OPERATION AND MAINTENANCE MANUAL
AUTOMATIC FIRE PROTECTION SYSTEM
(CLEAN AGENT HFC227EA AND CO2 BASED FLOODING SYSTEM)

FET

One Stop Solution for Safety Needs

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About Us : Fire Engineering Technology, started with the vision to cater the Hospitals, Hotels, Government sector, and other sectors like Mining and Industries to provide best quality of Fire Safety system with satisfaction.

The company is engaged in Training, Product support and designing activities. It has a history of delivering value to the customers through engineering expertise, efficient operations and Quality systems.

The company has demonstrated its ability to handle projects successfully in the domain of Manufacturing and other sectors. Flexibility to adapt to varying needs of the customers coupled with the extensive knowledge of the industry has ensured delivery of quality products consistently.

Over the years, Fire Engineering has provided its Clients products which are Import Substitutes as well as customized products developed indigenously. The products have been certified for quality, functionality and acceptability by the Regulatory Authorities of the Indian Government.

Fire Engineering believes in investing on its infrastructure and newer technologies from time to time.

Product and Services:

1. Fire Suppression System
2. Mining safety products
3. Gas Flooding System
4. Fire Extinguishers
5. Hydrant accessories
6. Detection Systems
7. Installations of Fire Alarm System
8. Installation of Fire Detection System
9. Installation of Suppression system and Flooding Systems
10. AMC
11. Training and Certifications
12. Fire Audit

Fire Extinguishers

ABC type Fire Extinguishers- all size.	CO2 Type Fire Extinguishers-All Size
DCP Type Fire Extinguishers- all size.	Foam Type Fire Extinguishers-All size
Clean Agent – All Size	Water CO2 Type Fire Extinguishers -all size

HYDRANT ACCESSORIES	
Short Branch Pipe	Hose Box
Shut of Nozzle	First Aid Hose Reel (RRL)
Draw Out Connection	Hose Reel
Lending Valve	Fire Hose Delivery Coupling
Sprinklers	Fire Man Axe
Fire Bridge Connection	Coupling
Adaptors for Hydrant	Butter Fly Valve
Fire Bucket	Fire Stand
Fire Beater	NRV (Non Return Valve)
DETECTORS SYSTEMS	
Addressable/ Conventional Fire Alarm System	Smoke Detectors
Heat Detectors	MCB/Hooter
Fire Panel	Repeater
Sprinkler Panel	Mimic Panel
P.A Systems	Electric Siren
FIRE SUPPRESSION SYSTEM	
Fire trace system for Electrical Panels	**Fire Trace system for Server Rack**
Fire Trace System for Engine Area	**Fire Trace System for Fume Cupboards**
FM 200 Suppression System Novec 1230 Suppression System	CO2 Flooding System Total Flooding System
NVF 125 Suppression System	Vesda
Fire Finder Suppression System	Argon Flooding System
REFILLING OF EXTINGUISHERS	
Refilling of ABC Fire Extinguishers	Refilling of CO2 Fire Extinguishers
Refilling of Water CO2 Fire Extinguishers	Refilling of DCP Fire Extinguishers
Refilling of Foam Type Fire Extinguishers	Refilling of Clean Agent
Refilling of FM 200/ NVF	Refilling of CO2 Flooding Systems Gas

SAFETY PRECAUTIONS

To ensure the effective performance of the Fire Protection System, this manual contains CAUTION STATEMENTS. These CAUTIONS are to be adhered to during installation / operation of the system.

1. CAUTION:

THE FIRE-FINDER TUBE IS MADE OF HIGH TECH POLYMER MATERIAL. ANY DAMAGE CAUSED TO THE FIRE-FINDER TUBE BY CRUSHING, CUTTING OR KINKING WILL ACTIVATE THE SYSTEM AND DISCHARGE THE C02 FROM THE CYLINDER.

