



DEPARTMENT OF  
PUBLIC WORKS

STREET DIVISION

CITY OF SACRAMENTO  
CALIFORNIA

5730-24TH STREET  
BUILDING NINE  
SACRAMENTO, CA  
95822-3699

916-449-5236

ROBERT L. LEE  
STREET DIVISION  
MANAGER

September 8, 1987.

Joint Transportation and Community Development Committee/  
Budget and Finance Committee  
Sacramento, California

Honorable Members in Session:

SUBJECT: Updating of City Policy and Procedure for the  
Installation of Undulations

SUMMARY

Nearly five years have passed since the City Council last updated the policies and criteria which staff utilize to evaluate proposed undulation projects. In response to the issue of appropriate criteria for undulations near parks and schools, it is now recommended that the attached policies, procedures and criteria (see Exhibit A), be adopted as the official guidelines for undulation installations.

BACKGROUND

In September 1982, the City Council adopted a set of more refined criteria for evaluating and prioritizing candidate streets for undulations. The minimum qualifications adopted in February, 1980 were expanded and the points assigned for the length of the street were re-evaluated. The basic requirements set forth were:

1. The street must be primarily a neighborhood collector street as opposed to local or major streets.
2. The abutting land uses should be at least 75 percent residential.
3. The street must be a minimum of 1,500 feet in length.
4. All street intersections within the measured length must be "T" or three-legged intersections only.
5. The posted speed limit shall be 25 or 30 MPH.
6. The subject street cannot be a bus route.

The change in point assignments was as follows:

1. One point was assigned for every 50 vehicles (i.e., 500 vehicles per day equals ten points).
2. One point was assigned for every percent of traffic exceeding the speed limit (i.e., 37 percent exceeding the limit equals 37 points).
3. One point was assigned for each house fronting on the street and/or one point for every 70 feet of school, park, playground or multi-family dwelling.

During the last five years the criteria previously described have been used to evaluate and prioritize requested undulation projects. Experience obtained during these five years indicates the need for a more comprehensive set of procedures and guidelines for accompanying the adopted criteria (see attached Exhibit A). The proposed new policy and procedures thus contains minimum qualifying and priority ranking criteria, as well as guidelines for undulation location selection, signing, striping, design specifications, moving and/or removal of undulations, Regional Transit coordination and public notifications. The consolidation and documentation of these policies and procedures will assist staff in efficiently carrying out the speed control undulation program.

Summarization:

Two separate qualifying categories will be created; one category for residential streets and another for streets fronting parks or schools. Each category will be independent of the other and will be prioritized on separate lists. Yearly budgeting for the undulation program will be divided evenly between the two categories of qualifying streets.

The following is a summary of the changes being proposed to update the City's policies concerning the Traffic Undulation Program. These changes refer to minimum qualifying criteria and a priority ranking system. Also note that the policy of only implementing speed control undulations on local residential streets remains unchanged. A comparison of the changes relative to the 1982 criteria is shown below:

MINIMUM QUALIFYING CRITERIA

1982 CRITERIA

1987 CRITERIA

RESIDENTIAL

RESIDENTIAL

PARKS & SCHOOLS

1500 feet in length between traffic controls with no four way intersections.

1500 feet in length between traffic controls with no four way intersections.

1000 feet in length between traffic controls with no four way intersection

1982 CRITERIA

RESIDENTIAL

Street frontage of subject street segment must be 75 percent residential.

Posted speed must be 25 or 30 MPH.

Street cannot be part of the Regional Transit bus network.

1987 CRITERIA

RESIDENTIAL

Street frontage of subject street segment must be 75 percent residential.

Posted speed must be 25 or 30 MPH.

Street cannot be part of Regional Transit bus network.

Street contains no curves with greater than a 70 degree angle.

Two-thirds majority residential approval required.

PARKS & SCHOOLS

\*Street frontage of subject street segment must contain a school or park.

Posted speed must be 25 or 30 MPH.

Street cannot be part of Regional Transit bus network.

Street contains no curves with greater than a 70 degree angle.

PRIORITY RANKING POINT SYSTEM FOR QUALIFYING STREETS

1982 POINT SYSTEM

RESIDENTIAL

One point for every 50 vehicles travelling the street in a 24 hour period.

One point for each residential unit fronting the street plus one point for each 70 feet of school, park, playground or apartment frontage.

1987 POINT SYSTEM

RESIDENTIAL

One point for every 50 vehicles travelling the street in a 24 hour study period.

One point for each residential unit fronting the street plus one point for each 70 feet of school, park, playground or apartment frontage.

