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AUTH.NAME AUTHOR AFFILIATION
WATSON,R.A. Carolina Power & Light Co.
RECIP.NAME RECIPIENT AFFILIATION
DENTON,H.R. Office of Nuclear Reactor Regulation, Director

SUBJECT: Forwards info in response to Eddleman Contention 9 re environ qualification program.FSAR will be amended to provide description of program.

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Carolina Power & Light Company

SERIAL: NLS-84-343

JUL 25 1984

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
United States Nuclear Regulatory Commission
Washington, DC 20555

SHEARON HARRIS NUCLEAR POWER PLANT
UNIT NO. 1 - DOCKET NO. 50-400
ENVIRONMENTAL QUALIFICATION PROGRAM

Dear Mr. Denton:

Carolina Power & Light Company hereby provides information in response to Eddleman Contention 9. This information is based on the Shearon Harris Environmental Qualification program. We will amend the Final Safety Analysis Report shortly to provide a complete description of our program.

Should you have any questions with regard to this issue, please contact Mr. Sherwood R. Zimmerman at (919) 836-6242.

Yours very truly,

R A Watson

R. A. Watson - Vice President
Harris Nuclear Project

PS/cfr (408PSA)

cc: Mr. B. C. Buckley (NRC)
Mr. Bob Legrange (NRC-NRC/EQ)
Mr. Armand Masciantonio (NRC-NRR/EQ)
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411 Fayetteville Street • P. O. Box 1551 • Raleigh, N. C. 27602

SHEARON HARRIS NUCLEAR POWER PLANT
ATOMIC SAFETY AND LICENSING BOARD
EDDLEMAN CONTENTION NO. 9

9A. The proposed resolution and vendor's modification for ITT-Barton transmitters has not been shown to be adequate. (Ref. IE Information Notices 81-29, 82-52, and 83-72).

Response to Contention 9A:

ITT Barton transmitters, model numbers 763 and 764, are supplied to the Shearon Harris project by Westinghouse.

Carolina Power & Light Company (CP&L) has addressed IE Information Notices 81-29, 82-59, and 83-72 as follows:

1. Information Notice 81-29 dated September 24, 1981, Equipment Qualification Notice No. 2 - Test Summary Report No. 1 indicated noisy output followed by erroneous output for two DP transmitters and noise followed by erroneous output for 40 minutes for one pressure transmitter (Model 763 and 764 ITT Barton). CP&L did not take any action at that time because the manufacturer was investigating the failures, concentrating on aging methodology, test set-up, and duplicating test conditions to establish what the failure mechanisms were. There were no corrective actions recommended at that time. Subsequently, as described in IE Notice 82-52, the causes of the problems were identified and corrected. The transmitters have been successfully retested.

2. Information Notice 82-52 dated December 21, 1982, Equipment Qualification Notice No. 2 - Test Summary Report No. 2 indicated that the failure mechanisms had been determined to be bad connections in the connector assembly. Satisfactory resolution of the failures on Information Notice 81-29 also had been established. The transmitter was successfully retested by Westinghouse.

   CP&L sent all Barton Models 763 and 764 safety-related transmitters back to ITT Barton on November 11, 1982 after receipt of a change notice from Westinghouse for rework (i.e., resoldering connector assemblies). They are still at the factory.

3. Information Notice 83-72 dated October 28, 1983, Equipment Qualification Notice No. 20 - Test Summary Report No. 1 indicated a negative shift in output during initial exposure to operating pressure for the Model 763 pressure transmitter.

   The reported defect had a specific cause which was determined to be creep in the mechanical linkage and the material used to attach the link wire to the bourdon tube and strain-sensing beam.

   Since the Model 763 Barton transmitters had already been sent to the factory for rework per Information Notices 81-29 and 82-52, CP&L indicated that the 763 transmitters should remain at ITT Barton until all corrective hardware modifications could be implemented at the same

(401PSA/ccc)

time. Westinghouse has maintained a close follow on the Barton transmitter testing and will inform CP&L when qualification testing and developments have been thoroughly evaluated. CP&L will perform an evaluation of the corrective actions to insure that this problem has been corrected, and the results of the evaluation will be documented in the EQ package.