2. CAUTION:

THE INFORMATION CONTAINED IN THE DECALS AND THIS MANUAL SHOULD BE READ AND UNDERSTOOD BEFORE THE SYSTEM IS OPERATED.

3. CAUTION:

THE BALL VALVE ON THE FM 200 CYLINDER MUST BE KEPT IN "ON" POSITION FOR THE SYSTEM TO OPERATE. WHILE CARRYING OUT ROUTINE MAINTENANCE OR ANY OTHER KIND OF REPAIR, ENSURE THAT THE BALL VALVE IS IN "OFF" POSITION ELSE THE SYSTEM MAY DISCHARGE THE CYLINDER INSTANTANEOUSLY AND COMPLETELY.

4. CAUTION:

CARE SHOULD BE EXERCISED TO AVOID DAMAGES TO THE FIRE-FINDER TUBE AND OTHER SUB - ASSEMBLIES TO ENSURE RELIABLE OPERATION OF THE SYSTEM.

INTRODUCTION

Fire is a serious hazard to life and property. Occurrence of fire besides leading to personnel injuries and property damage also leads to loss of productivity and precious time.

The primary cause of fire may be due to short circuit /overheating of certain components in side the Electrical Panel.

Since the areas are unmanned and completely closed, fire inside the Electrical Panel is not visible and accessible from out side till it becomes too big, dangerous and unmanageable.

The Fire Protection System calls for early detection of fire and quenching the same by flooding with FM 200 besides giving out an audio-visual alarm.

SYSTEM OPERATION

The main features of the system are:

- Automatic Detection of Fire
- Automatic flooding by FM 200.
- Activation of Audio-visual Alarm.

The detection of fire is primarily made by a FIRE-FINDER Tube .

In the event of a fire, this will lead to rapid reduction of pressure inside the FIRE-FINDER Tube. This will make the Differential High Pressure Valve fitted on the FM 200 Cylinder to open out instantaneously. The FM 200Gas Stored in the Cylinder will get released through the nozzle points made at FIRE-FINDER Tube at hottest point. The drop of pressure in the FIRE-FINDER Tube due to the discharge will activate an Audio-Visual Alarm.

FIRE-FINDER Tube can Detect Fire anywhere along its length. The FIRE-FINDER Tube is highly flexible and can be conveniently routed to cover the various hazard areas. The FIRE-FINDER Tube is a fixed temperature sensing Tube made up of a high Tech Polymer material to cater to long term leak resistance, flexibility, and accurate and consistent heat sensitivity. One end of the FIRE-FINDER Tube is connected to the FM 200 Cylinder and the other end to an End of Line Adapter through a Non return valve.

A Pressure Switch is connected to the End of Line Adapter which is electrically connected to an Audio Alarm Unit.

In the event of a Fire contacting the FIRE-FINDER Tube, the Tube starts melting and bursts at the hottest point. This leads to a rapid reduction of pressure in side the Tubing. The reduction of Pressure will make the Differential High Pressure Valve fitted on the FM 200Cylinder open out instantaneously. The FM 200Stored in the Cylinder will get released through the pre-defined Nozzle points. The drop of pressure in the FIRE-FINDER Tube due to the discharge will activate an Audio-Visual Alarm.

SYSTEM CONFIGURATION

- FIRE-FINDER Tube.
- Control Unit.
- FM 200 Cylinder Assembly.
- Pressure Switch.
- Audio-visual Alarm Unit.

FIRE-FINDER TUBE

The FIRE-FINDER Tube is a flexible detection and delivery device installed within the protected equipment. The FIRE-FINDER Tube does not rely on detecting fire at a single point but at anywhere along its length.

CONTROL PANEL

The Control Unit is located near the cylinder and controls the operation of the system. It is connected to the Mains 230V A.C.

The Control Unit continuously monitors the status of FIRE-FINDER Tube. In the event of a fire sensed by FIRE-FINDER Tube the control unit will

(1) Activate Audio Alarm

(2) Send Signal to BMS/ SCADA through NO/NC potential free contacts.

