

**CONCEPT PATENT PENDING S&F REF :2019/01686**

introducing

# **REFUGE SAFE**

**Refuge safe is a fully automated monitoring system for the refuge bay,**  
The automated Refuge safe system monitors your refuge bay and reports every safety aspect of your refuge bay instantly and are logged for reporting purposes.

**01**

Although the system continually monitors the refuge bay in real time, inspection and daily checks still has to be done. Each responsible person will have access to the system via a pin identification entered either locally on the panel screen or remotely from the control room. This identification is also logged along with time stamps when triggered.

**02**

A Pre shift check is automatically done by the system before start of each shift and reports the status of your refuge bay, if an alarm is triggered it will be displayed in the haul road at your refuge bay as well as in the control room.

**03**

A audio and visual alarm is located in the haul road that will be triggered on the event of refuge bay safety failure, test or in the event of an accident / explosion. This is triggered by an concussion switch located in the haul road.

**02**

During an emergency when the refuge bay alarm is triggered or during a test there is a LED emergency light at the refuge bay door that will illuminate the door in case of poor visibility. The haul road sign board will indicate your refuge bay number and direction.

**8 X PRE CONFIGURED  
OUTPUTS**

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INPUTS**

**1 X HIGH SPEEN PRXY  
INPUT FAN RPM SENSING**

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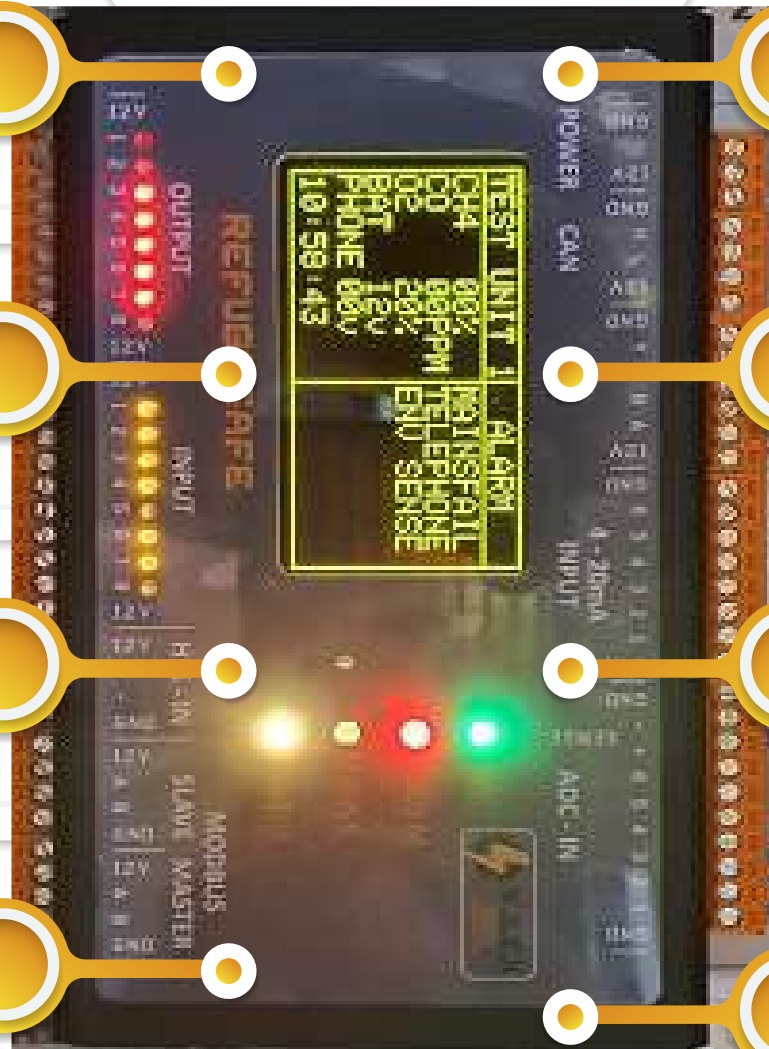
**12VDC POWER SUPPLY**

**CAN COMMUNICATION  
INPUT FOR FIELD DEVICES**

**422 COMMUNICATION  
FOR 7" HMI**

**6 X DC VOLTAGE INPUT  
FOR TELEPHONE AND  
BATTERY MONITORING, 1  
X SHUNT 700A INPUT FOR  
MULTIPLE BATTERY  
MONITORING**

# RS CONTROLLER



# RS CONTROLLER

## I/O OPERATION

### Power supply

-12vdc.

