



**Design Division**  
**Engineering Services**  
**ISO – 9001:2008**


**FUNCTIONAL SPECIFICATION**  
**FOR**  
**CLEAN AGENT FIRE**  
**EXTINGUISHING SYSTEM**

SPEC No:	5103
Rev No	2
Discipline	Mechanical
Page 1 of 27	

**FUNCTIONAL SPECIFICATION**  
**FOR**  
**“CLEAN AGENT FIRE EXTINGUISHING SYSTEM”**

Prepared/Revised by	Reviewed by	Approved By	Total Pages	Date	Rev. No.
KNS	NM	AJ	27	02.01.2019	2
NG	VBD	PKM	27	27.04.2011	1
PLN	VBD	JSS	27	10.07.2008	0

FORMAT No.	Ref. PROCEDURE No.	ISSUE No.	REV. No.	REV. DATE:
ODS/SOF/004	ODS/SOP/023	01	00	21.07.2010

	<b>Design Division</b> <b>Engineering Services</b> <b>ISO – 9001:2008</b>	<b>FUNCTIONAL SPECIFICATION</b>  <b>FOR</b> <b>CLEAN AGENT FIRE</b> <b>EXTINGUISHING SYSTEM</b>	SPEC No:	5103
			REV No	2
			DISCIPLINE :	Mechanical
			PAGE No. 2 OF 27	

## CONTENTS

### 1.0 INTRODUCTION

- 1.1 Scope
- 1.2 Purpose
- 1.3 Application of this Document
- 1.4 Contractor/vendor's Responsibilities
- 1.5 Sub-Contractors/ Sub Contractor/Vendors

### 2.0 CODES, STANDARDS AND REFERENCE DOCUMENTS

- 2.1 Codes, Standards and Regulations
- 2.2 Reference Specifications and Drawings

### 3.0 SCOPE OF SUPPLY

- 3.1 General
- 3.2 Equipment furnished
- 3.3 Acceptance Criteria


### 4.0 ENVIRONMENTAL DESIGN CRITERIA AND UTILITIES

- 4.1 Climatic Conditions
- 4.2 Design Life, Availability and Reliability
- 4.3 Area Classification

### 5.0 SYSTEM DESIGN CRITERIA

- 5.1 System Design
- 5.2 Pipes, Valves and fittings
- 5.3 Protective painting
- 5.4 Safety
- 5.5 General Plant Process Design
- 5.6 Performance
- 5.7 Mechanical Requirements
- 5.8 Materials
- 5.9 Welding
- 5.10 Electrical
- 5.11 Operating Device
- 5.12 Instrumentation and Controls
- 5.13 Insulation
- 5.14 Fire Protection
- 5.15 Utilities
- 5.16 Skid

FORMAT No.	Ref. PROCEDURE No.	ISSUE No.	REV. No.	REV. DATE:
ODS/SOP/004	ODS/SOP/023	01	00	21.07.10

	<b>Design Division</b> <b>Engineering Services</b> <b>ISO – 9001:2008</b>	<b>FUNCTIONAL SPECIFICATION</b>  <b>FOR</b> <b>CLEAN AGENT FIRE</b> <b>EXTINGUISHING SYSTEM</b>	SPEC No:	5103
			REV No	2
			DISCIPLINE :	Mechanical
			PAGE No. 3 OF 27	

## **6.0 CLEAN AGENT FIRE EXTINGUISHING SYSTEM PACKAGE DESIGN**

## **7.0 INSPECTION, TESTING AND CERTIFICATION**

- 7.1 General
- 7.2 Quality Assurance
- 7.3 Shop Inspection and Testing
- 7.4 Material and Welding Inspection

## **8.0 WARRANTY**

## **9.0 SPARE PARTS & TOOLS**

- 9.1 Spare Parts
- 9.2 Special Tools

## **10.0 CONTRACTOR DATA REQUIREMENTS**


- 10.1 Along with the Technical Bid
- 10.2 After award of the Contract

## **11.0 CORROSION PROTECTION AND PREPARATION FOR SHIPMENT**

- 11.1 Painting and Protective Coatings
- 11.2 Preparation for Shipments

### **Annexure-1**

FORMAT No.	Ref. PROCEDURE No.	ISSUE No.	REV. No.	REV. DATE:
ODS/SOF/004	ODS/SOP/023	01	00	21.07.10

	<b>Design Division</b> <b>Engineering Services</b> <b>ISO – 9001:2008</b>	<b>FUNCTIONAL SPECIFICATION</b>  <b>FOR</b>  <b>CLEAN AGENT FIRE</b>  <b>EXTINGUISHING SYSTEM</b>	SPEC No:	5103
			REV No	2
			DISCIPLINE :	Mechanical
			PAGE No. 4 OF 27	

## 1.0 INTRODUCTION

### 1.1 Scope

The specification covers the minimum and the functional requirements for design, supply of materials, manufacture/fabrication, transportation, installation, testing, pre-commissioning and commissioning of **“Clean Agent Fire Extinguishing System”**.

### 1.2 Purpose

The purpose of the Clean Agent Fire Extinguishing System is to ensure fire protection of normally occupied areas such as Control rooms, Switch Gear room, Battery room etc. as specified in Annexure 1, in offshore installations.

### 1.3 Application of this Document

The scope of this document is limited to the Offshore Platform Project. This document shall not be used for any other purpose.

### 1.4 Contractor/vendor's Responsibilities

The Contractor/vendor shall be responsible for the complete engineering, coordination, design, manufacture, supply, inspection, testing, preparation for shipment, installation and commissioning of the clean agent Fire extinguishing system including full compliance with all applicable design codes, standards and the specifications as listed in Section 2.0 of this specification.

The items shall preferably be supplied by the Contractor/vendor as a standard package. Contractor/vendor shall comply with all the requirements of this Specification and its attachments.

### 1.5 Sub-Contractors /Vendors

Approval shall be obtained from the Company before any work is subcontracted or any equipment is purchased from any sub Vendor whose name does not appear in Suggested Vendor list of this tender.


## 2.0 CODES, STANDARDS AND REFERENCE DOCUMENTS

### 2.1 Codes, Standards and Regulations

The following codes, standards and regulations (latest edition) shall be referred to and made a part of this specification for the detailed design of the Clean Agent System:

- OISD – STD – 116 (latest): Fire Protection Facilities For Petroleum Refineries & Oil / Gas Processing Plant (Oil Industry Safety Directorate , Government Of India, Ministry of Petroleum & Natural Gas)

FORMAT No.	Ref. PROCEDURE No.	ISSUE No.	REV. No.	REV. DATE:
ODS/SOF/004	ODS/SOP/023	01	00	21.07.10

	<b>Design Division</b> <b>Engineering Services</b> <b>ISO – 9001:2008</b>	<b>FUNCTIONAL SPECIFICATION</b>  <b>FOR</b> <b>CLEAN AGENT FIRE</b> <b>EXTINGUISHING SYSTEM</b>	SPEC No:	5103
			REV No	2
			DISCIPLINE :	Mechanical
			PAGE No. 5 OF 27	

- NFPA 2001 (latest edition): Standards on Clean Agent Fire Extinguishing Systems.
- API RP 14 G: Recommended practice for fire prevention and control on open type offshore production platform.
- BS – 5445, 5446, 5839 (For Detectors)
- NFPA 70: National Electric Code
- NFPA 72: National Fire Alarm Code
- SMPV (static and mobile pressure vessels (unfired)) Rules, PESO (Petroleum & Explosive Safety Organization, Chief Controller of Explosive, Nagpur, India) (for storage containers)
- TAC (Tariff Advisory Committee) Approval.
- Clean Agent manufacturer's recommendation.

