



PROJECT

HILLBROOK - BMS

DOCUMENT

SPECIFICATION

SITE ADDRESS

**42 HURDCOTTE STREET
ENOGGERA 4051**

CLIENT

**HILLBROOK
42 HURDCOTTE STREET
ENOGGERA 4051**

DESCRIPTION

**REVISION: A
DATE: 29 MAY 2020**

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REVISION SCHEDULE	
REVISION	PARAGRAPH/S CHANGED
Rev A	Original revision

Post the original revision the most recent changes are in italic and bold as per this note.

1.0 EXTENT OF WORKS

1.1 SCOPE

The School consists of a newly built Niagara 4 BMCS system controlling the mechanical plant and lighting in the Administration Building and D Block. Given the complexity of licencing arrangement with the Niagara 4 BMCS system the intention is to replace it with a new more open building management system (BMS) maintaining the majority of the hardware provided as part of the Niagara 4 BMCS system.

The new BMS is to also include control and monitoring of the following:

- Block B air-conditioning.
- Block E air-conditioning.
- Block F air-conditioning.
- Block G mechanical services as is currently under construction.
- Block G lighting as is currently under construction.
- Block G DALI Buses inputs as is currently under construction.
- REC air-conditioning as is currently under construction.
- REC mechanical services as is currently under construction.
- REC lighting as is currently under construction.
- REC DALI Bus inputs as is currently under construction.
- PAC air-conditioning.
- PAC Philips Dynalite lighting control system.
- En-trak metering system in the MSB as is currently under construction.
- En-trak metering system in MDB as is currently under construction.
- En-trak metering system in DB-PAC as is currently under construction.
- En-trak metering system in DB-G as is currently under construction.
- En-trak metering system in DB-R as is currently under construction.
- Planet Arc solar metering.
- Weather station

The long-term aim is to expand the BMS to manage all aspects of the School's energy consumption over an already embedded IP network.

The BMS will be further expanded as part of separate future contracts to the remaining areas of the School as the remaining areas are renovated or when approved / requested by the School.

Configure the BMS such that it is web based and can provide functionality from any computer connected to the network or network via a standard web browser. Ensure the system provides the ability to manage the system on a day to day basis, view graphics, set up trend logs, change set points and time schedules, and view and acknowledge alarms. Set up the BMS such that it is reconfigurable from either a standard web browser anywhere on the network, or via engineering software loaded onto the site server PC with enhanced password protection protocol.

Undertake investigation into the existing arrangements on all buildings included within the BMS works to determine locations of the existing controllers, plant, switchboards and available IP network points locations. Provide all necessary CAT 6 Ethernet cabling as required to the existing communications rack within each respective building. Provide all necessary low voltage and 240-volt cabling / power supplies as required to facilitate the operation of all components supplied as part of the BMS works.

Fully commissioning and update the BMS and its graphical user interfaces at the following times to the satisfaction of the superintendent:

- Practical Completion.
- One month post Practical Completion.
- Six months post Practical Completion.
- One year post Practical Completion.

All points in the controllers and in the user, interfaces are to be provided with non-technical names that a person familiar with the layout of the school will immediately recognise. All rooms are to be named via the room number which is found above the main entry door. An example of such a name is Room D1-6 Air-conditioning. Submit a schedule of the proposed names of all input and output points for approval.

Name all points such that when displayed via a BACnet Discovery device list, the name of each point is non-technical such that a person familiar with the layout of the school will immediately recognise the point.

Master controllers with distributed IO are not acceptable. RS485 and RS495 networks between switchboards, distribution boards or control panels are not acceptable.

BACnet MSTP or Modbus RTU protocols must only be used for connection to equipment located within the same switchboard, distribution board or control panel which houses the BMS controller and must be only used to provide direct high-level interface data.

At the end of the defects liability period the BMS supplier must provide all administration level passwords to the school and provide a sufficient training to the end user and their representatives in all aspects of the software including but not limited to, programming controllers, adding and editing graphic pages, creating and modifying alarms and creating histories.

Undertake a demand study and implement the agreed outcomes.

The BMS contract includes but is not limited to the following:

- Supply and installation of all components forming part of the BMS.
- Attendance at a handover meeting.
- Demand study.
- Co-ordination.
- Approvals.
- Shop drawings.
- Work-as-executed drawings.
- Inspections.
- Testing and commissioning.
- Maintenance.
- Software.
- Licences.
- Programming.
- Manuals.
- Training.
- Cabling, cable support systems and access.
- DALI bus interfaces.
- Metering interfaces / data extraction.
- Quality assurance.
- Cat 6 communications cabling.
- 240-volt power supplies including cabling.
- All minor components and incidental works not specifically referred to, however necessary to complete the BMS installation such that it is handed over complete, operational and fit for the intended use.

With the tender response provide a copy of the Contractor's licence. Include a copy of all of the above licences in the Operations and Maintenance Manual.

Accept full responsibility for liaising, arranging and co-ordination all works that have an effect on or will be affected by the BMS.

Should the Contractor not provide the information required to be submitted by this specification within two weeks of being requested to do so or as agreed to in writing, the Contractor is to agree to a variation credit of \$2,000.00 to the contract in lieu of the provision of such information.

Should the Contractor not provide the Work-As-Executed drawings within two weeks of practical completion or as agreed to in writing, the Contractor is to agree to a variation credit of \$2,000.00 to the contract in lieu of the provision of the Work-As-Executed drawings.

Should the Contractor not provide the Operations and Maintenance Manual within two weeks of practical completion or as agreed to in writing, the Contractor is to agree to a variation credit of \$5,000.00 to the contract in lieu of the provision of the Operations and Maintenance Manual.

Supply a full set of licenced software including programming, monitoring, alarm management, history management and reporting, graphical head end software including all software required to create and edit pages. Include all costs to provide software upgrades and patches for the lifecycle of the system regardless of whether they are engaged by the School in a maintenance capacity. At the end of the defects warranty period provide all administration level passwords to the School. All tenderers are required to provide a binding deed of agreement to confirm compliance with these requirements. Submissions that do not comply will be excluded from the tender.

1.2 CONTRACT DRAWING

The BMS drawing C2208a-BMS01(A).dwg for the building locations of the works associated with the BMS contract.

1.3 SITE CONDITIONS

As part of the tender, the tenderer is required to familiarise themselves with all site conditions and allow for such conditions within the tender. Changes or additions due to site conditions or requirements which could have been established during a tender period site inspection will not be accepted as the basis of a cost variation.

1.4 CORROSION AND UV PROTECTION

Ensure that all metal surfaces are suitably protected against corrosion, and that all plastic materials are UV stabilised. Repair to new condition or replace any components showing any signs of corrosion during the defect's liability period.

Ensure that all metal surfaces are suitably protected against corrosion likely to be experienced during the life of the installation. Cover all electrical terminations including terminal screws and exposed raw metal including exposed conductors with clear synthetic resin based insulating enamel before fixing the terminal covers in place. Provide all fixings exposed to the weather and those in potentially corrosive environments as stainless steel. Do not use materials that will react with or cause galvanic reactions with adjacent materials or surfaces.

Use only plastic materials, paints, insulation materials and coatings that are UV stabilised and will not break down with the normal exposure to ultra violet radiation during the life of the installation. Provide written evidence for approval that all such materials are UV stabilised. Do not install PVC in locations it will be exposed to direct sunlight.

1.5 WORKMANSHIP

Ensure that the work is performed by the holder of a current ACMA license. Provide a copy of the license before commencing work onsite and include a copy in the Operations and Maintenance Manual.

Ensure the installation and all components, fixtures, fittings, outlets and cables are supplied and installed to a high standard throughout, and installed in a neat and tradesman like manner, to the current industry standards. Ensure all materials and components of a similar type are of the same manufacturer and installed in a uniform manner.

It is the Contractor's responsibility to ensure that the installation is fit for purpose and is provided as a complete working installation. It is the Contractor's responsibility to provide all components, fittings, fixtures, systems, programming etc irrespective of the level detailed in the documents such that the installation is provided as a complete working installation.

Irrespective of the information documented it is the Contractor's responsibility to ensure all aspects of the installation comply with and meet the requirements of all relevant authorities and the relevant current Australian Standards.

Provide all materials as new, and of the highest class available for their respective types.

Within the tender allow to conceal all wiring and conduits. Exposed cabling or conduits are generally not acceptable. For extreme circumstances a written request to allow the running of an exposed service in a specific location may be considered. In such circumstances the Contractor is to agree to a variation credit of \$1,000.00 to the contract for each exposed service.

Install components and equipment in accordance with the manufacturer's recommendations and ensure such components and equipment are not operated outside of the limits specified by the manufacturer.

Irrespective of the extent of information or the accuracy of such information it is the Contractor's responsibility to confirm the location of all existing services on site. The cost of repairing and of disruption to service due to damage to existing services is to be met by the Contractor.

Ensure all components, equipment and materials supplied are new, unused, designed and selected to ensure satisfactory operation under varying atmosphere, climatic, humid tropical conditions without distortion and deterioration in any part affecting efficiency and reliability of the systems. Design and select all equipment to provide the necessary safety to human life and property during operation and maintenance with particular attention given to electrical safety and segregation precautions.

Check the finished paintwork around the area of each installation and touch up all damaged parts and finishes after the installation of the BMS works.

Within the tender response provide a list of sub-contractors that will be engaged by the Contractor including the postal address, fax number, telephone number and email address. Within two weeks of being awarded the contract provide the names and contact phone numbers of the Contractor's supervisor and site foreman as well as the supervisor and site foreman of each of the sub-contractors that are to be engaged by the Contractor.

