



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

APR 4 1989

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

REFER TO:  
HNG-14

John F. Boozer, III, P.E.  
Product Development Engineer  
Shakespeare Products Group  
Electronics and Fiberglass Division  
Route 3 P.O. Box 733  
Newberry, South Carolina 29108

Dear Mr. Boozer:

Your December 1, 1988, request for Federal Highway Administration (FHWA) acceptance for use on Federal-aid highway projects of direct burial breakaway fiberglass light poles manufactured by your company has been reviewed. In support of this request you submitted four Southwest Research Institute (SWRI) reports (Project No. 06-2128), dated September 1988, containing pendulum tests on two different poles in "strong" soil. You submitted additional information on March 13 responding to specific questions we posed concerning design details of the poles. The supplemental information also included video tapes and reports of two tests in "weak" soil conducted at your company's facility. Your March 23 supplement covered calculations for using multiple mast arms.

Instrumented 1,800-pound pendulums fitted with 10 stage crushable noses were used to perform the tests. The luminaire mounting heights for the SWRI tests were 40 and 30 feet for poles BC47-18N5BK44BW and BH35-18N5BG20, respectively. The luminaire mounting heights for the tests at Shakespeare's facility were 40 and 30 feet for poles BC47-18N5BK08 and BH35-18N2BG20, respectively. The vertical shafts of the supports consisted of two sections, an above-ground section slipped inside and bonded to a fiberglass sleeve base. The SWRI-tested poles were buried in NCHRP S1 (strong) soil and the Shakespeare-tested poles were buried in S2 (weak) soil. Embedment was up to the top of the sleeve base. The measured and extrapolated results from the tests are shown on enclosure 1.

This information shows that the actual test and calculated changes in pendulum velocity and pole stub height meet provisions of Section 7 of the 1985 American Association of State Highway and Transportation Officials (AASHTO) "Standard Specifications for Structural Supports for Highway Signs, Luminaire and Traffic Signals." Therefore, the tested Shakespeare direct burial fiberglass light poles will be acceptable for use on Federal-aid projects if proposed by a State. The tested poles were representative of Shakespeare's line of direct burial breakaway light poles. Our acceptance is extended to include the following poles as detailed in your catalog:

Acceptable Pole Series

BH20	BH24	BH30	BH35		
		BS30	BS35		
		BX30	BX35		
		BB30	BB35	BA41	BA47
		BC30	BC35	BB41	BB47
				BC41	BC47

## Enclosure 1

Test Number	Designation	Mounting Height Feet	Pole Height (Lpole) Feet	Butt Diam Inches	Top Diam Inches	Delta Velocity 20 MPH FPS	Delta V Velocity 60 MPH* FPS	Stub Height Inches
A-1	BC47-18N5BK44BW	40	38.08	11.9	6.60	12.6	8.9	0
A-2	BC47-18N5BK44BW	40	38.08	11.9	6.60	11.0	8.3	0
A-3	BH35-18N5BG20	30	28.08	8.38	4.63	3.7	3.3	0
A-5	BH35-18N5BG20	30	28.08	8.38	4.63	4.0	3.4	0
Inhouse-1	BC47-18N5BK08	40	38.08	11.63	6.63	11.8	N/A	0
Inhouse-2	BH35-18N2BG20	30	28.08	8.25	4.9	8.83	N/A	0

See "Spec Data"  
Sheet For Codes

\*Calculated

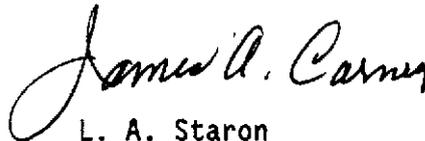
N/A Not Available

The tests were conducted using a single 8-foot mast arm on each test pole while your catalog indicates up to four mast arms may be used. Our acceptance covers poles with one or two mast arms of lengths from 4 feet to 15 feet. Your calculations show that breakaway performance requirements are met even when using up to four 15-foot mast arms attached at 90 degrees apart around the pole, however, we are concerned that mast arms oriented parallel to the roadway might enter a vehicle after impact. This configuration should not be used in the highway environment unless subjected to further testing.

The acceptance is limited to breakaway characteristics of the poles and does not cover their structural features. Presumably, you will supply potential users with sufficient information on structural design and installation requirements to ensure proper base performance.

