Santa Barbara City College

BIKEWAY SYSTEM

DESIGN STANDARDS

This design standard and maintenance guide was written and designed by Peter R. Hodges, traffic engineer and chief architect of the Santa Barbara City College bikeway system in conjunction with ENERGY CYCLES, the original founders of the Santa Barbara City College bikeway system.

November, 1982
These standards are for the purpose of maintaining existing paths as well as for designing and maintaining future bike paths.

1. LANE WIDTHS*: Each lane of a two-way bike path shall be no less than 3½ feet, nor more than 4 feet in width. A lane up to 8 feet wide may be used around a severe downhill curve for either direction.

2. MARKINGS: All striping and delineation shall conform to the Manual of Uniform Traffic Control Devices.
   a. Colors: Pavement markings shall be WHITE or YELLOW. BLACK (optional) may be used with the above colors only for contrast and appearance.
   b. Use of Colors: YELLOW is used only for centerlines, WHITE for edge-lines, lane lines, transverse markings and hazard markings. BLACK is for contrast with dashed and dotted stripes. BLACK may be used in conjunction with WHITE or YELLOW on all light-colored pavements for dashed centerlines and lane lines. It may also be used to augment messages, arrows, hazard markings, etc., and along the left edge of a solid yellow approach stripe. BLACK may also go along the outer edge of edge-stripes on concrete for contrast. BLACK shall be used to cover a failure to retrace previous markings along dashed and dotted stripes, and fill the gaps between the correct stripes. All black stripes shall be 4" wide, minimum.
   c. Dimensions and Placement of Markings: All longitudinal pavement markings shall be no less than 3", nor more than 4" in width. Transverse markings shall be no less than 6", nor more than 8"

*Minimum lane width shall be four feet per lane on all new construction.
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in width. Centerlines and lane lines shall be dashed on a 1:3 ratio, providing a 3' stripe and a 9' gap painted on a 12' cycle, as used by Caltrans. "Follow-marks" shall be established prior to any striping. A solid centerline shall be painted for 18 to 20 feet before and beyond any crosswalk, intersection, or any post or other hazard directly in the path of travel and along the center on a severe blind curve. Such solid lines indicate not to cross the stripe and to exercise caution at these locations. Crosswalks, stop-bars, and all messages and arrows shall be WHITE. The edge lines delineating the bike path shall be solid WHITE, and shall be painted as shown where a bikeway and walkway share the same pavement, and as needed elsewhere. A white line shall also be painted where a walkway intersects but does not cross a bikeway. At all standard pedestrian crossings and major pedestrian crossings of 16' or more in width (i.e., in front of the Humanities building), the centerline and edgelines of the bikeway shall continue through the crossing as dotted lines, having a one-foot stripe and a three-foot gap painted on a four-foot cycle. At these points the dotted edgeline is on both sides of the bikeway. The dotted edgelines shall be painted at all pedestrian crossings, regardless of whether the bikeway has edge-striping or not.

d. Painted Messages: "PED XING", "¥ XING", "CAR XING", "YIELD", "STOP", "CAUTION", "SLOW", all arrows, etc., shall have letters 24" high and 6" wide. Horizontal members of letters shall be at least triple the thickness as the vertical members when viewed directly. Messages shall be no wider than three feet. They may be accompanied by signs, but these are subject to vandalism; however it is difficult to steal or deface pavement messages. Non-bikeway messages such as "Walk Bikes" and "No Skating", etc. are of optional
design. Braces or struts in stencil cutouts shall be made across (not vertically) on the letters as shown (see diagram p. 5).

e. Roadside Hazard Markings: A solid white edgeline shall be painted at least 10 feet before a curb, parallel grate, wall or pavement width transition, or as needed. Chevron markings shall be used behind the edgeline, if pavement width permits. WHITE shall be used for all such markings. The concrete portion of the main campus bikeway shall have an outer edgeline as well as an inner one, as shown. The entire main campus bikeway should have edgelines on both sides, particularly for night use, but is optional other than the required dotted edgelines for pedestrian crossings, walkway separation, edge-striping, and hazard markings as shown.

