INSTALLATION NOTES

.1 ALL ELECTRICAL (120v) WIRING, INCLUDING CIRCUIT BREAKERS, SHALL BE PROVIDED (i.e. SUPPLIED & INSTALLED) BY THE CONTRACTOR.

.2 ALL LOW VOLTAGE (24v) WIRING, INCLUDING 120/24VDC CONTROL TRANSFORMERS, SHALL BE PROVIDED (i.e. SUPPLIED & INSTALLED) BY THE CONTRACTOR.

.3 ALL NETWORK/COMMUNICATION WIRING, INCLUDING DATA CONNECTIONS & DROPS, SHALL BE PROVIDED (i.e. SUPPLIED & INSTALLED) BY THE CONTRACTOR.

.4 THE SCHEMATIC SHOWN BELOW IS NOT NECESSARILY INDICATIVE OF THE REQUIRED NUMBER OF ROOM-LEVEL INTEGRATION DEVICES.

   .1 IF THE LABORATORY AIRFLOW CONTROL SYSTEM DEVICES ARE BACNET IP DEVICES AND ROOM-LEVEL INTEGRATION IS NOT REQUIRED TO INTEGRATE WITH THE EXISTING EMCS, INTEGRATIONS DEVICES ARE NOT REQUIRED.

   .2 ALTERNATIVELY, IF THE MANUFACTURER'S ROOM-LEVEL INTEGRATION DEVICES CAN HANDLE A LARGER (OR SMALLER) NUMBER OF CONNECTIONS, THE DEVICE COUNT SHALL BE ADJUSTED SUCH THAT EACH DEVICE HAS A TOTAL CONNECTION COUNT NOT EXCEEDING 80% OF ITS MAXIMUM ALLOWANCE.
