

Cypress Envirosystems Wireless Site Survey Submittal Wireless Pneumatic Thermostat System Library of Congress Madison Building

Project #PC-000051

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Site Survey Completed June 23-26, 2020 by David Roberts and Joe Tallant



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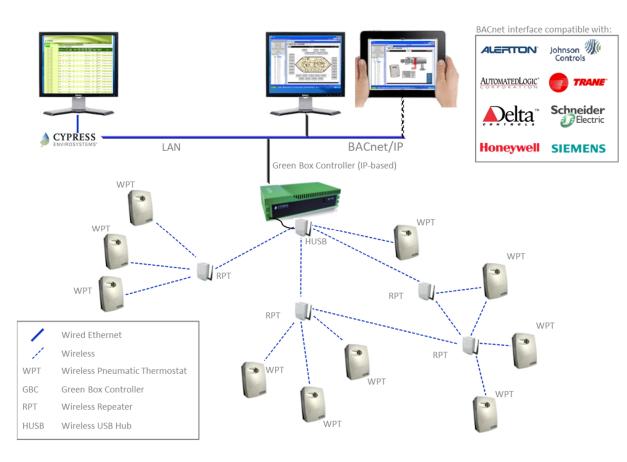


Description of Wireless Site Survey and Results

- During the week of June 23-26, 2020, Joe Tallant and David Roberts of Cypress Envirosystems conducted a wireless site survey of the Library of Congress's Madison Building utilizing the 2.4 GHz Wireless USB technology.
- A survey tool kit was used to determine actual radio strengths throughout the building to ensure that all devices will have robust wireless coverage when installed.
 - The tool kit consists of two radio devices—a receiver and transceiver. The receiver displays the radio strength on a scale of 1-5 with 3 and above being considered a strong radio signal.
 - The survey started at the locations of the Green Box and wireless repeaters were designated in locations where the survey kit still displayed a 4 before dropping to a 3 so that almost all connections between repeaters is a 4 or better. Since 3 is considered strong, this repeater placement is conservative and will ensure a very strong signal.
 - This process was repeated from each designated location until wireless coverage for all thermostats was confirmed. Signals from the repeaters to the thermostats were accepted at 3 and above.
 - 15 Green Box locations and 133 repeater locations were identified and documented on floor plans for the Madison Building (pages 7-43 of this report)
- Thermostat locations: Identifying the thermostats to be retrofitted, the counts and locations was not in scope for Cypress Envirosystems. This wireless survey was based on locations for thermostats identified on drawings that were created by a testing and air balancing (TAB) contractor.
 - The new Wireless Pneumatic Thermostats will replace the legacy thermostats identified by the TAB contractor and will be installed in the same locations. (relocating thermostats is not in scope and this wireless survey report relies on the accuracy of the drawings provided to Cypress)
 - Thermostat locations are shown on the drawings with a symbol consisting of a circle with a T inside.
 - Cypress Envirosystems measured the wireless strength to these thermostat locations.
- Once the system is installed and commissioned, the Cypress system will generate a commissioning report that will show actual wireless strength and reliability of every node in the network. Cypress will provide these reports during commissioning to provide confidence that the system is communicating reliably before system handoff.



Illustration of Cypress Wireless Network



Cypress Wireless Network

- All devices on one wireless network will report to a specific Green Box Controller
- In large buildings, multiple Green Boxes are needed. Each Green Box will have a dedicated wireless network ID so the devices on that network all work together.
- The wireless is a self-healing hybrid mesh that will utilize the best path home when redundancy is available. (The thermostats do not act as repeaters.)
- Green Box Controller
 - Requires 110V power (provision of power is not in scope for Cypress)
 - Requires LAN connection and IP address (provision of network connection is not in scope for Cypress Envirosystems)
 - Can be integrated via BACnet/IP (Integration is not in scope for Cypress Envirosystems)
- Wireless repeaters
 - Require 24VAC (provision of power is not in scope for Cypress)
- Wireless Pneumatic Thermostats
 - No power, utilize Lithium 123A batteries (provided by Cypress)
- The Green Box has a Commissioning Tool, which will provide a complete report of all nodes in the network showing actual strength and reliability of communications





Description	Count	Notes
Wireless Pneumatic Thermostats	1,467	Locations provided in TAB report. Thermostat locations with RH sensors (100 units) must provided to Cypress Envirosystems before installation.
Green Box Controllers and hubs	15	Locations noted in this section of report
Wireless Repeaters	133	Locations noted in this section of report

Understanding Symbols and Notations Used in this Report















- Thermostat locations are designated by circles with the letter T inside. These locations and counts were provided to Cypress Envirosystems. This report and the success of the project depends on the accuracy of the thermostat locations that were noted on the drawings provided.
- Green Box Controllers (GBC) are represented by a green rectangle. The GBCs are located inside of secure utility closets where 110V power and a network connection to the building automation system can be provided. (Note, the GBC numbers used in this report are for reference only. During deployment, different network IDs will be assigned.)
- Wireless repeaters (RPT) are represented by blue triangles. The RPTs are generally mounted above drop ceilings to be out of
 view. Each location noted with a blue triangle requires 24VAC. (Note, the RPT numbers used in this report are for reference
 only. During deployment, different RPT IDs will be assigned.)
- The primary wireless path from the GBC to each repeater is noted with a dashed green line. The two devices connected by the green line are noted so the path can be easily traced from the Green Box to the most distant device. Several redundant paths will exist, but these secondary paths are not noted in this report. The system will automatically identify the strongest and most reliable connection. Any thermostats near the pathway of these green lines will communicate with one of the two devices noted.
- The minimum wireless coverage from GBCs and RPTs is shown with a dashed yellow line to demonstrate that each thermostat will be covered by this network. When two devices' wireless coverage overlap, the yellow lines will stop at the mid-point between the two devices and not show the maximum extent of coverage. Also, the yellow line represents a radius of radio coverage in that direction, so it is implied that thermostats in nearby areas not explicitly covered by the yellow line, but within the same radius, have adequate wireless coverage.
- Each GBC will constitute a specific wireless network and that network will be associated with a single IP address. All devices in one wireless network can only communicate with its assigned GBC. When integrated with a third-party building automation system, these wireless networks will be transparent to the user. However, it is important that installers know which GBC each device will communicate to. This information will also be important for troubleshooting in the future. The red dashed outline and notation identify which GBC network the devices are assigned to.



