TECNICAS REUNIDAS	CONTRACT Nº CA/CSPD/0116 TR Project Nº: 8595

TR DOCUMENT NUMBER:	COMPANY DOCUMENT NUMBER:	PROJECT REV.
3-MR-340-0-TR/HEISKW-5038		D

TR DOCUMENT STATUS

A1	APPROVED	A2	APPROVED WITH COMMENTS	A3	NOT APPROVED
R1	REVIEWED	R2	REVIEWED WITH COMMENTS	R3	NOT REVIEWED

THE FACT THAT IT IS MARKED "A1- APPROVED", DOES NOT RELEASE THE SUBCONTRACTOR / VENDOR FROM HIS RESPONSIBILITIES IN TERMS OF COMPLIANCE WITH ALL CONTRACTUAL REQUIREMENTS

THE DOCUMENT ACCEPTANCE PROCESS IN ORDER TO GET THE "ACCEPTANCE" WITHOUT COMMENTS" DOCUMENT DOES NOT ENTITLE THE SUBCONTRACTOR TO CONSIDER REPERCUSSIONS TO DEADLINES OR CONTRACTUAL AMOUNT

COMPANY STATUS	☐ APPROVED	☐ WITH COMMENTS	☐ NON APPLICABLE

TR INITIALS & SIGNATURE (Technical Reviewer):	DATE:
JCMF	03-06-2018

SUBCONTRACT:	SUBCONTRACTOR NAME
8595-ZA-G10-K	HEAVY ENGINEERING INDUSTRIES & SHIPBUILDING COMPANY

DOCUMENT CODE	DOCUMENT TITLE	Subcontractor rev
3.22	MATERIAL APPROVAL REQUEST FOR E&I WORKS - CABLE ROUTE MARKER	D1

TECNICAS REUNIDAS	EPC&C OF GAS TRAIN 5 PROJECT AT MAA REFINERY MATERIAL APPROVAL REQUEST (MAR)	Project: 8595

MATERIAL APPROVAL REQUEST (MAR) CODE: 3-MR-340-0-TR/HEISKW-5038	Rev.: D1
CONTRACTOR: Tecnicas Reunidas	Date submitted: 02.6.2018
Sub-Contractor: Heavy engineering Industries & ship building Co.	Contract Nº: CA/CSPD/0116

Submitted by: HEISCO — Submitted to: Tecnicas Reunidas (TR)

Reviewed by QA/QC Dept. (signature): S.Mouty — Department: Electrical/Instrumention

We request approval to the following material

Material Description	Material for Cable Route Marker (Type and Sizes as required)
Material Specification	Concrete Marker block having embedded stainless steel plate
Reference Specification	Spec.3-S-340-2-0001 sec. 5.5.3, 3-D-340-2-58-6802-2
Material to be used for	Electrical and Instrumentation Works
Brand/Manufacturer	M/s MIDDLE EAST COMBINED GEN. TRADING CO.
Supplier	N/A
Supplier in VEC list	☐ YES ■ Not Categorized in VEC list ☐ NO
	Vec product code: — Vendor code:
Material required at site on (Date):	After Approval

Enclosures	Yes	No	Remarks
Material test certificates		√	Complies with specification ■ YES ☐ NO
Catalogue/Brochure	√		Ref. Attached KNPC approval for the Brand/Manufacturer.
Sample		√	
Others (Manual, data sheet, etc.)	√		

For CONTRACTOR		Approval Cycle	
			CONTRACTOR Discipline engineer	CONTRACTOR Site Manager
Approved	☑	Name	JCMF	
Approved with Comments	☐	Date	03-06-2018	
Rejected	☐	Signature		

Comments:

MATERIAL APPROVAL REQUEST FOR E&I WORKS - CABLE ROUTE MARKER

D1	02 Jun. 2018	Issued for Review and Approval	RV	SM/SK	AH
C1	29 Jan. 2018	Issued for Review and Approval	RV	SK	IEE
B1	20 Dec. 2017	Issued for Review and Approval	SM	AV/SK	IEE
A1	11 Oct. 2017	Issued for Review and Approval	SM	SK	IEE
Rev.	**Date**	**Description**	**Prepared Initials / signature**	**Checked Initials / signature**	**Approved Initials / signature**