### Outputs

-8 x preconfigured digital outputs.

-out1 refuge bay healthy / alarm

sign board

-out2 siren

-out3 co outside indication

-out4 ch4 outside indication

-out5 o2 outside indication

-out6 fan start

-out7 220v supply disengage

for tests

-out8 spare

### Inputs

-in1 inside door closed

-in2 outside door closed

-in3 fire extinguisher present

-in4 first aid kit present

-in5 220v supply present

-in6 emergency latch input

-in7 explosion switch

-in8 spare

### Hss-in

-high speed proxy input to detect fan rpm

### Modbus slave input

-modbus 485 communication for between plc and rs controller.

### Modbus master input

-modbus 485 communication for between environmental sensor and rs controller.

### Can

-canbus communication for between field devices.

### Ui

-user interface 422 communication port for between rs controller and 7" hmi screen.

### 4-20ma input

-6 x 4-20ma input for environmental sensor

### Adc-in

-6 x dc voltage input for analog telephone and battery monitoring.

-0 to 60vdc range (configurable).

### Sense + -

-700a shunt input for multiple battery monitoring.

# RS CONTROLLER CALIBRATION

**A USER INTERFACE IS DEVELOPED TO DO PRE CALIBRATION ON EACH REFUGEBAY TO CONFIGURE THE FOLLOWING:**

FAN RPM SPEED,  
ANALOG TELEPHONE VOLTAGE,  
MODBUS SLAVE ADDRESS,  
PRE SHIFT AUTO TEST TIMES,  
REFUGEBAY IDENTIFICATION,  
O2,  
CH4  
CO ALARM SETPOINTS



# AUTO PRE SHIFT CHECK

**One hour before each shift (client to specify time) a auto check sequence will start and test all safety devices.**

The system will shut down for 10 min and also shuts down the mains power and run completely on the battery power to test your battery efficiency, it is a 12Vdc system with 600Watt / 1000 Watt inverter for 220Vac equipment. The ventilation fan will auto start and the fan speed and or ventilation speed will be monitored to check operation and efficiency of the fan. After all tests are done the battery voltage will be compared to pre start voltage and checked for proper charge and condition.

Again if any alarm is triggered there will be an audio and visual alarm in haul road and alarm will be indicated in control room and logged in real time.

All monitoring devices including environmental sensors tests can be logged and stored for reporting purposes.



The inspection start by the responsible person logging into the system by unique pin code that will identify the responsible person entering the test mode.

