



**Cambridge**

**Replacement Cold Laboratory – Room 82A**

**SPECIFICATION**

---

Contents

1.0 PROJECT PARTICULARS ..... 5

    1.1 PROJECT ..... 5

    1.2 SCOPE OF THE WORKS ..... 5

    1.3 CLIENT ..... 6

    1.4 DESCRIPTION OF THE SITE ..... 6

    1.5 TENDER ..... 7

    1.6 PROGRAMME ..... 8

    1.7 SCHEDULE OF SITE CONDITIONS ..... 8

    1.8 HEALTH AND SAFETY ..... 8

    1.9 ASBESTOS ..... 9

    1.10 CONSTRUCTION DESIGN AND MANAGEMENT REGULATIONS 2015 (CDM) ..... 9

2.0 OBLIGATIONS AND RESTRICTIONS IMPOSED BY THE EMPLOYER ..... 10

    2.1 OPERATIONS AND MAINTENANCE MANUALS ..... 10

    2.2 VERIFICATION OF SIZES ..... 10

    2.3 INSPECTIONS AND TESTS ..... 11

    2.4 ACCESS TO AND POSSESSION OR USE OF SITE ..... 12

    2.5 PREVENTION OF NUISANCE AND TRESPASS ..... 12

    2.6 SPEED LIMITS ..... 13

    2.7 VEHICLE PARKING ..... 13

    2.8 OUT OF HOURS WORKING ..... 13

    2.9 WORKING HOURS ..... 13

    2.10 ADVERTISING RIGHTS ..... 13

    2.11 MAINTENANCE OF EXISTING SERVICES ETC. .... 13

    2.13 SITE SPECIFIC RESTRICTIONS ..... 14

    2.13 WASTE ..... 14

    2.14 SUPERVISION ..... 15

    2.15 WATER FOR THE WORKS ..... 15

    2.16 LIGHTING AND POWER FOR THE WORKS ..... 15



Cambridge

Replacement Cold Laboratory – Room 82A

**SPECIFICATION**

---

2.17	TEMPORARY ACCOMODATION .....	16
2.18	MESS CANTEEN FACILITIES .....	16
2.19	TOILET FACILITIES .....	16
2.20	TRANSISTOR RADIOS .....	17
2.21	ATTENDANCE .....	17
2.22	SCAFFOLDING .....	17
2.23	TREASURE TROVE .....	17
2.24	DATA PROTECTION ACT .....	17
3.0	FIRE PRECAUTIONS .....	18
3.1	EXISTING STRUCTURES .....	18
3.2	FIRE PRECAUTIONS GENERALLY .....	18
4.0	MATERIALS, GOODS AND WORKMANSHIP .....	19
4.1	Compliance .....	19
5.0	MECHANICAL (COLD ROOMS).....	20
5.1	GENERAL.....	20
5.2	DESIGN STANDARDS.....	20
5.3	DOCUMENTATION AND CALCULATIONS .....	21
5.4	DESIGN PARAMETERS .....	21
5.5	COLD ROOM REFRIGERATION SYSTEMS.....	22
5.6	REFRIGERATION PIPEWORK .....	23
5.7	AIR COOLED CONDENSING UNITS .....	24
5.8	INTERNAL CEILING MOUNTED COOLERS.....	25
5.9	DEFROST SYSTEM .....	26
5.10	REFRIGERATION LEAK DETECTION SYSTEM.....	26
5.11	DRAINS.....	26
5.12	PRESSURE RELIEF VALVES.....	26
5.13	DEHUMIDIFIER.....	27
6.0	PLANT MONITORING AND CONTROLS .....	28
6.1	CONTROL PANELS.....	28



**Cambridge**

**Replacement Cold Laboratory – Room 82A**

**SPECIFICATION**

---

6.2	DRAWINGS.....	28
6.3	ELECTRICAL INFORMATION WITH TENDER .....	29
7.0	ELECTRICAL .....	30
7.1	ELECTRICAL SCOPE OF WORKS .....	30
7.2	SYSTEM OF WIRING .....	30
7.3	FABRIC HEATERS, DOOR HEATER AND THRESHOLD HEATER.....	31
7.4	PROTECTION AGAINST ELECTRIC SHOCK.....	31
7.5	PROTECTION AGAINST THERMAL EFFECTS .....	32
7.6	PROTECTION AGAINST OVERCURRENT .....	32
7.7	EARTHING .....	32
7.8	FLEXIBLE CONDUIT .....	32
7.9	CABLE TRUNKING .....	32
7.10	WIRING GRADE CABLES FOR CONDUIT OR TRUNKING .....	33
7.11	FLEXIBLE CORDS.....	34
7.12	IDENTIFICATION, NOTICES AND DOCUMENTATION .....	34
8.0	FIRE ALARM .....	35
8.1	COMPLIANCE WITH RELEVANT STANDARDS.....	35
8.2	FIRE ALARM CIRCUITS.....	35
8.3	ASPIRATING SMOKE DETECTION SYSTEM .....	36
9.0	LIGHTING AND EMERGENCY LIGHTING .....	38
9.1	GENERAL.....	38
9.2	SYSTEM OF WIRING .....	39
9.3	LIGHTING REQUIREMENTS .....	39
9.4	EMERGENCY LIGHTING.....	39
10	COMMISSIONING TESTING AND DOCUMENTATION.....	40
10.1	COMMISSIONING .....	40
10.2	OPERATING AND MAINTENANCE INSTRUCTIONS / DRAWINGS / AS FITTED DRAWINGS .....	40
10.3	PROVISION OF DRAWINGS .....	40
10.4	INSTALLATION, OPERATION AND MAINTENANCE MANUALS .....	40



Cambridge

Replacement Cold Laboaratory – Room 82A

**SPECIFICATION**

---

10.5	INSPECTION AND TESTING .....	41
10.6	SPECIAL TOOLS .....	41
11	LABORATORY FURNITURE: .....	43
11.1	DESIGN AND INSTALLATION .....	43
11.2	DRAWINGS.....	43
11.3	DIMENSIONS.....	43
11.4	WORKTOPS .....	43
11.5	BENCH LEG FRAMES .....	43
11.6	ACCESSORIES/OTHER REQUIREMENTS .....	44

DRAFT

Cambridge

Replacement Cold Laboratory – Room 82A

**SPECIFICATION**

---

**1.0 PROJECT PARTICULARS**

**1.1 PROJECT**

The replacement of the Cold Room housing the Cold Laboratory Room 82 at the British Antarctic Surveys office in Cambridge.

This specification shall form the basis of the work and should be read in conjunction with drawing no.

BAS/M/C018/01 – Plan of Proposed Works

**1.2 SCOPE OF THE WORKS**

The Contractor shall include for all necessary tools, labour, materials and equipment to design, supply, install and test the cold room and refrigeration services including the following:-

1. Provide and install all works associated the cold rooms including refrigeration system, lighting systems, fire alarm systems and condensate drains, floor/door/threshold heating door alarms, temperature control panels, external controls, fresh air dehumidification systems etc.
2. Provide and install all Direct Expansion (DX) cooling units for the new Cold Laboratory room.
3. Prepare and carry out all builders work and drawings necessary for the building engineering services installation
4. Design Co-ordination and liaise with any other sub contracted trades.
5. Include for all thermal insulation in compliance with thermal insulation standards detailed elsewhere in this specification, including critical vapour sealing, cladding, identification bands, discs and valve charts
6. Carry out all necessary testing, commissioning, filling, balancing, corrosion prevention treatment, venting and putting into operation the complete refrigeration system.
7. Allow for all necessary expansion and contraction measures in accordance with the specification.
8. Prepare all necessary Operating and Maintenance instructions together with 'As fitted' drawings, detailed demonstrations to users and the facilities management team together with all soft landings support activities.
9. Provide all primary and secondary support systems to install the services.



Cambridge

Replacement Cold Laboratory – Room 82A

**SPECIFICATION**

---

10. The Contractor shall undertake the complete electrical installation works associated with this Section of the Specification including all cabling, local isolation and protective devices.
11. Protection of existing decoration and lab equipment in Room 82 adjacent to the works including temporary screens and floor coverings.
12. Provide development of the Employer's Requirements drawings and detailing from the base tender information to fully designed and constructed standards as detailed previously. This shall include full design responsibility (but not limited to) as follows:
  - a. Expansion and contraction within the system networks.
  - b. Development and adoption of the BAS's concept for equipment and the systems specified to achieve the criteria described within the tender documents.
  - c. Design development of the Controls Performance Specification for the hardware, software, power, controls wiring and all associated equipment.
  - d. Preparation of co-ordinated ceiling and elevation drawings (1:20) showing all mechanical and electrical services outlets including the Specialist(s) Sub-Contractor's equipment.

