CONSTRUCTION STANDARD FOR ELECTRICAL INSTALLATION

FIRST REVISION
JULY 2009

대한민국

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تشريعات و استعدادها

DEPUTY MINISTER OF ENGINEERING & LOCAL MANUFACTURING RESEARCH & STANDARDS
FOREWORD

The Iranian Petroleum Standards (IPS) reflect the views of the Iranian Ministry of Petroleum and are intended for use in the oil and gas production facilities, oil refineries, chemical and petrochemical plants, gas handling and processing installations and other such facilities.

IPS are based on internationally acceptable standards and include selections from the items stipulated in the referenced standards. They are also supplemented by additional requirements and/or modifications based on the experience acquired by the Iranian Petroleum Industry and the local market availability. The options which are not specified in the text of the standards are itemized in data sheet/s, so that, the user can select his appropriate preferences therein.

The IPS standards are therefore expected to be sufficiently flexible so that the users can adapt these standards to their requirements. However, they may not cover every requirement of each project. For such cases, an addendum to IPS Standard shall be prepared by the user which elaborates the particular requirements of the user. This addendum together with the relevant IPS shall form the job specification for the specific project or work.

The IPS is reviewed and up-dated approximately every five years. Each standards are subject to amendment or withdrawal, if required, thus the latest edition of IPS shall be applicable.

The users of IPS are therefore requested to send their views and comments, including any addendum prepared for particular cases to the following address. These comments and recommendations will be reviewed by the relevant technical committee and in case of approval will be incorporated in the next revision of the standard.

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GENERAL DEFINITIONS:
Throughout this Standard the following definitions shall apply.

COMPANY:
Refers to one of the related and/or affiliated companies of the Iranian Ministry of Petroleum such as National Iranian Oil Company, National Iranian Gas Company, National Petrochemical Company and National Iranian Oil Refinery And Distribution Company.

PURCHASER:
Means the "Company" where this standard is a part of direct purchaser order by the "Company", and the "Contractor" where this Standard is a part of contract document.

VENDOR AND SUPPLIER:
Refers to firm or person who will supply and/or fabricate the equipment or material.

CONTRACTOR:
Refers to the persons, firm or company whose tender has been accepted by the company.

EXECUTOR:
Executor is the party which carries out all or part of construction and/or commissioning for the project.

INSPECTOR:
The Inspector referred to in this Standard is a person/persons or a body appointed in writing by the company for the inspection of fabrication and installation work.

SHALL:
Is used where a provision is mandatory.

SHOULD:
Is used where a provision is advisory only.

WILL:
Is normally used in connection with the action by the "Company" rather than by a contractor, supplier or vendor.

MAY:
Is used where a provision is completely discretionary.
CONSTRUCTION STANDARD

FOR

ELECTRICAL INSTALLATION

FIRST REVISION

JULY 2009

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این استاندارد متعلق به وزارت نفت ایران است. تمام حقوق آن متعلق به مالک آن می‌باشد. نباید بدون رضایت کتبی وزارت نفت ایران، تمام یا بخشی از این استاندارد در هر شکلی یا وسیله ازجمله تکنیکی، دیجیتال، انتقال یا روش دیگری در اختیار فرد یا تالک قرار گیرد.
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1. SCOPE

1.1 This Standard Specification covers the minimum requirements for installation, testing and setting to work, including the responsibility of contractor for construction, installation and maintenance period of the electrical installation associated with specified project.

Note 1:
This bilingual standard is a revised version of the standard specification by the relevant technical committee on July 2009, which is issued as revision (1). Revision (0) of the said standard specification is withdrawn.

Note 2:
In case of conflict between Farsi and English languages, English language shall govern.

2. REFERENCES

Throughout this Standard the following dated and undated standards/codes are referred to. These referenced documents shall, to the extent specified herein, form a part of this standard. For dated references, the edition cited applies. The applicability of changes in dated references that occur after the cited date shall be mutually agreed upon by the Company and the Vendor. For undated references, the latest edition of the referenced documents (including any supplements and amendments) applies.

IEC (INTERNATIONAL ELECTROTECHNICAL COMMISSION)

- IEC 60079-14 “Electrical Apparatus for Explosive Gas Atmosphere”
- IEC 60417 "Graphical Symbols for use on Equipments"
- IEC 61892-6 "Mobile and Fixed Offshore Units—Electrical Installations” Part 6 – Installation”

IPS (IRANIAN PETROLEUM STANDARDS)

IPS-E-EL-100(1) "Engineering and Equipment Standard for Electrical System Design(Industrial & Non-Industrial)"
Section 7.11 "Earthing, Bonding and Lightning Protection"

IPS-E-EL-110(0) "Engineering Standard for Hazardous Area"

IPS-D-EL-208(0) "Reference Drawing Power Installation Details, Canal Route Marker & Location Category 200"

IPS-D-EL-209(0) "Reference Drawing Power Installation Details, Concrete Cable Duct Bank (Road Crossing) Category 200"

IPS-D-EL-210(0) "Reference Drawing Power Installation Details, (Cable Trenches) Category 200"

IPS-I-EL-217(0) "Inspection Standard for Precommissioning Electrical Tests"

2.1 Local Information

The contractor will be required to obtain any local information necessary to permit compliance with the above stipulations. Also, to give notice to Local Authorities (if required), in order to enable the electrical services to be made and requirement to be met in respect of approval of inspections and tests in which the installation is to comply.

