

DEP SPECIFICATION

TELECOMMUNICATIONS FOR ONSHORE FACILITIES

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DESIGN AND ENGINEERING PRACTICE

DEM1



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1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for telecommunication equipment and systems for onshore facilities.

For Shell operated facilities, the DEP is supplemented by the Field Telecom Technology Design Guide (TDG) and the Technical Engineering Guide (TEG), which provide more detailed technical design guidelines and configuration standards.

Telecommunications for offshore and onshore-unconventional facilities is not covered in this DEP. Refer to DEP 32.71.00.12-Gen. which applies to offshore facilities and refer to PRS 39.01.40.10-Gen. for the North America onshore unconventional facilities.

Telecommunication services for onshore construction sites are the responsibility of the Contractor and are not subject to Shell DEPs.

This DEP contains mandatory requirements to mitigate process safety risks in accordance with Design Engineering Manual (DEM) 1 – Application of Technical Standards.

This is a revision of the DEP with the same number dated February 2015; see (1.5) regarding the changes.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by Shell GSI, the distribution of this DEP is confined to Shell companies and, where necessary, to Contractors and Manufacturers/Suppliers nominated by them. Any authorised access to DEPs does not for that reason constitute an authorisation to any documents, data or information to which the DEPs may refer.

This DEP is intended for use in facilities related to oil and gas production, gas handling, oil refining, chemical processing, gasification, distribution and supply/marketing. This DEP may also be applied in other similar facilities.

When DEPs are applied, a Management of Change (MOC) process shall be implemented; this is of particular importance when existing facilities are to be modified.

If national and/or local regulations exist in which some of the requirements could be more stringent than in this DEP, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable with regards to the safety, environmental, economic and legal aspects. In all cases, the Contractor shall inform the Principal of any deviation from the requirements of this DEP which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned, the objective being to obtain agreement to follow this DEP as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

The **Contractor** is the party that carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party that manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party that initiates the project and ultimately pays for it. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

The word **shall** indicates a requirement.

The capitalised term **SHALL [PS]** indicates a process safety requirement.

The word **should** indicates a recommendation.

The word **may** indicates a permitted option.

1.3.2 Specific definitions

Term	Definition
A60 firewall	Barrier that provides A60-certified fire protection.
Codec	A set of equipment that encodes an analogue speech or video signal into digital form for transmission purposes
Collaborative Work Environment	A generic high-end collaboration audio-visual (AV) room or a collection of integrated rooms/facilities which takes into account specific business collaboration requirements, principally focused on remote collaboration between two or more facilities. The purpose of a CWE is to enable implementation of business processes and workflows (e.g., production monitoring, exception based surveillance, scheduling remote team activities/jobs, coordination and planning of drilling and infrastructure activities, and general multi-point collaboration).
Data Classification - Unrestricted	Information which may be shared without restrictions because consequential value erosion, financial loss, reputational damage, harm to any party, or breach of any law, regulation or agreement is not expected
Data Classification - Restricted	Information which may be shared with Staff, associated parties and selected other external parties but must not be shared with other external parties as to do so may result in value erosion, financial loss, reputational damage, harm to any party, or a breach of a law, regulation or agreement.
Data Classification - Confidential	Information which must be shared only with selected staff and selected external parties, because sharing with others may result in value erosion, financial loss, reputational damage, harm to any party, or a breach of a law, regulation or agreement.
Data Classification – Most Confidential	Information which is extremely sensitive or extremely valuable and must be shared only with named individuals on a strict need-to-know basis because sharing with others could result in very serious value erosion, financial loss, reputational damage, harm to any party, or breach of a law, regulation or agreement. Inside information is Most Confidential.
Hazardous area	Area in which an explosive gas atmosphere is or may be expected to be present in quantities to require special precautions for the construction, installation and use of electrical apparatus.
High Availability	High availability refers to systems that are durable and likely to operate continuously without failure for a long time. The term implies that parts of a system have been fully tested and, in many cases, that there are accommodations for failure in the form of redundant components. Availability may be measured relative to 100 % available.
Hotline	Refers to any mechanism in which a telephone call is automatically directed to a preselected destination without any additional action by the user.