Suppressed zero transmitters are used to measure pressurizer pressure. The effect of this drift allowance on over-temperature delta T is minimal and can be absorbed. The effect on low trips and DNB calculations is conservative. Credit is taken for the high trip on loss of load only and this transient is not limiting for DNB or overpressure protection. Therefore, Westinghouse has established that the observed excessive negative drift is not a safety concern.

4. Information Notice 83-72 dated October 28, 1983, Equipment Qualification Notice No. 23 - Test Summary Report No. 1 indicated that the Models 763 and 764 transmitters had thermal nonrepeatability which caused results in performance outside Barton's specification.

   The defect was determined to be leakage current through the shafts of the zero and span potentiometers to the mounting bracket.

   As stated before for the Model 763 transmitters, CP&L has indicated that the Model 764 transmitters which have already been sent to ITT Barton for rework per IN 81-29 and IN 82-52 should remain at the factory until all hardware modifications can be implemented at the same time. Westinghouse will maintain a close follow on the Barton transmitter testing and will keep CP&L informed of qualification testing and developments until they have been thoroughly evaluated. CP&L will perform an evaluation of the corrective actions to insure that this problem has been corrected and the results of the evaluation will be included in the EQ package.

   CP&L believes that the above corrective actions are adequate to address the concerns expressed in Eddleman Contention 9A.

(401PSA/ccc)

9B. There is not sufficient assurance that the concerns with Limitorque valve operators identified in IE Information Notice 83-72 (except for Items C2, C5, and C7) have been adequately resolved.

Response to Contention 9B:

The Information Notice 83-72 (IN 83-72) addressed several concerns with the Limitorque valve operators at the Midland Plant. These concerns were related to:

1. Terminal blocks - underrated, unqualified, unidentifiable (A, B, C9).

2. Motor insulation material - ambient temperature rating (C1).

3. Orientation of the operators (C3).

4. Drain plug installation (C4).

5. Installed equipment not in accordance with the purchase order and EQ program (C6).

6. O-ring qualification uncertain (C8).

Limitorque Corporation has been contacted on several occasions and has provided several written responses to CP&L concerning the above deficiencies. Limitorque concluded that except for the nylon terminal blocks, the above deficiencies were related to lack of information at Midland and thus do not represent actual equipment qualification concerns applicable to Shearon Harris.

However, it is CP&L's practice to perform an independent assessment of the applicability of IE Notices and Bulletins to Shearon Harris. To that end, the following assessment is offered:

1. Terminal blocks will be field verified on a sample basis using vendor supplied information. The verifier will measure the dimensions of the power and nonpower lead terminal blocks, including the point-to-point distances of the terminal screws, using manufacturer catalog information provided by Limitorque. This field verification will ensure that the terminal blocks provided are the same type that were qualified. If any discrepancies are found, ~~all~~ remaining safety-related operators will be inspected.

2. Motor insulation material is presently being verified in the field as part of our equipment qualification effort. Verification consists of identification of motor insulation class from the motor nameplate data. For valve operators inside containment insulation class should be RH. If any operators are found not to have RH insulation, Limitorque will be contacted for resolution. No discrepancies have been noted thus far in the verification process.

3. Orientation of the operators is specified on design drawings and is independently verified by the on-site Quality Assurance (QA) organization. (See our response to Eddleman 9E of this submittal.)

4. Drain plugs are required by the vendor for inside-containment operators. Installation is inspected by site QA and verified on a sample basis by the site EQ group.

5. Safety-related equipment is manufactured under the vendor's facility QA program. Prior to shipment, CP&L, Westinghouse, or Ebasco inspect (both documentation and physical) the equipment and issue a "Quality Release". Upon arrival on site, CP&L QA personnel inspect the equipment prior to release to the field for installation. Thus, the installed equipment is assured to be in accordance with the purchase order and EQ program.

6. O-rings are designed for the specific application and are qualified as an integral part of the operator assembly.

Limitorque EQ reports have been reviewed by Westinghouse, Ebasco, and CP&L and have been found to be qualified. Except for the above mentioned verifications, no further action is deemed necessary at this time.

