# Health & Safety

# Task Procedures Manual

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| **Site Details -** | **Various Sites<br>Various Site Addresses** |
| **Project No. –** | **As per individual job number** |

- **TASK PROCEDURES**
- **RISK IDENTIFICATION**
- **IMMINENT DANGER PROCEDURES**

JGR BUILDING SERVICES LTD.

# Guidance Notes – Task Procedures Manual

The Task Procedures, related Risk Identification information and Imminent Danger Procedures within this manual are provided principally for the persons who undertake the work described their supervisors and their management.

The information is generic in nature, e.g. it summarise the results of model assessments undertaken on a range of tasks / activities that are commonly undertaken.

These Task Procedures are designed to present a way of doing things that will ensures a safe system of work under most conditions, for an engineer who has received suitable general training in their trade, had basic training in health & safety at work and gained the appropriate experience in the range of normal working environments.

However, as with all generic arrangements, the information within this manual relates only to the perceived conditions at the time of assessment, and such information cannot therefore exactly cover all of the situations in which engineers may work.

Therefore, all engineers must realise the importance of staying alert to the range of additional hazards that may affect the everyday task and they should always consider whether or not, a change is required to the normal control measures, to ensure their own health & safety and that of others who may be affected by your work.

Should an engineer come across a work situation, where the control measures detailed within this manual or other established arrangements do not appear to be sufficient (e.g. work conditions are not as they usually come) then all works must be suspended until such times that a safe system of work can be established and the following conditions are met –

1. The engineer has successfully encountered a similar experience before and can follow the same safe procedures as before or you have had suitable training to deal with the particular situation
2. You are confident about all additional control measures that are required
3. You have and can, competently and safely, use all additional resources that are required e.g. tools, equipment, and items personal protection equipment.

If, at any time, the engineer is not confident that the above conditions can be met, he must refer the situation to your supervisor / manager for advice and for assistance.

These Task Procedures form part of the site Health & Safety documentation found in the project Site Safety Folder. This folder contains all relevant safety documents required for works being carried out safely such as Method Statements and Risk Assessments as well as these Task Procedures. All engineers should ensure all works are carried out in accordance with the information detailed in this Safety Folder.

## Contents – Refrigeration / Air Conditioning Procedures



| Review Status | |
|---|---|
| **Review Completed By** | Guy Wood |
| **Signature** |  |
| **Position** | Director / Commissioning Manager |
| **Date of Last Review** | February 2018 |
| **Next Review Due** | February 2020 |

## Contents – Electrical Procedures



| Review Status | |
|---|---|
| **Review Completed By** | Dave Cheyne |
| **Signature** |  |
| **Position** | Electrical Supervisor |
| **Date of Last Review** | February 2018 |
| **Next Review Due** | February 2020 |

| Task Reference | R01 |
|---|---|
| Task Activity | Pump Down of Refrigerant from Refrigeration & Air Conditioning Equipment |

## Hazards

- Refrigerant leaking into the surrounding atmosphere
- Asphyxiation from the uncontrolled release of refrigerants
- Refrigerant burns from the uncontrolled release of refrigerants
- Explosion
- Electrocution
- Injury when moving cylinders

## Risk

| Low | ✓ | Medium | | High | |
|---|---|---|---|---|---|

## Control Measures

- Only competent trained operatives to complete works.
- Follow all control measures and task methodologies detailed in all relevant site Method Statements, Task Procedures and Risk Assessments
- When working in isolated area(s) ensure other persons are available to render assistance if required.
- Check and make sure pressure relief valves are fitted to liquid receiver.
- Check operation of high-pressure switch and ensure it is at the correct cut out setting (e.g. R22 = 275 psi, R134a & R404 200psi).
- Fit discharge gauge, if excessive discharge pressure is indicated, this would suggest inadequate liquid receiver size.
- See Task Procedure R5 (Refrigerant Removal and Handling).

## Task Methodology

***While working on Refrigeration and Air Conditioning systems, operatives must ensure they meet all requirements from all relevant legislation and guidance such as –***

- ***F-Gas Regulations***
- ***Pressure Equipment Directive***

**1.** Advise site management of works to be carried out and gain permission to complete works.

**2.** Assess the area where works will be completed and –
- Ensure the immediate area has a satisfactory working space, free from trailing cables, ropes and hoses
- Cordon off the immediate with suitable signage and protective barriers to protect other persons & prevent unauthorised access to work area.
- Ensure the immediate work area is suitably illuminated, with sufficient lighting provided.

**3.** Where required, complete site permit to work system for working on refrigeration and air conditioning systems, ***prior*** to completing any works.

**4.** Ensure all tools and equipment used on refrigeration and air conditioning systems are -
- Suitable for the tasks being carried out and the environment in which they are to be used
- Suitably maintained and tested (i.e. where required PA Tested and calibrated) and in good condition, with pre-user checks carried out prior to use.

**5.** Ensure all operatives working on refrigeration and air conditioning systems are suitably competent for the works being carried out and have full understanding of the works to be carried out, with all site Method Statements, Task Procedures and Risk Assessments for the work to hand.

**6.** Ensure all operatives working on refrigeration and air conditioning systems are wearing all required items of PPE, as detailed in this Task Procedure and site Risk Assessments.

**7.** Where required, arrange with site management for isolation of any plant alarms, i.e. if they are likely to be affected by the refrigeration and air conditioning works.

**8.** Carry out refrigeration and air conditioning works in an orderly manner on an item-to-item basis, ensuring that by working on refrigeration and air conditioning systems, 'danger' is not caused to others as a result.

- Fit suction and discharge manifold gauges to system
- Re-calibrate low-pressure control switch to 0 psig
- Close off the shut off valve at the outlet of the liquid receiver / condenser.
- Switch on compressor and when the suction gauge reaches 0 psig switch off, check discharge pressure gauge for excessive discharge pressure

  If suction gauge / pressure rises above 0 psig repeat process until suction gauge reading is static at 0 psig.
- Front seat compressor suction valve
- Isolate system electrically, following Task Procedures E01 (Electrical Isolation)
- When plant is put back into operation (normal), do not forget to re-adjust low pressure switch setting.

**9.** Ensure that on completion of works, all connections are made good and all equipment is operating safely and correctly and warning notices are removed

**10.** Ensure work area is clear of all tools and equipment

**11.** Inform site management works have been completed and, where required, sign off Permit to Work and return any access / plant room keys, if applicable

## Plant & Equipment Used to Carry out Task

- Gauges and Lines
- Hand Tools
- Multi-meter / Electrical Tester & Test Leads

## Training / Competency

- NVQ level 2 in Small Commercial Refrigeration & Air Conditioning Systems
- C&G 2079 – F-Gas Training Certificate

## Emergency Procedures

- Evacuate Area Evacuate Area / Clear personnel, especially injured persons, from immediate area
- If safe to do so –
  - If discharge pressure is excessive, switch off plant and isolate - See Task Procedure R5 (Refrigerant Removal and Handling)
  - Shut off leak
  - Switch off electrical supply
  - Remove any cylinders from any heat source and keep cylinders cool
- Handle refrigerant in accordance with JGR CoSHH Assessment and Manufacturers Material Safety Data Sheet
- Treat ill-health conditions in accordance with JGR CoSHH Assessment
- Call Emergency Services if necessary

## Protection of Other

- Immediate area to be kept free from cables, ropes and equipment that may affect the works to be carried out
- Suitable signage / safety barriers to be erected around the area where works are being carried out to warn of works and prevent unauthorised access to work area.

## Personal Protective Equipment required for Task

- Safety Footwear (BS EN 20345)
- Gloves (BS EN 388)
- Goggles (BS EN 166)

| Task Reference | R02 |
|---|---|
| Task Activity | Refrigerant Removal and Handling |

## Hazards

- Refrigerant leaking into the surrounding atmosphere
- Asphyxiation from the uncontrolled release of refrigerants
- Refrigerant burns from the uncontrolled release of refrigerants
- Explosion
- Electrocution
- Injury when moving cylinder and plant

## Risk

| Low | ✓ | Medium | | High | |
|---|---|---|---|---|---|

## Control Measures

- Only competent trained operatives to complete works
- Follow all control measures and task methodologies detailed in all relevant site Method Statements, Task Procedures and Risk Assessments
- When working in isolated area(s) ensure other persons are available to render assistance if required
- Read and understand COSHH information on substances before proceeding
- Use the correct recovery cylinders and make sure they are not damaged
- Use accurate weighting scales, preferably electronic
- **No smoking, heat source or naked flames**

## Task Methodology

***While working on Refrigeration and Air Conditioning systems, operatives must ensure they meet all requirements from all relevant legislation and guidance such as –***

- ***F-Gas Regulations***
- ***Pressure Equipment Directive***

**1.** Advise site management of works to be carried out and gain permission to complete works.

**2.** Assess the area where works will be completed and –
- Ensure the immediate area has a satisfactory working space, free from trailing cables, ropes and hoses
- Cordon off the immediate with suitable signage and protective barriers to protect other persons & prevent unauthorised access to work area.
- Ensure the immediate work area is suitably illuminated, with sufficient lighting provided.

**3.** Where required, complete site permit to work system for working on refrigeration and air conditioning systems, ***prior*** to completing any works.

**4.** Ensure all tools and equipment used on refrigeration and air conditioning systems are -
- Suitable for the tasks being carried out and the environment in which they are to be used
- Suitably maintained and tested (i.e. where required PA Tested and calibrated) and in good condition, with pre-user checks carried out prior to use.

**5.** Ensure all operatives working on refrigeration and air conditioning systems are suitably competent for the works being carried out and have full understanding of the works to be carried out, with all site Method Statements, Task Procedures and Risk Assessments for the work to hand.

**6.** Ensure all operatives working on refrigeration and air conditioning systems are wearing all required items of PPE, as detailed in this Task Procedure and site Risk Assessments.

**7.** Where required, arrange with site management for isolation of any plant alarms, i.e. if they are likely to be affected by the refrigeration and air conditioning works.

**8.** Carry out refrigeration and air conditioning works in an orderly manner on an item-to-item basis, ensuring that by working on refrigeration and air conditioning systems, 'danger' is not caused to others as a result.

- Establish refrigerant type to be removed. If unable to identify refrigerant type, Pressure Temperature Relationship may have to be used.
- Prior to Handling and Removing refrigerants, engineers will ensure –
  - They have the correct number of recovery cylinders available
  - All cylinders to be used are designated for received refrigerant and labelled for the refrigerant
  - All necessary paperwork such as labels and Hazardous Waste Consignment Note are available
  - Recovery equipment is in working order and a set of instructions concerning the equipment is at hand
  - Recovery equipment has been emptied completely of any refrigerants
  - A set of calibrated weighting scales are available, preferably electronic, and are all in good working order.
  - All hoses are complete with leak free disconnect coupling and are all in good order
  - Ensure safe system of handling cylinders can be employed (a manual handling risk assessment may be required in certain circumstances).
  - Check all recovery cylinders are complete with shut off valves are in good working order
  - That all empty recovery cylinders are evacuated and if possible cooled before recovery occurs
- Place Recovery Cylinder on the scales
- Pump down refrigeration system, if possible, using Task Procedure R01 (Pump Down of Refrigeration & Air Conditioning Equipment).
- Connect gauges to relevant ports on the high & low (Suction & Discharge0 sides of the system
- Start recovery machine and operate in accordance with manufacturer's instructions and ensuring that the recovery of refrigerant is supervised at all times by a competent person.
- When cylinder is filled correctly and process is completed, ensure the Hazardous Waste Consignment Note has been fully completed and arrange for the cylinders to be promptly removed from site.

**Important Notes –**

- Engineers should take into account that refrigerant / oil mixtures have a lower density than pure refrigerant, which will reduce cylinder capacity.
- Recovery Cylinders should ***never*** be over filled (No more than 80% volume liquid charge)
- Recovery of refrigerant should be supervised at all times by a competent person and never exceed the maximum working pressure of the cylinder, even temporarily
- Recovered refrigerant should not be charged into another refrigeration system unless it has been cleaned and checked.
- Due to the fact that polyester oils are non-miscible and to avoid cross-contamination, it is advisable to use a separate set of equipment when using a new refrigerant or blend, as follows: -
  - Vacuum pump via new return valve (i.e. solenoid valve) fitted between refrigerant source and vacuum pump
  - Recovery system
  - Flexible hoses
  - Gauges

**9.** Ensure that on completion of works, all connections are made good and all equipment is operating safely and correctly and warning notices are removed.

**10.** Ensure work area is clear of all tools and equipment

**11.** Inform site management works have been completed and, where required, sign off Permit to Work and return any access / plant room keys, if applicable

| Plant & Equipment Used to Carry out Task |
|---|
| ▪ Reclaim Rig<br>▪ Reclaim Cylinder<br>▪ Vac Pump<br>▪ Gauges and Lines<br>▪ Weighing Scales<br>▪ Hand Tools |
| **Training / Competency** |
| ▪ NVQ level 2 in Small Commercial Refrigeration & Air Conditioning Systems<br>▪ C&G 2079 – F-Gas Training Certificate |
| **Emergency Procedures** |
| ▪ Evacuate Area / Clear personnel, especially injured persons, from immediate area<br>▪ If safe to do so –<br>o Shut off leak<br>o Switch off electrical supply<br>o Remove any cylinders from any heat source and keep cylinders cool<br>▪ Handle refrigerant in accordance with JGR CoSHH Assessment and Manufacturers Material Safety Data Sheet<br>▪ Treat ill-health conditions in accordance with JGR CoSHH Assessment<br>▪ Call Emergency Services if necessary |
| **Protection of Other** |
| ▪ Immediate area to be kept free from cables, ropes and equipment that may affect the works to be carried out<br>▪ Suitable signage / safety barriers to be erected around the area where works are being carried out to warn of works and prevent unauthorised access to work area. |
| **Personal Protective Equipment required for Task** |
| ▪ Safety Footwear (BS EN 20345)<br>▪ Gloves (BS EN 388)<br>▪ Goggles (BS EN 166) |

| Task Reference | R03 |
|---|---|
| Task Activity | Replacement of Refrigeration & Air Conditioning Components |

## Hazards

- Refrigerant leaking into the surrounding atmosphere
- Asphyxiation from the uncontrolled release of refrigerants
- Refrigerant burns from the uncontrolled release of refrigerants
- Explosion
- Electrocution
- Injury when moving cylinders, plant and equipment

## Risk

| Low | ✓ | Medium | | High | |
|---|---|---|---|---|---|

## Control Measures

- Only competent trained operatives to complete works.
- Follow all control measures and task methodologies detailed in all relevant site Method Statements, Task Procedures and Risk Assessments
- When working in isolated area(s) ensure other persons are available to render assistance if required.
- Never attempt to use brazing equipment if refrigerant is present in the atmosphere.
- Never seal-off pipework, which may contain liquid refrigerant, which is below ambient temperature.
- Make sure all refrigerant has been removed from the section of the system before breaking into the system

## Task Methodology

***While working on Refrigeration and Air Conditioning systems, operatives must ensure they meet all requirements from all relevant legislation and guidance such as –***

- ***F-Gas Regulations***
- ***Pressure Equipment Directive***

**1.** Advise site management of works to be carried out and gain permission to complete works.

**2.** Assess the area where works will be completed and –
   - Ensure the immediate area has a satisfactory working space, free from trailing cables, ropes and hoses
   - Cordon off the immediate with suitable signage and protective barriers to protect other persons & prevent unauthorised access to work area.
   - Ensure the immediate work area is suitably illuminated, with sufficient lighting provided.

**3.** Where required, complete site permit to work system for working on refrigeration and air conditioning systems, ***prior*** to completing any works.

**4.** Ensure all tools and equipment used on refrigeration and air conditioning systems are -
   - Suitable for the tasks being carried out and the environment in which they are to be used
   - Suitably maintained and tested (i.e. where required PA Tested and calibrated) and in good condition, with pre-user checks carried out prior to use.

**5.** Ensure all operatives working on refrigeration and air conditioning systems are suitably competent for the works being carried out and have full understanding of the works to be carried out, with all site Method Statements, Task Procedures and Risk Assessments for the work to hand.

**6.** Ensure all operatives working on refrigeration and air conditioning systems are wearing all required items of PPE, as detailed in this Task Procedure and site Risk Assessments.