1.6 ACCESS

Allow to provide all necessary access to install and complete the BMS works irrespective of the BMS provisions detailed on the drawings. This includes though is not limited to the following:

- Conduits.
- Blockouts.
- Ducts.
- Risers.
- Hat sections.
- Covers.
- Cable trays and ladders.
- Chasing.
- Cutouts.
- Pits and trenching.

1.7 ALTERNATIVES

Alternative components and design will be considered with the cost of the consideration being borne by the Contractor. Any alternative may be rejected without a reason being provided. Alternatives which are used without written approval must be removed from the installation and replaced with the complying item at the Contractor's cost.

1.8 DEFECTS

Should more than two defect inspections due to poor workmanship, be required to be performed by the engineer the cost of such inspections will be passed on the Contractor. The approval of the contract payment will be dependent upon the rectification of such defects and the settlement of the respective inspection costs.

When advice of a defect is received by the Contractor provide written advice within 24 hours of the date the defect will be rectified.

The expiration of the warranty period does not exclude the contractor or the Contractor from the responsibility of latent defects discovered after the warranty has expired.

1.9 ANOMALIES

It is a requirement that the tenderer allow for within the tender, the most expensive solution to address anomalies which may exist between any of the drawings, the drawings and the specification or between any of the contract documents and an authority requirement or a relevant Australian Standard. The Contractor is to identify any anomalies and request in writing a direction on which option to proceed with. Any such direction will not constitute grounds for a variation or an extension of time.

1.10 APPROVALS

Where information has been nominated as requiring to be submitted for approval or the information must be approved, apply the following definition:

Each request for approval must be made in writing, accompanied with all necessary supporting information to allow for the prompt assessment of the request.

It is the Contractor's responsibility to seek approvals and do so in a timely manner with the understanding that approvals may not be given and the request for approval may have to be modified and resubmitted. Delays in submitting requests for approval and resubmitting revised requests for approval will not constitute grounds for an extension of time. Unless advised otherwise the Contractor must allow one working week for the approval to be given by each approving entity.

1.11 CUSTOMER ACCEPTANCE

At the conclusion of the installation, a preliminary walkthrough with the installation contractor and the customer's representative will be performed to check for installation quality, accurate performance of the work, and to verify the accuracy of work-as-executed documents. Complete any modifications to the documentation or the installation that may be required within a 2-week period from the walkthrough. Customer Acceptance will be given following a final walkthrough with the installation contractor and the customer's representative if all previously identified issues have been addressed.

If the Contractor has advised that the previously identified issues have been addressed and it is found they have not been, the Contractor is responsible for meeting the costs of subsequent customer acceptance inspections at the rate of \$250.00 per hour plus GST plus disbursements. The walk through will be scheduled within 3 weeks of the completion of the installation in order to turn the project and documentation over to the end user. Please note that "Customer Acceptance" does not release the Contractor from repairing any cabling errors or improperly labelled circuits, caused by the Contractor that may be discovered at a later date.

1.12 HANDOVER

Within two weeks of the contract being awarded, the contractor's foreman is required to attend an BMS handover meeting for a duration that will not exceed three hours. The time and location will be confirmed by the Electrical Design Group. The contractor's foreman is required to confirm in writing to the Electrical Design Group that they will be attending the handover meeting. The intention of the handover meeting is to review the following information, answer any questions and identify any potential issues:

- How the BMS is documented and the purpose of each document.
- The communication process and channels used by the Electrical Design Group.
- The relationship between the BMS and the existing installation.
- The client's expectations of the BMS works.
- An overview of the contractual arrangements.
- A summary of the unusual contractual requirements within the BMS documents.
- Identify any areas and items that may be subject to further design development or change.
- Summarise the major risks and or difficulties within the BMS works.
- Review the design of each system within the BMS works identifying the design critical components and components within the design that are open to the contractor's input.
- Summarise the major areas of coordination and the coordination requirements.

Prior to the hand over meeting the contractor's foreman is required to have reviewed the BMS documents. Others such as the client, and contractor's supervisor are encouraged to attend the handover meeting, though not considered essential. If the contractor's foreman does not attend the full duration of the handover meeting, the contractor agrees to a credit variation of \$1,000.00 to cover the costs of the aborted handover meeting and the handover meeting is to be rescheduled.

2.0 QUALITY REQUIREMENTS

2.1 STANDARDS

Irrespective of information contained in the BMS documents or in instructions, it is the Contractor's responsibility to ensure all BMS works are installed in accordance with the requirements of the following. Refer any discrepancies between the requirements of the following and/or the BMS documents and instructions to the engineer for clarification prior to the placing of orders, fabrication or installation of the items/methods in discrepancy.

- Local supply authority.
- ACMA.
- Local Council.
- State Government Department of Environment and Heritage.
- Queensland Department of Justice and Attorney-General, Workplace Health and Safety Queensland
- Queensland Department of Justice and Attorney-General, Industrial Relations
- Building Regulations 2006
- Fire and Rescue Services Act 1990
- Building Fire Safety Regulation 2008
- Queensland Electricity Act
- Queensland Electricity Regulation
- Queensland Electrical Safety Act
- Queensland Electrical Safety Regulation
- Queensland Development Code
- Queensland Fire and Rescue Service (QFRS)
- Queensland Electricity Connection and Metering Manual
- SAA Communications Cabling Manual
- AS/NZS 3000 SAA Wiring Rules
- Queensland Sustainable Planning Act and Regulation 2009
- Queensland Building Act 1975
- National Construction Code (NCC) Building Code of Australia (BCA).
- Fire and emergency services authority
- All relevant current Australian Standards and amendments including thought not limited to:

AS/NZS 1768	Lightning Protection.
AS/NZS 2184	Low Voltage Switchgear And Control Gear - Moulded-Case Circuit-Breakers For Rated Voltages Up To And Including 600 v AC and 250 v DC
AS/NZS 2293	Emergency Evacuation Lighting for Buildings (All Parts).
AS/NZS 3000	SAA Wiring Rules. Part 1 - Wiring Methods.
AS/NZS 3008	Selection of Cables for AC Voltages up to 0.6/1kV.
AS/NZS 3010	Electrical Installations - Supply by Generator Set.
AS/NZS 3011	Electrical Installations - Secondary Batteries Installed in Buildings.
AS/NZS 3013	Electrical Installation - Classification of Fire and Mechanical Performance of Wiring Systems.
AS/NZS 3017	Electrical Installations - Testing Guidelines.
AS/NZS 3439	Low Voltage Switchgear and Control gear Assemblies (All Parts).

AS/NZS 3947	Low-voltage switchgear and control gear (All Parts)
AS/NZS 61000	Electromagnetic Compatibility (All Parts)
AS/NZS CISPR 14.1:2010	Electromagnetic Compatibility – Requirements for household appliances, electrical tools and similar apparatus -Emissions

It is the Contractor's responsibility to obtain from all equipment and component supplier's confirmation that the equipment and components supplied as part of the BMS installation comply with all of the following relevant standards and codes. Specific specification of equipment or a component does not alleviate the Contractor of the aforementioned requirement.

2.2 AUTHORITIES

Ensure all of the BMS works complies with the requirements of all regulatory authorities having jurisdiction over the site including but not limited to the following authorities, codes, standards and regulations:

- ACMA.
- Local Council.
- Local Supply Authority.
- State Government Department of Environment and Heritage.
- Queensland Department of Justice and Attorney-General, Workplace Health and Safety Queensland
- Queensland Health
- Queensland Department of Justice and Attorney-General, Industrial Relations
- Building Regulations 2006
- Fire and Rescue Services Act 1990
- Building Fire Safety Regulation 2008
- Queensland Electricity Act
- Queensland Electricity Regulation
- Queensland Electrical Safety Act
- Queensland Electrical Safety Regulation
- Queensland Development Code
- Queensland Fire and Rescue Service (QFRS)
- Queensland Electricity Connection and Metering Manual
- SAA Communications Cabling Manual
- AS/NZS 3000 SAA Wiring Rules
- The building certifier.
- Queensland Sustainable Planning Act and Regulation 2009
- Queensland Building Act 1975
- National Construction Code (NCC) Building Code of Australia (BCA).

2.3 CONTRACTOR DOCUMENTS

2.3.1 SHOP DRAWINGS

Before commencing fabrication or erection of the nominated item, submit an AutoCAD 2000 format electronic copy of detailed shop drawings via compact disc/USB or via email to brisbane@edg.net.au for approval. Prepare all drawings as A3 or A1 size to AS1100, AS1102, AS1103 and AS3702 with information detailed at the following minimum scales:

- Layout Drawings: 1:100
- Site Plans: 1:500
- Equipment Assembles: 1:50

Ensure the shop drawings include the following information:

- General arrangement of all equipment: Include layout and clearances around equipment.

- Mounting details, structural details and calculations verifying the structural efficiency of load-bearing slabs, etc., footings and the like, supporting electrical equipment mounting structures, poles, lighting masts, etc.
- Supports: Details of equipment and cable support brackets and fixings including mountings.
- Physical cable layouts: Showing arrangement, location and identification of interconnecting wiring and cabling. All cable penetrations, connections and terminations details. Include all forms of conductors such as Bus Bars and Bus ducts.
- Labelling: Details of labelling and engraving.
- Earthing.
- The type, rating and capacity of all equipment and components.
- Comprehensive schematic diagrams showing the configuration and operation of all components.
- Co-ordination details with all other services.
- Plant Room Layouts.

2.3.2 WORK-AS-EXECUTED DRAWINGS

Prior to practical completion, provide for approval the following Work-as-Executed Drawings:

- Reticulation Drawings.
- Layout Drawings.
- Schematic Drawings.

