

BMS POINTS LIST
AND
SPECIFICATION
FOR
CARRICK-ON-SHANNON
COMMUNITY SCHOOL
AT
CO LEITRIM

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Building Management System (BMS)

General

A Building Management System (BMS) as indicated on the points schedule in the equipment schedules. Document and described hereafter. The BMS shall be linked to a front-end display on a client PC and hosted on the clients' servers for remote access. Contractor to ensure sufficient networking points are provided within the plantroom to enable connection to PC in Client preferred location. The contractor shall be responsible for full supply and installation of BMS system including:

- BMS Control Panel, complete with power supplies
- Supply & installation of field equipment
- Commissioning of system

Details of BMS Provision

- Compile panel drawings, a strategy overview & handover documentation.
- Provide schedules & support documentation.
- Program BMS graphics on Front End PC provided by Contractor.
- Conduct rotational & operational checks.
- Commission system as per specification.
- Demonstrate new system to client.

The mechanical contractor shall be responsible for generating the points list and going to market to obtain prices. The system shall be an open protocol-based system.

All monitoring should include for a 3-year warranty period / contract as part of the tender. All proposed equipment shall be open protocol.

Hardware

This list is to be checked in line with the Mechanical schematics and Equipment Schedule to ensure all points are included.

Provide 1 No MCC.01 Plantroom BMS Control Panel (Form 2) containing the following:

- BMS Controllers
- HOA selector switches & Run/Trip indications.
- Panel terminals, indicator lamps, relays, and ancillaries
- Power supplies
- Pump starters
- Provide 1 No. Front End PC c/w Software Licence.

BMS supplier to provide the following meters.

- 125mm Heat Meter (heat pumps)
- 80mm Heat Meter (boilers)
- Electrical Meter (mechanical services).

Field Instrumentation to be provided as detailed on Schematics and Schedule.

Responsibilities of contractors

Item No.	Details	Responsibility
01	Supply Equipment / Panels / Instruments / System	Mech. Contractor
02	Mounting of Panels	Elec. Contractor

03	Fitting of sensors / equipment in pipework & ductwork	Mech. Contractor
04	Fitting room mounted controllers / devices	Elec. Contractor
05	Controls / BMS containment & wiring throughout	Elec. Contractor
06	Present & Dress cables in panel	Elec. Contractor
07	Terminate in Panels	Elec. Contractor
08	Test & terminate in 'Field'	Elec. Contractor
09	Verification of Terminations & commission of System	Mech. Contractor
10	Assist Commissioning / attendance	Elec. Contractor

Panels & Commissioning all to form part of the Mechanical Contract

The electrical contractor shall be responsible for the complete electrical containment and control wiring installation.

An early coordination meeting is to be arranged between the M&E contractors, Development Management, and the onsite Controls maintenance contractor to agree works requirement and coordination of BMS and controls installation into the overall system.

Front End

The main menu will provide a clear graphical overview of the relevant equipment and show floor plans and site layouts to outline their operation and location.

The front-end graphics must represent all plant accurately and be easy for the end user to understand.

Selecting the plant room from the main menu displays the systems complete with the live values of temperatures and plant conditions.

All time schedules and set points outlined in the BMS Points list will be shown on the front end.

The BMS shall be capable of being remotely monitored by the BMS Company.

The BMS Control Panel & Front End shall be designed to control and feedback the parameters outlined on the accompanying Points List Document. An overview of each system control strategy is provided as follows.

Heat recovery units

All heat recovery units will be enabled on/off via a time schedule. Each unit to be daisy chained together for common time scheduling, unit controller to determine unit speed local to the space based on CO₂ concentration.

Heating System

Central Heating is provided by gas fired boilers. The control and set points of this must be programmable from the BMS Front End.

The system will be weather compensated. The flow temperature will vary depending on the outside conditions. The BMS will have set points so the compensated slope can be adjusted to suit the buildings requirement. The radiator circuit will also have eco hold off set point on the front-end computer which will hold off the radiators off if the outside air temperature is above the set point on the BMS. Heat metering is to be provided to record and monitor heat energy used by each circuit.

