

ANNEXUR

MATERIAL REQUISITION

DOC NO. 6907-70-XT-MR-0220, Rev.A

ITEM DESCRIPTION: FIRE ALARM AND PLANT COMMUNICATION CABLE.

ITEM SL.NO. 1(a)

ITEM CODE: As per Annexure-I

ITEM SUMMARY: Design, manufacture, supply, testing at works, packing and delivery at site of Non Jelly filled cables of the following sizes as per EIL standard specifications no. 6-51-0052, other specifications as listed in attachments and data sheet No.6907-70-XT-DS-0220

ITEM DESCRIPTION: 20 Pair, each conductor 0.9 sq.mm. Copper Conductor Cable. (As per Annexure-I)

Notes :

1. The cables shall be provided with overall screen.
2. Drum Length mentioned in the standard specification are tentative. Exact drum lengths will be furnished with PR.
3. Minimum drum length for a given cable size could be as low as 330m. Price quoted by the vendor shall be included in this requirement.
4. Cables shall be of armoured type.
5. Colour of outer sheath of cables shall be as per Note-1 of datasheet no. 6907-70-XT-DS-0220 i.e. Grey Colour Outer sheath.

LIST OF ATTACHMENT:

1. Standard Spec. for PA, FA and Telephone Cables - Doc. No. 6-51-0052 Rev.5
2. Cable Data Sheet- Doc. No. 6907-70-XT-DS-0220, Rev A.
3. Vendor Data Requirement Communication and Fire Alarm Cables - Doc. No.6907-70-XT-VR-0220, Rev A.
4. Instructions to Vendor- Doc. No.6907-70-XT-TR-0220, Rev A.
5. Specification for Quality Management System requirements from Bidders- Doc. No.6-78-0001, Rev 0.
6. Specification for documentation requirements from suppliers - Doc. No.6-78-0003, Rev 0.
7. Inspection and Test Plan for Communication and Fire Alarm Cables - Doc. No.6-81-1052, Rev.3.

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संचार और अग्नि चेतावनी केबल के लिए विनिर्देश

SPECIFICATION FOR COMMUNICATION AND FIRE ALARM CABLES

5	27/04/11	REVISED AND ISSUED AS STANDARD SPECIFICATION	PS	ANPS	UAP	DM
4	25/04/08	REVISED AND ISSUED AS STANDARD SPECIFICATION	ANPS	UAP	JMS	VC
3	21/03/03	REVISED AND ISSUED AS STANDARD SPECIFICATION	UAP	AAN	VPS	SKG
2	05/05/97	REVISED AND ISSUED AS STANDARD SPECIFICATION	NS	VPS	SG	AS
1	08/07/84	ISSUED AS STANDARD SPECIFICATION	UAP	SGG	GNT	
Rev.	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
						Approved by



Abbreviations:

ASTM	:	American Society for Testing and Materials
BIS	:	Bureau of Indian Standards
BS	:	British Standards
CEA	:	Central Electricity Authority
DOT	:	Department of Telecommunications (Government of India)
IEC	:	International Electrotechnical Commission
IEEE	:	Institute of Electrical and Electronics Engineers
IS	:	Indian Standard
NEMA	:	National Electrical Manufacturers Association
PE	:	Polyethelene
PO	:	Purchase Order
PVC	:	Poly Vinyl Chloride
VDE	:	Verband Deutscher Electrotechniker

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1.0 SCOPE

The intent of this specification is to define the requirements for design, manufacture and supply of Flame Retardant type PVC sheathed cables for use in plant communication and fire alarm systems and jelly filled telecommunication cables.

2.0 CODES AND STANDARDS

The equipment shall comply with the requirements of the latest revision of the following standards:

2.1 BIS and other Standards

ASTM D-883	:	Standard terminology relating to plastics.
ASTM D-924	:	Standard test method for dissipation factor (or power factor) and relative permittivity (dielectric constant) of electric insulating liquids.
BS-6234	:	Specification for polythene insulation and sheath of electric cables.
IS-694	:	PVC insulated cables for working voltages upto and including 1100V.
IS-1554 (Part 1)	:	PVC insulated (heavy duty) electric cables (Part-1 for working voltages up to and including 1100V).
IS-5831	:	PVC insulation and sheath of electric cable.
IS-8130	:	Conductors for insulated cables and flexible cords.
IS-9938	:	Recommended colours for PVC insulation for LF wires and cables.
IS-10418	:	Drums for electric cables.
IS-10462 (Part 1)	:	Fictitious calculation method for determination of dimensions of protective coverings of cables (Part-1: Elastomeric and thermoplastic insulated cables).
IS-10810 (Part 58)	:	Methods of test for cables (Part 58: Oxygen index test).
IS-10810 (Part 61)	:	Methods of test for cables (Part 61: Flame retardant test)
IS-10810 (Part 62)	:	Methods of test for cables (Part 62: Fire resistance test for bunched cables).
IS-12444	:	Continuously cast and rolled electrolytic copper wire rods for electrical conductors.

2.2 DOT Standards

GR/WIR-06/03	:	Specification for cable - switchboard (Screened and Unscreened) - Generic requirements.
GR/CUG-01/03	:	Specification for solid polythene insulated fully filled, polythene sheathed underground telecom cables.

2.3 In case of imported cables, standards of the country of origin shall be applicable, if these standards are equivalent to or stringent than the applicable Indian standards.

2.4 The cables shall also conform to the provisions of the CEA Regulations and other statutory regulations currently in force in the country.

2.5 In case Indian standards are not available for any material, standards issued by IEC / BS / VDE / IEEE / NEMA or equivalent agency shall be applicable.

2.6 In case of any conflict between requirements specified in various applicable documents for the project, the most stringent one shall prevail. However, Owner's decision in this regard will be final and binding.

3.0 SITE CONDITIONS

Cables shall be suitable for installation in following conditions:

- Above ground in open-air locations (trays/ ducts) in tropical, humid and corrosive atmosphere prevalent in refineries/ petrochemical plants with severe weathering and exposure to solar radiation.

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- ii. Directly buried in underground trenches, conduits with uncontrolled back-fill and possibility of flooding by water and chemicals.
- iii. Design ambient air temperature of 40°C/ ground temperature of 30°C.

4.0 TECHNICAL REQUIREMENTS FOR NON JELLY FILLED CABLES

4.1 Non jelly filled communication and fire alarm cables shall in general conform to the requirements of DOT specification GR/WIR-06/03.

4.2 Conductors

4.2.1 The size of conductor shall be as per job requirement.

4.2.2 The conductors shall consist of annealed, high conductivity solid copper wire, smoothly drawn, circular in cross-section, uniform in quality, free from defects and uniformly coated with pure tin and shall conform to Cl. 3.0 of DOT specification GR/WIR-06/03.

4.3 Insulation

4.3.1 The core insulation shall be with PVC compound applied over the conductor by extrusion.

4.3.2 PVC insulation shall meet the following requirements:

Conductor Diameter (Area)	Type of Insulation	Thickness of Insulation (Minimum)
Up to 0.5mm (0.2mm ²)	Type-A or B as per IS-5831	0.18 mm
Above 0.5mm (0.2mm ²) & up to 0.71mm (0.4mm ²)		0.26 mm
Above 0.71mm (0.4mm ²) & up to 0.9mm (0.63mm ²)		0.31 mm
Above 0.9mm (0.63mm ²) & up to 1.12mm (1mm ²)		0.39 mm
Above 1.12mm (1mm ²) & up to 1.38mm (1.5mm ²)		0.58 mm
1.78mm (2.5mm ²)		0.71 mm
2.26mm (4mm ²)		0.80 mm

4.3.3 The colours used for insulation shall conform as nearly as practicable to the standard colours as per IS-9938. The wire insulation shall have colours in accordance with Table-2 of DOT specification GR/WIR-06/03. The applied colour shall neither have deleterious effect on the electrical, mechanical or ageing properties of basic insulation nor shall get damaged by any friction etc.

4.3.4 For single pair cables, the colour shall be incorporated in the insulation.

4.3.5 For multi pair cables, cores shall have uniform pattern of continuous spiral (Pitch not exceeding 25mm) to facilitate easy identification. This may be done by the application of one or more coloured strips on a base colour or by direct extrusion.

4.3.6 Alternately, colouring may consist of concentric coloured rings or dots or dashes on the base colour. The coloured rings, dots or dashes shall have a width of not less than 1.0mm and shall be repeated along the length of the insulation at an interval not less than 15mm and not more than 25mm.

4.3.7 The dots or dashes shall be applied on diametrically opposite sides of the insulation, so that all colours are visible when the insulation is viewed from any side.

4.4 Twisting

The two insulated conductors of a pair shall be uniformly twisted with a suitable right hand lay, which shall not exceed 80mm.

4.5 Core Formation

The core formation shall conform to Cl. 6.0 of DOT specification no. GR/WIR-06/03.

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4.6 Screen

- 4.6.1 The cables used for fire alarm and detection shall be provided with overall screen. The screen shall be of aluminium tape with minimum thickness of 0.04mm. The overlap shall be minimum 3mm for cables up to 50 pair & minimum 6mm for cables above 50 Pair. The screen shall be backed by an outer protective layer of 0.13mm PVC tape or other non-hygroscopic material lapped applied longitudinally or helically with overlap.
- 4.6.2 The cables shall be provided with a drain wire. Drain wire shall have a minimum cross-section of 0.5mm^2 , shall be composed of multistrand bare tinned annealed copper conductor. The drain wire shall be in continuous contact with the aluminium side of the overall screen. The drain wire resistance including screen shall not exceed 30 ohm/km.

4.7 Ripcord

A non-metallic ripcord of suitable quality shall be laid longitudinally under the inner sheath & screen. The ripcord when pulled shall cut through the sheath and strip the core.

4.8 Inner Sheath

- 4.8.1 An extruded inner sheath of type ST1 PVC, as per IS-5831, with minimum thickness as per Table-4 of IS-1554 (Part-1) shall be applied over the laid up core, by extrusion to fit closely on it.
- 4.8.2 The inner sheath shall be as circular as possible. It shall be possible to remove the inner sheath without damage to the insulation.
- 4.8.3 When one or more layers of non-hygroscopic tape is helically applied over the laid up cores, as a binder, the thickness of such tape(s) shall not be construed as a part of the inner sheath.

4.9 Armour

- 4.9.1 The cables shall be provided with armouring, made of hot dip galvanised steel wire /strip over the inner sheath.
- 4.9.2 The armour shall be by means of 1.4mm thick round wires for cables with under armour diameter upto 13mm. For cables with an under armour diameter above 13mm, the armour shall either be of steel strip or round wire with thickness as per IS-1554 (Part-1).

4.10 Outer Sheath

- 4.10.1 The cables shall be provided with an extruded PVC sheath for external protection. The PVC shall be type ST1 PVC, as per IS-5831.
- 4.10.2 The other sheath shall be with oxygen index 29 at $27\pm 2^\circ\text{C}$ and possess flame retardant properties meeting the requirements of IS 10810 Part-62 category - AF. In addition, suitable chemicals shall be added to the PVC compound of the outer sheath to protect the cable against rodent and termite attack.
- 4.10.3 The thickness of outer sheath shall be as per IS-1554 (Part 1).
- 4.10.4 The outer sheath shall fit tightly on the armour and shall be applied in such a manner that no undue residual strain is left in the material.
- 4.10.5 The outer sheath shall be red in colour for cables to be used for fire alarm system, grey in colour for cables to be used for telephone & communication system and black in colour for all other functions.
- 4.10.6 Sequential marking of the length of the cable, in meters, shall be provided on the outer sheath at every one meter. The marking shall be legible and indelible by suitable method.
- 4.10.7 The overall diameter of the cables shall be strictly as per the values declared in the data sheet, subject to a maximum tolerance of $\pm 2\text{mm}$.

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4.11 Cable Capacitance

- 4.11.1 The core to core capacitance of the cables shall not exceed 100nF/km at 1kHz.
- 4.11.2 The core to screen capacitance for the screened cables shall not exceed 250nF/km at 1kHz.

