

Stephen A. Byrne
Vice President, Nuclear Operations
803.345.4622



March 16, 2001
RC-01-0058

Document Control Desk
U.S Nuclear Regulatory Commission
Washington, DC 20555

Gentlemen:

Subject: VIRGIL C. SUMMER NUCLEAR STATION (VCSNS)
DOCKET NO. 50/395
OPERATING LICENSE NO. NPF-12
REQUEST FOR ADDITIONAL INFORMATION TESTING OF KAOWOOL
FIRE BARRIER SYSTEMS ON DECEMBER 28, 1999
(TAC NO. MA9190)

South Carolina Electric & Gas (SCE&G) is submitting the attached documents as a response to your request for additional information, dated February 20, 2001, on the testing of Kaowool fire barrier systems which was conducted on December 28, 1999.

Should you have any questions, please call Mr. Jeff Pease at (803) 345-4124.

Very truly yours

A handwritten signature in black ink, appearing to read "Stephen A. Byrne".

Stephen A. Byrne

JWP/SAB/dr
Attachments

c.

J. J. Galan (w/o attachment)
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L. A. Reyes
K. R. Cotton
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RTS (O-C-99-1520)
File (818.07)
DMS (RC-01-0058)

A006

COMMENTS TO KAOWOOL FIRE BARRIER TEST REPORT
(REFERENCE TAC NO. MA9190)

NRC COMMENT 1: Circuit Meggering

"Meggering was not performed throughout the testing, in accordance with GL86-10, Supplement 1."

RESPONSE:

There was a conscious decision by SCE&G based upon the following:

In accordance with GL 86-10, Supplement 1, the only monitoring required during fire exposure is for instrument cables. Cables included within Design Engineering scope of testing were power, control, and instrument. SCE&G conducted discussions with our test vendor and test laboratory regarding the performance of meggering during the test. It was agreed that, to protect the integrity of the computers used and data collected during the cable testing, we would do only the meggering necessary to bound the worst case cable / cable types.

NRC COMMENT 2: Raceway Weights

"The weight of the raceways and of cables and the information on cable types should be a part of the report."

RESPONSE:

The information on the weight of the raceway on a pound/linear foot basis will be added to the technical report as pages 332D, 332E and 332F, and have been included with this letter (Attachments V, VI, and VII, respectively). This information was derived from SCE&G Guidelines (EE-02, Attachment VIII), with selected pages included with this letter. These sheets (Attachments V, VI, and VII) are part of an existing calculation (DC07870-002).

NRC COMMENT 3: Cable Types

"The type of cable used in the fire test is included in the test report with no reference to the type of cable, conductor material, cable jacket material or dimensions."

RESPONSE:

The type of cable, conductor material, cable jacket material, dimensions and weights will be added to the technical report as pages 332A, 332B and 332C, and have been included with this letter(Attachment IV).

Manufacturer's cut sheets for the various types of cables have been included with this letter (Attachment IX).

NRC COMMENT 4: Megger Scope

"The Insulation Resistance Measurement Data Sheets (Megger results) for Items 2, 5 and 6 (pages 214 to 220) are incomplete and should be provided."

RESPONSE:

The Insulation Resistance Measurement Data Sheets (Megger results) for items 2, 5, and 6 (pages 214 to 220) are incomplete because the Post Test megger was not completed for these cables. The justification for this follows:

Pages 209 through 213 show the meggering tests for cables 3A, 3B, 3C, 4A and 10A. Cable 3A was an EK-B1B cable, 3B was an EK-B1J, 3C was an EK-A3H, 4A was an EK-B1K, and 10A was an EK-B1B. We will refer to these cables as Group I.

Pages 214 through 220 show the meggering tests for cables 2A, 5A, 5B, 5C, 5D, 5E and 6A. We will refer to these cables as Group II.

SCE&G gave careful consideration to the selection of cables for pre and post test meggering. In order to reduce the time required for meggering, we agreed to test the five worst case temperature profile cables (Group I). Based upon the continuous temperature monitoring, SCE&G determined which of the pre hose test circuits were to be megger tested prior to hose stream testing. Worst case cables / cable types were selected at that time. This gave a representative cable from most of the different raceway configurations. We knew the Group II cables would be bounded by the Group I cables. For example, Group I cables 3A and 10A are the same as cable 5A of Group II; cable 3B is the same as 5D; cable 3C is the same as 5E; and cable 4A is smaller than 2A.

The five bounding cables / cable types (Group 1) were meggered at the completion of the hose stream test (post test meggering).

NRC COMMENT 5: Test Plan Attachments

"Attachments 1 and 2, which were referenced in the test report, but were not included in the test report, should be provided."

RESPONSE:

During final assembly of the test report, the Design Engineering Test Contractor relocated the cable / trace details from the "Test Plan Attachments" into the body of the test report. This created the "omitted" attachments, as the information was included elsewhere.

For ease of reference, page 34A (Attachment 1) has been added (as Attachment II to this letter) to reference the new page location for each test item. Page 34B (Attachment 2) has been added (as Attachment III to this letter) to show the test item cable type/loading summary and where its pages are shown.

TRANSCO PRODUCTS INC.

Transco Products Inc.

34A

ATTACHMENT 1

General Orientation and Configuration of the Test Items and Test Slabs

| ITEM # | PAGE (S) |
|---------------|-----------------|
| 1 | 304 |
| 2 | 311 |
| 3 | 323/339 |
| 4 | 340/345 |
| 5 | 347/348 |
| 6 | 365/373 |
| 7 | 374/384 |
| 8 | 385/391/392 |
| 9 | 393/397/398 |
| 10 | 399 |
| 11 | 404 |
| 12 | 404 |

TRANSCO PRODUCTS INC.

Transco Products Inc.

