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ENGINEERS, INCORPORATED
PO Box 240826 • 4223 South Boulevard
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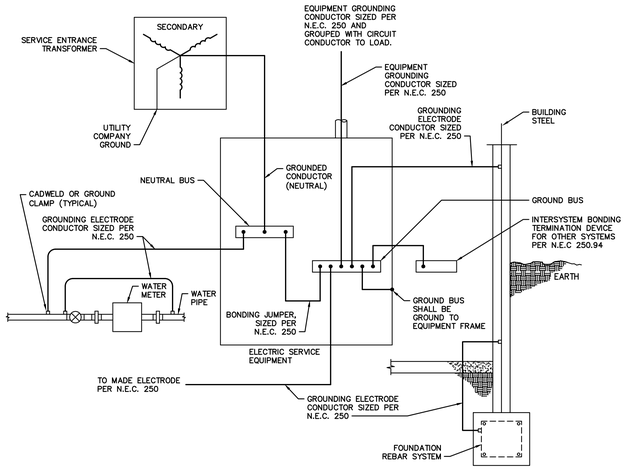
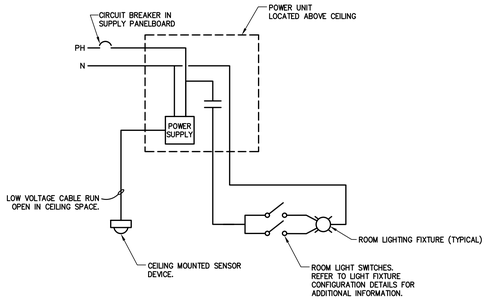
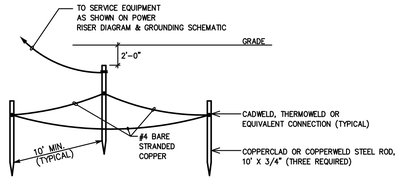
F-0595
17-130



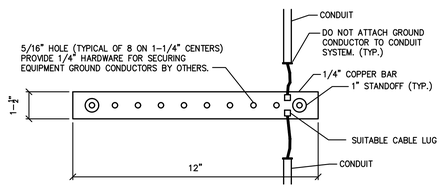
1 E4.1 GROUNDING CONNECTION DIAGRAM
NOT TO SCALE



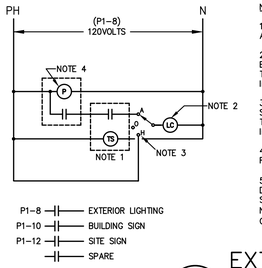
2 E4.1 DETAIL – OCCUPANCY SENSOR CONTROL
NOT TO SCALE



3 E4.1 DETAIL – TYPICAL MADE GROUNDING ELECTRODE
NOT TO SCALE



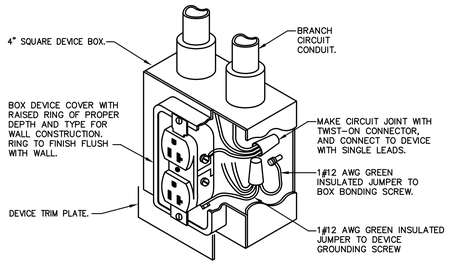
4 E4.1 GROUND BAR DETAILS
NOT TO SCALE



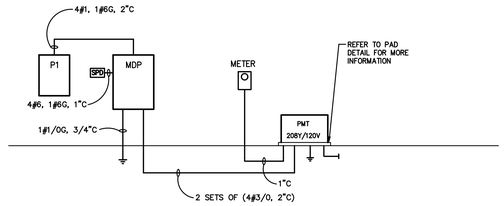
NOTES:

1. DIGITAL TIME SWITCH. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION.
2. ELECTRICALLY HELD LIGHTING CONTACTOR WITH 20A BALLAST RATED CONTACTS. CONTACTOR SHALL BE OPEN TYPE. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION.
3. HAND-OFF-AUTOMATIC SELECTOR SWITCH. SWITCH SHALL BE HEAVY-DUTY, OIL TIGHT, MAINTAINED CONTACT TYPE. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION.
4. PHOTOCELL CONTROL DEVICE. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION.
5. MOUNT TIME SWITCH AND CONTACTOR IN 18"x 18"x 6" DEEP NEMA 1 ENCLOSURE WITH HINGED DOOR. MOUNT SELECTOR SWITCH ON DOOR. PROVIDE PERMANENT NAMEPLATE ON DOOR TO READ: "EXTERIOR LIGHTING CONTROL".

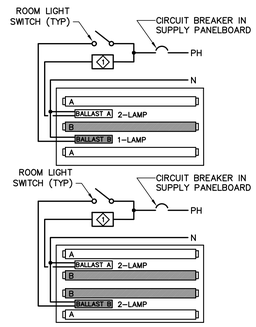
5 E4.1 EXTERIOR LIGHTING CONTROL DIAGRAM–ELC
NO SCALE



6 E4.1 DETAIL – TYPICAL DUPLEX RECEPTACLE INSTALLATION
NOT TO SCALE



7 E4.1 POWER RISER DIAGRAM
SCALE: NOT TO SCALE



8 E4.1 DETAIL – MULTI-LEVEL SWITCHING LIGHT FIXTURE CONFIGURATION
NOT TO SCALE

NOTES:

① IN CONFERENCE ROOM, BALLAST A WILL BE CONTROLLED BY WALL LIGHT SWITCH. IN WORKROOM BALLAST A WILL BE CONTROLLED BY 3 HOUR TIMER RELAY. REFER TO WORKROOM LIGHTING CONTROL DIAGRAM FOR ADDITIONAL INFORMATION.

PANELBOARD: MDP					GROUND BUS				SC RATING: 22 KAMPS RMS SYMM.			
SERVICE: 208Y/120V 3PH 4W									MOUNTING: SURFACE			
MAINS: 400 AMP MCB					TYPE: DISTRIBUTION				ENCLOSURE: NEMA 1			
LOAD DESCRIPTION	WIRE	BKR	CKT	NEUT	CONNECTED LOAD (KVA) A	B	C	CKT	BKR	WIRE	LOAD DESCRIPTION
SSAH-1	8	45/3	1A		4.1 1.8			2A	25/3	10	SSHP-1
	8	/	3B			4.1 1.8		4B	/	10	
	8	/	5C				4.1 1.8	6C	/	10	
SSAH-2	8	45/3	7A		4.1 2.2			8A	30/3	10	SSHP-2
	8	/	9B			4.1 2.2		10B	/	10	
	8	/	11C				4.1 2.2	12C	/	10	
SSAH-3	8	45/3	13A		4.1 1.8			14A	25/3	10	SSHP-3
	8	/	15B			4.1 1.8		16B	/	10	
	8	/	17C				4.1 1.8	18C	/	10	
PANEL P1	1	125/3	19A	10.0	10.0 2.1			20A	30/3	10	SCISSOR LIFT
	1	/	21B	10.7		10.7 2.1		22B	/	10	
	1	/	23C	8.7			8.7 2.1	24C	/	10	
SPACE ONLY		/3	25A		0.0 1.3			26A	20/2	12	WH#1
		/	27B			0.0 1.3		28B	/	12	
		/	29C				0.0 0.0	30C	/1		SPACE ONLY
SPACE ONLY		/3	31A		0.0 0.0			32A	/3		SPACE ONLY
		/	33B			0.0 0.0		34B	/		
		/	35C				0.0 0.0	36C	/		
SPD	6	60/3	37A		0.0 0.0			38A	/3		SPACE ONLY
	6	/	39B			0.0 0.0		40B	/		
	6	/	41C				0.0 0.0	42C	/		
					29.4	31.4	32.2	28.9			

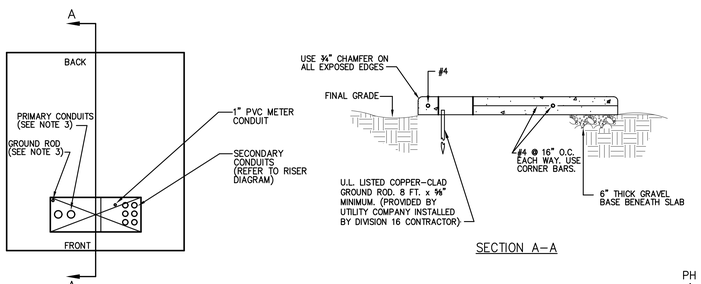
NOTES:
PROVIDE WITH SERVICE ENTRANCE LABEL.