Ensure the Work-as-Executed Drawings include the following information:

- All information required by the shop drawings.
- Comprehensive details on the reticulation for all of the BMS works including:
 - Support types and locations.
 - Conduit types and locations.
 - Junction Boxes.
 - All cable locations.
 - Circuiting.
- Comprehensive details on the layout of all outlets, fittings and equipment of all of the BMS works including:
 - Outlet types and locations.
 - Equipment types and locations.
 - Mounting Detailing.
- Cross reference to the onsite labelling and numbering of all components and outlets.

Submit an AutoCAD 2000 format electronic copy of the work-as-executed drawings via compact disc/USB or via email to brisbane@edg.net.au for approval.

2.4 MAINTENANCE / BUILDING TUNING

2.4.1 MAINTENANCE REQUIREMENT

Undertake all necessary maintenance and tuning of the BMS works during the Defects Liability Period for a period of 12 months. Provide monthly maintenance reports including energy usage breakdowns and savings for each previous month. It is anticipated that tenderers will allow a minimum of eight hours per month to continue to tune the system to find savings. All changes to the system are to be documented on a rolling basis in the Operations and Maintenance Manuals. The defects and liability period will not end until the Operations and Maintenance Manual has been updated to reflect all changes made during the defect's liability period.

The defects and liability period will not end until such certification has been approved.

2.4.2 SYSTEM QUARTERLY MAINTENANCE

Undertake the following quarterly maintenance tasks:

1. For every site visit sign-in with the School's property and work department, filling out required security forms, sign-out security ID passes and any required keys.
2. Make contact with the School's Property and Works Manager and discuss any identified faults / issues with the Energy Management System.
3. Confirm all controllers are on line via the device manager, compare results against original device table details check all controllers are communicating, report and check the communications status of all controllers not appearing on device table.
4. Check and confirm the correct operation of time schedule settings, daylight savings settings, and holiday schedules.
5. Check and adjust communications voltages, setting the desired parameters for field controllers.
6. Set-up trend logs to assist in control strategy tuning and confirm the operation of plant input statuses.
7. Check the operations of all visual and audible alarms.
8. Carry out scheduled field controller maintenance.
9. Investigate all faults identified by the School's Property and Works Manager.
10. Fill out appropriate maintenance spreadsheet highlighting identified faults and a service report on completion of scheduled maintenance service.
11. Return all keys and security passes (if issued).
12. Provide a detailed report with a summary of identified faults with a remedy and budget cost.

2.4.2 SYSTEM HALF YEARLY MAINTENANCE

Undertake the following half yearly maintenance tasks:

1. Perform tasks 1 to 9 as specified in the quarterly maintenance.
2. Carry out a save of all controller software using the device manager; use the backup utility to carry out a backup to the BAS hard drive.
3. Carry out a backup to USB flash drive.
4. Delete all superseded, unrelated controller software.
5. Check if PC maintenance utilities defrag BAS PC hard drive, carry out disk scan, delete / empty recycle bin, to maximize system resources or equivalent has been carried out by the School's IT representative.
6. Check the operation of CPU and power supply ventilation fans and check the operation of controller cubical ventilation fans.
7. Tune control strategies to coincide with seasonal changes.
8. Carry out voltage checks of all control transformers, check the integrity of earth for secondary wiring for field controllers.
9. Perform tasks 10 to 12 as specified in the quarterly maintenance.

2.4.3 SYSTEM ANNUAL MAINTENANCE

Undertake the following annual maintenance tasks:

1. Perform tasks 1 to 9 as specified in the quarterly maintenance.
2. Perform tasks 2 to 8 as specified in the half-yearly maintenance.
3. Replace all global controller batteries.
4. Check for loose electrical connections.
5. Clean all DDC Cubicles.
6. Check and tighten all connections.
7. Tune controls strategies, implementing minor strategy control developments.
8. Perform tasks 10 to 12 as specified in the quarterly maintenance.

2.4.4.1 REMOTE CHECK

Undertake the following half yearly remote maintenance tasks for the air-conditioning controls:

1. Decrease zone set-point to 10°C monitor supply temperature, confirming the correct operation of the chilled water valve and actuator.
2. Check and calibrate 25% of zone sensors on a half-yearly basis, with the intention that all sensors be checked on a two-year cycle.
3. If AC is operational confirm space temperature is within acceptable tolerances from set-point.
4. If AC is not operational, set manual override to active. Confirm status is active.
5. Confirm all AC parameters are set to auto operation.
6. Print off tabular page if available or fill out AC service check report, highlighting any anomalies.

2.4.4.2 LOCAL CHECK

Undertake the following annual maintenance tasks for the air-conditioning controls:

1. For every site visit sign-in with the School's property and work department, filling out required security forms, sign-out security ID passes and any required keys.
2. Make contact with the School's property and works manager and discuss any identified faults / issues with the Energy Management System.
3. Inspect each controller and tighten all connections.
4. Functionally test the operation of all components; valve actuators, filter DP sensors and fans.
5. Check valve actuator linkages, ensuring valve strokes are correctly set.
6. Perform tasks 1 to 6 as specified in the AC remote maintenance check.
7. Investigate all faults identified by the School's Property and Works Manager.
8. Fill out appropriate maintenance spreadsheet highlighting identified faults and a service report on completion of scheduled maintenance service.
9. Return all keys and security passes (if issued).
10. Provide a detailed report with a summary of identified faults with a remedy and budget cost.

2.4.5 MISCELLANEOUS EQUIPMENT MAINTENANCE

Undertake the following annual maintenance tasks for the miscellaneous controls:

1. For every site visit sign-in with the School's Property and Works Department, filling out required security forms, sign-out security ID passes and any required keys.
2. Make contact with the School's Property and Works Manager and discuss any identified faults / issues with the Energy Management System.
3. Command each fan in turn to Active, Inactive and then Null. Confirm status matches command.
4. Check all associated time schedules and load shedding software settings.
5. Check the operation of fan status indication, i.e. C/T or air pressure switches.
6. Inspect all associated controllers tighten all connections.
7. Fill out a service report, highlighting any anomalies.
8. Investigate all faults identified by the School's Property and Works Manager.
9. Fill out appropriate maintenance spreadsheet highlighting identified faults and a service report on completion of scheduled maintenance service.
10. Return all keys and security passes (if issued).
11. Provide a detailed report with a summary of identified faults with a remedy and budget cost. Works

2.5 OPERATIONS AND MAINTENANCE MANUAL

Within ten working days prior to practical completion, provide an electronic copy of combined Operations and Maintenance technical manuals for approval, written in clear concise English, containing the following data in the following format:

Within ten working days of receiving approval of the combined Operations and Maintenance technical manuals, provide the two copies of each of the approved combined Operations and Maintenance technical manuals.

Within ten working days of practical completion, provide the two copies of a combined Operations and Maintenance technical manuals, written in clear concise English, containing the following data in the following format:

- Contents.
- System details.
 - Comprehensive description of the BMS works.
 - Contact details of the Contractor and each of the major suppliers.
 - Work as executed documents.
 - Schedule of all components.
- Licences and certificates.
 - Copies of all licences, certificates and statements of compliance as required by the specification.
- Operating instructions.
 - Provide an overall description and functional description of the operation of the BMS works.
 - Describe the safe working procedures of the BMS works.
 - Detail the environment that must be maintained for the safe and satisfactory operation of the BMS works.
 - Detail the specific operating requirements for each component of the BMS works
 - Include a description of the general maintenance requirements for the BMS works.
 - Include a description of the safe working procedures for the maintenance of the BMS works.
 - Detail the specific maintenance requirements for each component of the BMS works.

Provide the manuals as A4 size, machine printed or typed on durable printing paper, with each page consecutively numbered, and neatly bound in a permanently labelled durable white vinyl covered ring binder folder. Securely fix a labelled CD or USB containing all of the information in the manual including Auto CAD files of all drawings.

2.6 OPERATING PARAMETERS

Ensure the BMS installation is installed in accordance with the following operating parameters and service conditions:

- Nominal voltages:
- Line: 400-volt
- Phase: 230-volt
- Frequency: (Hz): 50Hz
- Number of phases: Three
- Number of wires: Four
- Neutral Connection: Star Point
- Earthing System: MEN
- Ambient air temperature range: (°C): -5°C to 40°C
- Maximum relative humidity: (%): 90%

2.7 QUALITY ASSURANCE

Establish and maintain records which give evidence that the trade works has passed inspection and/or test with defined acceptance criteria and submit one (1) copy of all such records within seven (7) days of completion of the relevant work.

Allow approved representatives the right to verify at source or upon receipt that the purchased product conforms to the specified requirements. Such verification will not absolve the Contractor of the responsibility to provide acceptable product nor will it preclude subsequent rejection.

Ensure a quality system is planned, established, implemented and maintained according to the requirements of AS9002 for and during the carrying out of the Services.

Allow approved representatives appointed as a Quality System Auditors the right to undertake a quality assurance audit. Provide access and all necessary assistance to the Auditors in order to demonstrate compliance with the requirements of the quality standard.

Review and analyse the cause of any deficiency revealed in the report of an audit by the Quality System Auditors and develop and implement or procure the development and implementation of corrective action to prevent recurrence.

2.8 LABELLING

Permanently label and individually number all components, fixtures, fittings, outlets and cables installed as part of this contract such that they can be quickly and accurately identified. All labels must be permanent with the type and size of label appropriate to the location and conditions. The label type must be appropriate for weathering, UV exposure, vandalism and mechanical damage. Stick on and hand written labels are not acceptable. The numbering and identification are to be consistent and consecutive for all items. Provide matching labelling and numbering where an existing numbering and labelling system exists. Submit all labelling types, identification schemes and numbering schemes for approval. Ensure all labelling is clearly identified and cross-referenced in the manual and on the work-as-executed drawing. Double sided tape is not acceptable as a method of securing labels.