الشرق الأوسط المشتركة للتجارة العامة
MIDDLE EAST COMBINED GEN. TRADING CO.
Email: mecckw@gmail.com mecc@warqa.com
P.O. Box 7569, 64006-Ahmadi, Kuwait. Tel :(00965) 66552016 Fax : (00965) 23261234

CABLE ROUTE MARKERS

The Reinforced/Non reinforced Cable Route Markers are manufactured using Sulphur Resistant Cement with 10mm Aggregate. These Cable Route Markers are produced in different sizes casted along with Stainless Steel plate of 1mm, 2mm or 3mm thick engraved with Directional Signs and different markings in English or Arabic to identify the cable laid underground. 33KV Danger Cable – LV Cable Danger – FO Cable as per the customers drawings.

Engraved Stainless Steel plates are fixed with anchor bolts or spot welded support and the paint applied is protected by coating as per the requirement.



The following are the standard cable route markers

Cable Route Marker as per FIG 3 –of the KOC Standard Cable Route Marker Drawing . 1220mm height 130 mm Thick with marking inscribed as per the customer requirement

Cable Route Marker as per FIG 2 –of the KOC Standard Cable Route Marker Drawing . 1000mm height 75 mm Thick with marking inscribed in English on one side and Arabic on the other side. Stainless Steel Direction mark will be fixed on one side

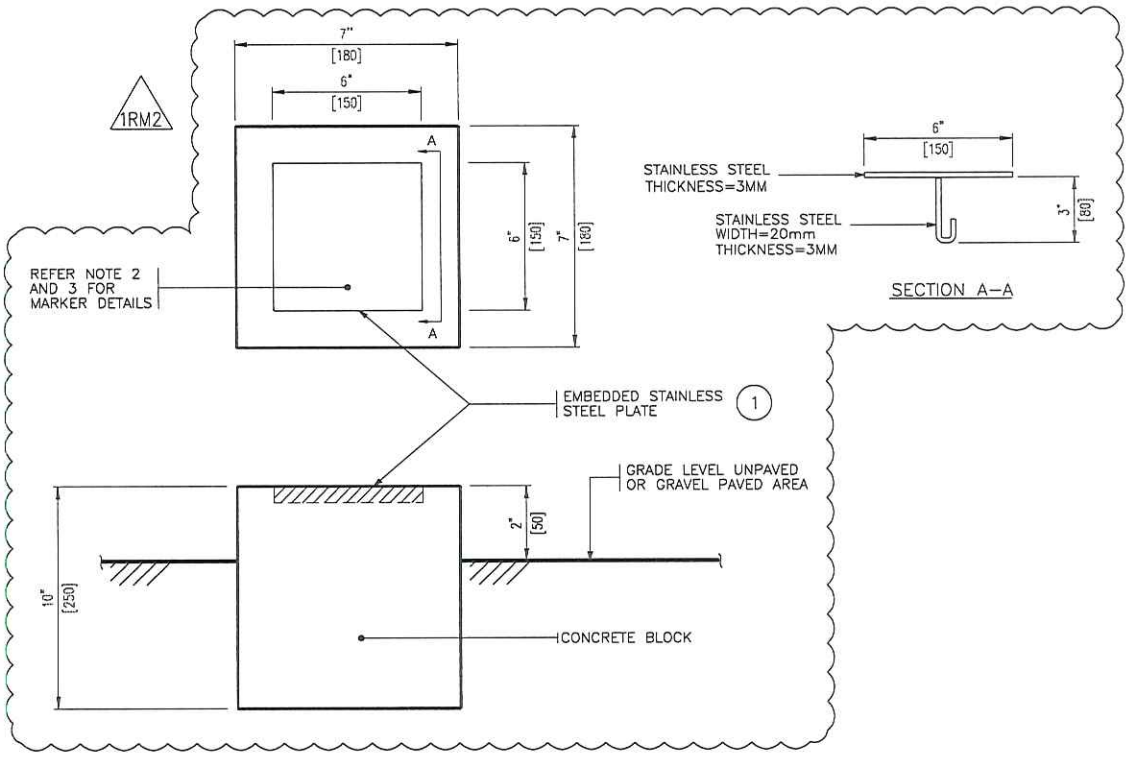
300mm x 300mm x 200mm Non reinforced Cable Route Marker with 150mm x 150mm Stainless steel engraved plate on top as per fig.4 of KOC drawing