LIGHTS	5.6 KVA
RECEPTS	13.5 KVA
MOTORS	30.4 KVA
HEAT	34.9 KVA
KITCHEN	0.0 KVA
CMPTR	0.3 KVA
OTHER	7.8 KVA
TOTAL	92.5 KVA

PANELBOARD: P1					GROUND BUS				SC RATING: 22 KAMPS RMS SYMM.			
SERVICE: 208Y/120V 3PH 4W									MOUNTING: SURFACE			
MAINS: 225 AMP MLO					TYPE: BRANCH				ENCLOSURE: NEMA 1			
LOAD DESCRIPTION	WIRE	BKR	CKT	NEUT	CONNECTED LOAD (KVA) A	B	C	CKT	BKR	WIRE	LOAD DESCRIPTION
TTB	12	20/1	1A	1.5 1.3	1.5 1.3			2A	20/1	12	LTG: WORKROOM
TTB	12	20/1	3B	1.5 1.2		1.5 1.2		4B	20/1	12	LTG: WORKROOM
REC: MECH.	12	20/1	5C	0.9 0.8			0.9 0.8	6C	20/1	12	LTG: GENERAL
REC: GENERAL	12	20/1	7A	0.7 0.3	0.7 0.3			8A	20/1	12	LTG: EXTERIOR
REC: OFFICE	12	20/1	9B	1.0 0.2		1.0 0.2		10B	20/1	12	LTG: SIGN
CEILING REC: WORKROOM	12	20/1	11C	0.6 1.5			0.6 1.5	12C	20/1		FUTURE LIGHTING
CEILING REC: WORKROOM	12	20/1	13A	0.6 0.9	0.6 0.9			14A	20/1		FUTURE RECEPTACLES
CEILING REC: WORKROOM	12	20/1	15B	0.6 0.9		0.6 0.9		16B	20/1		FUTURE RECEPTACLES
REC: COLUMNS	12	20/1	17C	0.5 0.9			0.5 0.9	18C	20/1		FUTURE RECEPTACLES
REC: COLUMNS	12	20/1	19A	0.4 0.9	0.4 0.9			20A	20/1		FUTURE RECEPTACLES
REC: WORKROOM	12	20/1	21B	0.6 0.9		0.6 0.9		22B	20/1		FUTURE RECEPTACLES
REC: WORKROOM	12	20/1	23C	0.6 0.9			0.6 0.9	24C	20/1		FUTURE RECEPTACLES
REC: WORKROOM	12	20/1	25A	0.6 0.9	0.6 0.9			26A	20/1		FUTURE RECEPTACLES
REC: WORKROOM	12	20/1	27B	0.6 0.9		0.6 0.9		28B	20/1		FUTURE RECEPTACLES
REC: WORKROOM	12	20/1	29C	0.6 0.9			0.6 0.9	30C	20/1		FUTURE RECEPTACLES
REC: SWITCHED	12	20/1	31A	0.9 0.9	0.9 0.9			32A	20/1		FUTURE RECEPTACLES
EF-1,EF-2,EF-3	12	20/1	33B	1.0 1.0		1.0 1.0		34B	20/1	12	FACP
REC: BREAK	12	20/1	35C	0.2 0.0			0.2 0.0	36C	20/1		SPARE
REC: BREAK	12	20/1	37A	0.2 0.0	0.2 0.0			38A	20/1		SPARE
EWC	12	20/1	39B	1.2 0.0		1.2 0.0		40B	20/1		SPARE
SPARE		20/1	41C	0.0 0.0			0.0 0.0	42C	20/1		SPARE
SPARE		20/1	43A	0.0	0.0 0.0			44A	/3		SPACE ONLY
SPARE		20/1	45B	0.0		0.0 0.0		46B	/		
SPARE		20/1	47C	0.0			0.0 0.0	48C	/		
SPACE ONLY		/3	49A		0.0 0.0			50A	/3		SPACE ONLY
		/	51B			0.0 0.0		52B	/		
		/	53C				0.0 0.0	54C	/		
					30.1	10.1	11.6	8.4			

NOTES:

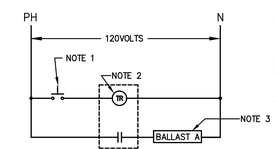
LIGHTS	5.3 KVA
RECEPTS	13.5 KVA
MOTORS	2.2 KVA
HEAT	0.0 KVA
KITCHEN	0.0 KVA
CMPTR	0.3 KVA
OTHER	8.8 KVA
TOTAL	30.1 KVA



NOTES:

1. CONCRETE SHALL BE AIR-ENTRAINED, 4000 PSI.
2. MAINTAIN 2" COVER FOR REINFORCING BARS.
3. UTILITY COMPANY SHALL SUPPLY GROUND ROD, GROUND ROD CLAMP, PRIMARY CONDUITS AND BENDS. ELECTRICAL CONTRACTOR SHALL INSTALL THE GROUND ROD, GROUND ROD CLAMP, AND TWO CONDUIT BENDS SUPPLIED BY UTILITY COMPANY. (THE CONDUIT BENDS WILL NEED TO BE CUT TO FIT THIS APPLICATION).
4. COORDINATE EXACT SIZE OF CONCRETE PAD AND OPENINGS WITH UTILITY COMPANY.

9 E4.1 DETAIL – TRANSFORMER CONCRETE PAD
SCALE: NOT TO SCALE



NOTES:

1. ILLUMINATED RED MUSHROOM MOMENTARY PUSHBUTTON. MOUNT IN 4" SQ. BOX.
2. 3 HOUR TIMER RELAY MOUNTED IN 4" SQUARE BOX. LOCATE RELAY ON COLUMN ABOVE PUSHBUTTON.
3. BALLAST A OF TYPE A3 (2 BALLAST FIXTURE) IN WORKROOM.

10 E4.1 WORKROOM LIGHTING CONTROL DIAGRAM
NO SCALE

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INTERIOR UPFIT
USPS SPOUT SPRINGS NC CAX
XXXXXXXXX
XXXXXXXXX

UNITED STATES POSTAL SERVICE.

Revisions:

E4.1 Electrical Details

Scale: As Indicated Date: 5/17/2018

Project: SPOUT SPRINGS INTERIOR UPFIT
USPS File Number: XXXXXX
USPS Project Number: G97932

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4/16/2018

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INTERIOR UPFIT
USPS SPOUT SPRINGS NC CAX
XXXXXXXXX
XXXXXXXXX

UNITED STATES POSTAL SERVICE.

USPS SIGN POWER CONTROL METHOD

TO CONTROL A SINGLE SIGN OR MULTIPLE SIGNS, ALL ON OR OFF AT THE SAME TIME.

METHOD 'B'

NOTE:
SET TIME CONTROL CIRCUIT 1 'ON' @ 4:30pm
'OFF' @ ? pm

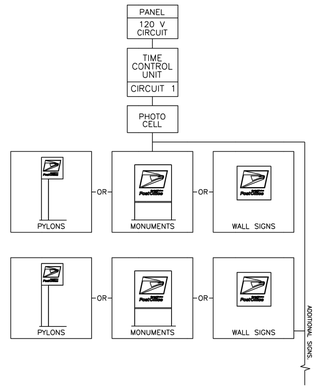
PROGRAMMING:
24 HOUR – 7 DAY (AUTO SKIP, RESET)
SINGLE DAY AND TEMPORARY HOLIDAY PROGRAMMING
AUTOMATIC DAYLIGHT SAVINGS CHANGEOVER AND LEAP YEAR CORRECTED
MINIMUM 16 PROGRAMMING SET POINTS.

SINGLE CHANNEL ELECTRONIC TIME CONTROL UNIT

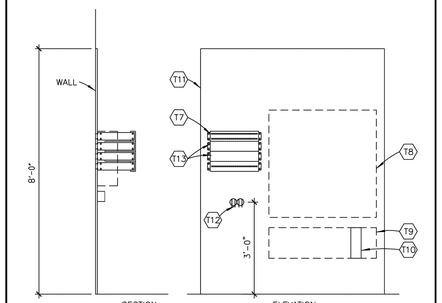
- UL LISTED
- CAPACITY AND CERIFICATIONS SHALL MEET ALL GOVERNING CODE REQUIREMENTS.
- INDOOR / OUTDOOR LOCKABLE ENCLOSURE
- LCD DISPLAY OF DAY, DAY OF WEEK AND OUTPUT STATUS.
- POWER OUTAGE CARRY–OVER SHALL MAINTAIN TIME AND PROGRAM FOR MINIMUM OF 7 DAYS.

PHOTOELECTRIC CONTROL

- PHOTOCONTROL ENCLOSURE SHALL BE CONSTRUCTED OF DIE CAST ZINC, GASKETED FOR WEATHER PROTECTION.
- CELL SHALL BE CADMIUM SULPHIDE, EPOXY COATED, ONE INCH DIAMETER.
- CONTACTS SHALL BE NORMALLY CLOSED AND FAIL IN THE ON POSITION.
- PHOTOCONTROL MUST WITHSTAND TEMPERATURES OF –40 TO 140 F.
- UNIT TO BE PROVIDED WITH THREE COLOR CODED, SIX INCH WIRE LEADS, #16 AWG, RATED FOR 105°C.
- PHOTOCONTROL SHALL HAVE A FIXED BASE FOR MOUNTING THROUGH 7/8 INCH OPENING OR 1/2 INCH K.O.



1 Detail: EXTERIOR LIGHTING SIGN POWER CONTROL METHOD — Doc. G5-3-2d — CAD File: ..\uspe\library\details\G5-3-2d.dwg — Scale: NTS — USPS SDL Issued: 5/1/2014 — Last Revised: 12/17/2008



2 Detail: COMMUNICATIONS - WALL MOUNTED MC AND TEL. EQUIPMENT DETAIL — Doc. G5-4-0d — CAD File: ..\uspe\library\details\G5-4-0d.dwg — Scale: NTS — USPS SDL Issued: 5/1/2014 — Last Revised: 3/17/2002

T1 TELECOMMUNICATION OUTLET (T.O.) FOR POS NETWORK (POS), FUTURE VENDING POLLING (FV), AND DEDICATED HEADQUARTERS TELEPHONE (HQ).

T2 TELECOMMUNICATION OUTLET (T.O.) FOR CREDIT TELEPHONE (CT) & VOICE TELEPHONE (VT), AND ONE FUTURE.

T3 TELECOMMUNICATION OUTLET (T.O.) FOR POS NETWORK (POS), AND TWO FUTURE.

T4 NOT USED.

T5 NOT USED.

T6 ONE FLEXIBLE CONDUIT WITH HOME RUN OF (3) TELECOMMUNICATION WIRES PER TELECOMMUNICATION OUTLET. ROUTE CONDUIT UP THROUGH WALL AND STUB ABOVE CEILING.

T7 PATCH PANEL FOR TELECOMMUNICATION TERMINATION, WALL MOUNTED.

T8 WALL MOUNTED TELEPHONE EQUIPMENT (PROVIDED BY USPS, REQUIRES 42"X42" CLEAR SPACE).

T9 TELEPHONE COMPANY DEMARCATION, WALL MOUNTED.

