INDEX

1. Introduction

Equipment Overview

The installation comprises of an electrically heated lift off cover furnace. This is approximately split horizontally into two halves, the top or cover and base, plus the necessary control equipment.

The cover has a lifting shackle to enable the shop crane to raise the cover from the base and transport it to the park position next to the furnace installation. An access ladder is provided on the cover to enable the operator to connect the crane to the cover's lifting shackle.

The furnace base contains all the elements, which are wire wound supported on Alumina tubes. The tubes are mounted on Alumina support brackets held in steel ferrules welded to the inside of the furnace base. Power to the elements is from a 415 volt, 3 phase, 50 Hz supply. Control is from thyristor units mounted in the panel. The base is connected to the power and control equipment by a permanent cable connection, which is supported on cable tray in the floor ducting and on to the furnace where the cables enter a junction box mounted on the furnace structure, from the junction box cable ducting distributes the power to the element junction boxes.

The circulation fan is roof mounted and its impellor is just below the roof lining with the shaft and motor assembly outside on the roof.

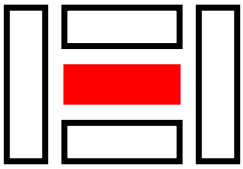
Cooling fans are also positioned outside the furnace cover on the roof.

Inert atmosphere purge motorised valve is also mounted on the cover roof.

Power is provided to the recirculation fan, cooling fans and the motorised valve by a plug and socket arrangement mounted at the rear of the furnace close to the control panel.

The low thermal mass insulation is made up of ceramic fibre blanket backed by mineral wool insulation.

The base is built from steel frames enclosing fire brick backed with two layers of insulating brick. The side walls of the base are low thermal mass construction in the same way as the furnace cover. The Inert gas is feed through a pipe mounted in the bases to provide the protective furnace atmosphere during the heating cycle.



The control panel is mounted adjacent to the furnace

The control system comprises of programmable load temperature controller, air temperature controller, ICU, thyristors, chart recorder, policeman and the necessary ancillary buttons and switches etc. Thermocouples are mounted in the furnace roof to provide information to the controller. Under normal operating conditions the load thermocouples are used to control the cycle.

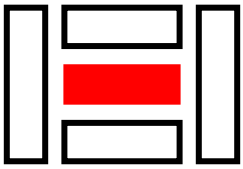
The control philosophy is that the ICU will scan all the load thermocouples, it then selects the highest read temperature and controls the furnace accordingling. This ensures that the critical temperature is not exceeded assuming the load thermocouples are positioned correctly.

The system incorporates a thermal head ratio system which is a technique using two instruments. One instrument monitors the load and transmits a calculated set point to the other instrument, which measures and controls the atmosphere temperature in the usual way.

This type of control heating system is ideally suited to large mass componets, as the load is of high thermal mass compared to the furnace atmosphere. This limits the rate at which the heat can be taken up. Since the heat transfer is proportional to the temperature difference the rate of heat transfer and therefore the rate of temperature rise, decreases rapidly as the set point is approached

Using this method the air temperature can exceed the maximum required load temperature in the initial stages of the heating cycle thus allowing the maximum heat to be transferred into the load. The scanning of the load thermocouples in the component continually monitors this. The heat head is then automatically reduced as the load comes up to temperature to ensures that the load never exceeds the maximum permissible temperature.

A hold function on the instrumentation waits for all the load thermocouples to be within the preset temperature tolerance before the soak is started. Ensuring the complete load has the full time at the soak temperature.



2. Safety Precautions

General

The overall responsibility for operating the plant safely rests with the plant manager.

In accordance with the contract awarded Excel Heat the responsibility for pit safety cover barriers etc lies with FMC.

Personnel must not work alone when maintaining any electrical equipment where a potential difference of 50 volts may be present.

Personnel working on the equipment must be competent and familiar with site safety procedures, permit to work schemes, etc.

ALWAYS isolate the equipment from its electrical power source before removing access covers

Isolate or inhibit all peripheral equipment connected to the system before starting work.

Local RF transmissions may cause the equipment to malfunction. Suitable precautions should therefore be taken before using hand held radio transceivers, etc.

The equipment is designed and manufactured to ensure high reliability. It is still possible for component failure to occur, however, and failure to safety can not always be guaranteed. Failure modes must therefore be taken into account by the customer when designing the overall system to ensure ultimate safety.