The BMS system shall be capable of communicating with the Boilers via Modbus and receive alarms and faults complete with associated codes.

The system shall have the capability of recording, controlling, and scheduling heating operation as outlined in the BMS Points List.

Readings will be logged on a 15min basis with minimum storage of 1,000 logs and archived monthly to a remote spreadsheet.

Domestic Hot Water

The domestic hot water generation is via the dedicated hot water heater. Similar to the Heating System, the set points at which each system carries out this function shall be programmable from the front end.

The Secondary Return shall modulate to provide the required DHW return temperature of 55°C. DHW temperature will be monitored via an immersion sensor in the cylinder and controlled by a setpoint input from the BMS. A hard-wired high-limit thermostat will shut down the water heater if the set temperature is exceeded. The BMS shall monitor and record the DHW return temperatures via an immersion sensor. The system shall have the capability of recording, controlling, and scheduling operation as outlined in the BMS Points List.

Readings will be logged on a 60min basis with minimum storage of 1,000 logs and archived monthly to a remote spreadsheet.

Cold Water Services

The cold-water booster set shall have its own on-board controls. The BMS system shall be capable of communicating with the pump control panel via Modbus and receive alarms and faults complete with associated codes. The system shall have the capability of recording, controlling, and scheduling the pump operation as outlined in the BMS Points List.

The cold-water tank temperature shall be recorded. Readings will be logged on a 30min basis with minimum storage of 1,000 logs and archived monthly to a remote spreadsheet. A warning shall be provided should the water tank temperature exceed 18°C.

A warning shall be proved to the panel and front end should the water tank level go past the set low and high limit level.

Pressurisation Unit

The pressurisation Unit shall be linked to BMS and provide a signal of parameters as outlined in BMS Points List.

Water Softener

The water softener shall be linked to BMS and provide a signal of parameters as outlined in BMS Points List.

Frost protection

The two-stage frost protection shall activate circulating pumps at outside air temperatures $\leq 2^{\circ}\text{C}$ and fire heating system when the return temperatures $\leq 5^{\circ}\text{C}$ and switch off at 15°C .

The frost protection system shall be independent of the optimisation control. All times and set points are adjustable via the front-end computer.

Fire alarm interface

A signal from a fire alarm interface shall shut down the panel when the fire alarm activates. The panel shall be automatically re-set when alarm is de-activated.

Distribution Boards

All distribution boards will include a smart meter linked back to BMS for energy monitoring. Lighting, Power & Mechanical plant electrical usage are to be monitored with individual meters. All electrical sub-meters shall be readable from the BMS and will record instantaneous kW, kilowatt hours, kVARh, kVA, voltage, and current.

Water & Heat Meters

The contractor shall provide meters as scheduled to be monitored by the BMS. Readings will be logged on an hourly basis with minimum storage of 1,000 logs and archived monthly to a remote spreadsheet. The Water Meters should be capable of sounding an alarm when usage is outside of expected limits as a leak detection measure.

Photovoltaics

A photovoltaic system shall be installed during the Phase 2 works. Provision should be made within the BMS to intelligently control the heat pumps to maximise the use of photovoltaics.

Control Panels & field devices

The Mechanical Contractor shall be responsible for the supply and commissioning of control panels and control equipment as per the Control Panel Schedule of Equipment.

The control equipment supplied shall be CE marked to show conformance with Low Voltage Directives and a 'Certificate of Conformity' to show compliance with EMC directives.

The various control valves installed by the mechanical contractor.

The control and sensor locations shall be coordinated with the electrical control wiring installation.

With regard to commissioning the controls manufacturer shall allow for 10 No number visits to site to commission, demonstrate and carry out periodic inspections of the equipment as directed by the supervising engineer / Development Management. This shall include revisiting the site post-handover in order to further optimise the control strategy at 1 month, 3 months, 6 months, and 12 months (prior to end of defects). At each time, the client shall be present to address any operational concerns and explaining the system operation.