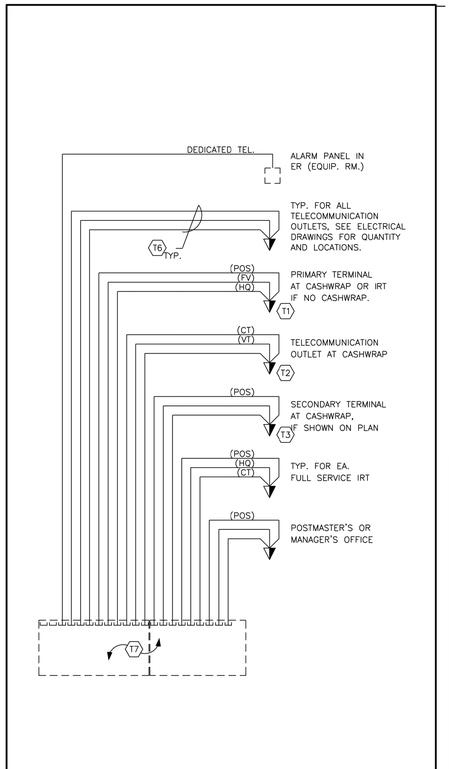
T10 24 PORT RJ-11 MODULAR 66 BLOCK FOR TELEPHONE COMPANY LINE INTERFACE. INSTALL MODULAR 66 BLOCK ONTO PLYWOOD BACKBOARD.

T11 3/4" FIRE TREATED PLYWOOD ON WALLS INDICATED FROM FLOOR TO 8'-0" AFF FOR MOUNTING OF EQUIPMENT.

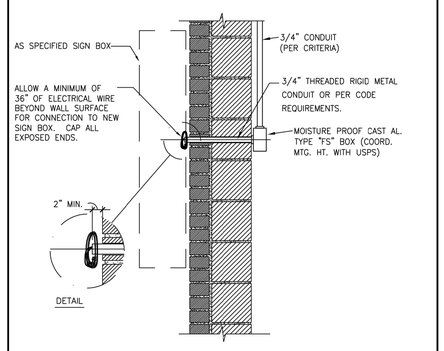
T12 DUPLEX OUTLETS TO DEDICATED CIRCUITS.

T13 COMMUNICATIONS HUB (N.I.C.) AND POS HUB (N.I.C.)

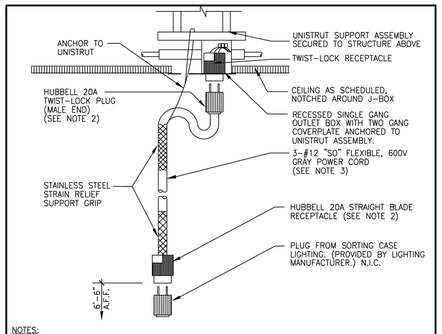
3 Detail: COMMUNICATIONS - WALL MOUNTED MC KEYED NOTES — Doc. G5-4-0dl — CAD File: ..\uspe\library\details\G5-4-0dl.dwg — Scale: NTS — USPS SDL Issued: 5/1/2014 — Last Revised: 3/17/1999



4 Detail: COMMUNICATIONS STRUCTURED CABLING RISER DIAGRAM — Doc. G5-4-0b — CAD File: ..\uspe\library\details\G5-4-0b.dwg — Scale: NTS — USPS SDL Issued: 5/1/2014 — Last Revised: 9/17/2003



5 Detail: EXTERIOR LIGHTING THROUGH - WALL SIGN CONNECTION — Doc. G5-3-2c — CAD File: ..\uspe\library\details\G5-3-2c.dwg — Scale: NTS — USPS SDL Issued: 5/1/2014 — Last Revised: 6/11/2012



NOTES:
1. THIS INSTALLATION IS FOR SERVICE TO WORKROOM SORTING CASE LIGHTING (120 V) ONLY.
2. USE TYPE OF CONNECTOR BODY THAT GRIPS ON INSULATION OF "SO" CORD SO THAT TENSION IS NOT TRANSMITTED TO CONDUCTORS OR TERMINAL SCREWS.
3. USE CONTINUOUS LENGTHS OF "SO" CORD AT EACH LOCATION. SPLICES ARE NOT PERMITTED.

6 Detail: CONVENIENCE OUTLETS - TWIST-LOCK DROP CORD THRU CEILING — Doc. G5-2-8b — CAD File: ..\uspe\library\details\G5-2-8b.dwg — Scale: NTS — USPS SDL Issued: 5/1/2014 — Last Revised: 4/20/2011

Revisions:

E4.2 Electrical Details

Scale: As Indicated Date: 5/17/2018

Project: SPOUT SPRINGS INTERIOR UPFIT
USPS Proj Number: XXXXXXX
USPS Project Number: C97932

16010 - ELECTRICAL GENERAL REQUIREMENTS

1.1 SCOPE:

a. Applicable requirements of the General Conditions of the Contract, Amendments, Supplementary General Conditions, and Special Conditions govern work under this Division.

b. Minor details not usually shown or specified, but necessary for the proper installation and operation, shall be included in the work, the same as if herein specified or shown.

1.2 RECORD DRAWINGS:

a. During construction of this project, the Contractor shall maintain one complete set of electrical contract drawings, on which shall be recorded all significant changes. This set of drawings shall be used for no other purpose. Upon completion of the work, the Contractor shall submit these drawings to the Architect/Engineer for approval and presentation to the Owner.

1.3 REGULATIONS AND COMPLIANCE:

a. The requirements of the North Carolina State Building Code which includes the National Electrical Code, and of all other State and Local codes, ordinances, regulations and interpretations by authorities having jurisdiction are binding upon this Contractor, and nothing contained in, or inferred by, these specifications or the applicable drawings may be construed as waiving those requirements. The latest edition of the National Electrical Code, referred to herein and on the drawings as "N.E.C.", forms a part of these specifications; and under no circumstances may the installation fail to meet the minimum requirements therein.

A. All materials and equipment shall bear the approval label, and shall be listed by the Underwriters' Laboratories, Inc.

2.1 GENERAL:

a. Except where reuse of existing items are specifically indicated or permitted, all materials and equipment shall be new and shall conform with the standards of the National Electrical Manufacturer's Association and Underwriters' Laboratories, Inc. in every instance where such a standard has been established for the item involved.

b. It is the intention of these specifications and drawings to call for finished work, tested and ready for operation. Whenever the work "provide" is used, it shall mean "furnish and install complete and ready for use".

3.1 COORDINATION:

a. This Contractor coordinate the work of all subs and shall furnish any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.

b. The Contractor shall furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

3.4 PROTECTION AND CLEAN-UP:

a. Protect all material and work from damage during construction. Equipment installed in the building prior to its being closed in and dried out shall be protected from the elements in the same manner as previously specified for stored materials. Protect finished surfaces from splattering of mortar, paint, dirt, plaster, etc.. Do not install device plates, face plates, canopies, flush cabinet trims, or fixtures on walls or ceilings until after painting or cleaning of the surface has been completed, and arrange for such items that are required to be field painted to be painted before being mounted. Repair, clean and touch-up, or replace, all damaged material. At the completion of the project, remove all dust from finished surfaces, including lighting fixtures, lenses and lamps.

b. The Contractor shall keep premises free of debris resulting from his work.

3.5 PAINTING AND FINISHING:

a. Suitable finishes shall be provided on all items of electrical equipment and materials which are exposed. This shall consist of either an acceptable finish as manufactured and supplied to the job or application of suitable finishes after installation.

b. Where installed in finished areas, exposed equipment and materials shall be supplied with prime coat, and shall be professionally painted or enameled as directed to match or blend with adjacent surfaces.

c. In unfinished areas such as equipment rooms, exposed equipment shall be furnished with suitable factory applied finishes (e.g. standard gray enamel finish for panelboards, etc.).

16030-EQUIPMENT CONNECTIONS AND COORDINATION

1.1 SCOPE:

a. The connection of all equipment provided under any Division of these specifications or by the owner requiring electrical connection shall be provided as part of this Division, unless otherwise indicated or specified. Special outlets, where indicated, are considered to be electrical connection to the equipment.

b. Drawings indicate approximate equipment capacity (including motor horsepower) and approximate location of connection. It is the responsibility of this Contractor to determine the exact characteristics of equipment actually being supplied; and to provide proper branch circuit connections, conductors protection, and grounding.

2.1 GENERAL:

a. Heating, Ventilating, Air Conditioning, Refrigeration and Plumbing Equipment: Unless otherwise indicated, provide all power wiring, including feeders and branch circuits, to the terminals of the equipment, including mounting of motor starters; feeder and branch circuit over-current protection; disconnecting means within sight of each motor and each starter, whether or not specifically indicated on drawings.

b. Individually mounted motor starters: Unless otherwise indicated, individually mounted motor starters will be furnished as part of the Division furnishing the driven equipment. Unless otherwise indicated, remote control wiring for Heating, Ventilating, Air Conditioning, and Plumbing equipment will be provided as part of those respective Divisions.

16100-BASIC MATERIALS AND METHODS

1.1 WIRING METHOD:

a. Unless otherwise indicated or specified, the Wiring Method for this project shall consist of copper conductors with 600 volt insulation installed in metal raceways.

b. The word "Raceway" and the word "Conduit" (or abbreviation "C") used herein or on the drawings indicate Rigid Metal Conduit, and where permitted, Intermediate Metal Conduit, Electrical Metallic Tubing, Flexible Metal Conduit, or Liquidtight Flexible Metal Conduit.

c. Reference to "Rigid Conduit" or "RMC" indicates heavy-wall Rigid Metal Conduit only.

d. Reference to "IMC" indicates Intermediate Metal Conduit.

e. Reference to "EMT" or "Tubing" indicates Electrical Metallic Tubing.

f. Reference to "Flex" or "Flexible Conduit" indicates Flexible Metal Conduit, or, where required, Liquidtight Flexible Metal Conduit.

