Dam Safety Structures: **Assistant Lecture: Taban K. Hamad**

Chapter One: Spillways

1.1. Introduction

1.2. Essential Requirements of a Spillway

- 1.2.1. Requirement of a Spillway Capacity

1.3. Factors affecting design

- 1.3.1. Safety considerations consisting with economy
- 1.3.2. Hydrological and site conditions
- 1.3.3. Type of dam
- 1.3.4. Purpose of dam and operating conditions
- 1.3.5. Condition downstream of dam
- 1.3.6. Nature and amount of solid material brought by the river

1.4. Classification of spillways

- 1.4.1. Classification based on purpose
- 1.4.2. Classification based on control
  - Types of gates
  - The Advantages and Disadvantages of Gates
- 1.4.3. Classification based on prominent feature

1.5. Free overfall spillway

1.6. Ogee – Shaped (Over flow) spillway

- 1.6.1. Downstream profile
- 1.6.2. Upstream profile
- 1.6.3. Discharge computation for an ogee spillway
  - 1.6.3.1. factors affected on discharge coefficient
    - a. Height of the upstream crest above the stream bed
    - b. Ratio of actual head to the design head
    - c. Slope of the upstream face of spillway
    - d. Downstream apron interface and downstream submergence

1.6.4. Effective length of crest

1.6.5. Discharge formula for gated spillway

1.7. Side Channel spillway

1.7.1. Hydraulics of Flow in Side Channel Spillway

1.7.2. Water Surface Profile in Trough Channel

1.7.3. Control point

1.8. Chute (or open channel or trough) spillway

1.8.1. Design of low-ogee weir

1.8.2. Discharge carrier (Chute)

1.8.3. Slope of Chute Channel:

1.8.4. Chute Sidewalls

1.8.5. Dynamic Force on Spillway (Structural Design):

1.9. Stepped Spillways (Cascade spillway)

1.9.1. Flow regimes on a stepped chute

1.10. Shaft Spillway

1.11. Siphon Spillway

1.12. Labyrinth Spillways

1.13. Conduit and Tunnel Spillways

1.14. baffled chute spillway

Chapter two: Hydraulic Jump & Energy Dissipation Devices:

2.1. Hydraulic Jump (Standing Wave) Phenomenon

2.2. Momentum formula

2.3. Loss of energy in the standing wave

2.4. Location and Profile of Hydraulic Jump

2.5. Forms of the Hydraulic Jump

2.6. Energy Dissipators

a) Hydraulic jump type stilling basins

b) Jet diffusion and free jet stilling basins

c) Bucket type energy dissipators

2.7. Measure adopted for dissipation of energy

2.8. Stilling Basin

2.9. Types of stilling basin

2.9.1. U.S.B.R. Stilling basins

2.9.2. Indian Standards of Stilling Basin

2.9.3. R. S. Varshney stilling basin

2.9.4. The Saint Anthony Falls (S. A. F.) Stilling Basin

2.9.5. Design of stilling basin with sloping apron (IS type III and IV):