2.9 KEYING

Ensure all of the lockable enclosures provided as part of the BMS works are keyed alike and keyed as part of the sites master key system.

2.10 TESTING AND COMMISSIONING

Commission all components of the BMS works to ensure the correct interfacing operation and control of all systems to the satisfaction of the engineer. Arrange for and give two weeks' notice so the commissioning may be witnessed for approval.

Provide all necessary software, equipment and personnel to fully program and configure all systems to the satisfaction of the engineer.

Following the completion of the commissioning and prior to Practical Completion thoroughly clean all components of the installation and areas of work to the satisfaction of the engineer.

Following commissioning, operate each component and system at the convenience of the engineer to the satisfaction to provide evidence to the engineer that each component and system is working correctly.

A record of all settings, set point and offsets should be maintained throughout the commissioning period and included in the Operations and Maintenance Manual. Update the Operations and Maintenance Manual record following the completion of each of the post practical completion commissioning requirements. The defects and liability period will not end until the Operations and Maintenance Manual has been updated.

As part of the commissioning process, ensure the following actions are completed:

- Check that time schedules enable the intended operation at the correct times.
- Check that the specified routine to ensure unified time clocks throughout the complete control system operates correctly.
- Check for the correct control and operation on start-up and shutdown. Check that the defined restart routine operates correctly when power is reinstated after failure. Check for any specified sequenced start-up to accommodate high loads.

Check the control system to confirm its specified operation following a mains power supply failure. In particular undertake the following checks:

- Check that controllers preserve control strategy configuration data for a specified period when the mains power is lost.
- Check that the condition of any volatile data protection system is regularly and automatically monitored. Check that an alarm is raised on loss of data by any controller or other device and/or failure of the monitoring system.
- Check that the control system operates correctly under generator standby and UPS power if applicable,
- Check that the control system will automatically return to normal action without operator intervention restoration of the mains electrical power supply.
- Check that any specified load shedding procedures operate correctly.

2.13 TRAINING

Beyond time spent during commissioning stage, at times to be agreed with the operator, instruct the operator's staff in the recommended methods of operation the BMS works. Allow to provide four such operational training sessions on site each for duration of 2 hours.

3.0 INSTALLATION REQUIREMENTS

3.1 CABLES

3.1.1 INSTALLATION

Unless otherwise specified, install and terminate cables in accordance with the manufacturers' recommendations. Unless noted otherwise, joints are not acceptable. Install power wiring utilising the loop-in, loop-out system with joints in cables being affected at outlets.

Ensure oil, wax and powder based electrical cable lubricants are not used as cable lubricants.

Remove redundant equipment and wiring, including that in accessible ceiling spaces, and make good exposed surfaces before commencing the installation of new wiring.

Handle cables so as to avoid damage to insulation and serving or sheathing. Replace all wiring with insulation damage after determining and removing the cause of damage.

Identify multicore cables and trefoil groups at each end and at crowded intermediate points by means of stamped, non-ferrous tags, clipped around each cable, or trefoil group.

Install and adequately support fixed wiring as specified throughout the installation. In accessible false ceilings, keep cables clear of all ceiling insulating material and/or removable ceiling tiles by securely fixing the cabling to permanent structural members. If the structural members are more than 1,200mm above the suspended ceiling, provide a catenary support system. It is not allowable to fix cables to the ceiling hangers.

Provide flexible connections or an approved form of vibration/movement isolation on the terminations of all cables that will experience vibration or movement under their normal operation.

Cable installation in areas where there are motors and/or generators is to comply with the guidelines set out in AS/NZS 3548 and AS/NZS 2834.

3.1.2 GENERAL CABLING REQUIREMENTS

The terms wiring and cabling are used interchangeably throughout this contract to refer to any cabling types and relevant standards.

Ensure all of the BMS cabling complies with the following requirements:

- All cables are installed without joints.
- All cabling is concealed from view.
- All cabling installed externally is installed in conduit.
- All cabling that is installed in locations that are not concealed such on exposed roof trusses, are to be run in conduit.
- Cabling fixed to trusses and beams in concealed ceiling spaces is to be fixed to the side of the truss / beam and not on top of the bottom cord of the truss / beam.
- Chasing of masonry walls is co-ordinated with other trades. Horizontal wall chases must be approved.
- Coordination of the installation of conduits and cables in the ceiling space does not interfere with the operation or maintenance of any equipment.
- Cables do not come into contact with hot water pipes.
- Above suspended ceilings, all conduits and cables are secured to the ceiling support members or roof structure above. Conduits and cables laid directly on the ceilings (on the ceiling suspension system or framing) are not acceptable.
- All cables in underground conduits are approved by the manufacturer for external underground use.
- Cables are secured to prevent any strain on the cable terminations. Support cables at a maximum of 1200mm spacing with minimum sag.
- The use of spring clips will not be permitted without approval.

- Where cables traverse areas above set plasterboard ceiling (or similar) particularly in an office environment and providing access difficulties, use conduit secured to a catenary wire, or suitably saddled to the ceiling.
- All cables passing through a metal surface, any sharp surface or any surface that could damage the cable insulation over the life of the installation is to be protected by grommetted nylon bushes.
- Replace all wiring that contains kinks or abrasions.
- Provide flexible connections on the terminations of all cables that would experience sufficient stress/force under a bolted line fault condition that would cause damage to the cable termination or the equipment.

Provide mechanical protection of all cables in the following locations:

- Within 2,400mm of any floor, platform or landing that is accessible under normal operation and routine maintenance.
- All locations it is reasonable to expect that the cabling would be interfered with.
- All locations the cable could be subject to damage during normal operation and maintenance.

3.2.3 SETTING OUT OF RETICULATION

The routes shown on the Drawings are approximate only. Determine the final routes to suit the building structure or site conditions. Unless otherwise specified, conceal and protect cables and conduits. Arrange cables and conduits parallel with walls, ceilings and floors.

3.2.4 WIRING IN CONDUIT

Complete and permanently fix the conduit run before installing the wiring. Use draw wires to pull in the conductor groups from outlet to outlet. For vertical conduit runs in excess of 15m make adequate provision for supporting the weight of the wiring to avoid insulation damage. Run circuits originating at different distribution boards in separate conduits.

3.2.5 TERMINATIONS

Terminate all cables installed as part of this contract. It is the Contractor's responsibility to check and ensure the component or equipment the cable is being terminated to be appropriate and suitable for the cable to be terminated to. Advise the architect of any concerns with the component or equipment prior to the cable being terminated.

Where core identification is required, fit to each core durable numbered ferrules permanently engraved with numbers and/or letters to suit the specified connection diagrams. Terminate and identify any spare cores into spare terminals, if available; otherwise neatly insulate and bind the spare cores to the terminated cores.

Insulation displacement terminations or connections are not acceptable for 240-volt cabling. All 240-volt terminations must be screw type.

3.3 CONDUITS

Ensure all conduits installed as part of the BMS works are installed in accordance with the following requirements:

- Corrugated conduits are not permitted in any food preparation, food storage or food servery area.
- Conduits are sized to permit drawing-in of cables to finished conduit runs without damage to cables.
- Protect all PVC conduits against UV exposure.
- Steel and galvanized conduits are not installed underground.
- Rigid UPVC conduit fittings are fastened to the conduits by fresh solvent cement in accordance with the manufacturer's recommendations. The cement is to be a contrasting colour to the conduit.
- Corrugated UPVC conduit fittings may be fastened with solvent cement as above or by use of snap-lock connectors in accordance with the manufacturer's recommendations.
- Flexible smooth wall PVC conduit fittings of the black nylon conduit clamp band type are provided.

- Conduits, pipes and conduit fittings are not visible on any wall, floor or ceiling surface with the exception of Switch rooms, Plant rooms and risers.
- Unless noted otherwise provide conduit located internally as PVC light duty (LD), high impact rigid, minimum size being 20mm circular. Corrugated PVC conduit is to not be used unless approved.
- Conduit adaptors are lock nutted into metal wall boxes or welded into PVC boxes.
- All change directions of conduits are set. Undertake setting by warming the conduit and bending around an internal spring. Ensure burn marks are not visible as a result of warming. Cold bending is not permitted. Secure conduits within 50mm of each change in direction.
- Secure 40mm or larger conduits every 500mm or less. Secure conduits less than 40mm every 300mm or less.
- Where subject to mechanical damage, exposure to sunlight, weather and/or damp conditions and/or ambient or contact temperatures exceeding 60 degrees Celsius, use heavy duty galvanised screwed steel conduit. Provide mechanical protection to UPVC conduit for a height of not less than 3m above ground or platform level.
- Prior to the installation of wiring, ensure conduits are clear of debris and liquids.
- Metallic saddles with corrosion protection equal to hot dipped galvanizing with two galvanized fixings per conduit saddle are used to secure all surface mounted conduits. Do not use explosive-powered or similar equipment unless approved. Ensure the metallic saddles and fixings do not create a galvanic reaction with the support structure. In locations it is not practical to use saddles, submit details of the proposed conduit securing method for approval prior to commencing installation of the conduit. Any alternative conduit securing method must provide corrosion protection equal or better than galvanizing.
- UPVC conduits installed in accessible roof spaces and the like are protected by timber battens.
- Up to the commercially obtainable conduit lengths of run, conduits are installed without joints. Remove all jags, burrs, and sharp edges from each length before completing each conduit joint. Fit moulded plastic screwed bushes to the free ends of metallic conduit runs before installing the conductors.
- All inspection fittings and the like are accessible.
- Draw-in boxes are provided at suitable intervals not exceeding 30m in straight runs, and at intervals not exceeding 25m in other runs including directional changes.
- After removal of sharp edges, burrs, etc., ends and joint threads of steel conduits are painted with a rust-inhibiting metallic paint, which maintains conductivity.
- Arrange conduits below 2,700 AFFL such that a person cannot hang from or climb from the conduit by using the conduit as a foot hold or hand hold.
- All PVC conduits located externally above ground to a height of 2,000mm AFFL are protected with 1.6mm thick folded galvanised sheet steel hat section. Galvanized conduit may be substituted in the above ground location in lieu of the PVC conduit and steel hat section.
- Where the conduit is in an exposed location, paint the exposed conduit and hat section to match the building colour.
- All conduits are installed such that any moisture in the conduit drains away from the electrical connections. Where required provide the conduits with weep holes and drip loops.
- All conduits are installed and sealed such that insects cannot nest or seek refuge in them.
- All conduits are sealed such that the sealant can be removed in the following locations to prevent vermin and moisture entering through the conduits.
- Do not use conduits smaller than 20mm diameter in any circumstance or conduits smaller than 25mm diameter underground.
- Do not use light duty (MD-UPVC) conduit underground or where it may be exposed to mechanical damage or to sunlight.
- Ensure all associated plastic conduit fittings are of the same material as the conduits.
- Install conduits directly from the entry point to the termination point, with the minimum number of sets ensuring the number bends does not exceed the equivalent of 3 x 90-degree bends.
- Do not install elbows, tees, etc. in inaccessible locations.
- Do not run conduits in roof spaces directly below the thermal insulation or sisalation.
- Do not run conduits in roof spaces or ceiling spaces directly on top of the ceiling.
- Do not use wall boxes with sliding type lugs for attaching flush plates.
- Earth all metal wall boxes.