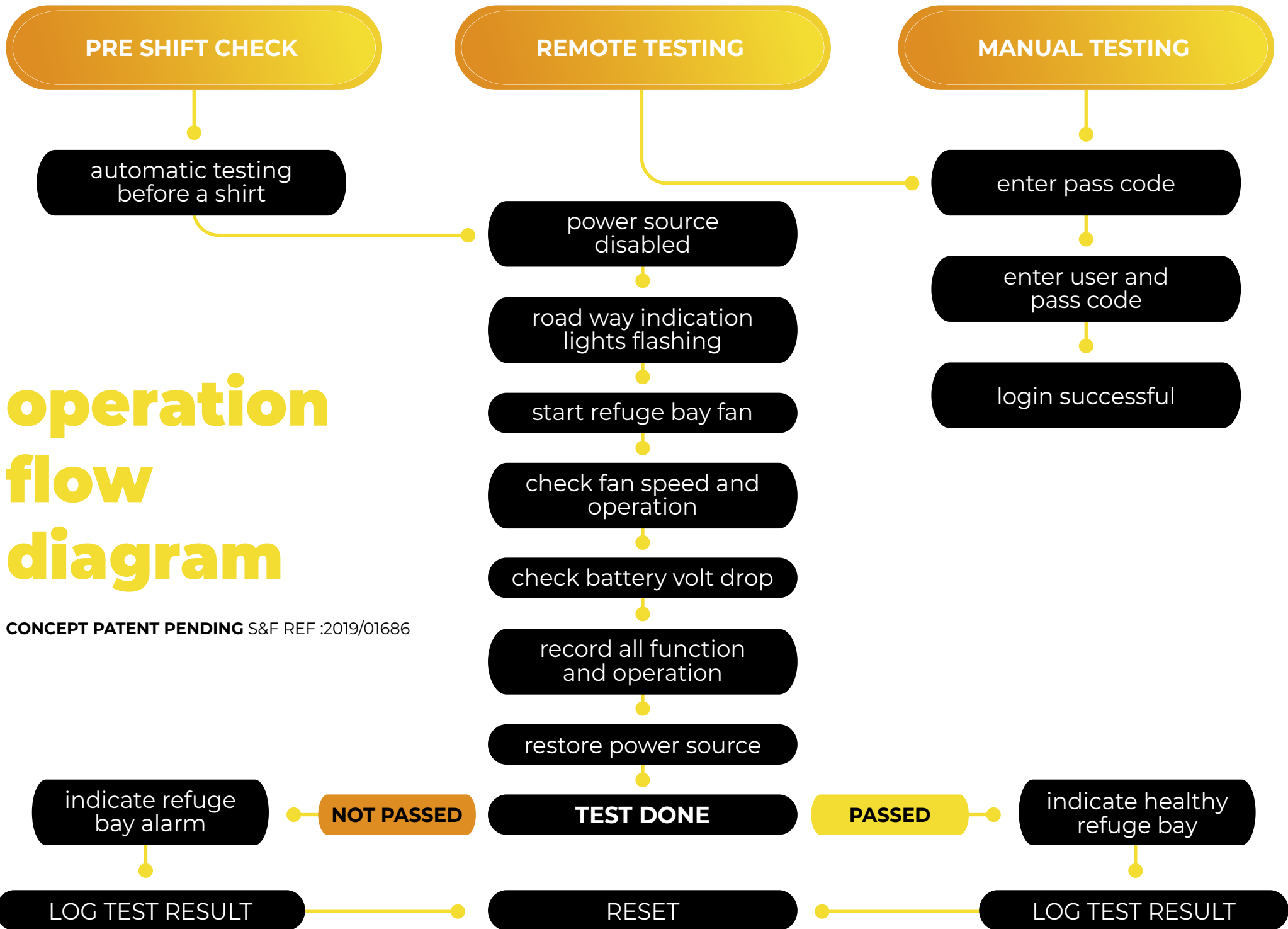
This mode is activated by logging into the manual test login button located on the screen and after successfully logged in they will have to press the login button located on the local screen to start manual test mode.

The system will then switch off mains power and run the fan and system on battery power, all door switches, fire extinguisher, first aid switches and all environmental sensors are then checked as responsible person inspects the equipment for any physical damage and any tampering or wire bridge took place.

Once all inspections is done the system is then automatically switched back to auto mode.

This all can be logged via a camera system installed inside the refuge bay and can either be monitored through live movement / recording or screen shot recording. This forms part of the RefugeSafe system.