## 2.2 Reference Specifications and Drawings.

The Clean agent Fire Extinguishing system Package covered by this Specification shall be designed, manufactured and tested in accordance with the requirements of the following Project Specifications:


- Mechanical, Safety and Life Saving Equipment Design criteria
- P&ID / other Process related documents.
- Instrumentation Design criteria.
- Instrumentation Specification for Packaged Equipment 3503
- Specifications for Electrical Equipment with Packaged Plant FS 4017
- Specification for medium voltage motors FS 4008
- Specification for Insulation of Piping and Equipment Spec. No. 2006
- Specification for Packaged Equipment Spec. No. 5100P.
- Specification for Structural Welding and Inspection for Offshore Platform Spec. No. 2009F
- Protective Coatings for Offshore Structures and Facilities Spec. No. 2005
- FS for Fire and Gas detection , FS-3500
- FS for Instrumentation cables, FS-3508
- FS for Safety Specification, FS -5102
- FS for Safety Studies, FS-5101

## 3.0 SCOPE OF SUPPLY

### 3.1 General

This specification and referenced specifications, outlines the minimum requirements for complete Clean Agent Fire extinguishing system.

FORMAT No.	Ref. PROCEDURE No.	ISSUE No.	REV. No.	REV. DATE:
ODS/SOF/004	ODS/SOP/023	01	00	21.07.10

	<b>Design Division</b> <b>Engineering Services</b> <b>ISO – 9001:2008</b>	<b>FUNCTIONAL SPECIFICATION</b>  <b>FOR</b> <b>CLEAN AGENT FIRE</b> <b>EXTINGUISHING SYSTEM</b>	SPEC No:	5103
			REV No	2
			DISCIPLINE :	Mechanical
			PAGE No. 6 OF 27	

This specification does not dictate detailed design of the equipment or assembly of components. It is intended that those responsibilities be retained fully by the Contractor/vendor so that all equipment and process warranties remain unmitigated.

The Contractor/vendor shall have single point responsibility for the entire Clean Agent Fire extinguishing system which shall include the survey if any required, complete design, engineering, coordination, manufacture, testing delivery and proper functioning of the equipment, not withstanding any omissions from this specification.

The Contractor/vendor shall not commence manufacturing and/or purchasing of the required equipment/materials until required contractor/vendor drawings and datasheet(s) have been submitted to, and approved by the Company.

### 3.2 Equipment furnished

The Contractor/Vendor shall supply all necessary equipment as described hereinafter to make a complete and operable unit. This shall include but not be limited to the following:

Contractor/vendor shall supply the following minimum equipment and auxiliary systems and all other requirements in accordance with this specification. Any equipment that is required for safe operation and shutdown of the Clean Agent Fire extinguishing System as determined by the Company but not specifically identified herein shall also be included in the Contractor's scope of supply.

The Contractor/vendor shall be responsible for the complete design, engineering, co-ordination, manufacture, inspection and testing, delivery and pre-commissioning and commissioning of the equipment, not withstanding any omissions from this specification.


The system shall be designed to meet the requirements of total flooding fire extinguishing Clean Agent system as per NFPA 2001(latest edition) and having design concentration for the risk to be protected as specified at 70 deg. F (21deg.C).

All equipment's shall be approved by UL/FM/Vds/LPCB and cylinders along with cylinder valve assemblies shall be seamless and PESO (Petroleum & Explosive Safety Organization, Chief Controller of Explosive, Nagpur, India) approved.

The Contractor/vendor shall supply all the items listed below as a minimum and other items considered necessary to meet the performance guarantees.

- Electrically actuated automatic Clean Agent Fire Extinguishing System complete with filled up Clean Agent cylinders, cylinders rack, manifolds, Control Panels with inbuilt logics, push buttons, lamps etc., cylinder valves, piping, discharge nozzles, brackets, supports, hangers and such other fittings as necessary for complete installation of the system. The system shall also comprise of the different modes of operation, actuation and cancellation facility etc. with necessary local control panel.

FORMAT No.	Ref. PROCEDURE No.	ISSUE No.	REV. No.	REV. DATE:
ODS/SOF/004	ODS/SOP/023	01	00	21.07.10

	<b>Design Division</b> <b>Engineering Services</b> <b>ISO – 9001:2008</b>	<b>FUNCTIONAL SPECIFICATION</b>  <b>FOR</b> <b>CLEAN AGENT FIRE</b> <b>EXTINGUISHING SYSTEM</b>	SPEC No:	5103
			REV No	2
			DISCIPLINE :	Mechanical
			PAGE No. 7 OF 27	



- Audible and visual Pre-discharge alarms and mechanical/ electrical discharge delays shall be provided. They shall be of sufficient duration to warn personnel of an impending discharge of Clean Agent and allow for hazard area evacuation and preparation. Warning signs shall be provided at each entrance to the hazard area. Upon entering the alarm mode, audible indication shall be supplied by the steady sounding of an alarm electronic sounder. The sounder shall be provided with a red finish. This unit shall be polarized for full supervision and U.L. listed. It shall have an output of 86-90 dBA at 24 V (DC). All field wiring connections shall be made to terminal strips or wire leads on the device. The design shall be in accordance with the requirements of NFPA-2001.

- The system shall also comprise of both Automatic and Manual actuation, cancellation (abort) facility etc. with necessary control panel.

- Abort switches shall be located within the protected area and shall be located near the means of egress for the area. The abort switch shall be of a type that requires constant manual pressure to cause abort. In all cases, the normal manual control and the manual emergency control shall override the abort function. Operation of the abort function shall result in both audible and distinct visual indication of system impairment. The abort switch shall be clearly recognizable for the purpose intended.

- The Clean Agent Fire Extinguishing Systems shall include a detection sub system, agent storage and releasing sub-system.

- The clean agent fire system cylinders, valves, discharge hoses, nozzles, panels etc. must be considered from the same OEM to ensure proper performance as a system with UL/FM approvals.

- System supplied shall be approved by UL/FM/Vds/LPCB. Design calculation of the Clean Agent fire extinguishing system shall be certified by any international accredited certifying agency. Flow calculations for each system shall be done to comply with design parameters as specified in NFPA-2001. System operating devices shall be listed or approved as per NFPA-2001

- Complete system shall be suitable for marine environment.


All the above components shall be fully assembled, piped with outlet/inlet piping as applicable terminated at the skid edge with appropriately rated flanges, wired, tested and painted for marine environment.

### 3.3 Acceptance Criteria

As a minimum requirement:

- Contractor/Vendor shall have designed, manufactured/packaged, tested and supplied at least two units/systems of similar type, design and of equal or higher capacity/rating of the offered equipment/package/model at the proposed manufacturing plant in last 10 years.

FORMAT No.	Ref. PROCEDURE No.	ISSUE No.	REV. No.	REV. DATE:
ODS/SOP/004	ODS/SOP/023	01	00	21.07.10

	<b>Design Division</b> <b>Engineering Services</b> <b>ISO – 9001:2008</b>	<b>FUNCTIONAL SPECIFICATION</b>  <b>FOR</b> <b>CLEAN AGENT FIRE</b> <b>EXTINGUISHING SYSTEM</b>	SPEC No:	5103
			REV No	2
			DISCIPLINE :	Mechanical
			PAGE No. 8 OF 27	

- At least one such unit/system shall have been successfully commissioned and in service for a period of two years on an offshore platform prior to the issue of the bid package.

#### 4.0 ENVIRONMENTAL DESIGN CRITERIA AND UTILITIES

##### 4.1 Climatic Conditions

The Climatic and other conditions under which the Equipment will operate are detailed elsewhere in the Bid Package.

The Equipment will be operated on an offshore platform.

The Contractor is responsible for ensuring that all equipment and components provided are suitable for the utility and environmental conditions as specified in the bid package.

##### 4.2 Design Life



Equipment shall be designed and constructed for a minimum service life equal to platform life mentioned elsewhere in the bid package.

##### 4.3 Area Classification

Electrical and instrumentation will be rated for the applicable Hazardous Area Classification specified according to API RP 500/505 definitions.