Rectify all damage caused by flooding or vermin ingress that has occurred as a result of the conduits not being correctly sealed. Any such damage post practical completion is to be considered a latent defect and must be rectified as such.

3.4 PENETRATIONS

Seal all penetrations in a neat and tidy manner in such a way that the sealing material can be removed to allow future use of the penetration. Ensure all penetrations are sealed to at least the original integrity of the member or structure being penetrated. Provide independent certification of all fire rated and sound rated penetrations. Do not penetrate fire rated finishes, structural members, acoustically rated finishes or damp courses without approval. Run pipes entering a building at ground level under the waterproof membrane and vertically penetrate the membrane and the floor slab. Provide a suitable seal between the pipe and the roofing material.

3.5 MOUNTING REQUIREMENTS

As part of the works allow for all necessary mounting brackets, fixings, trims, cut-outs, blockouts and any other incidental component that will be required to complete the BMS works. Provide a shop drawing of all such components including how they are mounted for approval.

Fittings and components that have any moving parts or weigh more than 2.5 kgs that are fixed to the lined ceiling or walls must be provided with independent support system connected to the structure.

3.6 DALI BUS

Separate DALI bus systems are being provided in the current construction projects to provide user inputs into the BMS via the schools embedded communications network via IP BACnet.

Provide two-way communication between the BMS and the Dali Buses. Configure the push buttons such that when they are on the LED is illuminated.

Smartscape QLD Pty Ltd Phone: (07) 3357 1922 are to be engaged as a nominated subcontractor to undertake the commissioning of the DALI Bus systems and the interfacing of such to the BMS.

The DALI Bus Input Schedule details the DALI Bus inputs that need to be interfaced to the BMS.

The following description of the DALI Buses is for information only.

The DALI buses include:

- DALI power supplies (Zencontrol AC-PSU) DIN Rail mounted in the respective DB's.
- DALI controllers (Zencontrol ZC-Controller) DIN Rail mounted in the respective DB's.
- DALI network cable / bus.
- DALI push buttons (Zencontrol ZC-PBS-2020) mounted in the switch panels.
- Connection of the DALI controllers to the school's communications network via Cat 6 fly lead.

4.0 SYSTEM REQUIREMENTS

4.1 SCOPE

Provide an BMS that utilises direct digital controls. The BMS is to comprise a network of interoperable, stand-alone digital controllers, graphics and programming and other control devices as required.

The BMS is to provide secure password access to all features, functions and data.

The BMS is to utilise an open protocol BACnet IP control platform that will allow additional interfaces, expansion and changes without further licence or software costs. The system is to allow for the connection of any brand of BACnet ethernet IP based device.

Only use BACnet products that are certified and listed as such on the <http://www.bacnetinternational.net/btl/> website and carry the BTL Mark.

For the purpose of establishing a tender price assume the room controllers in the following locations are in working condition and appropriate interconnected. The Block B East system is not connected to the Block B West system and must be connected as part of the BMS works.

- Administration building.
- Block B East.
- Block B West.
- Block F.
- Block G.
- REC.
- PAC.

In addition to the above assumption, allow to undertake an investigation within two weeks of being appointed into the condition and networking of the room controllers in the above buildings and provide a short form written report.

4.2 ARCHITECTURE

Provide the BMS with open, interoperable, integrated architecture that utilises peer-to-peer networked, stand-alone, distributed control.

The system is to incorporate the ability to access all data using HTML5 enabled browsers without requiring proprietary operator interface and configuration programs or browser plug-ins. Systems requiring a proprietary database and user interface programs or do not utilise HTML 5 are not acceptable.

4.3 CONTROLLERS

The controllers are to be fully programmable to meet the unique requirements of the facility it controls.

Each controller is to include as a minimum:

- Sufficient processing capacity to execute all its control routines and functions in less than 1 second
- Sufficient extra programming capacity to increase the amount of onboard programming by 100%
- Sufficient inputs and outputs to meet the requirements of the project
- A minimum of one 10/100 Ethernet Port
- RS485 port

The controllers must be enabled to support and licensed with the following Open protocol drivers (client and server) by default:

- BACnet

- MODBUS

The controllers are to be capable of executing application control programs to provide:

- Calendar functions.
- Scheduling.
- Optimum start stop routines
- Trending.
- Alarm monitoring and routing.
- Time synchronization.
- Integration of BACnet, and MODBUS data.

The controllers are to support standard Web browser access via the Intranet/Internet and must support a minimum of 5 simultaneous users.

The controllers are to be able to route any alarm condition to any defined user location whether connected to a local network or remote via wide-area network.

Alarms are to be enunciated in any of the following manners as defined by the user:

- Text message and / or Email of complete alarm message to multiple recipients which can be set by time of day and day of week.
- Graphics with flashing alarm object(s).

The following are to be recorded by the SNC for each alarm (at a minimum):

- Time and date.
- Equipment (air handler #, access way, etc.).
- Acknowledge time, date, and user who issued acknowledgement.

All controllers are to have their own on-board CPU, clock/calendar, EEPROM, RAM, ROM, communication port(s), and network connection. All controllers are to be capable of complete standalone operation upon any network communications failure.

Provide memory that is adequate to meet both the needs of local I/O and the number of secondary controllers connected with each controller.

The input section of the controller is to have "universal" inputs / output capable of accepting / providing information on any point in the form of a temperature, voltage, digital, or pulse counter with only a programming command required for differentiation between the input / output type without the need for hardware changes.

Analogue inputs are to monitor each analogue input, perform A/D conversion, and hold the digital value in a buffer for interrogation. The A/D conversion is to have a minimum resolution 12 bits. The input ranges are to be within the range of 0-10 VDC.

The digital Inputs are to accept dry contact closures and voltage level transitions.

Provide outputs that are digital, analogue or universal.

Provide each controller with a battery backed uninterruptible "Real Time Clock", providing time of day, day, month, year, and day of week automatically accounting for leap years.

Upon restoration of power, each controller is to automatically and without operator intervention; update all monitored functions; resume operation based on current, synchronized time and status, and implement special start-up strategies as required.

Provide each controller with at least 48 hour of battery backup to maintain all volatile memory.

House the controllers in a lockable enclosure.

Clearly label with the model number of the controller and its system identity code cross reference the labelling of the controllers on the as built documentation.

4.4 NETWORK COMMUNICATIONS

All communications are to be via the School's local area network (LAN) operating at a minimum speed of 100 Mbits/s utilising Native BACnet over Ethernet / TCP-IP.

All network points are to be considered global points. Any program in any controller on the network is to be able to reference any point in any controller regardless of its location on the network.

4.5 SOFTWARE

All software must operate solely from a web browser using HTML5. All controller level software must allow live programming such that the operational logic can be changed or fined tuned without the controller being taken offline.

The software supplied as part of the system must broadly fall into the following categories:

- Controller level software to allow the controllers functionality to be created, modified and monitored
- Alarm software which monitors Controller level and software alarms, the software shall be capable of annunciating alarms as a minimum in the systems graphical interface and by text message or email. The recipients of alarm messages shall adjustable such that recipients can be set by time of day and day of week.
- Historical data to display data from controllers and high-level interfaces on devices such as weather stations and energy meters, the software shall allow users to create multiple reports and to add notations to logged data.
- Graphics interface and builder, this shall support the creation and modification of the user interface. The software shall live changes to the interface.
- User management will allow designated users to create accounts and the access levels for users.
- Energy module to show the sites energy usage including detailed data from the connected energy meters. The module shall allow alarm levels to be set in the event that usage is exceed limits on a whole of School basis or by individual meters.

Provide a SQL database and all necessary associated software installed on the school's data base server to log, access, backup, manage, restore, edit, report, display and control the BMS data.

4.6 WEATHER STATION

Provide a weather station with a high-level interface to the BMS via BACnet IP interface. The weather station must measure the following values:

- Dry bulb temperature
- Relative humidity
- Wind direction
- Wind speed
- Rain present
- Daylight sensor

Specific considerations must be taken in relation to the installation of the weather station as follows:

- Mounted externally adjacent the REC mechanical services switchboard.