PARKS & SCHOOLS

One point for every 50 vehicles travelling the street in a 24 hour study period.

One point for each residential unit fronting the street plus one point for each 70 feet of school, park, playground or apartment frontage.

\*Preschool, Elementary or Junior High School

1982 CRITERIA

RESIDENTIAL

One point for every percentage point of traffic exceeding the speed limit.

1987 CRITERIA

RESIDENTIAL

One point for every percentage point of traffic exceeding the speed limit, plus one-half point for each mile per hour of speed differential between the posted speed and the 85 percentile speed.

PARKS & SCHOOLS

One point for every percentage point of traffic exceeding the speed limit, plus one-half point for each mile per hour of speed differential between the posted speed and the 85 percentile speed.

Note: The purpose of placing undulations near parks and schools is to create a safer environment for young children (preschool through junior high school). Streets fronting high schools will be considered using the standard minimum criteria for residential streets as high school students are more responsible and fall into the category of young adults.

FINANCIAL

Undulation contracts go to bid on a cost per linear foot basis. Current cost analysis indicates that undulations cost approximately \$13.00/linear foot. The average cost for a set of undulations ranges from \$12 to \$25 per linear foot or approximately \$1500 per installation. Through the annual Capital Improvement Program, the City's Budget and Finance Committee has generally budgeted between \$20,000 to \$40,000 per year for the undulation program. Funding of \$20,000 is enough to construct approximately 15 sets of undulations divided among 5 streets. The cost of undulations will vary from year to year depending on the amount of the low bid and economic fluctuations, as well as annual fiscal appropriation levels.

During the 1987/88 CIP review process, the Budget & Finance Committee directed staff to appropriate an additional \$20,000 from Gas Tax revenue sources in conjunction with updating the undulation policies. The total appropriation of \$40,000 for speed undulation projects in 1987/88 will be equally divided between the two categories of residential and parks & schools.

Neighborhood groups wishing to have undulations installed on a specific street in their community may contribute the total cost of installing undulations, according to the following guidelines:

1. All streets must meet minimum criteria standards.

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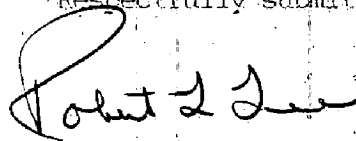
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2. When the total cost is being borne by residents, the projected cost will be paid to the City prior to the awarding of bids for the undulation program in the year installation is to take place.

RECOMMENDATION

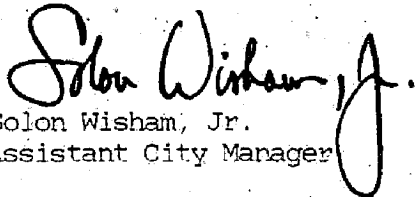
It is recommended that the Joint Transportation and Community Development/Budget and Finance Committees approve the adoption of the new undulation guidelines and forward this report to the City Council with recommendation for approval.

Respectfully submitted,



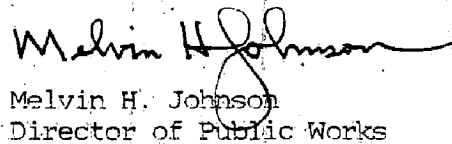
Robert L. Lee  
Street Division Manager

Recommendation Approved:



Solon Wisham, Jr.  
Assistant City Manager

Approved:



Melvin H. Johnson  
Director of Public Works

MHJ:RLL:jf  
CA7-5

September 8, 1987  
All Districts

## EXHIBIT A

### SPEED CONTROL UNDULATIONS

#### Policies and Procedures

##### Program Objective

The purpose of installing undulations on residential streets in the City is to reduce vehicle speeds and to reduce through traffic on residential streets and on streets adjacent to parks and elementary schools. The application of undulations is limited to streets where geometric configuration or design fails to passively deter many drivers from exceeding the speed limit. When vehicle speeds are reduced, public safety is enhanced.

##### General

Undulations are intended to have two direct impacts on the traffic flow of a particular street. These impacts are "average vehicle speed" and "average daily traffic", both of which would be expected to decrease. Average speeds would decrease as drivers would be urged to reduce speeds when crossing undulations because of the discomfort incurred when crossing undulations too fast. Also, a percentage of vehicles which access side streets as alternative routes, would be deterred from using streets with undulations because of the forced speed reduction.

