Scope of work

The Scope of works for this section is for the planned maintenance of the following:-

(i) Fire Alarm and Gas detection Systems which shall include but not limited to Fire Alarm Panels, Fire Alarm Control Panels, Break Glass Units, Alarm Bells, Electronic Sounder & Strobe lights, Smoke detectors, Heat & Gas Detectors, Beam Detectors, Gas Control Units etc as listed in Appendix E

(ii) Fire Protection and Suppression Systems (Gas and Chemical Agent) including but not limited to all fire extinguishers within the site boundary and in addition shall also include FM200 system and CO2 system complete with all accessories including but not limited to fire suppression control panel, extinguisher release and abort switch, sounder and strobe lights and nozzles, fusable link detectors, manual foam release valves and chemical foam cylinders.

(iii) The Contractor should provide one Log Book system at every Fire Alarm Panels and the Technicians must always ensure that the Log Book must be updated and kept at all time next to every Fire Alarm Panels. All the activities such as inspection, tested, corrective and serviced must be recorded and updated in the Log Book.

(iv) All Fire Extinguishers must be provided with Inspection Card and must consists details of service action taken every month and year, the condition of the Fire Extinguisher in details for example pressure, safety pin, service, date of inspection and the name of the Technician inspected.

(v) The Contractor is to provide the details of checklist of every items of the Fire System equipments stipulated in the scope of work.

(vi) The Technicians and Helpers **MUST** be located and situated within all the buildings/sites in University Brunei Darussalam.

(vii) Fire Protection Systems (Water based)

i. The Contractor shall refer to the schedule of equipment.

ii. The Contractor shall be responsible for maintaining all the equipments listed at the schedule of equipment for the above systems in specification and Facilities Data. The specification for maintenance activities given for this section act only as guidelines. As such the Contractor shall ensure such maintenance works are in compliance with the manufacturer's requirements and recommendations.

iii. The scope of works for this section is for the satisfactory maintenance of all the fire alarm system, fire protection and fire suppression system installations and its accessories within the Site Area and Kuala Belalong Field Study Centre (Temburong).

iv. The Contractor, at all times, during the maintenance works shall ensure that the maintenance activities do not render the original supplier / manufacturer's warranty void or invalid. The Contractor shall always refer to the terms and conditions of warranty / indemnity furnished by the original supplier / manufacturer prior to performing any maintenance activities. Any defaults by the Contractor and associated damages arising due to violation of warranty / indemnity terms and conditions shall make the Contractor liable for payment to the Client for the associated damages. The Client shall notify the Contractor of such damages and shall make necessary adjustments to any payment due for the Contractor.

v. The Contractor shall be responsible for maintaining any battery packs that are associated with the above systems and replace as necessary to ensure smooth operations of the systems.

vi. The Costs included under Schedule 8 - Schedule of Prices Part C - Schedule of Lump Sum Costs - Bill C6 are deemed inclusive of all the above Scope of Works. No additional claims or whatsoever will be entertained by the Client in Contractor's failure to include any costs associated therewith.

b. **Emergency Contact**

i. The Contractor shall also be required to perform emergency Work outside of normal working hours as and when requested by the Client.

ii. The Contractor shall ensure that all times during normal working hours he is available and contactable at all times for emergency Work. The Supervisor shall be the principal contact at all times throughout the Contract period and is responsible for leading the Emergency Response Team (ERT. The Supervisor shall ensure that the Client is advised of his contact details including hand phone numbers which shall be 24/7 accessible by the Employer.

iii. The costs related with the standby and support of an Emergency Response Team lead by the Supervisor and supported by the Team is deemed inclusive in the Contract Price under Bill of quantity. No additional cost for any overtime work or emergency attendance / support will be entertained by the Client.

iv. It is the total responsibility of the Contractor to ensure that adequate spares, materials, tools, equipments and labour are made available to perform such works and no additional claims will be entertained due to the emergency nature of any of the works and services to be executed.

2.6.2 Maintenance Works Schedule - Fire Alarm System

2.6.2.1 For the purposes of this Contract, Electrical Fire Alarm System includes:-

- 2.6.2.1 .1 Manually operated electrical alarm system
- 2.6.2.1 .2 Smoke and heat initialled detection system
- 2.6.2.1 .3 Gas and Beam detectionsystem
- 2.6.2.1 .4 Remotely transmitted alarm system

2.6.2.2 Following schedule indicates the preventive task maintenance for fire alarm system.

COMPONENT	ACTIVITY	FREQUENCY	CATEGORY
Fire Alarm Panels and Remote Indicator Panel	Visually inspect all Control Panels and check that "SYSTEM NORMAL" conditions obtain throughout	Daily	A
	Carry out the following: 1. Test each of fire alarm panel for correct indications and operations at all mode positions. 2. Test the full function of the panel audible alarm unit. 3. Test the alarm bell function for each level. 4. Test air-conditioning and ventilation fans shut down and fire booster pump start up functions (where applicable) 5. Switch off main power supply to the panel and operate standby power for at least fifteen (15) minutes. Record any appreciable drop in battery charger. 6. Clean out battery compartment 7. Top up wet battery cells where necessary.	Quarterly	G
Conventional Manual Call Point/ Break Glass Unit	1. Check on all units for wear or damage. Record observation on service report and replace whenevernecessary 2. Open one (1) unit on each level andtest fire alarm bell operation. This operation is to be carried out in such amanner as to ensure that all units areopened at least once a year 3. Test the Manual Call points as follows: Using a 4mm AF exagonal key (or as recommended by the Manufacturer),insert the key into the test hole (situated on bottom right hand side of glass cover), and engage into test cam. Turn the key in a clockwise direction(approx. 60°); this will simulate the breaking of the glass. Release the key to reset the unit.	Quarterly	G

	4. Visual inspection is essential if abnormal or unusual environmental conditions occur due to plant damage or accident etc.		
Alarm Vibrating Bells	1. Carry out visual and inspection of all appliances.	Quarterly	G
	1. Examine bell for accumulation of dirt and clean when necessary. 2. Carry out audible check vibrating bell.	Yearly	I
Electronic Sounder	1. Carry out visual and audible inspection of all appliances	Quarterly	G
	1. Examine bell for accumulation of dirt and clean when necessary. 2. Carry out audible check vibrating bell.	Yearly	I
Smoke Detectors	3. Clean detectors elements by blowing with clean air. (Take not that air blowing is not advisable for online detectors, this may inherit a spurious alarm. Prior to carrying out this activity.}	Quarterly	G
	4. Check the correct operation of the unit by activating it with a smoke generated (cigarette smoke is not to be used for the test). Clean smoke detector elements by blowing through with clean air.	Yearly	I
Heat Detectors	Activate heat detectors using an indirect heat source i.e. an electric lamp. Under no circumstances is a naked flame to be used for this test.	Yearly	I
	Check for any fault condition which may be indicated is in fact being attended to and that all other indicators are normal.	Daily	A
	Check calibration to prevent loss of sensitivity	Weekly	B

Gas Detectors	Maintenance schedule as follows: 1. All zeros at the control unit to be checked logged and aligned. 2. Each detector to be gas tested and reading logged (sensitivity checked) 3. Field indicatorsto be tested. 4. All alarm set points checked and re-aligned. 5. Lamp test. 6. All faulty parts replaced where required. 7. All filter elements checked and replaced as necessary. 8. Power supply- complete functional check. 9. Visual inspection made to confirm that all cabling fitting and equipment is secure, undamaged and adequately protected.	Six Monthly	H
	Activate gas detectors using an indirect gas source to ensure the gas detectors are working properly. Corrective action if the apparatus alarm sounds: 1. Extinguish all naked flames, including all smoking materials. 2. Turn off all gas appliances 3. Do not switch on or off any electricallights or appliances. Corrective action if the apparatus alarm sounds: 1. Turn off the gas supply at the gas emergency control and/or (with L.P.G. supply) the storage tank. 2. Open doors and windows to increase ventilation. 3. If the alarm continues to operate, even after an alarm re- setting action where appropriate, and the cause of the leak is not	Yearly	I

	apparent and/or cannot be corrected, vacate the premises and immediately notify the Client's Representative so subsequent actions can be taken.		
Beam Detector	Clean detectors elements (transmitter and receiver) by blowing with clean air to remove dust and in all the	Yearly	I

COMPONENT	ACTIVITY	FREQUENCY	CATEGORY
	beam detector lenses to ensure reliability and performance.		
Strobe light	Carry out visual check for flash tube degradation.	Monthly	D
	Clean strobe light to maintain maximum light output. Only mild, non- abrasive cleaning agents should be used.	Monthly	D
	Inspect dome for scratches and chips, and if damaged, must replace withnew.	Monthly	D
Electrical Components	All electrical components of the system including cables, detection, audible alarms, indicator lights, batteries etc are to be inspected and tested in accordance with therequirements.	Yearly	I
Electric Wiring	Carry out insulation and continuity test of all system wiring with particular attention to the locating of areas ofpoor insulation values below one (1) mega-ohm are to be reported to the Client's Representative without delay. Faulty connections and / or joints are to be repaired by the Contractor.	Yearly	I

2.6.2.3 Following schedule indicates the task listing for batteries:-

Battery Test Methods	
Device	**Method**
1. **Batteries- General test**	Prior to conducting any battery testing, the Contractor shall ensure that all system software stored in volatile memory is protected from loss.
a. Visual Inspection	Batteries shall be inspected for corrosion or leakage. Tightness of connections shall be checked and ensured. If necessary, battery terminals or connections shall be cleaned and coated. Electrolyte level in lead-acid batteries shall be visually inspected.
b. Battery Replacement	Batteries shall be replaced in accordance with the recommendations of the alarm equipment manufacturer or when the recharged battery voltage or current falls below the manufacturer's recommendations.
c. Charger Test	Operation of battery charger shall be

