The following Guidelines come into force on 1 October 2013.

Germanischer Lloyd SE

Head Office
Brooktorkai 18, 20457 Hamburg, Germany
Phone: +49 40 36149-0
Fax: +49 40 36149-200
headoffice@gl-group.com

www.gl-group.com

"General Terms and Conditions" of the respective latest edition will be applicable
(see Rules for Classification and Construction, I - Ship Technology, Part 0 - Classification and Surveys).

Reproduction by printing or photostatic means is only permissible with the consent of
Germanischer Lloyd SE.

Published by: Germanischer Lloyd SE, Hamburg
### Table of Contents

**Section 1 Fire and Gas Detection Systems and Safety Systems**

<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Overall Safety and Monitoring System</td>
<td>1-1</td>
</tr>
<tr>
<td>B</td>
<td>Fire Detection and Fire Alarm System</td>
<td>1-1</td>
</tr>
<tr>
<td>C</td>
<td>Gas Detection Systems</td>
<td>1-3</td>
</tr>
<tr>
<td>D</td>
<td>Door Closing Systems</td>
<td>1-5</td>
</tr>
<tr>
<td>E</td>
<td>Indicator Systems for Fire Doors</td>
<td>1-6</td>
</tr>
<tr>
<td>F</td>
<td>( \text{CO}_2 ) Alarm Systems</td>
<td>1-6</td>
</tr>
<tr>
<td>G</td>
<td>Alternative Gas Fire Extinguishing Systems</td>
<td>1-6</td>
</tr>
</tbody>
</table>

**Section 2 Communication and Signalling Equipment**

<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>General Requirements</td>
<td>2-1</td>
</tr>
<tr>
<td>B</td>
<td>External Communication</td>
<td>2-1</td>
</tr>
<tr>
<td>C</td>
<td>Internal Communication</td>
<td>2-1</td>
</tr>
<tr>
<td>D</td>
<td>Signalling Equipment</td>
<td>2-2</td>
</tr>
</tbody>
</table>

**Section 3 Control and Monitoring Systems**

<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>General Requirements</td>
<td>3-1</td>
</tr>
<tr>
<td>B</td>
<td>Scope of Control and Monitoring Systems</td>
<td>3-3</td>
</tr>
<tr>
<td>C</td>
<td>Data Transmission Links for Remote Control</td>
<td>3-4</td>
</tr>
</tbody>
</table>
Section 1 Fire and Gas Detection Systems and Safety Systems

A Overall Safety and Monitoring System

A.1 An integration of the safety systems of a substation described in the following shall be established by an overall safety and monitoring system.

A.2 The integration of the safety systems shall be designed in co-ordination with GL. The different safety systems shall be connected by a bus system as data link but shall work without repercussion to each other.

A.3 For the design principles of the different safety systems refer to Chapter 3, e.g. for Active Fire Protection and shut down systems.

A.4 Power supply via UPS may be required for safety systems, e.g. shut down, fire detection, gas detection, depending on the system design.

A.5 Field instrumentation for safety systems shall have a suitable IP-rating and, where required, explosion protection complying with the environmental conditions of the respective location.

B Fire Detection and Fire Alarm System

B.1 Design

B.1.1 Central fire control panels, fire detectors and Aspirating Smoke Detection Systems (ASD detection units and associated sampling pipe system) which are used shall be approved by GL or type-approved according to an applicable/recognised standard.

B.1.2 Manual call points and automatically activated fire detectors are to be used in fire detection and alarm systems.

B.1.3 Ingress protection requirements (IP rating according to IEC 60529) shall be observed for the selection of fire detectors and manual call points.

For appropriate IP rating of fire detection equipment in different locations, the column "communication equipment" of in GL Rules for Electrical Equipment (IV-7-5), Section 1, Table 1.4 shall be applied.

B.1.4 Explosion protection requirements shall be observed for the selection of fire detectors and manual call points. Requirements for explosion protection shall be observed according to the location of the detectors. Local standards and authority requirements shall be adhered to.
B.1.5 Automatic detectors shall be activated by heat, smoke or other combustion products, flames or any combination of these factors. Detectors activated by other influences may be approved if their sensitivity is not less than that of the approved detectors.

B.1.6 Flame detectors may generally only be used in addition to the prescribed detectors unless they are installed in areas where other detectors would be ineffective.

