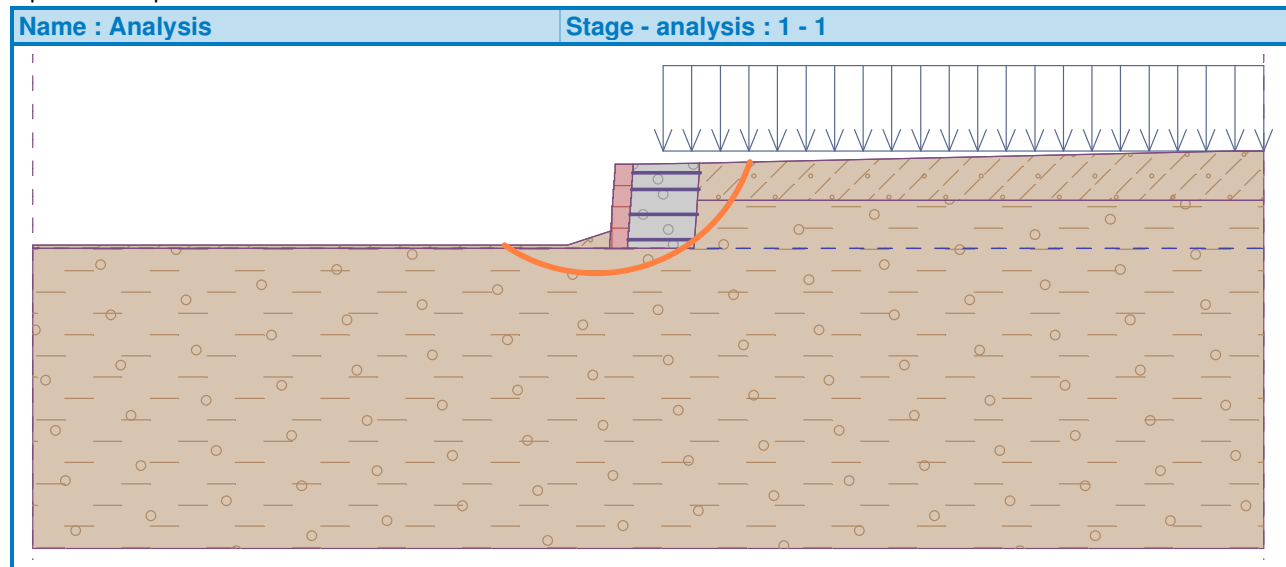
Utilization : 85.4 %

Slope stability ACCEPTABLE**Combination 2**Sum of active forces : $F_a = 34.71 \text{ kN/m}$ Sum of passive forces : $F_p = 34.94 \text{ kN/m}$ Sliding moment : $M_a = 93.72 \text{ kNm/m}$ Resisting moment : $M_p = 94.35 \text{ kNm/m}$

Utilization : 99.3 %

Slope stability ACCEPTABLE

Optimized slip surface for : Combination 2



FLEX MSE Specification Terminology

(Direct Name) Flex MSE BBA HAPAS Accredited Vegetated Wall System

(Indirect Name) BBA HAPAS Accredited (120 years) Geomodular Vegetated Wall System

Accreditations

EPD Certification

120 year design life - BBA HAPAS Accredited

75 year manufacturer's warranty

Manufactured/Distributed under UKAS Accredited ISO9001 & ISO14001

Flex MSE Interlocking plates

Flex MSE branded plate – arrow marking face of wall.

Dimension Spec:

Length: 285mm

Width: 99mm

Spikes: 11

Friction strips: 2

Weights 63g

Plate Description: Branded Plate is composed of 100% polypropylene (100% recycled post industrial content), must be weather resistant to minus 30 Degrees Celsius and must be 100% recyclable. 3 conical spikes protrude from the top and 8 conical spikes protrude from the bottom of the unit to interlock a total of 2 filled Bags.

2 'Friction Strips' with Geogrid Hooks cross the width of the top of the Plate, providing additional shear strength and frictional contact.

The Plate is to be used in all applications, including those using geogrid for reinforced walls and slopes, gravity walls, and erosion control applications at a 1:1 ratio with the bags.

