

GOLDEN GATE BRIDGE

**SUICIDE PREVENTION STUDY (PHASE I)
REPORT ON THE CONCEPT**

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PHASE I JANUARY 1971

GOLDEN GATE BRIDGE TRANSPORTATION AND HIGHWAY DISTRICT, SAN FRANCISCO, CALIFORNIA

ANSHIEN & ALLEN

ALLEN · PARKER · RICHARDSON · STROTZ · ARCHITECTS

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April 7, 1971

The Board of Directors
Golden Gate Highway &
Transportation District
Box 9000
San Francisco, California 94129

Subject: Suicide Prevention Study
Phase I

Gentlemen:

In accordance with your letter of November 19, 1970, we submit our report on the concept for a physical suicide barrier for the Golden Gate Bridge.

It is our opinion that by your choice of any of the Proposals 11, 16 or 17, depending on your policy decisions, such as suicide prevention versus apprehension, we can develop a satisfactory and aesthetically pleasing solution in keeping with the graceful concept and beauty of the existing bridge.

We would like to express our appreciation to Mr. D. W. Luehring, General Manager, for the assistance we received from Mr. R. Shields and his staff.

We thank you for giving us the opportunity to prepare this report and hope your favorable decision will enable us to proceed with the proposed further phases of the study.

Very truly yours,

ANSHEN & ALLEN



August K. Strotz, AIA

AKS:cc

SUICIDE PREVENTION STUDY

Report on the Concept (Phase I)

Since 1950 the Golden Gate Bridge, Highway and Transportation District has concerned itself with the prevention of suicides occurring from the bridge.

The statistics show a considerable increase in suicide reports in 1970:

	Suicides:	Possible:	Attempts:	Total Reports:
1969	8	6	85	99
1970	15	26	97	138

- A. More than half were pedestrians.
- B. In 1970, all but two jumped from the east side of the Bridge.
- C. Most jumped from mid-span.
- D. Most occurred on clear days and during daylight hours.
- E. Most were males, which is a significant change since 1968 in the ratio of males to females.

The District's personnel are taking about every action possible to prevent suicides.

- A Roving Patrol operates twenty-four hours each day.

Closed circuit television is constantly surveying the Bridge deck. Low light level television cameras are under consideration.

Bridge personnel have been specially trained and are constantly on the alert to detect possible suicides.

To positively prevent any future suicides the Board decided to engage Anshen & Allen to design a physical barrier which is effective, pleasing in appearance, economically and structurally feasible and acceptable to the District and the public.

SCOPE AND ASSIGNMENT:

Anshen & Allen proposed five work phases:

- I. Conceptual Phase:
Review of past suggestions and investigations and presentation of a number of more promising ideas.
- II. Feasibility Phase:
Ideas selected by the Board are to be studied further for their feasibility and presented with recommendations leading to a final selection by the Board.
- III. Design Development Phase:
Develop final scheme for testing, estimates, models and mock-up.
- IV. Construction Document Phase:
Prepare Drawings and Specifications for bidding and construction.
- V. Construction Phase:
General Administration of Construction Contract.

On October 30, 1970 by Resolution #7140 the Board of Directors instructed Anshen & Allen to proceed with Phase I, Conceptual Phase, only, presented in this report.

CONCEPTUAL PHASE:

A. EXISTING CONDITIONS:

1. The Bridge has a southern approach of 1268 feet; a northern approach of 1432 feet; two side spans each of 1125 feet; and a center span of 4200 feet.
2. From the San Francisco abutment to the Marin County Bridge anchorage is a total of approximately 15,100 lineal feet of metal railing and an additional 3,200 lineal feet of concrete railing.
3. For Bridge maintenance there are four traveling scaffolds, one each at the sidespans and one each for half of the centerspan. These scaffolds are suspended from the top cord as well as from the bottom lateral truss system.
4. It is estimated that the present structural design of the Bridge centerspan will allow an increase of 144 pounds per lineal foot of bridge without impairing the safety of the structure. The existing Railings weigh 81 pounds per lineal foot for a total of 518 tons on the suspended structure.
5. Statistics show that since the Bridge was dedicated no vehicle has jumped the roadway rail onto the sidewalk hitting the rail. Therefore the new rail is not designed to withstand the impact of a truck.
6. A unique feature of this Bridge is that pedestrians and cyclists are allowed on the sidewalk.

B. SUGGESTED BARRIERS CONSIDERED:

Over the course of the years many suggestions were received from the general public, professionals, bridge personnel and interested parties. While the various ideas ranged from "do nothing" to "Close the bridge for pedestrians", it was felt that all well-meant proposals should be reviewed and evaluated.

THE FOLLOWING IS A SUMMARY OF SUGGESTED BARRIERS:

1. Barbed wire fence, 9 feet high.
2. Square mesh safety net fence above rail.
3. U-shaped spikes, 18 inches high on top of rail.
4. Rail bent outward to form 1/4 circle.
5. Nylon safety net on either side.
6. Plexiglas screen on top of rail.
7. Redesigned Rail 7 feet high with Plexiglas balusters.
8. Horizontal Tension cables.
9. Low voltage electric fence.
10. Laser beam.
11. Wrought iron fence, curved spikes top.
12. Chain link fence, bent top.
13. Horizontal fence, 8 feet out, collapsible net.
14. Rotating horizontal cylinder on top of rail.
15. Re-designed handrail - top rail widening.
16. Vertical tension Rods.
17. Lowered sidewalk with tension-rod rail.
18. Aluminum side guards with net.

C. ELIMINATION CRITERIA:

Any design for a suicide barrier must recognize the present safety standards and any proposal in violation of the following criteria was eliminated:

1. Safety or nuisance hazards to pedestrian or bridge personnel.
2. Total ineffectiveness as a barrier.
3. Barring pedestrian traffic.
4. Weight beyond established allowable limits (144 lbs. per lineal foot).
5. Excessive maintenance problems.
6. Aerodynamics beyond established allowable limits.
 - a. Lateral forces, static
 - b. Dynamic forces

PROPOSALS ELIMINATED ON BASIS OF ABOVE CRITERIA:

- Proposal 1. Barbed wire fence, 9 feet high:
Would present a safety hazard to pedestrians and bridge personnel. Nuisance law suits could be brought against District for injury and torn clothing.
- Proposal 2. Square mesh safety net fence above rail:
Ineffective because of horizontal members acting as a ladder. Could easily be cut with wire cutters thus creating a maintenance nuisance.
- Proposal 3. U-shaped spikes, 18 inches high on top of rail:
Ineffective, can be climbed over, spikes act as handles. Interfere with pedestrians leaning on rail, creates torn clothing.

- Proposal 4. Rail bent outward to form 1/4 circle:
Ineffective, can be climbed over. Hazardous to pedestrians because it would create a feeling of insecurity.
- Proposal 5. Nylon safety net on either side:
A better variation can be found in a developed scheme. Further, the nets would interfere with the maintenance scaffolding and would be difficult to install and replace. Ineffective because a jumper caught in the net can climb over the edge. It would also be difficult for the bridge personnel to rescue someone unwilling to cooperate in a rescue attempt.
- Proposal 6. Plexiglas screen on top of rail:
Would be obscure in a short period of time, caused by salt air, bridge maintenance paint spray, sand blasting and scratches by cleaning. If on top of existing rail it would have to be extremely high. If replacing existing rail it would most probably exceed the aerodynamic allowed limits for lateral forces.
- Proposal 7. Redesigned rail 7 feet high with plexiglas balusters:
A better variation can be found in a developed scheme; further, most comments on item 6 apply.
- Proposal 8. Horizontal tension cables:
Ineffective because cables act as a ladder and therefore can easily be climbed on.
- Proposal 9. Low voltage electric fence:
Hazardous to safety of pedestrians and bridge personnel. Depending on the atmospheric conditions, people could be electrocuted. Nuisance hazard if used for vandalism.
- Proposal 10. Laser beam:
 - a. with low voltage would only act as a detection device and is ineffective as a physical barrier or deterrent.
 - b. with high voltage can cause severe burns, possibly fatal, to pedestrians and personnel. Ineffective as a deterrent.