B.1.7 The central fire control panel shall be mounted in a suitable control room on the substation. On manned installations the fire control panel should be located in a permanently manned location.

B.1.8 Alarms shall be always transmitted to a permanently manned onshore control room, especially in the case of a normally unmanned offshore substation or a not permanently manned offshore control room.

B.1.9 Clear information shall be displayed at the central fire control panel and at each display panel, indicating which rooms are monitored and the location of the individual sections. In case of a fire, its location shall clearly be indicated, i.e. the respective fire zone.

B.1.10 The activation of a fire detector shall trigger a visual and audible alarm at the central fire control panel and at the additional remote display panels incl. the onshore control station.
For all operating, service and accommodation areas on the offshore substation, this alarm shall normally be passed on to the crew manually using the signalling facilities of the general alarm system. However, if the fire alarm at the central control panel is not acknowledged within 2 minutes, the fire alarm shall be automatically transmitted to all areas of the unit via the general alarm system or shall be audibly and visually signalled via another system suitable for this purpose.

B.1.11 The audible fire alarm signal shall be clearly distinguishable from all other signals.

B.1.12 In workshops and rooms where the activation of detectors is liable to be caused by, for example, welding work, the detectors may be rendered temporarily inoperative. After the expiry of a pre-selected time the detectors shall automatically become operative again.

B.2 Central fire control panel

B.2.1 The installation shall be supplied directly by separate cables from the main and the emergency power supply system. Provision is to be made in the central fire control panel for automatic switch-over to take place should one of the supplies fail. The switch-over shall be signalled visually and audibly.
Cables forming part of the fire detection system are to be so arranged as to avoid galleys, category A machinery spaces and other closed spaces with a high fire risk, except if it is necessary to transmit a fire signal from these spaces, to initiate a fire alarm in these spaces, or to make the connection to the appropriate source of electrical power.

B.2.2 A signal at the central control panel shall indicate that the system is operative.

B.2.3 Each detecting loop is to be provided with its own visual display.

B.2.4 The audible and visual signals shall be maintained until they are acknowledged at the central fire control panel. The acknowledgement shall not suppress further alarms in other detecting loops.

B.2.5 The central station shall be provided with means for testing and disconnecting of individual detectors or detecting loops. When a particular detector / detecting loop is disconnected, this shall be clearly indicated.

B.2.6 The failure or disconnection of a detecting loop shall not affect the operation of another detecting loop.

B.2.7 Detectors responding simultaneously shall not impair the operation of the equipment.
B.2.8 The fire detection system shall be so constructed that any faults which occur, e.g. a supply failure, short circuit or wire breakage in detecting loops, removal of a detector from its socket or an earth fault in detecting loops insulated on all poles, are signalled visually and audibly at the central fire control panel. Fault alarms are to be acknowledgeable and, wherever possible, distinguishable from a fire alarm.

B.2.9 Fire detection systems with a loop-wise indication shall be so designed that
- a loop cannot be damaged at more than one point by a fire
- equipment is available which ensures that a fault in the loop (e.g. wire break, short circuit, earth fault) does not cause failure of the entire loop
- all possible precautions have been taken to allow the function of the system to be restored in the event of a failure (electrical, electronic, affecting data processing)
- the first fire alarm indicated does not prevent the indication of further alarms by other fire detectors

B.2.10 Where the detectors in the alarm mode are not all simultaneously indicated at the central fire alarm panel, the central panel shall have the means of scanning all the detectors which have responded in order to establish clearly whether other detectors are in the alarm mode besides the one indicated.

B.3 Fire detectors

B.3.1 For the requirements concerning arrangement of fire detectors and alarm loops reference is made to GL Rules for General Safety (IV-7-3), Section 9, C.

B.3.2 The following types of detectors may be used depending on local conditions:
- aspirating smoke detection (ASD) units, ionization detectors and optical smoke detectors which respond to a fire even in the initial phase
- differential detectors which respond as soon as a given temperature rise per unit time is exceeded
- heat detectors which respond when a predetermined limit temperature is exceeded
- flame detectors activated, for example, by the infrared or ultraviolet radiation of naked flames
- manual call points

B.3.3 The sensitivity of automatic detectors, either individually or in groups, shall be adaptable to local conditions.

B.3.4 Unless the central fire control panel shows which detector has been activated, each detector shall itself be provided with a visual indicator. This signal shall be maintained pending acknowledgement at the central control panel.

