

Traffic Engineering Division
City and County of San Francisco

WILLIE LEWIS BROWN, JR., MAYOR
STUART R. SUNSHINE, EXECUTIVE DIRECTOR

IMPLEMENTING SAN FRANCISCO'S BICYCLE ROUTE AND SIGN SYSTEM

By Adam Gubser, Manito Velasco, and Virginia Summerell

INTRODUCTION

In response to a growing interest in bicycling, the City and County of San Francisco recently designed a city wide bicycle route network and a comprehensive route signing system. This paper describes the design and implementation of this innovative and highly successful system.

BACKGROUND

The San Francisco Bicycle Program, working within the Department of Parking and Traffic (DPT), is responsible for bicycle planning in San Francisco. The program has grown over the last five years from a one-person operation. It is now staffed by a Bicycle Program Manager, a Planner, an Assistant Transportation Engineer, and two Summer Interns. This team plans, coordinates and carries out all bicycle-related projects and programs in San Francisco. One of the team's recent accomplishments was the implementation of a comprehensive bicycle route network and a sophisticated route signing system.

GOALS AND OBJECTIVES

One goal of the bicycle route network and sign project is to promote bicycle use by making the public more aware of the bicycle as a legitimate transportation mode. The signs direct cyclists to follow the bicycle route network, designed to include the safest, most direct and least hilly routes between major destinations around the City. Though most of the network's 180 miles are Class III routes, there are approximately 30 miles of Class I and Class II bikeways. The signs serve to remind motorists that they are sharing the road with cyclists who are traveling on official bicycle routes. In addition, they attract new bicycle riders who may be intimidated by traffic, steep hills and other constraints. We expect that these goals will be realized in the coming months, as we install more than 3,000 bicycle route signs.

ROUTE NETWORK DEVELOPMENT PROCESS AND PUBLIC INPUT

The preparation of the bicycle route network involved input from the public in a variety of formats. The first draft of the bicycle route map was prepared by the San Francisco Bicycle Advisory Committee (SFBAC), whose members are appointed by and report to the City and County Board of Supervisors. In addition, the San Francisco Bicycle Coalition (SFBC) reviewed all preliminary plans for the network. The map was distributed for public comment. Written comments on the proposed routes were received and compiled by DPT and the SFBAC. Four

public meetings were held with a total of 265 people attending and 110 letters and faxes submitted.

SIGN DESIGN

The new sign, designed by DPT Assistant Traffic Engineer Scott Broady, is the first customized bicycle route sign to be approved by the California Traffic Control Device Committee (CTCDC). It is now the approved standard numbered bicycle route sign for use by all California jurisdictions.

The new Bicycle Route Signs, designated SG45 in Caltrans' Standard Sign Specification, replace the old G93 bicycle route signs. The old sign, though functional and recognizable to both motorists and bicyclists, did not incorporate any detail for direction or destinations. The Highway Design Manual suggests using supplementary arrow and destination plates under the old signs as needed at high demand destinations. The new SG45's, described in detail below, provide direction, destination, and other information that allows bicyclists to appreciate the scope of the entire network.

The attractive signs (see attached illustrations) feature a large white bicycle and route number on a green oval. At the top of the oval is a graphic of the Golden Gate Bridge over a layer of fog. The signs also include information on destinations and travel directions. Routes in the system are divided into two classes. Primary cross-town routes feature a full color graphic of the bridge and act as "bicycle arterials." Local neighborhood routes have a green and white graphic.

In addition to arrows and destinations, the bicycle community in San Francisco requested that cardinal directions be included on the sign to provide additional information to bicyclists as to the direction the route is following. This information is important at turns in the route where bicyclists can sometimes be routed in a direction other than the ultimate direction of the route (i.e., go one block west to go north).

ROUTE NUMBERING SYSTEM

The numbering system is based on the Federal Highway System methodology, using odd numbers for north-south routes, and even numbers for east-west routes. Loops and spurs have three-digit designations. The system is laid out on a grid with the lowest route numbers (5 and 2) originating in the northeast part of the city, progressing to the highest numbers in the southwest (95 and 98). The system also has the flexibility to accommodate network expansion. Route numbers were selected so that new routes can be easily inserted between existing ones, while maintaining the numerical progression. No route number duplicates a state highway number used in the city.

SIGN PLACEMENT

The general placement for the bike signs is at route junctions and at turns within the route. Reassurance signs are also required at long uninterrupted segments of the route. At wide or odd-angled intersections, reassurance signs are also added at the far side.

The standard height of any traffic sign is 7 feet, which is appropriate for bicyclists' line of sight. Generally, we designed the bike signs to be posted at this height though that was not always possible. We had the additional constraint of minimizing the number of posts on the sidewalks to

reduce cost and clutter. As a result, some signs have been posted at higher than the desired height. At STOP sign posts, for example, an extension was attached to allow bike route signs to be supported above the STOP signs. There are also several locations where two or three routes are coincident and three signs (all with different route numbers) are stacked vertically. The third sign is usually more than 15 feet high. Despite this height the sign information is still legible.

