

July 13, 2001

HSA-10/B-88

Mr. Mats Heinevik
Blue Systems AB
Halleflundragatan 24
426 58 V. Frolunda
Sweden

Dear Mr. Heinevik:

In your June 27 letter addressed to the Director of the Federal Highway Administration's former Office of Engineering, you requested formal acceptance of your tensioned wire rope system (called Safence 350) as an National Cooperative Highway Research Program (NCHRP) Report 350 test level 3 (TL-3) traffic barrier. To support this request, you also sent copies of two test reports prepared by the VTI test laboratory in Linköping, Sweden under the direction of Messrs. Thomas Turbell and Jan Wenall. and video tapes of the two tests that were conducted. The test reports were both dated January 3, 2001 and identified as Test Report No. 56555 and Test Report No. 56556.

The Safence 350 wire rope barrier system test installation was approximately 116 meters long, including its anchorages. Its four 19-mm diameter steel cables were supported on 2100-mm long elliptically-shaped line posts spaced on 2500-mm centers. Each post was embedded 1110-mm in the ground and made from 4-mm thick steel and set in a compacted AASHTO Type M 147-65 soil. The top cable was set 930 mm above the ground with the remaining three cables spaced at 150 cm. Thus, the cable heights were 480 mm, 630 mm, 780 mm, and 930 mm. All four cables are attached to the traffic side of the posts. Once the cables are mounted on the posts, they are tensioned to a specified degree, the exact figure depending on the ambient temperature at the time of installation. This tension can vary from 800 kPa at 38 degrees Celsius to 3200 kPa at -40 degrees Celsius. Enclosure 1 is a schematic drawing of the Safence 350 as tested.

For test 3-10, an 907-kg vehicle impacted the wire rope at 102 km/h and an impact angle of 20 degrees. Maximum occupant impact velocity was 5.0 m/sec and maximum ridedown acceleration was reported as 8.1 g's. Dynamic deflection was 1.1 meters. For test 3-11, a 2036-kg pickup truck impacted the barrier at 104.0 km/h at 25degrees. Maximum occupant impact velocity was 4.4 m/sec and maximum ridedown acceleration was 6.6 g's. Dynamic deflection was 1.8 meters in this test.

Based on staff review of the information you provided, I concur that the 4-strand Safence 350, as tested, meets all evaluation criteria for an NCHRP Report 350 roadside barrier at test level 3 (TL-3) and it may be used on the National Highway System (NHS) when such use is proposed by the contracting agency. Since this product is made from steel and is proprietary, the provisions of Sections 635.410 and 635.411 of Title 23 Code of Federal Regulations are both applicable. Copies of each are enclosed for your ready reference (Enclosures 2 and 3, respectively).

You noted in your letter that testing to develop a crashworthy end terminal for this system has yet to be completed. I agree that the current terminal design may be used in the interim, provided it is located beyond the minimum clear zone or shielded with an accepted device such as a sand barrel array as stated in your letter.

Sincerely Yours,

(original signed by Frederick G. Wright, Jr.)

Frederick G. Wright, Jr.
Program Manager, Safety

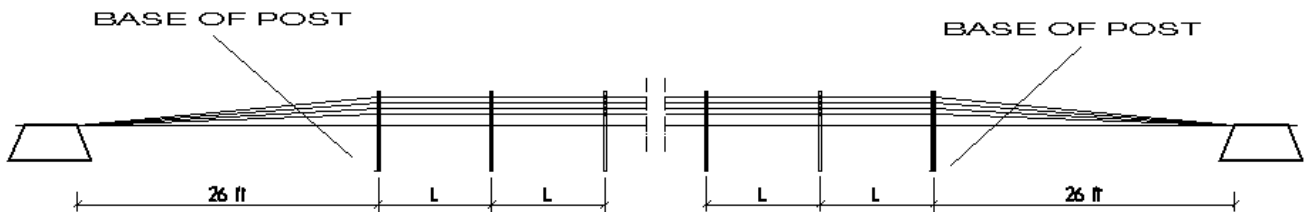
3 Enclosures



Wire Rope Safety Fence

Product description

Longitudinal positioning of fence



The post nearest the anchoring point is provided with a reinforced post footing that absorbs vertical forces.