**1.3 CLIENT**

British Antarctic Survey  
High Cross,  
Madingley Road,  
Cambridge, CB3 0ET

**1.4 DESCRIPTION OF THE SITE**

The British Antarctic Survey, Cambridge, is part of the Natural Environment Research Council. The primary use for the site is polar scientific research, and therefore the site contains many laboratories, cold rooms, workshops, as well as office accommodation

The site can sometimes be occupied 24 hours a day. All buildings will be occupied throughout the works. The Contractor must take all reasonable care not to interfere with any other activities on the site.

Cambridge

Replacement Cold Laboratory – Room 82A

SPECIFICATION

---

The Contractors are recommended to visit the site before submitting their Tender to acquaint themselves with local conditions, means of access, the full extent and character of the Works and any other matters which might affect the execution of the Works.

**1.5 TENDER**

The Contractor is required to examine the tender documents prior to submitting their Tender and notify the Employer of any conflicting or inadequate information contained therein. On submitting their Tender the Contractor shall be deemed to be satisfied as to the sufficiency of the information provided to enable them to carry out and complete the contract. No subsequent claim for consequential loss upon the Contractor's failure to comply with these provisions will be entertained.

The Contractor is to visit and inspect the site prior to Tendering as no claim will be allowed on the grounds of ignorance of the conditions under which the work will be executed, the character of the work and all that is involved in carrying out this Contract. No claim will be entertained for the Contractor's failure to comply with this Clause.

The Employer shall not be bound to accept the lowest of any tender or any section of same; neither do they hold themselves responsible for any expense the Contractor may incur in the estimating or in the adjustment of accounts.

The Employer will not be liable for any costs incurred in the preparation and submission of a tender.

This shall be a fixed all-inclusive priced based upon the contract documents and a careful inspection of the site including for handing over the works clean, functional and complete, fit for immediate occupation and use as intended.



Cambridge

Replacement Cold Laboratory – Room 82A

**SPECIFICATION**

---

**1.6 PROGRAMME**

- Contract commencement - Monday 28<sup>th</sup> November 2016
- Start On Site - Monday 2<sup>nd</sup> January 2017
- Contract Completion - Friday March 3<sup>rd</sup> 2017

The Contractor shall advise if the lead time of any item of supply will exceed the time required for the installation.

Final invoicing shall be complete prior to the end of March 2017.

**1.7 SCHEDULE OF SITE CONDITIONS**

Before commencing work, the Contractor shall prepare in conjunction with the Employers Representative, a schedule of conditions, including a complete photographic record of finishes and items to be retained.

This is intended to ensure that any damages or losses occurring during the contract can be quantified and actions taken accordingly.

**1.8 HEALTH AND SAFETY**

Provide for the safety, health and welfare of all workpeople employed on the site whether by the Contractor, domestic sub-contractor, or the Employer and complies with the requirements of any statute, regulation or industrial agreement, applicable to the various industries concerned and particularly with the requirements of the Health and Safety at Work Act 1974.

As some of the works are external and will on occasion involve working around fire escape exits and both pedestrian & vehicular routes, the Contractor will in conjunction with the Employers Representative, maintain alternative exits as thought necessary. The Contractor will also provide all necessary temporary signage, directing personnel towards any alternative exits, walkways etc.

All appropriate and distinctive warning signs are to be displayed as the work progresses. These are to be removed as soon as possible once they no longer apply.

Protective barriers are to be placed around any works for the protection of any non-contractor personnel who may pass close to any works being carried out.

The contractor will not be permitted to carry out any of the following activities without a separate permit to work.



Cambridge

Replacement Cold Laboratory – Room 82A

**SPECIFICATION**

---

- Hot works
- Work in existing electrical distribution cupboards

**1.9 ASBESTOS**

The Contractors attention is drawn to the fact that Asbestos can be found on the site, an Asbestos register is held by the Employer, and can be viewed by the Contractor upon request.

Previous surveys have found no evidence of asbestos in the areas affected by this tender; however the Contractor must remain vigilant and report any suspicious materials to the Employers Representative immediately.

**1.10 CONSTRUCTION DESIGN AND MANAGEMENT REGULATIONS 2015 (CDM)**

CDM will apply however the Employer considers this a “non-notifiable” project and therefore does not require the HSE to be notified. However, the Employer requires sight of all risk assessments, method statements and COSHH assessments prior to work being carried out. Work will not be able to commence without these been in place.

Should the Contractor believe that this project is “notifiable” then this should be advised in the tender return.

A copy of the Project Health and Safety Plan will be made available at the time of contract award.



Cambridge

Replacement Cold Laboratory – Room 82A

**SPECIFICATION**

---

**2.0 OBLIGATIONS AND RESTRICTIONS IMPOSED BY THE EMPLOYER****2.1 OPERATIONS AND MAINTENANCE MANUALS**

Prior to Practical Completion the contractor shall supply 2 sets of the completed O&M manuals to the Employers Representative. They are to include as a minimum.

- As built drawings showing the complete new layout, wiring layouts, etc.
- Operating manuals for all new equipment
- Safety aspects in relation to the CDM regulations
- Frequency and details of routine maintenance requirements, including any spare components and manufacturer recommended site held spares.
- Cleaning regimes
- Manufacturer's literature for all components

Information shall be presented on A4 white paper in loose leaf A4 binders with hard covers.

Drawings shall be a minimum scale of 1:50 and be presented on A1 180gm/m<sup>2</sup> matte paper folded and placed in an A4 reinforced plastic wallet inserted into the O&M folder.

In addition a full electronic version of the documentation shall be supplied; file formats shall be as follows.

Drawings – Autodesk AutoCAD 2011 or later

Text Files and Spreadsheets – Microsoft Office 2007 or later

Adobe PDF format may be supplied but only in addition to the above.

**2.2 VERIFICATION OF SIZES**

The Contractor is advised not to scale from the drawings and verify all dimensions on site.

The Contractor, sub-contractors and suppliers must verify all sizes, quantities, descriptions, etc. from the Works, drawings and other documents before ordering materials or putting work in hand.

Imperial equivalents are to be used for any materials included in the Specification that is not available in metric sizes.



Cambridge

Replacement Cold Laboratory – Room 82A

SPECIFICATION

---

### 2.3 INSPECTIONS AND TESTS

The Contractor must give at least 48 hours' notice to the Employer during the progress of the Works to enable the inspections, tests, commissioning, witnessing etc. to be carried out by the Employer.

DRAFT



Cambridge

Replacement Cold Laboratory – Room 82A

SPECIFICATION

---

**2.4 ACCESS TO AND POSSESSION OR USE OF SITE**

The Contractor must not use the site for any purpose other than that of executing the Works. The Contractor must obtain the approval of the Employer to the proposed siting of all temporary structures, plant, materials, roads, paths, spoil heaps, etc.

On completion of the Works, the Contractor must remove from the site all temporary works plant, surplus materials, etc. and make good any disturbance or damage, including damage to the ground or structures, to the satisfaction of the Contract Administrator.

Any deliveries are to be via the Service Yard, which is accessed via the electronic security controlled gates to the West of the site. The Contractor is to become familiar with the restrictions concerning this access.

The storage of any flammable materials required for the works, is to comply strictly with all current UK legislation and shall not be stored within any building.

**2.5 PREVENTION OF NUISANCE AND TRESPASS**

The Contractor must take all necessary precautions to prevent any trespass on property adjoining the site by workers, plant or materials under his control, and to prevent nuisance arising from the execution of the Works. The Contractor must discuss with the Employers Representative the measures proposed to counter any risk of trespass and mitigation measures shall be agreed prior to commencement of the works.

The Contractor must take all necessary precautions for the prevention of nuisance arising from dust, excessive noise and vibration. The Contractor must discuss with the Employers Representative the measures proposed to adopt to counter nuisances described above and must give notice of, and agree periods when, noisy operations and operations causing vibrations are to be executed.

The Contractor must allow for dealing with any complaints in connection with alleged nuisance arising from the execution of the Works and for making such arrangements and negotiations as may be necessary, including temporarily suspending any portion of the Works, and must include for everything required to enable the Works to be completed and handed over on the Contract completion date.



Cambridge

Replacement Cold Laboratory – Room 82A

SPECIFICATION

---

**2.6 SPEED LIMITS**

The Contractor must ensure that all vehicles are driven at safe speeds and in conformity with any speed or traffic restriction signs within the building grounds.

**2.7 VEHICLE PARKING**

Parking for the Contractors vehicles and those of all site staff is restricted to the north and south general site car parks. General parking is not permitted within the BAS service yard or main entrance car park.