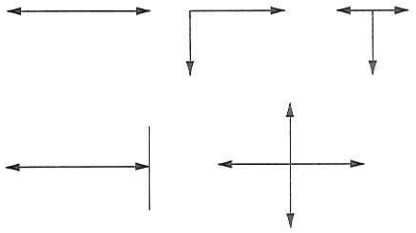
240mm x 220 mm x 440mm Non reinforced Cable Route Marker with 2 Nos 90mm x 90mm Stainless steel engraved plate on top

300mm x 750mm x 75 mm Reinforced Cable Route Markers with 100 x 75mm Stainless steel plate mounted on side

7" x 7" x 10" Non reinforced Cable Route Marker with 6"x6" Stainless steel engraved plate on top as per KNPC Drawing

Any other sizes of cable route markers can be manufactured as per the customer's drawings and specification.





TYPICAL DIRECTION MARKS

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN IMPERIAL WITH EQUIVALENT DIMENSIONS IN MILLIMETERS [SHOWN IN BRACKETS].
2. CABLE ROUTE MARKER PLATES TO BE ENGRAVED IN RED MARK WITH HV OR LV AND DIRECTION MARKS.
3. CABLE JOINT MARKER PLATES TO BE ENGRAVED IN RED MARK WITH "CABLE JOINT".

1RM2

ABBREVIATIONS:

RCU	REMOTE CONTROL UNIT	SS	START/STOP
HDG	HOT DEEP GALVANIZED	RC	REINFORCED CONCRETE
DWG	DRAWING	RGS	RIGID GALVANIZED STEEL
LCS	LOCAL CONTROL ESTATION	LV	LOW VOLTAGE
JB	JUNCTION BOX	HV	HIGH VOLTAGE

REV.	DATE	DESCRIPTION	DRWN	CHKD	APPRD
1RM2	25/04/18	RED MARKS– ISSUE FOR CONSTRUCTION	EAS	AJL	JCMF
1	10/11/17	ISSUE FOR CONSTRUCTION (COMPANY CATEGORY FOR REVIEW)	MLM	DVU	FSS
0	04/11/16	ISSUE FOR CONSTRUCTION (COMPANY CATEGORY FOR REVIEW)	SMC	DVU	FSS
C	30/09/16	ISSUE FOR DESIGN (COMPANY CATEGORY FOR REVIEW)	SMA	DVU	FSS
B	07/07/16	ISSUE FOR DESIGN (COMPANY CATEGORY FOR REVIEW)	RTR	DVU	FSS
A	11/03/16	ISSUE FOR REVIEW (COMPANY CATEGORY FOR REVIEW)	RTR	DVU	FSS

TECNICAS REUNIDAS
RELEASED FOR CONSTRUCTION

CONTROLLED COPY
Issue Date: 26.MAY.18 Initial:

1RM2 05/05/18 ELMER A. SIERAS

BILL OF MATERIAL				
ITEM	DESCRIPTION OR SPECIFICATION	Q'TY 16	SUPPLY SCOPE	REMARKS
1	EMBEDDED STAINLESS STEEL PLATE	AS REQD.	BY SUBCONTRACTOR	

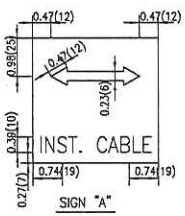
OWNER: KUWAIT NATIONAL PETROLEUM COMPANY

CONTRACTOR: TECNICAS REUNIDAS

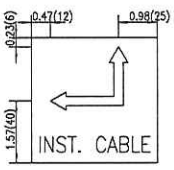
KNPC CONTRACT NO.	CA/CSPD/0116	PROJECT TITLE : GAS TRAIN 5 PROJECT MINA AL-AHMADI REFINERY		
TR CONTRACT NO.	8595	DRAWING TITLE : CABLE ROUTE AND JOINT MARKERS (IN UNPAVED AREAS) (PD-16) 1		
UNIT NO.	340	TR DWG. NO. : 3-D-340-2-58-6802-2	SHEET 18/35	REV. 1
SCALE	NONE	KNPC DWG. NO. : TO BE SPECIFIED AT AS-BUILT STAGE	SHEET	REV.