2.2 Specifications, Rules and Regulations

2.2.1 The work executed under the contract shall be carried out in accordance with the General Conditions. Specification, Drawings, Orders, Rules and Regulations and Standards are part thereof referred to herein where relevant.

2.2.2 Main contract documents.

2.2.3 IPS Fire and safety regulations.

2.2.4 Any special regulations are laid down by the local utility services, such as power, water drainage, gas, and telecommunication governing the use of their services (if required).

2.2.5 HSE Regulations (Ministry of Labor &
3. CONSTRUCTION & INSTALLATION

3.1 All installation work shall be carried out by skilled personnel in pertinent kind of installations.

3.2 The completed installation shall meet all requirements and to be carried out in accordance with relevant Rules, Regulations, Codes and Standards previously specified, and executed in good workmanship, to the satisfaction of Engineer.

3.3 All tools, measuring instruments and installation equipment for use by contractor shall be provided by Contractor.

3.4 Where special tools are recommended by the Equipment Manufacturer, the Contractor shall conform to such recommendation.

4. EXAMINATION OF OWNER DRAWINGS AND LOCATION OF EQUIPMENT

4.1 General
The drawings indicate the extent and general arrangements of electrical equipment. Exact locations, distances and, levels will be governed by actual field conditions. The electrical contractor shall verify all dimensions in the field prior to the installation, as soon as possible and inform Engineer the discrepancies.

4.2 Changes
If any departures from the original intent of the drawings and or specifications are deemed necessary by the electrical Contractor, details of such departure with drawings, if necessary-together with reasons of departure shall be submitted to the owner as soon as practicable for approval. No such departure shall be made without the prior written consent of the Engineer. Phase and neutral colours plus the conductor numbering shall be clearly visible.

5. CABLES

5.1 General

5.1.1 All Miniral Insulated Cables, cabling shall be neatly formed using levels and plumb lines.

5.1.2 Where more than one cable is pulled through a duct or conduit, the cables shall be
pulled through as a bunch and fed to eliminate crosses and abrasions of sheaths.

5.1.3 Cores of multi core control cables shall be identified by numbered beads or sleeves at the terminal of equipment.

5.1.4 Cable ducts or cable ways entering or leaving building shall be sealed at both ends by bitumen compound or other accepted practices to prevent ingress of hydrocarbons, water etc., into cable.

5.1.5 Sufficient information is given in the project drawings to indicate the general routes of cables. Final route are to be determined on site and changes made only where absolutely necessary and with the approval of the Engineer.

On 3 and 4 core cables, phase colours to be: Red, Yellow, Blue, and neutral color to be Black.

On multi core control cables the same color or number shall be used for each termination where identical duties are involved.

At termination points, where cable cores and conductors are connected to bus bars, switches, terminal boards etc., the phases and neutral colors plus conductor labeling shall be clearly visible.

5.1.6 Glands for use with "PVC/SWA/PVC" and "PVC/LC/SWA/PVC" cable shall be of the mechanical (none wiping) types flameproof or "PVC/LC/SWA/PVC" cable shall be of the accordance with IPS-D-EL-208(0) standard.

Glands for use with "PVC/SWA/PVC" and "PVC/LC/SWA/PVC" cable shall be of the mechanical (none wiping) types flameproof or "PVC/LC/SWA/PVC" cable shall be of the accordance with IPS-D-EL-208(0) standard.

5.2 Underground Cabling

5.2.1 Cables laid below ground shall be buried in accordance to the standard drawing IPS-D-EL-210(0) unless otherwise specified in project drawings.

5.2.2 The cable shall be laid on a 100 mm sand base free from sharp protrusions and covered with 150 mm of sand. The cable run shall then be covered with concrete slab cable covers with sufficient width to cover all cables in the run. To complete the installation, the trenches shall be backfilled and rammed with the soil originally removed. Routes drawings and location of cable joints shall be indicated with concrete markers in accordance with IPS-D-EL-208(0) standard.
drawings, by non corrosive metal at intervals on horizontal or vertical runs.

