THEORY AND DESIGN OF IRRIGATION STRUCTURES Volume II

CHAPTER 1 Irrigation Structures on Permeable Foundation

Introduction, Bligh's Creep Theory, Lane's Weighted Creep Theory, Potential Flow Theory, Properties of a Flow Net, Trial and Error of Graphical Method, Mathematical Solution of Laplace Equation, Khosla's Theory of Independent Variables, Method of Electrical Analogy, Method of Relaxation, Seepage Force and Safety Against Piping, Inverted Filter, Considerations in the Design of Structures of Permeable Strata, Design with Considerable of Scour, Structural Design.

CHAPTER 2 Hydraulic Jump & Energy Dissipation Devices

Hydraulic Jump (Standing wave) Phenomenon, Normal & Sequent Depths in Rectangular Channels-Design Chart, End Depth, Forms of Hydraulic Jump, Energy Dissipators, Design Criteria of Different Energy Dissipators, Hydraulic Design of Stilling Basin (for low Froude Number) Design Examples.

CHAPTER 3 Transitions

Introduction, Contracting Transitions, Expanding Transitions, Design Examples.

CHAPTER 4 Foundations and Explorations

Types of Foundations, Types of Spread Foundations, Depth of Foundations Bearing Capacity, Terzaghi's Analysis, Standard Penetration Test, Plate Loading Test, Settlement of Foundations, Allowable Bearing Pressure, Bearing Capacity under Eccentric Loading Examples, Soil Explorations.

CHAPTER 5 Canal Head Works

Introduction, Types of Diversion Works, Location of a Weir, Types of Weirs, Components of Headworks, Divide Wall or Groyne Effect of Construction of a Weir on the River Regime, Failure of Weirs on Permeable Foundation, Considerations in Design of Weir or Barrage, Design with Consideration of Surface Flow, Design with Consideration of Hydraulic Jump, Design of Barrage (stepwise procedure), Examples on Design of Barrage, Design Example on Head Regulator, Example on Structural Design of Wing Wall and Abutment Barrage, Effect of Three Dimensional Seepage Flow on the Design of Barrage Floor, Example of uplift Pressures with 3D Seepage Flow.

CHAPTER 6 Cross Regulator

General, Off-Take Alignment, Design of Cross and Head Regulator off-taking Channel (Design Criteria), Design Example on Cross and Head Regulators.

CHAPTER 7 Sediment Control and Exclusion Devices

General, Classification of Sediment Control (Measures and Devices), Sediment Preventive Measures, Sediment Control Devices, Design Example of King's Vanes on Distributary Skimming Platform, Vortex Tubes, Sediment Excluders, Design Example on Sediment Excluder, Sediment Ejectors or Extractors, Design Example of a Sediment Ejector, Advantages and Disadvantages of Excluders and Ejectors, Sediment Basins or Sedimentation Chambers, Design Example of a Sedimentation Chamber.

CHAPTER 8 Canal Falls

Introduction, Type of Falls, Selection of Type of Fall, Principles of Design, Design of Sharda Type Fall, Design of Glacis Fall, Energy Dissipators, Freeboard, Parapat Wall and Railing, Gauge Well, Low Discharge Falls, Design of Sharda Type Fall for Q = 10 cumec and for Q = 50 cumec, Design Example on Unflumed Straight Glacis Non Meter Fall, Design Example on Flumed Straight Glacis Meter, Falls, Design Example on UnflumedNon Meter Baffle Fall, Design Example on Flumed Baffle Meter Fall.

CHAPTER 9 Drainage Works

Necessity of Cross Drainage Works, Classification of Cross Drainage Works, Selection of Suitable Type of Cross Drainage Works, Foundations and Cross-Sections, Important Features of Design of Cross Drainage Works, Design Discharge, Waterway of the Drain, Discharge and head loss through the Cross Drainage Works, Fluming of Canal Waterway, Uplift Pressure on the Roof or Underside of Trough, Uplift Pressure on the floor of the Syphon Adueduct, Uplift in Syphon Barrels, Exit Gradient, Design Examples on Aqueduct, Syphon Aqueduct, Barrel Type Syphon Aqueduct, Syphon, Example on Structural Design of Syphon Barrel, Example on Superpassage.

CHAPTER 10 Miscellaneous Canal Structures

Outlet Works, Components of Outlet Works, Design of Sluice, Meters, Venturi Flume, Standing Wave flume, Escape, Bridges, General Instruction for Design of Canal Bridges (Decking R. C. Slab), Design of Roadway, Design Example on Piers of Aqueduct, Proportional Distributors.

CHAPTER 11 Investigations and Planning for Dams and Reservoirs

Introduction, Selection of a Dam Site, Types of Reservoirs and Zones of Storage, Types of Dams, Selection of a Suitable Type of Dam, Investigations, Engineering Surveys, Geological Investigations, Items of Investigations, Investigation area, Stages of Investigations, Methods of Investigations, Explorations by Geophysical Methods, Exploration by Fits & Trenches, Exploration by Boring-Drifts-Shafts, Explorations by Field and Laboratory Testing, Exploration for Construction material, Hydrological Investigations, Fixation of Storage Capacity of Reservoirs, Reservoir Operation, Flood Routing, Economic Height of Dam, Reservoir Losses, Sediment in Reservoirs, Life of a Reservoirs, Allocation of Costs of Multipurpose River Valley Projects.

CHAPTER 12 Spillways

Introduction, Factors Affecting Design, Components of Spillways, Types of Spillways, Selection of Spillway Type and Size, Location of Spillway, Design Principles of Ogee or Overflow Spillway, Design Example on Hydraulic Design of Ogee Spillway and Bucket Type Energy Dissipator, Design Principles of Side Channel Spillways, Design Principles of Chute Spillway, Design Example on Hydraulic Design of Shute Spillway, Design Principles of Syphon Spillway, Design Principle of Shaft Spillway.

CHAPTER 13 Gravity Dams

General, Dam Parameters, Criteria for Selection of Dam Site, Construction Materials, Foundation Treatment, Joint and Keys, Cooling Arrangements, Waterstops at Joints, Closing Gaps, Forces Acting on Dam, Types of Loads, Stability Analysis Methods, Safety Criteria, Gravity Analysis Elementary Profile of a Gravity Dam, Examples on Elementary Profiles, Determination of Profiles of a Dam, Top Width and Free-Board, Design Example on Gravity Dam, Effect of Foundation Elasticity on Stresses in the Dam, Galleries Instrumentation.

CHAPTER 14 Buttress and Arch Dams

General, Types of Buttress Dams, Provision of Spillways and Outlet Works, Design Principles, Advantages and Disadvantages of Buttress Dams, Arch Dams-General, Valleys suited for Arch Dams Laying out Dam in Plan, Types of Arch Dams, The Appurtanent Works, Design of an Arch Dams, Design Examples, Constant Radius Arch Dam-Constant Angle Arch Dam.

CHAPTER 15 Earth and Rockfill Dams

Introduction, Foundation for Earth Dams, Causes of Failure of Earth Dams, Design Criteria of Earth Dams, Prevention of Erosion, Embankment Details, Seepage through Dams, Seepage or Phreatic Line, Stability of Slopes, Control of Seepage through Foundations, Drainage in Earth Dams, Selection of Type of Earth Dams, Maintenance and Treatment of Common Troubles in Earth Dams, Design Example on Earth Dams.

CHAPTER 16 Hydro Electric Development

General-Types of Power Plants, Terms Relating to Hydro-Power, Main Types of Power Plants, Turbines, Selection of the Turbine, Setting of Turbines, Main Parts of a Hydro-Electric System.