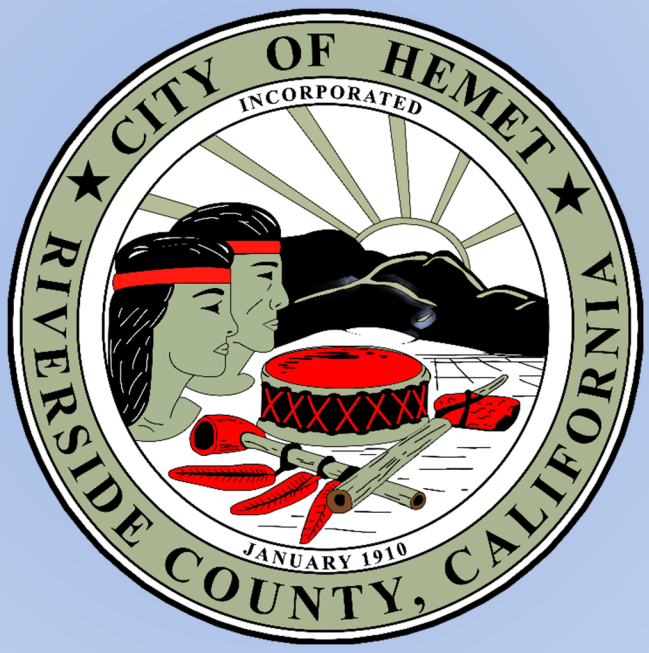

6

STREET DRAINAGE

6
STREET DRAINAGE

Urban streets with curb and gutter serve an important and necessary drainage service, even though their primary function is for the movement of traffic. Traffic and drainage uses are compatible up to a point, beyond which drainage is, and must be, subservient to traffic needs.

Gutter flow in streets is necessary to transport runoff water to storm drain catch basins and to major drainage channels. Good street planning can substantially help in reducing the size of, and sometimes eliminate the need for, a storm drain system in newly urbanized areas.

Drainage design for the collection and conveyance of storm water on public streets is based on a reasonable frequency and magnitude of traffic interference. That is, depending on the character of the street, certain traffic lanes can be fully inundated once during the design storm return period. However, during less intense storms, runoff will inundate traffic lanes but to a lesser degree. Therefore, one of the primary functions of streets is to convey nuisance flows quickly and efficiently to a storm drain or other drainage facility without obstructing traffic movement. During a major storm event, the function of streets is to provide an emergency escape for flood flows with minimal damage to urban environment.

6.1 STREET CLASSIFICATION

The streets in the City are classified for drainage purposes as Local, Collector or Arterial according to the average daily traffic (ADT) for which the street is designed. The larger the ADT, the more restrictive the allowable drainage encroachment into driving lanes. Traffic classifications and typical cross sections of the three drainage classifications are presented in Table 6.1 and Figure 6.1, respectively.

TABLE 6.1
TRAFFIC AND DRAINAGE CLASSIFICATION

TRAFFIC CLASSIFICATION	STANDARD DRAWING NO.	DRAINAGE CLASSIFICATION
Arterial Highway	ST-100	Arterial
Arterial Highway	ST-l00A	Arterial
Major Highway	ST-101	Arterial
Divided Secondary Highway	ST-102	Arterial
Secondary	ST-102A/ST102B	Arterial
Express Collector	ST-103	Collector
Collector	ST-104	Collector
Local Street	ST-106	Local

6.2 DESIGN CRITERIA FOR STREETS

6.2.1 Design Frequency

Storm drainage within a street system serves two primary objectives:

1. Removes nuisance flows from pavement during frequent return period storms to maintain safe and efficient movement of traffic.

2. Protects adjacent properties from damage caused by large, infrequent storms.

The function of removing storm flows from pavement is based on providing storm drain catch basins at points where maximum depth or driving lane inundation criteria are reached.

