



COUNTY OF LOS ANGELES

DEPARTMENT OF PUBLIC WORKS

2250 ALCAZAR STREET
LOS ANGELES, CALIFORNIA 90088
Telephone: (213) 226-4111

ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 2418
LOS ANGELES, CALIFORNIA 90061

THOMAS A. TIDEMANSON, Director
MIAM BARMACK, Chief Deputy Director
JAMES L. EASTON, Chief Deputy Director
WYNN L. SMITH, Chief Deputy Director

IN REPLY PLEASE
REFER TO FILE:

March 31, 1986

TO WHOM IT MAY CONCERN:

FROM: T. A. Tidemanson
Director of Public Works

LEVEL OF FLOOD PROTECTION
FILE NO. 2-15.321

The following Level of Flood and Drainage Protection Standards has been adopted by the Department of Public Works:

I. Capital Flood Protection (Based on a rainfall with a probability of occurrence of once in 50 years).

A. Natural watercourses -

All facilities that are constructed in or intercept flood waters from natural watercourses shall be designed for the Capital Flood. These include open channels, closed conduits, bridges, and dams or debris basins (not under State of California jurisdiction). See Attachment A for definition of a watercourse.

B. Floodways - All areas mapped as floodways shall be mapped based on the Capital Flood.

C. Natural Depressions or Sumps -

All facilities that are constructed to drain natural depressions or sumps shall be designed for a Capital Flood. These include channels, closed conduits, retention basins, detention basins, pump stations and highway underpasses. See Attachment A for definition of sumps.

D. Culverts under major and secondary highways.

II. Urban Design Storm (Based on a rainfall with a probability of occurrence of once in 25 years).

The Urban Design Storm shall be the level of protection for all developed areas with other than conditions described in I above.

The surface capacity of the street or highway may be used up to a water surface level not exceeding the road right of way line. The available surface capacity of the street, however, may be restricted by vehicular or pedestrian traffic requirements see (Attachment A). If a storm drain is required to reduce the water surface level in the street to an acceptable level, it shall be designed for not less than 10-year frequency rainfall flow rates. The storm drain capacity shall be increased where necessary to lower the water surface level for the 25-year frequency storm to within road right of way or to meet other requirements as indicated in Attachment A.

III. Probable Maximum Flood -

All dams (earth embankment, concrete or other materials) that fall under the control of the State of California laws defining dams shall be constructed to safely pass the probable maximum flood as determined from the probable maximum precipitation as defined by the National Weather Service.

See Attachment B for background and other pertinent data.

GJP:yo

Attach (2)

Attachment A
Level of Flood Protection

Definitions:

1. Natural Watercourses -

A natural watercourse is a path along which water flows as a result of natural topographic features. Furthermore, for the purposes of this definition, a natural watercourse drains a watershed greater than 100 acres and also meets one or more of the following conditions:

- a. Experiences flow velocities greater than five feet per second while carrying a Capital Flood.
- b. Has flow depths greater than 1.5 feet while carrying a Capital Flood.
- c. Would have water surface elevations, while carrying a Capital Flood, within one foot of the bases of adjacent habitable structures, if such water surface elevations would result from construction of facilities with less than a Capital Flood capacity.

2. Depression or sump -

A depression or sump is an area for which there is no surface route to outlet flows. Furthermore, for the purposes of this definition, a depression or sump also meets one or more of the following conditions:

- a. Would have a ponded water surface elevation, during a Capital Flood, within one foot of the bases of adjacent habitable structures, if such elevation would result from construction of facilities with less than a Capital Flood capacity. This condition does not apply if there is a surface route for outflow such that the ponded water surface cannot reach the bases of adjacent structures during a Capital Flood.
- b. In a roadway, would have a ponded water surface elevation higher than the elevation of the public right of way line if facilities with less than a Capital Flood capacity were constructed. This condition applies to flows which reach the roadway upstream of the sump and are conveyed to the sump by the roadway.
- c. Has a ponded depth of three feet or greater.