We anticipate that the States will require certification from Shakespeare that poles furnished have properties comparable to those used in the tests and that the poles will meet the 1985 AASHTO change in velocity requirements as modified by the FHWA.

Sincerely yours,



L. A. Staron

for Chief, Federal-Aid and Design Division

Enclosure

LS-6  
CONT



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

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

MAR 5 1990

REFER TO:  
HNG-14

John F. Boozer, III, P.E.  
Product Development Engineer  
Shakespeare Products Group  
Route 3, P.O. Box 733  
Newberry, South Carolina 29108

Dear Mr. Boozer:

This is in response to your letter of February 20 to Mr. Thomas O. Willett in which you requested Federal Highway Administration (FHWA) acceptance of a 45-foot mounting height for your company's direct burial "BC" series light poles. Our previous acceptance, dated April 4, 1989, included these 47-foot long poles, but the 7-foot embedment limited the mounting height to 40 feet. You now propose to extend the mounting height of the BC-47 pole with a special mast arm to achieve the 45-foot height.

In support of this request, you sent an analysis dated February 7 by Dr. Raymond P. Owings of Rhomicron, Inc., which assumes there would be no significant difference between poles in velocity change under 20 m.p.h. test conditions. This assumption is reasonable since pole dimensions have relatively little influence during low speed crashes--it is the breakaway mechanism itself which causes the greatest portion of the velocity change. The analysis indicated that the expected change in velocity of a 1,800-pound car during a 60 m.p.h. test with an extended BC-47 pole would still be within the 16-foot-per-second limit recognized by FHWA.

We, therefore, concur that the BC-47 pole with a mast arm which increases the luminaire mounting height to 45 feet would be acceptable for use on Federal-aid projects, subject to the same limitations in our April 4, 1989, letter, a copy of which is enclosed for your reference.

Sincerely yours,

L. A. Staron  
Chief, Federal-Aid and Design Division

Enclosure

LS-6  
CONT

NOTES:

- 1- MATERIAL: 6061-T6 ALUMINUM
- 2- FINISH: NATURAL ALUMINUM
- 3- ALL JOINTS MIG WELDED
- 4- FITS 5/8" BOLTS ON 9 1/2" CENTERS
- 5- WEIGHT: 50 LBS.