Battery Test Methods	
Device	**Method**
	checked in accordance with charger test for the specific type of battery.
d. Discharge Test	With the battery charger disconnected, the batteries shall be load tested following the manufacturer's recommendations. The voltage level shall not fall below the levels specified. *Exception:* An *artificial load equal to the f ull fire alarm load* connected *to the battery shall be permitted to be used in conducting this test.*
e. Load Voltage Test	With the battery charger disconnected, the terminal voltage shall be measured while supplying the maximum load required by its application. The voltage level shall not fall below the levels specified for the specific type of battery. If the voltage falls below the level specified, corrective action shall be taken and the batteries shall be retested. *Exception:* An *artificial* load *equal to the f ull fire alarm load* connected *to the battery shall be permitted to be used in conductingthis test.*
2. **Battery Tests (Specified Types)** Primary (Dry Cell) i. Primary Battery Load ii. Voltage Test	The maximum load for a No.6 primary battery shall not be more than 2 amperes per cell. An individual (1.5-volt) cell shall be replaced when a load of 1 ohm reduces the voltagebelow 1 volt. A 6-volt assembly shall be replaced when a test load of 4 ohms reducesthe voltage below 4 volts.
Lead-Acid Type i. Charger Test	With the batteries fully charged and connected to the charger, the voltage across the batteries shall be measured with a voltmeter. The voltage shall be 2.30 volts per cell ±0.02 volts at 25°C (77°F) or as specified by the equipment manufacturer.
i. Load Voltage Test	Under load, the battery shall not fall below 2.05 volts per cell.
iii. Specific Gravity	The specific gravity of the liquid in the pilot cell or all of the cells shall be measured as required. The specific gravity shall be within

Battery Test Methods	
Device	**Method**
	the range specified by the manufacturer. Although the specified gravity varies from manufacturer to manufacturer, a range of 1 .205- 1.220 is typical for regular lead-acid batteries, while 1.240-1 .260 is typical for high-performance batteries. A hydrometer thatshows only a pass or fail condition of the battery and does not indicate the specific gravity shall not be used, because such a reading does not give a true indication of thebattery condition.
Nickel-Cadmium	
i. Charger Test	With the batteries fully charged and connected to the charger, an ampere metershall be placed in series with the battery under charge. The charging current shall be in accordance with the manufacturer's recommendations for the type of battery used. In the absence of specific information, 1/30 to 1/25 of the battery rating shall be used.
ii. Load Voltage Test	Under load, the float voltage for the entire battery shall be 1 .42 volts per cell, nominal. Ifpossible, cells shall be measured individually.
Sealed-Lead Acid	
i. Charger Test	With the batteries fully charged and connected to the charger, the voltage acrossthe batteries shall be measured with a voltmeter. The voltage shall be 2.30 volts per cell ±0.02 volts at 25°C (77°F) or as specified by the equipment manufacturer.
ii. Load Voltage Test	Under load, the battery shall performin accordance with the battery manufacturer's specifications.

2.6.2.4 The following schedule summaries the battery types and their corresponding visual inspection frequencies:-

Component	Frequency	Category
Batteries		
Lead-Acid	Monthly	D
Nickel-Cadmium	Six Monthly	H
Primary (Dry-Cell)	Monthly	D
Sealed Lead-Acid	Six Monthly	H

2.6.2.5 The following schedule summaries the battery testing frequencies:-

Component	Frequency	Category
Batteries- Fire Alarm System		
1. Lead-Acid		
i. Discharge test (30 minutes)	Six Monthly	H
ii. Load Voltage Test	Six Monthly	H
iii. Specific Gravity	Six Monthly	H
iv. Charger Test (Replace battery as needed)	Yearly	I
2. Nickel-Cadmium		
i. Load Voltage Test	Six Monthly	H
ii. Charger Test (Replace battery as needed)	Yearly	I
iii. Discharge test (30 minutes)	Yearly	I
3. Primary Type (Dry Cell)		
i. Load Voltage Test	Monthly	D
4. Sealed Lead-Acid		
i. Load Voltage Test	Six Monthly	H
ii. Charger Test (Replace battery every 4 years)	Yearly	I
iii. Discharge test (30 minutes}	Yearly	I

2.6.3 Maintenance Works Schedule - Fixed Fire Suppression System (Chemical Based)

2.6.3.1 For the purposes of this Contract, this system includes Carbon Dioxide extinguishing systems (C02), Foam and FM200 fire extinguishing systems.

2.6.3.2 Periodic inspections to C02 fire suppression systems, Foam and FM200 fire extinguishing system determine exact condition of the systemequipment.

2.6.3.3 An inspection log shall be maintained for ready reference. As a minimum, the log should record inspection interval, inspection procedures performed, maintenance performed, if any, as a result of inspection, and name of the inspector performing such task.

2.6.3.4 The contractor shall be responsible for topping up any chemical cylinder/vessel which is found to have been partially discharges and is found to be below the specified content of the vessel.

2.6.3.5 The contractor will be required to recharge a system, normally total, within one day of discharge. When release was caused by fire, false alarm or accidental discharge, in this instance the cost of chemical will be paid in accordance with the price in the Schedule of Rates.

2.6.3.6 The contractor will be liable to discharge any system at his own expense if it be proved that chemical loss was effected by:

- An accidental discharge caused by his staff during maintenance.
- Discharge of chemical due to poor maintenance executed by his staff.

2.6.3.7 Perform inspection and preventive maintenance in accordance to schedules and tasks shown below:-

FREQUENCY	CATEGORY	ACTIVITY
Monthly	D	Inspect hazard area system components *
	D	Check nitrogen cylinder pressure
Six Monthly	H	Check C02 cylinder weight
	H	Test electric control head
	H	Test pressure switch
Yearly	I	Check nitrogen cylinder pressure
	I	Check C02 cylinder weight
	I	Blow out distribution piping
	I	Perform complete system function
	I	Test pneumatic detection system
Sixty Monthly	M	Hydrostatic test all C02 and nitrogen system hoses and flexibleconnectors.

Note:
* Task involves inspection of Fire Extinguisher listed in asset data in appendix 'E'.

Monthlv Inspection - Cateaorv D Tasks

The following monthly inspection program should be conducted visually only. If any defects are apparent as described below, **SUSPEND ALL OPERATIONS IN THE PROTECTED AREA**, and immediately contact the Client's Representative so subsequent action can be taken. All inspections including monthly inspection to be conducted by authorized personnel only. Check that all personnel who may have to operate the system are properly trained and authorized to do so. In

particular, check that all new employees have been instructed in the use of the system.

1. . Make a general inspection survey of all cylinders and equipment for damaged or missing parts. If any equipment requires replacement, contact the Client's Representative.
2. Inspect flexible actuation hoses for loose fittings, damaged threads, cracks, distortion, cuts, dirt and frayed wire braid. Inspect flexible actuation hose adaptors for stripped threads and damage. Inspect couplings and tees for tightness. If any of these defects are present, inform the Client's Representative to obtain approval and subsequent replace, tighten or clean system parts. The cost of any replacement is deemed inclusive of the corresponding maintenance costs in Section 8 - Schedule of Prices - Part C- Bill C6
3. Inspect control heads, attached to C02 cylinders, nitrogen cylinders, stop valves and time delays for physical damage, deterioration, corrosion, distortion, cracks, dirt and loose couplings. If a defect is found, inform Client's Representative; a replacement may be necessary. The cost of any replacement is deemed inclusive of the corresponding maintenance costs in Section 8 - Schedule of Prices - Part C - Bill C6. Ensure that all control heads, actuation devices etc. are all in the SET or CLOSED position with the locking pin installed and seal wire intact.
4. Inspect carbon dioxide cylinder and valve assembly for leakage, physical damage such as cracks, dents, distortion, and worn parts.
5. Inspect cylinder straps, cradles and attaching hardware for loose, damaged or broken parts. Check straps and associated parts or corrosion, oil, grease and grime etc.
6. Inspect C02 system discharge heads for cracks, corrosion, grime etc.
7. Inspect flexible discharge hoses for loose fittings, damaged threads, cracks, rust, kinks, distortion, dirt and frayed wire braid.
8. Inspect discharge manifold for physical damage, corrosion and dirt. Inspect manifold support brackets and clamps for looseness and damage. Inspect check and stop valves, where applicable, for deformation, leakage, cracks,wear, corrosion and dirt.

NOTE: Do *not paint nozzle orifices. The part number of each nozzle is stamped*

Monthly Inspection - Category D Tasks

on the nozzle. Nozzle must be replaced by nozzles of *the same part number. Nozzles must never be interchanged, since random interchanging* of *nozzles will adversely affect proper* C02 *distribution within* a *hazard area.*

9. Inspect discharge nozzles for dirt, clogs and physical damage. Where frangible discs are used, ensure they are intact and clean. Look for holes or cutes. Broken discs will allow vapours, oil, etc. to enter into the nozzles and system piping from the hazard and seriously affect or block system discharge.
10. Inspect pressure switches for deformations, cracks, dirt or other damage.
11. Inspect the lock-out valve. The valve must be secured and locked in the OPEN position.
12. Visually inspect control panel and detection system. Ensure that the system is in "Normal" status and free from any "Alarm" or "Trouble" signals.
13. If any defects are found during the monthly inspection, immediately contact the Client's Representative to service the systems.

Monthly Inspection - Category D Tasks
- Inspect Hazard Area System Components - Inspection of Fire Extinguisher

NO	EQUIPMENT	FIRE EXTINGUISHERS
	INSPECTION	**C02**
1.	Located in designated place	Yes
2.	No obstruction to access or visibility	Yes
3.	Operating instruction on nameplate and facing outward	Yes
4.	Seals and tamper indications not broken or missinq	Yes
5.	Determine fullness by weiqhinq	Yes
6.	Examine for obvious physical damage, corrosion, leakaqe or cloqqed nozzle	Yes
7.	Pressure qauqe readinq in the operable area	No

Legend:

C02 - Hand Portable Fire Extinguisher

*** -** Provisional item to be maintained.

Maintenance for all fire extinguishers shall be as per manufacturer's recommendation

Six Monthly: Inspection - Category H Tasks

The system must be thoroughly inspected on a six monthly basis with the following minimum tasks:-

1. Weigh the agent cylinders and make a report on their minimum required weight conformance. If there is a loss of weight below the minimum required weight, top-up to meet the minimum required level. Costs for such top-ups are deemed inclusive of the contract prices.
2. test the electric control head
3. test pressure switch

Yearly Inspection - Category I Tasks

The system must be thoroughly tested & inspected on a yearly basis with the following minimum task:-

1. check the cylinder weight
2. blow out pressure &function test

2.6.3.1 Perform the following inspection and preventive maintenance for Foam or FM200 in accordance to schedules and tasks shown below:-

COMPONENT	ACTIVITY	FREQUENCY	CATEGORY
Electrical Components	All the electrical components of the system, including cables detectors, audible alarms, batteries, etc. are to be inspected and tested in accordance with the requirements specified or in accordance with manufacturer's recommendation.	Quarterly	G
Manual and	All release mechanisms shall be automatic and physically tested to ensure correct operation. All such mechanisms are to be properly	Quarterly	G

COMPONENT		ACTIVITY	FREQUENCY
Chemical Cylinders	All vessels containing chemical extinguishers agents are to be lubricated and are to be kept free of dirt and corrosion. checked to ascertain that: a. The vessel contains the correct chemical. b. The vessel is painted the correct color code and in accordancewith the standards required in Negara Brunei Darussalam. c. The vessel contains the correct quality of chemical. d. The vessel has not been physically damaged and that it is safe to contain the type of chemical in use.	Quarterly	G
Time DelayDevices	Check the test the correct operation and physical condition of any time delay devices fitted.	Quarterly	G
Warning notices and Operating Instruction	• To ensure appropriate warning notices and operating instructions are prominently displayed at each installation. • To ensure that notices and instructions are in both English and Malay • To ensure that they are clearly legible and that are securely fitted in the correct location.	Quarterly	G

The Contractor shall carry out annual testing of all the above maintenance, test and inspections and the following tests and inspections and a service report containing full details of the services and any comments on additional findings is to be submitted to the Client's Representative within three days of the inspection.