PROJECT TIME LINE

The original estimate for completion of the sign project was two years. However, given the complexity of the project and the large variety of signs, we were unable to meet this goal. A number of factors contributed to the delay. Our Traffic Sign Division had to contend with the bike sign project in addition to their regular installation and maintenance duties. They currently maintain close to 120,000 signs with limited staffing and can become overburdened at times. To facilitate the installation process, we trained traffic sign installers on the bike route network and sign system. Because of staff turnover in the Sign Division, the training had to be repeated. In spite of these limitations, we still expect the entire network to be signed by Summer 1999.

SURVEY AND INSTALLATION

Each route in the network was reviewed in the field to ensure that routes made sense. At this stage, we were able to identify problems like gaps, one-way streets and turn restrictions. We eliminated gaps by making adjustments to routes. At one location, the design of a complex intersection where two one-way streets merge created an access problem for cyclists. We solved the problem by providing a bicycle channel through a median to allow through bicycle access.

We addressed problems created by turn restrictions on a case-by-case basis. At most locations, we installed a sign with a graphic illustrating how a typical bicycle left turn can be made by following the crosswalks. The graphic was modeled after a graphic in the California Traffic Manual. At some locations, "USE CROSSWALK" plates were installed in addition to the supplementary left turn instruction signs. We attempted to minimize the use of "USE CROSSWALK" plates since most bicyclists are unlikely to dismount and walk their bikes across crosswalks. In a few cases, we were able to legislatively exempt bicycles from the turn restrictions. The exemptions were typically for locations where the turns could be made safely but were prohibited because of traffic congestion.

Working from the Bicycle Plan's Route Network Map, a database of signs was developed on a Paradox computer database. Student interns entered location, sign legend and other pertinent information into the database. The database provided useful information for sign survey technicians and was used to prepare purchase orders. It should prove useful in the long term for maintenance. If a sign is missing, we can refer to this inventory to identify the type of sign to be replaced. Finally, the sign database was used by an engineer and a surveyor to complete a 6 month survey of the entire route.

Our success to date in installing the bike route signs efficiently can be contributed to the enthusiasm of both the sign surveyor and the installer. This has been a project that everyone has enjoyed.

WORKING WITH OTHER JURISDICTIONS - SPECIAL CONCERNS

Golden Gate Park, The Port of San Francisco and the National Park Service, which controls the Presidio, were among the internal jurisdictions to whom we presented the sign proposal. Each jurisdiction required staff review followed by commission approval. All of the entities we approached expressed support for the proposal, which was consistent with their general plans, and indicated that the signs would be a positive addition that would improve access to their locations. However, each jurisdiction expressed concerns about the impacts of such an extensive proposal. Among the issues causing concern were aesthetics, environmental impacts, installation and maintenance.

Our proposal to these agencies was to install and maintain the bicycle route signs. We included the total number of signs, sign locations and new pole installations. After a preliminary survey was completed, we presented it for their staff to review. In each case, concern was expressed about the number of signs proposed. We then negotiated for fewer signs in order to address staffs concerns while maintaining the connectivity and accessibility of the basic route system. Some additional conditions arose during the negotiation process that we also had to address. For example, the Presidio has particular requirements for sign installation. For installations in dirt, 4" x 4" painted wood poles must be used; installations in cement and asphalt must be a 2" sleeve-mounted galvanized steel.

We worked with several entities including the California Department of Transportation (Caltrans), Daly City and the City of Brisbane on sign installation issues. We applied for an encroachment permit from Caltrans to install signs on the bike routes that coincided with State Highways 1, 35 and 82 within the City of San Francisco. There were a number of other locations where sign installation was required within Caltrans jurisdiction, such as the Cesar Chavez Street Circle paths.

Daly City and Brisbane are cities that border San Francisco and portions of the bike route network fell within their city limits. Both cities expressed concern about maintenance and liability for the signs. We assured them that San Francisco would be responsible for maintenance; however, the issue of liability was more difficult to resolve. We eventually determined that the improvements associated with bike route system (i.e. improved road conditions, increased motorist awareness) could themselves reduce concerns about liability. Apart from these concerns, the sign proposal appealed to Daly City and Brisbane because of its flexibility. Each city can easily incorporate our route numbering into their own bicycle network once developed, and we will offer advice once they are ready to proceed.

FUNDING

The Bike Route Network signs were funded in part through an \$85,000 state grant the city obtained in 1993 from Proposition 116 Rail Bonds.

