APPENDIX IV

SEQUENCE OF OPERATION

Greenhouse Condensing Boilers   EMCS: SEQUENCE OF OPERATION   APPENDIX IV
FRDC, B1
Fredericton, NB
Project No. R.106443.001   April, 2020

.1   <u>General</u>:

    .1   The following global strategies shall be applied to control the new boiler plant.

    .2   The new boilers must integrate into the existing Alerton BMS complete with graphics, alarming, trending, etc.

    .3   Graphics:

        .1   Graphics shall clearly indicate all control points and a select list of variables from the Boiler manufactures list BACnet MSTP object.
The owner to be presented with a list of BACnet objects to be approved for the graphics.

    .4   Scheduling:

        .1   Programing is required to provide three (3) modes of Operation:

            .1   Summer Mode

            .2   New Boiler Plant Heating Mode (Shoulder Season Mode)

            .3   Main Boiler Plant Heating Mode (Winter Mode)

        .2   During the 'Summer Mode' the boilers and all heating circulation pumps shall remain disabled.

        .3   If the OAT ≤ 5°C during the 'Summer Mode' send an alarm to the Operator Workstation.

        .4   If the OAT ≤ 5°C during the 'Shoulder Season Mode' send an alarm to the Operator Workstation.

        Note: The switch over from shoulder season mode to winter mode (or vice versa) shall be done manually.

.2   <u>New Boiler Plant Control Sequence</u>:

    .1   During the 'Shoulder Season Mode', the boiler plant shall be sequenced as follow:

        .1   The greenhouses and the remainder of Header House shall send a signal to the BMS on a call for heat:

            .1   The greenhouse heating systems are controlled by a proprietary control system, PRIVA greenhouse controls system. This system operates as stand-alone from the BMS and simply provides a binary 'call for heat' type signal to the BMS when any heat is required.

            .2   The remainder of the Header House has mostly hydronic radiant ceiling panels, two wall convector heaters and one vertical unit heater. These heaters are feed from Pump HCR 17.

        .2   The boiler controllers for HB-1, HB-2, HB-3 and HB-4, shall receive a plant enable/disable and hot water demand setpoint signal from the BMS.

        .3   Contractor (with the assistance of the supplier) to engineer the control system to ensure BMS output correlates to Boiler output.

Greenhouse Condensing Boilers   EMCS: SEQUENCE OF OPERATION   APPENDIX IV
FRDC, B1
Fredericton, NB
Project No. R.106443.001   April, 2020

.4   The boilers will utilize on-board controls to modulate their firing rate as well as their associated circulator pumps (BP-1, BP-2, BP-3 and BP-4). These circulator pumps shall be monitored on the BMS.

.5   The boiler plants Heating Hot Water Supply (HWS) temperature shall be reset based on an operator adjustable schedule.

.6   Initially the HWS schedule shall be established as follows.

OAT	HWS Hi Limit
+5°C	+60°C
+18°C	+48°C

.7   The boiler shall be modulated based on a scaled analogy signal to maintain HWS setpoint. If the lead boiler cannot maintain setpoint, the second boiler shall start modulating, and so on.

.8   The boilers shall be configured to equalize the run time of all boilers.

.9   If any of the boilers or their associated circulator pumps go in alarm, the next boiler and pumps shall start to maintain setpoint and an alarm shall be sent to Operator Workstation

.3   <u>Main Boiler Plant Control Sequence</u>:

.1   During the 'Winter Mode', the Main boiler plant shall be enabled and run as per existing sequence with the following exception:

.1   Pump 5 & 6 are currently enabled when the OAT ≤ 18°C and they modulate to maintain a differential pressure.

.2   The sequence shall be changed to enable the pump once the system goes from shoulder season mode to winter mode. The pump shall modulate as required to maintain a delta T of 11.1°C (20°F) between the existing supply water temperature sensor and the new return water temperature sensor.

.3   Pumps 5 & 6 shall continue to alternate as per existing and if the lead pump fails, the lag pump shall start automatically and an alarm sent to the Operator Workstation.

END OF SECTION