

SECTION 26200

SERVICE AND DISTRIBUTION

1.0 GENERAL

1.01 DESCRIPTION

- A. All work specified in this Section shall comply with the provisions of Section 260010.
- B. Provide a complete electrical distribution system. The system shall include the service entrance, main switchboard, feeders, transformers, distribution panels, panelboards, busway, remote control switches, contactors, etc., to provide a complete system.
- C. All distribution switchgear (branch circuit panelboards, switchboard, distribution panelboards, transformers, busway, etc.) shall be the unit responsibility of one manufacturer. All component parts of the above listed items shall be of the same manufacturer except where a written request for deviation from this requirement has been approved prior to bid date.
- D. Shop drawings for equipment specified in this Section shall show that all specified requirements have been incorporated.
- E. All floor mounted distribution equipment shall be mounted on a 4" high concrete pad.

1.02 ELECTRICAL SERVICE (EXISTING)

1.03 METERING (EXISTING)

2.0 PRODUCTS

2.01 BRANCH CIRCUIT PANELBOARDS

- A. Panelboards (panels) shall be general purpose enclosures and shall be surface or flush mounted as indicated. Panels shall be of the automatic circuit breaker type, factory assembled by the manufacturer of the circuit breakers. Panels shall be for the voltage indicated with the quantity of poles and ampacity of circuit breakers shown.
- B. Boxes and trim shall be made from code gauge steel. Boxes shall be sufficient size to provide a minimum gutter space of 4" on all sides. Boxes shall be minimum 20" width and 5 3/4" depth.
- C. Hinged door covering all device handles shall be included in all panel trim. Doors shall have flush-type cylinder lock and catch, except that doors over 48" in height shall have auxiliary fasteners at top and bottom of door in addition to flush-type cylinder lock and catch. Door hinges shall be concealed. All locks shall be keyed alike. Directory frame and card having a transparent cover shall be furnished each panel door.
- D. Trims for flush panels shall overlap the box by at least 3/4" all around. Surface trims shall have the same width and height as the box. Trims shall be mountable by a screwdriver without the need for special tools. After installation, trim mounting mechanism or hardware shall not be accessible when panel door is closed and locked.
- E. All exterior and interior steel surfaces of the trim shall be cleaned and finished with gray paint over a rust-inhibiting phosphatized coating.
- F. All interiors shall be completely factory assembled with protective devices, wire connectors, etc. All wire connectors, except screw terminals, shall be of the anti-turn solderless type and all shall be suitable for copper or aluminum wire.
- G. Interiors shall be so designed that devices can be replaced without disturbing adjacent units and without removing the main bus connectors, and shall be so designed that devices may be changed without machining, drilling or tapping.
- H. Bus bars for the mains shall be of copper sized in accordance with U.L. standards. Full size bars shall be included. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of the branch circuit devices.
- I. Phase bussing shall be full height without reduction. Cross and center connectors shall be of the same material as the bus.
- J. The neutral bus shall utilize setscrews to bond the neutral wire to the neutral bus through holes drilled in the neutral bar. A sheet copper neutral bus utilizing flathead screws to hold the neutral wires will not be acceptable.
- K. Spaces for future devices shall be included as indicated and shall be bussed for the maximum rated device that can be fitted into them.
- L. All circuit breakers shall be manually operated, thermal-magnetic, automatic, of the ampacity and poles as indicated. They shall be quick-make, quick-break, both on manual and automatic operation. Breakers shall be over-the-center toggle operating type, with the handle going to a position between ON and OFF to indicate automatic tripping. All multi-pole breakers shall have internal common trip. Breakers shall have a minimum of 10,000 RMS symmetrical amperes interrupting capacity unless designated otherwise. The breakers furnished shall be determined by the specifications and by the minimum U.L. labeled RMS symmetrical amperes interrupting capacity at circuit voltage. All circuit breakers shall be bolted on and rigidly braced.
- M. Panels having sub-feed lugs for feeding through shall have 8" minimum extra gutter space at the lug end and on one side.
- N. Each panel as a complete unit shall have a short-circuit current rating equal to or greater than the equipment rating indicated.
- O. Panels shall be as manufactured by some manufacturer installed in the base building.