Simulate fire conditions and ensure the following:

- Extinguishing agents shall be correctly and efficiently released by the operation of the detectors fitted.
- Extinguishing agents shall be released by the operation of the mechanical release unit, if fitted.
- Safety cut outs and other electrical / mechanical contacts for power supply, air conditioning plant and ventilation fan etc. operate correctly and efficiently under this simulated fire condition.
- All audible alarms must operate correctly.

2.6.4 Maintenance Works Schedule - Fixed Fire Suppression System (Water Based)

2.6.4.1 The following schedules summaries the PM activities for the above system:-

COMPONENT	ACTIVITY	FREQUENCY	CATEGORY
Electrical Components	All electrical components of the system, including cables, detection, audible alarms, indicator lights, batteries etc. are to be inspected and tested in accordance with the requirements.	Quarterly	G
Pressure Switches	All pressure switches, where fitted, are to be checked for correct operation and pressure setting.	Quarterly	G
Pre-Run Inspection	Before operating any pumped system the contractor must first carry out a detailed visual inspection of the equipment and must ensure that allmoving parts have been adequately lubricated.	Quarterly	G

Wet Drill	Testing of hydrant hose reel installations is to be carried out by a "Wet Drill". The contractor shall:- • Connect lengths of hose to two (2) hydrants, or use two (2) fitted hose reels, whichever is applicable. • Open the necessary valves to the hydrants / hose reels and visually note that the water pressure and throughput is sufficient to fight fires within the buildings in the vicinity of thehoses.	Quarterly	G
Wet Drill (Cont'd)	• If there is any doubt as to the quantity and pressure of the water available at the hydrant outlet, a more accurate test is to be carried out using appropriate flow and pressure reading equipment. • Hydrants not used in the wet drill shall be fitted with a blanking piece and the valve operation checked by fully opening and fully closing the valve. • All hose reel valve and nozzle controls shall be checked for correct and efficient operation. • Each hose length is to be uncoiled, laid out straight, and examined for damage or signs of mildew. • After test or wet drill the contractor is to ensure that hoses are thoroughly dried, before restoring them in the correct location.	Quarterly	G

COMPONENT	ACTIVITY	FREQUENCY	CATEGORY
Gauges	Water and pressure gauges are to be inspected to determine their accuracy. Water levels and air pressures of system pressuring cylinders are to be checked to ensure they are operating within the design parameter.	G	Quarterly
Hoses	Each length of hose, of whatever type used in the installation shall be tested by water to a pressure of 700 kpa (1OOpsi) or to maximum pressure likely to be obtained from the system, whichever is greater. Any hoses found to be showing signs of deterioration are to be labelled, put to one side and reported to the Client's Representative.	Yearly	
Water Flow Switch	Inspect detectors and replace if a leak occurs.	Weekly	B
	Test detectors to ensure proper operation.	Quarterly	G
Fire Hydrant	Inspect hydrants is in satisfactory condition for their intended use: 1. Remove outlet nozzle caps and check for seat leakage visually at each valve on wet barrel hydrants; 2. Wet barrel hydrants require that each valve be so operated using a special test outlet nozzle cap. If stem action is tight, repeat operation several times until opening and closing action is smooth and free.	Six Monthly	H
	3. While under pressure check for leakage at joints, around outlet nozzles, at packing or seals and past outlet nozzle caps. 4. If leakage is observed, tighten outlet nozzle, replace O-rings or gaskets. The Contract prices are deemed to be inclusive of such replacements. If leakage cannot be corrected with the tools at hand, record the nature of the leakage for		

COMPONENT	ACTIVITY	FREQUENCY	CATEGORY
	for repairs. 5. Remove nozzle cap and attach a section of hose if necessary to direct flow into the street. Open the hydrant and flush to remove foreign material from the interior and lateral piping. 6. Remove all nozzle caps and inspect for thread damage from impact or cross threading. Clean and lubricate outlet nozzle threads and use caps to check for easy operation of threads.		
	7. Check for nozzle cap chains for free action on each cap. If binding is observed, open the loop around the cap until the action is free enough to prevent kinking during removal of the cap under emergency conditions. 8. Replace caps, tightens with a spanner wrench, then back off on threads slightly so that the caps will not be excessively tight, but leave sufficient frictional resistance to prevent removal by hand.		
	9. Check for any exterior obstruction which may interfere with hydrant use in fire emergency. 10. Clean the exterior of the hydrant and repaint if deemed necessary 11. . Be sure auxiliary valve is in the wide open position		
	12. If a hydrant is inoperable, tag it with a clearly visible marking toprevent loss of time by fire fightingcrews if any emergency occursbefore the hydrant s repaired. Report this condition to the Client'sRepresentative. at once		
Piping	All piping shown to be leaking during a "wet drill" with discharge valuing closed shall be noted and a separate report submitted to the Client's Representative. Minor leaks requiring	Yearly	

COMPONENT	ACTIVITY	FREQUENCY	CATEGORY
	no new fittings or spares shall be repaired by the contractor.		
Automatic & Manual Controls	All mechanisms associated with the automatic and manual control of the pumping installation, both main, standby and, where fitted, diesel backup, shall be brought into operation, inspected and tested. Any parts found to be malfunctioning are to be repaired by the contractor.	Yearly	I
	Any malfunction that requires spares and / or replacement parts is to be reported to the Client's Representative without delay.		

COMPONENT	ACTIVITY	TASK DESCRIPTION	FREQUENCY	CATEGORY
Fire Department Connections	Inspection	Inspection shall verify the following: a) The fire department connections are visible and accessible. b) Couplings or swivels are not damaged and rotate smoothly. c) Plugs or caps are in place and undamaged. d) Gaskets are in place and in good condition. e) Identification signs are in place. f) The check valve is not leaking.	Quarterly	G
		g) The automatic drain valve is in place and operating properly; • If fire department connection plugs or caps are not in place, the interior of the connection shall be inspected for obstructions, and it shall be verified that the valve clapper is operational over its full range • Components shall be repaired or replaced as necessary in accordance with manufacturer's instructions. Any obstructions that are present shall be removed.		

COMPONENT	ACTIVITY	TASK DESCRIPTION	FREQUENCY	CATEGORY
Main Drains	Test	A main drain test shall be conducted ateach water-based fire protection system riser to determine whether there has been a change in the condition of the water supply piping and control valves.	Yearly	
Water flow Alarm	Test	All water flow alarms shall be tested in accordance with manufacturer's instructions.	Quarterly	G
Control Valves				
Position	Test	Each control valve shall be operated annually through its full range and returned to its normal position. Post indicator valves shall be opened until spring or torsion is felt in the rod, indicating that the rod has not become detached from the valve. Post indicating and outside screw and yoke valves shall be backed a one-quarter turn from the fully open position to prevent jamming.	Quarterly	G

COMPONENT	ACTIVITY	TASK DESCRIPTION	FREQUENCY	CATEGORY
Operation	Test	A main drain test shall be conducted at each water-based fire protection systemriser to determine whether there has been a change in the condition of the water supply piping and control valves.	Yearly	
Supervisory	Test	Valve supervisory switched shall be tested semi-annually. A distinctive signal shall indicate movement from the valve's normal position during either the first two revolutions of a hand wheel or when the stem of the valve has moved one-fifth of the distancefrom its normal position. The signal shall not be restored at any valve position except the normal position.	Six Monthly	H
Pre-action/Deluge Valves				
Priming water	Test	The priming water level in supervised pre-action systems shall be tested for compliance with the manufacturer's instructions.	Quarterly	G
Low air pressure alarms	Test	Low air pressure alarms, if provided shall be tested in accordance with the manufacturer's instructions.	Quarterly	G

COMPONENT	ACTIVITY	TASK DESCRIPTION	FREQUENCY	CATEGORY
Fullflow	Test	Each deluge or pre-action valve shall be trip tested at full flow in warm weather and in accordance with the manufacturer's instructions. Where testing deluge systems, care shall be taken to prevent water damage by verifying that there is adequate drainage. Protection shall be provided for any devices or equipment subject to damage by system discharge during tests. **Exception 1:** *Where the nature of the protected property is such that water cannot be discharged for test purposes, the trip test shall be conducted in a manner that does not necessitate discharge in the protected area.*	Yearly	I
		Exception 2: *where the nature of the protected property is such that water* cannot *be discharged unless protected equipment is shut* down *(e.g. energized electrical equipment),* a *full flow system test shall be conducted at the next scheduled shutdown. In all cases, the test frequency shall not exceed 3 years.*		
Dry Pipe Valves/Quick Opening Devices				
Priming water	Test	The priming water level shall be tested quarterly.	Quarterly	G

COMPONENT	ACTIVITY	TASK DESCRIPTION	FREQUENCY	CATEGORY
Low air pressure alarms	Test	Low air pressure alarms, if provided shall be tested in accordance with the manufacturer's instructions.	Quarterly	G
Quick opening devices	Test	Quick opening devices if provided shall be tested quarterly.	Quarterly	G
Trip Test	Test	Each dry pipe valve shall be triptested annually during warm weather.	Yearly	I
Full flow trip test	Test	Every 3 years and whenever the system is altered, the dry pipe valve shall be trip tested with the control valve fully open and the quick opening device if provided, in service.	Thirty Six Monthly	K
Pressure Reducing and Relief valves				
Circulation Relief	Test	During annual fire pump test, it shall be verified that the circulation relief valve is correctly adjusted and set to relieve at the appropriate pressure and to close below that pressure setting.	Yearly	I
Pressure relief valves	Test	During annual fire pump test, it shall be verified that the circulation relief valve is correctly adjusted and set to relieve at the appropriate pressure and to close below that pressure setting.	Yearly	I

