SHORT CIRCUIT, COMPONENT PROTECTION, FLASH HAZARD ANALYSIS, AND SELECTIVE COORDINATION STUDY PART 1 GENERAL

1.1SUMMARY

Provide a short-circuit, component protection, flash hazard analysis, and selective coordination study for the emergency electrical distribution system from all power sources (normal and emergency) down to the branch circuit overcurrent protective device and equipment per NEC 700.27.

1.2PURPOSE

- The study shall calculate the available short-circuit current at each point in the emergency electrical distribution system. The overcurrent protective devices shall have an interrupting rating equal to or greater than the available short-circuit current at the point of application.
- The study shall examine proper protection of emergency electrical system components and utilization equipment such that the equipment has a sufficient short-circuit current rating. If a specific type of overcurrent protective device is required for proper protection of equipment, it shall be noted in the report and reflected in the design of the system.
- The study shall include a flash hazard analysis for electrical distribution equipment where required per codes and standards. The analysis shall determine the flash protection boundary, incident energy, and required level of personal protective equipment (PPE) for workers at the electrical distribution equipment. The flash protection boundary and incident energy shall be determined based upon a working distance of 18 inches. The electrical distribution equipment shall be field marked with this information in accordance with codes and standards
- The emergency overcurrent protective devices shall be analyzed for selective coordination. This analysis shall identify any potential selective coordination problems up the available short-circuit current. Any areas where the overcurrent protective devices are not selectively coordinated shall be explicitly noted and recommendations shall be made to achieve selective coordination if desired.

1.3REFERENCES

- The study shall be completed in accordance with the latest edition of IEEE Standard 242 Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
- The flash hazard analysis shall be completed in accordance with latest editions of NFPA 70E Standard for Electrical Safety Requirements for Employee Workplaces and IEEE Standard 1584 - Guide for Performing Arc-Flash Hazard

1.4 QUALIFICATIONS

- The company and individual(s) performing the study shall have a minimum 5 years documented experience in power system analysis and completed projects of similar size and scope. The individual(s) performing the study shall be a registered Professional Engineer in the state of the project location.
- B. The company performing study shall have the capability and experience to provide assistance during system start up. 1.5 SCHEDULING
- The selection of the company and individual performing the study shall be submitted and approved by the design engineer prior to the start of the study.
- The study shall be completed and submitted prior to the equipment submittals. The study will be reviewed during the equipment submittal and review process. Any changes to the study or equipment will be noted in the returned submittals.
- Final approval of both the study and equipment submittals shall be given prior to the release of equipment for manufacturing

1.6 SUBMITTALS

- The results of the study shall be summarized in report form. Submit 10 copies for review and approval by the design
- The results of the study shall include the following:
 - Descriptions, purpose, basis, and scope of study.
- Fault current calculations including definition of terms and guide for interpretation of computer printout. Tabulations of protective device and equipment ratings versus calculated short-circuit duties, and commentary regarding
- . Flash hazard analysis report for electrical distribution equipment.
- 5. Time versus current curves or fuse selectivity ratio analysis, with tabulations of overcurrent protective device settings, and selective coordination analysis and commentary regarding same.
- If power company review and approval is required, the results of the study shall be submitted to the power company for review and approval. Approved copies from the power company shall be forwarded to the design engineer.

1.7 SUBMITTALS - CLOSEOUT

Submit ten copies of the final approved study to the electrical design engineer.

PART 2 PRODUCTS 2.1REQUIREMENTS

- The short circuit and flash hazard analysis study shall be completed with the aid of a computer software program where
- The available short-circuit current, corresponding required interrupting or short-circuit current ratings of components, and flash hazard analysis data, shall be calculated based upon the 3-phase bolted short-circuit current and phase to ground/neutral short-circuit current at each of the following (if applicable):
- Utility Service Point.
- Medium voltage switchgear. Medium voltage motor controllers
- Medium/Low-Voltage Unit Substations. Low-voltage switchgear or switchboards.
- Distribution panelboards.
- Branch circuit panelboards Motor control centers.
- Busway and Busplugs. 10. Other significant equipment or utilization equipment.
- The study shall include the following:
- 1. Calculation methods and assumptions.
- 2. One-line diagram (with available short-circuit current and flash hazard data identified).
- Calculations shall identify: a. Available short-circuit currents from all power sources (kVA)
- b. Motor fault contribution Component impedance data
- d. X to R ratio Symmetrical and asymmetrical fault current characteristics
- Flash hazard analysis data
- 4. Tabulation of all calculation quantities and results
- 5. Detailed description of each protective device identifying its type, function, manufacturer, interrupting rating, ampere rating, selected settings, and time-current characteristics
- 6. System component characteristic curves or short-circuit current ratings identified and/or plotted up to the maximum
- symmetrical fault current to which the component is exposed. Include the following where applicable: Medium voltage equipment characteristics b. Low voltage equipment characteristics
- ICEA conductor damage characteristics d. Transformer characteristics
- Motor and motor circuit equipment characteristics
- Generator and transfer switch (manual or automatic) characteristics g. Other system equipment characteristics.
- 7. Time-current curves prepared graphically on full size, log-log forms with title, one-line diagram, and specific system
- 8. Conclusions regarding interrupting rating for overcurrent protective devices, flash hazard analysis, protection of components, selective coordination, and recommendations and requirements on the same.