All control panels shall have at least 20% spare (equipped) and 25% spare (unequipped) capacity, at handover.

Contactors shall be DIN rail mounting and shall have an AC 23 duty rating in accordance with EN 60947-4.

Each motor starter shall be complete with MCB, contactor and thermal overload, selected to provide Type 2 co-ordination.

Each motor starter control circuit shall be complete with "run and trip" indicator lights and a "hand – off - auto" switch.

Each duty / standby control circuit shall also be complete with a 1 / 11 duty select switch.

Indicator lights shall be multicellular LED type and shall be provided for panel live, Run & Trip status of all motors, Heat pump lock out.

The mechanical contractor shall be responsible for all co-ordination, holding of meetings and planning with the electrical contractor in relation to the control's installation.

Plant may be Single or Three Phase.

The contractor shall ensure that the manufacturer's representative is present while all tests to the new installation are being carried out to ensure the equipment is not damaged.

External Lighting

All external lighting will be enabled on/off via a time schedule.

Manufacturer

The BMS system shall be a Cylon Control system installed and commissioned by a Cylon approved agent / installer.

Contractor to confirm to client prior to commence of works the following:

- Emergency call number
- Insurance cover for public liability, product liability, and goods in transport
- Technical team at hand to answer any queries.
- Switchboard systems build accreditation.
- Dedicated vehicle suitable for delivering Control Panels
- Traceable build procedure for accountability purposes
- Rigorous testing procedure
- Test certificates issued with every control panel
- Proven track record with at least 10 years' experience

The electrical contractor shall confirm the name of the specialist controls company at tender stage along with a company profile and preliminary controls strategy for review.

It is this mechanical contractor's responsibility to provide specialist working drawings, health & safety documents and method statement relating to this installation.

The overall time clock and frost protection shall be supplied and wired under the Electrical Contract. The Contractor shall allow for fitting all control valves and sensors as handed over by BMS specialist.

Good Installation Practice

To ensure that the effects of EMI are minimal it is important that the correct installation practices are observed.

The following screened cables shall be used for communication, sensor, and valve wiring:

COMMS CABLE	VDE Li – YCYP 2 X 0.75mm ² (1 X TWISTED PAIR)
SENSOR CABLE	VDE Li – YCYP 2 X 0.75mm ² (1 X TWISTED PAIR)
VALVE CABLE	VDE Li – YCYP 4 X 0.75mm ² (2 X TWISTED PAIR)

To provide effective suppression against emission of high frequency radio noise both ends of the screen must generally be connected to earth. It is important that the contact between the screen and the earth/chassis terminal is good. Pro-term spring clamp IP68 gland or equivalent shall be utilised.



Pro-term Spring Clamp IP68 Glands

Control wire connections, particularly those supplying analogue speed reference signals should be in screened cable. To prevent hum loops, the screen should only be earthed at one end and the cable itself should not be laid in the same ductwork or trunking as electrical power cables.

The screen should always be earthed at the drive end; it should be taken to a fixing stirrup which is connected to the main chassis. The screen should not be taken to a terminal. This eliminates the need to have a screen "pigtail." In general, all conductors from a screened control cable should be kept as short as possible, long conductor ends will function as an aerial and collect noise signals.

Noise is often coupled onto sensitive control wires via noisy cabling such as mains or motor cables. This can be reduced by separating parallel cable runs by at least 0.25 m. This rule applies for cable runs typically under 10 m. For cable runs over 10 m then separation should be increased in proportion, e.g., if the cable run is 30 m separation would be $(30/10) \times 0.25 \text{ m} = 0.75 \text{ m}$.

If control cables need to pass noisy cables, then they should pass at 90 degrees. If it is impractical to screen the noisy cable effectively it is relatively easy to increase the immunity of the control cables.