The network required installation of 3,100 signs, which we ordered for a total cost of \$24,000. The City took advantage of its traffic sign contract, which based sign per unit costs on size and color. For a three-color sign at a 12' x 18' size, the unit price according to the contract was around \$8.00. Since reflectivity of the sign was not critical, conventional engineering grade

reflectivity was specified. We also ordered some blank route signs for maintenance. The labor cost figures includes one sign laborer and one sign survey technician and totaled \$45,000.

We also spent considerable time planning and coordinating the project. Student interns were assigned to survey portions of routes to find any unforeseen problems. They also assisted in the development of the sign database. We were also able to make route improvements or changes in the course of our other bike path and bike lane projects, and were able to defer some costs to these projects. The planning and administrative sections of the project accounted for the remaining \$16,000 of the cost.

The City recently approved funding to maintain the bike signs, which have a life-expectancy of 7 years. Our best estimate, based on experience with other guide signs in the City, is that 20 percent of the signs will need to be replaced because of either vandalism, theft or sign deterioration each year. The cost of supplying and installing a sign is roughly \$100. The total yearly maintenance cost for the signs is \$60,000.

PROMOTION

A map of the bicycle route network and a description of the route signs is available in most homes, businesses, and even on the street. In an innovative private-public partnership, DPT encouraged Pacific Bell to produce and include a map in the Local Area Pages of the 1997 Pacific Bell Smart Yellow Pages. This is the first telephone directory bicycle route map in California and one of the few in the U.S. The Pacific Bell Smart Yellow Pages has provided a unique opportunity to promote the bicycle route network.

A publicity photo of Mayor Willie L. Brown, Jr. announcing the bicycle route map in the phone book was included in our newsletter and Pacific Bell sent it out to local media. It includes the Mayor standing in front of the Golden Gate Bridge next to the bike route sign and a phone booth. He is standing next to a vintage bicycle while looking at the bike route map in the phone book. Pacific Bell used this photo as a nationwide publicity campaign informing people that they can travel to SF and easily find the bike route map. Having a map in the phone book has been an effective outreach tool.

CONCLUSIONS

This sign project was a very labor-intensive undertaking crafted through neighborhood input, careful surveys and bicycle staff effort and enthusiasm. It is a relatively low cost but high visibility project that shows a commitment to promoting cycling. We have already received positive feedback from bicyclists and residents. Other cities including Honolulu, Las Vegas, Napa and Oakland have inquired about the signs and are considering their use. We will continue to install bike paths and lanes within the network to further cycling and promote safe riding. We expect the network will encourage more people to adopt this alternative mode of transportation.

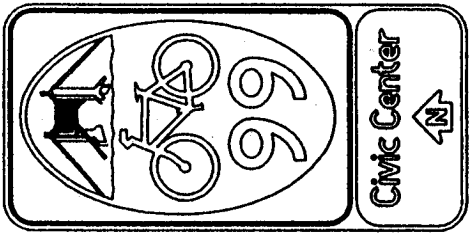
Bios:

Adam Gubser is a Transportation Planner with the City and County of San Francisco Department of Parking and Traffic assisting with the development and implementation bicycle projects and programs. His duties include Community relations, safety education and outreach,

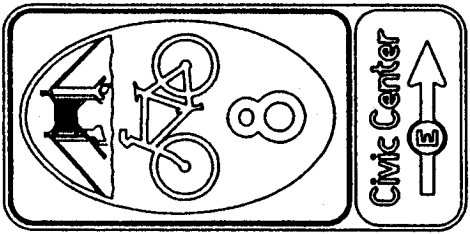
and management of a bicycle rack installation program several Bay Area Air Quality District-funded projects and bikes on transit programs. He received a Bachelor of Arts degree in History from San Francisco State University in 1995 and has completed major course work in Geography and Urban Studies.

Manito Velasco has been with the city for 3 years, the last two working on reviewing bicycle-related parking traffic issues. Among the other bicycle projects he is managing are bicycle parking for City buildings and feasibility studies of implementing bicycle lanes on City streets. He received his Bachelor of Science degree in Civil Engineering 1993 and a Masters of Science in Transportation Engineering in 1995 from UC Berkeley.

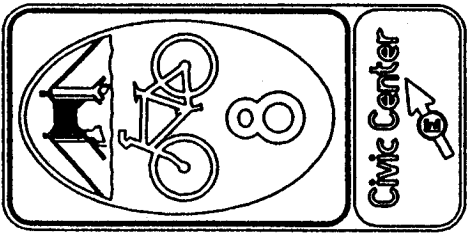
Virginia Summerell is completing a Masters Degree in Geography at San Francisco State University and has been working with the Bicycle Program since June, 1997,