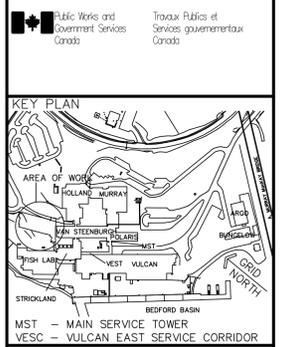
VIEW MONITORS ARE SHOWN WITHIN ALL CONTROL SCHEMATICS CONNECTED INTO THE LOCAL COMMUNICATION NETWORK. THESE CAN EITHER CONNECT INTO THE LOCAL COMMUNICATION NETWORK (AND PASS THROUGH THE ROOM LEVEL INTEGRATION DEVICES TO INTEGRATED TO THE EXISTING EMCS) OR DIRECTLY INTO THE BACNET IP NETWORK TO INTEGRATE TO THE EXISTING EMCS DIRECTLY. CONFIRM EXACT WIRING REQUIREMENTS WITH MANUFACTURER.
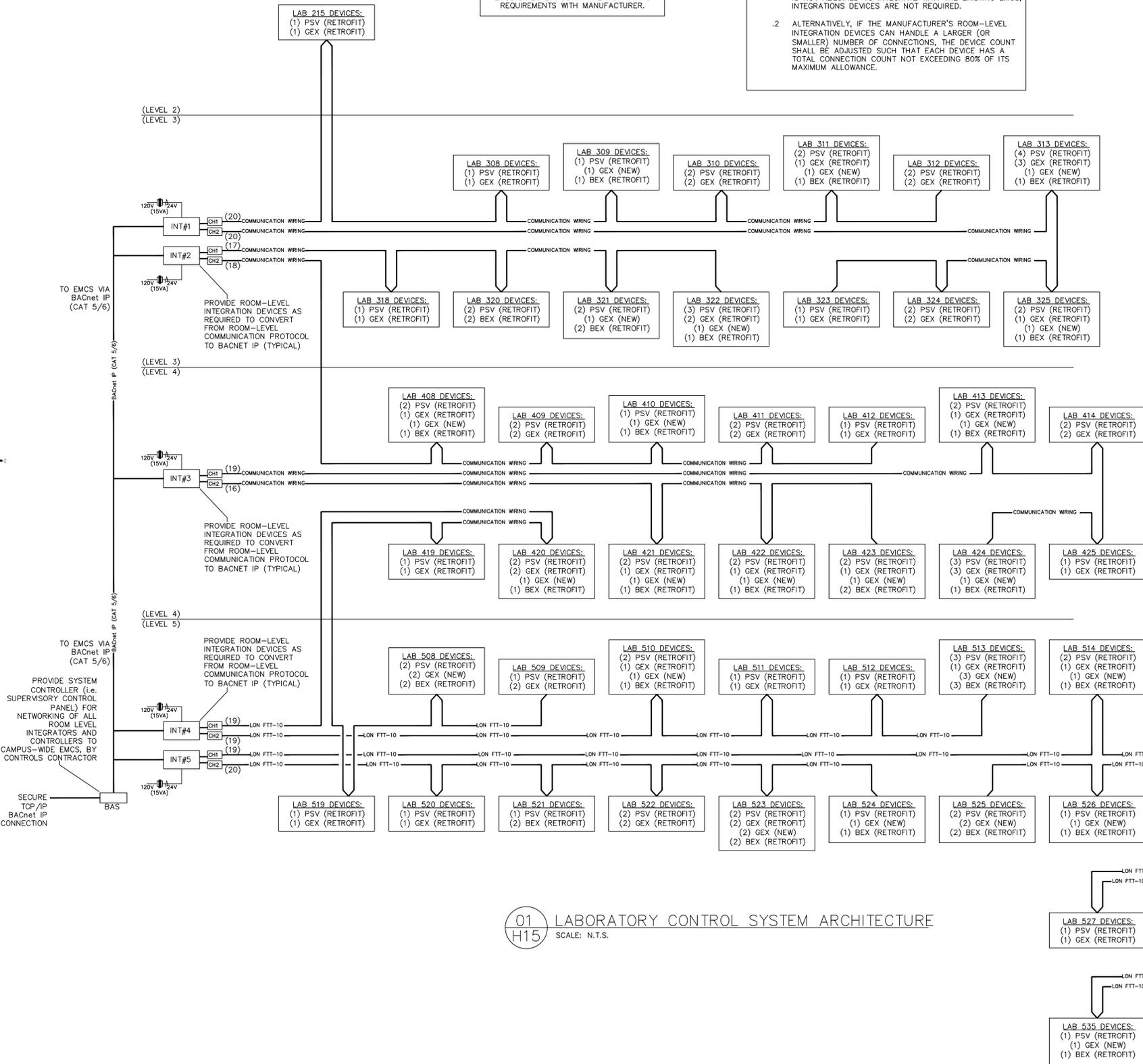
SEQUENCE OF OPERATION

THE SEQUENCE OF OPERATION FOR THE LABORATORY SYSTEM IS AS FOLLOWS:

.1 SYSTEM OPERATIONAL PRIORITY (i.e. AIR CHANGE RATE WITHIN THE LABORATORY SPACES) WILL BE BASED ON THE FOLLOWING PRIORITIES:
   .1 OCCUPANCY (i.e. TIME-OF-DAY SCHEDULE).
   .2 THERMAL COMFORT (i.e. HEATING/COOLING REQUIREMENTS OF THE SPACE).
   .3 FUME HOOD OPERATION (i.e. INCREASED AIRFLOW DUE TO FUME HOODS OPERATIONAL).

