Slope Stability Analysis by using SMR and CFC Techniques in and Around of Sirumalai, Dindigul District

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Abstract:- **Landslides are among the major natural disasters in the world. In hilly terrains of India, including Himalayan mountains landslides have been a major and widely spread natural disasters that strike life and property almost perennially and occupy a position of major concern. The present study of slope stability analysis by using SMR and CFC method in and around Sirumalai area of Dindigul District, Tamil Nadu involves in collecting the data from different sources. Pre-field data are collected such as selection of location, Base map, climatic condition, etc., On-field data are acquired by collecting the samples from different places where failures obtained. Post-Field data are done by testing the samples which are collected and obtaining the compressive strength for the rock and Factor of Safety (FOS) for slope failure. Slope stability analysis is done by using the methods of Rock Mass Rating (RMR) and Slope Mass Rating (SMR) for rock slopes and Circular Failure Chart (CFC) method for soil slopes. Based on the field parameters and experimental test, FOS is calculated and predicted slope stability condition. Finally, Remedial measures are to be taken in the necessary places where required. Remedial measures such as decreasing the degree of slope and designed retaining walls.**

INTRODUCTION:

Landslide is a important geo-environmental hazard, which poses major threat to human settlements, communication links like highways and rail routes as well as civil structures like dams, buildings and other structures. Urban centers in the hill often face slope stability problems causing damage to human settlements. The term landslides particularly represent only a type of movement that is slide. However it is generally used as a term to cover all the types of land movements including falls, creeps, spreads, flaws and other complex movements (Varnes, 1978). The slope stability analyses are performed to evaluate the safe and economic design of anthropogenic activities or natural slopes (e.g. embankments, road cuts, open-pit mining, excavations, and landfills). In the assessment of slopes, engineers primarily use factor of safety values to determine how close or far slopes are from failure. When the FOS is greater than 1, resistive shear strength is greater than driving shear stress and the slope is considered stable. When this ratio is close to 1, shear strength is nearly equal to shear stress and the slope is close to failure or critical state, if FOS is less than 1 the slope should have already failed. Slopes either occur naturally or are engineered by humans.

Slope stability problems have been faced throughout history when men and women or nature has disrupted the delicate balance of natural rock and soil slopes. Furthermore, the increasing demand for engineered cut and fill slopes on construction projects has only increased the need to understand analytical methods, investigative tools, and stabilization methods to solve slope stability problems.

An understanding of geology, hydrology, and soil properties is central to applying slope stability principles properly. Analyses must be based upon a model that accurately represents site subsurface conditions, ground behavior, and applied loads. Judgments regarding acceptable risk or safety factors must be made to assess the results of analyses. The analyses are generally carried out at the beginning, and sometimes throughout the life, of projects during planning, design, construction, improvement, rehabilitation, and maintenance. Planners, engineers, geologists, contractors, technicians, and maintenance workers become involved in this process. This chapter is intended for individuals who deal with slope stability problems, including most geotechnical engineers and geologists who have an understanding of geotechnical engineering principles and practice.

The stability problems can be classified as “internal” or "external." "Internal" embankment stability problems generally result from the selection of poor quality embankment materials and/or improper placement of the embankment fills and/or improper placement requirements. The infinite slope failure mode is an example of an “internal” stability problem; often such a failure is manifested as sloughing of the surface of the slope. Internal stability can be assured through project specifications by requiring granular materials with minimum gradation and compaction requirements.

Slope failure processes are the common sites in the hilly terrain. These are one major natural hazard which not only results in the loss of life and property but also can economic burden on the society. Hence, there is a necessity for better methods of landslide evaluation and its zonation.

A natural hazard means the probability of occurrence within a specified period of time and within a given area of a potentially damaging phenomenon. Though hazard is a process and it is very difficult to map a process which has not yet occurred. However, hazard mapping may be defined as “the identification of those sites where there is a likelihood of hazardous events rather than hazard affected sites”.

The conventional limit equilibrium method determines the stability of slope by evaluating of FOS. These methods are based on analysis of slopes, incorporating several engineering parameters of the slope material. This involves collection of samples, evaluation of shear strength properties under field condition and subsequent slope stability analysis. Obviously, this is a detailed investigation process and hence requires significant amount of time and resources. However, this is always needed for a method which can be carried out rapidly for preliminary assessment of slope stability. One such method is RMR and SMR techniques developed by Romana (1985). This method is preliminary based on field data and it is comparatively fast. Hence, the SMR technique is used here for stability assessment of individual rock slopes.

