

Van Ness Corner Bulb Design Evaluation Report

I. Background

A. Summary

This study examined the pedestrian corner bulbs along Van Ness Avenue in San Francisco for insights regarding usage, maintenance, and safety, using a combination of field surveys and historical data. The study finds that the bulbs are well used by crossing pedestrians. The study also finds that the bulbs generally show evidence of contact with vehicle tires in their outer 6-12 inches, but analysis of collision history indicates that no collisions have been caused by the bulbs, and that collision rates along Van Ness Avenue have not changed following the bulb installation. Furthermore, field observation indicates that contact between vehicles and corner bulbs is rare. The study concludes that the bulbs along Van Ness Avenue have been effective in improving pedestrian conditions without posing a safety risk, but that slight adjustments to the bulb design may be warranted for maintenance reasons.

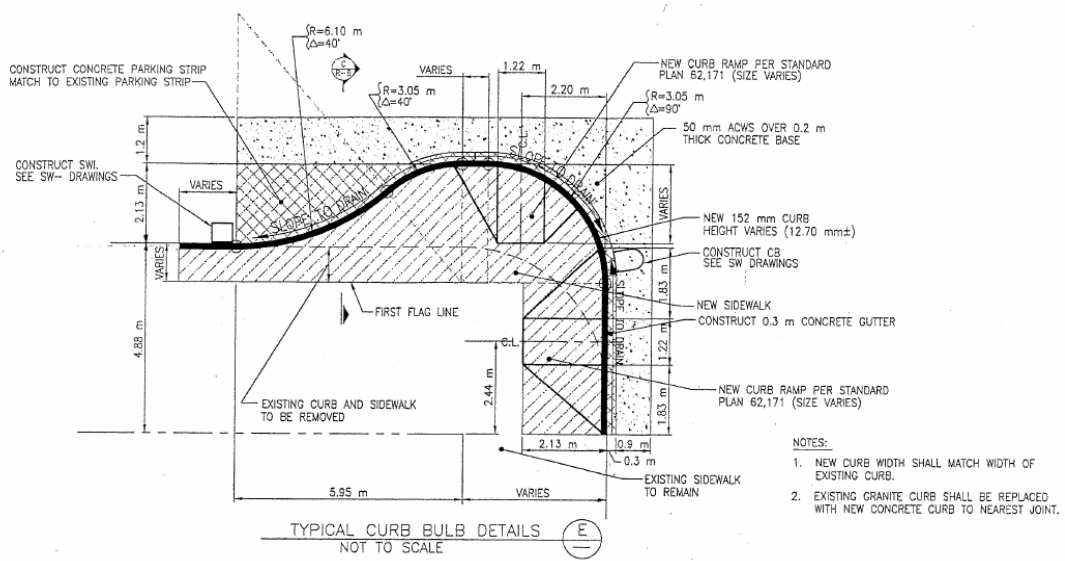
B. Design and Location of Van Ness Avenue Bulbs

The bulbs that are the subject of this study are located on Van Ness Avenue between Market and Clay, a 1.2 mile stretch of State Route 101. Van Ness Avenue has a posted speed of 25 mph and average daily trip rates of 40,000 vehicle trips and 20,000 transit trips. By 2002, the San Francisco Municipal Transportation Agency (SFMTA) had installed 33 corner bulbs at 17 intersections in two phases of work, mostly at far-side locations. The purpose of the bulbs is to:

- Shorten the pedestrian crossing distance across Van Ness Avenue
- Increase pedestrian visibility at intersections
- Reduce speeds of right-turning vehicles

Based on the as-built engineering drawings of the existing Van Ness bulbs, the Caltrans Design Exception Fact Sheets prepared for the bulbs, and discussions with SFMTA staff, typical bulb dimensions are seven feet wide by approximately 25 feet long, as shown in Figure 1.