f. Class II Bikelanes on Campus Drives (as on West Campus road): One-way bike lanes at each side of a standard width car road shall be no less than five feet in each direction. A solid white line, no less than four inches wide, shall mark these lanes and this line shall be dashed at 96 feet before any car intersection or driveway. Dashes are three feet long with nine foot gaps. (See the diagrams of the striping standards on the following pages.)

g. Paint. Traffic paint shall be used for all striping and marking purposes. Bauer\(^{(r)}\) paint is a top-grade lacquer-base paint used by the City for all striping. Bauer\(^{(r)}\) paint should be used on all concrete pavement. (Santa Barbara Paint Factory traffic paint should not be used on concrete pavement as it does not adhere properly to concrete.) For asphalt, Santa Barbara Paint Factory traffic paint may be used, however Bauer\(^{(r)}\) paint is more durable. If an asphalt bikeway is resurfaced or sealed, all markings shall be repainted before the bikeway is reopened for traffic. Old markings will show through the sealer as "bumps", therefore follow-marks shall be placed to retrace the new stripes exactly over the old ones under the sealer coating.
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h. **Reflectorization:** Glass beads are used to reflectorize all traffic paint except black, at the time of application. The beads are dropped onto the wet stripes or messages as they are being painted. Beading is optional but helpful for night visibility.

3. **SIGNING:** As mentioned previously, signing is avoided because of the possibility of vandalism and pavement messages are clear enough. All signing used shall conform to the Manual of Uniform Traffic Control Devices. Roadside hazard markings may be supplemented by horizontal clearance markers. A horizontal clearance marker is an aluminum sign panel 12" wide and between 24" to 36" high, displaying 4" wide yellow stripes separated by 4" black stripes, all at a 45° angle as shown. The edge of the sign with the stripes pointing down is always nearest the edge of the traveled way, as shown. Scotchlite(r) or other reflective material shall be used for the yellow diagonal stripes on the signs.

![Diagram of sign and markings]

- Low ends of stripes towards the roadway edge.
- 4" white or yellow, and black chevrons at approx. 45° angle.
- Hazard behind or to the right of sign.
- Sign should be mounted on the Hazard if it is a wall or post, etc.
Roadside hazard markings:
- White 6"-8" chevrons spaced @ 2' O.C.

4" Dashed yellow centerlines 3'stripe+9'gap.

Yellow 3'stripes →

9'gap →

3'-4' wide all stripes.

4" Solid white inner edgeline.

← 8' walkway →

Standard 8-foot Bikeway, marked on existing pavements 16 feet wide or more, or on separate 8-foot pavement.

Outer edgelines also painted whenever bikeway crosses any large paved area, such as the Library Plaza, or a parking lot.

At the Library Plaza, the outer edgeline is painted beside the inlet brick trim. (East Campus Bikeway)

← 5' walkway → (7' on 14' pavement)

Minimum width 7-foot Bikeway, marked on pavements between 12 feet and 14 feet in width. Where pedestrian traffic is light, Bikeway should be 8 feet on a 14-foot pavement.

Stencil struts or braces shall run across these letters. STANDARD DESIGN FORMAT FOR ALL STENCILS.

All horizontal members of letters at least triple the width of vertical members.
Bikeway is delineated through all pedestrian crossings by these dotted lines. Do not use chevron markings. These markings shown here tell pedestrians where to cross as well as define the travelway and guide bicyclists across the pedestrian zone in their lanes. Chevrons are harder to paint and a waste of paint. Use chevrons only as shown elsewhere for hazard markings.

MAJOR PEDESTRIAN CROSSING: Centerline and edgeline contined as dotted lines through the crossing. Dotted lines shall be painted at all crossings regardless of whether or not the bikeway has edgeline stripes.

If a walkway intersects and ends (does not cross) at a bikeway, a solid white line and "Caution - Bikeway" shall be placed at such an intersection. This is not a ped-crossing.

STANDARD PEDESTRIAN CROSSING: Marked at least as wide as adjoining walkway. Centerline and edgeline continued as dotted lines through the crossing. Dotted lines shall be painted at all crossings, regardless of whether the bikeway has edgeline-stripes or not.
STRIPING A SEVERE DOWNHILL CURVE:

Only on pavements 16' wide or more, as on the fire road down to Pershing Park.