In the event of a Fire condition. Which leads to a rapid reduction of pressure in side the Tubing. The reduction of Pressure will make the Differential Low Pressure Valve fitted on the FM 200Cylinder open out instantaneously. The FM 200Stored in the Cylinder will get released through the pre-defined Nozzle points. The drop of pressure in the FIRE-FINDER Tube due to the discharge will activate an Audio-Visual Alarm. The control unit will indicate fire condition by lighting up RED Lamp.

Control Unit has got the following indications: -

1.System Status: System Status indications are used to confirm the efficient operation of the Control Panel.

2.POWER ON: A GREEN lamp lights up to indicate the availability of power to the system from the AC point.

3.**FAULT:** Fault indication works same like the FIRE indication except that it blinks when there is SHORT or OPEN in the sensor circuit i.e. FAULT. Yellow LED's are used for indication.

EXTINGUISHER AGENT:

The extinguishing Agent used for quenching the fire is FM-200 gas (Hepato flouropropane,CF3CHFCF3). FM 200 is a colourless odourless gas, low in toxicity, electrically non-conductive, leaves no residue and is an extremely effective fire suppression Agent.

FM-200 extinguishing fire by a combination of chemical and physical mechanical without affecting the available oxygen. This allows personal to see and breath, permitting them safe leave the fire area. It is an effective total flooding extinguishing agent that can be used on many types of fires. It is effective for use class A, B and C fire.

FM 200 CYLINDER ASSEMBLY

A self-activating differential Low Pressure Valve is fitted to the FM 200 Cylinder through which the FIRE-FINDER Tube are connected. The Valve contains a pressure regulator, which reduces FM 200 pressure in the FIRE-FINDER Tube to 15 bars.

In the event of a Fire, the FIRE-FINDER Tube bursts open at the hottest spot letting out the pressure in the FIRE-FINDER tube or a Pressure drop is occurred due to activation of valve on detection of fire. The differential pressure arising of this activates the plunger inside the differential low pressure valve and the FM 200 Gas gets released from the out let port through the nozzle made at FIRE-FINDER Tube due to flame.

PRESSURE SWITCH

The Pressure Switch monitors the pressure inside the FIRE-FINDER Tube. It is connected to the FIRE-FINDER Tube through an End of Line Adapter. The Pressure Switch operates at a pre-set pressure of 5 to 8 bar. In the event of a reduction in pressure, the Pressure Switch opens and activates the Audio-Visual Alarm.

AUDIO ALARM

Audio Alarm is to alert people around on the activation of FM 200flooding System. It monitors the pressure in the FIRE-FINDER Tube through the Pressure Switches.

SYSTEM FEATURES

The following are the features of the FIRE-FINDER Automatic Fire Protection System.

- Simple self-activating system without human intervention.
- Linear Heat Detection - senses fire anywhere along the entire length of the FIRE-FINDER tube and Smoke Detector.
- Extinguishes fire at an early stage.
- System activates automatically.
- Safe against malfunction.
- Easy to maintain because of simple construction.

SYSTEM INSTALLATION PROCEDURE

- While routing the FIRE-FINDER Tube care should be taken that it is not fixed to any surface that is over 80° C during normal condition.
- The bending radius of the FIRE-FINDER Tube should not be sharper than 1 inch in the middle and 2 inches at the termination.
- Pressure Switch should be fixed tightly to the End of Line Adapter.
- Electrical Connection to Pressure Switch should be proper.

SYSTEM MAINTENANCE

ROUTINE:

- Check all Parts of the System for Physical Damage, Rust or Corrosion.
- Check for proper mounting of FIRE-FINDER Tube, Smoke Detector, Control Unit, FM 200Cylinders etc.

- Check the Cable assembly, Smoke Detector and FIRE-FINDER Tube for Mechanical Damages or Corrosion and clean up coatings of mud, grease and dirt if any.