# INSPECTION



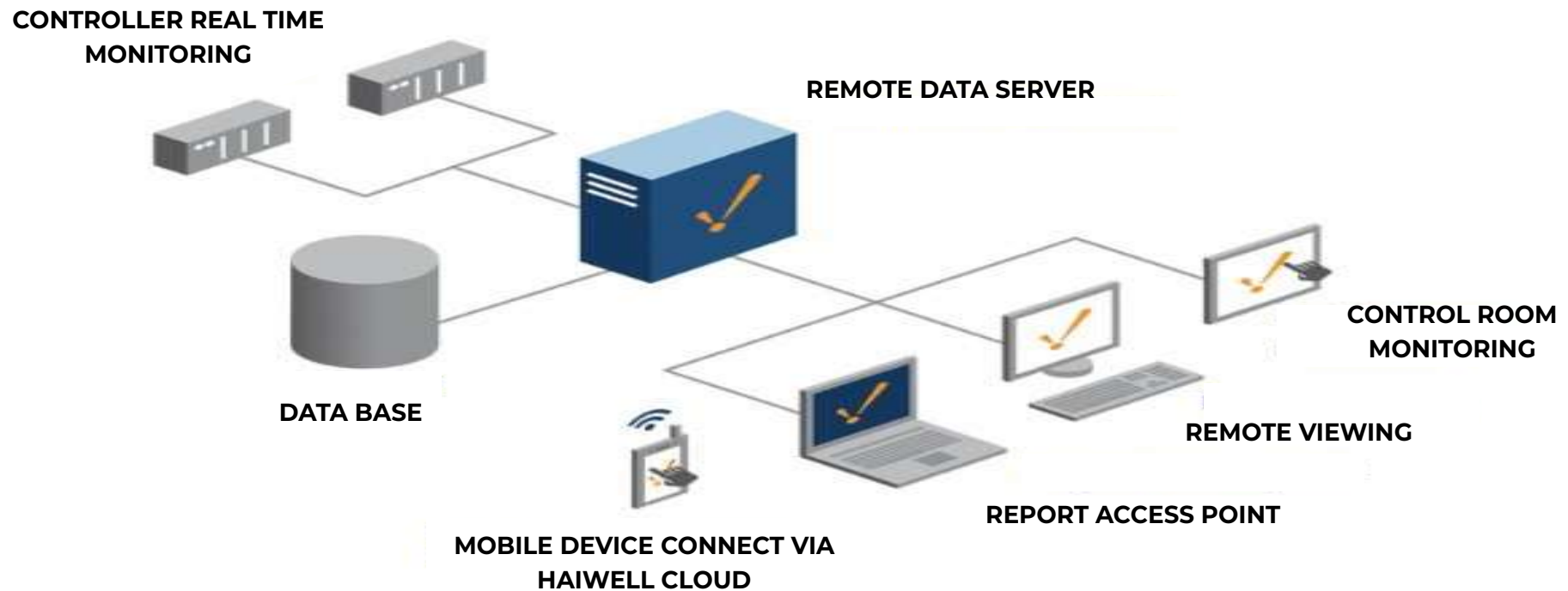
# operation flow diagram

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# REPORTING

The system can be accessed by any reporting interface and logged according to timestamp alarms instantly in real time.

Reporting can then be accessed either on request or be emailed to area responsible person daily, weekly, etc.



# REMOTE VIEWING

01

The refuge bay systems can be remotely viewed in the control room and in the offices via a terminal box and or on the local scada system depending on the controller the client prefers to use.

02

The terminal box / Scada can be configured to either view the entire mine's refuge bays or only the sections that person is responsible for.

03

The terminal box has a HDMI output and can therefore be displayed on any size screen whether small in the office or large for the lamp room at the shaft.

04

The refuge Safe system can be viewed from anywhere via a cloud based connection specifically allocated for that client.



# REMOTE VIEWING SCREEN



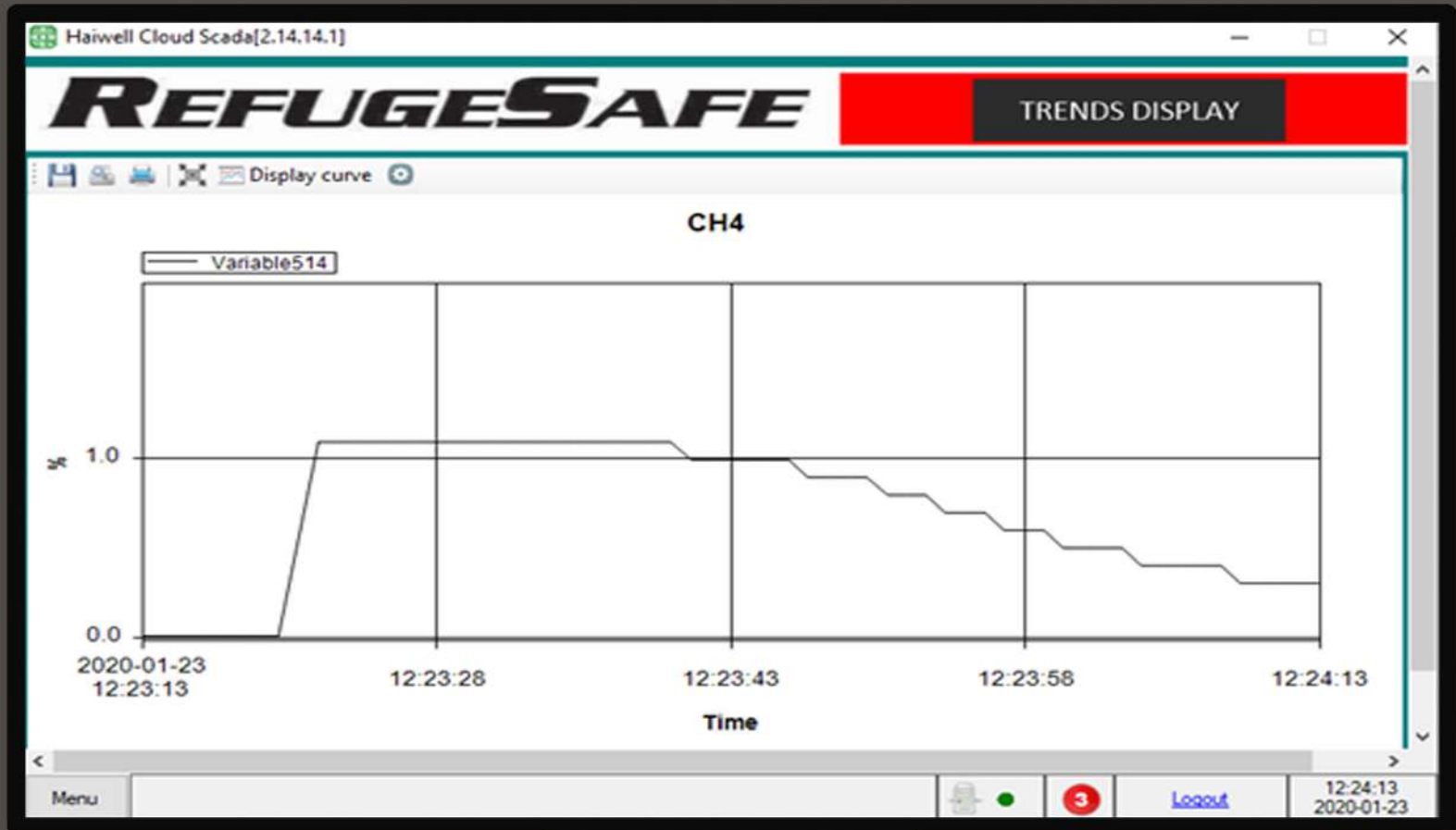
To be viewed in control Room or office. This screen can be divided in up to 9 displays at once on a single screen.