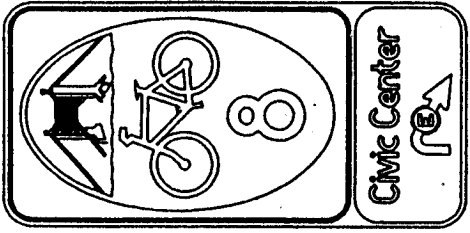
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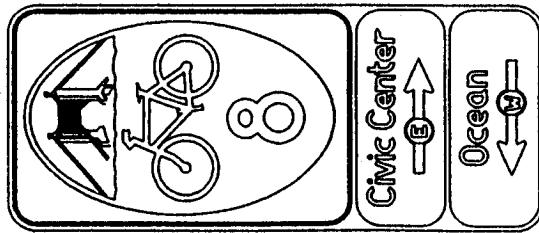
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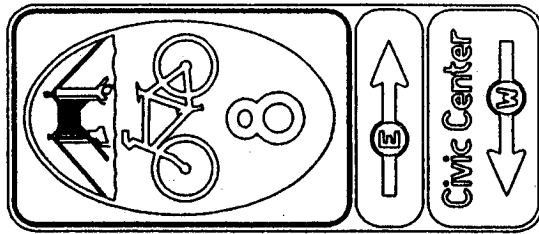
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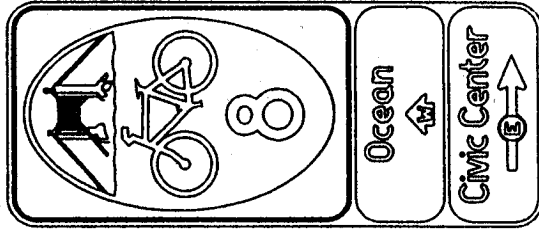
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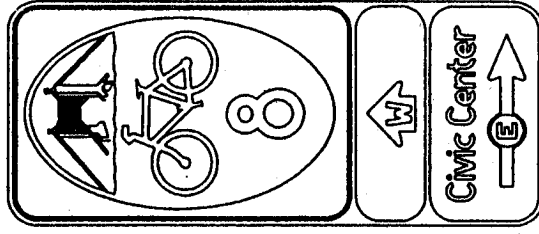
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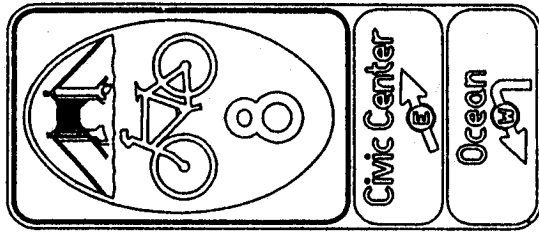
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12' x 28'

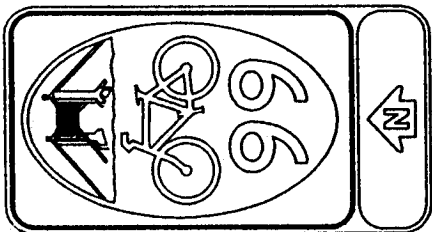


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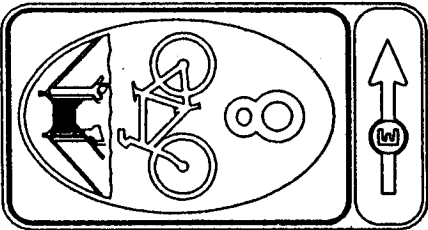


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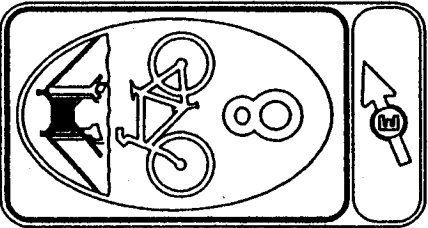
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REVISIONS NO. DATE DESCRIPTION BY APP.	CHECKED WITH TRACING TO SEE IF YOU HAVE LATEST REVISION	SCALE: No. Score SHEET OF SHEETS	APPROVED: DATE: 4/28/94 CHECKED: DATE: 4/28/94 SECTION NUMBER: DATE: 4/28/94 DRAWN: DATE: 4/28/94 PLANNED: DATE: 4/28/94 DESIGN: DATE: 4/28/94