Flex MSE Geotextile bag

Flex MSE Labelled bags

Dimensions filled Spec (Max Optimum 10% tolerance):

Height: 140mm

Length: 760mm

Width: 300mm

Weight approx. 32kg



Bag Description: The labelled GTX Bag is sewn from a proprietary non-woven geotextile polypropylene that will not rot or mildew, is non-biodegradable and able to withstand significant cutting or tearing without negatively affecting system performance. Bags provide a filtering functionality and are water permeable and root friendly. Bags have met all applicable ASTM standards for geotextile testing (as seen below):

Weight (typical) ASTM D5261
Grab Tensile ASTM D4632
Grab Elongation ASTM D4632
Trap Tear ASTM D4533
CBR Puncture ASTM D6241
Mullen Burst ASTM D6786 (modified)
A.O.S. ASTM D 4751, h)
Permittivity ASTM D 4491
Water Flow ASTM D 4491
U.V. Resistance ASTM D4355
ASTM D256

Bag fill content

Walls, Slopes and above Water line applications:

- 1) Freely draining soils and granular materials cleaned of all debris, roots, branches, stones in excess of 20 mm diameter and other deleterious materials. Remove soil contaminated with calcium chloride, toxic materials and petroleum products.
- 2) Properties should include: Approximate Organic Content: 30% by total mixed volume Granular Content smaller than 20 mm - larger than .075mm: 70% by volume (less than 5% Fines by mass)
*Total Fines of mixed Bag medium: Less than 8% by mass Percolations shall be such that no standing water is visible 60 minutes after at least 10 minutes of moderate to heavy rain or irrigation.
- 3) Organic additive materials must be a viable commercial compost product and/or a native soil tested for nutritional content. Bag Fill properties are to be confirmed with an up to date combined sieve and nutritional analysis. .
- 4) Thoroughly mix all constituents of the Bag Fill material.
- 5) Other criteria may be required in project specific Engineer Drawings.

Below Permanent Water line Applications:

Poorly graded clean granular material; maximum 20 mm gravel - minimum particle size 2 mm.

Vegetation

To be retro actively vegetated within 12 months of installation – see advanced installation guidelines.



Declaration of Performance (D.O.P.)

DOP DATE: 03.01.24

To whom it may concern,



This is to confirm that Flex MSE complies with/to the following testing standards and accredited bodies based on the claims seen below, Manufactured in the Republic of Ireland (ROI).

Gravitas (International) Ltd Manufactures and Distributes under UKAS Accredited:

BS EN ISO 9001:2015

BS EN ISO 14001:2015

BS EN ISO 45001:2018

LONGEVITY AND DURABILITY OF THE FLEXMSE SYSTEM

The Flex MSE system is designed to provide a permanent vegetated solution in soil retention and slope stability applications. In ideal conditions, the Flex MSE System is designed to meet the BBA HAPAS design life criteria of 120 years where full vegetated cover, screening all potential UV exposure, is achieved within 1,000 hours of Peak UV exposure after installation. The geotextiles used in the construction of a Flex MSE wall comply with all the relevant American Standards for Testing and Materials (ASTMs).

ASTM 4355 UV Exposure

ASTM D4751 Apparent opening Size

ASTM D4491 Drainage & Filtration

ASTM D5035 Standard Test Method for Breaking Force & Elongation of Textile Fabrics

ASTM D5262 Reinforcement

ASTM D4632 Grab Tensile Strength, Elongation

ASTM D4533 Trap Tear

ASTM D4833 Long Term Design (survivability)

ASTM D6241 CBR Puncture

ASTM D5261 Mass/Unit Weight

The face of the Flex MSE system is designed to become vegetated within one growing season. When it is first built, a growing medium is applied to the face protecting the geotextile bags from the elements. Once the vegetation becomes established, vegetation foliage protects the face while the vegetation root structure increases the system's structural strength.

Soils used for growing medium in the Flex MSE Bag structure must be of reasonable quality to sustain and nurture vegetation as referenced in the Flex MSE specifications, and adherence to the below bodies:

Environmental Product Declaration (EPD) registration number: **S-P-05184**

British Board of Aggregate HAPAS (BBA) number: **22/H6246** - 120 year design life

Managing Director
Jacob Sallon

