SECTION 27 51 75 - WIRELESS CLOCK SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDES

A. The work of this section includes a Wireless Clock System. Included in this work shall be a complete and full functional clock system with coverage throughout the new facility at all points. Provide a receiver to synchronize with the Global Positioning System satellites, an interface to synchronize to, or send synchronization information to, an IP based network time server, and a transmitter to broadcast local time synchronization information.

B. Contractor shall provide an extension of the District's existing system: Primex Wireless.

1.2 RELATED SECTIONS

A. Section 27 05 00 – Communications Common Work Results

B. Section 27 05 25 – Technology Firestopping

C. Section 27 05 28 – Pathways for Communications Systems.

1.3 DEFINITIONS

A. GPS: Global Positioning System, a worldwide system that employs 24 satellites in an integrated network to determine geographic location anywhere in the world, and which employs and transmits atomic time, the most accurate and reliable time.

1.4 SYSTEM DESCRIPTION

A. Clock system shall continually synchronize clocks throughout the facility, and shall be capable of clock readouts in multiple time zones where desired.

B. Time system shall be a synchronized master-satellite time system. The system shall synchronize all clocks to each other. The system shall utilize GPS technology to provide atomic time. The system shall not require hard wiring. Clocks shall automatically adjust for Daylight Savings Time.

C. Clocks shall be synchronized to within 10 milliseconds 6 times per day, and the system shall have an internal oscillator that maintains plus or minus one second per day between synchronizations, so that clock accuracy shall not exceed plus or minus 0.2 seconds.

D. The system shall include internal clock so that failure of the GPS signal shall not cause the clocks to fail in indicating time.

E. The system shall incorporate fail-safe design so that failure of any component shall not cause failure of the system. Upon restoration of power or repair of failed component, the system shall resume normal operation without the need to reset the system or any component thereof.

F. Clock locations shall be as indicated, and clocks shall be fully portable, capable of being relocated at any time.

1.5 REGULATORY REQUIREMENTS

A. Equipment and components furnished shall be of manufacturers latest model.

B. Transmitter and receiver shall comply with Part 90 of FCC rules, as follows:
1. The equipment shall not cause harmful interference.
2. The equipment shall accept interference that will cause adverse on equipment operation.
3. Transmitter frequency shall be governed by FCC Part 90.35.
4. Transmitter output power shall be governed by FCC Part 90.257 (b).

C. The system shall be UL listed.

D. System shall be installed in compliance with local and state authorities having jurisdiction.

1.6 SUBMITTALS

A. Product Data:
1. Submit complete catalog data for each component, describing physical characteristics and method of installation. Submit brochure or color card showing available colors and finishes of clocks. Note to Specifier: In accordance with FCC regulations, an application for license must be filed prior to use of the equipment. Normally, the manufacturer will have completed the filing and obtaining the license. If not, the Owner will be required to file the application with the FCC prior to use. Furnishing the license, or a copy of the application, will confirm that FCC approval has been obtained.

B. Operating License:
1. Submit evidence of application for operating license prior to installing equipment. Furnish the license, or if the license has not been received, a copy of the application for the license, to the Owner prior to operating the equipment. When license is received, deliver original license to Owner.

C. Samples:
1. Submit one clock for approval. Approved sample shall be tagged and shall be installed in the work at location directed.

D. Manufacturer's Instructions:

1. Submit complete installation, set-up and maintenance instructions.

1.7 SUBSTITUTIONS

A. Proposed substitutions, to be considered, shall be manufactured of equivalent materials that meet or exceed specified requirements of this Section.

B. Proposed substitutions shall be identified not less than 10 days prior to bid date.

C. Other systems requiring wiring and/or conduit between master and clocks, or which require connection of clocks to external electrical power supply will not be acceptable.

1.8 QUALITY ASSURANCE

A. Permits: Obtain operating license for the transmitter from the FCC.

B. Qualifications
   1. Manufacturer: Company specializing in manufacturing commercial time systems with a minimum of 10 continuous years of documented experience.
   2. Installer: Company with documented experience in the installation of commercial time systems.

1.9 DELIVERY STORAGE AND HANDLING

A. Deliver all components to the site in the manufacturer's original packaging. Packaging shall contain manufacturer's name and address, product identification number, and other related information.

B. Store equipment in unopened containers until ready for installation. Store in building in finished, air-conditioned space.

1.10 PROJECT/SITE CONDITIONS

A. Clocks shall not be installed until painting and other finish work in each room is complete.

B. Coordinate installation of GPS receiver with work on the roof or exterior side wall so that the bracket and related fasteners are watertight.

1.11 SYSTEM STARTUP

A. At completion of installation and prior to final acceptance, start up the equipment, assure that all equipment is operating properly, and that all clocks are functioning.

