Section 6 — Design Flood and Check Flood Standards

TxDOT's approach to selecting the design standard for a drainage facility is to use a reference table that specifies a range of design AEPs for different types of facilities. Table 4-2 provides the design frequencies for TxDOT projects. For most types of facilities a range of design frequencies is presented. For those types of facilities with a range of possible design frequencies, usually one design frequency in the range is recommended (indicated by an X with square brackets in Table 4-2). Structures and roadways should be serviceable (not inundated) up to the design standard.

Table 4-2: Recommended Design Standards for Various Drainage Facilities

Functional classification and structure type	Design AEP (Design ARI)				
	50% (2-yr)	20% (5-yr)	10% (10-yr)	4% (25-yr)	2% (50-yr)
Freeways (main lanes):					
Culverts					X
Bridges					X
Principal arterials:					
Culverts			X	[X]	X
Small bridges			X	[X]	X
Major river crossings					[X]
Minor arterials and collectors (including frontage roads):					
Culverts		X	[X]	X	
Small bridges			X	[X]	X
Major river crossings				X	[X]
Local roads and streets:					
Culverts	X	X	X		
Small bridges	X	X	X		
Off-system projects:					
Culverts	FHWA policy is "same or slightly better" than existing.				X
Small bridges					X
Storm drain systems on interstates and controlled access highways (main lanes):					
Inlets and drain pipe			X		
Inlets for depressed roadways*					X

Table 4-2: Recommended Design Standards for Various Drainage Facilities

Functional classification and structure type	Design AEP (Design ARI)				
	50% (2-yr)	**20% (5-yr)**	**10% (10-yr)**	**4% (25-yr)**	**2% (50-yr)**
Storm drain systems on other highways and frontage roads:					
Inlets and drain pipe	X	[X]	X		
Inlets for depressed roadways*				[X]	X
Table 4-2 notes: * A depressed roadway provides nowhere for water to drain even when the curb height is exceeded. [ ] Brackets indicate recommended AEP. Federal directives require interstate highways, bridges, and culverts be designed for the 2% AEP flood event. Storm drains on facilities such as underpasses, depressed roadways, etc., where no overflow relief is available should be designed for the 2% AEP event.					

All facilities must be evaluated to the 1% AEP flood event.

Selecting a design flood is a matter of judgment; it requires balancing the flood risk with budgetary constraints. When considering the standard for a drainage facility, the designer should follow these guidelines:

- Decide on the design standard by considering the importance of the highway, the level of service, potential hazard to adjacent property, future development, and budgetary constraints.
- Develop alternative solutions that satisfy design considerations to varying degrees.
- After evaluating each alternative, select the design that best satisfies the requirements of the structure.
- Consider additional factors such as the design standards of other structures along the same highway corridor to ensure that the new structure is compatible with the rest of the roadway. Also assess the probability of any part of a link of roadway being cut off due to flooding.

The designer should design a facility that will operate:

- Efficiently for floods smaller than the design flood.
- Adequately for the design flood.
- Acceptably for greater floods.

In addition, for all drainage facilities, including storm drain systems, the designer must evaluate the performance for the check flood (1% AEP event). The purpose of the check flood standard is to ensure the safety of the drainage structure and downstream development by identifying significant risk to life or property in the event of capacity exceedance.

The intent of the check flood is not to force the 1% AEP through the storm drain, but to examine where the overflow would travel when this major storm does occur. For example, the water may

travel down the gutter to the same creek as the outfall, travel down a driveway and directly into a home, inundate the mainlanes, erode a new drainage path to the outfall, or other problems.

The examination of the check flood should also include assessment of the tailwater. There may be locations on the project that are lower than the 100 year water surface elevation (or tailwater) of the creek. This situation may increase the hydraulic grade line through the storm drain system, or may even cause negative flow through the system. This may cause blowouts which may in turn cause any of the same problems as above.