- Check the Supply Connection to Alarm / Pressure Switch.

DOS AND DON'S

- Do not crush the FIRE-FINDER Tube.
- Do not cut the FIRE-FINDER Tube.
- Do not kink the FIRE-FINDER Tube.
- Check for Ball Valve to be in "ON" position on the FM 200Cylinder.
- Do not open the ball valve if FIRE-FINDER tube ends are not sealed / closed.
- Turn the Ball valve to "OFF" position before recharging the cylinder if system is operated.
- Ensure FIRE-FINDER tube is not in contact with any heating, moving parts and sharp edges.
- Check the system regularly.

PROCEDURE FOR RE-CHARGING EMPTY CYLINDER

- It should be ensured that there is no physical damage to the cylinder, filling-in and out let port of the Valve.
- Remove the Valve and clean the inner parts of the Cylinder Head assembly to ensure that it is free from dust.
- Check the dip tube and the 1mm diameter bore drilled just under the Tube threading, is not blocked.
- Replace `O' rings if found damaged.
- Close the out let port by applying pressure from the low-pressure side of the valve.
- Fill FM 200according to specified requirement.
- If system is operated manually, the knob on the Manual Release unit should be turned to "OFF" position and sealed.
- Connect the Extinguisher Cylinder with the Adapter.
- Pressurise the FIRE-FINDER Tube externally through End of Line Adapter to 10-bar and Check for leakage at all joints.
- Turn the Ball Valve on the FM 200 Cylinder to "ON" position slowly.

SYSTEM OPERATION

The main features of the system are:

- Automatic Detection of Fire.
- Automatic flooding of carbon dioxide.
- Activation of Audio-visual Alarm unit.
- Manual Release valve.

The detection of fire is primarily made by FIRE-FINDER TUBE, which can detect fire anywhere along its length. The tube is highly flexible and can be conveniently routed to cover the various hazard areas in electrical panels.
The FIRE-FINDER Tube is a fixed temperature sensing tube made up of high tech polymer material to cater to long term leak resistance, flexibility, accurate and consistent heat sensitivity. One end of the FIRE-FINDER Tube is connected to the Co_2 Cylinder and the other end to an End of Line Adapter through a Non return valve. The Co_2 Cylinder Assy is mounted on a Weight Monitoring System.

A Pressure Switch is connected to the End of Line Adapter, which is electrically connected to an audio-visual Alarm Unit.

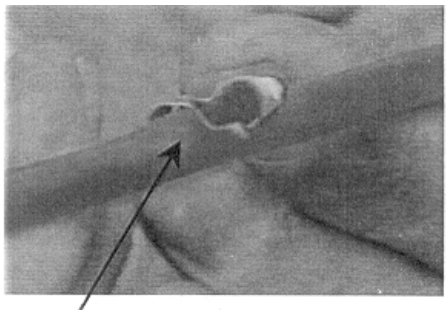
In the event of fire contacting the FIRE-FINDER Tube, the Tube starts melting and bursts at the hottest point. This leads to a rapid reduction of pressure in side the tubing. This will make the Differential High Pressure Valve fitted on the Co_2 cylinder open instantaneously and the Co_2 gas stored in the cylinder will get released through the Tube at the burst point into the panel.

The drop of pressure in the Tube followed by reduction in the weight of the Co_2 in cylinder due to the discharge will activate an audio-visual Alarm.