FOR THE EVALUATION OF THE REMAINING EIGHT DESIGN SUGGESTIONS A 10 FACTOR RATING SYSTEM WAS ESTABLISHED

- A. Each of the factors was weighed to its importance in relation to the designed end result, thus arriving at a grading of Value "V" with maximum importance value 5, minor importance value 1.
- B. Each proposal was rated "r" on each factor at a rate of:
- "Up to +5 : If the proposal is an improvement over the present condition.
 "0" : If the proposal had no change or effect compared with the existing condition.
 "Down to -5": If the proposal indicated a decline or worsening condition relative to the present.
- C. The "score" in each of ten factors was the result of multiplying the value with the rate and adding the total score for each proposal, as shown on the following table:

COMPOSITE AVERAGE OF SCORES:

FACTORS:

PROPOSALS:

V = Value is based on scoring 1 to 5
 r = rate is based on scoring -5 to +5
 s = score, product of value times rate.

	V	11		12		13		14		15		16		17		18	
		r.	s.	r.	s.	r.	s.	r.	s.	r.	s.	r.	s.	r.	s.	r.	s.
1. Effectiveness of suicide prevention	5	5	25	5	25	4	20	1	5	1	5	5	25	5	25	4	20
2. Suicide Apprehension	5	-2	-10	-2	-10	2	10	1	5	1	5	-1	-5	-1	-5	4	20
3. Aesthetics/Appearance on bridge to Pedestrian and Motorists, and off bridge silhouette	5	-1	-5	-3	-15	-3	-15	-2	-10	-3	-15	1	5	2	10	1	5
4. Aerodynamics	5	1	5	1	5	-1	-5	-1	-5	-1	-5	1	5	2	10	0	0
5. Practicality for bridge maintenance and resulting cost	4	0	0	0	0	-2	-8	-2	-8	-2	-8	0	0	0	0	-1	-4
6. Impediment to viewing for Pedestrians and Motorists	4	1	4	-1	-4	-2	-8	-3	-12	-4	-16	2	8	3	12	0	0
7. Weight Factor	3	2	6	2	6	-1	-3	-12	-3	-1	-3	2	6	3	9	-3	-9
8. Capital Outlay	3	-2	-6	-2	-6	-1	-3	-1	-3	-1	-3	-2	-6	-3	-9	-4	-12
9. Vandalism	2	1	2	2	4	-3	-6	-2	-4	-1	-2	1	2	1	2	0	0
10. Maintenance Cost of barrier	1	2	2	2	2	-3	-3	-2	-2	-1	-1	1	1	1	1	-2	-2
TOTAL SCORE			23		7		-21		-37		-43		41		55		18
Relative Rating of the eight proposals:			3rd		5th		6th		7th		8th		2nd		1st		4th

-2
Fence

-2
Fence

2
net

1
roller rail

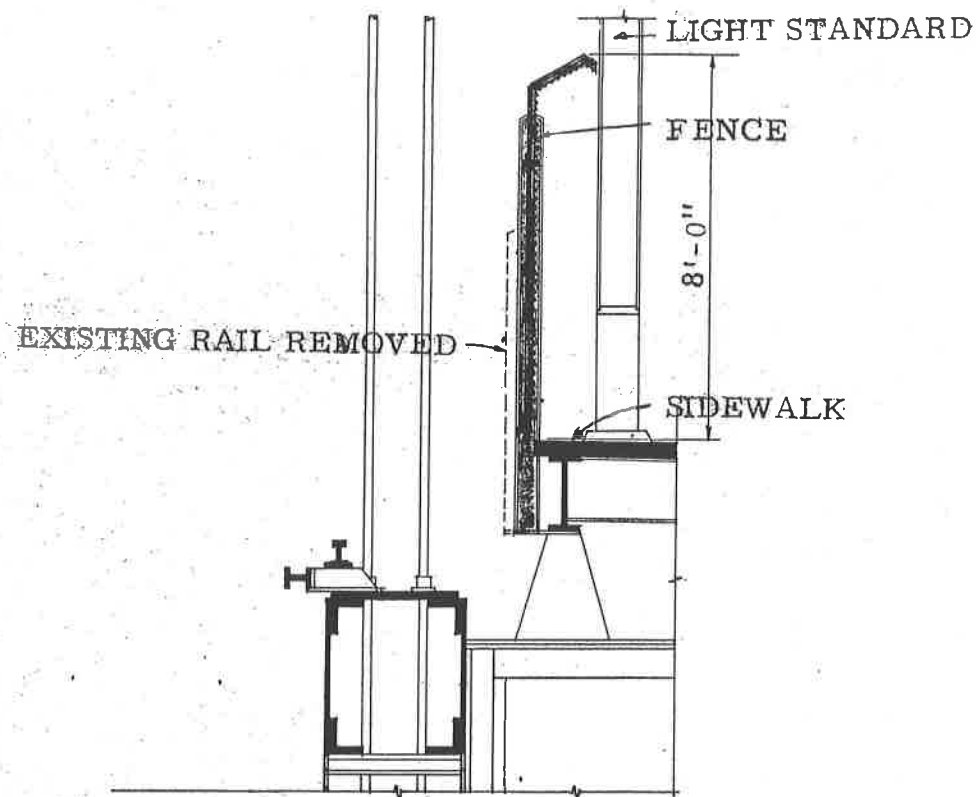
1
mask rail

-1
Hi rail

-1
Hi rail

4
barney

PROPOSAL **12**



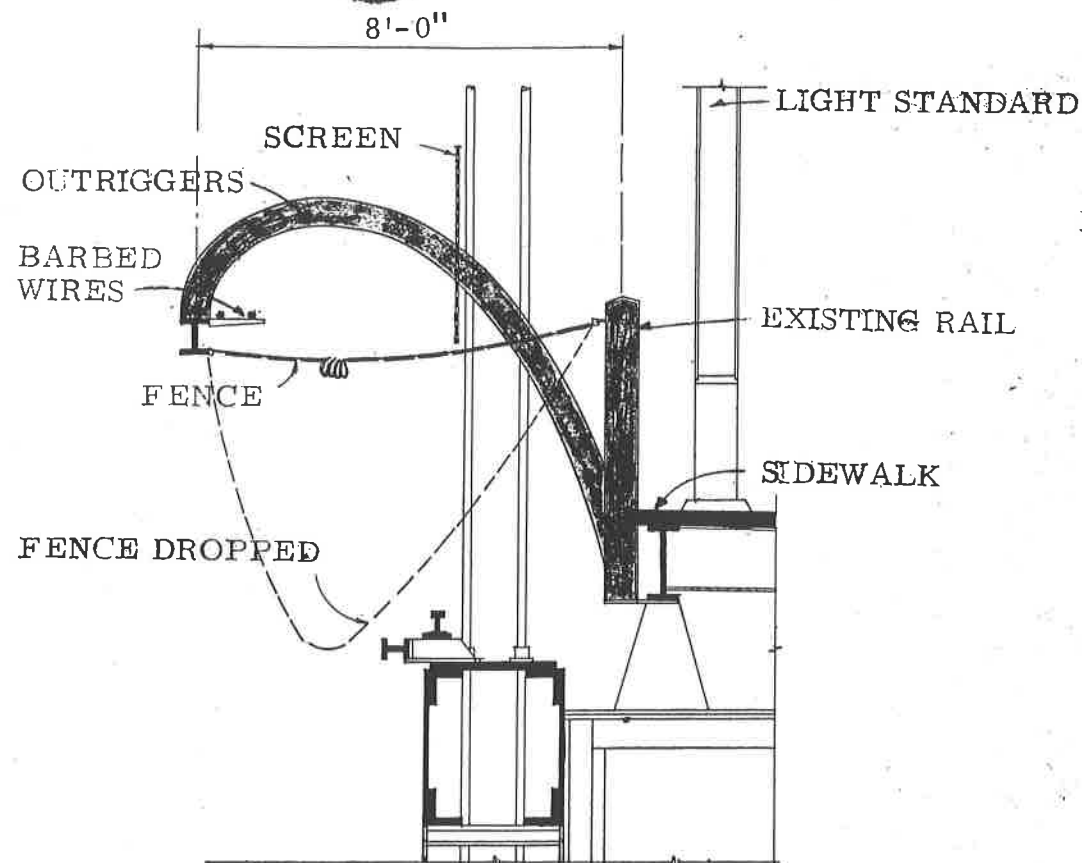
DESIGN:

Existing Rail is to be replaced with a chain link fence with bent top over sidewalk to prevent climbing. Stanchions are approximately 12 feet on centers with intermediate supports 4 feet apart; top, intermediate and bottom rails designed to carry fencing. Fencing could be vinyl coated or periodically roller-painted.