5.2.3 All cables shall be identified by their respective number stamp onto stainless steel tag and wired to the cable at each cable gland termination. Similar tags shall be attached to the cables at intervals of 500 mm in all situations other than in duct, but a tag must be wired to each cable where it enters or leaves a duct.

5.2.4 HV/MV cables may be laid in the same trench with LV cables. HV /MV distribution cables shall be separated from LV cabling, e.g. By means of a continuous row of cable tiles placed vertically between the two types, or by any other suitable barrier. If cable tiles or any other barrier is not used, at least 600mm clear space should be considered between cables. For dimensions, reference to be made to the IPS-D-EL-210, Drawing.

5.2.5 For road crossing of power cables reference should be made to the IPS-D-EL-209(0) Standard drawing.

5.2.6 HV/MV and LV single core cables shall be laid in trefoil formation with 150 mm clear spacing between the trefoils. They shall be braced by non-magnetic clamps riced in 500 mm distances for withstanding expected short circuit forces. Trefoil formation shall be used for each three phase group of single core cables.

When trenches are not filled with soil, the cables shall be fixed to trench bottom / cable trays inside the trench. The distance between the fixed points shall be 3000mm.

5.2.7 Power carrying (HV/MV) cables in trenches shall be laid in a single layer formation, and shall only be laid in a double layer with the owner's approval. In this case a distance of 300 mm between HV/MV cable layers shall be considered.

LV cables in trenches shall be laid in two layers formation maximum.

Control cables in trenches may be installed as additional layer on top of the LV cables. In this

ملاحظات: 

5.2.3 كليه كابل ها باید توسط شماره اي بروی یک برجسپ از جنس فولاد ضد زنگ حک شده و به کابل در محل گندی مناسب است. مشخص کنند. برجسپ های مشابه باید در فواصل 500 میلیمتری بر روی کابل نصب و این روش در تمام حالات بجا در داشت کابل رعایت گردد و در این مورد نیز برجسپ در مورد ورود خروج از کنال مربوط به کابل منشی شود.

5.2.4 کابل های فضایی و فشار متوسط را میتوان در یک ترنشن با کابل های فضایی ضعیف قرار داد. کابل های توزیع فشار قوی و فشار متوسط باید از کابل های فضایی ضعیف جدا باشد. بطور مثال، توسط یک ردیف از جدا کننده سیمانی بطور عمودی بین دو نوع کابل با بوسیله مناسب دیگر قرار گیرند. اگر جدا کننده سیمانی و یا مناسب دیگر مورد استفاده قرار نگیرد، باید حداکثر 600 میلیمتر فضا خالی بین کابل ها در نظر گرفته شود. برای ملاحظه ابعاد به نقشه های استاندارد مراجعه کنید.

5.2.5 جهت تفکیق کابل های قدرت با جاده به نقشه استاندارد(0) مراجعه گردد.

5.2.6 کابل های فضایی و فشار متوسط تک رشته با یک آرایش مثلثی با 150 میلیمتر فاصله بین گره کابل ها در داخل زمین قرار گیرند. به منظور تحمل کابل ها در برای نیروی اتصال کوتاه باید بست هایی با فواصل 500 میلیمتر توسط هر یک غیر مناطقی محکم بپوشند. برای هر فضای ساز، با کابل های هر یک آرایش یک رشته سازی باید آرایش چندانی ترانش شده با خاک بر نشون کابل ها باید به کف ترانش و یا سینی کابل محکم شود. فاصله بین نقط محکم شده باید 3000 میلیمتر باشد.

5.2.7 کابل قدرت فضایی و فشار متوسط در ترانشنهای با باید شبک یک یا چند قرار گیرند و فقط با تایید کارفرما میتوانند بشكل دو یا چند قرار داده شوند. در این حالت یک فاصله 300 میلیمتری بین هر ها یا کابل فضایی و قرار متوسط باید در نظر گرفته شود.

کابل های فضایی ضعیف در ترانشنهای با باید جداکن یا دو لایه قرار گیرند.

مکان است کابل های کنترل در ترانشنهای به صورت یک لایه اضافی در بالای کابل های فضایی ضعیف نصب شود. در این
case a distance of 300 mm over the LV cables shall be considered.

5.2.8 A clear distance of at least 300 mm between cable and pipe (including insulation) shall be maintained. Cables should cross underneath buried pipelines except where the depth measured at the top of the pipeline is more than 1 meter.

If close crossing with Underground pipelines carrying hot liquids or gases or which are regularly steam-cleaned can not be avoided, the pipeline shall be insulated in order to limit its outside temperature to a maximum of 60 degree c, and the clear distance increased to 600 mm. In these cases cables may need to be run above pipelines using a sand-filled concrete bridge.

5.2.9 A Minimum of 20% spare space shall be considered for all future expansion and / or modification for future cable laying in concrete or duct bank.

