GENERAL ELECTRICAL NOTES

A. GENERAL

1. THE ELECTRICAL INSTALLATION, AS A MINIMUM, SHALL MEET ALL FAA STANDARDS, THE NATIONAL ELECTRICAL CODE AND LOCAL REGULATIONS.

2. THE CONTRACTOR SHALL ASCERTAIN THAT ALL LIGHTING SYSTEM COMPONENTS FURNISHED BY HIM (INCLUDING FAA APPROVED EQUIPMENT) ARE COMPATIBLE IN ALL RESPECTS WITH EACH OTHER AND THE REMAINDER OF THE NEW/EXISTING SYSTEM. ANY NONCOMPATIBLE COMPONENTS FURNISHED BY THIS CONTRACTOR SHALL BE REPLACED BY HIM AT NO ADDITIONAL COST TO THE AIRPORT SPONSOR WITH A SIMILAR UNIT, APPROVED BY THE ENGINEER (DIFFERENT MODEL OR DIFFERENT MANUFACTURER) THAT IS COMPATIBLE WITH THE REMAINDER OF THE AIRPORT LIGHTING SYSTEM.

3. IN CASE THE CONTRACTOR SELECTS TO FURNISH AND INSTALL AIRPORT LIGHTING EQUIPMENT REQUIRING ADDITIONAL WIRING, TRANSFORMERS, ADAPTERS, MOUNTINGS, ETC., TO THOSE SHOWN ON THE DRAWINGS AND/OR LISTED IN THE SPECIFICATIONS, ANY COST FOR THESE ITEMS SHALL BE INCIDENTAL TO THE EQUIPMENT COST.

4. THE CONTRACTOR INSTALLED EQUIPMENT (INCLUDING FAA APPROVED) SHALL NOT GENERATE ANY ELECTROMAGNETIC INTERFERENCE IN THE EXISTING AND/OR NEW COMMUNICATIONS, WEATHER, AIR NAVIGATION, AND AIR TRAFFIC CONTROL EQUIPMENT. ANY EQUIPMENT GENERATING SUCH INTERFERENCE SHALL BE REPLACED BY THE CONTRACTOR AT NO ADDITIONAL COST WITH EQUIPMENT MEETING THE APPLICABLE SPECIFICATIONS AND NOT GENERATING ANY INTERFERENCE.

5. WHEN A SPECIFIC TYPE, STYLE, CLASS, ETC. OF FAA APPROVED EQUIPMENT IS SPECIFIED ONLY THAT TYPE, STYLE, CLASS, ETC. WILL BE ACCEPTABLE, EVEN THOUGH EQUIPMENT OF OTHER TYPES, STYLES, CLASS, ETC. MAY BE FAA APPROVED.

6. ANY AND ALL INSTRUCTIONS FROM THE ENGINEER TO THE CONTRACTOR REGARDING CHANGES IN, OR DEVIATIONS FROM THE PLANS AND SPECIFICATIONS SHALL BE IN WRITING WITH COPIES SENT TO THE AIRPORT SPONSOR AND THE FAA FIELD OFFICE (ADO/AFO). THE CONTRACTOR SHALL NOT ACCEPT ANY VERBAL INSTRUCTIONS FROM THE ENGINEER OR OWNER REGARDING ANY CHANGES FROM THE PLANS AND SPECIFICATIONS.

7. A MINIMUM OF THREE COPIES OF INSTRUCTION BOOK SHALL BE SUPPLIED WITH EACH DIFFERENT TYPE OF EQUIPMENT. THE BOOKS DESCRIBING A MORE SOPHISTICATED TYPE OF EQUIPMENT, SUCH AS REGULATORS, PAPI, ETC. AS A MINIMUM SHALL CONTAIN THE FOLLOWING:
   (A) A DETAILED DESCRIPTION OF THE OVERALL EQUIPMENT AND ITS INDIVIDUAL COMPONENTS.
   (B) THEORY OF OPERATION INCLUDING THE FUNCTION OF EACH COMPONENT.
   (C) INSTALLATION INSTRUCTIONS.
   (D) START-UP INSTRUCTIONS.
   (E) PREVENTATIVE MAINTENANCE REQUIREMENTS.
   (F) CHART FOR TROUBLESHOOTING.
   (G) COMPLETE POWER AND CONTROL DETAILED WIRING DIAGRAM(S), SHOWING EACH CONDUCTOR/CONNECTION/COMPONENT-"BLACK" BOXES ARE NOT ACCEPTABLE. THE DIAGRAM OR THE NARRATIVE SHALL SHOW VOLTAGES/CURRENTS/WAVE SHAPES AT STRATEGIC LOCATIONS TO BE USED WHEN CHECKING AND/OR TROUBLE SHOOTING THE EQUIPMENT. WHEN THE EQUIPMENT HAS SEVERAL MODES OF OPERATION, SUCH AS SEVERAL BRIGHTNESS STEPS, THESE PARAMETERS SHALL BE INDICATED FOR ALL THE DIFFERENT MODES.
   (H) PARTS LIST WHICH WILL INCLUDE ALL MAJOR AND MINOR COMPONENTS, SUCH AS RESISTORS, DIODES, ETC. IT SHALL INCLUDE A COMPLETE NOMENCLATURE OF EACH COMPONENT AND, IF APPLICABLE, THE NAME OF ITS MANUFACTURER AND THE CATALOG NUMBER.
   (I) SAFETY INSTRUCTIONS.

8. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS, INSPECTIONS AND APPROVALS.

9. ALL MATERIALS SCHEDULED FOR REMOVAL SUCH AS EXISTING RUNWAY AND TAXIWAY LIGHTS WHICH ARE DEEMED SALVAGABLE BY THE AIRPORT SHALL BE DELIVERED TO THE LOCATION ON AIRPORT PROPERTY AS INDICATED BY THE AIRPORT. ALL NONSALVAGABLE MATERIALS REMOVED SUCH AS CONCRETE FOUNDATIONS, CONDUIT, CONDUCTORS, ETC. SHALL BE REMOVED FROM THE SITE BY THE CONTRACTOR.

10. THE CONTRACTOR SHALL COORDINATE HIS WORK WITH THE DULUTH INTERNATIONAL AIRPORT MANAGEMENT, FEDERAL AVIATION ADMINISTRATION (FAA) AND THE RESIDENT PROJECT REPRESENTATIVE (RPR) PRIOR TO AND DURING ALL CONSTRUCTION TO ENSURE THAT ALL ELECTRICAL CIRCUITS AND FACILITIES HAVE BEEN LOCATED, FLAGGED AND ACCOUNTED FOR AND THAT ALL NECESSARY CIRCUITS HAVE BEEN DETERMINED PRIOR TO INITIATING CONSTRUCTION IN ANY LOCATIONS.

11. DEWATERING FOR THE INSTALLATION OF MANHOLES AND/OR DUCTBANKS IS INCIDENTAL TO THE RESPECTIVE PAY ITEM. THE CONTRACTOR SHALL BE RESPONSIBLE TO PAY FOR AND OBTAIN ANY AND ALL PERMITS REQUIRED FOR DEWATERING.

12. THE DULUTH INTERNATIONAL AIRPORT "LOCK/TAG/TRY" PROCEDURE SHALL BE COMPLIED WITH BY THE CONTRACTOR. THE AIRPORT WILL PROVIDE TRAINING TO THE CONTRACTOR FOR THIS SAFETY PROCEDURE.

13. AIRFIELD SIGNS PROVIDING DIRECTIONS TO CLOSED AREAS SHALL BE COVERED. ALL AREAS CLOSED TO AIRCRAFT SHALL NOT BE LIGHTED. ADEQUATE LIGHTING IN THE OPINION OF THE RESIDENT ENGINEER SHALL BE PROVIDED TO DELINEATE THE ACTIVE AND CLOSED AREAS OF THE AOA.

B. POWER AND CONTROL

1. LEGEND PLATES SHALL BE FURNISHED AND INSTALLED ON ALL PANELBOARDS, JUNCTION BOXES, REGULATORS, POWER DISTRIBUTION EQUIPMENT, CONTROL PANELS AND ANY OTHER ITEMS AS REQUIRED OR DIRECTED BY THE ENGINEER. LEGEND PLATES SHALL BE WEATHERPROOF AND ABRASION RESISTANT PHENOLIC MATERIALS. LETTERING SHALL BE BLACK ON WHITE BACKGROUND. LEGEND PLATES SHALL BE INSTALLED USING DOUBLE SIDED TAPE OR ADHESIVE WITH PEAL OFF BACKING.