- Mounted on a foldable mast at least 4 meters above the mounting service and free from any reflected heat or building effected windage. The mast shall be supported by stainless steel cables as required to provide a stable mounting under extreme conditions
- Fitted with a lightening arrestor installed and earthed in accordance with the manufacturer's recommendations.

Provide a communications outlet and 240volt power supply as required. If the weather station can be powered via POE the 240volt power supply will not be required.

Provide a weather station with it own live web page that can be accessed independently to the BMS.

5.0 METERING

The existing REC solar installation is to be reconnected with a new submain sized to match the existing to DB-R. Protect the new solar submain with an appropriately sized MCCB.

The current construction contract includes an En-trak metering system in the MSB, MDB, DB-PAC, DB-G and DB-R which contains 15 port meter controllers connected to the school’s communication network via BACnet IP.

Interface the following En-trak metering into the BMS to record, display and provide historical data as indicated. Additionally, the demand data from the bulk supply ports is to be used by the BMS in controlling the schools demand.

Coordinate the interface of the En-trak metering with the construction contractor and the En-trak supplier Contact Nick Czeperko 0413 741 745 Nick.czeperko@en-trak.com.

Description	Location	En-trak Meter	Phases	port
Bulk Supply	MSB	1	3	1,2,3
Science / English AC	MSB	1	3	4,5,6
Block B Level 1	MSB	1	3	7,8,9
Block B Level 2	MSB	1	3	10,11,12
Building F	MSB	2	3	13,14,15
Building E	MSB	2	3	1,2,3
Building C	MSB	2	3	4,5,6
Library	MSB	2	3	7,8,9
Block G AC	MSB	2	3	10,11,12
Science / English Basement	MDB	3	3	1,2,3
Science / English Level 1	MDB	3	3	4,5,6
Science / English Level 2	MDB	3	3	7,8,9
Administration Level 1	MDB	4	3	1,2,3
Administration Level 2	MDB	4	3	4,5,6
Administration AC	MDB	4	3	7,8,9
PAC AC 1	PAC	5	3	1,2,3
PAC AC 2	PAC	5	3	4,5,6
PAC Light & Power 1	PAC	5	3	7,8,9
PAC Light & Power 2	PAC	5	3	10,11,12
PAC Light & Power 3	PAC	6	3	1,2,3
PAC Light & Power 4	PAC	6	3	4,5,6
PAC lift	PAC	6	3	7,8,9
Chapel	PAC	6	3	10,11,12
Solar Input	DB-G	7	3	1,2,3
Block G Lower Ground (DB-GB)	DB-G	7	3	4,5,6
Block G Workshop (DB-GC)	DB-G	7	3	7,8,9
Block G Power (DB-GA1)	DB-G	7	3	10,11,12
Block G Lighting (DB-GA2)	DB-G	7	3	13,14,15
Solar Input	REC	8	3	1,2,3
REC Ground Power 1	REC	8	3	4,5,6
REC Ground Power 2	REC	8	3	7,8,9
REC Level 1 & 2 Power	REC	8	3	10,11,12

REC Lighting	REC	9	3	1,2,3
REC AC	REC	9	3	4,5,6

Interface the sites existing Planet Arc Solar metering into the BMS via BACnet Modbus TCP/IP. Coordinate the interface with Planet Arc Power contact Merv Joyce 0437 022 481 mjoyce@planetarcpower.com.

Display the meter data as defined in section 8.0 Graphical User Interface.

Store the meter data in the data base and provide the ability for predefined users to export and download the meter data in CSU UTF-8 (Comma delimited) (*.csv) format. Provide the user with the ability to select the meter and a date range of the data to be downloaded.

Store the bulk supply meter demand data such that the BMS can access it to initiate the demand reduction strategies.

6.0 COMMUNICATIONS CABLING

6.1 SCOPE

Intravision Pty Ltd, Heath Duncan 0410 837 061 / (07) 3040 0880 is to be engaged as a nominated subcontractor to install the new fixed cat 6 communications cabling.

All of the communications works are to be undertaken in consideration of the existing live installation without disrupting the current connectivity during normal business hours. Advise the school two weeks prior of any potential disruption to the existing communications services and restrict such disruptions to less than 8 hours between 10.00pm and 6.00am.

The communications cabling component of this contract includes an integrated telephone and data EIA/TIA 568-A Molex certified cabling solution.

All outlets and patch panels that are required to terminate the cabling provided as part of the communications cabling are to be provided as part of these works.

The terms Category and Cat are used interchangeably throughout this contract to refer to cabling types and standards.

Provide all copper products within the communications cabling scope as being capable of supporting the provision of power to the Data Terminal Equipment via the electrically conductive Media Dependant Interfaces as specified in the latest IEEE 802.3af "Power over Ethernet" standard.

The communications cabling component of this contract includes but is not limited to the following extent of work:

- Communications cabling.
- Cable access ways.
- Facility cabling.
- Patch panels.
- Access and conduits.
- Independent certification.
- Communications outlets.

Provide the communications system as a propriety structured cabling system with a component manufacturer's 25-year warranty over the communications installation. Include a copy of the propriety structured cabling system manufacturer's warranty in the Operations and Maintenance Manual.

Provide comprehensive details for approval of the structured cabling solution including the manufacturer's performance and installation requirements as well as details of the FOBOTs, patch panels, frames, patch leads, cables, faceplates, outlets and fly leads.

All suppliers and sub-contractors to the Electrical Sub Contractor must ensure they are familiar with and comply with the requirements of sections 1.0, 2.0 and 3.0 of this specification

Ensure that the work is performed by the holder of a current ACMA license and the staff member has been trained and is certified by the propriety structured cabling system manufacturer. Provide a copy of the appropriate ACMA license and propriety structured cabling system manufacturer's certification for approval prior to commencing work onsite and include a copy in the Operations and Maintenance Manual.

7.0 WORKS REQUIREMENTS

7.1 ADMINISTRATION BUILDING

The recently completed Administration building incorporates a Niagara BMS controlling the mechanical services and lighting.

The Administration Building Niagara BMS includes the following equipment all connected over the school's existing IT network:

- Honeywell Jace-8000 (JACE) located in the lower ground server room.
- Mitsubishi AE200 (AE200) located in the roof mounted mechanicals services switchboard.
- Mitsubishi CIPer50 (CIPer50) located in the roof mounted mechanicals services switchboard.
- Mitsubishi FX5U PLC (PLC4) located in the lower ground electrical distribution board DB-4.
- Mitsubishi FX5U PLC (PLC5) located in the lower ground electrical distribution board DB-5.
- Database residing on the school's database server.

The Niagara BMS also controls the mechanical services and lighting in the recently completed Block D as noted below in the Block Section.

The existing AE200, CIPer50, PLC4 and PLC5 are to be interface into the new BMS with all existing levels of function and control provided through the new BMS. The preference is to remove the existing JACE or database if the new BMS is able to provide all of the necessary functions and control.

The installers programming tools and firmware access will be made available for the CIPer50 and PLCs. If the proposed BMS cannot interface with the CIPer50 and PLCs at the same level as its own controllers then allow to replace these units as necessary.

Provide a new controller located in the lower ground server room to control the scheduling of the administration building and block D. All scheduling is to be contained in the controller not the AE200, CIPer50 or PLCs.

The existing CIPer50, PLC4 and PLC5 inputs and outputs are to remain as is.

The attached as constructed BMS documentation of the existing BMS is provided for information only and the extent must be confirmed on site. Any differences between the as constructed BMS documentation, the actual site conditions and the requirements of this specification must be allowed for in the tender and will not be accepted as a variation.

Provide an interface to the schools existing security system located in the Administration building lower ground level server room. Provide all necessary hardware, components and cable to facilitate the security system such that the security system status in each building (armed / disarmed) is reported to the BMS. Network Locksmiths PO Box 24, Kedron, QLD, 4031, Contact Belinda Parker, e-mail: belinda@networklock.com.au Phone 0488 006 667 is to be engaged as a nominated subcontractor to undertake all works associated with the existing security system.

7.2 BLOCK B

Replace the two separate Block B AT50 controllers with a Mitsubishi AW50 (EW50) with all of the existing control functions to be provided / managed by the new BMS. Extend the Mnet cabling from the room controllers in eastern portion of the building to connect to the room controllers in the western portion of the building.

Provide a cat 6 network outlet and a double GPO for the new AW50.

Provide a new controller located adjacent the MSB to control the scheduling of the Block B and Block F BMS services. All scheduling is to be contained in the controller not the EW50s.

The existing Mitsubishi PAR31 room controllers are to have all scheduling, mode control and set point control inhibited such they only provide On/Off user input function.

7.3 BLOCK D

The mechanical services and lighting in the recently completed Block D is controlled / connected to the Niagara BMS in the Administration building.

The Block D Niagara BMS includes the following equipment all connected over the school's existing IT network:

- Mitsubishi AE200 (AE200) located in the roof mounted mechanicals services switchboard.
- Mitsubishi CIPer50 (CIPer50) located in the roof mounted mechanicals services switchboard.
- Mitsubishi FX5U PLC (PLC1) located in the lower ground electrical distribution board DB-1.
- Mitsubishi FX5U PLC (PLC2) located in the ground electrical distribution board DB-2.
- Mitsubishi FX5U PLC (PLC3) located in the upper ground electrical distribution board DB-3.

The existing AE200, CIPer50, PLC4 and PLC5 are to be interfaced into the new BMS with all existing levels of function and control provided through the new BMS.

The installers programming tools and firmware access will be made available for the CIPer50 and PLCs. If the proposed BMS cannot interface with the CIPer50 and PLCs at the same level as its own controllers then allow to replace these units as necessary.