.2 THE OPERATION OF THE SUPPLY, GENERAL EXHAUST AND FUME HOOD EXHAUST AIR VALVES WILL BE SELF-CONTAINED WITHIN THEIR MANUFACTURER-SPECIFIC PROGRAMMING. PROVIDE LABORATORY ROOM CONTROLLERS AS REQUIRED IF THE VALVES THEMSELVES DO NOT HAVE THE NECESSARY PROGRAMMABLE LOGIC CONTROL TO MODULATE TO MAINTAIN A VOLUMETRIC OFFSET SET-POINT BASED ON SYSTEM PROGRAMMABLE PRIORITY INPUTS PROVIDED BELOW. TO BE DONE WITHIN THE LAB-SPECIFIC PROGRAMMABLE LOGIC CONTROL. TO BE INSTALLED, PROGRAMMED AND COMMISSIONED TO MAINTAIN THE SPECIFIED AIRFLOW OFFSET (I.E. BETWEEN SUPPLY AND EXHAUST).
   .1 OCCUPANCY (I.E. TIME-OF-DAY SCHEDULE), MULIT-STATE SIGNAL TO CHANGE FROM OCCUPIED ACH RATE (i.e. 4 ACHS) OR UNOCCUPIED ACH RATE (i.e. 2 ACHs).
   .2 THERMAL COMFORT (I.E. HEATING/COOLING REQUIREMENTS OF THE SPACE), SEE ADDITIONAL REQUIREMENTS PROVIDED WITHIN THE SEQUENCE OF OPERATION BELOW, THE INDIVIDUAL LABORATORY CONTROLLERS & AIR VALVE CONTROLLERS SHALL CONTROL ROOM THERMAL CONDITIONS.
   .3 FUME HOOD OPERATION (i.e. INCREASED AIRFLOW DUE TO FUME HOODS OPERATIONAL), WHERE FUME HOODS ARE BEING CONVERTED TO VAV FUME HOODS, RAISING THE FUME HOOD SASH WILL INCREASE THE EXHAUST FLOW FROM THE FOOD.

.3 A MINIMUM OF 15% OF THE NEW SUPPLY AIR VALVES AND 15% OF THE NEW GENERAL/FUME EXHAUST AIR VALVES SHALL BE COMPLETE WITH DIFFERENTIAL PRESSURE TRANSDUCERS (ANALOG) TO ALLOW FOR THE IMPLEMENTATION OF A STATIC PRESSURE RESET PROGRAM. THESE AIR VALVES SHALL BE IDENTIFIED AT THE TIME OF SHOP DRAWINGS. THE CONTROLS CONTRACTOR SHALL IMPLEMENT THE STATIC PRESSURE RESET PROGRAM FOR THE MAIN SUPPLY AND EXHAUST SYSTEMS.

.4 THE BUILDING AUTOMATION SYSTEM WILL INTEGRATE WITH THE FOLLOWING POINTS THROUGH THE ROOM INTEGRATORS, INCLUDING:

#	Point	Type	Access
.1	JAM_ALARM	BINARY	READ
.2	FLOW_ALARM	BINARY	READ
.3	EFF_VLV_CMD	ANALOG	READ
.4	EFF_VLV_FLOW_FDBK	ANALOG	READ
.5	BROKEN_SASH_CABLE	BINARY	READ
.6	HOOD_OVERRIDE	BINARY	READ
.7	SASH_HEIGHT_ALARM	BINARY	READ
.8	FACE/VELOCITY	ANALOG	READ
.9	SASH_OPEN_PERCENT	ANALOG	READ
.10	USER_STATUS_STATE	BINARY	READ
.11	OCCUPANCY_CMD	MULTI-STATE	READ/WRITE
.12	EFF_OCC_MODE	MULTI-STATE	READ
.13	EFF_EMER_MODE	MULTI-STATE	READ
.14	EMER_MODE_CMD	MULTI-STATE	READ/WRITE
.15	OCC_COOL_SETPT	ANALOG	READ/WRITE
.16	OCC_HEAT_SETPT	ANALOG	READ/WRITE
.17	UNOCC_COOL_SETPT	ANALOG	READ/WRITE
.18	UNOCC_HEAT_SETPT	ANALOG	READ/WRITE
.19	EFF_TEMP_SETPT	ANALOG	READ
.20	OCC_TEMP_SETPT	ANALOG	READ
.21	AVG_SPACE_TEMP	ANALOG	READ
.22	TEMP_CTRL_MODE	MULTI-STATE	READ
.23	HVAC_MODE_OVERRIDE	MULTI-STATE	READ/WRITE
.24	OCC_MIN_SETPT	ANALOG	READ
.25	UNOCC_MIN_SETPT	ANALOG	READ/WRITE
.26	TOTAL_ZONE_SUPPLY	ANALOG	READ
.27	TOTAL_ZONE_EXHAUST	ANALOG	READ

