

SECTION VIII

IRRIGATION AND DRAINAGE PIPES AND STRUCTURES

8-01. General. Levees are one of the primary means by which lives and property along the river channels are protected from floodwaters. In view of the intensive development taking place along the river channels in the Central Valley, any construction which affects the safety of the levee must be given careful consideration. The installation of new or the modification of existing irrigation or drainage pipes through a levee presents an extreme hazard. The following standards, which have been developed to be used as a guide, will be followed by the Sacramento District in project construction and will be the basis for review by the Federal Government and the State for all pipe applications submitted to the Reclamation Board for approval. These standards apply to new installations as well as to the modification of existing installations.

In the interest of safety the objective, to the extent possible, is for all pipes through the project levees to have their invert above project design flood plane. All new installations should meet this criteria. Existing installations requiring modification must be given special considerations, as to require the owner to reinstall the pipe with the invert above the project design flood plane, would deprive him of an established prior right. A change in pipe size shall constitute a new installation.

Pipes for the passage of irrigation and drainage flow through the project levees can be divided into two general classes and the policy to be followed for each class is set forth in the following paragraphs:

8-02. New installations.

a. Invert of pipes above project design flood plane (either pressure or gravity flow).

(1) There is no restriction on pipe size for pressure flow. The minimum diameter pipe for gravity flow is 12 inches. Pipes through the levee shall be new steel, welded or riveted, and be soil proofed, except for threaded sizes, which shall be galvanized. Consideration can be given to pipes of composition other than steel if the strength is comparable. Joints shall be butt-welded, flange connected, or have mechanical couplings. No flange connections or mechanical couplings shall be used in the portion of the pipe which is buried in the levee slope or crown. Such joints will be in locations where they can be readily inspected at any time. The minimum gages for steel pipes are as follows:

(a) No. 10 gage (0.1345-inch thickness) up to and including 12 inches in diameter.

(b) No. 7 gage (0.1793-inch thickness) for pipes over 12 inches in diameter.

c. No. 3 gage (0.2391-inch thickness) for pipes over 30 inches in diameter.

(2) Cutoff wall. In levees constructed of homogeneous impervious fill 2 cutoff walls are required on all pipes 6 inches and over in diameter. The cutoff walls shall be either poured-in-place reinforced concrete or plate steel and shall be placed around the pipe at the crown-lines of the levee or at least 20 feet apart. (See Exhibit D, Drawing No. 4488/6). Drainage fill with annular thickness of 18 inches all around the pipe shall be provided on the landside third of the pipe.

(3) When siphon action is possible. Some means must be provided to break the siphon action on irrigation pumps or siphon pipelines 12" in diameter or less, and on drainage pump pipelines a Harris siphon breaker is required.

(4) Gates and valves. A flap gate will be required on all drainage pipes which pass through the levee above flood plane. A gate valve will be required on all irrigation pipes over 12" in diameter and shall be readily accessible and shall be on the waterside of the levee.

(5) Pipe coverage. Pipes shall have a minimum coverage of 24 inches to withstand vehicular traffic on the crown. If necessary the levee grade shall be raised to get the required cover over the pipe; the longitudinal slope along the levee shall not be steeper than 1 on 10. The pipes shall be installed in excavated trenches of the following widths: for pipes up to and including 12 inches in diameter, one diameter plus one foot on each side of the pipe; for pipes over 12 inches in diameter, one diameter plus one diameter on each side of the pipe up to 36-inch diameter. For pipe over 36-inch diameter trench shall be 72 inches plus diameter of pipe in width. (See Standard Drawing 4488/6). When two or more pipes are installed in a levee there shall be a minimum space between the pipes of 12 inches or the diameter of the larger pipe whichever is greater, up to a maximum of 36 inches. In the case of pipe arches the minimum spacing shall be 1/3 of the span of the pipe arch. Pipes or pipe arches need not be spaced more than 36 inches apart. The trench shall be excavated a minimum of 12 inches wider than the pipes or arches for small size pipes up to 12-inch diameter. For larger size pipes and arches a minimum distance of 36 inches shall be provided between the outside of the pipe or arch and the trench. The trench shall be backfilled in 4-inch layers and compacted to the same density as the undisturbed levee. Under certain conditions, such as when a railroad or highway is located on the levee crown, the jacking of the pipe through the levee above flood plane will be permitted. If a sleeve pipe is first jacked through the levee, the sleeve pipe shall have a minimum inside diameter 2 inches greater than the outside diameter of the pipe carrying the flow. The entire annular space between the sleeve and the pipe shall be pressure grouted with portland cement grout. On all installations where the pipe passes through the levee above flood plane, no portion of the pipe above the point of entry

and exit shall be exposed on the landside or riverside slope. The pipe shall be placed in the levee slope in a trench, backfilled as indicated above, and shall have a minimum coverage of 12 inches.