5.3 Aboveground Cabling

5.3.1 Aboveground cables shall be adequately supported on hot dip galvanized cable trays, fixed to steel brackets. Cables shall be fixed or clamped to the trays. Metal parts of the cable racks and trays shall be bonded and connected to the common earthing grid.

5.3.2 On multiple cable runs the cables shall be neatly grouped and where bends are required, additional clipping to be used.

5.3.3 For bending radius of cables see in attachment to Electrical System Design Standard No: IPS-E-EL-100(1)

5.3.4 HV/MV and LV single core cables shall be laid in trefoil groups with 150 mm clear spacing between the trefoils. They shall be braced by non-magnetic clamps for withstanding expected short circuit forces. Trefoil formation shall be used for each three phase group of single core cables.

On trays or raders HV/MV cables shall be segregated from the LV cables.

5.3.5 Cables or cable supports shall not be fixed in trays or raders HV/MV cables shall be considered.

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5.3.5 Cables or cable supports shall not be fixed in trays or raders HV/MV cables shall be considered.

5.3.6 A clear distance of at least 300 mm between cable and pipe (including insulation) shall be maintained. Cables should cross underneath buried pipelines except where the depth measured at the top of the pipeline is more than 1 meter.
directly or indirectly to plant equipment or process piping which may require removal or replacement.

5.3.6 Individual cables emerging from floors or soil shall be protected against mechanical damage by means of hot dip galvanized steel pipes. Single core cables emerging from floors or soil shall be protected by rigid PVC pipes. These pipes shall extend at least 100 mm above ground floor level.

5.3.7 Power cables in trays / ladders shall be installed in one layer. Control cables in trays / ladders may be installed in two layers maximum,

5.3.8 A minimum of 20% spare space shall be considered for all future expansion and / or modification for future cable laying in cable trays.

5.3.9 The distance between supports of aboveground cable tray / ladder in vertical runs 1500 mm, and in horizontal run 2500 mm maximum shall be considered.

6. EARTHING OF ELECTRICAL CIRCUITS AND EQUIPMENT

6.1 The method used to connect metalwork to earth has to be compatible with the type of installation and its supply system. The requirement for the connection of metalwork of electrical equipment other than parts that are normally live on current connection of metalwork of electrical equipment and its supply system. The requirement for the earthing of electrical circuits and equipment shall be adequately bonded together and connected to the earthing system.

References, to be made to the standard drawings IPS-D-EL-400.

Note:

a) Pipe work joints where not electrically continuous shall be provided with copper jumpers.

b) Where insulated flanges are included in the pipe run in locations where cathodic protection is applied on pipe line, the application of jumper

6.2 However, in absence of earthing drawings:

All metallic structures, tanks, vessels, pumps, motors and other equipment shall be adequately bonded together and connected to the earthing system.

References, to be made to the standard drawings IPS-D-EL-400.

Note:

- Pipe work joints where not electrically continuous shall be provided with copper jumpers.
- Where insulated flanges are included in the pipe run in locations where cathodic protection is applied on pipe line, the application of jumper

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- The distance between supports of aboveground cable tray / ladder in vertical runs 1500 mm, and in horizontal run 2500 mm maximum shall be considered.
shall be avoided and special stoppers to be used. This shall be coordinated with cathodic protection Engineer.

6.3 The earth connecting method shall comply with accepted practice i.e. Cad welding for underground and cad welding / bolted for aboveground. Brackets to equipment shall be used and shall have the approval of the Engineer before welding is commenced. Bolted and studs parts shall be tin plated.

7. INSTALLATION OF LIGHTNING PROTECTION

7.1 Lighting and static earthing and bonding system shall be in accordance with "Electrical System Design" Section 7.11“Earthing, Bonding and Lightning Protection".

7.2 Where protective systems are required they shall include air terminals, down conductors and earth terminations so installed as to minimize the possibility of voltages being induced in electric cables due to the passage of electric currents.

7.3 A protective system need not be fitted to a unit of metallic construction, where a low resistance path to earth will be inherently provided by bolted and welded steelwork from the highest point of unit to earth.

7.4 Air terminals (top of lightning arresters) shall be made of copper or copper alloy conducting bar of not less than 12mm diameter and shall project at least 300mm beyond the top of the mast.

7.5 Down Conductors shall be tape or cables made of copper or copper alloy. Cable is preferred as both the insulation and circular shape inhibits surface discharge.

7.6 For Offshore installation, other materials which are resistant to sea water may be used for air terminals and down conductors, for example, stainless steel or aluminum alloys. The resistance between air terminals and earth terminals shall not exceed 0.02 ohms.

8. MATERIALS

8.1 General

All materials provided by contractor shall be new and conform to the latest pertinent standard for the equipment. This shall be coordinated with cathodic protection Engineer.