ALL POINTS ABOVE SHALL BE TRENDED FOR 4 MONTHS USING CHANGE OF VALUE TRENDING (i.e. EACH TIME THE VALUE CHANGES, IT CREATES A TREND LOG INPUT). EACH ALARM IDENTIFIED ABOVE SHALL BE BROUGHT THROUGH AND ESCALATED AS DIRECTED BY BUILDING OPERATIONAL STAFF MEMBERS. ALL CONTROL GRAPHICS, EVENT MANAGEMENT, DATA LOG TRENDING, ALARM MONITORING, etc. SHALL BE THROUGH THE EXISTING DELTA ENERGY MANAGEMENT AND CONTROL SYSTEM.

.5 THE LABORATORY ROOM CONTROLLERS SHALL, IN ADDITION TO THE REQUIREMENTS OUTLINED ABOVE, PROVIDE:
   .1 SPACE TEMPERATURE CONTROL BY (A) VARYING THE SUPPLY AIRFLOW TO THE SPACE AND/OR (B) MODULATING THE REHEAT CONTROL VALVE. THROUGH THE ROOM INTEGRATOR THE BUILDING AUTOMATION SYSTEM WILL PROVIDE OCCUPIED/UNOCCUPIED SET POINTS BASED ON TIME-OF-DAY SCHEDULE, WITH MINOR (+/- 5°C) VARIABILITY AT THE LOCAL, ROOM-LEVEL CONTROLLER.

.6 USING THE "READ/WRITE" POINTS TO BE INTEGRATED ABOVE, THE BUILDING AUTOMATION SYSTEM WILL PROVIDE THE FOLLOWING CONTROLS:
   .1 SHALL PROVIDE OCCUPANCY TIME-OF-DAY SCHEDULE TO LABORATORY SPACES THROUGH A SIGNAL TO "OCCUPANCY_CMD". EACH LABORATORY SPACE WILL HAVE A SEPARATE SCHEDULE, WITH THE ABILITY TO GLOBALLY UPDATE/EDIT ALL SCHEDULES.
   .2 THE BUILDING AUTOMATION SYSTEM WILL ALLOW FOR THE MANUAL SETTING OF THE FOLLOWING POINTS "OCC_MIN_SETPT", "UNOCC_MIN_SETPT" AND "EMER_MODE_CMD".
   .3 THE "EMER_MODE_CMD" ALLOWS THE SYSTEM TO ESTABLISH FOUR (4) EMERGENCY CODE SCENARIOS, THE CONTRACTOR WILL PROGRAM AT LEAST ONE (1) CODE SUCH THAT IT ALLOWS THE USERS TO MANUALLY REVERT EACH LABORATORY SPACE TO FULL FLOW AND ONE (1) CODE SUCH THAT IT ALLOWS THE USERS WITHIN THE LABORATORY TO UTILIZE THE EMERGENCY PURGE BUTTON ON THE FUME HOOD CONTROLLER & REVERTS THE LABORATORY SPACE TO FULL FLOW.
   .4 REFER TO ADDITIONAL REQUIREMENTS AS OUTLINED ABOVE.

