Conveyance and Distribution Systems

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I. INTRODUCTION

The design, construction, and maintenance of conveyance and distribution systems is an integral part of most water resource developments, whether the development is small or large, simple or complex, and serves one or several purposes. In most cases, the project will be dual or multipurpose. To optimize the benefits of the development, the entire project must be considered as a unit before the design requirements for the conveyance and distribution systems can be established. The design of the system must consider public health and the nuisance standpoint, and the supply and quality of water must be adequate for successful irrigation. If the distribution system is gravity flow, reservoirs must be located at a sufficient elevation above the irrigated area to provide adequate head for delivery. In most instances in present and future developments the design of conveyance and distribution systems must consider the distribution of water for domestic and municipal purposes, water for industrial use, and stock water. Also, power development and flood control measures may be integrally involved in the design.

Project studies must be conducted to verify project feasibility and must precede design and construction. Basic data required to compile such a study may include maps, aerial photographs, triangulation and bench marks, geology, land classification, climatological data, streamflow data, sediment, quality of water, irrigation and drainage data, etc.

Numerous factors must be considered to derive an adequate conveyance capacity. The annual farm delivery requirement, usually expressed in acre-feet per acre, must be accurately determined by the agronomist working in close cooperation with the irrigation district. It is necessary to evaluate the annual farm delivery demand which is the quantity of water required to bring the crops to maturity exclusive of rainfall. This quantity includes economically unavoidable losses such as percolation, runoff and evaporation and is the base from which conveyance capacity is determined. The annual farm delivery requirement is usually expressed as a monthly demand schedule in acre-feet. This monthly demand varies with crops, climate and soil. In addition, distribution system losses (pipe or open lateral losses) and operational losses must be taken into account. Water losses resulting from seepage, operational losses, and evaporation are of prime importance where water conservation is essential.

With the capacity requirements of the system established, the conveyance and distribution system, including conveyance and control structures, can be designed in accordance with the fundamentals of hydraulics, fluid mechanics, soil mechanics, and structural engineering.