COMPONENT	ACTIVITY	TASK DESCRIPTION	FREQUENCY	CATEGORY
Hose connections	Test	A full flow test shall be conducted on each valve at 5 years intervals and shall be compared to previous test results. If adjustments are necessary, theyshall be made in accordance with the manufacturer's instructions.	Sixty Monthly	M
Hose racks	Test	A full flow test shall be conducted on each valve at 5 years intervals and shall be compared to previous test results. If adjustments are necessary, theyshall be made in accordance with the manufacturer's instructions.	Sixty Monthly	M
Backflow Prevention Assemblies	Test	All backflow preventers installed in fire protection system piping shall be tested annually in accordance with the following: a) A forward flow test shall be conducted at the system demand, including hose stream demand, where hydrants or inside hose stations are located downstream of the backflow preventer. b) A backflow performance test, as required by the authority having jurisdiction, shall be conducted at the completion of the forward flow test.	Yearly	I

COMPONENT	ACTIVITY	TASK DESCRIPTION	FREQUENCY	CATEGORY
		Exception 1: *For backflow preventers sized 2 in (50.Bmm) and* under, *it shall be acceptable to conduct the* forward *flow test without measuring flow, where the test outlet is of a size to flow the system*		
		Exception 2:Where *water rationing shall be enforced during shortages lasting* more *than 1 year,* an *internal inspection of the backflow preventer to ensure the check valves will fully open shall be acceptable in lieu of conducting the annual forward flow test.*		
		Exception 3: Where connections of a size sufficient to conduct afull flow test are not available, test shall be completed at the maximum flow rate possible. **Exception 4:**The forward flow test shall not require where annual fire pump testing causes the system demand to flow through the backflow	Yearly	I

COMPONENT	ACTIVITY	TASK DESCRIPTION	FREQUENCY	CATEGORY
Control Valves	Maintenance	The operatingstems of outside screw and yoke valves shall be lubricated annually. The valve thenshall be completely closed and reopened to test its operation anddistribute the		
Pre- action/ Deluge Valve	Maintenance	During the annual trip test, the interior of the pre action or deluge valve shall be cleaned thoroughly and the parts replaced or repaired as necessary. (Please refer to note 2	Yearly	I
Dry Pipe valves/Quick Opening Devices	Maintenance	During the annual trip test, the interior of the pre action or deluge valve shall be cleaned thoroughly and the parts replaced or repaired as	Yearly	I

2.6.6 GUIDELINES FOR MINIMUM FREQUENCIES

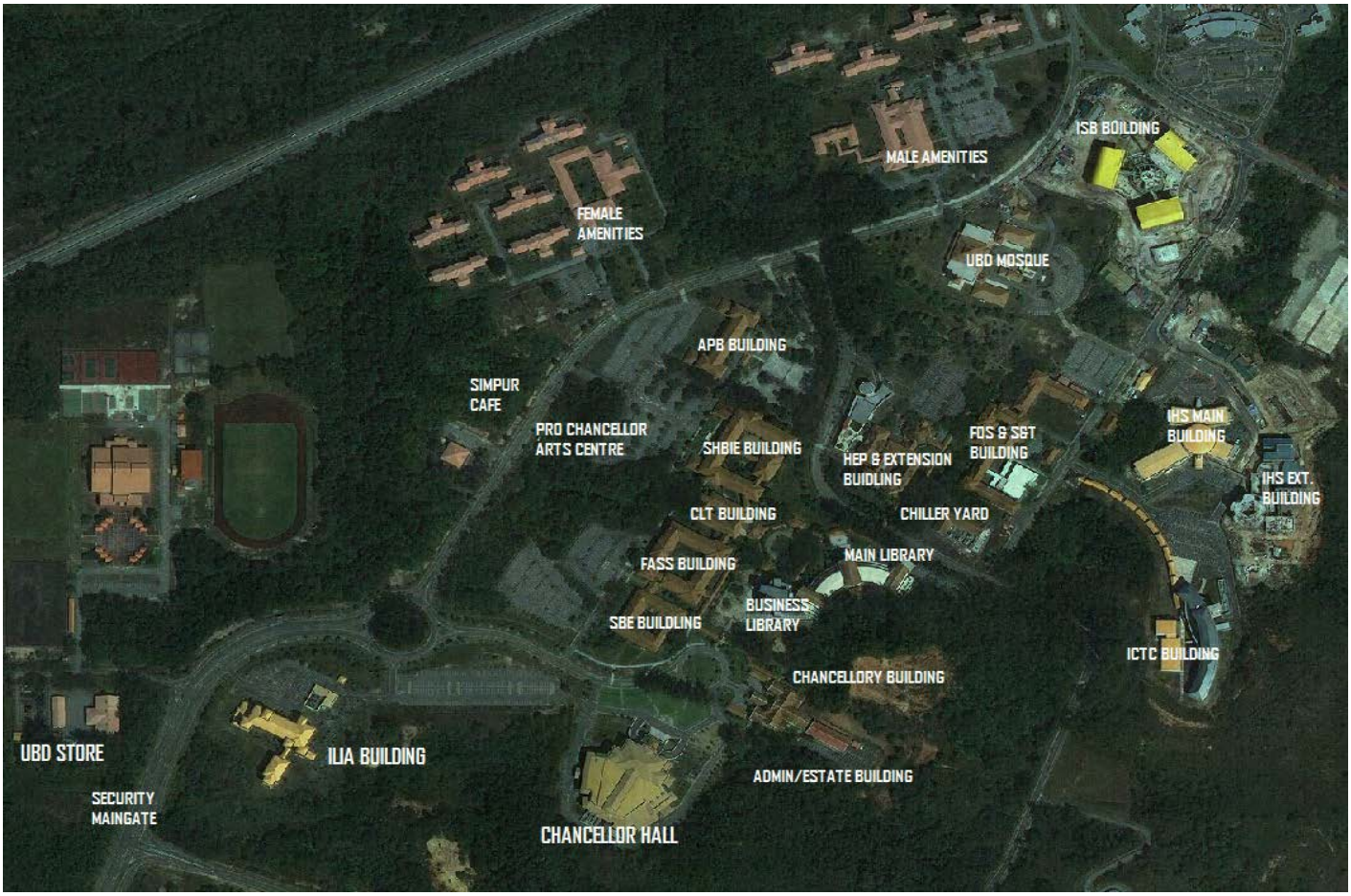
Work	Area	Frequency / Requirement
Electrical Fire Alarm Systems	Entire Facility	Refer to Maintenance Works Schedule on item 2.6.4 above
Fixed Fire Protection Systems (Chemical Agent)	Entire Facility	Refer to Maintenance Works Schedule on item 2.6.4 above
Fixed Fire Protection Systems (Water)	Entire Facility	Refer to Maintenance Works Schedule on item 2.6.4 above

2.6.7 Maintenance Works Schedule - Fire Blanket

2.6.7. 1 This section involves maintenance of all fire blankets as per maintenance task below:-

Equipment	Maintenance Works	Category	Frequency
All Fire Blankets	**Accessibility:** Check the blanket is - Conspicuous - Readily available - In its assigned location and - Installed in accordance with AS2444	Annually	I
	Location sign: - Check that the blanket location sign is visible and correct.		
	Blanket Container: - Check that the blanket container is securely and correctly supported - The container is clean and free from damage - The container has clear and legible instructions there on and - The container has a maintenance tag attached to the		
	Blanket - Remove the blanket from the container and check for any damage or contamination to the blanket - Check the blanket is correctly folded - Check for insecure or damaged hand-holding devices		

Equipment	Maintenance Works	Frequency	Category of Maintenance Works
	Where the blanket conforms with the above, repack the blanket into the container as by the recommended manufacturer.	Annually	I
	Note: It is important that fire blankets are always folded in the manner prescribed by the manufacturer, in order that they can be removed from the container quickly. **Corrective action:** Where a blanket, container or location sign doesn't conform with the requirements of the technical sheet, it shall be rectified or condemned. Record maintenance with a hole punched through the tag in the appropriate space. Any other manufacturer's recommendation		



LEGEND :

UBD STORE : **Store**
SECURITY : **Security Maingate**
SHBIE: **Sultan Hassanal Bolkiah Institute of Education**
APB : **Academy of**
CLT: **Central Lecture Theatre**
FASS: **Faculty of Art and Social Science**
SBE : **School Of Business & Economics**
HEP: **Hal Ehwal Pelajar**
HEP Ext.: **Hal Ehwal Pelajar Extension**
FOS & S&T: **Faculty of Science & Science Technology**
ICTC: **Information, Communication Technolocy Centre**
IHS : **Pengiran Anak Puteri Rashidah Sa'adatul Bolkiah Institute of Health Science**
IHS Ext. : **Pengiran Anak Puteri Rashidah Sa'adatul Bolkiah Institute of Health Science Extension**
ILIA: **Institute for Leadership, Innovation and Advancement**
KBFSC: **Kuala Belalong Field Staff Centre (Temburong)**
PCAC : **Pro Chancellor Arts Centre**
ISB : **Integrated Science Building**
CHANCELLOR HALL
CHANCELLORRY BUIDLING3
ADMINISTRATION/ESTATE BUILDING
BUSINESS LIBRARY
MAIN LIBRARY
MALE & FEMALE AMENITIES
SIMPUR CAFE
UBD MOSQUE
CHILLER YARD