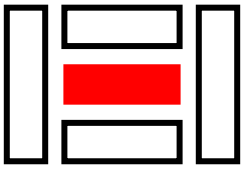
Reference should always be made to the Excel Heat Instruction Manual and associated documentation before performing any installation, commissioning or maintenance work on the equipment.

Low thermal mass insulation. When handling minimise airbourne dust. If dust concentrations exceed exposure control limits or are not Known, wear approved Respiratory protective equipment.

Mechanical irritant to skin, wear loose fitting, long sleeved clothing

Wear gloves, eye protections and other protective clothing where required.

After handling, rinse exposed skin with water.



Wash work clothing separately

See ECFIA code of practice and material safety data sheet

ALWAYS comply with national and local regulations

ALWAYS replace guards removed for maintenance purposes before the unit is returned to operation.

ALWAYS tighten loose bolts, nuts and screws and replace split pins, locking washers and other fasteners after maintenance.

ALWAYS renew electrical cables, piping and flexes at the first sign of damage or leakage.

ALWAYS wear approved gloves when handling the treated components. DO NOT assume that because metal is not glowing it is not too hot to handle or touch.

REMEMBER that when noise is excessive, audible warnings may not be heard.

ALWAYS rope off an area from which floor plating has been removed. DO NOT remove the rope barrier until floor plating has been replaced.

ALWAYS replace floor plating over ducts and pits as soon as possible after maintenance has been carried out.

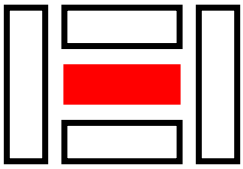
NEVER stand below the furnace unless it is supported to prevent accidental lowing

NEVER move the furnace when personnel are on the roof.

Isolation of Equipment

ALWAYS isolate electrically the circuits associated with equipment undergoing maintenance and any other equipment that presents a hazard.

Ensure that the electrical feed is switched OFF and padlocked in the ‘OFF’ position. If this is not possible, the fuses should be withdrawn and placed in a place of safety from which they can not be removed without consent. Place a DANGER notice on the control panel to warn would –be operators of danger to personnel.



ALWAYS station a responsible person at the controls of the unit, if it is not possible to isolate the equipment whilst maintenance is being carried out. Place a DANGER notice on the control panel to warn would-be operators of danger to personnel.

DO NOT by-pass safety interlocks without first informing the relevant supervisor and ensuring that no one is in the danger area. Reinstate the interlocks as soon as possible.

ALWAYS isolate the Inert gas supply before working on the base.

ALWAYS check the oxygen level in the pit and the bottom (base) of the furnace before entering and station a responsible person outside the pit monitoring the person in the pit all the time. If there is any oxygen depletion DO NOT enter the pit or furnace base.

Moving Structures

STAND CLEAR of all moving structures.

NEVER operate moving structures without first ensuring that the movement area is clear of personnel and equipment. If lighting or visibility is bad, DO NOT assume that the area is clear until a responsible person has checked that this is so.

NEVER operate any controls when a system is shut down, in such a manner that associated equipment will move when the system is restored.

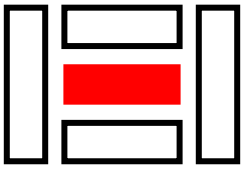
Lifting Gear

When lifting an item of equipment, ALWAYS ensure that the eyebolts used are designed to carry the weight involved and that additional equipment is not being lifted beyond the design load.

ALWAYS ensure that slings and other lifting gear are in good condition and adequate for the job in hand.

ALWAYS ensure the safe working load of the hoist is greater than the weight of the lift.

Fire Fighting Equipment



ALWAYS ensure that appropriate fire fighting equipment is available and correctly sited at points where the risk of fire exists.

ALWAYS ensure that personnel familiar with such apparatus are immediately available.

When welding or carrying out other operations that present a fire risk, ALWAYS ensure that the appropriate fire fighting equipment is available and ready for instant use.

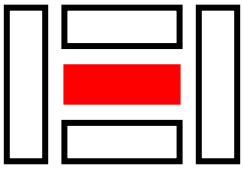
Carbon Dioxide Fire Extinguishers

The discharge of large amounts of CO_2 to extinguish fire may create hazards to personnel such as oxygen deficiency and reduced visibility.

