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APPLICATION		REVISION HISTORY					
NEXT ASSY	USED ON	PART NO.	ZONE	REV	DESCRIPTION	DATE	APPROVAL

120E3100001

SPECIFICATION FOR HEAVY DUTY GSE CABLE, GENERAL

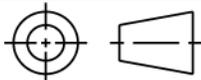
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	SOFTWARE MS Word	DRAFTSMAN A. Dufresne	CHECKER J. Jones	120E3100001 HEAVY DUTY GSE CABLE SPECIFICATION, GENERAL		
FILENAME 120E3100001 - Heavy Duty GSE Cable Specification, General.doc	ENGINEER D. S. Parker	CHECKER				
MATERIAL	ENGINEER A. Dufresne	STRESS	SIZE A CAGE CODE 22264 DWG NO 120E3100001 REV -			
HEAT TREATMENT	ENGINEER C. Reeves					
FINAL PROTECTIVE FINISH	SUBMITTED M. Lunceford	APPROVED J. Shaver	SCALE None	UNIT WEIGHT —	SHEET 1	OF 7

REVISION HISTORY					
PART NO.	ZONE	REV	DESCRIPTION	DATE	APPROVAL

1. SCOPE

This document contains the requirements for procurement of heavy duty multi-conductor cables for use in harsh environments at John F. Kennedy Space Center (KSC). Cables using conductor sizes 22 AWG through 1/0 AWG are covered in this specification. Cable location type may include Class I, Division 2 Hazard Classified Zone, UV exposure, water exposure, heat and abrasives. These cables are NOT approved for Plenum or Riser Installations.

2. REQUIREMENTS

2.1 Underwriters Laboratory (UL) Requirements

2.1.1 UL Cable Type

Cables with 120E3100001 designation shall meet all requirements specified in UL 13 (PLTC) or UL 1277 (TC) as listed in Appendix A. UL designation shall be determined by design engineering with consideration of supported circuit type. Reference information for selecting the appropriate UL designation is listed below. For further design information, consult GP-864 (GSE Cable Handbook), NFPA 70, and the associated UL documents.

2.1.1.1 PLTC – UL 13, Power Limited Tray Cable

Used for circuits rated at 300V or less. Type PLTC cable is recommended for general use where a higher voltage rating is not required.

2.1.1.2 TC – UL 1277, Electrical Power and Control Tray Cables with Optional-Fiber Members

Used for circuits rated at 600V or less; install per NFPA 70, Article 336.

2.1.2 Exposed Run Cables

Cables shall have an Exposed Run (-ER) designation.

2.1.3 UL Ratings – Other

Cables shall be UL rated for Direct Burial, Sunlight Resistant, and Oil Resistant II.

2.2 Construction

Construction of the cable shall be as specified in Appendix A.

SIZE A	CAGE CODE 22264	DWG NO 120E3100001	REV —
SCALE None	UNIT WEIGHT —	SHEET 2	OF 7

REVISION HISTORY					
PART NO.	ZONE	REV	DESCRIPTION	DATE	APPROVAL

2.2.1 Grounding Conductor Requirement

All type TC cables comprised of 4 AWG or larger conductors shall contain a grounding conductor. All type TC cables with only two conductors shall contain a grounding conductor. The size of the grounding conductor is referenced in Appendix A.

2.3 Conductor Requirements

2.3.1 Materials

Conductors shall be constructed of tinned, soft annealed, commercially pure copper conforming to the requirements of ASTM B33.

2.3.1.1 Stranding

Conductors shall be stranded as listed below:

22 AWG thru 12 AWG – ASTM B8, Class C
 10 AWG – ASTM B174, Class K
 8 AWG thru 1/0 AWG – ASTM B173, Class H

2.3.1.2 Insulation (22AWG-12AWG)

Individual conductors sized between 22 AWG and 12 AWG shall be insulated with Cross-linked Polyethylene (XLPE) and conform to the requirements of UL 44, Thermoset-Insulated Wires and Cables. Temperature rating for insulation shall be 105°C.

2.3.1.3 Insulation (10AWG-1/0)

Individual conductors sized between 10 AWG and 1/0 AWG shall be insulated with Flame Retardant Ethylene Propylene Rubber (FR-EPR) and conform to the requirements of UL 44, Thermoset-Insulated Wires and Cables. Temperature rating for insulation shall be 105°C.

2.4 Shielding Requirements

2.4.1 Inner Shields

Where indicated in Appendix A, inner shields shall be insulated aluminum foil, not spirally wrapped. Individual shields shall be electrically isolated from all other shields. A drain wire shall be provided for each foil shield and shall be the same size as the conductors in the shielded pair or triad.

SIZE A	CAGE CODE 22264	DWG NO 120E310001	REV —
SCALE None	UNIT WEIGHT —	SHEET 3 OF 7	

REVISION HISTORY					
PART NO.	ZONE	REV	DESCRIPTION	DATE	APPROVAL

2.4.2 Overall Shield

Overall shielding shall be a combined insulated foil shield and braid. The aluminum foil inner overall shield shall not be spirally wrapped and shall be conductive to the outer overall braided shield. The overall braided shield shall be tinned copper in accordance with ASTM B33 with 90% or better coverage.