SYSTEM CONFIGURATION:

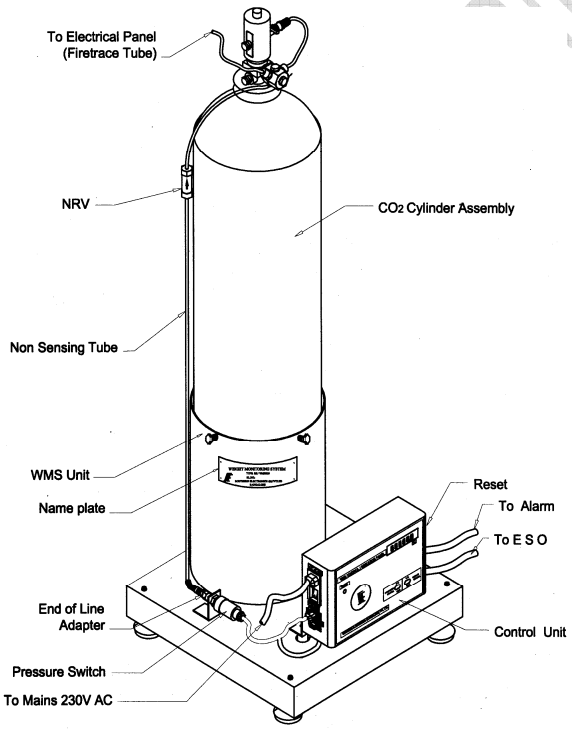
- FIRE-FINDER Tube
- Carbon Dioxide Cylinder Assembly.
- Manual Release Valve.
- Pressure Switch
- Audio-visual Alarm Unit.
- Weight Monitoring System.

FIRE-FINDER TUBE :



The FIRE-FINDER Tube is a flexible detection and delivery device installed within the protected equipment. The FIRE-FINDER Tube does not rely on detecting fire at a single point but at anywhere along its length.

CARBON DIOXIDE CYLINDER ASSEMBLY:



A self-activating Differential High Pressure Valve is fitted to the Co_2 Cylinder through which the FIRE-FINDER Tube is connected. The valve contains a pressure regulator, which maintains Co_2 pressure in the FIRE-FINDER tube to 15 bars. The Co_2 Cylinder Assy is fitted in Weight Monitoring System.

In the event of a fire, the FIRE-FINDER Tube bursts open at the hottest spot letting out the pressure in the FIRE-FINDER Tube. The differential pressure arising of this activates the plunger inside the valve and the Co_2 gas gets released from the out let port through

WEIGHT MONITORING SYSTEM:

This unit enables on line monitoring of the weight of CO_2 gas in the Cylinder and pressure inside the FIRE-FINDER tube. It consists of a load cell with Electronic Control Unit and a Cylindrical ring for holding the CO_2 Cylinder in place. In the event of reduction in the weight of CO_2 Cylinder and discharge of gas in the FIRE-FINDER Tube (due to Leakage or Release of CO_2 gas), beyond a pre-set limit (2Kg in the present case & below 8 bar in case of pressure inside the Tube), it activates the Audio - Visual Alarm.

***Caution**: Do not tamper with the Control Unit as the same contains sensitive Circuitry / Adjustments inside. The same will have to be serviced only by Qualified factory trained personnel.*

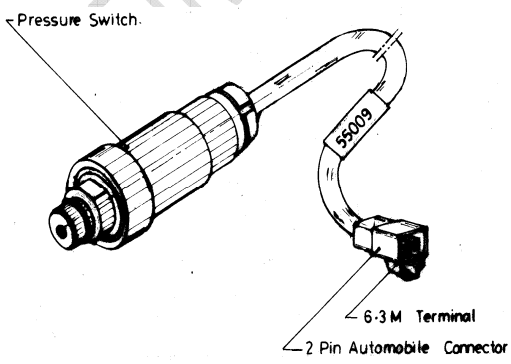
MANUAL RELEASE VALVE:

The Manual release Valve is intended for activation of the Co_2 System manually. It consists of a BallValve actuator mechanism. To operate the System, pull out the locking pin and turn the knob to "ON" position. This will activate the system instantaneously.

