



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

1200 New Jersey Ave., S.E.  
Washington, DC 20590

August 20, 2007

In Reply Refer To:  
HSSD/LS-64 (REVISED)

Mr. Ray Minor  
HAPCO  
26252 Hillman Highway  
Abingdon, VA 24210

Dear Mr. Minor:

Your letter March 20, 2007, requests the Federal Highway Administration (FHWA) to revise our acceptance issued for your company's HAPCO cast base assemblies for decorative lighting poles for use on the National Highway System (NHS) under the provisions of National Cooperative Highway Research Program (NCHRP) Report 350 "Recommended Procedures for the Safety Performance Evaluation of Highway Features." Accompanying your most recent correspondence was a revised report on testing of your system conducted by the Texas Transportation Institute (TTI). This letter revises our previous letter, LS-64, to include updated cast base assembly model numbers and includes the consideration of a cast base that was retested and redesigned.

### **Requirements**

Luminaire 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 luminaire supports and on use of low-speed pendulum tests as a surrogate for full-scale crash testing.

### **Product description**

The following four HAPCO Decorative Lighting Pole Bases were tested at the TTI outdoor pendulum testing facility.

1) *HAPCO A73704 Cast Base Assembly for a Decorative Lighting Pole.* The base of the lighting pole was cast aluminum (alloy 356-T6) with a 11.5 inch (292 mm) square base going into an octagonal shape and then tapering to a fluted base for a base height of 3 ft-7-1/4 inches (1.1 m). Atop this was a 5 inch (127 mm) diameter straight aluminum tube (Alloy 6063-T6) with 0.188 inch (4.8 mm) wall thickness and a length of 16 ft-4-3/4 inches (5 m), giving a total height of 20 ft (6.1 m). A cast aluminum adapter ring was placed on top of the pole to accommodate

**AMERICAN  
ECONOMY**

the round light. The weight of the pole with base was 86.8 pounds (39.4 kg) and the round light was 23.8 pounds (10.8 kg), totaling a weight of 110.6 pounds (50.2 kg). The base was attached to a steel reaction plate with 1/2 inch (12.7 mm) steel anchor bolts, hex nuts, lock washers, and flat washers. Drawings of the HAPCO A73704 cast base assembly and the A88869 test pole are enclosed.

2) *HAPCO A76696 Cast Base Assembly for a Decorative Lighting Pole.* The base of the lighting pole was cast aluminum (alloy 356-T6) with a 17 inch round base (432 mm) tapering to a fluted shape for a base height of 20-1/4 inches (514 mm). A 5.8 inch (147 mm) diameter tapering to a 3 inch (76 mm) diameter aluminum tube (alloy 6063-T6) with a 0.125 inch (3.2 mm) wall thickness and a length of 18 ft-3-3/4 inches (5.6 m) was welded to the base, giving a total height of 20 ft (6.1 m). A cast aluminum adapter ring was placed on top of the pole to accommodate the round light. The weight of the pole with the base was 91.0 pounds (41.3 kg) and the round light was 23.8 pounds (10.8 kg), totaling a weight of 114.8 pounds (52.1 kg). The base was attached to a steel reaction plate with 3/4 inch (19 mm) steel anchor bolts, hex nuts, lock washers and flat washers. Drawings of the HAPCO A76696 cast base assembly and the B88870 test pole are enclosed.

3) *HAPCO A79419 Cast Base Assembly for a Decorative Lighting Pole.* The base of the lighting pole was cast aluminum (alloy 356-T6) with a 17 inch round base (432 mm) tapering to a fluted shape for a base height of 30-3/4 inches (0.78 m). A 6 inch (152 mm) diameter tapering to 3 inch (76 mm) diameter aluminum tube (alloy 6063-T6) with 0.188 inch (4.8 mm) wall thickness and a length of 17 ft-5-1/4 inches (5.3 m) was welded to the base, giving a total height of 20 ft (6.1 m). A cast aluminum adapter ring was placed on top of the pole to accommodate the round light. The weight of the pole with base was 110.2 pounds (50 kg) and the round light was 23.8 pounds (10.8 kg), totaling a weight of 134.0 pounds (60.8 kg). The base was attached to a steel reaction plate with 3/4 inch (19 mm) steel anchor bolts, hex nuts, lock washers and flat washers. Drawings of the HAPCO A79419 cast base assembly and the A88871 test pole are enclosed.

4) *HAPCO A78284 Cast Base Assembly for a Decorative Lighting Pole.* The base of the lighting pole was cast aluminum (alloy 356-T6) with an octagonal base going into a fluted tube for a base height of 42 inches (1.1 m). Atop this was a 5 inch (127 mm) aluminum tube (alloy 6063-T6) with 0.188 inch (4.8 mm) wall thickness and 16 ft-6 inches long (5 m), giving a total height of 20 ft (6.1 m). A cast aluminum adapter ring was placed on top of the pole to accommodate the square light. The weight of the pole with base was 103.2 pounds (46.8 kg) and the round light was 15.0 pounds (6.8 kg), totaling a weight of 118.2 pounds (53.6 kg). The base was attached to an in-ground 5 inch (127 mm) diameter aluminum tube (alloy 6063-T6) with 0.188 inch (4.8 mm) wall thickness, 4 ft (1.22 m) long, and flattened 12 inches (305 mm) from the bottom with a 2.5 inch (63.5 mm) wide by 8 inch (203 mm) long slotted hole centered 2 ft (0.61 m) below the ground surface. Drawings of the HAPCO A78284 cast base assembly and the A88868 test pole are enclosed.

## Testing

Your company's cast base assemblies for decorative lighting poles were tested at the TTI outdoor pendulum testing facility, as a surrogate for full-scale crash testing. The pendulum bogie was built according the specifications of the Federal Outdoor Impact Laboratory's (FOIL)

pendulum, and the frontal crush of the aluminum honeycomb nose of the bogie simulated the crush of an actual vehicle. Tests with pendulums are acceptable for most breakaway supports, exceptions being base bending or yielding supports.

Five low speed pendulum tests were conducted on your company's assembly bases for decorative lighting poles, one test on each of the poles with an additional test conducted on HAPCO A79419. Summaries of the test results are provided in Enclosure 2. All of the cast base assemblies met the NCHRP Report 350 occupant risk criteria. In addition, TTI extrapolated the high-speed performance from the low speed pendulum tests. We agree that the test articles appear to perform appropriately to make such high-speed extrapolations. All high speed extrapolations yield lower change in velocity values than the paired low speed pendulum tests.

In tests with HAPCO A73704 and HAPCO A76696 cast base assemblies, the base pulled out of the anchor bolts. In the test with HAPCO A78284 cast base assembly, the base fractured at ground level. This performance satisfies the FHWA limit of maximum 4 inch (100 mm) stub height remaining after a support breaks away.

However, in the first test conducted on the HAPCO A79419 cast base assembly, the remaining base left on the reaction plate was 9 inches (229 mm) tall, which exceeds the FHWA limit of a maximum 4 inch (100 mm) stub height. While you reported that a portion of the fractured base was contacted by the pendulum sweeper plate and the associated change in velocity was negligible, a concern remained that the stub may have a potential to cause vehicle undercarriage snagging and vehicle instability if a wheel hits the stub. The same cast base assembly was retested and the base fractured at ground level. The cast base appears to fracture randomly when impacted, and the FHWA requested additional changes be made to the design. Subsequently, the HAPCO A79419 cast base assembly was redesigned as shown on HAPCO Drawing A12500 (enclosed) to match the HAPCO A76696 by widening the anchor bolt slots. With the passing test and subsequent design improvement, the HAPCO A12500 is now acceptable to the FHWA and no further testing is required.

