

ELECTRICAL SPECIFICATIONS

GENERAL CONDITIONS: THE GENERAL CONDITIONS, SPECIAL CONDITIONS, SUPPLEMENTARY CONDITIONS AND ELECTRICAL SPECIFICATIONS OF THE SPECIFICATIONS AND "GENERAL CONDITIONS OF THE CONTRACT", CURRENT EDITION, ESTABLISHED IN STANDARD FORM BY THE AMERICAN INSTITUTE OF ARCHITECTS SHALL APPLY TO ALL WORK ON THIS PROJECT EXCEPT AS MODIFIED BELOW. THIS CONTRACTOR SHALL FAMILIARIZE THEMSELVES WITH THESE PROVISIONS AND ADHERE TO THESE REQUIREMENTS. CONTRACTOR SHALL COORDINATE THEIR WORK WITH OTHER TRADES PRIOR TO INSTALLATION.

DEFINITIONS: FURNISH MEANS TO SUPPLY AND DELIVER TO PROJECT SITE, READY FOR INSTALLATION. INSTALL MEANS TO PLACE IN POSITION AND MAKE CONNECTIONS FOR SERVICE OR USE. PROVIDE MEANS TO FURNISH AND INSTALL, COMPLETE AND READY FOR INTENDED USE.

RELATED DOCUMENTS: THIS CONTRACTOR IS REFERRED TO THE ARCHITECTURAL, STRUCTURAL AND MECHANICAL PLANS AND SPECIFICATIONS. SUCH PLANS AND SPECIFICATIONS ARE A PART OF THE CONTRACT DOCUMENTS.

SITE VISITATION: CONTRACTORS SHALL VISIT THE SITE AND FAMILIARIZE THEMSELVES WITH ALL CONDITIONS SURROUNDING THE WORK. IF ANY OF THE CONDITIONS REQUIRE A MODIFICATION OF THE SYSTEMS INDICATED BY THESE PLANS AND SPECIFICATIONS, THE CONTRACTOR SHALL INCLUDE THE COST OF SUCH MODIFICATIONS IN THEIR BID. NO EXTRA COMPENSATION WILL BE ALLOWED BECAUSE OF FAILURE TO FIELD VERIFY EXISTING CONDITIONS PRIOR TO SUBMITTING BIDS.

MODIFICATIONS TO PLANS AND SPECIFICATIONS: THROUGHOUT THE COURSE OF THE WORK, THE ARCHITECT/ENGINEER MAY REQUEST MINOR CHANGES AND ADJUSTMENTS TO PLANS AND SPECIFICATIONS. THE CONTRACTOR SHALL MAKE SUCH ADJUSTMENTS WITHOUT ADDITIONAL COST TO THE OWNER, WHERE SUCH ADJUSTMENTS ARE NECESSARY FOR THE PROPER INSTALLATION AND OPERATION AND WITHIN THE INTENT OF THE CONTRACT DOCUMENTS.

INTENT OF DOCUMENTS: IT IS THE INTENT OF THE PLANS AND SPECIFICATIONS TO FORM A GUIDE FOR A COMPLETE INSTALLATION. EVERYTHING NECESSARY FOR THE COMPLETION AND SUCCESSFUL OPERATION OF THE WORK, WHETHER OR NOT HEREBY DEFINITELY SPECIFIED OR INDICATED ON THE DRAWINGS SHALL BE FURNISHED AND INSTALLED AS WELL AND AS FAITHFULLY AS IF SO SPECIFIED OR INDICATED WITHOUT ADDITIONAL COSTS TO THE OWNER. THIS CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND LENGTHS PRIOR TO INSTALLATION.

DISCREPANCY PROCEDURE: IF ANY ERRORS, DISCREPANCIES OR OMISSIONS APPEAR IN THE DRAWINGS, SPECIFICATIONS OR OTHER CONTRACT DOCUMENTS, THE CONTRACTOR SHALL NOTIFY THE ARCHITECT/ENGINEER IN WRITING OF SUCH ERROR/OMISSION. IN THE EVENT OF THE CONTRACTOR FAILING TO GIVE SUCH NOTICE BEFORE CONSTRUCTION AND/OR FABRICATION OF THE WORK, THEY WILL BE HELD RESPONSIBLE FOR THE RESULTS OF ANY SUCH ERRORS, DISCREPANCIES OR OMISSIONS AND THE COST TO RECTIFYING SAME.