9C. It has not been demonstrated that the RTDs have been qualified in that the Arrhenius thermal aging methodology employed is not adequate to reflect the actual effects of exposures to temperatures of normal operation and accidents over the times the RTDs could be exposed to those temperatures. (Ref. NUREG/CR-1466, SAND-79-1561, Predicting Life Expectancy of Complex Equipment Using Accelerated Aging Techniques.)

Response to Contention 9C:

Depending on the application of a piece of equipment, the environment it is exposed to can vary. The Shearon Harris Environmental Qualification Program includes Aging, which reflects the intended application. The goal of the aging program is to simulate a certain age of the equipment (40 years) prior to testing under the severe environmental conditions representative of the postulated accident to which it must be qualified.

The aging program addresses the types of experiments discussed in Part II of NUREG/CR-1466 (SAND 79-1561) "Predicting Life Expectancy and Simulating Age of Complex Equipment Using Accelerated Aging Techniques",

1. Failure Mode Tests,
2. Capability Tests, and
3. Accelerated Aging Tests, as follows:

1. Failure Mode Tests - The purpose is to indicate where a change in material, components, or design may lead to enhanced reliability. This is accomplished by exposing the equipment to environments that have higher than use stress levels. With respect to environmental qualification at Shearon Harris, the equipment is subjected to an aging temperature greater than the actual environment temperature it will be subjected to during its installation. All components making up the equipment see this higher temperature, which places the equipment in a high stress condition for a specific period of time usually expressed in many hours, or days.

2. Compatibility Tests - The purpose is to show whether the aging of a specified material is affected by the aging of other materials in the group. As stated in the Failure Mode Tests, all components making up the equipment are aged simultaneously under high stress conditions thus accounting for this condition.

3. Accelerated Aging Tests - This is the method employed to age the equipment. Specifically, aging is primarily based on the Arrhenius methodology which is acceptable to the NRC (See NUREG 0588, Section 4-4).

On the Shearon Harris RTDs, CP&L has reviewed the Westinghouse supplied test results and has done a detailed analysis of the results. This analysis included a review of the aging parameters used by Westinghouse with comparison to actual parameters values at Shearon Harris.

Additional information about aging methodology used for the Harris RTDs is presented in WCAP-8587, which has been approved by the NRC.

As reported in WCAP 8687, Supplement 2 - E-05A and E-06A, organic materials in the RTD assemblies are limited to epoxy potting at the cable/probe interface and silicon varnish on the cable lead. With the sealed armor protecting the RTD cable from the intrusion of moisture, the silicon varnish does not serve a critical function. Only the epoxy serves any physical function in providing some support for wires in the transition from cable to probe body. Like the varnish, the potting is not a primary seal against moisture in the event of a Design Basis Event. The other materials are inorganic and are not age-sensitive.

The accelerated aging parameters were chosen for an ambient temperature of 50°C with an elevated temperature in the area of the epoxy potting of 50°C above ambient. The elevation of temperature above ambient is the result of heat transfer from the reactor coolant pipe or reactor coolant bypass manifold. Because no age-sensitive material is exposed to the full reactor coolant temperature, there is no reason to perform accelerated aging simulation using that temperature over the intended qualified life. The accelerated thermal aging is described in the respective EQ test reports which have been approved by the NRC.

9D. The qualification of instrument cables did not include adequate consideration and analysis of leakage currents resulting from the radiation environment. These leakage currents could cause degradation of signal quality and/or spurious signals in Harris instrument cables.

Response to Contention 9D:

In addressing to the claim that the qualification of instrument cables did not include adequate monitoring of leakage currents during and after tests, it merits noting that IEEE 383-1974, which forms the basis for the cable qualification program at Shearon Harris, does not required monitoring this parameter.

A review of the methods used in testing cable for Shearon Harris will, however, show that even though leakage current is not a standard measured parameter, other tests that are performed are equal or even harsher than leakage current measurements. One of these tests is the post thermal/radiation test which involves submergence of the aged cable and application of high voltages. After cables have been aged thermally and received an equivalent 40 year plus accident total integrated radiation dose, they are straightened and recoiled with an inside diameter if approximately 20 times the cable overall diameter and immersed in tap water at room temperature. While still immersed these specimens should pass a voltage withstand test at voltages several times higher than required during normal operation. If an insulation breakdown has occurred during the test, this would show up.