In a rock slope section it is assumed that the failure is controlled by geological features such as discontinuities, joints, fractures etc,. In case of soil, a strongly defined structural pattern no longer exists and the failure surface is free to find the line of least resistance through the slope. The failure surface of the soil generally takes the form of circle and most stability theories are based upon this observation. The conditions under which circular failure will occur in the slope. The CFC charts were produced my means of Hewlett Packard 9100BCalculator with graph plotting facilities. There are five types of charts such as chart 1, 2, 3, 4 & 5 to determine FOS with corresponding of the Ground water conditions. Based on the FOS of rock and soil slopes, the remedial can be suggested for further development of an area. In this research is aimed to find unstable slopes and suggest suitable control measures in Sirumalai, Dindigul district, Tamil Nadu.

OBJECTIVES:

- Preparation of detailed base map of the study area (Sirumalai), to understand the geological structures, the causative factors and type of failures.
- Estimating rock mass (RMR) properties particularly shear strength properties using laboratory and field methods.
- Calculation of SMR for different segments to identify unstable rock slopes.
- Calculating Factor of Safety (FOS) of soil slopes using Circular Failure Chart (CFC) method and to identify unstable rock slopes.
- Identification of short term and long term remedial measures for slope stability.

SCOPE OF WORK:

- To understand the development and form of natural and manmade slopes and the processes responsible for different features.
- To assess the stability of slopes under short-term (often during construction) and long-term conditions.
- To assess the possibility of slope failure involving natural or existing engineered slopes.
- To reduce the landslides occurs in the future.
- To provide the safest side for the peoples living in that area

STUDY AREA AND METHODS:

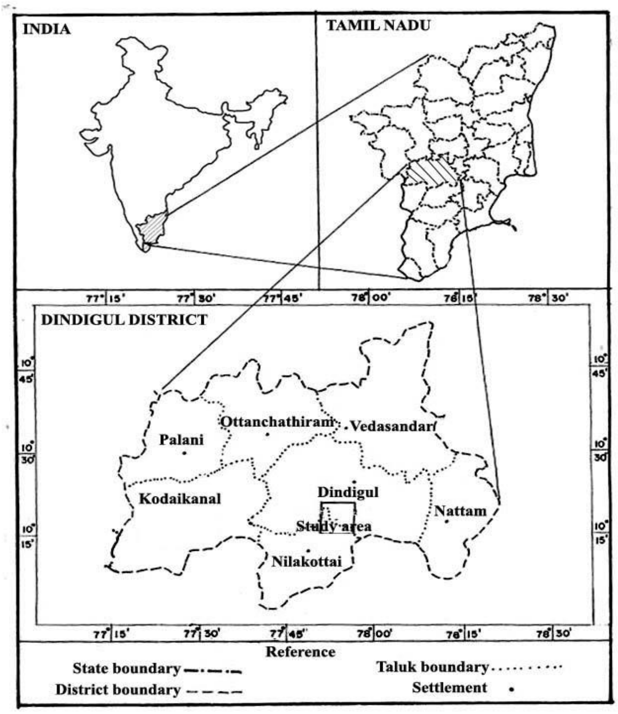
4.1. STUDY AREA

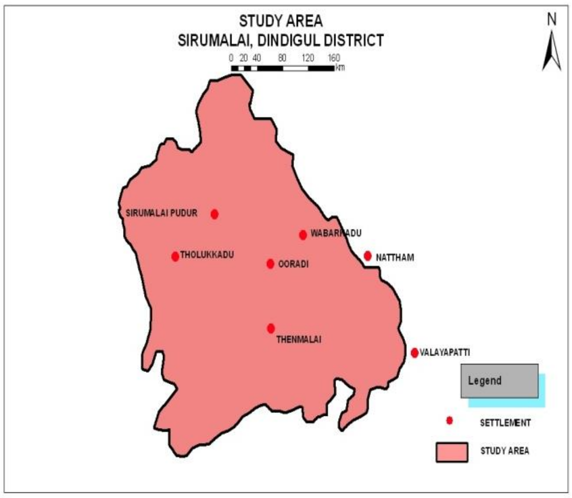
4.1.1. GENERAL

Sirumalai is a Hilly region of 60,000 acres and it is situated at 25km from Dindigul and 90km from Madurai, Tamil Nadu, India (Figure 3.1). Sirumalai is a dense forest region with a moderate climate throughout the year. It is with an altitude of 1600 meters above sea level. The hill has 18 hairpin bends. On the 18^{th} hairpin bend, a view point of Dindigul city will be there. Sirumalai hills is about 19.3km long and 12.8km broad with an area of $247km^2$. Starting from Nadukandamalai in the northeast, one ridge slopes down in the northwest to Reddiapatti. The only motorable Ghats road is on this slope. Another ridge runs northwest for 4.8 km, and abruptly descends to Ambathurai. Two ridges diverge from Pudur village (1100 m), on the southern slope of Nadukandamalai, one running west, the other south. The latter, after some 1.6 km, slopes down north of Kodaikanal Road Railway station; the inner one, after reaching Ayyanar hills (1040m) continues south and forms the western ridge. The southern ridge of Sirumalai hills slopes down to Sattiar valley at the eastern end. The eastern side has a continuous ridge for 20km, starting at Annanagar of Sirumalai 33 Palayaur and sloping down to Sattiar valley via Kadamankulam, Madhagamalai and Waverkadu. From the eastern slope, two ridges slope down to Thavasinnadai and Anjukulipatti. The main peaks are Mullupanrimalai (1380m) in the north-east, Vellimalai (1350m) in the north, Kaluguparai (1350m) in the south and Madhagamalai (1250m) in the north.

4.1.2. GEOLOGY AND SOIL

Geographically, Sirumalai Hills is an archaean formation several hundred million year old, without stratification and devoid of fossils. The rocks are gneissic referred to as charnokite, consisting of mica, felspar and quartz. The soil is a sandy loam, low in bases, high in sesquioxides, with signs of leaching. The soil pH is 6.8 to 7.2. In the high altitudes, the soil is a few centimeters black humus, to some extent depending upon the nature of the vegetation.





4.1.3. CLIMATE

The maximum and minimum temperatures are in the months of May (29.2°C) and January (18.3°C) respectively. The annual rainfall is around 1200 mm per year, with approximately 75 rainy days in two seasons. The maximum rainfall is received from the North-East monsoon (October-November). April, June is noted as the hot summer season. The humidity is maximum in the rainy months (91%) and minimum in the summer months (68%).

4.2. METHODOLOGY

4.2.1. PRE-FIELD WORKS:

4.2.1.1. TOPOSHEET MAP COLLECTION:

The top sheet is the map prepared by the government of the country, on the purpose of study and identification of natural and artificial features. We selected the study area as Sirumalai, Dindigul district, as many landslides occurred in recent years. The top sheet of the study area is collected from the Survey of India.

The toposheet no: 58 F/7, 8, 11 & 12. The toposheet map helps to identified the exact location of study are along with the surrounding features.

4.2.1.2. Base Map Preparation:

The base map is the reference of the selected area of study containing the data related to the project work. It is prepared from the top sheet map.

4.2.1.3. Field Table Preparation

- Location detail table
- Field data table
- RMR and SMR value table
- Rock sample test table
- Soil sample test table

4.2.2. ON FIELD WORKS:

4.2.2.1. SITE IDENTIFICATION:

On moving the field location of Sirumalai hills, the site was located where more rock mass slopes and soil slopes are identified with sliding conditions. The slopes with rock masses of critical condition are selected and marked for investigation. The site of R1, R2, R3, R4& R5 are selected for investigation.

4.2.2.2. COORDINATION COLLECTION BY USING GPS:

Global positioning system (GPS) is a land based technology that work to improve the accuracy of GPS navigation. In this study, GARMIN – Etrex 10 was used to find out exact locations with accuracy of 7m in horizontal and 8m in vertical position. In the field investigation, locations of the selection (rock and soil) with landmark and landslide inventorypoints collected using Global Positioning System.The coordinates are collected from site for easy mapping and result analysis. The Northing, Easting and Elevation values of the location are collected by using GPS and are plotted in the location data table and used while mapping locations.