**7.** Where required, arrange with site management for isolation of any plant alarms, i.e. if they are likely to be affected by the refrigeration and air conditioning works.

**8.** Carry out refrigeration and air conditioning works in an orderly manner on an item-to-item basis, ensuring that by working on refrigeration and air conditioning systems, 'danger' is not caused to others as a result.

- Before any component can be removed or replaced within a refrigerant system, the refrigerant must be evacuated from the section of the system concerned. This can be achieved by either the following methods –
  - Pump down the system using Task Procedure R01 (Pump down of Refrigerant from Refrigeration & Air Conditioning components)
  - Remove the entire refrigerant from the system using Task Procedure R02 (Refrigerant removal and handling)
- Close off isolation valves each side of the component
- If the component that requires replacing is on the discharge side of the system:
  - Switch off the system
  - Isolate the component with hand shut off valve each side of the component
  - Evacuate the refrigerant from the section of pipework isolated.
- Isolate the system electrically using Task Procedure E01 (Electrical Isolation). At ***NO TIME*** will any expose live electrical circuits / areas to be left unattended.
- Carry out all repairs / replacement of components, following all relevant Task Procedures i.e. Task Procedures R15 (Brazing & Soldering of Refrigeration and Air Conditioning pipework)
- Once all works have been completed –
  - Pressure Test system using Task Procedure R06 (Pressure Testing of Refrigeration & Air Conditioning systems)
  - Evacuate the system using Task Procedure R05 (Evacuation of Refrigeration Systems) to remove all moisture, air and other 'non condensable' from the system, leaving it in a clean and dry condition.
  - Charging the system with refrigerant following Task Procedure R04 (Refrigerant Charging)
  - Reconnect electrical supplies following Task Procedures E04 (Electrical Connection)
  - Re-commission the system following Task Procedures R11 (Commissioning & Re-commissioning Refrigeration & Air Conditioning systems)

**9.** Ensure that on completion of works, all connections are made good and all equipment is operating safely and correctly and warning notices are removed.

**10.** Ensure work area is clear of all tools and equipment

**11.** Inform site management works have been completed and, where required, sign off Permit to Work and return any access / plant room keys, if applicable

**Plant & Equipment Used to Carry out Task**

- Gauges and Lines
- Hand Tools
- Multi-meter / Electrical Tester & Test Leads

**Training / Competency**

- C&G 2079 – F-Gas Training Certificate
- NVQ level 2 in Small Commercial Refrigeration & Air Conditioning Systems

**Emergency Procedures**

- Evacuate Area / Clear personnel, especially injured persons, from immediate area
- If safe to do so –
  - Shut off leak
  - Switch off electrical supply
  - Remove any cylinders from any heat source and keep cylinders cool
- Handle refrigerant in accordance with JGR CoSHH Assessment and Manufacturers Material Safety Data Sheet
- Treat ill-health conditions in accordance with JGR CoSHH Assessment
- Call Emergency Services if necessary

**Protection of Other**

- Immediate area to be kept free from cables, ropes and equipment that may affect the works to be carried out
- Suitable signage / safety barriers to be erected around the area where works are being carried out to warn of works and prevent unauthorised access to work area.

| Personal Protective Equipment required for Task |
| --- |
| ▪ Safety Footwear (BS EN 20345)<br>▪ Gloves (BS EN 388)<br>▪ Goggles (BS EN 166) |

| Task Reference | R04 |
|---|---|
| Task Activity | Refrigerant Charging |

## Hazards

- Refrigerant leaking into the surrounding atmosphere
- Asphyxiation from the uncontrolled release of refrigerants
- Refrigerant burns from the uncontrolled release of refrigerants
- Explosion
- Injury when moving cylinder and plant

## Risk

| Low | ✓ | Medium | | High | |
|---|---|---|---|---|---|

## Control Measures

- Only competent trained operatives to complete works.
- Follow all control measures and task methodologies detailed in all relevant site Method Statements, Task Procedures and Risk Assessments
- When working in isolated area(s) ensure other persons are available to render assistance if required.
- Always use correct tools and equipment for the purpose of charging.
- Use mechanical handling equipment for cylinders when possible.
- Ensure adequate ventilation of area.
- Labels prominently displayed to state refrigerant in system and warning against charging any other gas into system. Where an ester lubricant is being used, this should be clearly indicated with label attached to system.
- No smoking, heat source or naked flame(s)

## Task Methodology

***While working on Refrigeration and Air Conditioning systems, operatives must ensure they meet all requirements from all relevant legislation and guidance such as –***

- ***F-Gas Regulations***
- ***Pressure Equipment Directive***

**1.** Advise site management of works to be carried out and gain permission to complete works.

**2.** Assess the area where works will be completed and –
- Ensure the immediate area has a satisfactory working space, free from trailing cables, ropes and hoses
- Cordon off the immediate with suitable signage and protective barriers to protect other persons & prevent unauthorised access to work area.
- Ensure the immediate work area is suitably illuminated, with sufficient lighting provided.

**3.** Where required, complete site permit to work system for working on refrigeration and air conditioning systems, ***prior*** to completing any works.

**4.** Ensure all tools and equipment used on refrigeration and air conditioning systems are -
- Suitable for the tasks being carried out and the environment in which they are to be used
- Suitably maintained and tested (i.e. where required PA Tested and calibrated) and in good condition, with pre-user checks carried out prior to use.

**5.** Ensure all operatives working on refrigeration and air conditioning systems are suitably competent for the works being carried out and have full understanding of the works to be carried out, with all site Method Statements, Task Procedures and Risk Assessments for the work to hand.

**6.** Ensure all operatives working on refrigeration and air conditioning systems are wearing all required items of PPE, as detailed in this Task Procedure and site Risk Assessments.

**7.** Where required, arrange with site management for isolation of any plant alarms, i.e. if they are likely to be affected by the refrigeration and air conditioning works.

**8.** Carry out refrigeration and air conditioning works in an orderly manner on an item-to-item basis, ensuring that by working on refrigeration and air conditioning systems, 'danger' is not caused to others as a result.

To transfer refrigerants from storage cylinder to plant, engineers will –

- Check and confirm correct refrigerant type required
- Check plant / system has been evacuated, following Task Procedure R05 (Evacuation of Refrigeration Systems) or holds a positive pressure of the same refrigerant
- Place refrigerant cylinder on to weighing scales
- Connect manifold to storage cylinder and to high and low side of plant
- Check system control circuit and safety devices
- Check system is ready to run
- Dump charge refrigerant, until required amount of refrigerant has been added to the system
- Run system
- Once refrigerant has been charge has been completed, where required –
  - Carry out a leak test following Task Procedure R07 (Leak Testing of Refrigeration & Air Conditioning systems)
  - Commission the system following Task Procedures R11 (Commissioning & Re-commissioning Refrigeration & Air Conditioning systems)

**Important Notes –**

- No refrigerant must be allowed to escape into the atmosphere
- Ensure air and moisture in charging line is kept to an absolute minimum
- Certain refrigerants are mixtures and as such will need to be charged in liquid form
- When charging with new refrigerants or blends the correct lubricant should be used in accordance with compressor manufacturer/suppliers recommendations.
- Ensure components are compatible, e.g. filter drier / expansion valve when using new refrigerants or blends.
- Never mix refrigerants
- For charging plant on retrofits, depending upon the refrigerant or blend that is used, checks must be made with manufacturer in connection with the acceptable level of residual quantities of the original oil within the system.
- Separate devices, vacuum pumps, NRV valves (Solenoid valves) fittings and components, (e.g. specialist's flexible hoses), should be used for new refrigerant and blends.
- Due to the molecular structure of the new blends, leakage is more prevalent; therefore mechanical joints should be kept to an absolute minimum.
- Refer to JGR COSHH Assessment Sheets and refrigerant handling information.

**9.** Ensure that on completion of works, all connections are made good and all equipment is operating safely and correctly and warning notices are removed.

**10.** Ensure work area is clear of all tools and equipment

**11.** Inform site management works have been completed and, where required, sign off Permit to Work and return any access / plant room keys, if applicable.

| Plant & Equipment Used to Carry out Task |
|---|
| ▪ Gauges and Lines<br>▪ Weighing Scales<br>▪ Hand Tools<br>▪ Refrigerant |
| **Training / Competency** |
| ▪ NVQ level 2 in Small Commercial Refrigeration & Air Conditioning Systems<br>▪ C&G 2079 – F-Gas Training Certificate |

| Emergency Procedures |
|---|
| ▪ Evacuate Area / Clear personnel, especially injured persons, from immediate area<br>▪ If safe to do so –<br>  o Shut off leak<br>  o Switch off electrical supply<br>  o Remove any cylinders from any heat source and keep cylinders cool<br>▪ Handle refrigerant in accordance with JGR CoSHH Assessment and Manufacturers Material Safety Data Sheet<br>▪ Treat ill-health conditions in accordance with JGR CoSHH Assessment<br>▪ Call Emergency Services if necessary |
| **Protection of Other** |
| ▪ Immediate area to be kept free from cables, ropes and equipment that may affect the works to be carried out<br>▪ Suitable signage / safety barriers to be erected around the area where works are being carried out to warn of works and prevent unauthorised access to work area. |
| **Personal Protective Equipment required for Task** |
| ▪ Safety Footwear (BS EN 20345)<br>▪ Gloves (BS EN 388)<br>▪ Goggles (BS EN 166) |

| Task Reference | R05 |
|---|---|
| Task Activity | Evacuation of Refrigeration Systems |

| Hazards | | | | | |
|---|---|---|---|---|---|
| ▪ Electric shocks from faulty vacuum pump or trailing electrical leads etc.<br>▪ Trip hazards from training leads and position of pump | | | | | |
| **Risk** | | | | | |
| **Low** | ✓ | **Medium** | | **High** | |

**Control Measures**

- Only competent trained operatives to complete works.
- Follow all control measures and task methodologies detailed in all relevant site Method Statements, Task Procedures and Risk Assessments
- When working in isolated area(s) ensure other persons are available to render assistance if required.

**Task Methodology**

***While working on Refrigeration and Air Conditioning systems, operatives must ensure they meet all requirements from all relevant legislation and guidance such as –***

- ***F-Gas Regulations***
- ***Pressure Equipment Directive***

**1.** Advise site management of works to be carried out and gain permission to complete works.

**2.** Assess the area where works will be completed and –
- Ensure the immediate area has a satisfactory working space, free from trailing cables, ropes and hoses
- Cordon off the immediate with suitable signage and protective barriers to protect other persons & prevent unauthorised access to work area.
- Ensure the immediate work area is suitably illuminated, with sufficient lighting provided.

**3.** Where required, complete site permit to work system for working on refrigeration and air conditioning systems, ***prior*** to completing any works.

**4.** Ensure all tools and equipment used on refrigeration and air conditioning systems are -
- Suitable for the tasks being carried out and the environment in which they are to be used
- Suitably maintained and tested (i.e. where required PA Tested and calibrated) and in good condition, with pre-user checks carried out prior to use.

**5.** Ensure all operatives working on refrigeration and air conditioning systems are suitably competent for the works being carried out and have full understanding of the works to be carried out, with all site Method Statements, Task Procedures and Risk Assessments for the work to hand.

**6.** Ensure all operatives working on refrigeration and air conditioning systems are wearing all required items of PPE, as detailed in this Task Procedure and site Risk Assessments.

**7.** Where required, arrange with site management for isolation of any plant alarms, i.e. if they are likely to be affected by the refrigeration and air conditioning works.

**8.** Carry out refrigeration and air conditioning works in an orderly manner on an item-to-item basis, ensuring that by working on refrigeration and air conditioning systems, 'danger' is not caused to others as a result.

- Before the system can be evacuated the refrigerant in the system should be either pumped down or removed from the system. This can be achieved by either the following methods –
  - Pump down the system using Task Procedure R01 (Pump down of Refrigerant from Refrigeration & Air Conditioning components)
  - Remove the entire refrigerant from the system using Task Procedure R02 (Refrigerant removal and handling)
- Isolate the system electrically using Task Procedure E01 (Electrical Isolation). At ***NO TIME*** will any expose live electrical circuits / areas to be left unattended.

- Connect gauges and a Torr Gauge to both the high and low (suction & discharge) sides of the system
- Ensure pressure on both high and low (suction & discharge) sides of the system is at 0psig
- Switch on Vac Pump and wait until gauges show a reading of below 2 Torr
- Switch off Vac Pump and disconnect both sets of gauges
- Once all brazing works have been completed, where required –
  - Charging the system with refrigerant following Task Procedure R04 (Refrigerant Charging)
  - Connect electrical supplies following Task Procedures E04 (Electrical Connection)
  - Commission the system following Task Procedures R11 (Commissioning & Re-commissioning Refrigeration & Air Conditioning systems)

**Important Notes –**

- The purpose of the evacuation is to remove all moisture, air and other 'non condensable' from the system, leaving it in a clean and dry condition, prior to charging the system with refrigerant
- The vacuum pump selected must be of suitable capacity to evacuate the system; it must be in good working order and have sufficient oil.

**9.** Ensure that on completion of works, all connections are made good and all equipment is operating safely and correctly and warning notices are removed.

**10.** Ensure work area is clear of all tools and equipment

**11.** Inform site management works have been completed and, where required, sign off Permit to Work and return any access / plant room keys, if applicable.

## Plant & Equipment Used to Carry out Task

- Vac Pump
- Gauges and Lines
- Torr Gauge
- Hand Tools
- Multi-meter / Electrical Tester & Test Leads

## Training / Competency

- NVQ level 2 in Small Commercial Refrigeration & Air Conditioning Systems
- C&G 2079 – F-Gas Training Certificate

## Emergency Procedures

- Evacuate Area / Clear personnel (especially injured persons) from immediate danger area
- If safe to do so –
  - Switch off / isolate equipment
  - Shut off / isolate all services, such as electrical supplies
- Call Emergency Services if necessary

## Protection of Other

- Immediate area to be kept free from cables, ropes and equipment that may affect the works to be carried out
- Suitable signage / safety barriers to be erected around the area where works are being carried out to warn of works and prevent unauthorised access to work area.

## Personal Protective Equipment required for Task

- Safety Footwear (BS EN 20345)
- Gloves (BS EN 388)
- Goggles (BS EN 166)

| Task Reference | R06 |
|---|---|
| Task Activity | Pressure Testing of Refrigeration & Air Conditioning Pipework / Systems |

| Hazards | | | | | |
|---|---|---|---|---|---|
| ▪ Uncontrolled (i.e. explosive) release of energy from failure of joint or system component<br>▪ Injury when moving cylinder and plant | | | | | |
| **Risk** | | | | | |
| **Low** | ✓ | **Medium** | | **High** | |

**Control Measures**

- Only competent trained operatives to complete works.
- Follow all control measures and task methodologies detailed in all relevant site Method Statements, Task Procedures and Risk Assessments
- When working in isolated area(s) ensure other persons are available to render assistance if required.
- Ensure that nitrogen cylinders are properly secured to prevent them from being knocked over.
- Clear all non-essential personnel from the risk area

**Task Methodology**

***While working on Refrigeration and Air Conditioning systems, operatives must ensure they meet all requirements from all relevant legislation and guidance such as –***

- ***F-Gas Regulations***
- ***Pressure Equipment Directive***

**1.** Advise site management of works to be carried out and gain permission to complete works

**2.** Assess the area where works will be completed and –

- Ensure the immediate area has a satisfactory working space, free from trailing cables, ropes and hoses
- Cordon off the immediate with suitable signage and protective barriers to protect other persons & prevent unauthorised access to work area.
- Ensure the immediate work area is suitably illuminated, with sufficient lighting provided.

**3.** Where required, complete site permit to work system for working on refrigeration and air conditioning systems, ***prior*** to completing any works.

**4.** Ensure all tools and equipment used on refrigeration and air conditioning systems are -

- Suitable for the tasks being carried out and the environment in which they are to be used
- Suitably maintained and tested (i.e. where required PA Tested and calibrated) and in good condition, with pre-user checks carried out prior to use.

**5.** Ensure all operatives working on refrigeration and air conditioning systems are suitably competent for the works being carried out and have full understanding of the works to be carried out, with all site Method Statements, Task Procedures and Risk Assessments for the work to hand.

