SECTION 230923.21 - MOTION INSTRUMENTS

Revise this Section by deleting and inserting text to meet Project-specific requirements.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

1. GENERAL
	* + 1. RELATED DOCUMENTS

Retain or delete this article in all Sections of Project Manual.

* + - * 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
			1. SUMMARY
				1. Section Includes:

PIR motion sensors.

Ultrasonic motion sensors.

Dual-technology motion sensors.

* + - * 1. Related Requirements:

Retain subparagraphs below to cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections.

Section 230923 "Direct-Digital Control System for HVAC" for control equipment and software, relays, electrical power devices, uninterruptible power supply units, wire, and cable.

Section 230993 "Sequence of Operations for HVAC Controls" for requirements that relate to Section 230923.21.

* + - 1. SUBMITTALS
				1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
				4. Product Data: For each type of product.

Include operating characteristics; electrical characteristics; and furnished accessories indicating process operating range, accuracy over range, control signal over range, default control signal with loss of power, calibration data specific to each unique application, electrical power requirements, and limitations of ambient operating environment, including temperature and humidity.

Include product description with complete technical data, performance curves, and product specification sheets.

* + - * 1. Shop Drawings:

Include details of product assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

Include diagrams for power, signal, and control wiring.

Include number-coded identification system for unique identification of wiring, cable, and tubing ends.

Retain "Coordination Drawings" paragraph below for situations where limited space necessitates maximum utilization for efficient installation of different components or if coordination is required for installation of products and materials by separate installers. Coordinate paragraph with other Sections specifying products listed below. Preparation of coordination drawings requires the participation of each trade involved in installations within the limited space.

* + - * 1. Coordination Drawings: Plan drawings and corresponding product installation details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

Product installation location shown in relationship to visual range and obstructions.

Wall- and ceiling-mounted instruments located in finished space showing relationship to other installed devices.

* + - * 1. Field quality-control reports.
			1. CLOSEOUT SUBMITTALS
				1. Operation and Maintenance Data: For motion instruments to include in operation and maintenance manuals.
1. PRODUCTS

See Editing Instruction No. 1 in the Evaluations for cautions about named manufacturers and products. For an explanation of options and Contractor's product selection procedures, see Section 016000 "Product Requirements."

* + - 1. INDOOR MOTION SENSORS

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=9822) Subject to compliance with requirements, provide products by one of the following:

[Bryant Electric](http://www.specagent.com/Lookup?uid=123456944497).

[Cooper Industries, Inc](http://www.specagent.com/Lookup?uid=123456944498).

[Hubbell Control Solutions; Hubbell Incorporated, Lighting](http://www.specagent.com/Lookup?uid=123456944499).

[Leviton Manufacturing Co., Inc](http://www.specagent.com/Lookup?uid=123456944500).

[Lithonia Lighting; Acuity Brands Lighting, Inc](http://www.specagent.com/Lookup?uid=123456944502).

[Lutron Electronics Co., Inc](http://www.specagent.com/Lookup?uid=123456944503).

[NSi Industries LLC](http://www.specagent.com/Lookup?uid=123456944504).

[RAB Lighting](http://www.specagent.com/Lookup?uid=123456944505).

[Sensor Switch, Inc](http://www.specagent.com/Lookup?uid=123456944506).

[Signify North America Corporation (formerly Philips Lighting)](http://www.specagent.com/Lookup?uid=123457177274).

[Square D; Schneider Electric USA](http://www.specagent.com/Lookup?uid=123456944507).

[WattStopper; Legrand North America, LLC](http://www.specagent.com/Lookup?uid=123456944508).

Approved equivalent.

* + - * 1. Description: Wall- or ceiling-mounted, solid-state units with a separate relay unit.

Retain subparagraphs below to specify various types of units required for Project.

Operation: Unless otherwise indicated, turn on when covered area is occupied and off when unoccupied; with a time delay for turning off, adjustable over a minimum range of 1 to 15 minutes.

Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.

Relay Unit: Dry contacts rated for 20-A load at 120- and 277-V ac. Power supply to sensor shall be 24-V dc, 150 mA, Class 2 power source as defined by NFPA 70.

Mounting:

Sensor: Suitable for mounting in any position on a standard outlet box.

Relay: Externally mounted through a 1/2-inch knock out in a standard electrical enclosure.

Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

Indicator: Digital display, to show when motion is being detected during testing and normal operation of the sensor.

Bypass Switch: Override the on function in case of sensor failure.

Retain one or more of three paragraphs below. Revise coverage area of detectors, and add detectors with different coverage patterns and features to suit Project.

* + - * 1. PIR Type: Ceiling mounting; detect occupancy by sensing a combination of heat and movement in coverage area.

Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in.

Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.

Detection Coverage (Corridor): Detect occupancy within 90 feet when mounted on a 10-foot- high ceiling.

* + - * 1. Ultrasonic Type: Ceiling mounting; detect occupancy by sensing a change in pattern of reflected ultrasonic energy in coverage area.

Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.

Coverage areas listed in four subparagraphs below are typical.

Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 96-inch- high ceiling.

Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.

Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch- high ceiling.

Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet when mounted on a 10-foot- high ceiling in a corridor not wider than 14 feet.

* + - * 1. Dual-Technology Type: Ceiling mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in coverage area. A particular technology or combination of technologies that controls on-off functions shall be field selectable by operating controls on unit.

Sensitivity Adjustment: Separate for each sensing technology.

Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.

Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling. Apply occupancy detectors where indicated.