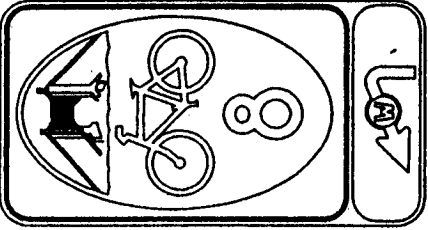
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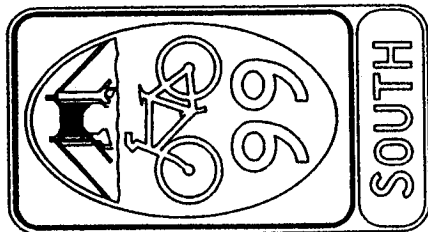
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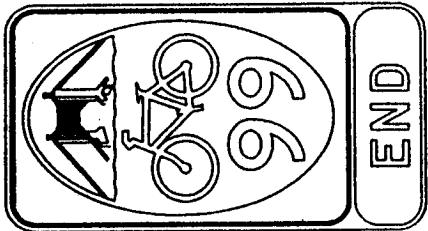
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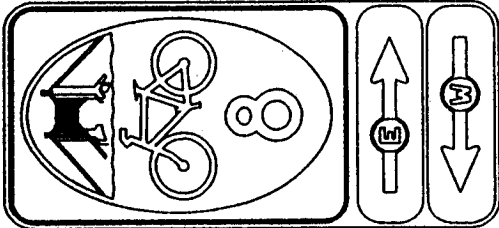
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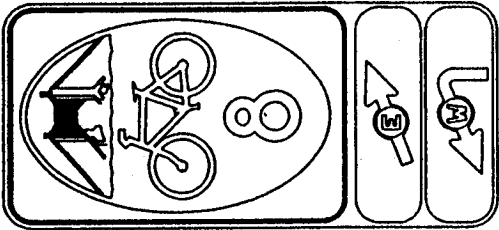
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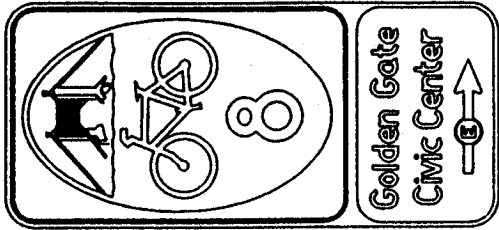
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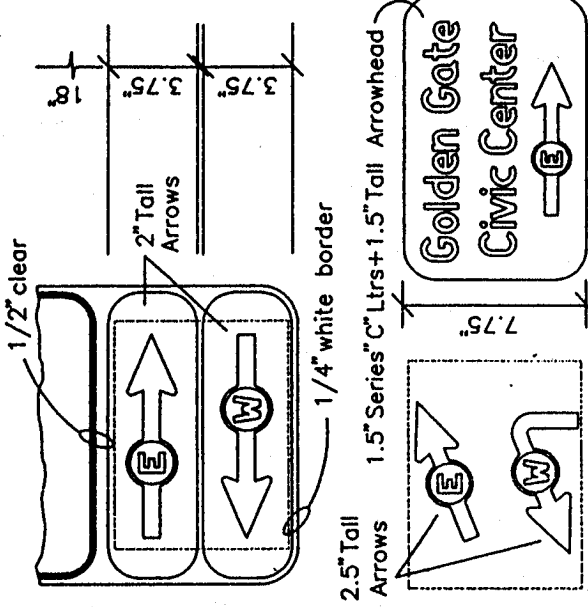
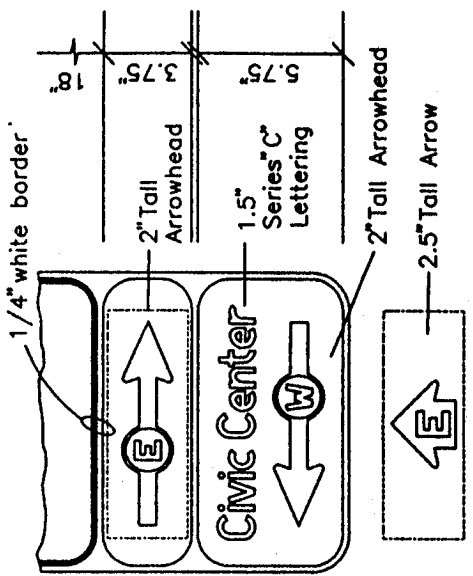
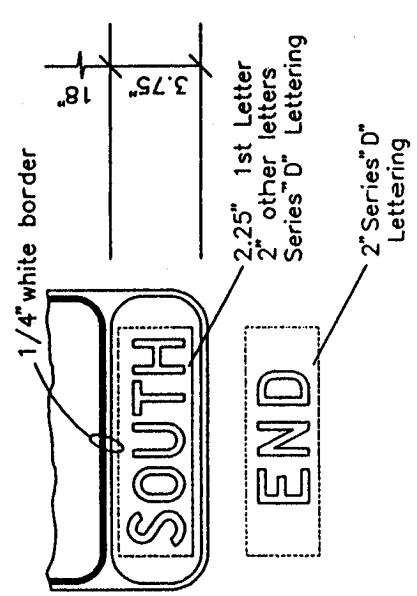
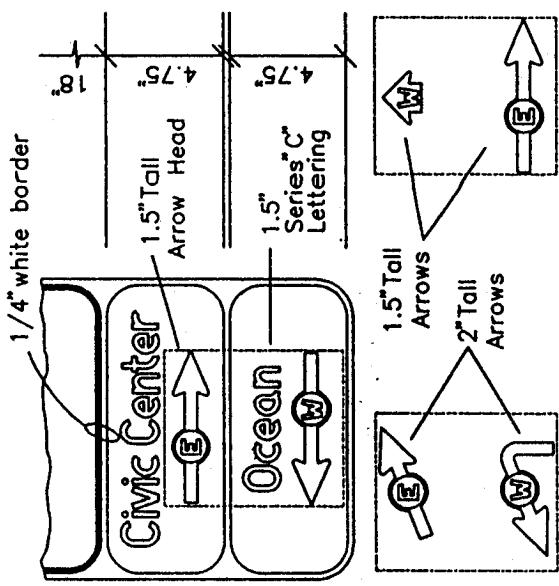
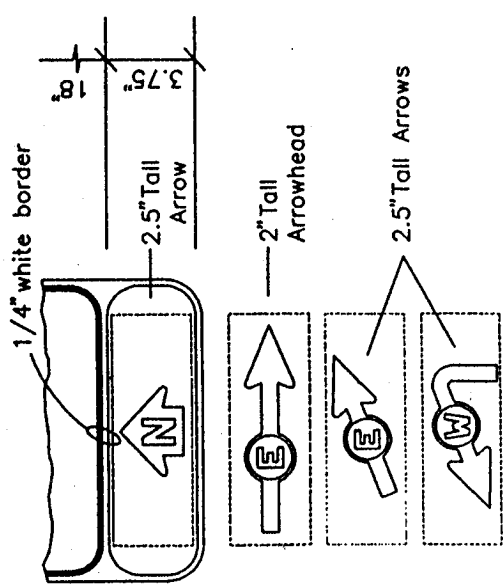
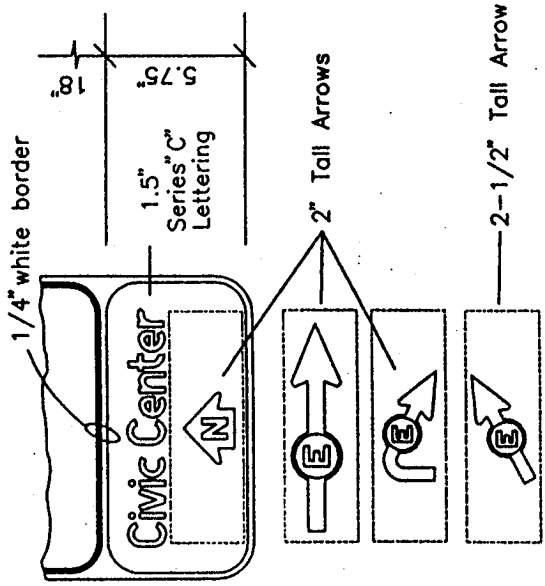
NO.	DATE	DESCRIPTION	BY	APP.

