Engineering Standard

SAES-T-629 31 March, 2004

Telecommunications Buried Cable and Wire

Saudi Aramco DeskTop Standards

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Previous Issue: 30 September, 2003 Next Planned Update: 1 April, 2009

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1 Scope

This standard prescribes mandatory requirements governing the direct burial of telecommunications cable and wire.

2 Conflicts and Deviations

Any deviations, providing less than the mandatory requirements of this standard require written wavier approval as per Saudi Aramco Engineering Procedure SAEP-302.

3 References

The selection and design of equipment and facilities covered by this standard shall comply with the latest edition of the references listed below, unless otherwise noted.

3.1 Saudi Aramco References

Saudi Aramco Engineering Procedure

SAEP-302	*Instructions for Obtaining a Waiver of a Mandatory Saudi Aramco Engineering Procedure*

Saudi Aramco Engineering Standards

SAES-B-005	*Spacing and Diking for Atmospheric and Low-Pressure Tanks*
SAES-B-006	*Fireproofing in on-Shore Facilities*
SAES-B-008	*Restrictions to Use of Cellars, Pits, and Trenches*
SAES-B-064	*Onshore and Nearshore Pipeline Safety*
SAES-B-068	*Electrical Area Classifications*
SAES-O-112	*Communications*
SAES-O-119	*Work Permit Procedures*
SAES-O-126	*Blast Resistant Control Buildings*
SAES-T-011	*Symbols - Communications*
SAES-T-435	*Telecommunications: Station Protection*
SAES-T-603	*Telecommunications - Safeguards and Warning Devices*
SAES-T-622	*Communication Conduit and Manholes*
SAES-T-624	*Telecommunications Outside Plant - Fiber Optics*

SAES-T-632	*Communications - Cable Splicing*
SAES-T-634	*Communications - Cable Testing & Identification*
SAES-T-887	*Telecommunications Electrical Coordination - Protection at Power Plants and Radio Stations*
SAES-T-903	*Telecommunications Outside Plant Electrical Protection and Grounding*
SAES-T-911	*Communication Conduit System Design*
SAES-T-916	*Telecommunications Building Cable Systems*
SAES-T-920	*Telecommunications - Cable Information*
SAES-T-928	*Telecommunications - OSP - Buried Plant*

Saudi Aramco Standard Drawings

AA-036748	*Buried Telephone Cables/Distribution Wires - Installation Details*
AB-036897	*Buried/Underground Cable Route Marker Post And Signs*

Saudi Aramco General Instructions

GI-0002.100	*Work Permits*
GI-1021.000	*Street and Road Closure: Excavations, Reinstatements and Traffic Controls*

Construction Safety Manual

Operations Instructions Manual

Refinery Instructions Manual

3.2 Industry Codes and Standards

National Electrical Code (NEC)

National Electrical Safety Code (NESC)

4 Design

The GTE 629 Series, "Buried Cable and Wire" is hereby recognized as Saudi Aramco Engineering Standard SAES-T-629, as modified below.

4.1 GTE SECTION 629-000-100 Issue 2, July, 1968
Buried Cable and Wire - General

4.1.1 Paragraph 2.01 (Addition) Refer to SAES-T-928, Para. 4.1.2.2.

4.1.2 Paragraphs 3.01 - 3.06 (Addition) Refer to SAES-T-920 for additional information on cable types.

4.1.3 Paragraph 5.01 (Addition) Refer to SAES-T-632 for cable splicing information.

4.2 GTE SECTION 629-100-105 Issue 2, July, 1968
Buried Cable and Wire - Precautions

4.2.1 Paragraphs 2.01 - 2.03 (Addition) Refer to SAES-T-928 paragraph 4.1.2.1 for information on the processing of land use permits and coordination with Non-Saudi Aramco agencies. Work Permits shall be handled in accordance with GI-0002.100, "Work Permits". In Refinery and Plant areas, work permit procedures shall also comply with the "Refinery Instructions Manual" and the Plant "Operations Instructions Manual".