#### 5.0 SYSTEM DESIGN CRITERIA


##### 5.1 System Design

**5.1.1** Contractor/vendor to note that Clean Agent System design shall meet the guidelines of NFPA-2001 (latest edition) including its safety guidelines with respect to “Hazards to Personnel”, electrical clearance and environmental factors in line with environmental considerations of Kyoto & Montreal Protocols and clean agent shall be selected as per latest OISD-STD-116 and in line with latest MoEF (Ministry of Environment & Forest, Government of India) regulations/guidelines and shall be an approved clean agent by MoEF. The clean agent shall comply with the requirements of the “Ozone Depletion Substances Regulation & Control Rules 2000”, Ministry of Environment & Forests, Government of India. Selected Clean Agent design concentration shall be less than NOAEL (No Observable Adverse Effect Level) value as specified in NFPA – 2001 (latest edition) by volume and suitable for using in occupied areas.

**5.1.2** The system shall be designed to protect the largest single hazard or group of hazards to be protected simultaneously in a particular building and Clean Agent system to be provided shall meet the requirements of NFPA-2001 (Latest edition).

FORMAT No.	Ref. PROCEDURE No.	ISSUE No.	REV. No.	REV. DATE:
ODS/SOF/004	ODS/SOP/023	01	00	21.07.10



	<b>Design Division</b> <b>Engineering Services</b> <b>ISO – 9001:2008</b>	<b>FUNCTIONAL SPECIFICATION</b>  <b>FOR</b> <b>CLEAN AGENT FIRE</b> <b>EXTINGUISHING SYSTEM</b>	SPEC No:	5103
			REV No	2
			DISCIPLINE :	Mechanical
			PAGE No. 9 OF 27	

**5.1.3** Clean Agent properties shall be as per NFPA-2001 (latest edition). Each batch shall be tested and certified to the NFPA specification. Agent blend shall remain homogeneous in storage and use within the listed offshore environment temperature range and condition of service encountered.

**5.1.4** In case the system is designed for the largest risk and there are several risks varying in size in a particular building, the system design shall permit use of required cylinders for any individual risk involved so that the concentration of gas in that risk does not be less than the minimum specified concentration. However, Contractor/Vendor shall verify its usage and concentration before offering the system.

**5.1.5** The agent discharge shall be substantially completed in a nominal 10 seconds, or a shorter time. This period shall be measured as the interval between the first appearance of agent at the nozzle and the time when the discharge becomes predominantly gaseous. Hydraulic calculations shall be undertaken to provide information on:-

1. Pipe diameters.
2. Nozzle Orifice size determined by flow rate and system design requirements.
3. System flow and pressures.

System flow calculations shall be performed using A CALCULATION METHOD LISTED OR APPROVED BY THE AUTHORITY HAVING JURISDICTION (i.e. UL/FM/Vds). The system design shall be within the manufacturers listed limitations.

Approval certificate of software from the UL/FM/Vds/LPCB etc. shall be submitted along with the offer.


#### **5.1.6 Clean Agent Quantity**

**5.1.6.1** The amount of clean agent to be provided shall be the amount required to obtain a uniform concentration as per NFPA-2001/ clean agent manufacturer's recommendations. Factors such as opening (if any), "rundown" time of fans, time required for dampers to close, and any other feature of the facility that could affect concentration shall be taken into consideration. The design concentration shall be by volume at 21 deg.C (70deg.F).

**5.1.6.2** Clean Agent concentration requirement shall be computed considering the volume of the hazard.

The quantity of clean agent required for local application systems shall be based on the rate of discharge and the time that the discharge must be maintained to ensure complete extinguishment. The minimum design quantity shall be no less than 1.5 times the minimum quantity required for extinguishment at any selected system discharge rate.

FORMAT No.	Ref. PROCEDURE No.	ISSUE No.	REV. No.	REV. DATE:
ODS/SOF/004	ODS/SOP/023	01	00	21.07.10

	<b>Design Division</b> <b>Engineering Services</b> <b>ISO – 9001:2008</b>	<b>FUNCTIONAL SPECIFICATION</b>  <b>FOR</b> <b>CLEAN AGENT FIRE</b> <b>EXTINGUISHING SYSTEM</b>	SPEC No:	5103
			REV No	2
			DISCIPLINE :	Mechanical
			PAGE No.	10 OF 27

In addition to the concentration requirement shall be specified 10 % of the gas quantity as computed above shall be added to compensate for leakages and extinguishing efficiency.

The Clean Agent system shall be provided for the areas to be protected as specified in Annexure – I and quantity of Clean Agent shall be worked out by the contractor/vendor.

- 5.1.6.3** Clean Agent banks with filled up 100% stand by cylinders shall be provided for the risk protected (largest single or group of hazards). Each reserve supply shall contain an amount of Clean Agent equal to the primary supply of the system to which it is connected. Both main and reserve cylinders shall be permanently connected to the distribution piping through manifold and arranged for easy and auto changeover. The suppression system shall be designed separately for each building with 100% standby for areas. The system for every individual building shall have its own storage, distribution piping, nozzles etc.

#### **5.1.7 Clean Agent Storage Cylinders**

- 5.1.7.1** The Clean Agent shall be stored in cylinders designed to hold Clean Agent at ambient temperatures. Cylinder shall be seamless, brand new and never retested and approved. The new cylinders shall be charged to filling density as per NFPA-2001.

- 5.1.7.2** Each agent container shall have a permanent name plate specifying the agent, serial number, tare and gross weight, weight/volume of Clean Agent stored in addition to the super – pressurization level of the container.

- 5.1.7.3** Storage temperature shall not exceed 130 °F (55°C) nor be less than 20 °F (-29°C) for total flooding system.


- 5.1.7.4** All cylinders shall bear the mark of manufacturer, serial number and shall be duly approved by PESO (Petroleum & Explosive Safety Organization, Chief Controller of Explosive, Nagpur, India). Cylinders without the approval will not be accepted.

- 5.1.7.5** A reliable means of indication, other than weighing shall be provided to determine the pressure in refillable cylinder. The means of indication shall account for variation of cylinder pressure with temperature.

- 5.1.7.6** Storage cylinders shall be arranged in the following manner :

- i. The Clean Agent cylinders (Main + Reserve) shall be securely supported on skids with provision for convenient individual servicing, according to the manufacturers installation manual. Such servicing shall be possible without shutting down the system.
- ii. A reserve battery of cylinders with manifold and automatic change over to any of the two banks after actuation shall be provided. The reserve of standby Clean Agent cylinders shall be 100% of the quantity required for the risk to be protected.
- iii. On multiple cylinder arrangements (discharge into a common hazard), one cylinder shall be designated as the pilot cylinder and employ the restorable electric actuator, mechanical manual actuator, or both.
- iv. The manifold cylinders referred to above shall be adequately mounted on the floor and suitably supported in a rack with provision for convenient individual servicing

FORMAT No.	Ref. PROCEDURE No.	ISSUE No.	REV. No.	REV. DATE:
ODS/SOF/004	ODS/SOP/023	01	00	21.07.10

	<b>Design Division</b> <b>Engineering Services</b> <b>ISO – 9001:2008</b>	<b>FUNCTIONAL SPECIFICATION</b>  <b>FOR</b> <b>CLEAN AGENT FIRE</b> <b>EXTINGUISHING SYSTEM</b>	SPEC No:	5103
			REV No	2
			DISCIPLINE :	Mechanical
			PAGE No. 11 OF 27	


and content weighing. Such servicing or weighing shall be possible without shutting down the system.