The dilution of the oxygen in the air by CO_2 in a sufficient concentration to extinguish fire, may create an atmosphere that will not sustain life. Such an atmosphere will be produced in spaces subject to total flooding with CO_2 and may be produced by any large volume discharge drifting into adjacent low-lying areas.
Persons rendered unconscious in such atmospheres can usually be revived without any permanent ill effects when promptly removed from the CO_2 atmosphere.

Large volume discharge of CO_2 may seriously interfere with visibility during and immediately after the discharge period.

Carbon Dioxide is normally colourless but when discharged from a storage cylinder under pressure it resembles a cloud of steam.



3. Technical Data

Furnace Capacity

The furnace capacity is	-	9500 Kg

Furnace Operating Temperature

Maximum operating temperature	-	850°C
Normal operating temperature (stress relieving)	-	600°C – 675°C

Furnace Rating

Furnace rating	-	300kW

Recirculating Fans

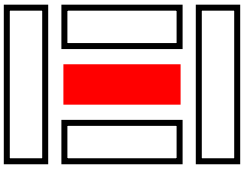
Number of fans	-	One
Motor size	-	11kW 4 Pole
Motor Voltage	-	415V 3ph 50 Hz

Cooling Fans

Number of fans	-	Two
Motor size	-	0.75kW @ 1440 rpm

Cooling Tubes

Number of tubes	-	Four
Cooling surface Area	-	4.96m^2



Electrical Supply

Supply	-	415 volts, 3 phase, 50Hz
Control equipment	-	110 volts, single phase

Inert Gas Supply

Estimated demand		
During heating to 200°C or 1 hour	-	Five volume changes / hour
During heating from 200°C		
To operating temperature	-	One or two volume changes / hour
During soak at temperature	-	One volume change / hour
During cooling cycle	-	One volume change per hour

Furnace Usable Dimensions

Effective Width	-	2000 mm
Effective Length	-	2000 mm
Effective Height	-	4300 mm

Overall Plant Dimensions

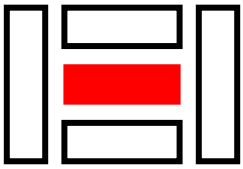
Width	-	3100 mm
Length	-	3100 mm
Height	-	5400 mm
Maximum Height (Furnace Cover raised)	-	5900 mm from floor to top of lifting shackle

Weights

Furnace Cover (Approx.)	-	3000 Kg

Process Cycle Pre Programmed

Program 1
Stress relieving:-
Ramp to 640°C in 4.16 hours
Hold @ 640°C for 4 hours
Cool to 200°C in 2.56 hours



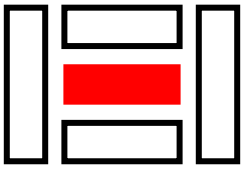
Program 2
Stress relieving:-
Ramp to 675°C in 4.3 hours
Hold @ 675°C for 10 hours
Cool to 200°C in 3.1 hours

Program 3
Stress relieving:-
Ramp to 615°C in 4.06 hours
Hold @ 615°C for 10 hours
Cool to 200°C in 2.46 hours

Program 4
Stress relieving:-
Ramp to 675°C in 4.3 hours
Hold @ 675°C for 8 hours
Cool to 200°C in 3.1 hours

Program 5
Stress relieving:-
Ramp to 620°C in 4.08 hours
Hold @ 620°C for 16 hours
Cool to 200°C in 2.48 hours

Program 6
Stress relieving:-
Ramp to 655°C in 4.22 hours
Hold @ 655°C for 4 hours
Cool to 200°C in 3.02 hours



4. Furnace Description

Lift Off Cover

The lift off cover furnace is fabricated from mild steel plate. The cover is stiffened with rolled hollow sections to provide a robust and dimensionally stable construction.

An access ladder to the roof is provided.

The cover incorporates a lifting shackle designed to accommodate the hook of your hoist. The shackle is purpose designed to allow balancing of the cover during commissioning

WARNING: Never lift the cover when personnel are on the platform.

Steel panel (painted orange) are located on each side of the furnace base these have screwed plates which cover the heating element terminals.

Two guide posts are provided to ensure the accurate location of the cover over the base. The posts slide through tubular steel sections mounted on the cover. The upper ends of the posts are capped to retain them in the tubes when the cover is lifted. The lower ends are cone shaped to make location in the tubes welded to the base easier. Lifting the cover and guide posts leaves clear access to the base for loading and unloading of the charge by your crane.