34B

ATTACHMENT 2

Test Item Cable Type/Loading

| <u>Description</u> | <u>SEE PAGES</u> |
|--|-------------------------|
| Test Item Loading Summary | 332 |
| Cable Type, Quantity, Conductor/Cable Jacket Material, and Cable Outside Diameter for Each Test Item | 332A/332B/332C |
| Fire Test Calculation Summary (Table of the Weight of the Raceway on a Pound/Linear Foot Basis for Test Items) (Page 6.1.1-1 of Calculation DC07870-002, Rev.0) | 332D |
| Thermal Mass Calculation Summary (Table of the Weight of the Raceway on a Pound/Linear Foot Basis for Deviation Items) (Pages 6-1 and 6-2 of Calculation DC07870-002, Rev.0) | 332E/332F |
| Test Item Loading Summary | 361 |

| Test Item No.: | Test Item: | Cable Type: | Quantity: | Cable Description: | Cable Outside Dia. |
|----------------|----------------|-------------|-----------|--|--------------------|
| 1 | 4" Conduit | EK-A1C | 1 | 3/C, #350MCM-37 strands tinned copper, extruded semi-conducting strand screen, .175" Okoguard insulation, extruded semi-conducting insulation screen .005" flat tinned copper tape helically applied, cabled with fire and moisture resistant fibrous fillers, .012" neoprene filled binder tape, double wrap .015" hypalon bedding tape, .005" corrugated bronze tape applied helically, .012" neoprene filled binder tape, .140" Okolon outer jacket | 2.84" |
| 2 | 4" Conduit | EK-A1E | 1 | 3/C, #4/0 - 19 strands tinned copper, extruded semi-conducting strand screen, .175" Okoguard insulation, extruded semi-conducting insulation screen .005" flat tinned copper tape helically applied, cabled with fire and moisture resistant fibrous fillers, .012" neoprene filled binder tape, double wrap .015" hypalon bedding tape, .005" corrugated bronze tape applied helically, .012" neoprene filled binder tape, .140" Okolon outer jacket | 2.42" |
| | 1-1/4" Conduit | EK-B1L | 1 | 7/C, 12 AWG (7 strands), 40 mils FR insulation (printed colors), cabled, zinc tape, 65 mils FR jacket Class B stranding, copper tin-coated conductor | 0.80" max. |
| 3 | 6" x 6" Tray | EK-A3H | 2 | 3/C, 8 AWG, stranded, 55 mils HT Kerite insulation, (printed colors), cabled, 65 mils FR jacket (printed), Class B stranding, copper conductor | .79" max. |
| | | EK-A3J | 2 | 3/C, 10 AWG, stranded 40 mils HT Kerite insulation, (printed colors), cabled, 65 mils FR jacket (printed), Class B stranding: copper insulation | .64" max. |
| | | EK-B1J | 12 | 4/C, 12 AWG (7 strands), 40 mils FR insulation (printed colors), cabled, zinc tape, 65 mils FR jacket Class B stranding, | 0.69" max |

| Test Item No.: | Test Item: | Cable Type: | Quantity: | Cable Description: | Cable Outside Dia. |
|----------------|---------------|-------------|-----------|--|--------------------|
| | | EK-B1B | 12 | copper tin-coated conductor 2/C, 9 AWG (7 strands), 40 mil FR insulation, (printed colors), cabled, zinc tape, 65 mils FR jacket, Class B stranding, copper tin-coated conductor | 0.69" max |
| 4 | 1" Conduit | EK-B1K | 1 | 5/C, 12 AWG (7 strands), 40 mils FR insulation (printed colors), cabled, zinc tape, 65 mils FR jacket. Class B stranding, copper tin-coated conductor | 0.74" max. |
| 5 | 6" x 36" Tray | EK-B1B | 8 | 2/C, 9 AWG (7 strands), 40 mil FR insulation, (printed colors), cabled, zinc tape, 65 mils FR jacket, Class B stranding, copper tin-coated conductor | 0.69" max |
| | | EK-C1A | 28 | Dekoron Instrument Wire, Dekoron Part No. 1952-68640, 1/pair, shielded, 16 AWG 7-strand tinned copper conductors, primary insulation of 30 mils EPDM with a 15 mil Hypalon primary jacket, color coded black and white, conductors twisted with a 16 AWG 7-strand tinned copper drain wire, 2.0 mil aluminum/Mylar overall shield, 45 mil Hypalon outer jacket | 0.436" |
| | | EK-C6B | 6 | 7300" equipment cable, 12 Pair #18-19 strands tinned copper, .010" Tefzel insulation, color coded, twisted, cabled with fiberglass fillers, mylar/aluminum tape, 1 x #18 7-strand tinned copper drain wire, tape, .020" Tefzel jacket | 0.528" |
| | | EK-A3J | 7 | 3/C, 10 AWG, stranded 40 mils HT Kerite insulation, (printed colors), cabled, 65 mils FR jacket (printed), Class B stranding: copper insulation | 0.64" max |
| | | EK-A3H | 8 | 3/C, 8 AWG, stranded, 55 mils HT Kerite insulation, (printed colors), cabled, 65 mils FR jacket (printed), Class B stranding, copper conductor | 0.79" max |