The block D scheduling is to be contained within the new administration building controller not the AE200, CIPer50 or PLCs.

The existing CIPer50, PLC1, PLC2 and PLC3 inputs and outputs are to remain as is.

The attached as constructed BMS documentation of the existing BMS is provided for information only and the extent must be confirmed on site. Any differences between the as constructed BMS documentation, the actual site conditions and the requirements of this specification must be allowed for in the tender and will not be accepted as a variation.

7.4 BLOCK F

Replace the Block F AT50 with a Mitsubishi AW50 (EW50) with all of the existing control functions to be provided / managed by the new BMS.

Provide a cat 6 network outlet and a double GPO for the new AW50.

The Block F scheduling is to be contained within the Block B BMS controller not the EW50.

The existing Mitsubishi PAR31 room controllers are to have all scheduling, mode control and set point control inhibited such they only provide On/Off user input function.

7.5 BLOCK G

The current Block G construction contract includes the provision of separate DALI bus systems from DB-GA and DB-GB to provide user inputs into the BMS via the schools embedded communications network via IP BACnet. The DALI buses provided as part of the current Block G construction contract include:

- DALI power supplies DIN Rail mounted in the respective DB's control cubical.
- DALI controllers DIN Rail mounted in the respective DB's control cubical.
- DALI network cable / bus.

- DALI push buttons mounted in the switch panels.
- Programming and commissioning.
- Connection of the DALI bus controllers to the BMS via an on-board IP RJ45 Ethernet port via IP BACnet IP through the school's communications network via Cat 6 fly lead.

The DALI bus user inputs include inputs that are incorporated into the BMS to control the lighting, fans, ventilation and air-conditioning. The DALI bus inputs are detailed in the DALI Bus Input Schedule.

Provide BMS Panels wall mounted adjacent distribution boards DB-GA (ground Level) and DB-GB (Lower Ground Level) to house the din rail mounted BMS controllers. Provide the control wiring including cable ducts between the BMS panels and the associated distribution board. Provide the control wiring including cable access between the DB-GA BMS panel and the roof mounted mechanical services switchboard. Additionally, provide the control wiring including cable access between the DB-GB BMS panel and the two external ground mounted air-conditioning condensers.

The current Block G construction contract includes the provision of all of the cabling, relays, contactors and accessories required to connect the Block G electrical services to the BMS controllers as noted in the BMS output schedule. Additionally, the current Block G construction contract includes the provision of a cat 6 network outlet and a double GPO for each BMS panel.

Coordinate with the current Block G construction contract contractors and sub contractors.

The current Block G construction contract includes the provision of a Mitsubishi AE200 (AE200) located in the roof mounted mechanical services switchboard which will control all of the ground level and upper ground level air conditioning. The AE200 will be connected to the school's IT network as part of the current Block G construction contract.

The Block G mechanical services scheduling is to be contained within the DB-GA BMS controller not the AE200.

The lower ground level mechanical services are a combination of existing and new standalone systems. Provide an On/Off signal from the DB-GB controller to the AC1 and AC2 condensers located on the western side of the building on the ground adjacent the driveway. Coordinate the signals with the current Block G construction contract mechanical sub contractor.

Provide the DB-GA BMS panel controller with I/Os to control / monitor the following the fan On/Off and Run/Fault terminals in the roof mounted mechanical services switchboard provided as part of the current Block G construction contract:

- TEX G.13
- OAF G.6
- KEX 1.18
- GEX 1.15
- DEX 1.4
- OAF 1.2
- GEX 1.7
- SBEX

7.6 REC

The current rec construction contract includes the provision of a DALI bus system from DB-R to provide user inputs into the BMS via the schools embedded communications network via IP BACnet. The DALI bus provided as part of the current REC construction contract include:

- DALI power supplies DIN Rail mounted in the DB-R control cubical.
- DALI controllers DIN Rail mounted in the DB-R control cubical.
- DALI network cable / bus.
- DALI push buttons mounted in the switch panels.

- Programming and commissioning.
- Connection of the DALI bus controllers to the BMS via an on-board IP RJ45 Ethernet port via IP BACnet IP through the school's communications network via Cat 6 fly lead.

The DALI bus user inputs include inputs that are incorporated into the BMS to control the lighting, fans, ventilation and air-conditioning. The DALI bus inputs are detailed in the DALI Bus Input Schedule.

Provide a BMS Panels wall mounted adjacent distribution board DB-R to house the din rail mounted BMS controllers. Provide the control wiring including cable ducts between the BMS panel and DB-R and the level 2 REC mechanical services switchboard.

The current REC construction contract includes the provision of all of the cabling, relays, contactors and accessories required to connect the REC electrical services to the BMS controllers as noted in the BMS output schedule. Additionally, the current REC construction contract includes the provision of a cat 6 network outlet and a double GPO for the BMS panel.

Coordinate with the current REC construction contract contractors and sub contractors.

The current REC construction contract includes the provision of a Mitsubishi AE200 (AE200) located in the level 2 mechanical services switchboard which will control all of the REC air conditioning. The AE200 will be connected to the school's IT network as part of the current REC construction contract.

The REC mechanical services scheduling is to be contained within the DB-R BMS controller not the AE200.

Provide the DB-R BMS panel controller with I/Os to control / monitor the following the fan On/Off and Run/Fault terminals in the roof mounted mechanical services switchboard provided as part of the current REC construction contract:

- OAF 1.08
- TEX 1.10
- TEX 1.07
- TEX 1.03
- OAF 1.01
- OAF 3.05

7.7 PAC

Provide a BMS Panel wall mounted in the existing PAC mezzanine plantroom to house the din rail mounted BMS controller and all associated equipment. Provide the control wiring including cable ducts between the BMS panel and the Philips Dynalite control system and the mechanical services switchboard.

Provide all of the cabling, relays, contactors and accessories required to connect the PAC services to the BMS controllers. Additionally, provide a cat 6 network outlet and a double GPO for the PAC BMS panel and the new Mitsubishi AW50 (EW50).

The PAC contains an existing Philips Dynalite control system which is to be interfaced to the BMS with the BMS providing enabling / disabling and time control. Smartscape QLD Pty Ltd Phone: (07) 3357 1922 are to be engaged as a nominated subcontractor to undertake the works associated with the Philips Dynalite control system.

The PAC includes two separate existing mechanical services installations each with a separate control system. The older system utilises an Innotech DDC control system and the newer system utilises a Mitsubishi AT-50B (AT50).

The AT50 is to be replaced with an EW50 with all of the existing control functions to be provided / managed by the new BMS.

The scheduling of the systems controlled by the EW50 is to be contained within the BMS controller not the EW50.

The Innotech DDC control system is to be upgraded or replaced with all of the existing control functions to be provided / managed by the new BMS.

Utilise the existing mechanical services manual switch panel as connected to the Innotech DDC control system to provide the user inputs to the BMS. Upgrade the switchpanel and provide all necessary cabling, cable access ways and associated I/Os within the BMS controller as required to enable the existing mechanical services manual switch panel with the new BMS.

As part of the tender proves the tenderer must inspect the Innotech DDC control system and allow for the interface to / control off or for the replacement of if necessary, of all field devices including though not limited to:

- Temperature Sensors
- Remote Setpoint Adjusters
- Temperature Controllers
- Damper Actuators

Configure the BMS control of the existing mechanical services controlled by the Innotech DDC control system with the following functionality to reflect the existing strategies:

- The mechanical services are to be started and stopped from manual switches mounted on the mechanical services switch panel with the same configuration and level of function as currently exists.
- Each air-conditioning unit has 4,2,1-stages of cooling and reverse cycle heating as applicable with the thermostats duct mounted in the return ducts.
- Air-conditioning units 1,3,4,5 units operate on ventilation only with full modulating outside air cycle cooling available providing ambient dry bulb is less than 18degC. The outside air cycle is to be automatically available on normal A/C cycle when required.
- All proportional bands and dead bands are independently adjustable.

8.0 GRAPHICAL USER INTERFACE

8.1 GENERAL

Provide a graphical user interface (GUI) to the BMS to allow multiply levels of display to be made available to multiple levels of users.

Maintenance staff will have the highest level of access and control via a matrix what information / display is available to which level of user as well as controlling usernames and passwords.

The GUI is to be presented in dashboard style with horizontal tabs to allow quick and intuitive navigation through the displays. Information, that is not available to the level including the blank landings is not to be displayed.

Every display / page must be similar in arrangement and must include all available tabs and a home button being the initial dashboard display/page.

All tables that include more than 20 rows are to be provided with search and sort facilities.

The following information/displays is/are the minimum that must be provided. In all cases provide examples of the displays for approval.

8.2 USERS

Provide a user access matrix similar to the following as part of Display 1 to allow level 1 users to manage the displays each level of user can access:

Level	Display 1	Display 2	Display 3	Display 4	Display 5	Display 6	Display 7	Login required
1	Yes	No	No	No	No	No	No	Yes
2	No	Yes	Yes	Yes/No	Yes/No	Yes/No	Yes	Yes
3	No	No	Yes	No	No	No	No	Yes
4	No	No	No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
5	No	No	No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
6	No	No	No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
7	No	No	No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
8	No	No	No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
9	No	No	No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
10	No	No	No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No

If a level does not require a login, it is to be publicly available as an open web site.

Provide the level 1 user with the ability to rename the levels and displays.

Provide a user level matrix as part of Display 1 to allow level 1 users to manage each user's username, password and level access:

- Provide facility for up to 4 users including all licences for the level 1 users.
- Provide facility for up to 4 users including all licences for the level 2 users.
- Provide facility for up to 12 users including all licences for the level 3 users.
- Provide facility for up to 1,000 users including all licences for the level 4 to level 10 users.
- Provide facility for the level 1 user to add, delete and edit users.

