

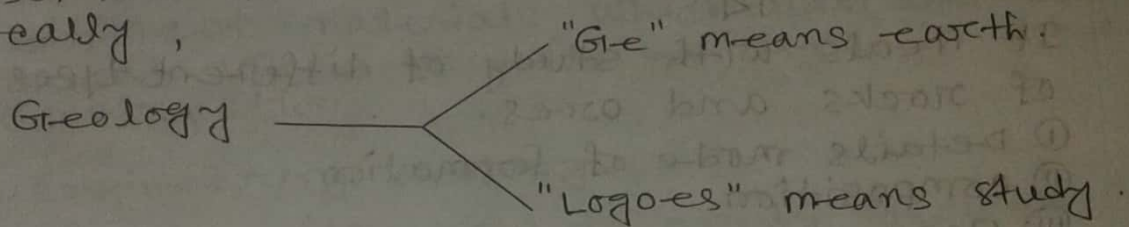
GEOLOGY3A - MMM side
23-02-2015

2008.06.05.

I Introduction:

Geology is the study of earth. It is also the science of earth. Geology comes from the addition of two greek words like "Gre" and "logos". Where "Gre" means that earth and "logos" means science or study.

In 1778, "Geology" was used by G. A. De fue. So, we have seen Geology in etymologically,



Geology deals with different aspects. Some of them are as following.

- ① Origin, age, interior structure and the history of earth.
- ② Evaluation and modification of various surface features like rivers, lakes, mountains, etc.
- ③ Material that makes up the earth.

2005, 07

Importance of Geology:

An adequate geological knowledge is indispensable for a civil engineer. Without having the knowledge of geology, a civil engineer can't be designed a structure successfully. So, the importance of geology in civil engineering is very much. If we see the following points, then we will understand this,

- ① Geological knowledge which is very important for the civil engineering construction.
- ② In the construction of dams, reservoirs, tunnels, there faces many problem, which can be solved by the help of geology.
- ③ For making the city in hilly or plain region, geological knowledge must be needed.
- ④ The important matter as stability and durability of the building also depends on the knowledge of geology.
- ⑤ To know the materials, rocks, ores and soil, geology must be needed for the designation of structure.

⑥ Economic geology helps us by giving the knowledge how to design the structure in economic. Because, expensive structure can be avoided by someone.

⑦ Geology gives us the knowledge of the earthquakes. Which is so important. By knowing about it, the structure will be built up by some of rules which helps the structure to become more stable and durable.

From the above explanation, we have concluded that, the importance of geology is so much. Because, without it, civil engineering construction will be hampered and with the help of it, civil engineering construction will be safe for all.

MINERALOGY.

4A-MMM515C.
02-03-2015

⇒ Minerals: The basic component of rock, which having acted as the organic substance with definite chemical composition and definite atomic structure.

⇒ Mineralogy:

In which part of geology helps to study about the minerals and their origin, structure and optical properties etc are known as the mineralogy.

The minerals are got from rock or the there are many rocks which having the minerals. But the rocks have no minerals are having in the earth. But this sense minerals are got from rock and many rocks have no minerals. So all minerals are rock but all rocks are not mineral.

⇒ When rock forming silicates are in minerals is known as rock forming minerals. In 98% amount. But other 2% is non-silicate which is very important for mineral's ores.

Q1 Identification of minerals:

The identification of minerals are done in the laboratory by the following three process or methods,

1. Petrographic analysis:-

In this method rock and minerals are identified. Where the minerals are taken into the revolving plate and also there abrasion change will be added. Then next, there rotation will be completed and a thin sheet of thickness 0.03 mm or $0.001''$ and with the help of Petrographic microscope the optical properties will be observed and measured.

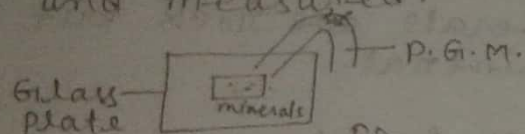


Fig 1.

Alternative system: crushing minerals are made as powder are taken into glass plate and a liquid of known optical property is mixed with that plate. And then with the help of petrographic microscope, there find out the optical property of minerals.

2. X-ray Analysis:-

In this system the formation of the mineral, structure of it and atoms of its crystal and etc are observed in taking it as laboratory in machine.

3. chemical method:-

with the addition of chemical into the minerals and form as the insoluble solution as solid solution and finding its optical properties as transparency, etc.

Then minerals can be identified.

Q1 What steps and tests would you undertake to completely describe and identify the unknown?

Ans:- At first the minerals are taken and the following two will be made,

- i) Grinding and some sample to a powder, as hand sample.
- ii) Thin section of minerals.

This hand samples are as powder and thin sheet or section will be taken in lab. test to identify

① the origin of it.

② physical property - colour, streak (mineral powder colour form) - luster (light - metallic, nonlight - non-metallic), hardness - resistance to abrasion etc.

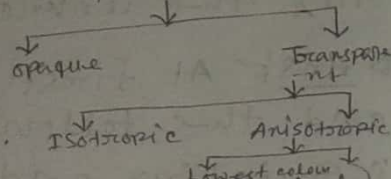
if not there the thin section will be observed and as of its colour, texture, crystal, shape, alternative product, twinning - layers, iso-tropic,

next, the opaque test as the chemical test will be made. Then also see there, at the sample have - air bubbles, biaxial matter etc after adding the chemicals and etc then there, exists, there which minerals are in form, identification

① Igneous rock.

② Sedimentary rock.

③ Metamorphic rock.



And etc, which can be essential to test and identify of minerals - which are unknown.

→ Both low, high → uniaxial and biaxial.

*Exam

5A-MMM Sm
10-03-2015

① Physical properties:

The following physical properties of minerals are very important.

Physical Property	Definition	Testing method
1. Cleavage	- Breaking of mineral along weakness in the crystal structure.	- Examine the mineral for areas where the mineral is broken.
2. Colour	- Visible light spectrum radiation reflected from a mineral.	- Look at the sample and what it's colour - white, black, red etc.
3. Crystal form	- Geometrical shape	- cubic, hexagonal etc.
4. Fracture	- Breakage of minerals not along planes of weakness in the crystal structure.	- Examine the other areas of mineral without broken areas.
5. Hardness	- Resistance to scratching, or abrasion.	- To know it by diff. nail or instrument.
6. Luster	- Character of the light reflected by mineral.	- To know the metallic, or not of mineral.

7. Magnetism - Electromagnetic - Use a magnet force generation by an object to determine this.

8. Reaction to HCl - Chemical interaction - Reaction - bubbles of mineral and or not.

9. Specific gravity - Ratio of mass of mineral and mass of an equal volume of water. - By Lab.

10. Streak - colour of the mineral when it is powdered. - by grinding of mineral.

11. Taste - Nerve ending reaction in the tongue to diff. chemicals. - by smell of the mineral.

12. Other properties - Fluorescence, radioactivity. - Requires other special test by UV radiation.

* Mineral identification: Diagnostic physical properties.

* 1. Apatite - Green colour, $H=5$, hexagonal.

2. Augite - Dark or dull green, 2 cleavages - 90 degrees, similar properties to Hornblende.

3. Biotite - Black colour, one perfect direction of cleavage, flexible sheets.

* 4. Calcite - $H=3$, reacts with HCl, 3 directions of cleavages.

5. Corundum - $H=9$, hexagonal.

6. Dolomite - reacts with HCl, as calcite.

7. Fluorite - $H=4$, 4 directions of cleavages, purple colour.

8. Galena - Gray, metallic, 3 directions cleavage.

9. Garnet - brown, no cleavage, dodecahedrons.

10. Graphite - "pencil lead", soft metallic,

* 11. Gypsum - $H=2$, scratched by fingernail.

12. Halite - Salt, $H=2.5$, no scratched.

13. Hematite - Reddish brown streak, rust.

14. Hornblende - Black, green, 2 directions cleavage.

15. Magnetite - magnetic, metallic mineral.

16. Muscovite - clear, one perfect direction cleaves.

17. Olivine: Apple green, H=7, conchoidal fracture.

18. Orthoclase - H=6, salmon pink, 2d - cleavage.

19. Plagioclase - H=6, white/gray, 2d - c.

20. Pyrite - "Fools Gold" gold metallic.

21. Quartz - H=7, conchoidal fracture, no cleavage, pink, red.

22. Sulfate - Yellow, "rotten egg" smell if burned.

* 23. Talc - H=1, very soft, easily scratched by fingernail.