4.2.2 Paragraphs 4.01 - 4.03 (Addition) Maintenance of traffic during construction in or along Saudi Aramco roads and streets shall be carried out in accordance with GI-1021.000 "Street and Road Closure: Excavations, Reinstatements and Traffic Controls". Where construction along Government roads or streets is involved, the appropriate Government standards and requirements shall apply where they differ from the Saudi Aramco requirements. The Saudi Aramco "Construction Safety Manual", the SAES-B-Series, the SAES-O-Series and other applicable safety standards requirements shall be complied with.

4.2.3 Paragraphs 5.01 - 5.03 (Addition) All subsurface structures shall be shown on construction drawings in accordance with SAES-T-928, paragraph 4.1.2, utilizing symbology specified in SAES-T-011.

Extreme caution shall be exercised when excavating near gas, oil and other hydrocarbon pipelines and buried power cables or conductors. No work shall start in the vicinity of these facilities until the proper work permits have been obtained and countersigned by the appropriate agencies including, PDD (Power Distribution Dept) where power cables are involved.

4.2.4 Paragraphs 6.01 - 6.07 (Addition) Since location and repair is much more difficult after installation, all cables for direct burial shall be thoroughly inspected before, during, and after installation (before back filling trench) to determine that the cable is placed without damage to

sheath, shield or conductors. All damaged cable sections shall be repaired or replaced.

4.3 GTE SECTION 629-100-200 Issue 3, July, 1973
Exchange Buried Cable, Distribution and Service Wire - Placing

4.3.1 Paragraph 3.04 - In general, when a direct buried cable is placed through a metallic conduit/pipe, the cable shield/ armor must be bonded (Cadweld method preferred) to the metallic conduit/pipe at each end of the conduit/pipe in accordance with GTE Section 887-000-050, paragraph 4.08 and 629-100-202, paragraph 4.13.

4.3.1.1 Paragraph 3.04 (Exception) - In direct buried cable runs, where, for some reason it becomes necessary to place a section of conduit to protect the cable or to provide a raceway through which the cable can be placed, the conduit, where practical, shall be of a dielectric material (i.e., PVC). Where it becomes prudent in best engineering judgment, to install telecommunications cables through metallic pipes (i.e., necessary to push metallic pipe under roadways because the proponent will not permit open excavation across these roadways), it will not be required that the cable shield be bonded to the metallic pipe through which it passes, where it is not practical to do so, provided that this is concurred to by the Saudi Aramco Communications Standards Committee Chairman (Information Technology Planning Division).

4.3.1.2 Paragraph 3.04 (Addition) - Where it is necessary to install metallic pipe bends at building entrances, pole risers, etc., and the pipe bend is extended underground with non-metallic conduits, the cable shield to metallic pipe bond may be omitted at the underground end of the pipe bend. However, if the metallic pipe bend is extended underground with metallic pipe, the cable shield/armor must be bonded to the metallic pipe at both ends.

4.3.2 Paragraph 3.05 (Exception) For standards requirements related to excavations/reinstatements in streets and other paved areas, refer to SAES-T-928, paragraph 4.1.8.7.

4.3.3 Paragraph 3.06 (Addition) During construction, cables shall be protected from being driven over by highway traffic, construction equipment and other vehicles, and from any other activity that might damage the cable.

4.3.4 Paragraphs 4.01 - 4.04 (Exception) Direct buried telecommunication cables shall be placed at minimum depths in accordance with SAES-T-928, paragraph 4.1.8. Buried service wires shall be placed at a minimum depth of 500mm (20").

Buried cable crossings of streets, roads, and highways shall comply with SAES-T-928, paragraph 4.1.8.4 and 4.1.8.7.

4.3.5 Paragraph 6.01 (Exception) Buried cables which cross pipeline corridors shall be placed in conduit below the pipes and be constructed in accordance with SAES-T-911, paragraph 5.5.1. See SAES-T-928, paragraph 4.1.8.5 also.

Buried telecommunication cables when crossing buried power cables should preferably be placed above the power cables. Refer to typical installation Drawing AA-036748 "Buried Telephone Cables...".

