US Department
of Transportation
**Federal Highway Administration**

400 Seventh St., S.W.
Washington, D.C. 20590

May 31, 1996

Refer to: HNG-14

Mr. Don L. Ivey
Research Engineer
Safety Division
Texas Transportation Institute
Texas A&M University System
College Station, Texas 77843-3135

Dear Mr. Ivey:

In your May 21 letter to Mr. Gerald L. Eller you requested the Federal Highway Administration's (FHWA) acceptance of a Low Profile Barrier as a National Cooperative Highway Research Program (NCHRP) Report 350 test level 2 (TL-2) temporary work zone barrier. In support of this request, you also provided one copy of the Texas Transportation Institute Research Report 990-4F, "Development of a Low Profile Portable Concrete Barrier," dated November 1991.

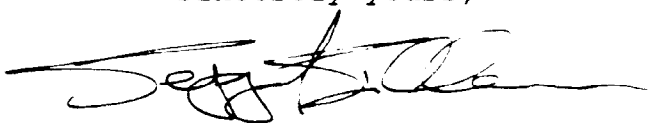
We have noted that the Low Profile Barrier is included in the recent AASHTO-AGC-ARTBA Report "A Guide to Standardized Highway Barrier Hardware" as drawing number SWC03. It is a precast reinforced concrete barrier 510 mm high with a base width of 660 mm and a top width of 710 mm. Adjacent 6100-mm long segments are bolted together with two ASTM A36 steel bolts at each end. These bolts pass through bulkheads at the end of troughs in each segment end as shown in the enclosed barrier drawings. We recommend that the 25-mm diameter drainage hole in each trough be increased to perhaps 75 mm to minimize freezing problems if the barrier is used in northern climates. This change could require modifications to the reinforcing details.

Two tests were reported, 9901F-1 and 9901F-2, which correspond to the NCHRP Report 350 tests 2-11 and 2-10, respectively. A summary of the test results are enclosed. Vehicle post-crash trajectories were acceptable and the occupant impact velocities and subsequent ride-down accelerations were lower than the preferred NCHRP Report 350 evaluation criteria limits. We conclude that the low profile barrier, as defined herein, is acceptable for use as an NCHRP Report 350 TL-2 temporary barrier on the National Highway System (NHS) where there are few trucks, the highest impact speeds are expected to be in the 70 km/h range, and its use is requested by a State agency.

Since the low profile barrier has been patented, it must be considered a proprietary device. As such, its use on Federal-aid highway projects, except exempt, non-NHS projects, is subject to the conditions stated in Title 23, Code of Federal Regulations, Section 635.411, a copy of which is enclosed.

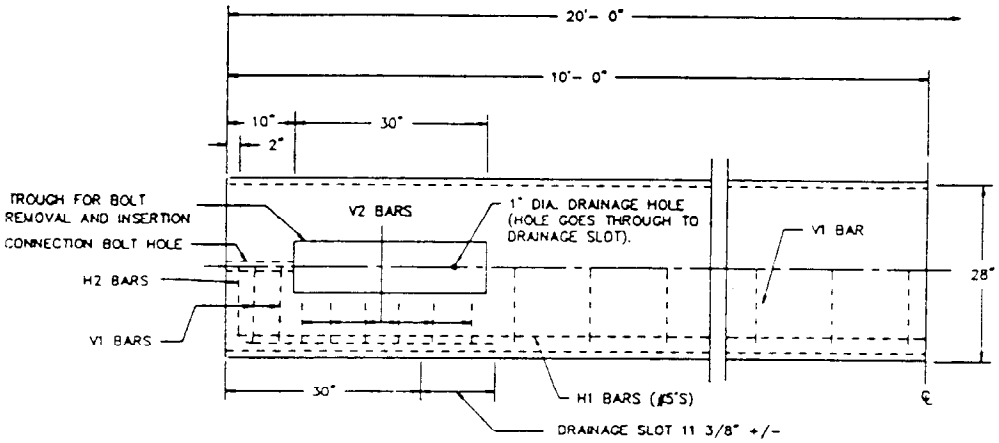
We are aware that a sloped concrete end section has been used to terminate the low profile barrier and that this terminal section has been crash tested to a limited degree. However, since it has not been tested to the minimum matrix recommended in the NCHRP Report 350 for any test level, we do not consider it to be a crashworthly end treatment at the present time. Pending notification that the appropriate test series has been run with acceptable results, we recommend that the low profile barrier be terminated outside the appropriate clear zone or shielded with a crashworthy device when it is used on the NHS.

