



U.S. Department  
of Transportation  
**Federal Highway  
Administration**

January 23, 2007

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

In Reply Refer To:  
HSSD/SS-144

Mr. Bryan Reeves  
ARC Technologies, LLC  
966 Liledoun Road  
Taylorsville, NC 28681

Dear Mr. Reeves:

Thank you for your mail correspondence of August 18, 2006, requesting the Federal Highway Administration (FHWA) acceptance of your company's simulated stone mailbox columns for use on the National Highway System (NHS). Accompanying your letter was a report on testing of this roadside hardware conducted by the Texas Transportation Institute, test videos and digital photographs. You requested that we find it acceptable for use on the NHS under the provisions of the National Cooperative Highway Research Program (NCHRP) Report 350 "Recommended Procedures for the Safety Performance Evaluation of Highway Features."

### **Requirements**

Mailbox supports should meet the guidelines contained in the NCHRP Report 350, "Recommended Procedures for the Safety Performance Evaluation of Highway Features". The FHWA memorandum "ACTION: Identifying Acceptable Highway Safety Features" of July 25, 1997, provides further guidance on crash testing of breakaway supports.

### **Product description**

The ARC simulated stone mailbox column for use on the NHS is fabricated as a hollow, one-piece rotational casting. The hardened shell or wall of the column has a thickness that ranges from 0.19 in. (4.8 mm) to 0.38 in. (9.7 mm) and is comprised of two layers or coats. The first coat or face mix, which has a thickness ranging from 0.09 in. (2.3 mm) to 0.19 in. (4.8 mm), consists of gypsum, sand, liquid and dry resin, hardener, accelerator, and pigment. The second coat or back-up mix is comprised of a two-component polyurethane and has a thickness ranging from 0.09 in. (2.3 mm) to 0.19 in. (4.8 mm). The exterior surface of the column is molded to resemble stone masonry construction.

The column measures 20 in. x 20 in. x 62 in. tall (508 mm x 508 mm x 1575 mm). The upper cap of the mailbox column measures 24 in. x 24 in. (610 mm x 610 mm). A U.S. Postmaster approved T2 mailbox measuring 21 in. long x 8 in. wide x 10.5 in. high (533 mm x 203 mm x 267 mm) is cast into the column at a height of 40 in. (1016 mm) to the bottom of the mailbox. A 6 in. (152 mm) diameter x 16.5 in. (419 mm) long plastic newspaper tube is also cast into the



mailbox column at a height of 30 in. (762 mm) to the bottom of the tube. The upper two thirds of the hollow simulated stone column is backfilled with two-part Instapak FlowRite™ foam that has a molded density of 1.0-1.4 lb/ft<sup>3</sup> (16.0-22.4 kg/m<sup>3</sup>).

### **Test article installation**

In tests, the ARC simulated stone mailbox column was installed on precast concrete foundation pad measuring 24 in. x 24 in. x 2.5 in. thick (610 mm x 610 mm x 64 mm) and weighing 64 lb (29 kg) placed level to and flush with the surrounding ground. The pad was secured in place by driving two 0.38 in. (9.7 mm) diameter x 18 in. (457 mm) long anchoring spikes into the ground through precast holes. The bottom shell of the mailbox column was secured to the top surface of the concrete foundation pad through liberal application of Liquid Nail™ adhesive. The pattern use for the adhesive included a line around the perimeter of the mailbox column and several lines extending radially outward from the center to the outer edges of the column.

### **Testing**

Full-scale automobile testing which included the NCHRP report 350 Test 3-60 (low-speed test) and the NCHRP Report 350 Test 3-61 (high speed test) was conducted on your company's mailbox column. The complete device as tested is shown in the enclosed drawing. The NCHRP Report 350 test 3-60 involved an 820 kg passenger car (820C) impacting the mailbox column head-on with the left quarter point of the vehicle aligned with the centerline of the mailbox column at a nominal impact speed and angle of 35 km/h and 0 degrees, respectively. The NCHRP Report 350 test 3-61 involved an 820 kg passenger car (820C) impacting the mailbox column head-on with the right quarter point of the vehicle aligned with the centerline of the mailbox column at a nominal impact speed and angle of 100 km/h and 0 degrees, respectively.

