U.S. Department
of Transportation
Federal Highway
Administration

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

October 20, 1997

Refer to: HNG-14

Mr. Michael Budd
Vice President
Rockingham Precast
P.O. Box 1347
Harrisonburg, Virginia 22801

Dear Mr. Budd:

In your August 13 letter to Mr. James H. Hatton of my staff you requested Federal Highway Administration's (FHWA) acceptance of the connection design used in your precast concrete median barrier. This request was accompanied by a Texas Transportation Institute research report dated July 1997, entitled "NCHRP Report 350 Compliance Tests on Rockingham Precast Concrete Barriers," and a videotape showing the full scale testing that was done.

In reviewing this information, we noted that the tested barrier consisted of 3658-mm long, standard F shape concrete units. One end of each unit had an integral "T" shaped steel plate cast into the concrete and the opposite end contained a slotted steel tube. In addition to the steel in the connections, each unit contained three number 5 bars (number 16 metric) running the length of each segment and lapped with the number 6 (number 18 metric) bars at each end as shown in Enclosure 1. Two units are connected by lifting one unit and lowering it so that the "T" in the end of one unit slides into the slot in the tube in the end of the other unit.

Three National Cooperative Highway Research Program (NCHRP) Report 350 tests were run on a 47.55-m long installation. The first test (NCHRP Report 350 test 3-10) resulted in acceptable performance with the containment and redirection of the 820-kg car impacting at a nominal speed of 100 km/h and an angle of 20 degrees. The impact point was 10.14 m from the upstream end. Permanent deflection was 180 mm. The second test, with a 2000-kg pickup truck impacting at 100 km/h and at an angle of 25 degrees (NCHRP Report 350 test 3-11), resulted in the separation of the barrier as a result of severe damage to several of the connections. The connections were redesigned (the final design is shown in Enclosure 1) and the third test, a repeat of the 3-11 test, met all evaluation criteria. The impact point for this test was 17.26 m from the upstream end. Permanent barrier deflection was 1150 mm.

All segments w[redacted]-standing on a concrete surface and there was no deflection of the end units. Based on t[redacted]test, we suggest that the length of need for unanchored units begin a minimum of approximately 18 m upstream from the point at which the barrier is introduced and extend a similar distance beyond the end of the length of need when this system is used on high-speed routes. Summary data for the first and third tests are shown in Enclosure 2. The maximum roll, pitch, and yaw angles were 34 degrees, 15 degrees, and 13 degrees, respectively.

Based on our review of the information you submitted, we agree that the Rockingham CMB Connection as described above and used with an F-shape concrete barrier configured as tested in the passing 3-11 test satisfies the evaluation criteria for a NCHRP Report 350 test level 3 (TL-3) barrier. Thus, it may be used for temporary barrier installations on the NHS when such use is requested by a State highway agency. Since your design is patented, its use on Federal-aid projects, except exempt, non-NHS projects, is subject to the conditions listed in Title 23, Code of Federal Regulations, Section 635.411, a copy of which is enclosed as Enclosure 3.

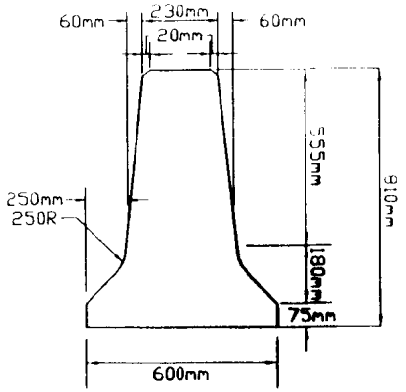
Sincerely yours,

Dwight A. Horne

Dwight A. Horne, Chief
Federal-Aid and Design Division

3 Enclosures

Geometric and Safety Design Group Acceptance Letter B-42.