3.0 Rozh antrasal bi tesimti zigmin byad ba roshayey mordi qobol zaftak daste byad yunin biay antrasal zigmimi at antrasal Groshy va biay antrasal roz zigmin at antrasal Groshy ya gip va mohre byadests joshd. Pesty ha byad pasal byad bakar byad dast beshon va taayid byadests murobeht qabil az agaz joshkariki ksp gerd. Pijg va mohre ha byad qule bawad byadest.

7.0 Nbsp tesimti ghotatat az spagh 

7.0 1 zigmin kerd biay antrasal hizaz az zigmin byad tesimti bawad matalikan  "Electrical System Design" Section "Earthing, Bonding and Lightning Protection".

7.0 2 jageke tesimti ghotatat zigmin byad bawad az tesimti zigmin byad samal berye, gire, simayey rapii va tennimaliz zigmin mi yand e byad bawadii desn qoshon to b filmed ehor jereez byadtki key albyan byad.

7.0 3 byad yek yek saza fardii ke yek msiyey va yaz va mohre va joshkariky az balahtynyn

7.0 4 berye zigmin byad bazhe tennimaliz zigmin byad heya msiy to aaliz meya vakatar haddakan 0310 miliyeyemat vahadii e jokh mohre va yek berye zigmin byad.

7.0 5 tennimaliz zigmin byad bazhe tennimaliz zigmin byad heya msiy to aaliz meya vakatar haddakan 0310 miliyeyemat vahadii e jokh mohre va yek berye zigmin byad.

7.0 6 berye zigmin byad bazhe tennimaliz zigmin byad heya msiy to aaliz meya vakatar haddakan 0310 miliyeyemat vahadii e jokh mohre va yek berye zigmin byad.

7.0 7 mohre va yek berye zigmin byad bazhe tennimaliz zigmin byad heya msiy to aaliz meya vakatar haddakan 0310 miliyeyemat vahadii e jokh mohre va yek berye zigmin byad.

8. Ennas

8.1 Umoomi

Kileh ennas heye shede tawit pimanka byad to va az jens
use and locations for which they are intended. All materials shall meet with the owner’s approval.

8.2 Owner Supply
The contractor shall take delivery of and install the items shown on the drawings, listed on the bill of materials and/or specified within the contract documents as owner supplied materials. The contractor becomes responsible for owner supplied materials, upon receipt by the contractor.

8.3 Electric Contractor Supply
All materials necessary for a complete operable electrical installation not designated owner supplied shall be supplied and installed by the contractor. Any material required or called for on the drawings and not listed in bill of materials shall be provided by the contractor. Verification of quantities listed on the bill of materials is expected at early stages of work.

8.4 Expediting
It shall be the responsibility of the contractor to determine what materials he must expedite to maintain the agreed construction schedules.

8.5 Delivery
It shall be the responsibility of the contractor to provide on site, storage for all the electrical equipment and materials to keep them clean, dry and free from possible hazards in the field prior to installation.

9. EQUIPMENT INSTALLATIONS IN GENERAL

9.1 All electrical equipment such as rotating machinery, transformers, transformer-rectifiers switchgear and control gear, M.C.C., protection system, batteries, charger, and 'UPS' shall be installed according to Company approved Manufacturer’s instructions and engineering drawings, unless manufacturers are responsible for installation, of their delivered equipment.

10. ELECTRICAL INSTALLATIONS IN HAZARDOUS AREAS (POtentially EXPLOsive ATMospheres)

When electrical work is carried out in hazardous areas, requirement of IEC 60079-14 shall be adhered to in conjunction with the area classification drawings and the following standards:

IPS-E-EL-110(0) "Engineering standard for Merjou and Mafeeqi"
11. INSTALLATION OF GENERATORS AND MOTORS

11.1 Generators shall be located in well-ventilated spaces where combustible gases cannot accumulate.

11.2 Generators and motors shall, where applicable, be installed to minimize the effect of vibration of the unit. See IPS-D-EL-201,20 , L.V. motor horizontal and vertical Installations.

12. INSTALLATION OF TRANSFORMERS

12.1 Large oil-immersed transformers shall be installed over an oil pit whose volume is compatible with the quantity of oil in transformer. Oil-immersed transformers shall be installed in an area with provisions for containment and drainage of liquid leakage. When flammable liquid such as oil is used, consideration shall be given to the need for fire extinguishing equipment, taking into account other equipment that may be installed within the same space.

12.2 Transformers can stand on skid or on caster. While they have to be on caster, proper iron rail to allow movement of transformer shall be provided. Transformer base shall be surrounded by gravel as recommend on pertinent drawings.

12.3 Transformers and their connections shall be protected against mechanical damage, condensation and corrosion as may reasonably be expected.