**2.8 OUT OF HOURS WORKING**

Out of hours may be required due to the nature of the site. The contractor must obtain written permission of the Employer before any out of hours working commences. Out of hours working should be taken into account with your bid.

**2.9 WORKING HOURS**

Normal working hours are between 8am and 6pm; however the site will be occupied 24 hrs.

Noisy, dust and disruptive work that prevents the normal function of the space / building must be carried out, out of hours.

Access to the site outside of normal working hours will only be allowed through prior discussion with the Employer, as security arrangements are required to be made.

The Contractor is to include in the tender for all reasonable out of hours working.

**2.10 ADVERTISING RIGHTS**

The Contractor must not permit or display advertisements on the site without the consent of the Contract Employer.

**2.11 MAINTENANCE OF EXISTING SERVICES ETC.**



Cambridge

Replacement Cold Laboratory – Room 82A

**SPECIFICATION**

---

The Contractor must protect, uphold and maintain all existing structures, live drainage, ducts, water, gas and other mains or power services and if any such items are damaged shall be liable for and shall indemnify the Employer against any expense, liability, loss, claim or proceedings provided always that the damage is due to any negligence, omission or default of the Contractor's workpeople or sub-contractors.

The Contractor must not make connections or interfere with the operation of existing services such as live drainage, water, gas or other mains or power services without the written permission of the Employer.

The Contractor must give ten days' notice before any service is interrupted.

Isolation of services, i.e. water, electricity, gas – not without Employers Representative approval

**2.13 SITE SPECIFIC RESTRICTIONS**

Prior to the daily commencement of any works and at the end of each working day, all contract staff are to report to BAS reception and 'sign in' or 'sign out', using the Contractors Pass scheme.

No Smoking Policy – only permitted within agreed areas

Noise - The Contractor will be working, in close proximity to scientific research facilities. In most instances these facilities require low levels of noise disturbance, which may be in excess of those specified in the Noise at Work Regulations 1989. Work must therefore be scheduled to take account of this requirement.

**2.13 WASTE**

Disposal of all waste produced from the works is to be disposed of offsite by the Contractor in a responsible and legal manner in accordance with all relevant Health & Safety and Environmental Regulations. The use of the BAS waste disposal system is not permitted.

The Contractor is requested to recycle as much waste as is practically possible.

The Contractor must remove all rubbish, debris, etc. at regular intervals as it accumulates and must remove all protective casings and coverings and clean the Works internally and externally. On final completion, all areas are to be given a 'deep clean' and left in a condition satisfactory to the Employers Representative.

The Contractor must keep a log containing the following information for each waste & debris disposal trip. This must also include all waste transfer notes from any skip hire that may be required for the duration of the works



### Cambridge

### Replacement Cold Laboratory – Room 82A

### SPECIFICATION

---

- Skip Hire Company and Disposal Site.
- Contract Name and Disposal Site.
- Vehicle ID – License Number.
- Date of Disposal.
- Time of Disposal.
- Origin of Debris.
- Location of tip
- Net Weight. of Load.

The Contractor will hand over a copy of all waste tickets, fully completed to the Employers Representative each time waste is removed from site. All tickets must be handed to the Employers Representative by Practical completion. Practical completion may be withheld if all waste tickets have not been copied to the Employer.

The Employer reserves the right to audit the waste disposal process

#### **2.14 SUPERVISION**

All work must be carried out by, or closely supervised by workers skilled in the appropriate trade.

The Contractor shall allow for all on and off site management costs and shall keep on the Works a competent General Foreman at all times and always in charge, who shall be considered the Contractor's representative on site and shall carry out the instructions of the Contract Administrator. The presence of the Foreman on site from commencement to completion is obligatory and no departure from this condition or substitution for them by a Trade or Working Foreman can be permitted excepting on the written agreement of the Employers Representative.

#### **2.15 WATER FOR THE WORKS**

The Contractor may connect to the existing supply. However it is the contractor's responsibility to provide all necessary connections.

#### **2.16 LIGHTING AND POWER FOR THE WORKS**

**Cambridge**

**Replacement Cold Laboratory – Room 82A**

**SPECIFICATION**

---

The Contractor may use the site power supply, free of charge, to carry out the works. However it is the Contractor's responsibility to ensure sufficient power supplies and provide all equipment to provide the correct voltage.

The Contractor must provide temporary electric lighting and power distribution supplies for the Works. The temporary installations must be in accordance with BS and the current IEE Regulations. Extension outlet units for portable tools must be provided within 20 metres of the point where the tool is to be used, measured by the actual route taken. The Contractor must provide lighting for any temporary hoarding and the like.

All Equipment shall have a current PAT test certificate and be safe to use

**2.17 TEMPORARY ACCOMODATION**

No temporary office accommodation will be provided by The Employer for the Contractor

The Contractor will not be permitted to use the existing building telephones. The Contractor must provide any temporary telephone facilities that they may require.

**2.18 MESS CANTEEN FACILITIES**

The Contractor may be permitted to use Canteen facilities when available on site, but must note the wearing of overalls or dirty work clothes is not permitted in the canteen.

**2.19 TOILET FACILITIES**

The Contractor may be allowed to make use of an existing toilet but this must be left and maintained in a clean state.



Cambridge

Replacement Cold Laboratory – Room 82A

**SPECIFICATION**

---

**2.20 TRANSISTOR RADIOS**

The use of radios etc. by the Contractor's workers will not be allowed.

**2.21 ATTENDANCE**

The Contractor shall make all necessary allowances for attendance on their subcontractors including obtaining full particulars of requirements with regard to chases, holes, recesses, etc.; supplying all necessary dimensions and other information for the proper execution of the sub-contract work; free use of temporary roads and paving, standing scaffold, standing power operated hoisting plant; the provision of temporary lighting and water supplies; clearing away rubbish, provision of space for the storage of plant and materials, the use of mess rooms, sanitary accommodation and welfare facilities.

**2.22 SCAFFOLDING**

The Contractor is to allow for all necessary scaffolding, ladders, trestles, etc., for the due and proper completion of the job, and at all times complying with the appropriate Safety Regulation.

**2.23 TREASURE TROVE**

Any treasure trove, coins, or objects of antiquity, which may be found on the site, are to become the property of the Employer.

**2.24 DATA PROTECTION ACT**

The Contractor hereby undertakes that they and their Employees or Agents will treat as confidential and will not hold or publish in any form any personal data, as defined by the Data Protection Act, which they become aware of during the execution of this Contract and will not pass on such data to any other person or body.



Cambridge

Replacement Cold Laboratory – Room 82A

**SPECIFICATION**

---

**3.0 FIRE PRECAUTIONS**

**3.1 EXISTING STRUCTURES**

The Contractor must take all reasonable precautions to avoid the outbreak of fire, particularly in work involving the use of naked flames: such work must be examined at short intervals immediately following its completion. Before any works of maintenance, adaptation or extension to existing buildings or services are carried out or connections to existing services are made, the Contractor must discuss any proposals with the Employers Representative responsible for fire precautions to ensure that the extent of any fire hazards in the Works are known fully to both the Contractor and the Employer. The Contractor must draw the attention of all workpeople on the site to the dangers involved in the careless use of naked flames in proximity to combustible materials, disposal of matches, cigarettes, tobacco ash, etc., and of the accumulation of rubbish must be fully impressed on them. Workpeople must be required strictly to conform with all "No Smoking" rules applicable in specific areas of the site and existing buildings.

Fire protection compartments must be maintained and fire escape routes must remain unobstructed and where necessary illuminated. The Contractor must provide and maintain suitable fire extinguishers. The building's fire alarm system(s) must be maintained by the Contractor at all times.

**3.2 FIRE PRECAUTIONS GENERALLY**

The attention of the Contractor is drawn to the current HMSO Publication "Standard Fire Precautions P5 - to be taken by Contractors engaged on building and engineering works and maintenance for the Department of the Environment" and they must observe its recommendations where relevant to the Works.

Fire extinguishers and hydrants must not be obstructed and access to them must be maintained at all times

The Contractor must remove all cylinders containing inflammable gases from buildings or enclosed spaces at the end of each working day.

Cambridge

Replacement Cold Laboratory – Room 82A

**SPECIFICATION**

---

**4.0 MATERIALS, GOODS AND WORKMANSHIP**

**4.1 Compliance**

All work shall comply with the Building Regulations and the Regulations of the Local Authority and Statutory Authorities.

Materials and components shall be new, shall comply with BS or BBA documentation where such exists and shall be delivered to site in the manufacturers' wrappings where they are provided.

All self-finished and decorative materials and components shall be subject to selection and approval.

Workmanship shall comply with the appropriate CoP where such exists and with other relevant authoritative documentation such as that published by the BRE. Work of an aesthetic significance shall always be undertaken with particular care and attention.