- 5.1.7.7** Each cylinder shall be equipped with a pressure seat-type valve and gauge. Each valve shall also include a safety pressure relief device to protect against excessive pressure condition. Minimum design level pressure of storage cylinder shall be as per NFPA-2001.
- 5.1.7.8** Where multiple cylinders are required for one hazard area, a common manifold shall be used. Each cylinder shall discharge through the manifold through common piping and discharge nozzles. All Clean Agent cylinders supplying the same manifold outlet for distribution of the Clean Agent shall be interchangeable and of one select size and charge. Each cylinder on a manifold shall also include an agent check valve installed to the manifold inlet.
- 5.1.7.9** The releasing device (control head) of the cylinders shall be easily removable from the cylinder without emptying the cylinder. While removed from the cylinder, the releasing device shall be capable of being operated, with no replacement of parts required after operation.
- 5.1.7.10** The releasing device shall also be capable of direct manual actuation, providing a means of discharge in the event of total electrical malfunction. The device shall be provided with a manual lever and a faceplate with clear instructions on how to mechanically activate the system.
- 5.1.7.11** Clean Agent cylinders and accessories shall be so located and arranged that inspection; testing, recharging and other maintenance is facilitated. The skids for Clean Agent cylinders shall be provided with canopies to protect the cylinders from severe weather conditions and/or mechanical, chemical or other damage.
- 5.1.7.12** In case of a Revamp Project, Pre-engineering survey is required to be made and ascertain the exact dimensions of each room, routing of piping and locations of cylinders etc for installing the clean agent fire extinguishing system. Actuation of new Clean agent shall be through Fire & Gas panel. All hardware required for interfacing between Clean Agent system and Fire & Gas system/control system shall be contractor scope of supply and work. This shall include supply of interconnection cables, cable glands, junction boxes (as applicable) etc.

## **5.2 Pipes, Valves and Fittings**

- 5.2.1** The system piping shall be of non-combustible material having physical and chemical characteristics such that its integrity under stress can be predicted with reliability. All pipe fittings shall satisfy the applicable requirements of NFPA-2001(latest) including Annexure - A. Pipe and fittings shall be provided and installed as per NFPA-2001 (latest edition) including Marine System requirements. Piping shall be Galvanized steel pipe as per ASTM A-106, ANSI B 36.10.  
Under no conditions cast iron pipe, steel pipe conforming to ASTM A-120 or non-metallic pipe or ASTM A-53 shall be used.
- 5.2.2** Normally welded joints shall be provided. Threaded pipes if used shall have threads in joints and fittings conforming to ANSI B 1.20.1.
- 5.2.3** All valves shall be listed or approved for the intended use. The gaskets O-ring and other valve material shall be compatible with the agent and shall meet the NFPA requirement.

FORMAT No.	Ref. PROCEDURE No.	ISSUE No.	REV. No.	REV. DATE:
ODS/SOF/004	ODS/SOP/023	01	00	21.07.10

	<b>Design Division</b> <b>Engineering Services</b> <b>ISO – 9001:2008</b>	<b>FUNCTIONAL SPECIFICATION</b>  <b>FOR</b>  <b>CLEAN AGENT FIRE</b>  <b>EXTINGUISHING SYSTEM</b>	SPEC No:	5103
			REV No	2
			DISCIPLINE :	Mechanical
			PAGE No. 12 OF 27	


Valves shall be installed as necessary to bypass and allow removal of duplicate components for maintenance without shutting down or draining the complete system.

- 5.2.4** The nozzle orifice shall be such as to discharge the entire quantity of Agent within 10 seconds time through the number of nozzles fed by the system. Each nozzle shall be permanently marked to identify by the part number orifice code, or other suitable marking as specified by the authority having jurisdiction. Nozzles shall be UL listed and/or FM approved.
- 5.2.5** It is to be taken care of that the space above false ceiling is required also for running electrical conduits and clean agent piping therefore shall have to be laid in a manner to accommodate the electrical conduits. The clean agent piping and nozzles etc. shall have to be planned clearing other facilities coming in the areas where agent protection is being envisaged.
- 5.2.6** Equipment shall be oriented on the Package to allow as much space as possible between pieces of equipment to facilitate maintenance. Adequate space shall be allowed for access to and maintenance of package components without removing any major assembly.
- 5.2.7** Piping shall be installed in accordance with good engineering practice and care should be taken to avoid possible restrictions due to foreign matter, faulty fabrication or improper installation.
- 5.2.8** Piping joints shall be suitable for the design conditions and shall be selected with consideration of joint tightness and mechanical strength.
- 5.2.9** An orifice union/nipple shall be included in the manifold to reduce pressure in the downstream pipe network. Orifice union/nipple assemblies shall be permanently marked with the manufacturer's orifice code. The orifice union/nipple shall be threaded directly to the manifold piping without use of special adapters and orifice union/nipple assemblies shall be UL listed and/or FM/Vds/LPCB approved for intended use.
- 5.2.10** Piping shall be arranged in such a manner as to avoid tripping or overhead problems. Piping or tubing of insufficient mechanical strength for standing on or hanging from shall be protected from personnel traffic. All piping and tubing shall be adequately supported.
- 5.2.11** Fittings shall have a minimum rated working pressure equal to or greater than the minimum design working pressure as specified in NFPA-2001. As a minimum, fittings beyond the orifice union/nipple shall be corrosion resistant and ordinary cast iron fittings shall not be used.

### **5.3 PROTECTIVE PAINTING**

Painting and coloring of piping, nozzles, Agent storage containers, supports, etc. shall be done as per relevant functional specifications including supply of all paints and consumables and other items required for carrying out painting and coloring.

FORMAT No.	Ref. PROCEDURE No.	ISSUE No.	REV. No.	REV. DATE:
ODS/SOP/004	ODS/SOP/023	01	00	21.07.10

	<b>Design Division</b> <b>Engineering Services</b> <b>ISO – 9001:2008</b>	<b>FUNCTIONAL SPECIFICATION</b>  <b>FOR</b> <b>CLEAN AGENT FIRE</b> <b>EXTINGUISHING SYSTEM</b>	SPEC No:	5103
			REV No	2
			DISCIPLINE :	Mechanical
			PAGE No. 13 OF 27	

#### 5.4 SAFETY

It is the intent of the Company that operational hazards be reduced to a minimum. Contractor shall use sound engineering judgment to complete an installation that will perform the required process function without compromising this aim. The packages shall be designed in accordance with API RP 14C, "Recommended Practice for Analysis, Design, Installation and Testing of Basic Safety Systems on Offshore Production Platforms."

All electrical devices shall meet the requirements for the area classification in which they are installed.

All controls shall operate in a fail-safe mode.

Piping shall be arranged in a manner so as to avoid tripping or headroom problems. Piping or tubing of insufficient mechanical strength for standing or hanging shall be protected from personal traffic.

The unit shall be suitably earthed to prevent stray currents causing corrosion to external equipment.

The Contractor shall conduct a HAZOP study on the complete Clean Agent Fire Extinguishing System.

#### 5.5 GENERAL PLANT PROCESS DESIGN

Sufficient descriptive information including a process flow-sheet with heat and material balances and piping and instrument drawings (P&ID's) shall be furnished with the Equipment Contractor/Vendor's quotation to enable equipment size, weight, performance, quality, capacity and specification adherence to be determined. The Process Flow Diagram shall include all vapour and liquid flows, temperatures, pressures, power & chemical consumption and other relevant physical properties to enable full evaluation of the proposed system. The P&IDs shall provide details of line sizes, control valve sizes, control logic, process and safety set-points.


The Contractor shall furnish all calculations and/or design criteria necessary to confirm Clean Agent flow rate and all other process criteria.

#### 5.6 PERFORMANCE

The Contractor/vendor shall guarantee the process performance of all the Equipment in the Clean Agent Fire Extinguishing System. The guarantee shall extend to the design parameters specified on the Data Sheet as per applicable codes, practices etc and furnished by Contractor/Vendor.

Performance test at the design conditions and performance requirements as per relevant codes and standards needs to be carried out by contractor. Results of the performance test evaluation and operational data along with necessary engineering calculation shall be used to determine if the system meets guarantee requirements.