13. INSTALLATION OF SWITCHGEAR AND CONTROLGEAR ASSEMBLIES

13.1 Switchgear and Controlgear Assemblies shall, in so far as practically possible, be installed in easily accessible and well-ventilated locations where combustible gases, acid vapours or similar do not occur, and shall be located well clear of heat sources such as boilers, heated oil tanks, steam exhaust pipes or other heated pipes.

13.2 Where switchgear and controlgear assemblies are located in dedicated rooms, pipes or conduits for water, steam, gas, oil, etc., which are not related to the electrical equipment, are not permitted.

13.3 An insulating mat or grating shall be provided in front of switchgear and controlgear assemblies and also at the rear, if access from the rear is
required. The insulating mat or grating shall be oil-resistant and non-slip.

14. STORAGE AND CARE OF ELECTRICAL EQUIPMENT

14.1 General

General checking of equipment materials, and electrical equipment and machinery shall be examined as soon as possible following arrival at the site.

Checking should be carried out against respective orders and specifications and where deficiencies or non compliance with an order occurs, details shall immediately be notified, to site Engineer. Wherever possible equipment shall be returned to its original packing for storage until required for use.

14.2 Storage and Protection

Methods of storage and protection required will vary according to the type of equipment and the area of operation concerned. Details of storage accommodation and proposed methods of storage for electrical hardware should be discussed and agreed with site Engineer.

14.3 Cable Storage and Inspection

Underground cable supplied under a bulk order is delivered to site in a sequence largely dictated by the Manufacturer both in regard to volume and content of individual consignments. Initial site planning of cable storage space should be based on the overall volume of cable involved and convenience of handling to the various site conditions.

As far as possible different types and sizes of cables should be segregated and grouped into single line formation with drum marking readily visible.

Adequate space should be left between drum formations to allow access for the heavy duty lifting equipment and transport involved. Cable deliveries shall be inspected on arrival at the site and checked against.

14.4 Storage in Outdoor Location

Generally storage should be provided in a secured and weatherproof building. Exception may be justified for items of equipment which form part of packaged unit for outdoor installation such motor drive etc., it should be noted however, that such equipment may not necessarily be fully protected until installation procedures have been completed.

باشد قرار داده شود و کف پوش عایق با صفحه شبکه ای عایق باشد مقاوم در مقابل روند بهد و سطح آنها لغزندی نباشد.

14.5 اثربند کردن و مراقبت از تجهیزات الکتریکی

بازدید بازدید جهت تعیین سفارش مربوط به مشخصات آن سفارش گیری و در صورت وجد کردن و در صورت عدم تلقیه با سفارش جزئیات امر بازدید کردن با سفیر مسئول گزارش شود، در صورت امکان نبودن انجام بسته بندی اولیه تا زمان نیاز در انجام نگهداری شود.

14.6 انبار کردن و نگهداری

روش های انبار کردن و چگونگی نگهداری بسته به نوع لازم و محل متغیر است. محیط و روستایی بیشتری، انا بر دایر لازم و وسایل الکتریکی بازدید با مهندس مسئول فضای سطح و مورد توافق قرار گیرد.

14.7 انبار کردن کابل و پاسورسی

کابل زیرزمینی که با سفارش کردن عمد خریدای شده است بصورت مرحله‌ای که عمداً توسط سازنده با توجه به حجم و محیط‌های محفظه معمولی ميدوش حمل و تحول می‌گردد.

طرح اولیه فضای مورد نیاز برای انبار کردن کابل بر اساس حجم کلی کابل‌های مورد نظر و سهولت انتقال آنها به نقاط مختلف منطقه صورت می‌زند.

تا جایی که امکان بدید است بازدید انتواو از اندامه‌ای مختلف کابل از یکدیگر جدا و گروه بندی شده و به‌عنوان علامت گذاری شوند که کاملاً قابل قبول و باشد.

بايد فضایی کابل ورود کرده بازی حرکت ساپل سنگین و حمل ونقل بینی شود. کابلها نیز در زمان ورود به منطقه مورد بازدید و کنترل قرار گیرند.

14.8 انبار کردن در فضای آزاد

بطور کلی فضائی انبار بازی در بازرگانی ایمن و مقاوم در مقابل هوا باشد. ان استثناء در مورد اقلامی از وسایل که خود در هوا از آزاد نصب می‌شود وجود دارد. در مورد اقلامی جون مونتاژ و غیره، بازدید توجه شود که این یک طرحی برای استثناء در مورد بازدید به حفاظت کامل تا زمان نگهداری روند نصب ندارند.
Machined flanges associated with flameproof enclosures and cable glands are particularly vulnerable in this respect and equipment within this category should be carefully checked both before and during period of storage.

Electrical plant and equipment should be stored on a supported base above floor level and in outdoor locations, should be adequately covered to ensure protection against the local weather, environment etc., and in particular in rain, snow and dust as may be applicable. Any discrepancies or damage shall immediately be notified to site Engineer.