1.2 FASTENINGS METHODS:

a. Acceptable fastening methods include wood screws and nails on wood construction, toggle bolts on hollow masonry, expansion bolts and lead anchors on brick and concrete, and machine screws on metal surfaces.

b. Explosive fasteners may be used in steel and concrete in accordance with the manufacturer's recommendations.

c. Wire, perforated metal strap, and wooden plugs are not acceptable as fastening material.

d. Materials used shall be good quality, made of zinc or cadmium coated steel or other non-corroding material.

e. Materials, whether exposed or concealed, shall be firmly and adequately held in place. Fastening and support shall afford safety factor of three or higher, and shall be in full compliance with the seismic protection requirements of the N.C. State Building Code.

f. Fixtures, raceways, and equipment shall be supported from the structure. Nothing may be supported on suspended ceiling unless definitely noted so on the Drawings or specifically permitted by the Architect/Engineer.

g. Equipment and raceways attached to outside walls, or interior walls subject to permanent moisture, shall be shimmed out with non-corrodible material so as to provide 1/4" air space between wall and equipment or raceway.

1.3 NAMEPLATES:

a. Suitable nameplates shall be provided for the identification of electrical equipment.

b. Nameplates shall be of engraved white core plastic laminate, not less than 1/16" thick. For 120/208 volt systems, nameplates shall have white letters on black backgrounds.

c. Engraving shall be of professional quality, with block style letters, minimum 1/4" high.

d. Nameplates shall be attached with sheet metal screws. They shall be sized to allow for installation of screws without obscuring text.

16110-RACEWAYS AND FITTINGS

1.1 MATERIALS AND APPLICATIONS:

a. Rigid Metal Conduit shall be zinc coated steel or alloy 6063-T42 aluminum with threaded couplings and fittings. Termination at sheet metal enclosures shall consist of double locknuts and insulating bushings. Rigid Steel conduit shall be used for all exposed and concealed work except where other raceways are indicated or permitted. Aluminum conduit complete with aluminum fittings may be used in lieu of steel conduit except in wet locations, underground, or in poured concrete. Steel and aluminum shall not be mixed in the same run of conduit.

b. Intermediate Metal Conduit (IMC) with threaded couplings and fittings may be used for exposed and concealed work in lieu of rigid metal conduit except underground outside the building foundation, or where supporting lighting fixtures, or in hazardous locations, or where exposed to severe impact or injury. Termination at sheet metal enclosures shall consist of double locknuts and insulating bushings.

c. Electrical Metallic Tubing (EMT) of 2" maximum size may be used for concealed work in lieu of Rigid Metal Conduit except underground or in poured concrete. EMT of 2" maximum size may be used for exposed work in lieu of Rigid Metal Conduit except outdoors, or above a roof, or where supporting lighting fixtures, or where exposed to severe impact or injury, or in hazardous locations, or less than 10 feet above a floor or platform in other than in electrical, mechanical, or communications closets or equipment rooms.

d. Flexible Metal Conduit shall be of zinc coated steel of minimum length, and shall be used in lieu of Rigid Metal Conduit for connections to moving or vibrating apparatus, recessed lighting fixtures, dry-type transformers, and motors. Flexible Metal Conduit may be used where rigid connections are impractical due to obstructions or space limitations. Flexible Metal Conduit used in wet, damp, or corrosive location shall be PVC jacketed liquid-tight complete with liquid-tight connectors.

e. Fittings for steel conduit and tubing shall be of zinc coated steel or malleable iron. Insulating bushings of plastic provided for Rigid and Intermediate Metal Conduits shall be rated for 150oC. Bonding bushings shall be steel or malleable iron with non-removable plastic throats rated 150oC. EMT fittings shall be of the compression type. Set-screw, indentor, pressure cast, and die cast fittings are not acceptable. Connectors for EMT, Flexible Metal Conduit and Liquid-tight Flexible Metal Conduit shall be the insulated throat type. Connectors for Flexible Metal Conduits shall be of the "Tite-Bite" design.

f. Conduit expansion fittings shall be of zinc coated cast or malleable iron and steel conduit, complete with flexible bonding straps. Expansion fittings shall allow longitudinal conduit movement of 4 inches.

g. Minimum raceway size shall be 1/2". Other raceway sizes, unless indicated on the drawings, shall be determined by the Contractor in accordance with NEC requirements for type THW insulated conductors, or the actual insulation used if it is thicker than type THW.

2.1 INSTALLATION:

a. Rigid and Intermediate Metal Conduits shall be made up with full threads, to which a conductive pipe compound (T & B Kopr-Shield or equal) has been applied, and butted in coupling. Terminations at sheet metal enclosures in indoor dry locations shall be made with double locknuts and an insulating bushing. Terminations at sheet metal enclosures in outdoor, damp, and wet locations shall be made with threaded conduit hubs of zinc coated malleable iron.

b. Conduits shall be rigidly supported not more than 8 feet on center and shall be concealed within walls, ceilings, and floors, except as indicated or specifically approved by the Architect/Engineer; kept at least 6" from flues and steam or hot water pipes; and protected against the entry of dirt, plaster, or trash. Raceways shall be supported independently of suspended ceiling members and suspension wires.

c. Suspended EMT shall be provided with additional hangers at elbows and bends, and where necessary to avoid strain at couplings and connectors.

d. Exposed conduits, where permitted, shall be run parallel or perpendicular to walls, structural members and ceilings; with right-angle turns consisting of symmetrical bends or cast metal fittings with threaded hubs. Offsets may be used where necessary provided that they are of minimum length.

e. Conduits crossing expansion and contraction joints shall cross perpendicular to the joint and shall be provided with expansion fittings. Conduits shall not be embedded in the concrete slabs at the expansion and contraction joints.

16120-CONDUCTORS

1.1 MATERIALS:

a. Unless otherwise indicated, all wire and cable conductors shall be copper.

b. Conductors shall be not smaller than #12 AWG except that #10 AWG minimum is required for the entire length of 120 volt branch circuits whose distance to the center of the load exceeds 75 feet. #14 AWG may be used for signal and remote control circuits. #16 AWG may be used for taps to individual recessed lighting fixtures on circuits protected by over-current devices rated at 20 amperes or less and contained within flexible metal conduits that do not exceed 6 feet in length. Other conductors smaller than #14 AWG may be used only where specifically indicated on the drawings or specified herein.

c. Conductors #10 AWG and smaller shall be solid, dual rated type THWN/THHN.

d. Conductors #8 AWG and larger shall be stranded, dual rated type THWN\THHN.

e. Each conductor shall bear easily readable markings along entire length, indicating size and insulation type.

f. Insulation on conductors #10 AWG and smaller shall be suitably colored in manufacture.

g. Conductors in any location subject to abnormal temperature shall be furnished with an insulation type suitable for temperature encountered.

h. Where no indication is made of wire size, the conductor shall be of N.E.C. size to match its overcurrent protective device, but in no case smaller than #12 AWG.

2.1 SPLICES, TAPS, AND CONNECTIONS:

a. Splices in conductors #10 AWG and smaller shall be made with twist-on spring steel devices UL listed as Pressure Cable Connectors, with integral insulating covers rated 75oC. at 600 volts.

b. Splices in copper conductors #8 AWG and larger shall be made with mechanical devices UL listed as Pressure Cable Connectors and insulated with thermoplastic tape UL listed for use as sole insulation. Tape may be omitted from connectors supplied with securely fastened insulating covers which completely enclose the connector and the conductors. Insulating covers shall be rated 75oC at 600 volts.

2.2 COLOR CODING:

a. All wiring shall be color coded.

b. On 120/208V, 3 phase, 4 wire power systems, conductors shall be color coded Black (Phase A), Red (Phase B), Blue (Phase C), and White (Neutral).

c. Conductors #8 AWG and larger may be identified with two or more bands of proper color plastic tape applied near each splice and termination. Painting of wire will not be acceptable.

d. Phase sequence shall be "A", "B" and "C" from left to right, top to bottom or front to back when facing equipment.

2.3 BRANCH CIRCUIT RACEWAY WIRING:

a. Three-phase circuits shall be limited to one such circuit per raceway. They shall consist of three different phase wires, and a neutral where required.

b. A neutral shall not serve more than one circuit. The neutral carrying all or any part of the current of any specific load shall be contained in the same raceway or enclosure with the phase wire or wires also carrying that current.

c. Circuits shall be connected to panels as shown in the panel schedules.

d. Under the above requirements and with required color coding system no raceway shall contain more than one wire of the same color, except for switch legs and control conduits.

e. Conductors supplying lighting outlets may be combined in the same raceways with conductors supplying receptacles; but lighting outlets and receptacle outlets shall not be connected to the same circuits unless specifically indicated on the drawings.

2.4 FEEDER CONDUCTORS:

a. Unless specifically shown otherwise, each set of feeder conductors shall be installed in a separate raceway.

b. Where paralleling of conductors is shown for feeders, it is absolutely required they be exactly the same length between terminations.

c. Where feeder conductors are so installed that the conductor markings cannot be read without moving or twisting conductors, they shall be provided with suitable tags indicating the conductor size and insulation.

16122-METAL-CLAD CABLE SYSTEMS

1.1 SCOPE:

a. Furnish and install a complete system of Metal-Clad Cable for branch circuit, signal, and remote control wiring as specified herein. Comply with Section 16100 BASIC MATERIALS AND METHODS.

b. Types AC cable is not permitted.

1.2 APPLICATIONS:

a. Metal-Clad Cables may be used in lieu of wire in metal raceway only for concealed work in dry locations above suspended ceilings and within stud partitions.

b. Cables may not be run in, or through, concrete or masonry, fire-rated partitions, smoke partitions, or floors.

1.3 SUBMITTALS:

a. Submit for approval manufacturer's data sheets for metal-clad cable systems.

2.1 MATERIALS:

a. Metal-Clad Cables shall be UL listed as type MC with copper conductors, THHN insulated; with full size green insulated grounding conductors. Minimum sizes shall be #12 AWG for branch circuits, #14 AWG for signal and remote control. Maximum size shall be #10 AWG.

b. Cable connectors shall be UL listed for grounding the metal sheath. Connectors shall be of steel or malleable iron with insulated throats.

c. Cables shall be color-coded in manufacture. Color-code shall comply with Section 16120 CONDUCTORS.