| Test Item No.: | Test Item: | Cable Type: | Quantity: | Cable Description: | Cable Outside Dia. |
|----------------|----------------|-------------|-----------|---|--------------------|
| | | EK-B1J | 8 | 4/C, 12 AWG (7 strands), 40 mils FR insulation (printed colors), cabled, zinc tape, 65 mils FR jacket Class B stranding, copper tin-coated conductor | 0.69" max |
| | | EK-A1E | 1 | 3/C, #4/0 - 19 strands tinned copper, extruded semi-conducting strand screen, .175" Okoguard insulation, extruded semi-conducting insulation screen .005" flat tinned copper tape helically applied, cabled with fire and moisture resistant fibrous fillers, .012" neoprene filled binder tape, double wrap .015" hypalon bedding tape, .005" corrugated bronze tape applied helically, .012" neoprene filled binder tape, .140" Okolon outer jacket | 2.42" |
| 6 | 1-1/4" Conduit | EK-A3J | 1 | 3/C, 10 AWG, stranded 40 mils HT Kerite insulation, (printed colors), cabled, 65 mils FR jacket (printed), Class B stranding: copper insulation | 0.64" max |
| 7 | 1" Conduit | EK-B1K | 1 | 5/C, 12 AWG (7 strands), 40 mils FR insulation (printed colors), cabled, zinc tape, 65 mils FR jacket Class B stranding, copper tin-coated conductor | 0.74" max. |
| 8 | Junction Box | NA | 0 | N/A | N/A |
| 9 | Blank Opening | NA | 0 | N/A | N/A |
| 10 | Airdrop | EK-B1B8 | 1 | 2/C, 9 AWG (7 strands), 40 mil FR insulation, (printed colors), cabled, zinc tape, 65 mils FR jacket, Class B stranding, copper tin-coated conductor (Same as EK-B1B. 8 denotes reel number) | 0.69" max |
| 11 | Junction Box | NA | 0 | N/A | N/A |
| 12 | Junction Box | NA | 0 | N/A | N/A |

FIRE TEST CALCULATION SUMMARY

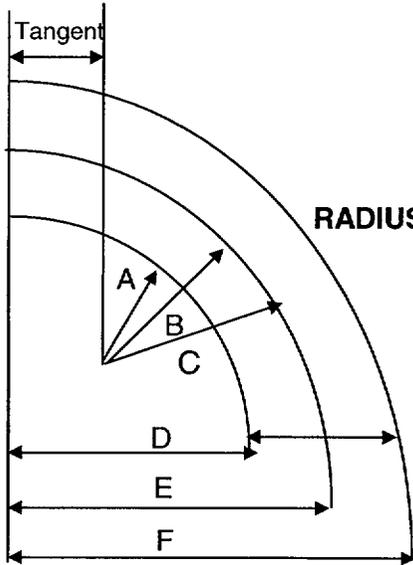
| SCE&G Test Item | Length (ft) | Conduit/Cable Tray | | | | | | Cable Type | | | | | | | %Fill |
|-----------------|-------------|------------------------------|-----------|----------------------|----------------|----------------|------------------|---------------|----------|-----------------------|----------------|----------------|------------------|-----------------------|---------|
| | | Description | Size (in) | Inside Diameter (in) | Weight (lb/ft) | Area (sq. ft.) | Volume (cu. ft.) | Cable Type | Quantity | Outside Diameter (in) | Weight (lb/ft) | Area (sq. ft.) | Volume (cu. ft.) | Total Volume (cu.ft.) | |
| 1 | 20 | 4" Open Air Conduit | 4 | 4.026 | 9.820 | 0.088 | 1.768 | EKa1c | 1 | 2.842 | 6.620 | 0.0441 | 0.881 | 0.881 | 49.963% |
| | | | | | | | | Bare # 8 Wire | 1 | 0.146 | 0.051 | 0.0001 | 0.002 | 0.002 | |
| 2a | 20 | Bundled 4" Conduit | 4 | 4.026 | 9.820 | 0.088 | 1.768 | EKa1e | 1 | 2.424 | 4.573 | 0.0320 | 0.641 | 0.641 | 36.382% |
| | | | | | | | | Bare # 8 Wire | 1 | 0.146 | 0.051 | 0.0001 | 0.002 | 0.002 | |
| 2b | 20 | Bundled 1.25" Conduit | 1.25 | 1.380 | 2.010 | 0.010 | 0.208 | EKb1l | 1 | 0.800 | 0.378 | 0.0035 | 0.070 | 0.070 | 34.726% |
| | | | | | | | | Bare # 8 Wire | 1 | 0.146 | 0.051 | 0.0001 | 0.002 | 0.002 | |
| 3 | 20 | 6" x 6" Open Air Cable Tray | 6 x 6 | N/A | 8.000 | 0.250 | 5.000 | EKa3h | 2 | 0.790 | 0.533 | 0.0034 | 0.068 | 0.136 | 29.433% |
| | | | | | | | | EKa3j | 2 | 0.640 | 0.240 | 0.0022 | 0.045 | 0.089 | |
| | | | | | | | | EKb1j | 11 | 0.690 | 0.268 | 0.0026 | 0.052 | 0.571 | |
| | | | | | | | | EKb1b | 12 | 0.690 | 0.284 | 0.0026 | 0.052 | 0.623 | |
| | | | | | | | | Bare # 8 Wire | 1 | 0.146 | 0.051 | 0.0001 | 0.002 | 0.002 | |
| | | | | | | | | EKb1j | 1 | 0.690 | 0.268 | 0.0026 | 0.049 | 0.049 | |
| 4 | 16 | Open Air 1" Conduit | 1 | 1.049 | 1.530 | 0.006 | 0.096 | EKb1k | 1 | 0.740 | 0.311 | 0.0030 | 0.048 | 0.048 | 51.701% |
| | | | | | | | | Bare # 8 Wire | 1 | 0.146 | 0.051 | 0.0001 | 0.002 | 0.002 | |
| 5 | 20 | 6" x 36" Open Air Cable Tray | 6 x 36 | N/A | 15.000 | 1.500 | 30.000 | EKa3j | 7 | 0.640 | 0.240 | 0.0022 | 0.045 | 0.313 | 10.356% |
| | | | | | | | | EKa1e | 1 | 2.424 | 4.573 | 0.0320 | 0.641 | 0.641 | |
| | | | | | | | | EKb1j | 8 | 0.690 | 0.268 | 0.0026 | 0.052 | 0.415 | |
| | | | | | | | | EKb1b | 8 | 0.690 | 0.284 | 0.0026 | 0.052 | 0.415 | |
| | | | | | | | | EKa3h | 8 | 0.790 | 0.533 | 0.0034 | 0.068 | 0.545 | |
| | | | | | | | | EKc1a | 28 | 0.440 | 0.081 | 0.0011 | 0.021 | 0.591 | |
| | | | | | | | | EKc6b | 6 | 0.530 | 0.207 | 0.0015 | 0.031 | 0.184 | |
| | | | | | | | | Bare # 8 Wire | 1 | 0.146 | 0.051 | 0.0001 | 0.002 | 0.002 | |
| 6 | 16 | 1.25" Wall/Ceiling Conduit | 1.25 | 1.380 | 2.010 | 0.010 | 0.166 | EKa3j | 1 | 0.640 | 0.240 | 0.0022 | 0.036 | 0.036 | 22.627% |
| | | | | | | | | Bare # 8 Wire | 1 | 0.146 | 0.051 | 0.0001 | 0.002 | 0.002 | |
| 7 | 16 | 1" Upgraded Open Air Conduit | 1 | 1.049 | 1.530 | 0.006 | 0.096 | EKb1k | 1 | 0.740 | 0.311 | 0.0030 | 0.048 | 0.048 | 51.701% |
| | | | | | | | | Bare # 8 Wire | 1 | 0.146 | 0.051 | 0.0001 | 0.002 | 0.002 | |
| 10 | 16 | Air Drop of Single Cable | N/A | N/A | N/A | N/A | N/A | EKb1b8 | 1 | 0.690 | 0.284 | 0.0026 | 0.042 | 0.042 | |
| | | | | | | | | Bare # 8 Wire | 1 | 0.146 | 0.051 | 0.0001 | 0.002 | 0.002 | |

