

SECTION 27 53 13

~~~ PROJECT NOTE ~~~~~

ARCHITECT OF RECORD/ENGINEER OF RECORD IS RESPONSIBLE FOR REVIEWING THIS SPECIFICATION SECTION IN DETAIL FOR COORDINATION WITH THE PROJECT SCOPE OF WORK.

ALL "PROJECT NOTE" TEXT IS TO BE REMOVED FOLLOWING REVIEW OF THE CONTENT OF EACH NOTE BY THE ARCHITECT OF RECORD/ENGINEER OF RECORD.

EDIT THE DOCUMENT FOOTER TO INCLUDE THE PROJECT NAME AND NUMBER.

EDIT THE DOCUMENT HEADER TO INDICATE THE ARCHITECT OF RECORD PROJECT ISSUE" DATE. THE "CPS CONTROL" DATE SHOULD NOT BE EDITED.

ANY MODIFICATIONS TO THE TECHNICAL STANDARDS IN THIS SECTION - INCLUDING THE REMOVAL OR ADDITION OF MANUFACTURERS - MUST BE APPROVED BY CPS.

REQUESTS FOR MODIFICATION ARE TO BE SUBMITTED TO THE DESIGN MANAGER DURING THE DESIGN PHASE FOR REVIEW AND APPROVAL.

~~~ END OF PROJECT NOTE ~~~~~

MASTER CLOCK SYSTEMS

~~~ PROJECT NOTE ~~~~~

THIS SECTION IS TO BE UTILIZED FOR RETROFIT AND STANDALONE SYSTEMS.

~~~ END OF PROJECT NOTE ~~~~~

PART 1 GENERAL

1.01 SECTION INCLUDES

~~~ PROJECT NOTE ~~~~~

ADJUST LIST BELOW TO SUIT PROJECT.

~~~ END OF PROJECT NOTE ~~~~~

- A. Section specifies a master clock and program system equipment including the following components:
 - 1. Master clock and program control unit.
 - 2. Secondary indicating clocks.
 - 3. Program signal devices.
 - 4. Clock circuit power boosters.
 - 5. Interface with intercom public-address system.
 - 6. System wire and cable.

1.02 DEFINITIONS

- A. Refer to Section 27 05 03 - Communications General Requirements for definitions.

1.03 REFERENCE STANDARDS

- A. City of Chicago Building Code - Municipal Code of Chicago for the Building Industry; 2017.
- B. City of Chicago Electrical Code - National Electrical Code with Chicago Amendments; 2017.
- C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.
- D. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. Shop Drawings: Indicate wiring diagrams and interconnection diagrams.
 - 1. Wiring diagrams to detail power, signal, control, and correction circuits. Identify terminals and wiring color-codes to facilitate installation, operation, and maintenance. Indicate recommended wire types and sizes, and circuiting arrangements for field-installed system wiring. Show protection from overcurrent, static discharge, and voltage surge.
 - 2. Riser diagram of system components.

- B. Product Data: Provide for each item of equipment; show specified ratings, colors, finishes, and physical dimensions.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes (including available colors) for each product indicated and describe features and operating sequences, both automatic and manual.

~~~ PROJECT NOTE ~~~~~
RETAIN PARAGRAPH AND SUBPARAGRAPHS BELOW IF SAMPLES ARE REQUIRED BY ARCHITECT/ENGINEER OF RECORD.

~~~ END OF PROJECT NOTE ~~~~~

- C. Samples for Initial Selection: Include the following:
 - 1. Manufacturer's color charts showing the full range of colors available for clocks, signal equipment, control panels, and other items exposed to view.
 - 2. Full-size operating models of each clock type indicated.
- D. Qualification Data: For Installer and manufacturer.
- E. Field quality-control test reports.
- F. Operation Data: Operating instructions.
 - 1. Include four (4) quick-reference guides for the Building Engineer.
- G. Maintenance Data: Maintenance and repair instructions.
 - 1. Include information regarding the microprocessor, signal generator, power supplies, and other major components.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Authorized representative of master clock manufacturer, who is trained and approved for installation and maintenance of units required for this Project, and who maintains a service center within 50 miles of Project site, that is certified by the manufacturer to providing replacement parts and emergency maintenance repairs.
- B. Source Limitations: Obtain master and secondary clocks and signal-device-control components through one source from a single manufacturer.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in City of Chicago Electrical Code, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with City of Chicago Building Code.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Do not install electronic components until major construction work in the area is complete. Do not install in areas where dust or moisture can contaminate the working parts or where finish can be marred by construction work.
- B. Stage materials in a secure area of the project site until installation. Materials and items shall be placed so that they are protected from damage and deterioration.