2.02 DISTRIBUTION PANELBOARDS

- A. Distribution panelboards (panels) shall be of the circuit breaker type, factory assembled by the manufacturer of the circuit breakers, complete with front door cover. The main breaker and the branch circuit breakers shall be as indicated. The main bus shall be 98% conductivity silver plated copper, rated as and of capacity equal to or greater than the rating or setting of the over-current protective device next back in the line. Panel shall be suitable for the voltage and phase indicated. Provide 25# ground bus.
- B. Panels shall be flush or surface mounted as indicated, with baked-on enamel trim, adjustable trim clamps and door with chromium plated combination cylinder lock and catch, all locks keyed alike. Provide a specified nameplate for each device and a blank (not engraved) nameplate for each spare breaker or space.
- C. The neutral bus shall utilize setscrews to bond the neutral bus through holes drilled in the neutral bar. A sheet copper neutral bus utilizing flathead screws to hold the neutral wires will not be acceptable.
- D. All circuit breakers shall be manually operated, thermal-magnetic, automatic, of the ampacity and poles as indicated. They shall be quick-make, quick-break both on manual and on automatic operation. Breakers shall be over-the-center toggle operating type, with the handle going to a position between "ON" and "OFF" to indicate automatic tripping. All multi-pole breakers shall have internal common trip.
- E. The interrupting capacity of the breakers furnished shall be 10,000 RMS symmetrical unless indicated otherwise.
- F. All main circuit breakers shall be molded case and vertically mounted. All vertically mounted molded case circuit breakers shall be mounted so that the handle is up for "ON" and down for "OFF", when viewed from the normal standing position. All vertically mounted molded case main circuit breakers shall be UL approved for feeding in the bottom and out the top.
- G. All circuit breakers, including any connectors to the main bus, shall be bolted and rigidly braced.
- H. Spaces for future installation of molded case circuit breakers are specifically by range of trip rather than a single trip size or frame size. The spaces so scheduled shall be complete with all bus and required bus connectors such that future breakers can be installed without adding or changing bus connectors on the main bus and without using a larger (frame size) or more expensive breaker than the trip size and interrupting capacity would require. If the bus connectors furnished on the main bus will not cover the trip range specified, then duplicate sets of connectors shall be furnished on the main bus for each frame size required.
- I. Distribution panels shall be as manufactured by some manufacturer installed in the base building.

2.03 TRANSFORMERS

- A. Branch circuit and distribution transformers shall be the dry type and shall have the ratings indicated.
- B. Single phase transformers shall be 480 volt primary and 120/208 volt secondary. Three phase transformers shall be 480 volt delta primary and 120/208 volt grounded type secondary. Transformers 25 KVA and larger shall have a minimum of 4 1/2% full capacity

primary taps.

- C. Transformers shall have a U.L. recognized 220 degree insulation system and shall be designed so that under full load, the average conductor temperature rise does not exceed 115 degrees C. rise above a 40 degree C. ambient and the enclosure does not exceed a 50 degree C. rise at any point.
- D. Transformer coils shall be of the continuous wound construction and shall be impregnated with non-hygroscopic, thermosetting varnish. All cores to be constructed of high grade, non-aging silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. Magnetic flux densities shall be kept well below the saturation point. The core laminations shall be clamped together with structural steel angles. The completed core and coil shall then be bolted to the base of the enclosure but isolated therefrom by means of rubber, vibration-absorbing mounts. There shall be no metal-to-metal contact between the core and coil and the enclosure. On transformers 500 KVA and smaller, the vibration isolating system shall be designed to provide a permanent fastening of the core and coil to the enclosure. Sound isolating systems requiring the complete removal of all fastening devices will not be acceptable. Sound levels shall be guaranteed by the manufacturer not to exceed the following: 25 to 50 KVA - 45 DB; 51 to 150 KVA - 50 DB; 151 to 300 KVA - 55 DB; 301 to 500 KVA - 60 DB.
- E. Transformers 24 KVA and larger shall be in a heavy gauge, sheet steel, ventilated enclosure. The ventilating openings shall be designed to prevent accidental access to live parts in accordance with UL, NEMA, and National Electrical Code standard for ventilated enclosures. Transformers 25 KVA through 112.5 KVA shall be designed so that they can be either floor or wall mounted. Above 112.5 KVA, they shall be floor-mounted design. The entire transformer enclosure shall be degreased, cleaned, phosphatized, primed and finished with a gray, baked enamel.
- F. Transformers shall be compliant with the 2016 DOE efficiency standards:

Table 1.6---Electrical Efficiencies for All Low-Voltage Dry-Type Distribution Transformer Equipment Classes

Equipment Class 3 (Single-Phase)		Equipment Class 4 (Three-Phase)	
kVA	%	kVA	%
15	97.70	15	97.89
25	98.00	30	98.25
37.5	98.20	45	98.40
50	98.30	75	98.60
75	98.50	112.5	98.74
100	98.60	150	98.83
167	98.70	225	98.94
250	98.80	300	99.02
333	98.90	500	99.14
		750	99.23
		1,000	99.28

- F. Transformers that are of the floor-mounted type shall be mounted on Korfund Vibration Eliminators of the pad type.
- G. Transformers shall be as manufactured by some manufacturer installed in the base building.

3.0 EXECUTION

3.01 INSTALLATION

- A. Provide a typewritten directory under plastic for all panelboards with spares marked in pencil. Circuit identification shall include sufficient detail to allow each circuit to be distinguished from all others. Include specific tenant suite numbers in multi-tenant buildings in the circuit description. Provide a label on each breaker in a switchboard or distribution panelboard with the same level of circuit identification details.
- B. Provide all necessary hardware to level and secure the switchgear as required by the manufacturer's instructions. Make all electrical connections for supply and load circuits and leave in operating condition.
- C. Clean enclosure of all switchgear of all foreign matter, including dust.
- D. Remove all rust marks and repaint to leave switchgear in new condition.

END OF SECTION

SECTION 26300

LIGHTING

1.0 GENERAL

1.01 DESCRIPTION

- A. All work in this Section shall comply with the provisions of Section 260010.
- B. Provide all lighting fixtures and lamps as specified herein and as shown.
- C. All lamps shall be operating at the time of the final inspection and for a period of six (6) months after the final acceptance of the project by the Owner.
- D. Confirm exact locations of all lighting fixtures by coordination with the Architects Reflected Ceiling Plans and mechanical equipment above or on the ceiling.
- E. Confirm all ceiling types before ordering lighting fixtures.
- F. Each lighting fixture shall have been tested and certified for proper operation by the fixture manufacturer for the type mounting and ceiling on/in, which it is installed.

2.0 PRODUCTS

2.01 LIGHTING FIXTURES

- A. Each lighting fixture shall be as specified in the Lighting Fixture Schedule corresponding with its fixture type indication (letter).
- B. Most lighting outlets are lettered or groups of outlets are indicated by a letter.
- C. Each lighting fixture shall have a manufacturer's label affixed and shall comply with the requirements of all authorities having jurisdiction.
- D. The lighting fixtures that are indicated by the letters shall be as indicated on the Lighting Fixture Schedule.

2.02 LAMPS

- A. The type lamps shall be as specified for each lighting fixture in the lighting fixture schedule.
- B. The lamp catalog number is the catalog number is generally for Sylvania Lighting and is given as a standard of the quality and performance required. Equal lamps by General Electric or Philips will be acceptable. When a lamp manufacturer's name is used along with the catalog number in the lighting fixture schedule, it is considered unequaled by any other lamp and shall not be substituted for. The lamp performance with energy conserving ballasts furnished under this Section shall be certified by a nationally recognized independent testing laboratory.
- C. Fluorescent lamps shall be as specified in the Lighting Fixture Schedule.
- D. Incandescent lamps shall be as specified in Lighting Fixture Schedule.
- E. All incandescent lamps, except quartz tubes, shall be rated for 130 volt operation.
- F. High Intensity Discharge (HID) lamps shall be as specified in the Lighting Fixture Schedule.