PART 2 - PRODUCTS

2.1 MANUFACTURER
A. Master-Satellite Time System shall have a basis of design of Primex Wireless.

2.2 SEQUENCE OF OPERATION

A. Transmitter Operation:
   1. When power is first applied to the transmitter, it checks for and displays the software version, then it checks the position of the switches and stores their position in memory. The transmitter then looks for the GPS time signal. Once the transmitter has received the GPS time, it sets its internal clock to that time. The transmitter then starts to transmit its internal time once every second. The transmitter updates its internal clock every time it receives valid time data from the GPS.

B. Clock Operation:
   1. When the batteries are inserted into the clock:
      a. Press the red button when the red second hand is at the 12:00 position. At this time the microprocessor will lock in the location of the second hand.
      b. After the red second hand has passed over the minute hand (first second hash mark after minute hand), press and release the red button. At this time the microprocessor will lock in the location of the minute hand. The microprocessor then assumes the location of the hour hand.

c. After the red button has been pressed twice, the microprocessor will start searching the channels. It will start at channel No. 1 and proceed one by one until it either decodes a valid signal or reaches channel No. 16. If no signal is detected the receiver will be shut off and try again later. If a signal is received, the micro processor will store the channel number, set the clock to the receive time, then for the next minute the clock will beep every time that it receives a valid time signal. If the clock is in a good signal area it will beep once a second. If the clock beeps every few seconds, the clock is in a marginal signal area. Clocks should operate in marginal signal areas, but battery life will be about 25 percent shorter.

2. After initial set, the clock will shut off the receiver. On a pre-scheduled basis, the microprocessor will turn the receiver back on and starting with the stored channel, it will again look for a valid time signal. However, the beeper will not operate.
3. If the clock has not decoded a valid time signal for seven days, then it will go back to a double step mode. Non signal reception can be caused by low battery voltage. If this occurs, replace the batteries.

C. Equipment

1. General
   a. The time system shall include a transmitter, a roof or window mounted GPS receiver, indicating clocks, and all accessories for complete operation.
   b. Transmitter: Primex Wireless Model FM-72, or equal by Sapling or American Time and Signal, consisting of wireless transmitter with GPS receiver. Unit shall obtain current atomic time from satellite, The clock system shall transmit time continuously to all clocks in the system.
2. Transmission
   a. Frequency Range: One watt at frequency of 72.100 to 72.400 MHz.
   b. Transmission Range: One mile, open field.
   c. Radio technology: Narrowband FM
   d. Number of channels: 16
   e. Channel bandwidth: 20 kHz maximum
   f. Transition mode: one-way communication
   g. Data rate: 2 KBps
   h. Operating range: 0 degrees C. to 70 degrees C.
3. Transmitter:
   a. Transmitter output power: +30 dBm (one watt)
   b. Frequency deviation +/- 4 kHz
   c. Transmitter power requirements: 120 VAC 60 Hz
   d. Internal power requirements: 5 volts DC
   e. Carrier frequency stability +/1 20 ppm
4. Transmitter shall have 16 selectable channels to assure interference-free reception.
5. Transmitter shall have the following switches:
   a. Time zone adjust switches for all time zones in the world. Includes all US time zones: Eastern, Central, Mountain, Pacific, Alaska and Hawaii.
   b. Daylight saving time bypass switch.
   c. 12-hour or 24-hour display.
6. Transmitter housing shall be black metal case, 16-3/4 inches by 12 inches by 1-7/8 inches in size.
7. Antenna shall be 46 inches high, commercial type, mounted on top center of transmitter housing. Antenna gain shall be > 110 dBm. Antenna polarization shall be data logic, zero to 5 volts.
8. Transmitter housing shall incorporate a display which shall include the following:
   a. Time readout

b. AM and PM indicator if 12 hour time display is set
c. Day and date readout
d. Indicator for daylight savings or standard time
e. LED which shall flash red in event of reception problem
f. GPS reception indicator

9. Transmitter shall contain an internal clock such that failure of reception from the GPS will not disable the operation of the clocks.

D. Power supply:
1. Model Number: Q11666
2. Input: 120 volt AC 50/60 Hz, 0.4 amp.
3. Output: 9 volt DC, 1.5 amp.
4. TC shall select appropriate cable length for distance between GPS unit and transmitter, from the following:
a. GPS Receiver: Model Number Q 11722, GPS roof mounted, with 15 foot cable attached (additional cable available: 50 100 150 200 foot Primex Wireless cable).

E. The GPS Receiver shall be a complete GPS receiver including antenna in a waterproof case, 3-7/8 inches by 4-3/16 inches by 2 inches, designed for roof or outdoor mounting. Provide mounting bracket for attachment to roof structure.