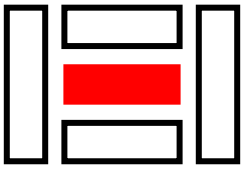
WARNING: Never enter the furnace base or the pit until oxygen level has been checked.

Cover And Base Walls Insulation

The cover and base walls are lined with ceramic fibre backed with mineral wool to minimise its overall weight and to allow rapid heat up times from cold. The lining thickness is designed to give an economic cold face temperature and to minimise casing losses.

The insulating layers are fitted to the roof and walls of the cover and secured with heat resisting studs and locking washers, these are easily replaceable if damaged.

Element Supports



The furnace walls accommodate the element support brackets which consist of high percent of sintered Alumina The One end of the bracket is located in a steel ferrule

welded to the furnace cover. The other end of the bracket supports high Alumina tubes which the element slide over and rests in the horizontal position.

The ferrule is equipped with a locating pin. The support brackets have a push and turn slot arrangement to secure them in position.

Element support replacement is carried out by simply gripping the open end of the support bracket (with Pliers or similar), pushing the support towards the ferrule, turning clockwise to unlock the bracket from the ferrule and withdrawing the complete element support assembly. This system of removal applies equally to any element support, which has broken flush with the lining.

Heating Elements

Heating is by means of electric wire wound elements supported from the four walls of the furnace base. The elements in 80/20-Nickel Chromium alloy wire are wound onto sintered Alumina tubes and connected in star formation to operate at 240 volts.

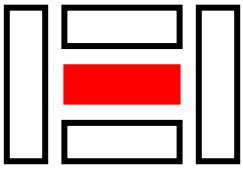
The ends of the elements pass through insulated tubes into steel tubes welded to the furnace wall. Each steel tube is packed with insulating material. The element then passes through an end cap that screws to the tube. The end cap holds the loose insulation in place. The element tail is then covered in insulated beading and connected to the power supply.

A total of thirty-six heating elements are included, giving a total connected rating of approximately 300kW. The elements are arranged in four groups of nine along each of the base walls. Within each group the separate element legs are connected together in star fashion. All elements phase legs are connected to the electrical phase conductors in parallel within each group, but the star point of each of the groups is separate.

Furnace Base Floor and Insulation

The furnace base consists of a rolled steel section frame, which is positioned directly onto the floor of the pit. The steel frame supports a hearth of hard wearing firebrick backed with two layers of high grade insulating brick.

This arrangement will support the charge



The firebricks are laid in a specific pattern designed to assist the operators to load the charge in the correct position.

The fire bricks are interspersed with nine load bearing high temperature piers refractory cast with stainless steel needles for added strength and durability.

Furnace Atmosphere (PROVISIONAL)

As the inert gas supply was not available at the time of issuing this manual the references to the inert gas atmosphere and its mode of operation is provisional only. Once the inert gas system in commissioned, by others, their manuals should be referred to.

Others provide an atmosphere control panel and they're operating and maintenance manual should be consulted before any operation or maintenance is carried out.

The inert gas is brought up to the furnace via the inert gas control panel and enters the furnace base at one inlet point via interconnecting pipework mounted beneath the hearth it then turns through 90° and goes through the hearth brick work.

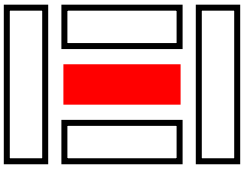
Exhausted inert gas is vented via a pipe located at the opposite end of the furnace cover. This pipe terminates in a motorised valve, which enables control of the purging to be carried out.

When the cycle is initiated, the inert gas is introduced into the furnace and the vent valve is opened to purge the atmosphere as the heating cycle begins. The inert gas is fed into the furnace though out the heating cycle to ensure an inert rich atmosphere. When the heating, soak and cooling cycle is over, the inert gas feed valve is closed and raising the cover disperses the gas.

Others provide an atmosphere control panel and they're operating and maintenance manual should be consulted before any operation or maintenance is carried out especially when maintaining the base of the furnace in the pit as oxygen levels may be depleted.

Circulation Fan

One high temperature insulated plug type fan is provided in the furnace roof to provide a high volume of atmosphere recirculation over the heating elements and the charge. The fan is mounted in a radial discharge diffuser housing positioned close to the underside of the furnace roof.



In manual mode the fan is started and stopped by the push buttons mounted on the front of the control panel.