2. COLOR CODE ALL PHASE WIRING BY THE USE OF COLORED WIRE INSULATION AND/OR COLORED TAPE. WHERE TAPE IS USED, THE WIRE INSULATION SHALL BE BLACK. BLACK AND RED SHALL BE USED FOR SINGLE-PHASE, THREE WIRE SYSTEMS AND BLACK, RED AND BLUE SHALL BE USED FOR THREE-PHASE SYSTEMS. NEUTRAL CONDUCTORS, SIZE NO. 6 AWG OR SMALLER, SHALL BE IDENTIFIED BY A CONTINUOUS WHITE OR NATURAL GRAY OUTER FINISH ALONG ITS ENTIRE LENGTH. NEUTRAL CONDUCTORS LARGER THAN NO. 6 AWG SHALL BE IDENTIFIED EITHER BY A CONTINUOUS WHITE OR NATURAL GRAY OUTER FINISH ALONG ITS ENTIRE LENGTH OR BY THE USE OF WHITE TAPE AT ITS TERMINATION AND INSIDE ACCESSIBLE WIREWAYS.

3. ALL BRANCH CIRCUIT CONDUCTORS CONNECTED TO A PARTICULAR PHASE SHALL BE IDENTIFIED WITH THE SAME COLOR. THE COLOR CODING SHALL BE EXTENDED TO THE POINT OF UTILIZATION.

4. IN CONTROL WIRING, THE SAME COLOR SHALL BE USED THROUGHOUT THE SYSTEM FOR THE SAME FUNCTION, SUCH AS 10%, 30%, 100% BRIGHTNESS CONTROL, ETC.

5. ALL POWER AND CONTROL CIRCUIT CONDUCTORS SHALL BE COPPER; ALUMINUM SHALL NOT BE ACCEPTED. THIS INCLUDES WIRE, CABLE, BUSSES, TERMINALS, SWITCH/PANEL COMPONENTS, ETC.

6. LOW VOLTAGE (600 V.) AND HIGH VOLTAGE (5000 V.) CONDUCTORS SHALL BE INSTALLED IN SEPARATE WIREWAYS.

7. NEATLY LACE WIRING IN DISTRIBUTION PANELS, WIREWAYS, SWITCHES AND JUNCTION/PULL BOXES.

8. THE MINIMUM SIZE OF PULL/JUNCTION BOXES, REGARDLESS OF THE QUANTITY AND THE SIZE OF THE CONDUCTORS SHOWN, SHALL BE AS FOLLOWS:
   (A) IN STRAIGHT PULLS THE LENGTH OF THE BOX SHALL NOT BE LESS THAN EIGHT TIMES THE TRADE DIAMETER OF THE LARGER CONDUIT. THE TOTAL AREA (INCLUDING THE CONDUIT CROSS-SECTIONAL AREA) OF A BOX END SHALL BE AT LEAST 3 TIMES GREATER THAN THE TOTAL TRADE CROSS-SECTIONAL AREA OF THE CONDUITS TERMINATING AT THE END.
   (B) IN ANGLE OR U PULLS THE DISTANCE BETWEEN EACH CONDUIT ENTRY INSIDE THE BOX AND THE OPPOSITE WALL OF THE BOX SHALL NOT BE LESS THAN SIX TIMES THE TRADE DIAMETER OF THE LARGEST CONDUIT. THIS DISTANCE SHALL BE INCREASED FOR ADDITIONAL ENTRIES BY THE AMOUNT OF THE SUM OF THE DIAMETERS OF ALL OTHER CONDUIT ENTRIES ON THE SAME WALL OF THE BOX. THE DISTANCE BETWEEN CONDUIT ENTRIES ENCLOSING THE SAME CONDUCTOR SHALL NOT BE LESS THAN SIX TIMES THE TRADE DIAMETER OF THE LARGEST CONDUIT.

9. A RUN OF CONDUIT BETWEEN TERMINATIONS AT EQUIPMENT ENCLOSURES, SQUARE DUCTS AND PULL/JUNCTION BOXES, SHALL NOT CONTAIN MORE THAN THE EQUIVALENT OF FOUR QUARTER BENDS (360 DEGREES TOTAL), INCLUDING THOSE BENDS LOCATED IMMEDIATELY AT THE TERMINATIONS. CAST, CONDULET TYPE OUTLETS SHALL NOT BE TREATED AS PULL/JUNCTION BOXES.

10. EQUIPMENT CABINETS SHALL NOT BE USED AS PULL/JUNCTION BOXES. ONLY WIRING TERMINATING AT THE EQUIPMENT SHALL BE BROUGHT INTO THESE ENCLOSURES.