Should any materials, components and workmanship be not fully specified the Contractor shall comply with good building practice and produce work fit for its designed purpose?



Cambridge

**Replacement Cold Laboratory – Room 82A****SPECIFICATION**

---

**5.0 MECHANICAL (COLD ROOMS)****5.1 GENERAL**

This Performance Specification details the requirements for the cold areas detailed within the clients brief document and indicated within the tender documents.

This work package covers the design, supply and installation of the complete cold room, together with all associated controls and safety devices, dehumidifier systems (where stated), a plant monitoring system and all associated electrical wiring.

All technical queries on the project should be dealt with during the tender period and no additional terms should be made to pricing once the contract has been awarded.

In support of the return tender, details of the proposed plant and equipment should be provided, together with any other relevant information that the Tenderer feels would be beneficial when considering their offer. They shall also advise the COP and SEER of each refrigerant system.

The information within this tender stipulates the criteria for the design of the refrigeration systems. It does not state for instance how the pipework distribution between the chillers and coolers should be dealt with, for example in terms of the number of coolers on one circuit. This has been left to the Tenderers to decide based upon their choice of equipment.

Drawings are provided as part of the Tender documentation which shows the general plant and routing requirements of the Refrigeration Installation for this project. Architectural and structural drawings are available by request from the BAS.

**5.2 DESIGN STANDARDS**

The refrigeration system shall be designed and installed to the following:-

1. Commercial Refrigeration code of conduct for reducing carbon emissions
2. BS4434: 1997 Safety & Environmental Aspects in the Design, Construction and Installation of Refrigerating Appliances and Systems.
3. All relevant British Standards and Codes of Practice.
4. All requirements of the Health and Safety Executive.
5. The 17th edition of IEE Regulations.
6. The requirements of the Local Water Authority.
7. The Building Regulations.
8. The CDM regulations.



## Cambridge

## Replacement Cold Laboratory – Room 82A

## SPECIFICATION

9. Code of Practice for the Design and Construction of cold store envelopes incorporating insulating panels, Institute of Refrigeration, 1986 and all subsequent amendments
10. The Fire Precautions Act

### 5.3 DOCUMENTATION AND CALCULATIONS

The Tenderer shall provide all detailed drawings and calculations of all plant and equipment associated with the installation.

The time required for all approvals (minimum 10 working days) shall be detailed into the Refrigeration Contractors programme of work. The layout of all plant and equipment shall conform to the requirements of CDM and shall be subject to the approval of the BAS who shall have the authority to ask for equipment to be relocated if they deem it an improvement in terms of access for maintenance and plant replacement.

### 5.4 DESIGN PARAMETERS

The following design parameters shall be used in calculating the refrigeration load.

#### Cold Store

External ambient condition (summer)	35°C (db.)/21°C (wb)
External ambient condition (Winter)	- 10°C / 100% sat, winter.
Operating condition	-15°C to -30°C adjustable via controls (Normal operation -25°C)
Hysteresis	±1°C
Assumed adjacent room condition	30°C maximum / 10°C minimum.



## Cambridge

## Replacement Cold Laboratory – Room 82A

## SPECIFICATION

**Heat Gains**

Structural transmission	To be determined by the Contractor.
Cooler fans (to be as installed)	To be determined by the Contractor
Lights	To be determined by the Contractor
Minimum Air infiltration allowance	6 air changes per day (to be confirmed by Cold Room Manufacturer).
Fresh Air Supply Allowance	8 l/s per person (min)

**Occupation**

Maximum Occupation	4 Persons for 8 Hours each day
--------------------	--------------------------------

**5.5 COLD ROOM REFRIGERATION SYSTEMS**

The Tenderer shall offer refrigeration system utilising a non-ozone-depleting refrigerant.

The cold room shall be supplied with independent refrigeration systems. Each system shall be provided with 2 No. air cooled condensers, each selected on at 100% duty to provide full run and standby to each system. So that the temperature within the space can be maintained following the failure of one of the condensers. There shall be a routine within the control to ensure duty/share for each unit on a weekly basis. The layouts of the condensers are shown diagrammatically on the tender drawings. The tenderer is asked to confirm the ability of the system to meet the performance requirements quoted with the cooler layout as shown. Defrost of each system shall be by means of either electric heater battery or by hot gas bypass with only one cooler in each space allowed to defrost at any given time.



## Cambridge

## Replacement Cold Laboratory – Room 82A

SPECIFICATION

---

**5.6 REFRIGERATION PIPEWORK**

The Refrigeration Contractor shall allow for designing, installing and testing all interconnecting refrigeration pipework between each cooling coil or cassette and each condensing unit. Only half hard seamless refrigeration grade copper tube to BS EN 1057 (BS 2871:Part 2:1972), ASTM B280, DIN 1754/8905 shall be used. Fittings and joints shall be kept to a minimum with all bends being long radius as made using proprietary pipe bending equipment.

Flare joints shall be kept to a minimum i.e. final terminations only, with all other site joints being brazed on site. All brazing shall take place when the pipework is being continuously purged with oxygen free dry nitrogen to ensure no moisture enters the system and also preventing formation of oxides of copper. When the pipework is not being directly worked on all ends of the pipework shall be capped off.

Any joints required shall be correctly swaged and any pipework being cut shall be done using sharp cutting wheels with any resulting burrs removed to return the pipework to its original dimension.

If the Design Engineer has any reason to believe that any of the above has not been carried out he/she may require the Refrigeration Contractor to degas, and cut out any suspect joints or fittings for inspection. If any joints or fittings are found to be burred, contaminated or in any way not be good installation practice then he may instruct the Refrigeration Contractor to remove the entire circuit for reinstallation at the Contractors own cost.

Each refrigeration circuit shall be pressure tested to 1½ times the working pressure or 28kg/cm<sup>2</sup> whichever is the greater for 24 hours. Any drop in pressure shall require the Contractor to locate any leaks and make good.

Each circuit shall then be triple evacuated for de-hydration using oxygen free dry nitrogen as the purge gas. During the final evacuation each circuit must be shown to hold vacuum for 1 hour prior to charging.

The vacuum shall be broken with oxygen free nitrogen on the first two occasions and with any necessary refrigerant charge on the third.

The Refrigeration Contractor shall inform the Engineer of the amount of refrigeration used to charge the system, and shall allow in their tender to return to site during design ambient conditions to check the performance of the refrigeration plant against its design intent.

All suction lines shall be insulated with 19mm Armaflex Class 'O' insulation with all joints being in accordance with the manufacturer's instructions. All insulation external to the building shall be finished with two coats of arma-finish HM coating. All insulation joints shall be glued using armaflex adhesive after the systems have been commissioned.



**Cambridge**

**Replacement Cold Laboratory – Room 82A**

**SPECIFICATION**

---

The Contractor shall ensure any headers/manifolds are insulated with oversize Armaflex insulation or Armaflex sheet to provide a vapour seal.

The refrigerant lines shall be installed in accordance with the equipment manufacturer's recommendations.

The Tenderer shall note that the route of refrigerant lines and condensate services shall be agreed on site, prior to installation commencing.

All refrigerant pipework shall be mounted and secured on heavy duty galvanised cable tray.

Pipework passing through fire resisting walls and ceilings shall be fitted with proprietary fire stops.

Consideration shall be given for the need to provide within the pipework installation adequate flexibility for thermal movement.

All pipelines shall be identified in accordance with BS 1710. It shall be additionally identified to state whether the refrigerant within the pipeline is at HP or LP and whether it is in a gaseous state or a liquid state.

**5.7 AIR COOLED CONDENSING UNITS**

The Refrigeration Contractor shall supply, deliver, pressure test, evacuate install and commission air cooled condensing units in the positions indicated on the drawings, for the calculated duty from each system.

Each condensing unit shall be capable of satisfying the design requirements. The condensing units shall include the following facilities:-

The casings shall include removable panels to enable unrestricted access to all components and an integral isolator. If an integral isolator is not available, the Refrigeration Contractor shall provide a separate electrical isolator adjacent to each condensing unit.

Each unit shall be complete with all necessary internal controls, electrical wiring and components to ensure that the unit functions correctly.

Each condenser shall contain a full head pressure control (modulating damper or solid state to the lead fan).

Each condensing unit shall be suitable for a 3 Phase, 415 Volt electrical supply. The Electrical Contractor shall supply and install these 3 phase supplies from the non-essential LV distribution.

**Cambridge****Replacement Cold Laboratory – Room 82A****SPECIFICATION**

---

The crank case heaters for the compressors shall derive their power supplies from the system control panel.