In automatic mode the fan is started and stopped automatically

The fans are designed for continuous operation at temperatures up to 850°C. The fan is complete with electric motor rated at 11kw on a 415 volt 3 phase 50 Hz supply

Cooling System

An indirect cooling tube system is employed which consists of Four-inverted 'T' shaped tubes. Cooling air to the tubes is supplied from roof mounted fans. The fans are connected to the tubes by sheet steel ducting. The tubes provide controlled cooling for the process cycle.

The rate of cooling is controlled from the program / controller by switching the fans on and off as required to achieve the cooling rate demanded.

The tubes are fabricated in stainless steel material. Each tube is supported from the furnace roof by its central leg. The four tubes provide a collective total cooling surface area of approximately 4.96 m^2

Each tube incorporates baffle plates, which directs the cool air from the inlet through the tube and out through the exhaust. Each of the tubes incorporates a mechanically pivoted damper blade to ensure that heated exhausted air is not drawn back. The damper also prevents the possibility of reverse flow of ambient air during the heating or soak period of the cycle, which would have an undesirable cooling effect.

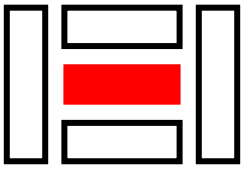
Furnace Sealing

Both the furnace cover and the furnace base steelwork are fully seam welded for gas tightness.

Shaft seals are fitted to the recirculation fan which require a small inert gas feed during an atmosphere cycle this is fed from the main inert gas connection near the base of the furnace via a quick release couple and ridge pipework to the fan seal.

Mechanical seals are provided for the element lead-outs.

Cooling tubes are fully seam welded into position.



Sealing between the furnace cover and base structure is effected by two seals the first is the compression of the inner lining ceramic fibre blanket which is folded especially to

compress against the cover and base and provide the initial heat seal. The second is a compressible high temperature ceramic fibre 'Tadpole' seal attached around the base of the cover and designed to seat on the base steelwork.

Electrical Equipment

All the electrical equipment is housed in a floor mounted, front access, sheet steel cubicle located against the Column D6.

The electrical cubical contains the following main items:-

Mains isolator
Motor starter for the recirculation fan
Motor starter for the cooling fans
415 volt to 110 volt transformer
Relays
Thyristors
12 type 'K' load thermocouple sockets

The output from the thysistor sets are controlled by the temperature program controller

Instrumentation

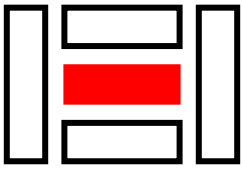
The process control equipment is housed in the same sheet steel cubical as the electrical equipment.

The heating element control is by means of pulse firing thyristor units

During the cycle all the events on the furnace, except over temperature are indicated by the controller. The controller will modulate the output of the thyristors in accordance with the temperature of the furnace and the requirements of the heating profile of the cycle.

The functions of the program control may be accessed via the panel on the front. For detailed instruction please refer to the program controller operating instructions in data sheet section 7.

A flashing beacon is provided to alert the operator to fault conditions.



In the event of an over temperature situation in the furnace the dedicated policeman will shut down the heat input to the furnace but will maintain the recirculation fan running to prevent damage to the fan.

Thermocouples

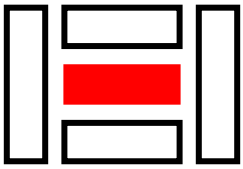
The instrumentation operates in conjunction with metal sheathed duplex type ‘K’ thermocouples position in the roof of the furnace cover. There are two duplex thermocouples.

The temperature program controller uses one element of one duplex thermocouple.

The over temperature Policeman uses one element of the other duplex thermocouple.

The other element in the temperature program controller is used for temperature recording.

Load thermocouples are used for the ICU scanning system and loan controller.



5. Operating Procedure

Ensure the main is switched on.

Connect load thermocouple to the load as necessary

Lower furnace cover onto base

Ensure that the guide posts contacts its locating tube. Lower the furnace cover slowly. When fully seated, remove the crane hook from the cover shackle.

Check the cover is seating evenly on the base.

Connect load thermocouples via the plug and socket arrangement on the back of the furnace near the control panel.

Select the required cycle on the program controller.

Set the required over temperature controller. (This is normally only done once during commissioning)

Ensure there is sufficient chart recorder paper.