Size: A3

INSTALLATION OF CABLE TRENCH MARKERS



SIGN "A"



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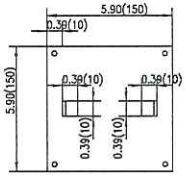
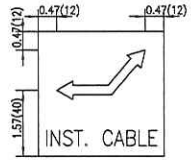
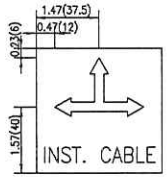
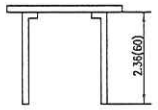




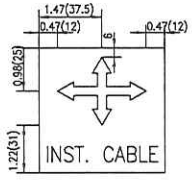
SIGN "C"



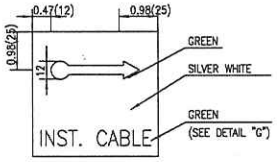
SIGN "D"



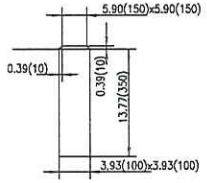
DETAIL OF CABLE ROUTE MARKER PLATE



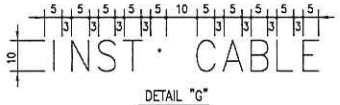
SIGN "E"



SIGN "F"



INSTALLATION OF CONCRETE CABLE ROUTE MARKER POST(NOTE 3&4)



DETAIL "G"

CABLE ROUTE MARKER PLATE
DIMENSIONS ARE IN MM.

NOTE :
1. CABLE ROUTE MARKER PLATES SHALL BE 1.2MM THICK STAINLESS STEEL PLATE EMBOSSED OR ENGRAVED WITH APPROPRIATE SYMBOLS.
2. CABLE ROUTE MARKER PLATES SHALL BE INSTALLED ON CABLE ROUTE MARKER POSTS.
3. CABLE ROUTE MARKER SHALL BE LOCATED AT A MAXIMUM DISTANCE OF 30m AND ALL TURNS BENDS.
4. INSTALLATION OF CABLE ROUTE MARKERS SHALL BE CENTER OF CABLE TRENCH.

TECNICAS REUNIDAS
RELEASED FOR CONSTRUCTION

ITEM NO.	DESCRIPTION	QTY	UN	REMARK

REV.	DATE	DESCRIPTION	DRWN	CHKD	APPRD
0	03/08/17	ISSUED FOR CONSTRUCTION (COMPANY CATEGORY FOR REVIEW)	ARR	JFR	FSS
B	21/07/16	ISSUED FOR DESIGN (COMPANY CATEGORY FOR REVIEW)	ARR	JFR	FSS
A	06/05/16	ISSUED FOR REVIEW (COMPANY CATEGORY FOR REVIEW)	MCG	JFR	FSS

P.A.

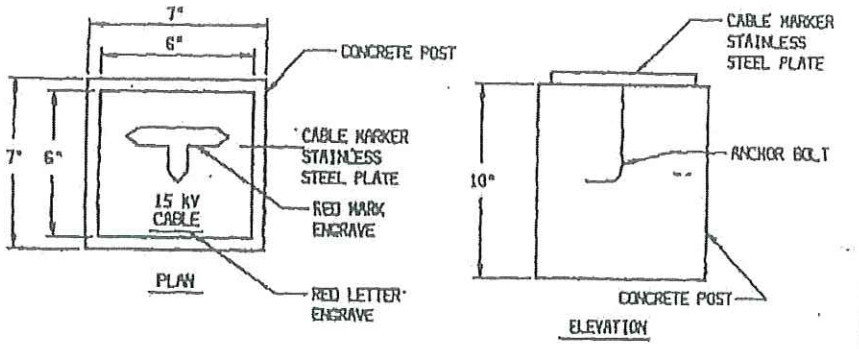
OWNER: KUWAIT NATIONAL PETROLEUM COMPANY