In summary, we agree that HAPCO A73704, HAPCO A76696, HAPCO A12500, and HAPCO A78284 cast base assemblies for decorative lighting poles as described above, meet the appropriate evaluation criteria for a NCHRP 350 Test Level 3 devices and may be used at all appropriate locations 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 FHWA letters of acceptance:

- This acceptance is limited to the crashworthiness characteristics of the devices and does not cover their structural features, nor conformity with the Manual on Uniform Traffic Control Devices.
- 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.

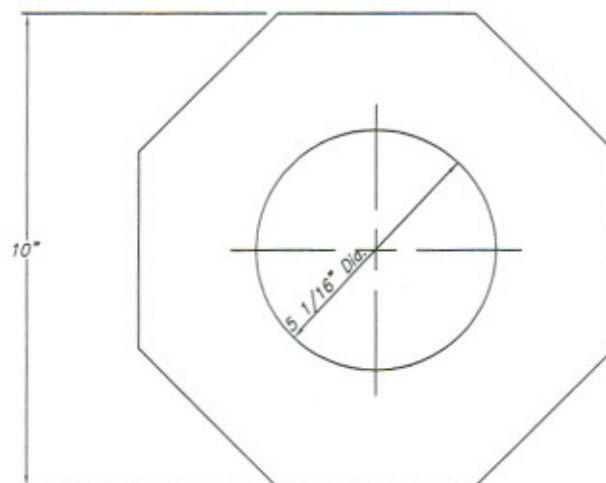
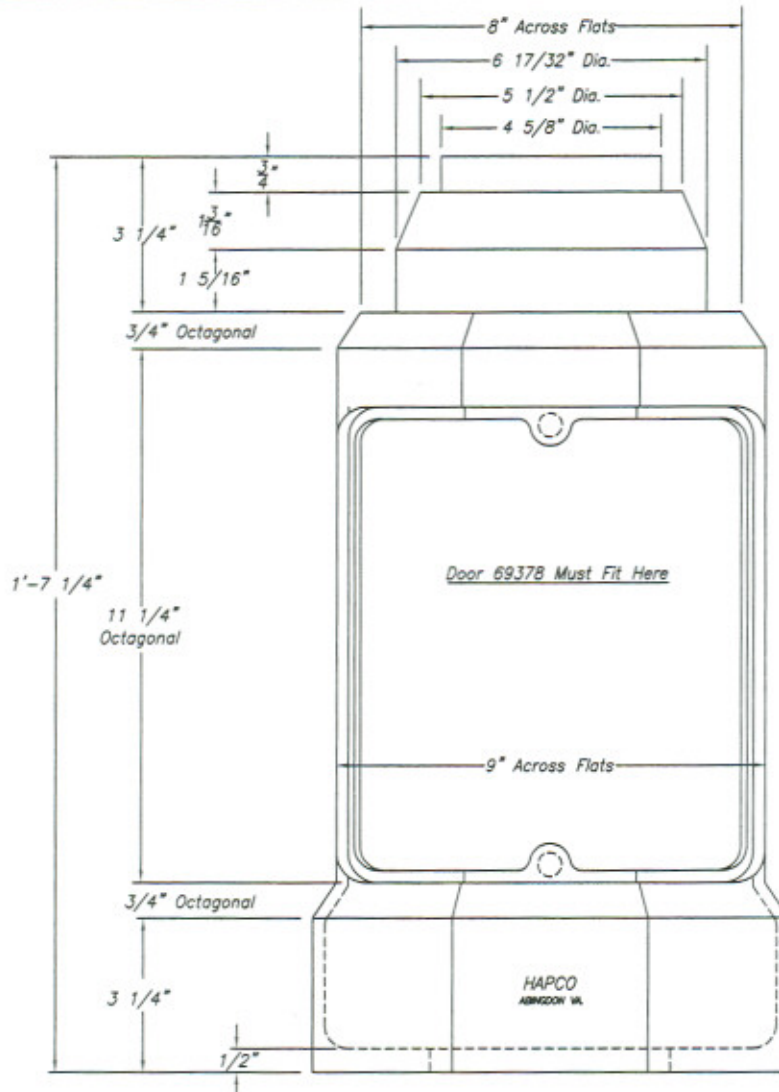
- You will be expected to supply potential users with sufficient information on design and installation requirements to ensure proper performance.
- You will be expected to certify to potential users that the hardware furnished has essentially the same chemistry, mechanical properties, and geometry as 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 LS-64 shall not be reproduced except in full. This letter and the test documentation upon which this letter is based, is public information. All such letters and documentation may be reviewed at our office upon request.
- The HAPCO devices are patented products and considered proprietary. If proprietary devices are specified by a highway agency for use on Federal-aid projects, except exempt, non-NHS projects, they: (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 the 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.
- This acceptance letter shall not be construed as authorization or consent by the FHWA to use, manufacture, or sell any patented device for which the applicant is not the patent holder. The acceptance letter is limited to the crashworthiness characteristics of the candidate device, and the FHWA is neither prepared nor required to become involved in issues concerning patent law. Patent issues, if any, are to be resolved by the applicant.

Sincerely yours,



George E. Rice, Jr.  
Acting Director, Office of Safety Design  
Office of Safety