5.0 TECHNICAL REQUIREMENTS FOR JELLY FILLED CABLES

- 5.1 Jelly filled telecom cables shall in general conform to the requirements of DOT specification GR/CUG-01/03.

5.2 Conductors

- 5.2.1 The conductors shall consist of annealed, high conductivity solid copper wire, smoothly drawn, circular in cross-section, uniform in quality, free from defects and uniformly coated with pure tin and shall conform to Cl. 3.0 of DOT specification GR/CUG-01/03.

5.3 Insulation

- 5.3.1 Each conductor shall be insulated with insulating grade PE conforming to Cl. 4.0 of DOT specification GR/CUG-01/03.

5.4 Twisting

The two insulated conductors of a pair shall be uniformly twisted with a suitable right hand lay, which shall not exceed 150mm.

5.5 Core Formation

The core formation shall conform to Cl. 6.0 of DOT specification GR/CUG-01/03.

5.6 Filling Compound

- 5.6.1 The cable core shall be filled with a suitable stable water resistant compound, which shall be compatible with the insulation, binders and tapes used in the cable.
- 5.6.2 It shall be homogeneous and uniformly mixed material containing an anti-oxidant.
- 5.6.3 The compound shall not obscure the identification of the colour of the insulation of the conductors.
- 5.6.4 It shall not contain dirt, metallic particles or other foreign matter.
- 5.6.5 The compound shall be readily removable from the insulated conductors by wiping.
- 5.6.6 It shall be free from any unpleasant odour and shall have no toxic or dermatic hazards.
- 5.6.7 The flash point of the compound shall not be less than 200°C.
- 5.6.8 The volume resistivity measured at 100°C shall not be less than 10^{10} ohm-cm.
- 5.6.9 The permittivity at 1 MHz tested as per ASTM D-924 shall not be greater than 2.3 at 20°C.

5.7 Core Wrapping

At least one closed helical or longitudinal application of a nonhygroscopic and nonwicking polyester tape or tape of any other suitable material shall be provided over the cable core.

5.8 Screen

- 5.8.1 The cables used for telephone system shall be provided with overall screen. The screen shall be of aluminium tape with minimum thickness of 0.2mm. The overlap shall be minimum 3mm for cables having maximum diameter over inner sheath < 30mm & minimum 6mm for cables having maximum diameter over inner sheath $\geq$ 30mm. The screen shall be coated with 0.05 mm nominal thickness polythene/copolymer on both sides. The thickness of the composite tape shall be $0.3\text{mm} \pm 15\%$.
- 5.8.2 The aluminium tape shall be electrically continuous through out the length of the cable.

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5.9 Inner Sheath

- 5.9.1 The inner sheath shall be as circular as possible and free from pinholes and other defects. It shall be possible to remove the inner sheath without damage to the insulation.
- 5.9.2 The inner sheath shall be of polythene conforming to type 03C or H03C of BS 6234 and shall contain a suitable antioxidant system. The material shall be virgin as per ASTM D-883 and meet the requirements of Cl. 10.1 of DOT specification no. GR/CUG-01/03.
- 5.9.3 The thickness of inner sheath shall conform to Table-6 of DOT specification no. GR/CUG-01/03.
- 5.9.4 The maximum diameter over inner sheath shall conform to Table-7 of DOT specification no. GR/CUG-01/03.

5.10 Armour

- 5.10.1 The cables shall be provided with bedding and armour over the inner sheath.
- 5.10.2 The bedding shall consist of two close helical lappings of polythene or polypropylene tape. Each tape shall be applied with a minimum of 5% overlap.
- 5.10.3 The armour shall be made of hot dip galvanised steel tape of thickness as per Table-8 of DOT specification GR/CUG-01/03.

5.11 Outer Sheath

- 5.11.1 The external protection shall consist of a polythene sheath conforming to the material specification defined in Clause 5.9 above.
- 5.11.2 The thickness of outer sheath shall conform to Table-9 of DOT specification GR/CUG-01/03.
- 5.11.3 The outer sheath shall be as circular as possible and free from pinholes and other defects.
- 5.11.4 Colour of outer sheath shall be grey.
- 5.11.5 The maximum diameter over outer sheath shall conform to Table-7 of DOT specification GR/CUG-01/03.

5.12 Cable Capacitance

The average mutual capacitance of the pairs measured at 800 to 1000Hz shall be 52 ± 3 nF/km. However, the mutual capacitance of individual pairs shall be within the limits of 52 ± 4.5 nF/km.

6.0 INSPECTION, TESTING AND ACCEPTANCE

- 6.1 The cables shall be tested and examined at the manufacturer's works. All the materials employed in the manufacture of the cable shall be subjected to examination, testing and approval by EIL/ Owner. Manufacturer shall furnish all necessary information concerning the supply to EIL/ Owner's inspectors. The inspector shall have free access to the manufacturer's works for the purpose of inspecting the process of manufacture in all its stages and he will have the power to reject any material, which appears to be of unsuitable description or of unsatisfactory quality.
- 6.2 The following acceptance tests shall be conducted on the completed jelly filled cables as per the test procedures given in DOT specification GR/CUG-01/03 and this specification:
 - i. Measurement of diameter of conductor, over inner sheath & over outer sheath.
 - ii. Measurement of thickness of insulation, inner sheath, screen, armour & outer sheath.
 - iii. Measurement of resistance of conductor.
 - iv. Measurement of resistance unbalance.
 - v. Continuity check & measurement of resistance of Poly-al tape.
 - vi. Colour coding.
 - vii. Conductor continuity test.
 - viii. Mutual capacitance test.
 - ix. Capacitance unbalance test.
 - x. Cross talk test.

mf

- xi. Attenuation test.
- xii. Insulation resistance test.
- xiii. Dielectric strength test.
- xiv. Drip test.
- xv. Armour galvanisation test.
- xvi. Conductor annealing test.
- xvii. Measurement of drum length.

6.3 The following tests shall be conducted on the completed non jelly filled cables as per the test procedures given in DOT specification GR/WIR-06/03 and this specification:

6.3.1 Acceptance tests:

- i. Measurement of diameter of conductor, over inner sheath & over outer sheath.
- ii. Measurement of thickness of insulation, inner sheath, screen, armour & outer sheath.
- iii. Measurement of resistance of conductor.
- iv. Colour coding.
- v. Conductor continuity test.
- vi. Mutual capacitance test.
- vii. Capacitance unbalance test.
- viii. Insulation resistance test.
- ix. High voltage test.
- x. Armour galvanisation test.
- xi. Conductor annealing test.
- xii. Measurement of drum length.

6.3.2 Special Tests

The non jelly filled cables shall also be subjected to following special tests.

- i. Oxygen index test as per IS-10810 (Part 58).
- ii. Flammability test on finished cable as per IS-10810 (Part 61 & 62).

The special test shall be conducted on one sample from each lot. The sample will be selected by the inspector.

7.0 PACKING AND DESPATCH

7.1 Cables shall be despatched in non-returnable wooden drums of suitable barrel diameter, securely battened, with the take-off end fully protected against mechanical damage. The wood used for construction of the drum shall be properly seasoned, sound and free from defects. Wood preservatives shall be applied to the entire drum. Ferrous parts used shall be treated with a suitable rust preventive finish or coating to avoid rusting during transit and storage.

7.2 On the flange of the drum, necessary information such as project title, manufacturer's name, type, size, length of cable in meters, drum no., cable code, BIS certification mark, gross weight, 'Owner's particulars', 'P.O. numbers' etc., shall be printed. An arrow shall be printed on the drum with suitable instructions to show the direction of rotation of the drum.

7.3 The drum lengths for cables shall be as below:

- | | | |
|-----------------------------------|---|---|
| - Upto 50 pairs | : | 1000 meters |
| - Above 50 pairs & upto 100 pairs | : | 500 meters |
| - Above 100 pairs | : | As per job requirement (subject to max. length of 500 meters) |

7.4 A tolerance of $\pm 5\%$ shall be permissible for each drum. However overall tolerance on each size of cable shall be limited to $\pm 2\%$.

7.5 For non jelly filled cable, PVC/ rubber end caps shall be supplied free of cost for each drum with a minimum of eight per thousand meter length. In addition, ends of the cables shall be properly sealed, with caps, to avoid ingress of moisture/ water during transit and storage.

- 7.6 For jelly filled telephone cables, the ends of the cable shall be sealed by thermo shrinkable end caps of adequate wall thickness. Alternately ends may be sealed by enclosing them in rubber or PVC caps of wall thickness not less than 1.8mm. The caps shall be secured to the outer sheath with hose clips or ties or black adhesive tape or heat shrinkable sleeves.
- 7.7 The cables may be stored outdoors for long periods before installation. The packing shall be completely suitable for outdoor storage, in areas with heavy rains and high ambient temperature.

DATA SHEET
COMMUNICATION & FIRE
ALARM CABLES

Datasheet No.
6907-70-XT-DS-0220

Rev : A
Page 1 of 1

PURCHASER'S DATA					
Project			Location		
Client			Unit		
A Site conditions					
1	Maximum ambient temperature:	39.8 °C	4	Relative humidity:	93 %
2	Minimum ambient temperature:	1 °C	5	Altitude above MSL:	< 1000 m
3	Design ambient temperature:	40 °C	6	Environment:	Dusty, Tropical & corrosive
B Technical particulars					
1	Cable type/code	Non jelly/As per spec	4	Details of pairing	As per MR
2	Embossing details	As per spec.	5	Standard drum length	As per spec
3	Details of colour coding	As per spec	6	Colour of Outer sheath	See note-1

MANUFACTURER'S DATA									
A Twisted pair shielded cables									
1	Name of manufacturer				10	Maximum inductance			mH
2	Conductor dia.			mm	11	Nominal impedance			Ohms
3	Insulation thickness			mm	12	Material of shielding			
4	Inner sheath thickness			mm		Minimum thickness			mm
5	Outer sheath thickness			mm		Coverage and overlap			
6	Rated voltage			660 V	13	Drain wire material			
7	Max. resistance at 20°C			Ohms		Area of cross section			mm ²
8	Max. core-core capacitance			nF		No. of strands			
9	Max. core-screen capacitance			nF		Diameter			mm
1	No. of pairs								
2	Approx. overall diameter (mm)								
3	Approx. dia. over armour (mm)								
4	Approx. dia. under armour (mm)								
5	Armour galvanised steel wire thickness								
6	Minimum outer sheath thickness (mm)								

Note :

1. Colour of outer sheath for various cable sizes of MR shall be as indicated below :

MR SI no. 010102 - 17000m Grey and 45000m Red colour outer sheath
All Other MR Items - Grey colour outer sheath

A	28.05.10	ISSUED WITH MR	JDM	HK	AKS/AK
Rev. No	Date	Purpose	Prepared by	Checked by	Approved by

PROJECT : BRAHMAPUTRA PETROCHEMICAL COMPLEX

CLIENT : M/s BCPL

Sr. No.	Description	With Bids	Post Order		Final Documents
			For Review	For Records	
1.	Schedule of Vendor Documents		*		
2.	Data Sheets (Duly Filled In)			*	*
3.	Dimensional Drawings				
	a. Crossectional view of cable			*	*
	b. Crossectional view of accessories				
4.	QA Plan of Vendor (For review by Inspection)		*		*
5.	Inspection Plan and Testing Procedure (For review by Inspection)		*		*
6.	Test Records			*	*
7.	Type Test Certificate (For similar Cables)			*	*
8.	Data Book/Manual				
	a. Installation Manual			*	*
	b. Operating/Maintenance Manual				*
	c. Catalogues/Brochures			*	*
9.	Equipment storage procedure at site				*

*DATA REQUIRED.