11. SPLICES AND JUNCTION POINTS SHALL BE PERMITTED ONLY IN JUNCTION BOXES, DUCTS EQUIPPED WITH REMOVABLE COVERS, AND AT EASILY ACCESSIBLE LOCATIONS.

12. CIRCUIT BREAKERS IN POWER DISTRIBUTION PANEL(S) SHALL BE THERMAL-MAGNETIC, MOLDED CASE, PERMANENT TRIP WITH 100 AMPERE, MINIMUM, FRAME.

13. DUAL LUGS SHALL BE USED WHERE TWO WIRES, SIZE NO.6 OR LARGER, ARE TO BE CONNECTED TO THE SAME TERMINAL.

14. RIGID STEEL CONDUIT SHALL BE USED THROUGHOUT THE INSTALLATION UNLESS OTHERWISE SPECIFIED. THE MINIMUM TRADE SIZE SHALL BE 3/4 INCH.

15. ALL RIGID CONDUIT SHALL BE TERMINATED AT CONSTANT CURRENT REGULATORS WITH A SECTION (36" MINIMUM) OF FLEXIBLE CONDUIT.

16. UNLESS OTHERWISE SHOWN ALL EXPOSED CONDUITS SHALL BE RUN PARALLEL TO OR AT RIGHT ANGLES WITH THE LINES OF THE STRUCTURE.

17. ALL STEEL CONDUITS, FITTINGS, NUTS, BOLTS, ETC. SHALL BE GALVANIZED.

18. USE CONDUIT BUSHINGS AT EACH CONDUIT TERMINATION. WHERE NO. 4 AWG OR LARGER UNGROUNDED WIRE IS INSTALLED, USE INSULATED BUSHINGS.

19. USE DOUBLE LOCK NUTS AT EACH CONDUIT TERMINATION.

20. WRAP ALL PRIMARY AND SECONDARY POWER TRANSFORMER CONNECTIONS WITH SUFFICIENT LAYERS OF INSULATING TAPE AND COVER WITH INSULATING VARNISH FOR FULL VALUE OF CABLE INSULATION VOLTAGE.

21. UNLESS OTHERWISE NOTED, ALL INDOOR SINGLE CONDUCTOR CONTROL WIRING SHALL BE NO. 12 AWG. (MIN.).

22. BOTH ENDS OF EACH CONTROL CONDUCTOR SHALL BE TERMINATED AT A TERMINAL BLOCK. THE TERMINAL BLOCKS SHALL BE OF PROPER RATING AND SIZE FOR THE FUNCTION INTENDED AND THEY SHALL BE LOCATED IN EQUIPMENT ENCLOSURES OR SPECIAL TERMINAL CABINETS.

23. ALL CONTROL CONDUCTOR TERMINATIONS SHALL BE OF THE OPEN-EYE CONNECTOR/SCREW TYPE. SOLDERED, CLOSED-EYE TERMINATIONS, OR TERMINATIONS WITHOUT CONNECTORS ARE NOT ACCEPTABLE.

24. IN TERMINAL BLOCK CABINETS THE MINIMUM SPACING BETWEEN PARALLEL TERMINAL BLOCKS SHALL BE 6 INCHES. THE MINIMUM SPACING BETWEEN TERMINAL BLOCK SIDES/ENDS AND CABINET SIDES/BOTTOM/TOP SHALL BE 5 INCHES. THE MINIMUM SPACING WILL BE INCREASED AS REQUIRED BY THE NUMBER OF CONDUCTORS. ADDITIONAL SPACING SHALL BE PROVIDED AT CONDUCTOR ENTRANCES.

25. BOTH ENDS OF ALL CONTROL CONDUCTORS SHALL BE IDENTIFIED AS TO THE CIRCUIT, TERMINAL BLOCK, AND TERMINAL NUMBER. ONLY STICK-ON LABELS SHALL BE USED.

26. A SEPARATE AND CONTINUOUS NEUTRAL CONDUCTOR SHALL BE INSTALLED AND CONNECTED FOR EACH BREAKER CIRCUIT IN THE POWER PANEL(S) FROM THE NEUTRAL BAR TO EACH POWER/CONTROL CIRCUIT.