4.3.6 Paragraph 6.02 (Exception) Road and railroad crossings shall be constructed in accordance with SAES-T-928, paragraph 4.1.8.4; SAES-T-622, paragraph 5.3.7, and in accordance with any Government requirements when Government roads are involved.

Where direction is not given by the Government, construction of railroad crossings shall comply with the Paragraph 4.3.6 above and also with GTE Section 906-300-070 "Railroad Crossings".

4.3.7 Paragraphs 7.01 - 7.03 (Addition) Telecommunication cables which are placed in the vicinity of power facilities shall be installed in accordance with SAES-T-928, paragraphs 4.1.4 and 4.1.5.

4.3.8 Paragraph 8.01 (Exception) See SAES-T-928 paragraph 4.1.8 for minimum buried cable depth requirements.

4.4 GTE SECTION 629-100-202 Issue 5, September, 1983
Joint Buried Cable - Installation

4.4.1 Paragraphs 3.01 - 3.04 (Exception) The "Random Separation" joint trench method shall not be used in Saudi Aramco for joint trench construction with power facilities. Joint buried construction with power facilities requires fixed separation as indicated above and in SAES-T-928.

4.4.2 Paragraphs 4.01 - 4.06 (Exception) Minimum cover for buried telecommunications cables shall be as given in SAES-T-928, paragraph 4.1.8. See statement on "Random Separation" in paragraph 4.4.1 above.

4.4.3 Paragraphs 4.07 - 4.10 (Exception) Buried service wires shall be placed at the minimum depth as specified in paragraph 4.3.4 above.

4.4.4 Paragraphs 4.11 - 4.13 (Exception) Refer to paragraph 4.3.1 above for bonding requirements when placing a cable inside a metallic conduit.

4.4.5 Paragraphs 5.01 - 5.03 (Exception) Buried telecommunication cables shall be installed by the fixed separation method as outlined above.

4.4.6 Paragraphs 6.01 - 6.04 (Exception) See paragraph 4.4.5 above. Joint pedestals for power and telecommunication cables shall not be used.

Telecommunication terminal housings/pedestals located within 3 m (10') of power apparatus (transformer/pedestals etc.), or vertical pole grounds (MGN) shall have their grounding systems bonded together in accordance with SAES-T-928, paragraph 4.3.1.

4.4.7 Paragraphs 8.01 - 8.07 (Addition) All excavations and restorations shall be carried out in accordance with the Saudi Aramco "Construction Safety Manual".

4.4.8 Paragraphs 9.01 - 10.01 (Exception) Buried telecommunication cables shall be installed by the fixed separation method as outlined above. Electrical station protection shall be installed in accordance with SAES-T-435, and SAES-T-916. Additional electrical protection requirements are given in SAES-T-887 and SAES-T-903.

4.5 GTE SECTION 629-100-203 Issue 1, March, 1979
Optimized Direct Buried Cable Delivery System

This section is intended, primarily, as a guide to be used when ordering or purchasing cable plowing equipment, however, the following are mandatory requirements when telecommunication cables are to placed by the plowing-in method.

4.5.1 Paragraph 2.12 (Exception) The diameter of the cable plow chute used shall provide a minimum clearance of 15% of the cable diameter on all sides of the cable being placed. See SAES-T-624 when placing fiber optic cables.

4.5.2 Paragraph 2.13 (Exception) The minimum cable bending radius is ten times the cable diameter. A cable bending radius of less than ten times the cable diameter shall not be permitted in any part of the cable handling or placing operation. Therefore, the radius at the bottom of the cable plow chute shall be equal to or greater than ten times the cable diameter that is being placed. The arc of the radius of the cable chute

used shall be extended so that the cable leaves the cable chute at a tangent to the arc (Refer to Figure 6 of this GTE Section).

4.5.3 Paragraph 2.15 (Addition) To ease the tension placed on the cable as it is pulled off the reel during installation, the cable reel carrier shall be equipped with cam roller type bearings on which the spindle bar will be mounted.