A	28.05.2010	Issued with MR	JDM	HK	AKS/AK
Rev. No	Date	Purpose	Prepared by	Checked by	Approved by



Notes :

1. Unless otherwise agreed, the number of copies of various drawings and documents shall be as follows:
 - a. Post order submission : For Review/Records - Four copies
 - b. Final document : Six prints and two sets of CDs

Vendor shall furnish soft copy of all drawings in AutoCad and all documents in MS Office , as part of final documentation.
2. For Quality management during Pre-order and Post-order stage, Bidder shall refer EIL Standard 6-78-0001 "Specification for Quality Management System Requirements from Bidders " & 6-78-0003 "Specification for Documentation Requirements from Suppliers" ,enclosed with the MR.
3. Vendor shall furnish Schedule of Vendor Drawings and Documents (Format EIL 1641-1923) within 15 days after placement of order.

INSTRUCTIONS TO VENDORS (PA/FA/TELEPHONE CABLES)

PROJECT : BRAHMAPUTRA PETROCHEMICAL COMPLEX
OWNER : BRAHMAPUTRA CRACKER & POLYMER LIMITED
PMC : ENGINEERS INDIA LIMITED

A		ISSUED WITH MR		
Rev. No	Date	Purpose	Prepared by	Checked by
Approved by				

1.0 SPECIAL INSTRUCTIONS TO VENDOR

- 1.1 Bidder to note that no correspondence shall be entered into or entertained after the bid submission.
- 1.2 Bidder shall furnish quotations only for those items, which he can supply strictly as per MR specifications and for which he is approved by EIL.
- 1.3 No technical details of any nature shall be included in the offer. If the offer contains any **technical deviations or clarifications or stipulates any technical specifications (even if in line with the MR requirements), the offer shall be liable for rejection.**
- 1.4 The submission of prices by the bidder shall be construed to mean that he has confirmed compliance with all technical specifications of the corresponding item(s).
- 1.5 The quantities of various types of cables indicated in the MR are tentative and liable for change at the time of order placement. Variation of Overall quantity of each item to the order of $\pm 100\%$ shall be considered and the same shall be informed at the time of order placement. Bidder to note that no price implication for the same shall be applicable.
- 1.6 Prices by the vendor shall remain valid for Repeat ordering of 100% quantity for a period of 1 year from the date of placement of fax of intent/letter of intent.

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- 2.0 BIDDER SHALL NOTE THAT NO TECHNICAL QUESTIONNAIRE SHALL BE ISSUED. BIDDER SHALL ENSURE COMPLIANCE TO THE FOLLOWING:
- 2.1 Bidder has quoted for items as per item description exactly as specified in MR and confirmed compliance to the scope of MR.
- 2.2 Un-priced copy of the priced bid with item description exactly as per MR has been furnished.
- 2.3 Bidder has complied to EIL specification 6-51-0052 Rev 6 and Part-1 of Data Sheet No. 6907-70-XT-DS-0220, Rev.A. No deviation shall be acceptable. In case of deviation, the offer shall be rejected without raising any query to bidder.
- 2.4 Cables shall be supplied in total conformity with EIL standard specification. It may also be noted that type of armouring shall conform to cl. no. 4.8 of EIL spec. 6-51-0052 Rev 5. *Rev-6*.



संचार और अग्नि चेतावनी केबल
के लिए
निरीक्षण व परीक्षण योजना
INSPECTION AND TEST PLAN
FOR
COMMUNICATION AND
FIRE ALARM CABLES

3	30.01.2014	Revised and Reissued	MJ	RS	RKS	SC
2	29.06.2012	Revised and Reissued	RKP	RJD	AKC	SC
	28.09.2007	Revised and Re-issued	AKG	PPM	MVKK	VC
1	30.04.2002	Issued for implementation	RG	AKC	AKB	GRR
Rev. No.	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
						Approved by



Abbreviations

AS	: Alloy Steel	MPT/MT	: Magnetic Particle Testing
BSA	: British Approval Service for Electrical Equipment in Flammable Atmospheres	MRT	: Mechanical Run Test
BIS	: Bureau of Indian Standard	MTC	: Material Test Certificate
CCE or CCOE	: Chief Controller of Explosives	MOC	: Material of Construction
CEIL	: Certification Engineers International Limited	NPSH	: Net Positive Suction Head
CIMFR	: Central Institute of Mining & Fuel Research	NDT	: Non Destructive Testing
CE	: Carbon Equivalent	NEMA	: National Electrical Manufacturers Association
DFT	: Dry Film Thickness	PD	: Partial Discharge
DT	: Destructive Testing	PO	: Purchase Order
DPT	: Dye Penetrate Testing	PESO	: Petroleum Explosive Safety Organization
ERTL	: Electronics Regional Test Laboratory	PQR	: Procedure Qualification Record
FCRI	: Fluid Control Research Institute	PR	: Purchase Requisition
FM	: Factory Mutual	PMI	: Positive Material Identification
FLP	: Flame Proof	PVC	: Poly Vinyl Chloride
HT	: Heat Treatment	QC	: Quality Control
HIC	: Hydrogen Induced Cracking	TC	: Test Certificate
ITP	: Inspection and Test Plan	TPI or TPIA	: Third Party Inspection Agency
IP	: Ingress Protection	UT	: Ultrasonic Testing
IC	: Inspection Certification	UL	: Under writer Laboratories
IGC	: Inter Granular Corrosion	VDR	: Vendor Data Requirement
IEC	: International Electro technical Commission	WPS	: Welding Procedure Specification
JEC	: Japanese Electro technical Committee	WPQ	: Welders Performance Qualification
LPT	: Liquid Penetrate Testing	XLPE	: Cross Linked Poly Ethylene

Inspection Standards Committee

Convenor : Mr. S.C. Gupta

Members:

Mr. R.K. Singh	Mr. Rajeev Kumar	Mr. Himangshu Pal
Mr. Neeraj Mathur	Mr. T Kamalakannan	Mr. Deepak Gupta (Project)
Mr. Mayank Jain		

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**INSPECTION AND TEST PLAN
FOR COMMUNICATION &
FIRE ALARM CABLES**

STANDARD SPECIFICATION NO.

6-81-1052 Rev. 3

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1.0 SCOPE

This Inspection and Test Plan covers the minimum testing requirements of flame retardant type PVC sheathed cables for use in Plant communication, Fire Alarm systems and Jelly filled telecommunication cables.

2.0 REFERENCE DOCUMENTS

PO/PR/ Standards referred there in/Job specifications/Approved documents.

3.0 INSPECTION AND TEST REQUIREMENTS

SL NO.	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA/BCP
1.0	Procedures	---	---	---	---	---	---
2.0	Material Inspection						
2.1	Incoming raw material like Copper Aluminium, PVC, PE, Jelly Compound, Armour material, etc.	Dimensional, Purity, Physical, Chemical Properties, Tests on jelly compound as per DOT spec.	Sample	Sub supplier TC/Supplier's Test Records/ Third party Lab	H	H	-
3.0	In process Inspection						
3.1	Manufacturing Stage	Dimensions at various stages, Spark test, Stage Inspection	100%	Supplier's Test Records	-	H	-
4.0	Final Inspection						

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INSPECTION AND TEST PLAN
FOR COMMUNICATION &
FIRE ALARM CABLES

STANDARD SPECIFICATION NO.

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SL N ^o	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA/
4.1	Final Inspection on completed cable	Visual, Drum details, Size, Ends Capping, Drums Condition, Marking on outer sheath (such as incremental length, voltage grade, manufacturer's name and for jelly filled cables marking as per DOT spec), Colour coding of cores, etc.	100%	Inspection Witness Record	-	H	RW
4.2	Final Inspection on completed Cable(Jelly Filled Cables) Acceptance Test	• Dimension checks. • Test for insulation and sheath. • Continuity of conductors, absence of crossed pairs and absence of contact with poly-al tape • Continuity in poly-al tape • Colour coding • Conductor Resistance, Resistance Unbalance in pair. • Mutual capacitance (pair/average), Capacitance Unbalance (pair to ground and pair to pair) • Cross talk • Attenuation • Drip test • Dielectric Strength • Insulation Resistance • Conductor Annealing • Armour Galvanization • Overall finish and Drum length by re-winding	100%	Inspection Witness Record	-	H	RW



INSPECTION AND TEST PLAN
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SL N ^o	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA/BCPL
4.3	Final Inspection on completed Cable(Jelly Filled Cables) Type Tests	- Type tests on insulated conductors, compatibility of Insulation and filling compound as per DOT spec. - Type tests on Composite sheath and Jacket as per DOT spec - Oxygen index test - Water Penetration test - Cable bend test.	One Sample	Supplier's Test Records	-	H	R
4.4	Final Inspection on completed Cable(Non Jelly Filled Cables) Acceptance Test	- Dimension checks - Continuity of conductors - Colour code - Overlap in poly-al tape and drain wire resistance (if shielding specified) - Conductor Resistance. - Mutual capacitance (pair/average), Capacitance Unbalance (pair to ground and pair to pair) for communication cables - Dielectric Strength - Insulation Resistance / Volume Resistivity. - Tensile and Elongation (without ageing) - Conductor Annealing - Armour Galvanization - Tests on Insulation and sheath as per IS/IEC	100 %	Inspection Witness Record	-	H	RW

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**INSPECTION AND TEST PLAN
FOR COMMUNICATION &
FIRE ALARM CABLES**

STANDARD SPECIFICATION NO.

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SL N ^o	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA/BCPL
4.5	Final Inspection on completed Cable(Non Jelly Filled Cables) Special Test	- Oxygen Index Test - Flammability test as per applicable specification - Test for Rodent & termite repulsion - Surface finish and drum length check by wiring	100 %	Inspection Witness Record	-	H	RW
4.6	Final Inspection on completed Cable(Non Jelly Filled Cables) Type Tests	- Type test on conductor as per spec - Type tests on insulation and Sheath as per spec	Sample	Supplier's Test Records	-	H	R
5.0	Painting						
6.0	Documentation and IC						
6.1	Documentation and IC	- Review of Internal Test Reports and MTCs. - IC issuance	-	Supplier's Test Records / Inspection Certificate (IC)	-	H	H
6.2	Final Document submission	Compilation of Inspection reports ,drawings, etc as per VDR / PR	100%	Final data folder /Completeness certificate	-	H	H

* - Thermal Stability, Hot deformation, Heat shock and Shrinkage tests on insulation and sheath shall be witnessed by EIL (One Sample/Lot), all other tests as per IS-5831 shall be carried out by supplier and test reports shall be reviewed by EIL.

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**INSPECTION AND TEST PLAN
FOR COMMUNICATION &
FIRE ALARM CABLES**

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Legends: H- Hold (Do not proceed without approval, R-Review, RW-Random witness (As specified or 10 % - Samples must include min 1 No of each type), W- Witness (Give due notice, work may proceed after scheduled date).

NOTES :-

1. This document describes the generic test requirements. Any additional test or inspection scope if specified in contract documents shall also be applicable. (Unless otherwise agreed upon).
2. Acceptance Norms for all the activities shall be as per PO/PR/ Standards referred there in/ Job specifications /Approved documents



MATERIAL REQUISITION

DOC NO.- 6907-70-XT-MR-0230, Rev. B.

ITEM DESCRIPTION: MV POWER AND CONTROL CABLES.

ITEM SL.NO. 2a, b,c,d,e,f,g and 3 a, b,c,d,e,f,g.

ITEM CODE: As per Annexure-I.

ITEM SUMMARY: Design, Manufacture, Supply, Testing at works, inspection packing and delivery at site of the following 650V/1100V, Aluminium/Copper Conductor, PVC Insulated, GI strip/Wire Armoured, PVC Outer Sheathed, Multi Core Power Cables as per EIL Standard Specifications No. 6-51-0051, other specifications as listed in attachments and data sheet No. 6907-70-XT-DS-0230.

DESCRIPTION: Multi Core Power and Control Cables as per Annexure-I

Notes :

1. Drum Lengths mentioned in the standard specification are tentative. Exact drum lengths will be furnished with PR.
2. Minimum drum length for a given cable size could be as low as 270 m. Price quoted by the vendor shall be included in this requirement.