PART 3 EXECUTION

3.1INSTALLATION/START-UP

- The contractor shall install equipment and protective devices in accordance with the approved short-circuit and selective coordination study
- The contractor shall field mark equipment with flash hazard analysis data as required in accordance with codes and
- The company performing the study shall provide assistance to the installing contractor during start up of electrical system and equipment as needed

SECTION 16010 - GENERAL CONDITIONS

The electrical subcontractor is bound by the general and supplementary conditions, and Division I.

Document Priorities-

relieve contractor from meeting all requirements of specified item.

- In the case of discrepancies, the construction documents take precedence as follows:
- Change orders 2. Addendum
- 3. Specifications 4. Large scale drawings
- Small scale drawings
- 6. Submittal and equipment reviews
- 7. Substitution requests. Specifications take precedence over substitution requests and submittal reviews.
- Where discrepancies/duplications occur, the more stringent requirements shall be provided. Products under this contract shall meet minimum specification requirements in detail without exception unless specifically noted and approved as provided in these specifications. Equipment submitted for review must clearly state on cover sheet any differences from specified product. Equipment substitution or submittal review does not

Scope of Electrical Work-

Materials and workmanship shall be furnished and installed for complete, tested, and operating electrical systems as shown on the drawings and specified herein.

Electrical work is to include the electrical service. Complete to the point of connection with the serving utility. Any changes of or work required by the serving utility, are part of this work and shall be fully included in the bid price.

Work is also to include main distribution panel, feeder system and branch circuit panels. Complete branch circuit wiring. Light fixtures, wall switches, receptacles and similar items, exterior lighting and wiring, and wiring and connection to mechanical equipment, all fire alarm, intercom/emergency call system, phone system, unit phone wires, and kitchen equipment as required. Coordinate services with all trades. Coordinate locations of wiring conduit and other runs with other trades in confined areas such as in the corridor ceilings.

Work is to comply to the governing electrical codes as required and noted on the cover sheet, and shall comply with all applicable local codes, rules. and ordinances. All regulations, requirements and charges of the local utility company shall be complied with and paid. Materials used are to be listed by locally accepted listing agencies. Provide work per industry standards of acceptance and industry practice.

Check all equipment locations and connections on the site for coordination with other divisions equipment, connections, structure, and the like. Location of electrical equipment shall not impeed reasonable placement of furnishings including artwork. Locate readly accissble and readily used equipment such as switches near ends of

Test all parts of system at completion of installation. Instruct owners personnel in all aspects of operation.

walls where shown as to not impeed practicle use of walls for furnishings and artwork.

Contractor to provide full warranty on materials and workmanship for a period of one year after final completion o

Follow trenching and back fill requirements of local codes and ordinances, and pipe trenching detail on drawings.

PROTECTION OF PENETRATIONS AT FIRE RATED CONSTRUCTION To Protect penetrations of fire rated or draft stop construction. Typical for penetrations including conduit, fixtures,

- 1. Metal materials extending minimum 18 each side of surface -- draft seal with one of the following:
- a. Listed silicone foam b. Other listed product as approved
- 2. Other materials including plastic conduits and cables: UL listed fire barrier penetration sealing system. Install according to manufacturers instructions. Listing and approvals:
- -ASTM E-119 fire test of building construction and materials.

outlets, pipes, panel boxes, etc. Protection to be consistent with type of materials:

-UL 1479 firestops, tests of through penetrations. -ASTM E-814 fire tests of through penetration fire stops. -ICBO, BOCA, SBBC, NBC (Nat. Research Bd. REPORT NRB-243).

Electrical Devices in Common Wall-

-As required by Arch.

Electrical boxes shown in common walls serving adjacent rooms are to be offset from each other a minimum of 24" horizontally. Do not mount boxes back to back in any location. SECTION 16026-Submittals

Provide 5 (five) copies of shop drawings and catalog cuts of materials and equipment listed to architect prior to ordering of equipment. Alternate equipment will be considered for use only with proper Pre-Bid submittal, CSI substitution request form and procedures as given in the general and supplementary conditions. Submittal schedule for product evaluation indicated below. Each item requiring a submittal is given the following

L Manufacturer's Label C Manufacturer's Catalog data (cuts) E Technical and Engineering data S Shop drawings

- 16100 Wiring Systems L
- 16010 Firestopping (For Arch. review) C, E

CR Certifications/Qualifications

SA Samples

- 16140 Wiring Devices C, S 16170 - Disconnects - C, S
- 16195 Identification L
- 16400 Panels C, E, ,S
- 16500 Lighting C, E, S
- 16520 Timing Switches C, E, S

THERMOSTATS

DOOR HOLDERS

LIGHT SWITCH

STAIR LIGHTS

COUNTER OUTLETS

ELECTRICAL PANEL

REQUIREMENTS.

EMERGENCY CALL

SPEAKERS & PULL STATIONS

WALL LIGHTS IN CORRIDORS

OUTLETS (COMMON AREAS)

BATHROOM WALL VANITY LIGHT

. CENTER OVER CABINET BASE PROVIDE BACKING IF REQUIRED.