FORMAT No.	Ref. PROCEDURE No.	ISSUE No.	REV. No.	REV. DATE:
ODS/SOF/004	ODS/SOP/023	01	00	21.07.10

	<b>Design Division</b> <b>Engineering Services</b> <b>ISO – 9001:2008</b>	<b>FUNCTIONAL SPECIFICATION</b>  <b>FOR</b>  <b>CLEAN AGENT FIRE</b>  <b>EXTINGUISHING SYSTEM</b>	SPEC No:	5103
			REV No	2
			DISCIPLINE :	Mechanical
			PAGE No. 14 OF 27	

## 5.7 MECHANICAL REQUIREMENT

Man-holes/hand holes/inspection openings (if any), instrumentation, valves, etc., shall be located for ease of operation and maintenance. The Contractor's design shall provide access ladders, walkways, and platforms to service and maintain equipment that cannot be reached the Package deck level.

Access to all equipment on the Packages for operation, maintenance, etc. is of utmost importance. All equipment, such as filters and other components that require on-line maintenance shall be clearly identified and located in accessible positions. Removal of other piping or equipment to provide access to maintain equipment is not acceptable.

The minimum overhead clearance for piping shall be 2.2 m (Including any insulation).

## 5.8 MATERIALS

Materials of construction shall be selected to suit the fluid medium in which it is in contact and shall be suitable for offshore service. The process and Equipment design life shall be equal to platform life.

All materials shall be new and in accordance with the manufacturing requirements of API RP14E. Actual ASTM numbers and grades for all materials shall be specified on Contractor's data sheets.

All carbon and low-alloy steel equipment in these services shall be post weld heat-treated.

No asbestos or asbestos-based products shall be used.

## 5.9 WELDING

All welding shall be the responsibility of the Contractor and shall be in accordance with the appropriate Codes and Specifications as follows:

- Piping ASME B31.3
- Packaged equipment/Exchangers ASME VIII Div. 1 and ASME IX.
- American Welding Society Code.
- Project specification for Structural Welding and inspection for Offshore Platforms.


Each weld procedure shall be covered by a suitable procedure qualification tested in accordance with the requirements of ASME IX.

## 5.10 ELECTRICAL

All electrical devices and equipment shall meet the requirements for the area classification detailed on respective Data Sheets to be furnished by contractor.

FORMAT No.	Ref. PROCEDURE No.	ISSUE No.	REV. No.	REV. DATE:
ODS/SOF/004	ODS/SOP/023	01	00	21.07.10



	<b>Design Division</b> <b>Engineering Services</b> <b>ISO – 9001:2008</b>	<b>FUNCTIONAL SPECIFICATION</b>  <b>FOR</b> <b>CLEAN AGENT FIRE</b> <b>EXTINGUISHING SYSTEM</b>	SPEC No:	5103
			REV No	2
			DISCIPLINE :	Mechanical
			PAGE No. 15 OF 27	

All electrical work on the Conditioning Package shall conform to the project specification for Electrical Equipment of Packaged Plant (FS-4017).

Necessary controls/interlocks shall be provided as per process requirements/ P&IDs.

All equipment selected for hazardous area shall be certified by BASEEFA, UL, FM, CMRI or an internationally recognized certification agency for the service and area in which it is to be used.

Electric Supply: The fire detection alarm and suppression system shall be suitably for 24 V DC. The Company shall provide 240V/415V  $\pm$  6%, 50 HZ + 3%, 1 phase / 3 phase power supply at a convenient point or as recommended by the Contractor/Vendor. Converter required shall be in Contractor/Vendor's scope

#### 5.11 Operating Devices:


- a) In addition to Automatic actuation, there shall be a manual release station (MRS) and manual release inhibit station (MRI) shall be located just outside the room at each door so as to be conveniently and easily accessible at all times including the time of fire. The MRS shall provide a means of manually discharging the automatic fire extinguishing system when used in conjunction with the control panel. The MRS switch shall be of the "dual action" type, to prevent accidental operation. The switch shall remain in the operated position until reset by means of a key. This control shall cause the complete system to operate in its normal fashion.
- b) The automatic Clean Agent system shall be of robust design and shall not be readily rendered in-operative easily. The system shall be designed to function properly from 20 deg F (- 29 degC) to 130 deg F ( 55 degC ).
- c) Such normal controls shall not require a pull of more than 40 lb or a movement of more than 14 inch to secure operation. At least one manual control for activation shall be located not more than 5 ft above the floor.
- d) i) A signal shall be provided from the Agent control panel to shut off the air handling unit and air conditioning dampers / louvers.  
ii) Supervision of automatic systems shall be provided and shall included electrical supervisions of the actuating device and the wiring connecting the actuation device and the detection system.
- e) Operating instructions shall be displayed on a name plate fitted permanently on the Clean Agent Skid.

#### 5.12 INSTRUMENTATION AND CONTROLS

The system shall have a main control console and shall consist of

- i) Two alarms and one fault indicator lamp for each zone to be protected.

FORMAT No.	Ref. PROCEDURE No.	ISSUE No.	REV. No.	REV. DATE:
ODS/SOF/004	ODS/SOP/023	01	00	21.07.10

	<b>Design Division</b> <b>Engineering Services</b> <b>ISO – 9001:2008</b>	<b>FUNCTIONAL SPECIFICATION</b>  <b>FOR</b> <b>CLEAN AGENT FIRE</b> <b>EXTINGUISHING SYSTEM</b>	SPEC No:	5103
			REV No	2
			DISCIPLINE :	Mechanical
			PAGE No. 16 OF 27	

- ii) Combination of alarm silence and alarm off switch.
- iii) Combination of fault silence one trouble lamp switches.
- iv) Alarm test switch.
- v) Alarm re-set switch.
- a) The installation shall have arrangement to indicate by alarm as well as indication about actuation of the system, hazard to personnel of failure of any supervised system. The extent and type of alarms or indicators equipment shall be to the satisfaction of the Company.
- b) The system shall have a positive warning device by sounding alarm to alert personnel of the impending discharging and also a positive indication to show that the system has actuated.
- c) Alarm indicating failure of supervised devices of equipment shall give prompt and positive indication of any failure and shall be distinctive from alarm indicating operation of hazardous conditions.
- d) Warning and instruction signs at entrance to and inside protection areas shall be provided.

The following additional provisions shall be made in the main control panel:

- a) Automatic shut off of the Air conditioning dampers/louvers by solenoid damper closing unit or electrically operated damper motor.  
  
Only signal to be provided from Clean agent system control panel. Rest of the job shall be done by others.
- b) Automatic shut off of the air handling units.

The Contractor shall design and provide the regime for control and monitoring of the Clean Agent fire extinguishing system to assure effective and smooth operation.

Instrumentation shall be in accordance with Project Specifications:


- Basic bid work/ Description of works & Instrumentation Design Criteria.
- Instrumentation Specification for Packaged Equipment

The Clean agent fire extinguishing system shall be supplied with its own dedicated Unit control system that shall include Emergency Shut Down (ESD/FSD) functions.

The Unit Control System shall interface with the platform ESD/FSD System via a serial interface. The interface shall be capable of receiving and responding to Platform ESD/FSD and Safety Shutdown Signals.

FORMAT No.	Ref. PROCEDURE No.	ISSUE No.	REV. No.	REV. DATE:
ODS/SOF/004	ODS/SOP/023	01	00	21.07.10



	<b>Design Division</b> <b>Engineering Services</b> <b>ISO – 9001:2008</b>	<b>FUNCTIONAL SPECIFICATION</b>  <b>FOR</b> <b>CLEAN AGENT FIRE</b> <b>EXTINGUISHING SYSTEM</b>	SPEC No:	5103
			REV No	2
			DISCIPLINE :	Mechanical
			PAGE No. 17 OF 27	

The Clean agent fire extinguishing system ESD/FSD functions shall be independent of the process control functions and shall have separate field instruments, cabling and terminations. No part of the process control system shall be used for ESD/FSD functions.

