Chapter – 17: Natural Phenomena

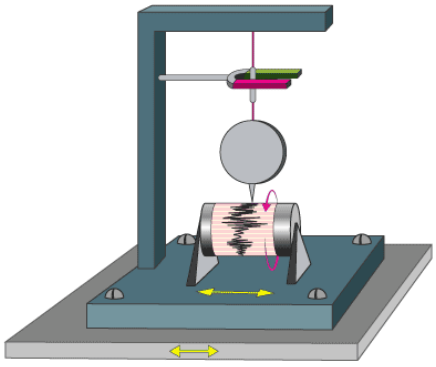
- Over years – humans – developed many machines – invented new technologies
- All these technology – cannot compare to power of nature
- One storm, tsunami, earthquake – wipe out years of construction and machinery
- Power of nature – cannot be controlled – BUT – effects can be reduced – understand them better
- Events, incidents – due to natural forces – natural phenomena
- Destructive events – loss of life and property – natural calamities (disasters)

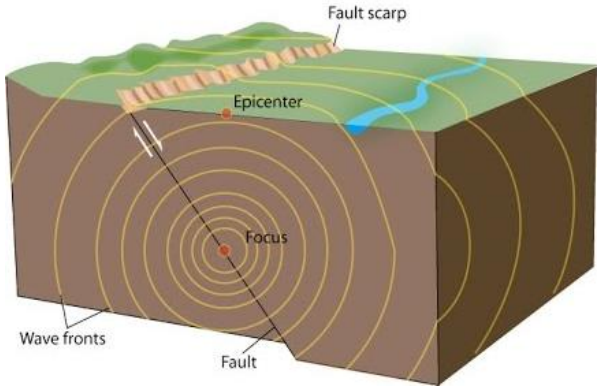
Earthquake

- Slight vibration, violent shaking – earth's surface
- Natural phenomena – very dangerous if intensity – very high
- Magnitude (intensity) – measured using Richter scale
- Magnitude – 3 or lower – hard to notice
- Magnitude – 4-6 – moderate – disturb loose structures and objects
- Magnitude – 7 or higher – very dangerous – damage permanent structures

How are Earthquakes Caused?

- Earthquake – result of release of energy – stored in earth's crust – creates seismic waves
- Seismic wave – wave of vibration – travel through earth
- Seismic waves – recorded by seismographs – intensity of waves
- Seismograph – simple instrument – consist suspended pendulum – pen attached to it – rotating drum with paper – spins under the pen
- During earthquake – pendulum vibrates – pen moves on paper – intensity measured this way





- Earth's crust, part of mantle – made of large slabs of solid rocks – tectonic plates
- These plates – under land and oceans – seems to float and move – internal pressure
- Sometimes – plates stuck – instead of sliding – puts stress on the ground
- After some time – stress increases – rocks break and slide – causing earthquake – ground failure
- Boundary of tectonic plates – fault plane
- Failure at fault plane – result in violent displacement of earth's crust – result is earthquake
- Point – under the surface – rocks break – focus
- Point – directly above the focus – on the surface – epicentre
- Magnitude – maximum at or near the epicentre
- After earthquake – tremors (vibrations) of lower magnitude – aftershocks

- May also occur – volcanic regions – tectonic faults – movement of magma
- Such earthquakes – early warning of volcanic eruptions

Effects of Earthquake

- Shaking and ground rupture –
  - Main effects of earthquake – cause damage to buildings, other rigid structure
  - Level of damage – depend on – magnitude of earthquake, distance from epicentre, local geological features
- Landslides and avalanches –
  - Damage caused in hilly and mountainous regions
- Fires –
  - After earthquake – fires start – broken electrical or gas lines
- Tsunamis –
  - Underwater earthquake – cause tsunamis
  - Example – 2004 Indian Ocean tsunami
- Human impacts –
  - Damage to property, roads, bridges, buildings, etc
  - May damage the foundation of buildings