Local scada can be used and as mentioned a remote view via Haiwell cloud can be viewed on your smart device.

# LOCAL VIEWING AND TESTING

Typical local screen inside Refuge bay for monitoring and local test purposes.



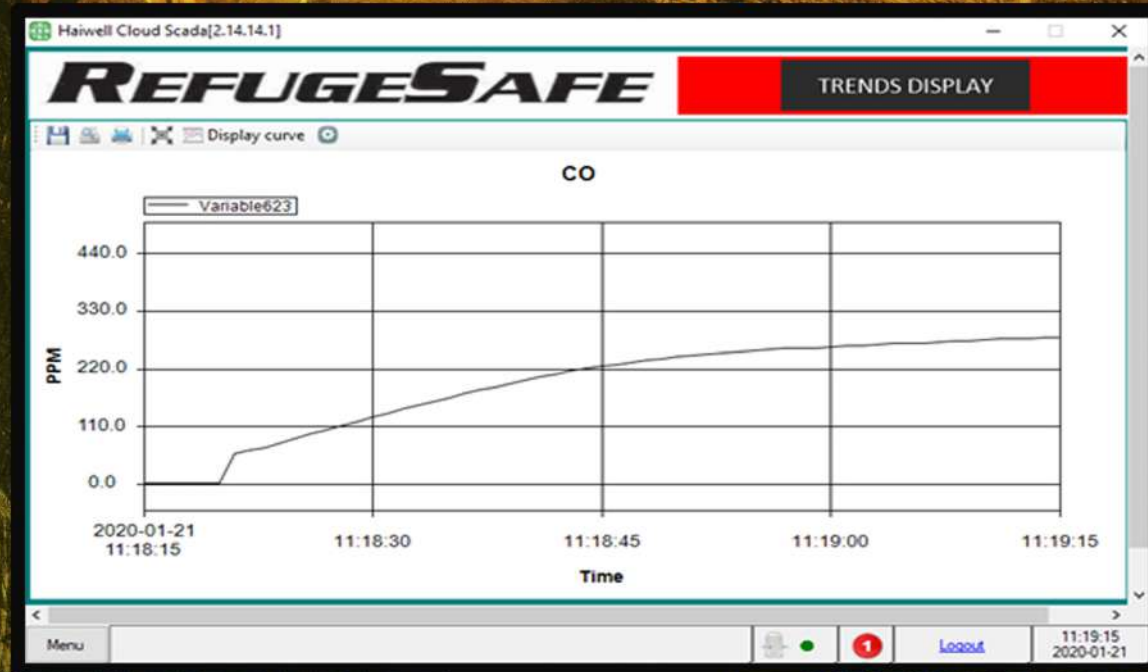


CH4 test done with  
Cocktail gas mixture of  
CH4 and CO.