EVALUATION:

Although this scheme is excellent in preventing suicides, it reduces the possibility of apprehension of "would-be-suicides" through the obvious difficulty surmounting it. Aesthetically a wire mesh fence is incompatible with the basic architecture of the bridge and is no more effective than other alternatives. Vistas through the wire mesh fence would be slightly improved for the motorist but the pedestrians' view would be greatly impaired.

PROPOSAL **13**



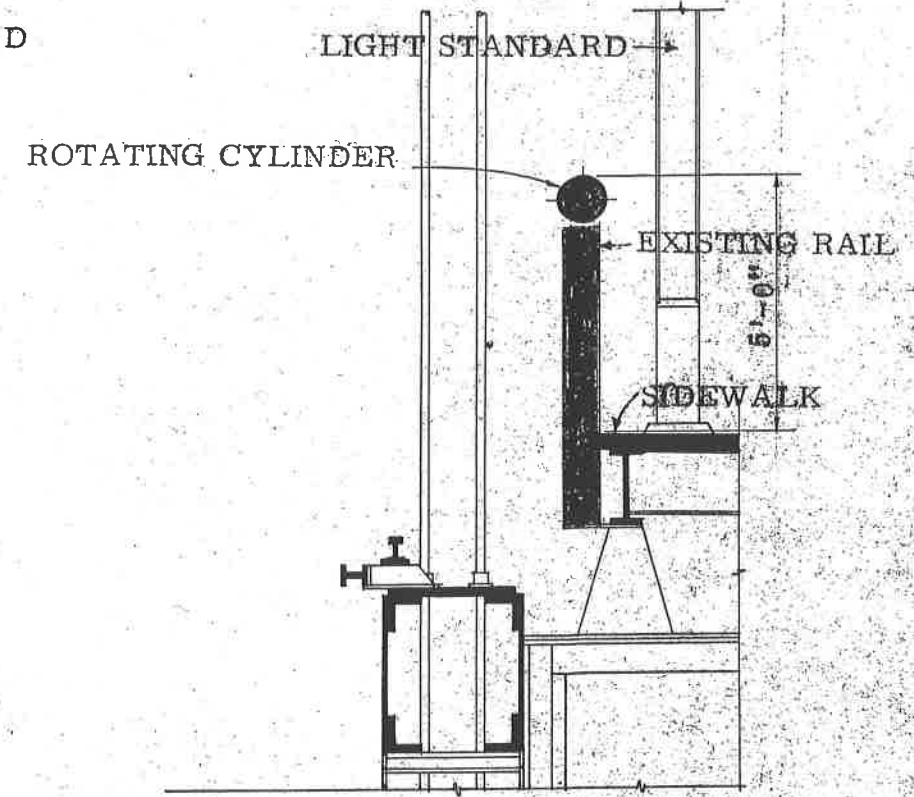
DESIGN:

Steel outriggers with an end rail to support a polypropelene net or fence. This fence is held with safety clasps which will release the stretched net when subjected to a weight in excess of 100 lbs. Thus the net will drop trapping a person. Barbed wire strands as well as wire mesh screens or grills at outriggers and suspension cables would prevent climbing the barrier.

EVALUATION:

This proposal, although ingenious, allows a person to slip through the net at the suspension cables or possibly climbing the outriggers over the screens. It does not present a positive measure to prevent suicides. The pedestrians' view would be greatly destroyed through the multitude of the various barriers such as net fence, outriggers with barbed wires and screens.

PROPOSAL **14**

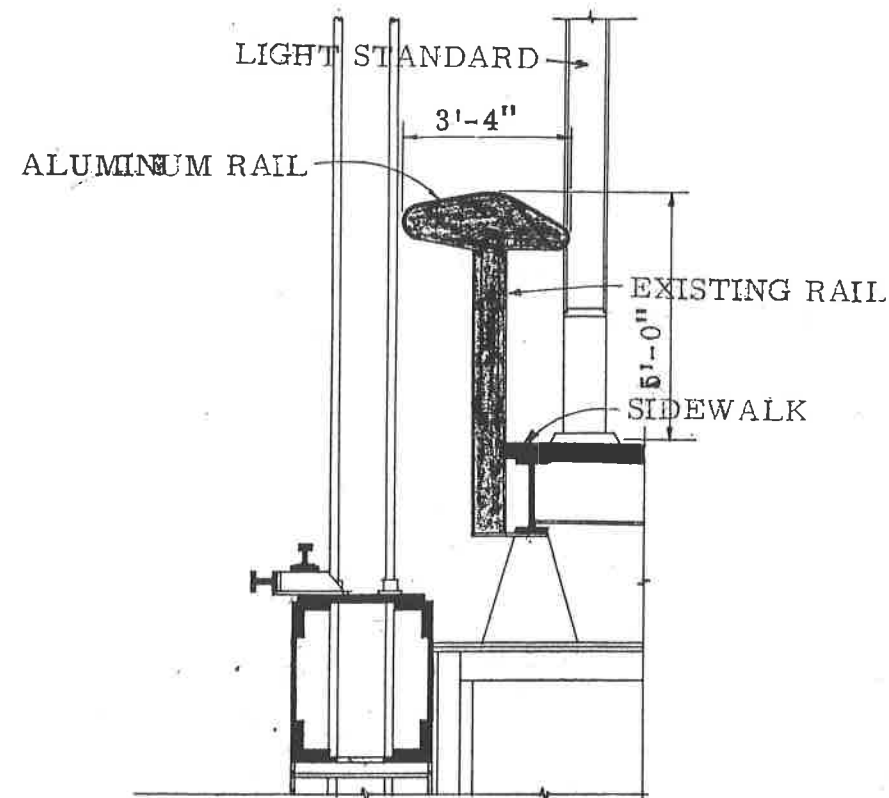


DESIGN:

Rotating cylinder on top of existing rail to prevent climbing of the rail.

EVALUATION:

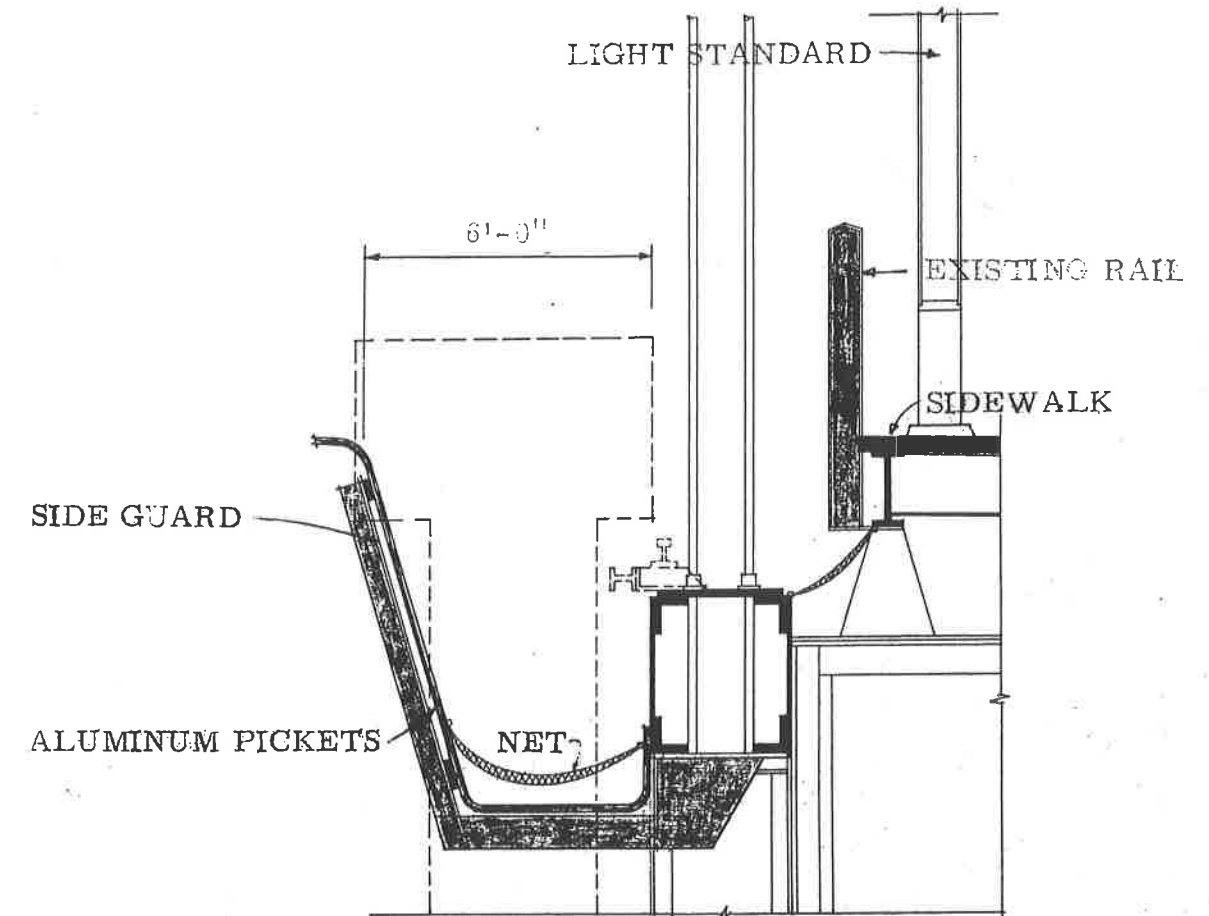
Rail can easily be jumped by many people or scaled by holding onto light standard or suspension cables, thus making the barrier ineffective. The cylinders will present a solid appearance for motorists and pedestrians, obscuring the view from the bridge for smaller persons. The rollers present an inviting object for vandalism by scratching the rotating cylinders and are hazardous for the unsuspecting to pinch or catch a finger between moving rollers.