B.3.5 All fire detectors and ASD units shall be so constructed that, after the prescribed regular testing, they are once more serviceable without having to change components.

B.3.6 Where addressable detectors are used, each such detector shall be indicated at the central fire alarm panel, and the audible alarm according to regulations must be initiated.

C Gas Detection Systems

C.1 Design of gas detection systems

C.1.1 For the necessity and general requirements covering gas detection systems on offshore substations and arrangement and location of gas detectors, see also GL Rules for General Safety (IV-7-3), Section 9, A.

C.1.2 Equipment type tested by GL should preferably be used for the central unit and the gas detectors.
C.1.3 The actual alarm limits depend on the properties of the media concerned and are to be de-
cided by agreement with GL.

C.1.4 The gas detection station shall be mounted in a suitable control room on the substation. On
manned installations the gas detection station should be located in a permanently manned location.

C.1.5 Gas alarms shall be also transmitted to a permanently manned onshore control room, espe-
cially in the case of a normally unmanned offshore substation or a not permanently manned offshore con-
trol room.

C.1.6 The gas detection station shall be provided with easily intelligible indications showing which
detectors have been activated and where these are located.

C.1.7 The appropriate arrangement of gas detectors depends on their purpose and the construction
of the area being monitored. Monitoring encompasses both the hazardous areas and areas classified as
„safe”, where it shall be assumed that the latter too could be endangered by an operational malfunction.

C.1.8 The activation of a gas detector shall trip a visual and audible alarm at the central gas detec-
tion station. This alarm shall be passed on to all areas of the unit via the signalling equipment of the gen-
eral alarm system or PA/GA. The audible signal of the gas alarm shall be clearly distinguishable from all
other alarms.

C.1.9 Safety functions initiated by the gas detectors and carried out automatically, e.g.
• the shut-down of a battery charger or a process unit,
• protection of unclassified (safe) areas
are to be designed in accordance with a safety logic tested and approved by GL.

C.2 Gas detection station

C.2.1 The installation shall be supplied with power via separate cables from the main power supply
and an emergency power source. Should one of the power supplies fail, the central gas detection station
shall switch automatically to the remaining supply. The completed switch-over shall trip an alarm.

C.2.2 Each gas detector shall be provided with its own evaluator.

Each evaluator should be equipped as follows:
• two adjustable alarm limit values
• an indicator lamp for the lower limit value
• an indicator lamp for the upper limit value
• an indicator lamp for failures (e.g. wire breakage)
• a pilot light showing that the evaluator is operative
• isolated signal outputs for actuating external alarms and safety circuits
• a reset button

Failure signals shall be acknowledgeable and, as far as possible, distinguishable from a gas alarm.

C.2.3 The measured gas concentrations are to be indicated as a percentage of the lower explosion
limit (LEL) or in ppm in the case of toxic hazard. The detection system shall initiate an alarm in the control
station before the gas concentration reaches dangerous limits. The adjustment of alarm limits depends on
the type of hazardous or toxic gas and shall be agreed with GL.

C.2.4 The central console shall be fitted with a selector switch for the "normal operation" and "test"
modes. The indicating device shall function both in the normal operating mode and in the test mode.

C.2.5 The visual and audible signals, including the external alarms, shall be maintained pending
acknowledgement at the central unit.
The visual signal at the evaluator and switching commands for safety equipment shall not be acknowledgeable until the variable concerned has dropped below the alarm limit value.

It shall be possible to identify the detector giving alarm on the control panel.

In systems for measuring toxic gases the external alarms shall be maintained until the variable concerned drops below the alarm limit value. Only then shall it be possible to acknowledge the external alarm.

C.3 Gas detectors

C.3.1 Gas detectors type tested by GL should be used. In any case, applicable national authority regulations, e.g. ATEX Directive as well as applicable technical standards, e.g. IEC 60079 shall be observed.

C.3.2 Only gas detectors with a type of protection suitable for the particular explosive atmosphere may be used.

C.3.3 Gas detectors shall be provided with sufficient IP rating, depending on their installation location.

C.4 Calibration and testing

C.4.1 Provision shall be made to enable the fixed system to be tested without disruption of the normal routine.

C.4.2 Means shall be provided whereby operational personnel may readily check on the accuracy of gas percentage readings.