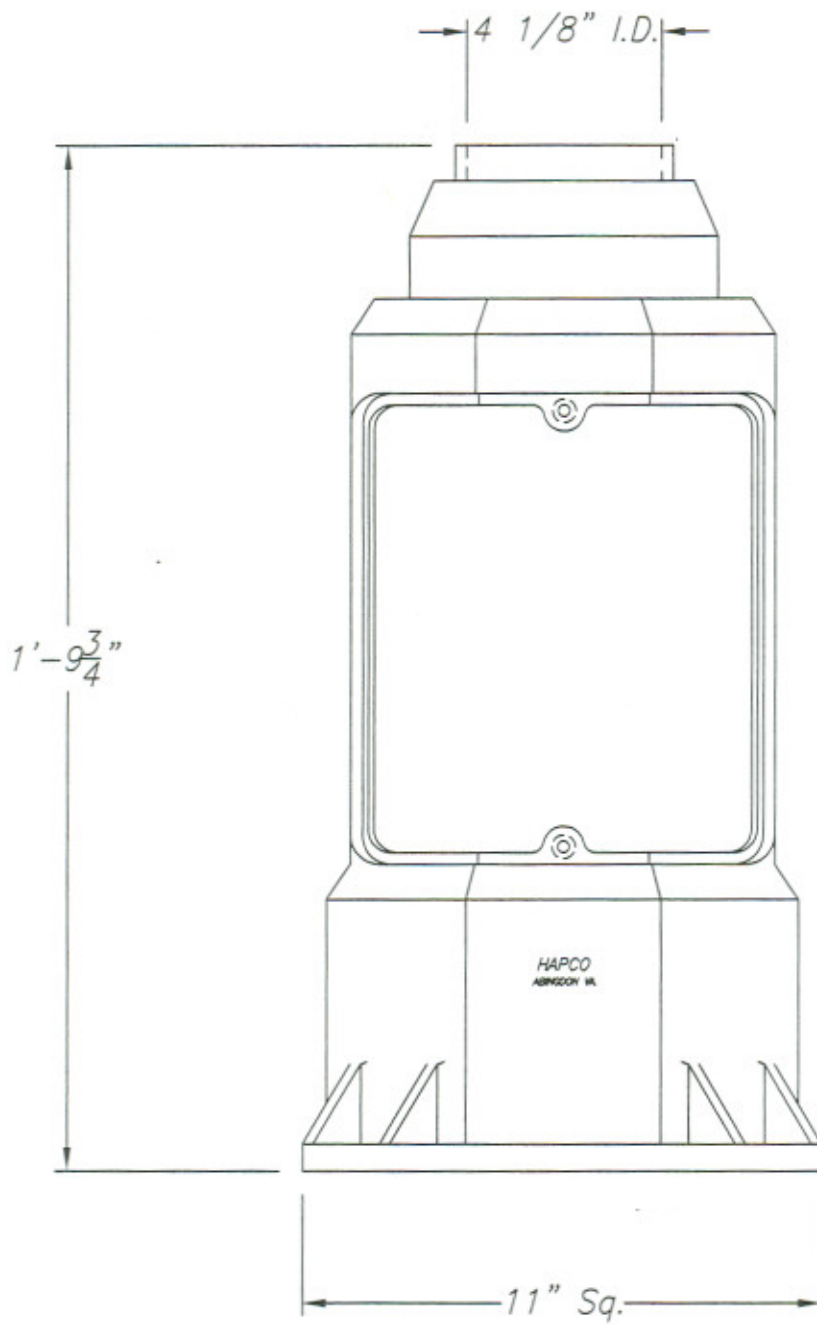
Enclosures



Notes:  
 (1) Material: Alum. Alloy 356-T6

NO.	REVISIONS	DATE	TITLE PEDESTAL BASE CASTING	
			CUSTOMER	
			SCALE NTS	DATE 6/18/07
			BY RCM	DWG. NO.
			CHK'D	A78284

**hapco**  
 Abingdon, Va.



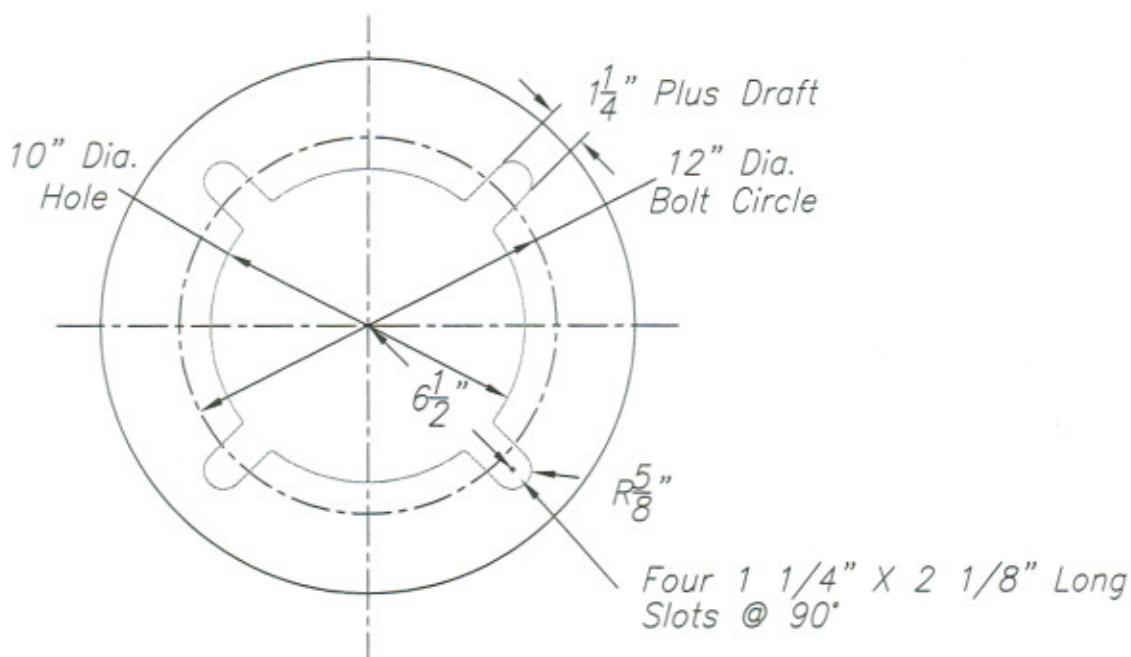
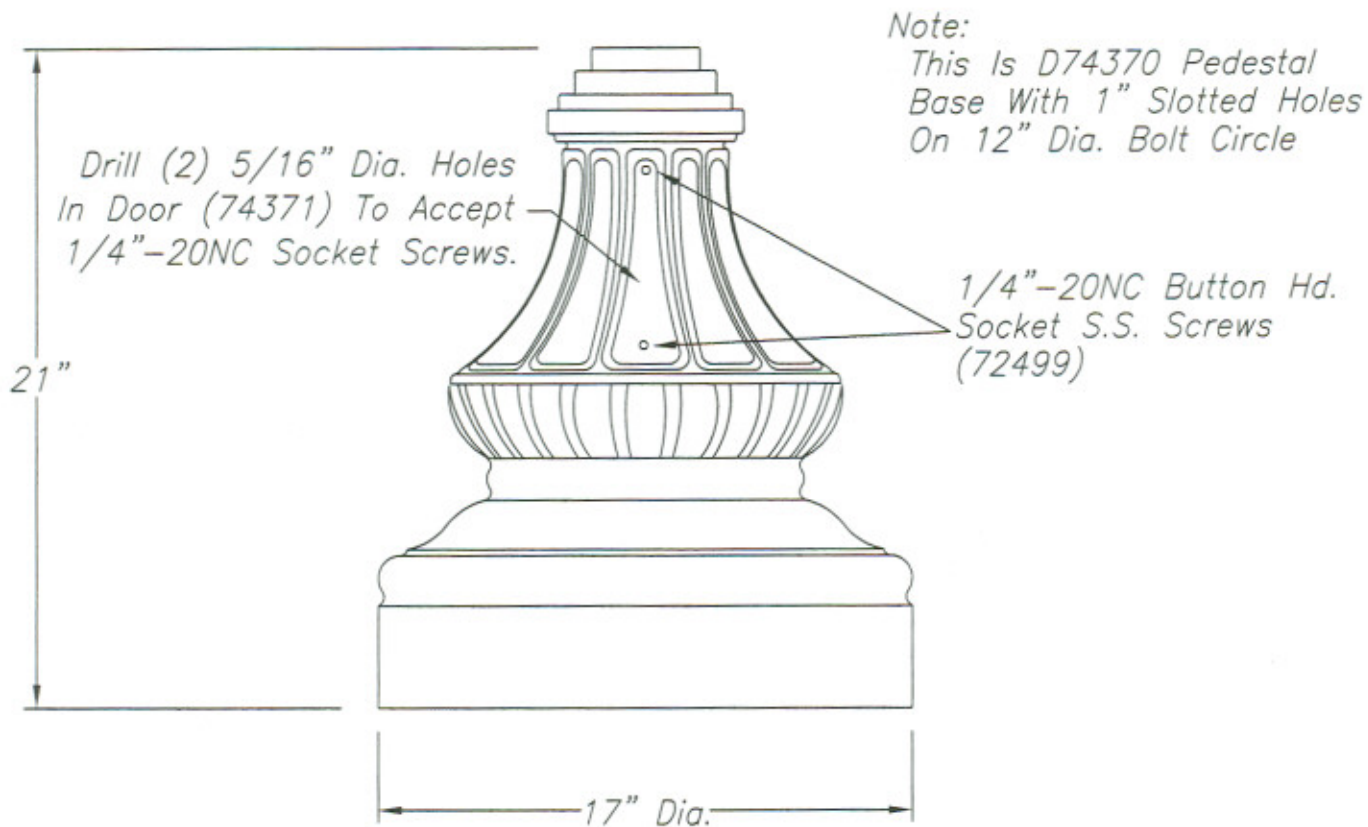
Cast Alum. Base  
(See C73704 For Details)