# CH4 TEST AND TRENDING

# CH4 AND CO TRIP LEVEL INDEICATION ON DISPLAY





**CO TEST AND**

**TRENDING**

CO test done with Cocktail gas mixture of CH<sub>4</sub> and CO.

# AUDIO AND VISUAL HAUL ROAD SIGN



NEW SLIMMER DESIGN

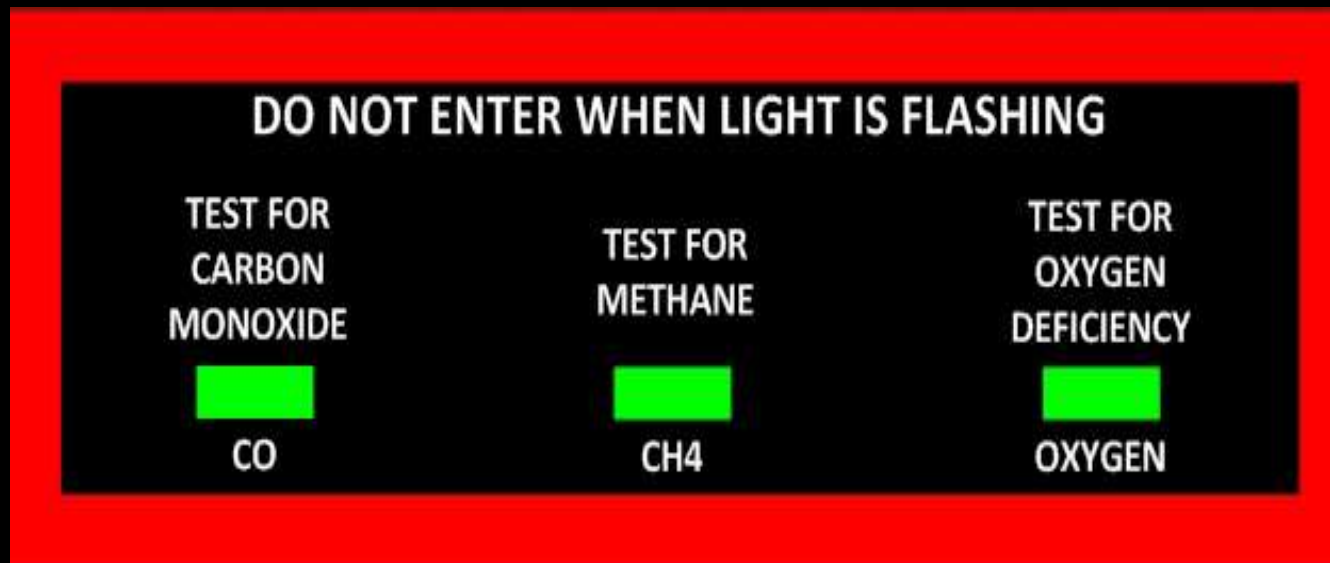


ALTERNATIVE/ CURRENT DESIGN



# ENVIROMENTAL SIGN

This sign is also located outside the refuge bay next to the entrance, its purpose is to warn you of the environment inside the refuge bay before entering the area.