. INFORMATION SHOWN FOR REFERENCE, CONFORM TO ARCH, ADA, AND CODE

EXTERIOR WALL LIGHTS

OUTLETS (SUITE AREAS)

16590 - Heaters - C, E, S

16600 - Emergency Generator System - C, E, S, CR

ELECTRICAL MOUNTING HEIGHTS

HEIGHT A.F.F. TO CENTER LINE

75" TO CENTER

44" TO BOTTOM

80" TO TOP OF PANEL

80" TO CENTER LINE

96" TO CENTER LINE (U.N.O.)

2" TO BOTTOM, ABOVE TREAD

6'-11" TO CENTER (SEE NOTE #1)

(Regardless of Supplier, Contractor shall submit generator/ATS information) 16700 - Low Voltage - C, E, S, CR

detailed in NEC Article 518, including corridors, assembly areas, meeting areas and common gathering areas. Provide EMT in unfinished spaces where raceway is not concealed such as in mechanical and electrical rooms as required by the NEC and local codes. All raceway in finished areas shall be concealed. Where conductors are exposed above a suspended ceiling, provide in a listed metal raceway. NMSC may be used in residential suites meeting the requirements of NEC 334.10 and as permitted by local codes. Fire alarm conductors shall be installed in accordance with NEC Article 760. Provide RMC for interior concrete encased raceway or where EMT is subject to damage. Aluminum conductors may be used in services and feeders 60A and larger. All branch circuit conductors shall be

Interior Raceway System: Power conductors shall be in EMT or MC cable throughout common areas of the facility, as

copper conductor. Sizes indicated on drawing are based upon copper ampacities.

Provide conductors with type THHN insulation in dry locations only. Provide conductors with type THWN, THW and XHHW in dry damp or wet locations.

Conductors smaller than #12 AWG for branch circuits not permitted.

Liquid tight flexible metallic conduit shall be used in short (2 foot nominal) lengths for all equipment which: Vibrates, May need to be moved for servicing, or is exposed to weather. Outside the building and below grade, wiring may be in schedule-40 PVC conduit with grounding conductor if

Conductors shall not be less then 12AWG. All other circuits shall be sized as noted or as required by equipment

Install exterior circuits underground. Direct buried branch circuit wiring outside the building and below grade my be in type UF moisture resistant cable, not less than 10AWG conductors or as noted. Comply with electrical code as

Clean and clear-out raceway prior to installation of any conductor/pull string. Provide pull string in empty raceways. Provide listed pulling lubricant/compound for installing conductors in raceway systems.

SECTION 16140 - Wiring Devices

acceptable by local codes.

SECTION 16100 - Wiring Systems

- Duplex receptacles: 2 blade grounding type, nylon face. 15 Amp. NEMA 5-15R, Leviton Decora 5325, (Residential Grade) in suites.
- 20 Amp. NEMA 5-20R. Leviton Decora 16352. (Spec. Grade) in Common greas G.F.C.I. Receptacles: 2 blade grounding type, nylon face, 20A NEMA 5-20R.

Tamper resistant receptacles required in all locations in the manager and co-manager suites listed under NEC section

Switches: Back & side wired 120 / 277v AC Leviton Decora AC quiet rocker switches 20-amp Spec. Grade in public areas, and 15-amp Residential Grade in suites. Dimming Switch: 1500w, 120v, 60hz. Leviton 81500 Series. With slide to off function.

Grade in suites, contractor selected, subject to approval. Automatic wall switches: Dual technology, conformance with Energy Code. Coverage verified by manufacturer SensorSwitch WSD-PDT-W.

Other wiring devices not listed here or elsewhere on drawings to be Specification Grade in common areas, Residential

Ceiling Mounted Occupancy Sensor: Dual Technology, conformance with energy code, coverage verified by manufacturer, Complete system by sensor manufacturer, Sensor Switch CMR-PDT. Devices (receptacles, switches, time switches) and cover plates shall be white, unless on emergency power, provide red receptacles and cover plate.

302 Stainless steel cover plates required in commercial kitchen. Outdoor receptacles and receptacles indicated with "WP" weather proof shall utilize non-metallic in-use type protective weatherproof covers.

SECTION 16170 - Disconnects

Motor and circuit disconnects shall be UL listed. Constructed of not less than NEMA 1 where installed indoor dry locations. Enclosures for outdoor, or wet locations shall be not less than NEMA 3R, NEMA rating as required where installed. Rated at voltage connected not less than 240 Volts. Heavy duty, quick make, quick break. Number of poles fusing, and ampacity as noted and required by Code. Solid ground, Solid neutral with Al/Cu compression or set-screw lugs. ON/OFF positions shall be clearly marked and lockable in OFF position. Provide interlock with defeater for authorized personnel. Interlock to prevent disconnect from being opened when "ON" or turned ON with cover open.

Provide disconnect per Code on all machines, HVAC equipment, water heaters including but not limited to: FSD's, AC units, Condenser units, commercial dishwasher, EF's, etc.

SECTION 16195 - Identification

Identify components with neatly printed labeled routed phenolic plastic signs, including any pertinent information for the owner. Panel directories to be typewritten on factory issued card, showing circuit number and description of use of each circuit. Permanently attach to inside of panel door.

The disconnecting means for each service, feeder or branch circuit originating on a switchboard or panelboard shall be legibly and durably marked to indicate its purpose unless such pupose is clearly evident, per NEC 100.22.