END VIEW

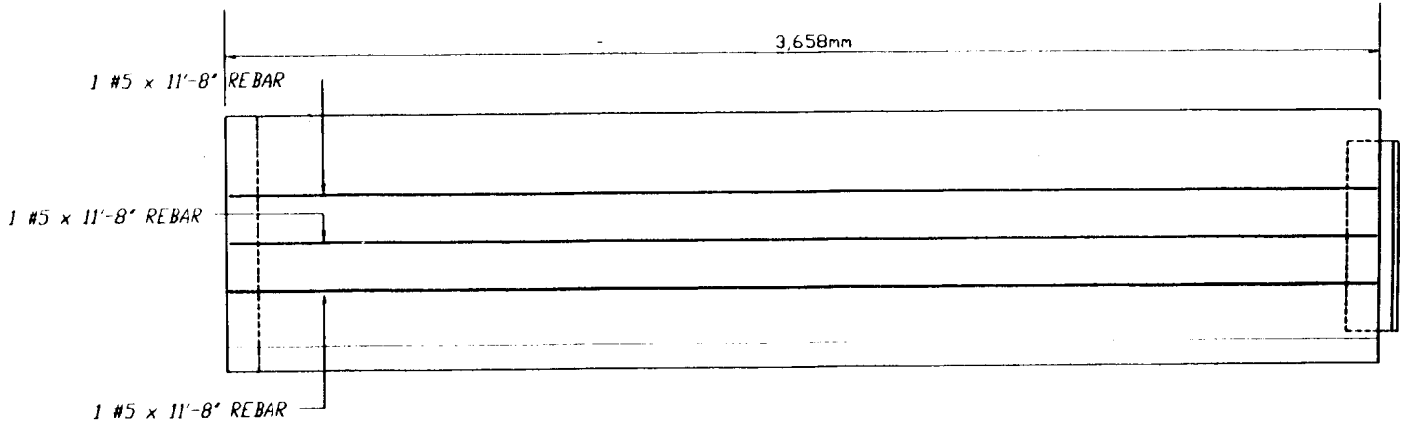
SCALE = 1/2" = 1'-0

GENERAL NOTES:

1) MINIMUM COMPRESSIVE STRENGTH OF CONCRETE AT THE AGE OF 28 DAYS (FC) SHALL BE 4,000 PSI.

2) ALL REINFORCEMENT SHALL CONFORM TO ASTM A615, GRADE 60.

(3) STANDARD BARRIER SECTIONS SHALL BE **3,658 mm** AS SHOWN. SHORTER SECTIONS SHALL BE CAST IN REQUIRED LENGTHS AS ONE UNIT. LONGER SECTIONS SHALL BE CAST TO REQUIRED DIMENSIONS IN TWO UNITS.

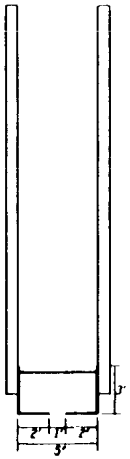


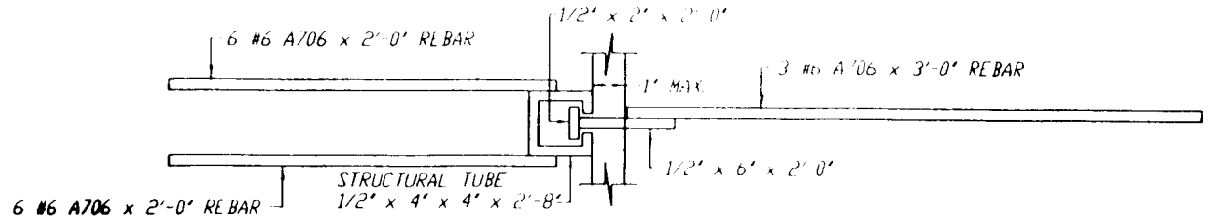
ELEVATION

SCALE = 1/2" = 1'-0

ROCKINGHAM PRECAST
P.O. BOX 1347 * HARRISONBURG, VA 22801
PHONE 540-433-8282 * FAX 540-433-8130

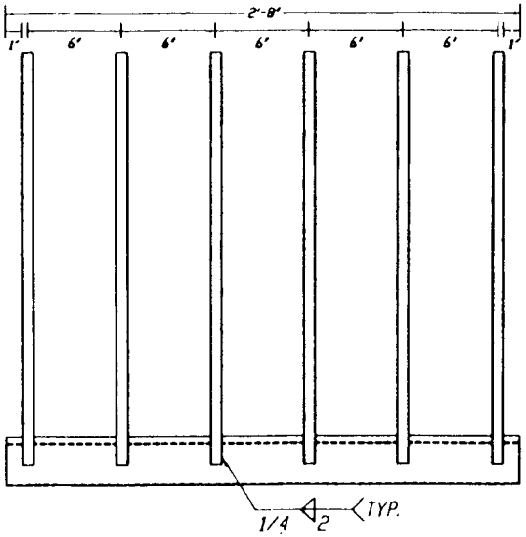
STRUCTURE	"F" SHAPED MEDIAN BARRIER
LOCATION	
DRAWN MB	DRAWING COVERS
DATE 9-30-97	CONTRACTOR