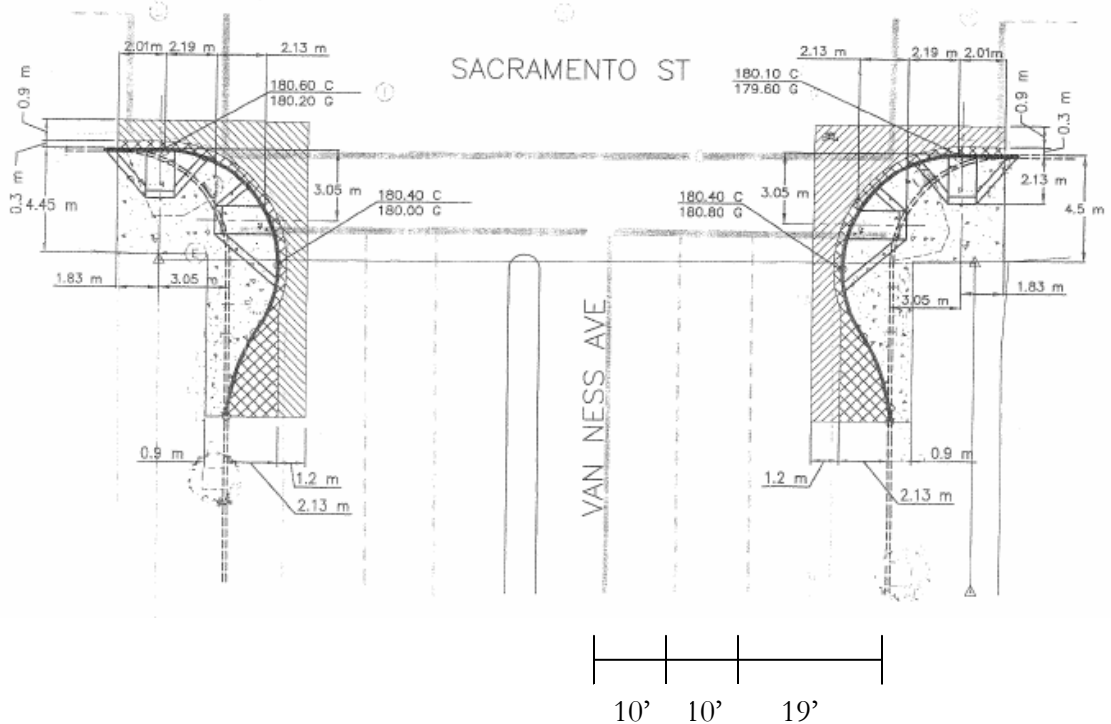
Figure 1. Typical Dimensions of Van Ness Avenue Corner Bulbs



In 2005, SFTMA modified the bulb design by painting a two-foot striped buffer area around select bulbs. SFMTA installed the buffer as a preventative measure in response to Caltrans' concerns about the potential for collisions between turning vehicles and the bulbs, associated safety risks, and structural damage to the bulbs.

The existing Van Ness Avenue cross section is shown in Figure 2. The combined width of the parking lane and curbside travel lane is 19 feet. With the buffer stripe, the dimensions result in a 10-foot travel lane, a two-foot buffer, and a 7-foot bulb.

Figure 2. Van Ness Avenue Cross Section with Bulbs



II. Analysis

The study consisted of three data-gathering and analysis tasks, as follows:

- An inventory of bulb conditions
- Field observations of bulb operation by pedestrian use of bulbs and the turning movement of automobiles and trucks around the bulbs
- Analysis of collision history



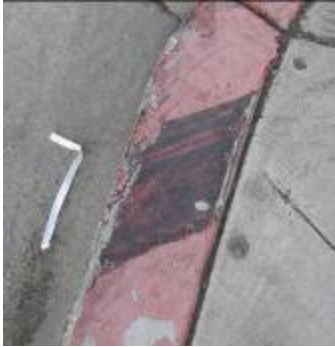



A. Bulb Conditions Inventory

In February and March 2008, the study team inventoried the bulbs by comparing observed dimensions with as-built engineering drawings, documenting the condition of each bulb with photos, and classifying the bulb's condition. The specific information collected as part of the bulb inventory included:

- Location, width and length
- Right-of-way dimensions including the bulb offset to lane and any striping
- Condition, noting tire marking and structural damage

Table 1 below shows examples of damage ratings used in summarizing bulb conditions.

