

DEPARTMENT OF THE ARMY  
PORTLAND DISTRICT, CORPS OF ENGINEERS  
P.O. Box 2946  
Portland, Oregon 97208-2946

NPEN  
Regulation  
No. 1130-2-5

17 March 1980

Project Operation  
LEVEE ENCROACHMENT STANDARDS AND PROCEDURES

1. Purpose. This regulation provides technical guidelines related to levee encroachments and the fulfillment of local agency maintenance obligations specified in Part 208.10, Title 33, CPR. It will help to insure that the integrity of a levee system is maintained in situations where a proposed levee encroachment is considered to be in the public interest, and also provides design guidelines for such encroachment.

2. Applicability. This regulation is applicable to all Divisions within the Portland District having civil works responsibilities.

3. References.

a. ER 1130-2-335, Levee Maintenance Standards and Procedures.

b. Title 33, Code of Federal Regulations, Chapter 2, Part 208, Flood Control Regulations.

c. EM 1110-2-1903, Design and Construction of Levees, dated 31 March 1978.

d. EM 1110-2-1410, Interior Drainage and Urban Leveed Areas: Hydrology, dated 3 May 1965.

4. General. Adequate levee maintenance and control of levee encroachments are essential in maintaining levee stability and assuring maximum safety for protected areas. Urbanization, increased river recreation use, and environmental construction restrictions on navigable waterways have created public pressure to construct utility lines, buildings, and boating facilities on, across, adjacent to and through existing levee embankments and rights-of-ways. Uncontrolled levee encroachments weaken a levee system. Defined standards and technical requirements for construction of encroachments are considered a necessity to establishing a well maintained, high performance levee system.

5. Policy. The standards and procedures presented in ER 1130-2-335 and the provisions included in this regulation will be followed in performing permit reviews and inspection evaluations for levee systems within the Portland District. Special attention will be given to construction of encroachments, such as utility lines, buildings and appurtenant levee structures, and the guidelines in this District regulation followed in providing technical assistance to Drainage Districts and local agencies in design of new projects and for levee permit or inspection evaluations.

---

New regulation.

6. Levee Encroachments. The policy regarding levee encroachments will be to permit in the levee section only those appurtenant installations that provide a flood control function during high river stages and heavy storm conditions. Exceptions to this policy will be allowed in cases where the function of the encroachment is considered to be in the public interest and where adequate provisions can be made to maintain the integrity of the levee system. In order to establish guidelines for levee encroachments, several conditions for agricultural and urban levee systems are presented in Appendix A. Figures 1 through 8 of the appendix show minimum section and zone restriction requirements for encroachments. For the purpose of establishing, presenting and illustrating these guidelines, the levee embankment section and adjacent area have been divided into four zones, A through D as shown on figure 1. More detailed standards for common levee encroachments are as follows:

a. Levee Landscaping. A good growth of sod will be encouraged on unrevetted levee slopes. Vegetation producing heavy foliage or root systems capable of penetrating into Zones A, B, and C will not be permitted. On landfill or levee overbuild sections, sparsely spaced trees and other deep root landscaping will be permitted provided a root-free zone having a minimum depth of 3 feet is maintained over the underlying zones.

b. Fences. Fences required to prevent animal grazing on the levee section will be restricted to Zone D. A 10-foot minimum width access way will be maintained between the toe of levee slope and the fence row.

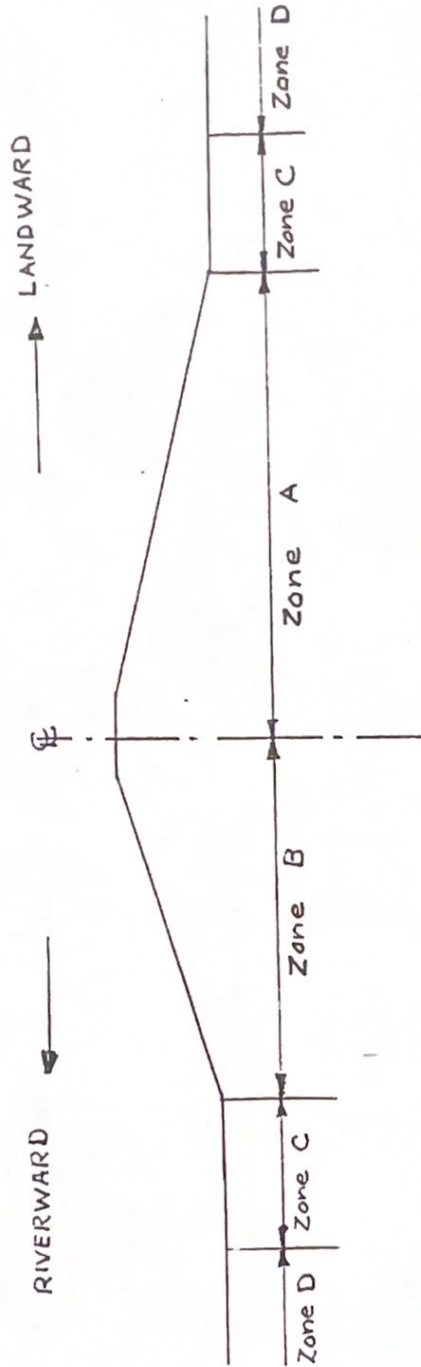
c. Utility Poles. Utility poles will be restricted to Zones B and C except for the Zone A utility poles required at pumping stations. Pumping station poles, located in Zone A, will be located within the limits specified in figures 1 and 5 of Appendix A.