27. THE FOLLOWING SHALL APPLY TO RELAY/CONTACTOR PANELS/ENCLOSURES:

   (A) ALL COMPONENTS SHALL BE MOUNTED IN DUST PROOF ENCLOSURE(S) WITH VERTICALLY HINGED COVERS.
   (B) THE ENCLOSURE(S) SHALL HAVE AMPLE SPACE FOR THE CIRCUIT COMPONENTS, TERMINAL BLOCKS, AND INCOMING AND INTERNAL WIRING.
   (C) ALL INCOMING/OUTGOING WIRING SHALL BE TERMINATED AT TERMINAL BLOCKS.
   (D) EACH TERMINAL ON TERMINAL BLOCKS AND ON CIRCUIT COMPONENTS SHALL BE CLEARLY IDENTIFIED.
   (E) ALL CONTROL CONDUCTOR TERMINATIONS SHALL BE OF THE OPEN-EYE CONNECTOR/SCREW TYPE. SOLDERED, CLOSED-EYE TERMINATIONS, OR TERMINATIONS WITHOUT CONNECTORS ARE NOT ACCEPTABLE.
   (F) WHEN THE ENCLOSURE COVER IS OPENED, ALL CIRCUIT COMPONENTS, WIRING, AND TERMINALS SHALL BE EXPOSED AND ACCESSIBLE WITHOUT REMOVAL OF ANY PANELS, COVERS, ETC., EXCEPT THOSE COVERING HIGH VOLTAGE COMPONENTS.
   (G) ACCESS TO, OR REMOVAL OF A CIRCUIT COMPONENT OR TERMINAL BLOCK WILL NOT REQUIRE THE REMOVAL OF ANY OTHER CIRCUIT COMPONENT OR TERMINAL BLOCK.
   (H) EACH CIRCUIT COMPONENT SHALL BE CLEARLY IDENTIFIED INDICATING ITS CORRESPONDING NUMBER SHOWN IN THE DRAWINGS AND ITS FUNCTION.
   (I) A COMPLETE WIRING DIAGRAM (NOT A SCHEMATIC DIAGRAM) SHALL BE MOUNTED ON THE INSIDE OF THE COVER. THE DIAGRAM SHALL REPRESENT EACH CONDUCTOR BY A SEPARATE LINE.
   (J) THE DIAGRAM SHALL IDENTIFY EACH CIRCUIT COMPONENT AND NUMBERING AND COLOR OF EACH INTERNAL CONDUCTOR AND TERMINAL.
   (K) ALL WIRING SHALL BE NEATLY TRAINED AND LACED.
   (L) MINIMUM WIRE SIZE SHALL BE NO.12 AWG UNLESS OTHERWISE NOTED.

C. FIELD LIGHTING

1. UNLESS OTHERWISE NOTED, ALL UNDERGROUND FIELD POWER MULTIPLE AND SERIES CIRCUIT CONDUCTORS WHETHER DIRECT BURIED OR IN DUCT/CONDUIT SHALL BE FAA APPROVED L-824 TYPE. INSULATION VOLTAGE AND SIZE SHALL BE AS SPECIFIED.

2. NO COMPONENTS OF PRIMARY CIRCUIT SUCH AS CABLE, CONNECTORS AND TRANSFORMERS SHALL BE BROUGHT ABOVE GROUND AT EDGE LIGHTS, SIGNS, REIL, PAPI, ETC.

3. THERE SHALL BE NO EXPOSED POWER/CONTROL CABLES BETWEEN THE POINT WHERE THEY LEAVE THE UNDERGROUND (DIRECT BURIED OR L-867 BASES) AND WHERE THEY ENTER THE EQUIPMENT (SUCH AS TAXIWAY SIGNS, PAPI, REIL, ETC.) ENCLOSURES. THESE CABLES SHALL BE ENCLOSED IN RIGID CONDUIT OR IN FLEXIBLE, WATER-TIGHT CONDUIT WITH BREAKABLE COUPLING(S) AT THE GRADE OR THE HOUSING COVER, AS SHOWN IN APPLICABLE DETAILS.

4. THE JOINTS OF THE L-823 PRIMARY CONNECTORS SHALL BE WRAPPED WITH AT LEAST ONE LAYER OF RUBBER OR SYNTHETIC RUBBER TAPE AND ONE LAYER OF PLASTIC TAPE, ONE-HALF LAPPED, EXTENDING AT LEAST 1/2 INCHES ON EACH SIDE OF THE JOINT.

5. THE ID OF THE PRIMARY L-823 FIELD ATTACHED CONNECTORS SHALL MATCH THE CABLE OD TO PROVIDE A WATERTIGHT CABLE ENTRANCE.