(6) Spillboxes or standpipes. Spillbox or standpipe installations on the landside of the levee shall be a minimum distance of 5 feet from the landside toe of the levee, measured from the nearest face of the spillbox or standpipe.

(7) Rock protection around pipes. Rock revetment shall be placed on the riverside slope of the bank and/or the levee upstream and downstream from the pipe as required to prevent erosion.

b. Invert of pipes below project design flood plane (either pressure or gravity flow). Normally no installation will be permitted through the levee with the invert below flood plane. However, there will be instances when public entities such as the State, counties, cities, reclamation and/or drainage districts, or responsible individuals must provide for the passage of relatively large volumes of water (100 cfs or more) from the landside to the stream channel. In this event the agency must present an engineering study to establish the need for the gravity structure, and to show adequate responsibility to construct and maintain the gravity structure. In each case both the District Engineer and the Local Sponsoring agency must give approval. A reinforced-concrete, cast in place box culvert built in accordance with standard drawing 4488/8 or precast reinforced concrete pipe with concrete collars conforming to Corps criteria at the joints and meeting ASTM specification C-76 may be used. The minimum size structure permitted will be 30 inches inside dimension.

8-03. Modifications to existing installations.

a. Invert of pipes above project design flood plane (either pressure or gravity flow).

(1) The same requirements govern as outlined in paragraph 8-02a for new installations.

b. Invert of pipe below project design flood plane (either pressure or gravity flow).

(1) The minimum size pipe permitted through the levee below the flood plane is 12 inches in diameter. Pipes shall be new, smooth steel pipe, ASTM-A382-66 or equal. The minimum gage for steel pipes 12 inches to 24 inches in diameter shall be 10 gage (.1345-inch in thickness) and 7 gage (.1793-inch in thickness) for pipes 24 inches to 28 inches in diameter.

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Where larger than 28-inch diameter pipe sizes are required, the minimum installation will consist of a 30-inch reinforced concrete, cast in place box culvert meeting the requirements and details shown on standard drawing 4488/8.

(2) Encasement and cutoff walls. Pipes 12 inches to 28 inches in diameter shall be encased with reinforced concrete, 6 inches thick in accordance with drawing 4488/6; the encasement shall extend from the water side levee toe to the landside levee toe. In levees constructed of homogeneous impervious fill two poured-in-place reinforced concrete cutoff walls shall be placed around the pipe at the levee crownlines or minimum 20 feet apart.

(3) Gates or valves. All irrigation pipes passing through the levee below flood plane shall have a positive closure device on the waterside of the levee that is accessible during high water. Drainage pipes passing through the levee below flood plane shall have a flap gate.

(4) Pipe excavation and backfill. Pipes shall be placed in an open cut with side slope of 1 on 3. The bottom width of the cut shall be equal to the outside diameter of encasement plus one foot each side of the encasement. The pipe installation shall be backfilled in 4-inch layers and compacted around the pipe to a distance of 4 feet above the pipe with mechanical tampers. Details shall be as shown on Standard Drawing No. 4488/6. From this point to levee grade the backfill shall be placed and compacted by the levee construction equipment. There may be special instances where the above procedure may not be practical. Such cases require special consideration.

(5) Concrete headwalls. Standard reinforced concrete headwalls shall be used on both the waterside and landside of the levee when the installation is used for either irrigation or drainage. A typical section of a gravity drainage system is shown on Standard Drawing 4488/6. Details for the adopted "U" headwall is shown on Standard Drawing 4488/7.

8-04. Sealing of abandoned pipes. Where abandoned pipes are encountered passing through the levee, and where modification of the levee is to be undertaken by the Sacramento District, that part of the pipe within the levee section should be completely removed during construction if practical. In the event that it is not practical to remove the pipe it should be sealed as follows: all abandoned pipes where the invert is at or below flood plane should be filled with concrete under pressure applied in such a manner as to insure that the pipe will be completely filled with concrete. Prior to filling the abandoned pipe with concrete the levee section shall be excavated so that the pipe can be cut off at each end approximately 10 feet from the slope of the levee. After filling the pipe the levee section shall be restored to its original section. All abandoned pipes, where the invert is above the flood plane, should be sealed by plugging with concrete. The plug should extend from the face of the

levee back into the pipe 2 feet, the distance being measured from the intersection of the top of the pipe with the levee slope. Such a plug is required only on the riverside. All structures requiring modification, removal or change by local interests will be modified, removed, plugged or changed by local interests before construction work is undertaken at a given location by the Corps of Engineers.

8-05. Sealing abandoned wells. All abandoned wells near or within the project improvements should be destroyed so they will not produce water, act as a channel for the movement of water or contaminate domestic water supply. The destruction of water wells shall be done in accordance with State of California Bulletin No. 74, Water Well Standards; State of California, Chapter V.