Each condensing unit shall have:-

- a) A thermal protection device in each motor windings to protect the motors from overcurrent and excessive temperatures.
- b) Built in over-pressure valves to protect the compressors from high discharge pressures.
- c) Hermetic or semi hermetic 3 phase compressors designed for use with the selected refrigerant, with internal mufflers and each compressor mounted on dedicated anti-vibration mountings.
- d) The Refrigeration Contractor shall also supply, install and commission any thermal expansion valves as required.

The Contractor, shall carry out all Electrical wiring from each condensing unit to the respective isolator including any control wiring interfacing. A 3 phase isolator for each condensing unit (integral to each condensing unit) shall also be supplied.

**5.8 INTERNAL CEILING MOUNTED COOLERS**

Coolers should be mounted at high level within the space supported directly off the building structure. Coolers shall be constructed from corrosion resistant coated copper coils contained within a heavy gauge galvanised or stainless steel casing. All drip trays and tray outlet pipes, connections and discharge pipework shall be heated to prevent freezing during or after defrosting. The units shall be mounted from the building structure by stainless steel or galvanised steel rods which shall be insulated and vapour sealed after erection.

Cooler fans shall be of the low velocity axial type selected to provide the required throw at minimum noise level. Coolers shall be sized on a maximum air side temperature drop of 4°C. Coolers shall be connected to the main pipework distribution via isolating valves.

Deflectors shall be fitted to prevent air streams from duty coolers interfering with defrost cycles on coolers in the 'off' cycle.

All valves shall be located outside the Cold room within in an accessible area adjacent. Drains from the cooler drip trays shall be run in ABS, insulated and trace heated to a heated trap located externally to the chilled space before being dropped to low level and discharged into the underground foul drainage system.

The drainage points have been provided at either end of each of the chilled spaces and the refrigeration contractor should ensure that all drains are installed at sufficient slope for the quick



Cambridge

**Replacement Cold Laboratory – Room 82A****SPECIFICATION**

---

effective removal of condensate and the tender should include for the main condensate drains to be run in 40mm tube. The use of condensate lift pumps is discouraged. The finish on both cooler casing and cooler fans shall be white plastic coated or stove enamel unless manufactured in stainless steel where they shall be self-coloured.

**5.9 DEFROST SYSTEM**

The refrigeration contractor should include for an effective defrost system to be installed for the coolers. The preferred system of defrost will be hot gas bypass, and the control system arranged such that only one cooler in each refrigerated chamber is allowed to defrost at any given time. The defrost system shall include all necessary temperature sensors to ensure a 'closed-loop' defrost cycle is obtainable and that the coolers are only defrosting when they are required. The use of defrost shut off socks would be welcomed should these prove effective on the equipment selected.

**5.10 REFRIGERATION LEAK DETECTION SYSTEM**

A refrigerant vapour detection system shall be installed within the service voids where refrigerant pipework is installed and at high level with the cold stores. In the service voids detectors will be installed directly above the distribution pipework. When a detector senses the presence of the refrigerant it should activate the alarm system. Audio and visual alarms shall be activated to ensure that occupants of the building are alerted to the potential hazard.

**5.11 DRAINS**

The requirements for the cooler drains have previously been detailed. Additionally the tenderer shall include for all drain pipework from drip trays of any other equipment installed to local gullies.

**5.12 PRESSURE RELIEF VALVES**

The tenderer shall allow for the provision of pressure relief valves in the cold store and cold store lobby ceilings. The tenderer shall supply and install sufficient differential pressure relief



## Cambridge

**Replacement Cold Laboratory – Room 82A****SPECIFICATION**

---

valves to ensure a maximum differential pressure of  $100\text{N/m}^2$  in the envelope, subject to confirmation by the cold room manufacturer.

The tenderer shall supply with the tender, details of their pressure relief valve arrangement together with a statement as to the pressure both positive and negative that the freezer composite panels can tolerate without damage.

**5.13 DEHUMIDIFIER**

Fresh air supplied to the cold room is responsible for the majority of humidity entering the cold room. This causes increased defrost requirements and frosting of cold surfaces within the cold room. As the cold room is used as a laboratory atmospheric moisture causes contamination of ice samples and should be reduced as far as possible as close to zero. Therefore is an absolute requirement to remove as much moisture from make-up air as possible. It is strongly recommended that dehumidification and cooling is applied to the fresh air make up system.

The plant for the current dehumidification system is housed in a plant room above the existing cold laboratory. It is envisaged that any new plant and equipment will be housed here.

Plant for the cooling and dehumidification of fresh air supply need not have duty/standby systems.



Cambridge

Replacement Cold Laboratory – Room 82A

**SPECIFICATION**

---

**6.0 PLANT MONITORING AND CONTROLS**

It is proposed that the existing TAC Xenta microprocessor plant control panel and monitoring system will be re-used. It is expected that the system will monitor and display all plant functions and operating conditions i.e. system pressures, temperatures, humidity levels, hours run etc. as well as fault monitoring, energy consumption etc.

As a minimum the following alarm conditions should be monitored.

1. Door Left Open.
2. High Temperature Alarm.
3. Plant failure Alarm (Duty or standby shall be selectable via HMI manually but normal operation should allow for an Auto changeover on defrost and/or fault.)

Current alarm notifications shall remain as existing.

Additional contactors, wiring, relays etc. required to integrate the new plant with the existing controls for a fully functioning system shall be included for in the tender price.

The system shall also be provided with a new connection to the existing Schneider Continuum BMS to monitor Status and fault conditions as detailed in the documentation.

**6.1 CONTROL PANELS**

The refrigeration plant shall be configured to run on one supply with a maximum incoming size of 100A, three phase and neutral.

It is highly desirable that any auxiliary supplies within the compartment are switched off by additional isolator contacts.

Where this may not be practicable in any particular instance, then the 'live' supplies remaining must be completely shrouded with warning labels fitted as required. The details of all such arrangements must be submitted to the Project Manager for approval prior to commitment to manufacture.

**6.2 DRAWINGS**

These must show complete circuitry of the equipment with references identical to label references on the equipment. It is preferred that internal connections of components be shown.



Cambridge

Replacement Cold Laboratory – Room 82A

**SPECIFICATION**

---

Where this may not be practicable, then the wire numbers connecting to the component must be shown, together with the component terminal numbers and the number of the detail drawing for the component.

Full details of fuse ratings, classes and types, protective relay ranges, ammeter ranges, c.t. ratios, (where applicable), resistor and capacitor values, timing ranges and proposed settings are to be shown, together with similar information for other items wherever meaningful.

Terminations for external connections between items must be clearly shown, together with cable box and gland positions.

Where equipment may need a special type of external cable (e.g. screened cable), this must be clearly marked on the drawing.

General arrangement drawings shall show, in addition to fixing details, externally mounted components such as relays, switches, instruments etc., together with the function, and quantities of any cable sealing box compound required.

**6.3 ELECTRICAL INFORMATION WITH TENDER**

The following information is to be provided by the tenderer within the tender submission.

1. Comprehensive specification of all equipment.
2. Statement as to whether certificates are available proving compliance with BS 5424 for the class of equipment required.
3. Certifying Authority.
4. Busbar short time rating. If this does not apply to the whole of the bus bar circuit, including risers, then give additional details.



## Cambridge

## Replacement Cold Laboratory – Room 82A

## SPECIFICATION

**7.0 ELECTRICAL****7.1 ELECTRICAL SCOPE OF WORKS**

- a) The Contractor shall be totally responsible for the complete electrical system serving the refrigeration plant. This shall include all cabling, conduits, connections, final tests and commissioning.
- b) The Contract includes the following works:-
- i) The supply and installation of refrigeration control panels, to be located in the refrigeration control plant room, and used for the complete supply and control of all refrigeration plant.
  - ii) The supply and installation of the emergency supplies/plant room ventilation control panel located in the control room.
  - iii) The complete supply and installation of all associated cabling from the refrigeration plant control panels to all the refrigeration plant and associated sensors, valves, fans etc. the emergency supplies panel and the ventilation control panel.
  - iv) Attendance for purposes of testing and commissioning the new refrigeration plant.
  - v) The supply and installation of a plant monitoring system for remote interrogation.
  - vi) Supply and installation of emergency and general lighting to the Cold Laboratory.
- c) Allow in the tender, in respect of all electrically operated equipment mentioned in the Electrical Specification and/or the associated drawings.
- i) Supply of all Control equipment and associated wiring, including switchgear and local isolating switches.
  - ii) Erection/installation/fixing of the above.
  - iii) Wiring to all equipment from the Main Control panels.
  - iv) Connection of all equipment.
  - v) Setting to work/commissioning.