3.1 INSTALLATION:

a. Cables shall not be run exposed. Conduit skirts may be provided on surface mounted panelboards to conceal cables between panel tops and ceilings.

b. Except where installed in continuous rows, lighting fixtures shall be individually connected to a concealed outlet box. Cables may not be looped from fixture to fixture.

c. Cables above ceilings shall be supported from overhead structure clear of ductwork, suspended ceilings, and ceiling hanger wires.

16130-GROUNDING AND BONDING

1.1 SCOPE:

a. The neutral of each separately derived system, and all non-current-carrying metal parts, raceways, and enclosures shall be permanently and effectively grounded.

b. Grounding and bonding shall be provided in strict accordance with the National Electrical Code, and as specified herein and on the drawings.

c. The Contractor shall note that required grounding conductors and connections are not all shown on the drawings. NEC requirements apply.

2.1 MATERIALS AND APPLICATIONS:

a. Grounding conductors shall be of THWN insulated copper, unless otherwise indicated.

b. Grounding bus bars in distribution equipment shall be bare copper.

c. Clamps for attaching conductors to water pipes and ground rods shall be of bronze. Ground rod clamps shall be U.L. listed for direct burial.

d. Clamps for attaching conductors to building steel shall be of steel, bronze, or malleable iron.

e. Threaded hubs for bonding metal raceways to the contained grounding electrode conductors and to the water pipe clamps shall be of bronze or malleable iron. Similar hubs shall be used to bond the same raceways to the conductors and to sheet metal equipment enclosures.

f. Driven grounding electrodes shall consist of copper clad steel rods. Rods shall be 8 feet long and 5/8" diameter unless otherwise indicated.

g. Bonding bushings shall be of steel or malleable iron with non-removable plastic throats rated 1500C.

h. Bonding locknuts and wedges for service conduits shall be of zinc coated steel.

3.1 EQUIPMENT GROUNDING:

a. All non-current-carrying metal parts, raceways, and enclosures of the electrical system and of equipment supplied through the electrical system shall be permanently and effectively grounded.

b. Equipment grounding conductors shall be provided for each feeder and for each branch circuit and shall be contained within the same raceways as the feeder and branch circuit conductors. The equipment grounding conductor shall be THWN insulated copper, not smaller than #12 AWG.

c. Copper bonding strips normally included in small sizes of liquid-tight flexible metal conduit and dependent upon the terminal connectors for bonding continuity will not be accepted in lieu of the equipment grounding conductors specified herein.

d. Where metal raceways enter sheet metal enclosures through knockouts provide bonding bushings and jumpers to the enclosure under any of the following conditions:

1. Branch circuit conduit exceeds 1" in size.

2. Feeder conduit regardless of size.

16140-BOXES

1.1 MATERIALS AND APPLICATIONS:

a. Unless specifically noted or approved otherwise, boxes shall be of zinc coated steel or cast ferrous alloy as manufactured by Steel City, Raco, Crouse-Hinds, Appleton, or approved equal.

b. Unless otherwise indicated, for exposed work on the interior of the building boxes shall be of cast metal with threaded conduit hubs and gasketed covers; or of zinc coated sheet steel of NEC gauge and size with screw fastened gasketed covers and threaded conduits hubs of zinc coated malleable iron and no knockouts or extraneous openings. Cover screws shall be stainless steel.

c. For exposed work Equipment Rooms; or, in other dry areas, 8 feet or more above a floor or platform, boxes 5" square and larger shall be NEC gauge and size of zinc coated sheet steel. 4" octagonal, 4" square and 4-11/16" square "knockout" boxes shall be of zinc coated steel, NEC gauge and size. Box extensions are not permitted on exposed "knockout" boxes, and covers shall be of the raised surface type. "Handy" boxes are not permitted.

16150-WIRING DEVICES

1.1 MANUFACTURERS:

a. Wiring devices and device plates shall be manufactured by General Electric, Hubbell, Bryant, Arrow Hart, Pass and Seymour, Leviton, or Eagle.

1.2 DEVICES AND PLATES - GENERAL:

a. Unless otherwise indicated or directed, devices shall be gray in color.

b. Unless otherwise indicated, plates for flush outlets shall be of #302 stainless steel. Those for surface cast boxes shall be of steel, of shape and finish to match the box. Screws shall be steel to match the plate.

c. Each device (including each switch) shall be equipped with a Hex-Head green grounding screw for grounding the device and plate to the outlet box and to the equipment grounding conductor run with the circuit conductors. "Self-Grounding" type mounting screws will not be accepted as the device grounding method.

1.3 SWITCHES:

a. Switches used for lighting control shall be rated 20 amps, 120-277 VAC, side wired, Pass and Seymour 521-G series.

b. Switches used for disconnecting small single-phase motors and appliances shall be rated 20 or 30 amps to match the branch circuit rating and comply with their horsepower ratings, 120-277 VAC, side wired, Pass and Seymour 521-G series and 30 ACI series.

1.4 RECEPTACLES:

a. Unless otherwise indicated or required, receptacles shall be the duplex type, side and back wired, with nylon face. On circuits supplying two or more such receptacles, they shall be rated 15 amps, 125 volts, NEMA 5-15R. Duplex receptacles on individual circuits shall be rated 20 amps, 125 volts, NEMA 5-20R.

b. Where no other features are indicated on the drawings provide Hubbell 5262 and 5362 series for 5-15R and 5-20R respectively.

c. Where indicated on the drawings provide Ground Fault Circuit Interrupter receptacles, Hubbell GF5262 and GF5362 series for 5-15R and 5-20R respectively.

16160-RACEWAY AND OUTLET SYSTEMS

1.1 SCOPE:

a. Contractor shall furnish and install systems of raceways, outlet boxes, equipment boards, and cabinets, as indicated on the drawings and as herein specified to accommodate the installation by others of wiring and equipment.

2.1 MATERIALS:

a. Raceways, and boxes, shall be in compliance with the relevant sections of these specifications.

b. Wall outlets shall consist of standard 4" x 4" x 2-1/2" outlet boxes with single device rings. Trim plates shall be blank to match wiring device trim plates, unless otherwise indicated.

c. Special outlets including floor outlets shall be as noted on the drawings.

d. Equipment boards shall be of size noted or shown on the drawings, and shall be constructed of 3/4" plywood, with finish grade on front. Paint board with gray fire-retardant paint.

3.1 COORDINATION:

a. Contractor shall fully coordinate with the telephone and system installer, and shall install service entrance raceways, backboards, and grounding conductors in accordance with their requirements.

b. Contractor shall fully coordinate with other installers of wiring and equipment and shall install raceways, outlets, cabinets, and backboards in accordance with their requirements.

3.2 INSTALLATION:

a. Install pull boxes as necessary to limit runs between pull points to two 90 degree bends (or equivalent) and to 100 feet in length, unless other arrangements are approved by the wiring installers.

b. Leave all raceways with 100 lb. test nylon pull cord.

c. Install raceways and boxes in accordance with relevant sections of these specifications.

d. Unless specifically noted otherwise, provide an individual 1" conduit from each indicated outlet to the nearest cable tray, equipment cable tray, cabinet or terminal board for the system involved.

e. Provide all conduits not terminating on boxes with plastic bushings.

f. At the equipment terminal board, terminate all conduits with plastic bushings.

16190-MISCELLANEOUS MATERIALS

2.1 TIME SWITCHES:

a. Time switches for the control of tungsten-lamps loads, fluorescent -lamp loads, resistive heating loads, motors and magnetically operated devices shall consist of a digital programmable timer and switch assembly in a suitable enclosure, as indicated and herein specified.

b. Timer shall operate from either 120, 208, 240 or 277.

c. Battery reserve power shall be provided which will automatically operate the timer in case of electric power failure for a period of not less than 30 days.

d. The switch mechanism shall include a heavy-duty, general purpose, precision snap-action switch. Provision shall be made for manual "OFF" and "ON" operation of the switch.

e. Time switches shall be manufactured by Tork, Sangamo, General Electric, or approved equal.

2.2 TIME SWITCH AND PHOTOCELL CONTROL DEVICES:

a. Time Switch/Photo Control: 7 day calendar dial type, with 16 hour reserve power, Tork 7200ZL, mounted in general purpose NEMA Type 1 enclosure.

b. Photocell control devices for control of outdoor fixtures and natural daylight utilization for indoor spaces shall be fixture mounted or individually mounted as indicated on drawings, or otherwise specified.

c. Fixture mounted photocell control devices shall include a snap-action switch with a rating of not less than 1000 watts incandescent load and 1200 volt-amp reactive or HID load at rated voltage and frequency. Device also shall have an inherent time delay in excess of 5 seconds, built-in surge protection, and the appropriate lock type receptacle base. The device shall be enclosed in a weatherproof enclosure. Device rating shall be 120 or 277 volts, as applicable, 60 hertz. The device shall be factory preset to turn "ON" lights at approximately 3 foot-candles with a ratio of "ON" to "OFF" of about 1 to 2.

d. Individually mounted photo control devices shall have the same characteristics as fixture mounted devices, except that they shall be field adjustable for "ON" "OFF" operation from 2 to 50 foot-candles, have a capacity of up to 2000 watts of incandescent load, be outlet box mounted, and not require surge protection.

e. Flush mounted in weatherproof stainless steel cover with full neoprene gasket, Tork Model #3010. Outlet box: Flush mounted on exterior of building sized 2 1/2" x 4 1/4" of weatherproof construction.