DEPARTMENT OF PARKING AND TRAFFIC
 DIVISION OF TRAFFIC ENGINEERING
 CITY AND COUNTY OF SAN FRANCISCO

DESIGNED DATE	APPROVED	SCALE	No. Scale
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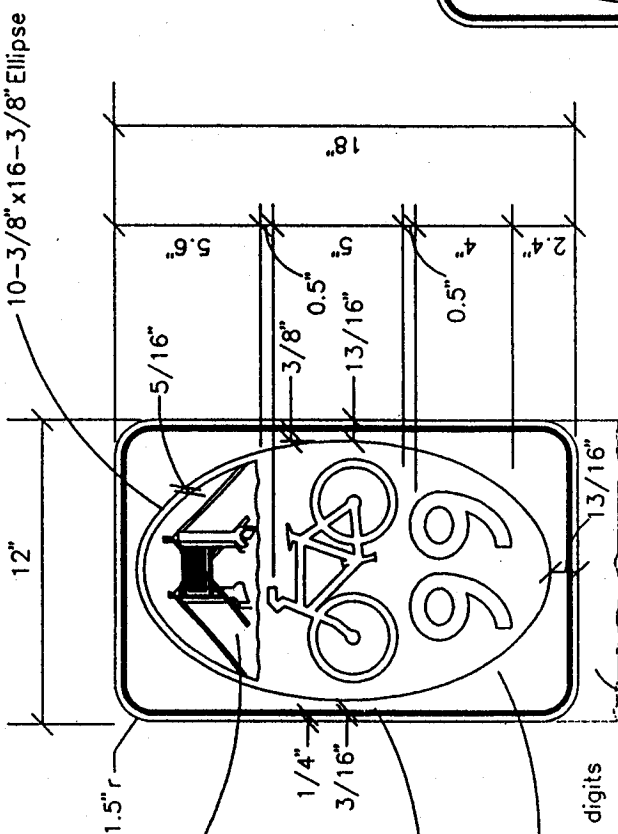
BIKE ROUTE SIGNS	Without Destinations + Others
572-7157 +	780' x 10'