All shutdowns/interlocking sequential start/stop and other auxiliary equipment shall be located within the unit Control Panel. In this panel, interface shall be provided to accept the signals from ESD/FSD to take local action and shall send signals to ESD/FSD in case action is required by Central Control room.

Contractor shall coordinate with Contractor/Vendor for interface. Auxiliary contacts required for closing/tripping of Remote breaker/contactors shall be rated for 06 Amp at 240 V A.C. Ac-11 duty and 4.0 Amp at 110V D.C–11 duty.  
First out sequence type alarm cabinet shall be provided on local panel.

The local control panel (LCP) shall have start/stop and auto/local switches. The LCP shall also have indicator lamp for process status.  
Level instruments supplied by the Contractor shall be test mounted to ensure correct nozzle alignment. For protection Instruments shall be packed and shipped loose.

The Contractor shall include all instrumentation necessary for the safe and effective control and operation of the Clean Agent Fire Extinguishing System. The Contractor shall provide full details of all instrumentation included and shall submit completed Instrument data sheets with their Tender.  
Instrumentation and associated equipment shall be suitable for use in a Class 1, Group D, Division 1, hazardous area.

Instruments shall be wired to Package edge mounted Local control Panel and junction boxes identified and terminated strictly in accordance with Project specifications. Cables from instruments to junction boxes shall be armored type in compliance with FS-4011. Junction boxes shall be suitable for use in a Class 1, Div 1, GR D hazardous area.

Contractor/Vendor shall furnish all items required to match characteristics of utilities required for operation of equipment and controls with respect to those available. Material of local panel and instrument lines shall be SS 316.


### 5.13 INSULATION

The respective P&ID drawings provide only the minimum requirements for equipment and piping insulation.

The contractor shall provide insulation for personnel protection for those parts on external equipment surfaces that can reach temperature more than 71 °C and for heat conservation, in accordance with Functional specification No. 2006

### 5.14 FIRE PROTECTION

FORMAT No.	Ref. PROCEDURE No.	ISSUE No.	REV. No.	REV. DATE:
ODS/SOF/004	ODS/SOP/023	01	00	21.07.10

	<b>Design Division</b> <b>Engineering Services</b> <b>ISO – 9001:2008</b>	<b>FUNCTIONAL SPECIFICATION</b>  <b>FOR</b> <b>CLEAN AGENT FIRE</b> <b>EXTINGUISHING SYSTEM</b>	SPEC No:	5103
			REV No	2
			DISCIPLINE :	Mechanical
			PAGE No. 18 OF 27	

Passive fire protection measures shall be as per the requirements of project specification and shall be incorporated in to the Clean Agent Fire Extinguishing system.

## 5.15 UTILITIES

Utilities available are indicated elsewhere in the bid. The contractor shall specify the utilities required along with their rate of consumption in his bid.

## 5.16 SKID

The skid shall be designed and built to ensure that all the equipment along with accessories, panel and piping are mounted suitably for convenient operation. The skid shall be designed and built in accordance with the attached Specification 5100P. All welding shall be in accordance with the attached Specification No. 2009F.

## 6.0 CLEAN AGENT FIRE EXTINGUISHING SYSTEM PACKAGE DESIGN

A Base plate shall be provided for the Clean agent extinguishing system. The minimum design and structural requirements for package shall be in accordance with the Project Specification for Packaged Equipment.

The Contractor shall be responsible for the design of the Base Plate to ensure it does not warp during lifting operations. The Package shall be mounted flush on the deck and be designed to be seal welded to the Platform deck.

The Contractor shall provide drains both open and over board. Open drains shall be covered with a removable grating.

The Package shall support all the equipment and instrumentation necessary to make the Clean agent fire extinguishing system Equipment operational.

The Contractor shall provide the necessary data required for structural dynamic and static analysis of the deck support steel. This information shall include but not be limited to the following:


- Package weights and center of gravity at dry operating condition

The Contractor shall submit a set of dimensional general arrangement drawings of their proposed Package with the Tender. The drawings shall display anticipated Package dimensions, weights, general item layouts and interconnection orientations.

## 7.0 INSPECTION, TESTING AND CERTIFICATION

### 7.1 General

FORMAT No.	Ref. PROCEDURE No.	ISSUE No.	REV. No.	REV. DATE:
ODS/SOP/004	ODS/SOP/023	01	00	21.07.10

	<b>Design Division</b> <b>Engineering Services</b> <b>ISO – 9001:2008</b>	<b>FUNCTIONAL SPECIFICATION</b>  <b>FOR</b> <b>CLEAN AGENT FIRE</b> <b>EXTINGUISHING SYSTEM</b>	SPEC No:	5103
			REV No	2
			DISCIPLINE :	Mechanical
			PAGE No. 19 OF 27	

The responsibility for inspection and testing rests with the Contractor. The Company reserves the right to inspect at any reasonable time during fabrication of the equipment and to witness all hydrostatic, mechanical and performance tests. Contractor shall give minimum 15 days prior intimation regarding test schedule. Tests shall be carried out as per applicable codes and standards. Test certificates shall be submitted for company's approval.

During inspection by company's authorized representative, material certificates, shop test data, certification for bought out components and other relevant information shall be furnished so as to ascertain that the specifications and quality are complied with.

### 7.1.1 Inspection and Testing

Contractor/Vendor shall carry out various tests as per approved data sheets and applicable codes/standards. Test certificates shall be submitted for Company's approval.

Company/its authorized representative or certifying agency shall have access to inspect the equipment at any stage during manufacture. During inspection, material certificates, shop test data, certificates for bought out components and other relevant information shall be furnished so as to ascertain that the specifications and quality are complied with.


Tests specified as "Witnessed" in the data sheet shall be at company's option carried out in presence of the Company/its authorized representative or certifying agency. Contractor/Vendor shall give minimum 15 days prior intimation regarding testing schedules.

### 7.1.2 APPROVAL OF INSTALLATION

The system has to be properly installed and the system shall meet all the requirements of NFPA-2001 for its function. To determine that the system has been properly installed and will function as specified, the following tests shall be performed:

- A thorough visual inspection of the installed system and hazard area. The piping, operational equipment and discharge nozzle shall be inspected for proper size and location. The locations of alarms and manual emergency releases shall be confirmed. The configurations of the hazard shall be inspected closely for un-closable opening and sources of agent loss which may have been overlooked in the original specifications.
- A check of labeling of devices for proper designation and instructions. Name plate data on the storage containers shall be compared to specifications.
- A test for mechanical tightness of the piping and associated equipment to assure that leakage will not occur and that there will be no hazardous pipe movements during discharge.

FORMAT No.	Ref. PROCEDURE No.	ISSUE No.	REV. No.	REV. DATE:
ODS/SOF/004	ODS/SOP/023	01	00	21.07.10


	<b>Design Division</b> <b>Engineering Services</b> <b>ISO – 9001:2008</b>	<b>FUNCTIONAL SPECIFICATION</b>  <b>FOR</b> <b>CLEAN AGENT FIRE</b> <b>EXTINGUISHING SYSTEM</b>	SPEC No:	5103
			REV No	2
			DISCIPLINE :	Mechanical
			PAGE No. 20 OF 27	