6. HEAT SHRINK WITH INTERNAL ADHESIVE SHALL BE INSTALLED OVER L-823 ASSEMBLY, AS DETAILED I N THE PLANS.

7. L-823 TYPE II, TWO-CONDUCTOR SECONDARY CONNECTORS SHALL BE CLASS "A" (FACTORY MOLDED).

8. THERE SHALL BE NO SPLICES IN THE SECONDARY CABLE(S) WITHIN THE STEMS OF A RUNWAY/TAXIWAY EDGE/THRESHOLD LIGHTING FIXTURES AND THE WIREWAYS LEADING TO TAXIWAY SIGNS AND PAPI/REIL EQUIPMENT.

9. ELECTRICAL INSULATING GREASE SHALL BE APPLIED WITHIN THE L-823, SECONDARY, TWO CONDUCTOR CONNECTORS TO PREVENT WATER ENTRANCE. THESE CONNECTORS SHALL NOT BE TAPED.

10. A SLACK OF 3 FEET, MINIMUM, SHALL BE PROVIDED IN THE PRIMARY CABLE AT EACH TRANSFORMER/CONNECTOR TERMINATION. PAYMENT SHALL BE PER LINEAR FOOT OF CABLE INSTALLED IN EACH BASE CAN.

11. DIRECTION OF PRIMARY CABLES SHALL BE IDENTIFIED BY COLOR CODING AS FOLLOWS: WHEN FACING LIGHT WITH BACK TO PAVEMENT, CABLE TO THE LEFT IS CODED RED AND CABLE TO RIGHT IS CODED BLUE. THIS APPLIES TO STAKE MOUNTED LIGHTS AND BASE MOUNTED LIGHTS WHERE THE BASE HAS ONLY ONE ENTRANCE.

12. L-867 BASES SHALL BE SIZE B, 24" DEEP, CLASS I, UNLESS OTHERWISE NOTED.

13. BASE MOUNTED BREAKABLE COUPLINGS SHALL NOT HAVE WEEP HOLES TO THE OUTSIDE. PLUGGED UP HOLES SHALL NOT BE ACCEPTABLE. IT SHALL HAVE A 1/4' DIAMETER, MINIMUM, OR EQUIVALENT OPENING FOR DRAINAGE FROM THE SPACE AROUND THE SECONDARY CONNECTOR INTO THE L-867 BASE.

14. THE ELEVATION OF THE BREAKABLE COUPLING GROOVE SHALL NOT EXCEED 1 1/2" ABOVE THE EDGE OF THE COVER IN CASE OF BASE MOUNTED COUPLINGS, OR THE TOP OF THE STAKE IN CASE OF STAKE MOUNTED COUPLINGS.

15. WHERE THE BREAKABLE COUPLING IS NOT AN INTEGRAL PART OF THE LIGHT FIXTURE STEM OR MOUNTING LEG, A BEAD OF SILICON SEAL SHALL BE APPLIED COMPLETELY AROUND LIGHT STEM OR WIREWAY AT BREAKABLE COUPLING TO PROVIDE A WATERTIGHT SEAL.

16. PLASTIC LIGHTING FIXTURE COMPONENTS, SUCH AS LAMP HEADS, STEMS, BREAKABLE COUPLINGS, BASE COVERS, BRACKETS, STAKES, SHALL NOT BE ACCEPTABLE. L-867 PLASTIC TRANSFORMER HOUSINGS ARE ACCEPTABLE. THE METAL THREADED FITTINGS SHALL BE SET IN THE FLANGE DURING CASTING PROCESS. BASE COVER BOLTS SHALL BE FABRICATED FROM 18-8 STAINLESS STEEL.

17. EDGE LIGHT NUMBERING TAGS SHALL BE FACING THE PAVEMENT.

18. CABLE/SPLICE/DUCT MARKETS SHALL BE PRECAST CONCRETE OF THE SIZE SHOWN. LETTERS/NUMBERS/ARROWS FOR THE LEGEND TO BE IMPRESSED INTO THE TOPS OF THE MARKERS SHALL BE PRE-ASSEMBLED AND SECURED IN THE MOLD BEFORE THE CONCRETE IS POURED. LEGEND INSCRIBED BY HAND IN WET CONCRETE SHALL NOT BE ACCEPTABLE.