DESIGN:

Top rail of existing balustrade is raised to 5 feet above sidewalk and widened with a formed steel plate to prevent persons from climbing it. A smooth top surface will prevent anyone from obtaining a hand or foot hold.

EVALUATION:

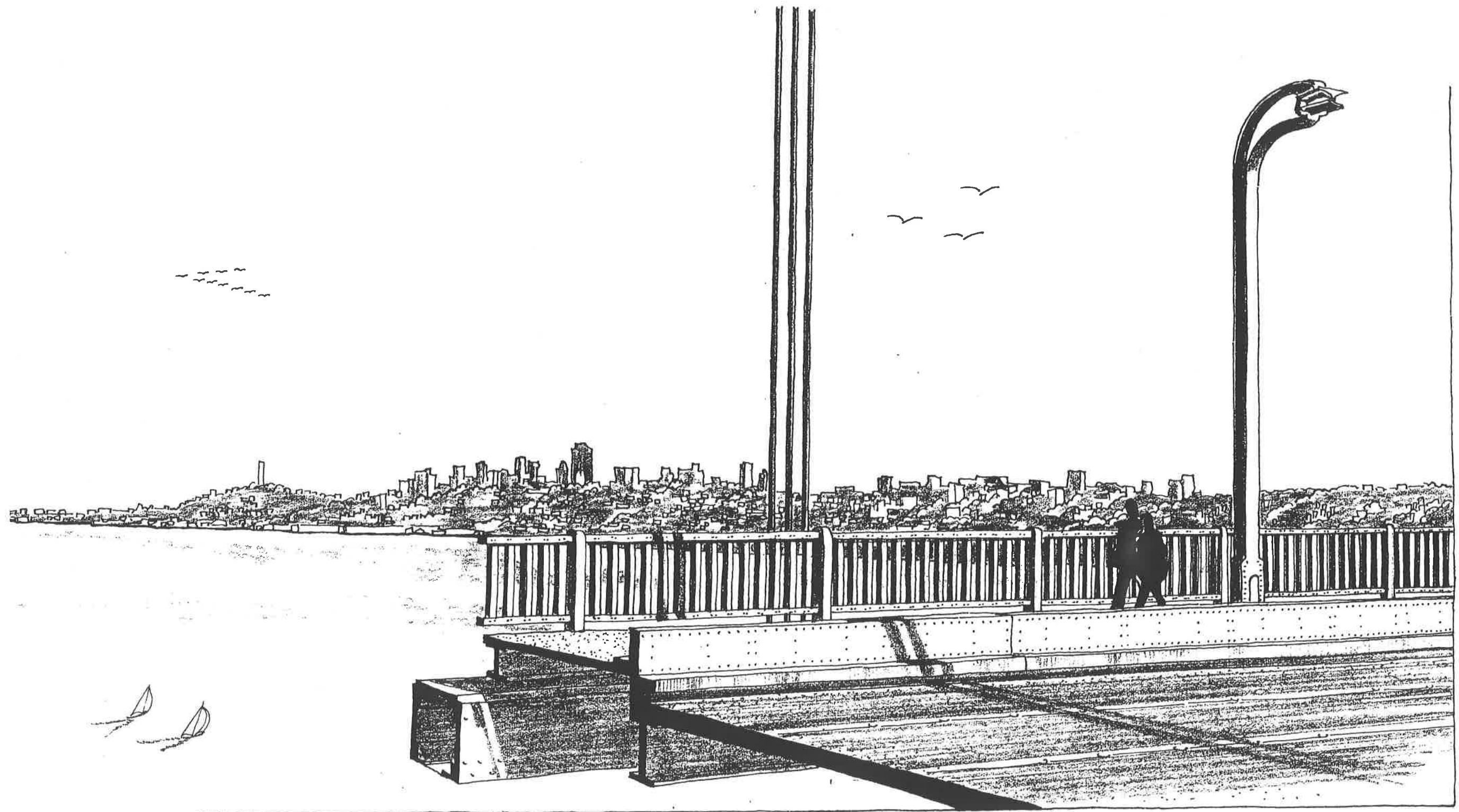
Ineffective because light standard or suspension cables can be used as an aid for climbing. Furthermore would this wide top rail impair greatly the pedestrians' view down to the water.

DESIGN:

Along both top cords a "basket" type metal side guard is constructed wide enough to positively prevent persons from jumping across it into the water. The sides of the basket are of similar construction as a picket fence. To break the fall of a jumper a polypropylene net is strung across the bottom of the "basket". Trap doors in the bottom will afford access to the maintenance scaffolding. The scaffoldings are reduced in height and supported from the bottom cord; with a lateral support near the top of the scaffold.

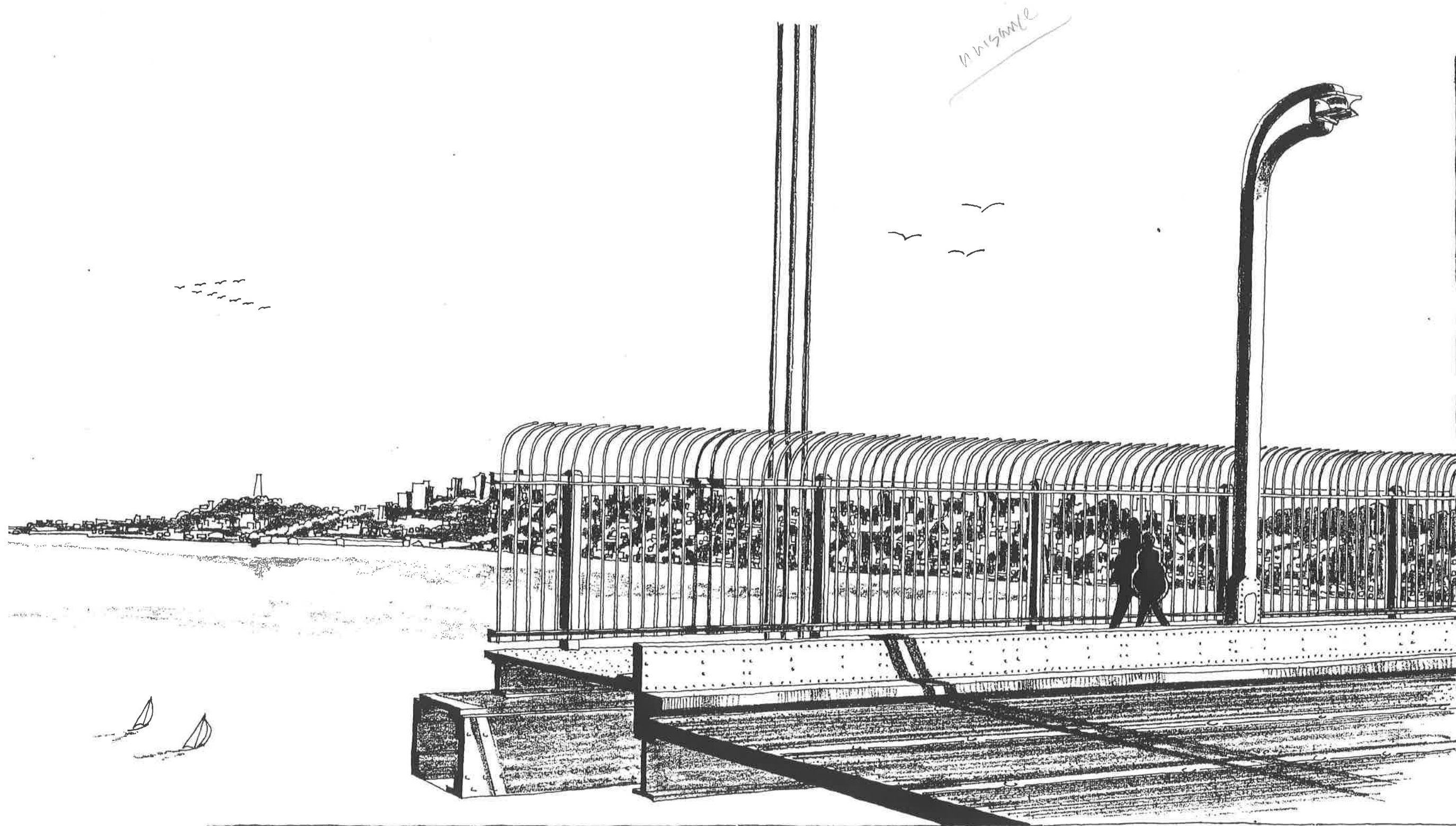
EVALUATION:

Prevention and apprehension are positive through the fact that the barrier is not immediately visible. The bridge silhouette is maintained by the side-guard blending in with the top cord of the bridge truss. Appearance for pedestrians is satisfactory and view is only impaired to a minor degree. Motorist view is unchanged. As opposed to proposals 16 and 17 this design adds rather than reduces weight and maybe the most costly of the four most highly rated proposals.



EXISTING BRIDGERAIL

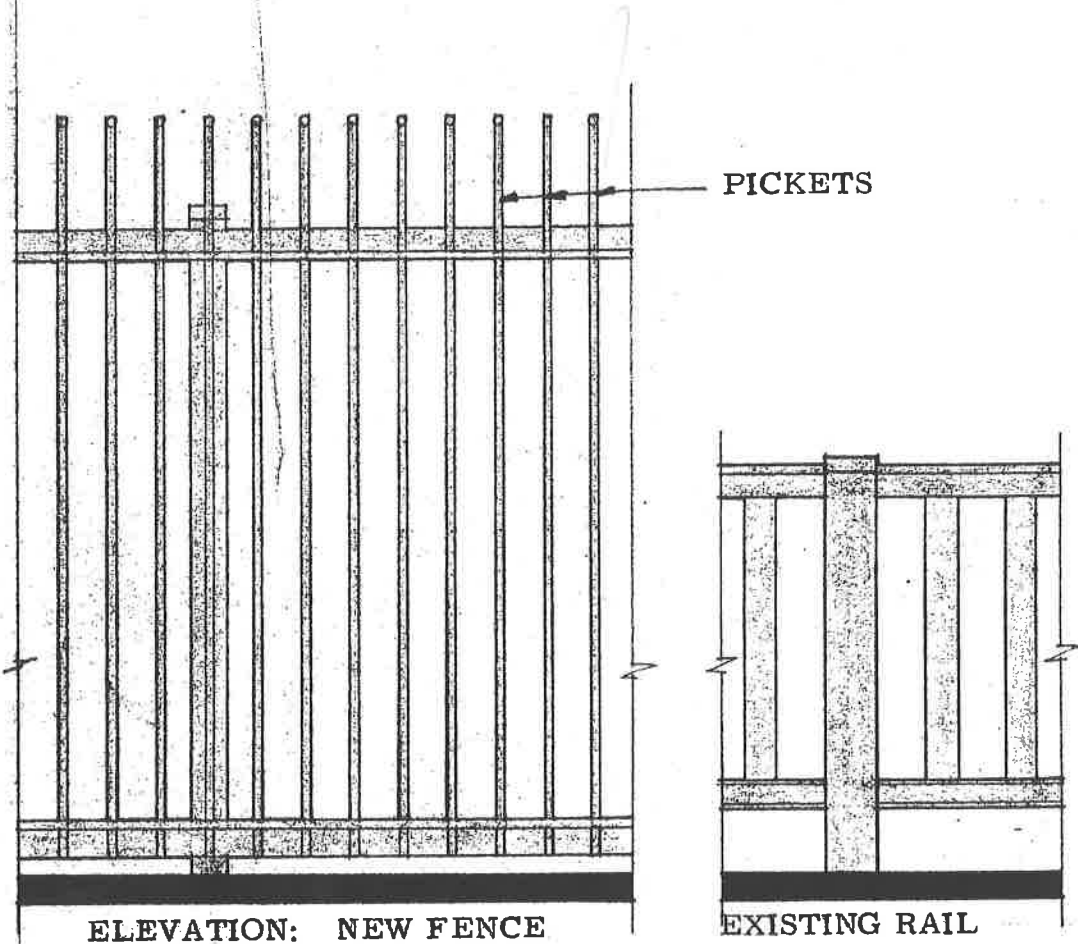
HIGHEST RATED OF EIGHT PROPOSALS (No. 11, 16, 17)