Term	Definition
Mandatory/safety critical systems	Equipment required by international, national and local regulations. Also services that are defined and maintained to safety critical levels as defined in the facility safety case (and operating license). Mandatory/Safety Critical systems are supplied from the Vital power supply.
Non-essential service	Service that is neither mandatory, vital nor operational/essential.
Non-hazardous area	Area in which an explosive gas atmosphere is not expected to be present in quantities such as to require special precautions for the construction, installation and use of electrical apparatus.
Omnibus	Omnibus is an extension of a hotline service which allows multiple parties to connect into a common audio communication link. A user initiating an omnibus call will be able to alert a specific end point station or all end-point stations (via ring tone, flashing light or loud speaker) allowing any user to join to the call at any moment. In the event an existing dialogue is in place between two station a third station on lifting the handset will automatically be joined to the conversation immediately.
Operational/Essential systems	Systems which, in the event of failure (or reduced output), could lead to a widespread and/or prolonged shutdown of other systems within the facility or would have a significant impact on the operating efficiency of the facility. Operational/Essential systems are normally supplied from the vital power supply.
Personnel Welfare	Worker welfare consists of a number of elements to support the needs of the individual worker, their relationship with their family and connections with their fellow workers.
Rig-In-A-Box (RIAB)	RIAB is a standard, portable and easy to deploy kit installed at the drilling rig for real time drilling data gathering.
Safety case	Case that is a demonstration that the hazards have been identified and assessed and under control and that the exposure of personnel to these hazards has been minimised.
Track and Trace	Provides a real-time locating system (RTLS) for capturing, storing, and making visible, sensor based location information about personnel, materials and equipment. The location information is obtained from fixed or mobile sensors/readers that respond to a tag (RFID, GPS, barcode) associated with a physical or logical entity (e.g., person, packaged material, piece of equipment). RTLS information is used in applications such as emergency response or on-site materials tracking that are built upon the RTLS (data acquisition) platform.
Vital services	Electrical supply provided to mandatory and operational/essential systems.

1.3.3 Abbreviations

Term	Definition
3D	Three Dimension
3G / 4G	Third Generation / Fourth Generation
ACL	Access Control List
ANPR	Automatic Number Plate Recognition
AP	Access Point
AV	Audio Video
BDA	Bi-Directional Amplifiers
BICSI	Building Industry Consulting Service International
CCR	Central Control Room
CCTV	Closed Circuit Television
CS	Corporate Security
CWE	Collaborative Work Environment
DART	Drilling Automation & Remote Technology
DMZ	Demilitarized Zone
DHCP	Domain Host Configuration Protocol
DNS	Domain Name System
DTRS	Digital Trunk Radio System
ECC	Emergency Control Centre
EM	Electromagnetic
EMF	Electro Magnetic Frequency
EOL	End of Life
EPR	Ethylene Propylene Rubber
ERT	Emergency Response Team
FAR	Field Auxiliary Room
FPSO	Floating Production Storage and Offloading
Gbps	Gigabit Per Second
GI	Global Infrastructure
GI-D	Global Infrastructure - Desktop
GPS	Global Positioning System

Term	Definition
HeC	High-end Collaboration
HSSE	Health, Safety, Security and Environment
HVAC	Heating, Ventilation and Air Conditioning
I/O	Input/Output
ICCS	Integrated Communication Console System
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IDF	Intermediate Distribution Frame
IDS	Intruder Detection System
IEC	International Electrotechnical Commission
iFAT	Integrated Factory Acceptance Test
IP	Internet Protocol
IP-Code	International Protection Code (marking)
IPT	IP Telephony
IPv4 / IPv6	IP version 4 / IP version 6
IRM	Information Risk Management
ISDN	Integrated Service Digital Networks
ITU	International Telecommunication Union
ITU-R	Radio Communications Sector of the ITU
ITU-T	Telecommunications Sector of the ITU
LAN	Local Area Network
LED	Light Emitting Diode
LSHF	Low Smoke Halogen Free
MDF	Main Distribution Frame
MGT	MICA Glass Tape
MPEG	Motion Picture Experts Group
NEMA	National Electrical Manufacturers Association
NMS	Network Management System
NVR	Network Video Recorder
OD	Office Domain
ONVIF	Open Network Video Interface Forum