At the hairpin curve above Pershing Park, a solid centerline shall be striped; this is a hazardous spot. Otherwise, a dashed line only, shall be painted. Also at this point is a major roadside hazard, the drain and exposed curbing combined with a width transition. Appropriate hazard markings must be used here.
STRIPPING AT A VEHICLE BARRIER ON A STANDARD 8' BIKEWAY (OR A 7' MINIMUM BIKEWAY):

A solid 4' yellow centerline shall be painted at least 20' before a barrier post as shown. The centerline shall extend beyond the post and end at the adjacent 20' stripe in the opposite direction as shown. Solid 4' white edgelines shall be painted as shown. The measurements do not include the width or thickness of the barrier posts. Six inch to 8" white diagonal chevrons shall be used with such approach markings.

The stripes shall form a tapered island, as shown:

Bicycle-Pedestrian crossings on Main Campus bikeway at southeast end of Humanities building. Exact placement of stripes and ideal placement of stencils:

Scale: $\frac{1}{8}'' = $ approx. 1'

- Bike Parking Area
- Humanities Bldg.
EXACT PLACEMENT OF STRIPES AT POSTS ON BIKEWAY BEHIND LOWER END OF HUMANITIES BUILDING:

Proper channelization of bicycle traffic around posts. Space between outside post and outer curb not wide enough for standard lane so it is marked as an auxiliary lane as shown.

CLEARANCE MARKERS: Posts seen from uphill side, looking down.

CLEARANCE MARKERS: Posts seen from downhill side, looking up.

Solid yellow 4" stripes forming center island around post.
Eight inch white chevrons in island.

Solid white 4" stripes form island around outer post.

One foot stripe and 3 foot gap.
Dotted white stripe.

Three foot stripe and 9' gap, dash centerline.
BICYCLE-PEDESTRIAN CROSSINGS AT WEST CAMPUS "Y"
EXACT PLACEMENT OF STRIPES

Bikeway shifts to south side of walkway due to proposed bikeway extension east of bridge. This minimizes bicycle-pedestrian conflicts at both ends of bridge.

Not to scale.
CLASS I BIKEWAYS

Reflective (not raised) Pavement Markers

Reflective pavement markers (RPM's) may be used in conjunction with center and lane lines for night visibility and as guidemarks for restriping worn off centerlines. "Scotchlite\(^{(r)}\) or similar reflective material shall be used and is applied with contact cement. The material is available in rolls from the City Traffic Department sign shop, or from the 3M Corporation. On centerlines, yellow 3" to 4" square RPM's are applied at 12' intervals, or one between each dash of the centerline. At the 18' to 20' solid approach stripes, four or five RPM's are placed 5' or 6' apart o.c. to the right of the stripe approaching the crosswalks or junctions.

At the pedestrian crossings **yellow** RPM's are applied at 4' intervals o.c., or one between each short dash of the centerline of the crossing. On major pedestrian crossings 16' or more in width, the RPM's may be placed 8' apart o.c., or between every other short dash.

**White** 3" to 4" square RPM's are applied to the dotted edgelines of the crosswalk at 4' or 8' intervals on centers also. White RPM's may be placed at 12' intervals o.c. along the inside edge of a solid white edgeline elsewhere. White RPM's should be placed 12' apart along a dashed laneline.

On asphalt pavements RPM's must be protected with tape or similar material during a fog-sealing or jet-sealing operation. RPM's are practical on any type of pavement and are already in place along the centerline on the concrete portion of the main campus bikeway. (See diagrams on p. 12.) These Scotchlite\(^{(r)}\) RPM's have proven to be permanent under all types of local weather conditions. Removal of one RPM recently with a steel paint scraper caused considerable scoring of the concrete pavement under the Scotchlite\(^{(r)}\) marker.
REFLECTIVE PAVEMENT MARKERS (3" - 4" WIDE)

PLACEMENT OF RPM's

All measurements taken on centers.

Yellow RPM's 12' apart on centers along centerlines.