Wisham

PROPOSAL

11

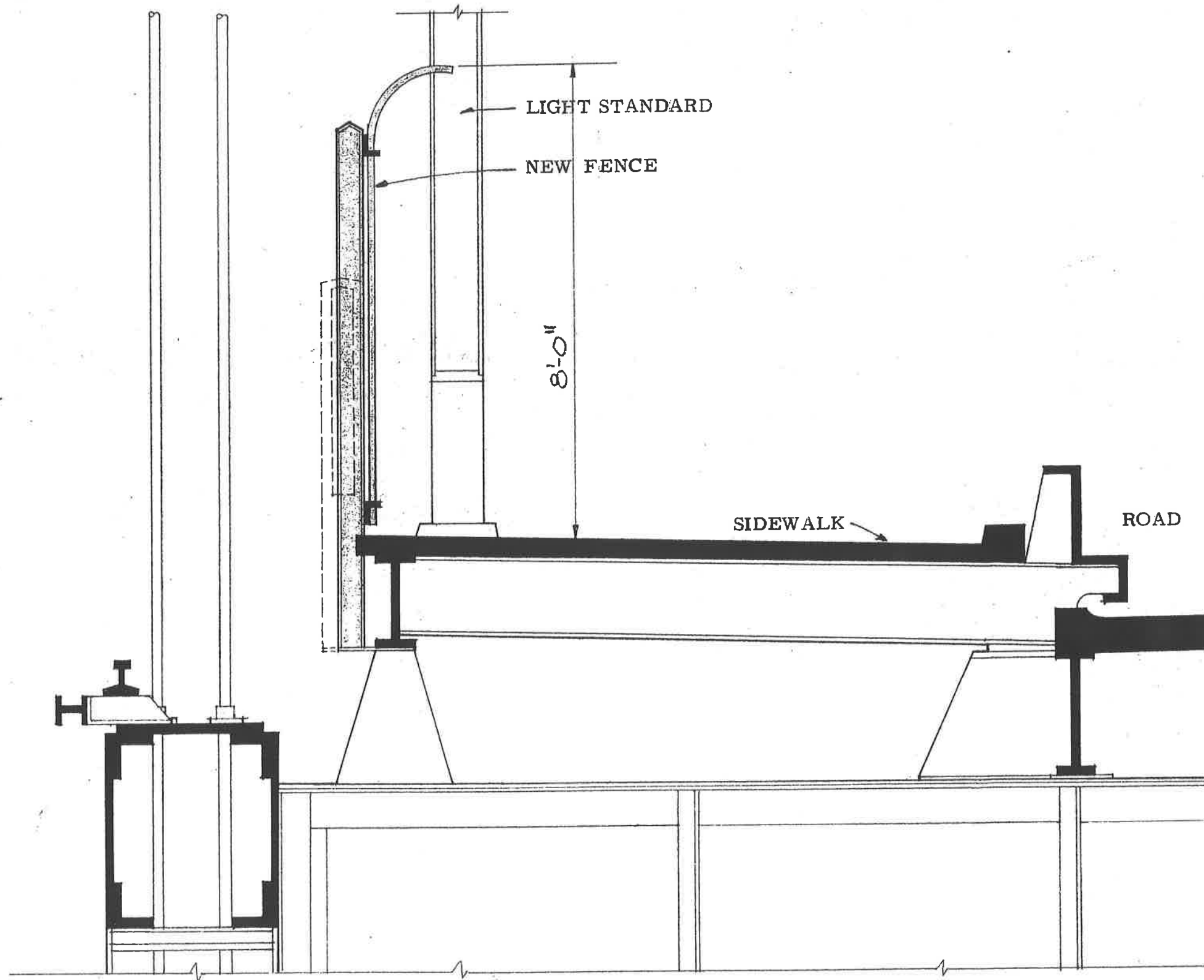


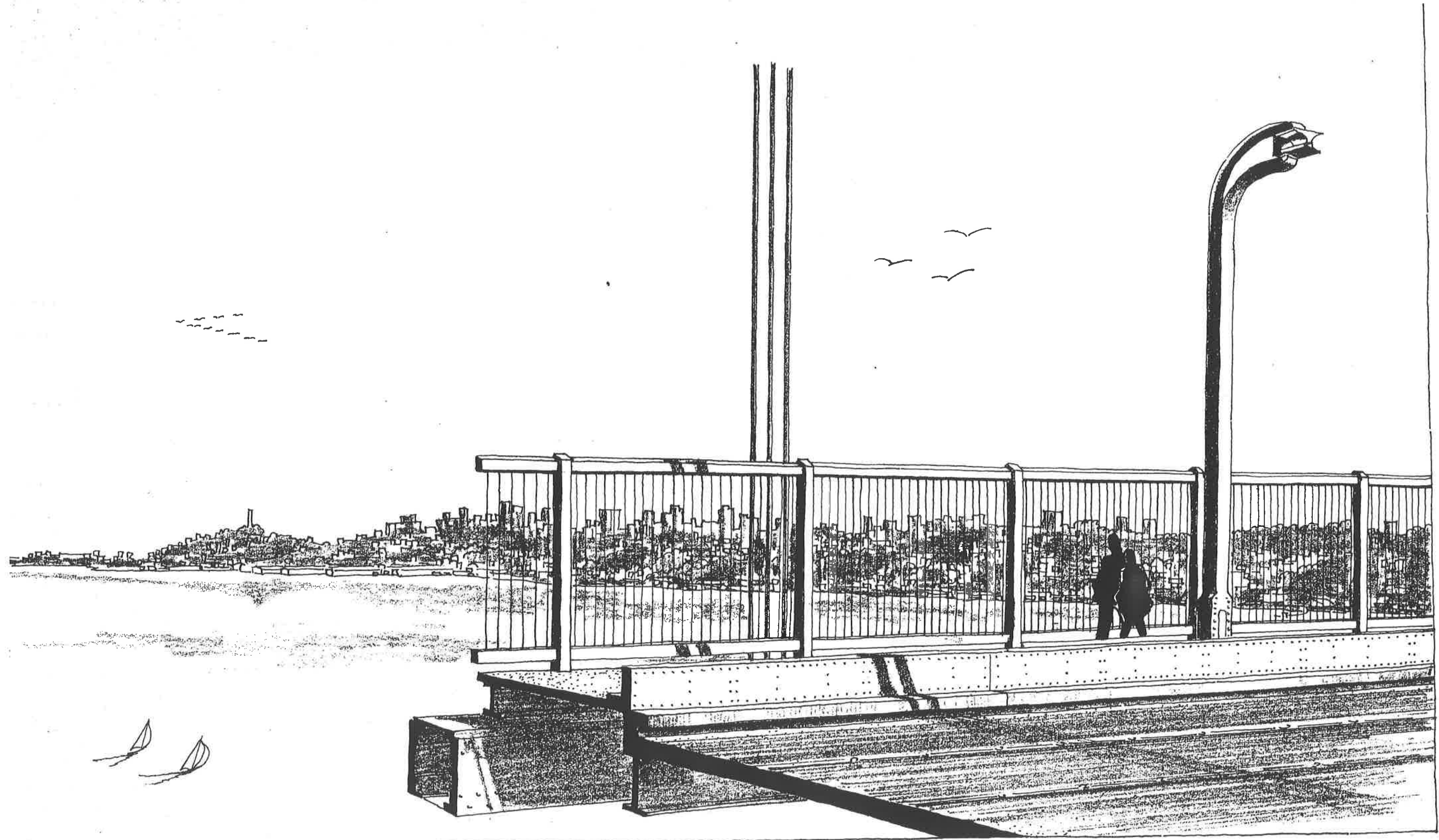
DESIGN:

Picket fence in lieu of existing railing. Stanchions spaced 12 feet (as existing rail) with a top and bottom rail supporting vertical bars 6 inches apart. Construction can be of painted steel or aluminum alloy. The curved top will increase effectiveness as a barrier while recalling the shape of the existing light standards.

EVALUATION:

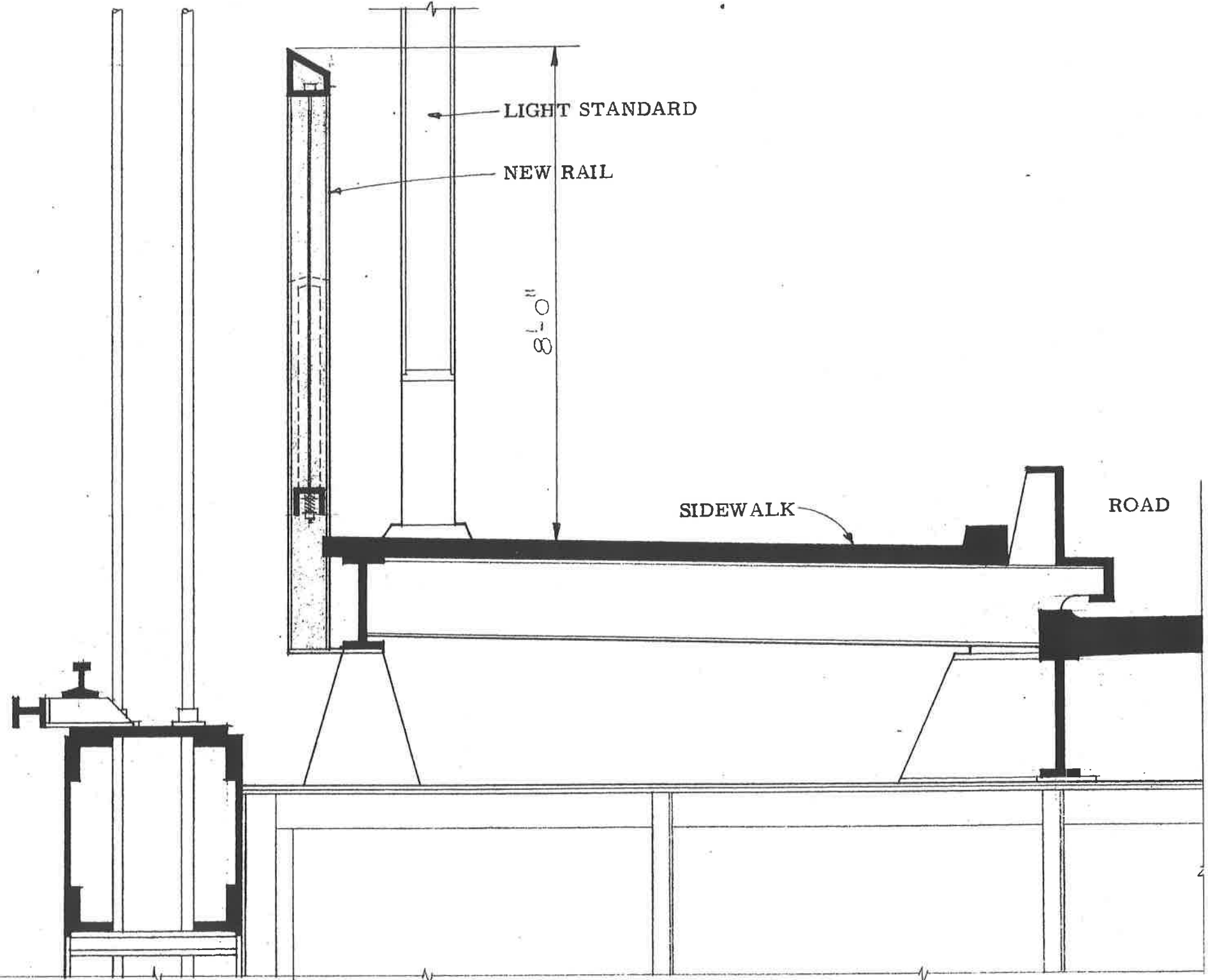
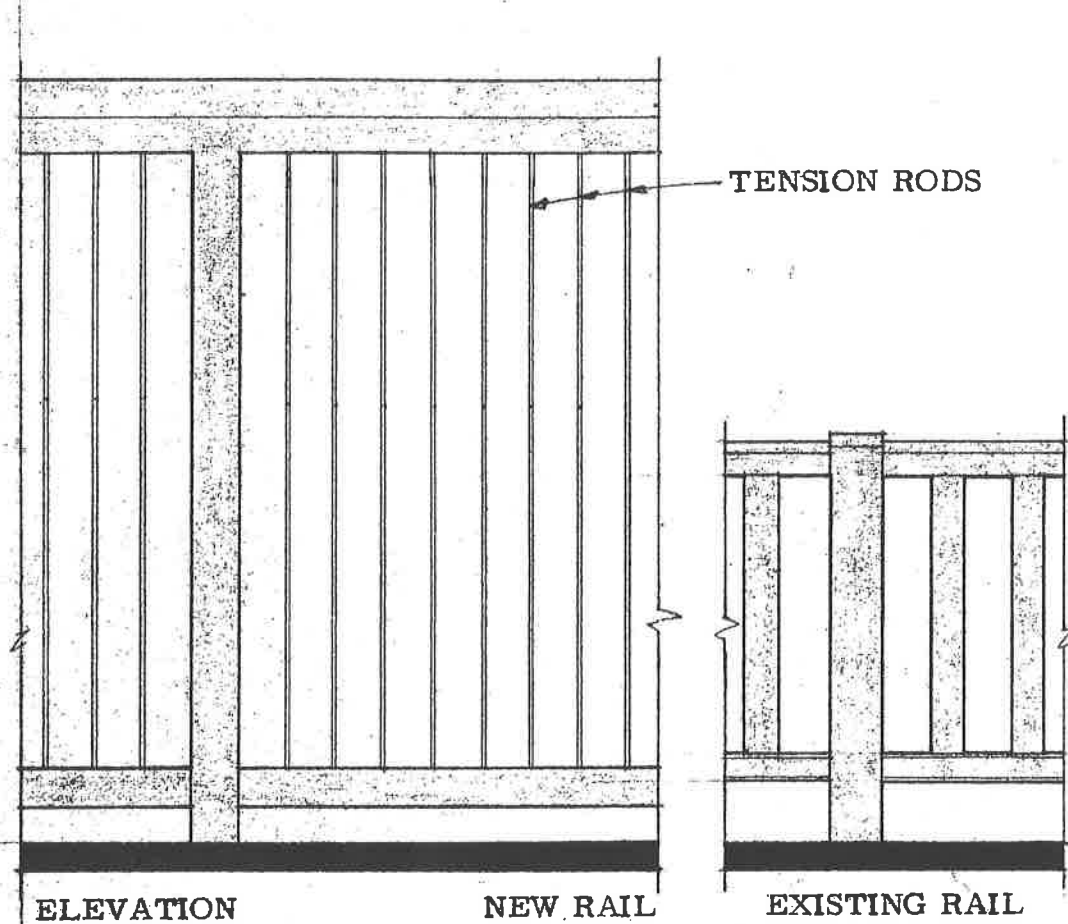
Positive in preventing suicides but would, as Proposal 12, reduce the possibility of apprehension. Properly designed in keeping with the bridge architecture, this fence would physically and visually be lighter than the present railing. Providing access gates, bridge maintenance would not be hindered or impaired.