**6.** Ensure all operatives working on refrigeration and air conditioning systems are wearing all required items of PPE, as detailed in this Task Procedure and site Risk Assessments.

**7.** Where required, arrange with site management for isolation of any plant alarms, i.e. if they are likely to be affected by the refrigeration and air conditioning works.

**8.** Carry out refrigeration and air conditioning works in an orderly manner on an item-to-item basis, ensuring that by working on refrigeration and air conditioning systems, 'danger' is not caused to others as a result.

- Before the system can be Pressure Tested the refrigerant in the system should be either pumped down or removed from the system. This can be achieved by either the following methods –
  - Pump down the system using Task Procedure R01 (Pump down of Refrigerant from Refrigeration & Air Conditioning components)
  - Remove the entire refrigerant from the system using Task Procedure R02 (Refrigerant removal and handling)

- Isolate the system electrically, using Task Procedure E01 (Electrical Isolation). At ***NO TIME*** will any expose live electrical circuits / areas to be left unattended
- Connect gauges to the system to ensure that there is no gas in the system
- Connect gauges to nitrogen cylinder, ensuring cylinder is adequately supported to prevent them falling over.
- Pressurise system by opening the shut off valve on the nitrogen cylinder.

  The pressure in the system is to be built up gradually and monitored by the remote gauge located in a safe place. Once the test pressure is reached, the nitrogen cylinder(s) should be closed off, isolated from the system under test, and safely stowed
- Once at correct pressure leave system on test for the allotted time and check Pressure Gauge.
- Discharge pressure in the system slowly to atmosphere.
- Should a leak be suspected, then a Leak Test will be carried out following Task Procedure R07 (Leak Testing of Refrigeration & Air Conditioning systems)
- Repairs involving welding, or brazing must not under any circumstances be carried out on any system, part of a system component while it is still under pressure
- Following the correction of any leaks in the system the system shall be re-tested
- Once all works have been completed, where required –
  - Evacuate the system using Task Procedure R05 (Evacuation of Refrigeration Systems) to remove all moisture, air and other 'non condensable' from the system, leaving it in a clean and dry condition.
  - Charging the system with refrigerant following Task Procedure R04 (Refrigerant Charging)
  - Connect electrical supplies following Task Procedures E04 (Electrical Connection)
  - Commission the system following Task Procedures R11 (Commissioning & Re-commissioning Refrigeration & Air Conditioning systems)

**Important Notes –**

- **Under no circumstances should a refrigeration gauge manifold and lines be used for pressure testing purposes**
- Only Oxygen Free (dry) Nitrogen (OFN) **or** Trace-A-Gas (95% Nitrogen & 5% Hydrogen) shall be used to carry out pressure testing. Cylinders must be adequately supported to prevent them falling over
- Before carrying out the initial strength pressure test, all non-essential personnel shall be evacuated from the areas of risk and warning notices shall be posted at suitable and sufficient locations around the systems to advising that the system/equipment is under high pressure
- Protective goggles shall be worn by all persons engaged with pressurising / depressurising the pipe-work / system and when working near systems during the initial strength-test phase
- Prior to testing, sensitive gauges, controls and instruments that may be damaged, by excess pressure must be isolated from the system. Relief valves shall be removed and the openings capped and plugged. Solenoid valves, pressure regulating valves and other control valves should be opened as necessary and the circuit(s) checked to ensure all relevant parts of the system can be pressurised.
- Test pressure shall not exceed that applied to the components by the manufacturer of the particular component. This may require the testing of the low-pressure side of the system separately from the high-pressure side. Test pressures higher than **BS EN 378-1** figures are only to be used when specified in writing by the designer.
- Particular care must be taken when first pressurising the system / equipment (strength test) since this is the most likely time for a structural failure to occur which could lead to an explosive release of pressure.

  Following the strength-test part of the process (which usually lasts for a minimum of 15 minutes), and once the system pressure has been reduced, workers may be allowed to return to work in the general vicinity of the pressurised system(s) providing adequate warning signage is maintained.
- Equipment required and to be used for pressure testing –
  - A pressure regulator, complete with gauges with ranges 0-4500 psi on cylinder side of nitrogen cylinder and range of 0-1500 psi on outlet side of regulator.
  - A 1/4" hose rated at 500-psi maximum working pressure.
  - A high pressure gauge range 0-500 psi connected by 1/4" OD Copper tube at safe viewing point in the system

- A Strength Pressure Test is when pressure is applied to a refrigeration system or part of a system to ensure a minimum level of integral strength, and it is usually defined as the maximum working pressure (m.w.p.) x factor for 1.3 for rolled or drawn materials (e.g. pipe-work), and m.w.p. x 1.5 for castings (Ref**: BS EN 378-1**).
- Leak Pressure Test is the pressure applied to a refrigeration system or part of a system to test its capability of retaining pressure. The leakage test pressure as defined by **BS EN 378-1** is equal or less than the designed m.w.p. of the particular system.

**9.** Ensure that on completion of works, all connections are made good and all equipment is operating safely and correctly and warning notices are removed

**10.** Ensure work area is clear of all tools and equipment

**11.** Inform site management works have been completed and, where required, sign off Permit to Work and return any access / plant room keys, if applicable

## Plant & Equipment Used to Carry out Task

- Pressure Gauges and Lines
- Hand Tools
- Nitrogen Cylinders
- Multi-meter / Electrical Tester & Test Leads

## Training / Competency

- NVQ level 2 in Small Commercial Refrigeration & Air Conditioning Systems
- C&G 2079 – F-Gas Training Certificate

## Emergency Procedures

- Evacuate Area / Clear personnel, especially injured persons, from immediate area
- If safe to do so –
  - Shut off / Isolate cylinder at isolation valve
  - Release any remaining pressure in the system safely
- Handle nitrogen in accordance with JGR CoSHH Assessment and Manufacturers Material Safety Data Sheet
- Treat injuries to personnel, where required
- Call Emergency Services if necessary
- Locate failure area and investigate damage caused to system or other equipment and make-safe

## Protection of Other

- Immediate area to be kept free from cables, ropes and equipment that may affect the works to be carried out
- Suitable signage / safety barriers to be erected around the area where works are being carried out to warn of works and prevent unauthorised access to work area.

## Personal Protective Equipment required for Task

- Safety Footwear (BS EN 20345)
- Gloves (BS EN 388)
- Goggles (BS EN 166)

| Task Reference | R07 |
|---|---|
| Task Activity | Leak Testing of Refrigeration & Air Conditioning Systems |

| Hazards |
|---|
| ▪ Refrigerant leaking into the surrounding atmosphere<br>▪ Asphyxiation from the uncontrolled release of refrigerants<br>▪ Refrigerant burns from the uncontrolled release of refrigerants |

| Risk | | | | | |
|---|---|---|---|---|---|
| Low | ✓ | Medium | | High | |

| Control Measures |
|---|
| ▪ Only competent trained operatives to complete works.<br>▪ Follow all control measures and task methodologies detailed in all relevant site Method Statements, Task Procedures and Risk Assessments<br>▪ When working in isolated area(s) ensure other persons are available to render assistance if required |

## Task Methodology

***While working on Refrigeration and Air Conditioning systems, operatives must ensure they meet all requirements from all relevant legislation and guidance such as –***

***F-Gas Regulations***

***Pressure Equipment Directive***

**1.** Advise site management of works to be carried out and gain permission to complete works.

**2.** Assess the area where works will be completed and –
- Ensure the immediate area has a satisfactory working space, free from trailing cables, ropes and hoses
- Cordon off the immediate with suitable signage and protective barriers to protect other persons & prevent unauthorised access to work area.
- Ensure the immediate work area is suitably illuminated, with sufficient lighting provided.

**3.** Where required, complete site permit to work system for working on refrigeration and air conditioning systems, ***prior*** to completing any works.

**4.** Ensure all tools and equipment used on refrigeration and air conditioning systems are -
- Suitable for the tasks being carried out and the environment in which they are to be used
- Suitably maintained and tested (i.e. where required PA Tested and calibrated) and in good condition, with pre-user checks carried out prior to use.

**5.** Ensure all operatives working on refrigeration and air conditioning systems are suitably competent for the works being carried out and have full understanding of the works to be carried out, with all site Method Statements, Task Procedures and Risk Assessments for the work to hand.

**6.** Ensure all operatives working on refrigeration and air conditioning systems are wearing all required items of PPE, as detailed in this Task Procedure and site Risk Assessments.

**7.** Where required, arrange with site management for isolation of any plant alarms, i.e. if they are likely to be affected by the refrigeration and air conditioning works.

**8.** Carry out refrigeration and air conditioning works in an orderly manner on an item-to-item basis, ensuring that by working on refrigeration and air conditioning systems, 'danger' is not caused to others as a result.

There are currently three methods employed for leak testing and they are as follows:-
- An electrode leak detection unit.
- Fluid either painted or sprayed on to external section of the system
- A chemical dye in the lubricating oil (subject to manufacturer's approval)

***Electronic Unit***

- Switch off system and isolate the system electrically using Task Procedure E01 (Electrical Isolation). At ***NO TIME*** will any expose live electrical circuits / areas to be left unattended.
- Switch on battery powered hand-held leak detector / sniffer and run over all sections of the system where leak is suspected.

  There are no foreseeable risks involved in using this type of unit for leak detecting purposes, but all Health and Safety rules must be applied when using it.

***Fluid either painted or sprayed on***

- Switch off system and isolate the system electrically using Task Procedure E01 (Electrical Isolation). At ***NO TIME*** will any expose live electrical circuits / areas to be left unattended.
- Spray all areas of the system where leak is suspected until leak has been found

  There are no foreseeable risks involved in using this type of unit for leak detection purposes, however before handling any leak detection fluids or spray, read the manufacturers CoSHH assessment and employ whatever recommendations are specified with regard to handling and inhalation.

***Chemical Dye***

- Connect gauges and lines to system
- Inject dye into the system, through the filter, following manufacturer's instructions.
- Return 24 – 48hrs later with infra-red light and glasses and trace system to identify location of leak.

  There are no foreseeable risks involved in using this type of unit for leak detection purposes, however before handling any leak detection fluids or spray, read the manufacturers CoSHH assessment and employ whatever recommendations are specified with regard to handling and inhalation.

**9.** Ensure that on completion of works, all connections are made good and all equipment is operating safely and correctly and warning notices are removed.

**10.** Ensure work area is clear of all tools and equipment

**11.** Inform site management works have been completed and, where required, sign off Permit to Work and return any access / plant room keys, if applicable.

| **Plant & Equipment Used to Carry out Task** |
|---|
| ▪ Electronic Leak Detector / Sniffer<br>▪ Leak Spray |
| **Training / Competency** |
| ▪ NVQ level 2 in Small Commercial Refrigeration & Air Conditioning Systems<br>▪ C&G 2079 – F-Gas Training Certificate |
| **Emergency Procedures** |
| ▪ N/A |
| **Protection of Other** |
| ▪ Immediate area to be kept free from cables, ropes and equipment that may affect the works to be carried out<br>▪ Suitable signage / safety barriers to be erected around the area where works are being carried out to warn of works and prevent unauthorised access to work area. |
| **Personal Protective Equipment required for Task** |
| ▪ Safety Footwear (BS EN 20345)<br>▪ Gloves (BS EN 388)<br>▪ Goggles (BS EN 166) |

| Task Reference | R08 |
|---|---|
| Task Activity | Oil Charging of Refrigeration Systems |

## Hazards

- Refrigerant leaking into the surrounding atmosphere
- Asphyxiation from the uncontrolled release of refrigerants
- Refrigerant burns from the uncontrolled release of refrigerants
- Oil Leakage

## Risk

| Low | ✓ | Medium | | High | |
|---|---|---|---|---|---|

## Control Measures

- Only competent trained operatives to complete works.
- Follow all control measures and task methodologies detailed in all relevant site Method Statements, Task Procedures and Risk Assessments
- When working in isolated area(s) ensure other persons are available to render assistance if required.
- Make sure all refrigerant has been removed from the particular section of system before breaking into it.
- Clear up any spillage of oil immediately

## Task Methodology

***While working on Refrigeration and Air Conditioning systems, operatives must ensure they meet all requirements from all relevant legislation and guidance such as –***

- ***F-Gas Regulations***
- ***Pressure Equipment Directive***

**1.** Advise site management of works to be carried out and gain permission to complete works.

**2.** Assess the area where works will be completed and –
- Ensure the immediate area has a satisfactory working space, free from trailing cables, ropes and hoses
- Cordon off the immediate with suitable signage and protective barriers to protect other persons & prevent unauthorised access to work area.
- Ensure the immediate work area is suitably illuminated, with sufficient lighting provided.

**3.** Where required, complete site permit to work system for working on refrigeration and air conditioning systems, ***prior*** to completing any works.

**4.** Ensure all tools and equipment used on refrigeration and air conditioning systems are -
- Suitable for the tasks being carried out and the environment in which they are to be used
- Suitably maintained and tested (i.e. where required PA Tested and calibrated) and in good condition, with pre-user checks carried out prior to use.

**5.** Ensure all operatives working on refrigeration and air conditioning systems are suitably competent for the works being carried out and have full understanding of the works to be carried out, with all site Method Statements, Task Procedures and Risk Assessments for the work to hand.

**6.** Ensure all operatives working on refrigeration and air conditioning systems are wearing all required items of PPE, as detailed in this Task Procedure and site Risk Assessments.

**7.** Where required, arrange with site management for isolation of any plant alarms, i.e. if they are likely to be affected by the refrigeration and air conditioning works.

**8.** Carry out refrigeration and air conditioning works in an orderly manner on an item-to-item basis, ensuring that by working on refrigeration and air conditioning, systems, 'danger' is not caused to others as a result.

***Note -*** Before adding oil to an operational system or compressor, the reasons for any loss of oil should be investigated.

There are three main procedures: -

- Charge oil into a compressor through oil filler port
  - Before oil charging of systems can take place, the refrigerant must be evacuated from the section of the system concerned. This can be achieved by either the following methods –
    - Pump down the system using Task Procedure R01 (Pump down of Refrigerant from Refrigeration & Air Conditioning components)
    - Remove the entire refrigerant from the system using Task Procedure R02 (Refrigerant removal and handling)
  - Allow compressor to stand for short time to allow any refrigerant to boil out of the oil (ensure suction pressure is at 0 psig.)
  - Remove oil filter plug from compressor
  - Charge required amount of oil using clear dry receptacles, i.e. oilcan or funnel.
  - Refit oil plug and purge air from compressor or carry out evacuation on the system using Task Procedure R05 (Evacuation of Refrigeration systems)
  - Re-commission system using Task Procedure R11 (Commissioning / Re-commissioning of Refrigeration & Air Conditioning systems)

- Charge oil into a system or compressor by use of a hand pump. (This method is usually used for larger compressors or multi-compressor packs using oil control systems).
  - Connect flexible tube from hand pump to oil inlet Shut off valve (SOV) of oil reservoir or appropriate port on compressor via manifold gauges.
  - Connect inlet connection of hand pump into oilcan and urge air from lines
  - Open inlet SOV on oil reservoir and pump in required amount of oil
  - Back seat oil inlet SOV and disconnect hand pump etc.

- Charge oil by means of vacuum (Hermetic units only)
  - Before oil charging of systems can take place, the refrigerant must be evacuated from the section of the system concerned. This can be achieved by either the following methods –
    - Pump down the system using Task Procedure R01 (Pump down of Refrigerant from Refrigeration & Air Conditioning components)
    - Remove the entire refrigerant from the system using Task Procedure R02 (Refrigerant removal and handling)
  - Fit length of flexible tube with 1/4" flare fitting and in line SOV to suction service valve, via manifold gauges
  - Insert other end of flexible tube into can of clean refrigeration oil
  - Draw vacuum on compressor
  - Open inline SOV, drawing required amount of oil into compressor
  - Allow compressor suction to balance at 9 psig
  - Remove flexible tube from compressor
  - Purge air from compressor or carry out evacuation using Task Procedure R9.
  - Re-commission system using Task Procedure R11 (Commissioning / Re-commissioning of Refrigeration & Air Conditioning systems)

- Monitor condition and operation of system

**9.** Ensure that on completion of works, all connections are made good and all equipment is operating safely and correctly and warning notices are removed.