LIST OF ATTACHMENT:

1. Standard Spec. for Medium and High Voltage Cables and Accessories- Doc. No. 6-51-0051 Rev.6
2. Cable Data Sheet- Doc. No. 6907-70-XT-DS-0230, Rev A.
3. Vendor Data Requirement (Electrical)- Power and Control Cables and Accessories- Doc. No. 6907-70-XT-VR-0230, Rev A.
4. Instructions to Vendor- Doc. No. 6907-70-XT-TR-0230, Rev A.
5. Specification for Quality Management System requirements from Bidders- Doc. No. 6-78-0001, Rev 0.
6. Specification for documentation requirements from suppliers - Doc. No. 6-78-0003, Rev 0.
7. Inspection and Test Plan for MV & HV cables and accessories - Doc. No. 6-81-1051, Rev.1.

मध्यम एवं उच्च वोल्टेज
केबल एवं असेसरीज
के लिए विनिर्देश

SPECIFICATION
FOR
MEDIUM AND HIGH VOLTAGE
CABLES & ACCESSORIES

6	11.04.11	REVISED AND ISSUED AS STANDARD SPECIFICATION	PS	ANPS	UAP	DM
5	20.04.09	REVISED AND ISSUED AS STANDARD SPECIFICATION	PB	UAP	JMS	ND
4	15/03/04	REVISED AND ISSUED AS STANDARD SPECIFICATION	RKM	AAN	VPS	SKG
3	30/07/98	REVISED AND ISSUED AS STANDARD SPECIFICATION	SKG	RKM	VPS	AS
2	08/12/92	REVISED AND ISSUED AS STANDARD SPECIFICATION	RKM	SG	GNT	
1	04/06/84	REVISED AND ISSUED AS STANDARD SPECIFICATION	RCD	SG	GNT	
Rev No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
					Approved by	

Abbreviations:

ASTM	:	American Society for Testing and Materials
BIS	:	Bureau of Indian Standards
BS	:	British Standard
CEA	:	Central Electricity Authority
DGMS	:	Director General of Mines and Safety
EPR	:	Ethylene Propylene Rubber
FR	:	Flame Retardant
HR PVC	:	Heat Resistant Polyvinyl Chloride
ICEA	:	Insulated Cable Engineers Association
IEC	:	International Electro technical Commission
IS	:	Indian Standards
NEMA	:	National Electrical Manufacturers Association
PVC	:	Polyvinyl Chloride
UV	:	Ultra Violet
XLPE	:	Cross linked Polyethylene

Electrical Standards Committee

Convenor: Mr. UA Patro

Members: Mr. AK Tickoo
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Mr. Saeed Akhtar



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1.0 SCOPE

This specification along with data sheets covers requirements for design, manufacture, testing at works and supply of Flame Retardant Medium & High Voltage cables and cable jointing / terminating accessories for medium and high voltage systems.

2.0 STANDARDS

2.1 The cables and cables jointing & terminating accessories shall comply with the latest edition of the following standards as applicable:

- | | | |
|-------------------|---|---|
| IS: 209 | : | Specification for zinc. |
| IS: 1554 | : | PVC insulated (heavy duty) electric cables. |
| IS: 3961(Pt-2) | : | Recommended current ratings for cables: Part - 2 PVC Insulated and PVC sheathed heavy-duty cables. |
| IS: 3975 | : | Mild steel wires, strips and tapes for armouring of cables. |
| IS: 5831 | : | PVC insulation and sheath of electric cables. |
| IS: 6380 | : | Specification for elastomeric insulation and sheath of electric cables. |
| IS: 7098 | : | Cross-linked polyethylene insulated PVC sheathed cables. |
| IS: 8130 | : | Conductors for insulated electric cables and flexible cords. |
| IS: 10418 | : | Drums for electric cables. |
| IS: 10462 (Pt-1): | : | Fictitious calculation method for determination of dimensions of protective coverings of cables: Part - I Electrometric and thermo-plastic insulated cables. |
| IS: 10810 | : | Methods of test for cables: <ul style="list-style-type: none"> - Part 41: Mass of zinc coating on steel armour - Part 58: Oxygen index test - Part-61: Flame retardant test - Part-62: Fire resistance test for bunched cables. |
| IS: 13573 | : | Joints and terminations for polymeric cables for working voltages from 6.6kV up to and including 33kV. |
| IEC: 60331-21: | : | Tests for electric cables under fire conditions circuit integrity – Procedures and requirements – Cables of rated voltage up and including 0.6/1.0kV. |
| IEC: 60332-3 | : | Tests on electric cables under fire conditions. |
| NEMA-WC70 | : | Standard for non shielded power cables rated 2000V or less for the distribution of electrical energy. |
| NEMA-WC53 | : | Standard test methods for extruded dielectric power, control, instrumentation and portable cables for test. |
| DIN-53387 | : | Artificial weathering and ageing of plastics and elastomers by exposure to filtered xenon arc radiation. |
| ASTM-G-154 | : | Standard practice for operating fluorescent light apparatus for UV exposure of non metallic materials. |
| BS: 7846 | : | Electric cables- 600/1000V armoured fire resistant cables having thermosetting insulation and low emission of smoke and corrosive gases when affected by fire. |

2.2 The cables and accessories shall also conform to the provisions of CEA Regulations and other statutory regulations, as applicable.

2.3 In case of any conflict between requirements specified in various applicable documents for the project, the most stringent one shall prevail. However, Owner's decision in this regard will be final and binding.



3.0 GENERAL CONSTRUCTION

- 3.1 The cables shall be suitable for laying in trays, trenches, ducts, and conduits and for underground-buried installation with uncontrolled backfill and possibility of flooding by water and chemicals.
- 3.2 Outer sheath of all cables shall be black in colour and the minimum value of oxygen index shall be 29 at $27 \pm 2^\circ \text{C}$. In addition suitable chemicals shall be added into the PVC compound of the outer sheath to protect the cable against rodent and termite attack.
- 3.3 All cables covered in this specification shall be flame retardant (FR). The outer sheath of cables shall possess flame propagation properties meeting requirements as per IS-10810 (Part-62) category AF.
- 3.4 Sequential marking of the length of the cable in metres shall be provided on the outer sheath at every one metre. The embossing/engraving shall be legible and indelible.
- 3.5 The overall diameter of the cables shall be strictly as per the values declared by the manufacturer in the technical information subject to a maximum tolerance of $\pm 2 \text{ mm}$ up to overall diameter of 60mm and $\pm 3 \text{ mm}$ for beyond 60mm.
- 3.6 PVC/ Rubber end caps shall be supplied free of cost for each drum with a minimum of eight per thousand metre length. In addition, ends of the cables shall be properly sealed with caps to avoid ingress of water during transportation and storage.
- 3.7 The cables meant to be used in mining area under the jurisdiction of DGMS shall comply with the requirements as specified in the Job specification/ Datasheet.

3.8 Medium Voltage Cables

- 3.8.1 All power/control cables for use on medium voltage systems shall be heavy-duty type, 650/1100V grade with aluminium/ copper conductor, PVC insulated, inner-sheathed, armoured/ unarmoured and overall PVC sheathed.
- 3.8.2 The conductors shall be solid for conductor of nominal area up to and including 6 mm^2 and stranded beyond 6 mm^2 . Conductors of nominal area less than 16 mm^2 shall be circular only. Conductors of nominal area 16 mm^2 and above may be circular or shaped as per IS 8130. Cables with reduced neutral conductor shall have sizes as per Table 1 of IS 1554 (Part-1).
- 3.8.3 The core insulation shall be with PVC compound applied over the conductor by extrusion and shall conform to the requirements of type 'A' compound as per IS: 5831. The thickness of insulation and the tolerance on thickness of insulation shall be as per Table 2 of IS: 1554 (Part-1). Control cables having 6 cores and above shall be identified with prominent and indelible Arabic numerals on the outer surface of the insulation. Colour of the numbers shall contrast with the colour of insulation with a spacing of maximum 50 mm between two consecutive numbers. Colour coding for cables up to 5 cores shall be as per Indian standard.
- 3.8.4 The inner sheath shall be applied over the laid-up cores by extrusion and shall be of PVC conforming to the requirements of Type ST-1 PVC compound as per IS: 5831. The minimum thickness of inner sheath shall be as per IS: 1554 (Part-1). Single core cables shall have no inner sheath.

- 3.8.5 All cables shall be provided with armour except those specifically specified as unarmoured. For multicore cables, the armour shall be by single round galvanised steel wires where the calculated diameter below armouring does not exceed 13 mm and by galvanised steel strips where this dimension is greater than 13 mm. Requirement and methods of tests for armour material and uniformity of galvanisation shall be as per IS - 3975 and IS -10810 (Part 41). The dimensions of armour shall be as per method (b) of IS - 1554 (Part -1). For single core cables, the armour shall be with H4 grade hard drawn aluminium round wire of 2.5 mm diameter.

For mining cables, the size and type of armour shall be such that the combined conductance of armour shall be equivalent to 75 percent of the conductance of the largest conductor of the cable.

- 3.8.6 The outer sheath for the cables shall be applied by extrusion and shall be of PVC compound conforming to the requirements of type ST-1 compound as per IS: 5831. The minimum and average thickness of outer sheath for unarmoured cables and minimum thickness of outer sheath for armoured cables shall be as per IS: 1554 (Part -1).

- 3.8.7 Where specified, 1100V grade power cables shall also be XLPE insulated and shall meet the requirement specified in IS-7098 (Part-1).

- 3.8.8 If heat resisting PVC cables are specified in the data sheet, the following shall be the requirements:

It shall be possible to continuously operate the cable at a maximum conductor temperature of 85° C. PVC compounds used for HR PVC cables shall be as follows:

- a. Conductor insulation -Type C
- b. Inner sheath -Type ST 2
- c. Outer sheath -Type ST 2

- 3.8.9 The fire survival cables shall meet the following additional requirements :

- i) The insulation shall be of EPR or equivalent material with glass mica tape below or above insulation.
- ii) The cables shall meet requirement of circuit integrity test for a minimum period of 3 hours at max. Temperature of 950° C.

3.9 High Voltage Cables

- 3.9.1 Power cables for 3.3kV up to and including 33kV systems shall be Aluminium/ Copper conductor, XLPE insulated, sheathed, armoured/ unarmoured and overall PVC sheathed.

- 3.9.2 The conductors shall be stranded and compacted circular for all cables.

- 3.9.3 All cables rated 3.8/ 6.6kV and above shall be provided with both conductor screening and insulation screening. The conductors shall be provided with non-metallic extruded semi conducting screen.

- 3.9.4 The core insulation shall be with cross linked polyethylene insulating compound dry cured, applied by extrusion. It shall be free from voids and shall withstand all mechanical and thermal stresses under steady state and transient operating conditions. It shall conform to the properties given in Table-1 of IS: 7098 (Part -2).

- 3.9.5 The insulation screen shall consist of non-metallic extruded semi-conducting compound in combination with a non-magnetic metallic copper screen. The copper screen for all the three cores together shall be capable of carrying the single line to ground fault current value and the duration specified in the data sheet.
- 3.9.6 The conductor screen, XLPE insulation and insulation screen shall all be extruded in one operation by 'Triple Extrusion' process to ensure perfect bonding between the layers. The core identification shall be by coloured strips or by printed numerals.
- 3.9.7 The inner sheath shall be applied over the laid up cores by extrusion and shall conform to the requirements of type ST 2 compound of IS: 5831. The extruded inner sheath shall be of uniform thickness. In case of single core cables, there shall be extruded inner sheath between insulation metallic screen and armouring.
- 3.9.8 All cables shall be provided with armour except those specifically specified as unarmoured. For multicore cables, the armour shall be by galvanised steel strips. Requirement and methods of tests for armour material and uniformity of galvanisation shall be as per IS - 3975 and IS - 10810 (Part 41). The dimensions of armour shall be as per method (b) of IS - 7098 (Part -2). For single core cables, the armour shall be with H4 grade hard drawn aluminium round wire of 2.5 mm diameter.
- 3.9.9 The outer sheath of the cables shall be applied by extrusion over the armouring and shall be of PVC compound conforming to the requirements of Type ST 2 compound of IS: 5831. The minimum and average thickness of outer sheath for unarmoured cables and minimum thickness of outer sheath for armoured cables shall be as per IS: 7098 (Part-2).
- 3.9.10 The thickness of the insulation, inner sheath shall be governed by values given in IS: 7098 (Part -2).