.7 THE FOLLOWING FRONT-END CONTROL REQUIREMENTS WILL BE PROVIDED:
   .1 EVENT MANAGEMENT
      .1 ALL ALARMS SHALL BE CREATED BY, AND VIEWED AND MANAGED THROUGH, THE EXISTING ENTELIWEB OWS SYSTEM.
      .2 ALARMS OBJECTS/EVENTS SHALL BE VIEWABLE, AND HAVE THE ABILITY TO BE ACKNOWLEDGED OR DISMISSED BY, THE EXISTING USERS AND USER GROUPS.
      .3 CRITICAL ALARMS SHALL BE ROUTED THROUGH TO THE COMMISSIONAIRES DESK. CRITICAL ALARMS WILL BE AS REQUIRED BY THE DEPARTMENTAL REPRESENTATIVE AND AS REQUIRED WITHIN THE DRAWINGS AND SPECIFICATIONS.
   .2 TRENDING AND ARCHIVING
      .1 ALL PHYSICAL AND VIRTUAL INPUTS, OUTPUTS, AND TEMPERATURE & PRESSURE SET POINTS SHALL BE TRENDED AND ARCHIVED ON THE EXISTING HISTORIAN SOFTWARE PLATFORM FOR A PERIOD OF 1 YEAR.
      .2 ARCHIVED TREND LOGS SHALL BE ALSO SET UP FOR THE POINTS DESCRIBED ABOVE.
      .3 TRENDS SHALL BE CONFIGURED TO RECORD ON 15 MINUTE INCREMENTS
      .4 ARCHIVED TREND LOG DATA SHALL BE VISIBLE UTILIZING THE EXISTING ENTELIWEB OWS.
      .5 TREND LOG DATA SHALL BE SELECTED BASED ON OBJECT AND TIME FRAME, AND BE EXPORTED TO AN EXCEL, PDF OR WORD DOCUMENT FORMAT.
   .3 NETWORK CONFIGURATION
      .1 SYSTEM LEVEL PANELS SHALL BE CONFIGURED TO COMMUNICATE ON THE EXISTING NETWORK UTILIZING BACNET IP. PANELS, GATEWAYS, OR OTHER BACNET APPLIANCES SHALL BE SOFTWARE ADDRESSABLE. PANEL ADDRESSES TO BE APPROVED BY CONSULTANT TO AVOID CONFLICTS WITH THE EXISTING BAS PANELS.
   .4 GRAPHICS
      .1 GRAPHICS SHALL RESIDE ON THE EXISTING OWS ENTELIWEB SOFTWARE PLATFORM.
      .2 GRAPHIC FILES SHALL:
         .1 APPEAR LOGICALLY BENEATH THE RELEVANT BUILDING, WITHIN THE EXISTING BUILDING STOCK.
         .2 LOGICALLY NAMED BY ROOM, SYSTEM OR DEVICE.
         .3 BE USER SELECTABLE UTILIZING "POINT AND CLICK"
      .3 GRAPHICS SHALL HAVE THE FUNCTIONALITY:
         .1 MOUSE HOVER OVER A GRAPHIC POINT SHALL PROVIDE A REAL-TIME VALUE
         .2 MOUSE HOVER OVER A GRAPHIC POINT SHALL PROVIDE ADDITIONAL POINT-AND-CLICK FUNCTIONALITY
            .1 SET POINT TO AUTO
            .2 SET POINT TO MANUAL, ALONG WITH AN APPROPRIATE ANALOGUE OR BINARY VALUE.
      .4 GRAPHICS SHALL HAVE THE SAME STRUCTURE, LOOK AND FEEL OF THE EXISTING GRAPHICS.
      .5 WORK IN EXISTING BUILDINGS SHALL UPDATE THE EXISTING GRAPHIC FILES TO REFLECT THE MECHANICAL, HARDWARE AND SOFTWARE CHANGES IN THE BUILDING
      .6 NEW BUILDINGS OR ADDITIONAL BUILDINGS SHALL BE INCLUDED AND LINKED ON THE "STARTNEW" GRAPHIC PAGE, WHICH IS THE HOMEPAGE FOR ALL GRAPHICS AT SITE.
   .7 OPERATING WORK STATION POINT COUNT:
      .1 THE ENTELIWEB OWS SYSTEM AT BIO IS LICENSED TO OPERATE UP TO A TOTAL CONNECTED BACNET I/O POINT COUNT. THESE I/O POINTS MAY BE PHYSICAL OR VIRTUAL. OTHER BACNET POINTS DO NOT INCREASE THE NUMBER.
      .2 EXCEEDING THIS POINT COUNT WILL CAUSE THE OWS SOFTWARE TO SHUT DOWN AFTER A MONTH DELAY.
      .3 IT IS THE RESPONSIBILITY OF THE CONTROLS CONTRACTOR TO ENSURE THAT THE BACNET I/O OBJECTS ADDED TO THE BIO NETWORK DO NOT EXCEED THE MAXIMUM PERMISSIBLE I/O THE ENTELIWEB SERVER IS LICENSED FOR. IF THE I/O POINT COUNT IS EXCEEDED, ADDITIONAL I/O LICENSES CAN BE PURCHASED THROUGH CONTROLS & EQUIPMENT. THESE SHALL BE PURCHASED BY THE OWNER AS AN EXTRA TO THE CONTRACT ON AN AS-NEEDED BASIS, VERIFICATION, COORDINATION & MODIFICATION REQUIREMENTS SHALL BE PART OF THIS CONTRACT.