3. Street Capacity -

Maximum street capacity as defined herein is the capacity of the street section to carry flows within street right of way (depth of flow does not exceed either property line). See Highway Design Manual for criteria on quantity of water to be removed from the road surface to provide favorable conditions for vehicular and pedestrian traffic for particular level of protection. This may increase the level of protection required to be provided by the drain.

Attachment B
Level of Flood Protection

Background

The Hydrology Subcommittee has reviewed the level of protection standards of the three former Departments (County Engineer, Road, and Flood) as well as all major agencies in Southern California. In addition, we have met with the County Counsel for legal advice.

The Flood Control District (FCD) in cooperation with the United States Army Corps of Engineers (C of E) has constructed the major flood control facilities in Los Angeles County. These facilities which have channelized the rivers and major streams have been designed for Capital Flood protection and, in the case of the C of E, their Standard Project Flood (SPF). Analysis has indicated that these are comparable levels of protection. In most cases, the SPF equals or exceeds the Capital Flood.

The Los Angeles County Road Department has also used the criterion of the FCD Capital Flood when providing facilities to cross over (bridge) major streams.

The County Engineer required Capital Flood protection in all instances where the FCD had indicated a comprehensive plan channel or had hydrology for a major stream. They required the developers to use FCD flow rates.

The level of protection for urban areas differed between the three Departments. The County Engineer required all new tract developments to use the 25-year frequency level. This could be obtained with a combination of storm drain and surface street capacity. However, if off site capability to accept the excess surface flows was limited, they required the drain exiting the development to carry the 25-year frequency flows. In the majority of the cases, therefore, the developers chose to construct the entire storm drain system for the 25-year frequency flow rates. The Road Department followed the County Engineer requirements for new tract developments. Road Department Cash Contract projects utilized a 10-year frequency protection level obtained by a combination of a storm drain and street surface capacity. The quantity of surface flow varied dependent upon whether the project fell under local or federal requirements. Sumps were designed to the Capital Flood protection level.

The FCD required the 10-year frequency level for storm drains in streets for the four Storm Drain Bond Issue Programs 1952-1970 and/or District projects constructed since the 1970's. Prior to these Storm Drain Bond Issues, the FCD was not involved to any great extent in other than major drainage channels. However, all projects including tributary storm drains in this period were constructed to the 50-year frequency level.

This background suggests that certain standards have been determined to be reasonable levels of protection. Our opinion, based on discussions with County Counsel, is that any lower levels of protection in future projects or approvals would increase the chances of liability should damage occur.

Compatibility to Federal Flood Insurance Requirements

The Federal Insurance Agency (FIA) has set the 100-year flood as their standard. The hydrology is based on historical runoff records to produce the 100-year flow rate. There is no allowance made for future urbanization. In developed areas the standard requires the finished floor elevation of proposed habitable structures to equal or exceed the water surface of the 100-year flood.

Our investigation indicates the recommended levels of protection, Capital Flood and Urban Design Storm, will meet or exceed FIA requirements.

A frequency analysis of the entire County shows that the FIA standard is between the 25-year and 10-year rainfall frequency levels. In most areas, facilities designed for the 10-year rainfall frequency level, when combined with the available street capacity, provide sufficient protection to meet FIA requirements. However, if development of an area changes and FIA restudies the area, 10-year rainfall frequency facilities may prove inadequate.

The proposed 25-year rainfall frequency level will meet FIA standards even if development changes.

The recommended protection levels are based on meeting FIA standards.

Compatibility with Existing Systems

The level of protection standards recommended may have to be modified in cases where the capacity of the conduit into which the proposed drain outlets has limited capacity. Where no relief drain is planned, it is recommended that the drain be restricted to the capacity available at its outlet. In cases where a relief drain is anticipated, the proposed drain is recommended to be sized for the appropriate level of protection.

There are enumerable possible situations, and all cannot be covered in this policy statement. The appropriate Section Head in the Department should review the proposed drainage system and the outlet conditions based on this policy and determine the required level of protection. In situations where the determination may not be clear-cut, the Section Head should recommend to his Division Head that it be referred to the Q Committee for its recommendations to the Director of Public Works.

