River Diversion:

Whenever a dam is to build a cross an existing river channel, the river must be diverted so that construction can be done.
The manner in which the diversion is accomplished depends on:

- **Kinds of dam being constructed.**
- **The character of the site,**
- **The characteristics of stream flow.**

Gravity Dams:

In the construction of this type, there are two stages:
First stage

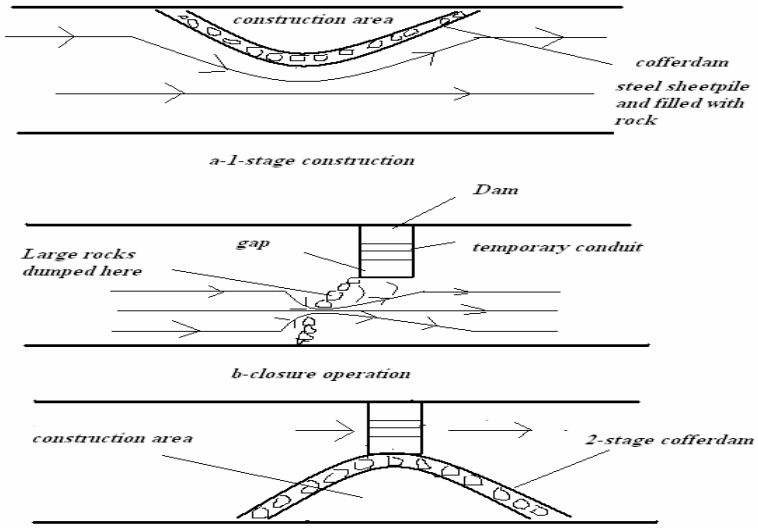
- **A coffer dam is constructed a cross about half the channel and the flow is diverted to the other half.**
- **The area inside the cofferdam is dewatered and part of the dam is built inside this cofferdam.**

A temporary diversion tunnel also may be including in this stage construction through which flow can be diverted in the second stage.

***The second stage*:**

- **The first stage cofferdam is removed and construction of part of the second stage is started,**
- **The flow is restricted to small opening in the second stage cofferdam.**

For the large river, cutting off the flow is a critical operation (2-stage) because the flow velocity through the opening in the already constructed cofferdam frequently will be large and will increase as the opening because smaller. The process of stopping this flow is called the closure.



After construction is complete the 2-stage the cofferdam is removed and flow is diverted through the part of the dam (spillway or powerhouse).
Scheduling the different phases of construction of the cofferdam must be synchronize with the normally expected variation in stream flow. For example, the first cofferdam will normally be built during a low-flow period and then the stream flow will be diverted to the completed structure during another low flow season.
The depending on the stream characteristics, the designer may have to think in term of 1-year time increments between low flow seasons.

The designer also will have to decide how high to design the cofferdams. Normally, they are not made so high that they would never be overtopped by the design flood for the dam. The designer must balance the added cost of a very high cofferdam against the damage might include the costs due to work stoppage and cleanup. For major dam, designing the cofferdams so that it will withstand a 20-year flood is common.

Arch Dams:

The two stage diversion described for gravity dam may not be suitable because of the limited working space in the canyon.

A common procedure is to excavate a tunnel through one abutment and then build cofferdams upstream and downstream dam sites. When the cofferdams are closed, the water is diverted through the tunnel, and construction of the dam can take place inside the cofferdam.

In designing arch dams, it is fairly common to include a tunnel as part of the spillway. In this case, part of the diversion tunnel can usually be used as part of the spillway tunnel.

Diversions for Earth Dams:

The diversion scheme is much more important for earth dams than for concrete dams, if cofferdams for an earth dam were overtopped. It is possible than all the work done to that date could be wiped out.

That is, the damage infected by overtopped a cofferdam protecting an earth embankment is usually much more than that for a concrete dam. Therefore the direction scheme for earth dam must be designed to accommodate very large floods.

Problems

Q (1): The following data represent the flow measurement of a river, which is achieved at the location of a construction dam site, design the diversion of the river if the type of dam is: v=3m/s

- **Gravity dam,**
- **Arch dam,**
- **Buttress dam,**
- **Earth dam**

Time	Elevation of Water	Q(m^3/s)
1	112	1500
2	111.7	1300
3	111.5	1150
4	111.35	1000
5	111.1	980
6	111	970
7	110.95	963
8	110.9	954
9	110.25	700
10	110.15	690
11	110.01	614
-	-	
50	-	