SI. NO	LOCATION ID	NORTHING	EASTING	ELEVATION IN "m"	LAND MARK
1	R1	10°16'48.84''	77°59'48.324''	547.80m	HB 3/18 →
2	R2	10°16'22.62''	77°59'34.356''	723.40m	HB 6 to 7→
3	R3	10°10'20.544''	77°59'33.523''	728.50m	HB 6 to 7 HB 6th mile stone→
4	R4	10°15'51.585''	77°59'57.486''	916.00m	HB 10/18 13/6 mile stone →
5	R5	10°15'2.156''	77°59'35.49''	1147.70 m	Before HB 18/18 ←

4.2.2.3 RMR PARAMETERS:

Rock Mass Rating (RMR) is an important input parameter of Slope Mass Rating (SMR). The Rock Mass Rating

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(RMR_{basic}) system also known as the Geo-mechanical classification is a rock mass classification developed by Beiniawski (1973) of South Africa Council for Scientific and Industrial Research (CSIR). The following six parameters are used to classify rock mass in the RMR_{basic}system IS 13365 (Part 1): 1998:

i. Compressive strength of rock material/Point load test
ii. Rock Quality Designation
iii. Spacing of Discontinuity
iv. Condition of Discontinuity
v. Ground Water Condition
vi. Orientation of Discontinuities

RMR	ROCK QUALITY
0-21	Very Poor
21-40	Poor
41-60	Fair
61-80	Good
81-100	Very Good

4.2.2.4. SMR PARAMETERS

Slope Mass Rating (SMR) system was developed by Romans (1985) as an application of Bieniawski (1989) Rock Mass $Rating_{basic.}$ In order to assess slope instability, risks parameters are introduced to cover altitude of discontinuities and slope, failure mode (Planar, Wedge, and Toppling) and slope excavation methods. Rock mass quality is evaluated by RMR index. Based on the results, the slopes are classified into different instability classes with risks.

Slope mass Rating is obtained from RMR by adding a factorial adjustment factor depending on the method of excavation.

Case	---	Very Favorable	Favorable	Fair	Unfavorable	Very Unfavorable
P T P/T	$\lvert\alpha_j - \alpha_s\rvert$ $\lvert\alpha_j-\alpha_s-100°\rvert$ **F1**	>30° 0.15	30° - 20° 0.40	20°-10° 0.70	10° - 5° 0.85	<5° 1.00
P T P/T	$\lvert\beta_j\rvert$ F2 **F2**	<20° 0.15 1	20° - 30° 0.40 1	30°-35° 0.70 1	35° - 45° 0.85 1	>45° 1.00 1
P T P/T	$\beta_j - \beta_s$ $\beta_j+\beta_s$ **F3**	>10° <110° 0	10° - 0° 110°-120° -6	0° >120° -25	0° - (-10°) --- -50	<-10° --- -60
			F4			
Blasting method and rating		Natural slope +15	Presplitting +10	Smoothblasting +8	Blasting or Mechanical 0	Deficient Blasting -8

$$SMR = RMR_{basic} + (F1 \times F2 \times F3) + F4$$

P – Planar failure; T – Toppling failure; α_j – Joint dip direction; α_s – Slope dip direction; β_s – Slope dip; β_j – Joint dip

- F1 depends on parallelism between joints and slope face strikes.
- F2 refers to joint dip angle in the planar mode of failure, in a sense, is a measure of the probability of joint shear strength.
- F3 reflects the relationship between slope face and joint dip. Conditions are fair when slope face and joint are parallel. When the slope dips 10° more than joints, very unfavorable condition.

The adjustment factor for the method of excavation is F4 on whether one deals with a natural slope or one excavation, or poor blasting. The potential rock slope sections were selected based on general condition and were subjected to slope stability analysis.