Term	Definition
P2M	Point To Multipoint
PAGA	Public Address General Alarm
PC	Personal Computer
PCD-IT	Process Control Domain Information Technology
PoE	Power over Ethernet
PSTN	Public Switched Telephone Network
PTT	Push To Talk
PTZ	Pan/Tilt/Zoom
QoS	Quality of Service
RFID	Radio Frequency Identification
RiaB	Rig in a Box
RoIP	Radio over IP
RTLS	Real-Time Locating System
SAT	Site Acceptance Test
SBM	Single Buoy Mooring
SCADA	Supervisory Control and Data Acquisition
SCS	Structured Cabling System
SDS	Short Data (messaging) Service
SIP	Session Initiation Protocol
SNMP	Simple Network Management Protocol
SRA	Security Risk Assessment
T&T	Track and Trace
TCP/IP	Transmission Control Protocol/Internet Protocol
TDG	Technology Design Guide
TEG	Technical Engineering Guide
TER	Telecommunication Equipment Room
TETRA	Terrestrial Trunk Radio
UHF	Ultra High Frequency
UPS	Uninterruptible Power Supply
UTP	Unshielded Twisted Pair

Term	Definition
VCA	Video Content Analysis
VHF	Very High Frequency
VMD	Vehicle Motion Detection
VPN	Virtual Private Network
VSAT	Very Small Aperture Terminal (satellite system)
WAN	Wide Area Network
WiFi	Wireless Fidelity
WINS	Windows Internet Name Service
WLAN	Wireless LAN
WLC	Wireless LAN Controller

1.4 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section or clause number is shown in brackets (). Other documents referenced by this DEP are listed in (14).

1.5 SUMMARY OF MAIN CHANGES

This DEP is a full revision of the DEP of the same number dated February 2015. The following are the main, non-editorial changes.

Section/Clause	Change
All	The term Mandatory changed to mandatory/safety critical. The term Operations changed to operational / essential.
All	Removal of duplicated requirement statements throughout.
All	Removal of text considered to be 'informative'.
All	Grammatical corrections throughout.
1.3.2, 1.3.3	Added definitions and abbreviations and deleted some.
7	Access control and Intrusion detection rationalised to refer to corporate standards.
2 and appendix 3	Added reference to lightning protection standard IEEE 780 for North America.
6	Added reference that lightning systems for CCTV should refer to DEP 33.64.10.10-Gen. (DEP 33.64.20.10-Gen. for North America).

1.6 COMMENTS ON THIS DEP

Comments on this DEP may be submitted to the Administrator using one of the following options:

Shell DEPs Online (Users with access to Shell DEPs Online)	Enter the Shell DEPs Online system at https://www.shelldeps.com Select a DEP and then go to the details screen for that DEP. Click on the "Give feedback" link, fill in the online form and submit.
DEP Feedback System (Users with access to Shell Wide Web)	Enter comments directly in the DEP Feedback System which is accessible from the Technical Standards Portal http://www.shell.com/standards . Select "Submit DEP Feedback", fill in the online form and submit.
DEP Standard Form (other users)	Use DEP Standard Form 00.00.05.80-Gen. to record feedback and email the form to the Administrator at standards@shell.com .

Feedback that has been registered in the DEP Feedback System by using one of the above options will be reviewed by the DEP Custodian for potential improvements to the DEP.

1.7 DUAL UNITS

This DEP contains both the International System (SI) units, as well as the corresponding US Customary (USC) units, which are given following the SI units in brackets. When agreed by the Principal, the indicated USC values/units may be used.

1.8 NON NORMATIVE TEXT (COMMENTARY)

Text shown in italic style in this DEP indicates text that is non-normative and is provided as explanation or background information only.

Non-normative text is normally indented slightly to the right of the relevant DEP clause.

1.9 ONSHORE FACILITY TYPES

1.9.1 General

Onshore facilities are grouped into conventional facilities (1.9.2), and conventional drilling fields (1.9.3). These groupings cover a wide range of facility types, including refineries, chemical plants, gas processing plants, supply and distribution terminals, and exploration and production oil and gas fields.

The operating philosophy for all types of facilities includes a minimum manning philosophy where reliable telecommunications provides an infrastructure for remote collaboration, monitoring and control from a consolidated data centre. Onshore drilling fields have additional specific requirements as specified in (10).

Onshore conventional facilities vary in size from small (fewer than 50 operational personnel) to large (more than 2000 operational personnel).

1.9.2 Conventional facilities

Conventional facilities operate 24x7 and have no personnel accommodation facilities. During project construction there may be a nearby accommodation camp.

