

## INTERIM CONSTRUCTION DEFICIENCY REPORT

SHALLOW STOP END BELLS USED WITH SCHEDULE 40 PVC CONDUIT

Name of Station:	St. Lucie Plant - Unit #2
Owner:	Florida Power & Light Co.
Architect/Engineer:	Ebasco Services, Incorporated
Date of Deficiency:	November 7, 1979
Interim Report Filed:	December 7, 1979
Supplier of Deficient Component:	Carlson Products
Final Report Filed:	April 11, 1980

## I. SUMMARY

On October 23, 1979 Florida Power & Light Construction discovered that Direct Burial (shallow stop) end bells had been supplied to St. Lucie Unit 2 and later installed in schedule 40 PVC Conduit. These shallow stop end bells are generally used with thinner wall DB and EB PVC Underground Duct and not schedule 40. An investigation showed that the PVC Conduit in which these end bells were installed is used primarily for underground raceways servicing safety related circuits. FPL Quality Assurance was notified and the Site Group met on November 7, 1979 to determine if the condition was reportable.

Per the requirements of 10 CFR 50.55(e) the Site Group determined that the end bells were delivered and accepted in violation of specification requirements and that the installation, if left uncorrected, could result in class IE cable insulation damage during cable pulling operations. This condition was reported to the Nuclear Regulatory Commission on November 7, 1979 in accordance with the requirements of 10 CFR 50.55(e).

## II. DESCRIPTION

In January 1978 when purchase order 49210-27358S SL-12008 for PVC Conduit was originally prepared, only the catalog number, E997, was used to identify the required end bells because Ebasco Services had been previously advised by Carlon that only one type of end bell was manufactured for schedule 40 PVC Conduit. This condition also existed for purchase order 55000-26948S SL-14939 issued in June of 1979. Subsequent investigation showed that Carlon makes both deep stop and shallow stop end bells with the same E997 series catalog number. Both types are made from the same PVC compound of identical chemical composition. The difference between parts is only in stop height dimension. These differences are illustrated in figure 1.

The shallow stop end bell will result in an exposed conduit edge ranging from approximately 0.077 to 0.1315 inches when used with schedule 40 PVC Conduit. This edge could shave the cable jacket during cable pulling operations as illustrated in Figure 1. A summary of exposed conduit lip calculations is provided in Table 1 for end bells of various diameters.

Based on material control records, a total of 2659 end bells have been released for installation. All of these end bells which were not installed, and which were of the shallow stop type, have been returned to the manufacturer. Shallow stop end bells were issued for installation in 110 manholes, in building walls and for switch gear bottom conduit entry outside the reactor containment building. An additional 5200 end bells with shallow stops not yet released were returned to Carlon and replaced with the corresponding deep stop end bell.

### III. CORRECTIVE ACTION

FPL Construction Quality Control has issued NCR 895 to document this condition. The following corrective actions are being taken to assure that cable pulling is not impaired where shallow stop end bells are already installed and that only deep stop end bells are used in future installations:

1. End bells released for installation but not yet installed have been returned to Carlon.
2. All unreleased shallow stop end bells have been returned to Carlon.
3. Carlon has shipped replacement deep stop end bells to the site.
4. Replacement deep stop end bells were 100% receipt inspected.
5. Carlon has provided a letter stating that the shallow stop and deep stop end bells are identical in all respects except for the stop height dimension. Carlon also recommends that the conduit lip be lightly reamed

or beveled to provide a smooth transition between the end bell and conduit where shallow stop end bells have been installed to eliminate any possibility of the edge scraping the cable insulation.

6. Quality Control will 100% inspect all future shipments of end bells for proper stop height dimensions.
7. The exposed conduit lip will be reamed prior to cable installation on all locations where shallow stop end bells have been used.
8. Quality Control will inspect 100% all locations prior to pulling class IE cables and will perform surveillance of balance of plant cable pulling to assure that all conduit lips have been reamed.

#### IV. SAFETY IMPLICATIONS

The use of shallow stop end bells with schedule 40 PVC conduit is considered a deviation from the performance specification which will require repair to establish the adequacy of the component to perform its intended safety function. If the deviation was left uncorrected, the PVC conduit could have damaged cable during the cable pulling process and as a result, could have affected adversely the safety of operations of the plant at some time throughout the expected lifetime of the plant. The protruding edges of PVC conduit could nick or shave the cable jacket and possibly insulation such that the cable may no longer meet the design requirements, i.e., cable insulation resistance, insulation level, and jacket/insulation integrity.

#### V. CONCLUSION

The corrective actions specified in section III above are being accomplished concurrently with cable pulling operations and as such are not fully completed. During preparation for cable pulling each exposed conduit lip is checked and reamed to assure a smooth transition between the end bell and conduit. As a result, cable pulling will not be impaired due to this incident.