SECTION 16400 - Panels

Main panel to be Square D, or equal by Cutler-Hammer, Siemens (ITE), General Electric, or approved. Panel shall be sized, arrangement, and capacity as shown. Verify available fault current with utility. Contractor is responsible for size of equipment within footprint shown. Verify physical equipment size.

Provide branch circuit panel board, with equal or greater series AIC rating shown on E2.2a not rated less than 10,000 AIC, with bolt-on circuit breakers with the same AIC rating as the panel board. Square D type NQOD or equal by Cutler-Hammer, General Electric, Siemens or Westinghouse. Load centers are not permitted.

Panel shall be lockable and include "door-in-door" type construction.

See one-line for additional locking requirements. Determine available fault current from serving electric utility at point of service. Calculate fault current at each panel-board throughout distribution system. Provide equipment with equal or greater series equipment AIC rating. Provide Flash label on switchboards and panelboard, control panels, meter sockets, and motor control centers, per NEC 110.16. Labels from panel equipment manufacturer, Seaton, or approved. Submit fault current from utility in writing clearly shown from utility (such as letter on utility letter-head). Fault currents shown are for reference only based

on general conditions.

SECTION 16450 - Grounding Grounding Electrodes to be installed per the NEC 250.50, 250.52 and 250.53 using any of the types listed as required (A)(1) thru (A)(7). Per the installation requirements in 250.53 if metal underground piping (i.e. copper water piping service) is used as the grounding electrode a supplemental electrode is required (see 250.53 (D)(2)) supplementing with an additional electrode specified in 250.52 (A)(2) thru (A)(7).

RECESSED FLUORESCENT LIGHT FIXTURE

WALL MOUNT FIXTURE, TYPE INDICATED

RECESSED FIXTURE, TYPE INDICATED

 $\otimes \otimes$

S.P.S.I. SWITCH

SURFACE MOUNT FLUORESCENT LIGHT FIXTURE

OPEN CHANNEL FLUORECENT, TYPE INDICATED

AREA OF RESCUE SIGN - SEE LIGHTING SCHEDULE

EXIT LIGHT, DIRECTIONAL ARROWS AS INDICATED.

S.P.S.T. SWITCH, DIMMER SWITCH, FAN SPEED

DOUBLE DUPLEX (TWO) DUPLEX RECEPTACLE

208V, 1P RECEPTACLE - 20A EXCEPT WHEN NOTED

THROUGH WALL PTAC UNIT. SEE MECHANICAL.

 $\$_3\$_{\kappa}$ 3-way switch, pilot light switch, keyed switch

AUTOMATIC WALL SWITCH

FLOOR BOX RECEPTACLE

WIRE ALL EXIT LIGHTS TO NEAREST EM, LIGHT CIRCUIT.

SURFACE MOUNT OR CHAIN HUNG FIXTURE, TYPE INDICATED

DUPLEX RECEPTACLE, SPLIT WIRED WITH 1/2 SWITCHED, ABOVE

SECTION 16500 - Lighting

See Lighting Fixture Schedule and notes. Circuit emergency and exit fixtures (E labeled) to emergency panel. Emergency lights and exit lights are to be switched per plans using Bodine GTD20A, NIN3E 24 or approved UL924 listed emergency lighting relay.

Emergency corridor lighting to be on continuously, unswitched.

Switch common area lighting where indicated with a maximum of 1440 watts per circuit.

Non emergency corridor lighting to be controlled by automatic lighting controller, located in the mechanical room.

ELECTRICAL LEGEND

TRANSFORMER

ELECTRICAL MOTOR LOAD

THERMOSTA

TIMESWITCH

TRANSFORMER

JUNCTION BOX

WEATHER PROOF

CVO CONVENIENCE OUTLET

SPECIAL RECEPTACLE

✓ TV TELEVISION SIGNAL CONNECTION

TELEPHONE CONNECTION

EMERGENCY PULL SWITCH

CELLING MOUNTED OCCUPANCY SENSOR

"E" INDICATES WIRING TO EMERGENCY POWER. SEE SCHEDULE ON

GROUND FAULT CURRENT INTERRUPTING RECEPTACLE

__ C__ CONTROL CABLE

ELECTRICAL HEAT SCHEDULE

16500 - LIGHT FIXTURE SCHEDULE NOTES

B. MAINTAIN 6" MINIMUM CLEARANCE BETWEEN INSULATION AND RECESSED FIXTURES - SEE LIGHTING FIXTURE PROTECTION

-PRIOR TO ORDERING LIGHTING FIXTURES AND ACCESSORIES LISTED ABOVE, PROVIDE SUBMITTAL OF PRODUCT DATA TO

-ALL FLUORESCENT FIXTURES TO HAVE ELECTRONIC BALLAST(S). LESS THEN 10% THD. INSTANT START, COLD WEATHER

ALL FLUORESCENT LAMPS TO HAVE A COLOR RATING OF 4100K (NO EXCEPTIONS).

6. FIXTURE IS SUBJECT TO ARCHITECTURAL APPROVAL. SUBMIT FIXTURE PRIOR TO ORDERING.

7. PROVIDE IN-FIXTURE DISCONNECT ON ALL FLUORESCENT FIXTURES WITH DOUBLE ENDED LAMPS.

2. 'E' DESIGNATION: FIXTURES INDICATED WITH AN "E" SHALL BE WIRED SEPARATELY ON EMERGENCY CIRCUITS.