Additionally, in the case of instrument cable where leakage current is a concern, insulation resistance, which can be used to indicate the values of leakage current, is also frequently measured before, during, and after the environmental qualification. A comparison of pre-test to post-test values of insulation resistance is done during the test report reviews.

All of the above tests results are reviewed by CP&L and this review is part of the test report review packages.

9E. There is not sufficient assurance that the physical orientation of equipment in testing is the same as the physical orientation of equipment installed.

Response to Contention 9E:

The environmental qualification reports describe and in some cases even provide photographs of the listed equipment orientation/set-up during their testing. The test set-up is reviewed in detail by the design organization with particular attention paid to any limiting conditions. The vendor may test in several orientations, test in the most limiting orientation, test in a single orientation and then analyze other orientations, or simply specify the exact tested orientation. This is also carefully reviewed by the design organization. The results of these reviews are then fed back into the installation drawings and form the basis for field installation. Any orientation questions, discrepancies, or inconsistencies are resolved with the vendor.

CP&L then assures that the equipment is installed per design drawings. Contractor personnel use only controlled engineering documents to install equipment. A very large quality inspection organization assures installation per design through a comprehensive, independent field inspection program using these design documents. Installation problems identified by the field installation personnel are resolved by design engineering personnel during the installation process. Documentation is maintained as part of plant records justifying the changes, thus allowing for future audit and verification. Problems that are identified during the inspection process are also evaluated by design engineering personnel. The non-conforming item is either reworked or justified by design engineering to be acceptable as-is.

Thus, it is shown that this multi-faceted program involving the vendor, design engineering, construction installation personnel, and quality inspection organization ensures that qualified equipment is installed in an orientation consistent with the test program. It should also be noted that in addition to the above, there are various walkdown programs being developed (post installation, post inspection) which will provide an additional overlay of assurance on the installation process.

9F. The effects of radiation on lubricants and seals has not been adequately addressed in the environmental qualification program.

Response to Contention 9F:

The Shearon Harris harsh environment qualification program uses actual type tests to demonstrate qualification. This includes irradiation of equipment as a whole, including the seals, lubricants, etc., used in the equipment. As such, the effects of radiation on lubricants and seals are included in the qualification of the equipment using these elements. This is documented in the Equipment Qualification packages and is reviewed by CP&L and audited by NRC. In those cases where lubricants, seals, etc., are the limiting component, inspection and replacement requirements are specifically hi-lighted by the EQ program and transmitted to operations personnel for inclusion in the maintenance and surveillance program for the plant.

9G. There is inadequate assurance that failure to report all results of environmental qualification tests, including failures, has been brought to light in connection with electrical equipment installed in Harris. This includes past test failures of equipment which subsequently passes an EQ test and test failures of equipment which is said to be qualified by similarity. (Ref. Item 2, Page 5, L. D. Bustard et al., Annual Report: Equipment Qualification Inspection Program, Sandia National Laboratories, FY83.)

Response to Contention 9G:

Environmentally qualified Class 1E electrical components are purchased from vendors who have CP&L approved quality assurance programs. The Vendor Surveillance Unit verifies that the vendor QA program and implementation are acceptable before the vendors are awarded contracts. The acceptance of the vendor's QA program is based on a review of the vendor's QA program manual/procedures and the performance of an on-site facility QA audit. For the SHNPP project, manual reviews and facility audits are performed by CP&L Vendor Surveillance Unit, Ebasco and/or Westinghouse personnel. During a facility QA audit conducted by CP&L Vendor Surveillance Unit personnel, a prepared checklist is used which included questions concerning verification of design adequacy and design analysis.

After a contract has been awarded, CP&L Vendor Surveillance Specialists perform shop inspections at the vendor's facilities to verify that the requirements of the specification for Class 1E electrical components are being met. During these surveillance visits, the Vendor Surveillance Specialists verify that a report is available for components that require environmental qualification. The CP&L Vendor Surveillance Specialists verify that the report represents the equipment that is being purchased and that the report has been approved by authorized laboratory, vendor, and CP&L personnel. Ebasco and Westinghouse surveillance representatives also perform shop inspections for contracts for which they are responsible. These surveillance representatives verify that electrical component qualification reports are available and that the reports have been approved by authorized laboratory, vendor and Ebasco/Westinghouse personnel.