### **Findings**

In the low-speed test, the simulated stone mailbox column yielded to the vehicle by breaking apart at the base. The largest fragment, which weighed 75 lb (34.0 kg), rode up the windshield (which shattered) and over the top of the vehicle. The fragment did not penetrate or show potential for penetrating the occupant compartment, nor to present hazard to others in the area. No occupant compartment deformation occurred. The vehicle remained upright during and after the impact. Occupant risk factors were within the preferred limits. The vehicle did not intrude into adjacent traffic lanes, as it traveled through the test site and came to rest 103 ft (31.4 m) behind the point of impact. The summary of test results is enclosed.

In the high-speed test, the simulated stone mailbox column yielded to the vehicle by breaking apart at the base. The largest piece weighed 53 lb (24.0 kg), rode up the windshield (which shattered) and over the top of the vehicle. The fragment did not penetrate or show potential for penetrating the occupant compartment, nor to present hazard to others in the area. Occupant compartment deformation was 3.5 in. (91 mm) in the roof area over the right front seat, which is less than the maximum acceptable roof crush criterion for breakaway support structures of 5 in. (127 mm) as established by the FHWA. The vehicle remained upright during and after the collision event. Occupant risk factors were within the preferred limits. The vehicle did not intrude into adjacent traffic lanes, as it traveled through the test site and came to rest 370 ft (113 m) behind the point of impact and 11.8 ft (3.6 m) to the left of centerline. The summary of test results is enclosed.

The results of testing met the FHWA requirements and, therefore, the ARC simulated stone mailbox column described above and shown in the enclosed drawings for reference is acceptable for use as the NCHRP Report 350 Test Level 3 device on the NHS, when selected by the contracting authority, subject to the provisions of Title 23, Code of Federal Regulations, Section 635.411 as they pertain to proprietary products.

### **Standard provisions**

Please note the following standard provisions that apply to the FHWA letters of acceptance:

- Our acceptance is limited to the crashworthiness characteristics of the devices and does not cover their structural features, nor conformity with the MUTCD.
- Any changes that may adversely influence the crashworthiness of the device will require a new acceptance letter.
- Should the FHWA discover that the qualification testing was flawed, that in-service performance reveals unacceptable safety problems, or that the device being marketed is significantly different from the version that was crash tested, it reserves the right to modify or revoke its acceptance.
- You will be expected to supply potential users with sufficient information on design and installation requirements to ensure proper performance.
- You will be expected to certify to potential users that the hardware furnished has essentially the same chemistry, mechanical properties, and geometry as that submitted for acceptance, and that they will meet the crashworthiness requirements of the FHWA and the NCHRP Report 350.
- To prevent misunderstanding by others, this letter of acceptance, designated as number SS-144 shall not be reproduced except in full. As this letter and the documentation which support it become public information, it will be available for inspection at our office by interested parties.
- The "ARC Simulated Stone Mailbox Column" is a patented product and is considered "proprietary". The use of proprietary devices specified on Federal-aid projects, except exempt, non-NHS projects: (a) must be supplied through competitive bidding with equally suitable unpatented items; (b) the highway agency must certify that they are essential for synchronization with existing highway facilities or that no equally suitable alternative exists or; (c) they must be used for research or for a distinctive type of construction on relatively short sections of road for experimental purposes. Our regulations concerning proprietary products are contained in Title 23, Code of Federal Regulations, Section 635.411, a copy of which is enclosed.

Sincerely yours,

*/original signed by/*

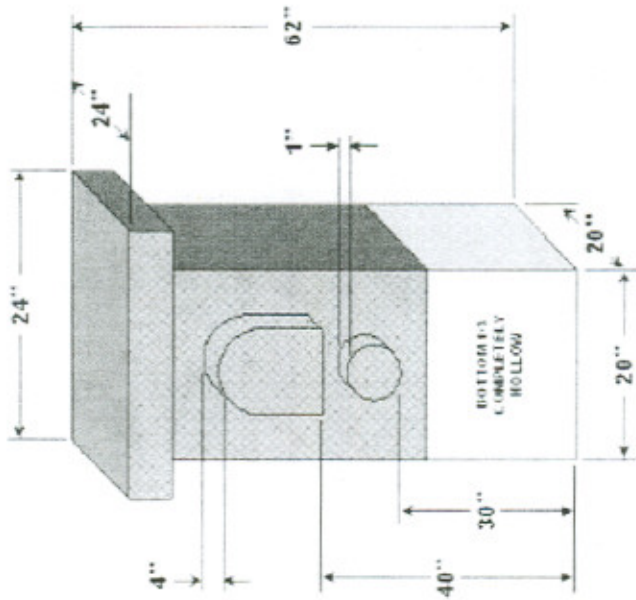
John R. Baxter, P.E.  
Director, Office of Safety Design  
Office of Safety

