Construction Services

Energy Management Systems Control Panel Construction

Version 1.0

Resources Directorate
1. **Preamble**


2. **Regulations**

The installation shall be designed, installed, tested and commissioned in accordance with:

- The Health and safety at Work Act etc 1974
- The Building Regulations Part L (2010 Edition)
- The Electricity at Work Regulations 1989
- The Electricity Safety, Quality and Continuity Regulations 2009
- Construction (Design and Management) Regulations 2007
- Control of Substances Hazardous to Health 2002 – COSHH
- The Control of Asbestos Regulations 2006 including future amendments and editions

The above shall not be seen as definite list of relevant standards and regulations and, unless stated otherwise, the whole of the works shall comply with the requirements of all relevant British Standards and European Harmonised standards and documents pertinent to the works.

Relevant Standards and Regulations shall be those that are in force three months prior to the return of tender or commencement of work unless stated otherwise in the particular specification documents.

3. **Definitions**

For the purpose of this document, terms and definitions shall be as those of the most recent edition of BS 7671 2008(2011).

4. **British Standards**

Where a British Standard or Code of Practice issued by the British Standards Institute is current, three months prior to the date of tender and appropriate to the case, the contract shall require that goods, materials and works shall be in conformity.

5. **General Operating Conditions**

This specification is written as the definitive requirement of the methods of control panel manufacture. However, there may be occasions when a
variation to the contract will be required because of site specific issues and these will need to be agreed with the Project Manager (who will consult with the relevant Cornwall Council Officer(s)).

Cornwall Council’s requirements and standards for equipment and wiring within the control panel will apply for all projects.

6. Control Panel Construction

All controls, indicator lamps and instruments shall be grouped and mounted together in a floor or wall-mounted panel.

The control panel shall be constructed within a suitably sized powder coated steel enclosure. The enclosure shall incorporate removable gland plates at both top and bottom.

The control panel shall be constructed to give a protection rating of not less than IP55 in accordance with BSEN 60529:1992 and shall be so constructed as to prevent the ready ingress of dust. The joints of plates and doors shall be suitably packed, using neoprene or equal (not rubber).

Design development of the room within which the control panel is located shall be such as to eliminate the need for mechanical ventilation. In some rare cases, mechanical ventilation shall be provided where it is likely that the operating temperature within the panel will be greater than those limits set by the equipment manufacturer. The ventilation system shall maintain the panel temperature to within the manufacturers limits regardless of the panel environment.

Panels shall be supplied with hinged and lockable access doors at the front of the panel. Two keys shall be provided which shall be common to all locks on all panels.

All equipment within the enclosure shall be mounted on a removable back plate such that if required, the complete system can be removed from the enclosure to aid installation.

Access doors or covers shall be so arranged that access cannot be made until an isolating device, interlocking with each door or cover, is opened and all equipment accessible through that door or cover is isolated. A purpose made device or suitable isolator shall be provided to enable a competent engineer to override the interlock when the door has been opened.

Panels secured to the floor shall be provided with metal plinths of a suitable size and strength i.e. ‘Unistrut’ or equivalent. This plinth must be earthed in accordance with BS7671 2008(2011) and BS 7430 1998. Where mounting is on raised builders work bases, metal plinths are not required, but in all cases fixing holes and detachable lifting eyes shall be provided.
Control panels shall be manufactured, equipped, wired and tested before delivery to site. Test certificates will be supplied to the Project Manager for inspection.

Indicating lamps, instruments and controls shall be from the same manufacturer and of the same style to provide uniformity of appearance and to facilitate maintenance. Externally visible equipment shall be flush mounted, with minimum projection and fixed securely to the front panel. Internal equipment shall be secured to the back plate using a suitable DIN type rail. Fixings shall incorporate shake-proof washers or other vibration resistant fastenings.

Where flexible looms are used to connect door mounted to interior-mounted components the panel manufacturer must ensure that wires will not weaken or break with repeated door openings. The loom must be arranged to avoid pinching or looping when the door is closed and it is fully supported at each end.

All terminations must be fully shrouded, recessed or otherwise protected against accidental contact.

Sufficient spare capacity in cable ways and trunking must be provided to comply with BS 7671 2008(2011).

The control panel shall be designed and built to comply with the details given by the Project Mechanical and Electrical Designer and the project documentation supplied.

The Control Specialist shall supply working drawings and fully numbered interconnection diagrams to enable an electrical contractor to make all connections between the control panel, plant and sensors.

This shall be deemed to include all valves, pumps, sensors, remote relays and all other forms of ancillary equipment associated with the controls package.

The Electrical Contractor shall be responsible for all connections external to the control panel and for this reason, the panel shall be constructed such that all connections for both low voltage mains wiring and extra low voltage control, monitoring and data and monitoring wiring are made to a single DIN rail terminal strip located at the top or the bottom of the enclosure.

The DIN rail terminal strip shall be arranged such that low voltage mains wiring and extra low voltage control, monitoring and data connections are segregated and suitably labelled. Mains voltage and low voltage cables must be segregated by a fixed barrier in accordance with IEE Regulations.

All terminals shall be numbered using appropriate slip on numbers, in accordance with the panel wiring diagram. A label shall be fitted inside each control panel, adjacent to the main isolator indicating:-
Supply voltage
Control voltage
Current rating
Date of manufacture

After installation the electrical contractor shall ensure that all swarf, dust and cable debris is removed from the panel. Particular care shall be exercised when working around the Building Management System (BMS). The electrical contractor shall be responsible for any damage resulting from this cleaning.