⇒ Scratching tools of minerals:

1. Finger nail.
2. Copper penny.
3. Common nail / pocket knife.
4. Piece of glass.
5. Steel file / concrete nail.
6. Piece of corundum.

⇒ Moh's scale of hardness: 20, 10, 10, 00, 00.

Hardness	Rating	Description	Mineral example
1	Very soft	Fingernail	Talc
2	Soft	"	Gypsum.
3	Soft	Copper penny	Calcite
4	Semi hard	Common nail	Fluorite.
5	Hard	"	Apatite
6	Hard	Piece of glass	Flint glass
7	Very hard	Concrete nail	Quartz
8	Very hard	"	Topaz.
9	Extremely hard	Diamond	Corundum
10	The hardest	Diamond	Diamond.

From the above Moh's scale of hardness, we can easily determine the hardness of a mineral. Where we can see there are about 10 minerals which are very important to know. As a result from the above we can learn the fact that about their rating, and by on which tools of cutting them can be essential.

Q1 Dome:

It is a special kind of anticline in which beds dip away from central point in all direction.

Q2 Basin:

Basin is a special type of syncline in which beds dip towards the centre from all direction.

Q3 Rock.

GA-MMMair
18-03-2015

⇒ Defination of rock:

Rock is defined as the aggregates which are the composition of different types of minerals.

Or, the composition of minerals are known as the rock.

Example: Granite, Basalt, Sand-stone, Limestone, Gneiss etc.

⇒ Types of rocks:

There are three types of rocks which are as given below,

1. Meta-morphic rock.
2. Sedimentary rock.
3. Igneous rock.

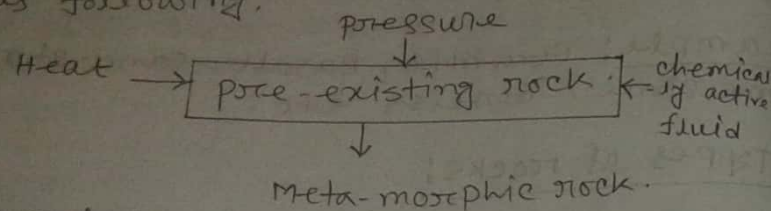
⇒ Metamorphic rock.

⇒ Defination:

pre-existing rock when gets pressure, chemical active fluid and heat then there changes of form of rock and produce a new rock is known as the meta-morphic rock.

When the metamorphic rocks are formed at small or limited area then it is called local metamorphic rock and when for large area, the metamorphic rock is formed then it is called the regional meta-morphic rock.

There forms of metamorphic rock is as following.



Example: Gneiss, Marble etc.

⇒ Agents of Meta-morphism:

The following three agents have a great impact on the formation of the meta-morphic rock as the meta-morphism,

① Heat - When the depth from the ground surface towards the below is increased, then the heat will be increased and for this the pre-existing rock will be molten and new meta-morphic rock will be formed.

In the fig. 1, we see the effect of heat on the pre-existing rock to form the meta-morphic rock.

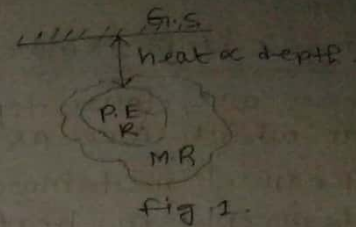


fig 1.

② Pressure - When soil can't take the load of a foundation then if there pillar is given to the soil and then this pillar gives compression on the underground's rock and for this the new meta-morphic rock will be formed.

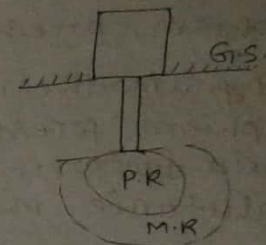


fig 2.

For developing the compressive stress there happens this process.

③ Chemically active fluid - which can be kept in the gas or in fluid form near the rock. which, if the gas is dissolved into water, then there will change the structure of the rock to form the meta-morphic rock.

2013.07.06

⇒ Types of metamorphism:

There are four types of metamorphism which are as given below,

- ① Thermal metamorphism: - At in which metamorphism, heat is main factor.
- ② Cataclastic: - At in which metamorphism, pressure is main factor.
- ③ Dynamothermal - At in which metamorphism, pressure and heat are the main factor.
- ④ Plutonic metamorphism: - When the metamorphism has taken place for acting of intensive heat and uniform pressure as main factor.

⇒ Magma: primary rocks were formed by the cooling and solidification of the hot molten mass called the magma.

⇒ Metamorphism: 2007.06

At in which process, the metamorphic rocks are produced or formed as defined metamorphism.

⇒ Sedimentary rock.

2008.05

⇒ Definition:

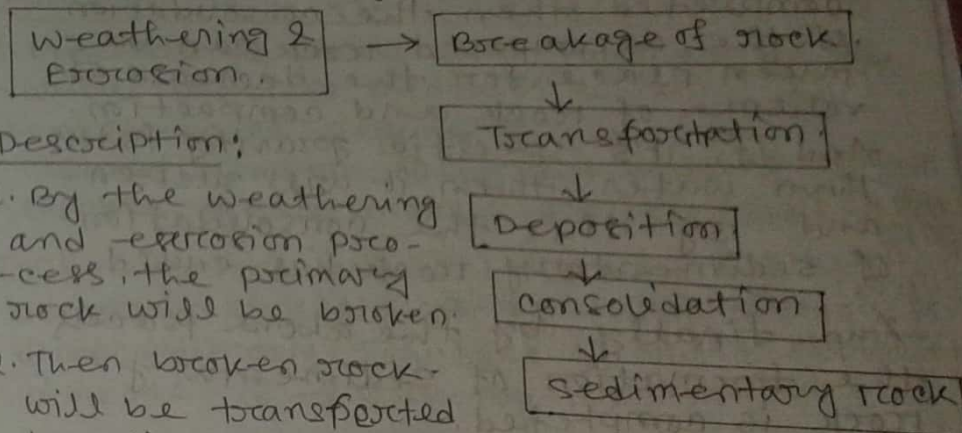
In which kinds of rock is prepared or can be produced by consolidation is known as the sedimentary rock.

Example: Lime stone, sand stone etc.

2013.12.11.10.09.08.05

⇒ Formation procedure:

If we see the following flow chart - the we can understand that, how the sedimentary rock will be formed.



Description:

1. By the weathering and erosion process, the primary rock will be broken.

2. Then broken rock will be transported by the agent as wind or water at high velocity.

3. At less velocity and self-weight of the broken particles will be deposited at a time.

Flow chart of sedimentary rock formation.

Figure:

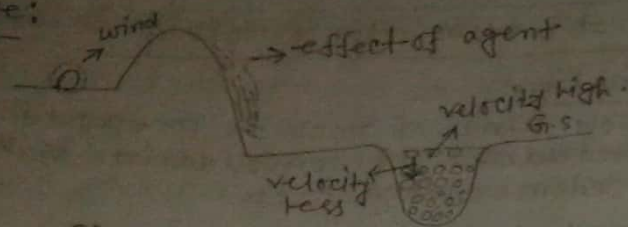


Fig. Sedimentation of rock.

Here Deposition may be shown in the fig of sedimentation as.

4. At last when the deposition will be completed then the consolidation of the decomposed rock can be taken place for the decrease of volume of rock and compaction. And if, its specific gravity is less than water, then it will suspend and by this the consolidation of sedimentary rock has ended.

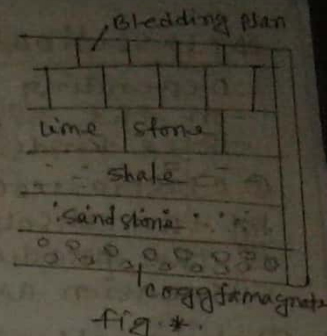
And, finally by the above process the formation of sedimentary rock is completed.

Here consolidation can be also taken place for the binding property or cementitious property of the rock.

⇒ Strata - when rocks are decomposed in layers and this formation is called the strata.

⇒ Stratum - Every and each layer of rock when they are decomposed is called the stratum.

⇒ Lamination - And the thin layer of rock is called lamination as the process.