THERMAL MASS CALCULATION SUMMARY

| | Item | Description | Raceway Total Weight (lb/ft) | Fire Barrier Total Weight (lb/ft) | Fire Barrier Thermal Mass (lb) |
|-----------------------------|--------------------------|------------------------------|------------------------------|-----------------------------------|--------------------------------|
| Fire Test Items | 1 | 4" Open Air Conduit | 16.491 | 16.491 | 329.820 |
| | 2a | 4" Bundled Conduit | 14.444 | 16.883 | 337.660 |
| | 2b | 1.25" Bundled Conduit | 2.439 | | |
| | 3 | 6" x 6" Open Air Tray | 16.221 | 16.221 | 324.420 |
| | 4 | 1" Open Air Conduit | 1.892 | 1.892 | 30.272 |
| | 5 | 6" x 36" Open Air Tray | 33.494 | 33.494 | 669.880 |
| | 6 | 1.25" Wall/Ceiling Conduit | 2.301 | 2.301 | 36.816 |
| | 7 | 1" Upgraded Open Air Conduit | 1.892 | 1.892 | 30.272 |
| | 10 | Air Drop of Single Cable | 0.335 | 0.335 | 5.360 |
| | Open Air Conduits | 3-TW | 2" Conduit - SWC87C | 4.068 | 4.068 |
| 6-TW | | 4" Conduit - CSM11B | 14.393 | 14.393 | 834.794 |
| 15-TW | | 3" Conduit - XX3413C | 8.734 | 23.844 | 763.008 |
| | | 3" Conduit - XX3417C | 8.734 | | |
| | | 2.5" Conduit - XX3574C | 6.376 | | |
| 17-TW | | 3" Conduit - EDE27A | 10.276 | 46.760 | 561.120 |
| | | 2.5" Conduit - EDE28A | 7.365 | | |
| | | 2.5" Conduit - XX2980A | 6.199 | | |
| | | 2.5" Conduit - XX2942A | 6.657 | | |
| | | 2" Conduit - EDE23A | 4.424 | | |
| | | 2" Conduit - EDE24A | 4.424 | | |
| | | 2" Conduit - YY-1953 | 4.424 | | |
| | | 1.5" Conduit - DGE23A | 2.991 | | |
| 18-TW | | 3" Conduit - XX897A | 8.238 | 16.110 | 80.550 |
| | | 3" Conduit - XX898A | 7.872 | | |
| 25-TW | | 4" Conduit - ESM171B | 16.440 | 16.440 | 164.400 |
| 29-TW | | 3" Conduit - XX3414C | 8.655 | 16.030 | 80.150 |
| | | 2.5" Conduit - XX3513C | 7.375 | | |
| 38-TW | | 4" Conduit - CCM38C | 14.393 | 28.786 | 1496.872 |
| | | 4" Conduit - CCM39C | 14.393 | | |
| 50-TW | 4" Conduit - ESM171B | 16.440 | 16.440 | 542.520 | |
| Open Air Cable Trays | 5-TW | 6" x 6" Cable Tray - 4065 | 20.154 | 41.248 | 989.952 |
| | | 6" x 6" Cable Tray - 4066 | 21.094 | | |
| | 8-TW | 6" x 6" Cable Tray - 4064 | 15.855 | 32.594 | 912.632 |
| | | 6" x 6" Cable Tray - 4065 | 16.739 | | |
| | 21-TW | 6" x 36" Cable Tray - 4284 | 52.856 | 173.786 | 6430.000 |
| | | 6" x 36" Cable Tray - 4314 | 92.741 | | |
| | | 6" x 36" Cable Tray - 5144 | 28.189 | | |
| | 22-TW | 6" x 24" Cable Tray - 4069 | 57.261 | 114.331 | 1715.000 |
| | | 6" x 24" Cable Tray - 4284 | 57.070 | | |
| | 23-TW | 6" x 36" Cable Tray - 4284 | 59.070 | 59.070 | 1418.000 |