19. ALL UNDERGROUND CABLE RUNS SHALL BE IDENTIFIED BY CABLE MARKERS AT 200 FEET MAXIMUM SPACING, WITH AN ADDITIONAL MARKER AT EACH CHANGE OF DIRECTION OF THE CABLE RUN. CABLE MARKERS SHALL BE INSTALLED IMMEDIATELY ABOVE THE CABLE.

20. LOCATIONS OF ENDS OF ALL UNDERGROUND DUCTS SHALL BE IDENTIFIED BY DUCT MARKERS.

21. ALL POWER AND CONTROL CABLES IN MAN/HAND HOLES SHALL BE TAGGED. USE EMBOSSED COPPER STRIPS TO BE ATTACHED AT BOTH ENDS TO THE CABLE BY THE USE OF PLASTIC STRAPS. MINIMUM OF TWO TAGS SHALL BE PROVIDED ON EACH CABLE IN A MAN/HAND HOLE - ONE AT THE CABLE ENTRANCE AND ONE AT THE CABLE EXIT.

22. APPLY AN OXIDE INHIBITING, ANTI-SEIZING COMPOUND TO ALL SCREWS, NUTS AND BREAKAGE COUPLING THREADS.

23. THERE SHALL BE NO SPLICES BETWEEN THE ISOLATION TRANSFORMERS. L-823 CONNECTORS ARE ALLOWED AT TRANSFORMER CONNECTIONS ONLY, UNLESS OTHERWISE SHOWN.

24. CONCRETE USED FOR SLABS, FOOTINGS, BACKFILL AROUND TRANSFORMER HOUSINGS, MARKERS, ETC. SHALL BE 4000 PSI, MIN., AIR-ENTRAINED, CONSISTENT WITH THE REQUIREMENTS OF ITEM P-610.

D. CABLE PROTECTION CRITERIA

1. ALL EXISTING SYSTEMS TO REMAIN SHALL BE PROTECTED FROM DAMAGE.

2. EXISTING CONDUIT, DUCTBANK, CIRCUITING AND UTILITY INFORMATION IS BASED ON BISHOP INTERNATIONAL AIRPORT "AS BUILT" AND "RECORD" DRAWINGS AND SITE VISITS BY THE UTILITIES AND THE ENGINEER. THE EXISTING UTILITY LOCATIONS SHOWN ON THE PLANS ARE APPROXIMATE AND SHALL NOT BE SCALED FOR EXACT LOCATIONS. NOT ALL UTILITIES MAY BE SHOWN. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO CONTACT THE APPROPRIATE UTILITY/AGENCY, PRIOR TO STARTING WORK, FOR THE LOCATION OF EXISTING UTILITIES. ANY INTERPRETATION OF AN EXISTING SYSTEM OR UTILITY SERVICE SHALL BE COORDINATED AND APPROVED BY THE AUTHORITY, AGENCY OR UTILITY HAVING JURISDICTION. PRIOR TO THE START OF WORK THE CONTRACTOR SHALL CONTACT ALL LOCAL UTILITIES.

3. THE CONTRACTOR SHALL BE RESPONSIBLE TO CONTACT THE APPROPRIATE UTILITY COMPANIES, AGENCY ETC. PRIOR TO ANY EXCAVATION/CONSTRUCTION TO LOCATE THE UTILITY, AGENCIES, UNDERGROUND CABLES, PIPES, CONDUITS, DUCTBANKS, ETC.. REPLACEMENT OF EXISTING CABLES OR UTILITIES DAMAGED BY THE CONTRACTOR DURING CONSTRUCTION SHALL BE AT THE CONTRACTORS EXPENSE.

4. EXISTING DIRECT BURIED CABLE THAT IS TO REMAIN INTACT, FUNCTIONAL AND OPERATIONAL SHALL BE ENCLOSED IN A CARLON SPLIT-DUCT OR APPROVED EQUAL AND ENCASED IN A 3" MIN. ENVELOPE OF P-610 CONCRETE UNDER THE FOLLOWING CONDITIONS.
   A. WHEN WITHIN 20' OF EXCAVATION, TRENCHING ETC..
   B. WHEN THE PAVEMENT WIDENING OR EXTENSIONS WILL BE ROUTED OVER THE EXISTING CABLE. THE DUCT BANK SHALL BE EXTENDED 10' BEYOND THE EDGE OF THE PAVEMENT.
   C. WHEN ENCOUNTERED DURING CONSTRUCTION.
   D. WHEN SUBJECT TO DAMAGE FROM CONSTRUCTION ACTIVITIES.