Economics

We believe the proposed level of protection will not result in a change in cost for either design or construction for Department-constructed drains or developer-constructed drains in a majority of the situations.

The Urban Design Storm (25-year) will not increase requirements for drains required in new developments. The Department-constructed drains may increase in size in areas where the terrain is very flat and street capacity is limited. We have analyzed a number of different situations on prior projects and concluded that design costs would not increase more than one percent and construction costs would increase between two percent and five percent. However, we believe the number of projects affected will be fewer than 20 percent.

There may be some situations where under previous County Engineer policy construction in or intercepting watercourses used a 25-year level, whereas now a 50-year level will be required. It is difficult to determine exactly what percentage of the projects will be affected. In any event, the cost increase for these projects would be approximately 8 percent.

Rainfall vs. Runoff Records

The Committee recommends the continued use of rainfall records to determine the design storm. The major reason for this is that rainfall records are not affected by urbanization, whereas runoff records tend to be poor predictors of future runoff in areas where development is changing. Although we now have considerable length of runoff records, there has been constant urbanization throughout the record period. In addition, there is continued urbanization in the Santa Clara Valley, Antelope Valley, and certain areas on the south slope of the San Gabriel Mountains and in the West County area.

Discussion of Comments

Comment: Use a straight 10-year rainfall level of protection for all storm drains in streets.

Reply: The proposed level of protection should in the majority of the cases result in storm drains designed for 10-year Q's. The proposed level of protection is a combined system of utilizing street capacity and drain. It will in all cases meet Federal Flood Insurance standards. It will not lower present levels of protection required by the County Engineer, whereas a straight 10-year would in some cases.

Comment: The proposed level of protection will increase cost.

Reply: An analysis of drains in a number of different areas indicate that in the majority of the cases, the street sections have adequate capacity for the difference between a 25-year and 10-year Q. In the areas with flat street slopes or other areas where street capacity may be limited for one reason or another, the increased costs for the drain and appurtenances range between two percent and five percent. Design costs will be increased approximately one percent.

Comment: We feel you must prepare a precise policy regarding the handling of the situation where the new hydrology method produces flows that are greater than the outletting system's capacity. We feel the new method will produce greater Q's in almost all cases based on the results of hydrology reviews made during the Bond Issue Programs. As you are aware, the Bond Issue Programs guideline was to accept flow rates based on the County Engineer's hydrologic method when the resultant Q's were as much as 15 percent lower than the Q's generated by the District's short-cut rational method. It is recommended that you adapt this 15 percent figure as a guideline for future hydrologic studies.

Reply: A policy regarding the compatibility of a proposed drain to an existing outletting system is given in this statement and if interpretation is required, it will be given by the appropriate Department Section Head. Difficult situations will be referred to the Q Committee for its recommendation to the Director. The 15 percent guideline would no longer be appropriate. It was used up through the 1964 Bond Issue Projects. At that time, there was a difference in some coefficients used, and on very large areas the Q's near the end of the drain using the County Engineer method were sometimes lower than the District method. However, the Q's at the upper end of the drain were usually larger than the District's using the County Engineer method.

Comment: Will a 10-year rainfall frequency drain result in acceptable flooding levels during the FIA 100-year flood? Will the flooding levels be below finished floor elevations? Can we use a standard that will adjust the drain size to account for this if necessary?

Reply: Our investigation indicates that in most cases 10-year drains will give protection such that flooding levels will not exceed FIA standards. A frequency analysis when considering the entire County indicates that the FIA flooding levels are between the 10-year and 25-year rainfall frequency flooding levels. A standard could be developed to adjust drain sizes to meet FIA standards, however, it would be more complex. It also would not produce uniform results throughout the County.

Level of Flood Protection

Page 5

March 31, 1986

Summary

The Hydrology Subcommittee has evaluated all the comments received on the proposed level of protection policy. After careful consideration of all points of view, we believe we have recommended a policy that is in the best interests of the public and the Department. We believe this policy will provide adequate flooding protection for Los Angeles County with insignificant, if any, increase in costs and minimize future Department liability.

GJP:yo