***NOTE : -** Leave Knob in "ON" position till Co_2 from the Cylinder is discharged completely.*

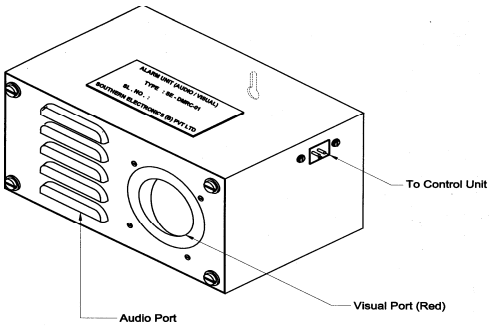
***Caution:** Operation of the Manual Release Valve will discharge the Co_2 from the cylinders instantaneously. Also breakage of the seal voids warranty.*

PRESSURE SWITCH :



The Pressure Switch monitors the pressure inside the FIRE-FINDER Tube. It is connected to the FIRE-FINDER Tube through an End of Line Adapter. The Pressure Switch operates at a preset pressure of 5 to 8 bar. In the event of a reduction in pressure, the pressure switch opens and activates the Audio - Visual Alarm unit.

AUDIO - VISUAL ALARM:

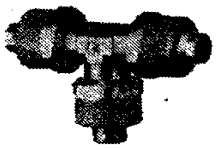


Audio-Visual Alarm is located at various zones to alert people around regarding the activation of Co2 flooding System. The alarm unit is ruggedly built to cater to the adverse environmental conditions

STRAIGHT FITTING:

This is used to join the FIRE-FINDER Tube. Straight Fitting is made up of forged Brass with nickel plating. The ends of the fitting are flared to exactly fit the FIRE-FINDER Tube. A G 1/8" thread lock is provided to ensure proper fitment of the FIRE-FINDER Tube.

TEE FITTING:



This is used as a three-way distributor. Tee Fitting is made up of forged Brass with nickel plating. The ends of the fitting are flared to exactly fit the FIRE-FINDER Tube. A G 1/8" thread lock is provided to ensure proper fitment of the FIRE-FINDER Tube.

CABLE:

Cables are used for inter connection of the Control Unit of Weight Monitoring System to the Audio-visual Alarm Unit and Master Alarm Unit.

SYSTEM FEATURES:

The following are the features of the FIRE-FINDER Automatic Fire Protection System.

- Simple self-activating system without human intervention.
- Linear Heat Detection - senses fire anywhere along the entire length of the FIRE-FINDER Tube.
- Extinguishes fire at an early stage.
- System activates automatically and also manually.
- Safe against malfunction.
- Easy to maintain because of simple construction.

SYSTEM INSTALLATION PROCEDURE

- While routing the FIRE-FINDER Tube care should be taken that it is not fixed to any surface that is over 80° C during normal condition.
- The bending radius of the FIRE-FINDER Tube should not be sharper than 1 inch in the middle and 2 inches at the termination.
- Knob on Manual Release Valve should be in "OFF" position and sealed.
- Care should be taken to grout the Weight Monitoring System unit properly.
- Pressure switch should be fixed tightly to the End of Line Adapter.
- Electrical Connection to pressure switch and WMS unit should be proper.
- Ensure Proper fittment of Co_2 cylinder in WMS unit.
- Electrical cable connection in the control unit to be verified periodically.
- Control Unit and Audio - Visual Alarm should be mounted properly.

PROCEDURE FOR RE-CHARGING EMPTY CYLINDERS

- It should be ensured that there is no physical damage to the cylinder, filling-in and out let port of the Differential High Pressure Valve.
- Remove the valve and clean the inner parts of the cylinder Valve assembly to ensure that it is free from dust.
- Check the dip tube and the 1mm diameter bore drilled just under the Tube threading, is not blocked.
- Replace `O' rings if found damaged.
- Close the out let port by applying pressure from the low-pressure side of the valve (Ball Valve).
- Fill Co_2 according to specified requirement.
- If system is operated manually, the knob on the Manual Release Valve should be turned to "OFF" position and sealed.
- Connect the Extinguisher Cylinder with the adapter.
- Pressurise the fire trace tube externally through End of Line Adapter to 10-15bar and Check for leakage at all joints.
- Turn the Ballvalve on the Co_2 Cylinder to "ON" position very slowly.