DISCONNECT SWITCH 2 KILOWATT RECESSED WALL HEATER WITH INTEGRAL THERMOSTAT. 208 VOLT. FUSED DISCONNECT SWITCH 1.5 KILOWATT RECESSED WALL HEATER WITH INTEGRAL THERMOSTAT, 120 VOLT ELECTRICAL PANEL OR ENCLOSURE, DESIGNATION NOTED

1. SOME FIXTURES MAY NOT BE USED: VERIFY WITH PLANS

4. ALL EXIT LIGHTS TO BE WIRED TO EMERGENCY PANEL.

5. NOT USED

ARCHITECT FOR APPROVA

TYPE WHERE REQUIRE

-NO PCBS IN ANY BALLASTS

DETAIL ON DETAIL SHEET. TYPICAL OF ALL RECESSED FIXTURES.

1250 WATT BASEBOARD HEATER CONTROLLED BY WALL THERMOSTAT, 120 VOLT 1 KILOWATT RECESSED WALL HEATER WITH INTEGRAL THERMOSTAT. 120 VOLT.

1 KILOWATT BASEBOARD HEATER CONTROLLED BY WALL THERMOSTAT, 120 VOLT. 750 WATT BASEBOARD HEATER CONTROLLED BY WALL

THERMOSTAT, 120 VOLT, 750 WATT LIQUID FILLED ELEC, HYDRONIC BASEBOARD HEATER CONTROLLED BY WALL THERMOSTAT, BERKO HBB750, 120 VOLT. 500 WATT RECESSED WALL HEATER WITH INTEGRAL

500 WATT BASEBOARD HEATER CONTROLLED BY WALL (0.5B) THERMOSTAT, 120 VOLT.

THERMOSTAT, 120 VOLT

SECTION 16520 - Time Switches Corridor lights: 24 hour type, PCI LiteKeeper Series, Mount in mechanical room,

Include 12 keypad programming and LCD interface. SECTION 16590 - Baseboard Heaters Baseboard heaters shall be, size and voltage as shown, 250 watt per foot nominal densities, Q-MARK 2500 Series. Heater and thermostat shall be white in color. Control with wall mount line voltage remote thermostat, type TA1AW.

Exterior lights: 7-day astrological time control. PCI LiteKeeper Series. Provide photo sensor. Mount in mechanical

Heater and thermostat shall be white in color. Heaters shown and connected by Electrical, but sized during design by Mechanical Engineer. Wall Heaters-Wall heaters shall be size and voltage as shown with integral thermostat, recessed type. Q-MARK AWH 4000 series.

Unit Heaters-Unit heaters shall be size and voltage as shown. Q-MARK Type MUH. Control with wall-mount line voltage thermostat Type MT-1. Heater shall be white in color.

SECTION 16600 - EMERGENCY GENERATOR SYSTEM

Emergency generator shall be 120/208 volt, 3 Phase, 4 wire WYE Unit, 125 KW nominal output, natural gas fired standby engine/generator unit shall be complete with transfer switch, low oil, high temp, over speed, voltage controls and gauges, starting batteries, continuous charging hardware, output circuit protection, water jacket heater and weatherproof enclosure. Provide remote annunciator with back-up battery located in office. Unit shall be complete with all accessories as recommended by the manufacturer, and shall be furnished complete with manufacturers start-up service. All equipment and installation shall conform to article 445 on the NEC and NFPA 110. Generator shall be

Cummins, furnished by owner, installed, connected and tested by electrical contractor.

Natural gas consumption: 1,668 cu. ft./hr. (1000 BTU/cu. ft.)

Mount on concrete pad in location indicated on site plan. Circuit to transfer switch in mechanical room as shown by riser diagram. Coordinate with mechanical for separate natural gas supply from gas meter. Do not connect after (down stream) automatic shut-off valve. Provide sign at all main gas valves to indicate emergency generator operates from natural gas supply. Refer to details on drawing. Integral generator breakers shall be coordinated with distribution equipment. Breakers shall be by same manufacturer as the panels/switchboard to assure selective coordination. Provide breaker, include form C auxiliary contact.

Heater shall be white in color.

Emergency Generator

Amps as shown, 120/208 volt 3 pole plus solid neutral. Equipped with manual test button, engine starting contact mechanically held, automatic return to normal. Provide separate control conductors in separate 1" C from generator to ATS. Provide two pair, stranded shielded twisted pair cable 24 AWG, Belden 9729. Transfer switches shall be manufactured by, and the responsibility of, the generator manufacturer.

ATS shall include form C auxiliary contacts mounted on mechanically operated switch blade shaft of ATS. Boxes and enclosures in the emergency system to be painted red and labeled with phenolic plastic sign saying Emergency so as to clearly identify components of system. Provide placard required by NEC 700-8(a).

SECTION 16700 - Low Voltage Installation

distribution system, and the emergency lights, including exit signs.

EMERGENCY POWER SYSTEM

into units smoke detectors (120 volt power). Run low voltage separate from 120v and at least 24" from service cables in corridors. Do not mount boxes back to back.

