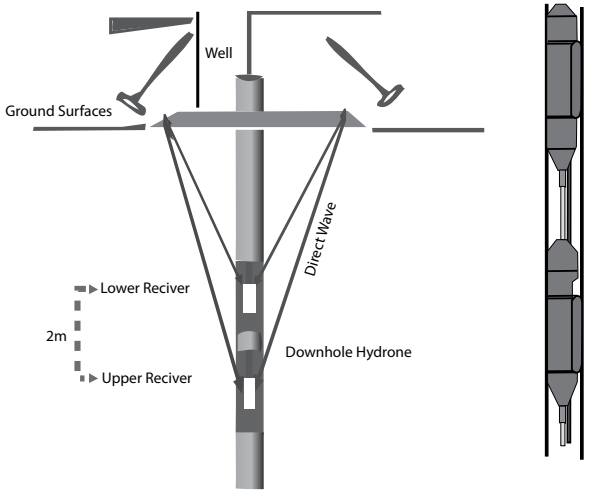

Fig. (1.7). Standard Down Hole Seismic

Soil/Rock Description	Shear Wave Velocity (m/s)	SPT Range	UCT Range (Kpa)	Soil Profile Type
Hard Rock	1500	-	-	S_A
Rock	760 to 1500	-	-	S_B
Very Dense Soil & Soft Rock	360 to 760	> 50	100	S_C
Stiff Soil Profile	180 to 360	15 to 50	50 to 100	S_D
Soft Soil Profile	180	<15	50	S_E
Soil Requiring Site - Specific Evaluation				S_F

SPT: Standard Penetration Test on Soil
UCT: Unconfined Compressive Strength Test on Rock

Hence, the following coefficent can be adopeted:
For very dense SAND and soft rock, the soil Profile Type is S_c

In addition, the following other parameters can be considered:

The Seismic Coefficients C_v and C_a can be considered with depending on the Seismic
Zone Factor (Z):

Soil Profile Type	Swismic Zone Factor Z=0.15				
	S_A	S_B	S_C	S_D	S_E
Swismic Coefficient C_a	0.12	0.15	0.18	0.22	0.30
Swismic Coefficient C_v	0.12	0.15	0.25	0.32	0.50

Hence, the following coefficients can be adopted also:
- For Soil Profile Type SD, The Seismic Coefficient C_a is 0.22
- For Soil Profile Type SD, The Seismic Coefficient C_v is 0.32

Table (1.9): UBC 1997 Soil Profile Class Estimation

1.2.32 Calculation of cyclic stress ratio (CSR, earthquake "Load") induced in the soil by earthquake. The ground motion parameters are: UBC zone class: 2A, Richter Magnitude M=6.0 & maximum ground acceleration a=0.225g at ground level or 0.15g at cap rock level (Amplification Factor = 1.5) unless otherwise specified by the main developer.

1.2.33 Calculation of cyclic resistance ratio (CRR, soil "strength") based on in-situ test data from SPT (Seed & Idriss) or CPT method (1996 NCEER workshop on Liquefaction Evaluation).

1.2.34 Evaluation of liquefaction potential by calculating the factor of safety against liquefaction from the earthquake load and soil strength.

1.2.35 [F.S. = CRR/ (1.2-1.5) CSR]. There are a potential for liquefaction if the F.S. less than unity, the layer is susceptible to liquefy and the ground densification or mitigation measures are needed.

1.2.36 Estimation of liquefaction induced settlement.

1.3 RECOMMENDATIONS TO BE INCLUDED IN THE SOIL INVESTIGATION REPORT:

1.3.1 **EXCAVATION WORKS:** Excavation works should be carried out in accordance with good construction practice and following BS 6031:2009 "Code of Practice for Earthworks". Recommendations for excavation of rock for cases of deep excavations should be provided. Fig. (1.8).

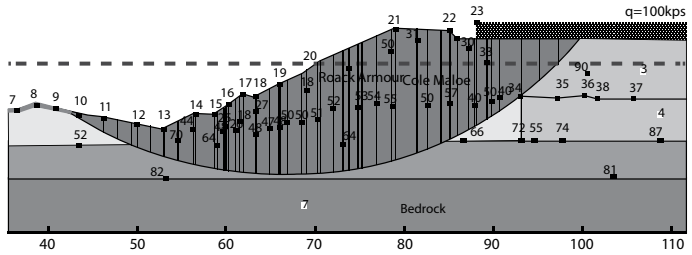

Fig. (1.8): Safe angle for open excavation

1.3.2 **OPEN EXCAVATION AND PROTECTION:** Where space permits and above the water table, sides of the excavation would be necessary to be battered. The CIRIA Report No. 97 "Trenching Practice" recommends a maximum safe temporary slope of 35 degrees to the horizontal. Recommendations for the safe angle for open excavation in different related soil