4.0 CABLE ACCESSORIES

- 4.1 The termination and straight through jointing kits for use on the systems shall be suitable for the type of cables offered as per this specification and shall meet requirements of IS 13573.
- 4.2 The accessories shall be supplied in kit form. Each component of the kit shall carry the manufacturer's mark of origin.
- 4.3 The kit shall include all stress grading, insulating and sealing materials apart from conductor fittings and consumable items. An installation instruction sheet shall also be included in each kit.
- 4.4 The contents of the accessories kit including all consumable shall be suitable for storage without deterioration at a temperature of 45° C, with shelf life extending to more than 5 years.
- 4.5 **Terminating Kits**

The terminating kits shall be suitable for termination of the cables to an indoor switchgear or to a weatherproof cable box of an outdoor mounted transformer/ motor. For outdoor terminations, weather shields/ sealing ends and any other accessories required shall also form part of the kit. The terminating kits shall be from one of the makes/ types mentioned in the data sheet.



4.6 Jointing Kits

The straight through jointing kits shall be suitable for installation on overhead trays, concrete lined trenches, and ducts and for underground burial with uncontrolled backfill and possibility of flooding by water and chemicals. These shall have protection against any mechanical damage and suitably designed to be protected against rodent and termite attack. The inner sheath similar to that provided for cables shall be provided as part of straight through joint. The jointing kits shall be from one of the makes/ types mentioned in the data sheet.

5.0 INSPECTION, TESTING AND ACCEPTANCE

The cables shall be tested and inspected at the manufacturer's works. Manufacturer shall furnish all necessary information concerning the raw material supply to EIL/ Owner's inspectors. The inspector shall have free access to the manufacturer's works for the purpose of inspecting the process of manufacture in all its stages and he will have the power to reject any material, which appears to him to be of unsuitable description or of unsatisfactory quality. For HV cables, the vendor shall give at least 2 weeks advance notice to the purchaser, regarding the date of testing to enable him or his representative to witness the tests.

5.1 Cables

- 5.1.1 After completion of manufacture of cables and prior to despatch, the cables shall be subjected to type, routine, acceptance and special tests as detailed below. The test reports for all cables shall be got approved from the Engineer before despatch of the cables.
- 5.1.2 All routine tests, acceptance tests, type tests and additional type tests for improved fire performance shall be carried out as listed in IS: 1554 (Part-1) and IS: 7098 (Part-2) on PVC and XLPE insulated cables respectively.
- 5.1.3 The test requirements for PVC insulation and sheath of cables shall be as per latest revision of IS: 5831.
- 5.1.4 Test for Resistance to Ultra Violet Radiation: This test shall be carried out as per DIN 53387 or ASTM-G-154 on outer sheath. The retention value of tensile strength and ultimate elongation after the test shall be minimum 60 % of tensile strength and ultimate elongation before the test. Test certificates with respect to this test (not older than one year) from recognised testing laboratory to be furnished for review by EIL before despatch clearance of cables. In case test certificates are not available, test is to be conducted by vendor at his own cost in any recognised test laboratory or in house testing laboratory, before despatch clearance of cables. Sampling for this test is to be done randomly once for each order, provided outer sheath remains same.
- 5.1.5 Acceptance tests as per IS-1554 (Part-1) and IS-7098 (Part-2) and the following special tests to be performed on the cables as per sampling plan for all cables. However these tests are required to be witnessed by EIL/ Owner for HV cables.
 - a. Accelerated water absorption test for insulation as per NEMA-WC-70. (For PVC insulated cables) and as per NEMA-WC-53 (for XLPE/ EPR insulated cables). Test certificates with respect to this test (not older than one year) from recognised testing laboratory to be furnished for review by EIL before despatch clearance of cables. In case test certificates are not available, test is to be conducted by vendor at his own cost in any recognized test laboratory or in house testing laboratory, before despatch clearance of cables. Sampling for this test is to be done randomly once for each order, provided type of insulation remains same.



- b. **Dielectric Retention Test:** The dielectric strength of the cable insulation tested in accordance with NEMA-WC-70 at $75 \pm 1^\circ \text{C}$ shall not be less than 50 % of the original dielectric strength. (For PVC insulated cables). Test certificates with respect to this test (not older than one year) from recognised testing laboratory to be furnished for review by EIL before despatch clearance of cables. In case test certificates are not available, test is to be conducted by vendor at his own cost in any recognized test laboratory or in house testing laboratory, before despatch clearance of cables. Sampling for this test is to be done randomly and once for each order.
- c. **Oxygen Index Test:** The test shall be carried out as per IS-10810 (Part 58). Sampling to be done for every offered lot/size as per sampling plan:
- d. **Flammability Test:** The test shall be carried out on finished cable as per IS-10810 (Part 61 & 62). Sampling for these tests is to be done randomly once for each order, provided outer sheath remains same. The acceptance criteria for tests conducted shall be as under:

Part-61-The cable meets the requirement if there is no visible damage on the test specimen within 300 mm from its upper end

Part-62-The maximum extent of the charred portion measured on the test sample should not have reached a height exceeding 2.5 m above the bottom edge of the burner at the front of the ladder.
- e. **Test for rodent and termite repulsion property** shall be done by analysing the property by chemical method.

5.1.6 The test for circuit integrity for fire survival cables shall be carried out as per IEC-60331 (Part-21).

5.2 Cable Accessories

Type tests should have been carried out to prove the general qualities and design of a given type of termination/ jointing system as per IS-13573. The type test certificates from independent testing laboratory shall be submitted before despatch.

6.0 PACKING AND DESPATCH

- 6.1 Cables shall be despatched in non-returnable wooden or steel drums of suitable barrel diameter, securely battened, with the take-off end fully protected against mechanical damage. The wood used for construction of the drum shall be properly seasoned, sound and free from defects. Wood preservatives shall be applied to the entire drum. Ferrous parts used shall be treated with a suitable rust preventive finish or coating to avoid rusting during transit or storage.
- 6.2 On the flange of the drum, necessary information such as project title, manufacturer's name, type, size, voltage grade of cable, length of cable in metres, drum no., cable code, BIS certification mark, gross weight etc. shall be printed. An arrow shall be printed on the drum with suitable instructions to show the direction of rotation of the drum.

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6.3 Cables shall be supplied in drum lengths as follows:

6.3.1 MV Cables

-	Multicore Power cables upto 6 mm ²	:	1000 m
-	Multicore Power cables from 10 mm ² up to 300 mm ²	:	500 m
-	Single Core Power cables upto 630 mm ²	:	1000 m
-	Control cables upto 61 cores	:	1000 m

6.3.2 HV Power Cables Upto 11kV (E) Grade

-	Three Core cables upto 400 mm ²	:	500 m
-	Single Core cables upto 400 mm ²	:	1000 m
-	Single Core cables above 400 mm ² and upto 1000 mm ²	:	750 m

6.3.3 HV Power Cables Above 11kV (E) Grade and upto 33kV (E) Grade

-	Three Core cables upto 300 mm ² grade	:	350 m
-	Single Core cables upto 400 mm ²	:	1000 m
-	Single Core cables above 400 mm ² and upto 1000 mm ²	:	500 m

However exact drum lengths shall be finalised during order execution. A tolerance of $\pm 3\%$ shall be permissible for each drum. However overall tolerance on each size of cable shall be limited to $\pm 2\%$.

PURCHASER'S DATA									
A Site conditions									
1	Maximum ambient temperature:			39.8 °C	4	Relative humidity:			93 %
2	Minimum ambient temperature:			1 °C	5	Altitude			< 1000 m
3	Ground temperature:			30 °C	6	Environment:			Humid & corrosive
B Technical particulars									
1	System voltage				4	Single line to ground fault current			
	Nominal	Highest	Voltage grade			Current value			
	415 V	500 V	650/1100V		☒	Duration			
	3.3kV(E)	3.6 kV	1.9/3.3kV		☐	5	Conductor material		
	3.3kV(UE)	3.6 kV	3.3/3.3kV		☐		HV Power cable		
	6.6kV(E)	7.2 kV	3.8/6.6kV		☐		MV Power cable	(See Note-3)	Cu/Al
	6.6kV(UE)	7.2 kV	6.6/6.6kV		☐		MV Control cable	Copper	
	11kV(E)	12 kV	6.35/11kV		☐	6	Cables to be flame retardant		Yes
	11kV(UE)	12 kV	11/11kV		☐	7	Cables to be heat resistant		No
	22kV(E)	24 kV	12.7/22kV		☐	8	Armouring requirement		Yes
	33kV(E)	36 kV	19/33kV		☐	9	Type of armour bonding		NOT APPLICABLE
2	Frequency			50 Hz ± 3%	10	Installation under DGMS jurisdiction		No	
3	Make of Accessories (If Applicable)			NA	11	Colour of Outer Sheath		Black	
MANUFACTURER'S DATA									
1	Name of Manufacturer					Thickness		mm	
2	Cable type/ code				9	Nominal dia under armour		mm	
3	Conductor material				10	Calculated dia under armour		mm	
4	Conductor semiconducting screen (HV cables)				11	Armour			
	Material					Material			
	Thickness				mm	Type			
5	Insulation					Size			
	Type of compound				12	Nominal dia under outersheath		mm	
	Thickness				mm	13	Calculated dia under outersheath		mm
6	Insulation semiconducting screen (HV cables)				14	Outersheath			
	Material					Type of compound			
	Thickness				mm	Thickness		mm	
7	Copper tape				15	Nominal outer dia of cable		mm	
	Thickness				mm	16	Tolerance on outer dia		%
8	Inner sheath				17	Maximum drum length		mtr.	
	Type of compound								

Notes

- 1 Single line to ground fault current is applicable for HV cables for sizing of insulation screening.
- 2 E- Earthed system
UE-Un Earthed system
- 3 For Conductor material i.e. Cu/Al, refer Material Requisition No. 6907-70-XT-MR-0230,Rev A,

A		ISSUED WITH MR			
Rev. No.	Date	Purpose	Prepared by	Checked by	Approved by

Sr.No	Description	With Bids	Post Order		Final Documents With Equipment	
			For Review	For Records	CD	Prints
1.	Vendor documents schedule		*			
2.	Data sheets (duly filled-in)			*	*	
3.	Dimensional Drawings					
	a. GA drawing for terminating kits and jointing kits					
	b. Cross sectional views of cables			*	*	
4.	Technical particulars of cables eg., impedance, inductance, resistance, current carrying capacity, derating factors etc.			*		
5.	QA plan of vendor (Reviewed by Inspection)		*			
6.	Inspection plan and testing procedure (Reviewed by Inspection)		*			
7.	Test records			*		
8.	Type test certificate			*		
	a. For similar cables					
	b. For cable accessories					
9.	DGMS approval certificate, where applicable					
10.	Data book/ manual					
	a. Installation manual					*
	b. Operating/ maintenance manual					*
	c. Catalogues/ Brochures	*				*
11.	Equipment storage procedure at site					*

* DATA REQUIRED.

Notes:

- Unless otherwise agreed, the number of copies of various drawings and documents shall be as below:

A 06.02.2010 ISSUED WITH MR SMK HK AK					
Rev. No	Date	Purpose	Prepared by	Checked by	Approved by

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- a. Post order submission - For Review/Records - Six copies
- b. Final documents - Six prints and Two sets of CDs

Vendor shall furnish soft copy of all drawings in AutoCAD version 2008 and all documents in MSOffice 2007 as part of the final documentation.

2. For Quality management during Pre-order and Post-order stage, bidder shall refer EIL std. 6-78-0001 and 6-78-0003, enclosed with the MR.
3. Vendor shall furnish 'Vendor Drawing/Document submission schedule' (EIL format- 1641-1923), within 15 days after placement of order.