**7.2 SYSTEM OF WIRING**

The system of wiring to be employed is to be as follows:-

- a) Control wiring and supplies under 20Amps operating in temperatures above 0°C.
- i) In Plant Rooms - LSF/Cu cables enclosed in galvanised steel conduit
  - ii) In Ceiling voids - LSF/Cu cables enclosed in galvanised steel conduit and trunking  
LSF/SWA/XLPE/Cu cables secured to galvanised
  - iii) Externally - LSF/SWA/XPLE/Cu cables secured to galvanised



## Cambridge

## Replacement Cold Laboratory – Room 82A

SPECIFICATION

---

- b) Supplies above 20Amp are to be wired in LSF/SWA/XLPE/Cu cables secured to galvanised cable tray.
- c) All supplies and control wiring intended for use in areas with an ambient temperature below 0oC shall be wired using bare mineral insulated cables.
- d) The Sub-Contractor will be required to co-ordinate the routes of all trays and trunking with all other services.
- e) Where multicore or data control wiring is employed, this will be required to be enclosed in conduit or trunking.

**7.3 FABRIC HEATERS, DOOR HEATER AND THRESHOLD HEATER**

The tenderer shall allow for the design, supply and installation, including all associated controls of suitable “ice free” floor, door and threshold heaters to serve the cold store.

The purpose of the floor heater is to prevent trapped moisture between the cold room floor panel and the building concrete slab freezing which is known to cause heave over a prolonged period of operation.

The tenderer shall ensure there is adequate space allowed for the threshold heater installation under the doors.

The tenderer shall be responsible for all coordination with appointed sub-contractors.

**7.4 PROTECTION AGAINST ELECTRIC SHOCK**

- a) The 17th Edition of the I.E.E. Wiring Regulations allows alternative methods of protection against electric shock. For the purpose of this Specification, protection against direct contact with live parts shall generally be by the use of the following measures:-
  - i) Protection by insulation of live parts.
  - ii) Protection by enclosures.
- b) The basic protection measure for protection against indirect contact shall be by earth equipotential bonding and automatic disconnection of the supply. All necessary earth bonding as is detailed in the Wiring Regulations (Section 413) shall be carried out.
- c) Protection devices providing automatic disconnection shall generally be fuses to B.S. 88, Part II, and/or miniature circuit breakers to B.S. 3871. The characteristics of these devices, the earthing arrangement and the circuit impedances shall be co-ordinated to provide protection against indirect contact with live parts. Where residual current devices are specified, they shall be to B.S. 4293.



## Cambridge

## Replacement Cold Laboratory – Room 82A

SPECIFICATION

---

**7.5 PROTECTION AGAINST THERMAL EFFECTS**

Attention is drawn to Chapter 42 of the Wiring Regulations, which outlines measures to be taken in respect of protection against thermal effects.

**7.6 PROTECTION AGAINST OVERCURRENT**

- a) With the exception of electric motors and associated circuits, circuit protection against overload and short current shall be provided by a single device.
- b) The overload and short circuit characteristics of each device together with circuit impedance satisfy the Wiring Regulations in respect of overload and short circuit protection, discrimination and circuit disconnection times in the event of earth fault conditions. Ensure that no alterations, howsoever caused, will negate this co-ordination procedure.

**7.7 EARTHING**

- a) At switch panels and other metallic electrical enclosures, reliance shall not be placed on the enclosure to form part of the protective conductor. Earthing tags or clamps and continuity conductors in conjunction with a suitable earthing bar shall be employed.
- b) For the purpose of this Specification, conduit and/or trunking systems shall not be relied upon to form the protective conductor. Earth continuity or protective conductors shall be installed for each final circuit, which shall comply with Regulation 543.
- c) The resistance between any point of the conduit/trunking installation and the local distribution board shall not exceed 0.1 Ohm. Conduits and distribution gear shall be earthed by means of earth continuity sockets.
- d) Where a Lightning Protection system forms part of the scheme such systems are to be connected to the building earthing system at the main earth bar. The Electrical Contractor will be responsible for advising the Supply Authority of this requirement and provide any information requested by the Supply Authority.

**7.8 FLEXIBLE CONDUIT**

- a) Flexible conduit shall be of the interlocked steel tape type with a P.V.C. sheath to B.S. 731. Terminations shall be by means of compression glands.
- b) An appropriately sized, insulated circuit protective conductor shall be drawn into the tubing and connected to earth terminals at each end.

**7.9 CABLE TRUNKING**

- a) For general purpose, cable trunking shall conform to B.S. 4678, Part 1, Class 3 galvanised. The gauge of the trunking shall be, 1.2mm up to and including 150 x 50mm,



## Cambridge

## Replacement Cold Laboratory – Room 82A

## SPECIFICATION

all other sizes up to and including 150 x 150mm shall be 1.6mm thick sheet steel. Where larger trunking is specified, the gauge of the trunking shall be detailed elsewhere in the Specification or on the accompanying drawings.

- b) Trunking shall be properly aligned and covers closely butted and secured.
- c) Manufacturers' standard accessories, e.g. bends tees, flares, etc., shall be employed throughout. Bends, Tees etc. shall be of the gusset or radius types.
- d) Sections of trunking shall be bolted together by sleeve couplings and local copper supplementary bonding connectors. Where trunking with a painted finish is specified, the surface of the trunking shall be scraped clean at all jointing pieces and beneath earth bonding studs.
- e) Multi-compartment trunking shall be welded internal fillets, and properly manufactured crossovers at junctions.
- f) Cable retaining straps shall be provided at 750mm intervals wherever the cover is not on top.
- g) For the support of cables, metal pin racks shall be fixed at 2m intervals inside trunking installed to guard against undue mechanical strain.
- h) Where trunking passes through floors, ceilings and walls, the cover shall be cut and fixed to project 75mm either side of the obstruction. When the structure is made good, this section of cover will not be removable. Internal fire resisting barriers shall also be fitted.
- i) Conduits shall be connected to the trunking by earthing sockets and male hexagon brass bushes. Insulated, single core earth continuity conductors shall be fitted.
- j) Where multi-compartment trunking is required, the Contractor shall fix printed labels to each compartment side wall at 3m intervals to denote the use of the compartment.

**7.10 WIRING GRADE CABLES FOR CONDUIT OR TRUNKING**

- a) For general wiring, the cable shall be 600/1000 Volt grade, single core, stranded copper with LSF insulation complying with B.S. 6004 or B.S. 6346.
- b) Where LSF cables are specified in plant rooms, they shall be of the high temperature specification for operating at temperatures up to 80°C. Where higher heat resisting grades of insulation are specified, silicone rubber insulated cables to B.S. 6007 shall be employed. Where the temperatures will not exceed 150°C such cables shall be identified throughout their length. For higher temperatures, cables shall have varnished glass-fibre insulation.
- c) During installation, the cables shall be combed to facilitate drawing in and future replacement.
- d) Inside trunking, cables forming final sub-circuits shall be tied together at 2m intervals to ease identification. The use of PVC self-adhesive insulating tape will not be permitted for this purpose.
- e) Cables shall be installed without joints.
- f) Live conductors of lighting circuits shall be taken direct to switches, whilst associated neutral conductors shall be looped at lighting points, unless 4 terminal ceiling roses are specified in the detailed Technical Clauses of this Specification.
- g) Cables shall be colour coded in accordance with the I.E.E. Regulations.



## Cambridge

## Replacement Cold Laboratory – Room 82A

SPECIFICATION

---

- h) In addition to phase identification, the cores of cables connecting control gear, thermostats, valves etc., shall be fitted with identification sleeves bearing the same markings as the terminals of the apparatus to which they are connected. All switch wires for lighting circuits shall be identified by means of an orange sleeve at each end.

**7.11 FLEXIBLE CORDS**

- a) Cords shall be 300/300 Volt or 300/500 Volt insulated and of conductor cross-section 0.m.sq. Or greater.
- b) For connections to terminals of lamp holders and heaters, cores shall be glass-fibre insulated glass braid/varnish sheathed for a service temperature of 180°C.
- c) For applications where the temperature does not exceed 60°C, cords shall have LSF insulation and sheath. Use of proprietary brass stuffing glands is to be made in all cases where flexible cables are used.

