Submitted by : M. Zubair Khan

Submitted To : Engr. Imtiaz Khan

ID # 7677

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Department : Civil Engineering

Assignment # 02

Igra national university
Peshawer

Q1

Earthquake

An earthquake is an intense shaking of Earth's surface. The shaking is caused by movement in Earth's outermost layers.

Causes of Earthquake

An earthquake is caused by a sudden slip on a Fault.

The tetonic plates are always slowly moving, but They get stuck at their edges due to friction. when the stress on the edge overcomes the friction, there is an earthquke that relases energy in waves that travel through the earth's crust and cause the shaking that we feel.

Richter scale :- The Richter magnitude scale measured the amount of seismic energy ~~Ra~~ released by an earthquake

(If the Richter magnitude reaches at 8 or above it cause Total destruction of buildig, bridges and Roads)

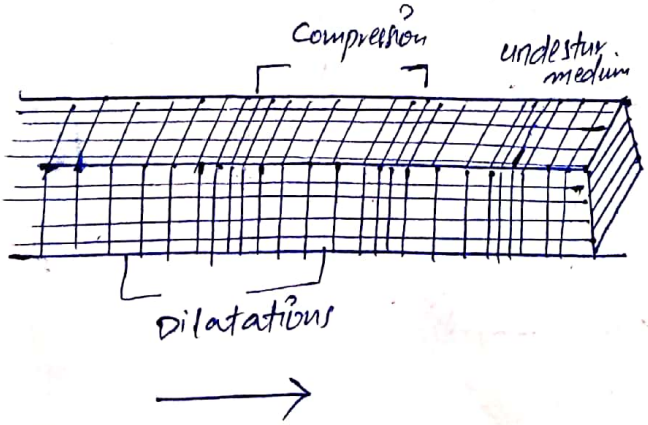
Differentiate Primary and secondary waves?

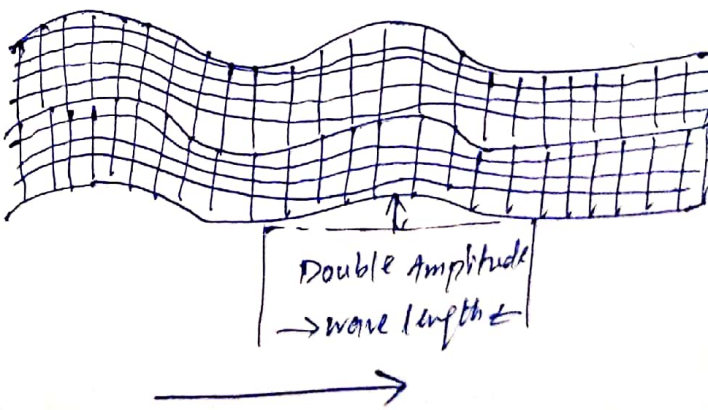
Primary wave:- The first kind of body wave is the primary wave

- The travel through the Earth's interior and can pass through both solid and molten rock. They shake the ground back & forth
- Typical speed are 330 m/s in air, 1450 m/s in water and about 5000 m/s in granite.

Secondary wave:- The second type of body wave is the secondary wave which is the second wave you feel in an earthquake.

- Secondary waves lag behind primary waves as they travel 1.7 times slower.
  However they do more damage because they're bigger and shake the ground vertically and horizontally





Q2 Role of geology in site selection for dam

a) Lithology : Surface and sub-surface studies must be carried out. these studies reveal the type, the composition and texture of the rock along the valley floor.

b) structures Dip and strike

Faults Dams founded on the fault zone are most liable to the shocks during an earthquake. Generally the small scale fault zone can be treated effectively by grouting

Folds : The effects of fold on rock are shattering and jointing along the axial planes and stressing of limbs. in the synclinal region dams placed on the upstream limbs have the risk of leakage from beneath the dam

seismicity. it is very important to analyse the behaviour of the dam under earthquake vibration thereby making it possible for the designer to check if a particular section of the dam is suitable or not

Porosity & permeability : A dam is water impounding structure so water must not find easy avenues to escape other than provided in design such as spillways. so porosity and permeability of the rock are tested both in laboratory and in-situ. Artifical treatment is given to the critical zone such as grouting to make the rock water tight

material availability : if the cost of Transportation of constr. material is excessively high, then an alternate design with locally available material, have to be considered

Detailed Geological Investigation For Dam site selection

- Study of Geological Toposheet
- Study of area with refrence to Geology.
- Study of Rock type
- Study of structural Geology of the Area
- History of the Area with refrence to Rainfall Data.
- Study of stream canal with diffrent order.
- Study of seismic Data of the Area.
- Geomorphological study
- preparation of geological Map of the area in detail.
- Study of core drill Data and its interpretation.
- Detailed Engg. Geological propertie of the area

§3 Types of mass wasting

Fast movements (slumps, Rock & Debris Fall, Rock & Debris slides, Flow)
slow movements (creep, solifcation, permafrost)

Rock & Debris slide: Happen when rocks or debris slide down a preexisting surface.