d. Buried Cables. Buried power and telephone cables will be allowed in Zones A, B, and C. Cables located in Zone A will be restricted to the freeboard portion of the levee embankment.

e. Gravity Conduits and Pipes. In general, tide box structures and sewer lines are the only gravity flow installation allowed to pass through the minimum levee section below maximum flood stage. Where possible, small gravity flow pipes will cross through the freeboard or overbuild portion of the levee embankment. Lines parallel to the levee centerline will not be allowed in the minimum levee section.

(1) Tidebox Structures. Minimum levee section requirements and guidelines for selection of the river closure system (Appendix B) will be given special attention for all tidebox installations and only those encroachments necessary for proper operation of the tidebox will be allowed. The above restrictions on encroachments will be maintained along the adjoining levee sections a sufficient distance to permit excavation and emergency repair of the tidebox. An example of a tidebox installation with gatewell structure is shown in Appendix B.





MINIMUM LEVEE SECTION  
 Note; See Appendix A for details.

Figure 1

(2) Sewer Lines. Where possible, sewer lines will cross through the levee embankment freeboard. Sewer lines crossing through the levee section below maximum flood stage will be provided with positive closure gates located on the riverside in Zone B or C. The type of river closure system will be selected using guidelines in Appendix B. On large sewer installations and sewer lines paralleling but not in the levee, a special foundation analysis will be required to determine need for gateway river closure systems, inspection manholes and special seepage control measures.

f. Pressure Conduits and Pipes. In general, safeguards will be provided on all pressure conduits and pipes to insure maintenance of the minimum levee section. Guidelines on emergency closures, located on riverside of levee, are included in Appendix B.

(1) Pumping Stations. Minimum levee section requirements and location of the pumphouse and discharge lines will be given special attention and only those encroachments necessary for proper operation of the pumping facility will be allowed. Pile supports for the pumphouse will be located in Zone D at least 5 feet from the toe of the embankment or foundation slope. Discharge lines will cross through the levee embankment freeboard and on or above the minimum section across Zones A and B. The discharge lines will be encased in reinforced concrete at all roadway crossings. Adequate bank protection will be provided around the periphery of the pump sump and discharge outlet. Small footings and piles for support of discharge lines will be permitted. Encroachment restrictions for a pumping station will be applied to the levee a sufficient distance on either side of the discharge lines to allow for repair to levee embankment or discharge lines. Discharge encasement details and an example of a pumping station installation are shown in Appendix B.

(2) Water Lines. Small water service lines, properly encased, will be permitted to cross the levee section. Similar lines paralleling the levee will be located landward of Zone C. On larger fire and service mains, a special review of levee conditions will be required to determine if additional safeguards are needed. Guidelines on emergency closures, located on riverside of levee, are included in Appendix B.

(a) Levee Crossings. Water service lines will be permitted to cross through the embankment freeboard and overbuild zones and penetrate into Zones A, B and C to the depth required for frost protection. Lines will be encased in reinforced concrete or placed inside a metal encasement pipe. Encasements shall extend the full levee width plus a distance of 5 feet for concrete or 3 diameters of the encasement pipe beyond each toe. The ends of metal encasement pipes will be plugged with concrete and telltale risers for detection of leakage provided at the concrete plugs. A minimum 1.5 foot backfill cover will be provided over encasements. Encasement details are shown in Appendix B. Lines crossing a landfill section will be encased to the outer limits required for adjoining levee section.

(b) Paralleling Levees. In general, paralleling lines will be located in Zone D and no encasement of these lines will be required. Proposals to



17 March 1980

place lines in landfill and levee overbuild sections will require a special review of conditions to determine necessary safeguards or restrictions.