**7.12 IDENTIFICATION, NOTICES AND DOCUMENTATION**

- a) Labels shall be provided to indicate the purpose of switchgear and control gear, unless there is no possibility of confusion. Labels shall be manufactured from traffolyte and be bolted to equipment, unless otherwise specified.
- b) Distribution board schedules and 'As fitted' drawings shall contain such information as is required to satisfy Clause 514-3 of the Regulations. In addition 'As fitted' drawings shall detail conduit runs giving sizes.
- c) Operation/maintenance manuals shall contain the following items:-
- i) Print of each 'As fitted' drawing.
  - ii) Circuit Chart for each Distribution Board.
  - iii) Test Chart for each Distribution Board.
  - iv) Emergency Lighting Test Certificate/Record Sheet. (Where self-contained luminaries are employed, one sheet will be required for each luminaire).
  - v) NICEIC/IEE Test Certificate.
  - vi) NICEIC/IEE Completion Certificate.
  - vii) A schedule of manufacturers along with catalogue numbers of all equipment used.
  - viii) Operation/Maintenance Instructions for all specialist equipment, provided in a hard backed ring binder or lever arch files, suitably labelled.
- d) The quantity of 'As fitted' drawings required and Operation/Maintenance manuals shall be as set out elsewhere in this Specification.  
Note: All of the above documents and labels should be available at the time of testing.
- e) Supply and fit such notices as may be required by Regulations 514-4 to 514-8 inclusive.



Cambridge

Replacement Cold Laboratory – Room 82A

**SPECIFICATION**

---

**8.0 FIRE ALARM**

The Contractor responsible for the design of the cold rooms shall employ a specialist fire alarm firm to provide a smoke detection system within the cold room and an aspirating smoke detection system within the ceiling void above the cold room. The system shall comply fully with the requirements of this document.

The detection system shall be interfaced onto the existing main building fire alarm system. The fire alarm specialist who is responsible for the main building system will provide an interface in a position to be agreed with the detection system contractor and this will be the connection point onto the main fire alarm system.

A power supply for the aspirating smoke detection system shall be provided by the Contractor.

**8.1 COMPLIANCE WITH RELEVANT STANDARDS**

The design, equipment and materials shall comply with the most recent issue and revisions of all relevant British Standards current at the time of Tender, and/or such other recognised standards.

The following are applicable standards: -

BS 5839	Fire Detection and Alarm Systems in Buildings (All Sections)
BS 5588	Fire Precautions in the Design and Construction of Buildings
BS 5445	Specification for Components of Automatic Fire Detection Systems
BS 3116	Automatic Fire Alarm Systems in Buildings
BS 6207	Mineral insulated cable.
BS 6266	Fire protection for electronic data processing installations.
BS 800	Specification for Radio Interference Limits and Measurements for Household Appliances, Portable Tools and Other Electrical Equipment causing Similar Types of Interference

**8.2 FIRE ALARM CIRCUITS**

Circuit Design – General

Detection circuits shall be capable of providing as a minimum requirement, monitoring of open and short circuits, together with monitoring of the removal of detector heads.

Circuits shall be arranged such that the removal of any detector does not impair the correct operation of any other detector or call point.



Cambridge

Replacement Cold Laboratory – Room 82A

**SPECIFICATION**

---

**8.3 ASPIRATING SMOKE DETECTION SYSTEM****General**

The Contractor shall supply and install an aspirating smoke detection (ASD) system to protect the ceiling void above the cold store as detailed on the outline drawings and specification.

**Control Units**

ABS detection tubing will be routed from each detector nozzle to detect smoke within the area. All ASD pipework shall be fully co-ordinated with all mechanical, electrical and specialist services.

ASD control units are to be located in the service void above the cold room.

ASD control units shall be fully monitored by means of a fail-safe common fault relay for all fault conditions including catastrophic failure.

The ASD control units shall provide programmable relay outputs to annunciate fire/fault conditions. Fire and common fault/detector isolators will be interfaced to the main fire alarm system via compatible addressable input interfaces provided by the main store Fire Alarm Sub-Contractor as part of the fire alarm system.

The Fire Alarm Sub-Contractor shall produce a system design for construction approval. The construction design process shall be in accordance with the latest Vesda system design manual. The pipework system shall be modelled using the current version of ASPIRE, to ensure correct system operation within the response time required by the BFPSA Code of Practice for Category 1 Aspirating Smoke Detection Systems.

A print-out of the ASPIRE calculations should be included with the drawings submitted for comment, prior to construction.

Each detector shall be protected by a 2 stage filter. The filter shall be monitored for efficiency and remaining lifetime.

**Pipework**

All pipework shall be monitored for abnormally high and low airflows (sampling point blockage/pipe breakage). Pipework shall be securely fixed using pipe clips and ABS solvent cement.

All pipework shall be fully coordinated with M&E services.

ABS solvent cement shall not be used to secure pipework to the detector manifold.

ABS detection tubing shall be coloured red and shall be indelibly marked 'ASPIRATING DETECTOR' at 2m intervals. Sampling points will be identified by appropriate labels.

In addition, each ABS detection tube shall be individually labelled to identify detector address and pipe number. Where ASD sampling pipework penetrates the cell wall, all penetrations shall be properly sealed with a solid

(Urethane foam) and/or flexible (mastic) material to ensure that the air tightness of the cell is maintained.



Cambridge

Replacement Cold Laboratory – Room 82A

**SPECIFICATION**

---

Surface soffit or wall mounted sample points shall be provided as per the design drawings. These sample points shall be mounted at each end of the detection tubing sampled via capillary tube. Each sampling point shall be identified with a suitable label detailing its detector address and pipe number.

The Fire Alarm Sub-Contractor shall provide an A4 suitably framed colour co-ordinated mimic diagram wall mounted below detector at 1800mm AFFL for each detector.

The A4 diagrams shall detail detection tubing emanating from its particular detector and shall be coloured accordingly.

- Pipe 1 - Red
- Pipe 2 - Yellow
- Pipe 3 - Blue
- Pipe 4 - Green

Each ASD control unit shall have full LPC/UL third party approvals. The detectors shall be supplied complete with status LED's only.

A single hand held programmer shall be provided by the Fire Alarm Sub-Contractor. Correct use of the programmer shall be demonstrated and then passed to the Employer at system handover.

The ASD systems shall be commissioned by competent fire alarm engineers who possess current accreditation certificates.

The ASD systems commissioning should follow the guidelines and standard forms found in the Manufacturers System Design Manual.

The smoke transport time from each test point shall be recorded in the O&M documentation.



## Cambridge

## Replacement Cold Laboratory – Room 82A

SPECIFICATION

---

**9.0 LIGHTING AND EMERGENCY LIGHTING**

The following clauses are concerned with the lighting and emergency lighting to be provided to all cold room areas.

All works will be undertaken by Sub-Contractors who work directly for the Cold Store Contractor. The installations within the cold store are to be suitable for operating in a temperature of minus 30°C continuously.

**9.1 GENERAL**

1. The Contractor shall supply, erect and connect all lighting luminaires complete with all glassware, diffusers, lamps, gasket seals, etc. Luminaires are to be selected suitable for the normal operating temperature within the cold room. The minimum IP rating for all luminaires within the Cold Lab shall be IP66.
2. All luminaires shall be installed in accordance with the individual lighting manufacturer's requirements. The Contractor shall where appropriate inform the manufacturer of various forms of suspended ceiling type to ensure that the correct type of seal, gaskets, flanges are provided.
3. All luminaires shall be supplied complete with lamps. All lamps shall be LED type with a colour temperature of 4000K. Note that a common manufacturer (Thorn Lighting) for all the lamps and luminaires on this scheme is required.
4. The Contractor shall supply and install all light switches and lighting control system as shown on the drawings. Switches shall be 20 amp rated grid switch type with in surface installation areas such as plant rooms and switch rooms surface metal clad switches shall be used. Where multi-gang switches are detailed with more than one phase present at the switch then suitable proprietary phase barriers and 'DANGER 400V' labels shall be fitted to maintain segregation. As the switches are outside the cold store neon indicators are required to indicate when the lights are on.
5. When installation in or below suspended ceiling areas luminaries shall be independently fixed from the soffit using 8mm diameter galvanised drop rods, such that the weight of the luminaires is not borne by the suspended ceiling grid.
6. The Contractor shall ensure that no luminaires, or switches, sensors etc. are damaged/spoiled by decoration, finishes or other trades etc. Any damage to the units shall be replaced at no cost to the employer such that the installation is new at the day of handover. The Contractor is thus advised not to install luminaires prior to decoration. The installation shall not be used for temporary/site lighting.
7. Luminaire details given in the Material Schedule Section of this Specification represent those that are of an acceptable quality in terms of their appearance, longevity, performance, and quality of construction.
8. In the cold store, lights shall be co-ordinated with major items of mechanical plant. However it is anticipated that these positions will require further adjustment both in height and location to ensure that the luminaires are ideally located for the pieces of equipment requiring maintenance.

**Cambridge****Replacement Cold Laboratory – Room 82A****SPECIFICATION**

---

9. The Contractor shall at time of tender ensure that the selected luminaire manufacturer control gear is fully compatible with the environment.