**10.** Ensure work area is clear of all tools and equipment

**11.** Inform site management works have been completed and, where required, sign off Permit to Work and return any access / plant room keys, if applicable.

| Plant & Equipment Used to Carry out Task |
|---|
| ▪ Oil Pump<br>▪ Gauges and Lines<br>▪ Hand Tools |
| **Training / Competency** |
| ▪ NVQ level 2 in Small Commercial Refrigeration & Air Conditioning Systems<br>▪ C&G 2079 – F-Gas Training Certificate |
| **Emergency Procedures** |
| ▪ Evacuate Area / Clear personnel, especially injured persons, from immediate area<br>▪ If safe to do so –<br>o Shut off / Isolate all cylinders at isolation valve<br>o Switch off electrical supply<br>o Extinguish any naked flames<br>o Remove any cylinders from any heat source and keep cylinders cool<br>▪ Handle refrigerant in accordance with JGR CoSHH Assessment and Manufacturers Material Safety Data Sheet<br>▪ Treat any ill-health conditions in accordance with JGR CoSHH Assessment<br>▪ Call Emergency Services if necessary<br>▪ Ventilate Area, if necessary<br>▪ Locate failure area and investigate damage caused to system or other equipment and make-safe |
| **Protection of Other** |
| ▪ Immediate area to be kept free from cables, ropes and equipment that may affect the works to be carried out<br>▪ Suitable signage / safety barriers to be erected around the area where works are being carried out to warn of works and prevent unauthorised access to work area. |
| **Personal Protective Equipment required for Task** |
| ▪ Safety Footwear (BS EN 20345)<br>▪ Gloves (BS EN 388)<br>▪ Goggles (BS EN 166) |

| Task Reference | R09 |
|---|---|
| Task Activity | Oil Removal & Disposal from Refrigeration Equipment |

## Hazards

- Refrigerant leaking into the surrounding atmosphere
- Asphyxiation from the uncontrolled release of refrigerants
- Refrigerant burns from the uncontrolled release of refrigerants
- Explosion
- Oil Leakage

## Risk

| Low | ✓ | Medium | | High | |
|---|---|---|---|---|---|

## Control Measures

- Only competent trained operatives to complete works.
- Follow all control measures and task methodologies detailed in all relevant site Method Statements, Task Procedures and Risk Assessments
- When working in isolated area(s) ensure other persons are available to render assistance if required.
- Make sure all refrigerant has been removed from the particular section of system before breaking into it.
- Clear up any spillage of oil immediately

## Task Methodology

***While working on Refrigeration and Air Conditioning systems, operatives must ensure they meet all requirements from all relevant legislation and guidance such as –***

- ***F-Gas Regulations***
- ***Pressure Equipment Directive***

**1.** Advise site management of works to be carried out and gain permission to complete works.

**2.** Assess the area where works will be completed and –
- Ensure the immediate area has a satisfactory working space, free from trailing cables, ropes and hoses
- Cordon off the immediate with suitable signage and protective barriers to protect other persons & prevent unauthorised access to work area.
- Ensure the immediate work area is suitably illuminated, with sufficient lighting provided.

**3.** Where required, complete site permit to work system for working on refrigeration and air conditioning systems, ***prior*** to completing any works.

**4.** Ensure all tools and equipment used on refrigeration and air conditioning systems are -
- Suitable for the tasks being carried out and the environment in which they are to be used
- Suitably maintained and tested (i.e. where required PA Tested and calibrated) and in good condition, with pre-user checks carried out prior to use.

**5.** Ensure all operatives working on refrigeration and air conditioning systems are suitably competent for the works being carried out and have full understanding of the works to be carried out, with all site Method Statements, Task Procedures and Risk Assessments for the work to hand.

**6.** Ensure all operatives working on refrigeration and air conditioning systems are wearing all required items of PPE, as detailed in this Task Procedure and site Risk Assessments.

**7.** Where required, arrange with site management for isolation of any plant alarms, i.e. if they are likely to be affected by the refrigeration and air conditioning works.

**8.** Carry out refrigeration and air conditioning works in an orderly manner on an item-to-item basis, ensuring that by working on refrigeration and air conditioning systems, 'danger' is not caused to others as a result.

- Removal of oil from compressor or plant.
  - Before any oil can be removed from the refrigerant system, the refrigerant must be evacuated from the section of the system concerned. This can be achieved by either the following methods –
    - Pump down the system using Task Procedure R01 (Pump down of Refrigerant from Refrigeration & Air Conditioning components)
    - Remove the entire refrigerant from the system using Task Procedure R02 (Refrigerant removal and handling)
  - Allow short time for refrigerant to boil out of oil.
  - Remove oil drain plug and drain waste oil into suitable container that can be sealed, using suitable drain hose.
- Disposal of waste oil
  - Ensure containers are adequately sealed.
  - Arrange for waste oil to be collected by registered waste company.
  - Keep records of transfer notes for at least 2 years

**9.** Ensure that on completion of works, all connections are made good and all equipment is operating safely and correctly and warning notices are removed.

**10.** Ensure work area is clear of all tools and equipment

**11.** Inform site management works have been completed and, where required, sign off Permit to Work and return any access / plant room keys, if applicable.

## Plant & Equipment Used to Carry out Task

- Drain hose
- Suitable oil containers
- Hand Tools

## Training / Competency

- NVQ level 2 in Small Commercial Refrigeration & Air Conditioning Systems
- C&G 2079 – F-Gas Training Certificate

## Emergency Procedures

- Evacuate Area / Clear personnel, especially injured persons, from immediate area
- If safe to do so –
  - Shut off / Isolate all cylinders at isolation valve
  - Switch off electrical supply
  - Extinguish any naked flames
  - Remove any cylinders from any heat source and keep cylinders cool
- Handle refrigerant in accordance with JGR CoSHH Assessment and Manufacturers Material Safety Data Sheet
- Treat any ill-health conditions in accordance with JGR CoSHH Assessment
- Call Emergency Services if necessary
- Locate failure area and investigate damage caused to system or other equipment and make-safe

## Protection of Other

- Immediate area to be kept free from cables, ropes and equipment that may affect the works to be carried out
- Suitable signage / safety barriers to be erected around the area where works are being carried out to warn of works and prevent unauthorised access to work area.

## Personal Protective Equipment required for Task

- Safety Footwear (BS EN 20345)
- Gloves (BS EN 388)
- Goggles (BS EN 166)

| Task Reference | R10 |
|---|---|
| Task Activity | Refrigeration & Air Conditioning System Fault Finding / Diagnosis |

## Hazards

- Refrigerant leaking into the surrounding atmosphere
- Asphyxiation from the uncontrolled release of refrigerants
- Refrigerant burns from the uncontrolled release of refrigerants
- Explosion
- Oil Leakage
- Electrocution

## Risk

| Low | ✓ | Medium | | High | |
|---|---|---|---|---|---|

## Control Measures

- Only competent trained operatives to complete works.
- Follow all control measures and task methodologies detailed in all relevant site Method Statements, Task Procedures and Risk Assessments
- When working in isolated area(s) ensure other persons are available to render assistance if required.

## Task Methodology

***While working on Refrigeration and Air Conditioning systems, operatives must ensure they meet all requirements from all relevant legislation and guidance such as –***

- ***F-Gas Regulations***
- ***Pressure Equipment Directive***

**1.** Advise site management of works to be carried out and gain permission to complete works.

**2.** Assess the area where works will be completed and –
- Ensure the immediate area has a satisfactory working space, free from trailing cables, ropes and hoses
- Cordon off the immediate with suitable signage and protective barriers to protect other persons & prevent unauthorised access to work area.
- Ensure the immediate work area is suitably illuminated, with sufficient lighting provided.

**3.** Where required, complete site permit to work system for working on refrigeration and air conditioning systems, ***prior*** to completing any works.

**4.** Ensure all tools and equipment used on refrigeration and air conditioning systems are -
- Suitable for the tasks being carried out and the environment in which they are to be used
- Suitably maintained and tested (i.e. where required PA Tested and calibrated) and in good condition, with pre-user checks carried out prior to use.

**5.** Ensure all operatives working on refrigeration and air conditioning systems are suitably competent for the works being carried out and have full understanding of the works to be carried out, with all site Method Statements, Task Procedures and Risk Assessments for the work to hand.

**6.** Ensure all operatives working on refrigeration and air conditioning systems are wearing all required items of PPE, as detailed in this Task Procedure and site Risk Assessments.

**7.** Where required, arrange with site management for isolation of any plant alarms, i.e. if they are likely to be affected by the refrigeration and air conditioning works.

**8.** Carry out refrigeration and air conditioning works in an orderly manner on an item-to-item basis, ensuring that by working on refrigeration and air conditioning systems, 'danger' is not caused to others as a result.

Fault diagnosis will follow a methodical pattern at all times

- Check / review previous commissioning information and maintenance records, if they are available
- Visually inspect the system and controls
- Where required, ensure the system is suitably shut down and electrically isolated using Task Procedures E01 (Electrical Isolation)
- If the plant has stopped, then this could indicate a control malfunction or an electrical fault. For all electrical works, all works should be carried out following relevant electrical task procedures i.e. Task Procedure E02 (Inspection & Testing of Terminals, Fuses and Circuit Breakers)
- Symptoms faults can be categorised as follows: -
  - Plant operating but not refrigerating
  - Plant not operating
  - Plant noisy
  - Plant overheating
- Fit gauges to suction and discharge and check pressures indicated on the gauges.
- Carry out pressure / temperature checks at various points on the plant could also indicate a fault
- Once the fault is located, ensure all works are carried out by a competent engineer and have full understanding of the works to be carried out, with all site Method Statements, Task Procedures and Risk Assessments for the work to hand.

**Important Notes –**

- While conducting Refrigeration & Air Conditioning System Fault Finding / Diagnosis, engineers should ensure they are aware of moving machinery and electrical terminals

  ***Whenever possible, live work will be avoided. Live Electrical Working will ONLY be carried out following Task Procedures E07 (Working on Live Electrical Equipment)***

  ***At NO TIME will operatives work alone on live systems***

**9.** Ensure that on completion of works, all connections are made good and all equipment is operating safely and correctly and warning notices are removed.

**10.** Ensure work area is clear of all tools and equipment

**11.** Inform site management works have been completed and, where required, sign off Permit to Work and return any access / plant room keys, if applicable.

| **Plant & Equipment Used to Carry out Task** |
|---|
| ▪ Gauges and Lines<br>▪ Hand Tools<br>▪ Multi-meter / Electrical Tester & Test Leads |
| **Training / Competency** |
| ▪ NVQ level 2 in Small Commercial Refrigeration & Air Conditioning Systems<br>▪ C&G 2079 – F-Gas Training Certificate |

| Emergency Procedures |
|---|
| ▪ Evacuate Area / Clear personnel, especially injured persons, from immediate area<br>▪ If safe to do so –<br>  o Shut off / Isolate all cylinders at isolation valve<br>  o Switch off electrical supply<br>  o Extinguish any naked flames<br>  o Remove any cylinders from any heat source and keep cylinders cool<br>▪ Handle refrigerant in accordance with JGR CoSHH Assessment and Manufacturers Material Safety Data Sheet<br>▪ Treat any ill-health conditions in accordance with JGR CoSHH Assessment<br>▪ Call Emergency Services if necessary<br>▪ Ventilate Area, if necessary<br>▪ Locate failure area and investigate damage caused to system or other equipment and make-safe |
| **Protection of Other** |
| ▪ Immediate area to be kept free from cables, ropes and equipment that may affect the works to be carried out<br>▪ Suitable signage / safety barriers to be erected around the area where works are being carried out to warn of works and prevent unauthorised access to work area. |
| **Personal Protective Equipment required for Task** |
| ▪ Safety Footwear (BS EN 20345)<br>▪ Gloves (BS EN 388)<br>▪ Goggles (BS EN 166) |

| Task Reference | R11 |
|---|---|
| Task Activity | Commissioning & Re-commissioning of Refrigeration & Air Conditioning Systems |

## Hazards

- Refrigerant leaking into the surrounding atmosphere
- Asphyxiation from the uncontrolled release of refrigerants
- Refrigerant burns from the uncontrolled release of refrigerants
- Explosion
- Injury when moving cylinder and plant
- Electrocution

## Risk

| Low | ✓ | Medium | | High | |
|---|---|---|---|---|---|

## Control Measures

- Only competent trained operatives to complete works.
- Follow all control measures and task methodologies detailed in all relevant site Method Statements, Task Procedures and Risk Assessments
- When working in isolated area(s) ensure other persons are available to render assistance if required.

## Task Methodology

***While working on Refrigeration and Air Conditioning systems, operatives must ensure they meet all requirements from all relevant legislation and guidance such as –***

- ***F-Gas Regulations***
- ***Pressure Equipment Directive***

**1.** Advise site management of works to be carried out and gain permission to complete works.

**2.** Assess the area where works will be completed and –
- Ensure the immediate area has a satisfactory working space, free from trailing cables, ropes and hoses
- Cordon off the immediate with suitable signage and protective barriers to protect other persons & prevent unauthorised access to work area.
- Ensure the immediate work area is suitably illuminated, with sufficient lighting provided.

**3.** Where required, complete site permit to work system for working on refrigeration and air conditioning systems, ***prior*** to completing any works.

**4.** Ensure all tools and equipment used on refrigeration and air conditioning systems are -
- Suitable for the tasks being carried out and the environment in which they are to be used
- Suitably maintained and tested (i.e. where required PA Tested and calibrated) and in good condition, with pre-user checks carried out prior to use.

**5.** Ensure all operatives working on refrigeration and air conditioning systems are suitably competent for the works being carried out and have full understanding of the works to be carried out, with all site Method Statements, Task Procedures and Risk Assessments for the work to hand.

**6.** Ensure all operatives working on refrigeration and air conditioning systems are wearing all required items of PPE, as detailed in this Task Procedure and site Risk Assessments.

**7.** Where required, arrange with site management for isolation of any plant alarms, i.e. if they are likely to be affected by the refrigeration and air conditioning works.

**8.** Carry out refrigeration and air conditioning works in an orderly manner on an item-to-item basis, ensuring that by working on refrigeration and air conditioning systems, 'danger' is not caused to others as a result.

- Prior to Commissioning or Re-commissioning systems, where required the following should be completed –
  - Pressure Test system using Task Procedure R06 (Pressure Testing of Refrigeration & Air Conditioning systems)
  - Evacuate the system using Task Procedure R05 (Evacuation of Refrigeration Systems) to remove all moisture, air and other 'non condensable' from the system, leaving it in a clean and dry condition.
  - Charging the system with refrigerant following Task Procedure R04 (Refrigerant Charging)
- Check compressor oil level is correct
- Check installation wiring is correct.
- Do a dry run on the electrical control circuit with the compressor fuses removed to ensure the controls are set to the correct values and are connected in the correct sequence.
- Connect electrical supplies following Task Procedures E04 (Electrical Connection)
- Check for correct rotation of all motors / compressors / fan motors.
- Operate the compressor and monitor suction and discharge pressure, suction-return, temperature, oil level, and pressure, and amperage above.
- Regularly check oil level in compressor crankcase
- Do not allow suction and discharge pressure to rise or fall outside the application range.
- Check electrical current at regular intervals to make sure plant is operating within application limits.
- Check expansion valve superheats.
- Adjust finally all safety pressure and temperature controls.
- If required, carry out final leak test following Task Procedure R07 (Leak Testing of Refrigeration & Air Conditioning systems)
- Log all final settings of controls, all final amperage of electrical equipment and record on commissioning sheets.
- Instruct personnel in the operation of the equipment.

**Important Notes –**

- Where appropriate, this work should be carried out in conjunction with a competent electrician

**9.** Ensure that on completion of works, all connections are made good and all equipment is operating safely and correctly and warning notices are removed.