The fence has been tested in accordance with NCHRP 350, with a distance between posts of 8 feet (2.5 m). When using other distances between posts, the elongation is estimated as follows:

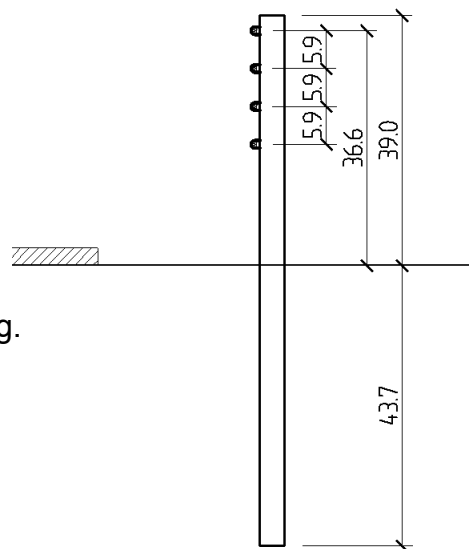
Post distance (ft)	Elongation (ft)
6.5	4.9 (Estimated)
8	5.9 (Tested)

Side positioning of fence

Normal positioning

The fence is positioned according to the drawing.

(All dimensions in inches)



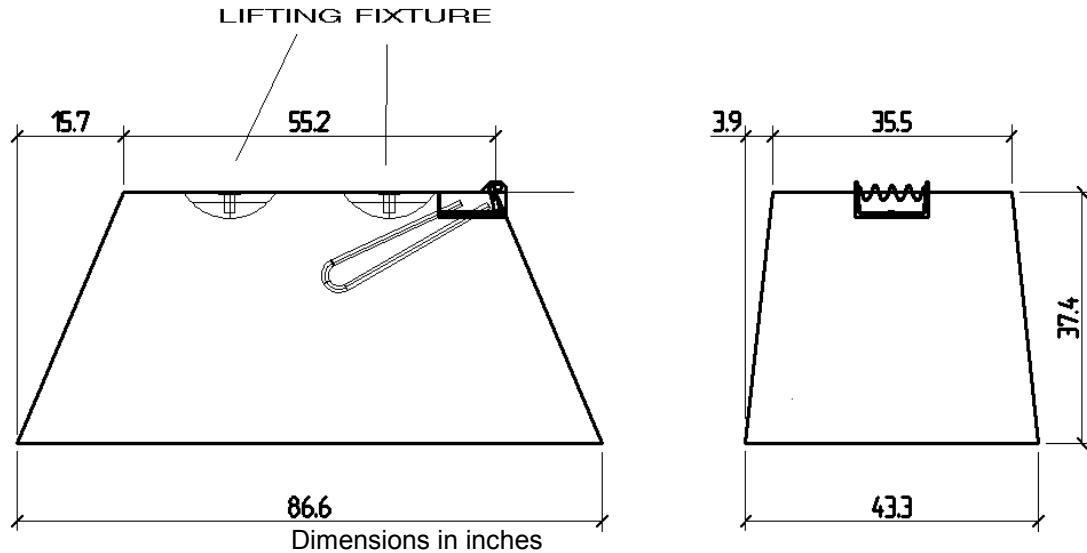
Safence, Inc.

c/o IMPACT ABSORPTION, Inc.
46-04 245th Street
Douglaston, NY 11362 USA

Phone: 718-229-0046
Fax: 718-225-2845
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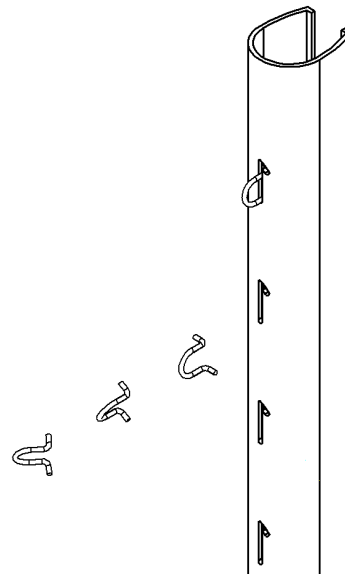
End anchors



- End anchors can be either cast on site or prefabricated.
- Make sure that anchors are aligned with the fence.
- The galvanised anchor box embedded in the concrete is to lie at ground level, be placed horizontally at the side of the road and follow the slope of the road longitudinally.
- Backfilling around end anchors is to be done with gravel, which is then vibrated.
- Anchors are to be well covered.