Rock & Debris Fall: Happen when a piece of rock fall down the slope. Debris Fall are similar except they involve a mixture of soil, regolith, and rocks. At the base there is an accumulation of Fallen material termed talus

Slumps: A types of slides where in downward rotation of rock occurs along a curved surface due to overlapping

Flow: Flow of soil and regolith, containing a large amount of water.

creep: The gradual downhill movement of soil and regolith

solification: is Flow of saturated soil downslope at a rate of a few millimeter or a Few centimes per day or per year.

Permafrost: slow landslide due to slowly melting of permanently Frozen ground

protection measure of landslide

Following are prevention of landslide

- Reducing slop
- To prevent percolation of water
- Constructing retaining wall, pilling and concrete piers.
- Consolidating the loose material by cement grouting or any other cementing material
- Draining water From slopes
- Revegetation with plant that have deep roots
- Terracing redistributes mass along a slope and reduce the slope angle.
- Rock bolts can be used to stabilize coherent masses

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Fold: permanent wave like deformation in layered Rock or sediment

Fault: A Fracture in bed rock along which rocks on one side have moved relative to the other side

Joint: A Fracture on a rock without noticeable movement.

a) Due to the inclined nature of the Fault plane and downward displacement of a part of the strata, normal Fault cause an extension in the crust wherever they occur.

b) In structural geology, a Fold occurs when one or a stack of originally flat and planar surfaces, such as sedimentary strata, are bent or curved as a result of permanent deformation. Synsedimentary Folds are those due to slumping of sedimentary material before it is lithified.

c) Faulting is essentially a process of rupturing and displacement along the plane of rupture. Its effects may involve- changes in the elevation of the ground omission of some strata where they are normally expected, repetition of some strata in a given direction & displacement & shifts in the continuity of the same rocks in certain regions.

d) As Far As possible the location of a civil Engineering project must be avoided on Fault or a Fold or a joint. But when there is no other choice, the same location can be treated with necessary methods and then the project can be implemented

Q5 Tunnel on the basis of Geology

(i) Hard work tunnel : Tunneling through hard rock almost always involves blasting

(ii) Soft rock tunnel : Worker dig soft-ground tunnel through clay, silt, sand, gravel or mud.

Geological investigation For Tunnels

(a) selection of tunnel route (Alignment) :. There might be available many alternate alignments that could connect two point through a tunnel.
However, the final choice would be greatly dependent on the geological consitution along & around different alternatives. the alignment having least geologically negative Factors would be the obvious choice

(b) selection of Excavation Method : Tunnel is a complicated process in any situation & involves huge costs which would multiply manifolds if proper planing is not exercised before starting the actual excavation. And the excavation methods are intimately linked with the type of rocks to be excavated. choice of the right method will, therefore be possible only when the nature of the rock and the ground all along the alignment is Fully known. This is one of the most important aim and object of geological investigations

(c) selection of Design For the tunnel: The ultimate dimension and design ~~procedure~~ parameters of a proposed tunnel are controlled, besides other factors, by geological constitution of the area along the alignment. whether the tunnel is to be circular, D-Shaped, horse-shoe shaped or rectangular or combination of one or more of these outline, is more often dictated by the geology of the alignment than by any other single factor.

D-shape or horse-shoe shape may be conveniallly adopted but these shapes would be practically unsuitable in soft ground or even in weak rocks, with unequal lateral pressure. In those cases circular outline may be the First choice.

(d) Assessment of cost & stability: these aspects of the tunneling projects are also closely interlinked with the First three considrations. since geological investigation will determine the line of actual excavation, the method of excavation and the dimension of excavation as also the supporting system (lining) of the excavation, all estimate about the cost of the project would depend on the geological details

(e) Assessment of Environmental Hazards: The process of tunneling, whether through rocks or through soft ground, and For whatever purpose, involves disturbing the environment of an area in more than one way. The tunneling methods might involve vibration induced through blasting or ground cutting and drilling, Producing abnormal quantities of dust and last but not the least, interference with water supply system of the nearby areas.