CODE COMPLIANCE: CONTRACTOR SHALL COMPLY WITH THE CURRENT REQUIREMENTS OF ALL STATE, LOCAL, AND NATIONAL CODES REGULATING THIS WORK. ALL INDOOR LIGHTING IS TO CONFORM WITH THE MINNESOTA ENERGY CODE, ARTICLE 7676.1300.

PERMITS, FEES, LICENSES: THIS CONTRACTOR SHALL PAY ALL FEES AND RELATED CHARGES REQUIRED FOR PERMITS, LICENSES, ETC., REQUIRED FOR INSTALLATION OF THE ELECTRICAL SYSTEMS.

EQUIPMENT ORDER: THE CONTRACTOR SHALL ORDER ALL EQUIPMENT REQUIRED WITHIN TEN DAYS UPON RECEIPT OF CONTRACT IN ORDER TO ENSURE TIMELY RECEIPT OF MATERIAL. SUBSTITUTIONS AFTER THIS DATE DUE TO LACK OF PLACEMENT OF ORDER WILL NOT BE APPROVED. CONTRACTOR IS TO REPLACE OR REPAIR ANY PROPERTY OR EQUIPMENT LOCATED AT THE PROJECT SITE THAT IS DAMAGED OR DESTROYED BY PERSONNEL, EITHER INTENTIONALLY OR ACCIDENTALLY, AT NO COST TO THE ENGINEER ARCHITECT OR OWNER. CONTRACTOR WILL AGREE TO REPAIR, REPLACE AND/OR REWIRE ANY EQUIPMENT THAT IS DAMAGED DUE TO INCORRECT INSTALLATION. CONTRACTOR WILL ALSO BE RESPONSIBLE FOR DAMAGE TO PERSONS AND/OR PROPERTY DUE TO THE MALFUNCTION OF SUCH INCORRECTLY INSTALLED EQUIPMENT, IF ANY OF THE EQUIPMENT, NOT ASSOCIATED WITH THE PROJECT, IS OBSERVED TO BE UNSAFE OR IN NON-CODE COMPLIANT CONDITION THAT PRESENTS A DANGER TO LIFE OR PROPERTY, THE CONTRACTOR MUST NOTIFY OWNER AND/OR PROPER LOCAL INSPECTORS. CONTRACTOR MAY NEGOTIATE WITH OWNER TO PROVIDE SERVICES IN CORRECTING THE SITUATION.

SHOP DRAWINGS: THIS CONTRACTOR SHALL PROVIDE THE OWNER WITH A MINIMUM OF SIX (6) CERTIFIED COPIES OF ALL SHOP AND EQUIPMENT DRAWINGS FOR HIS APPROVAL, TWO OF WHICH SHALL BE RETAINED BY THE OWNER, AND THE REMAINING BEING RETURNED TO THE CONTRACTOR. DRAWINGS SHALL BE SUBMITTED BEFORE START OF CONSTRUCTION. FAILURE OF COMPLIANCE WITH THIS PARAGRAPH WILL RESULT IN WITHHOLDING OF FINAL PAYMENT.

REBATES: WHERE THE INSTALLATION OF ENERGY EFFICIENT LIGHTING AND OTHER SYSTEMS QUALIFY FOR REBATES FROM THE POWER PROVIDER, THIS CONTRACTOR SHALL PROVIDE THE OWNER WITH ALL NECESSARY, COMPLETED FORMS, INVOICES, ETC AS REQUIRED BY THE POWER PROVIDER.

WARRANTY: THIS CONTRACTOR SHALL WARRANT THEIR WORK TO BE FREE FROM DEFECTS IN MATERIALS AND WORKMANSHIP FOR A PERIOD OF ONE YEAR AFTER SUBSTANTIAL COMPLETION OR OWNER ACCEPTANCE OF THE COMPLETED PROJECT.

BASIC MATERIALS AND METHODS: PROVIDE EQUIPMENT INDICATED ON THE DRAWINGS, AND AS REQUIRED FOR A COMPLETE FUNCTIONING SYSTEM. ALL WORKMANSHIP AND MATERIALS SHALL BE OF THE HIGHEST QUALITY IN EVERY RESPECT. ALL MATERIALS AND EQUIPMENT SHALL BE NEW, OF THE LATEST DESIGN AND FREE OF DEFECTS. ALL MATERIALS AND EQUIPMENT SHALL CONFORM TO THE LATEST AMENDED EDITION OF ALL APPLICABLE STANDARDS, INCLUDING BUT NOT LIMITED TO, NEC, UL AND NEMA STANDARDS. ANY EXISTING EQUIPMENT THAT WILL NOT BE USED SHALL BE REMOVED AND DISPOSED OF BY THE CONTRACTOR, IF THE CONTRACTOR WISHES TO KEEP REMOVED EQUIPMENT FOR THEIR OWN USE, CONTRACTOR MUST NEGOTIATE WITH OWNER FOR PURCHASE OF EQUIPMENT OR A FAIR ADJUSTMENT OF COSTS FOR THEIR SERVICES.