**10.** Ensure work area is clear of all tools and equipment

**11.** Inform site management works have been completed and, where required, sign off Permit to Work and return any access / plant room keys, if applicable.

| Plant & Equipment Used to Carry out Task |
|---|
| ▪ Gauges and Lines<br>▪ Hand Tools<br>▪ Multi-meter / Electrical Tester & Test Leads |

| Training / Competency |
|---|
| ▪ NVQ level 2 in Small Commercial Refrigeration & Air Conditioning Systems<br>▪ C&G 2079 – F-Gas Training Certificate |

| Emergency Procedures |
|---|
| ▪ Evacuate Area / Clear personnel, especially injured persons, from immediate area<br>▪ If safe to do so –<br>  o Shut off / Isolate all cylinders at isolation valve<br>  o Switch off electrical supply<br>  o Extinguish any naked flames<br>  o Remove any cylinders from any heat source and keep cylinders cool<br>▪ Handle refrigerant in accordance with JGR CoSHH Assessment and Manufacturers Material Safety Data Sheet<br>▪ Treat any ill-health conditions in accordance with JGR CoSHH Assessment<br>▪ Call Emergency Services if necessary<br>▪ Ventilate Area, if necessary<br>▪ Locate failure area and investigate damage caused to system or other equipment and make-safe |
| **Protection of Other** |
| ▪ Immediate area to be kept free from cables, ropes and equipment that may affect the works to be carried out<br>Suitable signage / safety barriers to be erected around the area where works are being carried out to warn of works and prevent unauthorised access to work area. |
| **Personal Protective Equipment required for Task** |
| ▪ Safety Footwear (BS EN 20345)<br>▪ Gloves (BS EN 388)<br>▪ Goggles (BS EN 166) |

| Task Reference | R12 |
|---|---|
| Task Activity | De-commissioning of Refrigeration & Air Conditioning Systems |

## Hazards

- Refrigerant leaking into the surrounding atmosphere
- Asphyxiation from the uncontrolled release of refrigerants
- Refrigerant burns from the uncontrolled release of refrigerants
- Explosion
- Electrocution

## Risk

| Low | ✓ | Medium | | High | |
|---|---|---|---|---|---|

## Control Measures

- Only competent trained operatives to complete works.
- Follow all control measures and task methodologies detailed in all relevant site Method Statements, Task Procedures and Risk Assessments
- When working in isolated area(s) ensure other persons are available to render assistance if required.

## Task Methodology

***While working on Refrigeration and Air Conditioning systems, operatives must ensure they meet all requirements from all relevant legislation and guidance such as –***

- ***F-Gas Regulations***
- ***Pressure Equipment Directive***

**1.** Advise site management of works to be carried out and gain permission to complete works.

**2.** Assess the area where works will be completed and –
- Ensure the immediate area has a satisfactory working space, free from trailing cables, ropes and hoses
- Cordon off the immediate with suitable signage and protective barriers to protect other persons & prevent unauthorised access to work area.
- Ensure the immediate work area is suitably illuminated, with sufficient lighting provided.

**3.** Where required, complete site permit to work system for working on refrigeration and air conditioning systems, ***prior*** to completing any works.

**4.** Ensure all tools and equipment used on refrigeration and air conditioning systems are -
- Suitable for the tasks being carried out and the environment in which they are to be used
- Suitably maintained and tested (i.e. where required PA Tested and calibrated) and in good condition, with pre-user checks carried out prior to use.

**5.** Ensure all operatives working on refrigeration and air conditioning systems are suitably competent for the works being carried out and have full understanding of the works to be carried out, with all site Method Statements, Task Procedures and Risk Assessments for the work to hand.

**6.** Ensure all operatives working on refrigeration and air conditioning systems are wearing all required items of PPE, as detailed in this Task Procedure and site Risk Assessments.

**7.** Where required, arrange with site management for isolation of any plant alarms, i.e. if they are likely to be affected by the refrigeration and air conditioning works.

**8.** Carry out refrigeration and air conditioning works in an orderly manner on an item-to-item basis, ensuring that by working on refrigeration and air conditioning systems, 'danger' is not caused to others as a result.

- Where able, prior to this task being carried out, an oil and refrigerant sample should be taken in case analysis is required prior to re-use or reclamation
- Recover all of the refrigerant from the system using Task Procedure R02 (Refrigerant removal and handling)
- Isolate the system electrically using Task Procedure E01 (Electrical Isolation). At ***NO TIME*** will any expose live electrical circuits / areas to be left unattended.
- Remove oil, using Task Procedure R09 (Oil Removal & Disposal from Refrigeration Equipment)
- Close off all isolation valves
- Label equipment stating that it has been decommissioned and emptied of refrigerant. The label should be dated and signed
- Where required, arrange to remove equipment following Site Method Statement, Risk Assessments and Task Procedures R14 (Relocation / Movement of Refrigeration & Air Conditioning units)

**9.** Ensure that on completion of works, all remaining connections and services are made good and all equipment is operating safely and correctly and warning notices are removed.

**10.** Ensure work area is clear of all tools and equipment

**11.** Inform site management works have been completed and, where required, sign off Permit to Work and return any access / plant room keys, if applicable.

## Plant & Equipment Used to Carry out Task

- Gauges and Lines
- Hand Tools
- Multi-meter / Electrical Tester & Test Leads

## Training / Competency

- NVQ level 2 in Small Commercial Refrigeration & Air Conditioning Systems
- C&G 2079 – F-Gas Training Certificate

## Emergency Procedures

- Evacuate Area / Clear personnel, especially injured persons, from immediate area
- If safe to do so –
  - Shut off / Isolate all cylinders at isolation valve
  - Switch off electrical supply
  - Extinguish any naked flames
  - Remove any cylinders from any heat source and keep cylinders cool
- Handle refrigerant in accordance with JGR CoSHH Assessment and Manufacturers Material Safety Data Sheet
- Treat any ill-health conditions in accordance with JGR CoSHH Assessment
- Call Emergency Services if necessary
- Ventilate Area, if necessary
- Locate failure area and investigate damage caused to system or other equipment and make-safe

## Protection of Other

- Immediate area to be kept free from cables, ropes and equipment that may affect the works to be carried out
- Suitable signage / safety barriers to be erected around the area where works are being carried out to warn of works and prevent unauthorised access to work area.

## Personal Protective Equipment required for Task

- Safety Footwear (BS EN 20345)
- Gloves (BS EN 388)
- Goggles (BS EN 166)

| Task Reference | R13 |
|---|---|
| Task Activity | Installation of Copper Pipework to Refrigeration & Air Conditioning Systems |

| Hazards | | | | | |
|---|---|---|---|---|---|
| ▪ Fire caused by flame from oxy-acetylene / brazing works<br>▪ Work at Height | | | | | |
| **Risk** | | | | | |
| **Low** | ✓ | **Medium** | | **High** | |

**Control Measures**

- Only competent trained operatives to complete works.
- Follow all control measures and task methodologies detailed in all relevant site Method Statements, Task Procedures and Risk Assessments
- When working in isolated area(s) ensure other persons are available to render assistance if required.

**Task Methodology**

***While working on Refrigeration and Air Conditioning systems, operatives must ensure they meet all requirements from all relevant legislation and guidance such as –***

- ***F-Gas Regulations***
- ***Pressure Equipment Directive***

**1.** Advise site management of works to be carried out and gain permission to complete works.

**2.** Assess the area where works will be completed and –
- Ensure the immediate area has a satisfactory working space, free from trailing cables, ropes and hoses
- Cordon off the immediate with suitable signage and protective barriers to protect other persons & prevent unauthorised access to work area.
- Ensure the immediate work area is suitably illuminated, with sufficient lighting provided.

**3.** Where required, complete site permit to work system for working on refrigeration and air conditioning systems, ***prior*** to completing any works.

**4.** Ensure all tools and equipment used on refrigeration and air conditioning systems are -
- Suitable for the tasks being carried out and the environment in which they are to be used
- Suitably maintained and tested (i.e. where required PA Tested and calibrated) and in good condition, with pre-user checks carried out prior to use.

**5.** Ensure all operatives working on refrigeration and air conditioning systems are suitably competent for the works being carried out and have full understanding of the works to be carried out, with all site Method Statements, Task Procedures and Risk Assessments for the work to hand.

**6.** Ensure all operatives working on refrigeration and air conditioning systems are wearing all required items of PPE, as detailed in this Task Procedure and site Risk Assessments.

**7.** Where required, arrange with site management for isolation of any plant alarms, i.e. if they are likely to be affected by the refrigeration and air conditioning works.

**8.** Carry out refrigeration and air conditioning works in an orderly manner on an item-to-item basis, ensuring that by working on refrigeration and air conditioning systems, 'danger' is not caused to others as a result.

To installation of copper pipework and associated services, engineers will –

- Where required, install sections of unistrut, M10 threaded bar and fixing accessories to create a sub-grid to attach pipework and associated services

  These sections will be cut to length at ground level and connected to existing structure of the building to create a suitable sub-grid

- Install lengths of copper pipework and connect them to the sub grid using hydra zorb cushion clamps.

  The copper pipework will be installed in sections, with each section small enough and light enough to be manually lifted into the final position. All fittings and pipes are to have brazed connections, unless mechanical joints have exceptionally been specified.

- Connect each length of copper pipework to the adjacent section pipework following Task Procedures R15 (Brazing & Soldering of Refrigeration & Air Conditioning pipework)

- Insulate all sections of pipework using Class 'O' fire retardant Armaflex insulation

- Connect the pipework & associated services to the refrigeration plant

- Once all works have been completed –
  - Pressure Test system using Task Procedure R06 (Pressure Testing of Refrigeration & Air Conditioning systems)
  - Evacuate the system using Task Procedure R05 (Evacuation of Refrigeration Systems) to remove all moisture, air and other 'non condensable' from the system, leaving it in a clean and dry condition.
  - Charging the system with refrigerant following Task Procedure R04 (Refrigerant Charging)
  - Connect electrical supplies following Task Procedures E04 (Electrical Connection)
  - Commission the system following Task Procedures R11 (Commissioning & Re-commissioning Refrigeration & Air Conditioning systems)

**Important Notes**

**i.** At all times, all services will follow agreed routes and any alterations to these routes will be first be approved and agreed with the client, prior to commencement of works.

**ii.** Pipework & Associated Services can be installed at various levels ranging from ground level up to high level.

a. Where any services are located at high level, access to install and alter pipework and associated services will be gained using suitable access equipment such as Mobile Elevated Work Platform, Mobile Tower Scaffold or Podium Steps, and following the control measures detailed in the site Method Statement and Risk Assessment manual.

b. For short duration work and areas where Mobile Elevated Work Platform, Mobile Tower Scaffold or Podium Steps are not accessible a Combination Ladder may be used, following the control measures detailed in the site Method Statement and Risk Assessment manual.

**c. Where access <u>cannot</u> be gained above areas such as cabinets and cases using access equipment such as Mobile Elevated Work Platform, Mobile Tower Scaffold or Podium Steps or for short duration work a Combination Ladder, engineers will adopt the procedure detailed in the Site Method Statement and the control measures detailed in the site Risk Assessment manual**

**iii.** Where required or specified by the client, when pipework and service go on to the shopfloor, white Service Columns will be installed by a specialist contractor.

**iv.** Allow sufficient clearance for expansion and contraction of pipework during operation of the system

**v.** All pipe supports are to be fixed, following the manufacturers or clients instructions and recommendations.

**9.** Ensure that on completion of works, all connections are made good and all equipment is operating safely and correctly and warning notices are removed.

**10.** Ensure work area is clear of all tools and equipment

**11.** Inform site management works have been completed and, where required, sign off Permit to Work and return any access / plant room keys, if applicable.

## Plant & Equipment Used to Carry out Task

- Hand Tools
- Battery Operated Power Tools
- 110v Chop Saw

| Training / Competency |
|---|
| ▪ NVQ level 2 in Small Commercial Refrigeration & Air Conditioning Systems<br>▪ C&G 2079 – F-Gas Training Certificate |
| **Emergency Procedures** |
| ▪ Evacuate Area Evacuate Area / Clear personnel, especially injured persons, from immediate area<br>▪ If safe to do so –<br>o Shut off / isolate all equipment<br>o Shut off / isolate all services, such as electrical supplies<br>o Remove any cylinders from any heat source and keep cylinders cool<br>▪ Call Emergency Services if necessary |
| **Protection of Other** |
| ▪ Immediate area to be kept free from cables, ropes and equipment that may affect the works to be carried out<br>▪ Suitable signage / safety barriers to be erected around the area where works are being carried out to warn of works and prevent unauthorised access to work area. |
| **Personal Protective Equipment required for Task** |
| ▪ Safety Footwear (BS EN 20345)<br>▪ Gloves (BS EN 388)<br>▪ Goggles (BS EN 166) |

| Task Reference | R14 |
|---|---|
| Task Activity | Relocation / Movement of Refrigeration & Air Conditioning Units |

## Hazards

- Manual handling injuries
- Refrigerant leaking into the surrounding atmosphere
- Asphyxiation from the uncontrolled release of refrigerants
- Refrigerant burns from the uncontrolled release of refrigerants
- Explosion
- Electrocution

## Risk

| Low | ✓ | Medium | | High | |
|---|---|---|---|---|---|

## Control Measures

- Only competent trained operatives to complete works.
- Follow all control measures and task methodologies detailed in all relevant site Method Statements, Task Procedures and Risk Assessments
- When working in isolated area(s) ensure other persons are available to render assistance if required.
- Ensure electrical system is fully isolated

## Task Methodology

***While working on Refrigeration and Air Conditioning systems, operatives must ensure they meet all requirements from all relevant legislation and guidance such as –***

- ***F-Gas Regulations***
- ***Pressure Equipment Directive***

**1.** Advise site management of works to be carried out and gain permission to complete works.

**2.** Assess the area where works will be completed and –
- Ensure the immediate area has a satisfactory working space, free from trailing cables, ropes and hoses
- Cordon off the immediate with suitable signage and protective barriers to protect other persons & prevent unauthorised access to work area.
- Ensure the immediate work area is suitably illuminated, with sufficient lighting provided.

**3.** Where required, complete site permit to work system for working on refrigeration and air conditioning systems, ***prior*** to completing any works.

**4.** Ensure all tools and equipment used on refrigeration and air conditioning systems are -
- Suitable for the tasks being carried out and the environment in which they are to be used
- Suitably maintained and tested (i.e. where required PA Tested and calibrated) and in good condition, with pre-user checks carried out prior to use.

**5.** Ensure all operatives working on refrigeration and air conditioning systems are suitably competent for the works being carried out and have full understanding of the works to be carried out, with all site Method Statements, Task Procedures and Risk Assessments for the work to hand.

**6.** Ensure all operatives working on refrigeration and air conditioning systems are wearing all required items of PPE, as detailed in this Task Procedure and site Risk Assessments.

**7.** Where required, arrange with site management for isolation of any plant alarms, i.e. if they are likely to be affected by the refrigeration and air conditioning works.

**8.** Carry out brazing works in an orderly manner on an item-to-item basis, ensuring that by working on refrigeration and air conditioning system, 'danger' is not caused to others as a result.