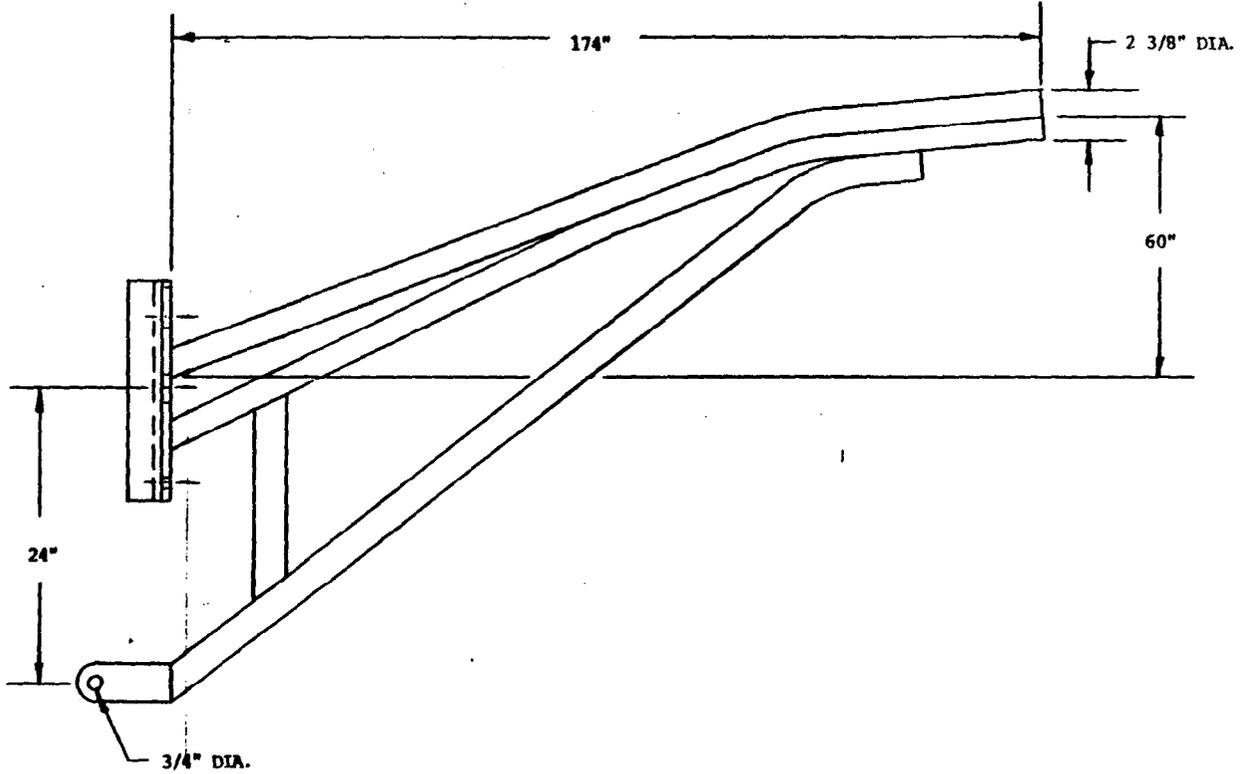
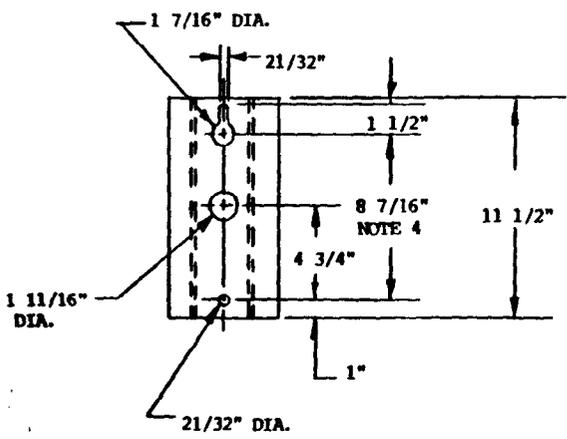
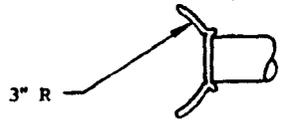
ALL DIMENSIONS AND SPECIFIED FITS ARE FOR FINISHED PARTS AND MUST BE MET AFTER FINISH IS APPLIED. COMMERCIAL TOLERANCES APPLY FOR GAUGE, TUBING AND BAR STOCK  
**DO NOT SCALE DRAWING**

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.  
TOLERANCES: DECIMALS ± .006 FRACTIONS ± 1/64  
ANGLES ± 1/8° OR AS SPECIFIED BELOW