NO.	REVISIONS	DATE

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TITLE OCTAGONAL PEDESTAL BASE	
CUSTOMER	
SCALE 4	DATE 11/30/95
BY LW	DWG. NO.
CHK'D	A73704

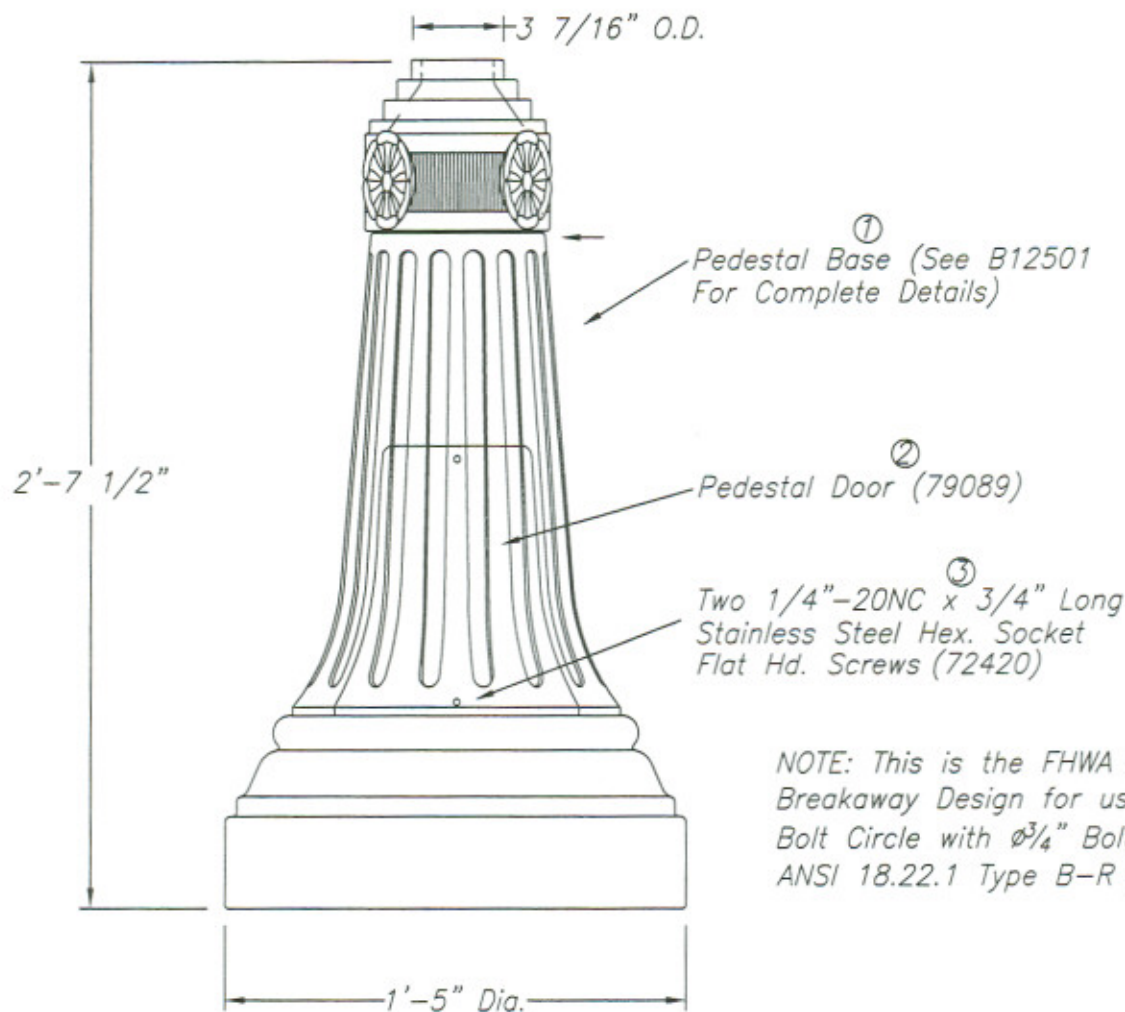




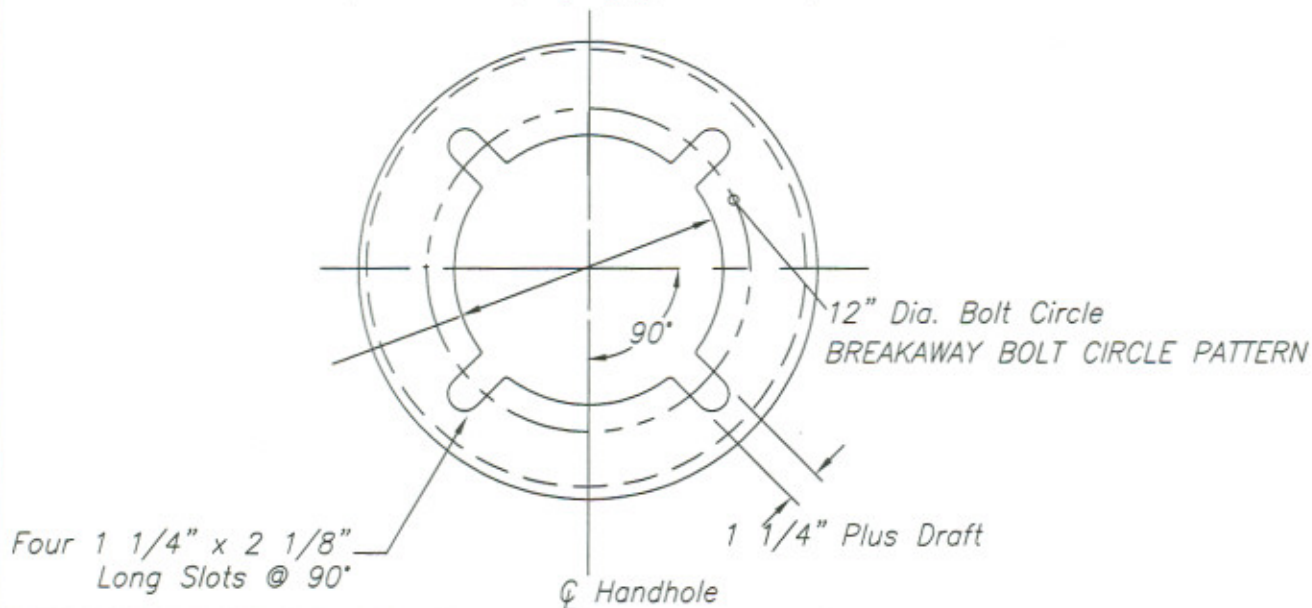
NO.	REVISIONS	DATE
1	Chg'd to 74370 Dims.	8/06
2	Correct'd Slot "Plus Draft"	7/07

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TITLE PEDESTAL BASE	
CUSTOMER	
SCALE 6	DATE 05/02/97
BY LW	DWG. NO.
CHK'D	A76696



NOTE: This is the FHWA Approved Breakaway Design for use on a 12" Bolt Circle with  $\phi 3/4$ " Bolts and ANSI 18.22.1 Type B-R  $3/4$ " Washers.