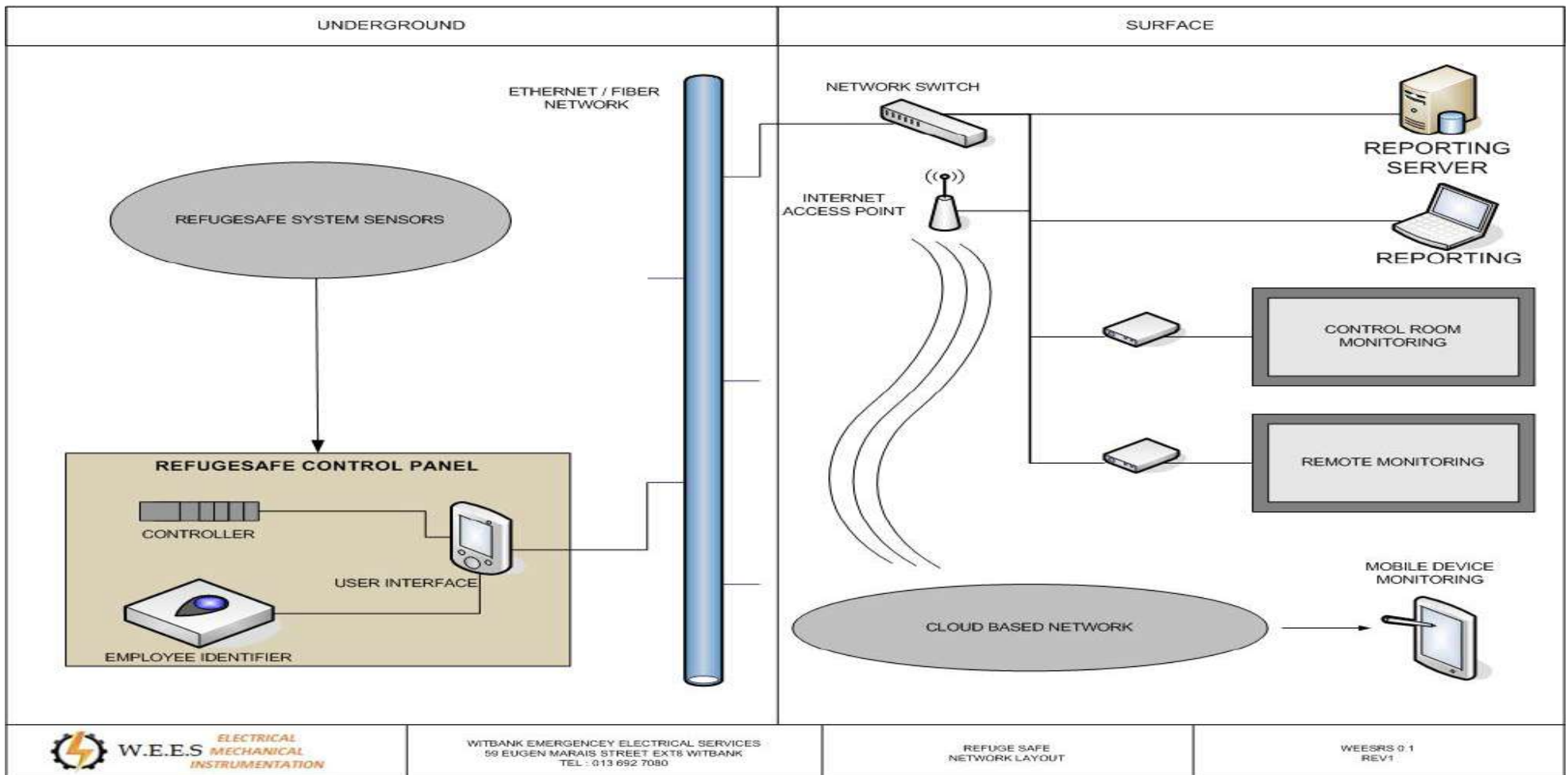


Optional extra environmental sensor can be placed outside the refuge bay for in the event of an emergency you can view inside the refuge bay the environment outside before exiting the refuge bay.



# NETWORK

# LAYOUT



# **STANDARD SYSTEM SENSORS**

**ENTRANCE DOORS OPEN/CLOSED**

**FIRE EXTINGUISHERS PRESENT**

**FIRST AID EQUIPMENT PRESENT**

**WATER CONTAINER PRESENT AND LOCKED**

**VENTILATION FAN SPEED AND AIR VELOCITY MONITORING**

**BATTERY VOLTAGE MONITORING**

**ANALOG TELEPHONE MONITORING**

**MOTION SENSOR**

**CAMERA RECORDING**

**LIGHT LUX SENSOR (FOR TEST ON HAUL ROAD INDICATION SIGN)**

**DB SOUND SENSOR (FOR TEST ON HAUL ROAD INDICATION SIGN)**

**CH<sub>4</sub>, CO<sub>2</sub>, CO, OXYGEN, AMBIENT TEMPERATURE, BAROMETRIC PRESSURE,**

**DIFFERENTIAL PRESSURE, VENTILATION SENSORS**

**CONCUSSION SENSORS IN CASE OF EXPLOSION**

# CONCLUSION

The Refuge safe system is a digitized system that allow you to not only monitor your refuge bay status in real time but reports to you every event that happens in the refuge bay, it alarms you immediately of any faulty condition in your refuge bay.

The digitized data generate any type of report you would want to look at whether it is only from your area of responsibility or from every refuge bay you monitor in the mine. The reporting server will have access to the controller an log any state of change, trending is included to view any history.

Via optional sensors the haul road indication can be monitored during testing for correct operation and can also be logged.