Post and hook

The hook is twisted into the post.



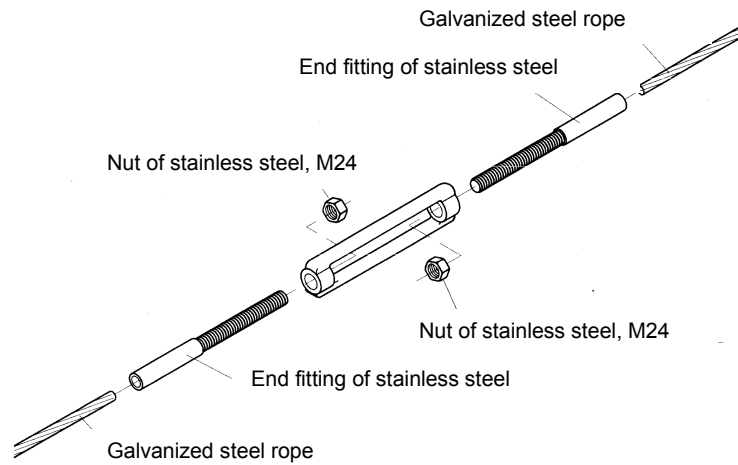
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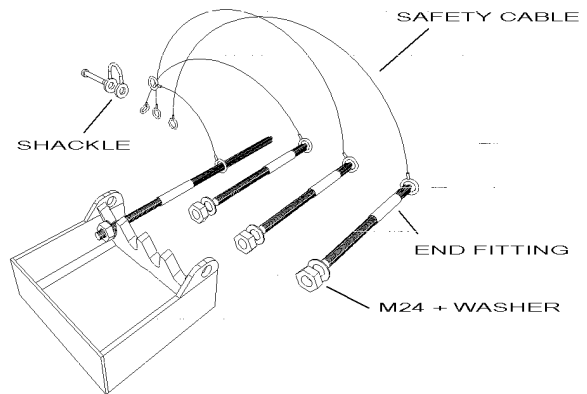
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End fittings and rigging screws



Tensioning table		
Temperature (Farenheit)	Tensionforce (lbf) (kp)	
-40	7 000	3200
-20	6 400	2900
0	5 700	2600
15	5 000	2300
30	4 400	2000
50	3 750	1700
70	3 100	1400
90	2 400	1100
100	1750	800



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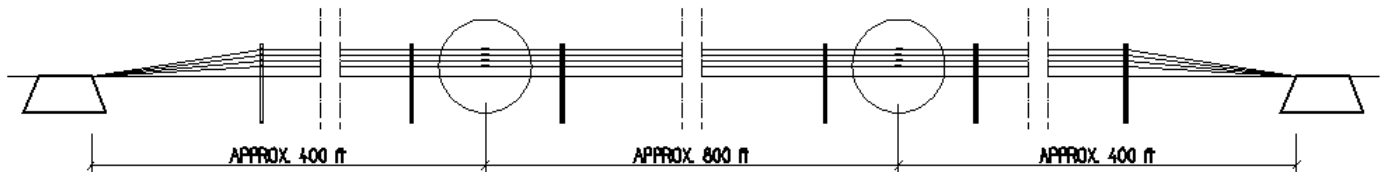
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Tensioning

1. Tension the wire ropes with nuts at both the end anchors.
2. Tension the wire ropes to the correct tensioning force at each rigging screw (see table). Start in the middle of the section and work alternately towards each respective anchoring.

If the length of the rigging screws is not sufficient to reach the correct tensioning force, tighten them to half the length of the rigging screw. Then readjust them so that all the rigging screws have the correct tensioning force.