THERMAL MASS CALCULATION SUMMARY

| | Item | Description | Raceway Total Weight (lb/ft) | Fire Barrier Total Weight (lb/ft) | Fire Barrier Thermal Mass (lb) |
|--|---------------------------|---------------------------------------|------------------------------|-----------------------------------|--------------------------------|
| Surface Mounted/ Open Air Conduits (Open Air Portion Only) | 8-TW | 1.25" Conduit - VLC4B | 2.250 | 2.250 | 2764.375 |
| | | Equipment - XFN-46B-VL 2752 lb | | | |
| | 10-TW | 1.25" Conduit - VLC1A | 2.250 | 2.250 | 2765.500 |
| | | Equipment - XFN-46A-VL 2752 lb | | | |
| | 13-TW | 2" Conduit - XX2511C | 4.287 | 4.287 | 12.861 |
| | 16-TW | 3" Conduit - XX1680D | 8.034 | 8.034 | 96.408 |
| | 19-TW | 3" Conduit - XX894E | 7.548 | 15.035 | 135.315 |
| | | 2" Conduit - XX895E | 3.745 | | |
| | | 2" Conduit - XX893E | 3.742 | | |
| | 25-TW | 1.25" Conduit - VLC17C | 2.388 | 2.388 | 9.552 |
| | 29-TW | 2.5" Conduit - XX3574C | 6.376 | 6.376 | 76.512 |
| | 34-TW | 3.5" Conduit - SWL11A | 14.634 | 14.634 | 760.968 |
| | 40-TW | 2.5" Conduit - VUL52C | 6.302 | 13.590 | 217.440 |
| | | 2.5" Conduit - VUL34B | 7.288 | | |
| 47-TW | 2" Conduit - XX3702B | 4.374 | 4.374 | 48.114 | |
| 51-TW | 1.5" Conduit - VLC44B | 3.125 | 3.125 | 18.750 | |
| Raceways Containing Cable Air Drops | 11-TW | 4" x 12" Cable Tray - 1012 | 17.146 | 17.146 | 1046.000 |
| | | 4" Conduit - CSM11B | 14.393 | 28.786 | 1670.000 |
| | | 4" Conduit - CSM42B | 14.393 | | |
| | 41-TW | 1.25" Conduit - CCE21A | 2.511 | 5.383 | 16.149 |
| | | 1.5" Conduit - XX3116A | 2.872 | | |
| | 42-TW | 1" Conduit - CCM44B | 1.841 | 4.713 | 28.278 |
| | | 1.5" Conduit - XX3115B | 2.872 | | |
| 45-TW | 4" x 6" Cable Tray - 1034 | 16.146 | 16.146 | 452.088 | |
| Cable Air Drops | 11-TW | CSM11B | 4.573 | 9.146 | 27.438 |
| | | CSM42B | 4.573 | | |
| | 41-TW | CCE21A | 0.501 | 0.883 | 1.325 |
| | | BIJ46XA | 0.191 | | |
| | | CCM16A | 0.191 | | |
| | 42-TW | CCM44B | 0.311 | 0.693 | 1.040 |
| | | BIJ56XB | 0.191 | | |
| | | CCM26B | 0.191 | | |
| | 45-TW | CCM38C | 4.573 | 9.146 | 13.719 |
| CCM39C | | 4.573 | | | |
| Cable Air Drop Upgrades | 11-TW | add 3-EKa1e cable (4.573lb/ft - each) | 22.865 | 22.865 | 68.595 |
| | 41-TW | add 3-EKa1e cable (4.573lb/ft - each) | 14.602 | 14.602 | 21.903 |
| | 42-TW | add 3-EKa1e cable (4.573lb/ft - each) | 14.412 | 14.412 | 21.618 |
| | 45-TW | add 3-EKa1e cable (4.573lb/ft - each) | 22.865 | 22.865 | 34.297 |



**STANDARD
 RADIUS ELBOWS - RIGID STEEL AND ALUMINUM CONDUIT**

AS PER SCE&G COMPANY
 V. C. SUMMER NUCLEAR STATION

| Non. Size | DIAMETERS | | Nipple Length | RADII | | | OFFSET | | | Tangent | Steel Approx. Weight per 100 pieces | Aluminum Approx. Weight per 100 pieces |
|-----------|-----------|----------|---------------|--------|--------|---------|--------|---------|--------|---------|-------------------------------------|--|
| | External | Internal | | A | B | C | D | E | F | | | |
| Inches | Inches | Inches | Inches | Inches | Inches | Inches | Inches | Inches | Inches | Inches | Pounds | Pounds |
| 1/2 | .840 | .622 | 11 1/4 | 3.83 | 4.25 | 4.67 | 6.08 | 6.50 | 6.92 | 2.25 | 75 | 29 |
| 3/4 | 1.050 | 8.24 | 12 1/2 | 4.105 | 4.625 | 5.155 | 8.075 | 8.595 | 9.125 | 3.975 | 111 | 43 |
| 1 | 1.315 | 1.049 | 14 3/4 | 5.84 | 6.5 | 7.16 | 11.466 | 12.09 | 12.75 | 5.598 | 195 | 71 |
| 1 1/4 | 1.660 | 1.380 | 17 3/4 | 7.17 | 8.0 | 8.83 | 11.34 | 12.17 | 13.0 | 4.17 | 320 | 110 |
| 1 1/2 | 1.900 | 1.610 | 19 3/4 | 8.175 | 9.125 | 10.075 | 12.725 | 13.675 | 4.625 | 4.55 | 423 | 153 |
| 2 | 2.375 | 2.067 | 22 1/2 | 9.0625 | 10.25 | 11.4375 | 14.5 | 15.6875 | 16.875 | 5.4375 | 671 | 249 |
| 2 1/2 | 2.875 | 2.469 | 26 | 11.747 | 13.137 | 14.627 | 20.87 | 22.31 | 23.75 | 9.125 | 1194 | 437 |
| 3 | 3.500 | 3.068 | 30 | 10.125 | 15.875 | 17.625 | 24.375 | 26.125 | 27.875 | 10.25 | 1807 | 767 |
| 3 1/2 | 4.000 | 3.548 | 39 1/2 | 13.00 | 15.00 | 17.00 | 21.75 | 23.75 | 25.75 | 8.75 | 2853 | 1036 |
| 4 | 4.500 | 4.026 | 39 1/2 | 18.875 | 21.125 | 23.375 | 28.5 | 30.75 | 33 | 9.625 | 3373 | 1228 |
| 5 | 5.563 | 5.047 | 59 1/2 | 21.22 | 24.00 | 26.78 | 32.12 | 34.9 | 37.68 | 10.90 | 7388 | 2490 |
| 6 | 6.625 | 6.065 | 76 | 26.68 | 30.00 | 33.31 | 40.13 | 43.44 | 46.75 | 14.14 | 12287 | 3850 |