Set cooling fan switch to required position (Normally Auto)

Set Reciculation fan switch to required position (Normally Auto)

Press cycle star push button

Recirculation fan running lamp illuminates.

Start Chart recorder

This initiate the start of the cycle which gives an appropriate output to the temperature controller, and sends a signal to the Inert gas outlet motorised valve mounted on the roof of the furnace to open allowing the furnace cover to be purged (PROVISIONAL).

When the cycle has reached a time duration or temperature in the cycle the program controller will signal the Inert gas outlet motorised valve to shut effectively sealing the furnace and ending the purge.

During the heating and soak period of the cycle the program controller will switch the heating elements on and off to control the heat input to the required level.

The amp meters will indicate when there is power to the element.

When the heating and soak period of the cycle is complete the program controller will switch off the power to the elements

When the treatment cycle requires cooling, the program controller will signal the cooling fan to start. If the fans are in AUTO.

Cooling fan running lamp will illuminate.

The cooling fans will be switched on and off to suit the cycle profile requirements.

At the end of the cycle the power to the cooling fan will be switched off and the lamp will be extinguished. If the fan is in AUTO.

The recirculation fan will remain on until the operator switches it off. This should only be done if the furnace is below 200° C.

If not required switch off recorder

Disconnect the load thermocouples from the control panel.

Before lifting the furnace cover switch off mains switch & disconnect the power plugs and socket and the quick release coupling feeding Nitrogen to the recirculation fan seal.

Attach the crane hook to the furnace shackle.

Slowly lift the furnace cover from the base.

Ensure the furnace cover is fully clear of the load

Ensure the furnace guide posts are fully clear of the guide tubes.

Slowly move the furnace cover to the park position.

Slowly lower the furnace cover in the park position.

Unload the furnace base. **Check Oxygen levels in the furnace before entering.**

In case of over temperature:-

The heat will be switched off

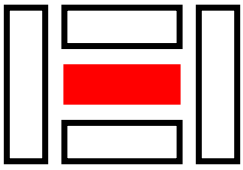
Flashing beacon will be illuminated.

When the temperature falls below the pre-set level, push the reset button to stop the beacon and re-start the heat treatment cycle.

6.Alarms

At any time during the cycle should the temperature in the furnace reach the set point of the policeman, a visual (flashing beacon) will be triggered and the power to the elements will be cut. Power will not be restored until the reset button on the panel is pressed.

Pressing the alarm accept button on the panel will stop the flashing beacon.



7. Maintenance

Furnace cover lining

The cover is lined with three layers of ceramic fibre blanket backed with two layers of mineral insulation. These are anchors to the furnace casing by heat resisting twistlock studding. The lining is sprayed with rigidiser after installation to prevent erosion.

This lining should require no maintenance, but monthly inspection to check for any mechanical damage is desirable.

DO NOT ENTER THE FURNACE COVER WITHOUT FIRST ENSURING THAT THE POWER HAS BEEN TURNED OFF AND THAT IT IS ISOLATED FROM THE SUPPLY AND THE OXYGEN LEVEL HAS BEEN CHECKED. PLACE "WORK IN PROGRESS" SIGNS ON THE CONTROL PANEL AND ENSURE THAT A RESPONSIBLE PERSON IS STATIONED AT THE CONTROL PANEL TO PREVENT UNAUTHORISED OPERATION OF THE EQUIPMENT.

DO NOT START ANY INSPECTION OR MAINTENANCE UNTIL YOU HAVE READ AND UNDERSTOOD THE SAFETY SECTION OF THIS MANUAL. THE NOTES IN THAT SECTION ARE INTENDED FOR YOUR SAFETY.

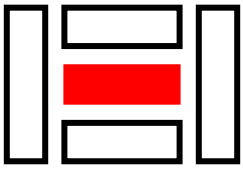
If any repair work is require we recommend that an experienced refractory company be used.

Hearth Brickwork

The upper layer of brickwork is 38% Alumina firebrick, backed with two layers of high quality insulating brickwork.

The hearth should be swept clean and inspected on a monthly bases with any repair work carried out using similar materials by an experienced furnace bricklayer.

