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 SWC01. 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 crashworthy 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,

[Signature]

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

3 Enclosures
PLAN VIEW
(SYMMETRICAL ABOUT CENTER LINES)

ELEVATION
(SYMMETRICAL ABOUT CENTER LINES)
NOTE: H2 REBAR IS TO BE BENT AT A 3" RADIUS.

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

H2 BAR (#3 BAR)

1/2" BAR (#4, GRADE 40 MINIMUM)

1 1/2" NON-SCA PIPE FOR CONNECTION BOLTS.

TROUGH FOR BOLT REMOVAL AND INSERTION.

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.

STANDARD THREADING

1 1/4" DIAMETER SHAFT.

STANDARD USS WASHER, GR. 5.

1 1/4" HEX NUT

CONNECTION BOLT
ALTERNATE WIRE MESH REINFORCING
SCHEME FOR THE LOW-PROFILE PCB

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 A-A
TRough FOR BOLT REMOVAL
AND INSERTION.

SECTION B-B

SIDE VIEW
<table>
<thead>
<tr>
<th>Test No.</th>
<th>9901F-1</th>
<th>9901F-2</th>
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<tbody>
<tr>
<td>Vehicle Weight, lb (kg)</td>
<td>4500(2043)</td>
<td>1800(817)</td>
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<tr>
<td>Impact Speed, mph (km/hr)</td>
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<td>45.7(73.5)</td>
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<tr>
<td>Impact Angle, degrees</td>
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<tr>
<td>Exit Angle, degrees</td>
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<tr>
<td>Displacement, in (cm)</td>
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<tr>
<td>Occupant Impact Velocity</td>
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<tr>
<td>ft/s (m/s)</td>
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<td></td>
</tr>
<tr>
<td>Longitudinal</td>
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<td>11.7(3.6)</td>
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<tr>
<td>Lateral</td>
<td>16.0(4.9)</td>
<td>18.6(5.7)</td>
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<tr>
<td>Occupant Ridedown Acceleration</td>
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<tr>
<td>g/s</td>
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<td></td>
<td>11LDLW1</td>
<td>11LDEW3</td>
</tr>
</tbody>
</table>
§ 635.411

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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) Requests for waiver may be submitted by the State to the Federal Highway Administrator, whose decision on the request shall be considered administratively final.

(4) A request for a waiver which involves nationwide public interest or availability issues or more than one FHWA region may be submitted to the FHWA from the State for action.

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

(6) A request for a 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 the 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, the cost, administrative burden, and delay that would be imposed if the provision were not waived.

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


§ 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 Tables 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 that such patented or proprietary item is essential for synchronization with existing highway facilities, or that no equally suitable alternative 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 a need for purchase of more than one nonpatented, nonproprietary material, semifinished or finished article or product that will fulfill the requirements for an item of work on a project and these available materials or products are judged to be of satisfactory quality and equally acceptable, the basis of engineering analysis and the anticipated prices for the required items are estimated to be approximately the same, the PS&E for the project shall either contain or include by reference the specific materials or products that are considered acceptable for incorporation in the work. If the State highway agency wishes to substitute semifinished or finished article or product for the material or product designated by the successful bidder or bid as the lowest alternate, such substitution is made only in an increase in costs, there will be a 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 obtained, the item will be made as part of the project, unless the Division Administrator determines that the alternative material or product is equally acceptable.

(d) Appendix A sets forth the FHWA requirements regarding the specification of alternative types of culvert pipes, and 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.

§ 635.412 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 otherwise maintain the work for a specified period after its satisfactory completion by the contractor and its subcontractors may be included in contracts for Federal-aid work. 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 mechanical equipment should generally include contract clauses that require

(1) Manufacturer’s warranties on local content, power distribution, and mechanical equipment consisting of materials, which are provided as custom trade practice, or

(2) Contractors’ warranties or guaranties providing for satisfactory in-service operation of the mechanical and electrical equipment and related materials, unless such components result in a material increase in cost, 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 obtained, the item will be made as part of the project, unless the Division Administrator determines that the alternative material or product is equally acceptable.

(d) Appendix A sets forth the FHWA requirements regarding the specification of alternative types of culvert pipes, and 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.

§ 635.417 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 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 qualified prison facilities 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,