* ⇒ Structure of sedimentary rock:

1. Mechanical structure - Formed by the various physical process while thereby deposition of sediments.

① Stratification. ② Current bedding. ③ Mud cracks. ④ Rain marks. ⑤ Ripple Marks → Book 188 Page.

2. Chemical structure - Formed by the deposition of sediments by chemical process.

① concretionary structure. ② oolitic ③ pisolitic ④ Geode. ⑤ → Book - page - 189.

3. Organic structures - Formed by the organic process of the sedimentary rocks - Book - page - 190.

⇒ Classification:

Depending upon the mode of formation the sedimentary rock is having three kinds.

① clastic rock:—The rocks are formed by the consolidation and cementation of the products of erosion carried in suspension are called clastic rock.

② chemically formed rock:—
This rocks are formed by the various chemical process.

③ Organically formed rocks:—
This rocks are formed organically by organic agents. → Book-page-190.

⇒ Igneous rock.

⇒ Definition:

The rocks are produced from the hot molten rock as magma, by cooling & solidification is known as the igneous rock.

Example: Granite, Basalt, etc.

⇒ Extensive rock—The rock can be existed on the ground surface from the under ground surface by volcanic force at high cooling is called extensive rock.

2003, 06
⇒ Intensive rock—The rock can be existed in under ground surface at less cooling.

⇒ Classification: of intensive rock.

① plutonic igneous rock—At high depth the rock can be existed from G.S. at less cooling.

② Hypabyssal rock—At mid depth of plutonic to G.S. at more cooling than plutonic rock.

③ volcanic rock—over the G.S. the rock can be existed by volcanic force by high cooling.

In fig. 1, all rocks are shown.



→ Grain size of rock fragments: 2012.

① Rate of cooling:

- ① In magma body if cooling is rapid, there is insufficient time for crystallization, for this mineral gets small sized and resulting rocks are fine grained.
- ② If cooling is gradual, sufficient time for crystallization and the large mineral in size can be got and resulting rocks are coarse grained.

② Molecular concentration of the constituents:

- ① From a magma of a higher concentration of molecules then resulting molecules grain size grows large.
- ② But for low concentration, the grain size will be low or small size.

③ Viscosity: For low viscosity melting of magma will free and large grain size. But, for higher viscosity, small grain size of rock fragments, for bad melting.

2013, 12, 11, 10, 09, 06

7A - MMM sir
25-03-2015

② Rock cycle:

The following system helps to form the rocks into different kinds of rocks where by any process as termed the rock cycle.

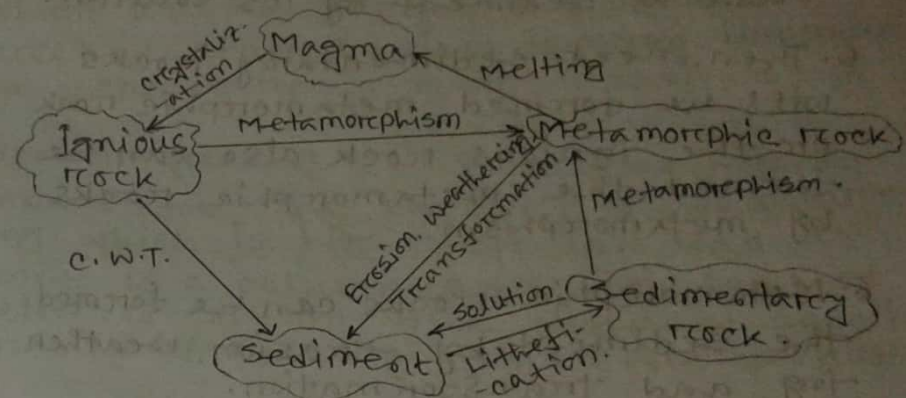


Fig. Rock cycle.

If we describe the rock cycle, then the following points will be seen where.

1. Hot molten rock as magma by the crystallization process (cooling & solidification) the igneous rocks will be formed.
2. Igneous rocks can be transferred into sediment by corrosion, weathering & transformation.

3. Sediment is transferred into sedimentary rock by lithification (consolidation & cementation).

4. Hence, sedimentary rocks can be made as sediment by its solution.

5. Then, next sedimentary rocks will be formed metamorphic rock or the igneous rock also can be formed the metamorphic rocks by metamorphism.

6. Metamorphic rocks can be formed the sediment by erosion, weathering and transformation.

7. Metamorphic rocks are transferred into magma by melting in presence of heat, pressure, chemically active fluid.

8. Next, the same cause will be happened as in like cycle.

As it is called rock cycle for forming different types of rocks in cycle.

① Requirements of good building stone:

The good building stone should have the following characteristics which proves them as the good building stone.

① Appearance - colour and its pattern which will be very light and its architectural view is very important in appearance.

② Specific gravity - It should be high in amount for the capacity of load carrying, which is high for low load at above of a column and high load at below of column the different specific gravity of building stones are needed.

③ Durability - For increasing the stability of the structure.

④ Hardness - Resistance to scratch and which must be strong for the building stone.

⑤ Strength - The strength of the building stone should be in ultimate strength for the high load capacity.

Uses of rocks of as in Engineering materials:

- i) Road metal - In bituminous road or in cement concrete road.
- ii) Railway ballast to decrease the friction in rail.
- iii) concrete aggregate - as a part stone in the mixture of water, cement and inert material (sand).
- iv) Rip-rap - In embankment the concrete layers as to resist the erosion from fluid.
- v) Masonry wall - stone - Foundation and the wall of masonry building.
- vi) Roofing stone - for making roof.
- vii) paving stone - for road.
- viii) Facing stone - To increase the beautifulness of of a wall by using this stone in the engineering construction.

Requirements of stone in various purposes:

* 1. masonry work ²⁰¹⁰

- ① should be collected from lower block.
- ② Workable.
- ③ Non-porous.
- ④ Good compressive strength.
Ex: Granite, Basalt etc.

2. flooring work

- ① High abrasive resistance.
- ② Free from cracks and smooth the surface.
- ③ Low porosity (void in particle) and impermeable in nature.
- ④ Good binding power.
→ Ex: same.

* 3. Railway ballast ^{2012, 11, 09, 08, 07}

- ① High compressive strength.
- ② Should hard & tough.
- ③ Free from cracks, joints, & smooth surface.
- ④ High modulus of elasticity.
Ex: Basalt, Granite etc.

*4. Rip-rap material. - 2011, 10.

- ① High compressive strength.
- ② Have no soluble material.
- ③ Free from cracks. Ex: Basalt.

*5. Face work.

- ① No iron in material.
 - ② For iron there happens the efflorescence. ④ Good polish, colour.
- Ex: Marble, limestone.

6. Roofing work. 2010

- ① High tensile strength.
- ② Free from joints.
- ③ Resistant to abrasion.

Ex: sandstone etc.

7. Flooring work.

- ① Hard and resistant to abrasion.
- ② Low porosity.
- ③ Available in the form of slab.

Ex: Slate, sandstone etc.

*8. Concrete work. 2012, 11, 09, 08, 07

- ① The stone should have good compressive strength.
- ② It should have binding material used.
- ③ Rocks should be free from minerals which ^{causes} retardation of setting of cement.

Ex: sandstone.

Earthquake.

7A-MMM Str.
04-04-2015

2013

⇒ Definition: The vibration passing on the earth due to large sea-wave, rock breakage which are too large is called the earthquake.

At the focus or centre of the earthquake the vibration is too more so there damages more but at some of distance from the centre the amount of vibration and damages are not too much.

So, vibration is inversely proportional to the distance.

$$\therefore \text{vibration} \propto \frac{1}{\text{Distance}}$$

2013

⇒ Seismology: The branch discuss the matter earthquake is called seismology.

2013

⇒ Seismograph: The instrument is used to record the vibration is called the seismograph.

2013

⇒ Seismogram: The recorded vibration or data is called seismogram.

① Depth of centre/focus:

The depth of centre or focus where earthquake is occurred is generally at 8 km from the ground surface. But sometimes it can be 30-35 km.

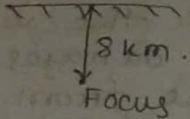
The depth can vary

① 0-50 km — shallow focus.

② 50-250 km — intermediate focus.

③ >250 km — Deep focus.

It can be varying at ^{least} 700 km.



② Epicentre:

If a vertical line is drawn towards the ground surface from the focus of earthquake, then this line intersects in which point on the earth surface or ground surface is called epicentre.