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4 (6)



Radii

Horizontal curves

The fence shall follow the road curvature without any visible break in its alignment in either the horizontal or the vertical direction.

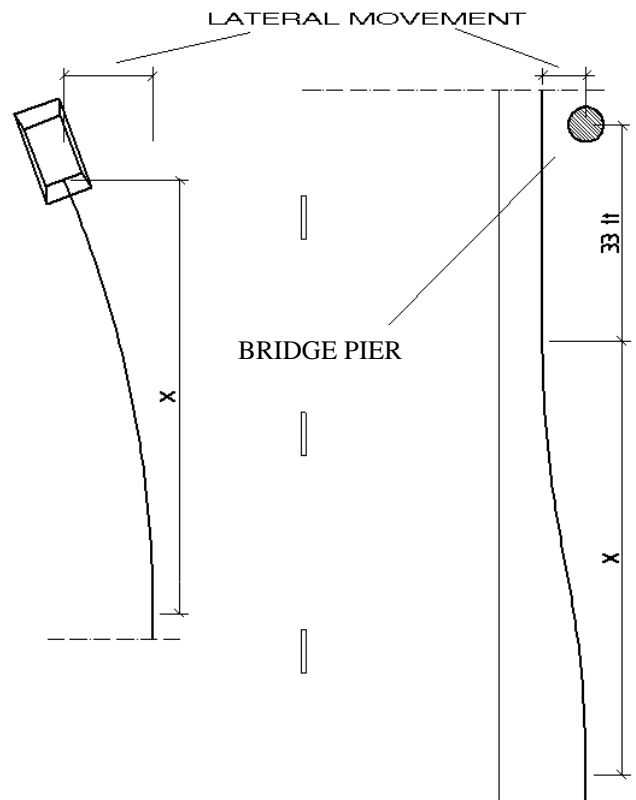
Normally the radius of the road should not be less than 650 feet.

If a smaller radius is required, the distance between shall be reduced in accordance with the table below:

Radius (ft)	Post distance (ft)
650	8
500	6.5
325	5

Passage of obstacles (e.g. bridge piers).

Lateral Movement (ft)	X (ft)
1,5	100
3	165
4.5	200
6	230



Vertical curves

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5 (6)



Fences should not be constructed in hollows with a radius of < 4000 feet.

Shortening of posts

Posts for Safence fences may be reduced in length according to the table below:

Shortened post	Action
0 – 4 inch	No action
One post is shortened 4 – 30 inch with five whole post on each side	No action
The post is shortened 10 – 12 inch	Reduce post distance to 6.5 ft
The post is shortened 12 – 20 inch	Reduce post distance to 5 ft
The post is shortened 20 – 27 inch	Reduce post distance to 3 ft
The post is shortened > 27 inch	Drill a hole 1.5 ft into the rock

_____ End _____

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Sec. 635.410 Buy America requirements.

(a) The provisions of this section shall prevail and be given precedence over any requirements of this subpart which are contrary to this section. However, nothing in this section shall be construed to be contrary to the requirements of Sec. 635.409(a) of this subpart.

(b) No Federal-aid highway construction project is to be authorized for advertisement or otherwise authorized to proceed unless at least one of the following requirements is met:

(1) The project either: (i) Includes no permanently incorporated steel or iron materials, or (ii) if steel or iron materials are to be used, all manufacturing processes, including application of a coating, for these materials must occur in the United States. Coating includes all processes which protect or enhance the value of the material to which the coating is applied.

(2) The State has standard contract provisions that require the use of domestic materials and products, including steel and iron materials, to the same or greater extent as the provisions set forth in this section.

(3) The State elects to include alternate bid provisions for foreign and domestic steel and iron materials which comply with the following requirements. Any procedure for obtaining alternate bids based on furnishing foreign steel and iron materials which is acceptable to the Division Administrator may be used. The contract provisions must (i) require all bidders to submit a bid based on furnishing domestic steel and iron materials, and (ii) clearly state that the contract will be awarded to the bidder who submits the lowest total bid based on furnishing domestic steel and iron materials unless such total bid exceeds the lowest total bid based on furnishing foreign steel and iron materials by more than 25 percent.