INSTRUCTIONS TO VENDORS

PROJECT : BRAHMAPUTRA PETROCHEMICAL COMPLEX

OWNER : BRAHMAPUTRA CRACKER & POLYMER LIMITED

PMC : ENGINEERS INDIA LIMITED

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1.0 SPECIAL INSTRUCTIONS TO VENDOR

- 1.1 Bidder to note that no correspondence shall be entered into or entertained after the bid submission.
- 1.2 Bidder shall furnish quotations only for those items, which he can supply strictly as per MR specifications and for which he is approved by EIL.
- 1.3 No technical details of any nature shall be included in the offer. If the offer contains any **technical deviations or clarifications or stipulates any technical specifications (even if in line with the MR requirements)**, the offer shall be **liable for rejection. However, for items where bidder has entered into MOU with EIL, he may state that the deviations are as per MOU with EIL.**
- 1.4 The submission of prices by the bidder shall be construed to mean that he has confirmed compliance with all technical specifications of the corresponding item(s).
- 1.5 The quantities of various types of cables indicated in the MR are tentative and liable for change at the time of order placement. Variation of Overall quantity of each item to the order of $\pm 100\%$ shall be considered and the same shall be informed at the time of order placement. Bidder to note that no price implication for the same shall be applicable.
- 1.6 Prices by the vendor shall remain valid for Repeat ordering of 100% quantity for a period of 1 year from the date of placement of fax of intent/letter of intent.

MODIFIED
AS PER
SCL.

MODIFIED
AS PER
SCL.

2.0 BIDDER SHALL NOTE THAT NO TECHNICAL QUESTIONNAIRE SHALL BE ISSUED. BIDDER SHALL ENSURE COMPLIANCE TO THE FOLLOWING:

- 2.1 Bidder has quoted for items as per item description exactly as specified in MR and confirmed compliance to the scope of MR.
- 2.2 Un-priced copy of the priced bid with item description exactly as per MR has been furnished.
- 2.3 Bidder has complied to EIL specification 6-51-0051 Rev 6 and Part-1 of Data Sheet No. 6907-70-XT-DS-0230, Rev.A. No deviation shall be acceptable. In case of deviation, the offer shall be rejected without raising any query to bidder.
- 2.4 Cables shall be supplied in total conformity with EIL standard specification. It may also be noted that type of armouring shall conform to cl. no. 3.8.5 of EIL spec. 6-51-0051 Rev. 6.

Wp

मध्यम एवं उच्च वोल्टेज केबल तथा सहायक सामग्री के लिए
निरीक्षण व परीक्षण योजना

INSPECTION AND TEST PLAN
FOR
MEDIUM AND HIGH VOLTAGE
CABLES & ACCESSORIES

3	30.01.2014	Revised and Reissued	MJ	RS	SGG	SC
2	15.07.2011	Revised and Re-issued	AB	RJD	AKC	DM
	28.09.07	Revised and Re-issued	AKG	PPM	MVKK	VC
0	30.04.02	Issued for implementation	RG	AKC	AKB	GRR
Rev. No.	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
						Approved by

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**INSPECTION AND TEST PLAN
FOR MEDIUM AND HIGH
VOLTAGE CABLES & ACCESSORIES**

Abbreviations:

B.S. 5958	: Alloy Steel	MPT/MT	: Magnetic Particle Testing
B.S. 5959	: British Approval Service for Electrical Equipment in Flammable Atmospheres	MRT	: Mechanical Run Test
BIS	: Bureau of Indian Standards	MTC	: Material Test Certificate
CCE or CCOE	: Chief Controller of Explosives	MOC	: Material of Construction
CEIL	: Certification Engineers International Limited	NPSH	: Net Positive Suction Head
CIMFR	: Central Institute of Mining & Fuel Research	NDT	: Non Destructive Testing
CE	: Carbon Equivalent	NEMA	: National Electrical Manufacturers Association
DFT	: Dry Film Thickness	PO	: Purchase Order
DT	: Destructive Testing	PESO	: Petroleum Explosive Safety Organization
DPT	: Dye Penetrate Testing	PQR	: Procedure Qualification Record
ERTL	: Electronics Regional Test Laboratory	PR	: Purchase Requisition
FCRI	: Fluid Control Research Institute	PMI	: Positive Material Identification
FM	: Factory Mutual	PVC	: Poly Vinyl Chloride
FLP	: Flame Proof	QC	: Quality Control
HIC	: Hydrogen Induced Cracking	RT	: Radiography Testing
ITP	: Inspection and Test Plan	TC	: Test Certificate
IP	: Ingress Protection	TPI or TPIA	: Third Party Inspection Agency
IC	: Inspection Certification	UT	: Ultrasonic Testing
IGC	: Inter Granular Corrosion	UL	: Under writer Laboratories
IEC	: International Electro technical Commission	VDR	: Vendor Data Requirement
JEC	: Japanese Electro technical Committee	WPS	: Welding Procedure Specification
LPT	: Liquid Penetrate Testing	WPQ	: Welders Performance Qualification
		XLPE	: Cross Linked Poly Ethylene

Inspection Standards Committee

Chairman: Mr. S.C. Gupta

Members:

Mr. R.K. Singh	Mr. Rajeev Kumar	Mr. Himangshu Pal
Mr. Neeraj Mathur	Mr. T Kamalakannan	Mr. Deepak Gupta (Project)
Mr. Mayank Jain		

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**INSPECTION AND TEST PLAN
FOR MEDIUM AND HIGH
VOLTAGE CABLES & ACCESSORIES**

STANDARD SPECIFICATION NO.

6-81-1051 Rev. 3

Page 3 of 6

1.0 SCOPE:

This Inspection and Test Plan covers the minimum testing requirements of PVC, XLPE insulated cables and cable jointing/terminating accessories for high and medium voltage systems.

2.0 REFERENCE DOCUMENTS:

PO/PR / Standards referred there in /Job specifications / Approved documents.

3.0 INSPECTION AND TEST REQUIREMENTS:

SL NO.	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA/
1.0	Procedures	--	--	--	--	--	--
2.0	Material Inspection						
2.1	Incoming raw material like Copper, Aluminum, PVC, XLPE, Galvanized Armour.	Purity, Dimensions, Physical and Chemical Properties.	100%	Material Test Certificates/ Test Records/Third Party Lab certificates	H	H	R
3.0	Inprocess Inspection						
3.1	Inspection during insulation, sheathing	Spark test, thickness of insulation, Conductor Resistance	100%	Test Records	--	H	R
4.0	Final Inspection						
4.1	Finished Cable	Visual, Drum details, Size, Ends Capping, Marking on outer sheath (such as Incremental Length, Voltage grade, manufacturer's name), Colour coding, etc.	100% for Drum details and Sample drums for balance details	Test Records	-	H	H/R**

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**INSPECTION AND TEST PLAN
FOR MEDIUM AND HIGH
VOLTAGE CABLES & ACCESSORIES**

STANDARD SPECIFICATION NO.

6-81-1051 Rev. 3

Page 4 of 6

SL NO.	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA/ DEP
4.2	Finished Cable(Routine Tests)	- Conductor Resistance. - High Voltage - Partial Discharge (for XLPE only)	100%	Supplier's Test Records	-	H	H/R**
4.3	Finished Cable (Acceptance tests)	- Check calibration status of all testing equipment. - Dimension checks – overall dia, over/under armour, thickness of insulation, sheath, copper screen dimension, etc. - Conductor Resistance - Insulation resistance /Volume resistivity - High Voltage tests - Partial Discharge(for XLPE) - Hot Set (for XLPE insulation) - Tests on Conductor as applicable - Tests on PVC/XLPE Insulation & Sheath * - Armour Galvanization - dip test - Volume resistivity, Insulation resistance - Tensile and elongation (without ageing)	As per sampling plan	Inspection Test Records	-	H	H/R**
4.4	Finished Cable (Special tests)	- Flammability test as per applicable specification. - Accelerated water absorption test as per NEMA(Electrical method) # - Test for resistance to Ultra Violet Radiation # - Oxygen Index test as per IS /IEC - Rodent & Termite repulsion check - Drum length /surface finish check by re-winding - Test for circuit integrity for fire survival cables as per IEC(If applicable)	1 sample/size/ lot 1 sample /order 1 sample/order 1 sample/ order 1 sample/size/ lot 1 sample/ lot 1 or 2 drums/ lot 1 sample/ lot	Inspection test records		H	H/R**

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INSPECTION AND TEST PLAN
FOR MEDIUM AND HIGH
VOLTAGE CABLES & ACCESSORIES

STANDARD SPECIFICATION NO.

6-81-1051 Rev. 3

Page 5 of 6

SL NO.	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA/
4.5	Finished Cable (Type tests **)	- Dielectric Retention. - Type tests on PVC insulation and Sheath - High Voltage test (Water Immersion) - Dielectric power factor tests as function of voltage, temperature. (XLPE cables) - Heating cycle test (XLPE Cables) - Impulse withstand test (XLPE cables)	Sample	Test Records		H	R
4.6	Cable accessories	- Visual - Dimensions - Type tests** as per IS/IEC	Sample	Test Records		H	R
5.0	Painting	---	---	---	---	---	---
6.0	Documentation and IC						
6.1	Documentation and IC	- Review of Routine, Acceptance, Type test reports. - IC issuance	100%	Supplier TC & IC	-	-	H
6.2	Final Document submission	Compilation of Inspection reports ,drawings, etc as per VDR / PR	100%	Final data folder /Completeness certificate	-	H	H

In case TC (not older than one year) from independent test lab is available & type of compound used is same then the same may be accepted.

* Hot deformation, Heat shock and Shrinkage tests on insulation & sheath (One sample/Lot) shall be witnessed by EIL/TPIA, all other tests as per IS/IEC shall be carried out by supplier and test reports shall be reviewed by EIL/TPIA.

** EIL witness for HT cables only

Legends: H- Hold (Do not proceed without approval, R-Review, RW-Random witness (As specified or 10 % - Samples must include min 1 No of each type), W- Witness (Give due notice, work may proceed after scheduled date).

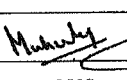
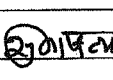
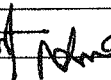
41

NOTES :-

- This document describes the generic test requirements. Any additional test or inspection scope if specified in contract documents shall also be applicable. (Unless otherwise agreed upon).
- Acceptance Norms for all the activities shall be as per PO/PR/ Standards referred there in/ Job specifications /Approved documents

बोलीकर्ता से गुणवत्ता प्रबंधन
प्रणाली अपेक्षाओं हेतु विनिर्देश

SPECIFICATION FOR QUALITY
MANAGEMENT SYSTEM
REQUIREMENTS FROM BIDDERS

0	04.06.09	Issued as Standard Specification				
			QMS Standards Committee	QMS Standards Committee	SCT	ND
Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standard Bureau Chairman
					Approved by	



Abbreviations:

MR	-	Material Requisition
PR	-	Purchase Requisition
PO	-	Purchase Order
QA	-	Quality Assurance
QMS	-	Quality Management System
ISO	-	International Organization for Standardization
CV	-	Curriculum Vitae

QMS Standards Committee

Convenor: Mr. S.C. Tyagi

Members: Mr. Chandra Kant (Insp.)
Mr. R.K. Trivedi (Engg.)
Mr. R.K. Sabharwal (C&P)
Mr. M.P. Jain (Projects)
Mr. Ravindra Kumar (Const.)
Mr. Mukesh Meena (CQA)

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5.0	QUALITY SYSTEM REQUIREMENTS.....	4
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7.0	DOCUMENTATION REQUIREMENTS	7

Attachment

Format for Concession/Deviation Permit : Format No.5-0000-0180-F1

1.0 SCOPE

This specification establishes the Quality Management System requirements to be met by BIDDER for following purpose:

- QMS requirements to be met by suppliers/contractors after award of work/during contract execution.

2.0 DEFINITIONS

2.1 Bidder

For the purpose of this specification, the word "BIDDER" means the person(s), firm, company or organization who is under the process of being contracted by EIL / Owner for delivery of some products (including service). The word is considered synonymous to supplier, contractor or vendor.