ORDER WITH INSTRUCTIONS TO SEE # YOU HAVE USED BEFORE



REFERENCE INFORMATION & FILE NO. OF SHEETS		BIKE ROUTE SIGN		SHEET NO.	
DATE		SCALE		SHEET OF SHEETS	
DESIGNED BY	DATE	1" = 5'	1	OF	
DRAWN BY	DATE				
CHECKED BY	DATE				
APPROVED BY	DATE				
PROJECT NAME		PROJECT NUMBER		DATE	
MPL E-2036					
DATE		DATE		DATE	
1/11/10		5/22/10		5/27/10	
DRAWN BY		CHECKED BY		DATE	
SMY					
PROJECT NO.		SHEET NO.		DATE	
512-7137 F					
DEPARTMENT OF PARKING AND TRAFFIC					
DIVISION OF TRAFFIC ENGINEERING					
CITY AND COUNTY OF SAN FRANCISCO					
Typical Plates with Dimensions					
CHECK WITH TRAFFIC TO SEE IF YOU HAVE LATEST REVISION					

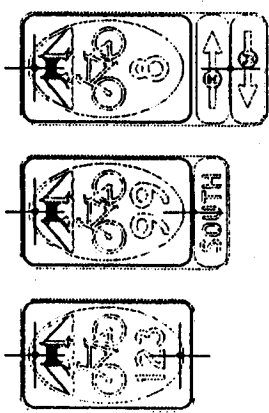
Red Bridge denotes Primary/Crosstown Route
 Green Bridge denotes Secondary/Local Route



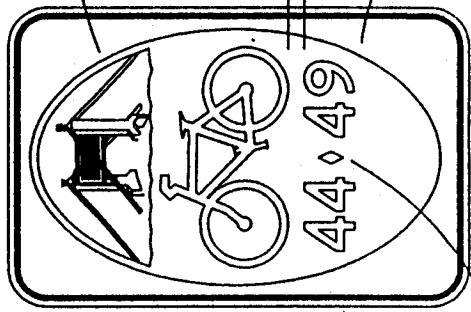
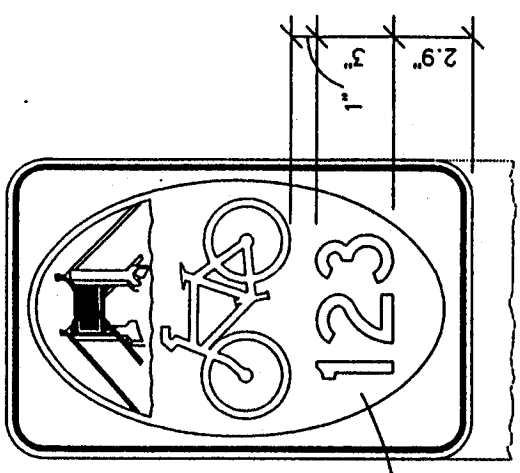
Std. Bike Sym.
 8.75" x 5"
 0.5" Stroke