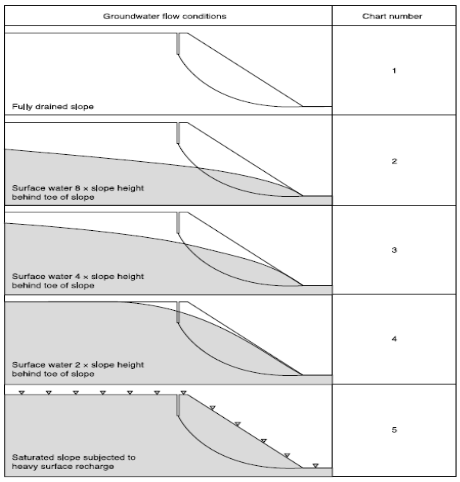
SMR	Class	Description	Stability	Failure	Support
81~100	I	Very good	Completely stable	None	None
61~80	II	Good	Stable	Some blocks	Spot
41~60	III	Fair	Partially stable	Some joints or many wedges	Systematic
21~40	IV	Poor	Unstable	Planar or large wedges	Important / Corrective
0~20	V	Very poor	Completely unstable	Large wedges or circular failure	Re-excavation

4.2.2.5. CIRCULAR FAILURE CHART (CFC) METHOD:

In rock slope section, it is assumed that the failure is controlled by and the failure surface is free to find the line of least resistance through the slope.

Observations of slope failure in soils suggest that this failure surface generally takes the form of a circle and most stability theories are based upon this observation. The conditions under which circular failure will occur arise when the individual particles in a soil or rock mass are very small as compared with the size of the slope and when these particles are not interlocked as a result of their shape.

In order to account for pore water pressure in subsoil and forces due to water present in tension cracks, a series of groundwater flow patterns are assumed.



4.2.2.6. LIMIT EQUILIBRIUM METHOD:

Fundamentals and methods presents basic principles for the safe design of constructed or natural earth slopes. The limit equilibrium method is the most common approach for analyzing slope stability in both two and three dimensions. This method identifies potential failure mechanism and derives factors of safety for particular geo-technical situations. It is an appropriate choice for assessing the stability of retaining walls, shallow and deep foundations, earth and rock dams, surfaces mining sites, and potential landslides.

The Slope which is below 5m Limit Equilibrium Method should be preferred. FOS value should be obtained for both Natural slope and cut slope. The FOS value is obtained by using the following equations.

i) In dry Condition. Zw = Z

$$F = \frac{[(\csc^2\phi_f)/\gamma z] + \tan\phi\,[1 - \left(1 - \frac{Z_w}{Z}\right)\frac{\gamma_w}{\gamma}]}{\tan\varphi_f}$$

ii) In partial Condition. Zw = 0.5Z

$$F = \frac{[(\csc^2\phi_f)/\gamma z] + \tan\phi\,[1 - \left(1 - \frac{Z_w}{Z}\right)\frac{\gamma_w}{\gamma}]}{\tan\varphi_f}$$

iii) In fully saturated Condition. Zw = 0

$$F = \frac{[(\csc^2\phi_f)/\gamma z] + \tan\phi\,[1 - \left(1 - \frac{Z_w}{Z}\right)\frac{\gamma_w}{\gamma}]}{\tan\varphi_f}$$

4.2.2.7. MEASURING DIP AND STRIKE

a. *MEASURING STRIKE*

In order to measure the strike, place the side or edge of the compass against the plane of the outcrop. Sometimes it is easier to
put your field book against the outcrop and then the compass against
the book to get a smoother and/or a large surface. Now, rotate
the compass keeping the lower side edge of the compass fixed, until
the bulls-eye level bubble is centered (the round tube; not the
long narrow one). When the bubble is centered, the compass is
horizontal against the plane and parallel to the line of strike. Now,
with the bulls-eye bubble centered, record the number that either end
of the compass needle is showing.

- Place the bottom edge of the compass flat against the plane of interest.
- Adjust the compass orientation, making sure the bottom edge is always flat against the plane, until the air bubble in the “Bull’s eye level” is centered.
- Read either end of the compass needle to obtain the value of strike.

MEASURING DIP

To measure the dip of the bedding plane, take your compass and put
its side against the rock so that it points in the same direction as the
line of dip (The dip line is perpendicular to the strike line). Move the clinometers until the clinometers level bubble is centre. As we
did when we found the strike, record where the white tipped end of
the clinometers needle is pointing. Note the degrees and the direction. Recall that the dip direction must always be perpendicular to the strike direction (e.g., a strike of 40° could only dip to the SE or NW, never NE or SW). The dip and strike are shown in Figure .