SYSTEM MAINTENANCE

ROUTINE:

- Check whether seals on the Manual Release Valve are intact.
- Ensure that the clamping of the cables, FIRE-FINDER Tube etc. is in order.
- Check all parts of the system for physical damage, rust or corrosion.
- Check for proper mounting of Manual Release Valve, Audio-Visual Alarm unit, Cylinders etc.
- Check the cable assembly and FIRE-FINDER tube for mechanical damages or corrosion and clean up coatings of mud, grease and dirt if any.

DOS AND DON'TS

- Do not crush the FIRE-FINDER Tube.
- Do not cut the FIRE-FINDER Tube.
- Do not kink the FIRE-FINDER Tube.
- Do not break the seal on Manual Release Valve unless there is fire and Manual Release Valve is to be operated.
- Check for Ball Valve to be in "ON" position on the Co2 Cylinder.
- Do not open the Ballvalve if FIRE-FINDER Tube ends are not sealed / closed.
- Turn the Ballvalve to "OFF" position before recharging the cylinder if system is operated.
- Ensure FIRE-FINDER Tube is not in contact with any heating, moving parts and sharp edges.
- Control unit should be kept free from dust.
- Check the system regularly.

DAILY TESTING:

- The LED indication on the front panel of the Main Control Unit is to be monitored on daily basis.
- Check the status of the Audio-visual Alarm by pressing the Reset Switch.
- On the control panel if any fault indication RED LED is "ON" then refer trouble-shooting instructions and take appropriate action.

TROUBLE SHOOTING

SL. NO.	NATURE OF FAULT	POSSIBLE CAUSE	REMEDY
1.	Power supply LAMP is not glowing	1. 230V AC Mains not connected. 2. Fuse blown off.	1. Connect the 230V AC Mains. 2. Replace the fuse (1A)
2.	Weight Status LOW (RED) LED glowing	1. Loss of CO_2 gas in the cylinder. 2. Disconnection of WMS unit cable to Control panel.	1. Check the cylinder for leakage. 2. Connect the WMS Unit cable to Control panel properly.
3.	Pressure Status (RED) LED glowing	1. Leakage of pressure in the FIRE-FINDER Tube. 2. Pressure Switch not working.	1. Check for leakage at FIRE-FINDER Tube joints. 2. Replace the Pressure Switch.
4.	Weight is not being displayed.	1. WMS unit cable is not connected properly	1. Connect the WMS Unit Cable properly.
5.	Audio-visual Alarm bulb is not glowing.	1. Bulb is blown off. 2. Check the input connection. 3. 230V Input is not available.	1. Bulb (230V) is to be replaced. 2. Connect the Audio-visual Alarm cable properly. 3. Control panel output is to be checked.
6.	Audio-visual Alarm is not hooting.	1. Check the input connection supply. 2. 230V Input is not available.	1. Connect the alarm unit cable properly. 2. Control panel output is to be checked.

RECOMMENDED SPARES TO BE STORED AT THE SITE

Sl. No.	Description	Part No.	Qty
1.	FIRE-FINDER Tube	FET-55005	100 Mts.
2.	Co2 Cylinder	FET-55	1 Nos.
3.	Straight Fitting	FET-55015	50 Nos.
4.	Cross Panel Fitting	FET-55016	50 Nos.
5.	Tie-raps with Base	FET-55021/1	500 Nos.
6.	Pressure Switch	FET-55009	6 Nos.
7.	Weight Monitoring System	FET-55098	1 Nos.
8.	Tee Fitting	FET-55014	15 Nos.
9.	Master Control Unit	FET-55007	4 Nos.
10.	End of Line Adapter	FET-55059	9 Nos.
11.	Manual Release Valve.	FET-55007	12 Nos.
12.	Audio-Visual Alarm		5 Nos.

LOG SHEET FOR MONTHLY INSPECTION

Date	Observation	Signature