In the test mode it shall be possible to test the operation of the individual measuring channels and the calibration of the gas detectors without transmitting control instructions to external equipment.

D Door Closing Systems

D.1 Hinged doors

D.1.1 Fire doors shall be generally self-closing with suitable mechanical devices.

D.1.2 Where fire doors are normally kept open, electric operating devices shall release the catches of these doors if the power supply fails or in case of a fire alarm, so that the doors can close automatically. The closure of the fire doors shall be capable of being initiated at a central point, and an individual release shall also be provided at each door. These devices are to be connected to the emergency power supply.

D.2 Sliding doors and roller shutters

D.2.1 Where sliding doors or roller shutters are installed, the automatic closing speed of such devices shall be defined and a protection system for persons in the door area shall be provided.

D.2.2 Sliding doors and roller shutters, which are operated manually only, are not acceptable within escape routes.

D.2.3 Automatically operated sliding doors, if driven by electrical power, shall be provided with a separate battery unit, supplied by a rectifier connected to the emergency switchboard. Other power sources to drive such doors, e.g. by hydraulic or pneumatic power, are permitted, if supplied by an independent energy storage.

D.2.4 The independent energy storage for operation of automatic doors shall be suitably dimensioned to facilitate at least three opening and closing cycles in case of a main power supply failure.
E  **Indicator Systems for Fire Doors**

E.1 Indicator lights at the control station are to indicate when the fire doors are closed.

E.2 It is permissible for the indicator system to be operated automatically only when a fire alarm is given.

E.3 This system is to be connected to the emergency source of power.

F  **CO₂ Alarm Systems**

F.1 For the general design of CO₂ alarm systems, see GL Rules for General Safety (IV-7-3), Section 8, G.

F.2 The CO₂ alarm system shall be supplied from the emergency switchboard.

F.3 An audible alarm combined with a visual signal shall precede for a sufficient long period the opening of the CO₂ flooding valves.

F.4 The alarm shall continue to be given as long as the flooding valves are open.

G  **Alternative Gas Fire Extinguishing Systems**

G.1 A pressure drop in the extinguishing agent container shall be signalled visually and audibly by the alarm system. If the propellant tanks are released electrically, the release station is to be supplied from two power sources, one of which shall be the emergency power supply.

In this case the supply lines to the containers holding the extinguishing agent are to be laid in such a way that they are fireproof (e.g. in metal conduits), or fire-proof cables are to be used.

The release device is to be self-monitoring and the release circuits are to be monitored for wire breakage and short circuit. Faults are to be signalled visually and audibly.

G.2 The release of each system shall be signalled visually and audibly outside the entrances to the rooms concerned as well as in the control rooms.

G.3 Further requirements defined in GL Rules for General Safety (IV-7-3), Section 8, G are to be observed.
Section 2 Communication and Signalling Equipment

A General Requirements

A.1 Ingress protection (IP rating according to IEC 60529) shall be observed for the selection of communication and signalling equipment (e.g. telephones, radio equipment, loudspeakers, flashing beacons, etc.). For appropriate IP rating of communication and signalling equipment in different locations, the column “communication equipment” in GL Rules for Electrical Equipment (IV-7-5), Section 1, Table 1.4 shall be applied.

A.2 Suitable explosion protection shall be observed for the selection of the above equipment. Requirements for explosion protection shall be observed according to the location of the items. Local standards and authority requirements shall be adhered to.

B External Communication

B.1 For verbal communication to the onshore facilities, a telephone link shall be provided via the subsea data cable. Additionally, a redundant way for verbal communication shall be available, in case of a subsea cable fault and if radio communication to the onshore facilities is not feasible. For redundant verbal communication, e.g. a satellite telephone may be used.

B.2 All substations shall be additionally equipped with suitable radio systems (marine and aeronautical radio) to facilitate communication with ships and helicopters during offshore operations.

B.3 Portable and fixed radio equipment may be used for marine and aeronautical communication. In case fixed radio equipment is used, it shall be supplied from the emergency switchboard and with a transitional source of power, i.e. UPS battery.

B.4 The requirements of the local authorities shall be observed for selection of relevant radio equipment.