1.07 EXTRA MATERIALS

- A. Extra Materials: Extra materials shall be delivered to the Board in the manufacturer's original packaging and stored at the Project site where directed. Extra materials shall include, but not be limited to, the following:
 - 1. Analog Clocks: Full-size, functioning clocks equal to 10 percent of quantity installed, but not more than five clocks.

1.08 WARRANTY

- A. Special Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to repair, restore, or replace master clock system components that fail in materials or workmanship within the specified warranty period.

1. Warranty Period: Three (3) years from date of Preliminary Acceptance or Substantial Completion.
2. Warranty Work: Warranty work shall be performed during normal working hours.
 - a. Emergency callback service shall be provided, at additional cost, within the following response times:
 - 1) High Schools: Four (4) hours or less.
 - 2) Elementary Schools: Eight (8) hours or less.

PART 2 PRODUCTS

2.01 SYSTEM DESIGN

~~~ PROJECT NOTE ~~~~~
BELOW IS A SAMPLE DESCRIPTION OF PERFORMANCE REQUIREMENTS FOR COMPLETED CLOCK AND PROGRAM CONTROL SYSTEM. EDIT DESCRIPTION ITEMS TO SUIT PROJECT. COORDINATE THIS ARTICLE WITH PRODUCTS AND FEATURES DESCRIBED IN THIS SECTION.

RETAIN OPTION IN FIRST SUBPARAGRAPH BELOW IF SOME CLOCKS HAVE OPERATING POWER SUPPLIED INDEPENDENT OF CORRECTION-SIGNAL WIRING.

~~~ END OF PROJECT NOTE ~~~~~

- A. System shall perform the following functions:
 1. Supply power to remote indicating clocks.
 2. Maintain correct synchronized time and transmit time-correction signals over dedicated system wiring from a master clock to any one type of secondary indicating clocks, including the following:
 - a. Analog Synchronous Clocks: Correct for minute- and second-hand synchronization at least once each hour and for hour-hand synchronization at least once each day.
 3. Initiate and execute programs for scheduled automatic operation of remote devices. Include audible signal devices.
 4. Provide for manual control of programmed signal and equipment switching circuits.
 5. Regulate system timing functions backed up for power outages by an internal battery-powered, temperature-compensated crystal-controlled oscillator.
 6. System shall be capable of programming multiple independent event schedules into memory and running them simultaneously for different output circuits.
 - a. Quantity of Programmable Schedules: Four minimum.
 - b. Number of Weekly Events That Can Be Programmed for Each Schedule: 600 minimum.
 - c. Simultaneous operation of independent schedules shall be limited only by the number of signal-device and equipment-switching output circuits.
 - d. Advance Programming for Automatic Holiday Schedule Changes: Number of schedule changes that can be programmed to suit holidays and vacations shall be 10, and each change may be programmed up to a year in advance to occur on any day of the calendar year.

~~~ PROJECT NOTE ~~~~~
DIAGNOSTICS IN FIRST SUBPARAGRAPH BELOW ARE AVAILABLE ON MORE EXPENSIVE AND COMPLEX SYSTEMS.

~~~ END OF PROJECT NOTE ~~~~~

7. Daylight Savings Time Correction: Programmable for automatic correction, or accomplished by manual controls on front of panel.
8. Adjustments to Master Clock Output Signals: Duration of momentary signal shall be individually programmable for each signal and equipment-control output circuit from 1 to 99 seconds. Signals shall be programmable for either on or off switching to suit equipment-operation scheduling.