**The following procedure identifies the recommended methods of relocating Refrigeration & Air Conditioning units located at ground level.**

- Assess the location where Refrigeration / Air Conditioning unit will be transferred, to and ensure the area is capable and ready for the plant
- Where required, assess the transport route to be taken to transport Refrigeration / Air Conditioning units to the fixing location, i.e. even surface exists, capable of taking the weight of the plant, and manoeuvring of the cabinets
- Pump down the refrigerant in system using Task Procedure R01 (Pump Down of Refrigeration & Air Conditioning Equipment) & Task Procedures R02 (Refrigerant Removal & Handling)
- Electrically isolate and disconnect the Refrigeration / Air Conditioning unit using Task Procedures E01 (Electrical Isolation)
- Disconnect the Refrigeration / Air Conditioning unit from the connecting pipework supplies & associated services, using suitable hand tools.
- Transport all Mechanical Lifting equipment to the location of the Refrigeration & Air Conditioning unit in preparation for relocation works, such as Pinch Roller Crow Bars (SWL - 1500kg), Shifting Skates (SWL 6 tonne) or Pallet Truck (SWL 2000kg)
- In turn raise each end of the Refrigeration / Air Conditioning unit using Pinch Roller Crow Bars to enable either a set of Shifting Skates (SWL 6 tonne) or Pallet Truck (SWL 2000kg) to be positioned below the unit.
- Transport the pack to the new location following the prearranged route
- Once the unit has been re-located, engineers will then in turn, lift each end of the unit, using the Pinch Roller Crow Bars to allow the Shifting Skates / Pallet Truck to be removed from under the unit.
- Remove all Mechanical Lifting equipment to a safe storage area in preparation for it being collected by the Plant Hire Company
- Connect the Refrigeration / Air Conditioning unit to the pipework supplies & associated services, using hand tools.
- Electrically connect, test and commission the Refrigeration / Air Conditioning unit using Task Procedures E04 (Electrical Connection)
- Re-commission the Refrigeration / Air Conditioning system using Task Procedures R04 (Refrigeration Charging & Task Procedures R11 (Commissioning / Re-commissioning of Refrigeration & Air Conditioning systems)

**Where Refrigeration / Air Conditioning units are located at ground level and only required to be relocated / moved short distances (approx 12”), the following procedure will be adopted**

- Assess the location where Refrigeration / Air Conditioning unit will be transferred, to and ensure the area is capable and ready for the plant
- Where required, assess the transport route to be taken to transport Refrigeration / Air Conditioning units to the fixing location, i.e. even surface exists, capable of taking the weight of the plant, and manoeuvring of the cabinets
- Pump down the refrigerant in system using Task Procedure R01 (Pump Down of Refrigeration & Air Conditioning Equipment) & Task Procedures R02 (Refrigerant Removal & Handling)
- Electrically isolate and disconnect the Refrigeration / Air Conditioning unit using Task Procedures E01 (Electrical Isolation)
- Disconnect the Refrigeration / Air Conditioning unit from the connecting pipework supplies & associated services, using suitable hand tools
- Transport 2no Pinch Roller Crow Bars (SWL - 1500kg) using the manoeuvring wheels, to the location of the Refrigeration Pack in preparation for relocation works.
- Raise one end of the pack using Pinch Roller Crow Bars and begin to ‘walk’ the pack slowly, using team manual handling techniques.

  This process will be repeated with engineers re-adjusting the location of the Pinch Roller Crow Bars to move the refrigeration pack approx 6” – 12” further the plinth.
- Once the pack has been re-located further along the plinth, engineers will then in turn, remove the Pinch Roller Crow Bars from below the pack.

- Remove the Pinch Roller Crow Bars to a safe storage area in preparation for it being collected by the Plant Hire Company
- Connect the Refrigeration / Air Conditioning unit to the pipework supplies & associated services, using hand tools.
- Electrically connect , test and commission the Refrigeration / Air Conditioning unit using Task Procedures R04 (Refrigeration Charging & Task Procedures R11 (Commissioning / Re-commissioning of Refrigeration & Air Conditioning systems)
- Re-commission the Refrigeration / Air Conditioning system using Task Procedures R04 (Refrigeration Charging & Task Procedures R11 (Commissioning / Re-commissioning of Refrigeration & Air Conditioning systems)

**If works cannot be completed in using the above process or additional lifting equipment is needed to move the Refrigeration / Air Conditioning units, engineers must stop works and contact the Health & Safety Manager to discuss a suitable method of completing the works**

**9.** Ensure that on completion of works, all connections are made good and all equipment is operating safely and correctly and warning notices are removed.

**10.** Ensure work area is clear of all tools and equipment

**11.** Inform site management works have been completed and, where required, sign off Permit to Work and return any access / plant room keys, if applicable.

## Plant & Equipment Used to Carry out Task

- Material Lifts
- Pump Truck
- Shifting Skates
- Hand Tools
- Pinch Roller Crow Bars
- Multi-meter / Electrical Tester & Test Leads

## Training / Competency

- NVQ level 2 in Small Commercial Refrigeration & Air Conditioning Systems
- C&G 2079 – F-Gas Training Certificate
- CSCS Card / ECS Card

## Emergency Procedures

- Evacuate Area / Clear personnel, especially injured persons, from immediate area
- If safe to do so –
  - Treat injuries to personnel, where required
- Call Emergency Services if necessary
- Locate failure area and investigate damage caused to system or other equipment and make-safe

## Protection of Other

- Immediate area to be kept free from cables, ropes and equipment that may affect the works to be carried out
- Suitable signage / safety barriers to be erected around the area where works are being carried out to warn of works and prevent unauthorised access to work area.

## Personal Protective Equipment required for Task

- Safety Footwear (BS EN 20345)
- Gloves (BS EN 388)
- Goggles (BS EN 166)
- Hi-visibility Vest (BS EN 471)

| Task Reference | R15 |
|---|---|
| Task Activity | Brazing of Refrigeration & Air Conditioning Copper Pipework |

## Hazards

- Spread of fire from uncontrolled brazing works
- Exposure to hazardous fumes / substances from heating materials (in particular system refrigerant and oil if present)
- Burn injuries from uncontrolled brazing works, generally to hands / wrists
- Setting off 'false' alarms from uncontrolled brazing works
- Danger to third party from uncontrolled brazing works

## Risk

| Low | ✓ | Medium | | High | |
|---|---|---|---|---|---|

## Control Measures

- Only competent trained operatives to complete works.
- Follow all control measures and task methodologies detailed in all relevant site Method Statements, Task Procedures and Risk Assessments
- When working in isolated area(s) ensure other persons are available to render assistance if required.

## Task Methodology

***While working on Refrigeration and Air Conditioning systems, operatives must ensure they meet all requirements from all relevant legislation and guidance such as –***

- ***F-Gas Regulations***
- ***Pressure Equipment Directive***

**1.** Advise site management of works to be carried out and gain permission to complete works.

**2.** Assess the area where works will be completed and –
- Ensure the immediate area has a satisfactory working space, free from trailing cables, ropes and hoses
- Cordon off the immediate with suitable signage and protective barriers to protect other persons & prevent unauthorised access to work area.
- Ensure the immediate work area is suitably illuminated, with sufficient lighting provided.
- Ensure the immediate work area has suitably general ventilation and sufficient air movement past the immediate brazing-area is maintained.

**3.** Where required, complete site permit to work system for working on refrigeration and air conditioning systems, ***prior*** to completing any works. ***If no site system in place***, JGR Hot Works Permit ***MUST*** be implemented prior to commencement of works to control hot works

**4.** Ensure all tools and equipment used on refrigeration and air conditioning systems are -
- Suitable for the tasks being carried out and the environment in which they are to be used
- Suitably maintained and tested (i.e. where required PA Tested and calibrated) and in good condition, with pre-user checks carried out prior to use.

**5.** Ensure all operatives working on refrigeration and air conditioning systems are suitably competent for the works being carried out and have full understanding of the works to be carried out, with all site Method Statements, Task Procedures and Risk Assessments for the work to hand.

**6.** Ensure all operatives working on refrigeration and air conditioning systems are wearing all required items of PPE, as detailed in this Task Procedure and site Risk Assessments.

**7.** Where required, arrange with site management for isolation of any plant and fire alarms, i.e. smoke detectors, and heat sensors, if they are likely to be affected by the brazing works.

**8.** Carry out brazing works in an orderly manner on an item-to-item basis, ensuring that by working on refrigeration and air conditioning systems, 'danger' is not caused to others as a result.

- Prior to brazing Refrigeration & Air Conditioning pipework, engineers will, where required –
  - Evacuate the refrigerant from the section of the system concerned. This can be achieved by either the following methods –
    - Pump down the system using Task Procedure R01 (Pump down of Refrigerant from Refrigeration & Air Conditioning components)
    - Remove the entire refrigerant from the system using Task Procedure R02 (Refrigerant removal and handling)
    - Isolate electrical supplies following Task Procedures E01 (Electrical Isolation)
  - Check surrounding ensure no combustible materials are in the immediate work-area; use a sufficient measure of heat shielding to protect materials that are near the joint-area and cannot be easily / effectively removed.
  - Arrange for isolation of all alarm systems, by site management, i.e. smoke detectors, and heat sensors where they are in the vicinity of the working area
  - Check all gauges / lines / regulators / flash-back arrestors and brazing gun for damage, if damaged replace with approved repaired component or new component.
  - Ensure an in date, serviceable, fire extinguisher of the correct type (2kg Dry Powder) will be present and within easy reach at all times, while hot works are being carried out.
- Each section of pipework / joint will then be prepared and brazed in accordance with good refrigeration practice by a competent engineer
- On completion of work, check surrounding area for smouldering and then complete a final check for smouldering after 30 minutes.
- Once all brazing works have been completed, where required –
  - Pressure Test system using Task Procedure R06 (Pressure Testing of Refrigeration & Air Conditioning systems)
  - Evacuate the system using Task Procedure R05 (Evacuation of Refrigeration Systems) to remove all moisture, air and other 'non condensable' from the system, leaving it in a clean and dry condition.
  - Charging the system with refrigerant following Task Procedure R04 (Refrigerant Charging)
  - Connect electrical supplies following Task Procedures E04 (Electrical Connection)
  - Commission the system following Task Procedures R11 (Commissioning & Re-commissioning Refrigeration & Air Conditioning systems)

**Important Notes –**

- If flux is to be used, when joining dissimilar metals, and / or there is a possibility that some residual refrigerant or oil may be present this could result in the production of fumes when subjected to high temperatures through brazing.

  All reasonable measures should be undertaken to avoid inhaling any resultant fumes by ensuring that the immediate work has suitable general ventilation and sufficient air movement past the immediate area where brazing works are being carried out.

  If suitable general ventilation and sufficient air movement past the immediate area where brazing works are being carried out cannot be guaranteed then –
  - If general ventilation is sufficient but air movement around the operative is not adequate a suitable half-mask with the correct filter(s) should be used
  - If general ventilation is not adequate then a forced-air breathing system is required.

  In both instances brazing works should be stopped until a suitable Risk Assessment has been completed to identify suitable control measures to enable the works to be completed safely.
- Should brazing be undertaken in an isolated location, or where breathing-protection equipment is required, another (safety) person is to remain in attendance for the duration of the works
- Low pressure Oxygen- free Nitrogen should be passed through sections of pipework while brazing operations are carried out to prevent scale formed by Oxidisation.

**9.** Ensure that on completion of works, all connections are made good and all equipment is operating safely and correctly and warning notices are removed.

**10.** Ensure work area is clear of all tools and equipment

**11.** Inform site management works have been completed and, where required, sign off Hot Work Permit and report back to customer's management to arrange to reinstate fire alarms

## Plant & Equipment Used to Carry out Task

- Oxy-acetylene kit (Trolley containing - Oxygen Cylinder, Acetylene Cylinder, Hoses, Brazing Torch, Gauges)
- Brazing Rods
- 2kg Dry Powder Fire Extinguisher (in-date and in good working order)

## Training / Competency

- BRA level 3 Brazing Certificate or CITB Pipework & Brazing – Industrial Certificate
- C&G 2079 – F-Gas Training Certificate
- NVQ level 2 in Small Commercial Refrigeration & Air Conditioning Systems

## Emergency Procedures

Type of Occurrence – FIRE

- Raise alarm by shouting
- Evacuate Area / Clear personnel (especially injured persons) from immediate danger area
- If safe to do so –
    - Turn off both oxygen & acetylene cylinders
    - Switch off electrical supply, if required
    - Remove any cylinders from any heat source and keep cylinders cool
    - Combat any fire with suitable fire extinguisher
- Activate building / site fire alarm system if fire persists
- Ensure appropriate emergency services have been called

## Protection of Other

- Immediate area to be kept free from cables, ropes and equipment that may affect the works to be carried out
- Suitable signage / safety barriers to be erected around the area where works are being carried out to warn of works and prevent unauthorised access to work area.

## Personal Protective Equipment required for Task

- Safety Footwear (BS EN 20345)
- Flame Retardant Gloves
- Brazing Goggles (BS EN 166)
- Flame-retardant general working clothes should be worn where access is restricted and a greater than normal risk of burning the hands / wrists exists

| Task Reference | R17 |
|---|---|
| Task Activity | Cleaning and Maintenance of Refrigeration and Air Conditioning systems |

| Hazards | | | | | |
|---|---|---|---|---|---|
| ▪ Cold burns from contact with cold surfaces on refrigeration equipment<br>▪ Contact with moving parts<br>▪ Electrocution | | | | | |
| **Risk** | | | | | |
| **Low** | ✓ | **Medium** | | **High** | |

**Control Measures**

- Only competent trained operatives to complete works
- Follow all control measures and task methodologies detailed in all relevant site Method Statements, Task Procedures and Risk Assessments
- When working in isolated area(s) ensure other persons are available to render assistance if required

**Task Methodology**

***Note – At NO time should any operative carryout any further works on Refrigeration and Air Conditioning systems, other than those detailed in this Task Procedure, unless they are competent and hold the relevant training certificates and they meet all requirements from all relevant legislation and guidance such as –***

- ***F-Gas Regulations***
- ***Pressure Equipment Directive***

**1.** Advise site management of works to be carried out and gain permission to complete works.

**2.** Assess the area where works will be completed and –

- Ensure the immediate area has a satisfactory working space, free from trailing cables and hoses etc.
- Cordon off the immediate with suitable signage and protective barriers to protect other persons and prevent unauthorised access to work area.
- Ensure the immediate work area is suitably illuminated, with sufficient lighting provided.

**3.** Where required, complete site permit to work system for completing Cleaning and Maintenance works on refrigeration and air conditioning systems, ***prior*** to completing any works.

**4.** Ensure all tools and equipment used for completing Cleaning and Maintenance works on refrigeration and air conditioning systems are –

- Suitable for the tasks being carried out and the environment in which they are to be used
- Suitably maintained and tested (i.e. where required PA Tested and calibrated) and in good condition, with pre-user checks carried out prior to use.

**5.** Ensure all operatives completing Cleaning and Maintenance works on refrigeration and air conditioning systems are suitably competent for the works being carried out and have full understanding of the works to be carried out, with all site Method Statements, Task Procedures and Risk Assessments for the work to hand.

**6.** Ensure all operatives working on refrigeration and air conditioning systems are wearing all required items of PPE, as detailed in this Task Procedure and site Risk Assessments.

**7.** Carry out cleaning and maintenance works on refrigeration and air conditioning works in an orderly manner on an item-to-item basis, ensuring that by completing the works, 'danger' is not caused to others as a result.