2.03 BALLASTS

- A. Fluorescent ballast shall be electronic type manufactured by Motorola, Magnetek or Advance.
- B. Ballast shall operate lamps at a frequency of 25 KHz or higher with less than 2% lamp flicker.
- C. Ballast shall operate at an input voltage of 108 - 132 Vac (120V line) or 249 - 305 Vac (277V line) at an input frequency of 60 Hz. Light output shall remain constant for line voltage fluctuation of ± 5%.
- D. Ballast shall comply with EMI and RFI limits set by the FCC (CFR 47 part 18) for non-residential applications and not interfere with normal electrical equipment.
- E. Ballast shall withstand transients as specified by ANSI C62.41 for location category A3 in the

normal mode and location category A1 in the common mode.

F. Ballast shall meet applicable ANSI standards.

G. Ballast shall have a minimum power factor of 0.99.

H. Ballast shall not be potted or weigh more than 1.3 pounds.

I. Ballast shall have less than 10% Total Harmonic Distortion.

J. Ballast shall have less than 6% Third Harmonic Distortion.

K. Ballast height shall be less than or equal to 1.5 inches.

L. Ballast shall have a poke-in wiretrap connector.

M. Ballast shall meet sound rating "A".

N. Ballast must be Underwriters Laboratories (UL) listed Class P, Type 1 Outdoor.

O. Ballast shall provide normal rated lamp life as stated by lamp manufacturers.

P. Rapid start ballasts are series wired and shall maintain full cathode heat during operation.

Q. Rapid start ballast shall have less than a 1.5 Lamp Current Crest Factor (LCOF) and instant start ballasts have less than a 1.7 LCOF.

R. Instant start ballast shall have parallel lamp operation.

S. Ballast factor standard is .875±0.025 on all normal light output products.

T. Ballasts for "PL" fluorescent lamps shall be coordinated with lamps and 2-pin or 4-pin configuration ballasts shall be provided to match lamps. Manufacturer for "PL" fluorescent fixtures shall be Advance, Roberson, Lightolier or Lutron.

U. Ballasts for High Intensity Discharge (HID) lamps shall be Constant Wattage Autotransformer (CWA) type or equal type with minimum power factor of 0.9.

2.04 DIFFUSERS

- A. Unless specified otherwise, all prismatic diffusers for fluorescent lighting fixtures shall be prismatic acrylic KSH K12 with a thickness of 0.125", measured from the back side to the peak of the prism.
- B. All wraparound lenses shall be virgin acrylic, one-piece and injection molded.

2.05 EMERGENCY BATTERY LIGHTING

- A. Lighting fixtures indicated on the drawings to be provided with an emergency battery ballast shall feature emergency lighting by using a standard fluorescent lamp or lamps and an emergency battery ballast. The ballast shall consist of a field replaceable high temperature, maintenance free nickel cadmium battery, charger and electronic circuitry contained in one metal case. Provide a solid state charging indicator light to monitor the charger and battery, double pole test switch and installation hardware. The battery ballast shall provide power to the fluorescent lamp upon failure of the normal supply to the fixture.
- B. The test button and indicator light shall be integral in the fixture reflector and shall be positioned within or on the surface of the fixture so as to be accessible and identifiable.
- C. Under normal mode the battery ballast shall keep the batteries at full charge. Upon loss of normal power the battery ballast shall operate the fluorescent lamp or lamps for 90 minutes.
- D. Battery recharge time shall not exceed 16 hours to fully recharge and shall not exceed 225 milliamperes charging current.
- E. The lumen output of the lamp or lamps powered by battery unit shall be not less than 1,100 lumens initially for a four-foot fluorescent lamp.
- F. The battery ballast shall meet or exceed all the requirements set forth in UL924 "Emergency Lighting and Power Equipment" and shall be UL listed for installation on top of or remote from the fixture. Emergency illumination shall meet or exceed the requirements set forth in the National Electric Code, Life Safety Code and UL 90-Minute Requirements.