SCOPE OF WORK AND SERVICES

APPENDIX 'B' – LIST OF BUILDINGS

APPENDIX - BI - FIRM BUILDINGS

No	Buildings	
Main Facilities		
1	Faculty of Science (FOS) **(ZETTLER)**	Ground Floor First Floor Second Floor Third Floor & Roof Animal House Electrical Plant Room & Genset Room Flammable House Growth Chamber
2	Faculty of Intergated Science **(MENVIER DF6000)**	Ground Floor First Floor Second Floor Third Floor & Roof
3	Science and Technology Research **(ZETTLER)**	Ground Floor First Floor
4	Sultan Hassanal Bolkiah Institute of Education (SHBIE) **(MENVIER DF6000)**	Ground Floor FirstFloor Second Floor Roof & Lift Motor Room Rubbish Centre and Gas Cylinder Area
5	School of Business & Economics (SBE) **(ZITON ZP3)**	Ground Floor First Floor
6	Faculty of Arts and Social Science (FASS) **(ZETTLER)**	Ground Floor First Floor Second Floor Roof & Lift Motor Room
7	Academy of Brunei Studies- The Language (Faculty of Islamic Studies) **(ZETTLER)**	Ground Floor First Floor Second Floor Roof & Lift Motor Room
8	Institutefor Leadership,Innovation and Advancement (ILIA) **(NOTIFIER)**	Ground Floor First Floor Second Floor Third Floor Roof & Lift Motor Room Pump Room, Sub Station, Chiller Yard Rubbish Centre
9	Pengiran Anak Puteri Rashidah Sa'adatul Bolkiah Institute of Health Science (Institute of Medicine) **(MULTRON)**	Ground Floor First Floor Second Floor Pump Room, Sub Station Chiller Yard Incenerator
10	Pengiran Anak Puteri Rashidah Sa'adatul Bolkiah Institute of Health Science (Institute of Medicine) Extension **(MULTRON)**	Ground Floor First Floor Second Floor Third Floor Four floor Fifth floor
11	Central Lecture Theatre **(AES Conventional)**	Ground Floor First Floor & Roof Level

No	Bulldlngs	
Main Facilities		
12	Student Staff Centre **(ZITON ZP3)**	Lower Ground Floor Upper Ground Floor First Floor, Roof & Lift Motor Room Sub Station Rubbish Centres
13	Student Staff Centre (Extension) **(ZETTLER)**	Ground Floor
14	Academic Service Centre and Library extension Educational Technology Centre - ETC(No 17) Library (No 17) **(ZITON ZP3) & (AES)**	Basement Ground Floor First Floor Second Floor Third Floor Roof & Lift Motor Rooms
15	Information Communication Technology Centre ICTC New (No 178) Block A & B **(MENVIER DF6000) & (AES)**	Sub Lower Ground Floor Lower Ground Floor Upper Ground Floor First Floor Second Floor Third Floor Fourth Floor, Roof & Lift Motor Room
16	Administration Building – Administration **(ZETTLER)**	Ground Floor First Floor Second Floor Attic Floor and Roof
17	Administration Building - Extension of Administration [Estate office) **(ZETTLER)**	Ground Floor First Floor Sub Station
18	Mosque **(AES)**	Main Prayer Hall - Ground Floor Male Ablution Female Ablution Minaret Mezzanine Floor Sub Station & Pump Room Chiller Yard
19	Store and Maintenance Centre **(AES)**	Central Store Maintenance Centre Lockable Compound Vehicle Garage Sub Station
20	Chancellor Hall **(ZETTLER)**	Lower Ground Floor Upper Ground Floor including Mezzanine Floor First Floor Roof Pump Room / Water Tank Area Chiller Yard
21	Kuala Belalong Field Study Centre (Temburong)	Planned and Corrective Maintenance
22	Securitv MainGate	Ground Floor
23	Service Tunnel	Underground
24	Male and female hostel amenities **(ZITON ZP3)**	Ground Floor
25	Simpur Café **(AES)**	Ground Floo

APPENDIX • B2 • PROVISIONAL BUILDING

No	Buildings	
Provisional		
26	CHILLER YARD **(ZITON ZP3)**	

SPECIFICATION

2. FIRE SEAL

a. General

The item to be manufactured by Promat Building System Pte. Ltd. 10 Science Park Road, #03-14 The Alpha Singapore Science Park II, Singapore 117684

The supplied Fire Seal shall comply with the following Building Codes / Standard:-

- AS 1530 : Part 4
- AS 4072
- BS 476 : Part 20
- prEN 1366 : Part 3

Performance Table

Separating element	**FRL (Fire Resistance Level) in minutes**		
Minimum thickness	Unpenerated openings	Cable or tray	Copper, brass steel and cast iron pipe
Slab 125mm Wall/Partition 96mm	-/120/120	/120/120*	-/120/120*
Slab 150mm	-/180/180	-/180/180*	-/180/-

*When insulation criterion is indicated on services, mesh guards may be required otherwise; insulation criterion on services may be waived.

3. FIRE EXTINGUISHER

a. General

All the supplied Portable fire extinguisher and fire blanket shall be to the approval of Local Fire Department.

The extinguisher to be hung or hooked or securely placed on galvanized iron brackets fastened to wall, partition or column in a suitable conspicuous and accessible position.

All extinguishers to be installed at height of 1.0 metre from the floor level to the handle unless otherwise stated.

SPECIFICATION

3. FIRE EXTINGUISHER (Cont'd)

b. ABC Dry Powder Fire Extinguisher

The dry powder shall be a safe and versatile extinguishant ideally suited for high risk environments. The dry powder medium shall be non-conductor of electricity. The headcap shall be corrosive resistant and shall ensure ultimate fluidisation of the powder prior to commencement of discharge. The powder extinguishers shall be designed and constructed in accordance to BS 5423.

c. Co2 Extinguishers

This shall be an efficient fire extinguishing medium. It shall smother flames and reduce the oxygen content of air around the fire, thus ensuring extinction. It shall be non-conductive and effective against fire in electrical plant. The extinguisher shall be of aluminium alloy with swivel horn applicator unless otherwise stated. The Co2 extinguisher shall be designed and constructed in accordance with BS 5423.

d. Water Co2 Extinguisher

This shall have a long life operating efficiency. A special protective coating to prevent corrosion to the containers made of polyethylene base coating shall be applied. The extinguisher bodies shall be prefabricated from steel sheets which are preformed and welded together. The neck rims shall be machined copper plated steel components welded into position on the tops of the extinguisher bodies. Caps shall be of Lexan and hoses shall be of PVC with moulded polycarbonate nozzle.

e. Powder and Foam Fire Extinguisher on Trolley EN 1866

Working Pressure: 14 Bar
Cylinder Test Pressure: 25 Bar
Discharge hose length: 6m
Finishing: Red
Operating Temperature: -20c to 60c (Powder), 1c to 60c (foam)

SPECIFICATION

3. FIRE EXTINGUISHER (Cont'd)

f. Mobile Foam Fire Extinguisher on Trolley

Performance Data

Input Pressure at Inductor	Total Water Flow	Foam Produced	Approximate running time (min.) Inductor Setting		Flow Throw from Branchpipe
Bar	Litre/min	Litre/min	3%	6%	m
5	180	1800	22	11	14
6	197	1970	20	10	
7	213	2130	18	9	17
8	228	2280	17	8.5	
10	255	2550	16	16	20

g. Portable Dry Powder Fire Extinguisher MS1539

Propellant	STORED PRESSURED TYPE (NITROGEN)				
Capacity, kg	1.0	2.0	4.0	6.0	9.0
Working Pressure. Bar (PSI)	12 (174)	14 (203)			
Test Pressure, Bar (PSI)	25 (362.5)				
Discharge time, sec	6-10	8-12	12-16	21-25	20-28
Overall height, mm	340.0	390.0	475.0		560.0
Cylinder diameter, mm	84.5	109.5	157.0		176.0
Overall weight, kg	1.9	3.3	7.8	9.3	12.7
Body Material	Cold Roll Steel				
Standard	Manufactured and approved to MS1539 Part 1				
Paint Finish	Red				
Fire Rating	5A 21B	8A 34B	13A 70B	21A 144B	27A 144B
Carton box size, mm					
Type of extinguishant	ABC Powder (Ammonium Phosphate)				
Type of fire	A, B, C, E				

SPECIFICATION

3. FIRE EXTINGUISHER (Cont'd)

h. Portable Carbon Dioxide Fire Extinguisher MS1539

Material	Carbon Steel	
Capacity, kg	2.0	5.0
Working Pressure. Bar	60.0	
Overall height, mm	525.0	700.0
Cylinder diameter, mm	115.0	150.0
Cylinder Test Pressure, Bar	250.0	
Discharge time, sec	12-16	18-24
Standard	Manufactured and approved to MS1539 Part 1	
Overall weight, kg	9.8	17.0
Paint Finish	Red	
Fire Rating	21B	55B
Operating Head	Brass	
Type of extinguishant	Carbon Dioxide	
Type of fire	B, C	

i. BS EN3 CO2 Type Fire Extinguisher

Extinguisher Type	2kg	5kg	2kg	5kg
Material	Steel	Steel	Aluminium	Aluminium
Fire Rating	34B	55B	34B	55B
Operating Temperature	-20°C to 60°C			
Operating Pressure	50 Bar at 20°C			
Cylinder Specification	1997/23/EC			
Height	625mm	770mm	575mm	695mm
Full Weight	8.4kg	15.8kg	6.1kg	15.2kg
Empty Weight	6.4kg	10.8kg	4.1kg	10.2kg
Discharge Time	14 Secs	15 Secs	14 Secs	15 Secs
Range of Throw (approx)	4 - 5 M	4 - 5 M	4 - 5 M	4 - 5 M

SPECIFICATION

3. <u>FIRE EXTINGUISHER</u> (Cont'd)

j. <u>BS EN3 Powder Type Fire Extinguisher</u>

Propellant	STORED PRESSURED TYPE (NITROGEN)					CO2 CARTRIDGE		
Capacity, Kg.	1.0	2.0	4.0	6.0	9.0	6.0	9.0	12.0
Fire Rating	8A, 34B	13A, 89B	21A, 113B	34A, 233B	34A, 233B	34A, 233B	43A, 233B	55A, 233B
Operating Temperature	-20°C to 60°C							
Working Pressure. Bar (PSI)	12 (174)	14 (203)				12 (174)	14 (203)	
Overall height, mm	340.0	390.0	475.0		560.0	340.0	390.0	475.0
Test Pressure, Bar (PSI)	25 (362.5)					25 (362.5)		
Discharge time, sec	6-10	8-12	12-16	21-25	20-28	6-10	8-12	12-16
Range of Throw (approx)	4 - 5 M	4 - 5 M	5 - 6 M	5 - 6 M	6 - 6 M	7 - 6 M	8 - 6 M	9 - 6 M

SPECIFICATION

4. FIRE ADDRESS / DETECTOR EQUIPMENT

a. Beam Detectors

The beam detector used to be the type of reflective infrared beam smoke detector.