DECIMALS		FRACTIONS		ANGLES
±	.XX	±	XXX	±

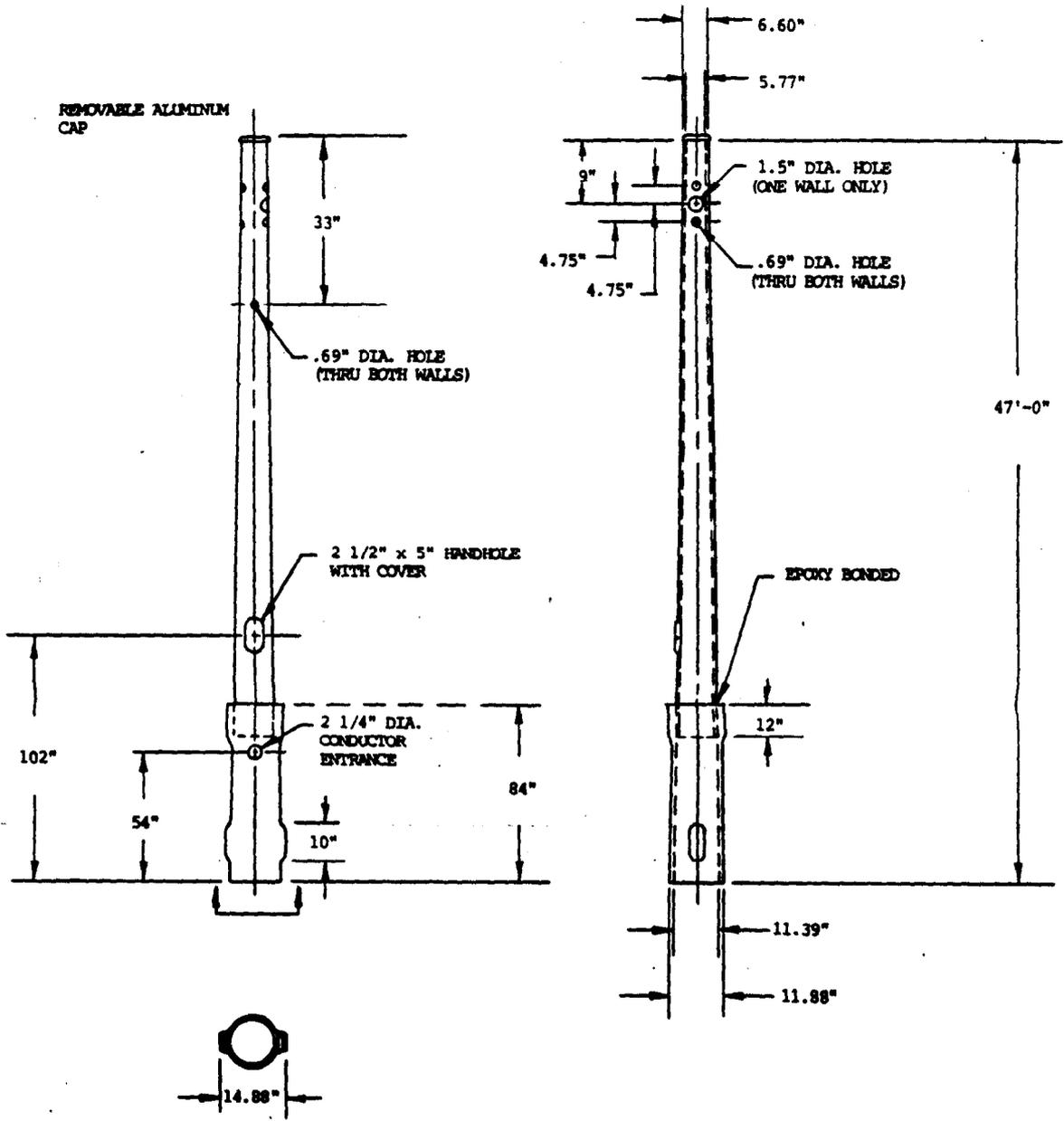
**Shalaps**  
ELECTRONICS AND FIBERGLASS DIVISION  
NEWBERRY, S. C. 29108

PART NO.	OPAR-15 x 6-HR		
	15' LUMINAIRE ARM		
DWR	DES	SCALE	DATE
D	12/1/77	N	12-11-89
LET	WAS	BY	DATE



NOTES:  
 1- WEIGHT: 340 lbs.  
 2- FINISH: SMOOTH  
 3- COLOR: SILVER

LS-6  
 CONT



ITEM	PART NUMBER	DESCRIPTION	MATERIAL
LET	WAS	BY DATE	<b>Shakespeare Electronics and Fiberglass Division</b> Newberry, S. C. 29108
		SAMPLE MUST BE APPROVED AS INDICATED BELOW BEFORE PROCEEDING WITH FABRICATION.  QUAL. APPROVAL      ENG. APPROVAL YES <input type="checkbox"/> NO <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/>	DIRECT BURIAL BREAKAWAY LIGHT POLE PREDRILLED FOR 15 FT. MAST ARM
		ALL DIMENSIONS AND SPECIFIED FITS ARE FOR FINISHED PARTS AND MUST BE MET AFTER FINISH IS APPLIED.	
		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES DECIMALS ± .005 FRACTIONS ± 1/64 ANGLES ± 1/8° COMMERCIAL TOLERANCES APPLY FOR GAUGE, TUBING AND BAR STOCK.	DRAWN <i>DD</i> CHECKED <i>[Signature]</i> SCALE <i>N</i> DATE <i>12-11-89</i> USED ON _____      PC. NO. <b>BCM47-5196BK58</b>



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Sincerely yours,

L. A. Staron  
Chief, Federal-Aid and Design Division

Enclosure

2002  
9-57

- NOTES:  
 1- MATERIAL: 6061-T6 ALUMINUM  
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 ANGLES ± 1/2° OR AS SPECIFIED BELOW

DECIMALS			FRACTIONS			ANGLES		
± .XX	± .XX	± .XX	±	±	±	±	±	±

**Shelburne**  
 ELECTRONICS AND FIBERGLASS DIVISION  
 NEWBERRY, S. C. 29108

PART NO.	OPAR-15 x 6-HR		
	15' LUMINAIRE ARM		
DWR	DD	SCALE	DATE
LET	WAS	BY	DATE