**9.2 SYSTEM OF WIRING**

The whole of the lighting installation within the cold room is to be undertaken using mineral insulated cable with an overall LSF cover (MICB). The installation is to be surface mounted with cable clipped to the surface using LSF covered metal cable clips.

Wiring for the cold store lighting shall be terminated within terminal box located external to the cold room and connections into the junction box shall be made by the Electrical Contractor responsible for the remainder of the electrical installation. One lighting circuit has been allocated for this purpose.

**9.3 LIGHTING REQUIREMENTS**

The lighting within the cold room should achieve a maintained luminance of 300 lux at 1 metre above finished floor level, taking into consideration the ambient temperature. All luminaires used within the cold room are to be suitable for operating in a temperature of -55°C and be manufactured to withstand the arduous environment. The Contractor will be required to produce lighting calculations demonstrating the performance of the proposed installation prior to commencement.

**9.4 EMERGENCY LIGHTING**

A complete emergency lighting system is to be provided to cover the cold room facility. Emergency lighting is to be achieved in all cases using surface mounted LED luminaires, which are to be selected for their location, i.e. IP rated for the storage areas, corridor optics where required to give a linear light distribution or symmetrical optics for 360° coverage.

The emergency lighting within the cold store shall be designed to comply with the requirements of BS 5266. The emergency luminaires selected are to be slave IP65 rated and are to have remote control gear boxes which are to be housed within the service void above the cold store.

Wiring for the emergency lighting system should also be terminated into an adaptable box from where the Main Electrical Contractor shall connect the emergency luminaires into the main building 240 volt central battery system.

A separate test sheet complying with BS 5266 will be provided for each luminaire. The test sheets shall bear the luminaire number and a description of its location. In addition to the individual test sheets, a Completion Certificate covering the complete emergency lighting system shall be issued confirming that all tests have been undertaken.



Cambridge

Replacement Cold Laboratory – Room 82A

**SPECIFICATION**

---

**10 COMMISSIONING TESTING AND DOCUMENTATION****10.1 COMMISSIONING**

Commissioning shall be undertaken to comply with the requirements Section 8 of the Institute of Refrigeration Code of Practice.

Additionally the Contractor shall allow to be in attendance during the commissioning of the cold rooms to rectify any problems that may be raised.

**10.2 OPERATING AND MAINTENANCE INSTRUCTIONS / DRAWINGS / AS FITTED DRAWINGS**

Prior to commencement on site the Refrigeration Contractor shall produce for approval drawings at a scale of 1:50 for general arrangement and 1:20 for plant rooms of his proposed installations. They shall also produce wiring diagrams for both power and control wiring. For approval they shall allow for supplying 6 copies of the drawing and for construction ten copies of the approved drawing. Drawings shall be available in AutoCAD 2004 (or later version) layered in accordance with the British Standard. Scanned drawings are not acceptable. They shall also produce builders work drawings for all their installations.

On completion of the contract, the Refrigeration Contractor shall supply three copies including CD of comprehensive operating maintenance manuals listing a schedule of all plant and equipment, the required maintenance of all installed equipment together with frequency of maintenance, a list of all appropriate spares, addresses and telephone numbers of all suppliers and all technical information of the plant installed.

**10.3 PROVISION OF DRAWINGS**

The Fire Alarm Specialist shall be employed to provide system wiring diagrams. Two copies of each drawing shall be forwarded to CPW for approval. Following approval, six copies of the drawings shall be issued for construction purposes via the Principal Contractor.

**10.4 INSTALLATION, OPERATION AND MAINTENANCE MANUALS**

The Fire Alarm Specialist shall be employed to prepare three copies of installation, operation and maintenance instructions which are to be forwarded to the Engineer one month prior to handover as outlined in the preliminaries.

Standard instruction sheets may be included for components and units, but sufficient other information must be incorporated as necessary to identify and permit full understanding of the characteristics and functions of the system as used for the particular application.

On approval of the paper copies, three copies shall also be provided on CD Rom and forwarded to the Engineer with the corrected paper copies.



Cambridge

Replacement Cold Laboratory – Room 82A

**SPECIFICATION**

---

**10.5 INSPECTION AND TESTING**

All equipment shall be tested and inspected and commissioned to demonstrate compliance with the relevant specifications and standards.

The Fire Alarm Specialist shall be employed to carry out a full functional test on site and to further demonstrate the same to the Employer, and the employer's representative, on a separate occasion.

Audibility tests shall be carried out during the testing of the system. The Fire Alarm Specialist shall carry out these tests using a suitable sound level meter. A copy of an up to date calibration certificate for the meter shall also be provided and handed to the Project Manager. In areas with mechanical handling plant audibility tests shall be carried out prior to the plant being put into operation and after all the plant is operational.

The Electrical Contractor shall ensure that all interfaces onto other systems and ancillary equipment is fully functional to meet stipulated requirements. Therefore, commissioning and testing needs to be co-ordinated with these systems.

The Fire Alarm Specialist shall issue an LPS1014 certificate stating that the system has been fully commissioned and is fully operational.

Once the Contractor is satisfied that the system is functioning correctly, the systems shall be offered for complete witness testing by the BAS Project Manager. At least 2 weeks notice shall be given of the intended dates for witness testing.

Witness testing shall include: -

- 1) Prove the operation of all installed devices, detectors, call points, ancillary equipment, and sounders using smoke generators for all zones.
- 2) Establish correct display and descriptor comes up on main control panel and repeater for each device, fault condition etc.
- 3) Simulate fault conditions, mains failure and all facilities and operations listed in the specification including the operations shown on the flow charts.
- 4) Audibility tests in all areas.
- 5) All interfaces onto ancillary systems functional and report correctly.
- 6) Any other tests to satisfy the requirements of BS 5839, including a continuity check/test of the detection loops, sounder circuits etc.
- 7) Provision and completion of the initial information in a Maintenance Logbook.

All devices must be tested 'in the field' and therefore proprietary detector actuating sprays and methods of activating heat detectors shall be utilised.

The Fire Alarm Specialist shall be in attendance during all witness tests

**10.6 SPECIAL TOOLS**

The Contractor shall supply any special tools required for operation and testing of the system in sufficient quantity.



**Cambridge**

**Replacement Cold Laboratory – Room 82A**

**SPECIFICATION**

---

The Contractor shall also provide a full schedule of devices with suggested labelling to the Employer/Contract Administrator at an early stage for comment.

DRAFT



Cambridge

Replacement Cold Laboratory – Room 82A

**SPECIFICATION**

---

**11 LABORATORY FURNITURE:****11.1 DESIGN AND INSTALLATION**

To BS EN 14056. Worktop to BS EN 13150.

Specialist Manufacturer: Lab Systems Furniture Ltd, Rotary House, Bontoft Avenue, Kingston upon Hull, HU5 4HF. 01482 444 650.

Product reference: 'Laboratory Worktop' range of 25mm thick Velstone.

**11.2 DRAWINGS**

Refer to drawing no. BAS/M/C018/01 – Plan of Proposed Works for details of work benches and positions of equipment

**11.3 DIMENSIONS**

Dimensions are to be based on design intent layouts, but are to be determined by the specialist supplier during the design development.

**11.4 WORKTOPS**

To be purpose made (not modular) to site dimensions of new cold room around 3 sides of room.

To be manufactured from the 'Laboratory Worktop' range of 25mm thick Velstone™ with rear and wall up stands having a 40mm x 13mm strip of Velstone bonded with cement forming an integral up stand.

All joints to be welded on site with liquid Cement. Tops to be continuous except for areas as detailed on the drawings Joints to be minimised based on commercially available manufactured sheet sizes. Exposed end edges to be finished to match exposed front edges. Tops to be supported at wall with a 50mm solid grade laminate section of self-colour wall plate, plugged and screwed to the wall.

Colour: White.

**11.5 BENCH LEG FRAMES**

'A' Type Leg Frames, To be fabricated from 38mm x 38mm x 18swg, 316 quality stainless steel tube leg with top and bottom cross rail fabricated from 50mm x 25mm x 18swg, stainless steel tube.

All joints to be tig welded, dressed off flush, acid cleaned and brush polished.

Cambridge

Replacement Cold Laboratory – Room 82A

**SPECIFICATION**

---

**11.6 ACCESSORIES/OTHER REQUIREMENTS**

Design of worktop to incorporate installation of Client's existing equipment (band saw, cross cut saw and CFA melt head), some of which will require integrating into the bench top with cut-outs for blades as required.

Shelves shall be provided as indicated on the drawing, minimum shelf depth shall be 350mm, shelves shall be fabricated from the same material as the worktop with side and rear up stands as previously detailed.

Design and layout (and in particular the integration of Client equipment) is to be developed with the BAS prior to finalising.

DRAFT