2.02 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one of the following manufacturers:
 - 1. American Time and Signal Company - www.american-time.com.
 - 2. DuKane; www.dukane.com.
 - 3. National Time and Signal; www.natsco.net.
 - 4. Rauland-Borg Corporation; www.rauland.com.
 - 5. Simplex Grinnell; www.tycosimplexgrinnell.com.
 - 6. Sapling; www.sapling-inc.com.

2.03 MASTER CLOCK

- A. Master Clock Unit: Master clock for maintaining standard time and transmitting time, correcting, and program control signals. Microprocessor-based, software-controlled unit complying with Class A device requirements in 47 CFR 15, and having the following components and features:
 - 1. Programming and control switches.
 - 2. Informational Display: LED or backlit LCD type.
 - a. Normally shows current time display.
 - b. Provides programming instructions when system is being programmed.
 - 3. Output Circuits for Power and Correction of Secondary Indicating Clocks:
 - a. Wired Synchronous Clock Power and Correction Circuits: For analog clocks; minimum of one required. Relay controlled.
 - b. Existing Clock Power and Correction Circuit: An output circuit suitable to match, and compatible with, existing system.
 - 4. Circuits for audible signal devices: Relay controlled, manually switchable, using controls on master clock. Rated 120-Volt AC, 5 A minimum. A minimum of four circuits.
 - 5. Power Supplies: Capacity for internal loads and power and correction circuits of connected clocks.
 - 6. Enclosure: Metal cabinet with locking front panel. When cabinet is locked, display indication shall be visible on or through front panel face. Arrange cabinet for surface, semi recessed, or flush mounting as indicated.
 - 7. Battery Backup for Time Base: Lithium battery to maintain the timekeeping function and retain the programs in memory during outage of normal ac power supply for up to ten (10) years.

2.04 SECONDARY INDICATING CLOCKS, GENERAL

- A. Analog Clock: Equipped with a second hand. Movement shall be driven by self-starting, permanently lubricated, sealed synchronous motor equipped with a correcting solenoid actuator, operating voltage shall be 24 VAC, compatible with the master clock.
- B. Connection Provision for Secondary Indicating Clocks: Plug connector or wire pigtail.

*~~~ PROJECT NOTE ~~~~~
RETAIN PARAGRAPH BELOW IF SOME CLOCKS ARE MOUNTED IN MODULAR ARCHITECTURAL
PANELS OR HOUSINGS. REVISE TO SUIT PROJECT. COORDINATE WITH DRAWINGS AND
OTHER SECTIONS. EDIT ITEMS IN BRACKETS TO SUIT PROJECT.*

~~~ END OF PROJECT NOTE ~~~~~

- C. Provision for Modular Panel Installation: Equip designated clock for panel mounting. Mount flush or semi recessed with arrangement and trim as indicated. Coordinate wiring with other modular panel components, including **[room lighting switches]** **[intercom devices]** **[convenience outlets]** **[speaker]** and other similar devices.

~~~ PROJECT NOTE ~~~~~

RETAIN BELOW IF SOME CLOCKS ARE MOUNTED IN PUBLIC-ADDRESS SPEAKER PANELS (TIME-TONE) OR HOUSINGS USED FOR PROGRAMMED TONE SIGNALS. REVISE TO SUIT PROJECT. COORDINATE WITH DRAWINGS.

~~~ END OF PROJECT NOTE ~~~~~

- D. Provision for Time-Tone-Unit Installation: Equip indicated clocks for housing or mounting in an acoustically treated and baffled speaker compartment.

2.05 DETAILED REQUIREMENTS FOR SECONDARY INDICATING CLOCKS

- A. Clock Type: Analog.
- B. Face Configuration: Single face and double face. Refer to drawings for locations of each type.
- C. Mounting: [**Semi recessed,**] [**Surface,**] [**and**] [**Within time-tone unit**]. Refer to drawings for location of each type.
- D. Nominal Dimensions: 12 inch diameter, round.
- E. External Finish: Metal case, black finish.
- F. Trim and Hardware:
 - 1. Letter height: 1-1/4" minimum.
 - 2. Letter color: Black.
 - 3. Hour hand color: Black.
 - 4. Minute hand color: Black.
 - 5. Second hand color: Red.
- G. Crystal: Clear polycarbonate lens.