Sincerely yours,



Seppo I. Sillan, Acting Chief
Federal-Aid and Design Division

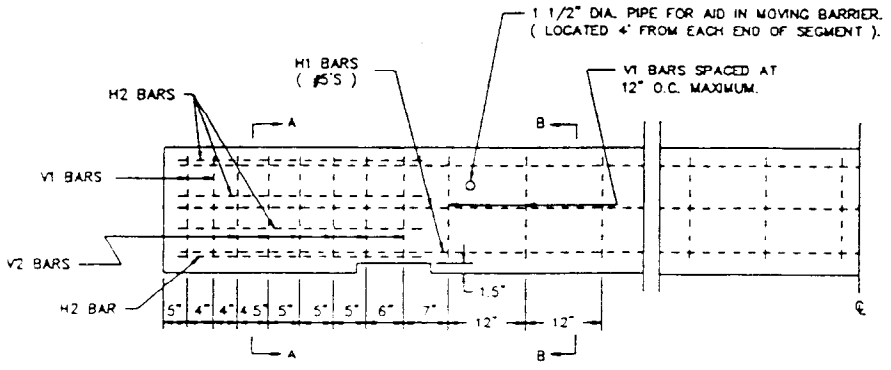
3 Enclosures




NOTE: CONCRETE ON BOTTOM HALF OF PLAN VIEW IS REMOVED IN ORDER TO SHOW DETAILS

PLAN VIEW

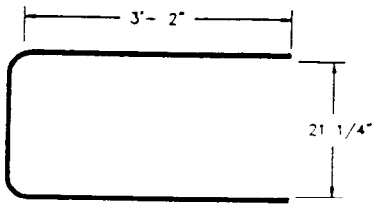
(SYMMETRICAL ABOUT CENTER LINES)




ELEVATION

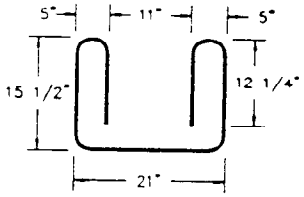
(SYMMETRICAL ABOUT CENTER LINES)

NOTE: H2 REBAR IS TO BE BENT AT A 3" RADIUS.

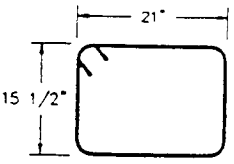



H2 BAR
(# 5 BAR)

NOTE: ALL BENDING OF SHEAR REBAR IS SPECIFIED AT A 2" RADIUS.

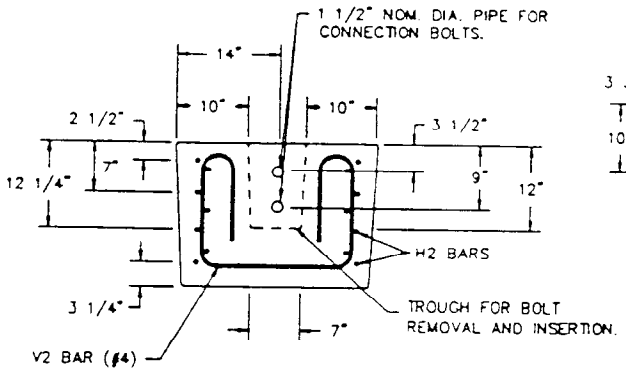



V2 BAR
(# 4's, GRADE 40 MINIMUM)

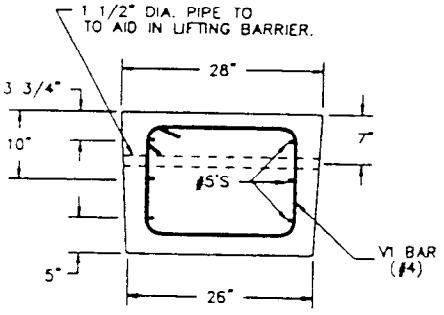



V1 BAR
(# 4's, GRADE 40 MINIMUM)

# REINFORCING STEEL DETAILS



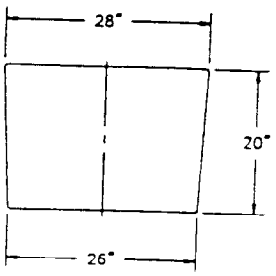

SECTION A–A




SECTION B–B

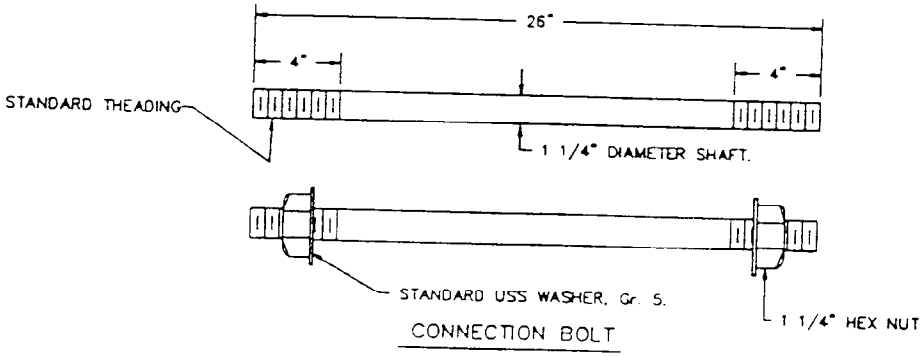
GENERAL NOTES

1. ALL CONCRETE SHALL BE CLASS A, C, OR H, UNLESS OTHERWISE SPECIFIED.
2. ALL REINFORCING STEEL SHALL BE GRADE 60, UNLESS OTHERWISE SPECIFIED.
3. CHAMFER END EDGES 3/4".