Table 1. Rating System for Tire Marking and Structural Damage

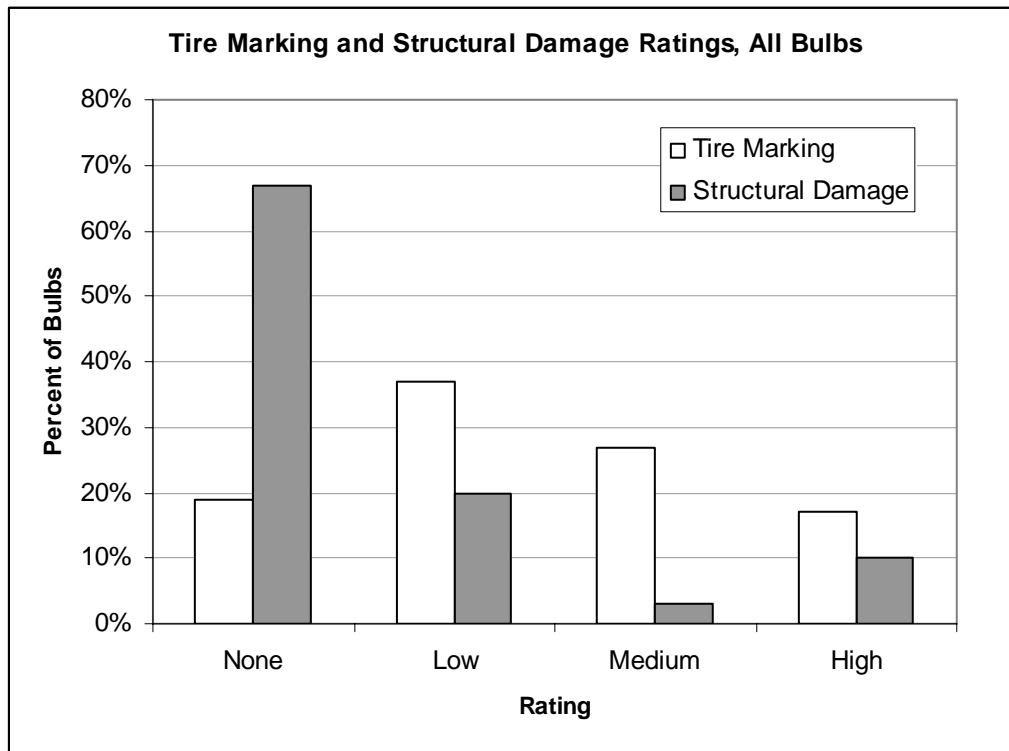
	Low	Medium	High
Tire Marking	 <p>Markings barely visible, low instance of markings [shown: Ellis]</p>	 <p>Markings visible, located in more areas around curb [shown: Golden Gate]</p>	 <p>Markings visible and dark, located in more areas around curb [shown: Turk]</p>
Structural Damage	 <p>Curb edge show signs of wear, minor slab crumbling [shown: California]</p>	 <p>Curb slab intact but more significant crumbling [shown: Hayes]</p>	 <p>Part of curb slab missing, dented, worn away [shown: California]</p>

Findings on Bulb Conditions

Most bulbs along Van Ness Avenue—81%—show some tire marking. The most common level of tire marking is low; only 17% of all bulbs have a high level of tire marking.

Thirty-three (33) percent of bulbs have some level of structural damage. Most of the damage is of low severity; only 13% of all bulbs had medium or high levels of structural damage. Table 2 synthesizes the level of damage to the Van Ness bulbs. See Appendix for individual bulb ratings.