RIGID STEEL AND ALUMINUM CONDUIT WEIGHT AND DIMENSIONS

| CONDUIT | | | | | | | | COUPLINGS | | | | | |
|---------------------|-----------------------|-------------------------|------------------------|-----------------------------------|----------------------------|---|--|--------------------------|----------|---------------|--|----------|----------------------------|
| Nominal Size Inches | Wall Thickness Inches | Outside Diameter Inches | Inside Diameter Inches | Internal Traverse Area Sq. Inches | Length * Without Couplings | Underwriters Min. Weight ‡ Lbs./100 ft incl. coupling | Nominal Weights § Pounds per 100 ft incl. coupling | Outside Diameter, Inches | | Length Inches | Approximate Weight per 100 pcs. Pounds | | Pieces Per Standard Carton |
| | | | | | | | | STEEL | ALUMINUM | | STEEL | ALUMINUM | |
| 1/2 | .109 | .840 | .622 | .304 | 9'11-1/4" | 79.0 | 29.8 | 1.010 | 1.078 | 1-9/16 | 12 | 6.1 | 100 |
| 3/4 | .113 | 1.050 | .824 | .533 | 9'11-1/4" | 105.0 | 39.8 | 1.250 | 1.328 | 1-5/8 | 21 | 9.1 | 50 |
| 1 | .133 | 1.315 | 1.049 | .864 | 9'11" | 153.0 | 58.9 | 1.525 | 1.562 | 2 | 34 | 12.5 | 50 |
| 1-1/4 | .140 | 1.660 | 1.380 | 1.495 | 9'11" | 201.0 | 79.8 | 1.869 | 1.953 | 2-1/16 | 54 | 18.9 | 50 |
| 1-1/2 | .145 | 1.900 | 1.610 | 2.036 | 9'11" | 249.0 | 95.6 | 2.155 | 2.219 | 2-1/16 | 74 | 23.3 | 50 |
| 2 | .154 | 2.375 | 2.067 | 3.355 | 9'11" | 334.0 | 128.8 | 2.730 | 2.750 | 2-1/8 | 121 | 34.6 | 25 |
| 2-1/2 | .203 | 2.875 | 2.469 | 4.788 | 9'10-1/2" | 527.0 | 204.7 | 3.250 | 3.281 | 3-1/8 | 172 | 68.3 | † |
| 3 | .216 | 3.500 | 3.068 | 7.393 | 9'10-1/2" | 690.0 | 268.0 | 4.000 | 3.937 | 3-1/4 | 250 | 91.4 | † |
| 3-1/2 | .226 | 4.000 | 3.548 | 9.886 | 9'10-1/4" | 831.0 | 321.3 | 4.625 | 4.437 | 3-1/8 | 425 | 108.0 | † |
| 4 | .237 | 4.500 | 4.026 | 12.730 | 9'10-1/4" | 982.0 | 382.1 | 5.000 | 5.000 | 3-1/2 | 474 | 142.0 | † |
| 5 | .258 | 5.563 | 5.047 | 20.006 | 9'10 | 1344.0 | 521.5 | 6.296 | 6.219 | 3-3/4 | 700 | 241.9 | † |
| 6 | .280 | 6.625 | 6.065 | 28.891 | 9'10 | 1770.0 | 677.5 | 7.390 | 7.312 | 4 | 750 | 321.0 | † |

A

* Tolerance of ±1/4 inch applies to the required length (including coupling).
‡ Weights indicated apply whether the conduit is enameled or zinc coated or both.
§ Alloy and Temper: Rigid conduit, couplings and elbows, 6063T42.
† Packed in bulk.

List of Cable Manufacturers

Dekoron/Samuel Moore
Kerite
Okonite

Glossary of Terms and Definitions

EPDM: Ethylene Propylene Diene Monomer is an elastomeric membrane.

FR Insulation: An extruded vulcanized flame retardant synthetic rubber insulation.

FR Jacket: An extruded thermosetting (vulcanized) flame retardant synthetic rubber jacket.

HT Kerite: High temperature Kerite - an extruded vulcanized discharge resistant synthetic rubber insulation for cables rated 600-25000 Volts.

Okoguard Insulation: Okonite's registered trade name for its exclusive ethylene propylene insulation.

Okolon: Okonite's registered trade name for its vulcanized hypalon compound which is mechanically rugged and resists abrasion, tearing, or cutting.

Okoprene: Okonite's registered trade name for its neoprene based jacketing or low voltage insulation material.

