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Engineering Note	XXXXX	XXXXX	1 of 6
author: D. Shuman	dept.: Mech.Engineering		date:10/19/2011

proj: **NEXT-100**

HV insulation

title:

DRAFT

From Essex Cable 2100 series, 100 and 150 kV cable with low density polyethylene dielectric ID and ODs

$d_i := 3.3mm$ (both) $d_{o\_100} := 9.4mm$ $d_{o\_150} := 12.4mm$

dielectric thickness: $0.5(d_{o\_100} - d_i) = 3.05 \, mm$ $0.5(d_{o\_150} - d_i) = 4.55 \, mm$

field, for concentric cylinders, from "High Voltage Technology", L.L. Alston table 1-1

$$E_{c\_100} := \frac{100kV}{0.5(d_i) \cdot \ln\left(\frac{d_{o\_100}}{d_i}\right)}$$

$$E_{c\_150} := \frac{150kV}{0.5(d_i) \cdot \ln\left(\frac{d_{o\_150}}{d_i}\right)}$$

$$E_{c\_100} = 57.9 \frac{kV}{mm}$$

$$E_{c\_150} = 68.7 \frac{kV}{mm}$$

This field is 2x the field for parallel plane geometry of same thickness:

$$E_{avg\_100} := \frac{100kV}{0.5(d_{o\_100} - d_i)}$$

$$E_{avg\_150} := \frac{150kV}{0.5(d_{o\_150} - d_i)}$$

$$E_{avg\_100} = 32.8 \frac{kV}{mm}$$

$$E_{avg\_150} = 33 \frac{kV}{mm}$$

It would be conservative, if incorrect to use this average value for design. Although a cable has less stressed area, cables typically are used in very long lengths (though perhaps not here for X-ray machines).

ESSEX-X-RAY - 2100 SERIES SHIELDED CABLE - DATA SHEET

| VOLTAGE | | PART | CONDUCTOR SIZE | | | | SEMICON | DIELECTRIC | | | SHIELD | | |
DC (kV)	AC (kV)	NUMBER	AWG	STRANDS	mm2	DIA (mm)	DIA (mm)	MATERIAL	DIA (mm)	CONSTRUCTION	AWG (equiv)	Coverage (%)	SEMICON
10		2232	6	133/27TC	13.30	5.30	N/A	LDHMW PE	7.60	30 TC BRAID	6	95	N/A
10		2164	11	#30 BC Braid	5.95	7.90	N/A	LDHMW PE	9.80	30 BC BRAID	9	93	N/A
10		2167	6	#30 BC Braid	13.30	18.30	N/A	LDHMW PE	21.10	30 BC BRAID	7	95	N/A
13	5	2075S_J	12	19/25 SPC	3.31	2.30	3.40	SILICONE	6.00	34 TC BRAID	18	90	ink & tape
15		2139SVJ	8	133/29 TC	8.37	4.20	N/A	SILICONE	6.50	34 TC BRAID	12	95	N/A
20		2168	8	#33 BC Braid	8.37	5.80	7.10	LDHMW PE	10.60	32 BC BRAID	9	90	N/A
25		2157-R1	2	#28 BC Braid	33.62	17.30	N/A	LDHMW PE	23.50	28 BC BRAID	3	90	N/A
25		2255	00	437X	108.90	15.50	16	EPR	26.70	2X50X18			N/A
25		2245	11	#30 BC Braid	4.00	9.40	N/A	LDHMW PE	12.40	30 BC BRAID	9	93	N/A
25		2250	6	#30 BC Braid	13.50	15.20	N/A	LDHMW PE	23.60	30 BC BRAID	6	80	N/A
30		2215STJ	16	19/29SPC	1.31	1.50	N/A	SILICONE	7.00	34 TC BRAID	15	83	ink & tape
40	15	2012S_J	18	19/30SPC	0.83	1.30	2.30	SILICONE	6.00	34 TC BRAID	18	82	ink & tape
50	17	2032S_J	16	19/29SPC	1.31	1.50	2.50	SILICONE	7.50	34 TC BRAID	17	90	ink & tape
50	17	2107	1	259/25TC	44.21	8.30	9.90	EPR	19.10	16X22 TC	10		extruded
60	20	2024S_J	12	19/25SPC	3.31	2.30	3.40	SILICONE	9.10	34 TC BRAID	15	82	ink & tape
60	20	2149SVJ	18	19/30TC	0.83	1.30	2.00	LDHMW PE	5.80	34 TC BRAID	17	86	N/A
60	20	2240-R2	12	19/25SPC	3.35	2.40	3.60	EPR	10.20	34 TC BRAID	14	95	extruded
75	25	2110SUJ	2	133/23TC	33.62	6.60	8.10	EPR	14.50	30 TC BRAID	4	95	N/A
100	30	2062S_J	8	133/29SPC	8.37	4.20	5.60	SILICONE	16.50	34 TC BRAID	16	82	ink & tape
100		2124	16	19/29TC	1.31	1.50	2.50	LDHMW PE	9.40	34 TC BRAID	13	90	N/A
100		2125	12	19/25TC	3.31	2.30	3.30	LDHMW PE	9.40	34 TC BRAID	13	90	N/A
100	30	2242	10	19/23TC	4.92	2.90	4.80	EPR	15.70	34 TC BRAID	14	90	extruded
125		2196	10	19/23TC	5.31	3.00	4.00	LDHMW PE	12.40	34 TC BRAID	12	90	N/A
125	40	2128	6	133/27TC	13.30	5.30	7.60	EPR	20.10	30 TC BRAID	8	82	ink & tpae
150		2121	12	19/25TC	3.31	2.30	3.30	LDHMW PE	12.40	34 TC BRAID	12	90	N/A
150	60	2265	2	Solid	6.54	6.50	8.00	XLPE	19.80	34 TC BRAID	10	90	extruded
200		2134	12	19/25TC	3.31	2.30	5.60	LDHMW PE	19.30	34 TC BRAID	13	80	N/A
250		2158	00	19X	67.43	10.30	12.20	LDHMW PE	33.30	30 BC BRAID	6	90	N/A
300		2077	4	Solid	21.15	5.20	6.10	LDHMW PE	3.30	30 TC BRAID	6	90	N/A
300		2182	7	Solid	10.00	3.60	5.10	LDHMW PE	3.30	30 TC BRAID	6	90	N/A
300	100	2019-01	0	19X	107.20	11.70	13.50	LDHMW PE	4.06	0.01 Cu TAPE	1	100	extruded