~~~ PROJECT NOTE ~~~~~

SELECT FROM SIGNALING DEVICES IN THIS ARTICLE. COORDINATE WITH DRAWINGS.

~~~ END OF PROJECT NOTE ~~~~~

2.06 PROGRAM SIGNAL DEVICES

~~~ PROJECT NOTE ~~~~~

RETAIN SIZES IN SUBPARAGRAPHS BELOW TO SUIT PROJECT.

~~~ END OF PROJECT NOTE ~~~~~

- A. Bells: Heavy-duty, modular, vibrating type with the following sound output ratings measured at 10 feet:
 - 1. 6-Inch Bell: 95 dB.
 - 2. 10-Inch Bell: 104 dB.
- B. Horns: Modular, adjustable-output, vibrating type with minimum full-intensity-rated sound output of 103 dB measured at 10 feet.
- C. Projector Horns: Adjustable-output, vibrating-type units with [**single**] [**double**] projector arranged to channel the sound in the direction of the projector axis, and with minimum full-intensity-rated sound output of 104 dB measured at 10 feet.
- D. Outdoor Signal Equipment: Weatherproof models listed for outdoor use.
- E. Mounting Arrangement for Signal Devices: Designed for attachment with screws on the mounting plate of a flush-mounted back box, unless otherwise indicated.
- F. Enclosures for Flush-Mounting Bells and Horns: Enclosure, mounting plate, and grille assembly shall be furnished by device manufacturer to match features of the device to be mounted. Enclosure shall be recessed in wall, completely enclosing the device, with the grille mounting over the open side of the enclosure and flush with the wall.
- G. Connection Provision for Signal Indicating Devices: Wire pigtail.

~~~ PROJECT NOTE ~~~~~

RETAIN THIS ARTICLE FOR PROJECTS WHERE THE LENGTH OF CLOCK CIRCUITS EXCEED 500 FEET.

~~~ END OF PROJECT NOTE ~~~~~

2.07 CLOCK CIRCUIT POWER BOOSTER

- A. Description: Transformer power supply, mounted in steel cabinet with hinged door, and having fuse-protected input and output circuits.
- B. Provide clock circuit power boosters for Projects where the length of clock circuits exceed 500 ft. and 40 devices.

2.08 BACK BOXES FOR SECONDARY INDICATING CLOCKS AND PROGRAM DEVICES

- A. Description: Box and cover plate assembly shall be furnished by device manufacturer and be suitable for device to be mounted. Back boxes shall be equipped with knockouts and hanger straps or mounting adapters arranged for flush mounting device, unless otherwise indicated.