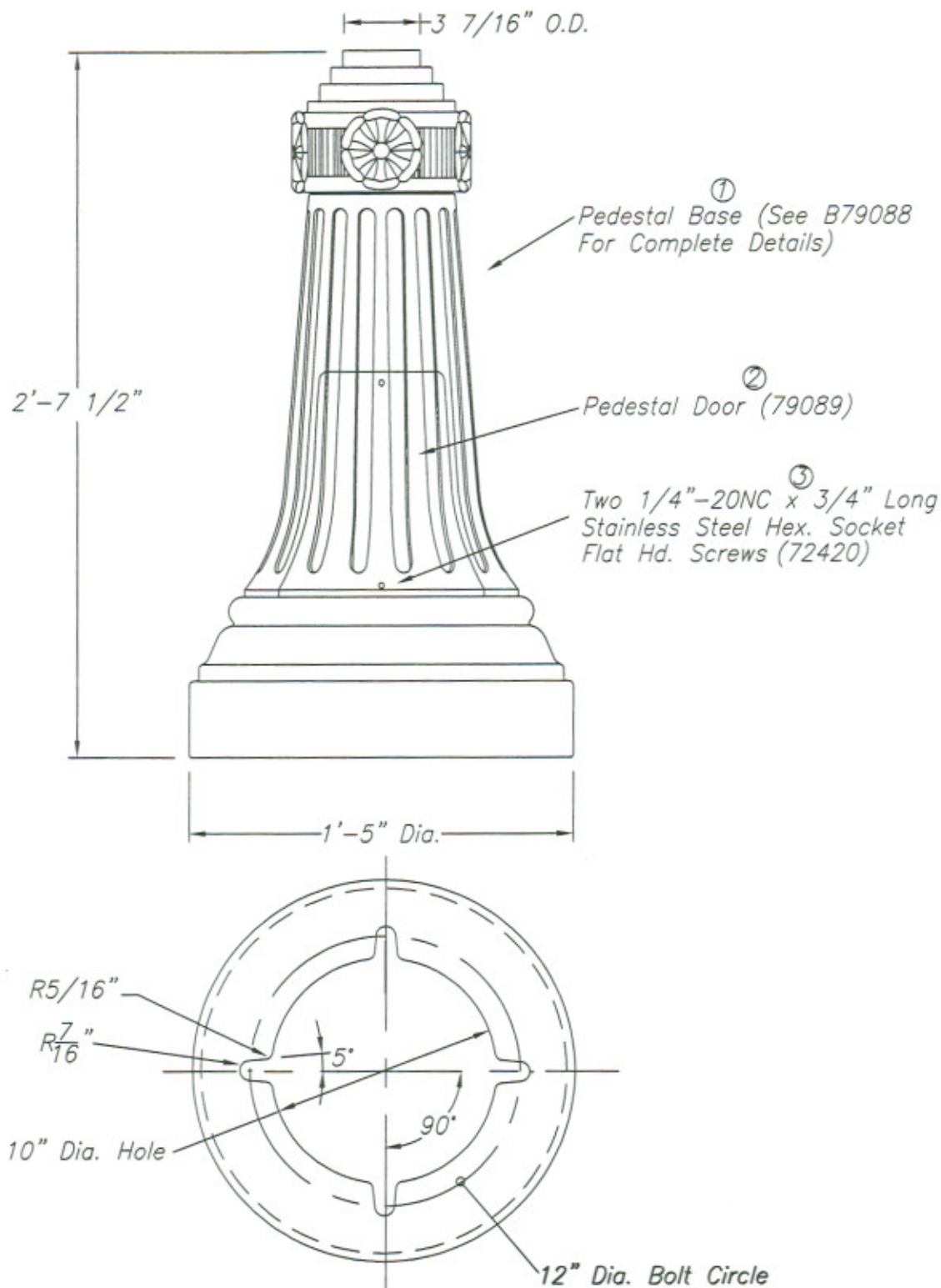


NO.	REVISIONS	DATE
1	Changed to correct draft.	7/7

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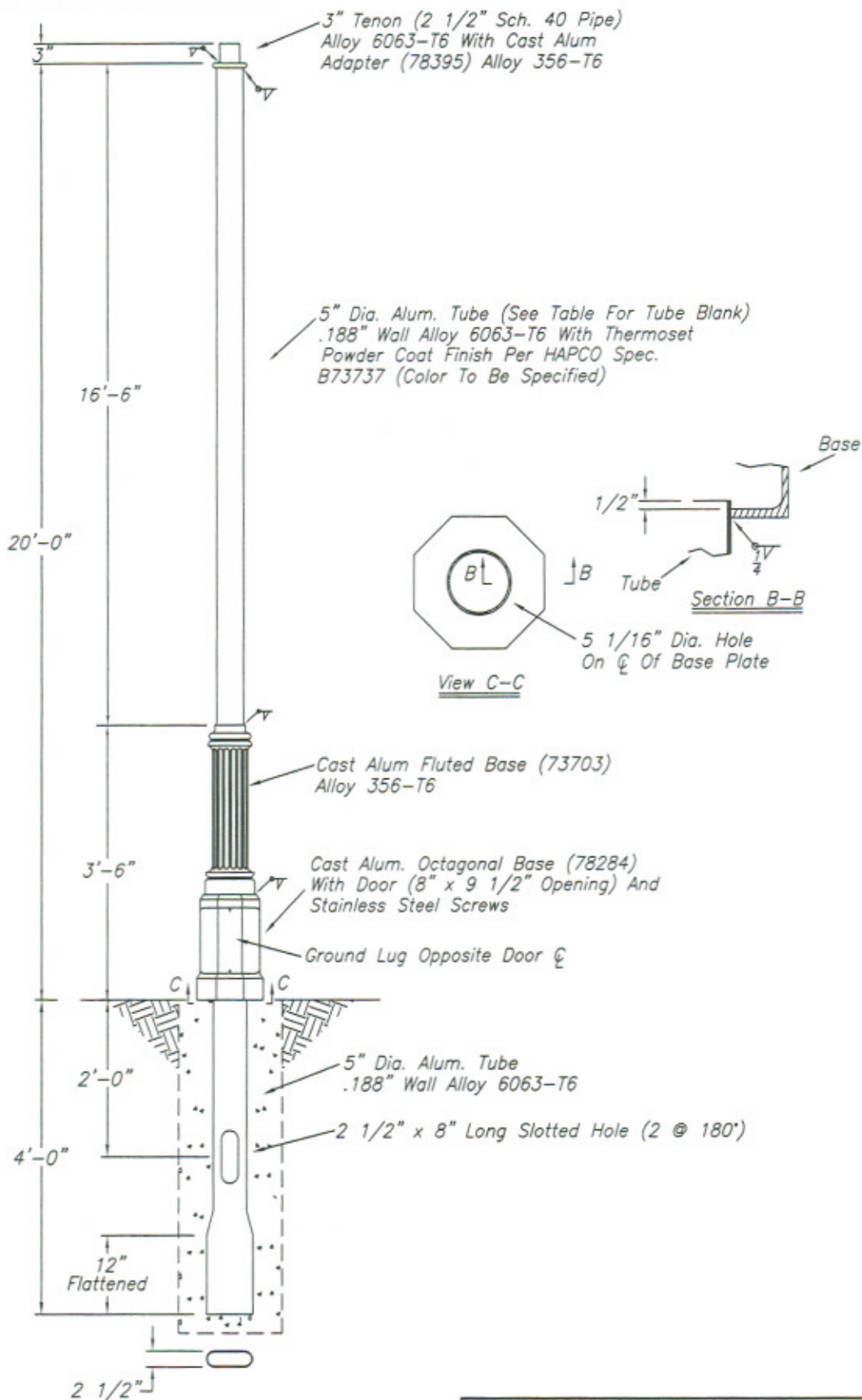
TITLE BREAKAWAY YORK BASE ASSEMBLY	
CUSTOMER	
SCALE 7	DATE 7/22/07
BY GM	DWG. NO.
CHK'D	A12500





