IQRA NATIONAL UNIVERSITY

ENGINEERING GEOLOGY

Lecture 05

Tunnels and Geological consideration

PREPARED BY ENGR. IMTIAZ KHAN LECTURER CED ,INU PESH

WHAT IS TUNNEL?

Tunnels may be defined as underground routes or passages driven through the ground without disturbing the overlying soil or rock cover.

TYPES OF TUNNELS

ON THE BASIS OF USE

1.Traffic tunnels

2. Hydro power tunnels

3. Public utility tunnels

TRAFFIC TUNNELS

vehicular road **traffic or** rail **traffic**

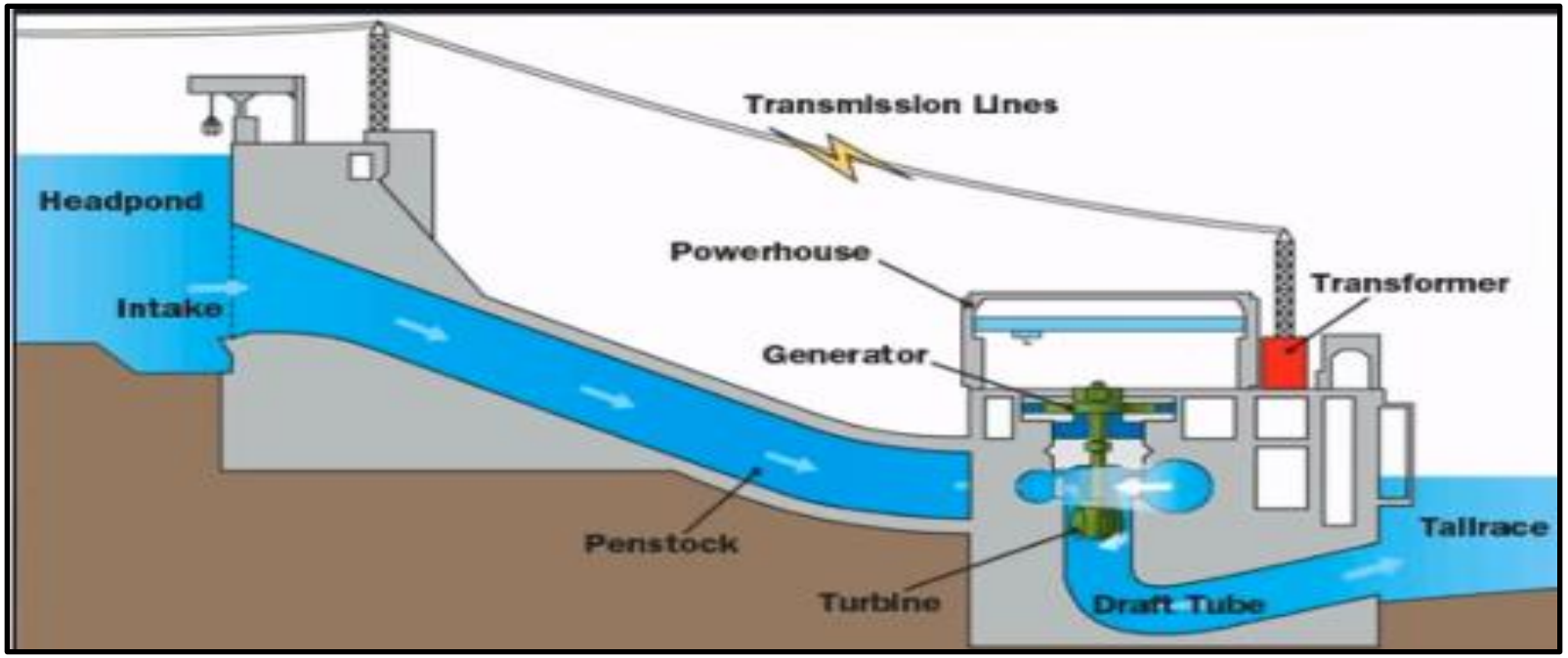
Kohat tunnel

Lawari tunnel

HYDRO POWER TUNNELS

Diversion tunnel purpose of conveying water under gravity from one point to another, as for example, to cross a hill. In such cases they are called discharge tunnels.

Pressure tunnel are those which feed water under great pressure to turbines and is distinguished as pressure tunnels.



PUBLIC UTILITY TUNNELS

This group includes a variety of underground excavations made for specific purposes such as for disposal of urban waste (sewage tunnels), for carrying pipes, cables and supplies of oil, water etc.

TYPES OF TUNNELS

ON THE BASIS OF Geology

1.Hard rock tunnels

2. Soft rock tunnels

Soft Ground (Earth) Workers dig **soft**-ground **tunnels** through clay, silt, sand, gravel or mud. ...

Hard Rock. **Tunneling** through **hard rock** almost always involves blasting.