The maximum no. of reflector(s) to be used shall not exceed 4 Nos. (1 to 4) depending on the distance of coverage from the detector.

The detector is to be built-in with microprocessor.

The detector shall be capable to carry out system adjustment, compensation due to variation in ambient data and judgment of fire and fault through fixed algorithm with indication by LED and signal output terminals.

The sensitivity of the detector is to be field adjustable hence, increasing the product range of application.

Technical Specifications:-

Operating Voltage	24VDC
Operating Voltage	Standby Current : < 12mA
	Alarm Current : < 22mA
Detection Range	Length from 8m to 100m
Monitoring Area	Maximum Area : 14 x 100 = 1400m2
	Maximum Width : 14m
Wiring	Non-Polarized Two-Core 24VDC
	Non-Polarized Two-Core Detection Loop
Operation Environment	Temperature : - 10°C ~ + 50°C
	Relative Humidity : < 92%
Casing Material	ABS

b. Fireman Intercom System

The fire alarm control panel shall be constructed as a wall mounted unit to IP42 rating using 1.60mm thick steel sheet sections suitably reinforced. The panel shall be fitted with a lockable front door with a transparent viewing panel or alternatively in the absence of a door, a key switch operation is required to disable the control keys.

The fire alarm panel shall incorporate a sequential polling system which polls each device individually and transmits or read information from it. The information is compared with all possible fire patterns in the software (algorithms) and a decision made as to the status of the device (pre alarm, fire, short/open circuit fault, incorrect addressing, unauthorized device removal or exchange, detector contaminated or normal) and events annunciated. The System polling time shall not exceed 1 second for each complete scan of all devices attached.

SPECIFICATION

4. FIRE ADDRESS / DETECTOR EQUIPMENT (Cont'd)

b. Fireman Intercom System (cont'd)

The system shall be capable of accommodating alterations/extensions without the need for relabelling (i.e. allocation of address shall be independent of the physical arrangement in the loop). The labelling shall be stored in a non-erasable memory within the control panel.

The wiring works to be of return loop arrangement and the panel shall be able to be configured in multiple loops. The loops shall be capable of accepting a minimum of 99 devices, which shall include fire detectors, break glass, contacts such as sprinkler flow switches (with delay timer incorporated), alarm sounders, interfere for trip delays, solenoid valves and other evacuation/alarm system.

c. Detectors

All electronic circuits and devices in the detectors shall be hermetically sealed to protect from dust, dirt or humidity. All circuitry shall be protected against electrical transients and electromagnetic interference while the sensor element is protected against dust and vermin. The detectors shall be compensated by temperature, humidity and barometric changes. The detector shall be of low profile, small footprint, aesthetically pleasing off white appearance.

Detectors shall be loop wired and loop powered using a two wire screened cable. The sensitivity of addressable detectors shall be individually adjustable from the control panel. Every detector base shall have a short circuit isolating device. It shall be possible to measure and display the detector sensitivity at the control panel. The detector shall incorporate a identification code and self test function, which shall be reported to the panel. If the detector is removed or the wrong type of detector is plugged in or the data returned is incompatible as compared to the database in the control panel, it must be annunciate at the control panel.

All detectors and devices should have a clear visual marker externally attached (Transfer tape or equivalent) stating the zone number followed by the point number.

d. Thermal Detector

Thermal detectors shall comply with BS 5445 part 5 for installation in normal environments and BS 5445 part 8 for high ambient temperatures. Thermal detectors shall have rate of rise and fixed temperature thermal detectors shall be used if specially shown in the drawings.

SPECIFICATION

4. FIRE ADDRESS / DETECTOR EQUIPMENT (Cont'd)

e. Smoke Detector

The smoke detector shall be in accordance with BS 5445 part 7 and part 9.

Photoelectric type detectors shall respond to visible smoke concentrations and shall consists of a light source in a labyrinth chamber, such that no light normally reaches the sensor, but the presence of smoke scatters the beam and activates the sensor. Alternatively sensors based on the obscuration principle may be used.

The ionization detector shall respond to the first traces of fire in the form of visible smoke or invisible products of combustion and shall be a dual chamber type. The radioactive source shall be less than 1 micro-curie of Americium 241 and shall comply with all atomic energy Agency requirements.

f. Sounders (Alarm Bell / Sirens)

The bell shall generally be 150mm diameter pressed steel dome shaped type.

The sirens shall be made either with pressed steel or high impact ABS.

Sounder shall be finishes in red colour and shall be mounted at a height of 2250mm above finishes floor level.

Sounder installed externally shall be weatherproof.

Bells shall sound at least 95dB at 1.0 metre and sirens 100dB at 1.0 metre when activated. The Contractor shall check the sound levels, which shall be 65dB or 5dB above the background noise all over the protected area, whichever is higher.

The sounders shall be able to produce three different tones (alert with 1 sec on and 1 sec off, continuous tone for evacuate and a user defined tone for specialized events) that are totally in phase and hence clearly distinguished from one another. The output of all sounder shall be synchronized with one another.

SPECIFICATION

4. FIRE ADDRESS / DETECTOR EQUIPMENT (Cont'd)

g. Manual Call Point

The call point shall be of the break glass type, with casing finished signal red. The lettering "Fire-Break Glass" shall be inscribed or printed on a thin plastic film laminated on the exterior surface of the glass. The call point shall be electrically compatible with the standard range of automatic detectors so that it can be connected directly into a addressable supervised two-wire zone. The call point shall comply to BS 5839 part 2. It shall be possible to test the manual call point with the use of the test key provided and without breaking the glass or removing the cover. Call points shall be flush mounted directly onto conduit junction boxes at a mounting height of 1400mm above finishes floor level to the centre of the call point. Where call points required additional protection they shall be supplied with a hinged transparent polycarbonate cover with the wordings "Lift cover before breaking glass". Call points exposed to the weather shall be provided with weather gaskets.

5. VALVES AND ACCESSORIES

a. General

The section covers the supply, installation, testing and commissioning of all valves and accessories. Valves and accessories shall be supplied and installed as shown on the drawings.

All valves shall be constructed and applied in accordance with the relevant British Standards and shall be fitted in accessible positions for operation and repair.

All stop valves shall be right handed and shall have indication whether the valve is open or shut. The controlling wheel must have markings of the direction on how the wheel is to be turned to close the valve. Valves shall generally be arranged to close on clockwise rotation of the hand wheel.

The connection between each valve and the adjacent equipment shall be made with a union for sizes up to 50mm or a flange, (BS 4504) for ease of dismantling.

Before installation, all valves shall be blown to remove any foreign matter that might have lodged in them.

Valves spindles shall be adequately lubricated with graphite and all glands shall be freshly packed before installation.

The size of the valves shall be of the same diameter as the pipe for which they are to fit except for pressure reducing and control valve which shall be designed for the duty concerned.

SPECIFICATION

5. VALVES AND ACCESSORIES (Cont'd)

a. General (cont'd)

All valves shall be suitable for the working and test pressure of the system in which they are installed and shall be of approved manufacture as per basic equipment standards and shall be of the same manufacture.

All valves and accessories shall be able to withstand a minimum operating pressure of 10 bars and a test pressure of 15 bars (PN 10).

Each valve shall be provided with a brass identification plate which indicates the valve number, area served and usage. Each valve shall also have on it an identification of the make, model and service pressure rating.

Valves larger than 65mm shall be fitted with an indicator plate to clearly indicate if the valve is in the open or close position.

b. Stop Valves

All fittings shall be provided with a screw down brass or chrome stop valve complying with BS 1010. Alternatively if specified a quarter turn ball valve shall be used. Ball valve shall comply with BS 4504.

c. Gate Valves

Gate valves less than 50mm diameter shall comply to BS 5154 and shall be constructed from copper alloy. Valves less than 50mm diameter may be with threaded ends while larger valve shall use flanged to BS 10.

Valves larger than 65mm diameter shall be of double flanged cast iron body construction to BS 5150 with non rising stem and solid gun metal wedge.

Valves handles shall be of similar materials as the valve body and should be easily removable with a tool to prevent unauthorized use.

Gate valves shall also comply with BS 5151 while globe valves shall comply with BS 5152.

d. Sluice Valves

Sluice valves shall be clockwise closing, cast iron construction, non rising spindle, solid wedge type gate, BS 10 flanged valve, complying with the requirements of BS 5163. The valves shall be supplied with iron caps and operating keys.

SPECIFICATION

5. VALVES AND ACCESSORIES (Cont'd)

d. Sluice Valves (cont'd)

The wedge and face shall be of gunmetal construction while the spindle shall be of high tensile bronze construction. Valves shall be coated in accordance with BS 4147.

e. Butterfly Valves

Butterfly valves shall comply with BS 5155. The valves shall be of cast steel body and shall be double flanged water type designed to give a tight shut off with renewable nitrile rubber sealing rings and nylon coated bronze discs with stainless steel shaft.

Valves up to 150mm diameter shall be fitted with a 10 position locked lever handle, while larger valves shall be provided with a worm gear type hand wheel with position indicators and limit stops.

f. Check Valves

Check valves of 50mm diameter and below shall be with threaded ends and of copper alloy construction and shall comply with BS 5154. Check valves shall be spring assisted non slam type. Check valves larger than 50mm diameter shall be of cast iron construction, double flanged or wafer type complying to BS5153. Checked valves shall be of non slam, centre guided, spring assisted, disc type.

g. Pressure Relief Valve

Pressure relief valves shall be of the fully spring loaded type in accordance with BS 1271 and shall be installed in locations as shown on the drawings.

h. Air Valves

Air valves shall be 25mm single and 50mm double orifice valves incorporating a screw on isolating valve. Body of air valve shall be cast iron to BS 1452. Floating ball and valve shall be stainless steel to BS 970 : Part 4 Grade 303 S21 and float shall be stainless steel to BS 1449 : Part 2 Grade 316. Air valves shall be coated in accordance to BS 4147 : 1980 Type 1. The discharge of air valves shall be piped to the nearest drain.

i. Ball Float Valve

Ball valve of 25mm diameter and below shall be of copper alloy construction equilibrium diaphragm type complying with BS 1212 : Part 2 and have copper floats to BS 1968.

Valves larger than 25mm diameter shall be of cast iron construction and with piston type valve complying with BS 1212 : Part 1 and have copper float complying with BS 1968.

A silencing pipe shall be fitted at the discharge of all float valves.