~~~ PROJECT NOTE ~~~~~

RETAIN THIS ARTICLE IF CLOCKS OR SIGNAL DEVICES ARE LOCATED WHERE THEY MIGHT BE EXPOSED TO PHYSICAL DAMAGE. COORDINATE WITH DRAWINGS TO INDICATE WHICH UNITS REQUIRE GUARDS.

~~~ END OF PROJECT NOTE ~~~~~

2.09 GUARDS

- A. Description: Formed-steel wire, shaped to fit around guarded device, with 1-inch maximum clearance.
- B. Mounting Provisions: Fixed tabs, welded to guard and arranged for screw attachment to mounting surface.
- C. Finish for Indoor Devices: Clear epoxy lacquer over zinc plating.
- D. Finish for Outdoor Devices: Black powder coat over zinc plating and primer.
- E. Locations: Provide guards for clock locations for lunch room, natatorium, gymnasium and locker rooms, and as indicated on Drawings.

2.10 WIRE AND CABLE

- A. Conductors: Insulated copper, with minimum sizes as recommended by the connected device manufacturer. Voltage drop for signal, control, and clock correction circuits shall not exceed 10 percent under peak load conditions.
- B. 120-Volt AC and Class 1 Signal and Control Circuits: Stranded single conductors of size recommended by system manufacturer. Materials and installation requirements are specified in Section 26 27 26 - Wiring Devices.
- C. Classes 2 and 3 Signal and Control Circuits: Single conductor or twisted-pair cable, unshielded, unless manufacturer recommends shielded cable.
- D. Conductor Color-Coding: Uniformly identified and coordinated with wiring diagrams. Provide black (hot), white (neutral), and red (correction).

PART 3 EXECUTION

3.01 WIRING METHOD

- A. Wiring: Install 110-Volt system wiring in raceways. Install low-voltage system wiring in EMT conduit raceways. Conceal raceways except in unfinished spaces.
 - 1. Install raceways and conduit in accordance with requirements of Division 26 Section 26 05 33.13 - Conduit for Electrical Systems, 26 05 33.16 - Boxes for Electrical Systems, and 26 05 33.23 - Surface Raceways for Electrical Systems.
 - 2. Control Circuit Wiring: Install control circuits according to City of Chicago Electrical Code, NFPA 90A and as indicated. Install number of conductors recommended by system manufacturer to functions indicated.

- B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points.

3.02 ELECTRICAL CONNECTIONS

- A. Make terminations on numbered terminal strips in junction, pull and outlet boxes, terminal cabinets, and equipment enclosures. Tighten connections with tightening torques specified in UL 486A-486B.
- B. Use plug connectors or splices for connections to clocks and signal devices.
- C. Ground clocks, programming equipment, and conductor and cable shields to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

3.03 IDENTIFICATION

- A. Comply with Section 26 05 53 - Identification for Electrical Systems.
- B. Color-code conductors and apply wire and cable marking tape to designate wires and cables so they are uniformly identified and coordinated with wiring diagrams throughout the system.

3.04 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in programming and field testing. Report results in writing.
- B. Perform the following field adjustments, tests, and inspections and prepare test reports:
 - 1. Perform operational-system tests to verify compliance with the Specifications and make adjustments to bring system into compliance. Include operation of all modes of clock correction and all programming and manually programmed signal and relay operating functions.
 - 2. Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.
- C. Remove and replace malfunctioning units and retest as specified above.

3.05 CLEANING

- A. On completion of installation inspect exposed finishes. Remove burrs, dirt, paint spots, and construction debris. Repair damaged finish(es), including chips, scratches, and abrasions.
- B. All equipment, hardware and finishes shall be cleaned prior to final acceptance of the work. Unless otherwise indicated, clean shall mean free of dust, dirt, mud, debris, oil, grease, residues, paint, and contamination.
- C. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Preliminary Acceptance or Substantial Completion. Protect conduit and wireway openings against the entrance of foreign matter by means of plugs or caps. Cover fixtures, materials, equipment and devices furnished or installed under this Section or otherwise protect against damage, both before and after installation. Hardware, materials, equipment, or devices damaged prior to final acceptance of the work shall be restored to their original condition or replaced.

3.06 ADJUSTING

- A. Program system according to the Board's requirements. Set system so signal devices operate on the Board-required schedules and are activated for durations selected by the Board. Program equipment-control output circuits to suit Board Representative's operating schedule for equipment controlled. Adjust sound-output level of adjustable signal devices to suit the Board's requirements.
 - 1. Adjust sound-output level of adjustable signal devices to suit the Board's requirements.
- B. When requested within 12 months of date of Preliminary Acceptance or Substantial Completion, provide on-site assistance for adjusting and reprogramming system to suit actual occupied conditions. Provide up to two visits to Project outside normal occupancy hours for this purpose.

3.07 CLOSEOUT ACTIVITIES

- A. Demonstrate normal and abnormal modes of operation, and required response to each.
- B. Train Board's operating personnel in the programming and operation of the system. Train Board's maintenance personnel to adjust, operate, and maintain clock-and-program-control system components. Refer to Section 01 79 00 - Demonstration and Training. Provide a minimum of two sessions of two (2) hours of training. Schedule training with at least seven (7) days advance notice.
- C. Contractor to provide sign off sheet to Board's Representative upon completion of the work.

END OF SECTION 27 53 13