White RPM's 12' apart on centers along edgeline.

Four or five yellow RPM's at right edge of approach stripe at 5' or 6' intervals O.C.

RPM's at 4' intervals O.C. on standard pedestrian crossing. At pedestrian crossings greater than 16' wide, RPM's may be placed at 8' intervals.

USE OF SCOTCHLITE(r) MATERIAL IN LIEU OF PAINT -- CENTERLINES AND LANE LINES

Scotchlite(r) material may be used in lieu of striping paint for dashed centerlines and lanelines on concrete pavement sections where paint has poor adhesion, as on the stretch of bikeway directly in front of the library. On bikeways with existing paint, new dashes cut from Scotchlite(r) or similar material shall be placed between the old painted dashes(r) as shown below. The strips of material shall be 4" wide and 3' long, placed 9' apart. Short scraps of Scotchlite(r) material may be placed end-to-end to form a 3' dash to save material.

New reflective tape dash - 3' long strip of Scotchlite(r)

Old painted dash

3' feet

9 feet
USE OF SCOTCHLITE\textsuperscript{(r)} MATERIAL IN LIEU OF PAINT: CROSSWALK LINES

Short pedestrian crossing dashes (dotted stripes) may be marked with 1' long Scotchlite\textsuperscript{(r)} strips 3' apart as shown.

Where old paint is present, the Scotchlite\textsuperscript{(r)} dashes shall be placed between the old painted dashes as shown.

The solid approach stripes may be marked (as shown above) with Scotchlite\textsuperscript{(r)} material, if no old paint is present and the same for the transverse crosswalk bars.

Square RPM's like those shown at the top of the preceding page were applied on an experimental basis in place of painted dashes on the stretch of bikeway in front of the Library plaza, in the manner shown thus:

However, visual contrast was poor on the concrete pavement. Scotchlite\textsuperscript{(r)} material shall not be used in this manner on concrete bikeway pavements! Complete dashes of Scotchlite\textsuperscript{(r)} material shall be used as shown at the bottom of the preceding page \textsuperscript{(r)} and the top of this page.
One-way lanes for access to and from a Bikeway:

"On" and "off" lanes shall be no less than 5', nor more than 6' in width. All such lanes shall have a solid yellow stripe along the left edge and the appropriate arrows. A dotted stripe as shown shall separate the egress lane from the main travel way as shown. Gore stripes must be 6" wide. For on-lanes, a standard lane line with 3' stripes and 9' gaps shall be painted from the entrance nose to the edge of the main travelway as shown.

These one-way lanes are very useful in channelizing bicycle traffic between intersecting bikeways and joining a bikeway with a large bike parking area.
BIKEWAYS WITH MORE THAN TWO LANES FOR HIGHER VOLUMES OF BICYCLE TRAFFIC

THREE LANE BIKEWAY WITH REVERSIBLE USE CENTER LANE, "BAILOUT" LANE, OR TWO-WAY LEFT TURN LANE

TWO DASHED YELLOW CENTERLINES SHALL BE USED HERE; 3' STRIPES AND 9' GAPS

MEDIAN STRIPS ON BIKEWAYS

A divided bikeway may be necessary with the use of turn lanes and high-use. A median is a strip between opposing lanes of traffic, either unpaved or with a raised curb or other such barrier. An island is a flush-paved median 1' or more in width marked only by paint, and is traversable (no barriers.) All medians and islands shall be marked with a solid 4" yellow stripe on each side of such dividers.

White 8" chevrons may be used in painted islands if desired. Distinct openings or left-turn lanes shall be provided in such painted medians. Otherwise the painted area is to represent a solid barrier, not to be crossed except at clearly marked openings.

Solid centerline used at all pavement width transitions for extra lane or lanes.

1/16" = 1'

4"-6" solid white stripe at least 3/4 total length of left turn bay.

1/16" = 1'

Pedestrian crossings shall be delineated the same as on a two-lane bikeway.