4.5.4 Paragraph 2.21 (Addition) When directed by Communications Engineering or by the Project Engineer, a cable shield fault alarm (See Figure 8 of this GTE Section) shall be used, during the plowing operation, to detect cable sheath damage. Use of a cable shield fault alarm should be considered when plowing cables in rough terrain (such as rocky areas) where there is concern of possible cable puncture or damage. All damaged cables shall be repaired or replaced.

4.5.5 Paragraph 2.22 (Addition) The cable shall be supported or guided from the cable reel to the cable plow chute. Vendor approved cable plowing mechanism/equipment/accessories shall be used. Refer to paragraph 4.5.2 above.

4.5.6 Paragraph 2.23 (Addition) The cable shall be positioned in such a way, during installation, that it will not come in close contact with extreme heat such as from a tractor's engine or exhaust pipe.

4.6 GTE SECTION 629-100-205 Issue 1, June, 1968
Guard - Buried Cable and Wire - Installation

This GTE Section is not a mandatory section for Saudi Aramco purposes.

4.7 GTE SECTION 629-100-220 Issue 6, June, 1982
Buried Cable Signs - Description and Installation

This GTE Section is not a mandatory section for Saudi Aramco purposes. Saudi Aramco Drawing AB-036897, "Buried/ Underground Cable Route Marker Post and Signs", provides typical installation information. Marker posts and signs shall be placed as directed by the Saudi Aramco Telecommunications Outside Plant Engineer in the scope of work. Marker post/sign locations shall be shown on the construction drawings. Marker/Identification tape shall be placed in accordance with SAES-T-928, paragraph 4.1.8.3.

4.8 GTE SECTION 629-100-300 Issue 3, July, 1978
Joint Buried cable - Maintenance/Emergency Safety Precautions

See paragraphs 4.2.1 and 4.2.2 above for other applicable safety requirements. The requirements listed below apply to new construction also.

4.8.1 Paragraph 3.01 (Addition) Existing facilities shall always be exposed by hand digging. Hand digging tools utilized shall have handles made of wood or other material having comparable insulating value. If power cables are to be exposed, PDD/Proponent should be on site prior to or during the excavation to advise as appropriate. Insulated rubber gloves, suitably certified, shall be worn while digging and while examining the markings and outside structure of the cables during the visual inspection of excavated cables.

4.8.1.1 After identifying the proper telephone cable and before breaking the cable metallic shield, a temporary bond shall be placed across the area to be opened to minimize difference in electrical potentials. Refer to GTE Section 632-100-210, "Cable Splicing - General - Bonding Across Sheath Openings".

4.8.1.2 Telecommunications personnel shall not move or bend power cables at any time. As per Para. 4.2.3.1 above, the Power Distribution Department/Proponent must be requested to identify and reposition power cable as necessary.

4.8.2 Paragraph 4.01 (Addition) In an event where a power cable and a telecommunication cable are damaged in the same excavation, the power cable should normally be repaired first. At any rate, repair of the telecommunications cable must not begin until both the supervisor and PDD/Proponent have determined that safe working conditions have been restored.

4.8.3 Paragraph 6.01 - 6.02 (Addition) Shoring of excavation walls and other required safety precautions shall be as directed in paragraphs 4.2.1 - 4.2.2 above.

5 Installation

Buried telecommunication cables shall be installed in accordance with the requirements of this standard, SAES-T-928 and other applicable codes and standards as referenced in paragraph 3 above. Construction in or near Hazardous or Classified areas shall comply with SAES-B-008, SAES-B-068, NESC, NEC and other applicable codes and standards. The Saudi Aramco "Construction Safety Manual", the SAES-B & O Series, SAES-T-603 and, in general, all safety and security requirements shall be complied with. In addition, the installation of all cables shall comply with general requirements related to land use, clearances, road or pipeline crossings etc.

6 Testing and Inspection

The testing and acceptance of buried telecommunication cables shall be done in accordance with SAES-T-634, "Cable Testing and Identification". Quality assurance inspections shall be performed during all phases of construction by a Saudi Aramco Communications Inspector.

Revision Summary

31 March, 2004	Revised the "Next Planned Update". Reaffirmed the contents of the document, and reissued with no other changes.