(4) When steel and iron materials are used in a project, the requirements of this section do not prevent a minimal use of foreign steel and iron materials, if the cost of such materials used does not exceed one-tenth of one percent (0.1 percent) of the total contract cost or \$2,500, whichever is greater. For purposes of this paragraph, the cost is that shown to be the value of the steel and iron products as they are delivered to the project.

(c)(1) A State may request a waiver of the provisions of this section if;

(i) The application of those provisions would be inconsistent with the public interest; or

(ii) Steel and iron materials/products are not produced in the United States in sufficient and reasonably available quantities which are of a satisfactory quality.

(2) A request for waiver, accompanied by supporting information, must be submitted in writing to the Regional Federal Highway Administrator (RFHWA) through the FHWA

Division Administrator. A request must be submitted sufficiently in advance of the need for the waiver in order to allow time for proper review and action on the request. The RFHWA will have approval authority on the request.

(3) Requests for waivers may be made for specific projects, or for certain materials or products in specific geographic areas, or for combinations of both, depending on the circumstances.

(4) The denial of the request by the RFHWA may be appealed by the State to the Federal Highway Administrator (Administrator), whose action on the request shall be considered administratively final.

(5) A request for a waiver which involves nationwide public interest or availability issues or more than one FHWA region may be submitted by the RFHWA to the Administrator for action.

(6) A request for waiver and an appeal from a denial of a request must include facts and justification to support the granting of the waiver. The FHWA response to a request or appeal will be in writing and made available to the public upon request. Any request for a nationwide waiver and FHWA's action on such a request may be published in the Federal Register for public comment.

(7) In determining whether the waivers described in paragraph (c)(1) of this section will be granted, the FHWA will consider all appropriate factors including, but not limited to, cost, administrative burden, and delay that would be imposed if the provision were not waived.

(d) Standard State and Federal-aid contract procedures may be used to assure compliance with the requirements of this section.

(23 U.S.C. 315, sec. 10 of Pub. L. 98-229, 98 Stat. 55, sec. 165 of Pub. L. 97-424, 96 Stat. 2136 and 49 CFR 1.48(b))

[48 FR 53104, Nov. 25, 1983, as amended at 49 FR 18821, May 3, 1984; 58 FR 38973, July 21, 1993]

ENCLOSURE 2

Sec. 635.411 Material or product selection.

(a) Federal funds shall not participate, directly or indirectly, in payment for any premium or royalty on any patented or proprietary material, specification, or process specifically set forth in the plans and specifications for a project, unless:

(1) Such patented or proprietary item is purchased or obtained through competitive bidding with equally suitable unpatented items; or

(2) The State highway agency certifies either that such patented or proprietary item is essential for synchronization with existing highway facilities, or that no equally suitable alternate exists; or

(3) Such patented or proprietary item is used for research or for a distinctive type of construction on relatively short sections of road for experimental purposes.

(b) When there is available for purchase more than one nonpatented, nonproprietary material, semifinished or finished article or product that will fulfill the requirements for an item of work of a project and these available materials or products are judged to be of satisfactory quality and equally acceptable on the basis of engineering analysis and the anticipated prices for the related item(s) of work are estimated to be approximately the same, the PS&E for the project shall either contain or include by reference the specifications for each such material or product that is considered acceptable for incorporation in the work. If the State highway agency wishes to substitute some other acceptable material or product for the material or product designated by the successful bidder or bid as the lowest alternate, and such substitution results in an increase in costs, there will not be Federal-aid participation in any increase in costs.

(c) A State highway agency may require a specific material or product when there are other acceptable materials and products, when such specific choice is approved by the Division Administrator as being in the public interest. When the Division Administrator's approval is not obtained, the item will be nonparticipating unless bidding procedures are used that establish the unit price of each acceptable alternative. In this case Federal-aid participation will be based on the lowest price so established.

(d) Appendix A sets forth the FHWA requirements regarding (1) the specification of alternative types of culvert pipes, and (2) the number and types of such alternatives which must be set forth in the specifications for various types of drainage installations.

(e) Reference in specifications and on plans to single trade name materials will not be approved on Federal-aid contracts.