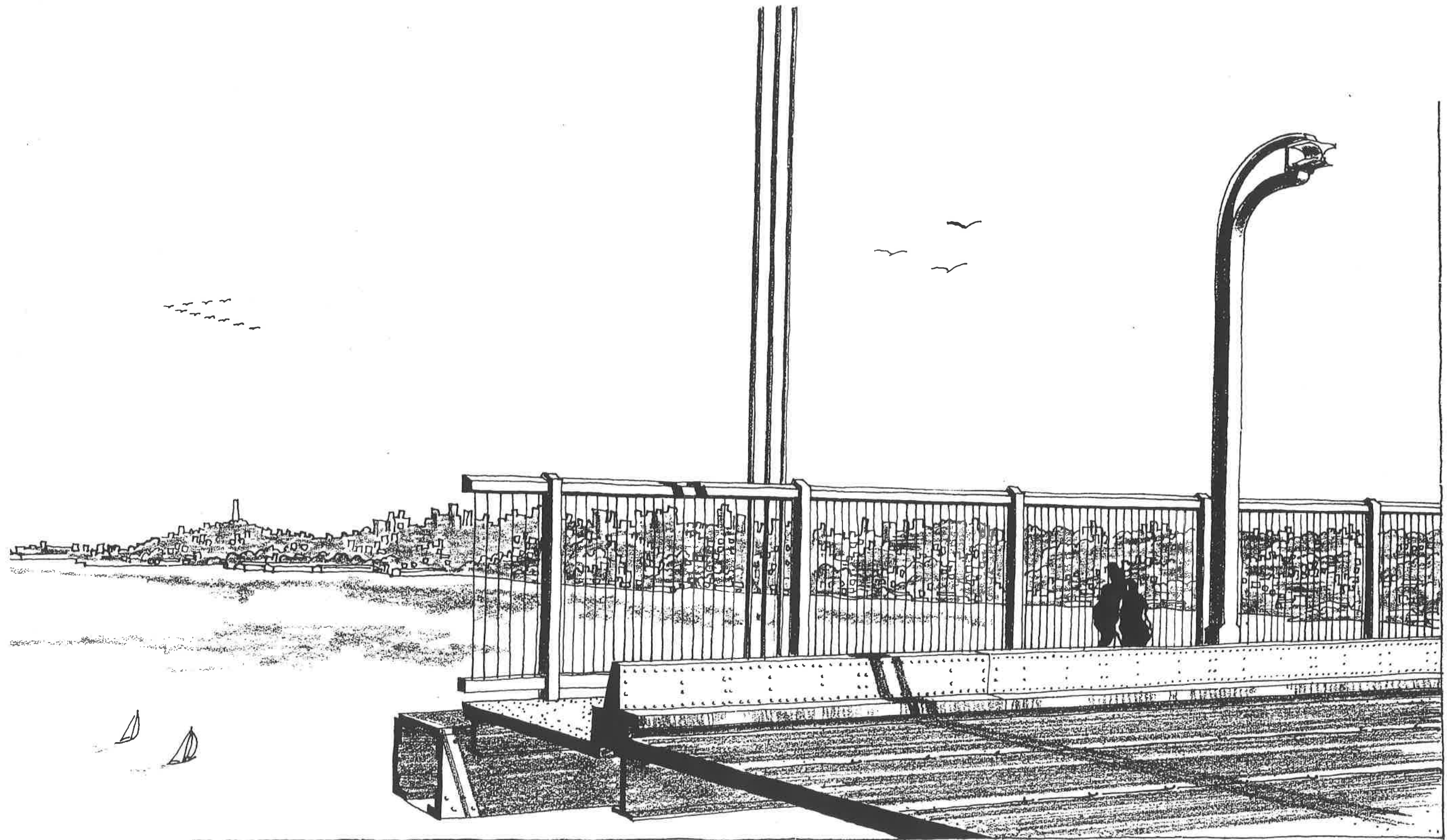
PROPOSAL

16

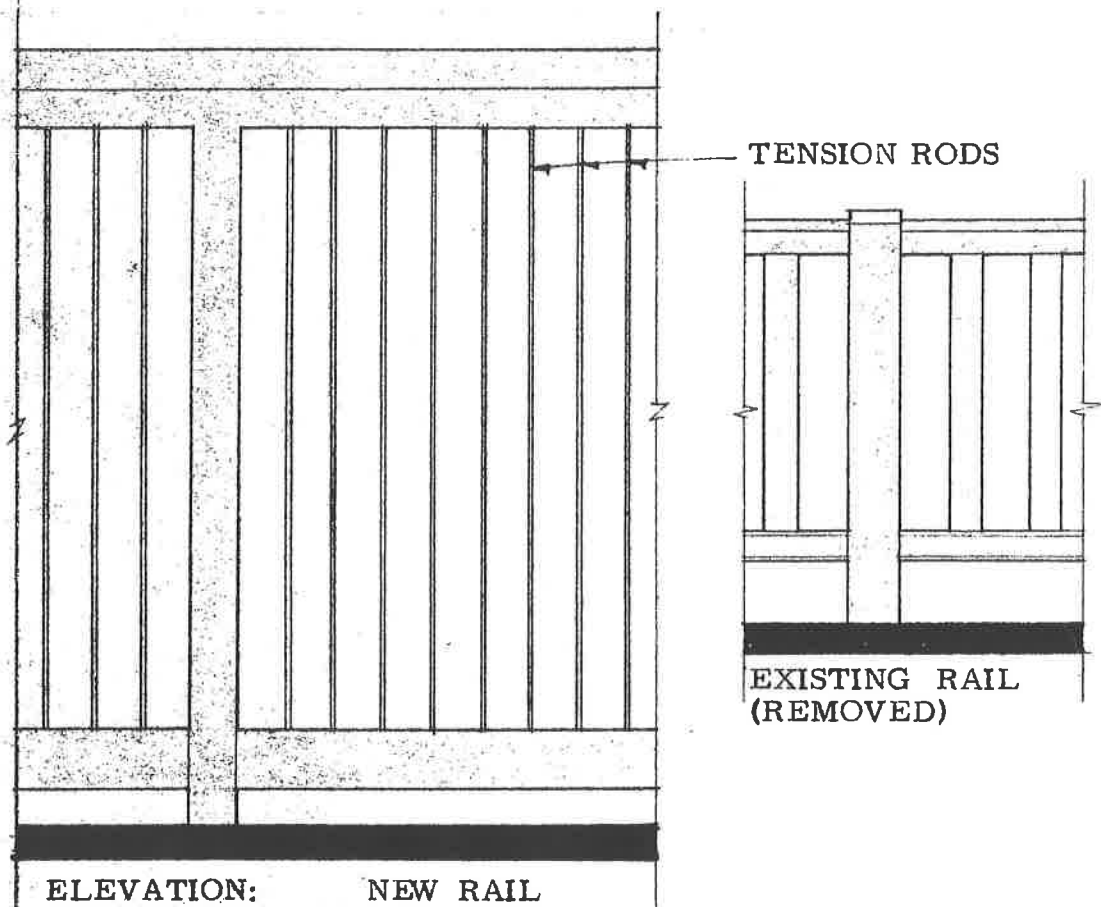


DESIGN:
 Existing Railing is replaced with an 8 foot high rail. Stanchions 12 feet apart with a solid top and bottom rail providing anchorage for tension rods spaced 6 inches on centers. Through the fact that the tension rods are very thin (3/8 inches diameter) it is impossible to climb the rail.

EVALUATION:
 A positive barrier, but by its light appearance would not deter "would-be-suicides" to attempt to scale the rail. Views for motorists and pedestrians are greatly improved especially looking down to the water. Through its light construction a reduction in dead load is especially beneficial for the center span. Access gates will provide for easy bridge maintenance. Wind resistance would be reduced below that of the present rail.



PROPOSAL **17**

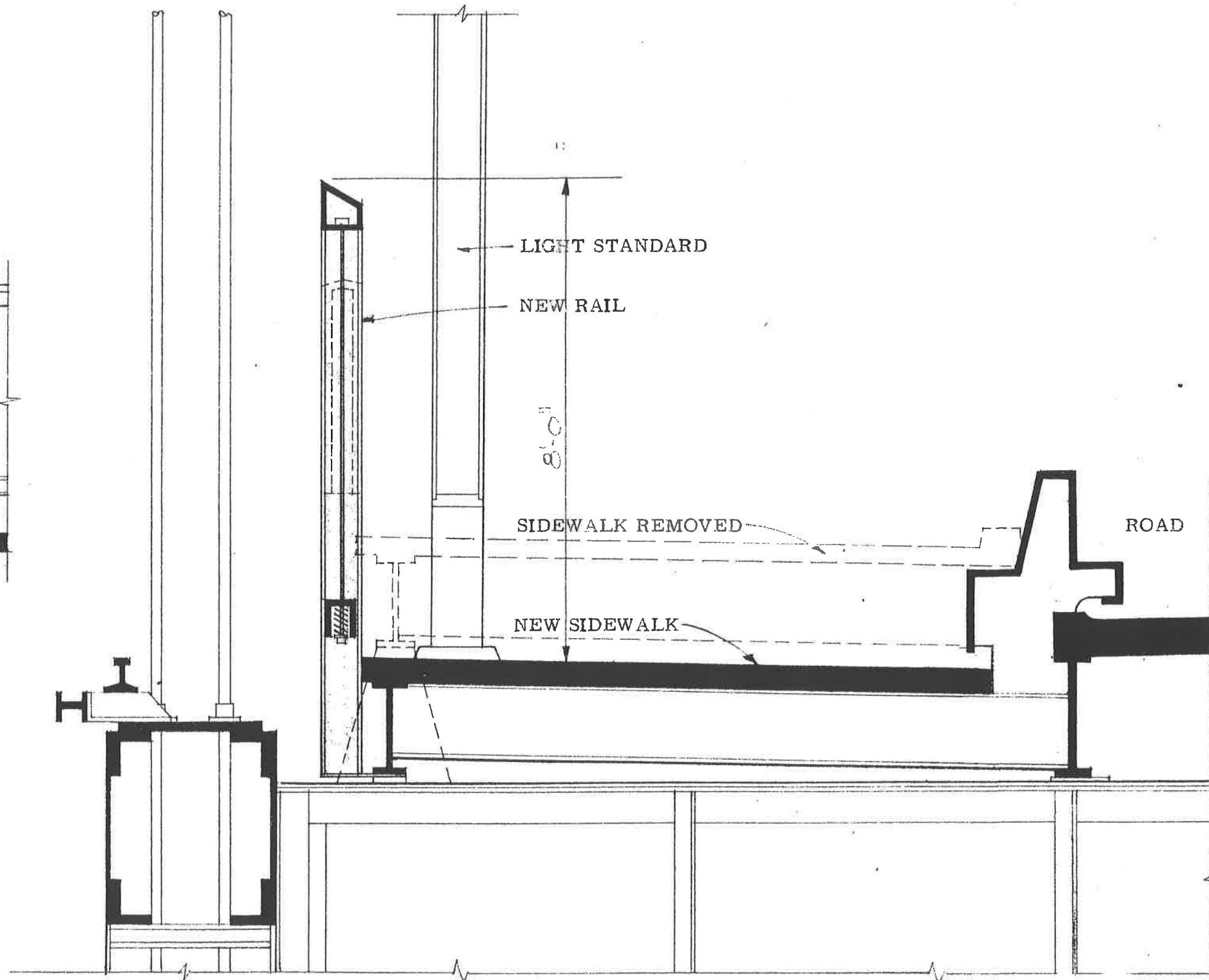


DESIGN:

The same rail construction as in Proposal 16 but through lowering the sidewalk the silhouette or bridge profile is maintained. Changing the sidewalk deck from concrete to an orthotropic steel deck provides an additional reduction in dead load for the center span over Proposal 16.

EVALUATION:

In addition to the same benefits of light construction of Proposal 16 it does maintain approximately the existing bridge silhouette and also includes the benefits of a lighter sidewalk construction saving the most weight of any proposal considered. A pedestrian's view to the west across the roadway is slightly impaired by lowering the sidewalk. Pedestrians and cyclists gain considerable safety by the high rail at the roadway.



PROPOSAL

17