2.3 PROGRAMMABLE LIGHT SWITCHES:

a. The digital time switch shall be programmable to turn lights off after a preset time.

b. Time switch shall be a completely self-contained control system. It shall have a ground wire and ground strap for safety. Switching mechanism shall be a latching air gap relay.

c. Time switch shall be compatible with all electronic ballasts, motor loads, compact fluorescent and inductive loads.

d. Time switch shall operate at universal voltages of 100-300 VAC; 50/60 Hz.

e. Time switch shall have no minimum load requirement and shall be capable of controlling 0 to 800 watt incandescent, fluorescent @ 100/120 VAC, 50/60 Hz; 0 to 1200 watts fluorescent @ 230/277 VAC, 50/60 Hz; 1/6 hp @ 125 VAC.

f. Time scroll feature shall allow manual overriding of the preset time-out period.

g. Time switch shall have the option for a one second light flash warning at five minutes before the timer runs out and twice when the countdown reaches one minute (when used to control lighting loads).

h. Time switch shall have the option for a beep warning that shall sound every five seconds once the time switch countdown reaches one minute.

i. Time switch shall have manual feature for timer reset where pressing the ON/OFF switch for more than 2 seconds resets the timer to the programmed time-out period.

j. Time switch shall have an electroluminescent backlit Liquid Crystal Display that shows the timer's countdown.

k. Time-out period shall be adjustable increments of 5 minutes from 5 minutes to 1 hour, and in increments of 15 minutes from 1 hour to 12 hours.

l. Time switch shall be capable of operating as an ON/OFF switch.

m. The time switch shall have a 100% OFF override switch with no leakage current to the load.

n. In the event there is an open circuit in the AC line such as a ballast or lamp failure, the time switch shall automatically switch to OFF mode.

o. Time switch shall have 5 year warranty and shall be UL and CUL listed.

2.4 OCCUPANCY SENSORS:

A. Provide ceiling mounted, 360 degree, dual technology occupancy sensor with the following features.

1. The Dual Technology sensor shall be capable of detecting presence in the control area by detecting doppler shifts in transmitted ultrasound and passive infrared heat changes.

2. Sensor shall utilize Dual Sensing Verification Principle for coordination between ultrasonic and PIR technologies. Detection verification of both technologies must occur in order to activate lighting systems. Upon verification, detection by either shall hold lighting on.

3. Sensor shall have a retrigger feature in which detection by either technology shall retrigger the lighting system on within 5 seconds of being switched off.

4. Ultrasonic sensing shall be volumetric in coverage with a frequency of 40 KHz. It shall utilize Advanced Signal Processing that automatically adjusts the detection threshold dynamically to compensate for changing levels of activity and airflow throughout controlled space.

5. The PIR technology shall utilize a temperature compensated, dual element sensor and a multi-element Fresnel lens. The lens shall be Poly IR4 material to offer superior performance in the infrared wavelengths and filter short wavelength IR, such as those emitted by the sun and other visible light sources. The lens shall have grooves facing in to avoid dust and residue build up which affects IR reception.

6. Each sensing technology shall have an LED indicator that remains active at all times in order to verify detection within the area to be controlled. The LED can be disabled for applications that require less sensor visibility.

7. Sensor shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1%. Sensors shall have standard 5 year warranty and shall be UL and CUL listed.

8. Basis of Design: Wattstopper #DT-305. Substitutions permitted.

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E5.1 Electrical Specifications

Scale: As Indicated Date: 5/17/2018

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USPS Title Number: XXXXXXX
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16400-SECONDARY DISTRIBUTION EQUIPMENT

1.1 OVERCURRENT PROTECTION DEVICES:

a. Unless otherwise indicated, circuit breakers shall be provided as the over-current protection devices for services, separately derived systems, feeders, and branch circuits. Fuses may be used only where indicated on the drawings, or required by the nameplate for equipment connected, or specified herein.

b. Molded-case and insulated-case circuit breakers shall be the static or thermal-magnetic type, quick-make and quick-break for manual and automatic operation. Multi-pole breakers shall be common trip. Circuit breakers shall be bolted in place where possible. Thermal-magnetic breakers shall be calibrated at 40oC. or ambient compensated. Ampere ratings, frame sizes, and short circuit ratings shall be as indicated on the drawings. Series ratings may be applied only where specifically indicated on the drawings. Individual enclosures shall be NEMA 1 indoors, 3R outdoors, unless otherwise indicated. Other circuit breakers shall be suitable for installation in Panelboards as here-in-after specified.

c. Single-pole 15 and 20 amp circuit breakers shall be SWD rated.

d. Fuses shall be the non-renewable, time delay, cartridge type, UL Class RK5 unless otherwise indicated; for installation in Safety Switches.

1.2 SWITCHING EQUIPMENT:

a. Fusible switches shall be incorporated into Safety Switches, as hereinafter specified. Manual operation shall be quick-make and quick-break. Fuse holders shall be the Class R rejection type unless otherwise indicated.

b. Safety Switches shall be the NEMA heavy duty type, horsepower rated, with interlocked covers, non-fusible except where fused switches are indicated or fuses are required. Switch mechanisms shall be quick-make and quick-break. Enclosures shall be NEMA 1 indoors, NEMA 3R outdoors unless otherwise indicated. Fuse holders, where required, shall be as specified above for fusible switches.

c. Switches for disconnecting small single-phase motors and appliances shall comply with SECTION 16150 WIRING DEVICES.

2.1 INSTALLATION:

a. Distribution Equipment shall be installed in strict accordance with the manufacturer's instructions for handling, support, connections, assembly, protection, energization, adjustment, and similar procedures.

b. Fastening methods shall comply with SECTION 16100 BASIC MATERIALS AND METHODS.

c. Floor mounted equipment such as Transformers shall be provided with 4" high concrete pads and shall be secured to the concrete pad. Pads shall have a 3/4 inch chamber on each accessible side.

d. Equipment interiors shall be thoroughly cleaned of dust, dirt, trash, and other foreign material prior to energization of the equipment.

e. Upon completion or the project, furnish to the Owner one complete set of replacement fuses, consisting of three fuses of each type and rating used.

f. Directory cards for Panelboards shall be neatly filled-in with a typewriter to indicate the type and location of the load on each circuit or feeder.

16401 - SURGE PROTECTION DEVICE SYSTEM

1.1 SCOPE:

a. These specifications describe the electrical and mechanical requirements for a high energy Surge Protection Device System (SPD). The specified system shall provide effective high energy surge current diversion, sine wave tracking as required for electrical line noise filtering and be suitable for application in ANSI/IEEE C62.41 Category A, B, and C environments, as tested by ANSI/IEEE C62.11, C62.45 and MIL_STD_220A. The system shall be connected in parallel with the protected system; no series connected elements shall be used which limit load current or kVA capability.

1.2 SYSTEM DESCRIPTION:

a. Operating Temperature range shall be _40 to +50 C (_40 to +122 F)

b. Operation shall be reliable in an environment with 0% to 95% non_condensing relative humidity.

c. The SPD maximum continuous operating voltage shall be greater than 115% of the nominal system operating voltage to ensure the ability of the system to withstand temporary RMS overvoltage (swell) conditions.

d. Protection Modes

1. All Modes. L_N, L_L, L_G, (N_G where applicable)
Note: L = Line, N = Neutral, G = Ground

e. The SPD shall have a minimum UL 1449 3rd Edition Nominal Discharge
Current Rating (In) of 10,000 Amps. When used in conjunction with a UL 96A certified Lightning Protection System the (In) rating shall be 20,000 Amps.

f. UL 1449 3rd Edition Listed, bearing the official UL 3rd Edition gold hologram label.

g. UL 1283 5th Edition Listed.

h. The Surge Protective Device (SPD) shall be a stand alone configuration. Systems that must be integral to the switchgear will not be considered.

i. All SPD systems shall be permanently connected, parallel designs. Series suppression elements shall not be acceptable.

j. The SPD shall be marked with a Short Circuit Current Rating (SCCR) and shall not be installed at a point on the system where the available fault current is in excess of that rating per the National Electric Code, Article 285, Section 6.

k. SPD designs that limit the 100% rated surge protection shall not be acceptable.

l. Hybrid design utilizing:

1. Thermally Protected Metal Oxide Varistors
2. Filter capacitors to suppress EMI/RFI electrical noise.

1.3 DOCUMENTATION:

a. Electrical and mechanical drawings shall be provided by the manufacturer which show unit dimensions, weights, component and connection locations, mounting provisions, connection details and wiring diagram.

b. Documentation of specified system's UL 1449 3rd Edition Listing and voltage protection ratings of all protection modes shall be included as required product data submittal information.

c. The manufacturer shall provide a full five year warranty from date of shipment against any part failure when installed in compliance with manufacturer's written instructions, UL listing requirements, and any applicable national or local electrical codes. Manufacturer shall make available local field engineering service support. Where direct factory employed service engineers are not locally available, travel time from the factory or nearest dispatch center shall be stated.

2.1 NON-MODULAR SURGE PROTECTION FOR DISTRIBUTON, SUB-DISTRIBUTION AND BRANCH CIRCUIT PANELS (LOWER AMPACITY, 15A TO 800A, APPLICATIONS):

a. The SPD surge current ratings shall be based on the electrical system ampacity listed in the table below.

Electrical System

Ampacity @ SPD Install Point	Surge Protection (kA)	
	Per Mode	Per Phase
400 - 800A	150	300
125 - 225A	100	200
15-100A	50	100

b. The SPD shall be rated for 480/277Vac 3 Phase, 4 Wire + Ground, Wye or 208/120Vac 3 Phase, 4 Wire + Ground, Wye, as required.

c. All non-modular units shall be factory wired using color coded #10AWG Rope Lay ultra-low resistance wire (with 413 strands/36AWG, seven (7) groups of 59 strands each): two feet (2') for each phase conductor and three feet (3') for Neutral and Ground conductors to be fed by 30 Amp circuit breaker.

d. Voltage Protection Ratings: The let-through voltage test results used to obtain the UL 1449 3rd Edition Voltage Performance Ratings "VPR" (6kV, 3000 Amps, 8/20µs waveform) shall not exceed the UL assigned values listed below.