Enclosure

FHWA:HSSD:NArtimovich:tb:x61331:1/18/07

File: s://directory folder/nartimovich/SS144-ARCSimStoneMailboxFIN.doc

cc: HSSD (Reader, HSA; Chron File, HSSD; NArtimovich, HSSD;  
MMcDonough, HSSD)



Wall Thickness

1" Coat (Form WG) - 5/32" - 5/16"

2" Coat (Polystyrene) - 5/32" - 5/16"

Overall - 5/16" - 5/8"

Foam Backfill Upper 2/3 of Column  
(Indicated by shaded area in drawing)

Total Column Weight 95 - 100 lbs.

**ARC Technologies LLC**

566 Lilledoun Road • Taylorsville, NC 28681  
Phone: (828) 635-7200 • Fax: (828) 635-7555

Title:

Simulated Stone Mailbox Column

Date:

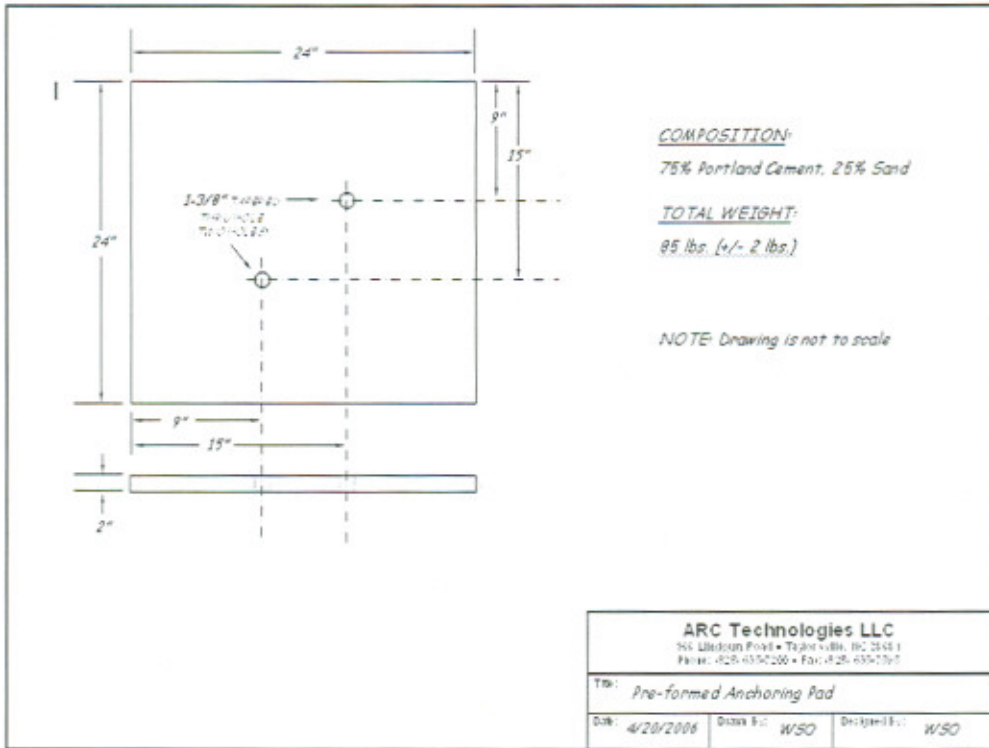
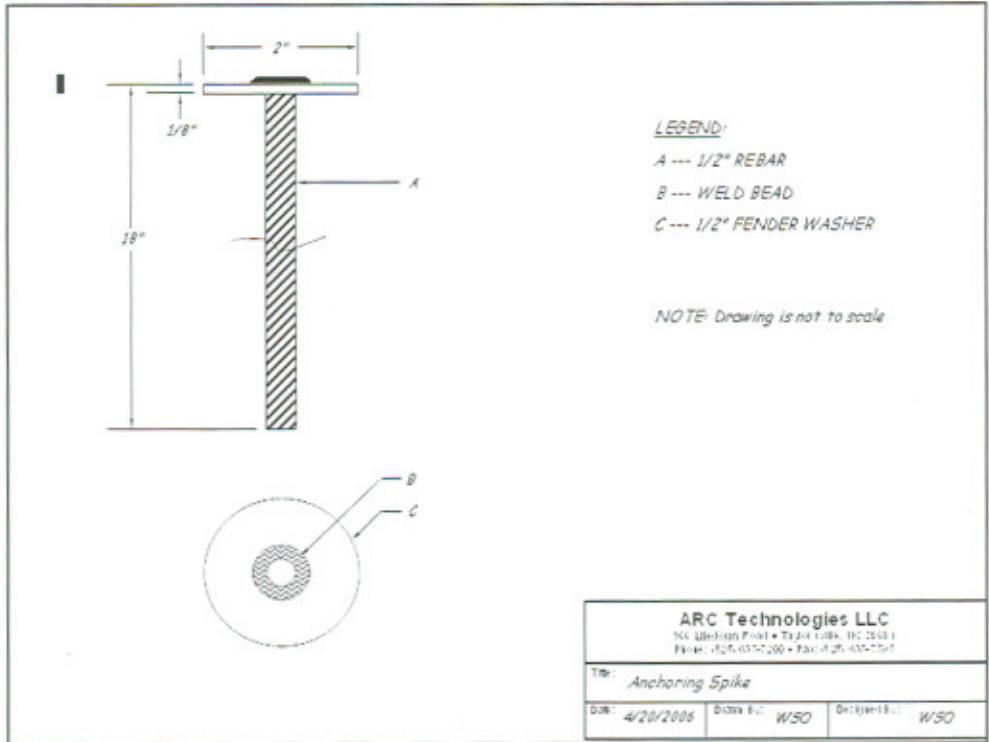
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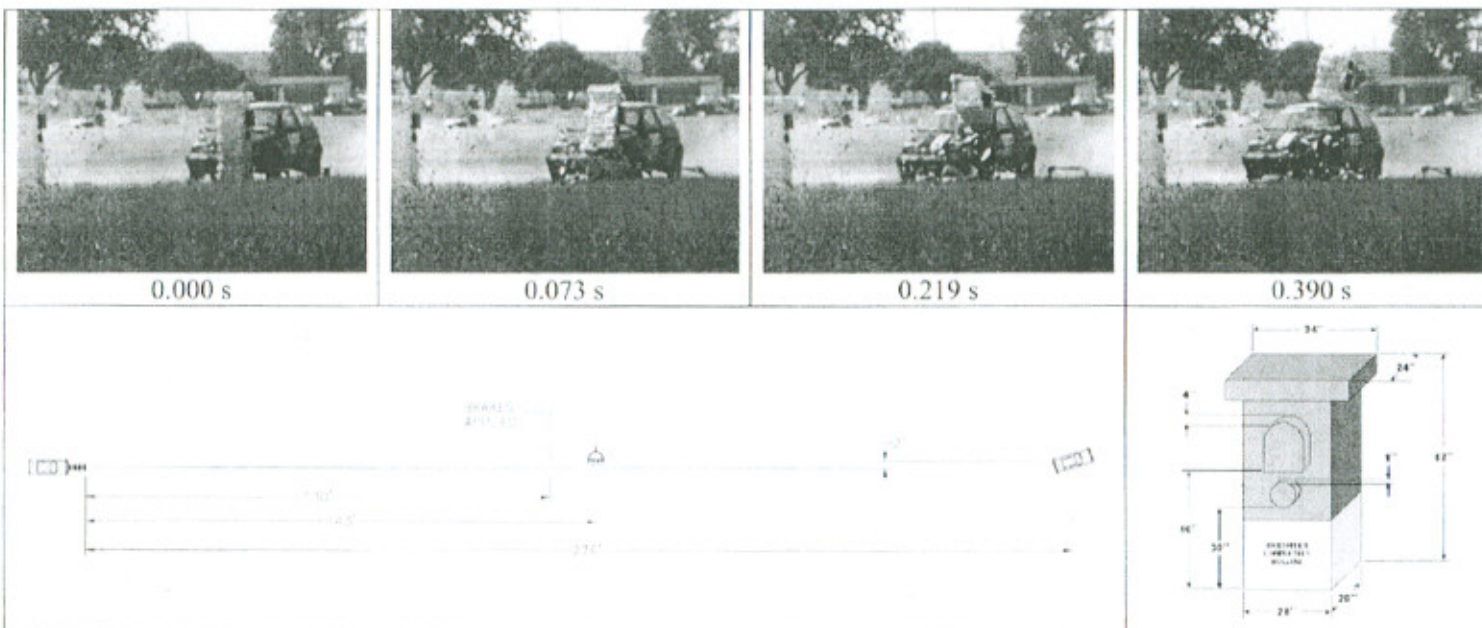
Drawn By:

WSO

Designed By:

WSO





**General Information**

Test Agency..... Texas Transportation Institute  
 Test No. .... 400001-ARC1  
 Date..... 06-08-2006

**Test Article**

Type..... Mailbox  
 Name ..... Simulated Stone Mailbox Column  
 Installation Height (m)..... 1.57  
 Material or Key Elements ..... Composite Shell; Lower Portion Hollow;  
 Foam Backfill in Upper Two Thirds

**Soil Type and Condition**

Standard Soil, Dry

**Test Vehicle**

Type..... Production  
 Designation..... 820C  
 Model ..... 1996 Geo Metro  
 Mass (kg)  
 Curb..... 805  
 Test Inertial..... 820  
 Dummy ..... 77  
 Gross Static..... 897

**Impact Conditions**

Speed (km/h) ..... 34.5  
 Angle (deg) ..... 0

**Exit Conditions**

Speed (km/h) ..... 32.1  
 Angle (deg) ..... 0

**Occupant Risk Values**

Impact Velocity (m/s)  
 Longitudinal ..... 1.2  
 Lateral ..... 0.1  
 THIV (km/h) ..... 4.5  
 Ridedown Accelerations (g's)  
 Longitudinal ..... -0.3  
 Lateral ..... 0.3  
 PHD (g's) ..... 0.4  
 ASI ..... 0.06  
 Max. 0.050-s Average (g's)  
 Longitudinal ..... -0.7  
 Lateral ..... 0.2  
 Vertical ..... 0.4