NO.	REVISIONS	DATE	TITLE PEDESTAL BASE ASSEMBLY	
			CUSTOMER	
			SCALE 7	DATE 3/3/00
			BY LW	DWG. NO.
			CHK'D	A79419

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Abingdon, Va.



B88868

NO.	REVISIONS	DATE

WARNING: DO NOT INSTALL LIGHTING POLES WITHOUT LUMINAIRES

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TITLE EMBEDDED PEDESTAL

CUSTOMER ENGINEERING

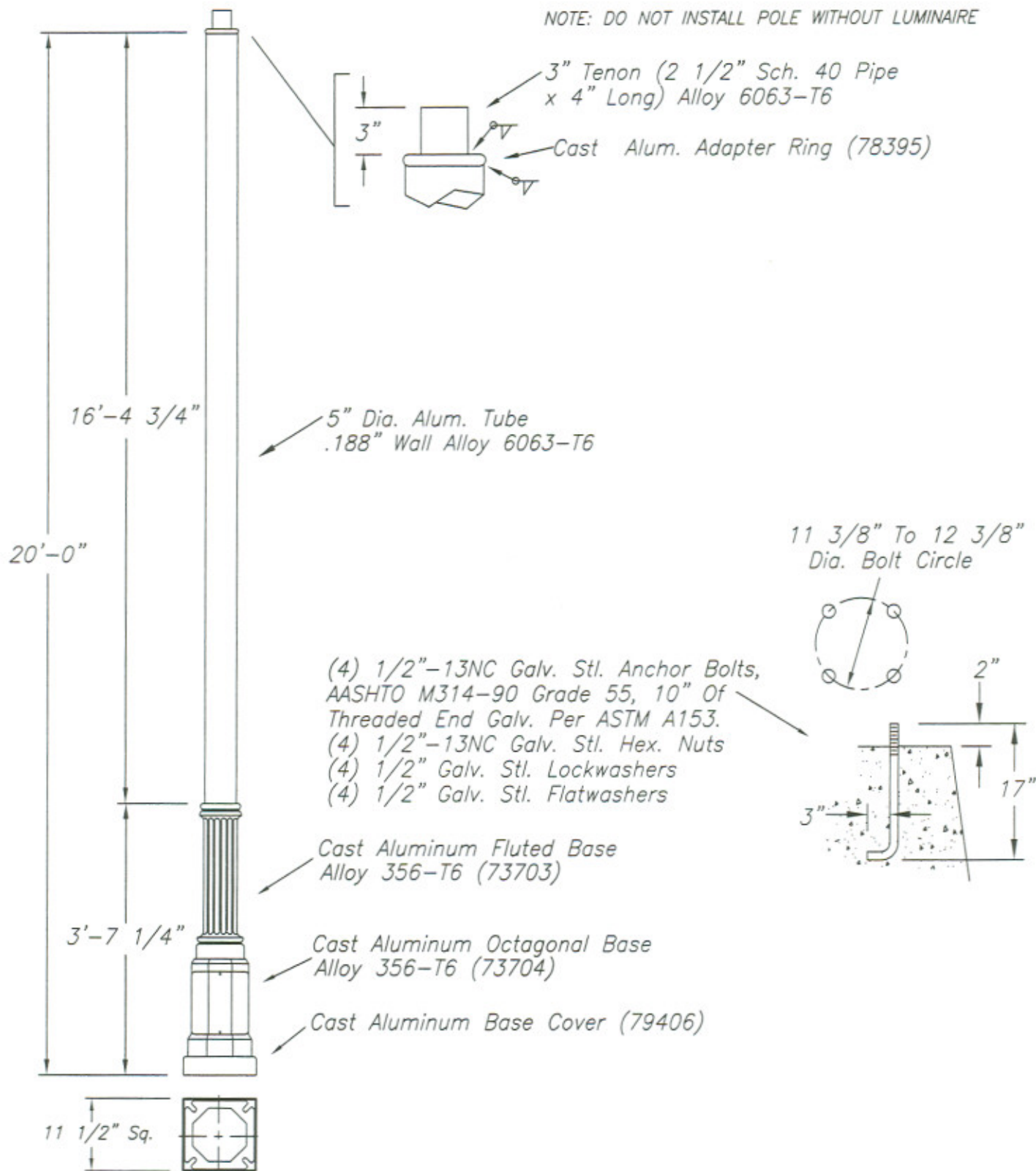
SCALE 15 DATE 8/29/2006

BY LW DWG. NO.