15. ELECTRICAL HEAT TRACING

15.1 Trace and surface heating shall be installed in accordance with the system documentation. Special care shall be taken to ensure that any limits specified in the system documentation are not exceeded.

15.2 Trace heating cables shall be strapped to equipment and pipes using glass fiber tape or another method in accordance with the manufacturer's documentation, and shall be spaced approximately at 300 mm intervals along pipes, and as required elsewhere.

15.3 Trace heating cables shall be installed in such a way as to allow dismantling of joints, valves, instruments, etc., without cutting or damaging the cable.

15.4 Where surface heat tracing comes under responsibility of electrical contractor it shall be coordinated among the Engineer, Electric Contractor, and Cathodic Protection Contractor.

No two flanges which are provided by insulator rings shall be jumpered. No earthing shall be provided on pipelines unless discussed and agreed by the Engineer with due consideration to insulation ring for cathodic protection.

For standard of installation of surface heating see IEC 61892 “Electrical Installation” Part 6- Installation of electric surface heating system.

16. PAINTING OF ELECTRICAL INSTALLATIONS

The contractor shall arrange for touch up of all electrical and control equipment marred by

فلج های مانیس کاری شده مربوط به بدن های ضدانگ و
گلدان کلی ها در این مورد اسبی برق دوم و سوابی در این
رده باید هم قبل و هم در دوران ابتداری دقیقاً از باین
دستگاه‌ها و سویل الکتریکی باید روی یک طبقه پالایش از سطحی
زیمن قرار گرفته و در پلاستیک رنگ، طوب، کامل پوشیده شوند تا
اطمینان حاصل شود که حفاظت در مقابل هوا محلی، محتوای
و غیره پوزه باران، برخ و گرد و خاک حسب مورد طور
مطابقی نامی شده است. هر گونه مغایر آنها خسارت وارد
بلافاصله باشد به‌هندی‌سیستم اطلاع داده شود.

15.0 سیستم انتقال الکتریکی

15.1 سیستم گرم کننده سطحی باید با طبق مدارک نصب
گردد. باید دقت کافی مبثم گردد و نیز اطمینان حاصل شود
که از هر مشخص شده (اعتراضی) در مدارک بیشتر نشود.

15.2 کابل‌های گرم کننده سطحی باید صورتی باند یا نسبت به
کمک نوار فیبر شیشهای یا روش دیگری روی لوازم و لوله‌ها بر
طبق مدارک زبانه نصب گردند و در فواصل 300 میلیمتری
از یک دیگر در طول لوله‌ها و در جای دیگر مطابق آنچه
خواسته شده قرار گیرند.

15.3 کابل‌های سیستم گرم کننده سطحی باید پوشی باشد
که اتصالات مانیس آلت، سویل ابراز دقیق و غیره بدون پاره
کردن و یا اسبی سرائیست به کلی از روی دستگاه نیاز
گرد. در

15.0 در صورتی که سیستم گرم کننده سطحی جزو وظایف
پیمانکار باشد باید موضوع بین هنگام مستند و
پیمانکار و
هنگام حفاظت کاندید هماهنگ گردد.

دو فلج که به رنگ‌های عمیق هستند نماد توسعه سیستم
اتصال را بی‌کننده رنگ مناسب شوند. هر گونه اتصال به زمین
روی خطوط لوله ناباید اجرا شود مگر به هنگام مستند مطروح
و با توجه به رنگ‌های عبارت مراجع حفاظت کاندید مورد موافقت
وی قرار گرفته باشد.

برای مشاهده استاندارد نصب سیستم یکنون گرم کننده سطحی به
استاندارد IEC 61892 "نصب الکتریکی" بخش 5 "نصب
سیستم یکنون سطحی " مراجعه شود.

16. رنگ آمیزی تاسیسات الکتریکی

پیمانکار باید پس از بررسی نسبت به ترمیم رنگ سطوح کلیه
وسایل الکتریکی و تجهیزات کنترلی که در اثر حمل و نقل

shipment or erection, using the same type of finish as the original.

17. LABELING AND IDENTIFICATION OF APPARATUS AND CIRCUITS

17.1 All electrical distribution apparatus shall have permanently fixed by danger labels with black lettering on a yellow background and shall comply with IEC 60417 (trifoliate is adequate).

17.2 Each distribution board must be fitted with a circuit or distribution way list. Against each circuit, the designation and number of current consuming devices shall be shown and size of fuse to be given.

17.3 Switch fuses bus bar chamber and distribution boards shall be fitted with labels stating the voltage and phases, where it is fed from and where it is feeding to.

17.4 Any remote switch located out of sight of load it controls, shall be provided with labels stating the name of load and pertinent precautions to be taken while putting the remote switch in on or off position.