**Inspection of Refrigeration Plant**

- Carry out a general inspection of the refrigeration plant to
  - Identify damage to any parts of the case / unit
  - Ensure all covers are in place and in good condition
- Carry out a visual check on oil level, using sight glass
- Carry out a visual check on all accessible pipework and lagging is in good condition
- Where refrigeration plant is located indoors, check plant room is clear and tidy
- Clean out condenser coils

  Depending on the location of the refrigeration plant and the condition of the condenser coil, the following methods will be adopted
  - Refrigeration Plant located outdoors –
    - Brush and clean coil with a soft hand brush
    - Spray warm tap water on to the coil using a pump action pump spray – **Note** – Only to be carried out on weatherproof sealed units with all covers and panels in place with no damage
    - Blow through the coil with Oxygen Free Nitrogen (OFN) – **Note** – Only to be carried out as a last resort and only if the surround area is clear of all other people and equipment that could be affected by the dust.
  - Refrigeration Plant located indoors –
    - Brush and clean coil with a soft hand brush

**Case Cleans**

- Confirm case has been emptied of stock by store staff.
- Switch off and isolate case / unit by switching off the local isolator
- Complete and place Tag-Out label on isolator
- Carry out general visual inspection of the case / unit to
  - Identify damage to any parts of the case / unit
  - Ensure all blinds are in place, working and in good condition
  - Ensure all covers are in place and in good condition
  - Ensure all lights are secure, working and in good condition
- Remove access covers and base plate / kick plate by removing securing screws to allow access
- Remove Honeycombs to clean by removing securing screws and sliding the Honeycomb out from the case
- Take the Honeycomb outside to a suitable clear location and clean using either Oxygen Free Nitrogen (OFN) or Warm tap water using a pump action pump spray
  - Oxygen Free Nitrogen (OFN)
    - Connect Nitrogen Gauge to Nitrogen
    - Following instructions and guidance from CoSHH Risk Assessment for OFN.
    - Blow through Honeycomb
  - Warm tap water & Pump Action Pump Spray
    - Fill pump action pump spray container with warm tap water
    - Connect lid and pump handle to obtain required pressure
    - Spray Honeycomb with water until clean.
    - Dry / wipe off Honeycomb using Paper Towel / Clean Rags
- Replace Honeycomb and secure into position
- Remove fan mounts to enable access to the wells by sliding them out, making sure connecting cables are not damaged.
- Clean all drains and dairy pumps using a Wet Vac

- Add one Gel Clear tablet, following manufacturer's instructions and guidance from CoSHH Risk Assessment
- Replace all drains and dairy pumps
- Replace / slide the fan mounts back into position in the wells, making sure connecting cables are not damaged
- Ensure all water spills are clear up using Paper Towel / Clean Rags and Bucket
- Replace base plate / kick plate by securing fixing screws into position
- Remove Tag-out label and switch ON isolator
- Inform store management that the case / unit can restocked

**Coldrooms**

- Confirm coldroom has been suitably emptied of stock by store staff, to enable suitable access to carry out cleaning and maintenance works.
- Carry out general visual inspection of the coldroom to -
  - Identify damage to any part of the coldroom
  - Carry out visual checks on all checker plate flooring is secure and in good condition, with no slip or trip hazards.
  - Ensure checker plate flooring is in secure, all fixings in place and in good condition
  - Check evaporator coil to ensure it is clean and free from ice build-up
  - Check evaporator fan guards to ensure they are in place, secure and in good condition
  - Check the doors, hinges and handles are in place, secure and in good condition and fully operational
- Test all drains to ensure they are operating correctly, using warm tap water & Pump Action Pump Spray
- Where installed, clean and inspect drain pumps
  - Where fitted, switch OFF and isolate pump by at the local isolator (Where there is no isolator fitted, ensure it is a sealed pump unit, prior to cleaning before continuing)
  - Complete and place Tag-Out label on isolator
  - Remove drain pump cover to enable access to the drain tank.
  - Clean all drains tank using a Wet Vac
  - Reconnect drain pump cover to the drain tank
  - Ensure all water spills are clear up using Paper Towel / Clean Rags and Bucket
  - Where required, remove Tag-out label and switch ON isolator

**8.** Ensure that on completion of works, all connections are made good and all tools and equipment is operating safely and correctly and warning notices and barriers are removed.

**9.** Ensure work area is clear of all tools and equipment

**10.** Inform site management works have been completed and, where required, sign off Permit to Work and return any access / plant room keys, if applicable.

| Plant & Equipment Used to Carry out Task |
|---|
| ▪ Hand Tools<br>▪ Battery Powered Tools<br>▪ 110v Wet Vac<br>▪ Pump Action Pump Spray<br>▪ 110v Wet Vac<br>▪ Paper Towel Roll / Clean Rags<br>▪ Bucket |
| **Training / Competency** |
| ▪ Appropriate CSCS card<br>▪ UKATA Asbestos Awareness Training Certificate |

| Emergency Procedures |
|---|
| ▪ Evacuate Area / Raise the alarm and clear personnel, especially injured persons, from immediate area<br>▪ Where required, if safe to do so –<br>  o Shut off / Isolate any equipment / cylinders<br>  o Switch off electrical supply<br>  o Remove any equipment / cylinders from any heat source and keep cylinders cool<br>▪ Call Emergency Services if necessary<br>▪ Ventilate Area, if necessary<br>▪ Locate failure area and investigate damage caused to system or other equipment and make-safe |
| **Protection of Other** |
| ▪ Immediate area to be kept free from cables, ropes and equipment that may affect the works to be carried out<br>▪ Suitable signage / safety barriers to be erected around the area where works are being carried out to warn of works and prevent unauthorised access to work area. |
| **Personal Protective Equipment required for Task** |
| ▪ Safety Footwear (BS EN 20345)<br>▪ FFP3 Dust Mask<br>▪ Gloves (BS EN 388)<br>▪ Goggles (BS EN 166) |

| Task Reference | E1 |
|---|---|
| Task Activity | Electrical Isolation |

| Hazards | | | | | |
|---|---|---|---|---|---|
| ▪ Exposure to live electrical circuits and systems resulting in electrical shock and / or electrical burn injuries<br>▪ Danger to third parties coming into contact with live electrical circuits and systems resulting in electrical shock and / or electrical burn injuries<br>▪ Risk of fire due to overheating and overloading or uncontrolled electrical works | | | | | |
| **Risk** | | | | | |
| **Low** | ✓ | **Medium** | | **High** | |

**Control Measures**

- Only competent trained operatives to complete works.
- Follow all control measures and task methodologies detailed in all relevant site Method Statements, Task Procedures and Risk Assessments
- Use of correct, suitably maintained, test equipment
- When working in isolated area(s) ensure other persons are available to render assistance if required.

**Task Methodology**

***While working on electrical circuits and systems , operatives must ensure they meet all requirements from the following documents –***

- ***BS: 7671 Requirements for Electrical Installation (IEE Wiring Regulations 17th Edition)***
- ***Electricity at Work Regulations 1989***
- ***HS(G) 85 Electricity at Work (Safe Working Practices)***

**12.** Advise site management of works to be carried out and gain permission to complete works.

**13.** Assess the area where works will be completed and –
- Ensure the immediate area has a satisfactory working space, free from trailing cables, ropes and hoses
- Cordon off the immediate with suitable signage and protective barriers to protect other persons & prevent unauthorised access to work area.
- Where required; install temporary insulation, protective enclosures, or screens to prevent parts at different potentials being touched at the same time
- Ensure the immediate work area is suitably illuminated, with sufficient lighting provided.

**14.** Where required, complete site permit to work system for working on electrical systems, ***PRIOR*** to working on electrical systems.

**15.** Ensure all tools used on electrical systems are -
- Suitable for the tasks being carried out and the environment in which they are to be used
- Suitably maintained and in good condition, with pre-user checks carried out prior to use.
- Suitably insulated, as detailed in BS EN 60900

**16.** Ensure all items of test equipment used on electrical systems are -
- Suitable for the tasks being carried out and the environment in which they are to be used
- Suitably maintained and in good condition, with pre-user checks carried out prior to use.
- Have insulated probes and fused leads are used to carry out works, as detailed in GS38 Electrical test equipment for use by electricians.

**17.** Ensure all operatives working on electrical systems are suitably competent for the works being carried out and have full understanding of the works to be carried out, with all site Method Statements, Task Procedures and Risk Assessments for the work to hand.

**18.** Ensure all tools and equipment are stored correctly to prevent objects such as tools and bolts cannot fall onto exposed live parts. Horizontal surfaces and projections inside control cabinets should not be used.

**19.** Ensure all operatives working on electrical systems are wearing all required items of PPE, as detailed in this Task Procedure and site Risk Assessments.

**20.** Where required, arrange with site management for isolation of any plant alarms, i.e. if they are likely to be affected by the isolation requirement.

**21.** Carry out electrical isolation works in an orderly manner on an item-to-item basis, ensuring that by isolating any equipment 'danger' is not caused to others as a result.

All electrical works will be carried out in accordance with BS: 7671 Requirements for Electrical Installation (IEE Wiring Regulations 17th Edition) and with the Electricity at Work Regulations 1989, HS (G) 85 Electricity at Work (Safe Working Practices).

**22.** After isolation has been carried out, check, using a single purpose mains tester to establish equipment has been disconnected properly.

**23.** To ensure safe working, isolators when switched off should be 'locked off' and suitably labelled using an Isolation / Tag-out label. If the removal of fuse links is the only available safe method of isolation, then personnel must ensure that the links stay in ***their possession*** until the work is completed.

**Important Note -** It is important that if fuses are the only method of isolation they are not withdrawn or removed under load conditions.

**24.** At ***NO TIME*** will any expose live electrical circuits / areas to be left unattended.

**25.** Ensure that on completion of works, all connections are made good and any shields or protective guards removed from control panels during works are replaced in a correct manner.

**26.** On completion of works, check all equipment is operating safely and correctly and warning notices are removed.

**27.** Ensure work area is clear of all tools and equipment

**28.** Inform site management works have been completed and, where required, sign off Permit to Work.

## Plant & Equipment Used to Carry out Task

- Isolation / Tag-out Label
- Insulated Hand Tools – Suitable for electrical works up to 1000v (BS EN 60900)
- GS38 Multi-meter / Electrical Tester & Test Leads
- Rubber mats – Suitable for electrical works up to 1000v (BS EN 61111)

## Training / Competency

- C&G 2382 - 17th Edition Certificate in the Requirements for Electrical Installations

## Emergency Procedures

- Switch off and isolate electrical supply, if safe to do so
- Remove injured person(s) from danger area, if safe to do so
- Render / seek first aid
- Raise alarm / call emergency services if / as required

## Protection of Other

- Ensure the immediate area is kept free from trailing cables, ropes and hoses etc.
- Cordon off the immediate with suitable signage and protective barriers to protect other persons & prevent unauthorised access to work area.

## Personal Protective Equipment required for Task

- Rubber Gloves – Suitable for electrical works up to 1000v (BS EN 60903)
- Goggles – BS EN 166
- Safety Footwear – BS EN ISO 20345

| Task Reference | E2 |
|---|---|
| Task Activity | Electrical Connection |

| Hazards |
|---|
| ▪ Exposure to live electrical circuits and systems resulting in electrical shock and / or electrical burn injuries<br>▪ Danger to third parties coming into contact with live electrical circuits and systems resulting in electrical shock and / or electrical burn injuries<br>▪ Risk of fire due to overheating and overloading or uncontrolled electrical works |

| Risk | | | | | |
|---|---|---|---|---|---|
| Low | ✓ | Medium | | High | |

| Control Measures |
|---|
| ▪ Only competent trained operatives to complete works.<br>▪ Follow all control measures and Task Methodologies detailed in all relevant site Method Statements, Task Procedures and Risk Assessments<br>▪ Use of correct, suitably maintained, test equipment<br>▪ When working in isolated area(s) ensure other persons are available to render assistance if required. |

## Task Methodology

***While working on electrical circuits and systems , operatives must ensure they meet all requirements from the following documents –***

- ***BS: 7671 Requirements for Electrical Installation (IEE Wiring Regulations 17th Edition)***
- ***Electricity at Work Regulations 1989***
- ***HS(G) 85 Electricity at Work (Safe Working Practices)***

**1.** Advise site management of works to be carried out and gain permission to complete works.

**2.** Assess the area where works will be completed and –
- Ensure the immediate area has a satisfactory working space, free from trailing cables, ropes and hoses
- Cordon off the immediate with suitable signage and protective barriers to protect other persons & prevent unauthorised access to work area.
- Where required; install temporary insulation, protective enclosures, or screens to prevent parts at different potentials being touched at the same time
- Ensure the immediate work area is suitably illuminated, with sufficient lighting provided.

**3.** Where required, complete site permit to work system for working on electrical systems, ***PRIOR*** to working on electrical systems.
- Ensure all tools used on electrical systems are -
- Suitable for the tasks being carried out and the environment in which they are to be used
- Suitably maintained and in good condition, with pre-user checks carried out prior to use.
- Suitably insulated, as detailed in BS EN 60900

**4.** Ensure all items of test equipment used on electrical systems are -
- Suitable for the tasks being carried out and the environment in which they are to be used
- Suitably maintained and in good condition, with pre-user checks carried out prior to use.
- Have insulated probes and fused leads are used to carry out works, as detailed in GS38 Electrical test equipment for use by electricians.

**5.** Ensure all operatives working on electrical systems are suitably competent for the works being carried out and have full understanding of the works to be carried out, with all site Method Statements, Task Procedures and Risk Assessments for the work to hand.

**6.** Ensure all tools and equipment are stored correctly to prevent objects such as tools and bolts cannot fall onto exposed live parts. Horizontal surfaces and projections inside control cabinets should not be used.

**7.** Ensure all operatives working on electrical systems are wearing all required items of PPE, as detailed in this Task Procedure and site Risk Assessments.

**8.** Carry out electrical connection works in an orderly manner on an item-to-item basis, ensuring that by connecting any equipment 'danger' is not caused to others as a result

- Check the system voltage
- Establish what type of joint is required
- Check that the connection is suitable for the environment
- Check that the connection chosen is suitable for the equipment
- Check the current carrying capacity of the connection
- Special attention should be given to joints required for portable equipment since these may be handled whilst alive
- Ensuring that joints are situated and/or covered to ensure safe usage

**Note -** Regulation 10 of the Electricity at Work Regulations 1989 - Where necessary to prevent ***danger***, every joint and connection in a ***system*** shall be mechanically and electrically suitable for use

**9.** After all connection works have been carried out, check, using a single purpose mains tester to establish equipment has been connected correctly.

**10.** At ***NO TIME*** will any expose live electrical circuits / areas to be left unattended.

**11.** Ensure that on completion of works, all connections are made good and any shields or protective guards removed from control panels during works are replaced in a correct manner.

**12.** On completion of works, check all equipment is operating safely and correctly and all warning notices are removed.

**13.** Ensure work area is clear of all tools and equipment

**14.** Inform site management works have been completed and sign off Permit to Work.

## Plant & Equipment Used to Carry out Task

- Isolation / Tag-out Label
- Insulated Hand Tools – Suitable for electrical works up to 1000v (BS EN 60900)
- GS38 Multi-meter / Electrical Tester & Test Leads
- Rubber mats – Suitable for electrical works up to 1000v (BS EN 61111)

## Training / Competency

- C&G 2382 - 17th Edition Certificate in the Requirements for Electrical Installations

## Emergency Procedures

- Switch off and isolate electrical supply, if safe to do so
- Remove injured person(s) from danger area, if safe to do so
- Render / seek first aid.
- Raise alarm / call emergency services if / as required

## Protection of Other

- Ensure the immediate area is kept free from trailing cables, ropes and hoses etc.
- Cordon off the immediate with suitable signage and protective barriers to protect other persons & prevent unauthorised access to work area.

## Personal Protective Equipment required for Task

Rubber Gloves – Suitable for electrical works up to 1000v (BS EN 60903)
Goggles / Face Protection – EN166
Safety Footwear - EN ISO 20345

| Task Reference | E3 |
|---|---|
| Task Activity | Commissioning & Testing |

| Hazards |
|---|
| ▪ Exposure to live electrical circuits and systems resulting in electrical shock and / or electrical burn injuries<br>▪ Danger to third parties coming into contact with live electrical circuits and systems resulting in electrical shock and / or electrical burn injuries<br>▪ Risk of fire due to overheating and overloading or uncontrolled electrical works |

| Risk | | | | | |
|---|---|---|---|---|---|
| Low | ✓ | Medium | | High | |

| Control Measures |
|---|
| ▪ Only competent trained operatives to complete works.<br>▪ Follow all control measures and Task Methodologies detailed in all relevant site Method Statements, Task Procedures and Risk Assessments<br>▪ Use of correct, suitably maintained, test equipment<br>▪ When working in isolated area(s) ensure other persons are available to render assistance if required. |

## Task Methodology

***While working on electrical circuits and systems , operatives must ensure they meet all requirements from the following documents –***

- ***BS: 7671 Requirements for Electrical Installation (IEE Wiring Regulations 17th Edition)***
- ***Electricity at Work Regulations 1989***
- ***HS(G) 85 Electricity at Work (Safe Working Practices)***

**1.** Advise site management of works to be carried out and gain permission to complete works.

**2.** Assess the area where works will be completed and –
- Ensure the immediate area has a satisfactory working space, free from trailing cables, ropes and hoses
- Cordon off the immediate with suitable signage and protective barriers to protect other persons & prevent unauthorised access to work area.
- Where required; install temporary insulation, protective enclosures, or screens to prevent parts at different potentials being touched at the same time
- Ensure the immediate work area is suitably illuminated, with sufficient lighting provided.

**3.** Where required, complete site permit to work system for working on electrical systems, ***PRIOR*** to working on electrical systems.

**4.** Ensure all tools used on electrical systems are -
- Suitable for the tasks being carried out and the environment in which they are to be used
- Suitably maintained and in good condition, with pre-user checks carried out prior to use.
- Suitably insulated, as detailed in BS EN 60900

**5.** Ensure all items of test equipment used on electrical systems are -
- Suitable for the tasks being carried out and the environment in which they are to be used
- Suitably maintained and in good condition, with pre-user checks carried out prior to use.
- Have insulated probes and fused leads are used to carry out works, as detailed in GS38 Electrical test equipment for use by electricians.