RECORD THE ACTUAL ROUTING OF ALL FEEDER CONDUITS TO SWITCHBOARDS, PANELBOARDS, MOTOR CONTROL CENTERS, ETC. AND ALL UNDERGROUND CONDUIT OR CONDUIT CONCEALED IN OR UNDER THE SLAB IN CONTACT WITH THE GROUND. INDICATE THE LOCATION OF JUNCTION AND PULL BOXES AND SEALING FITTINGS AND EXPANSION FITTINGS IN THESE CONDUITS. DIMENSION THE LOCATIONS OF CONDUITS, BOXES AND FITTINGS ON THE DRAWINGS REFERENCED FROM EITHER THE EXTERIOR WALLS, COLLUMNS OR CORNERS OF THE BUILDING. RECORD ANY MODIFICATIONS, DELETIONS OR ADDITIONS TO THE BRANCH CIRCUITRY INDICATED ON THE ORIGINAL DRAWINGS. ALL WIRING SYSTEMS ABOVE SUSPENDED CEILING, IN WALL OR FLOOR CONSTRUCTION SHALL BE CONCEALED WHERE POSSIBLE. ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR CUTTING EXISTING CONCRETE FLOOR SLAB FOR INSTALLATION OF FEEDERS, ETC. THE GENERAL CONTRACTOR IS RESPONSIBLE TO PATCH FLOOR TO MATCH EXISTING FLOOR.

PROVIDE VIBRATION ISOLATION DEVICES FOR ALL MOVING MACHINERY. PROVIDE FLEXIBLE CONNECTIONS TO ALL MOVING MACHINERY.

DESIGN ALL CONDUIT TO PRESENT A NEAT AND ORDERLY APPEARANCE. RUN ALL LINES PARALLEL WITH BUILDING WALLS AND CONSTRUCTION. KEEP CONDUIT FREE FROM CONTACT WITH STRUCTURE OR EQUIPMENT TO PREVENT NOISE TRANSMISSION, ALLOWING CLEARANCE FOR EXPANSION AND CONTRACTION.

ROOF PENETRATIONS SHALL COMPLY WITH "SMACNA" AND "IRCA" STANDARDS, AND SHALL COMPLY WITH THE REQUIREMENTS OF THE EXISTING ROOFING WARRANTY. DO NOT PERFORM ROOFING PENETRATIONS IN A MANNER WHICH WOULD VOID OR OTHERWISE LIMIT ANY EXISTING ROOF WARRANTY.

PROVIDE TWO (2) BOND SETS OF OPERATION MANUALS, MAINTENANCE MANUALS AND SCHEMATICS FOR ALL ELECTRICAL EQUIPMENT INSTALLED TO THE OWNER AT PROJECT COMPLETION.

CONTRACTOR IS TO TOUCH UP ANY DAMAGED SURFACES OF FIXTURES AND EQUIPMENT EXPOSED TO VIEW PRIOR TO COMPLETION OF JOB.

CONDUCTORS: ALL CONDUCTORS ARE TO BE OF COPPER. ALUMINUM CONDUCTORS ARE NOT PERMITTED EXCEPT AT THE SERVICE ENTRANCE. CONDUCTORS ARE TO BE SIZED USING 75C COLUMN ON TABLE 310.16 OF THE NATIONAL ELECTRICAL CODE. ALL INSULATION OF CONDUCTORS SHALL BE RATED FOR 90C AND EITHER THE TYPE OF THHN, THWN, RHM, OR XHHN. ELECTRICAL CONTRACTOR TO HAVE THE FOLLOWING COLOR CODING FOR ENTIRE ELECTRICAL SYSTEM: PHASE COLOR CODING: (FROM LEFT TO RIGHT FROM OPEN PANEL DOOR): L1: BLACK L2: RED L3: BLUE

COLOR CODE FOR HIGH VOLTAGE CONDUCTORS SHALL BE MEANS OF COLORED TAPE, INSULATION COLOR, PAINT OR OTHER PERMANENTLY APPLIED MEANS. OTHER CONDUCTORS IN THE SYSTEM MUST BE COLOR CODED AS FOLLOWS: NEUTRAL: WHITE EQUIPMENT GROUND: GREEN LOW NOISE GROUND: GREEN/YELLOW SWITCH LEG: RED OR ORANGE INTRINSICALLY SAFE CONDUCTORS: LIGHT BLUE