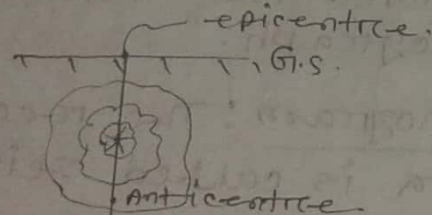


Fig. 1.

At the fig. 1. we see the epicentre.

→ Anticentre: From the above fig. 1, the vertical line from the focus towards below and the point on the vertical line is called anticentre. In fig. 1 we see it.

2013, 12, 11, 09, 00, 06, 05

③ Earthquake wave: As types,

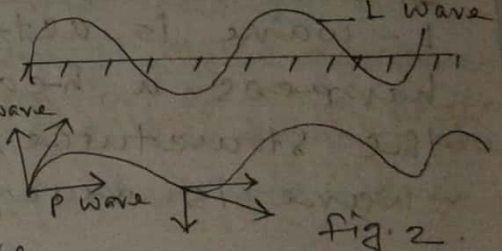
There are three kinds of earthquake wave, which are as following.

1. P wave (Primary).
2. S wave (Secondary).
3. L wave (Long).

→ L-wave: The wave passes through the ground surface is called the L-wave.

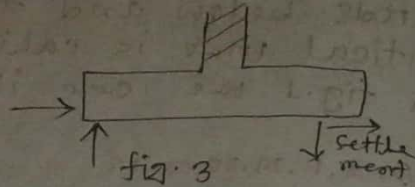
→ p wave: The wave below the ground surface if it is divided into vertical and horizontal wave.

Then the horizontal wave is called p-wave.



⇒ S-wave: From the above the vertical component wave of the wave at the below of ground surface is called S-wave.

For the fig 2, if the upward wave as S wave is given to the foundation and for



it pressure is given and the P wave in horizontally acting, the column will be failed as fig. 3. And the downward as acted in same. where differential settlement is occurred for. different case as downward force. Hence L-wave is acted on the ground surface and for it, L-wave is acted mostly and happens a heavy damages on the structure, so the L-wave is very dangerous.

2012.12.09, 05.06.05

Characteristics:

The characteristics of the above waves are as given below,

1. P-wave: ① Longitudinal wave.

② Very fast wave. ③ Duration of time is less. ④ It can be recorded very fastly. ⑤ passes through the solid and liquid in the direction of propagation. Ex: sound wave.

2. S-wave: ① Transverse wave.

② It is slow than P-wave. ③ It takes time for recording the data. ④ It passes through the solid. ⑤ It passes in perpendicular to the direction of the propagation.

3. L-wave: ① It passes through the ground surface. ② It is more dangerous than all. ③ Duration of time of it is high. ④ It is slow. ⑤ It takes more time to record. ⑥ It is called sea-wave.

Causes of earthquake:

Due to the following causes, the earthquake can be caused.

1. Surface causes.

- ① violent of large sea-wave.
- ② due to landslide.
- ③ When a large rock fall.

2. Volcanic causes.

- ① sudden exploration due to volcanic activity.
- ② Movement of magma or gases within the surface of earth's crust material (rock, combination of different material inside the earth).

3. Tectonic causes.

- ① For the increases of pressure and temperature within the earth.
- ② chemical adjustment and the readjustment inside the earth.

Earthquake wave transmission:

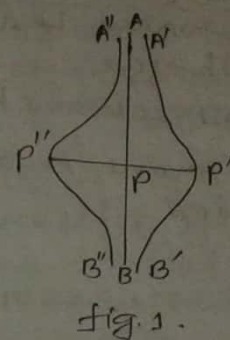


fig. 1.

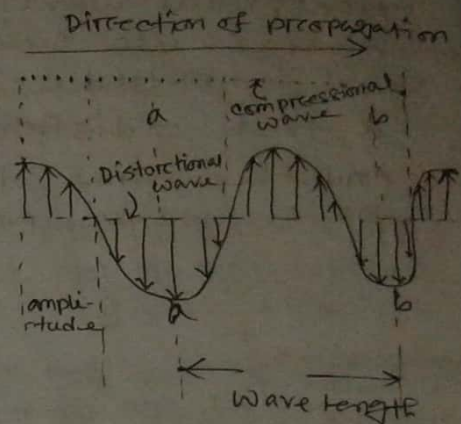


fig. 2.

From the above fig. 1.

APB is normal line. If force is given to the rock from left side then A'B' is created. But if it is elastic, then it can be reached at APB after removing the force. But it can't be elastic. So, there compressional wave is formed and energy can be stored and for it the momentum is formed. If the force is given from right then opposite will be shown.

At the fig. 2, the wave forms are shown as distortional wave, compressional wave etc.

Where we see wave length and amplitude. Where

λ to b = distance = wavelength

And the time to move λ at the b is wave period.

Earthquake

8A - MMSir
11-04-2015

Horizontal pendulum seismographs:

The seismographs record only the horizontal vibration are so called the horizontal pendulum seismographs.

Description:

The construction and the process by which the vibration or earthquake can be measured, is given below, fig. 1:

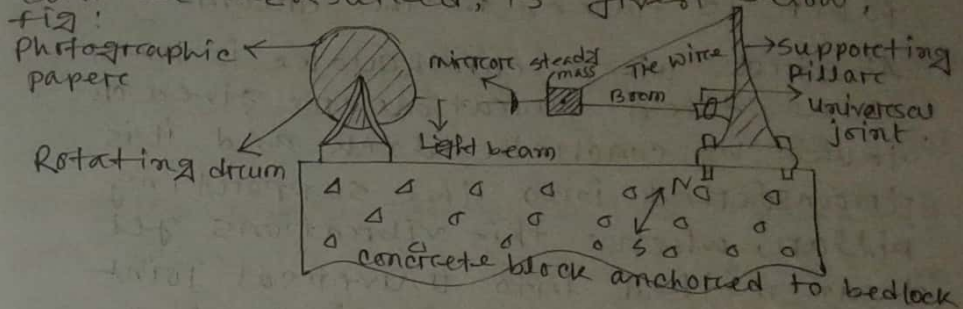


Fig. 1 Diagrammatic sketch of a horizontal pendulum seismograph.

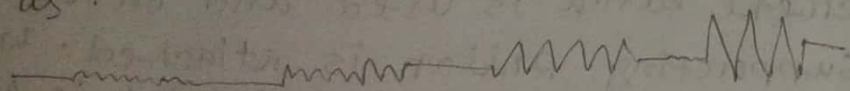
From fig. 1, we can describe the construction of this seismograph, where a concrete block is used and on its above a supporting pillar is attached. With the pillar an universal joint is connected.

ted which is used to bend the boom line of the steady mass. Here a steady mass is taken which is connected with the pillar by a tie wire and which is attached with the boom.

We can use a mirror exchange of the mass. Here a rotating drum is also used where photographic paper is taken on the drum.

At first, when earthquake is taken place, then vibrations are given on taken by concrete block and it is transferred into the supporting pillar, where this vibrations get transmitted into universal joint where transmitted vibrations can be passed through it and it can be bent in any direction.

Then if steady mass is taken then it is moved horizontally and the wave is seen in rotating drum as.



wave form of vibration for the steady mass.

But if mirror is taken then for the transmitted vibrations are gone to the mirror and light beam is produced and go into the rotating drum and for photographic paper the records are taken and the wave forms are got.

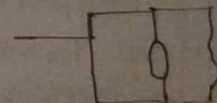
which is got in North-south direction. But if west-east directions record is needed, then opposite arrangements are given.

And for upward and down ward, vibrations are given by taking a weight on a spring which can be done by universal joint.

By this above process the records are taken in horizontal pendulum seismographs. It is very old process.

⇒ Universal joint or u-shape joint:

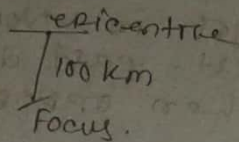
The joint is given to the supporting pillar in horizontal pendulum seismograph, where the transmitted vibrations passed through the joint and it can bend in any direction, such joint is called the universal joint or u-shape joint.



Measurement of Earthquake:

1. When the distance betn epicentre towards the focus of earthquake is 100 km (62 miles) then it is measured in richter scale.

fig:



Richter scale
measurement.

2. If the distance is exceed the 100 km from above fig. then the measurement magnitude methods is valueable.

This are the applicable methods for the measurement of the earthquake.