CHK'D

B88868

NOTE: DO NOT INSTALL POLE WITHOUT LUMINAIRE

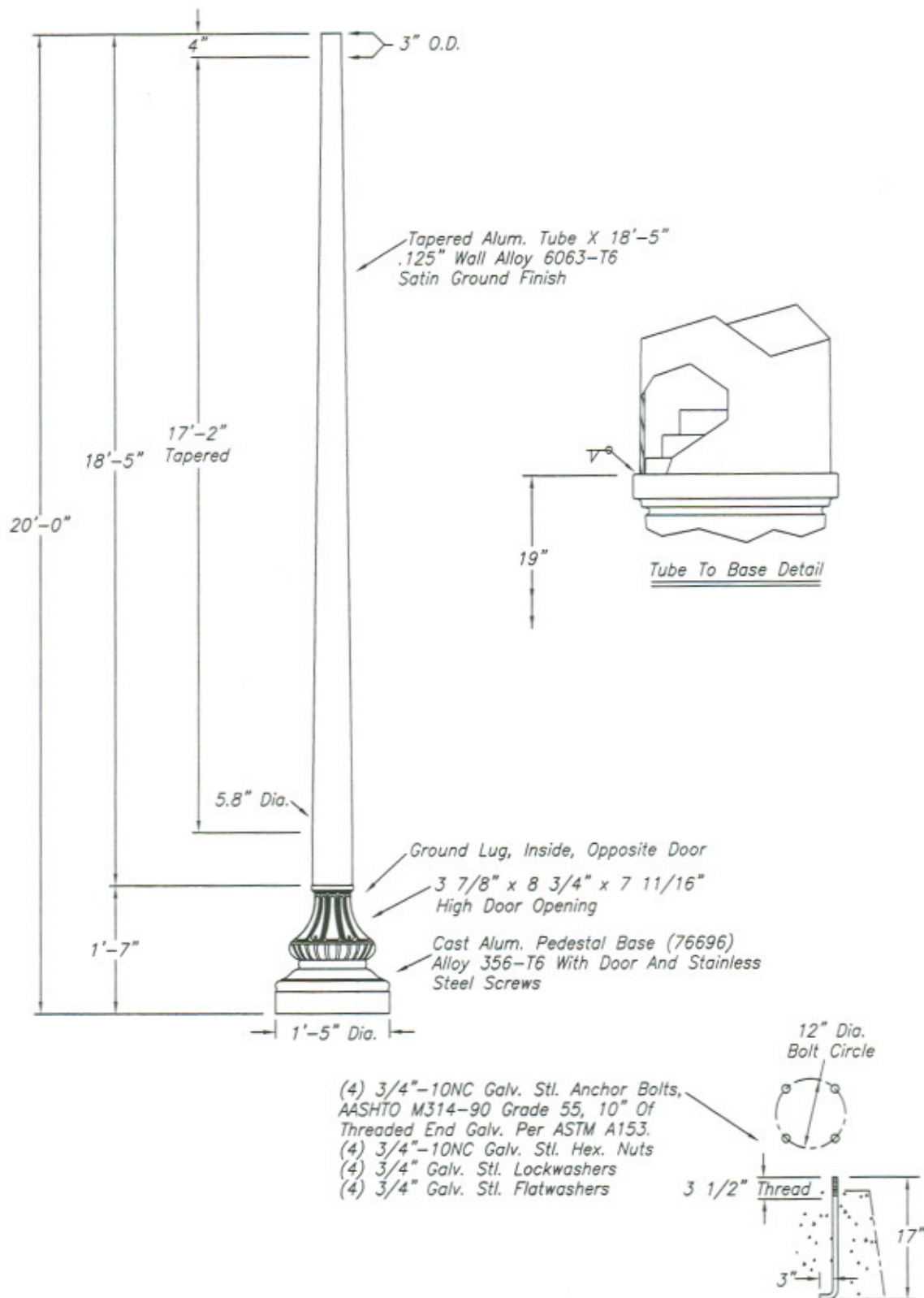


NO.	REVISIONS	DATE

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TITLE DECORATIVE LIGHTING POLE	
CUSTOMER ENGINEERING	
SCALE 20	DATE 8/29/2006
BY LW	DWG. NO. A88869
CHK'D	





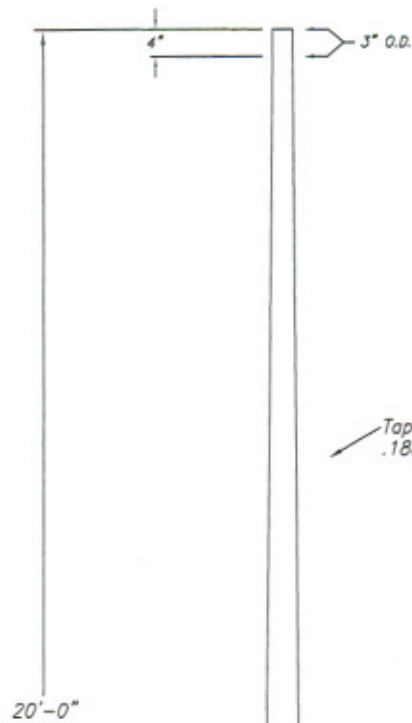
B88870

WARNING: DO NOT INSTALL LIGHTING POLES WITHOUT LUMINAIRES

NO.	REVISIONS	DATE
1	Removed 85511 Adapter Plate and Bottom Dia. of Tube Was 6"	10/06

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TITLE 20' LIGHTING POLE	
CUSTOMER ENGINEERING	
SCALE 24	DATE 8/29/2006
BY LW	DWG. NO.
CHK'D	B88870

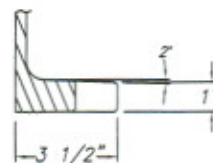


Tapered Alum. Tube X 17'-7"  
.188" Wall Alloy 6063-T6



Tube To Base Detail

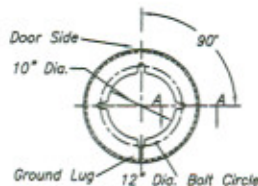
2'-5 1/4"



Section A-A

6" O.D.  
2'-5 1/4"

Ground Lug, Inside, Opposite Door  
3 7/8" x 5 3/4" x 8" High Door Opening  
Cast Alum. Pedestal Base Assembly (79419)  
Alloy 356-T6 With Door And Stainless Steel Screw



(4) 3/4"-10NC Galv. Stl. Anchor Bolts,  
AASHTO M314-90 Grade 55, 10" Of  
Threaded End Galv. Per ASTM A153.  
(4) 3/4"-10NC Galv. Stl. Hex. Nuts  
(4) 3/4" Galv. Stl. Lockwashers  
(4) 3/4" Galv. Stl. Flatwashers

12" Dia.  
Bolt Circle



WARNING: DO NOT INSTALL LIGHTING POLES WITHOUT LUMINAIRES

NO.	REVISIONS	DATE
1	Removed 85511 Adapter Plate	10/06

**hapco**  
Abingdon, Va.

TITLE 20' LIGHTING POLE

CUSTOMER ENGINEERING

SCALE 1/8"

DATE 8/29/2006

BY LW

DWG. NO.

CHK'D

B88871

B88871

**Table D1. Summary of results for pendulum test 400001-HAP P1.**

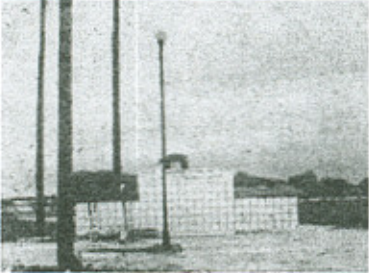

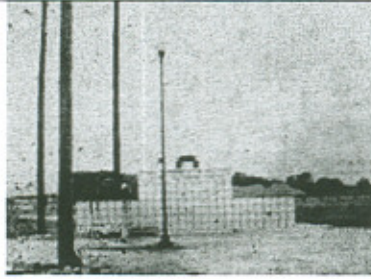
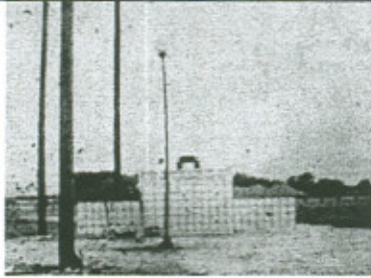
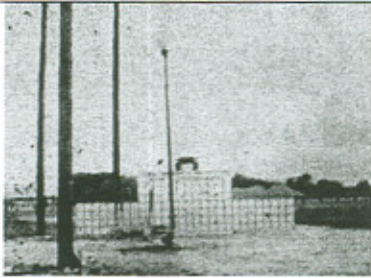
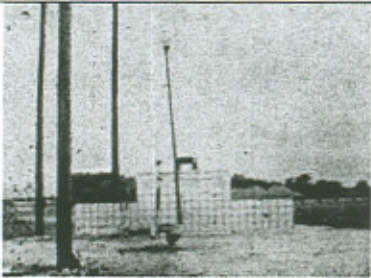