Pedestrian crossing on a 3-lane bikeway.
BIKEWAYS WITH MORE THAN TWO LANES
FOR HIGHER VOLUMES OF BICYCLE TRAFFIC

A three-lane bikeway is justified on a hill with high volumes of bicycle traffic if the extra lane is needed as passing or "bailout" lane because of slower bicyclists or because bicycle traffic is greater in one direction regularly. Pedestrian crossings shall be treated as shown for a 2-lane bikeway.

A four-lane bikeway is an extreme as of now. If one is ever considered, design is the same as for a standard or minimum width bikeway, except that it is 16' or 14' minimum width. A solid 4" yellow centerline shall be used as on a three-lane and white lane lines are dashed with 3' stripes and 9' gaps.

Pedestrian crossings shall be treated the same as on a two-lane bikeway: edgelines, lane lines and centerlines are continued as dotted lines with 1' stripes and 3' gaps through the crossings.

A divided bikeway with a median of any type between opposing lanes shall have a solid yellow stripe painted along the inner edge of each pavement beside such a divider. Where no physical barrier or grass strip exists, a traversible median 1' or more in width shall be marked with a solid yellow line on each side of the area to represent a solid median, not to be ridden on or crossed. Distinct openings or left-turn lanes shall be provided in such painted medians as are provided in physical medians.

Lane line:
Separates two or more lanes in the same direction; 3' white dash and 9' gap.

Ped crossing on a 4-lane bikeway

Standard 7' or 8' two-lane bikeway

Begin solid centerline at pavement width transition for extra lane/lanes.
CLASS II BIKEWAYS

BIKE LANES MARKED ON CAMPUS ROADWAY (as on West Campus)

All striping is white and solid except within 96' on the approach to any intersection or driveway where the bike lane stripe is dashed as shown. The solid line shall end within 96' of the junction; or if there are driveways closely spaced, dashed lines shall be used as indicated.

Bikelane approaches all car crossings with dashed lines.

(Required) dashed line -- 3' stripe with 9' gap, starts at 96' before any intersection.

Dashed lines shall be used between driveways 96' or less apart.

IMPORTANT: Appropriate stencils must be used here. Bicycle crossing at automobile road.
CLASS I BIKEWAYS

Improved striping equipment may permit painting of double yellow center-stripes. If double stripes are ever considered for use on a bikeway to indicate a no-passing zone, they shall be used where single yellow solid lines are currently used to mark a severe blind curve, the center of a multi-lane bikeway, and approaching hazards like posts at the center of the bikeway, any width-transition, and painted islands as shown. Double yellow stripes are currently ineffective and a waste of paint but the format is here if their use is ever considered or justified. Black is required in the 3" to 4" space between all the double stripes shown here for contrast and neatness; this black stripe shall be solid and continuous, never dashed.

Blind hill or Curve

Black in 3"-4" space

Three-lane bikeway

Width transition

Black in space

Four-lane bikeway

Barrier posts

Black in space

Left-turn islands and any median without a physical barrier.

Two way left turn lane

Reflective pavement markers, where used, shall be placed 12' apart on center for all the dashed yellow and dashed white stripes, and 6' apart along the outer edges of all the solid yellow and solid white stripes (shown by the dots in drawings above.)
CONCRETE PAVEMENT CONSTRUCTION

LONGITUDINAL JOINT

All new construction shall be no less than 8' wide for a two-lane bikeway. All concrete bikeway pavements 8' or more in width shall be constructed with a longitudinal (weakened plane) contraction joint, along the center and between each lane. The longitudinal joint (or joints) is always between the lanes on any width concrete pavement, as shown.

The longitudinal joint helps prevent unsightly lengthwise cracks and provides a permanent centerline along which to paint the dashed center-stripe or lane lines of the bikeway. Ideally, all such dummy-joints in concrete pavements should be given a bituminous filler at the time of construction.

\[ \frac{1}{8} \approx 1' \]

Transverse joints not less than 5' apart. Longitudinal joint between lanes of any concrete pavement 8' or more in width.

Spacing of transverse joints shall not exceed 8' due to inherent possibility of random cracking. Fiberboard-filled expansion joints should be placed at certain intervals in addition, or as ordered by the builder.

STANDARD TWO-LANE 8' BIKEWAY

Four 4' lanes

Concrete pavement for three or more lanes.