* + - 1. SWITCHBOX-MOUNTED MOTION SENSORS

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=9823) Subject to compliance with requirements, provide products by one of the following:

[Bryant Electric](http://www.specagent.com/Lookup?uid=123456944509).

[Cooper Industries, Inc](http://www.specagent.com/Lookup?uid=123456944510).

[Hubbell Control Solutions; Hubbell Incorporated, Lighting](http://www.specagent.com/Lookup?uid=123456944511).

[Leviton Manufacturing Co., Inc](http://www.specagent.com/Lookup?uid=123456944512).

[Lithonia Lighting; Acuity Brands Lighting, Inc](http://www.specagent.com/Lookup?uid=123456944514).

[Lutron Electronics Co., Inc](http://www.specagent.com/Lookup?uid=123456944515).

[NSi Industries LLC](http://www.specagent.com/Lookup?uid=123456944516).

[RAB Lighting](http://www.specagent.com/Lookup?uid=123456944517).

[Sensor Switch, Inc](http://www.specagent.com/Lookup?uid=123456944518).

[Signify North America Corporation (formerly Philips Lighting)](http://www.specagent.com/Lookup?uid=123457177275).

[Square D; Schneider Electric USA](http://www.specagent.com/Lookup?uid=123456944519).

[WattStopper; Legrand North America, LLC](http://www.specagent.com/Lookup?uid=123456944520).

Approved equivalent.

Each manufacturer's switch rating is different; however, rated design values are generally not less than those stated in "General Requirements for Sensors" Paragraph below.

* + - * 1. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.

Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.

Switch Rating: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent.

"WS1" and "WS2" in "Wall-Switch Sensor Tag WS1" and "Wall-Switch Sensor Tag WS2" paragraphs below are a suggested marking system on Drawings when detectors with different sensor characteristics are required.

* + - * 1. Wall-Switch Sensor Tag WS1:

Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of [**900 sq. ft.**] [**2100 sq. ft**].

Sensing Technology: [**PIR**] [**Dual technology - PIR and ultrasonic**].

Switch Type: [**SP.**] [**SP, dual circuit.**] [**SP, manual "on," automatic "off."**] [**SP, field selectable automatic "on," or manual "on" automatic "off."**]

Voltage: [**Match the circuit voltage**] [**120 V**] [**277 V**] [**Dual voltage, 120 and 277 V**]; [**passive-infrared**] [**dual-technology**] type.

Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.

Retain one of first two subparagraphs below.

Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.

Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.

Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

"Wall-Switch Sensor Tag WS2" Paragraph below is typical for square and near-square rectangular rooms.

* + - * 1. Wall-Switch Sensor Tag WS2:

Standard Range: 210-degree field of view, with a minimum coverage area of 900 sq. ft.

Sensing Technology: PIR.

Switch Type: [**SP.**] [**SP, dual circuit.**] [**SP, manual "on," automatic "off."**] [**SP, field selectable automatic "on," or manual "on" automatic "off."**]

Voltage: [**Match the circuit voltage**] [**120 V**] [**277 V**] [**Dual voltage, 120 and 277 V**]; [**passive-infrared**] [**dual-technology**] type.

Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.

Retain one of first two subparagraphs below.

Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.

Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.

Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

1. EXECUTION
	* + 1. EXAMINATION
				1. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
				2. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.
				3. Proceed with installation only after unsatisfactory conditions have been corrected.
			2. SENSOR INSTALLATION
				1. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
				2. Coordinate layout and installation of wall-mounted devices with other wall-mounted devices. Align centerline with adjacent devices. Align centerline with devices above.
				3. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.
			3. ELECTRICAL POWER
				1. Provide electrical power to products requiring electrical connections.
				2. Provide circuit breakers. Comply with requirements in Section 262816 "Enclosed Switches and Circuit Breakers."
				3. Provide power wiring. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
				4. Provide raceways. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems."
			4. IDENTIFICATION
				1. Identify system components, wiring, cabling, and terminals. Each piece of wire, cable, and tubing shall have the same designation at each end for operators to determine continuity at points of connection. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
			5. FIELD QUALITY CONTROL

Retain "Testing Agency," "Manufacturer's Field Service," and "Perform the following tests and inspections" paragraphs below to identify who shall perform tests and inspections. If retaining second option in "Testing Agency" Paragraph or if retaining "Manufacturer's Field Service" or "Perform the following tests and inspections" Paragraph, retain "Field quality-control reports" Paragraph in "Informational Submittals" Article.

Retain "Manufacturer's Field Service" Paragraph below to require a factory-authorized service representative to perform tests and inspections.

* + - * 1. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

Retain "Perform the following tests and inspections" Paragraph below to require Contractor to perform tests and inspections.

* + - * 1. Perform the following tests and inspections[**with the assistance of a Company Field Advisor**]:

Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.

Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

See Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

* + - * 1. Motion instruments will be considered defective if they do not pass tests and inspections.
				2. Prepare test and inspection reports.
			1. ADJUSTING
				1. Occupancy Adjustments: When requested within [**12**] <**Insert number**> months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to [**two**] <**Insert number**> visits to Project during other-than-normal occupancy hours for this purpose.

Verify operation at outer limits of detector range. Set time delay to suit Director’s Representative's operations.

* + - 1. DEMONSTRATION

This article covers optional services; retain if Project warrants. Coordinate with requirements in Section 017900 "Demonstration and Training."

* + - * 1. Coordinate demonstration of products specified in this Section with demonstration requirements for direct-digital control systems specified in Section 230923 "Direct-Digital Control System for HVAC."
				2. [**Engage a company field advisor to train**] [**Train**] Director’s Representative's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 230923.21