2013.

Seismic zoning map of Bangladesh:

fig:

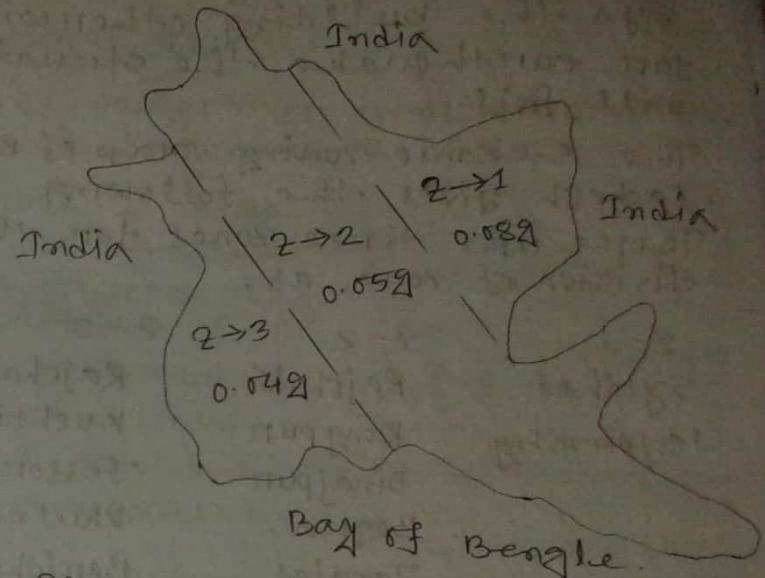


fig. 1 seismic zoning map of Bangladesh.

With the help of BNBC (Bangladesh National Building Code) we get the seismic zoning map of Bangladesh and according to BNBC the all zones are having different intensity of earthquake, recommendation of it and the co-efficient of different matters are obtained to good-well designation of building.

The above should be abide by the all civil engineers to design the building otherwise for earthquake, the structure will fail.

The seismic zoning map of Bangladesh gives the following. There are three zones for the division of zone as,

Z-1	Z-2	Z-3
Sylhet	Rajshahi	Rajshahi
Mymensing	Rangpur	Kushtia
	Dinajpur	Jessore
	Bogra.	Khulna
	Tangail	Barisal
	Dhaka	Noakhali
	Comilla	Bhola
	Pabna	Patuakhali
	Chittagong	Bagherhat.
	COX'S BAZAR.	

2011, 10, 08

Seismic co-efficient:

It is defined as the ratio of ground acceleration to the acceleration due to gravity. If ground acc. = a .

Acc. due to gravity = g .

Seismic co-efficient = a/g .

Fold.

Definition of fold:

The wavy pattern or undulation of rock surface is known as the fold.

When rock is compressed or pressure is given on rock then wavy pattern of it, can be occurred as formed the fold.

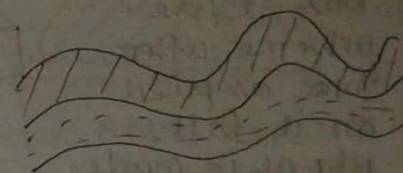


fig. of fold.

The fold can be made as from few mm to several km.

Ex: In hilly areas the rock forms fold.

Terminology: As parts, crest, fold axis, fold plane, limbs, strata.

When rock is compressed then fig. 1 fold is created generally.

where the layers are as limbs and they are having

in strata. There shows the fold plane and axis also.

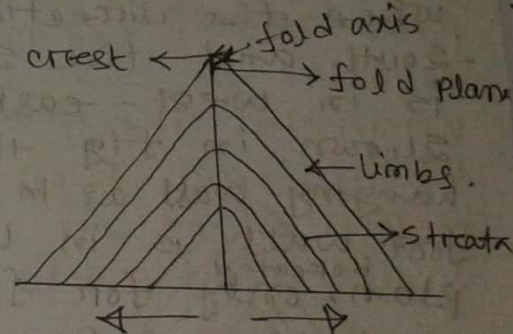


fig. 1.

⑪ 2011.

6107191

from the fig. 2 we get the another fold of rock as box type where after force applied on it fault plane is made. where at first, it was in trace line. Here Dip is formed as the angle betn the horizontal line and fault line and measured in degree. where Dip is perpendicular to the strike. when the direction of dip is in north-south and the strike direction is in west-east. Here hade also is shown in fig. the fault plane has hanging wall as in right of dip and foot wall is in left of dip. fault plane is created only for fracture after the application of force on rock.

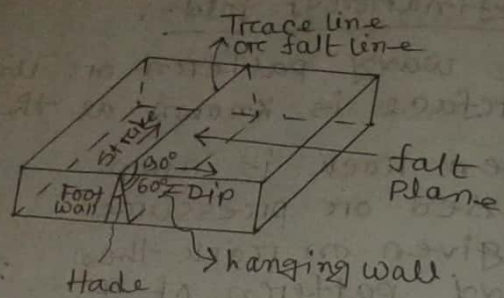


Fig. 2.

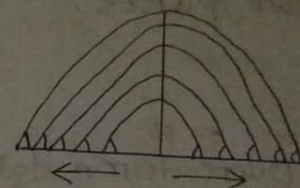
⑫ Terminology classification of fold:

1. Based on nature of bending.

2013, 12, 10, 07.

① Anticline -

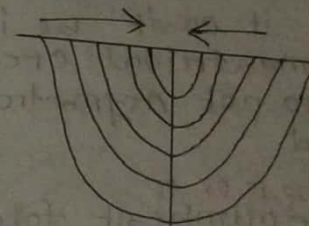
The bed are arc up. And the angle as dip are opposite type.



Anticline

② Syncline -

The bed are flexure down which are shown in fig. It is opposite of anticline.

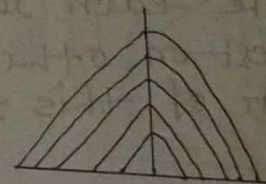


Syncline

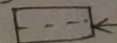
2. Based on axial plane.

① Symmetrical fold -

where the axial plane can be divided equally in two parts. Like in where lateral pressure is given on steel scale as below of neutral axis.

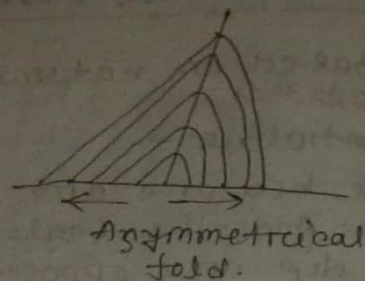


Symmetrical fold.



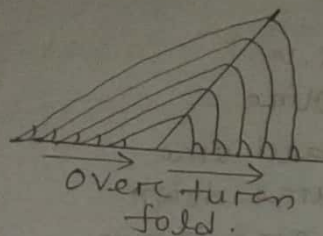
(ii) Asymmetrical fold -

The fold of axial plane can't be divided equally in two parts.



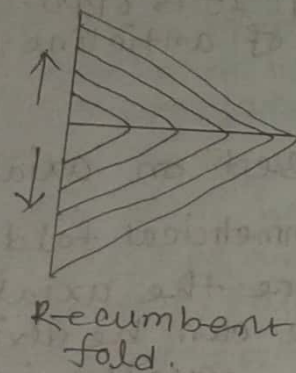
(iii) Overturn fold -

Where the axial plane is inclined so it can't be in symmetrical or also not Asymmetrical fold.



(iv) Recumbent fold -

Here axial plane is parallel to the horizontal line, where each layer is rest on other layers of this fold.



(v) Isoclinal fold: Two limbs are parallel to each other. Depending upon the axial plane, It is divided into following three types.

a) Vertical isoclinal fold -

Axial plane is vertical and where anticlines are combined to form this like in fig. a.

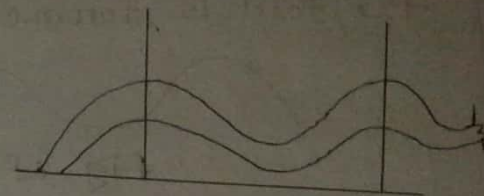


fig. a.

b) Inclined isoclinal fold -

Where the axial plane is inclined. In fig. b we see it.