- d) Non-destructive operational tests on all devices necessary for proper functioning of the system, including detection and actuation devices.
- e) The contractor/vendor shall perform & coordinate a complete approval test in the presence of Company/company's representative. All test procedures shall be performed in accordance to NFPA-2001.
- f) Contractor/vendor shall carryout the puff test as per NFPA-2001 to check the flow is continuous and piping/nozzles are un-obstructed. The flow test shall be carried out at a pressure not exceeding the normal operating pressure of Clean Agent system using gaseous nitrogen or inert gas.
- g) The installation of the system shall be carried out and inspected by factory authorized and trained personnel. The inspection shall include a full operational test of the system and of all the components as per the manufacturers's recommendations. Inspection shall also include a complete checkout of the control system and certification of cylinder pressure. All mechanical and electrical components shall be tested according to NFPA/manufacture's recommended procedure to verify system integrity. Inspection shall be carried out in presence of Company/company's representative.
- h) All tests shall be as per NFPA 2001. Functional test shall consist of detection, release, alarm, accessories related to the system, control unit and a review of the cylinders, piping, fittings, hangers and cylinders pressure.
- i) Contractor/vendor to note that acceptance of any equipment or system during factory acceptance test shall in no way absolve the vendor of their responsibility for the performance of the system. It shall be vendor's responsibility to modify and/or replace the hardware if the specified functions are not achieved during testing and factory acceptance.
- j) The vendor shall ensure that installation of the Clean Agent system is as per the relevant codes & standards and in accordance with the manufacturer's system design manual.
- k) The entire Clean Agent system component furnished shall be guaranteed against defect design, material and workmanship for the full warranty time. In addition, the LSTK contractor must guarantee the system against false actuation or leakage due to faulty equipment, design, workmanship for the full warranty period. In the event of Clean Agent leakage or system discharge from any of the above conditions, the installation contractor shall completely recharge and recondition the system at no cost to the company.

After the installation has been approved as above, it shall be tested by creating a smoke, getting it detected, actuating the release system and release of test gas. The test media shall be suitable gas. The Contractor/Vendor shall indicate testing procedure to assure that the system is operable and would actuate in case of fire.

## 7.2 Quality Assurance

FORMAT No.	Ref. PROCEDURE No.	ISSUE No.	REV. No.	REV. DATE:
ODS/SOF/004	ODS/SOP/023	01	00	21.07.10

	<b>Design Division</b> <b>Engineering Services</b> <b>ISO – 9001:2008</b>	<b>FUNCTIONAL SPECIFICATION</b>  <b>FOR</b> <b>CLEAN AGENT FIRE</b> <b>EXTINGUISHING SYSTEM</b>	SPEC No:	5103
			REV No	2
			DISCIPLINE :	Mechanical
			PAGE No. 21 OF 27	

The Contractor shall demonstrate that they operate a quality system in accordance with an acceptable international standard.

The Contractor shall submit a quality control plan for the review of company at the time of tender. The Contractor shall provide necessary facilities and cooperate with Company and statutory authority inspectors during manufacturing, assembly and testing.

### 7.3 Shop Inspection and Testing



All the Clean agent fire extinguishing system equipment required to meet the design conditions as stated herein shall be completely assembled and "function tested" in accordance with these specifications.

The Contractor shall submit for review and approval by the purchaser an Inspection and test Plan (ITP) covering all relevant components, equipment and systems.

For the purpose of testing, the Clean agent fire extinguishing system shall be tested at the point of manufacture and the complete packages shall be supplied under the Contract.

The entire Clean agent fire extinguishing system shall be tested functionally (no load) in the completed assembled configuration.

A dimensional check of the Package assembly and components shall be performed for compliance with approved drawings.

The Company's final acceptance of the equipment will be subject to a performance test once the equipment has been installed and commissioned offshore.

### 7.4 Material and Welding Inspection


The materials of construction used in the system shall be in accordance with NFPA-12A or as specified in relevant functional specifications.

Non-destructive materials tests and pressure testing shall be in accordance with the ASME Section VIII, Division 1 and project specification for Pressure Vessels and for Piping Fabrication. The tests shall be witnessed and approved by an inspector representing the Purchaser.

All butt welds shall be 100% examined by radiography and pressure retaining fillet welds shall be 100% examined by magnetic particle. Should radiography prove impractical, 100% ultrasonic inspection shall be permitted with the approval of the Company.

The final non-destructive examination of welds for acceptance purposes shall be carried out after completion of PWHT, where applicable. At the manufacturer's option, radiography may be performed before PWHT, in which case an ultrasonic examination shall be performed after PWHT for acceptance purposes.

FORMAT No.	Ref. PROCEDURE No.	ISSUE No.	REV. No.	REV. DATE:
ODS/SOF/004	ODS/SOP/023	01	00	21.07.10

	<b>Design Division</b> <b>Engineering Services</b> <b>ISO – 9001:2008</b>	<b>FUNCTIONAL SPECIFICATION</b>  <b>FOR</b> <b>CLEAN AGENT FIRE</b> <b>EXTINGUISHING SYSTEM</b>	SPEC No:	5103
			REV No	2
			DISCIPLINE :	Mechanical
			PAGE No. 22 OF 27	

All Package and vessel pad eyes shall require 100% NDT.

Radiographic, ultrasonic, magnetic particle or liquid penetrant inspection of welds shall be in accordance with the ASME/ASTM specification

All non-destructive testing shall be performed by a third party approved and accredited Non-Destructive Testing (NDT) inspection organization.

Full traceability of all material components (to material certificates) is required. Full traceability of all welds is required. The contractor shall provide a weld map with full traceability to individual weld numbers. The traceable data shall include NDT reports, welding procedure and welder number.

All vessels shall be ASME code stamped.

## 8.0 WARRANTY

Contractor/Vendor shall have final and total responsibility for the design and performance of all equipment furnished by him. Contractor/Vendor shall warrant that the equipment furnished by him and the performance of the said equipment is in accordance with this specification and general codes.

Contractor/Vendor shall warrant and guarantee that all the materials and equipments incorporated in the entire equipment under his Scope shall be new, and all work shall be of good quality.

Contractor/Vendor shall also be responsible for all system and detailed designing, the aspects of which may not have been covered in this specification as regards the workmanship, performance etc., of the equipment supplied by him.

Contractor/Vendor shall, upon notice from Company, make good at his own expense all defects found during the warranty period expeditiously.

Contractor/Vendor shall, if required, supply the services of an experienced engineer to supervise the correction of any defects found during the warranty period.

Contractor/Vendor shall also warrant and guarantee all work, materials and equipment furnished by any Sub-Contractor/Vendor and which is incorporated in the Package.

## 9.0 SPARE PARTS & TOOLS




### 9.1 9.1.1 Recommended Spares

Contractor/Vendor shall recommend and provide spare parts needed for start-up and commissioning. In addition, Vendor shall also furnish a separate itemized price list of recommended spares for one (1) year normal operation and maintenance. While preparing recommended spare parts lists, the contractor shall follow the equipment manufacturer's recommendations and shall indicate long lead items and available shelf replacement parts.

FORMAT No.	Ref. PROCEDURE No.	ISSUE No.	REV. No.	REV. DATE:
ODS/SOP/004	ODS/SOP/023	01	00	21.07.10



	<b>Design Division</b> <b>Engineering Services</b> <b>ISO – 9001:2008</b>	<b>FUNCTIONAL SPECIFICATION</b>  <b>FOR</b> <b>CLEAN AGENT FIRE</b> <b>EXTINGUISHING SYSTEM</b>	SPEC No:	5103
			REV No	2
			DISCIPLINE :	Mechanical
			PAGE No. 23 OF 27	

However all spare parts furnished by the Contractor along with equipment/package shall be wrapped and packaged to preserve original as new condition under normal conditions of storage anticipated in India. The same parts shall be appropriately tagged using stainless steel tags and coded so that later identification as to their intended equipment usage will be facilitated. All items supplied shall be packaged separately and clearly marked as "Spare Parts" and shipped along with the equipment in accordance with the instructions from the Company. Packing lists shall be furnished complete and in detail so that parts can be handled without uncrating. Start up spares shall be packed and identified separately. Recommended spare should take into account related factors of equipment reliability, effect of equipment downtime upon production and safety, cost of parts and availability of equipment Facilities.

## 9.2 Special Tools

The Contractor shall provide a list of any special tools required for the erection, operation and maintenance of the equipment with their Tender.