CONTRACTOR: TECNICAS REUNIDAS

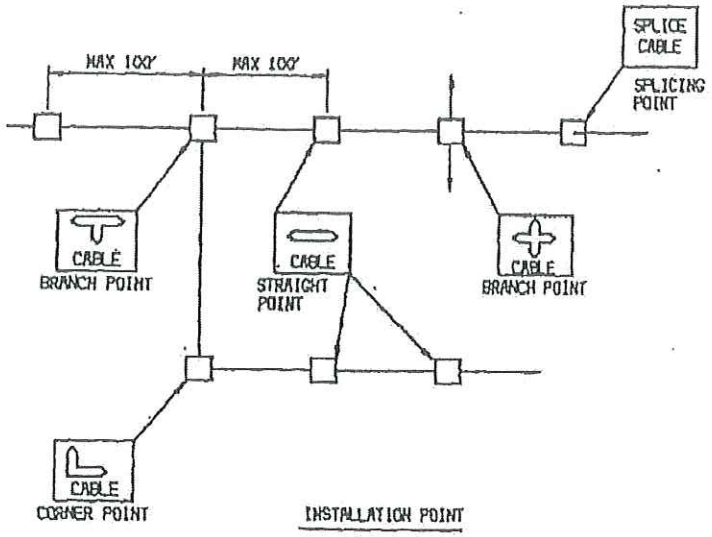
KNPC CONTRACT NO.	CA/CSPD/0116	PROJECT TITLE : GAS TRAIN 5 PROJECT MINA AL-AHMADI REFINERY	
TR CONTRACT NO.	8595	DRAWING TITLE : TYPICAL INSTRUMENT ELECTRICAL HOOK-UPS	
UNIT NO.	340	TR DWG. NO. : 3-D-340-1-65-0003-2	SHEET 04-14 / REV. 0
SCALE	NONE	KNPC DWG. NO. : TO BE SPECIFIED AT AS-BUILT STAGE	SHEET / REV.

Size: A3

MPC	ELECTRICAL-UNDERGROUND CABLE MARKERS SH 1	ENG STD 71823.3 PAGE 1 REVISION 1 DATE November 5, 1984



DETAIL OF CABLE MARKER



INSTALLATION POINT

d) Earth loop impedance (touch potential / disconnection time) requirements

Manufacturer's data (including rating tables) shall be used, when available, for each specific cable type. However, in the absence of this information the ratings and other data provided within IEC or BS standards may be used as a substitute.

7) Appropriate rating factors, as tabled within Manufacturer's data, shall be applied in all cases for each of the following installation conditions:

a) Depth of laying

b) Ground temperature (40 °C)

c) Air temperature (50 °C)

d) Grouping of cables

e) Thermal resistivity of soil

The above parameters shall be determined for each cable to be installed, from either site-measured data or established published data, and for similar installation conditions.

8) The voltage drop shall comply with those detailed within section 3.4 hereof.

5.5.3 Underground Installations

1) Cables run underground shall be direct buried. All through the cable trench below the grade, yellow PVC warning tape with inscription in English and Arabic of "DANGER" with voltage grade shall be provided.

2) The routing and arrangement of underground cables, particularly in areas adjacent to substations and control houses, shall be planned concurrently with main pipe routes and vehicle access ways, to give as far as possible, unimpeded direct routes.

3) 11 kV main distribution cables to on-plot substations shall be installed in separate/segregated trenches and arranged in a single layer. Each pilot cable shall be laid alongside its respective feeder cable.

4) For unpaved area: Company's preference is for single layer installation. If not possible, two or more layers of cables are also acceptable. The bottom of the trench shall be backfilled with a minimum of 150 mm of sand. Concrete tiles with a minimum of 50 mm thick shall be installed over the top layer of sand. The rest of cable trench shall be backfilled with clean earth (without hydrocarbon contamination). The depth of the trench shall be such that at least 750 mm distance is maintained from the bottom of finished grade to the top surface of largest cable. In transformer yard, the depth can be reduced to 600 mm.

Horizontal spacing between center of LV cables shall be 150 mm for cables through 95 mm^2, 200 mm for cables larger than 95 mm^2. The space between

center of LV cable and HV cable shall be 300 mm and between HV cables shall be 250 mm. In congested area, separation between LV and HV cables by means of a continuous row of cable tiles placed vertically between the two cables or by any other suitable barrier is acceptable.