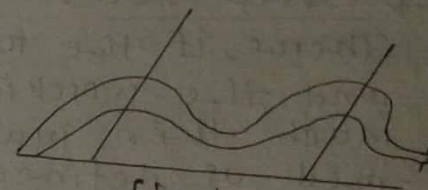


fig. b.

c) Recumbent isoclinal fold. - where the Axial plane is formed in 90° with the base and layers are rest on each other.

As shown in fig. c.

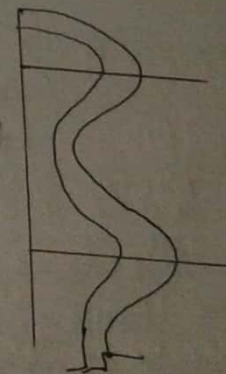


fig. c.

⇒ open fold:

The fold depends on the nature of rock and intensity of force on it where rock is very hard and force is acted very less, and then the fold is formed as open fold.



fig of open fold.

⇒ closed fold:

There, if the rock is very soft and the working force is very much then in which fold is formed as defined the closed fold.

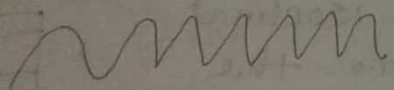


fig. of closed fold.

FAULTS.

⇒ Defination:

Fault is defined as the fracture, in the rocks, along which some definite displacement has taken place.

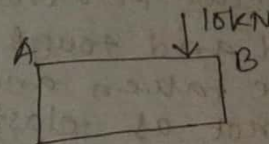
By the faults, the original position of a rock can be displaced, which is happened by the following three ways,

① slowly fracture can be taken place and for it, the displacement is not so much.

② sudden faults - by it displacement of rocks are very effective.

③ Reoccurring type of faults - which is happened at a ^{rest of} fixed time. So ^{taken} the displacement of rocks are at constant rate.

If at AB 10kN load is given as it is acting rock, then fracture or fault will be taken place which depends on nature of load on the rock which is in slow, sudden or reoccurring.



faults may be taken place in the rocks from a few centimeters to several kilometers.

Causes of faults:

The followings are included in the causes of faults.

① Horizontal compression -

When horizontal compressions given to the rock surface as it's below of neutral surface then the downward fracturational bend will be happened. For upward, the opposite will give to the arrangement. And for this the fault may be take place.

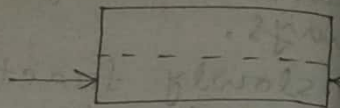


Fig. 1.

② Horizontal tension -

When hard and tough rocks are taken and which are not as elastic, for giving horizontal tension, there will happen the fault.

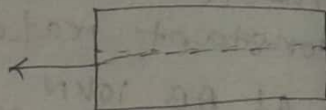


Fig. 2

③ Vertical movements -

When vertical force is given on side of a rock then it can be fractured and will be downward like hatch portion and for it the fault will be taken place.

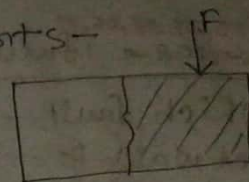


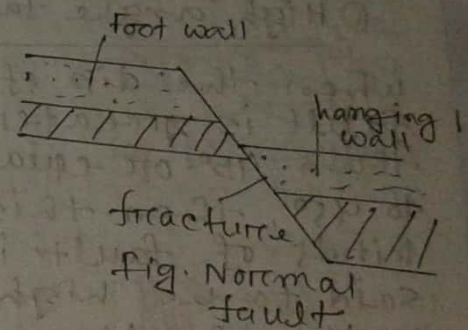
Fig. 3

Types of faults:

1. Based on movements of the blocks :-

① Normal fault:

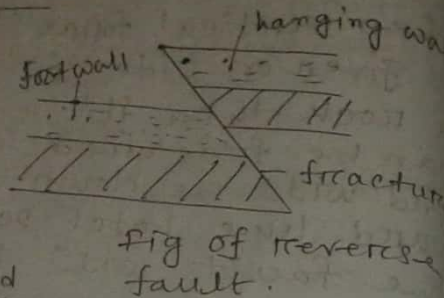
In which kind of faults, the foot wall is moved upward and the hanging wall is moved in downward of rocks. Surface is called the normal fault.



In fig. we see this fault.

⑪ Reverse fault:

At in which fault, the foot wall is moved downward and the hanging wall is moved upward after the fault in the rock body is called the reverse fault. In fig. we see it.



2. Based on amount of dip:-

① High angle fault:

When the dip of a fault is greater than 45° or equal to 45° , then this kind of fault is said to be high angle fault.

The fig. is shown it.

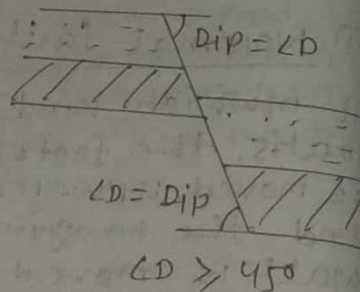
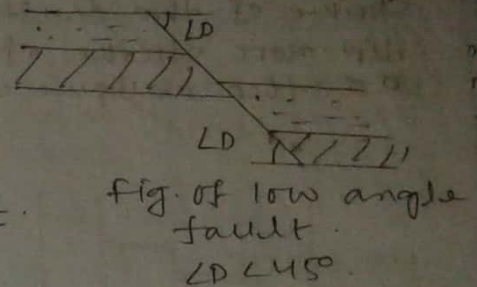


fig. of high angle fault

② Low angle fault:

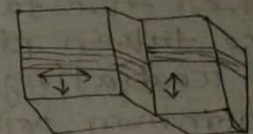
When the dip of a fault is less than 45° , is called the low angle fault. In fig. we see it.



3. Based on altitude of the fault:-

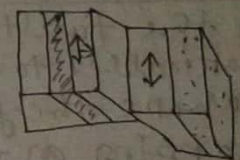
① Dip fault:

Strike of the fault is along the dip direction of the beds is called the Dip faults.



② Strike fault:

Strike of the fault is along the strike of the beds, at in which fault is called the strike fault.



(iii) Oblique fault:

Strike of the fault is neither along dip nor strike of the the beds, as the oblique fault.

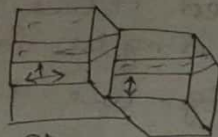


fig. oblique fault.

4. Based on general pattern:-

(i) Radial faults:

When the faults are taken place by radiating from a common point on rock surface is called radial faults.

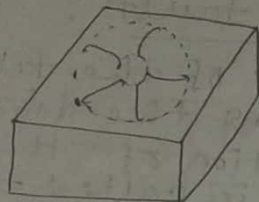


fig. of radial faults.

(ii) Encheon faults:

When the faults line looks like parallel to each other and where they are overlapping on each other is called encheon faults.

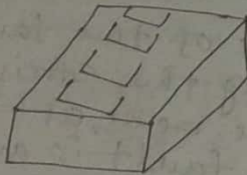


fig of encheon faults.

(iii) Parallel faults:

At in which faults the dips and strikes are same is known as the parallel faults.

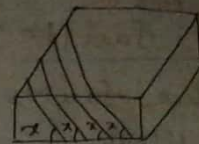


fig. of parallel faults.

(iv) Step faults:

The combination of parallel faults where looking like some step as formed, is called step faults.

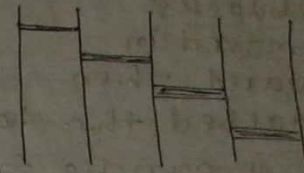


fig. of step faults.

(v) Peripherical faults:

When faults cover the small or big area within the peripherical shape as termed the peripherical faults.

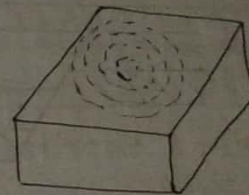
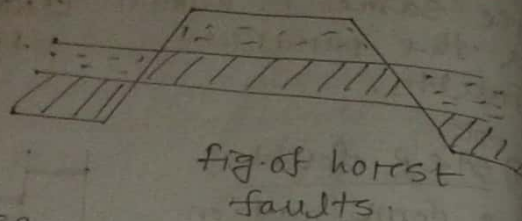


fig. of peripherical faults.

2012.05 (VI) Horst faults:

When the faults take place then if central block of a fracture moves upward and the side blocks are moved in downward then



it is called the horst faults. In fig it can be seen as a dam, which is the combination of the normal fault.