As part of the equipment qualification program, a review is done of the results of any testing. If, during this review, anomalies, gaps in testing, sample description discrepancies or improper assumptions are noted, the vendor is contacted. In some instances, visits to the vendors shops by Equipment Qualification Engineers have been made to personally verify the information and inspect the tested equipment. Additionally, comparison qualification (i.e., qualification by comparison to a similar tested component) is given a careful review to assure proper logic and basis.

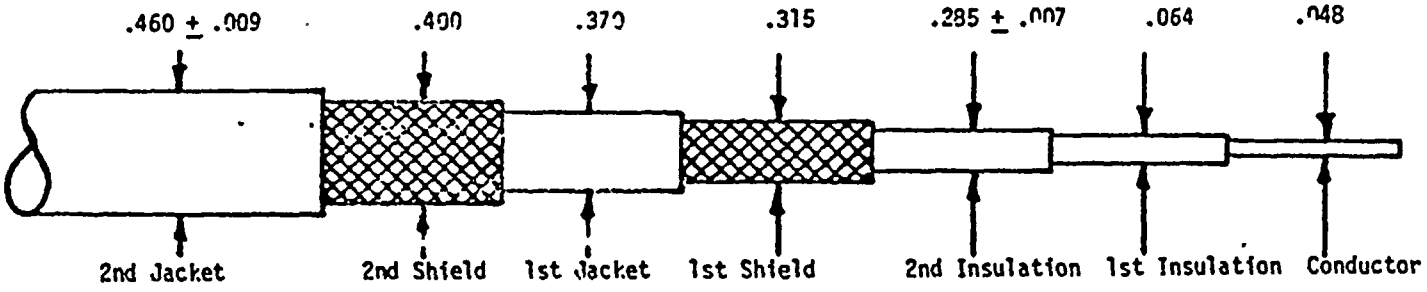
Item 2, p. 5 of the Sandia report which is referenced in the contention was addressed by the Staff in the "Discussion of Sandia Items" attached to the memorandum from William J. Dircks to the Commissioners, dated February 2, 1984. Item 2 is discussed together with certain other items. There are several inspection reports listed with those items. A review of those reports shows that Item 2 is taken from Inspection Report No. 9990277/83-02, which documents the results of an inspection of The Rockbestos Company conducted on June 20-23 and August 16-17, 1983.

The Inspection Report (p. 10, 11, and 14) questions the use of the company's qualification test report #2806 to qualify their entire 100 series line of cable, particularly in view of the fact that in the same test used to qualify RSS-6-104 type cables, four other type cables in the 100 series line failed the test.

The Rockbestos cable company uses their qualification test report #2806, which describes LOCA testing on R85-6-104 cable, to assert the qualification of their entire 100 series line. No mention is made of the RSS-6-100A, RSS-6-109, RSS-6-110, RSS-6-112 which were also a part of the qualification test used to generate QR2806 and failed.

Shearon Harris uses the RSB-6-104, RSS-6-105 and RSS-6-108 type cables. The RSS-6-104 was the model actually tested and did pass the test. RSS-6-105 and RSS-6-108 are used in the electrical containment penetrations only. A review of the spec sheets for these two models and discussions with Rockbestos have shown that the two cable types are very well represented, by comparison, to the RSS-6-104 alone. This comparison uses cable specifications such as installation material and thickness, and jacket material and thickness as comparison variables. As can-be seen by the attached equipment manufacturing catalog sheets, cable types RSS-6-104 and RSS-6-105 differ only in minor differences in the insulation material. Rockbestos has stated that the RSS-6-105 insulation is a higher quality insulation type than the RSS-6-104 which was successfully tested. The major differences between RSS-6-108 and the tested RSS-6-104 are that the 108 cable is a triaxial cable while the 104 cable is a coaxial cable, and the 108 cable contains the higher quality insulation similar to the 105 cable. Additionally, for the first jacket of the RSS-6-108 cable, it can be noted that the insulation/shielding/jacketing thick is greater than the RSS-6-104. The RSS-6-108 subsequently has a second shield and second jacket. Any comparisons done to establish qualifications are documented in the equipment qualification documentation packages. Therefore, the 2806 report can be used to qualify all three types of Rockbestos cable at Shearon Harris.