Figure 3. Summary of Tire Marking and Structural Damage Ratings

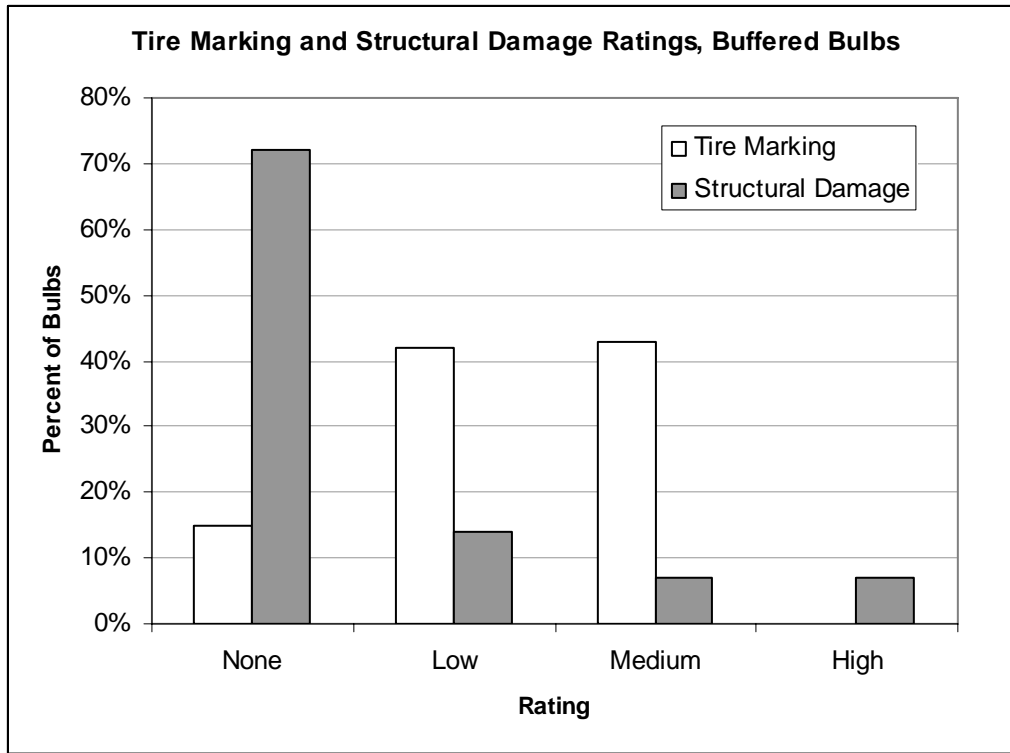


Damage to the corner bulbs indicates interaction with vehicle traffic either making a right turning movement or exiting a parallel parking space. The field observations, discussed in a subsequent section, investigated the likely causes of damage. All damage, both tire marking and structural, occurs on the outer 6-12 inches of the curb.

The team disaggregated the analysis of corner bulbs with a striped buffer from the analysis of all bulbs to determine whether the buffer helps to reduce damage on those outer 6-12 inches. It is difficult to make a conclusive finding here because there exists no baseline data regarding bulb condition before the buffers were installed. The analysis can only compare cumulative data between buffered and non-buffered bulbs.

The percentage of buffered bulbs showing no damage is not significantly different from that for all bulbs. There is, however, some difference relating to severity of marking and damage; 'high' ratings are down slightly for buffered bulbs, indicating a potential beneficial effect.

Figure 4. Summary of Tire Marking and Structural Damage Ratings, Buffered Bulbs



The above analysis shows frequent tire markings and some damage to the outer areas of existing bulbs, suggesting that the current bulbs on Van Ness Avenue may be too wide and that a bulb one foot shorter may be more appropriate. This idea is explored further in Section C below.

B. Field Observations

The peak period field observations at selected bulbs along Van Ness are intended to document pedestrian and vehicular interaction with the bulbs, including turning movements around bulbs. The observations help determine whether trucks and vehicles regularly come in contact with the bulbs as they turn, and whether vehicles or trucks are likely to cross the centerline when turning from Van Ness onto a two-way street.

Methodology

Over three days, Authority staff monitored pedestrian and auto turning movements around bulbs along Van Ness at three locations:

- Northbound Van Ness to California
- Northbound Van Ness to Bush
- Northbound Van Ness to Eddy

Bush and California were chosen for the high volumes of right turning vehicles. Bush is a one-way, three-lane street and California is a bi-directional street with two lanes for Van Ness right-turning traffic. Eddy is a two-lane, two-way street, chosen to demonstrate trends for smaller streets.