Voltage Protection Ratings (VPR)
6kV, 3000A, 8/20µs Waveform

Voltage Rating @ 208/120V	
Line to Neutral	700V
Line to Ground	700V
Neutral to Ground	800V
Line to Line	1000V

3.1 INSTALLATION:

a. The installing contractor shall connect the SPD in parallel to the power source, keeping conductors as short and straight as practically possible. The contractor shall twist the SPD input conductors together to reduce input conductor impedance.

b. A modular SPD shall be close nippled to the distribution panel and shall be supplied by a 60 Amp circuit breaker. (Where possible, a bottom feed modular SPD is preferred, close nippled to top of distribution cabinet.)

c. A non-modular SPD shall be close nippled to the panelboard and shall be supplied by a 30 Amp circuit breaker.

16420-PANELBOARDS

1.1 SUBMITTALS:

a. Submit for approval panelboard shop drawings which include as a minimum the following information:

1. Cabinet dimensions.
2. Mounting requirements.
3. Bussing arrangement.
4. Circuit breaker arrangement.
5. Accessories.

2.1 BRANCH CIRCUIT PANELBOARDS:

a. Equipment shall be built to NEMA Standard PB-1, UL Standards UL50 and UL67, and NEC requirements.

b. Panelboard backboxes shall be constructed of galvanized sheet steel and shall be securely fabricated with screws, bolts, rivets, or by welding. Backboxes shall be a minimum 20" wide and 5-3/4" deep, unless noted otherwise, and heights shall not exceed 72" overall. Top or bottom gutter space shall be increased 6" where feeder loops through panel. End plates shall be supplied without knockouts.

c. Covers shall be constructed of high grade flat sheet steel with:

1. Door-in-door construction shall be provided. The inside hinge door shall allow access to device handles only. Door shall close flush with cover and against a full inside trim stop. Hinges shall be inside type. The outer hinged door shall allow access to wiring gutter.

2. A flush latch and tumbler type lock, so panel door may be held closed without being locked. All such locks shall be keyed alike. Furnish to the Owner two keys with each lock, or a total of 10 keys for the project.

3. Four or more cover fasteners of a type which will permit mounting plumb on box. Cover shall also have inside support studs to rest on lower edge of backbox while being fastened. For flush mounted panelboards, cover fastening hardware shall be concealed behind the hinged door.

d. Panelboard phase and neutral bus buswork shall be of copper. A copper ground bus shall be provided in each panel.

e. Minimum short circuit rating of any panelboard assembly shall be 10,000A. Furnish panelboards with higher rating where so noted or where evidently intended by specification of circuit breakers with higher interrupting capacity.

f. Ampacity of mains shall be equal to, or greater than, the ampacity of the feeder unless otherwise indicated.

g. Where drawings schedules indicate spaces for addition of future circuit breakers, furnish all necessary buswork, strap, brackets, hardware, and removable blank covers.

h. Breakers in panelboards shall be physically arranged in locations shown in panel schedules on the drawings where possible. They shall be connected to the phases as shown.

i. Unless otherwise indicated and where available for the panelboard type specified, circuit breakers shall be of the bolt-on type.

2.2 DISTRIBUTION PANELBOARDS

a. Panelboards required to have two or more subfeed breakers rated 100 amperes or greater shall be Distribution Type.

b. Description: NEMA PB 1, circuit breaker type.

c. Panelboard Bus: Copper. One continuous fully rated bus bar per phase with ratings as indicated. Provide copper ground bus and aluminum neutral in each panelboard equipped with lugs to accommodate all conductors to be connected. Unless otherwise noted, neutral bus shall be sized 100% of phase bus rating and the ground bus shall be sized a minimum of 25% of the phase bus rating. Where more than one ground bar is furnished, each ground bar will be interconnected with a conductor sized not less than the panelboard feeder ground conductor. Ground bar shall be bonded to enclosure.

d. Interior trim shall be dead front construction. Main lugs shall be mounted in the mains compartment.

e. Main circuit breaker and main lug interiors shall be field convertible for top or bottom incoming feed.

f. Enclosure: NEMA PB 1, Type 1 unless otherwise indicated on drawings. In compliance with UL 50.

1. Panelboard backbox shall be constructed without pre-punched knockouts.

2. Cabinet front shall be a four piece surface trim for surface mount standard. Where specifically indicated on the drawings, either a single hinged door or door-in-door construction shall be provided. For door-in-door construction, the inner hinged door shall allow access to the device handles only and the outer hinged door shall allow access to wiring gutter.

3. Enclosure and front shall be either galvanized steel or stainless steel and shall be finished in manufacturer's standard gray enamel.

4. The enclosure shall be minimum 26 inches wide.

g. Minimum fully rated short circuit rating: RMS symmetrical amperage shall be minimum 22,000 amperes unless otherwise indicated on drawings.

h. Molded Case Circuit Breakers: NEMA AB 1, UL 489 listed circuit breakers.

16500-LIGHTING FIXTURES AND ACCESSORIES

PART 1: GENERAL

1.1 SCOPE:

a. The Contractor shall furnish and completely install Lighting Fixtures and Accessories as indicated on the drawings and as herein specified.

b. All fixtures shall be equipped with lamps.

c. A lighting fixture shall be provided for each lighting outlet indicated. Outlets lacking fixture designations shall be brought to the attention of the Architect/Engineer before submitting proposal; otherwise units selected by the Architect/Engineer shall be furnished and installed at no additional charge.

1.2 SUBMITTALS:

a. Submit for approval complete manufacturer's data sheets for all fixtures. Indicate all components, characteristics, and options.

b. Submit for approval manufacturer's data sheets for all lamps to be furnished.

c. Submit for approval Lighting Fixture samples as requested by the Architect/Engineer. Samples shall be equipped with lamps, cords, plugs, and ballasts for 120 volt operation.

PART 2: PRODUCTS

2.1 LIGHTING FIXTURES:

a. All fixtures shall be labeled by Underwriters' Laboratories, Inc.

b. Fixture designations on the drawings generally consist of a letter indicating the fixture type. Fixture types are identified in the Lighting Fixture Schedule or Symbol Schedule, however, the Schedule does not necessarily list all accessories and hardware necessary for the complete installation, nor does it detail the construction to be encountered at the fixture locations. It is the Contractor's responsibility to properly determine and provide correct components, accessories, and hardware required for the installation.

c. Pendant Fixtures shall be equipped with swivel hangers; twin stem for individual fluorescent fixtures and single stem for continuous row fluorescent fixtures, spaced according to the manufacturer's recommendations but not less than one per fixture unit plus one per row.

d. Recessed fixtures in plaster and gypsum board ceilings shall be equipped with plaster frames. In other ceilings they shall be equipped with plaster frames and/or other devices as approved by the Architect/Engineer, to facilitate removal of fixture and access to the concealed junction box.

e. Plastic materials indicated to be "acrylic" shall be of 100% virgin methyl methacrylate produced by Rohm and Haas, Dupont, or Cyanamid.

f. Eight-foot chassis with lamps in tandem may be used in lieu of four-foot fluorescent units in continuous rows, except where recessed into ceiling construction which incorporates exposed support members at four-foot intervals.

2.2 LED DRIVES

a. General.

1. Ten-year operational life while operating at maximum case temperature and 90 percent non-condensing relative humidity.
2. Designed and tested to withstand electrostatic discharges up to 15,000 V without impairment per IEC801-2.
3. Electrolytic capacitors to operate at least 20 degrees C below the capacitor's maximum temperature rating when the driver is under fully-loaded conditions and under maximum case temperature.
4. Maximum inrush current of 2 amperes for 120V and 277V drives.
5. Withstand up to a 4,000 volt surge without impairment of performance as defined by ANSI C62.41 Category A.
6. Manufactured in a facility that employ ESD reduction practices in compliance with ANSI/ESD S20.20.
7. Class A Sound Rating - Inaudible in a 27 dBA ambient.
8. No visible change in light output with a variation of plus/minus 10 percent line voltage input.
9. Total Harmonic Distortion less than 20 percent and meet ANSI C82.11 maximum allowable THD requirements.
10. Drives to track evenly across:
(a) Multiple fixtures.
(b) All light levels.
11. Constant current drives must provide models to:
(a) Support from 200mA to 2.1 Amps (in 10mA steps) to ensure a compatible driver exists.
(b) Support LED arrays up to 40W or 50W (710mA to 1.05A in 10mA steps).
12. Constant voltage drives must provide models to:
(a) Support from 10V to 40V (in 0.5V steps) to ensure a compatible driver exists.
(b) Support LED arrays up to 40W.
13. Configuration tool must be available to optimize the following for LED fixtures:
(a) Light level.
(b) Efficacy.
(c) Thermal performance.
14. Driver must be capable of operating from a supply voltage of 120 through 277VAC at 60Hz for digitally addressable and 3-wire models.

b. 3-Wire Control.

1. Continuous dimming from 100 percent to 1 percent relative light output.
2. Provide integral fault protection to prevent driver failure in the event of an input mis-wire.

d. Forward Phase Control (Neutral Wire Required).

1. Continuous dimming from 100 percent to 1 percent relative light output.

2.3 LED 0-10V DIMMING DRIVERS:

a. Physical Characteristics.

1. LED Driver shall be installed inside an electrical enclosure.
2. Wiring inside electrical enclosure shall comply with 600V/105°C rating or higher.

b. Performance.