Storm drain system design is generally based on the concept of a design storm. The design storm is the storm associated with the governing return period for longitudinal street flow from Table 6.2. In some locations, along Local and Collector streets, physical improvements may prohibit the water surface from spreading to the building setback line, such as a street lined with block walls constructed at the right-of-way line. In this situation, the depth of flow at the centerline of the street, assuming flood waters are spread between the building setback lines, will define the design storm. In the upper reaches of a system the 10-year criteria will govern. Farther downstream in the system, the storm drain system design for the 10-year event may not meet the street flow criteria stated for the 100-year storm. In this case, the storm drain will need to be upsized to meet the appropriate criteria. Both return periods need to be checked to determine which condition governs. In other words, the greatest storm condition governing design at any point is the design storm.

TABLE6.2
DESIGN STORM FREQUENCIES FOR STREET DRAINAGE

DRAINAGE CLASSIFICATION	LIMITS OF LONGITUDINAL STREET FLOW BY DESIGN STORM FREQUENCY	
	10-YEAR	**100-YEAR**
Local and Collector	Flows contained with top of curb	Flow contained within right-of-way
Arterial	One 12-foot driving lane in each direction, with flows contained within curb	Flow contained between right-of-way lines.

6.2.2 Pavement Encroachment

The following sections present specific design requirements for storm drainage on urban streets for the design storm. Determination of street carrying capacity for the design storm shall be based upon the requirements outlined in Table 6.2:

The storm drain system should begin at or prior to the point where the maximum encroachment and/or depth is reached, and should be designed on the basis of the design storm. The final design must meet both the 10-year and 100-year criteria established in Table 6.2.

6.3 CATCH BASINS

Proper surface drainage of streets and highways may require intercepting excess flows with stormwater catch basins. The most upstream catch basin in the system should be placed as far downstream as possible, because as soon as the runoff enters the pipe system, it is carried rapidly downstream which tends to reduce the time of concentration. Locating catch basins is dictated by encroachment into the traveled way and flow depth criteria (see Table 6.2).

6.4 DESIGN CRITERIA

6.4.1 General

Catch basins shall be located within street rights of way unless otherwise approved by the City Engineer. All catch basins which must be located outside street right of way lines in order to intercept storm waters under existing conditions are acceptable only when other provisions can not be made to intercept these flows. Right of way for such catch basins, or inlets, will be offered for dedication on the tract or parcel map for the project or acquired prior to final approval of the storm drain system.

Catch basins to be constructed off the paved portion of the roadway but within the street right of way lines shall be made operable by grading the roadway to permit storm water to flow to the basin. Street remodeling of this nature shall be performed as soon as possible after construction of the drainage facilities.

If, during the design of the project, it is determined that storm water cannot be adequately collected by a catch basin to be constructed off the paved portion of the roadway, the designer should consider using alternate methods of collecting storm runoff Alternatives and recommendations shall be reviewed and approved by the City Engineer prior to preparation of final construction drawings.

6.4.2 Limitations

Grated catch basins shall be used where street slopes are five percent or greater, grated basins should generally not be used in sump conditions because of the possibility of debris clogging the grates.

6.4.3 Length Requirements

The construction of catch basins over 28 feet in length should be avoided. In lieu thereof, two shorter equivalent length basins should be designated.

6.4.4 Series Catch Basins

The number of catch basins to be connected in a series should normally not exceed two. If the connection of more than two catch basins in a series is unavoidable, consideration should be given to designing a lateral drain.

6.4.5 Local Depressions

The Local Depression has a drop of 4 inches and produces a curb face at the catch basin opening equal to the existing curb face plus 4 inches.

A Local Depression of 2 inches can be used with side inlet or combination catch basins.

6.4.6 Connector Pipe

- The minimum diameter of connector pipe shall be 18 inches.
- The horizontal alignment of connector pipes shall contain no angle points or bends, unless approved by the City Engineer.
- The minimum length of connector pipe to be installed between catch basins shall be 12 feet, unless prevented by field conditions.