Conventional facilities have telecommunication systems to assist emergency response and safe evacuation of personnel. Due to the hazards associated with hydrocarbon production, conventional facilities have strict security and safety processes.

Conventional facilities generally make use of commercial IT services for LAN/WAN and voice, with specialist services for safety and emergency response. In remote areas, where

no commercial services exist, it is often necessary to install dedicated fibre cable, microwave or similar technology to provide the last mile connectivity.

Conventional facilities also require wireless IP network infrastructure within the operational footprint of the facility to enable mobile data for operational teams and wireless sensors and controllers.

1.9.3 Conventional drilling fields

Conventional drilling fields can support exploration, drilling and production services, with each service potentially operating in multiple lifecycle phases in the same field area. Conventional drilling fields are typified by a sparse, low density footprint over a wide geographic area.

Individual onshore mobile drilling units (MDUs) are generally small, being operated by three to five persons. MDUs are usually modular with hazardous area wellhead separated from a site office (safe area). MDUs can operate 24x7, and may require on-site accommodation. Conventional drilling fields can contain a number of MDUs in addition to production wellheads, pipeline and processing facilities which operate 24x7. These vary in size, and require supporting administration and logistic facilities.

Telecommunication solutions for drilling fields support multiple requirements and require a high degree of flexibility. They are required to be cost effective and flexible, allowing for rapid deployment and short duration use in locations with limited infrastructure.

Drilling fields generally have low bandwidth requirements, which are often difficult to deliver due to the remote location. Although commercial IT services are preferred, it is common to have to design and build telecommunication networks, where IT and SCADA traffic are shared for economical delivery. The drilling specific requirements are specified in Section 10.

2. GENERAL

2.1 SYSTEM CLASSIFICATION

2.1.1 Classification

1. Telecommunication systems for onshore facilities shall be identified as one of the following:
 - a. Mandatory/Safety Critical systems (2.1.2);
 - b. Operational/essential systems (2.1.3); or
 - c. Non-essential telecommunications (2.1.4).

2.1.2 Mandatory/safety critical systems

1. Mandatory/safety critical telecommunication systems shall be provided in accordance with national operational regulations and to meet the functional requirements of the Shell safety performance standards defined in facility emergency response plans.
2. Mandatory/safety critical telecommunication systems shall be identified in development of the operational/essential safety case.
 - a. Mandatory/safety critical telecommunication systems shall comply with the operational/essential safety case (or equivalent) and local regulations.
3. Mandatory/safety critical telecommunication systems shall be designed and constructed to remain operational in emergency situations, as defined by the Principal.
4. The requirements for formal maintenance, inspection and testing of mandatory/safety critical telecommunication systems shall be defined and handed over to operations, to enable assurance of the system availability during the operating phase.

Mandatory/safety critical telecommunications are typified by high availability and duplication of design to ensure high reliability, with system monitoring to give an early indication of failure. Total loss of mandatory/safety critical telecommunication systems can be a sufficient reason to shut down an onshore facility.

2.1.3 Operational/essential systems

Operational/essential telecommunication systems are provided to enhance efficiency of operation of facilities. They are typified with high availability and reliability with system monitoring to give an early indication of potential failure. They are typically defined in the Business Continuity Plan.

Temporary loss of operational/essential systems is not, on its own, normally a reason to shut down a facility.

Onshore operational telecommunication activities can include the following:

- *basic production and process control activities,*
- *crew communication and collaboration,*
- *logistics,*
- *administration,*
- *management and planning activities.*

2.1.4 Non-essential telecommunications

1. Non-essential telecommunications should include personnel welfare, recreation and non-essential administrative data systems (9).
2. Non-essential telecommunications should be provided in facilities that have living quarters (LQs) to provide personnel with communications to home, internet access, and audio and video entertainment systems.

3. Administrative data systems, such as video conferencing, should be deemed to be non-essential telecommunications.

2.2 USER REQUIREMENTS

1. User requirements shall be defined for each system.

Onshore facilities that are heavily integrated with other facilities, (e.g., gas gathering or distribution networks) have additional user requirements and will require advice from the Principal.

Onshore facilities may be designated as National Critical Infrastructure that requires telecommunications systems that are compliant with applicable national guidelines.