F. Contractor shall provide interface to extend master clock into paging system.

G. Clocks:
1. Primex Wireless clocks, or equal by Sapling or American Time and Signal, 12-1/2 inch diameter or 16 inch diameter as selected, color and finish as selected from manufacturer's standard colors and finishes. Clocks shall be wall mounted, and 12-1/2 inch diameter clocks shall have polycarbonate frame and polycarbonate lens. Face shall be white. Hour and minute hands shall be black. Clocks shall be provided with red sweep second hand.
2. Clocks shall be battery operated, and shall have 5 year battery life.
3. Clocks shall be capable of automatically adjusting for daylight saving time. An on-off switch located on the transmitter shall disable this function if desired.
4. Time shall be automatically updated from the transmitter 6 times per day.
5. Clocks shall remember the time during changing of batteries.
6. Clock lock: Tamper-proof/theft resistant hangers and slots in the backs of the clocks.
7. Clocks shall be single and double faced as indicated on the Drawings.
8. Provide 2 alkaline D cell batteries with each clock.
9. Clock receivers shall be as follows:
a. Decode sensitivity: >-110 dBm
b. Receiver power: Two alkaline "D" cells
c. Antenna type: internal
d. Antenna gain: -7 dBd
10. If transmitter stops transmitting valid time signals due to power failure, the clocks will continue to function as accurate quartz clocks until a valid time signal is decoded.
11. Clocks:
a. Analog
1) 12.5” Black, single sided
2) 12.5” Black, Dual-Sided
3) 16” Black, for all Gyms, Student Dining and Commons Areas.
b. Digital
1) 2.5”, 6-digit display, 120 VAC

12. Where wire guards are depicted on the floorplans for the protection of clocks, provide the following equipment:
    a. Wire Guards: Provide one for each clock as follows:
        1) 14 by 14 inch size, for nominal 12.5 inch diameter clocks.
        2) 18 by 18 inch size, for 16 inch diameter clocks.
13. Provide an analog clock with remote antenna in rooms that are shielded from radio frequencies.

H. Cable Connection Sealant: Radio Shack Coaxial Cable Connector Sealant 278-1645, or approved electrical grade silicone sealant.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that construction is complete in spaces to receive equipment and that rooms are clean, dry, and permanent air conditioning systems are operating.

B. Verify that 120-volt electrical outlet is located within 6 feet of location of transmitter, and that outlet is operational and properly grounded.

3.2 INSTALLATION

A. The Contractor shall review the design of the facility with the Clock manufacturer and provide all receivers, transmitters and local repeaters required to provide 100%coverage of the entire facility. These devices shall be located as recommended by the manufacturer.

B. The GPS unit must have a clear view of the sky. If the GPS unit is mounted on the roof, it must be located on a suitable bracket, well above the level of standing or incidental water. If the GPS unit is mounted at a window, it must be located away from low-E glass. A. GPS Unit: Install on roof in location indicated, in clear view of the sky. Install unit in location free from standing water, and above accumulations of leaves or debris. Seal cable connection to GPS with cable connection sealant. Any added cable lengths must be protected from outside elements. Provide a platform for installation of transmitter, a minimum of 2 to 3 feet above the floor. The preferred transmitter location for best transmission coverage is on the top floor of the building.

C. Transmitter:
1. Locate transmitter where indicated, a minimum of 2 to 3 feet above the floor, away from large metal objects such as filing cabinets, lockers or metal framed walls.
2. Attach receiver to transmitter using coaxial cable.
3. Connect antenna to transmitter, using care not to strip threads.
4. Connect power supply to the transmitter.
5. Set the channel number on the display to correspond to the FCC license.
6. Plug power supply into electrical outlet.
7. Clocks: Perform the following operations with each clock:
    a. Install D cell batteries.
    b. Set clock to correct time in accordance with manufacturer's instructions.
    c. Observe clock until valid signals are received and clock adjusts itself to correct time.
    d. Install the clock on the wall in the indicated location, plumb, level, and tight against wall.
    e. Attach using Clock-Lock hanging method and suitable fasteners as approved by clock manufacturer.

f. Delete the following if wire guards are not required.
1) Wire Guards: Secure to wall, using approved theft-resistant fasteners.

3.3 ADJUSTING

A. Prior to final acceptance, inspect each clock, adjust as required, and replace parts which are found defective.

3.4 CLEANING

A. Prior to final acceptance, clean exposed surfaces of clocks, using cleaning methods recommended by clock manufacturer. Remove temporary labels from clock faces. Do not remove labels from backs of clocks.

3.5 DEMONSTRATION

A. Provide training to Owner's representative on setting and adjusting clocks, replacing batteries and routine maintenance.

3.6 PROTECTION

A. Protect finished installation until final acceptance of the project.

B. Provide **three (3)** year warranty on all parts and materials from date of Owner acceptance.

END OF SECTION 27 51 75