Geological Investigations for Tunnels:

- **These determine to a large extent solutions to following engineering problems connected with tunneling:**

(a) Selection of Tunnel Route (Alignment):

There might be available many alternate alignments that could connect two points through a tunnel. However, the final choice would be greatly dependent on the geological constitution along and around different alternatives: the alignment having least geologically negative factors would be the obvious choice.

Geological Investigations for Tunnels:

(b) Selection of Excavation Method:

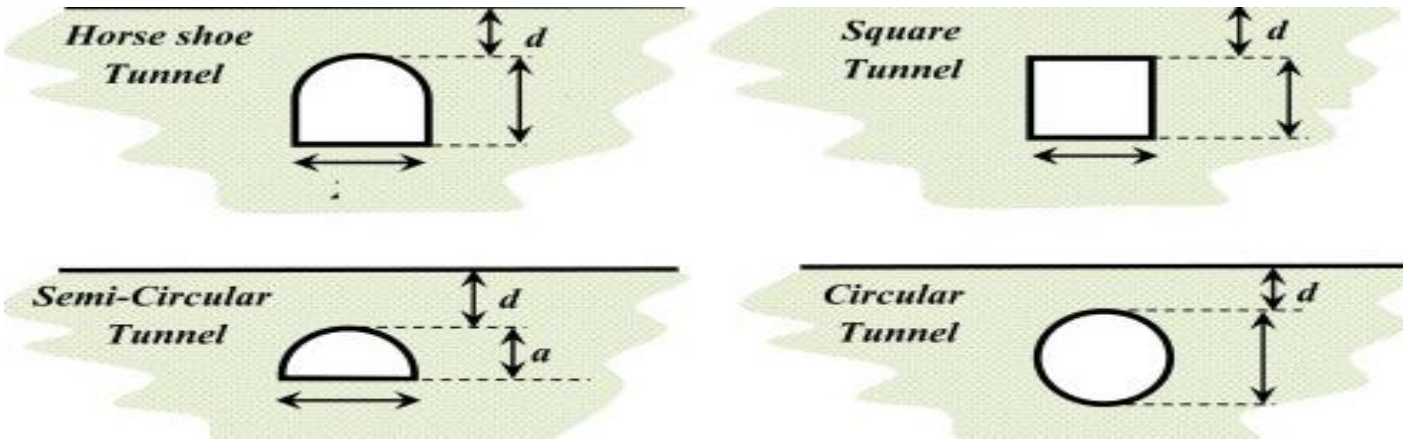
Tunneling is a complicated process in any situation and involves huge costs which would multiply manifolds if proper planning is not exercised before starting the actual excavation. And the excavation methods are intimately linked with the type of rocks to be excavated. Choice of the right method will, therefore, be possible only when the nature of the rocks and the ground all along the alignment is fully known. This is one of the most important aim and object of geological investigations.

Geological Investigations for Tunnels:

(c) Selection of Design for the Tunnel:

The ultimate dimensions and design 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 outlines, is more often dictated by the geology of the alignment than by any other single factor.

D-shape or horse-shoe shape may be conveniently 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.



Geological Investigations for Tunnels:

(d) Assessment of Cost and Stability:

These aspects of the tunneling projects are also closely interlinked with the first three considerations. Since geological investigations will determine the line of actual excavation, the method of excavation and the dimensions of excavation as also the supporting system (lining) of the excavation, all estimates about the cost of the project would depend on the geological details.

Geological Investigations for Tunnels:

(e) Assessment of Environmental Hazards:

The process of tunneling, whether through rocks or through soft ground, and for whatsoever purpose, involves disturbing the environment of an area in more than one way. The tunneling methods might involve vibrations 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.

Preliminary Surveys

The general topography of the area marking the highest and the lowest points, occurrence of valleys, depressions, bare and covered slopes, slide areas, and in hilly regions and cold climates, the snow-line.

The litho-logy of the area, meaning thereby, the composition, attitude and thickness of rock formations which constitute the area.

The hydrological conditions in the area, such as depth of water table, possibility of occurrence of major and minor aquifers of simple type and of artesian type and the likely hydrostatic heads along different possible routes or alignments.

The structural condition of the rock, that is, extent and attitude of major structural features such as folding, faulting, unconformities, jointing and shearing planes, if developed. Existence of buried valleys is also established during the preliminary surveys.

In addition, such surveys would also reveal occurrence of reserves of rocks that could be beneficially used for construction programmes (lining etc.) in the tunnel project.

It is obvious that with the help of above information, the engineers could propose a number of alternative tunnel routes to connect the two places, and in most cases, even decide about the general run of the tunnel.

ASSIGNMENT

Geological Detail survey of the tunnels.

Note:

- What is meant by Geological Detail survey?
- What are the parameters/points to be considered in Geological Detail survey of tunnels?
- Detail of each parameter?

END OF THE LECTURE