Light fixtures with the "E" designation shall be wired to emergency panel. In the event of a power failure, the

emergency generator will start and the automatic transfer shall provide emergency power to the emergency

Low voltage equipment installation shall maintain fire ratings of wall. Equipment to be mounted on 2x4x2 listed

boxes. The use of Mud Rings only, is not acceptable. Check with local codes on running low voltage wire directly

16500 - LIGHT FIXTURE SCHEDULE 2'x4' 2 TUBE FLUORESCENT TROFFER (SUSPENDED) HONIA 2GT8-2-32-A12-120-GEB10IS 2) F028T8 2'x4' 3 TUBE FLUORESCENT TROFFER (SUSPENDED) HONIA 2GT8-3-32-A12-120-GEB10IS 'x4' 2 TUBE FLUORESCENT SURFACE MOUNT THONIA M-2-32-A12-MVOLT-GEB10IS 1/2"x53-1/8" 2 TUBE FLUORESCENT SURFACE MOUNT (SURFACE MOUNTED) HONIA 11430-WH-32-120-GEB10IS -7/8"x53-1/8" 4 TUBE FLUORESCENT SURFACE MOUNT (SURFACE MOUNTED) HONIA 114-32-WH-32-120-GEB10IS // SOLID WOOD FRAME 2x4' 3 TUBE FLUORESCENT SURFACE MOUNT (SURFACE MOUNTED) THONIA 2M-3-32-A12-MVOLT-1/3-GEB10IS TEP LIGHT - FLUORESCENT RECESSED WALL MOUNT. PROVIDE WHITE FACEPLATE HONIA WSLIF 13DTTE FPL 120 (FPSBL INDOORS AND BLACK FACEPLATE OUTDOOR ED UNDER CABINET LINEAR DISPLAY LIGHT, 24" LONG, HARDWIRE INSTALLATION, 500 MENS, 3,000 KELVIN COLOR TEMPERATURE. 120 VOLT. PROVIDE REQUIRED CCESSORIES, WIREWAYS, CONNECTORS, AND MOUNTING TRACK FOR COMPLETE INSTA EP LIGHT - INCANDESCENT RECESSED WALL MOUNT OREL 4453-A-40I-120-LLV-B 40W T10 WATT, LED LANDSCAPE LIGHT. BLACK FINISH. UL LISTED WET LOCATION. 120 VOLT. 700 JMEN OUTPUT, 4,000K COLOR TEMP. 31.31.09N2k 36 WATT | FD LANDSCAPE LIGHT, BLACK FINISH, UL LISTED WET LOCATION, 20° SPOT D 36 WAT ISTRIBUTION. 120 VOLT. 2,800 LUMEN OUTPUT. 4,000K COLOR TEMP. L4S03N2K 2800 LUMENS WATT, LED LANDSCAPE LIGHT, BLACK FINISH, UL LISTED WET LOCATION, 40° FLOOD ED 36 WATT ONOLIGH* ISTRIBUTION, 120 VOLT, 2,800 LUMEN OUTPUT, 4,000K COLOR TEMP. GHT STRING MOUNTED IN ARBOR, APX, 70' IN LENGTH, MOUNT TO UNDERSIDE OF ARBOR GL4F03N2K ERICAN LIGHTIN LAMP SPACING, CANDELABRA BASE, BLACK WIRE, WITH LED C7 LAMPS, STANDARD WALL MOUNT LED DOWNLIGHT. FULL CUTOFF, 9.5"DX8.75"WX4.5"H, DARK BRONZE FINISH CONOLIGHT .350 LUMENS 50 LUMENS, 4,000 KELVIN COLOR TEMPERATURE, 120 VOL VP6L03NZ D 16 WATTS WALL MOUNT LED DOWNLIGHT, FULL CUTOFF, 6-3/16"LX4-7/8"WX5-3/16"H, BLACK FINISH. CONOLIGHT UMENS, 4,000 KELVIN COLOR TEMPERATURE. 120 VOL VALL MOUNT LED DOWNLIGHT. 9.5"DX5.75"WX4"H. DARK BRONZE FINISH CONOLIGHT 200 LUMENS, 4,000 KELVIN COLOR TEMPERATURE. 120 VOLT VW1L21NMP D 34 WATTS WALL MOUNT LED UP/DOWN LIGHT. 7-1/4"LX6"WX7-3/16"H. BLACK FINISH. CONOLIGHT 00 LUMENS 500 LUMENS 4 000 KELVIN COLOR TEMPERATURE, 120 VOLT ALL MOUNT LED GOOSENECK WITH STARLIGHT SHROUD. 31-1/2"LX15-1/4"WX25-3/4"H CONOLIGHT 260 LUMENS BLACK FINISH. 1260 LUMENS, 4.000 KELVIN COLOR TEMPERATURE. 120 VOLT G1L13USK PARKING LOT WALL MOUNT LED DOWNLIGHT. FULL CUTOFF. 11.75"DX13"WX5.75"H. DARK CONOLIGHT ED 72 WATTS

BROAN MODEL 163

ROGRESS P4082-09

ROGRESS P3608-81

TANT START BALLAST)