Provide the user level matrix with sort and search facilities.

8.3 MASTER SCHEDULE

Provide a master schedule as part of display 2 to allow the user to associate all user inputs with one or more outputs as well as define the Run duration and Off conditions. Provide each input with three group names (text field) to allow the user to group the inputs.

The master schedule is to be provided with the following columns:

- Input (Inputs description- Eg Room D-1-3 Light Switch)
- Group 1 (User added text -Eg; Block D)
- Group 2 (User added text -Eg; Level 1)
- Group 3 (User added text -Eg; Science)
- Control (Feature to simulate the manual operation of the input)
- Status (Status indication On or Off)
- Run time (Option to select a number of hours or indefinite Eg; 2 hours)
- Off (Option to select manual, or time Eg; 5.00pm)
- Output 1 (Outputs available via drop down including nul Eg; Room D-1-3 Lights1)
- Output 2 (Outputs available via drop down including nul Eg; Room D-1-3 Lights2)
- Output 3 (Outputs available via drop down including nul Eg; Room D-1-3 Lights3)
- Output 4 (Outputs available via drop down including nul Eg; Room D-1-3 Lights4)
- Output 5 (Outputs available via drop down including nul Eg; Nul)
- Output 7 (Outputs available via drop down including nul Eg; Nul)
- Output 8 (Outputs available via drop down including nul Eg; Nul)

User inputs include all modes of manual input including direct inputs to a controller, DALI Bus inputs, and inputs via the air-conditioning room controllers.

8.4 EXTERNAL LIGHTING SCHEDULE

Provide an external lighting schedule as part of display 2 to allow the user to define an output as an external security lighting with the ability to nominate the on and off conditions:

The on conditions are to be via the illumination trigger (dusk) from the weather station or via a predefined time.

The off conditions are to be via the illumination trigger (dawn) from the weather station or via a predefined time.

The outputs are to be selected via a drop down.

8.5 SET POINT SCHEDULE

Provide an air-conditioning set point schedule as part of display 2 to allow the user to define the air-condition set points for each air-conditioning unit.

8.6 ALARMS

Provide an alarms schedule as part of display 2 to allow the user to define the action required upon receipt of an alarm including the duration / repetition of the action.

Provide a log of alarms and the user with the ability to review, manage, sort and export the alarms.

8.7 LOGGING

Provide as part of display 2 the ability for the user to review, manage and sort all log data including though not limited to:

- The associated date and time

- Description
- Status
- Rooms air temperature if applicable
- Weather conditions

Provide the user with the option to download the selected data range.

8.8 ON OFF PAGE

Provide the Level 3 display as a ON OFF page that can be effectively accessed by a smartphone or tablet to allow the user to simulate the operation of any user input.

The On/Off page is to include the following columns from the master table:

- Input (Inputs description- Eg Room D-1-3 Light Switch)
- Group 1 (User added text -Eg; Block D)
- Group 2 (User added text -Eg; Level 1)
- Group 3 (User added text -Eg; Science)
- Control (Feature to simulate the manual operation of the input)
- Status (Status indication On or Off)

8.9 DEMAND MANAGEMENT

Provide the Level 2 display with a demand management schedule to allow the user to set the demand triggers and events.

8.10 ENERGY

Provide the Level 2 display with a meter schedule to allow the user to select, display any combination of the following values from any of the energy meters:

- Meter name.
- Phase to neutral voltage
- Current
- Watts
- Watt /hours
- Total harmonic distortion
- Power factor
- Date
- Time

Provide the user with the option to select a date / time range for the data as well the option to view the data in a table or a X/Y line scatter graph. Provide the user with the option to download the selected data range.

In addition to the above schedule provide a permanent live display of the watts for each meter.

8.11 GRAPHICAL DISPLAY

Provide the Level 2 display with a graphical display that initially includes a site plan with interactive display and navigation features.

Navigation is to be by:

- From the site plan selecting a building displays the building level plan or a floor plan if the building only has a single level. The site plan is to be available as a key plan with its selection returns the user to the site plan.

- From the building level plan selecting a level displays the level. The site plan is to be available as a key plan with its selection returns the user to the site plan. The building level plan is to be available as a key plan with its selection returns the user to the building level plan.
- The level plan is to include a detailed layout of the level including the room names.
- If the rooms services are controlled by the BMS the room is to contain simple graphical images depicting the service controlled. If the service is disabled by the BMS's predefined parameters the symbol is to be greyed out with a cross over it. If the service is enabled by the BMS's predefined parameters and it is not on or running the symbol is to be light red. If the service is on or running the symbol is to be green.
- Selecting the room is to display the room temperature if available and the user inputs associated with that room. With each user input display and provide the ability to edit the Master Schedule Run time. Additionally, provide the ability to control (turn on or off) each user input in the room.

The successful tenderer will be provided with the required plans as DWG and PDF files.

8.12 STUDENT DATA

Provide the Level 4 to Level 7 displays with data presented in the formats nominated to allow the school's students and community access the data to facilitate education and taking an active role in energy management.

Provide the Level 4 display with student data in a graphic format appropriate for year 7 and 8 students including:

- Selection of a date range.
- Selection of a room, building or site
- Time and date of operation of each output
- Weather conditions
- Energy generated by the PV systems
- Associated energy used
- Comparisons by total values and simple predefined graphs

Provide the Level 5 display with student data in a graphic format appropriate for year 9 students including:

- Selection of a date range.
- Selection of a room, building or site
- Time and date of operation of each output
- Weather conditions
- Energy generated by the PV systems
- Associated energy used
- Comparisons by total values and a number of different types of predefined graphs

Provide the Level 6 display with student data in a combination of graphic and tabulated formats appropriate for year 10 students including:

- Selection of a date range.
- Selection of a room, building or site
- Time and date of operation of each output
- Weather conditions
- Energy generated by the PV systems
- Associated energy used
- Comparisons by total values and a number of different types of customisable user defined graphs

Provide the Level 7 display with student data in a combination of graphic and tabulated formats appropriate for year 11 and 12 students including:

- Selection of a date range.
- Selection of a room, building or site
- Time and date of operation of each output
- Weather conditions
- Energy generated by the PV systems
- Associated energy used
- Comparisons by total values and a number of different types of customisable user defined graphs
- Provide the user with the option to download the selected data range.

9.0 OPERATIONAL REQUIREMENTS

Irrespective of the status of operation or remaining duration of operation when the security system is armed all of the internal lighting and mechanical services controlled by the BMS in the building that is armed are to be turned off.

Upon disarming of the security system, the internal lighting and mechanical services controlled by the BMS is to remain off until the master schedule enables the associated outputs and it has been called for by:

- The manual operation of the associated user input or;
- The associated output is turned on automatically at a predefined time or input as called up in the master schedule.

External functional lighting is typically off until manually turned on via a user input for the duration as defined in the master schedule.

External security lighting is to be turned on prior to dusk and off at dawn as sensed by the weather station daylight sensor.

If the master schedule enables the outputs associated with a manual user input and it is currently off and manual user input is operated, the associated output/s is/are to be turned on for the duration as defined in the master schedule.

If the master schedule disables the outputs associated with a manual user input and it is currently off and manual user input is operated, the associated output/s is/are to be remain off.

If the master schedule enables the outputs associated with a manual user input and it is currently on and manual user input is operated for less than 1 second, the associated output/s is/are to be turned off.

If the master schedule enables the outputs associated with a manual user input and it is currently on and manual user input is operated (held down) continuously for more than 1 second, the associated output/s is/are to remain on and the duration of operation as defined in the master schedule is to recommence.

Configure the system such that multiple operations (held down) continuously for more than 1 second of the manual user inputs are not summated and duration of operation as defined in the master schedule recommences after the last manual operation.

10.0 DEMAND STUDY

Undertake a detailed study of the potential demand management opportunities of the equipment controlled by the BMS and develop a demand management strategy in conjunction with the School. The demand management strategy is to utilise the BMS to automatically reduce loads based upon predefined criteria including demand set points. Present the study to the school four weeks after practical completion and update it following the presentation incorporating the agreed changes.

Upon receiving acceptance from the school, implement the BMS control recommendations from the demand management strategy.

Review the operating data at six months after the initial report, update the demand management strategy and provide it to the school for their review. Following the school's review incorporate the required changes and implement the BMS control recommendations from the demand management strategy.

Undertake a thorough review of the operating data 12 months after the initial report and update the demand management strategy. Present the updated strategy to the school and update it following the presentation incorporating the agreed changes.

Upon receiving acceptance from the school, implement the BMS control recommendations from the demand management strategy.

11.0 TENDER SUBMISSION

Within the tender submission include copies of data sheets on each product to be used, including:

- BMS Controllers.
- Weather station.
- All software.
- All licences included as part of the proposed installation.
- Details of all licences that can be applied to the hardware and or software that are proposed to be provided as part of the system that are not included as part of the proposed installation.
- Details of the update arrangements and ongoing costs for all proposed software and firmware.

With the tender submission provide the following program / timing information:

- Number of weeks to mobilise once the contract has been awarded.
- Number of weeks to commence initial site investigation after mobilisation.
- Number of weeks to undertake the site investigation.
- Number of weeks to obtain equipment after the site investigation.
- Number of weeks to install the equipment once it has been obtained.
- Number of weeks to test and commission the BMS works.

With the tender submission provide the tender price in the following breakup:

- Installation including all hardware software, licences, programming and commissioning.
- Demand management study and implementation.
- All costs during the defects and liability period excluding that associated with the demand management.

With the tender submission provide details of the proposed works / approach to interfacing to / replacing the existing Niagara BMS in the Administration building.

Provide the proposed conditions of contract.

Include a list of all exclusions.