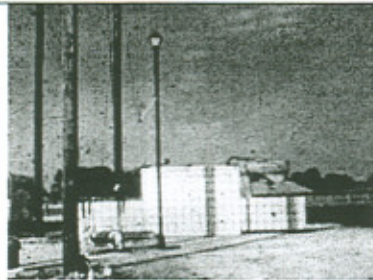
	<b>General Information</b>
0.000 s	Test Agency..... Texas Transportation Institute
	Test No. .... 400001-HAP P1
	Date ..... 10-20-2006
	<b>Test Article</b>
	Type ..... Luminaire
	Name ..... HAPCO A88869 Decorative Lighting Pole
	Installation Height (m)..... 6.1 m (20 ft)
	Material of Key Element ..... Cast Aluminum (Alloy 356-T6)
	and 5-inch Dia. Aluminum (Alloy 6063-T6) Tube
	<b>Soil Type</b> ..... Reaction Plate
	<b>Test Vehicle</b>
	Type..... Bogie
	Designation..... Pendulum
	Test Inertia Mass ..... 839 kg
	<b>Impact Conditions</b>
	Speed ..... 35.1 km/h
	Angle ..... 90 deg
	<b>Occupant Risk Values</b>
	Impact Velocity
	Longitudinal direction..... 2.7 m/s
	Ridedown Accelerations
	Longitudinal direction..... -0.6 g's
	<b>Maximum change in Velocity</b> ..... 2.5 m/s
	<b>Predicted High-Speed Change in Velocity</b> ..... 1.4 m/s
	



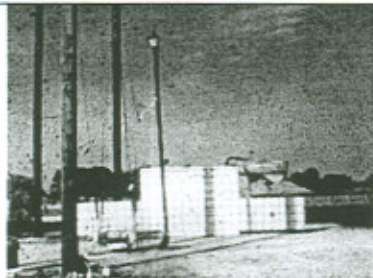
Table D2. Summary of results for pendulum test 400001-HAP P2.

	<b>General Information</b>
	Test Agency..... Texas Transportation Institute Test No. .... 400001-HAP P2 Date ..... 10-20-2006
	<b>Test Article</b>
	Type..... Luminaire Name ..... HAPCO B88870 Decorative Lighting Pole Installation Height (m)..... 6.1 m (20 ft) Material of Key Element ..... Cast Aluminum (Alloy 356-T6) and Tapered 5.8-3-inch Dia. Aluminum (Alloy 6063-T6) Soil Type..... Reaction Plate
	<b>Test Vehicle</b>
	Type..... Bogie Designation..... Pendulum Test Inertia Mass ..... 839 kg
	<b>Impact Conditions</b>
	Speed ..... 34.9 km/h Angle ..... 90 deg
	<b>Occupant Risk Values</b>
	Impact Velocity Longitudinal direction..... 4.6 m/s
	Ridedown Accelerations Longitudinal direction..... -0.6 g's
	Maximum change in Velocity ..... 4.9 m/s
	Predicted High-Speed Change in Velocity ..... 2.2 m/s
	

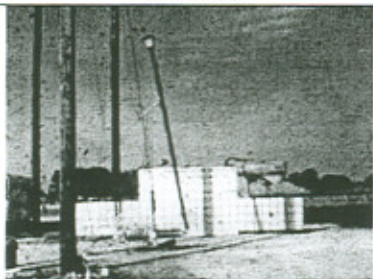
**Table D4. Summary of results for pendulum test 400001-HAP P4.**



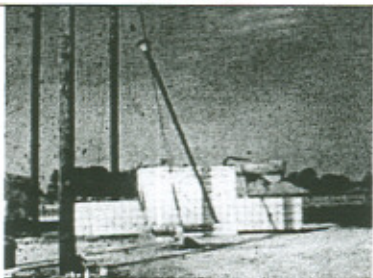
0.000 s



0.048 s



0.120 s



0.217 s

### General Information

Test Agency.....Texas Transportation Institute

Test No. .... 400001-HAP P4

Date ..... 10-21-2006

## Test Article

Type.....Luminaire

Name ..... HAPCO B88868 Decorative Lighting Pole

Installation Height (m)..... 6.1 m (20 ft)

Material of Key Element ..... Cast Aluminum (Alloy 356-T6)  
and 5-inch Dia. Aluminum (Alloy 6063-T6) Tube

Soil Type.....Standard Soil

### Test Vehicle

Type ..... Bogie

Designation..... Pendulum

Test Inertia Mass ..... 839 kg

### Impact Conditions

Speed ..... 35.0 km/h

Angle ..... 90 deg

### Occupant Risk Values

Impact Velocity

Longitudinal direction.....2.6 m/s

### Ridedown Accelerations

Longitudinal direction.....-0.8 g's

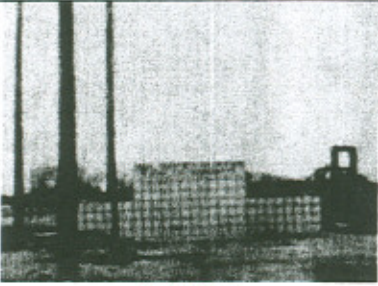
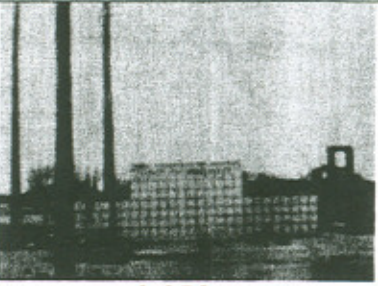
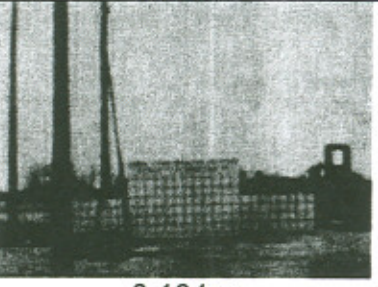
Maximum change in Velocity ..... 1.2 m/s

Predicted High-Speed Change in Velocity ..... 1.0 m/s





**Table D1. Summary of results for pendulum test 400001-HAP P5.**

	<p><b>General Information</b>          Test Agency..... Texas Transportation Institute          Test No..... 400001-HAP P5          Date..... 02-15-2007</p> <p><b>Test Article</b>          Type..... Luminaire          Name..... HAPCO B88871 Decorative Lighting Pole          Installation Height (m)..... 6.1 m (20 ft)          Material of Key Element ..... Cast Aluminum (Alloy 356-T6)          and Tapered 3-6-inch Dia. Aluminum (Alloy 6063-T6) Tube          Soil Type..... Reaction Plate</p>
	<p><b>Test Vehicle</b>          Type..... Bogie          Designation..... Pendulum          Test Inertia Mass ..... 839 kg</p> <p><b>Impact Conditions</b>          Speed ..... 33.7 km/h          Angle ..... 90 deg</p>
	<p><b>Occupant Risk Values</b>          Impact Velocity          Longitudinal direction..... 4.0 m/s          Ridedown Accelerations          Longitudinal direction..... -0.7 g's</p> <p><b>Maximum change in Velocity</b> ..... 3.4 m/s  <b>Predicted High-Speed Change in Velocity</b> ..... 1.8 m/s</p>