2.3 SYSTEMS REQUIRED

The following telecommunication systems or facilities are normally required for onshore facilities:

- *Shell wide area network (WAN) and third party Internet field backhaul connections.*
- *End point connectivity (LAN/wireless LAN).*
- *Voice and telephony.*
- *On-site mobile radio system.*
- *Emergency communication systems.*
- *CCTV system.*
- *Security and Intruder detection system.*
- *Access control system.*
- *Public cellular access.*
- *Welfare and entertainment services (where the facility has accommodation).*
 - o *The services may include Internet and television.*
- *PAGA system, specified in DEP 32.30.20.11-Gen.*

The following special telecommunication systems might also be provided:

- *Communication for marine loading terminal and facilities.*
- *Communication for aircraft and helicopter operations.*
- *Communication for gas gathering and/or gas distribution network.*
- *Telecommunications systems outside the plant area to cover requirements such as export pipelines.*
- *Temporary telecommunications systems for local, national and international communications for construction maintenance programmes.*
- *Temporary telecommunications for periods of increase site activity such as campaign maintenance or turnaround.*

2.4 HAZARDOUS AREA CONSIDERATIONS

1. To permit the selection of telecommunications equipment for areas where flammable gas or vapour risks may arise, relevant area classification drawing(s) shall be consulted.
 - a. Unless otherwise advised by the Principal, IEC 60079 or the equivalent local standard shall be used.

This includes electrical, optical and radio frequency protection.

Area classification drawings are prepared with reference to DEP 80.00.10.10-Gen. or DEP 80.00.10.13-Gen. for North America.

2. Refer to DEP 33.64.10.10-Gen. (or DEP 33.64.20.10-Gen. for North America) for requirements related to electrical equipment protection in areas classified as hazardous.
3. Main and auxiliary telecommunications equipment rooms should be located in areas classified as non-hazardous.
4. Telecommunications equipment that is required to operate during emergency scenarios, such as hydrocarbon release, SHALL [PS] be identified and provided with the level of protection appropriate to the credible exposure during the emergency scenarios.

The default protection is typically approved to use in Zone 1 (Division 1, or equivalent) operation. This requirement includes associated infrastructure such as cable, fibre, and junction boxes.

5. All telecommunication equipment not identified for use in emergency situation shall be electrically isolated, and radio system switched to low power transmit (< 1 watt), as per the facility emergency shutdown plan.
6. Portable telecommunication equipment, such as hand portable radios, cellular phones, industrial mobility devices, and wireless IP telephones, SHALL [PS] be suitable for the most stringent area classification to which staff carrying the portable equipment may be exposed.
7. The headset for the portable telecommunication equipment shall be approved for their country of operation while considering personnel safety as well as practical operation.
8. Unless otherwise specified by Principal, the following minimum standards should be followed:
 - a. Surface industry gas group II as per IEC or NFPA 497 (or equivalent), appropriate for propane, ethylene and hydrogen.

As per IEC, propane is Group IIA, ethylene is Group IIB, and hydrogen is Group IIC. Per NFPA 497, propane is Group D, ethylene is Group C, and Hydrogen is Group B.
 - b. Temperature classification to maximum surface temperature of 135 °C (275 °F).
9. Consideration should be given to PD CLC/TR 50427 assessment of inadvertent ignition of flammable atmospheres by radio frequency radiation, when designing wireless or other radio frequency solutions in and around areas classified as hazardous

2.5 TELECOMMUNICATION AUTHORITY

1. During the Define stage, the national telecommunication regulatory authority (usually a department or agency of government) shall be contacted for each project in which telecommunication is required to confirm if the licenses for the desired frequencies are likely to be issued.
2. Telecommunication systems that will be connected to the public communication network and all systems based on radio transmission (e.g., plant radio) shall have the approval of the telecommunication authority before commissioning.
3. Regulatory authorities shall be informed and involved if private communications systems are required for construction and subsequent operation of the plant.
4. If early works are implemented before Execute, a license application should be made as soon as the licensing requirements are known.

2.6 TELECOMMUNICATION STANDARDS

1. International telecommunications standards should be used wherever possible to satisfy regulatory authorities, to allow interconnection with other systems, and to help Manufacturer/Suppliers meet minimal requirements set by the standards.