7. Control equipment

The Building Management System (BMS) control equipment shall be from the Allen-Martin, Priva or Schneider range of controllers unless specified otherwise by Cornwall Council.

The BMS controller shall be contained within the control panel. It shall be fed from a 5A rated un-switched spur taken from the live side of the incoming isolator such that the supply to the controller is not isolated when the panel supply is switched off.

A durable yellow notice with black text to this affect shall be located adjacent to the isolator. This label shall be engraved traffolyte type to BS7671 2008(2011) and affixed with mechanical fixings, not adhesive.

A plant maintenance override key switch shall be provided within the control panel to allow all plant to run under the dictate of a competent engineer.

A single data socket shall be located within the panel for connection to the building intranet system.

A single socket outlet shall be fitted within the panel for the connection of a power supply for dialup modem communications when used.

A space shall be provided within the control panel for the subsequent mounting of a suitable power supply and modem unit. Both shall be fixed via proprietary mechanical fixings.

No interface whatsoever shall be made with the BMS module. All connections shall be via the incoming terminal strip.

All wiring within the control panel shall be identified at each end with a number unique to that cable. Numbers shall only change due to a control device.

All wiring within the control panel shall be terminated using ferrule type crimp lugs constructed in accordance with the manufacturer’s instructions.

All panel wiring shall be single core, flexible plain annealed copper conductor, heat resistant PVC insulation. Panel wire to BS6231 2006 Type CK and UL/CSA approved. 600/1000 volts grade
Wiring within the control panel shall be contained within slotted trunking with close fitting lids.

Internal wiring shall be colour coded to BS7671 2008(2011) for LV cables.
ELV cables shall be coloured as follows:
- 24V a.c. White
- 24v (0V) Black
- 15V + ve Orange
- 15V –ve Grey
- Analogue input Purple
- Analogue output Brown with marker
- Digital output Brown
- Digital input Pink

Type C M9 to BS 60898 MCB’s shall be used for all motor circuits.

All protective devices shall be so sized and co-ordinated that they provide shock and overload protection to BS7671 2008(2011).

Contactors shall be DIN rail mounted. Overload protection is required for all circuits. The full load current of all circuits shall be recorded on the as fitted drawings and established to provide the correct setting of the overcurrent element.

Relays shall be DIN rail mounted.

Panel indicator lights shall be of the high output LED type. All indicator lamps shall be coloured for their mode according to BS EN 60073:2002, IEC 60073:2002.

- Running Green
- Tripped Red
- Healthy White
- Fault Red
- Warning Orange/Amber
- Abnormal Blue

Switches shall be from the Telemechanique range such that they match the selected indicators.

Volt Free Contacts (v.f.c.) shall be provided for all items of plant to enable alarm/status signal to be sent to the BMS.
The Control Panel shall be fitted with a key operated (tumbler type) maintenance override switch. The switch shall be fitted on the front of the panel. Operating the switch shall run all plant and open all valves and solenoids.

A red indicator lamp shall be fitted adjacent to the override switch and shall be illuminated when the switch is operated.
The switch shall be labelled “Plant maintenance override ON/OFF”
The indicator shall be labelled “Override ON”

8. **Pressure switches**

Two pressure switches shall be fitted on the cold feed to the system; these shall be the high and low limit switches. The set points shall be agreed with the Project Manager (who will consult with relevant Cornwall Council Officer(s)) at the commissioning stage.

Activation of either of these pressure switches shall cause the plant to be shut down immediately and display a “Pressure Fault” on the main control panel. The control specialist shall also allow for the provision of “closed when healthy” signal to open under these fault conditions and initiate a fault alarm on the BMS. The fault condition will latch and will require local or remote manual resetting.

9. **Commissioning**

The Principal Contractor is to allow reasonable time within the main programme for all testing and commissioning of the control panel to suit the programme of works.

This is to include inspecting, testing and commissioning of all works by any sub Contractors and specialist Contractors works arranged by the Principal Contractor.

Commissioning shall mean the advancement of the systems from static completion to working order, to the specification, and relevant works to achieve compliance with Part L of the Building Regulations and functionality to the complete satisfaction of Cornwall Council’s approved representative(s).

All shall be conducted without prejudice to the need to comply with all Health and Safety requirements.

Commissioning works shall include, but not be limited to, the following.

- Demonstrate the correct operation of all items of equipment within the control panel such as relays, contactors and circuit breakers
- Demonstrate that sensors, actuators, pumps and boilers etc are correctly connected and addressed
- Demonstrate the correct operation of control panel shut down in the event of a fire alarm or pressure abnormality
- Demonstrate the correct operation of all alarm fault relays
- Demonstrate the correct operation of all control panel function switches and indicator lamps
- Demonstrate the correct procedures for fault finding and reporting in the event of mechanical or electrical faults within the control panel.
The Controls Specialist contractor shall appoint an engineer to commission the complete system. The Controls Specialist shall give 48 hours notice to the relevant Cornwall Council Officer(s) so that the whole or part of the process shall be witnessed and accepted.

As fitted control panel drawings shall be supplied immediately upon completion of the project.

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