Shearon Harris does not use any of the type cables which failed during the qualification program used to generate QR2806.



Description	Construction Details
Conductor	18 AWG Tin Coated Copper (7x26) to ASTM B33 & B286
1st Insulation	Rockbestos Polymer LE
2nd Insulation	Radiation Cross-Linked, Low Noise Treated, Modified Polyolefin
1st Shield	33 AWG Tin Coated Copper to ASTM B33, 90% (minimum) coverage
1st Jacket	Radiation Cross-Linked, Flame Retardant, Non-Corrosive Modified Polyolefin
2nd Shield	33 AWG Tin Coated Copper to ASTM B33, 90% (minimum) Coverage
2nd Jacket	Radiation Cross-Linked, Flame Retardant, Non-Corrosive Modified Polyolefin

Electrical Properties

Impedance	72 ohms (nominal)	For Engineering Reference Only
Capacitance	21.7 pf/ft. (nominal)	
Velocity	65% (nominal)	
Dielectric Constant	2.3 (nominal)	
*Corona Extinction	1000 volts (rms) (minimum)	
*Insulation Resistance	10^6 megohms for 1000 ft. (minimum)	
* Dielectric Withstand	5000 volts (rms) (minimum)	
	1000 volts (rms) (minimum) between shields	

Physical Properties

Weight	140 lb/1000 ft. (nominal)
Minimum Bend Radius	5.5 inches for permanent installation

Environmental Properties

Cold Bend	-40°C on a 4.75 inch mandrel
Flammability	*IPCEA S-19-81, Sec. 6.19.6 (September 1977)

This cable is suitable for Class 1E service in nuclear generating stations and meets applicable requirements of IEEE 383-1974. Unless otherwise specified, printed legend will include "Rockbestos RSS-6-108/LE. 19XX."

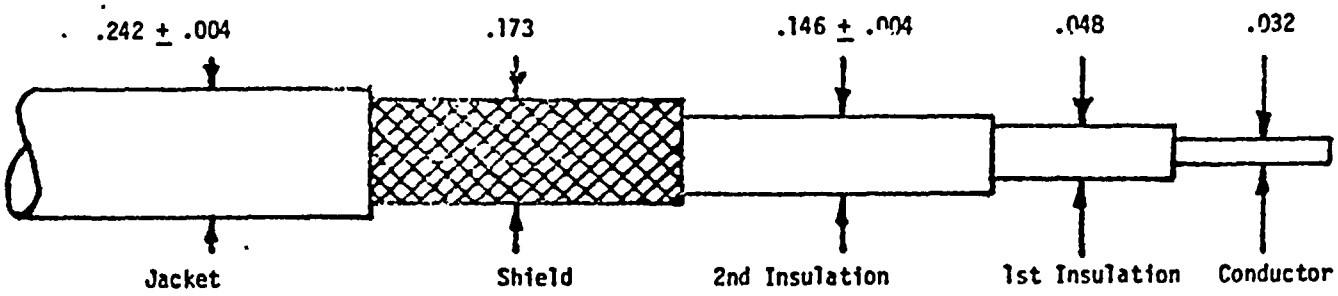
Dimensions are in inches and are nominal unless otherwise designated.

Required tests to be run in accordance with Rockbestos Test Procedures.

*Production Tests

THE ROCKBESTOS COMPANY
NEW HAVEN, CONNECTICUT 06504 USA TELEPHONE: (203) 772-2250 TELEX: 710-465-2149

Coaxial Cable - Low Noise — Adverse Service



Description	Construction Details
Conductor	22 AWG Tin Coated Copper (19x34) to ASTM B33 & B286
1st Insulation	Rockbestos Polymer LE
2nd Insulation	Radiation Cross-Linked, Low Noise Treated, Modified Polyolefin
Shield	34 AWG Tin Coated Copper to ASTM B33, 90% (Minimum) Coverage
Jacket	Radiation Cross-Linked, Flame Retardant, Non-Corrosive Modified Polyolefin