LABORATORY CONTROL SYSTEM ARCHITECTURE

01 / H15   SCALE: N.T.S.

Device blocks

LAB 215 DEVICES: (1) PSV (RETROFIT) (1) GEX (RETROFIT)

LAB 308 DEVICES: (1) PSV (RETROFIT) (1) GEX (RETROFIT)
LAB 309 DEVICES: (1) PSV (RETROFIT) (1) GEX (NEW) (1) BEX (RETROFIT)
LAB 310 DEVICES: (2) PSV (RETROFIT) (2) GEX (RETROFIT)
LAB 311 DEVICES: (2) PSV (RETROFIT) (1) GEX (RETROFIT) (1) GEX (NEW) (1) BEX (RETROFIT)
LAB 312 DEVICES: (2) PSV (RETROFIT) (2) GEX (RETROFIT)
LAB 313 DEVICES: (4) PSV (RETROFIT) (3) GEX (RETROFIT) (1) BEX (NEW)

LAB 318 DEVICES: (1) PSV (RETROFIT) (1) GEX (RETROFIT)
LAB 320 DEVICES: (2) PSV (RETROFIT) (2) GEX (RETROFIT)
LAB 321 DEVICES: (2) PSV (RETROFIT) (2) BEX (RETROFIT)
LAB 322 DEVICES: (3) PSV (RETROFIT) (2) GEX (RETROFIT) (1) GEX (NEW) (1) BEX (RETROFIT)
LAB 323 DEVICES: (1) PSV (RETROFIT) (1) GEX (RETROFIT)
LAB 324 DEVICES: (2) PSV (RETROFIT) (2) GEX (RETROFIT)
LAB 325 DEVICES: (2) PSV (RETROFIT) (1) GEX (NEW) (1) BEX (RETROFIT)

LAB 408 DEVICES: (2) PSV (RETROFIT) (1) GEX (RETROFIT) (1) GEX (NEW) (1) BEX (RETROFIT)
LAB 409 DEVICES: (2) PSV (RETROFIT) (2) GEX (RETROFIT)
LAB 410 DEVICES: (1) PSV (RETROFIT) (1) GEX (NEW) (1) BEX (RETROFIT)
LAB 411 DEVICES: (2) PSV (RETROFIT) (2) GEX (RETROFIT)
LAB 412 DEVICES: (1) PSV (RETROFIT) (1) GEX (RETROFIT)
LAB 413 DEVICES: (2) PSV (RETROFIT) (1) GEX (RETROFIT) (1) GEX (NEW) (1) BEX (RETROFIT)
LAB 414 DEVICES: (2) PSV (RETROFIT) (2) GEX (RETROFIT)