SPECIFICATION

5. VALVES AND ACCESSORIES (Cont'd)

j. Strainers

Strainers of 50mm diameter and below shall be with threaded ends and of copper alloy construction while larger strainers up to 300mm diameter shall be of double flanged cast iron construction. Strainers shall be of the "Y" pattern.

Strainer cages shall be of 22 SWG 18/8 stainless steel and have 0.8mm perforations, the free area of which shall be not less than 5 times the cross sectional area of the pipe and shall be easily remove for maintenance. Valves larger than 150mm shall incorporate basket type strainers and shall incorporate a drain cock.

k. Pressure Regulating Valves

Pressure regulating valves shall be provided at the incoming supply line and elsewhere as shown on the drawings and shall comply with BS 6494.

The pressure reducing mechanism should be able to regulate the pressure within the set limit irrespective of flow rate or incoming water pressure fluctuations. Manual adjustment of the setting should be possible and a inlet and outlet pressure gauge should be provided to facilitate setting.

Ball valve of 25mm diameter and below shall be of copper alloy construction diaphragm type complying with BS 1212 : Part 2 and have copper floats to BS 1968. Valves larger than 25mm diameter shall be of cast iron construction and with piston type valve complying with BS 1212 : Part 1 and have float complying with BS 1968.

l. Flexible Coupling

Piping connections to all pumps and all equipment shall be by means of wire and fabric reinforced moulded high pressure convoluted rubber connectors. The fittings shall have integral rubber flanges and be bolted onto the pipe lines using flanges for 50mm diameter and larger. Smaller coupling shall utilize a screw connection.

SPECIFICATION

6. HOSEREEL SYSTEM INSTALLATION

a. Hose

The hose shall be made of continuous non-kinking reinforced rubber hose complying with BS 3169; type 'A' fitted with a shut-off-type nozzle by means of steel cadmium plated hose clips.

The nozzle shall be made of corrosion resisting metal material. It shall be adjustable for jet and spray pattern with complete shut-off. The nozzle shall be in compliance with BS 336.

The length of hose shall be 30m and 25mm bore with 6.5mm discharge nozzle. The hose shall be suitable for operation at a maximum working pressure of 1600 kpa.

The discharge nozzle and isolating gate valve shall be easily accessible; in no case shall be more than 900mm above the finished floor level.

b. Reel

Reel shall be of double swivel type unless otherwise indicated on the drawings.

Drum shall be constructed of 1.6mm thick pressed steel free from denting and twisting and finished in red epoxy polyester paint. The hub and shaft shall be of brass, fitted with a device to prevent overrun of the hose, having glandless centre seal.

In case of fixed type reels, a swivel hose guide with swing-arms of nylon rollers or similar material shall be provided adjacent to enable the hose to be pulled in any direction as required. Every reel shall be marked with the following information in a prominent position:

a. Manufacturer's name and trade mark.

b. Instruction for operation and use should include the following:-

   i. Turn on stop valve to release nozzle.

   ii. Run-out hose.

   iii. Turn on water at nozzle.

   iv. The year of manufacture.

   v. The test pressure of hose in kpa.

SPECIFICATION

6. HOSEREEL SYSTEM INSTALLATION (Cont'd)

b. Reel (cont'd)

The whole assembly of hose and reel shall be in compliance with BS (EN) 671. The hose reel shall achieve a throw of 6.0 metre at 0.41/s with an input pressure of 150 kpa.

Where reel cabinets are specified they shall be of steel construction (1.6mm) with a wire glass from labelled "Fire hose reel" in letters 50mm high in Malay and English. The door shall be fitted with a spring lock.

7. SPRINKLER SYSTEM

a. Sprinkler Heads

The Contractor to supply and install speaker heads of the type and finish as described in the Work Orders and in the drawings.

Sprinklers shall generally be of the glass bulb type with a temperature rating 68ºC and shall be colour coded. Higher temperature sprinklers shall be used where specified. Sprinklers shall generally be selected with a temperature rating which is 30ºC higher than the anticipated temperature.

The nominal orifice size thread size K factor and thermal sensitivity ratings shall as per the requirements of LPG Technical Bulletin TB: 20:1994:1 in accordance with the specified class of hazard. All sprinklers shall be marked with the make, model number and year of manufacture.

The type and finish of sprinkler used shall generally be as follows;

1) Upright Sprinkler - For use to protect areas above the ceiling and where there are no ceilings. The sprinkler to be installed upright with the deflector above the frame and providing an umbrella shaped downward spray.

2) Pendant Sprinkler - A standard spray sprinkler installed with the deflector below the frame and forming an umbrella shaped downward spray.

3) Conventional Sprinkler - A sprinkler providing a spiracle spray with about 60% of water, directed downward and a portion upward.

SPECIFICATION

7. <u>SPRINKLER SYSTEM</u> (Cont'd)

a. <u>Sprinkler Heads</u> (cont'd)

4) Vertical Sideway (upright or pendant) - A sprinkler installed vertically near a wall and near the ceiling and providing a quarter spherical pattern spray.

5) Horizontal Sidewall - A sprinkler installed horizontally near a wall and near the ceiling and providing a quarter spiracle pattern spray.

6) Extended Coverage Sprinkler - A special sprinkler providing an extended coverage.

7) Quick Response Sprinkler - A sprinkler with a fast actuating operating element.

8) Flush Sprinkler - A pendant decorative sprinkler intended for installation with a concealed piping. The operating element is exposed below the ceiling. A decorative surface mounted escutcheon plate is to be provided.

9) Recessed Sprinkler - A pendant sprinkler intended for installation with a concealed piping and decorative adjustable recessed escutcheon.

10) Concealed Sprinkler - The sprinkler shall be hidden from view by a solder link cover plate installed flush with the ceiling.

The sprinkler assembly shall be a two piece type which permits the cover to be installed later while also providing a 15mm adjustment to allow easy installation of the cover.

11) Dry Pendant Sprinkler - A sprinkler for use in cold rooms and areas subject to freezing. The unit shall consist of a pendant sprinkler permanently secured to an extension nipple which has a sealed inlet and to prevent water entering the nipple until the sprinkler operates.

SPECIFICATION

8. WET RISER SYSTEM

a. General

This section of the specification is to cover the supply, installation, testing and commissioning of the wet riser system including piping, breeching inlets, pressure reducing landing valves, hoses, pumps, control panels and all other accessories to complete the system as specified and as shown in the drawings and in accordance with BS 5306 : Part 1.

b. Pumps

The main wet riser pumps shall be a back pull out end suction centrifugal pump, while the jockey pumps shall be a vertical inline multistage centrifugal pump.

Refer to “Pumps” section for detailed specification.

c. Pipework / Fittings

Refer to “Pipes and Fittings” section for detailed specification.

d. Valves and Gauges

Refer to “Valves and Gauges” section for detailed specification.

e. Breeching Inlets

The fire services inlet shall have 4 instantaneous coupling connections. Each inlet consists of 64mm instantaneous male coupling and a back pressure valve. Valves shall be protected by a cap secured by a short chain. A 25mm diameter drain valve shall be incorporated to facilitate drainage. The breeching inlet shall be enclosed in a suitable wireglass fronted box with spring locks and signage “WET RISER INLET TANK INLET” in Malay and English.

The breeching inlets and boxes should conform to requirements of BS 5041 : Part 3 and Part 5.

SPECIFICATION

8. WET RISER SYSTEM (Cont'd)

f. Landing Valves

The landing valve for wet risers to comply with the requirements of BS 5041 : Part 1 and of bronze/brass construction. They shall be purpose made fitting (screwed and socketed), with 65mm instantaneous female coupling outlet fitted with a removable plug secured by a chain. The valves shall be of renewable disc type and suitable for a test pressure of 22.5 bars. The pressure reducing springs shall be steel construction and the setting should be extremely adjustable. The handle shall be at least 165mm diameter with the direction of opening and closing permanently embossed.

The valves shall be protected by and enclosed within a cupboard or a box conforming to the requirements of BS 5041: Part 4. Every landing valve shall be kept shut with a padlock and leather strap. The padlocks used shall be of master – key type.

g. Hose and Gradle

Each landing valve to be provided with a 30m long 65mm diameter hose. The hose shall be fitted with a male instantaneous coupling at the inlet end and a light alloy/bronze/ brass jet nozzle at the outlet end. The nozzle shall be in compliance with BS 336.

The hose shall be a rubber lined polyester fibre, circular weave hose capable of withstanding an operating pressure of 17 bars and a bursting pressure of 37 bars and in conformances with BS 6391: Type 1. The hose shall be neatly folded into a hose cradle fitted to the wall within the riser.

SPECIFICATION

9. AUTOMATIC SMOKE CURTAINS

a. General

The automatic smoke master smoke curtain system comprises of curtain assemblies, motors, brakes and controls. As the system is for life safety purposes the activation of the smoke curtain system, it is to be completely reliable and shall be activated by a control signal from an automatic detection system and/or manual override from the fire command centre.

The automatic smoke curtain system must have the following compliance:

1) BOMBA approval for use in Smoke Control System
2) BS 7346 Part 3 : 1990
3) ISO 9001 : 1987 for the Design, Manufacture, Installation, Testing and Commissioning of Smoke Curtain System

b. Smoke Curtain Assemblies

The components of the smoke curtain assemblies to be manufactured in accordance with the BS 7346 Part 3 : 1990. A factory certificate shall be issued by the manufacturer to certify the assemblies.

All the materials used in the construction of the smoke curtains shall be impervious to smoke and should not add to the fire risk nor contribute to a fire during use.

The curtain fabric shall be coiled onto a hexagonal shaped tubular roller to provide a segmented and firm retraction/descend of the fabric with no "slip". The curtain assemblies shall be housed within galvanized mild steel enclosure with the curtain bottom bar fully flush with the ceiling to design detail.

Smoke curtain material thickness is to be not less than 0.40mm. The material is to be dimensionally stable in temperature up to 600ºC and shall be rated Class "O" surface spread of flame to BS 476 : Part 7 : Method for Classification of the Surface Spread of Flame of Products.

Bottom bars of curtains will seat exactly flush with ceilings. The triangular shaped bottom bar shall have a flat base. No limit switches shall be used to set the height of descend or ascend.