2.2 Project Quality Plan

Document tailored from Standard Quality Management System Manual of BIDDER, specifying how the quality requirements of the project will be met.

2.3 Owner

Owner means the owner of the project for which services / products are being purchased and includes their representatives, successors and assignees.

3.0 REFERENCE DOCUMENTS

6-78-0002	Specification for Documentation Requirements from Contractors
6-78-0003	Specification for Documentation Requirements from Suppliers

4.0 QUALITY MANAGEMENT SYSTEM – GENERAL

Unless otherwise agreed with EIL / Owner, the BIDDER proposed quality system shall fully satisfy all relevant requirements of ISO 9001 "Quality Management Systems – Requirements." Evidence of compliance shall be current certificate of quality system registration to ISO 9001 or a recent compliance audit recommending registration from a registrar. The quality system shall provide the planned and systematic control of all quality related activities for execution of contract. Implementation of the system shall be in accordance with BIDDER'S Quality Manual and PROJECT specific Quality Plan.

5.0 QUALITY SYSTEM REQUIREMENTS

- 5.1 BIDDER shall ensure that the responsible authority for execution of the order / contract has communicated the PO / contract requirements including any identified or intended statutory and regulatory requirements to all concerned in their organization and sub-contractor's organization who are contributing to the execution of the PO/ contract.
- 5.2 BIDDER shall establish a documented Quality Policy and Quality Objectives to achieve the specified and intended requirement of PO / contract.

- 5.3 BIDDER shall identify and communicate the responsibilities and authorities of the personnel contributing to the execution of the PO / contract.
- 5.4 BIDDER shall deploy competent and trained personnel for various activities for fulfillment of PO / contract. BIDDER shall arrange adequate infrastructure and work environment to ensure that the specification and quality of the deliverable are maintained.
- 5.5 BIDDER shall do the quality planning for all activities involved in delivery of order. The quality planning shall cover as minimum the following:

- Resources
- Product / deliverable characteristics to be controlled.
- Process characteristics to ensure the identified product characteristics are realized
- Identification of any measurement requirements, acceptance criteria
- Records to be generated
- Need for any documented procedure

The quality planning shall result into the quality assurance plan, inspection and test plans (ITPs) and job procedures for the project activities in the scope of bidder. These documents shall be submitted to EIL/Owner for review/approval, before commencement of work.

- 5.6 Requirements for sub-contracting / purchasing of services specified in contract / tender shall be adhered to. Wherever requirements are not specified, the sub-contractor shall establish and maintain a system for purchasing / sub-contracting to ensure that purchased product / service conforms to specified requirements. Criteria for selection of sub-contractor, evaluation, re-evaluation, maintenance of purchasing data and verification of purchased product (sub-contractor services), constitute important components of this requirement.
- 5.7 BIDDER shall plan and carry production and service provision under controlled conditions. Controlled conditions shall include, as applicable
- a) the availability of information that describes the characteristics of the product
 - b) the availability of work instructions
 - c) the use of suitable equipment
 - d) the availability and use of monitoring and measuring devices
 - e) the implementation of monitoring and measurement
 - f) the implementation of release, delivery and post delivery activities
- 5.8 BIDDER shall validate any processes for production and service provision where resulting output cannot be verified by subsequent monitoring and measurement. This includes any process where deficiencies become apparent only after the product is in use or service has been delivered.
- 5.9 BIDDER shall establish a system for identification and traceability of product / deliverable throughout product realization. Product status with respect to inspection and testing requirements shall be identified.
- 5.10 BIDDER shall identify, verify, protect and safeguard EIL / Owner property (material / document) provided for use or incorporation into the product. If any Owner / EIL property is lost, damaged or otherwise found to be unsuitable for use, this shall be reported to the EIL / Owner.

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- 5.11** BIDDER shall preserve the conformity of product / deliverable during internal processing and delivery to the intended destination. Requirements mentioned in the tender shall be adhered to.
- 5.12** BIDDER shall establish system to ensure that inspection and testing activities are carried out in a manner that is consistent with the inspection and testing requirements. Where necessary, measuring equipments shall be calibrated at specified frequency, against national or international measurement standards; where no such standard exists, the basis used for calibration shall be recorded. The measuring equipments shall be adjusted or re-adjusted as necessary, identified to enable the calibration status to be determined. The measuring equipments shall be protected from damage during handling, maintenance and storage.
- 5.13** BIDDER shall ensure effective monitoring, using suitable methods, of the processes involved in production and other related processes for delivery of the scope of contract.
- 5.14** BIDDER shall monitor and measure the characteristics of the product/deliverable to verify that product requirement has been met. The inspection (stage as well as final) by BIDDER and EIL / Owner personnel shall be carried out strictly as per the ITPs forming part of the contract. Product release or service delivery shall not proceed until the planned arrangements have been satisfactorily completed, unless otherwise approved by relevant authority and where applicable by Owner / EIL.
- 5.15** BIDDER shall establish and maintain a documented procedure to ensure that the product which does not conform to requirements is identified and controlled to prevent its unintended use or delivery
- 5.16** All non-conformities (NCs) / deficiencies found by the BIDDER'S inspection / surveillance staff shall be duly recorded, including their disposal action shall be recorded and resolved suitably. Effective corrective and preventive action shall be implemented by the BIDDER so that similar NCs including deficiencies do not recur.
- 5.17** All deficiencies noticed and reported by EIL / Owner shall be analyzed by the BIDDER and appropriate corrective and preventive actions shall be implemented. BIDDER shall intimate EIL / Owner of all such corrective and preventive action implemented by him.
- 5.18** BIDDER should follow the standards, specifications and approved drawings. Concessions/Deviations shall be allowed only in case of unavoidable circumstances. In such situations Concession/deviation request must be made by the BIDDER in attached Format No. 5-0000-0180-F1.
- 5.19** BIDDER shall have documented procedure for control of documents.
- 5.20** All project records shall be carefully kept, maintained and protected for any damage or loss until the project completion, then handed over to EIL / Owner as per contract requirement (Refer Specification Nos. 6-78-0002 - Specification for Documentation Requirements from Contractors and 6-78-0003 - Specification for Documentation Requirements from Suppliers), or disposed as per relevant project procedure.
- 5.21** BIDDER shall prepare and submit for review and approval, Project Quality Plan / Quality Assurance Plan for contracted scope / job. The BIDDER'S Quality Plan shall address all of the applicable elements of ISO 9001, identify responsible parties within BIDDER'S organization, for the implementation / control of each area, reference the applicable procedures used to control / assure each area, and verify the documents produced for each area. The Project Quality Plan shall necessarily define control or make reference to the relevant procedures, for design and engineering, purchase, documentation, record control, bid evaluation, inspection, production/manufacturing, preservation, packaging and storage,

quality control at construction site, pre-commissioning, commissioning and handing over (as applicable) in line with contract requirement and scope of work.

6.0 AUDITS

BIDDER shall plan and carry out the QMS audit for the job. Quality audit programme shall cover design, procurement, construction management and commissioning as applicable including activities carried out by sub-vendors and sub-contractors. This shall be additional to the certification body surveillance audits carried out under BIDDER'S own ISO 9001 certification scheme.

The audit programmes and audit reports shall be submitted to EIL / Owner as per specified documentation requirements. EIL or Owner's representative reserves the right to attend, as a witness, any audit conducted during the execution of the WORKS.

In addition to above EIL, Owner and third party appointed by EIL/Owner may also perform Quality and Technical compliance audits. BIDDER shall provide assistance and access to their systems and sub-contractor / vendor systems as required for this purpose. Any deficiencies noted shall be immediately rectified by BIDDER.

7.0 DOCUMENTATION REQUIREMENTS

BIDDER shall submit following QMS documents immediately after award of work (Within one week) for record / review by EIL / Owner.

- Organization chart (for complete organization structure and for the project)
- Project Quality Plan/Quality Assurance Plan
- Job specific Inspection Test Plans
- Job Procedures
- Inspection/Test Formats

In addition to above QMS documents, following documentation shall be maintained by the BIDDER for submission to EIL / Owner on demand at any point of time during execution of the project.

- Quality Manual
- CVs of the personnel in BIDDER'S QA Organogram
- Certificate of approval for compliance to ISO: 9001 standard
- Procedure for Control of Non-conforming Product
- Procedure for Control of Documents
- Sample audit report of the QMS internal and external audits conducted during last one year
- Customer satisfaction reports from at least 2 customers, during the last one year
- Project audit report
- Corrective action report on the project audits
- Technical audit reports for the project

Documents as specified above are minimum requirements. BIDDER shall submit any other document/data required for completion of the job as per EIL/Owner instructions.

CONCESSION/DEVIATION PERMIT

(USE ONLY THIS PAGE FOR COMMUNICATION WITH VENDOR/CONTRACTOR)

TO BE FILLED BY ORIGINATOR	Project _____	Originator Ref. _____					
	Job No. _____	Order/Contract No. _____					
	Equipment Title _____	Item No. _____					
	Originator: Vendor/Contractor _____						
	Caution : Originator to note that any delay in processing of concession/deviation permit shall be to originator's account and shall not be used as a reason for extension in delivery						
	Requirement as per specification	Description of Concession/Deviation sought					
	Why the Concession/Deviation is required? Supporting evidence/calculations enclosed/not enclosed						
Contractual implications if Concession/Deviation is granted:							
<table style="width: 100%; border: none;"> <tr> <td style="width: 60%;">* Time impact</td> <td>More/Less/No change</td> </tr> <tr> <td>* Cost impact</td> <td>More/Less/No change</td> </tr> <tr> <td>* Performance Warranty/Guarantee</td> <td>Affected/Not affected</td> </tr> </table>		* Time impact	More/Less/No change	* Cost impact	More/Less/No change	* Performance Warranty/Guarantee	Affected/Not affected
* Time impact	More/Less/No change						
* Cost impact	More/Less/No change						
* Performance Warranty/Guarantee	Affected/Not affected						
Under present constraints requested Concession/deviation is most optimum for the project and does not involve any hazard, and shall meet the stipulated performance requirements.							
Date: _____ Signature Vendor /Contractor (with seal)							

Decision on Concession/Deviation including decision, on time and cost implications

(To be filled by the Inspection engineer [at RPO/HO] or RCM, responsible for conveying the decision to the originator, after resolution)

Date: _____

Signature _____

Location : _____

Name _____

Opinion from EIL site supervisor/inspection engineer
(Specify whether post-facto approval required for regularization)

Date : _____

Name : _____
RPO/Site Name _____

Original forward to : _____
(Target division/department/group)

Copy to : _____
(Project Manager)

Date : _____

Name : _____

Disposal by target division/department

Whether any vendor/contractor made 'Technically not Acceptable' during bid evaluation, on the aspect of which this concession/deviation is sought-----YES/NO

Date : _____

Name : _____

Final decision of Project Manager along with overall review
(Client's decision required/not required)

Date : _____

Name : _____

Client's decision, if required

Date : _____

Signature : _____
Name : _____

आपूर्तिकर्ताओं से प्रलेखन
अपेक्षाओं हेतु विनिर्देश

SPECIFICATION FOR DOCUMENTATION REQUIREMENTS FROM SUPPLIERS

0	04.06.09	Issued as Standard Specification	QMS Standards Committee	QMS Standards Committee	SCT	ND
Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
Approved by						

Abbreviations:

HOD	-	Head of Division / Department
QMS	-	Quality Management System
MOU	-	Memorandum of Understanding
PO	-	Purchase Order
PR	-	Purchase Requisition
MR	-	Material Requisition
EDMS	-	Electronic Document Management System
FOA	-	Fax of Acceptance
LOA	-	Letter of Acceptance
ITP	-	Inspection and Test Plan
URL	-	Universal Resource Locator
PVC	-	Poly Vinyl Chloride
TPIA	-	Third Party Inspection Agency

QMS Standards Committee

Convenor: Mr. S.C. Tyagi

Members: Mr. Chandra Kant (Insp.)
Mr. R.K. Trivedi (Engg.)
Mr. R.K. Sabharwal (C&P)
Mr. M.P. Jain (Projects)
Mr. Ravindra Kumar (Const.)
Mr. Mukesh Meena (CQA)



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Attachments

Format for Drawing/Documentation Transmittal	:	Format No. 3-78-0001
Format for Drawing/Documentation Schedule	:	Format No. 3-78-0002
Format for Comments Resolution sheet	:	Format No. 3-78-0003
Format for completeness of Final Documentation	:	Format No. 3-78-0004



1.0 SCOPE

This specification establishes the Documentation Requirements from Suppliers.