- After you determine strike, rotate the compass 90°.
- Place the side of the compass flat against the plane.
- Adjust the lever on the back of the compass until the air bubble in the “Clinometers level” is centered.
- Read the dip directly from the scale in the compass.

4.2.3. POST FIELD WORKS:

4.2.3.1 ROCK SAMPLE TEST:

The collected samples are tested in point load testing machine (Figure 3.12). The machine consists of two point needles which are used to hold the samples and also to apply load. The load is applied and the values are obtained in kN and later converted to kgf/m^2.

4.2.3.2 SOIL SAMPLE TEST:

The unit weight (γ), density (ρ) of this soil materials are found out from core samples collected in the field. Direct shear test was conducted on these representative samples with five different normal loads to get their corresponding shear strength values. The values were plotted in normal stress (x axis) – shear stress (y axis) to obtain representative shear strength parameters. Of many possible combinations derived from best fit lines of shear test results, cohesion (c) and a value of friction angle (ϕ) has derived in each samples. The direct shear test has been carried out as per the procedure indicated in IS: 2720 part 13 (1986). From the investigation clayey sand, poorly graded sand clay mixtures are present in the study area. In grain size sieve analysis, as per USCS classification (Wagner, 1957) clayey sand present 12 % passed through the 0.075mm sieve.

FIELD FORM - RMR & SMR - R2 SECTION			
Locaion ID:	HB 6 to 7		
DATE:	10/03/2018		
Northing:	10° 16'22.62"	**Elevation:**	723.4 m
Easting:	77°59'34.356"	**Point ID:**	2
Landmark:	HB 6 to 7		
Rock type:	Highly Weathered Charnockite		
Height of slope:	4.3	**Co (Mpa):**	3.5
Excavation:	Manual Blasting	**RQD:**	12
Strike Direction:	N 35°	**Joint Spacing:**	60cm, 30cm, 8cm
Dip Direction:	N 305°	**GW conditions:**	Damp
Dip amount:	23°		
Joint Conditions:			
i.Discontinuity Length (m) :	12		
ii.Spacing (mm):	4,5		
iii.Roughness:	Weathered		
iv.Infilling (mm):	5		
v.Weathering:	Highly Weathered		
Rock Sample Nos.:	R2 /1		
Slope summary:			
7 to 12 m trees available, Roots penetrate into the slope SD – N 28°, DD – N 298°, DA – 40°			

FIELD FORM - RMR & SMR - R3 SECTION			
Locaion ID:	HB 6 to 7		
DATE:	10/03/2018		
Northing:	10° 16'20.544"	**Elevation:**	728.5 m
Easting:	77°59'33.522"	**Point ID:**	3
Landmark:	HB 6 to 7, 6th mile stone near by		
Rock type:	Highly Weathered		
Height of slope:	5.3	**Co (Mpa):**	1.75
Excavation:	Manual Blasting	**RQD:**	10
Strike Direction:	N 327°	**Joint Spacing:**	8cm,30 cm, 45cm
Dip Direction:	N 203°	**GW conditions:**	Damp
Dip amount:	38°		
Joint Conditions:			
i.Discontinuity Length (m) :	5,6,7,8		
ii.Spacing (mm):	4,5		
iii.Roughness:	Highly Weathered		
iv.Infilling (mm):	5 to 8		
v.Weathering:	Highly Weathered		
Rock Sample Nos.:	R3 /1		
Slope summary: SD – N 28°, DD – N 298°, DA – 40° Near by 6th mile stone- Stonage of Rock fall down, Critical SlopeAvailable Retaining Wall – 4m			

FIELD FORM - RMR & SMR - R1 SECTION			
Locaion ID:	Sirumalai 3/18 HB		
DATE:	10/03/2018		
Northing:	10° 16'48.84"	**Elevation:**	547.80 m
Easting:	77°59'48.324"	**Point ID:**	1
Landmark:	HB 3/18 →		
Rock type:	Charnockite Weathered Rock		
Height of slope:	5.4m	**Co (Mpa):**	6
Excavation:	Manual Blasting	**RQD:**	8
Strike Direction:	N 150°	**Joint Spacing:**	30cm, 20cm, 10cm
Dip Direction:	N 75°	**GW conditions:**	Damp
Dip amount:	45°		
Joint Conditions:			

FIELD FORM - RMR & SMR - R5 SECTION	
Locaion ID:	24/1 Before HB 18/18

Unit weight of water – 9.81 kN/m^3
Cohesion of soil – 27.500 kPa
Angle of internal friction – 34°
Dimensionless ratio
($c / \gamma H. \tan\phi$) – 0.89

According to the given observation, factor of safety is calculated in different groundwater conditions i.e. dry (chart 1) to saturated condition (chart 5).

