

November 16, 1998

Refer to: HNG-14

Mr. David Allardyce
Mechanical Engineer
B&B Electromatic
14113 Main Street
Norwood, Louisiana 70761

Dear Mr. Allardyce:

In your August 31 letter, you presented some preliminary information on a traffic barrier gate (called the VT-6802) that you developed and tested to the National Cooperative Highway Research Program (NCHRP) Report 350 test level 2 (TL-2). You asked if the Federal Highway Administration (FHWA) would require any tests to be repeated as a result of design changes made in the course of the testing and you provided some analyses indicating that the changes would not adversely affect the results of the earlier test. I responded on September 11 by requesting additional information and a copy of the final test report.

On October 13, you sent Mr. Richard Powers of my staff a detailed analysis of the predicted affect of the design changes on the small car test and on October 28 you sent him the final crash test report from the Texas Transportation Institute. The detailed analysis predicted an occupant impact velocity of 11 m/sec and a ridedown acceleration of 17.4 G's, both values falling below the maximums recommended in Report 350. The analysis was reviewed by staff at the FHWA/NHTSA National Crash Analysis Center who concluded that the analytical methods and results appeared valid based on the assumptions used in the study. They cautioned, however, that some vehicles might not interact with all three cables due to front-end geometry and that high center of gravity vehicles could experience high pitch and roll. While the possible ranges in vehicle size and shape remain a concern for all roadside appurtenances, we have concluded that the VT-6802 as described below meets the minimum requirements for a TL-2 device.

The VT-6802 is a moveable barrier gate intended to close a roadway temporarily at a drawbridge or railroad crossing. It consists of a housing containing the electro-mechanical components that lower and raise the barrier arm. The arm is comprised of three 19-mm diameter steel cables. The top and bottom cables are set inside two 90-mm diameter Schedule 40 aluminum tubes which are connected by twenty-two 380-mm long rectangular aluminum connectors welded vertically between the upper and lower tubes. Three separate 8.5-mm diameter cables are threaded through each of these vertical connectors to join the upper, middle and lower energy absorbing 19-mm cables to hold them in place in a crash. When the gate is in its closed position, the cables and aluminum framework fit into two endlock assemblies that are bolted to concrete foundations on both sides of the roadway. The center of the lowest tube is 375 mm above the pavement surface and the center of the top tube is 730 mm above the ground when the barrier arm is down. Total gate width is 13.7 meters. Enclosure 1 is a schematic drawing of the final design.

Crash test details on the VT-6802 were contained in the Texas Transportation Institute October 1998 report, "NCHRP REPORT 350 TESTING OF THE MODIFIED VT-6802 TRAFFIC BARRIER GATE" by Menges and Buth. Enclosure 2 contains the summary sheets of the two tests which were submitted for our review. The primary modifications between the 820C test and the 2000P test were the increase in primary cable size (from 16-mm diameter to 19-mm diameter), the use of additional vertical connectors at a closer spacing, and the addition of an endlock assembly at the housing side of the gate to reduce damage to this housing in the event of a crash. As noted above, we will accept your analysis that these modifications would not significantly change the outcome of the small car test.

Based on our review, we conclude that the VT-6802 traffic barrier gate, as designed and tested with the 2000-kg pickup truck, meets the evaluation criteria for an NCHRP Report 350 TL-2 attenuator and may be used at selected sites on the National Highway System (NHS) when such use is requested by the appropriate highway authority. This acceptance is based on the demonstrated crash worthiness of the device and is not intended to address the operational aspects of the VT-6802 or its compliance with the Manual on Uniform Traffic Control Devices. The endlock assemblies and the housing assembly are fixed objects that will usually require shielding. Since the VT-6802 is a proprietary device, its use on Federal-aid projects, except exempt non-NHS projects, is subject to the conditions noted in Title 23, Code of Federal Regulations, Section 635.411, a copy of which is enclosed for your ready reference (Enclosure 3). Please call Mr. Richard Powers of my staff at (202) 366-1320 if you need any additional information.