##### Minimum Criteria

Installation of undulations may be warranted:

1. On a residential street which is at least 1,500 feet in length between controls, has no four-way intersections and no curves greater than 70° angle. The street frontage must consist of at least 75% residential development. The street may not serve as a Regional Transit bus route and must have a speed limit of 30 MPH or less.

and

A two-thirds majority of residents having direct access to the street in question. Each household will have one vote.

2. Where frontage includes a school or park, the street is at least 1,000 feet in length between controls and has no four-way intersections and no curves greater than 70° angle. The street may not serve as a Regional Transit bus route and must have a speed limit of 30 MPH or less.

NOTE: Only preschools through middle schools are eligible for consideration under the reduced length criteria.

NOTE: The two sets of minimum criteria are independent of each other.

### Priority Ranking

Priority ranking is done annually using a point system. Streets under consideration are investigated and data accumulated. The data collection includes a traffic count to determine the average daily traffic volume, and speed surveys to determine the range and percentages of vehicle speeds. A count is taken of the number of houses fronting the street, with the balance of frontage being measured and categorized by school, park, playground or multi-family dwellings. Points are awarded in the following manner:

#### Point System

1. One point for every 50 vehicles which travel the street in a 24-hour study period.
2. One point for each percentage point of traffic exceeding the posted speed limit, plus one-half point for each mile per hour speed differential between the posted speed limit and the 85th percentile speed.
3. One point for every residential unit fronting the street, plus one point for each 50' of school, park, playground or apartment frontage.

NOTE: Two separate priority lists will be maintained, each according to type of qualifying minimum criteria.

### Undulations Construction Specifications

Upon installation, asphaltic concrete undulations will have a width of 12 feet, a height of three inches (3") to three and one-half inches (3-1/2"), and a vertical curvature of 72 feet (See Figure 1). Undulations will extend from lip of curb to lip of curb. There will be a two foot (2') horizontal taper originating at the crest of the undulation and converging at the lip of curb. At the time of construction the temperature of the asphalt will range between 250°F and 400°F. The outside air temperature will be no less than 70°F.

### Location Selection Guidelines

In selecting precise locations for undulation installation the following guidelines shall be followed:

1. Undulations will not be located over manholes, water valves or street monumentation or within 25 feet of fire hydrants.
2. Undulations should be located five to ten feet away from driveways, where possible.
3. Undulations should be located on property lines whenever possible.
4. Undulations should be located near street lights when possible in order to illuminate them at night.

5. Undulations should be located a distance of 150 feet from corners, when possible, but at a minimum never within a corner radius.
6. Undulations will not be located on sharp horizontal curves due to motorcycle and bicycle stability problems.
7. Each pair of undulations will be spaced at a maximum of 42 feet on center, and a minimum of 24 feet on center (See Figure 1).
8. Undulations will be spaced at a minimum interval of 500 feet and a maximum of 1,000 feet. Undulations will be placed no closer than 250 feet from traffic control devices or four-way intersections.
9. No less than two sets of undulations will be placed on a given street, as one set is not effective for speed control. The maximum number of sets is dictated by street length and spacing requirements.
10. To deter drivers from driving around undulations, there may be two inch (2") pipes set in the sidewalk, centered on the undulation in each approach direction. The pipes will be placed at a maximum of six inches (6") from the back of the curb. (See Figure 3).

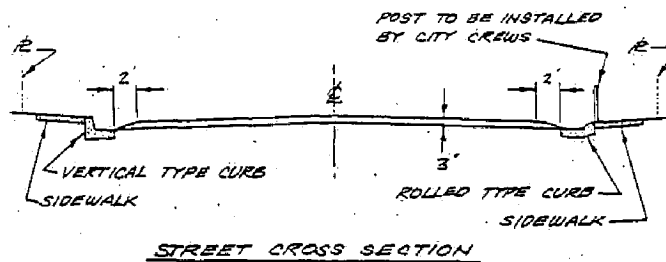
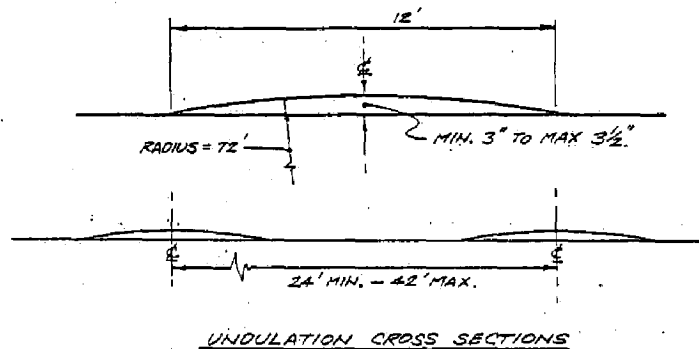


FIG. 1



Warning Signs and Striping

There are two types of advanced warning devices used to alert motorists of upcoming undulations:

- Street signs; and,
- Pavement markings

The signing includes a 30 inch sign stating "UNDULATIONS" in four inch (4") series "C" letters, above which is a pictorial of a pair of undulations. A second sign recommending a 15 MPH speed is placed directly below the warning sign. (See Figure 2).