FIGURE 1

SCHEDULE 40 CONDUIT TERMINATIONS

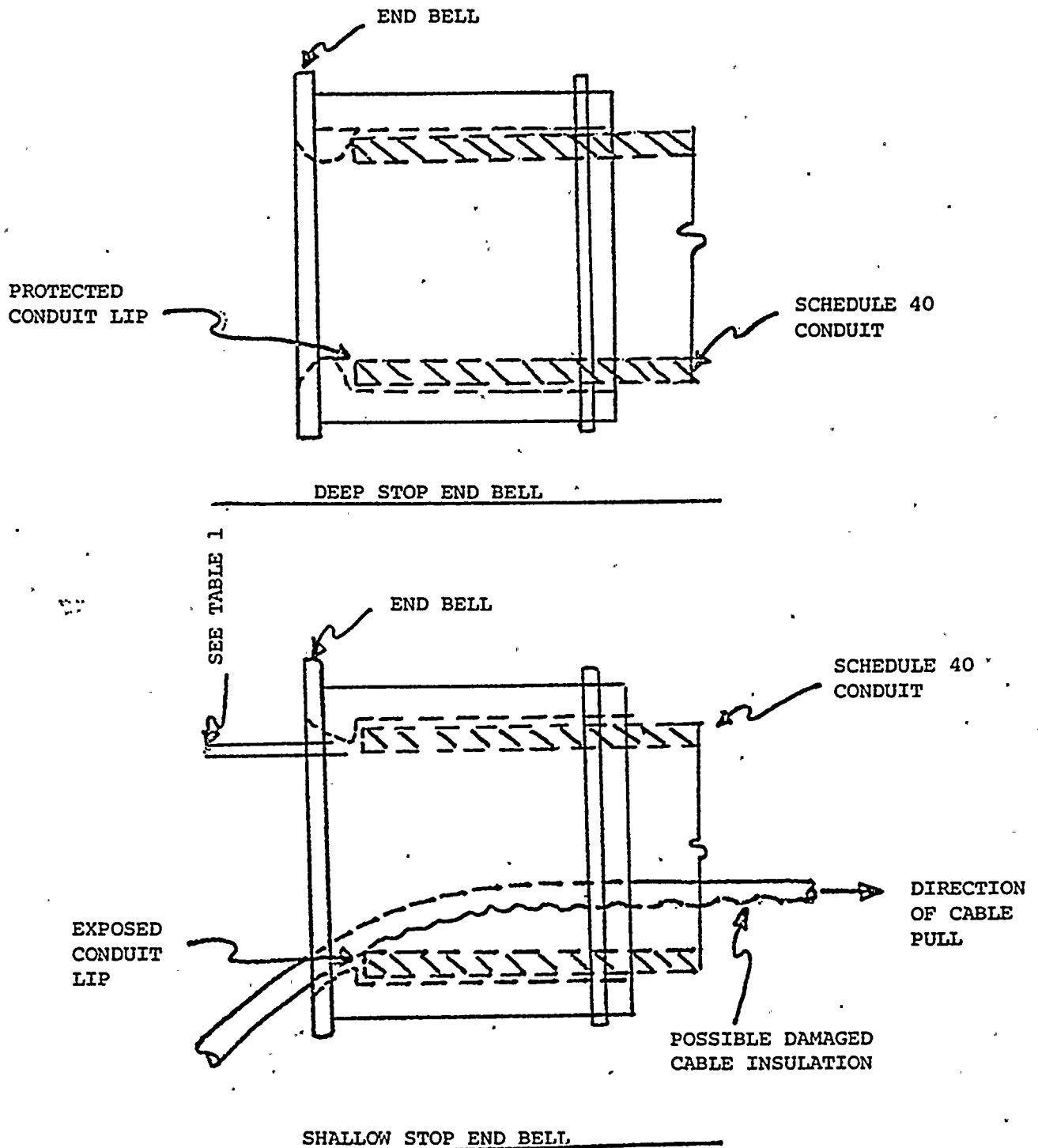


TABLE 1

## EXPOSED CONDUIT LIP CALCULATIONS

	a	b=A + Toler	c=a - Toler	d	e	f = b - 2e	g = c - 2d	h measured	I max = (h-g)/2	I min = (h-f)/2
Norm Size	O.D. Avg.	O.D. Max.	O.D. Min.	Wall Thick Max.	Wall Thick Min.	I.D. Max.	I.D. Min.	Bell Throat I.D.	Exposed Conduit Lip Max.	Exposed Conduit L P Min
1	1.315	1.320	1.310	0.153	0.133	1.054	1.004	N.A.	N.A.	N.A.
1 1/2	1.900	1.906	1.894	0.165	0.145	1.616	1.564	1.770	.103	.077
2	2.375	2.381	2.369	0.174	0.154	2.073	2.021	2.180	.0795	.0535
3	3.500	3.508	3.492	0.242	0.216	3.076	3.008	3.070	.031	.003
4	4.500	4.509	4.491	0.265	0.237	4.035	3.961	4.275	.157	.120
5	5.563	5.573	5.553	0.289	0.258	5.057	4.975	5.320	.1725	.1315