(VII) Graben faults: 2013

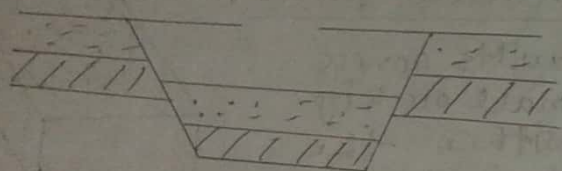


fig. of graben faults.

At in which faults, when central block is moved in downward and the side blocks move in upward, is called the graben faults.

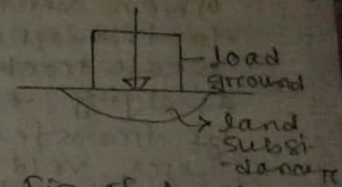
MECHENT Land sub-sidence.

11A-MMMGirc
05-05-2015

Definition: 2012, 2011, 05

The sinking and setting of land surface is known as the land sub-sidence.

When any vertical load is applied on land then land sub-sidence will be occurred when the load is excessively on land. So for this there must be stable ground surface is essential for the



every structure to help to prevent the structure from the bad effect of land sub-sidence. So, there must have solution for the land sub-sidence and one of it, is done the compaction on the ground surface.

Here, for giving the vertical load on the ground surface as in excessive amount which moves downward, then there also the land-sub-sidence must be occurred. So, for designing any structure, must have known to, about of the land sub-sidence.

2013.10.05

→ Causes of subsidence in land:

The following causes of land subsidence are very common and gives as below:

① Weak rock/sediments/soil due to load when vertical excessive load is given to the ground surface and if there is weak rock under the ground, then applying excessive load, the soil will be transferred from there and at a place there void will create at that place. For the void, there must be occurrence of the land subsidence.

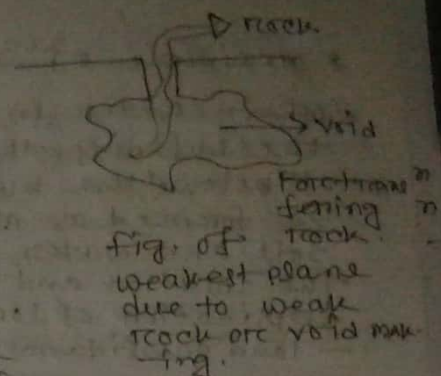
② Excessive load.

When excessive load is given to the ground surface and which is out of bearing capacity of the soil then there must create the void and land subsidence will occur.

③ Solution of rocks due to ground water

There takes place the reaction in between the ground water and the rock under the ground and solution of them will create. For the solution, for load applied on ground, weakest plane will be unable to carry it and where land subsidence will occur.

We see in fig. due to the above reason there, voids are formed in the under ground and land subsidence is occurred.



④ Underground Mining.

If the minerals are also displaced then void will make and which helps to perform the land subsidence.

⑤ Extraction of excessive ground water.

For this also water goes into the solid soil and makes solution and as a result the weakest plane forms and at a time for giving load, void will form and for the void the land subsidence will be occurred.

⑥ Drainage of swamp ground.

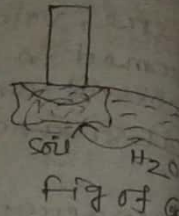
For same as ⑤ no. points.

⑦ Extraction of oil.

For same as to the ⑤ no. points.

* Drainage of swamp ground.

When water is in near to the building, then the soil of below the building, can be formed as mixture of soil and water and as acting the solution and for it after application of load - void - land subsidence occurs.



2011

→ Preventing measures of Land subsidence

The following prevention must be done for cause

① compaction:

For the weakest plane, if compaction is given or done, then there void will be filled and no land subsidence may be happened for the application of load.

② Soft material is replaced by strong material:

For having the low thickness of the soft material, if compaction is done then which is not help to prevent, but if there will have the strong material higher thickness then compaction is done very mostly and preventing the land subsidence. So it must be done there clay as soft material is replaced by the stone or sand as strong material.

③ Construction work, load < strength of ground:

There are having the fixed bearing of load capacity of the ground surface. If there gives less load than the strength of ground surface then the land - subsidence will be minimized.

④ Mining work → filled back properly:

In this work, if void will fill up by the stone or sand then the land subsidence will be prevented.

⑤ Extraction of ground water; discharge = recharge:

If discharge = recharge of ground water then no void will be formed. So there should be given water to the ground but there not takes the water more from ground surface.

⑥ Surface drainage - planned appropriate

way: If it is done there exists of water, no here happens any swamp which occurs the void and so there land subsidence can be prevented.

So, we have concluded that after a great prevention of the land subsidence, if above works will be done frequently and without any retardation, then there must be prevented the land subsidence.

MEHEDI
120095

12A-MMM SMC
26-05-2015

LAND SLIDES.

2013.12.09

Definition:

Along the sloping surface the loose and unsupported soil moves downward, this downward movement of consolidated or unconsolidated rock or soil is known as the landslides.

Condition:

There must have two conditions for occurring the landslides. which are as given below.

1. The surface must be slope shaped.
2. Soil or rock must be loose and unsupported.

If the conditions are fulfilled then there the landslides will be occurred.

Explanation:

At the sloping ground in fig.1. for giving load, and as it is loose soil and unsupported, for this the land will move downward as happens the land slides.

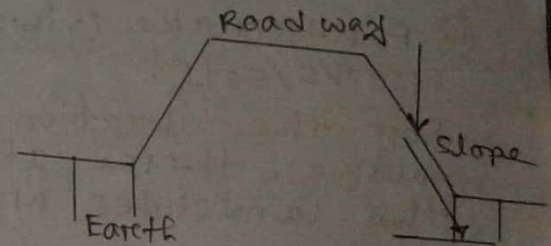


Fig. 1. of land slides.

2063 → Causes of Land slides:

There are two kinds of causes of slides which are as following,

1. External causes:-

The following external causes are found for happening the landslides.

① Excessive load on slope.
When it is done then the surface moves downward as occurred the slides. Hence the soil can be loose for water penetration due to rain.

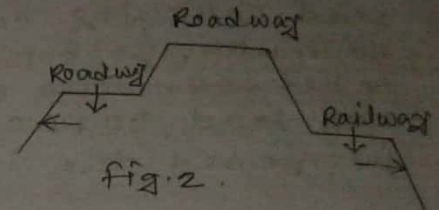
② Removing of material at the toe.
If earth excavation has been done with the sloping surface, then for the lateral load, the removal part of soil can be filled by the soil of loose on sloping surface and for the landslides are occurred.

③ Earthquake (vibrations) - shaking the rocks/soil.
For the vibration of soil due to earthquake, there at the sloping surface the landslides are occurred.

④ Vibration due to heavy traffic/Blasting
If the bearing capacity of load of soil exceed that limit, then there land slides can be occurred.

⑤ cutting made on the slope for road / railway.

If the compaction is not good at the sloping surface then there will be failed away the sloping surface and land slide can be occurred.



2. Internal causes:- The followings are found,

① Poor strength of Rock porous
permeable
nature.
If, there, rocks have the porous and permeable nature, then there water penetration can be done as it is reason for making the land loose and for load, land slides can occur.

② Presence of weak zone; plane of joint
If there has the presence of weak zone like plane of joint and then load is given that, joint, there fracture and crack will be seen and also land slides will be happened.

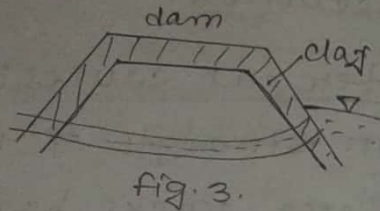
③ Weathering.

Due to weathering as bad effect, the land slides happen internally.

⑩ presence of clay beds (consolidation).
Load carrying capacity of clay is so much, so for this, because of voids in between the clay, and bad carrying load capacity, there must be happened the land slides.

⑪ presence of water.

For the saturated condition (having water) there the material with water can be existed by its side of dam and there must be happened the land slides.



* If there takes only sand, then for having its bad strength and water penetration through sand is high, so that there water is existed at the side of dam.

So, there uses the impervious layer of clay with sand are taken to construct the dam.

2005. ⑫ preventive measures:

For the above causes of landslides the following measures are taken as preventive measures of landslides.

① steep slope $\rightarrow$ flat type.

If the steep slope is made as flat slope, then landslides can be prevented.

② seepage of water. should be checked.

seepage of water - water passes through the soil particles interconnecting voids, as known the seepage water.