Heating Elements



It is recommended that during the monthly inspection of the furnace cover lining, a check on the furnace element supports be made to see if any have been broken and need replacement. Any element failure should be replaced as soon as convenient by the following procedure:-

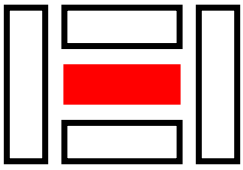
DO NOT ENTER THE FURNACE COVER WITHOUT FIRST ENSURING THAT THE POWER HAS BEEN TURNED OFF AND THAT IT IS ISOLATED FROM THE SUPPLY AND THE OXYGEN LEVEL HAS BEEN CHECKED. PLACE "WORK IN PROGRESS" SIGNS ON THE CONTROL PANEL AND ENSURE THAT A RESPONSIBLE PERSON IS STATIONED AT THE CONTROL PANEL TO PREVENT UNAUTHORISED OPERATION OF THE EQUIPMENT.

- Remove appropriate terminal box cover
- Cut off curled ends of the element tails where they are attached to the copper busbars
- Slide the insulating beads off the element tails
- Remove the screwed cap and ceramic fibre sealing from the lead-outs.
- From inside the furnace, slide out the ceramic support tube from inside the coils of the element
- Withdraw the element tails through the furnace lining.
- The new element should be stretched to the required length and manipulated to fit four support tubes in a similar manner to the other elements.
- The element tails should then be fed through the lining and lead-outs.
- The ceramic fibre seal should be renewed
- Replace the screwed caps and insulating beads
- Cut the element tails to length.
- Shape the element tails to fit the copper shell clamps prior to bolting tightly to the busbars.
- The terminal box cover should then be replaced.

Recirculation Fan

A weekly inspection should be made of the fan driving belts and they should be replaced if there is any sign of wear or fraying.

If the fan stops when it should be running for any reason other than belt failure, it is recommended that it be removed by undoing the flange bolts, disconnecting the electrical leads after first isolating the electrical supply, lifting out the fan by lifting lugs provided.



The fan should then be inspected by the manufacture to determine the cause of the stoppage.

Fully maintenance details are given in section 9 of this manual under Daniels Fans.

Cooling Fan

The cooling fan is direct driven and does not require any maintenance. Should the cooling fan fail or become out of balance, it should be referred to the manufactures.

For more information regarding the cooling fan see section 9 of this manual under Alldays Peacock.

Cooling Duct Damper

The cooling duct damper is located on the exit of the cooling tubes, one on each tube. These dampers are mechanical and require inspection once monthly to ensure free movement.

Furnace Cover to Base Seal

There is a tadpole seal held by a steel strip and set pins to the bottom channel of the furnace cover, this should be inspected at weekly intervals. If the tadpole seal needs replacing it is one complete length and will require all the set pins and steel retaining strip to be removed, before replacing with a new seal.

Motorised Inert Gas Outlet Valve

This valve is direct driven and does not require any maintenance. Should the valve or motor fail it should be referred to the manufacture.

Guide Posts

The furnace cover guide posts require greasing as necessary to ensure smooth movement.

8. Drawings

The following drawing are included as an aid to maintenance.

FMC/20659/GA General Arrangement Drawing of the Furnace

FMC/20659/101 (As Built) Electrical Schematic

FMC/20659/102 (As Built) Electrical Schematic

FMC/20659/103 (As Built) Electrical Schematic

FMC/20659/104 (As Built) Electrical Schematic

FMC/20659/105 (As Built) Electrical Schematic

FMC/20659/106 (As Built) Electrical Schematic

FMC/20659/107 (As Built) Electrical Schematic

FMC/20659/108 (As Built) Electrical Schematic

FMC/20659/109 (As Built) Electrical Schematic

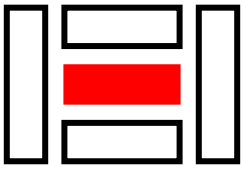
FMC/20659/110 (As Built) Electrical Schematic

FMC/20659/111 (As Built) Electrical Schematic

FMC/20659/112 (As Built) Electrical Schematic

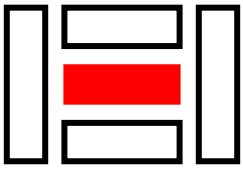
FMC/20659/113 (As Built) Electrical Schematic

FMC/20659/114 (As Built) Electrical Schematic



9. Data Sheets

The following data sheets, operating and maintenance manuals are arranged in manufactures alphabetical order.



10. Maintenance Schedule Sheet

The following sheet is only meant as an aid to routine inspections and maintenance.