5) For paved area: The bottom of the trench shall be backfilled with a minimum of 150 mm of sand and minimum of 150 mm between layers. The rest of the trench shall be filled with sand and then topped with paving. The depth of the trench shall be at least 600 mm from the bottom of finished grade to the top surface of the largest cable in the top layer.

Cable splicing in plant area is not acceptable, if such splicing is unavoidable, approved splicing kit/junction box shall be used.

6) Concrete duct banks shall be provided for cables passing below existing/new roads. Where maintenance is envisaged below paved areas, concrete duct banks shall be provided. Heavy duty PVC pipe of minimum size 150 mm shall be encased in the concrete for the purpose.

Minimum depth of the top of duct bank from the bottom of the asphalt road surface shall be 750 mm distance from the edge of the duct bank to the center of pipe sleeve (for 150 mm size shall be 175 mm and center to center distance horizontally and vertically between pipe sleeves (for 150 mm size shall be 225 mm). There shall be minimum of 50 mm concrete encasement around the sleeve. The duct bank length shall cover the road shoulder on both sides. Strength of the concrete shall be 300 Mpa (at 28 days by cylinder specimen), cement to be used Type V Portland cement, in accordance with ASTM C150. Below the duct bank 750 mm blinding concrete shall be provided.

7) Motor control cables shall be laid alongside the respective power supply cable. Multi layer cable laying is not preferred in paved area (within the process area). Minimum of 200 mm distance shall be maintained between cables of each layer. However, depth of the trench shall be as indicated in clause 5.5.3 5) above.

8) Single-core cables shall be run in a trefoil formation and held in place by suitable cleats. Where metal-sheathed single-core cables are employed, the non-magnetic armour shall be bounded at the remote (field) end only and insulated cable glands (of an appropriate design) employed at the supply end. Induced 'standing' voltage shall be kept below 60 V (at FLC) and 430 V (under short-circuit conditions).

9) No cables shall be run directly beneath pipes that follow the same direction as the cables (whether the pipes are laid in or directly on the ground) and shall always cross at 90° with a minimum separation of 1 m.

10) Cable routes in unpaved areas shall be marked with concrete marker block having embedded stainless steel plate indicating cable voltage marked in red. Located at each change of direction of route and at no more than 30 m spacing on straight sections. In paved areas, the trench route shall be identified by installing (embedded in concrete) engraved (in red) stainless steel marker plate with direction of routing. In unpaved area, if the trench width is larger than

1200 mm then marker shall be provided at each edge of trench and between each voltage class. For trench with between 600 mm to 1200 mm marker shall be at each edge of the trench and for less than 600 mm width trench at one edge of trench with arrow pointing to opposite edge.

11) Where there are underground cables or underground facilities, trial excavation shall be carried out as a necessary protection to such cables. It shall be Contractor's responsibility to restore the underground facilities, which are damaged while carrying out the work. Any repair or modification shall be subject to Company's approval.

12) All fiber optic cable (for Fire Alarm System, ENMC System) and Paging System cables shall be laid through heavy duty PVC pipes both in paved and unpaved areas. At each 100 m interval and at bends hand holes shall be provided.

5.5.4 Above Ground Installations and Cable Support Systems

1) DEP 33.64.10.10-Gen shall be referred to for detailed selection of cable tray and rack. These shall all be supported from structures and may only be used for overhead multiple cable runs. Cables shall be adequately secured in a single layer, although an individual cable may be clipped and supported directly to the structure. However, where the structure has been effectively fire-proofed these cables shall be clipped to a cable tray or otherwise supported clear of the fire-proofing material.

2) Cable clips, for securing PVC sheathed cables to the tray shall be for the purpose or site fabricated from PVC sheathed stainless steel strip.

3) Overhead cables shall not be routed close to items such as hot vessels and pipelines. A minimum distance of 300 mm shall be maintained between such equipment and cables.

4) Overhead cable tray/rack shall be hot-dipped galvanised steel.

5) Cable tray/rack may be run vertically or horizontally.

6) Straight sections and fittings shall have the provision for covers to be fitted when required for a specific installation.

7) Cable tray/rack proprietary accessories shall be used, wherever available, to limit the amount of site fabrication required.