Tefzel: DuPont's registered trade name for a modified version of ETFE (ethylene-tetrafluoroethylene) fluoropolymer.

GLOSSARY OF KERITE TERMS

INSULATION COMPONENTS AND SYSTEMS (5000~138000 Volts)

Permashield-An extruded layer of high dielectric constant (high SIC) insulating material, superior to semiconducting extrusions, to reduce the stress and limit available energy at insulation surfaces

SPS-Single Permashield-An extruded layer of Permashield between the conductor and the inner wall of insulation

DPS-Double Permashield-An extruded layer of Permashield under and over the wall of insulation.

TPS-Triple Permashield-Three extruded layers of Permashield, one over the conductor, one over the first layer of insulation, and one over the second layer of insulation

KERITE INSULATIONS

HTK-High Temperature Kerite - An extruded vulcanized synthetic rubber insulation for cables rated 600~25000 volts

HVK-High Voltage Kerite - An extruded vulcanized synthetic rubber insulation for cables rated 35000 - 138000 volts.

FR Insulation-An extruded vulcanized flame retardant synthetic rubber insulation.

KERITE JACKETS AND FINISHES

HTNS - High Temperature Electrical jacket-An extruded vulcanized discharge resistant synthetic rubber jacket, used on 5000 - 8000 volt non-shielded cables

FR Jacket - An extruded thermosetting (vulcanized) flame retardant synthetic rubber jacket

POB - A composite finish covered with a saturated woven braid which is highly flame retardant.

TF Jacket - An abrasion resistant and highly flexible polyurethane jacket

SPLICE AND TERMINAL ABBREVIATIONS

IT-Indoor terminal (print)

OT-Outdoor terminal (print)

S-Splice (print)

The Kerite Company
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Seymour, CT 06483
the kerite company

Product Data

Section 10: Sheet 1

Engineering Data

Handling and Storage Recommendations

On receipt, cable protective covering should be inspected for evidence of damage during shipment. Report should immediately be made to carrier if evidence of damage is found. Unloading should be accomplished so that equipment used does not contact cable surface, and in the case of protective wrap that the equipment does not contact the protective wrap. If unloading is accomplished by crane, either a cradle supporting the reel flanges or a shaft through the arbor hole should be used. If a fork lift is utilized, the forks must lift the reel at 90° to the flanges and must be long enough to make complete lifting contact with both flanges. Under no circumstances should the forks contact the cable surface or protective wrap. If an inclined ramp is used for unloading, the ramp must be wide enough to contact both flanges completely and stopping of the reels at the bottom shall be accomplished by using the reel flanges and not the surface of the cable.

Under no circumstances should reels be dropped from the delivering vehicle to the ground.

Reels should be stored on a hard surface so that flanges do not sink into the earth and allow the weight of the reel and cable to rest on the cable surface.

Reels should be stored in an area where construction equipment, falling or flying objects or other materials will not contact the cable.

Cable should be stored in an area where chemicals or petroleum products will not be spilled or sprayed on the cable. When a reel of cable is rolled from one point to another, care must be taken to see that there are no objects on the surface area which could contact or damage the cable surface or protective wrap. Cable should be stored in an area away from open fires or sources of high heat. If a length of cable has been cut from the reel, the cable end should be immediately resealed to prevent the entrance of moisture.

When cable has been stored out of doors in cold weather, care must be taken to see that it is not installed at temperatures lower than the following:

| <u>Okonite Trade Name</u> | <u>Type of Insulation</u> | <u>Minimum Temperature for Installation</u> |
|---------------------------|---------------------------|---|
| Okoseal | PVC | -10°C |
| Okonite | EPR | -40°C |
| Okoguard | EPR | -40°C |
| Okolene | Polyethylene | -40°C |
| X-Olene | XLPE | -40°C |
| Okoprene | Neoprene | -20°C |
| Okolon | Hypalon | -20°C |

Temperatures for any other compounds can be furnished on request.

January 1, 1972

THE OKONITE COMPANY
Ramsey, New Jersey 07446

Product Data Section 1: Sheet 2a

Glossary of Terms and Definitions

- AAR American Association of Railroads.
AEIC Association of Edison Illuminating Companies.
ALS Factory assembled cables, one or more insulated conductors, enclosed in an aluminum sheath.
ANSI American National Standards Institute.
- ASTM American Society For Testing And Materials.
AWM Appliance wiring material.
BM Federal Bureau of Mines.
C-L-X® Okonite's trade name for its continuous, corrugated, impervious metallic-sheathed cables.
- CMPPF® A corrugated metal tape finish with a wall of Okoseal or Okolene bonded to it. Provides high compressive strength.
CSA Canadian Standards Association.
CTC Designation for Centralized Traffic Control Code Line cable.
DEL Diesel electric locomotive and car wiring.
- DLO Diesel Electric locomotive and car wiring.
EEI Edison Electric Institute.
FILLER TAPE Used for filling irregular surfaces around mechanical type jugs and connectors to obtain a smooth surface for taping of splices and terminations.
FMPF A flat metal tape armor with plastic finish bonded to it. Provides high compressive strength and outstanding gopher and rodent protection.
- FULLY BONDED Oil well cable where all elements of construction are bonded together to prevent gas or oil migration.
G Multi-conductor, flat or round cable with ground conductor.
GC Indicates cable with insulated ground check in place of one of the ground conductors.
IEEE Institute of Electrical and Electronics Engineers.
- IPCEA Insulated Power Cable Engineers Association.
KTA Thermoplastic insulated, aluminum shielded, polyethylene jacketed communication cable.
KTA-8 Same construction as KTA, except for a galvanized steel messenger built into the cable jacket.
KTC Same construction as KTA except for a copper shield.
- KTC-F Same construction as KTC, with polyethylene/petroleum jelly filling the interstices and applied under and over the shield for outstanding moisture resistance.
KTT Thermoplastic insulated copper shielded, double polyethylene jacketed, direct burial communication cable.
KTT-MR Same construction as KU except for a moisture resistant ethylene copolymer coating on both sides of the shield.
LOXARMOR® An interlocked "S" shaped armor cable covering, normally galvanized steel or aluminum.
- MANSON TAPE Premium grade friction tape.
MIL U.S. Government - Military Specification
MTW Machine tool wiring.
NAED National Association of Electrical Distributors.
- NEC National Electric Code.
NECA National Electrical Contractors Association.
NEMA National Electrical Manufacturers Association.