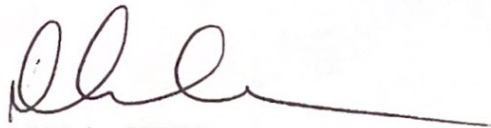
(3) Gas Lines. In general, gas lines will conform to the same restrictions specified for water lines.

g. Access Stairs and Bridges. Small footings in Zone A and pile supports in Zone B for access stairs and bridges will be permitted. Footings will be allowed to penetrate 1.5-feet into Zone A. On levee overbuild sections, pile supports in Zone A will be permitted if the embankment slope is flatter than 1 vertical on 10 horizontal.

h. Buildings and Structures. The general policy will be to restrict all buildings and structures to Zone D. No basements, tanks or permanent excavations will be allowed in Zones A, B, or C and adequate bank protection will be provided for structures built on the riverside of the levee. Structures supported by piles will not be permitted in Zone A. Any building or structure encroaching on Zone A will also be required to have toe drain or zoned filter systems with drainage outfalls provided for visual inspection or measurement of collected seepage. A special review of conditions will be required for all structures built into or on the minimum levee section, including backfill and overbuild sections, to determine if additional safeguards or restrictions are needed. Subsurface explorations will be required at all building and structure sites.

7. Inspections and Technical Assistance to Others. The standards and procedures presented in this regulation form the basis for providing technical assistance to local agencies, performing required or requested field inspections, and the designing of proposed new projects.

FOR THE DISTRICT ENGINEER:



DAN A. CONNER  
Lieutenant Colonel, CE  
Deputy District Engineer

DISTRIBUTION:  
B-PDR

17 March 1980

Appendix A  
PDR 1130-2-5

### LEEVE ENCROACHMENT RESTRICTION ZONES

1. General. This appendix establishes minimum levee section requirements and specifies restriction zones within, overlying or adjoining the minimum section. The restriction zones are intended to clarify the general provisions necessary to maintain levee stability for common types of encroachments. In general, encroachments are installations where undesirable weaknesses in the levee system can develop. Where possible, encroachments should be limited to those providing a needed function for flood protection.

2. Definition of Terms. Terms pertinent to technical guidelines descriptions presented in paragraph 6 of the text and figures 1 through 8 of this appendix are as follows:

a. Minimum Levee Section. This term indicates the minimum section considered necessary to provide good embankment performance during flood stages on Lower Columbia and Willamette River levees. The basis for setting the limits of the minimum section are general knowledge of embankment, foundation and river conditions, performance of levee systems during past flood stages, and emergency needs for access.

b. Minimum Section with Overbuild. This term indicates a condition where the geometric description of an existing levee section is larger and contains more embankment materials than the minimum section. The materials in excess of the minimum section are termed as "overbuild".

c. Landfill Section. This term indicates a condition where the existing levee section consists of placed fill with riverward and/or landward slopes flatter than 1 vertical or 10 horizontal. The materials in excess of the minimum section projected from the levee adjoining the landfill are termed as "overbuild". In cases where the existing grade of the landfill is higher than the grade of the adjoining levee, materials above levee grade are termed as "excess overbuild".

d. Overbuild and Excess Overbuild. These terms are used in condition cases to show foundation and embankment locations above the projected lines defining the minimum section.

e. Restriction Zones. Descriptions of zones related to minimum and overbuild sections are as follows:

(1) Zone A. This zone includes the landward portion of the levee section extending from centerline to the intersection of the specified slope line with the existing interior ground elevation.

(2) Zone B. This zone includes the riverward portion of the levee section extending from centerline to the intersection of the specified slope line with the existing interior ground elevation. In cases where the existing river channel grade bordering the levee is lower than the interior elevation, the river channel grade will control the zone limit on the riverside.



(3) Zone C (Minimum Section). This zone extends landward or riverward of the outer limits of Zone A or B and includes a specified extended width beyond the intersection of the existing ground elevation by the projection of the specified slope line.

(4) Zone C (Landfill or Overbuild Section). This zone includes projected limits extending landward and riverward from levee centerline to specified riverward and landward widths below placed fill or the existing ground line. The materials above the projected slope lines forming the zone limits are classified as "overbuild" or "excess overbuild" depending on the grade at levee centerline.

(5) Zone D. This zone lies landward or riverward of Zone C.

(6) Embankment Freeboard. This zone, in general, is the zone 3 feet below the levee crest grade.

(7) Maximum Flood Stage. This term is defined as a horizontal line projected across the levee embankment 3 feet below crest grade.

3. Levee Case Conditions. Figures 1 through 8 present case conditions for urban and agricultural levees. Each case includes restriction zone remarks related to common levee encroachments.