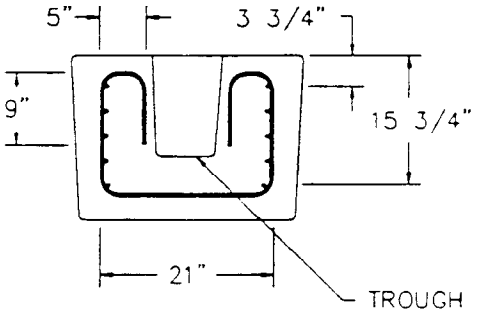

TYPICAL PROFILE

NOTE: BOLT MATERIAL IS
ASTM A36 ROUND BAR.




CONNECTION BOLT

# ALTERNATE WIRE MESH REINFORCING SCHEME FOR THE LOW-PROFILE PCB

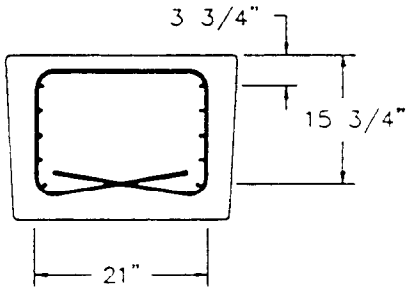



SECTION A–A

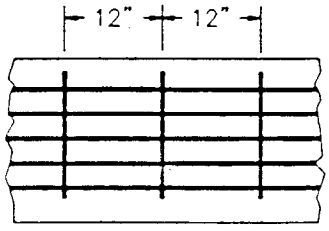
TROUGH FOR BOLT REMOVAL AND INSERTION.

Welded Wire Fabric
3x12 – D20 x D20
60 ksi minimum yield strength

NOTE: THIS WIRE FABRIC ALTERNATIVE CAN BE USED IN PLACE OF V1, V2 AND H1 BARS. THE H2 BARS SPECIFIED ARE STILL REQUIRED




SECTION B–B




SIDE VIEW

TABLE 1 SUMMARY OF CRASH TEST RESULTS

| Test No. | 9901F-1 | 9901F-2 |
|---|---|---|
| Vehicle Weight, lb (kg) | 4500(2043) | 1800(817) |
| Impact Speed, mph (km/hr) | 44.4(71.4) | 45.7(73.5) |
| Impact Angle, degrees | 26.1 | 21.3 |
| Exit Angle, degrees | 0.0 | 7.4 |
| Displacement, in (cm) | 5.0(12.7) | 0.0(0.0) |
| Occupant Impact Velocity ft/s (m/s) | | |
| Longitudinal | 21.2(6.5) | 11.7(3.6) |
| Lateral | 16.0(4.9) | 18.6(5.7) |
| Occupant Ridedown Acceleration g's | | |
| Longitudinal | -6.0 | -1.1 |
| Lateral | -11.4 | -8.7 |
| Vehicle Damage Classification | | |
| TAD | 11FL1 | 11LD3 |
| CDC | 11FLLK1 & 11LDLW1 | 11FLEK2 & 11LDEW3 |

these materials must occur in the United States.

(2) The State has standard contract provisions that require the use of domestic materials and products, including steel 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 materials which comply with the following requirements. Any procedure for obtaining alternate bids based on furnishing foreign steel 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 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 materials unless such total bid exceeds the lowest total bid based on furnishing foreign steel materials by more than 25 percent.

(4) When steel materials are used in a project, the requirements of this section do not prevent a minimal use of foreign steel 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 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 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]

### § 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.

### § 635.413 Guaranty and warranty clauses.

(a) Except as provided in paragraph (b) of this section, clauses that require the contractor to guarantee or warrant materials and workmanship or to otherwise maintain the work for a specified period after its satisfactory completion by the contractor and its final acceptance by the State, will not be approved for use in Federal-aid contracts. Work performed and materials replaced under such guaranty or warranty clauses after final acceptance of work are not eligible for Federal participation.

(b) Contracts which involve furnishing and/or installing electrical or mechanical equipment should generally include contract clauses that require:

(1) Manufacturer's warranties or guarantees on all electrical and mechanical equipment consistent with those provided as customary trade practice, or

(2) Contractors' warranties or guarantees providing for satisfactory in-service operation of the mechanical and electrical equipment and related components for a period not to exceed 6 months following project acceptance.

### § 635.417 Convict produced materials.

(a) Materials produced by convict labor may only be incorporated in a Federal-aid highway construction project if such materials have been:

(1) Produced by convicts who are on parole, supervised release, or probation from a prison or

(2) Produced in a qualified prison facility and the cumulative annual production amount of such materials for use in Federal-aid highway construction does not exceed the amount of such materials produced in such facility for use in Federal-aid highway construction during the 12-month period ending July 1, 1987.

(b) *Qualified prison facility* means any prison facility in which convicts,