FOS	Chart 1	Chart 2	Chart 3	Chart 4	Chart 5
X intercept	0.23	0.233	0.26	0.24	0.25
Y intercept	0.25	0.251	0.238	0.27	0.28
FOS average	2.64	2.62	2.56	2.49	2.39

SOIL SECTION – S3

The soil is Reddish yellow in colour and indicates in-situ nature. The wetness of the soil is mainly due to the improper drainage condition. The inclination of the general slope above cut face is about 45° towards N45° direction and cut slope is inclined at 70°. The soil cross section details are discussed in Table 4.11. The slope is fulfilling circular failure condition. The detailed input parameters for this analysis are as follows:

Slope angle – 70°
Height of the slope – 5.5 m

FIELD FORM - SOIL SLOPE - S3 SECTION			
Locaion ID:	Before HB 18/18		
DATE:	10/03/2018		
Northing:	10° 15'1.17"	**Elevation:**	1178 m
Easting:	77° 59'41.16"	**Point ID:**	3
Landmark: Before HB 18/18			
Soil type: Laterite Soil			
Height of slope:	5.5m	**Strike direction:**	N 45°
Excavation:	Manual Blasting	**Dip direction:**	N 305°
Natural Slope angle:	45°	**Root Penetration:**	yes
Cut Slope angle:	70°		
Colour:	Reddish Yellow	**Sample Nos.:**	S3/1
Soil Horizons:			
i."O" horizon (cm):	10		
ii."A" horizon (cm):	15		
iii."B" horizon (cm):	200		
iv."C" horizon (cm):	200		
v."R" horizon (cm):	200		
Slope summary: Root penetration, Soil slopes lies between two rock slopes, 15 m trees are available in the slope.			

Unit weight of soil – 13.84 kN/m^3
Unit weight of water – 9.81 kN/m^3
Cohesion of soil – 20.830 kPa
Angle of internal friction – 34°
Dimensionless ratio
($c / \gamma H. \tan\phi$) – 0.39

According to the given observation, factor of safety is calculated in different groundwater conditions i.e. dry (chart 1) to saturated condition (chart 5).

FOS	Chart 1	Chart 2	Chart 3	Chart 4	Chart 5
X intercept	0.15	0.153	0.184	0.192	0.17
Y intercept	0.36	0.361	0.45	0.48	0.42
FOS average	1.84	1.82	1.48	1.41	1.35

VULNERABLE SECTION:

As per slope stability analysis soil calculation, the FOS values indicate two sections (S1 and S3) comes under critically stable when it comes under Chart 3 & chart 4 and remaining one sections (S2) comes under stable condition. Along with conditions of discontinuities the SMR values also indicates the same class category of three sections (R1, R2 & R3) come under Class III and remaining two sections (R4 & R5) are under Class IV. It concluded S1 & S3 are critically stable in conditions and S2 is stable in condition.

CONCLUSION

The present study of slope stability analysis by using RMR & SMR and CFC method in and around Sirumalai area of Dindigul District, Tamil Nadu involves in collecting the data from different sources. Slope stability analysis is done by using the methods of Rock Mass Rating (RMR) and Slope Mass Rating (SMR) for rock slopes and Circular Failure Chart (CFC) method for soil slopes. Based on the field parameters and experimental test, FOS is calculated and predicted slope stability condition. In rock slope, as per SMR calculation, the RMR values indicates three sections (R1, R2 & R3) come under Class III and remaining two sections (R4 & R5) are under Class IV. Along with conditions of discontinuities the SMR values also indicates the same class category of three sections (Rock section 1, R2 section & R3 section) come under Class III and remaining two sections (R4 section & R5 section) are under Class IV. It concluded R1, R2 & R3 are fair in stable conditions and R4 & R5 are good in stable conditions. In soil slope, as per Hoek and Bray conditions, S1 and S3 sections are in critical stable condition and S2 are well stable condition.

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