③ Excavation at base/toe - should not be allowed, which can be made at some distance from slope.

④ Excessive loads such as building / strike of brick / heavy road / Railway traffic should be reduced - to increase slope stability.

⑤ There must be done the dumping extra material at the base of structure.

⑥ If shear stress is too high - materials from top of slope should be removed.

The aboves are taken to prevent the land slides which are so important.

2013. Classification of Landslides:

There are five types of landslides.

1. Soil slips - The slow movements of soil and other unconsolidated rock matters, down the slopes and then soil slips happen.
2. Earth slides - where unconsolidated rock will be moved downward.
3. Rock slips - When rock slips due to hard rock and they are slipped due to their having no action of it.
4. Rock falls - Hard rocks will fall due to their activity with the other materials of solid.
5. Compound slides - Land slides involving consolidated and unconsolidated rock matters.

This types are elaborated at book page 329. D.S. Arora.

Differences: 2012, 2011, 10, 09, 08, 07, 06.

The differences between the Landslides and the land subsidence are as following

Landslides	Land subsidence.
1. Along sloping surface the loose and unsupported rock and soil moves downward, this downward movement of consolidated and unconsolidated rock matter is termed as landslides.	1. The sinking and settling of land surface is known as the land subsidence.
2. It is occurred in sloping surface.	2. It occurs in level ground but not in sloping surface.
3. It is caused for (i) Excessive load. (ii) Earthquake. (iii) water penetration and etc.	3. It is caused by (i) Weak rock. (ii) Drainage of swamp ground. (iii) Extraction of oil.
4. It is prevented by (i) flat slope making. (ii) No water penetration. (iii) Good kind of compaction.	4. It is prevented by (i) Weak material replaced by hard mat. (ii) load of ground or strength > load of other construction. (iii) preventing discharge.

Q4. Write a short notes on Tsunamis?

⇒ Tsunamis:

The strong earthquake produce giant sea waves called "Tsunamis".

Height of wave of this earthquake is 18 meters, with speed 500 km per hour.

So, it is one of the most dangerous.

2012
Q1. Defination of Loess:

The fine dust of wind erosion thrown in the atmosphere is normally carried over considerable distance. Ultimately it may be brought down by the rains and deposited. Such deposits are called loess.

- (i) Fragile.
- (ii) Soft.
- (iii) don't show any layering.

Earthquake

Q1. Ground Acceleration:

The earthquake vibration produce an acceleration in the ground as defined the ground acceleration.

$$\therefore G.A., \quad a = \frac{2.925 \frac{10^{M-5}}{h}}{1 + 4.5 \frac{10^{M-5}}{h}} e^{-0.26(D/h)^{3/2}}$$

D = Distance from epicentre.
h = depth of focus
M = Magnitude

2011.
Q1. Base share force:

The result of the multiplication of the seismic co-efficient with the weight of structure is known as the base share force.

$$\therefore B.S.F. = S.co.efficient \times \text{Weight of S.} \\ = \frac{a}{g} \times W.S.$$

Q1. seismic co-efficient:

The ratio of the ground acceleration and the acceleration due to gravity is called the seismic co-efficient.

$$\therefore S.co.efficient = \frac{G.A. Acceleration}{Acceleration due to Gravity} \\ = \frac{a}{g} = \text{Seismic factor.}$$

2013, 10, 09, 08, 06

Q. what factors should be considered for design a building structure in seismic areas?

⇒ considering factors in seismic areas for design a building structure:

If the following factors are taken in designing the building structure in seismic areas, then it will be designed the perfect design of building,

- ① Good quality construction materials should be used, having specification.
- ② Foundation must be on hard ground.
- ③ Foundation should be given in uniform depth.
- ④ column should be in square size.
- ⑤ Doors and windows should not be in vertical rows, but in diagonally.
- ⑥ R.C.C work must be done in brickwork.
- ⑦ Roofing work be confidently done by R.C.C to the add of lateral stiffness.
- ⑧ Height of the building should be uniform.
- ⑨ Arches, chimneys, domes, cantilever support should be avoided.

So, above should be done for design a building structure in seismic areas.

Weathering

2013, 12, 10, 08, 03, 07

⇒ Defination: Disintegration and decomposition of rocks without any significant transportation of the resulting products is termed as weathering.

⇒ Types: There are two types of weathering, which are as following.

① Mechanical weathering:

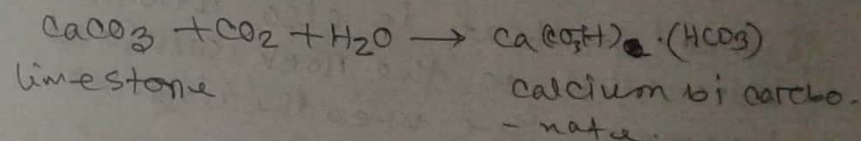
The physical breaking down of rocks into smaller fragments is called mechanical weathering.

At first, solid rocks break into ^{large} angular fragments which turn into finer products like sand and soil.

② Chemical weathering:

For the decomposition of rocks, the chemical process is responsible.

Ex: Water with CO_2 dissolve huge masses of carbonate rocks like limestone forming bicarbonate.



2012, 05,
Q1) Weathering agents:

The agents help to occur the process as weathering defined as the agents of weathering.

The followings are the weathering agents.

- ① Atmospheric gases:- CO_2 , N_2 , O_2 , and many vapours of acid dissolved in rain water and react with rock.
- ② Frost:- having given high pressure on rock surface and weathering occurs.
- ③ Gravity:- It effects the results in - collapse, of the unsupported and disrupted rock and breaking down.
- ④ Water:- It is most valuable that occurring weathering via in chemical weathering.
- ⑤ Organic agencies:- Different bacteria, vegetation and others organic agent also - help to occur weathering.
- ⑥ Heat:- Heat is also another which stressed on the rock surface to - happen the weathering.

2013, 2011, 10, 09, 08, 07,
Q1) Factors influencing the weathering:

The following factors influence the weathering.

- ① Chemical composition -
 - * Siliceous rocks resistant to mechanical and chemical decomposition.
 - * Quartz grains chemically inert & remain unchanged.
- ② Climatic condition -
 - * Extreme cold condition results in "frost action".
 - * Extreme hot condition disintegration of rocks can be done.
- ③ Types of rocks -
 - * Hard rock resists to mechanical weathering.
 - * Soft rocks readily wear out.
 - * Rocks with greater permeability allow more of seepage.
- ④ Landforms -
 - Mountains, valleys, plains, slopes - effect the weathering.
- ⑤ Time - For short time hardly and for long time effect may bring about significant changes.

2008, 05.

Q1 Scree: The angular rock fragments - detached from hillside may accumulate at the base or in valley, is called - the "scree".

2008, 05.

Q1 Deserts: The "vast sandy lands" formed by prolonged and persistent wind erosion are called deserts. For formation and expansion of deserts, arid climate is needed.

2009, 08, 06, 05, 04.

Q1 Sand dunes:

In deserts and beach areas, sands are accumulated to form of "hillocks" as defined sand dunes.

* gentle slope on windward side

* steep slope on lee-ward side.

2005

⇒ Unconformity: It is defined as the surface of erosion or non deposition, separating the underlying older formation from the overlying younger ones.

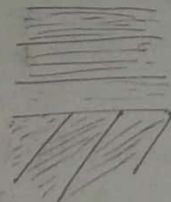


fig: unconformity.

2012.

⇒ Overlap: The fracture in which the overlying bed extends over the limits of its underlying beds.

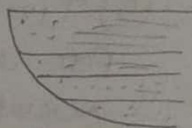


fig: overlap.

⇒ 2013 - 2004.

Q1 What are primary & secondary structures?

⇒ Primary structure:

The structures which are formed at the same time as the rock mass, itself or during its consolidation period are called primary structures.

Ex: stratification of sedimentary rock.

Secondary structure:

The structures which are formed after consolidation of rock mass are called secondary structures.

Ex: folds, rock cleavage, fractures etc.

2005

⇒ Nappe: The larger mass of rock that has been displaced forward for a considerable distance folding or faulting.

2012

⇒ Klippe:

A klippe is an isolated erosional remnant of an overthrust sheet.

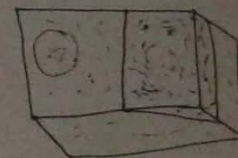


fig: klippe.