PROGRESS P5108-09 MED. BASE

ROGRESS P5150-20EBWB

RNISHED W/ COOLER

LO SLD612-9-40-WH

LO SLD405-9-40-WH-JB

LO SLD405-9-40-WH-JM

ROGRESS P3569-09 MED. BASE

LUME LIGHTING V8870-6 MED. BASE

1PHOLDER - MAX, 100 WATTS

MPHOLDER - MAX, 120 WATTS

ROGRESS P3484-09 MED, BASE

MPHOLDER - MAX, 100 WATTS

-700-40K-T3M-MVOLT-SPA-DDBXD

C-700-40K-T3M-MVOLT-SPA-HS-DDBXD LE: SSS-18-4C-DM19-FGL5A

-700-40K-T4M-MVOLT-SPA-DDBXD

C-700-40K-T4M-MVQLT-SPA-HS-DDBXD

C-530-40K-T3M-MVOLT-SPA-HS-DDBXD

VANIA 72509 LED-RT8-2000-8-40-120

VANIA 72509 LED-RT8-2000-8-40-120

JSING: COOPER C8042 JUNO C8H

JSING: COOPER C8042 JUNO C8H

IONIA TEM-50M-RG-TB-EV-DMB

HONIA LQM-P-W-2-R-120-EL N-SW04

HTWAY TRZP-21-A-1T42-4-B1

HONIA LOM S W 3 R 120/27

OGRESS P5774-20

ROGRESS FAN: P2501-30W

UD LACU410D

E: SSS-18-4C-DM19-FGL5A

LE: SSS-18-4C-DM19-FGL5A

E: SSS-18-4C-DM19-FGL5A

LE: SSS-12-4C-DM19-FGL5A

TA 1447-B-CR-13-120

KA LAVERY 347-84-P

OGRESS P7081-20

IONIA DSX0 LED

HONIA DSX0 LE

HONIA DSXOLE

ONOLIGHT

ROGRESS P5095-09

RC2L04CW

HONIA Z-1-32-MVOLT-GEB10IS

HONIA C-2-32-MVOLT-GEB10IS

SUITE BATH - HEAT LAMP AND LIGHT (RECESSED MOUNT), SEE DETAIL 6/E2.2b FOR FIXTURI

HANDELIER OWNER SUPPLIED, PROVIDE J-BOX, WIRE, SWITCHING AND INSTALLATION.

INCANDESCENT CHANDELIER. 36" DIA, 14" HIGH BOWL, 31" OVERALL HEIGHT. OLDE BRONZE

INCANDESCENT SEMI-FLUSH 24" DIA, 12" HIGH BOWL. OLDE BRONZE FINISH WITH SATIN

1/4" WIDTH 50-5/8" LENGTH 2-1/4" DEPTH FLUORESCENT SLIM LINE WRAP WITH WHITE

SQUARE 16" LED RECESSED CANOPY LIGHT. WHITE FINISH. 4,100 LUMENS, 4,000 KELVIN

4-3/4"~ FLUORESCENT PENDANT FIXTURE, BRONZE FINISH WITH TOPAZ TORTOISE ART GI

ED SURFACE MOUNT DISK LIGHT 7.8" DIA X. 7" DEEP, FITS IN STANDARD JUNCTION BOX

LED SURFACE MOUNT DISK LIGHT, 6" DIA X.7" DEEP, FITS IN STANDARD JUNCTION BOX.

SAME AS P2 EXCEPT PROVIDE PAINTABLE TRIM COVER. TRIM TO BE PAINTED TO MATCH

19" DIAMETER SEMI-FLUSH DIRECT CEILING MOUNTED FIXTURE. BRUSHED NICKEL FINISH

DECK/PATIO-10" CEILING-MOUNTED WHITE GLASS & FINISH, ULLISTED WET LOCATION.

UITE AREAS - 14"~ CEILING MOUNTED, BRUSHED NICKEL HOUSING, WITH ETCHED RIBB

19"~ SEMI-FLUSH DIRECT CEILING MOUNTED FIXTURE, ANTIQUE BRONZE FINISH WITH

FLUORESCENT WALL SCONCE. 16"H x 8"W x 4"D. BRUSHED NICKEL FINISH. ETCHED OPAL

LUORESCENT WALL SCONCEONE-LIGHT ADA WALL SCONCE WITH LIGHT SATIN AMBER

GLASS AND ANTIQUE BRONZE FINISH.

PARKING LOT - LED SHOEBOX WITH TYPE III MEDIUM DISTRIBUTION WITH 18' POLE (SEE S

PARKING LOT - LED SHOEBOX WITH TYPE III MEDIUM DISTRIBUTION WITH 12' POLE (SEE S

BRONZE FINISH. 7,700 LUMENS, 4,000 KELVIN COLOR TEMPERATURE. WITH HOUSE SIDE

ENCLOSED FLUORESCENT LENSED AND GASKETED FIXTURE. UL LISTED WET LOCATION

WALKWAY - LANDSCAPE LIGHT. SATIN BLACK POLYESTER POWDER COATED FINISH OVER

IE CAST ALUMINUM, CLEAR GLASS DIFFUSER (SEE SITE PLAN FOR LOCATION) (SEE DET.