Data collectors recorded pedestrian movements, right-turning movement counts, type of vehicle, and the nature of any interaction between vehicle and corner bulb. Staff observed California and Bush from 7 to 8 AM because truck volumes are highest during early mornings, based on information provided by Cindy Shamban, special event and oversize vehicle coordinator for SFMTA. Staff observed this location from 5:30 to 6:30 PM to capture peak-period vehicle traffic.

The team observed 177 turning movements over all observation periods. Of these movements, 10 were trucks, giving a 6% truck rate.

Findings from Observations

The team observed only one instance where a vehicle contacted a bulb; a parallel-parked vehicle drove onto the curb at slow speed while exiting from a parking space. Vehicle traffic is able to make a right turns around the corner bulbs without coming into contact with the bulb. This finding indicates the possibility that the tire contact may come more from vehicles leaving parallel parking spaces than from turning vehicles.

Bulbs appear to reduce the speeds of turning vehicles. Turning movements around the bulbs generally occurred at low speeds (particularly onto Eddy Street). When turning into a two-way street (Eddy) from Van Ness, all autos turned into the curb lane and in no case did a vehicle cross the center line when making the turn. Trucks tended to turn at slower speeds than autos. They turned into the 2nd and 3rd lanes from the curb, usually at greater speeds, when they were able to do so without risking contact with other vehicles.

The observations suggest that the risk or likelihood of collisions between vehicles and the curb, or between turning vehicles and oncoming traffic on the cross streets, is not increased substantially by the presence of a bulb.

Observations also suggest for that bulbs with painted buffer areas, vehicles track further from the curb as they turned than for bulbs without the buffers. Again, while not conclusive, this finding does suggest a potential positive effect of buffers.

The bulbs were observed to improve pedestrian walking and crossing conditions in addition to slowing down turning vehicles. First, they provided pedestrians with space to wait while crossing the street without impeding through-pedestrian traffic moving along the sidewalk. See Figures 5 and 6 for examples of pedestrian curb bulb use. Pedestrians also stepped onto the bulbs to watch for traffic, increasing their visibility to drivers and vice versa.

Figure 5. Eddy and Van Ness: Space to Wait



Figure 6. Geary and Van Ness: Increased Visibility



C. Comparison to Six-Foot Bulbs in San Francisco

The inventory of damage to Van Ness Avenue bulbs found that tire markings and structural damage occur in the outer 6-12 inches of the bulb. This suggests that a 6-foot bulb might experience less damage than the 7-foot bulbs on Van Ness Avenue. To investigate this question, the team conducted a survey of a 6-foot corner bulb at Potrero and 24th Street in San Francisco. Staff conducted a conditions inventory and field observation using the same methodology for the Van Ness Avenue locations.

The team selected the Potrero and 24th Street bulb because it provides a relatively similar context to 19th Avenue and Van Ness Avenue. However, there are some differences – 24th Street is configured with one travel lane in each direction, plus parallel parking, whereas Van Ness Avenue cross streets are generally configured with 3 lanes of traffic and parallel parking arranged in one-way pairs.

Additionally, the Potrero bulbs were installed and painted by April 6, 2007, several years later than the Van Ness Avenue bulbs, and so are less likely to show evidence of damage because of their relatively recent construction.

The Potrero bulbs have no tire markings or structural damage. This result is likely a combination of the shorter width as well as the relative recent installation of the infrastructure. Additionally, from the field observations, all turning vehicles stay in the curb lane without crossing the center line of 24th Street.

These observations on the 6-foot Potrero bulbs reinforce the previous findings that bulbs are of low risk for collisions, and that a slightly shorter bulb might reduce the risk of damage to the bulb.

D. Collision Analysis

Ramiel Gutierrez, Caltrans District 4, analyzed the State Traffic Accident Surveillance and Analysis System (TASAS) data for Van Ness Avenue to determine whether collisions along Van Ness Avenue are related to the corner bulbs. Caltrans analyzed TASAS for three periods between 1997 and 2007:

- 1) before construction of bulbs
- 2) after initial construction of bulbs
- 3) after the striped buffers were installed.