1. LED Driver is certified by UL Class 2 for use in a dry or damp location.
2. Led Driver has Class A sound rating.
3. LED Driver has a minimum operating ambient temperature of -40°C.
4. LED Driver has a life expectancy of 50,000 hours at Tcase of ≤70°C.
5. LED Driver has a life expectancy of 100,000 hours at Tcase of ≤62°C.
6. LED Driver has a maximum self rise of 25°C in open air without heat sink.
7. LED Driver maximum allowable case temperature is 75°C - see product label for measurement location.
8. LED Driver reduces output power to LEDs if maximum allowable case temperature is exceeded.
9. LED Driver has a failure rat ≤ 0.01% per 1,000 hours at Tcase≤ 70°C.
10. LED Driver has a failure rate of 0.01% - 0.02% per 1,000 hours at Tcase of 70°C - 80°C.
11. LED Driver tolerates sustained open circuit and short circuit output conditions without damage.
12. LED Driver complies with FCC rules and regulations, as per Title 47 CFR Part 15 Non-Consumer (Class A).

c. UL Conditions of Acceptability

1. The maximum available output parameters of the driver met the Class 2 Inherently limited parameters.
2. The Driver is suitable for use in "Dry" and "Damp" locations.
3. When the driver is installed in the end-use application, the measured case temperature at the (Tc) location specified on the marking label must not exceed 77.6°C.
4. The driver shall be installed in compliance with the requirements of the end-product standard.
5. The case of the driver must be connected to Earth ground when installed in the end-use application.

2.4 EMERGENCY EXIT LUMINARE:

a. It shall be completely self-contained, provided with maintenance-free battery, automatic charger, and other features. Luminaire must be third-party listed as emergency lighting equipment, and meet or exceed the following standards; NEC, N.C. Building Code, Volume X Energy Code, NFPA-101, and NEMA Standards.

b. Battery shall be sealed, maintenance-free type, with minimum of 90 minutes operating endurance. Battery shall have a normal life expectancy of 10 years. Batteries shall be high temperature type with an operating range of 0 degree C to 60 degrees C and contain a re-sealable pressure vent, a sintered + positive terminal and - negative terminal.

c. Charger shall be full automatic solid state type, full wave rectifying, with current limiting. Charger shall restore the battery to its full charge within 24 hours after a discharge of 90 minutes under full rated load. The unit shall be activated with the voltage drops below 80 percent. A low voltage disconnect switch shall be included if LEAD Battery is used, to disconnect the battery from the load and prevent damage from a deep discharge during extended power outage.

d. Pilot light shall indicate the unit is connected to AC power. The battery shall have high rate charge pilot light, unless self-diagnostic type. Tests switch shall simulate the operation of the unit upon loss of A.C. power by energizing the lamps from the battery. This simulation must also exercise the transfer relay.

e. The entire unit shall be warranted for three years. The battery must have an additional two more years' pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty shall be included in the contract document.

f. The use of LED is required due to their reliable performance, low power consumption, and limited maintenance requirements. Maximum LED failure rate shall be 25% within a seven (7) year period; otherwise, if exceeded, manufacturer shall replace the complete unit at no charge to the owner.

g. Contractor shall perform a test on each unit after it is permanently installed and charged for a minimum of 24 hours. Battery shall be tested for 90 minutes. The battery test shall be done 10 days prior to final inspection. Any unit which fails the test must be repaired or replaced, and tested again. The test shall demonstrate that the batteries conform to the requirements of NEC 700.12 (F).

2.5 EMERGENCY EGRESS LUMINARE:

a. Shall be completely self-contained, provided with maintenance-free 12 volt battery, automatic charger, two lamps, and other features. Luminaire shall be third-party listed as emergency lighting equipment, and meet or exceed the following standards: NEC, N.C. Building Code, Volume X Energy Code, NFPA-101, and NEMA Standards.

b. Pilot light shall indicate the unit is connected to A.C. power. The battery shall have high rate charge pilot light, unless self-diagnostic type. A test switch shall simulate the operation of the unit upon loss of A.C. power by energizing the lamps from the battery. This simulation must also exercise the transfer relay. If fluorescent emergency unit is used, an LED charging indicator light must be easily visible after installation and a remote test switch shall be installed adjacent to the fixture.

c. Battery shall be sealed, maintenance free type, with minimum of 90 minutes operating endurance. Battery shall have a normal life expectancy of 10 years. Batteries shall be a high temperature type with an operating range of 0 degree C to 60 degrees C and contain a resealable pressure vent, a sintered + positive terminal and - negative terminal.

d. Charges shall be fully automatic solid state type, full wave rectifying, with current limiting. Charger shall restore the battery to its full charge within 24 hours after a discharge of 90 minutes under full rated load. The unit shall be activated when the voltage drops below 80%. A low voltage disconnect switch shall be included if LEAD battery is used, to disconnect the battery from the load and prevent damage from a deep discharge during extended power outage.

e. The entire unit shall be warranted for three years. The battery must have an additional two more years' pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty shall be included in the contract document.

f. Contractor shall perform a test on each unit after it is permanently installed and charged for a minimum of 24 hours. Battery shall be tested for 90 minutes. The battery test shall be done 10 days prior to final inspection. Any unit which fails the test must be repaired or replaced, and tested again. The test shall demonstrate that the batteries conform to the requirements of NEC 700.12 (F).

PART 3: EXECUTION

3.1 COORDINATION:

a. Contractor shall verify ceiling or wall type in or on which each fixture is to be mounted, and shall furnish unit with appropriate trim type, mounting hardware, and accessories to fit the construction; and feed through junction boxes as required to maintain proper access to system wiring.

3.2 INSTALLATION:

a. Lighting fixtures shall be installed in accordance with the manufacturer's instructions.

b. Lighting fixtures shall be supported from the building structure using corrosion resistant steel hardware in compliance with Section 26 10 00, Basic Materials and Methods.

c. A minimum of two No. 12 gauge wire supports attached to the structure shall be provided for each lighting fixture unless otherwise indicated or approved by the Architect/Engineer. The supports shall be located at diagonal corners of rectangular fixtures and angled away from fixture. A minimum of three full twists shall be made at each end to secure wire.

d. In addition to the supports from the structure, fixtures shall also be secured to suspended ceilings on which they are mounted, or in which they are recessed. Where fixtures are secured to suspended ceilings, the primary supports from the building structure shall be slack.

e. Where installed recessed in grid type ceilings, the fixtures shall be attached to the main runners of the suspended ceiling at all four corners using sheet metal screws.

f. Mount fixtures plumb and square. Keep rows in perfect line.

g. At time of project completion, fixtures and lamps shall be clean and fully operational.

260500 - COMMON WORK RESULTS FOR ELECTRICAL

Part 1 - GENERAL

1.01 DESCRIPTION

A. Furnish of all labor, materials and services necessary for complete installation, testing, and adjusting of electrical lighting, power, and signal systems as specified and indicated.

B. Connections and Services: Provide, procure and pay for all permits, licenses, and fees required to complete work. Check and coordinate with the local utility companies. Pay all reimbursements for work performed by local utility companies.

1.02 RELATED DOCUMENTS

A. Refer to other sections of these specifications for related work, which is not work of this section.

B. Related sections:

1. Section 260503 - Basic Electrical Materials and Methods.
2. Section 265000 - Lighting / Electrical Work.

1.03 CODES

A. Work herein shall conform to all applicable laws, ordinances, and to regulations of the local utility companies. Work shall be in accordance with the latest applicable requirements of:

1. National Fire Protection Association (Fire Code)
2. National Electrical Code - 2011
3. Underwriter's Laboratories, Inc.

1.04 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Provide only materials that are new, and of the type and quality specified. Where Underwriters' Laboratories, Inc. have established standards for such materials, provide only materials bearing the UL label.

1.05 SUBMITTALS

A. Submittals shall identify all items and all technical data shall be included. All submittals shall be submitted at one time.

B. Submittals are required for the following:

1. Lighting Fixtures, Lamps and Ballasts
2. Wiring Devices
3. Meter Sockets
4. Branch Circuit Panel
5. Safety Switches
6. Smoke Detectors
7. Occupancy Sensors, Time Switch and Photo-Electric Control

1.06 HANDLING OF MATERIALS

A. Properly handle, house and protect, from damage and the weather, all materials, equipment and apparatus furnished under this section of the specifications.

1.07 EXAMINATION OF SITE

A. Where exact locations are required for conduit entries, request shop drawings, equipment location drawings, foundation drawings, and any other data required to locate the concealed conduit before the foundation is poured.

1.08 COORDINATION OF THE WORK

A. Examine architectural drawings for location of suitable openings and chases for the passage of equipment to be installed under this section.

1.09 ELECTRICAL COORDINATION

A. Coordinate with all other trades to avoid interferences and conditions which will not allow the installation of equipment, piping, fixtures, etc., as indicated.

B. Provide power wiring, conduit and connections to all electrically operated equipment and provide disconnecting means, unless specifically indicated otherwise, or furnished as part of factory packaged equipment.

C. Ensure that motors and equipment have proper voltage to operate on this system and that each motor has thermal overload protection, properly sized to nameplate data.

D. Verify exact equipment locations with architectural and mechanical drawings.

1.10 ACCESS TO ELECTRICAL WORK

A. Provide access panels for concealed junction boxes, ballasts, disconnect switches, or other electrical devices where concealed, or in areas not otherwise accessible.

1.11 SYMBOLS

A. Symbols for outlets and equipment are scheduled on the plans. Some symbols may not be used, others may not be scheduled.

1.12 ELECTRICAL IDENTIFICATION

A. Provide typewritten directory in branch circuit panel. Directory shall be in two columns with odd on left and even on right, to match numbers on breakers.

1.13 EXCAVATION

A. Provide excavation, backfill and compaction in conformance with other divisions of the specification.

1.14 BASIS FOR WIRING DESIGN

A. The drawings and specifications describe specific sizes of switches, breakers, fuses, conduits, conductors and other electrical equipment. These sizes are based on specific items of power-consuming equipment, i.e., heaters, lights, motors for fans, compressors, pumps, etc. Whenever power-consuming equipment differs from the drawings and specifications, electrical equipment for such installation shall be changed to proper sizes to match.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

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INTERIOR UPFIT
USPS SPOUT SPRINGS NC CAX
XXXXXXXXX
XXXXXXXXX

Revisions:

E5.2 Electrical Specifications

Scale: As Indicated Date: 5/17/2018

Project: SPOUT SPRINGS INTERIOR UPFIT
USPS Title Number: XXXXXX
USPS Project Number: C07932