2.5 Jacket Material

Thermoplastic Chlorinated Polyethylene (CPE) shall be used as jacket material.

2.5.1 Construction

Jacket thickness shall be according to the corresponding UL specification listed in Appendix A. See referenced UL document for more information. Temperature rating for jacket shall be 90°C.

2.6 Marking

Cable jackets shall be marked in accordance with the applicable UL requirement.

Cables shall be marked every two feet with the following:

- a. KSC Part Number (120E3100001-XXX)
- b. Sequential footage
- c. Lot Identification Number
- d. Manufacture Date

Twisted pair identification shall be in accordance with ICEA S-58-679, Method 9, number coded with black and white insulation. All straight conductors shall have white insulation with each conductor numbered in sequence by surface printing beginning with the number 1 (ICEA S-58-679, Method 4).

2.6.1 Quality

A Certificate of Conformance (CoC) shall be included with orders according to FAR 52.246-15.

SIZE A	CAGE CODE 22264	DWG NO 120E3100001	REV —
SCALE None	UNIT WEIGHT —	SHEET 4	OF 7

REVISION HISTORY

PART NO.	ZONE	REV	DESCRIPTION	DATE	APPROVAL

2.7 Shipping

For general GSE cable handling, transportation and storage directions, see KSC-E-166C section 3.4.2. Cable lengths, spool sizes, and shortest continuous runs will be determined by procurement documentation. Unless otherwise noted, tolerances on length shall be +/-5%. Spools of cables shall be wound in such a way that both cable ends are accessible for testing. During transportation and storage, cable ends shall be covered or protected from the environment.

SIZE A	CAGE CODE 22264	DWG NO 120E310001	REV —
SCALE None	UNIT WEIGHT —	SHEET 5	OF 7

REVISION HISTORY					
PART NO.	ZONE	REV	DESCRIPTION	DATE	APPROVAL

APPENDIX A. CABLE SPECIFICATION SHEET

Dash Number	Gauge	Total Number of Conductors	Construction	Number of Pairs/Triads/Quads	Internal Shield	Overall Shield	TC or PLTC*	ASTM B8 conductor stranding
-001	16	6	Pairs, Twisted, Shielded	3	Foil w/ Drain	Braid + Foil	PLTC	C
-002	16	2	Straight	n/a	n/a	Braid + Foil	PLTC	C
-003	16	3	Straight	n/a	n/a	Braid + Foil	PLTC	C
-004	16	2	Pairs, Twisted, Shielded	1	n/a	Braid + Foil	PLTC	C
-005	16	16	Pairs, Twisted, Shielded	8	Foil w/ Drain	Braid + Foil	PLTC	C
-006	16	8	Straight	n/a	n/a	Braid + Foil	PLTC	C
-007	16	10	Straight	n/a	n/a	Braid + Foil	PLTC	C
-008	16	16	Straight	n/a	n/a	Braid + Foil	PLTC	C
-009	16	20	Straight	n/a	n/a	Braid + Foil	PLTC	C
-010	16	30	Straight	n/a	n/a	Braid + Foil	PLTC	C
-011	16	50	Straight	n/a	n/a	Braid + Foil	PLTC	C
-012	16	48	Straight	n/a	n/a	Braid + Foil	PLTC	C
-013	12	4	Straight	n/a	n/a	Braid + Foil	PLTC	C
-014	12	10	Straight	n/a	n/a	Braid + Foil	PLTC	C
-015	12	15	Straight	n/a	n/a	Braid + Foil	PLTC	C
-016	12	50	Straight	n/a	n/a	Braid + Foil	PLTC	C
-017	18	8	Pairs, Twisted, Shielded	4	Foil w/ Drain	Braid + Foil	PLTC	C
-018	12	8	Pairs, Twisted	4	n/a	Braid + Foil	PLTC	C
-019	22	75	Triads, Twisted, Shielded	25	Foil w/ Drain	Braid + Foil	PLTC	C
-020	20	16	Pairs, Twisted, Shielded	8	Foil w/ Drain	Braid + Foil	PLTC	C
-021	16	10	Pairs, Twisted, Shielded	5	Foil w/ Drain	Braid + Foil	PLTC	C
-022	16	32	Pairs, Twisted, Shielded	16	Foil w/ Drain	Braid + Foil	PLTC	C
-023	16	24	Pairs, Twisted, Shielded	12	Foil w/ Drain	Braid + Foil	PLTC	C
-024	22	10	Pairs, Twisted, Shielded	5	Foil w/ Drain	Braid + Foil	PLTC	C
-025	22	80	Pairs, Twisted, Shielded	40	Foil w/ Drain	Braid + Foil	PLTC	C
-026	16	40	Pairs, Twisted, Shielded	20	Foil w/ Drain	Braid + Foil	PLTC	C
-027	14	48	Straight	n/a	n/a	Braid + Foil	PLTC	C
-028	22	8	Pairs, Twisted, Shielded	4	Foil w/ Drain	Braid + Foil	PLTC	C
-029	22	12	Pairs, Twisted, Shielded	6	Foil w/ Drain	Braid + Foil	PLTC	C
-030	22	100	Pairs, Twisted	50	no	Braid + Foil	PLTC	C
-031	20	10	Pairs, Twisted, Shielded	5	Foil w/ Drain	Braid + Foil	PLTC	C
-032	20	18	Triads, Twisted, Shielded	6	Foil w/ Drain	Braid + Foil	PLTC	C
-033	18	3	Straight	n/a	n/a	Braid + Foil	PLTC	C
-034	18	9	Straight	n/a	n/a	Braid + Foil	PLTC	C