2.7 TELECOM FACILITIES

2.7.1 General

1. Onshore telecommunication systems shall be designed to support and meet the operational and economic requirements of a facility.
2. Where the economics do not justify a high availability solution, a standard availability solution may be considered, subject to the agreement of the Principal.
3. In an Onshore environment, telecommunications and IT design shall provide services with high availability, reliability and the ability to perform remote fault diagnosis.

It is important to ensure that high availability, reliability and proactive fault management is also applied to the delivery of electricity supply and HVAC.

2.7.2 Telecommunication equipment room

1. One or more dedicated telecommunication equipment rooms (TERs) should be provided to place all telecommunication equipment in a facility.
 - a. More than one TER with physical separation by distance should be considered as part of the risk assessment to mitigate against single points of failure, or as required by the Principal.

In onshore facilities, it is often necessary to place telecommunication, data and instrumentation equipment in the same room.
2. The TER shall be a clean and dry environment, suitable for the location of sensitive electronic equipment.
3. The TER should be located in areas classified as non-hazardous areas.
 - a. The TER should not be in an intermediate space between other rooms.
 - b. The TER should not be located along an exterior wall of the building
4. The TER door should be sized to allow for installation of all telecommunication cabinets and equipment.
 - a. The TER door should not have a sill that impedes the movement of all types of telecommunication equipment required in the TER.
5. The TER room shall be protected by the facility (F&G) fire and gas system.
 - a. The TER room shall remain energized until the room is compromised, see DEP 32.30.20.11-Gen.
6. Cabinets for telecommunication and data communication equipment housed in the TER shall be bonded to the earth grid, including additional bonding for removable equipment cabinet back and side panels.
7. Telecommunication and data communication equipment in the TER should be as follows:
 - a. Housed in metal cabinets of the same type with dimension of 800 mm (32 in) wide, 800 mm (32 in) deep, and no less than 2000 mm (6.6 ft) high.
 - b. If servers are required then the cabinet dimension should be 800 mm (32 in) wide, 1000 mm (3.2 ft) deep, and at least 2000 mm (6.6 ft) high, and installed so as to prevent obstruction or hazard.
 - c. Cabinets initially sized with 50 % spare capacity.

- d. 50 % spare floor space in the TER.
- e. Lockable cabinet doors, opening outward, and not blocking an escape route during an emergency.
- f. Cabinets fitted with accessible vertical and horizontal cable management.
- g. Provided with the following documentation:
 - i. rack elevation and mechanical parts list;
 - ii. electrical diagram;
 - iii. interconnection diagram;
 - iv. cable schedule; termination diagram;
 - v. termination layout;
 - vi. IDF layout;
 - vii. earthing principle;
 - viii. Tag number table;
 - ix. material parts list;
 - x. field/rack external interface.
- 8. Design of the TER and telecommunication pathways should conform to ANSI/TIA-569 or equivalent local standards.
 - a. If telecommunication systems are shared with instrumentation systems, then refer to DEP 32.37.20.10-Gen., Section 3.8 for additional requirements.
- 9. The main TER and any associated substations in the facility should be linked with a route-diverse, redundant, fibre cable network.
- 10. Telecommunication equipment should be grouped according to the appropriate emission and immunity specifications as specified in DEP 33.64.10.33-Gen., Section 5.
- 11. Individual cable trays and all cables entering and in TER shall be bonded to the earth ring and cabinets, as specified in DEP 33.64.10.33-Gen. Section 4 (or DEP 33.64.20.10-Gen. Section 5 for North America).
- 12. TER lighting should conform to DEP 33.64.10.10-Gen., Section 4.10 (or DEP 33.64.20.10-Gen. for North America).
- 13. The TER should not be located below the ground water table.
- 14. The TER shall be free of unrelated water pipes and include a floor drain if risk of water ingress exists.
- 15. The TER should be located as near as possible to the intra-building backbone to reduce cable runs.
- 16. The TER should have a false floor installed above the structural floor.
- 17. Cables should be routed below the false floor, be contained in cable tray, and enter the work area through floor-mounted outlets.

2.7.3 Cabling

2.7.3.1 General

Specialist telecommunication and a structured cabling system (SCS) (both copper and optical) are key elements required for advanced voice, video and data systems. Effective planning and investment in cabling infrastructure is essential to meet demands of IT development, to optimise the cost, and to maximize the performance of the telecommunication systems throughout the life span of a facility.