2.06 LIGHT FIXTURE TRIM

- A. Each recessed lighting fixture shall have a trim to match the type of ceiling (plaster, exposed grid, concealed spine, exposed panel, etc.) in which it is being installed, regardless of catalog number given. Coordinate with the Architect's reflected ceiling plan to provide the right trim for the type of ceiling the fixture is to be installed in.
- B. Each lighting fixture recessed in a plastered ceiling of any type shall have a plaster frame.

2.07 RECESSED INCANDESCENT FIXTURES

- A. All recessed incandescent fixtures shall comply with Article 410-65, C of the N.E.C.

2.08 FLUORESCENT FIXTURES

- A. All indoor fluorescent fixtures utilizing double ended lamps or that are supplied from multi-wire branch circuits, shall have a disconnecting means that complies with Article 410-73, G of the N.E.C.

2.09 LED LIGHTING FIXTURES

- A. LED lamps for interior use shall be 3500K, CRI 80 (min.), unless noted otherwise. Color temperature chromaticity over the lifetime of the product shall be within 0.007 on the CIE 1976 (u,v) diagram.

B. System shall be rated at a minimum for 50,000 hours (min.) at 70% lumen maintenance (L80).

C. System shall comply with the following:

- ENERGY STAR® SSL Requirements for Luminaires
- IESNA LM-16
- IESNA LM-58-94
- IESNA LM-79
- IESNA LM-80
 - ANSI C82.2-2002
 - ANSI C82.77-2002
 - ANSI C78.377-2008
 - CE 13.3-1995
 - CE 15-2002
 - ANSI/UL 153
 - UL 1598

D. LED drivers shall be electronic, thermally protected and have an input voltage at 120/277VAC, 60Hz with a power factor of >0.90.

E. LED boards and drivers shall be provided with plug-in connections for tool-less replacement of components.

F. Compatibility of dimming switches for control of dimmable LED drivers shall be confirmed with LED fixture manufacturer.

3.0 EXECUTION

3.01 SUPPORT OF LIGHTING FIXTURES

- A. All lighting shall be supported from the building structure. The fixtures shall be supported in a manner that will insure the fixture weight being equally distributed from each support and the fixture remaining in a level position.
- B. Fluorescent fixtures installed recessed in a suspended ceiling system shall be supported from the building structure with two (2) 12 gauge wires on diagonal corners of the fixture. In addition, the fixture shall be clipped to members of the ceiling suspension system.
- C. Fluorescent fixtures installed in or on any ceiling other than a suspended ceiling system specifically mentioned above shall be supported with concealed steel rods. Rods shall be 1/4" diameter minimum and shall be located where recommended by the fixture manufacturer. Provide a minimum of two (2) supports for each 4' or 8' fixture chassis. Supports shall be maximum of 48" centers. For incandescent fixtures, steel hanging wire may be used by attaching the wire to the fixture mounting frame.
- D. Pendant mounted incandescent fixtures shall be stem supported by a fixture stud mounted in the outlet box. Suspended fluorescent fixtures shall have mounting stems located as per the manufacturer's recommendations, but in no case shall have less than two (2) stems per chassis.

3.02 AMING OF ADJUSTABLE LIGHT FIXTURES

- A. All fixtures with lamp position, tilt, shutters, rotation, or other types of adjustments during the final inspection. Fixtures serving areas where day lighting is predominant will be adjusted after sunset.

3.03 LIGHTING FIXTURES IN MILLWORK

- A. Special attention shall be given to lighting fixtures indicated to be mounted within, under, or otherwise incorporated into millwork or cabinetry.
- B. Refer to the Architectural drawings and details for specific dimensions. This coordination shall occur prior to ordering fixtures to assure fixtures will fit the space limitations of the millwork.
- C. This requirement is intended to preclude incurring additions to the Contract due to fixtures being too small or too large for the space.