The Contractor shall furnish two (2) sets of special tools. Prior to shipment each special tool shall be tagged with stainless steel tag detailing its description and where it is to be used.


## 10.0 CONTRACTOR DATA REQUIREMENT

The Contractor shall furnish data for review and approval in accordance with this specification.

- Approval certificate from UL/FM/Vds/LPCB
- Flow diagram indicating system design requirements.
- Indian / International standards to which the offered equipments conform.
- Catalogues / Brouchers giving technical particulars and details of operation / maintenance of the offered element / system.
- Certificates of agencies that have accorded approval for the elements offered.
- Typical PFD/P&ID of the system
- Area coverage for type of nozzles used.
- Quantity of each type of equipment offered along with the calculations.



FORMAT No.	Ref. PROCEDURE No.	ISSUE No.	REV. No.	REV. DATE:
ODS/SOF/004	ODS/SOP/023	01	00	21.07.10

	<b>Design Division</b> <b>Engineering Services</b> <b>ISO – 9001:2008</b>	<b>FUNCTIONAL SPECIFICATION</b>  <b>FOR</b> <b>CLEAN AGENT FIRE</b> <b>EXTINGUISHING SYSTEM</b>	SPEC No:	5103
			REV No	2
			DISCIPLINE :	Mechanical
			PAGE No. 24 OF 27	

- Protected room / area layouts.
- Quantity of Agent offered for various areas as per specifications.
- Calculations for pipe sizes, time of discharge, flow, nozzle rate of discharge etc.
- GA and dimensional drawings of the areas showing storage, piping and nozzles for various areas.
- Mounting / fixing details of all the elements.
- Inspection and Test Plan.
- Cylinders data sheets along with PESO approval certificate.



- Preliminary Package Layout Drawings
- Utility Requirements
- Data Sheets for all major items of Equipment
- Sizing Variables/ Process design calculations
- Descriptive process Information
- Process Flow Diagram/P&IDs
- Special Tools List
- Recommended Spare Parts List
- Compliance with Process Guarantee
- Reference list of previous installations




In addition Contractor shall submit detailed design information including design details for the following items as part of its proposal. This information will be used as part of the proposal evaluation.



- Instrument Index
- Deck space requirement for each separable installed component
- Weight and Centre of Gravities for each separable installed component

FORMAT No.	Ref. PROCEDURE No.	ISSUE No.	REV. No.	REV. DATE:
ODS/SOF/004	ODS/SOP/023	01	00	21.07.10



	<b>Design Division</b> <b>Engineering Services</b> <b>ISO – 9001:2008</b>	<b>FUNCTIONAL SPECIFICATION</b>  <b>FOR</b> <b>CLEAN AGENT FIRE</b> <b>EXTINGUISHING SYSTEM</b>	SPEC No:	5103
			REV No	2
			DISCIPLINE :	Mechanical
			PAGE No. 25 OF 27	



- Maintenance access space required around each such separable portion of the work.
- Locations and sizes of all electrical, control and piping connections to the package and each separately mounted portion
- Detailed power requirements specification with heat output



- Quantitative list of consumables and components required for normal operation per annum.
- As built drawings, inspection and test reports, operation & maintenance manual and other relevant documents, shall be submitted as a part of Equipment Data Book.

## 11 CORROSION PROTECTIONS AND PREPARATION FOR SHIPMENT

### 11.1 Painting and Protective Coating

Painting and protective coating and the procedures for preparation for painting shall be as specified in the Functional specification for Protective Coating for Offshore Structure and facilities.

### 11.2 Preparation for Shipment

ONGC's standard requirements for "Preparation for shipment" of Mechanical equipments are as under. Wherever applicable, the relevant provisions as under shall be met by contractor.

Prior to shipment, all instrumentation and other equipment vulnerable to damage shall be disassembled and boxed separately for shipment.

All items shall be adequately packed and protected against damage during shipment. Each crate, bag or packages shall be clearly identified with the purchase order number and identification symbol, and shall be securely fastened to the Package base.

Exposed machined surfaces shall be coated with an easily removable rust preventative.

All flanged openings shall be protected with steel plate covers attached by proper bolting and sealed with plastic compound.

All electrical control enclosures shall be appropriately plugged at entries and loaded with silica gel bags.

FORMAT No.	Ref. PROCEDURE No.	ISSUE No.	REV. No.	REV. DATE:
ODS/SOF/004	ODS/SOP/023	01	00	21.07.10



**Design Division**  
Engineering Services  
ISO – 9001:2008

**FUNCTIONAL SPECIFICATION**  
**FOR**  
**CLEAN AGENT FIRE**  
**EXTINGUISHING SYSTEM**

SPEC No:	5103
REV No	2
DISCIPLINE :	Mechanical
PAGE No. 26 OF 27	

Screwed connections shall be protected with threaded forged steel plugs.  
Contractor shall state in the proposals, his recommendations for long term storage (up to 12 months) for both indoor and open air storage in a marine environment.

Where specific calculations are required for transport cradles etc., the Contractor shall submit to the Company for approval.

The offered equipment along with their accessories shall be shipped packed in wooden crates. They shall be wrapped with polyethylene sheets, before being placed in the crates to prevent damage to finish. Crates shall have skid bottom for handling.


**ANNEXURE - 1**

**DETAILS OF AREA PROTECTED AND AGENT QUANTITY**



Sl. No.	Name of Unit / Room	Volume of Unit / Room (M <sup>3</sup> )	Design Concentration (As per NFPA 2001)	Agent Requirement at Design temp. (Kg/ M <sup>3</sup> )	Agent required Quantity	
					Present (main) (Kg)	Reserve (Kg)
1.	Central Control Room	As per Arch. Design criteria.	By Contractor/Vendor	By Contractor/Vendor	By Contractor/Vendor	100 %
2.	Switchgear Room	As per Arch. Design criteria.	By Contractor/Vendor	By Contractor/Vendor	By Contractor/Vendor	100 %
3.	Battery Room	As per Arch. Design criteria.	By Contractor/Vendor	By Contractor/Vendor	By Contractor/Vendor	100 %
4.	Emergency Gen. Room	As per Arch. Design criteria.	By Contractor/Vendor	By Contractor/Vendor	By Contractor/Vendor	100 %
5.	Transformer Room (if transformer is located in enclosed room)	As per Arch. Design criteria.	By Contractor/Vendor	By Contractor/Vendor	By Contractor/Vendor	100 %
6.	T.G. Control Room	As per Arch. Design criteria.	By Contractor/Vendor	By Contractor/Vendor	By Contractor/Vendor	100 %
7.	Instrument Equipment Room	As per Arch. Design criteria.	By Contractor/Vendor	By Contractor/Vendor	By Contractor/Vendor	100 %
8.	UPS Room	As per Arch.	By	By	By	100 %

FORMAT No.	Ref. PROCEDURE No.	ISSUE No.	REV. No.	REV. DATE:
ODS/SOF/004	ODS/SOP/023	01	00	21.07.10

	<b>Design Division</b> <b>Engineering Services</b> <b>ISO – 9001:2008</b>	<b>FUNCTIONAL SPECIFICATION</b>  <b>FOR</b> <b>CLEAN AGENT FIRE</b> <b>EXTINGUISHING SYSTEM</b>	SPEC No:	5103
			REV No	2
			DISCIPLINE :	Mechanical
			PAGE No. 27 OF 27	

		Design criteria.	Contractor/Vendor	Contractor/Vendor	Contractor/Vendor	
9.	Communication Room	As per Arch. Design criteria.	By Contractor/Vendor	By Contractor/Vendor	By Contractor/Vendor	100 %

Note: Clean agent shall also be provided for any other room as specified in bid document and as decided during safety studies.

Vendor should design the system in such a way that the persons inside the room are evacuated safely.



FORMAT No.	Ref. PROCEDURE No.	ISSUE No.	REV. No.	REV. DATE:
ODS/SOF/004	ODS/SOP/023	01	00	21.07.10