Sincerely yours,

(original signed by Dwight A. Horne)

Dwight Horne
Chief, Federal-Aid and Design Division

3 Enclosures
Acceptance letter CC-55

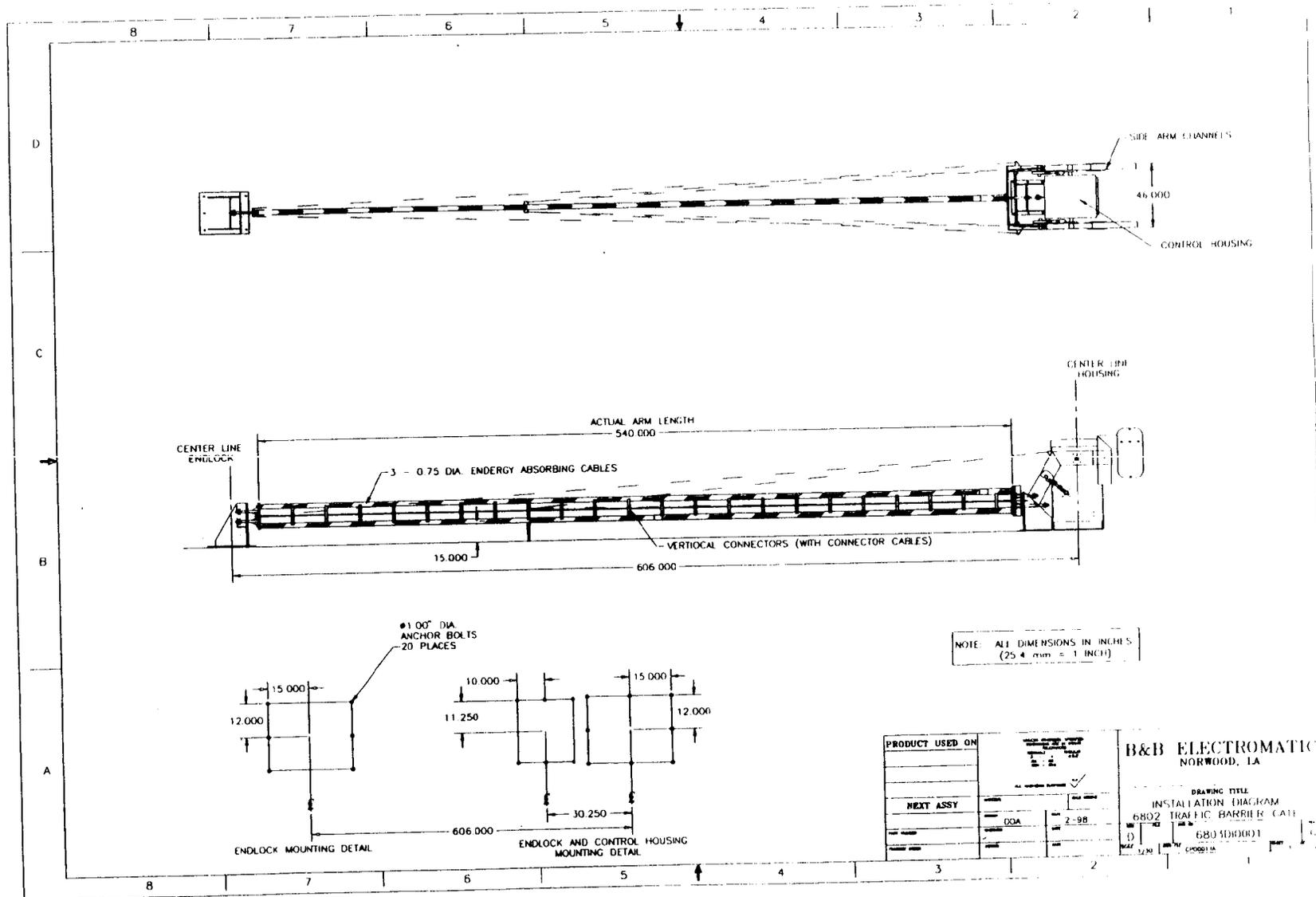
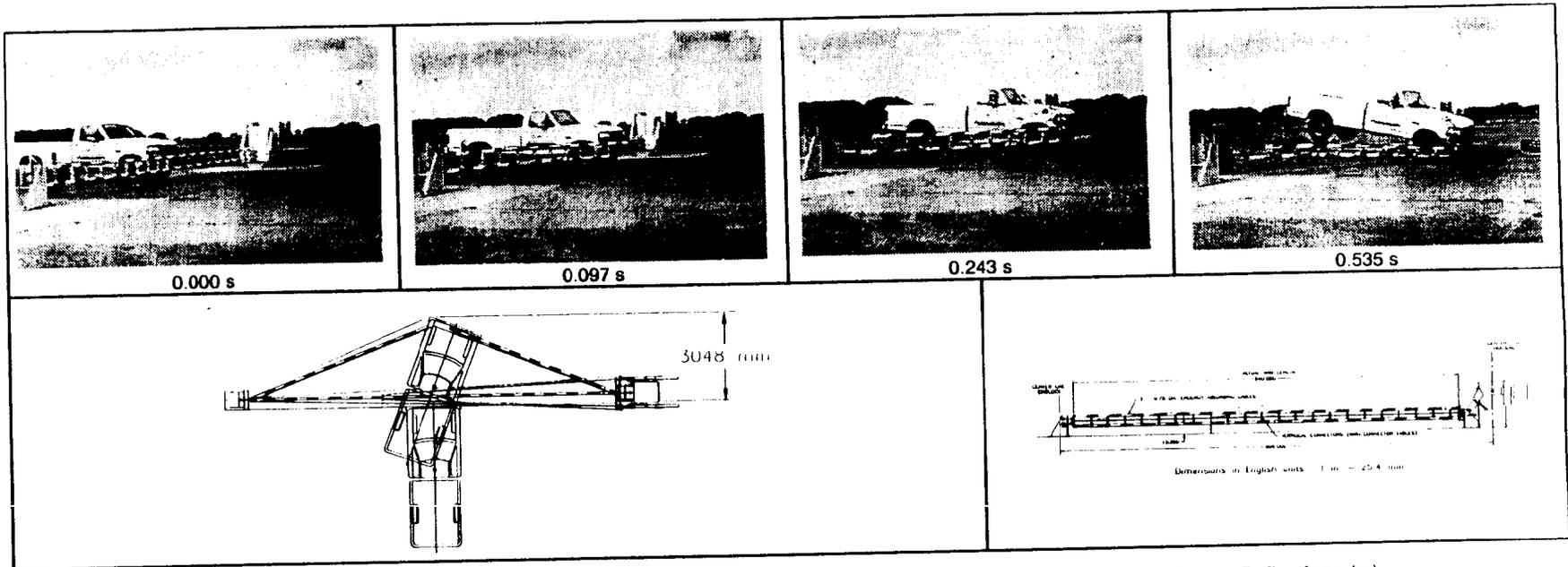