The Okonite Company. 1972

C-L-X® products manufactured in the United States under license granted by Kabelmetal of Hannover. Germany

Product Data Section 1: Sheet 2b

Glossary of Terms and Definitions

- OKOCLAD®** Okonite's trade name for its smooth sheath Type ALS cable.
- OKOCORD®** Rubber insulated, reinforced jacketed, mold-cured portable, flexible cables.
- OKOCOR-EP** Ethylene propylene insulation for mining cables.
- OKOFLEX®** Bundled pneumatic instrumentation tubing, either copper, aluminum or plastic.
- OKOGUARD®** Okonite's registered trade name for its exclusive ethylene-propylene base, thermosetting compound, whose optimum balance of electrical and physical properties is unequalled in other solid dielectrics.
- OKOGUARD LL** Specially compounded ethylene propylene insulation with low loss characteristics.
- OKOGUARD TAPE** An ethylene propylene based insulating tape, recommended for high voltage, high temperature splicing applications in cables insulated with ethylene propylene, butyl, oil-based and polyethylene (thermoplastic and cross-linked) compounds.
- OKOLENE®** Low loss thermoplastic polyethylene-base insulation or sheath.
- OKOLON®** Vulcanized Hypalon compound which is mechanically rugged and resists abrasion, tearing or cutting.
- OKONEX-CLF TAPE®** Heat, moisture and ozone-resistant butyl based insulating tape.
- OKONITE** Heat resistant, mechanically rugged ethylene-propylene based insulating compound.
- OKONITE NO.35 TAPE** Neoprene based jacketing tape.
- OKONITE #70** A neoprene impregnated nylon mesh tape designed for reinforcing cable jackets in vulcanized or non-vulcanized cable splices.
- OKONITE-OKOPRENE** Combination insulation/jacket.
- OKONITE-OKOSHEATH** Combination insulation/jacket.
- OKOPRENE®** Neoprene based jacketing or low voltage insulation material. Excellent resistance to flame, impact and abrasion.
- OKOSEAL®** A polyvinyl chloride compound with excellent resistance to flame, oil and most chemicals. Designed especially as jacketing and low voltage insulation material.
- OKOSEAL-N** Polyvinyl chloride insulated nylon jacketed low voltage cable.
- OKOSHEATH®** Moisture-resistant rubber compound serving as insulation or sheath.
- OKOTHERM®** Silicone heat-resistant rubber insulation or sheath.
- P** Pennsylvania Department of Mines.
- P-30** 600V control cables.
- P-45** 1000V control cables. PN-20 Small diameter 600V control cables.
- POLYPROPYLENE** Down hole cable insulation with excellent heat, oil and moisture resistance.
- P-OS** Single or multiple pair instrumentation cable with overall shield.
- REA** Rural Electrification Administration.
- RED SADDLE** Pre-formed Okoprene filler which provides a uniform cushion or barrier between the conductors of flat type portable cables.
- RHH** Heat resistant rubber for dry locations.
- RHW** Moisture and heat resistant rubber.
- SEMI-CON** A semi-conducting treated tape or compound.
- SHD** Portable cable having three insulated and shielded conductors with three ground conductors.
- SILICONE RUBBER** A flexible, mechanically rugged insulating compound with excellent electrical properties and outstanding resistance to weather, oils and most chemicals.

Product Data Section 1: Sheet 2c

Glossary of Terms and Definitions

- SJO 300 volt junior hard service flexible cord.
SO 600 volt extra heavy duty flexible cord.
SP-OS Multiple shielded pair instrumentation cable with overall shield.
SRG Silicone-Rubber impregnated glass tape..
- STEELPIC Thermoplastic insulated, aluminum and steel shielded polyethylene jacketed communication cable.
THHN Flame retardant, heat resistant thermoplastic with nylon jacket for dry locations.
THW Flame retardant, moisture and heat resistant thermoplastic.
THWN Flame retardant, moisture and heat resistant thermoplastic with nylon jacket.
- TIREX® Okonite's trade name for its cured-in-lead, neoprene jacketed portable cords.
TW Flame retardant, moisture resistant thermoplastic.
UL Underwriters Laboratories.
UR-P Okolene insulated underground residential distribution cable.
- UR-X X-Olene insulated underground residential distribution cable.
USE Underground service entrance cable.
VFR/LS Okonite's designation for its very flame resistant, low smoke emitting jacketing compound.
VULCANIZER COMPOUND An ethylene propylene based semi-conducting compound for use as strand screen in vulcanized splices in high voltage, solid dielectric cables.
- VULCANIZER TAPES A complete line of tapes for use with all cable vulcanizers.
W Multi-conductor flat or round cable without ground conductors.
WATERTITE® An organic based, synthetic rubber, moisture and heat resistant insulation.
WTC 300V Supervisory Control Cable.
- XHHW Flame retardant, moisture and heat resistant cross linked thermosetting polyethylene.
X-OLENE® Chemically cross-linked (vulcanized) polyethylene. X-OLENE (FM R) Specially compounded, chemically cross-linked polyethylene insulation with outstanding flame and moisture resistance.

May, 1974

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