**6.** Ensure all operatives working on electrical systems are suitably competent for the works being carried out and have full understanding of the works to be carried out, with all site Method Statements, Task Procedures and Risk Assessments for the work to hand.

**7.** Ensure all tools and equipment are stored correctly to prevent objects such as tools and bolts cannot fall onto exposed live parts. Horizontal surfaces and projections inside control cabinets should not be used.

**8.** Ensure all operatives working on electrical systems are wearing all required items of PPE, as detailed in this Task Procedure and site Risk Assessments.

**9.** Where required, arrange with site management for isolation of any plant alarms, i.e. if they are likely to be affected by the isolation requirement.

**10.** Carry out electrical Commissioning & Testing works in an orderly manner on an item-to-item basis, ensuring that by conducting the Commissioning & Testing works 'danger' is not caused to others as a result.

- To ensure safe working, works should be carried out following relevant task procedures, i.e. Task Procedure 1 – Electrical Isolation and Task Procedure 2 – Electrical Connection
- Ensure proper documentation is available to record results of checks and tests. Commissioning sheets should be filled in as the commissioning task progresses and not at the end of the commissioning period.
- All electrical works will be carried out in accordance with BS: 7671 Requirements for Electrical Installation (IEE Wiring Regulations 17th Edition) and with the Electricity at Work Regulations 1989, HS (G) 85 Electricity at Work (Safe Working Practices).

**11.** At ***NO TIME*** will any expose live electrical circuits / areas to be left unattended.

**12.** Ensure that on completion of works, all connections are made good and any shields or protective guards removed from control panels during works are replaced in a correct manner.

**13.** On completion of works, carry out checks to ensure all equipment is operating safely and correctly and warning notices are removed.

**14.** Ensure work area is clear of all tools and equipment

**15.** Inform site management works have been completed and, where required, sign off Permit to Work.

## Plant & Equipment Used to Carry out Task

- Isolation / Tag-out Label
- Insulated Hand Tools – Suitable for electrical works up to 1000v (BS EN 60900)
- GS38 Multi-meter / Electrical Tester & Test Leads
- Rubber mats – Suitable for electrical works up to 1000v (BS EN 61111)

## Training / Competency

- C&G 2382 - 17th Edition Certificate in the Requirements for Electrical Installations

## Emergency Procedures

- Switch off and isolate electrical supply, if safe to do so
- Remove injured person(s) from danger area, if safe to do so
- Render / seek first aid.
- Raise alarm / call emergency services if / as required

## Protection of Other

- Ensure the immediate area is kept free from trailing cables, ropes and hoses etc.
- Cordon off the immediate with suitable signage and protective barriers to protect other persons & prevent unauthorised access to work area.

## Personal Protective Equipment required for Task

Rubber Gloves – Suitable for electrical works up to 1000v (BS EN 60903)
Goggles / Face Protection – EN166
Safety Footwear - EN ISO 20345

| Task Reference | E4 |
|---|---|
| Task Activity | Inspection & Testing of terminals, Fuses, Circuit Breakers & Overloads |

## Hazards

- Exposure to live electrical circuits and systems resulting in electrical shock and / or electrical burn injuries
- Danger to third parties coming into contact with live electrical circuits and systems resulting in electrical shock and / or electrical burn injuries
- Risk of fire due to overheating and overloading or uncontrolled electrical works

## Risk

| Low | ✓ | Medium | | High | |
|---|---|---|---|---|---|

## Control Measures

- Only competent trained operatives to complete works.
- Follow all control measures and Task Methodologies detailed in all relevant site Method Statements, Task Procedures and Risk Assessments
- Use of correct, suitably maintained, test equipment
- When working in isolated area(s) ensure other persons are available to render assistance if required.

## Task Methodology

***While working on electrical circuits and systems , operatives must ensure they meet all requirements from the following documents –***

- ***BS: 7671 Requirements for Electrical Installation (IEE Wiring Regulations 17th Edition)***
- ***Electricity at Work Regulations 1989***
- ***HS(G) 85 Electricity at Work (Safe Working Practices)***

**1.** Advise site management of works to be carried out and gain permission to complete works.

**2.** Assess the area where works will be completed and –
- Ensure the immediate area has a satisfactory working space, free from trailing cables, ropes and hoses,
- Cordon off the immediate with suitable signage and protective barriers to protect other persons & prevent unauthorised access to work area.
- Where required; install temporary insulation, protective enclosures, or screens to prevent parts at different potentials being touched at the same time
- Ensure the immediate work area is suitably illuminated, with sufficient lighting provided.

**3.** Where required, complete site permit to work system for working on electrical systems, ***PRIOR*** to working on electrical systems.

**4.** Ensure all tools used on electrical systems are -
- Suitable for the tasks being carried out and the environment in which they are to be used
- Suitably maintained and in good condition, with pre-user checks carried out prior to use.
- Suitably insulated, as detailed in BS EN 60900

**5.** Ensure all items of test equipment used on electrical systems are -
- Suitable for the tasks being carried out and the environment in which they are to be used
- Suitably maintained and in good condition, with pre-user checks carried out prior to use.
- Have insulated probes and fused leads are used to carry out works, as detailed in GS38 Electrical test equipment for use by electricians.

**6.** Ensure all operatives working on electrical systems are suitably competent for the works being carried out and have full understanding of the works to be carried out, with all site Method Statements, Task Procedures and Risk Assessments for the work to hand.

**7.** Ensure all tools and equipment are stored correctly to prevent objects such as tools and bolts cannot fall onto exposed live parts. Horizontal surfaces and projections inside control cabinets should not be used.

**8.** Ensure all operatives working on electrical systems are wearing all required items of PPE, as detailed in this Task Procedure and site Risk Assessments.

**9.** Where required, arrange with site management for isolation of any plant alarms, i.e. if they are likely to be affected by the Inspection & Testing of Terminals, Fuses, Circuit Breakers & Overloads

**10.** Carry out Inspection & Testing works in an orderly manner on an item-to-item basis

**1.** To ensure safe working, works should be carried out following relevant task procedures, i.e. Task Procedure 1 – Electrical Isolation and Task Procedures 2 – Electrical Connection.

**2.** Carryout a physical inspection of the equipment to ensure that joints in conduit, trunking and armoured cables are correctly made to ensure earth continuity, other items to be included in the checks are:

- All connections are tight.
- That each circuit has a means of isolation.
- That all removable barriers have been replaced.
- That labels identifying purpose of switchgear; control gear and safety devices have been installed where confusion would occur as to which item controlled which equipment.
- Warning notices have been fixed where the voltages exceeding 250 volts in equipment would not normally be expected to exist.
- Equipment is protected against corrosion, vibration and any other form of environmental condition.

**3.** Testing. Having completed a physical check of the electrical equipment and components, the following test should be carried out: -

- Continuity of live conductors including the neutral.
- Continuity of protective conductors including equip potential bonding conductors.
- Insulation resistance of all live conductors to earth.
- Insulation resistance between live conductors.
- Polarity to ensure all switches is connected in the phase conductor and not the neutrals.
- Phase earth loop impedance tests.
- Operation of MCCB & RCD devices.

**11.** At ***NO TIME*** will any expose live electrical circuits / areas to be left unattended.

**12.** Ensure that on completion of works, Task Procedure E4 Electrical Connection

**13.** On completion of works, check all equipment is operating safely and correctly and warning notices are removed.

**14.** Ensure work area is clear of all tools and equipment

**15.** Inform site management works have been completed and sign off Permit to Work.

## Plant & Equipment Used to Carry out Task

- Insulated Hand Tools – Suitable for electrical works up to 1000v (BS EN 60900)
- GS38 Multi-meter / Electrical Tester & Test Leads, Such as Insulation tester (minimum voltage 500 volts) Phase earth loop impedance tester, RCD tester MCCB tester Continuity tester, Polarity tester
- Rubber mats – Suitable for electrical works up to 1000v (BS EN 61111)

## Training / Competency

- C&G 2382 - 17th Edition Certificate in the Requirements for Electrical Installations

## Emergency Procedures

- Switch off and isolate electrical supply, if safe to do so
- Remove injured person(s) from danger area, if safe to do so
- Render / seek first aid.
- Raise alarm / call emergency services if / as required

## Protection of Other

- Ensure the immediate area is kept free from trailing cables, ropes and hoses etc.
- Cordon off the immediate with suitable signage and protective barriers to protect other persons & prevent unauthorised access to work area.

## Personal Protective Equipment required for Task

- Rubber Gloves – Suitable for electrical works up to 1000v (BS EN 60903)
- Goggles / Face Protection – EN166
- Safety Footwear - EN ISO 20345

| Task Reference | E5 |
|---|---|
| Task Activity | Working on Live Electrical Equipment |

| Hazards |
|---|
| ▪ Exposure to live electrical circuits and systems resulting in electrical shock and / or electrical burn injuries<br>▪ Danger to third parties coming into contact with live electrical circuits and systems resulting in electrical shock and / or electrical burn injuries<br>▪ Risk of fire due to overheating and overloading or uncontrolled electrical works |

| Risk | | | | | |
|---|---|---|---|---|---|
| Low | ✓ | Medium | | High | |

| Control Measures |
|---|
| ▪ Only competent trained operatives to complete works.<br>▪ Follow all control measures and Task Methodologies detailed in all relevant site Method Statements, Task Procedures and Risk Assessments<br>▪ Use of correct, suitably maintained, test equipment<br>▪ ***At NO TIME will operatives work alone on live systems.*** |

**Task Methodology**

***Whenever possible, live work will be avoided. Live Electrical Working will ONLY be carried out if –***

- It is unreasonable in all circumstances for the conductor to be dead
- It is reasonable in all circumstances for the person to be at work on or near that conductor while it is live
- All suitable precautions (including, where necessary, the provision of personal protective equipment) have been taken to prevent injury.
- Minimum of 2 competent operatives in attendance at all times

***While working on electrical circuits and systems , operatives must ensure they meet all requirements from the following documents –***

- ***BS: 7671 Requirements for Electrical Installation (IEE Wiring Regulations 17th Edition)***
- ***Electricity at Work Regulations 1989***
- ***HS(G) 85 Electricity at Work (Safe Working Practices)***

**1.** Obtain permission from site management prior to working on Live Electrical systems.

**2.** Assess the area where Live Electrical works will be completed and –
- Ensure the immediate area is kept free from trailing cables, ropes and hoses,
- Cordon off the immediate with suitable signage and protective barriers to protect other persons & prevent unauthorised access to work area.
- Where required; install temporary insulation, protective enclosures, or screens to prevent parts at different potentials being touched at the same time
- Ensure the immediate work area is suitably illuminated, with sufficient lighting provided.

**3.** Ensure a permit to work system for working on Live Electrical systems has been completed ***PRIOR*** to working on Live Electrical Systems.

**4.** Ensure all tools used on Live Electrical Working are -
- Suitable for the tasks being carried out and the environment in which they are to be used
- Suitably maintained and in good condition, with pre-user checks carried out prior to use.
- Suitably insulated, as detailed in BS EN 60900

**5.** Ensure all items of test equipment used on Live Electrical Working are -
- Suitable for the tasks being carried out and the environment in which they are to be used
- Suitably maintained and in good condition, with pre-user checks carried out prior to use.
- Have insulated probes and fused leads are used to carry out works, as detailed in GS38 Electrical test equipment for use by electricians.

**6.** Ensure all operatives working on Live Electrical systems are suitably competent for the works being carried out and have full understanding of the works to be carried out, with all Method Statements, Task Procedures and Risk Assessments for the work to hand.

**7.** Ensure all tools and equipment are stored correctly to prevent objects such as tools and bolts cannot fall onto exposed live parts. Horizontal surfaces and projections inside control cabinets should not be used.

**8.** Ensure all operatives working on Live Electrical systems are wearing all required items of PPE, as detailed in this Task Procedure and site Risk Assessments.

**9.** Carry out Live Electrical Works in an orderly manner on an item-to-item basis.

All electrical works will be carried out in accordance with BS: 7671 Requirements for Electrical Installation (IEE Wiring Regulations 17th Edition) and with the Electricity at Work Regulations 1989, HS (G) 85 Electricity at Work (Safe Working Practices).

**10.** At ***NO TIME*** will any expose live electrical circuits / areas to be left unattended.

**11.** Ensure that on completion of works, any shields or protective guards removed from control panels during works / testing are replaced in a correct manner.

**12.** On completion of works, check all equipment is operating safely and correctly.

**13.** Ensure work area is clear of all tools and equipment

**14.** Inform site management works have been completed and sign off Permit to Work.

## Plant & Equipment Used to Carry out Task

- Insulated Hand Tools – Suitable for electrical works up to 1000v (BS EN 60900)
- GS38 Multi-meter / Electrical Tester & Test Leads
- Rubber mats – Suitable for electrical works up to 1000v (BS EN 61111)

## Training / Competency

- C&G 2382 - 17th Edition Certificate in the Requirements for Electrical Installations

## Emergency Procedures

- Switch off and isolate electrical supply, if safe to do so
- Remove injured person(s) from danger area, if safe to do so
- Render / seek first aid.
- Raise alarm / call emergency services if / as required

## Protection of Other

- Ensure the immediate area is kept free from trailing cables, ropes and hoses etc.
- Cordon off the immediate with suitable signage and protective barriers to protect other persons & prevent unauthorised access to work area.

## Personal Protective Equipment required for Task

Rubber Gloves – Suitable for electrical works up to 1000v (BS EN 60903)
Goggles / Face Protection – EN166
Safety Footwear - EN ISO 20345

| Task Reference | E6 |
|---|---|
| Task Activity | Cable Sizing |

## Hazards

- Overheating of cables and electrical equipment due to incorrect sizing of cables and overloading of conductors
- Leakage currents due to poor or inadequate insulation.
- Exposure to live electrical circuits and systems resulting in electrical shock and / or electrical burn injuries
- Danger to third parties coming into contact with live electrical circuits and systems resulting in electrical shock and / or electrical burn injuries
- Risk of fire due to overheating and overloading or uncontrolled electrical works

## Risk

| Low | ✓ | Medium | | High | |
|---|---|---|---|---|---|

## Control Measures

- Only competent trained operatives to complete works.
- Use of IEE Regulating cable tables and Manufacturers specification
- Verification of choice by qualified third party, if deemed necessary

## Task Methodology

1. Verify the current carrying capacity of a cable for the continuous use, under the particular installation conditions.
2. Refer to the relevant IEE cable tables for the type of cable and installation method concerned, for a single circuit in an ambient temperature of 30°C.
3. Verify the design current of the circuit, i.e. the total current intended to be carried under normal use.
4. Verify the nominal current or current setting of the device protecting the circuit against over-current i.e. overloads, MCB etc.
5. Verify the operating current, i.e. the fusing current or tripping current and the operating time (delay) of the device protecting the circuit against overload, i.e. fuse, MCB, etc. (Use manufacturer's tables to establish data values).
6. Apply suitable correction factors where the installation conditions differ from those for which the values of current carrying capacity are listed in IEE tables.
    - Ambient Temperature
    - Thermal Insulation (of cable)
    - Grouping (Number of cables running together)
    - Operating temperature of conductors
    - Ensure that the current carrying capacity of a cable is not less than the design current of the circuit in all circumstances.
7. Ensure that the rated current of the current setting device, which protects the circuit against over-current, is not less than the design of the circuit.
8. Ensure that Regulation 5 of the Electricity at Work Regulations 1989 is complied with.

Ensure, where cables are being replaced in an existing installation or control panel, that under no circumstances are they of a lesser current carrying capacity than those being replaced.

## Plant & Equipment Used to Carry out Task

N/A – This is a design function only and does not require any plant, tools or equipment to carry out this task

## Training / Competency

- C&G 2382 - 17th Edition Certificate in the Requirements for Electrical Installations

## Emergency Procedures

N/A – This is a design function only and is not considered to give rise to imminent danger

## Protection of Other

N/A – This is a design function only and does not require any controls to protect others

## Personal Protective Equipment required for Task

N/A – This is a design function only and does not require any individual to wear any Personal Protective equipment while completing this task