Caltrans determined that there is no relationship between the corner bulbs and the collisions (email communication, Ramiel Gutierrez, 02/14/2008). This determination reinforces the field observations finding of no added safety risk posed by the bulbs on Van Ness Avenue.

Additionally, Authority staff analyzed TASAS data to determine whether the collision rate along Van Ness Avenue changed following installation of the bulbs; the rate of collisions along Van Ness following bulb installation is slightly lower, but not to a statistically significant level.

III. Conclusions

Safety

The historical collision data analysis found no relationship between collisions and the pedestrian corner bulbs. The study also found no evidence of higher potential risk of collisions based on observed behavior of drivers. Specifically, all right-turning motorists are observed to make the turn without crossing the centerline of the cross-street or contacting the bulb.

Maintenance

The study found that most bulbs have some degree of tire marking and that about one third have some structural damage. The vast majority of the marking and damage are minor in nature and are confined to the outer 6-12 inches of the bulb.

Pedestrian Conditions

The corner bulbs are well used and provide clear benefits for pedestrians, including more walking space, higher visibility, shortened crossing distance, and reduced speeds of right turning traffic.

Dimensions

- Width. The 7-foot corner bulbs do experience tire markings along the outer 12 inches, even with a striped buffer. It is possible that these markings are made by parked vehicles exiting the parking lane. Constructing six-foot bulbs may reduce the incidence of tire contact.
- Buffer. A striped buffer may reduce the severity of bulb marking and damage by providing visual guidance for drivers when turning; the observed evidence is not definitive on this point.

IV. Acknowledgements and Sources Consulted

This study was conducted by Krute Singa and Nico Linesch, consultant planners with the Authority, under the management of Rachel Hiatt, Senior Transportation Planner. Tilly Chang, Deputy Director for Planning, and Chester Fung, Senior Transportation Planner, provided guidance and review.

The Authority conducted this study with guidance from staff of SFMTA, specifically Cindy Shamban who provided information on truck dimensions, driving hours and routing along Van Ness; Jack Fleck and Roop Jindal supplied the fact sheets of the two Van Ness corner bulb construction phases; and Mike Sallaberry provided background information on the Potrero bulb.

Caltrans staff Mike Thomas and Beth Thomas provided oversight for the study. Ramiel Gutierrez conducted the TASAS analysis.

Appendix: Inventory of Van Ness Bulb Conditions

Northbound Van Ness										
Location of Bulb		Bulb Design			Bulb Damage					
Van Ness @	NE Corner	SE Corner	Striped Buffer	Tactile Pads	Tire Markings			Structural Damage		
					Low	Med	High	Low	Med	High
Clay		x	x	x		x		x		
Sacramento		x		x			x	x		
California		x		x	x					x
Pine		x		x		x		x		
Bush		x	x			x				
Sutter		x		x			x			
Post		x	x	x		x				
Geary	x	x	x	x						
O'Farrell		x	x	x	x					
Ellis		x		x			x			
Eddy		x	x	x	x					
Turk		x		x			x			
Golden Gate		x	x	x	x			x		
McAllister										
Grove	x		x	x		x				x
Hayes										
Fell										

Southbound Van Ness										
Location of Bulb			Bulb Design		Bulb Damage					
Van Ness @	NW Corner	SW Corner	Striped Buffer	Tactile Pads	Tire Markings			Structural Damage		
					Low	Med	High	Low	Med	High
Clay	x		x	x						
Sacramento		x		x	x					
California	x			x		x		x		
Pine										
Bush	x			x			x			x
Sutter	x		x	x	x					
Post	x			x	x			x		
Geary				x						
O'Farrell	x									
Ellis	x		x	x		x				
Eddy	x			x	x					
Turk	x			x						
Golden Gate	x		x		x					
McAllister	x		x			x				
Grove				x	x					
Hayes	x		x		x				x	
Fell	x	x								