






Design Criteria	Section of the NFIP Regulations: 65.10(b)
<p>Description: For levee systems to be accredited by FEMA, communities and/or levee owners must submit data and documentation to show that adequate design and operations and maintenance systems are in place to provide reasonable assurance that the levee has, and will continue to have, base flood risk reduction capability.</p>	
<p>Checklist for Design Criteria:</p>	
	<p>Freeboard. The minimum freeboard required is 3 feet above the Base Flood Elevation (BFE) all along the length of the levee, with an additional 1 foot within 100 feet of structures (such as bridges) or wherever the flow is restricted, and an additional 0.5 foot at the upstream end of a levee. Levees impacted by coastal flooding have special freeboard requirements (see Paragraphs 65.10(b)(1)(iii) and (iv)).</p>
	<p>Closures. All openings must be provided with closure devices that are structural parts of the system during operation and designed according to sound engineering practice.</p>
	<p>Embankment Protection. Engineering analyses must be submitted that demonstrate that no appreciable erosion of the levee embankment can be expected during the base flood, as a result of either currents or waves, and that anticipated erosion will not result in failure of the levee embankment or foundation directly or indirectly through reduction of the seepage path and subsequent instability.</p>
	<p>Embankment and Foundation Stability Analyses. Engineering analyses that evaluate levee embankment stability must be submitted. The analyses provided must evaluate expected seepage during loading conditions associated with the base flood and must demonstrate that seepage into or through the levee foundation and embankment will not jeopardize embankment or foundation stability. An alternative analysis demonstrating that the levee is designed and constructed for stability against loading conditions for Case IV as defined in the U.S. Army Corps of Engineers (USACE) Engineer Manual 1110-2-1913, <i>Design and Construction of Levees</i>, (Chapter 6, Section II), may be used.</p>
	<p>Settlement Analyses. Engineering analyses must be submitted that assess the potential and magnitude of future losses of freeboard as a result of levee settlement and demonstrate that freeboard will be maintained. This analysis must address embankment loads, compressibility of embankment soils, compressibility of foundation soils, age of the levee system, and construction compaction methods. In addition, detailed settlement analysis using procedures such as those described in USACE Engineer Manual 1110-1-1904, <i>Soil Mechanics Design—Settlement Analysis</i>, must be submitted.</p>