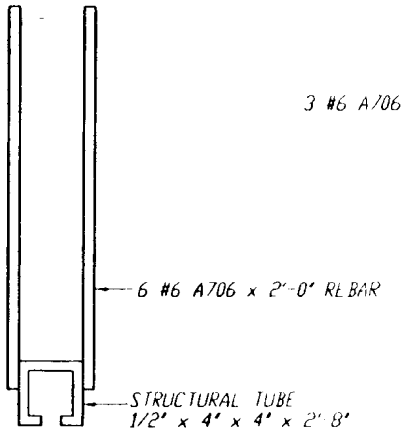




SECTION

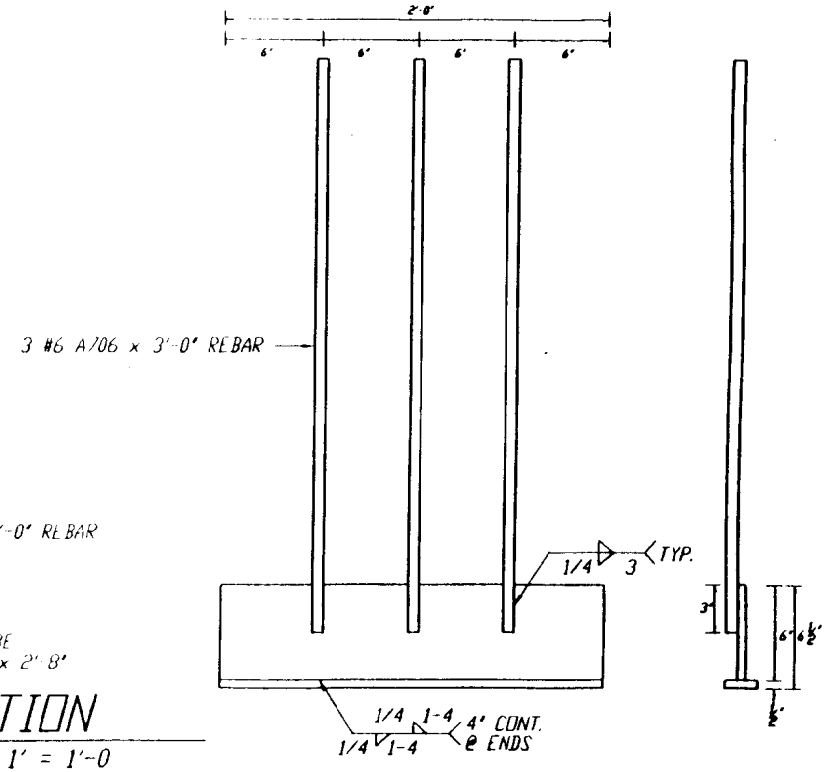
SCALE = 1" = 1'-0





SECTION

SCALE = 1" = 1'-0



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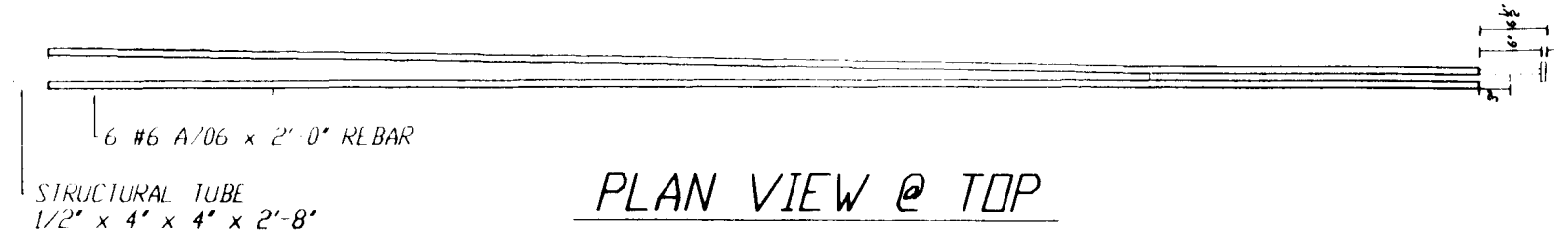