C Internal Communication

C.1 Generally, a public address system shall be provided on the offshore substation to facilitate announcements to personnel on board throughout the installation. PA announcements shall be at least possible from the onshore control station and substation control facilities. For the detailed requirements for Public Address and General Alarm Systems please refer to GL Rules for General Safety (IV-7-3), Section 9, D.
C.2 Additionally to the PA system, an internal communication system (e.g. PABX, telephones) is to be provided for exchanging information between all rooms and working places on the substation. The telephones may be also used to make announcements over the public address system.

C.3 Internal communication may be alternatively provided by suitable portable radio equipment, in those areas, where no telephones are installed and disturbances by the substation equipment are not.

C.4 In case of failure of the main power supply, the power supply to the above communication systems shall be automatically switched to the emergency power.

D Signalling Equipment

D.1 In areas with noisy environment, e.g. machinery spaces, visual devices such as flashing beacons shall be installed additionally to the acoustical alarm devices or loudspeakers.
Section 3  Control and Monitoring Systems

A General Requirements

A.1 Scope

A.1.1 This Section contains requirements for the equipment and design of control, monitoring and safety systems necessary for the operation of offshore substations.

A.2 Design criteria

A.2.1 The requirements laid down for each component and system depend on their use and the process-technological conditions. These Rules stipulate the minimum requirements for these.

A.2.2 If special operating conditions call for a particular system design, GL reserve the right to impose additional requirements, depending on the operational and system-specific considerations.

A.2.3 The design of safety measures, open and closed loop controls and monitoring of equipment shall limit any potential risk in the event of breakdown or defect to a justifiable level of residual risk.

A.2.4 Where appropriate, the following basic requirements shall be observed:

- compatibility with the environmental (e.g. IP rating, explosion protection, etc.) and operating conditions
- compliance with accuracy requirements
- recognisability and constancy of the parameter settings, limiting and actual values
- compatibility of the measuring, open and closed loop controls and monitoring systems with the process and its special requirements
- immunity of system elements to reactive effects in overall system operation
- non-critical behaviour in the event of power failure and power restoration
- unambiguous operation
- maintainability, traceability of faults and test capability
- reproducibility of values
- suitable availability of the system, depending on its function, e.g. for safety systems SIL rated equipment or equivalent shall be provided

A.2.5 Automatic intervention shall be provided where damage cannot be avoided by manual intervention.

A.2.6 If danger to persons or to the safety of the installation/unit arising from normal operation or from malfunctions cannot be ruled out, safety devices or safety measures are required.

A.2.7 If danger to machinery and systems arising from faults or malfunctions in control, monitoring and measuring systems cannot be ruled out, protective measures are required.
A.2.8 Where mechanical systems or equipment are either completely or partly replaced by electric / electronic equipment, the requirements relating to mechanical systems and equipment according to GL Rules for *Machinery and Utility Systems (IV-7-4)* shall be met accordingly.

A.3 Construction

A.3.1 Alarm systems, protection and safety systems, together with open and closed loop control systems for essential equipment shall be constructed in such a way that faults and malfunctions affect only the directly involved function.

This applies also to measuring facilities.

A.3.2 For machinery and process systems which are controlled remotely or automatically, control and monitoring facilities shall be provided to permit manual operation.

A.3.3 After disturbances or shutdowns an automatic reset is prohibited. A local manual reset is required. Exceptions have to be approved by GL.

A.3.4 The design of safety devices is to be as simple as possible and must provide reliable operation. Proven safety devices which are not depending on a power source should be preferred.

A.3.5 The suitability and function of safety devices shall be demonstrated in the given application.

A.3.6 Safety devices shall be designed so that potential faults such as loss of power or a broken wire do not create a hazard to human life or to the unit or installation. These faults as well as the tripping of safety devices shall be signalled by an alarm.

A.3.7 The adjustment facilities for safety devices have to be designed so that the last setting can be traced.

A.3.8 Where auxiliary energy is needed for the function of safety devices or systems, this has to be monitored and a failure has to be alarmed. An uninterruptible power supply has to be provided.

A.3.9 Safety systems as well as safety devices shall be independent of other systems of open and closed loop control and alarm systems. Faults in one system shall not affect other systems.

A.3.10 Safety systems shall be designed fail-safe, where applicable, i.e. the closed circuit principle has to be applied. Fail-safe conditions have to be determined before. In case of not defined fail-safe conditions, the monitored working current principle may be applied instead of the closed circuit principle, e.g. for control of fire extinguishing facilities (CO2).