SPECIFICATION

10. AUTOMATIC SMOKE CONTROL SYSTEM

a. General

ISO 9001 Quality Assurance on Design, Equipment, Installation, Testing and Commissioning

The manufacturer of the smoke control system equipment shall be an ISO 9001 certified firm with the BSI for the scope of registration:

i) The Design and Manufacture of Air and Fire Ventilation Equipment, Smoke Control Equipment, Electrical and Electro Pneumatic Control Equipment including appendices stating the scope of registration under Standard Industrial Codes (SIC) : SIC 3284, SIC 8370 and SIC 5030.

ii) The Design of Air and Fire Ventilation Equipment, Smoke Control Equipment, Electrical and Electro Pneumatic Control Equipment including appendices stating the scope of registration under Standard Industrial Codes (SIC) : SIC 3284, SIC 8070 and SIC 5030.

iii) The Design, Installation and Commissioning of Smoke Extract Systems, Smoke Control Systems, Natural Ventilations systems and Powered Ventilations Systems including appendices stating the scope of registration under Standard Industrial Codes (SIC) : SIC 3284, SIC 8370 and SIC 5030.

Copies of all the above schedules shall be submitted for review.

b. Codes and Standards

The design, supply, installation, testing and commissioning of the smoke control system shall be in full conformity with the following rules and regulations:

a) Code of Practice for fire Precaution in Buildings, 1997.

b) Building Research Establishment Report BR258 – "Design Approaches for Smoke Control in Atrium Buildings, 1994".

c) Building Research Establishment Report BR186 – "Design Principles for Smoke Ventilation in Enclosed Shopping Centres, 1990".

d) British Standards: BS 7346 Part 1, 2 and 3.

e) Other requirements of the BOMBA.

SPECIFICATION

10. AUTOMATIC SMOKE CONTROL SYSTEM (Cont'd)

c. Design Criteria

The smoke control specialist must adopt the following design criteria in the design of the smoke control system:

a. Type of Building : Sprinkled

b. Shape of Fire : Square

c. Sprinkler Operating Temperature : 68°C

The number and position of the smoke control equipment are shown in the drawings. The specialist shall adhere to the designed number and position of the specified equipment into the design of the entire smoke control system. No deviation shall be considered unless it is due to any technical or engineering aspects, which have to be justified accordingly.

d. Automatic Smoke Curtain System

General Description

The automatic smoke curtain system shall comprise of curtain assemblies, motors, brakes and controls. As the system is for life safety purposes the activation of the smoke curtain system shall be completely reliable and shall be activated by a control signal from an automatic detection system and/or manual override from the fire command centre.

To avoid the risk of injury, the curtain shall descend in a controlled manner in all conditions, in other words, under the conditions:

a. Mains power failure

b. Emergency power failure

c. Back-up battery power failure

d. All the above

TABLE ON FAIL SAFE REQUIREMENTS	Status of Smoke Control Equipment During a Fire Scenario with the following conditions:			
	Mains Power Failure	Emergency Power Failure	Battery Power Failure	Complete Power Failure
Gravity Fall Fail-Safe Automatic Smoke Curtain System	DOWN	DOWN	DOWN	DOWN

In any eventuality should the curtain fall at a velocity greater than 0.7m/s. The braking system **must not** rely upon battery power.

SPECIFICATION

10. AUTOMATIC SMOKE CONTROL SYSTEM (Cont'd)

d. Automatic Smoke Curtain System (cont'd)

General Description (cont'd)

The automatic smoke curtain system must have the following compliance:

1. FSB approval for use in Smoke Control System.
2. SPSB Label for Installation and Construction.
3. BS 7346 Part 3 : 1990 – Specifications for Smoke Curtains.
4. ISO 9001: 1987 for the Design, Manufacture, Installation, Testing and Commissioning of Smoke Curtain System.

Smoke Curtain Assemblies

The components of the smoke curtain assemblies to be manufactured in accordance with the BS 7346 Part 3 : 1990. A factory certificate shall be issued by the manufacturer to certify this.

All the materials used in the construction of the smoke curtains shall be impervious to smoke and should not add to the fire risk nor contribute to a fire during use.

The curtain fabric shall be coiled onto tubular roller during ambient conditions. The curtain assemblies shall be house within galvanized mild steel enclosure with the curtain bottom bar fully flush with the ceiling to the design detail.

Summary test report shall be prepared to relate the results of the tests to the requirements for a Class "O" surface of a material or composite product.

Bottom bars of curtains will seat exactly flush with ceilings as an option. If limit switches are utilized, the supplier will provide evidence to demonstrate that an **alignment tolerance of + 1.0mm** will be achieved.

(Note): Limit switches are generally not reliable in terms of durability. Full guarantees shall be provided for any limit switches used in the contract.

Motor Specification

To allow the curtain to be reset in the raised position after operation or testing, a motor shall be provided with curtain assembly. To ensure the integrity of a fail-safe smoke control system is maintained, the smoke curtain shall be designed to be gravity fail-safe, in other works, drop by gravity during a complete power failure situation.

SPECIFICATION

10. AUTOMATIC SMOKE CONTROL SYSTEM (Cont'd)

d. Automatic Smoke Curtain System (cont'd)

Installation Methods

In order to ensure an effective smoke curtain system is installed with the minimum number of gaps, **maximum size of 6.0m long smoke curtain rollers should be used wherever possible**. FSB approval letter for such an installation shall be submitted for assessment.

Gaps between curtains/structure and curtains should not exceed **60mm** where a number of curtains are used to create a continuous length or curtains abut at a corner. In order to ensure an effective smoke curtain system is installed with the minimum number of gaps, **maximum size of 6.0m long smoke curtain rollers should be used wherever possible**. In the situation where curtains meet at a corner, the gap between curtains shall not exceed **50mm**. All exposed surfaces for aesthetic aspects shall be polyester powder coated to match the ceiling or the interior design's requirements.

e. Fixed Smoke Barrier System

Materials

The smoke barrier system shall be designed and constructed to comply to BS 7346 Part 3 – Specification for smoke curtains. It shall be made of similar construction to the automatic smoke curtain system or of non-combustible materials and able to resist heat temperature of at least 1000º for 2 hours tested to BS 476 – Part 20. The material used must be BOMBA approved for use as smoke barriers in smoke control systems.

The specialist shall determine the height of the smoke barriers based on the plans and sections given as well as making provisions of all services penetrations and etc.

Construction

The framing system to be fixed to the soffit of slabs or other structural members using appropriate size of galvanized anchor bolts. Where inserts are provided at the soffit of slabs, they shall be fully utilized to secure the framing system.

Openings shall be formed in the smoke barrier system to allow services to pass through. No gaps shall be allowed as far as possible between the smoke barrier and services as well as other adjoining smoke enclosures. If unavoidable, it shall still comply to BS 7346 Part 3. Where necessary, modification shall be made to the framing system to avoid clashing of services and other obstructions. Product specifications, construction drawings and test reports such as BOMBA approvals and etc., shall be submitted for assessment.

SPECIFICATION

10. AUTOMATIC SMOKE CONTROL SYSTEM (Cont'd)

f. Liberator Roof Smoke Extractors

Smoke Extractors

The powered smoke extractor shall be designed, built and manufactured in accordance to BS 7346 Part 2 : 1990 with BSI ISO 9001 quality assurance from the design and manufacture of smoke control system. The minimum allowable operating temperature of the fan shall be 250ºC for 30 minutes. Higher temperature fans shall be recommended dependent on the smoke layer temperature derived in the design calculations.

At least 2 units of powered smoke extractors are to be provided in a single smoke control zone. Furthermore, the volumetric flow rate required within each zone shall be achieved when the largest capacity fan powered extract unit is discounted.

The motor mounting plate shall be formed in sheet galvanise and shall be bolted to the sides of the base. The aluminium used in the construction of the unit shall be in accordance to BS 1470 5251 H22 supplied in mill finish.

The fan/motor assembly shall comprise the motor, impeller, mounting plates and frame, manufactured of welded angle construction in an H configuration. Other components shall include anti-vibration hangers and flexible connections, all to be compliant to at least 2 hours at 250ºC.

The extract units shall have resistance to the effects of normal atmospheric corrosion and shall be structurally unaffected by the presence of water or water vapour. Electric motors shall be rated to withstand atmospheres up to 80% relative humidity. The units shall not be susceptible to attack by insects, mould or fungi.

RINGKASAN SEBUTHARGA
SUMMARY OF QUOTATION

Tajuk / Title : **TERM CONTRACT OF PREVENTIVE MAINTENANCE FOR FIRE PROTECTION SYSTEM IN UNIVERSITI BRUNEI DARUSSALAM**

Bil. Sebutharga Quotation No. : **UBD/Q/075/2025 - [G]**

Bil. No.	**Keterangan** / Description	**Unit** Unit	**Kadar** Rate	**Jumlah** Amount		
				Kuantiti Quantity	**$**	**¢**
	SCHEDULE A PERIODIC MAINTENANCE					
1	To provide **technicians** for carry out maintenance as per scope of work including 24hrs call back services and also troubleshooting services, testing and commissioning. The monthly rates shall including the provision of standby services for at least one technician as and per required by the client during function and event. For all UBD buildings.	no	1,200	2	2,400	00
2	To provide **helpers** for carry out maintenance as per scope of work including 24hrs call back services and also troubleshooting services, testing and commissioning. The monthly rates shall including the provision of standby services for at least one helper as and per required by the client during function and event. For all UBD buildings.	no	500	2	1,000	00
	JUMLAH KEESELURUHAN BAGI RINGKASAN TAWARAN INI TOTAL AMOUNT FOR THIS SUMMARY OF TENDER				3,400	00
	JUMLAH KEESELURUHAN BAGI RINGKASAN TAWARAN INI BAGI 12 BULAN TOTAL AMOUNT FOR THIS SUMMARY OF TENDER FOR 12 MONTHS				**40,800**	**00**

I/we, the undersigned, are willing to contract of preventive maintenance for fire protection system in Universiti Brunei Darussalam as may be ordered from time to time for the period of one (1) year or when needed not exceeding quotation limited, Which ever come first.

This quotation is open to contractor with valid registration minimum class 1 and Above & Category of E01,KPME05,P04 & P05

- (+)PLUS/(-) MINUS……% (… ..... Percentage)

Defect liability period shall be 6 months

Contract period:

1 year or not exceeding the amount of the quotation limit, which

ever come first.

Valid Offer

6(six) Months (from the date of the quotation)

From:……

Contract /Adress

…….
(Official chop/Signature)

……. Tel. (off):……

……. Mobile Phone:…….

……. Fax No:……

Classs/Category:……..