17.5 As appropriate all apparatus outgoing ways, outlets and extension outlets units shall have permanently fixed external labels to identify the connected apparatus and the source of supply.

18. CLEAN-UP AFTER COMPLETION OF WORK

18.1 The contractor shall be responsible for keeping his works areas clean and free from debris and waste materials at all times.

The interior of all electrical boxes, cabinets, control panels, motor control centers etc., shall be cleaned of dust, dirt and loose materials. Wire ways under computer floor etc, shall be kept free of moisture and debris, the above areas shall be vacuum cleaned to the satisfaction of owner.

18.2 All opening in chambers, panels, conduit work, and unused cable entries to be closed up or plugged to avoid entry of dust, rodents etc., to electrical installation.

19. PRELIMINARY INSPECTION AND CHECK

19.1 Every electrical installation shall be inspected and tested by installer before commissioning test.
this is to ensure as far as practicable that all the requirements of the contract have been carried out and installation is ready for pre-commissioning.

The contract requires that the test carried out shall not in any way be a danger to persons, property or equipment even if a circuit is faulty, it is important then that the following test are carried out wherever relevant before commissioning test:

a) Ring final circuit continuity when applicable.

b) Protective conductor continuity including bonding.

c) Measurement of earth electrode resistance.

d) Insulation resistance.

e) Insulation resistance of site built assemblies.

f) Protection by electrical separation.

g) Protection by barriers and enclosures.

h) Verification of polarity.

i) Earth fault loop impedance.

j) Operation of residual current devices.

k) In double pole, 3 poles and 4 pole switches ensure that phase pass through the fuse and switch.

l) In hazardous areas ensure that phase(s) pass through the fuse(s) and switch(es) and neutral is linked (no fuse and directly connected to outgoing terminal of switch fuse).

19.2 Warning shall be affixed to electric installation regarding the frequency of inspection and testing.

The inspection and testing shall not cause danger to persons or livestock and shall not cause damage to property and equipment even if the circuit is defective and notice shall be provided for periodic inspection and details of when it should be tested again". The period between tests may be 3-5 years depending on environmental and maintenance service, but this can be made less if this is thought appropriate by the Engineer.

19.3 The Engineer is entitled to inspect, examine and test the workmanship during the course of installation; any such inspection shall not release the contractor from his obligation under the contract. Any work in the opinion of the Engineer
which is not up to standard shall be rectified at the Contractor own expense.

19.4 After completion of installation and preliminary check, pre commissioning (pre-accepting test) to be carried out in accordance with pre commissioning tests standard IPS-I-EL-217.

20. RETURN OF UNUSED MATERIALS AND EQUIPMENT TO CLIENT

At the end of the work contractor shall provide a list of unused materials and equipment for Company representative for return of them to Company store allocated for the purpose, unless otherwise specified in the contract.

21. PREPARATION OF AS BUILT DRAWINGS FOR CLIENT

A set of as built drawings shall be marked up by the electrical contractor in red on a daily basis. The owner shall have access to view this set of drawings at all times.

Before final acceptance of the work, the electrical contractor shall furnish the owner with one completely detailed set of as built drawings showing final locations and connections for all electrical work carried out. Such as built drawings shall includes all pertinent notes and dimensions necessary to show clearly the location and physical characteristics of all conduits, conductors and connections.

As built drawing will be verified and shall not be deemed complete until they are to the satisfaction of owner.

22. PREPARATION FOR PRECOMMISSIONING TESTS

1) A programme including time schedule and test procedure shall be provided for precommissioning tests with the approval of Engineer.

2) All provision such as testing equipment, special tools and coordination for availability of power and all pertinent work permits shall be envisaged as perprecommissioning electrical tests standard IPS-I-EL-217.
23. TEST OF COMPLETED INSTALLATION

23.1 Inspections and Tests

Inspections and Tests shall be performed as per standard IPS-I-EL-217.

24. DOCUMENTATION

24.1 Installation shall be carried out in compliance with the detailed design and installation documents and to the satisfaction of the appropriate authority.

After installation, these documents shall incorporate all the variations made during the construction of the unit.

24.2 Maintenance procedures and records for electrical equipment shall be documented, together with a recommended programme. Such a programme shall ensure the continued suitability of the equipment for the application.

24.3 It shall be documented, by means of an installation contractor's declaration, that all equipment, cables, etc. have been installed in accordance with the procedures and guidelines issued by the manufacturer of the equipment, cables, etc., and that the installation has been carried out in accordance with this standard.

25. PROVISIONAL ACCEPTANCE OF ELECTRICAL INSTALLATION

After completion of installation and tests, client shall provide provisional acceptance test certificate complete with defect lists (which shall be remedied in agreed time). When defects are cleared and inspections results are satisfactory, acceptance certificate will be issued.