SIZE A	CAGE CODE 22264	DWG NO 120E310001	REV —
SCALE None	UNIT WEIGHT —	SHEET 6	OF 7

REVISION HISTORY					
PART NO.	ZONE	REV	DESCRIPTION	DATE	APPROVAL

Dash Number	Gauge	Total Number of Conductors	Construction	Number of Pairs/Triads/Quads	Internal Shield	Overall Shield	TC or PLTC*	ASTM B8 conductor stranding
-035	16	3	Triads, Twisted, Shielded	1	n/a	Braid + Foil	PLTC	C
-036	16	4	Straight	n/a	n/a	Braid + Foil	PLTC	C
-037	16	8	Pairs, Twisted, Shielded	4	Foil w/ Drain	Braid + Foil	PLTC	C
-038	16	12	Pairs, Twisted, Shielded	6	Foil w/ Drain	Braid + Foil	PLTC	C
-039	16	12	Triads, Twisted, Shielded	4	Foil w/ Drain	Braid + Foil	PLTC	C
-040	16	14	Pairs, Twisted, Shielded	7	Foil w/ Drain	Braid + Foil	PLTC	C
-041	16	18	Pairs, Twisted, Shielded	9	Foil w/ Drain	Braid + Foil	PLTC	C
-042	16	28	Pairs, Twisted, Shielded	14	Foil w/ Drain	Braid + Foil	PLTC	C
-043	16	29	Straight	n/a	n/a	Braid + Foil	PLTC	C
-044	16	36	Pairs, Twisted, Shielded	18	Foil w/ Drain	Braid + Foil	PLTC	C
-045	16	37	Straight	n/a	n/a	Braid + Foil	PLTC	C
-046	16	56	Pairs, Twisted, Shielded	28	Foil w/ Drain	Braid + Foil	PLTC	C
-047	16	60	Straight	n/a	n/a	Braid + Foil	PLTC	C
-048	16	75	Straight	n/a	n/a	Braid + Foil	PLTC	C
-049	12	2	Pairs, Twisted, Shielded	1	n/a	Braid + Foil	PLTC	C
-050	12	6	Pairs, Twisted, Shielded	3	Foil w/ Drain	Braid + Foil	PLTC	C
-051	12	6	Straight	n/a	n/a	Braid + Foil	PLTC	C
-052	10	3	Straight	n/a	n/a	Braid + Foil	TC	D
-053	10	4	Straight	n/a	n/a	Braid + Foil	TC	D
-054	10	6	Pairs, Twisted, Shielded	3	Foil w/ Drain	Braid + Foil	TC	D
-055**	8	2	Straight	n/a	n/a	Braid + Foil	TC	H^
-056	8	4	Straight	n/a	n/a	Braid + Foil	TC	H^
-057***	6	2	Straight	n/a	n/a	Braid + Foil	TC	H^
-058	20	4	Pairs, Twisted, Shielded	2	Foil w/ Drain	Braid + Foil	PLTC	C
-059	20	5	Straight	n/a	n/a	Braid + Foil	PLTC	C
-060	20	7	Straight	n/a	n/a	Braid + Foil	PLTC	C
-061****	1/0	2	Straight	n/a	n/a	Braid + Foil	TC	H^
-062****	1/0	3	Straight	n/a	n/a	Braid + Foil	TC	H^
-063****	1/0	4	Straight	n/a	n/a	Braid + Foil	TC	H^
-064****	2	2	Straight	n/a	n/a	Braid + Foil	TC	H^
-065	16	52	Straight	n/a	n/a	Braid + Foil	PLTC	C
-066****	2	6	Straight	n/a	n/a	Braid + Foil	TC	H^

* PLTC is rated for 0 - 300V circuits.
 ** Contains 10 AWG grounding wire, type D stranding.
 *** Contains 8 AWG grounding wire, type H^ stranding.
 **** Contains 6 AWG grounding wire, type H^ stranding.
 ^ Stranding per ASTM B173.

SIZE A	CAGE CODE 22264	DWG NO 120E310001	REV —
SCALE None	UNIT WEIGHT —	SHEET 7	OF 7