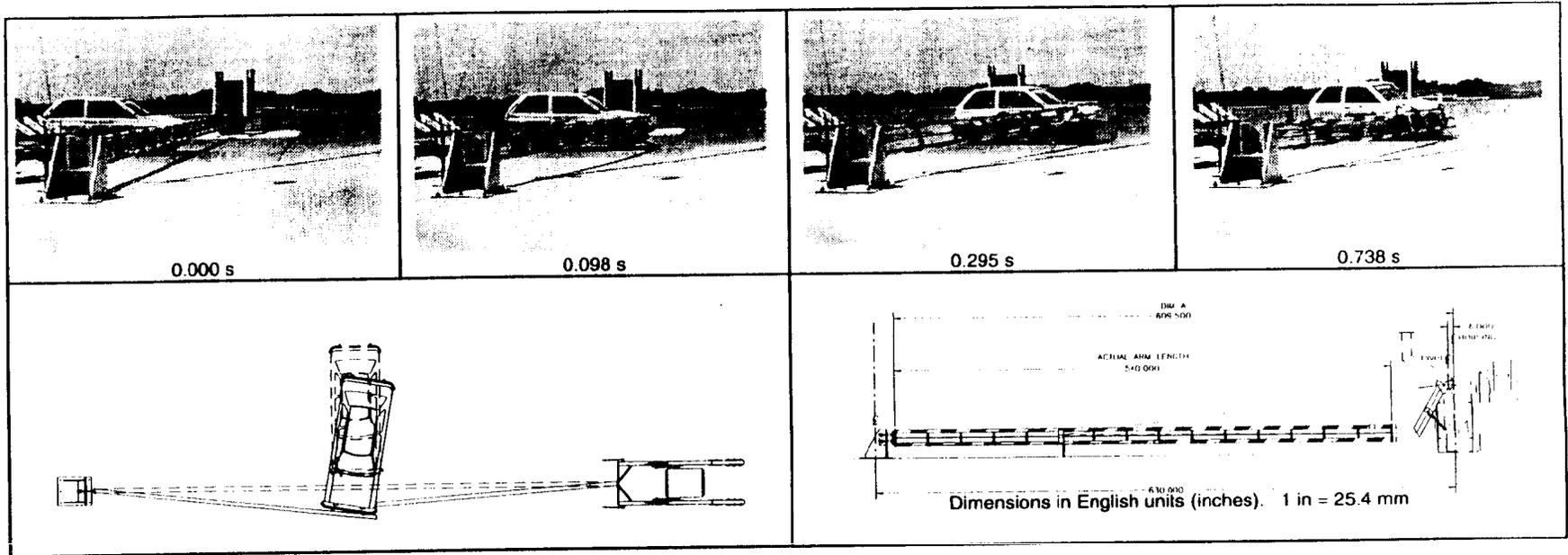
Figure 3. Details of the modified VT-6802 traffic barrier gate.