3.04 FINAL PREPARATION

- A. All plastic covers shall be removed from fluorescent fixtures.
- B. Clean all lens and reflectors from debris, fingerprints, dust, etc.

END OF SECTION

SECTION 269200

MOTOR CONTROLS AND WIRING

1.0 GENERAL

1.01 SCOPE

- A. All work specified in this Section shall comply with the provisions of Section 260010.
- B. All motors shall be provided under Division 22 and 23.
- C. A motor starter shall be provided under this Section for each motor except for those specified in Division 22 or 23 to be furnished with integral starters. Motor starters shall be installed either in a Motor Control Center or separately mounted adjacent to the motor served.
- D. Motor power wiring is defined as those conductors between the energy source and the motor. This power wiring shall be terminated at the motor terminals.
- E. All control wiring required for automatic starting and stopping of motors shall be provided under Division 22 or 23 unless specifically shown on the electrical drawings.
- F. Power wiring shall be connected through all line voltage control devices such as fuses and thermostats.

2.0 PRODUCTS

2.01 MOTOR STARTERS

- A. Starters for motors 1/3 horsepower or smaller shall be manual unless remote or automatic starting is required, in which case the starters shall be magnetic, full voltage, non-reversing, single-speed, unless otherwise indicated. All other starters shall be magnetic.
- B. Each starter for a three-phase motor shall be furnished with three (3) overload relays sized for the full load running current of the motor actually provided. Provide an external "HAND-OFF-AUTO" selector switch with green "RUNNING" light. Provide a red pilot light to indicate motor "STOPPED". Each pilot light shall have a legend plate indicating reason for stop.
- C. Each overload relay shall have a normally open alarm contact which will close only when actuated by an overload (not to be confused with N.O. or N.C. auxiliary contacts). These contacts shall be properly wired to their respective blue pilot light provided on the starter front cover and having a "TRIPPED" legend plate.
- D. Individually mounted motor starters shall be in a NEMA Type 1 general purpose enclosure in unfinished areas and shall be flush mounted in all finished areas. All starters mounted in exterior areas shall have a NEMA 3R enclosure. Each starter shall have a laminated nameplate to indicate Division 15 unit number, function and circuit number.
- E. A control power transformer shall be provided at each motor starter for connection to the controls provided under Division 15. The control power transformer shall be mounted inside the motor starter enclosure. All control transformers at 50 VA or greater shall have primary fusing. Coordinate all control equipments with Division 15 and equipment

manufacturers.

F. All motor starters, push buttons and pilot lights shall be of the same manufacturer as the switchboard and shall be General Electric, Square D, Siemens I.T.E., Joslyn Clark Controls or Westinghouse.

2.02 COMBINATION STARTERS

- A. Combination starters shall consist of a circuit breaker and a motor starter mounted in a common NEMA Type 1 general purpose enclosure.
- B. The motor starter components shall be as specified in paragraph 2.01 for motor starters.
- C. The circuit breaker component shall be a minimum 22,000 RMS interrupting capacity and shall be as required in Section 262000.

3.0 EXECUTION

3.01 INSTALLATION

- A. Provide power wiring to and install all motor starters, unless integrally factory mounted on a piece of equipment.
- B. Provide power wiring to all motors except packaged units that are prewired between the starter and motor.
- C. Where line voltage control devices are mounted at, on or inside a unit, such as aquastats, frestat for single phase devices, etc., the power wiring to the unit shall be connected through such a control device.
- D. On final inspection, it shall be demonstrated to the Architect or his representative, that each overload relay control circuit is properly wired and functioning correctly by manually tripping each overload relay individually, one at a time. This inspection procedure shall not involve removing any wiring or disconnecting any current carrying parts.

END OF SECTION



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Seal / Signature



Project Name 12/15/17

Unum Workplace Transformation
- Phase 2 & 3 (HO2 & HO3)

Project Number

59.6481.003

Description
SPECS (CONT) - ELECTRICAL

Scale

NO SCALE

E0.003