Protective Measures for Earthquake

- Experts suggest – earthquakes don't kill people – buildings do
- Most casualties (deaths) – collapse of human constructions
- Earthquakes – not predictable – BUT – loss of damage – reduced – preventive measures
- 4 basic protective measures –
  - Mitigation –
    - Efforts – reduce loss of life and property – lesser impact of disasters
    - Achieved through – risk analysis, reduction
    - Some steps –
      - Use lightweight materials – construction of buildings – reduce damage during collapse
      - Constructing buildings – solid grounds – follow building norms
      - Fixing heavy equipment, furniture to walls – do not fall during earthquake
  - Preparedness –
    - Many things – everyone must know – survival during earthquake –
      - Disaster first aid kit –
        - Food and water- at least 3 days
        - Basic medical supplies, tool kit, sanitation, family documents, etc
      - Home earthquake plan –
        - All family members – practice emergency situations
        - Safe areas in house – identified
      - Advisable – take training – emergency first aid, fire extinguishers, emergency exit plans
  - Response –

        - Keep calm during earthquake – very imp.
        - Basic safety steps –
            - When indoors – drop down to floor – take cover – under desk, table, etc – duck and drop technique – stay away from windows
            - When outside – go into open areas – away from buildings, power lines, trees, etc
            - When inside a car – stop the car – open areas – away from bridges, flyovers, etc
    - Recovery –
        - Earthquake – lot of damage – life and property
        - Effects of earthquake – long term – people – may be evacuated
        - Govt. – use disaster management plan – certain steps taken –
            - Check for injuries –
                - Do not move injured person – until very necessary
                - Provide first-aid – wherever required
            - Check for hazards –
                - Earthquakes – create other dangers
                - Very imp. – check for hazards, gas leaks, electrical wirings
            - Telephone line – functional – left free – emergency use
            - Expect aftershocks –
                - Most – smaller than main earthquake
                - Some – large enough – additional damage

Thunderstorms

- Another natural phenomenon – thunderstorm – lots of damage
- Storms – very dangerous – lightning strikes – responsible – killing people – damage property
- Moist air – rise up – form clouds – thunderstorms are formed
- Thunder clouds – also called – cumulonimbus clouds
- Warm air moves up – moisture condenses – forming ice crystals
- Condensed moisture – comes down – gravity – air still going up
- This instability – upward, downward movement – formation of static electrical charges
- This electricity – discharged – seen as thunder and lightning

Lightning

- Most beautiful display in nature – BUT – most deadly as well
- Lightning bolt – speed – 45 km/s (160,000 km/hr) – temperature – $28{,}000^0$ C

The phenomenon of lightning

- Thundercloud – move around – equal and opposite charge – induced (developed) at the ground
- Negative charges – travel downward – thundercloud to earth
- Electrical field – strong enough – electrical discharge between clouds
- During strike – air – works as conductor and expands – produce shock waves
- Shock wave – heard as thunder

- Lightning – seen before hearing thunder – speed of light greater than speed of sound
- 1752 – Benjamin Franklin – proved – electricity, lightning – same thing
- He flew his kite in thunderstorm – bottom part of string – dry
- Attached a key to the bottom part – kite – stuck by lightning
- Spark – travelled from key to his hand
- He was – lucky – didn't die
- Next 2 persons – tried this experiment – died

Safety Measures During Lightning Strikes

- People – stuck by lightning – receive electric shock – may be burnt
- These people – carry no charge – handled safely
- Someone – looking dead – may be revived – quick actions
- Lightning conductor – pointed metal – not attached to roof – BUT – connected to copper, aluminium piece – connected to conductive grid in the ground
- This conductor – protects building from lightning
- Purpose – lightning rods – low resistance path – to ground – conduct electrical currents – during lightning
- Lightning rod – current flows to ground – without damage
- Safety measures –
    - Never take shelter – under tall tree or only tree in the area
    - Do not stand – high ground
    - Don't fly kite – in thunderstorm, near power line, near air field
    - Stay away – wire fences, clothesline, metal pieces, etc – metal objects
    - When in vehicle – stay inside – vehicle – act as bad conductor