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General Information		Impact Conditions		Test Article Deflections (m)	
Test Agency	Texas Transportation Institute	Speed (km/h)	71.0	Dynamic	3.94
Test No.	400001-BBE7	Angle (deg)	90	Permanent	3.05
Date	08/04/98	Exit Conditions		Vehicle Damage	
Test Article		Speed (km/h)	Stopped	Exterior	
Type	Traffic Control Device	Angle (deg)	N/A	VDS	12FD2
Name or Manufacturer	B&B Electromatic	Occupant Risk Values		CDC	12FDEW2
Installation Length (m)	15.4	Impact Velocity (m/s)		Maximum Exterior	
Material or Key Elements	Two 13.7 m Long Cable/Tubing Barrier Arms	x-direction	9.2	Vehicle Crush (mm)	180
Soil Type and Condition	Concrete Pavement, Dry	y-direction	2.2	Interior	
Test Vehicle		THIV (km/h)	32.8	OCDI	FS0000000
Type	Production	Ridedown Accelerations (g's)		Max. Occ. Compart.	
Designation	2000P	x-direction	-13.3	Deformation (mm)	28
Model	1992 Ford F-250 pickup truck	y-direction	-3.4	Post-Impact Behavior	
Mass (kg)		PHD (g's)	13.7	(during 1.0 s after impact)	
Curb	2064	ASI	0.87	Max. Yaw Angle (deg)	11
Test Inertial	2000	Max. 0.050-s Average (g's)		Max. Pitch Angle (deg)	-9
Dummy	No dummy	x-direction	-10.4	Max. Roll Angle (deg)	8
Gross Static	2000	y-direction	-2.1		
		z-direction	-1.7		

Figure 15. Summary of Results for test 400001-BBE7, NCHRP Report 350 test 2-41.



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General Information	
Test Agency	Texas Transportation Institute
Test No.	400001-BBE3
Date	08/19/97
Test Article	
Type	Traffic barrier gate
Name or Manufacturer	B&B Electromatic X-97
Installation Length (m)	16.0
Size and/or dimension and material of key elements	Two 13.7 m long cable/tubing barrier arms
Soil Type and Condition	Concrete Pavement, dry
Test Vehicle	
Type	Production
Designation	820C
Model	1992 Ford Festiva
Mass (kg) Curb	805
Test Inertial	820
Dummy	76
Gross Static	896

Impact Conditions	
Speed (km/h)	69.93
Angle (deg)	90.0
Exit Conditions	
Speed (km/h)	stopped
Angle (deg)	29.77
Occupant Risk Values	
Impact Velocity (m/s)	
x-direction	8.48
y-direction	1.55
Ridedown Accelerations (g's)	
x-direction	-11.46
y-direction	-3.12
Max. 0.050-s Average (g's)	
x-direction	-10.63
y-direction	-1.55
z-direction	0.93

Test Article Deflections (m)		
Dynamic	2.90	
Permanent	2.90	
Vehicle Damage		
Exterior		
VDS	12FD2	
CDC	12FDEW2	
Maximum Exterior		
Vehicle Crush (mm)	215	
Interior		
OCDI	FS0000000	
Max. Occ. Compart. Deformation (mm)		0
Post-Impact Behavior		
(during 1.0 s after impact)		
Max. Roll Angle (deg)	-2.7	
Max. Pitch Angle (deg)	4.6	
Max. Yaw Angle (deg)	30.3	

Figure 36. Summary of results for test 400001-BBE3.

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.

(3) A request for waiver, accompanied by supporting information, must be submitted in writing to the Regional Federal Highway Administrator (RPHWA) 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 RPHWA 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 RPHWA 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 RPHWA 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. 96-229, 96 Stat. 55, sec. 105 of Pub. L. 97-424, 96 Stat. 2136 and 49 CFR 1.404b)

(48 FR 53104, Nov. 25, 1983, as amended at 49 FR 16821, 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

Federal Highway Administration, DOT

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,