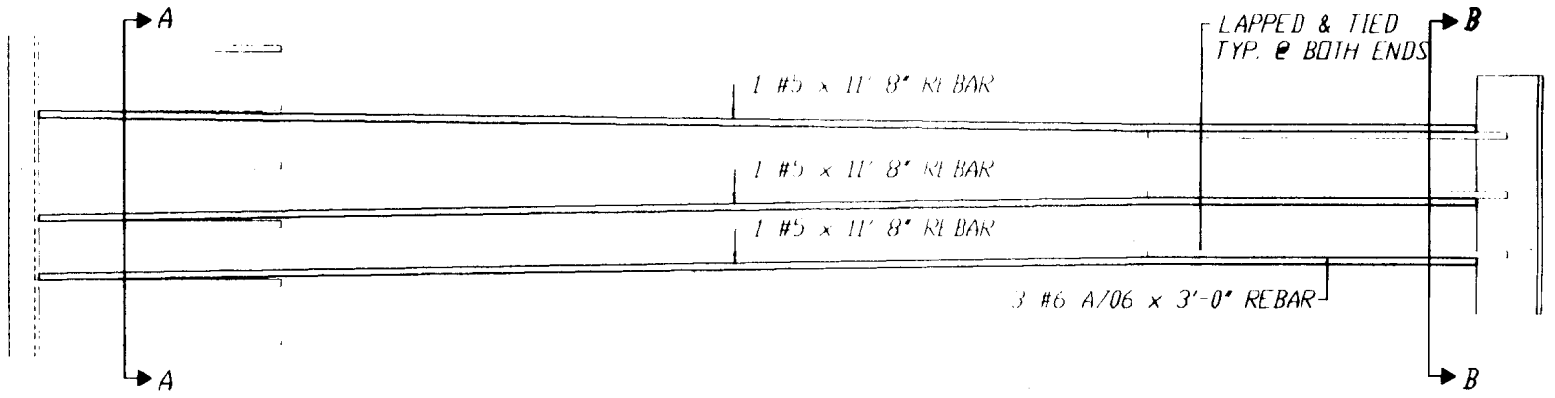
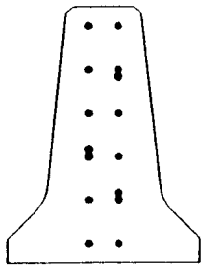
STRUCTURE	"F" SHAPED MEDIAN BARRIER
LOCATION	
DRAWN MB	DRAWING COVERS
DATE 9-30-97	CONTRACTOR