ED SIGN LIGHT WITH VISOR. 4.75"D X 7.75"W X 6"H. DARK BRONZE FINISH. 3,000 LUMENS,

FLAG LIGHT, 20° SPOT, 6"D X 10.75"W X 12.25"H, DARK BRONZE FINISH, 6,150 LUMENS

HID BUILDING LIGHT. NARROW PARABOLIC FLOODLIGHT WITH FULL VISOR. (SEE SITE PLA

POLE MOUNTED FLUORESCENT FIXTURE MOUNTED ON 8' POLE. ALUMINUM HOUSING BLAC

AREA OF RESCUE ASSISTANCE SIGN WITH ACCESS PICTOGRAM AND INTEGRAL BATTERY

52" WHITE CEILING FAN AND WITH LIGHT, 3 SPEED REVERSIBLE, WITH WHITE BLADES WITH

2" WHITE CEILING FAN AND WITHOUT LIGHT, 3 SPEED REVERSIBLE, WITH WHITE BLADES

52" WHITE CEILING FAN AND WITHOUT LIGHT, 3 SPEED REVERSIBLE, WITH WHITE ABS

BLADES WITH BOX LISTED FOR CEILING FAN. MOUNT 9' A.F.F. RATED FOR OUTDOORS. UL

.000 KELVIN COLOR TEMPERATURE, 120 VOLT, (SEE SITE PLAN FOR LOCATION)

WDER COAT FINISH, (SEE SITE PLAN FOR LOCATION) (SEE DETAIL #10/E2.2)

XIT - CEILING MOUNTED - EXIT SIGN 3/4" LETTERS WITH DIRECTION ARROWS AS

6-1/2" HIGH 5" DIAMETER TUBE CEILING MOUNTED DOWNLIGHT CUT-OFF - BRONZE

VALL MOUNTED INDIRECT H1D (WHITE FINISH)

X LISTED FOR CEILING FAN, MOUNT 9' A.F.I

WITH BOX LISTED FOR CEILING FAN, MOUNT 9' A.F.F.

PLAN FOR LOCATION) (SEE DETAIL #1/E2.2), WITH POLE MOUNTED RECEPTACLE, DARK

8" LED RECESSED DOWNLIGHT, PROVIDE 8" MOUNTING FRAME COMPATABLE WITH

OWNLIGHT KIT. 2000 LUMENS, 4,000K CCT, 82 CRI, 120 VOLT, 27 WATTS

SAME AS TYPE U1 EXCEPT PROVIDE SLOPED CEILING ADAPTER.

PLAN FOR LOCATION) (SEE DETAIL #1/E2.2), WITH POLE MOUNTED RECEPTACLE, DARK

BRONZE FINISH. 9,800 LUMENS, 4,000 KELVIN COLOR TEMPERATURE. 120 VOLT.

SUITE BATH - WALL-MOUNT THREE-LIGHT FIXTURE, BRUSHED NICKEL FINISH.

WHITE FINISH. 1,000 LUMENS, 4,000K CCT, 90 CRI, 120 VOLT, 15 WATTS.

WHITE FINISH, 710 LUMENS, 4,000K CCT, 90 CRI, 120 VOLT, 12 WATTS.

TCHED LENS. PROVIDE SWIVEL CANOPY WHERE INSTALLED AT VAULTED CEILING.

HANDELIER 23"W, 24"H. BRUSHED NICKEL FINISH. ETCHED OPAL GLASS.

NCANDESCENT BOWL PENDANT FIXTURE, BRUSHED NICKEL FINISH

INSTALLED IN RATED CEILING

1/8"x48" 1 TUBE FLUORESCENT STRIP

3/8"x48" 2 TUBE FLUORESCENT STRIP CHANNEL

CRYLIC DIFFUSER, 120v NPF ELECTRONIC BALLAST

18"~ INCANDESCENT PENDENT FIXTURE, CHAIN HUNG.

6-1/2"~ INCANDESCENT PENDANT FIXTURE.

COLOR TEMPERATURE, 120 VOLT

LASS, ELECTRONIC BALLAS

OR LOCATION)

SAME AS T1 EXCEPT WITH HOUSE SIDE SHIELD

SAME AS T2 EXCEPT WITH HOUSE SIDE SHIELD.

SAME AS T1 EXCEPT WITH TYPE 4 MEDIUM DISTRIBUTION.

VAPOR TIGHT

100°K W/MED, BASE

1) 250 WATT BR40

) F028T8

F028T8

0 WATTS MAX

F (3) 23 W/ATT 41

SE (3) 13 WATT 410

213 T.C.P., INC.

SE (5) 23 WATT 410

L. W/MED. BASE IT

SE (3) 23 WATT 410

L. W/MED. BASE I

23 T.C.P., INC

D 42 WATTS

100 LUMENS

SE (1) 13 WATT 410

213 T.C.P., INC.

E (1) 13 WATT 4100

L. W/MED. BASE ITI

13 T.C.P., INC.

13 WATT CFL.

1,000 LUMENS

D 710 LUMENS

710 LUMENS

SE (3) 23 WATT 410

E (1) 13 WATT 4100

. W/MED BASE IT

「213 T.C.P., INC.

SE (3) 23 WATT 4100

223 T.C.P., INC.

E (3) 13 WATT 410

L. W/MED. BASE ITI

13w G24 LAMPS

13W DIMMABLE

0 LUMENS

91 WATTS

91 WATTS

00 LUMENS

O 68 WATTS

700 LUMENS

2000 LUMEN

2000 LUMEN

F028T8

O 30 WATTS

000 LUMENS

72 WATTS

50 LUMENS

50W MH

L. W/MED. BASE ITI

8/28/2015 REVISED DATE

001K W/MED. BASE 100W MH SE (3) 9 WATT 4100 .. W/CANDELABR/