- Using a twisted pair, (this will reduce the effective magnetic coupling area)
- Using screened cables, (the screen will couple any induced noise to earth)
- Using a twisted and screened pair to offer the best of both worlds

It is this electrical contractor's responsibility to provide specialist working drawings, health & safety documents and method statement relating to this installation.

Points List

1.0 - BMS CONTROL POINTS SCHEDULE				PROJECT: Carrick-On-Shannon, Co Leitrim			
				JOB No. 2860			
				SIG: NP CHECKED: KF			
Point Description	Software Points	Inputs		Outputs		Pulse	Outline Control Strategy
		AI	DI	AO	DO		
General							
Fire Alarm			1				
Lighting Meters (Ref to electrical)			2				
Power Meters (Ref to electrical)			2				
Mechanical Power (Ref to electrical)			2				
Electrical Meters (Ref to electrical)			2				
Gas Fired Boiler 01							
Power							
Enable					1		
Fault			1				
Data/Modbus Interfere	20						
Cascade Control W/ Data/Modbus	20						
Gas Fired Boiler 02							
Power							
Enable					1		
Fault			1				
Data/Modbus Interfere	20						
Gas Fired Water Heater 01							
Power							
Enable					1		
Fault			1				
Primary Flow Temperature Sensor		1					
Incoming Flow Temperature Sensor		1					
High Level Temperature Sensor		1					
Low Level Temperature Sensor		1					
Data/Modbus Interfere	20						
LTHW Pipework							
Primary Flow Temperature			2				
Return Flow Temperature			2				
3 Port Control Valve			4		4		
Pressure Sensor		3					
Gas Services							
Gas Alarm					1		
GNI Gas Meter			1				
Plantroom Gas Meter			1				
Classroom Gas Meter			1				

1.0 - BMS CONTROL POINTS SCHEDULE				PROJECT: Carrick-On-Shannon, Co Leitrim			
				JOB No. 2860			
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Point Description	Software Points	Inputs		Outputs		Pulse	Outline Control Strategy
		AI	DI	AO	DO		
Hot Water Secondary Return Pump							
Power							
Enable					1		
Fault			1				
Flow Temperature Sensor				1			
High Limit Stat			1				
LTHW Header							
Main Primary Flow Temperature Sensor				1			
Main Return Flow Temperature Sensor				1			
Branch Primary Flow Temperature Sensor				2			
Branch Return Flow Temperature Sensor				2			
Immersion Frost Stat			1				
Future Branch Primary Flow Temperature Sensor				1			
Future Branch Return Flow Temperature Sensor				1			
Future 3 Port Control Valve		1		1			
Future Pump Power							
Future Pump Enable				1			
Future Pump Fault		1					
Pressurisation Unit							
Power							
Fault			1				
Low Pressure Alarm			1				
High Pressure Alarm			1				
Cold Water Storage Tank							
Tank Temperature Sensor		1					
Low Level Alarm			1				
High Level Alarm			1				
Room Temperature Sensor		1					
Motorised Louver Dampers				2			
Fault			1				
Meters							
Incoming Water Meter			1				
Pressurisation Unit Water Meter			1				
Pump Power Meter			3				
Total Extension Power Meter			1				
Boiler Heat Meter			1				
Gas Fire Water Heater Meter			1				
Photovoltaic Meter			1				
EV Charging Meter			1				

1.0 - BMS CONTROL POINTS SCHEDULE				PROJECT: Carrick-On-Shannon, Co Leitrim			
				JOB No. 2860			
				SIG: NP CHECKED: KF			
Point Description	Software Points	Inputs		Outputs		Pulse	Outline Control Strategy
		AI	DI	AO	DO		
MVHR							
Enable					14		
Fault			14				
H.E. Room Extract							
Power							
Enable					1		
Fault			1				
Data Interface	20						
Sub Totals	100	11	57	26	24		
Total	100	116					
Grand Total (+20%)		142					