PLAN VIEW @ TOP

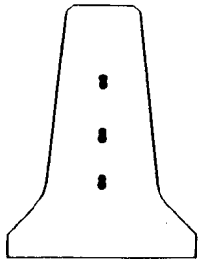


REINFORCEMENT DETAIL



SECTION A-A

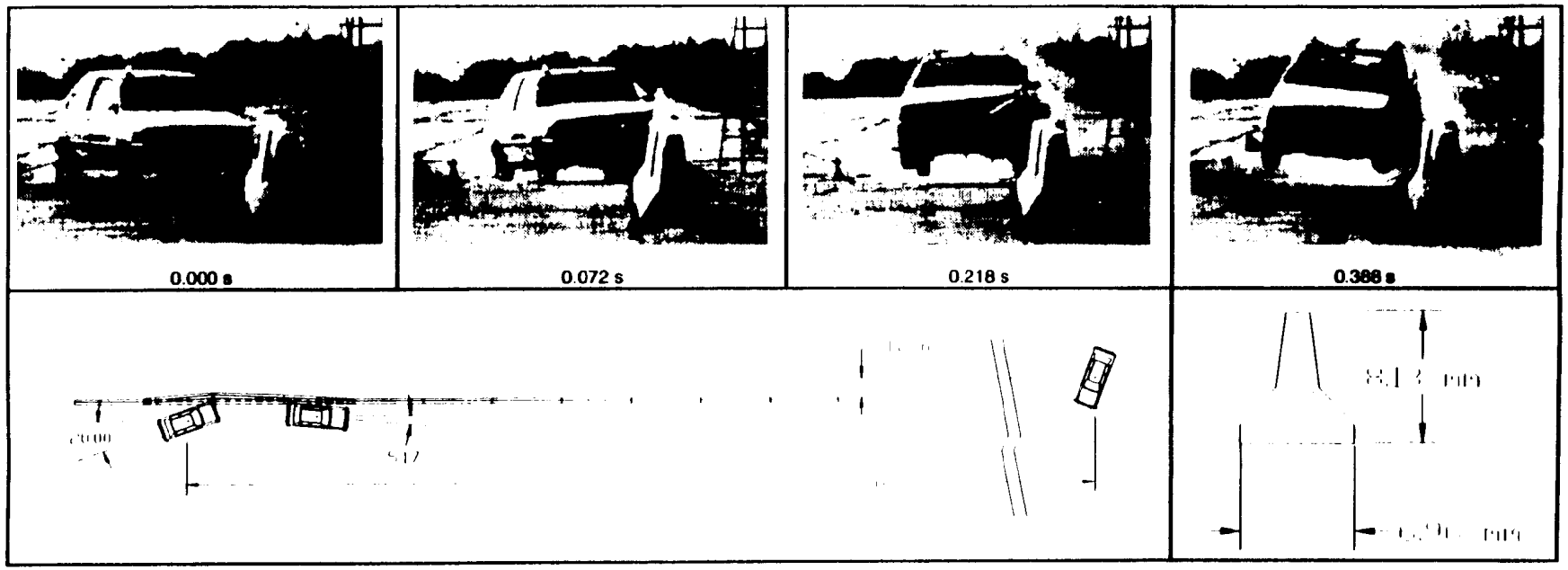
LEGEND
● = 11'-8" REBAR
⊗ = 2' AND 3' REBAR



SECTION B-B

ROCKINGHAM PRECAST
P.O. BOX 1347 * HARRISONBURG, VA 22801
PHONE 540-433-8282 * FAX 540-433-8130

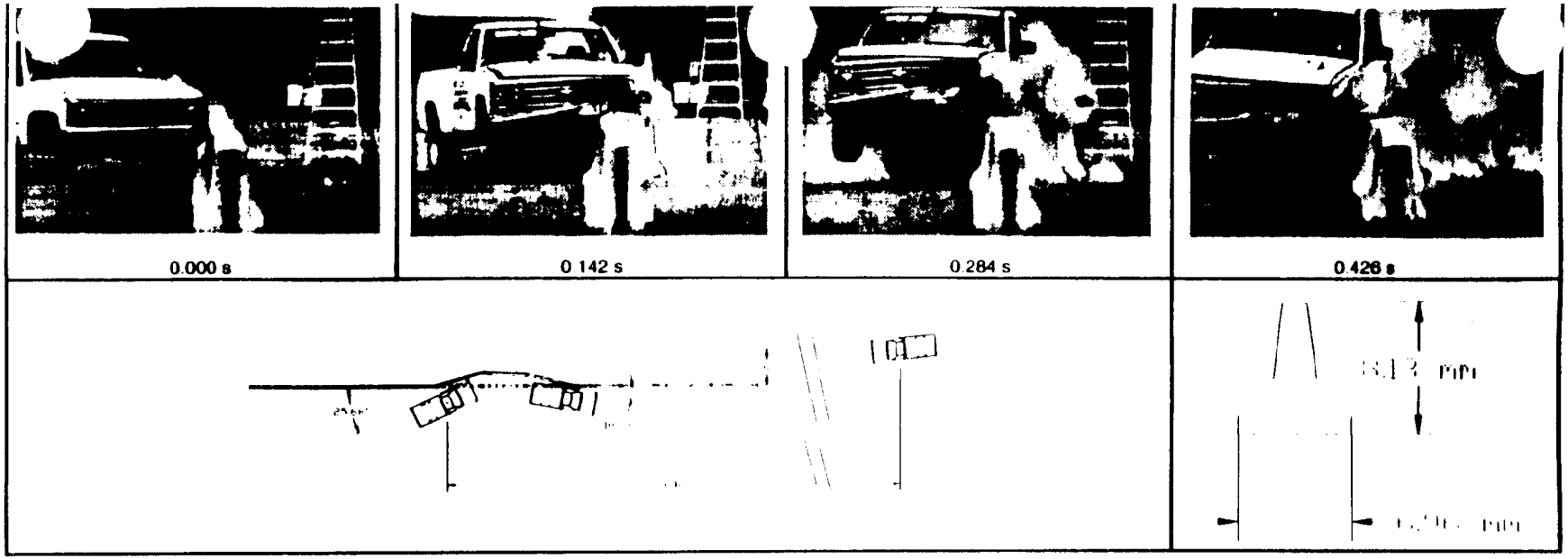
STRUCTURE	"F" SHAPED MEDIAN BARRIER
LOCATION	
DRAWN MB	DRAWING COVERS
DATE 10-13-97	CONTRACTOR