LAB 419 DEVICES: (1) PSV (RETROFIT) (1) GEX (RETROFIT)
LAB 420 DEVICES: (2) PSV (RETROFIT) (2) GEX (RETROFIT) (1) GEX (NEW) (1) BEX (RETROFIT)
LAB 421 DEVICES: (2) PSV (RETROFIT) (2) GEX (RETROFIT) (1) BEX (RETROFIT)
LAB 422 DEVICES: (1) PSV (RETROFIT) (1) GEX (RETROFIT) (1) GEX (NEW) (1) BEX (RETROFIT)
LAB 423 DEVICES: (2) PSV (RETROFIT) (2) GEX (RETROFIT) (1) BEX (RETROFIT)
LAB 424 DEVICES: (3) PSV (RETROFIT) (3) GEX (RETROFIT) (1) BEX (RETROFIT)
LAB 425 DEVICES: (1) PSV (RETROFIT) (1) GEX (RETROFIT)

LAB 508 DEVICES: (2) PSV (RETROFIT) (2) GEX (NEW) (2) BEX (RETROFIT)
LAB 509 DEVICES: (1) PSV (RETROFIT) (1) GEX (RETROFIT)
LAB 510 DEVICES: (2) PSV (RETROFIT) (1) GEX (NEW) (1) BEX (RETROFIT)
LAB 511 DEVICES: (1) PSV (RETROFIT) (1) GEX (RETROFIT)
LAB 512 DEVICES: (1) PSV (RETROFIT) (1) GEX (RETROFIT)
LAB 513 DEVICES: (3) PSV (RETROFIT) (2) GEX (RETROFIT) (3) GEX (NEW) (3) BEX (RETROFIT)
LAB 514 DEVICES: (2) PSV (RETROFIT) (1) GEX (NEW) (1) BEX (NEW)

LAB 519 DEVICES: (1) PSV (RETROFIT) (1) GEX (RETROFIT)
LAB 520 DEVICES: (1) PSV (RETROFIT) (1) GEX (RETROFIT)
LAB 521 DEVICES: (2) PSV (RETROFIT) (2) BEX (RETROFIT)
LAB 522 DEVICES: (2) PSV (RETROFIT) (2) GEX (RETROFIT) (2) GEX (NEW) (2) BEX (RETROFIT)
LAB 523 DEVICES: (2) PSV (RETROFIT) (2) GEX (RETROFIT) (1) GEX (NEW) (1) BEX (RETROFIT)
LAB 524 DEVICES: (2) PSV (RETROFIT) (2) GEX (RETROFIT)
LAB 525 DEVICES: (2) PSV (RETROFIT) (2) GEX (RETROFIT) (1) GEX (NEW) (1) BEX (RETROFIT)
LAB 526 DEVICES: (1) PSV (RETROFIT) (1) GEX (RETROFIT)

LAB 527 DEVICES: (1) PSV (RETROFIT) (1) GEX (RETROFIT)

LAB 535 DEVICES: (1) PSV (RETROFIT) (1) GEX (NEW) (1) BEX (RETROFIT)

Network annotations

INT#1 CH1 (20) CH2 (20) COMMUNICATION WIRING
INT#2 CH1 (17) CH2 (18) COMMUNICATION WIRING
INT#3 CH1 (19) CH2 (16) COMMUNICATION WIRING
INT#4 CH1 (19) CH2 (19) LON FTT-10
INT#5 CH1 (19) CH2 (20) LON FTT-10

120V/24V (15VA) — (5 transformers shown)

TO EMCS VIA BACnet IP (CAT 5/6)

PROVIDE ROOM-LEVEL INTEGRATION DEVICES AS REQUIRED TO CONVERT FROM ROOM-LEVEL COMMUNICATION PROTOCOL TO BACNET IP (TYPICAL)

PROVIDE SYSTEM CONTROLLER (i.e. SUPERVISORY CONTROL PANEL) FOR NETWORKING OF ALL ROOM LEVEL INTEGRATORS AND CONTROLLERS TO CAMPUS-WIDE EMCS, BY CONTROLS CONTRACTOR

SECURE TCP/IP BACnet IP CONNECTION

BAS

(LEVEL 2) (LEVEL 3)
(LEVEL 3) (LEVEL 4)
(LEVEL 4) (LEVEL 5)

BACnet IP (CAT 5/6)