4" series "D"
 Numbers
 for 1 or 2 digits

See other dwgs for details
 on Destination/Arrow plates

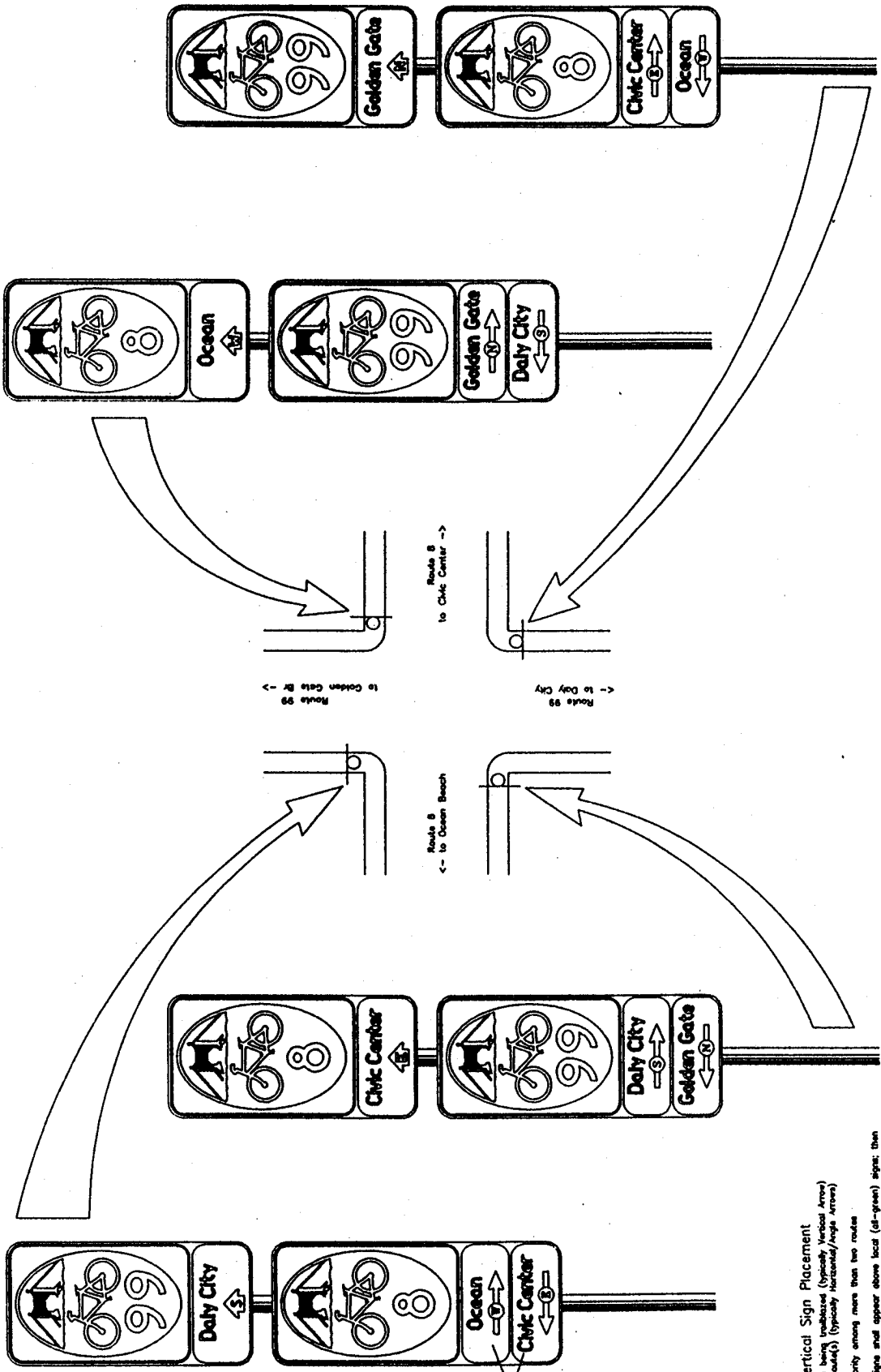


Bolt Holes
 Size shall be 3/8" dia
 Location of Center of Holes:
 Upper Hole: 1.5" from top on C/L
 Lower Hole: on C/L as shown at right



Use Color sign
 if any route
 is a primary.
 Use secondary
 all-green sign
 only if all rtes.
 are local rtes.

APPROVED		DATE	BY	DATE	BY	DATE	BY	DATE	BY	DATE	BY
DESIGNED	CHECKED	DATE	BY	DATE	BY	DATE	BY	DATE	BY	DATE	BY
OWNER	DESIGNER	DATE	BY	DATE	BY	DATE	BY	DATE	BY	DATE	BY
DATE	BY	DATE	BY	DATE	BY	DATE	BY	DATE	BY	DATE	BY
NO.	DATE	DESCRIPTION	BY	DATE	DESCRIPTION	BY	DATE	DESCRIPTION	BY	DATE	DESCRIPTION
CHECK WITH TRACKING TO SEE IF YOU HAVE LATEST REVISION											
DEPARTMENT OF PARKING AND TRAFFIC				SCALE: 1" = 5'				BIKE ROUTE SIGN			
DIVISION OF TRAFFIC ENGINEERING				SHEET OF SHEETS				Dimensions for Basic Sign			
CITY AND COUNTY OF SAN FRANCISCO				OF				FILE NO. 514 7127			
APPROVED				DRAWING NO.				REV NO.			



ARROW PLACEMENT CONVENTION FOR EACH SIGN (from top to bottom):
 1. Vertical Arrows;
 2. Right Arrow;
 3. Left Arrows.

Priority for Vertical Sign Placement
 - TOP: Route(s) being emphasized (typically Vertical Arrow)
 - BOTTOM: Cross-Route(s) (typically Horizontal/Angle Arrows)
 INK: to decide priority among more than two routes
 - Primary (color) signs shall appear above local (all-green) signs; then
 - Lower Numbers shall appear above higher numbers.

DEPARTMENT OF PARKING AND TRAFFIC DIVISION OF TRAFFIC ENGINEERING CITY AND COUNTY OF SAN FRANCISCO		BIKE ROUTE SIGN Typical Installation, Junction Signing	
APPROVED: _____ DATE: _____ CHECKED: _____ DATE: _____	SCALE: X000X SHEET OF: _____ OF: _____	SPECIFICATION NO. DRAWING NO.	FILE NO. 57c 7/37
EXTENSIVE INFORMATION & FILE NO. OF SUBJECTS	DATE: _____ BY: _____	DATE: _____ BY: _____	DATE: _____ BY: _____
CHECK WITH THINGS TO BE DONE IF YOU HAVE LATEST REVISION			