5. EXISTING CABLES SHALL BE EXCAVATED BY HAND.

6. THE CARLON SPLIT-DUCT SHALL EXTEND 10' BEYOND THE EDGE OF THE PAVEMENT INTO THE GRASSED AREA AND BE MARKED WITH AN END OF DUCT MARKER.

7. THE CABLE ELEVATION SHALL BE ADJUSTED SO THAT THE TOP OF THE DUCT CONCRETE ENCASEMENT IS 36" MINIMUM BELOW THE FINISHED GRADE OR TOP SUBGRADE WHICHEVER IS DEEPER. (UNLESS OTHERWISE NOTED)

8. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO DETERMINE THAT ALL AIRFIELD LIGHTING CIRCUITS, EXCEPT THOSE THAT ARE SERVING CLOSED TAXIWAYS OR RUNWAYS, ARE COMPLETELY OPERATIONAL, USING THE EXISTING CONTROLS, AT THE TERMINATION OF WORK EACH DAY AND SHALL SO CERTIFY TO THE OWNERS AUTHORIZED REPRESENTATIVE BEFORE LEAVING THE SITE.

9. MULTIPLE CABLES SHALL BE PROTECTED WITH MULTIPLE SPLIT-DUCT WITH A MINIMUM SEPARATION OF 2" BETWEEN DUCTS. REFER TO DUCT BANK DETAILS FOR MULTIPLE DUCT CONFIGURATIONS. POWER AND LOW-VOLTAGE (ANALOG OR DIGITAL) CONTROL SHALL NOT BE GROUPED TOGETHER. EXISTING SEPARATIONS SHALL BE MAINTAINED.

10. INSTALL A PLASTIC, DETECTABLE, MAGNETIC THREE INCH (3") WIDE TAPE EIGHT INCHES (8") BELOW GRADE ABOVE ALL PORTIONS OF EXISTING UNDERGROUND UTILITIES EXPOSED FOR ANY REASON. THIS INCLUDES ALL CABLING INSTALLED IN SPLIT-DUCT. THE DETECTABLE TAPE SHALL BE OMITTED WHERE THE UNDERGROUND UTILITY IS UNDER AIRFIELD PAVEMENT.

E. GROUNDING

1. GROUND ALL NON-CURRENT-CARRYING METAL PARTS OF ELECTRICAL EQUIPMENT BY USING NO. 6 AWG BARE COPPER. WIRE TO BE RUN INSIDE CABINETS AND IN CONDUITS TOGETHER WITH OTHER WIRES. WHERE THIS IS NOT FEASIBLE, RUN THE EXPOSED GROUNDING WIRE PARALLEL OR AT RIGHT ANGLES TO THE BUILDING LINES AND SECURE IT AT LEAST EVERY 24 INCHES AND WITHIN 6 INCHES FROM BEND OR JUNCTION. THE EXPOSED WIRE MAY BE NO. 6 AWG IF IT IS NOT SUBJECTED TO PHYSICAL ABUSE, OTHERWISE NO. 4 AWG SHALL BE USED.

2. ALL GROUND CONNECTIONS TO BUSSES, PANELS, ETC. SHALL BE MADE WITH PRESSURE TYPE SOLDERLESS LUGS AND GROUND CLAMPS. SOLDERED OR BOLT AND WASHER TYPE CONNECTIONS ARE NOT ACCEPTABLE. CLEAN ALL METAL SURFACES BEFORE MAKING GROUND CONNECTIONS. ALL GROUND CONNECTIONS AT GROUND RODS SHALL BE EXOTHERMIC TYPE (CADWELD OR EQUAL).

3. TOPS OF GROUND RODS SHALL BE A MINIMUM OF 12 INCHES BELOW GRADE AND A MAXIMUM OF 16" BELOW GRADE.

4. THE RESISTANCE TO GROUND OF THE VAULT GROUNDING SYSTEM WITH THE COMMERCIAL POWER LINE NEUTRAL DISCONNECTED SHALL NOT EXCEED 10 OHMS.

5. THE RESISTANCE TO GROUND OF THE COUNTERPOISE SYSTEM, OR AT ISOLATED LOCATIONS, SUCH AS AIRPORT BEACON SHALL NOT EXCEED 25 OHMS.

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NORTH BUSINESS DEVELOPMENT AREA

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Signature Darren K Christopher

Typed Name DARREN K. CHRISTOPHER

Date 08/18/2009 Reg. No. 45052

REVISIONS

NO.	DESCRIPTION	DATE

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