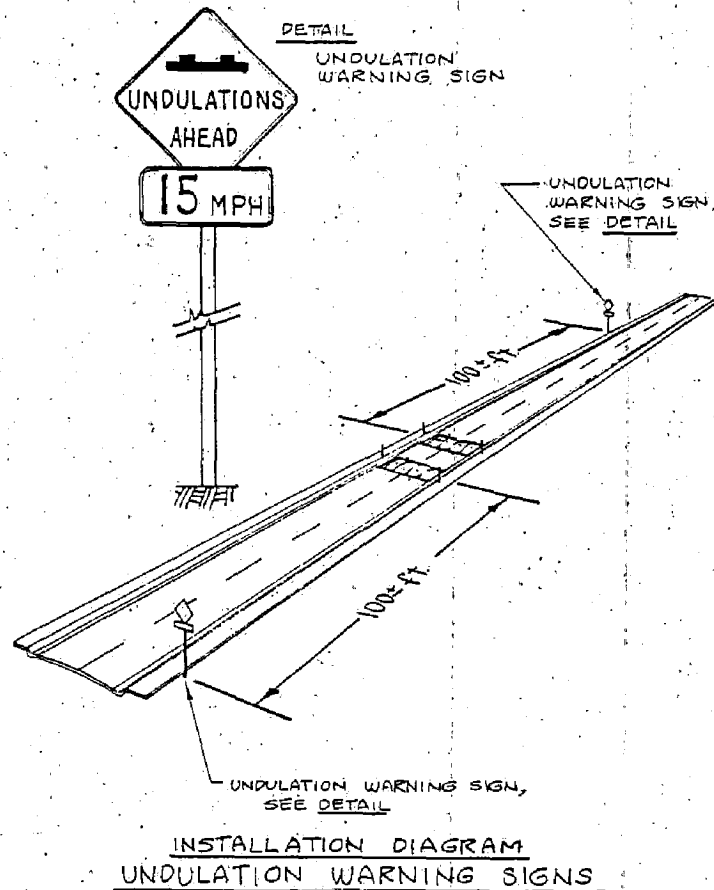


FIG. 2

Pavement markings should include 12" wide longitudinal ladder markings at four feet on center, which are stenciled across each undulation. In addition, raised reflectorized pavement markers shall be installed and placed on the centerline, positioned on the crest and in the front of the undulation from approach directions. This provides warning during the night and early morning hours (See Figure 3). All warning devices should be easily visible on approaches to undulations.