**Test Article Debris Scatter (m)**

Longitudinal ..... 7.6  
 Lateral ..... 3.2

**Vehicle Damage**

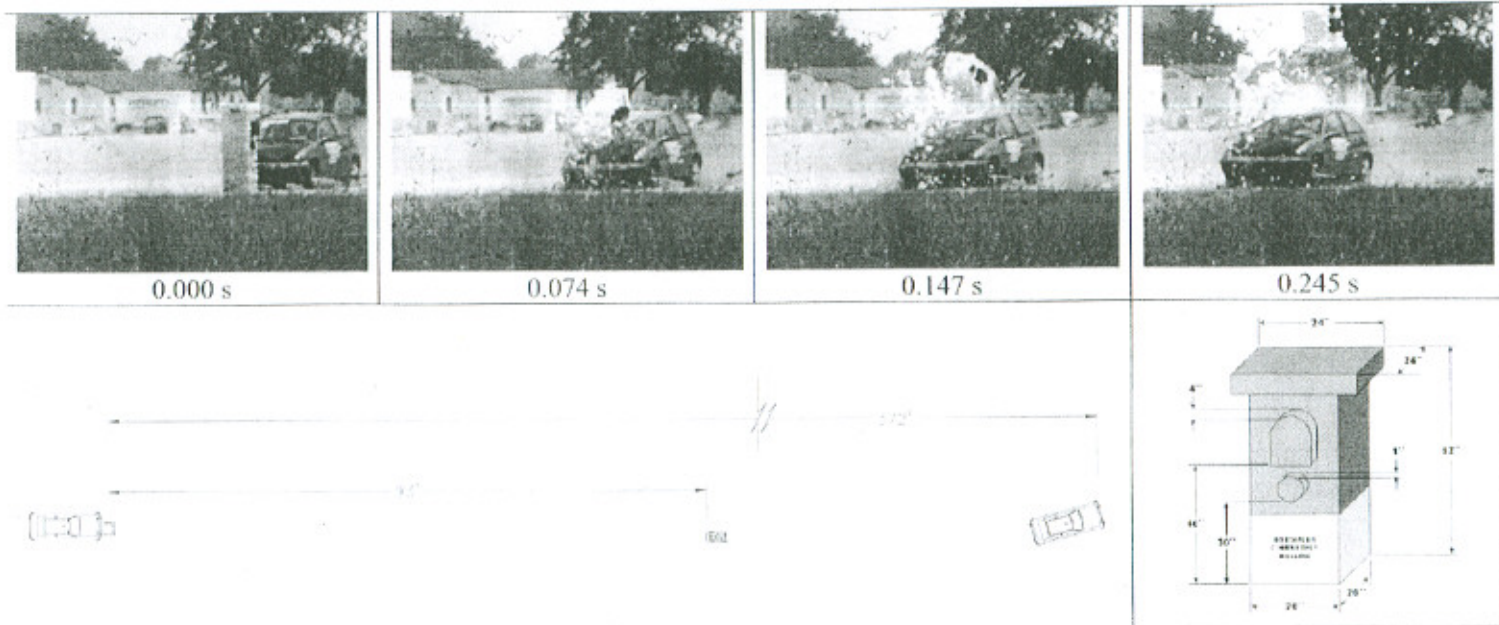
Exterior  
 VDS..... 12FL1  
 CDC ..... 12FLAN1  
 Max. Exterior  
 Vehicle Crush (mm) ..... 0  
 Interior  
 OCCDI ..... FS0000000  
 Max. Occupant Compartment  
 Deformation (mm) ..... 0

**Post-Impact Behavior**

(during 1.0 sec after impact)  
 Max. Yaw Angle (deg) ..... -1  
 Max. Pitch Angle (deg) ..... 1  
 Max. Roll Angle (deg) ..... -1

Summary of results for *NCHRP Report 350* test 3-60 on the simulated stone mailbox column.





<b>General Information</b>		<b>Impact Conditions</b>		<b>Test Article Debris Scatter (m)</b>	
Test Agency.....	Texas Transportation Institute	Speed (km/h) .....	99.6	Longitudinal .....	28.3
Test No .....	400001-ARC2	Angle (deg) .....	0	Lateral .....	7.62
Date .....	06-08-2006	<b>Exit Conditions</b>		<b>Vehicle Damage</b>	
<b>Test Article</b>		Speed (km/h) .....	96.0	Exterior	
Type .....	Mailbox	Angle (deg) .....	0	VDS .....	12FR2
Name .....	Simulated Stone Mailbox Column	<b>Occupant Risk Values</b>		CDC .....	12FRAN2
Installation Length (m) .....	1.57	Impact Velocity (m/s)		Max. Exterior	
Material or Key Elements .....	Composite Shell; Lower Portion Hollow; Foam Backfill in Upper Two Thirds	Longitudinal .....	1.4	Vehicle Crush (mm) .....	60
<b>Soil Type and Condition</b> .....		Lateral .....	1.2	Interior	
Standard Soil, Dry		THIV (km/h) .....	6.7	OCDI .....	RF0200000
<b>Test Vehicle</b>		Ridedown Accelerations (g's)		Max. Occupant Compartment	
Type .....	Production	Longitudinal .....	-0.4	Deformation (mm) .....	91
Designation .....	820C	Lateral .....	0.6	<b>Post-Impact Behavior</b>	
Model .....	1995 Geo Metro	PHD (g's) .....	0.6	(during 1.0 sec after impact)	
Mass (kg)		ASI .....	0.13	Max. Yaw Angle (deg) .....	6
Curb .....	796	Max. 0.050-s Average (g's)		Max. Pitch Angle (deg) .....	2
Test Inertial .....	820	Longitudinal .....	-1.5	Max. Roll Angle (deg) .....	-2
Dummy .....	77	Lateral .....	0.6		
Gross Static .....	897	Vertical .....	-1.1		

Summary of results for NCHRP Report 350 test 3-61 on the simulated stone mailbox column.



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.