Electrical Properties

Impedance	62 ohms (nominal)	For Engineering Reference Only
Capacitance	25.7 pf/ft. (nominal)	
Velocity	64% (nominal)	
Dielectric Constant	2.4 (nominal)	
*Corona Extinction	2300 volts (rms) (minimum)	
*Insulation Resistance	10^6 megohms for 1000 ft. (minimum)	
*Dielectric Withstand	5000 volts (rms) (minimum)	

Physical Properties

Weight	36.6 lb/1000 ft. (nominal)
Minimum Bend Radius	3.0 inches for permanent installation

Environmental Properties

Cold Bend	-40°C on a 2.5 inch mandrel
Flammability	*IPCEA S-19-81, Sec. 6.19.6 (September 1977)

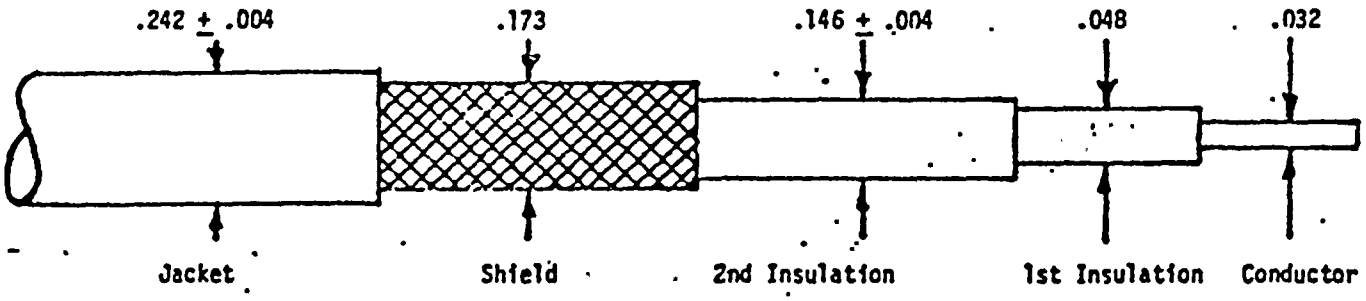
This cable is suitable for Class 1E service in nuclear generating stations and meets applicable requirements of IEEE 383-1974. Unless otherwise specified, printed legend will include "Rockbestos RSS-6-105/LE, 19XX."

Dimensions are in inches and are nominal unless otherwise designated.

Required Tests to be run in accordance with Rockbestos Test Procedures.

*Production Tests

THE ROCKBESTOS COMPANY
NEW HAVEN, CONNECTICUT 06504 USA TELEPHONE: (203) 772-2250 TELEX: 710-465-2149



Description	Construction Details
Conductor	22 AWG Tin Coated Copper (19x34) to ASTM B33 & B286
1st Insulation	Rockbestos Polymer LD
2nd Insulation	Radiation Cross-Linked, Modified Polyolefin
Shield	34 AWG Tin Coated Copper to ASTM B33, 90% (Minimum) Coverage
Jacket	Radiation Cross-Linked, Flame Retardant, Non-Corrosive Modified Polyolefin

Electrical Properties

Impedance	62 ohms (nominal)	For Engineering Reference Only
Capacitance	25.7 pf/ft. (nominal)	
Velocity	64% (nominal)	
Dielectric Constant	2.4 (nominal)	
*Corona Extinction	2300 volts (rms) (nominal)	
*Insulation Resistance	10^5 megohms for 1000 ft. (minimum)	
*Dielectric Withstand	5000 volts (rms) (minimum	

Physical Properties

Weight	36.6 lb/1000 Ft. (nominal)
Minimum Bend Radius	3.0 inches for permanent installation

Environmental Properties

Cold Bend	-40°C on a 2.5 inch mandrel
Flammability	*IPCEA S-19-81, Dec. 6.19.6 (September 1977)

This cable is suitable for Class 1E service in nuclear generating stations and meets applicable requirements of IEEE 383-1974. The cable will operate at temperatures up to 250°C for 1 hour, 171°C for 2 hours, and 150°C for 10 hours. Continuous service up to 110°C.

Dimensions are in inches and are nominal unless otherwise designated.

Required tests to be run in accordance with Rockbestos Test Procedures.

*Production Tests