A.4 Maintenance

A.4.1 Access must be provided to all facilities to allow measurements and repairs to be carried out. Facilities such as simulation circuits, test jacks, pilot lamps, etc. are to be provided to allow functional checks to be carried out and faults to be located.

A.4.2 The operational capability of other facilities shall not be impaired as a result of maintenance procedures.

A.4.3 Where the replacement of circuit boards in equipment which is switched on may result in the failure of components or in the critical condition of systems, a warning sign shall be fitted to indicate the risk.

A.4.4 Circuit boards and plug-in connections shall be protected against unintentional mixing up. Alternatively they shall be clearly marked to show where they belong to.

A.5 Tests

A.5.1 The suitability of systems and equipment is to be demonstrated by tests in the manufacturer's works and on site.
A.5.2 Factory acceptance test

A.5.2.1 Manufacturers shall ensure that their products meet the specified requirements and shall carry out and keep records of quality control tests.

A.5.2.2 In the case of extensive systems, tests are to be carried out in the presence of a GL Inspector on the basis of the approved technical documents, i.e. test procedure. These tests will be specified in each case depending on the application and scope of the system.

Exception to this rule may be type-tested equipment as per GL requirement or another institution acknowledged by GL.

A.5.3 On site tests

A.5.3.1 Tests are to be carried out on site on the basis of approved documents in the presence of the Inspector. Functions are to be checked in a coordinated operation with the peripheral equipment. Test procedures have to be approved by GL.

B Scope of Control and Monitoring Systems

B.1 General

B.1.1 As most transformer and converter substations will be normally unmanned during the operation phase, all relevant operational and auxiliary systems on the substation shall be operable and monitored by suitable control systems in order to react appropriately on e.g. fault conditions.

B.1.2 Remote control and monitoring shall be available for e.g.:

- High and Medium Voltage switchgear
- Power and Auxiliary Transformers
- HVDC Control Systems (for converter Substations)
- Low Voltage AC system
- Low Voltage DC system
- UPS Systems including chargers and batteries
- Auxiliary and Emergency Diesel generators
- Protection systems
- Fire fighting systems
- Platform HVAC system
- Cooling systems
- Drain systems
- Security and CCTV systems
- Platform marking systems (e.g AIS, visual navigation aids)
- etc.

B.1.3 Relevant data of the control systems shall be collected and processed in a SCADA (Supervisory Control and Data Acquisition) system for local and remote control of the substation.

B.1.4 Interlocks for electrical protection systems shall be preferably hardwired with potential free contacts or bus systems using a recognized communication protocol, e.g. according to IEC 61850.

B.1.5 Safety interlocks between dedicated safety-relevant (control) systems shall be generally hardwired with potential-free contacts. E.g. Fire Fighting Systems shall be connected this way with the Fire Detection System to initiate the release of extinguishing agent in case of a confirmed fire alarm. Such
interconnection provides maximum reliability and minimum reaction time. Exceptions to the above setup have to be approved by GL.

B.2 Instrumentation of control systems

B.2.1 All field instrumentation including transmitters, CCTV cameras, etc., which is necessary for control and monitoring shall have a suitable ingress protection (IP rating according to IEC 60529) as well as a suitable Explosion protection, if applicable.

B.2.2 For appropriate IP rating of field instruments in different substation locations, the column "communication equipment" in GL Rules for Electrical Equipment (IV-7-5), Section 1, Table 1.4 shall be applied.

B.2.3 Requirements for explosion protection of control system instrumentation shall be observed according to the location of the equipment. Local standards and authority requirements shall be adhered to.

B.2.4 CCTV cameras shall be equipped with a suitable lens cleaning system, if necessary, e.g. on the open deck.

C Data Transmission Links for Remote Control

C.1 All relevant data for control and monitoring of the substation shall be transmitted over the subsea cables (generally by fiber optical cable cores as composite of the high voltage subsea cables) to the onshore facilities.

C.2 As offshore substations are often unmanned, all safety-relevant data provided by safety and control systems and CCTV signals shall be transmitted to the onshore control station besides the operational data.

C.3 A redundant way of control and monitoring data transmission shall be provided additionally to the subsea cables, e.g. by a leased satellite link or microwave radio. Such redundant data communication with (normally) reduced bandwidth shall be suitable to facilitate safe operation of the offshore substation from the onshore control facilities, i.e. the most important safety-relevant data shall be covered by the redundant way of data transmission.