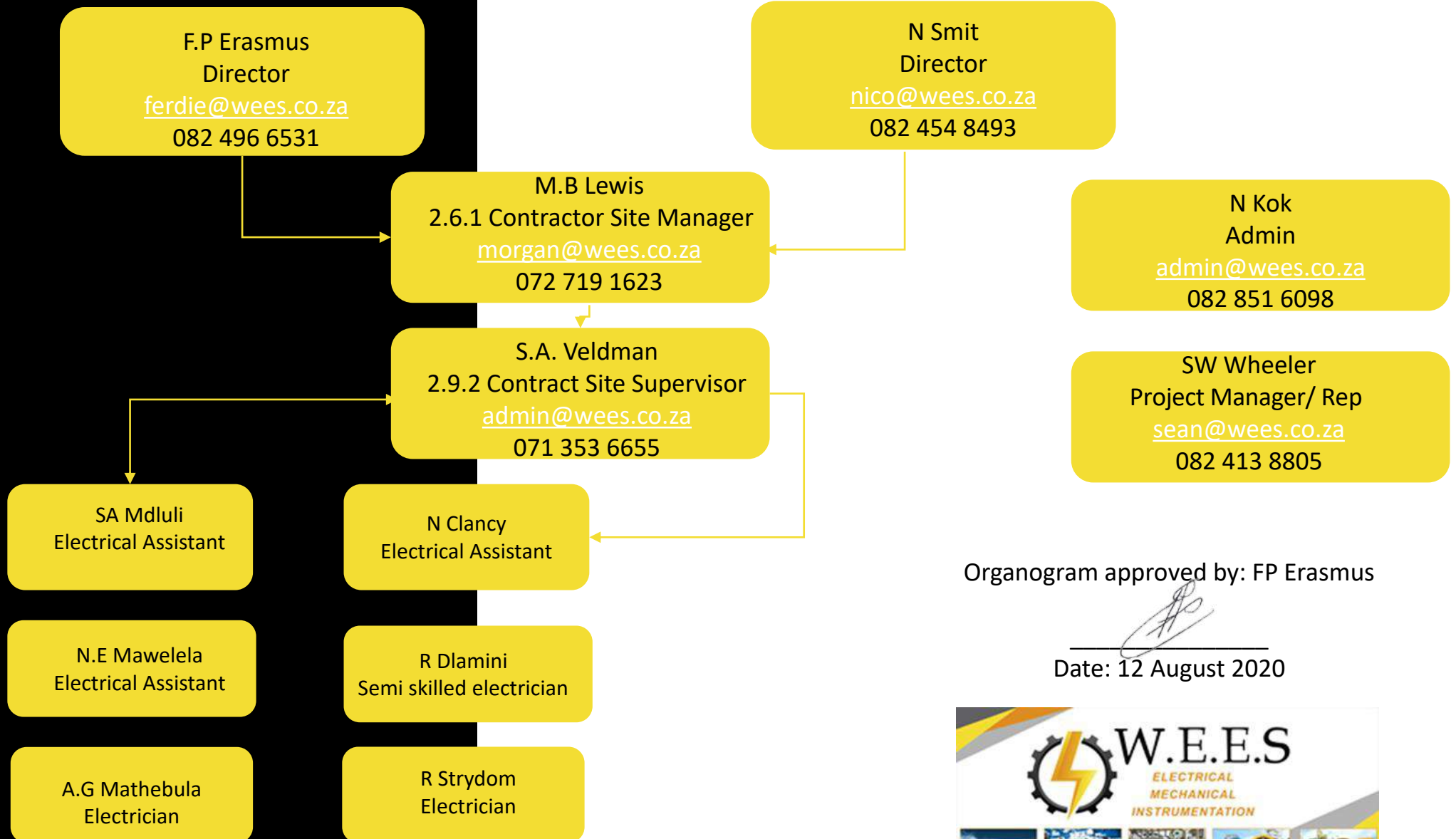
W.E.E.S

**AS LONG AS THERE IS A SENSOR FOR IT, WE CAN MONITOR IT**

# CONTACT DETAILS

## 🕒 24hr Emergencies

Irwing 356 Pty Ltd t/a Witbank Emergency Electrical Services  
Tel: (013) 492 2274



Organogram approved by: FP Erasmus

  
Date: 12 August 2020



# THANK YOU

BBBEE LEVEL 2

Reg No: 2017/448522/07

Vat No: 4410189668



# W.E.E.S

*ELECTRICAL | MECHANICAL | INSTRUMENTATION*