8) Proprietary cable tray/rack factory supplied fabricated section e.g. bends, tees, etc. shall be selected from the same Manufacturer's component system and be identical to the supplied straight sections e.g. rung spacing, strength, etc.

9) Each cable tray/rack installation shall be bonded to the common earth system. Cable tray and ladder racks shall be effectively earthed at each end and bonding jumpers are required across manufacturer's couplers for all cable tray and ladder rack per typical installation details for grounding.

شركة البترول الوطنية الكويتية
KNPC
27 JUN 2012

GS Engineering & Construction
27 JUN 2012
RECEIVED

PROJECT: NLTF-MAA DATE: TR. NO.: KNPC-GSEC-NLTF-X- 1890

DOCUMENT TRANSMITTAL

M/s GS Engineering & Construction 13F Gangnam Finance Center, 737 Yeoksam-dong, Gangnam-Gu, Seoul, Korea	Contract No. CA/CSPD/0013

Attn: Mr. D.J.Kim, Project Manager

KNPC comments on the following document(s) as listed below are hereby transmitted for your information/ action:

Total number of pages including this cover sheet : (2)

Ref. : GSEC-KNPC-NLTF-X-5506

Document ID	Rev. No.	Description / Title	Appr. Stat.(*)
RAM/ELE/015		Request for Approval of Material (RAM) for Cable Route Marker from M/s Middle East Combined Gen. Trading Co., Kuwait.	A1**

Approval category (*) A1: Approved, A2-Approved with comments, A3-Not approved

Review category (*) R1: Reviewed, R2-Reviewed with comments, R3-Not Reviewed

Remarks:

** Ingraving & Directions sign shall be as per site requirements.

MAA Review	
Yes	No
	√

Note: Any review, comments, agreement or approval by the Company shall in no way relieve the Contractor from its Obligations to fulfill all the requirements of the Contract or affect the Company's guarantee rights.
If in the opinion of the Contractor any comment submitted with this transmittal would involve any change to the scope of work or claim, for an amount that exceeds the Contract Price and/or extension to the Scheduled Provisional Turnover Date, Contractor to proceed in accordance with Clause 11 of General Conditions of Contract (GCC).

SKQ/ADS/RYZ

Cc: HIA, WH, VBV, SAF, SCS, MBJ, Archives

SENT BY:

Mohammad Al-Otaibi
A/NLTF Project Manager

KUWAIT NATIONAL PETROLEUM COMPANY (K.S.C.)

PROJECTS DEPARTMENT

CONSTRUCTION GROUP "B"

REQUEST FOR APPROVAL OF MATERIAL (Electrical)

Contract No.: : CA/CSPD/0013 Contractor's Name : GS Engineering & Construction	REF. NO. : RAM/ELE/015 Date: 19. June. 2012
CONTRACT TITLE : North LPG Tank Farm Project (NLTF) At MAA Refinery	

1. Area :		All Area (Electrical Cable Trench Area)
2. Relevant Section & Page of Contract Document :		Not Applicable
3. Item of Work :		Electrical Re-routing Work
4. Material item to be approved :		Cable Route Marker
5. Brand & Model Name proposed for approval		Middle East Combined Gen Trading Co.
6. Deviation to Specification :		No
Attachment 1 : Manufacturers Data Sheet :	☐	
Attachment 2 : Material Specification	☑	Catalogue / M/s Middle East Combined Gen.Trading Co.
Attachment 3 : Sample	☑	
Attachment 4 : Existing P.O of KOC and KNPC	☑	
Attachment 5 : Manufacturrers Catalogue	☑	Catalogue / M/s Middle East Combined Gen.Trading Co.

Compliance with Specification Yes ☑ No ☐	Supplier VEC Approved Yes ☐ No ☑ Not categorized In VEC List ☑ VEC Product Code : Vendor Code :
Prepared by : Mr. S.Sathish Kumar Date : 19 June. 2012	Contractor Representative : Mr. Y. J. LEE Date : 19 June. 2012

KNPC ACTION :

Approved ☑ Rejected ☐

By :

Date : 27.06.12

Distribution :

KNPC Contractor Others

PRJ-CMS SH-03-5310 Rev. 1