All documents/data against the PO / PR / MR shall be developed and submitted to EIL/Owner by the suppliers for review / records, in line with this specification.

2.0 DEFINITIONS

2.1 Supplier

For the purpose of this specification, the word "SUPPLIER" means the person(s), firm, company or organization who is under the process of being contracted by EIL / Owner for delivery of some products (including service). The word is considered synonymous to bidder, contractor or vendor.

2.2 Owner

Owner means the owner of the project for which services / products are being purchased and includes their representatives, successors and assignees.

3.0 REFERENCE DOCUMENTS

6-78-0001 Specification for Quality Management System Requirements from Bidders

4.0 DOCUMENTATION REQUIREMENTS

4.1 Documents/Data to be Submitted by the Supplier

4.1.1 The Supplier shall submit the documents and data against the PO/PR/MR as per the list given in respective PO/PR/MR.

4.1.2 Review of the supplier drawings by EIL would be only to review the compatibility with basic designs and concepts and in no way absolve the supplier of his responsibility/contractual obligation to comply with PR requirements, applicable codes, specifications and statutory rules/regulations. Any error/deficiency noticed during any stage of manufacturing/execution/installation shall be promptly corrected by the supplier without any extra cost or time, whether or not comments on the same were received from EIL during the drawing review stage.

4.1.3 Unless otherwise specified, submission of documents for Review/Records shall commence as follows from the date of Fax of Intent /Letter of Intent:

QMS - 1 week
Drawing/Document Index - 2 weeks
Other Documents/Drawings - As per approved Drawing/Document Index/Schedule

4.1.4 Documents as specified in PO/PR/MR are minimum requirements. Supplier shall submit any other document/data required for completion of the job as per EIL/Owner instructions.



4.2 Style and Formatting

- 4.2.1 All Documents shall be in ENGLISH language and in M.K.S System of units.
- 4.2.2 A blank space measuring 75 mm (W) x 38 mm (H) shall be provided on the body of all supplier drawings for marking of review codes by EIL.
- 4.2.3 Before forwarding the drawings and documents, contractor shall ensure that the following information are properly entered in each drawing:

Purchase Requisition Number
Name of Equipment / Package
Equipment / Package Tag No.
Name of Project
Client
Drawing / Document Title
Drawing / Document No.
Drawing / Document Revision No. and Date
Transmittal Number
EIL Vendor Print No.
(In case of second & subsequent Revisions)

Note: EIL "Vendor Print Number" is to be picked up from the EIL Review Code Stamp affixed on the previous revision.

4.3 Review and Approval of Documents by Supplier

- 4.3.1 The Drawing/Documents shall be reviewed, checked, approved and duly signed/stamped by supplier before submission. Revision number shall be changed during submission of the revised supplier documents and all revisions shall be highlighted by clouds. Whenever the supplier require any sub-supplier drawings to be reviewed by EIL, the same shall be submitted by the supplier after duly reviewed, approved and stamped by the supplier. Direct submission of sub-supplier's drawings without contractor's approval shall not be entertained.

4.4 Document Category

4.4.1 Review Category

Following review codes shall be used for review of supplier Drawings/Documents:

Review Code 1	-	No comments.
Review Code 2	-	Proceed with manufacture/fabrication as per commented document. Revised document required
Review Code 3	-	Document does not conform to basic requirements as marked. Resubmit for review
R	-	Retained for Records.
V	-	Void

4.4.2 Records Category

Documents under this category are meant for EIL records. These documents would not be returned to supplier. However, comments, if any, will be communicated to supplier.



4.5 Methodology for Submission of Documents to EIL/Owner

4.5.1 Submission of Soft Copy of Drawings/Documents

~~Soft copy of drawings/documents and data shall be uploaded on the EIL EDMS Portal. The detail guidelines for uploading documents on EIL EDMS Portal are available on following URL~~

~~<http://edocx.eil.co.in/vportal>~~

DELETED
NA

4.5.2 Submission of Hard Copy of Drawings/Documents

Required number of hard copies of drawings/documents shall be submitted as per PO/PR/MR along with drawing/document transmittal, Format for Drawing/Document Transmittal (Format No. 3-78-0001) is attached with this specification.

4.5.3 Designated Authority for Submission of Drawings/Documents

Drawings/Documents shall be submitted to the designated authority of EIL/Owner as per PO/PR/MR or as communicated to the supplier during kick off meeting or subsequent correspondences.

4.5.4 Details of Contact Persons of Supplier

After placement of order supplier shall inform in writing the details of contact persons associated with the project / job. The details should include e-mail address, mailing address, telephone nos., fax nos. and names of associated persons of the supplier. The above details shall be sent to ~~EIL Project Manager, EIL Inspection HO and concerned Regional Procurement office of EIL.~~ **BCPL/EIL.**

4.5.5 Drawing/Document Schedule

Supplier shall submit total index of drawings/documents required for review/records based on PO/PR/MR along with schedule date of submission of each drawing/document. The drawing schedule shall be submitted in Format No. 3-78-0002 for approval of EIL/Owner. The drawing schedule shall be specific with regard to drawing/document no., the exact title and size of the drawing/document. For submission of drawing schedule, the supplier shall proceed based on PO/PR/MR and subsequent correspondence. With each submission of drawings/documents, supplier shall submit updated index with schedule v/s actual submission dates, status of drawings, revision no., date, of approval etc. Any submission without index shall not be entertained for review. It shall be ensured that proper sequencing of the drawings/documents to be submitted is maintained in the drawing schedule

4.5.6 Schedule and Progress Reporting

Supplier shall submit monthly progress report and updated procurement, engineering and manufacturing status (schedule vs. actual) every month in, beginning within 2 weeks from FOA/LOA. In case of exigencies, EIL/Owner can ask for report submission as required on weekly/fortnightly/adhoc basis depending upon supply status and supplier shall furnish such reports promptly without any price implication. Format for progress report shall be submitted by the Supplier during kick off meeting or within one week of receiving FOA/LOA, whichever is earlier.



4.5.7 Quality Assurance Plan/Inspection and Test Plan

Inspection and test plans attached if any, to the MR/PR are generic and indicative only. Immediately after receipt of the order, supplier shall submit within one week of receiving FOA/LOA, the Quality Assurance Plan for manufacturing, covering quality control of critical bought out items/materials, inspection & testing at various stages of production, quality control records and site assembly & testing as may be applicable to the specific order and obtain approval from concerned Regional procurement Office of EIL/third party inspection agency, as applicable.

4.5.8 Inspection Release Note (IRN)

Supplier shall ensure that all documents viz. documents reviewed, manufacture's test certificate etc. mentioned in Inspection Release Note (IRN) issued by EIL/third party, are sent to EIL for issue of IRN.

IRN shall be issued by EIL Inspector/ third party inspection agency only after all the drawings/documents as per Supplier's index of drawings/documents are submitted and are accepted under review code-1. Material/Equipments dispatch from Supplier's/sub Supplier's works shall not commence till above condition is met.

Note: Non fulfilling above requirement shall result into appropriate penalty or with- holding of payment as per conditions of PO/PR/MR.

4.5.9 Transportation Plan

Transportation Plan for Over Dimensional Consignments (ODC), if any, shall be submitted to concerned Regional procurement Office within 2 weeks of receiving FOA/LOA, for approval. Consignment with parameters greater than following shall be considered as over dimensional.

Dimensions: 5.5 meters width x 5.5 meters height x 25 meters length

Weight : 100 MT

4.5.10 Statutory Approvals

Wherever approval by any statutory body is required to be taken by Supplier, the Supplier shall submit copy of approval by the authority to EIL.

4.5.11 Comments Resolution Sheets

While re-submitting drawings/documents the supplier shall confirm whether all comments have been incorporated, through a comments resolution sheet (As per attached format No. 3-78-0004). If any comments are not incorporated or excluded, then reason or justification for the same shall be furnished in comments resolution sheet

4.5.12 Multi Sheet Documents

Multi sheet documents other than drawings shall be submitted in their entirety in the event of a re-submission, even if only few sheets are revised.

4.6 Final Documentation

4.6.1 As Built Drawings

Shop changes made by Supplier after approval of drawings under 'Code 1' by EIL and deviations granted in deviation permits, if any, shall be marked in hard copies of drawings which shall then be stamped 'As-built' by the supplier. These 'As-built' drawings shall be reviewed and stamped by EIL Inspector or TPIA also. Supplier shall prepare scanned images files of all marked – up 'As – built' drawings. Simultaneously Supplier shall incorporate the shop changes in the native soft files of the drawings also.

4.6.2 As Built Final Documents

As built final documents shall be submitted as listed in PO/PR/MR.

4.6.3 Packing/Presentation of Final Documents

Final Documents shall be legible photocopies in A4, A3 size only. Drawings will be inserted in plastic pockets (both sides transparent, sheet thickness minimum 0.1 mm) with an extra strip of 12 mm wide for punching so that drawings are well placed.

Final Documentation shall be bound in Hard board Plastic folder(s) of size 265 mm x 315 mm ($10\frac{1}{2}$ inch x $12\frac{1}{2}$ inch) and shall not be more than 75 mm thick. It may be of several volumes and each volume shall have a volume number, index of volumes and index of contents of that particular volume. Where number of volumes are more, 90mm thickness can be used. Each volume shall have top PVC sheet of minimum 0.15 mm thick duly fixed and pressed on folder cover and will have 2 lever clip. In case of imported items documents, 4 lever clip shall also be accepted. All four corners of folders shall be properly metal clamped. Indexing of contents with page numbering must be incorporated by supplier. Spiral/Spico bound documents shall not be acceptable. As mentioned above, books should be in hard board plastic folders with sheets punched and having 2/4 lever clips arrangement.

Each volume shall contain on cover a Title Block indicating package Equipment Tag No. & Name, PO/Purchase Requisition No., Name of Project and Name of Customer. Each volume will have hard front cover and a reinforced spine to fit thickness of book. These spines will also have the title printed on them. Title shall include also volume number (say 11 of 15) etc.

4.6.4 Submission of Soft Copies

Supplier shall submit to EIL, the scanned images files as well as the native files of drawings/documents, along with proper index.

In addition to hard copies, Supplier shall submit electronic file (CD-ROM) covering soft copies of all the final drawings and documents, all text documents prepared on computer, scanned images of all important documents (not available as soft files), all relevant catalogues, manuals available as soft files (editable copies of drawings/text documents, while for catalogues/manuals/proprietary information and data PDF files can be furnished).

4.6.5 Completeness of Final Documentation

Supplier shall get the completeness of final documentation verified by EIL and attach the Format for Completeness of Final Documentation (Format No. 3-78-004) duly signed by EIL Inspector or TPIA as applicable to the document folder.

CONTRACTOR'S VENDOR'S LOGO ETC.
PL. DO NOT CHANGE LOCATION OR EXCEED THIS SPACE

PR/TENDER NO.	:	JOB NO.	:
CONTRACTORS/VENDOR'S NAME	:	PROJECT	:
EIL LOI/PO NO.	:	CLIENT	:
CONTRACTOR'S VENDOR'S LETTER NO.	:	DATE	:

[illegible]

Page 1 of 1

PROJECT	CONTRACTOR'S/VEHICLE'S NAME, LOGO ETC.	PL. DO NOT CHANGE LOCATION OR EXCEED THIS SPACE
EIL JOB NO. : CONTRACTOR'S/VEHICLE'S NAME EIL LOI/PO NO. DATE CLIENT		

[illegible]

R – Drawings which are required to be reviewed by EIL.
I – Drawings which are to be submitted for EIL record.