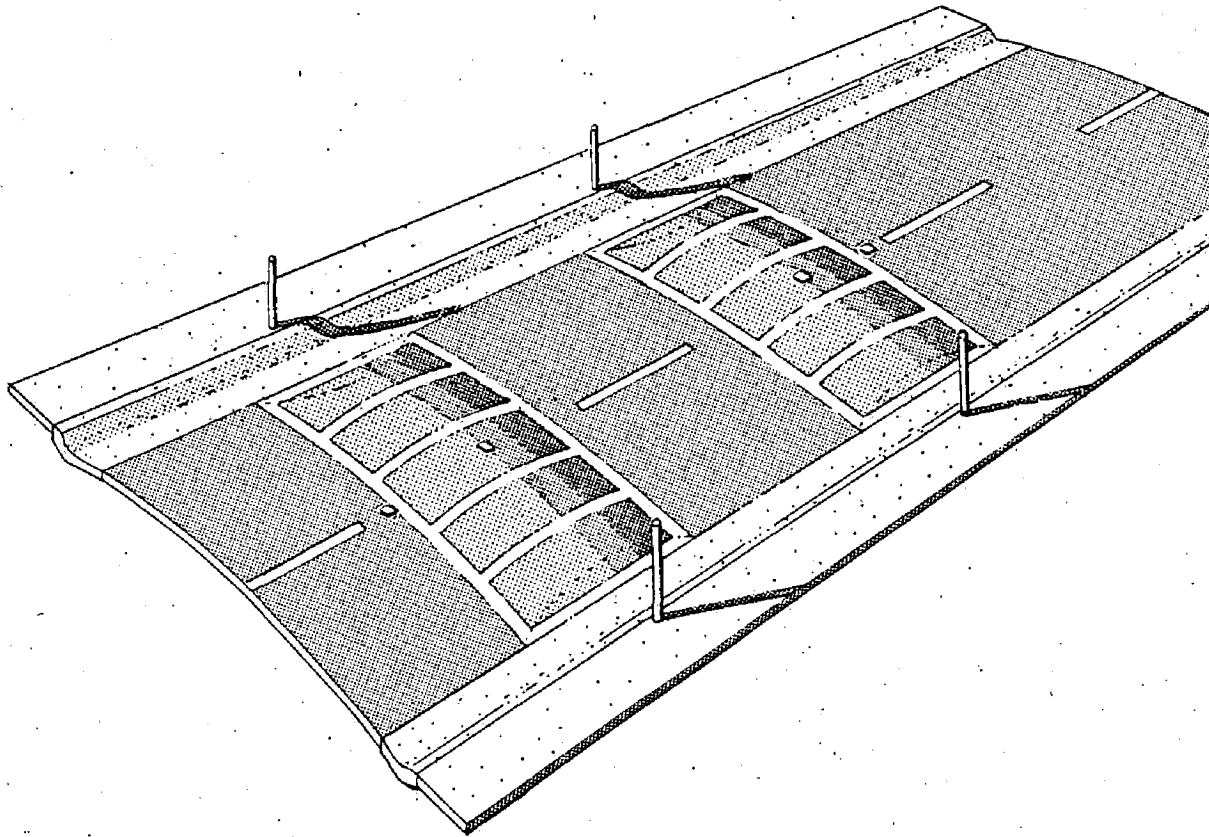


FIG. 3

### Relocation of Undulations

Changing the location of undulations on a street or the removal of undulations may be considered when all the criteria listed below are met:

1. Undulations are ineffective in reducing speeds and volumes of vehicles.
2. Undulations were placed in a location conflicting with adopted guidelines.
3. There is evidence that the original location is no longer in the best interest of the community.
4. There is a petition with a two-thirds majority of residents signatures in favor of relocation.

### Removal of Undulations

1. Undulations are ineffective in reducing speeds and volumes of vehicles.
2. Undulations were placed in a location conflicting with adopted guidelines.
3. There is no evidence that the original location is no longer in the best interest of the community.
4. There is a petition with a two-thirds majority of residents signatures in favor of relocation or removal.
5. Undulations have been installed for at least two (2) years.

Removal of undulations which have been installed for less than two years will only be considered if the City is compensated by those requesting undulation removal for the full cost of the original installation, including design, construction and inspection. This would not apply if a street became a Regional Transit bus route.

These are the specific guidelines to be followed prior to recommending the relocation or removal of undulations. The guidelines are intended to confirm whether such a decision would be in the public's interest.

1. Conduct an additional volume count.
2. Conduct additional speed surveys.
3. Survey the portion of the public that would be affected by said actions.
4. Hold a community meeting with the support of the district's City Councilmember to discuss the advantages of undulations.

If the decision is made to take action on existing undulations, a Council letter must be drafted to that effect. When passed by the City Council, the relocation or removal procedures may be initiated.

#### Undulations and Regional Transit

Regional Transit (RT) adopted a policy on bus routing with regard to undulations in 1982. This policy authorizes RT staff to modify bus routes so they do not utilize streets with existing or future undulations or other known problems and to coordinate future placement of such devices.

The Departmental policy is to provide RT with the locations of future undulations so that problems which this might create can be resolved prior to the installation. Undulations will not be placed on streets where RT bus service exists. If a majority of residents are in favor of installing undulations on their street, which is a Regional Transit route, it will be the responsibility of Regional Transit to change their bus routing accordingly.

#### Public Notification

Public Notifications, which are used to inform residents in a given area of potential undulations and other changes to their street system, may be distributed to residents by one of two methods:

1. Fliers may be hand delivered to residences where the fliers are attached to or slipped under a door. (Note: It is illegal to place fliers in a resident's mailbox.) Hand delivering of fliers should only be done in special cases where mailing would not be time effective.
2. The fliers may be mailed out through the City Manager's office. Two copies of a flier, accompanied by the range of addresses to which the fliers are to be sent, are delivered to the Citizen's Assistance Officer, located in the City Manager's office. The Citizen's Assistance Officer requires twenty one (21) days advance notice to ensure that the fliers arrive on time. Fliers which require a response should be sent out far enough in advance to reach the public one (1) full week prior to the response deadline.