General Information		**Impact Conditions**	
Test Agency	Texas Transportation Institute	Speed (km/h)	98.11
Test No.	400001-RPC1	Angle (deg)	20.00
Date	01/22/97		
Test Article		**Exit Conditions**	
Type	Precast Concrete Median Barrier	Speed (km/h)	87.71
Manufacturer	Rockingham Precast	Angle (deg)	5.17
Installation Length (m)	3.66 each segment		
Size and/or dimension and material of key elements	813-mm high F-shape CMB segments w/"T"-shaped connection	**Occupant Risk Values**	
Soil Type and Condition	Concrete pavement, dry	Impact Velocity (m/s)	
Test Vehicle		x-direction	4.41
Type	Production	y-direction	6.38
Designation	820C	Ridedown Accelerations (g's)	
Model	1990 Ford Festiva	x-direction	-3.65
Mass (kg) Curb	824	y-direction	8.63
Test Inertial	820	Max. 0.050-s Average (g's)	
Dummy	76	x-direction	-5.81
Gross Static	896	y-direction	10.58
		z-direction	-2.55

Test Article Deflections (m)	
Dynamic	0.20
Permanent	0.18
Vehicle Damage	
Exterior	
VDS	11LFQ3
CDC	11FLEK1 & 11FLEW2
Maximum Exterior Vehicle Crush (mm)	225
Interior	
OCDI	LF0000000
Max. Occ. Compart. Deformation (mm)	29
Post-Impact Behavior (during 1.0 s after impact)	
Max. Roll Angle (deg)	-20
Max. Pitch Angle (deg)	-11
Max. Yaw Angle (deg)	29

Figure 10. Summary of results for test 400001-RPC1.



General Information		**Impact Conditions**	
Test Agency	Texas Transportation Institute	Speed (km/h)	101.87
Test No.	400001-RPC3	Angle (deg)	25.66
Date	06/17/97		
Test Article		**Exit Conditions**	
Type	Precast Concrete Median Barrier	Speed (km/h)	80.62
Manufacturer	Rockingham	Angle (deg)	10.23
Installation Length (m)	3.66 each segment		
Size and/or dimension and material of key elements	813-mm high F-shape CMB segment w/ T -shaped connection	**Occupant Risk Values**	
Soil Type and Condition	Concrete pavement, dry	Impact Velocity (m/s)	
Test Vehicle		x-direction	5.33
Type	Production	y-direction	6.97
Designation	2000P	Ridedown Accelerations (g's)	
Model	1990 Chevrolet 2500 pickup	x-direction	-5.76
Mass (kg) Curb	1979	y-direction	10.06
Test Inertial	2000	Max 0.050-s Average (g's)	
Dummy	No dummy	x-direction	-7.15
Gross Static	2000	y-direction	11.10
		z-direction	-6.35

Test Article Deflections (m)	
Dynamic	1.24
Permanent	1.15
Vehicle Damage	
Exterior	
VDS	11LFQ4
CDC	11FLEK3 & 11LFEW3
Maximum Exterior	
Vehicle Crush (mm)	410
Interior	
OCDI	FS0000000
Max. Occ. Compart. Deformation (mm)	16
Post-Impact Behavior (during 1.0 s after impact)	
Max. Roll Angle (deg)	34
Max. Pitch Angle (deg)	-15
Max. Yaw Angle (deg)	-13

Figure 16. Summary of results for test 400001-RPC3.

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. 90-229, 90 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,