THE MINIMUM WIRE SIZES FOR ALL 120 VOLT, 20 AMP BRANCH CIRCUITS, BY DISTANCE FROM CIRCUIT BREAKER SHALL BE AS FOLLOWS: LESS THAN 100 FT: #12 AWG 101 TO 150 FT: #10 AWG 150 TO 250 FT: #8 OVER 250 FT: #6 AWG ON ALL 20 AMP BRANCH CIRCUITS REQUIRING CONDUCTORS LARGER THAN #12 AWG, THE WIRE SIZE SHALL BE REDUCED TO #12 AWG WITHIN 10 FT OF THE PANELBOARD AND THE FINAL WIRING DEVICE IN JUNCTION BOX. ALL WIRE #10 AWG AND LARGER MAY BE STRANDED. ALL #12 AWG WIRE MUST BE SOLID.

THE NEUTRAL, SWITCH LEGS, INTRINSICALLY SAFE CONDUCTORS AND GROUND CONDUCTORS MUST BE COLOR CODED BY MEANS OF WIRE INSULATION COLOR. FOR HEATING CABLE MARKING DETAILS, SEE ARTICLE 424.35 OF THE NEC.

GROUNDING: CONTRACTOR MUST CONNECT ALL GROUNDS TO THE GROUNDING ELECTRODE AT ONE POINT ONLY. THE LOW NOISE GROUNDING SYSTEM MUST BE EARTHED AT THE MAIN GROUNDING ELECTRODE LOCATED AT THE TRANSFORMER OR CABINET. THE LOW NOISE GROUNDING SYSTEM MAY BE CONNECTED TO ISOLATED GROUNDING STRIPS INSIDE EACH BRANCH CIRCUIT PANELBOARD OR LOAD CENTER. THE MAIN GROUNDING ELECTRODE SHALL BE IN A FORM OF A UFER GROUND. THE CONTRACTOR SHALL BOND A MINIMUM OF #4 AWG CONDUCTOR TO ALL REBAR, INCLUDING REBAR INSTALLED IN FOOTINGS AS WELL IN THE FLOOR. THE CONTRACTOR SHALL COORDINATE WITH THE GENERAL CONTRACTOR TO HAVE THE GROUNDING CONDUCTOR BONDING INSPECTED BY THE LOCAL INSPECTOR PRIOR TO POURING CONCRETE. THE #4 CONDUCTOR THAT IS BONDED TO THE REBAR SHALL BE STUBBED UP ABOVE THE CONCRETE FLOOR SURFACE IN A LOCATION WHERE IT CAN BE EFFICIENTLY BONDED TO THE NEAR WATER PIPE, BUILDING STEEL, ETC. ALL BONDING SHALL COMPLY WITH ARTICLE 250.70 OF THE NATIONAL ELECTRICAL CODE. IF THE CONCRETE FLOOR IS TO BE CONSTRUCTED WITH NON-CONDUCTIVE MATS INSTEAD OF REBAR, THEN ONLY THE REBAR INSTALLED IN THE FOOTINGS SHALL BE BONDED FOR USE AS THE GROUNDING ELECTRODE. IF THE AUTHORITY HAVING JURISDICTION REQUIRES MULTIPLE GROUND RODS IN ADDITION TO THE SPECIFIED UFER GROUND, THEN SAID GROUND RODS SHALL BE INSTALLED AT A DISTANCE OF TWICE THEIR LENGTH. THIS IS TO REDUCE THE SELF-INDUCED COUPLING CAUSED BY THE HIGH FREQUENCY AND HIGH VOLTAGE PULSES CREATED DURING A LIGHTNING STRIKE. ALL GROUND ELECTRODE CONDUCTORS MAY NOT HAVE BEND RADI LESS THAN 8". EQUIPMENT GROUNDING CONDUCTORS USED TO GROUND SWITCHGEAR, PANELBOARDS AND OTHER ELECTRICAL CABINETS IN CONTACT WITH A CONCRETE FLOOR MUST BE BONDED TO SAID EQUIPMENT AS CLOSE TO THE FLOOR AS IS PHYSICALLY POSSIBLE.

IN ALL DUPLEX RECEPTACLE CIRCUITS THE EQUIPMENT GROUNDING CONDUCTOR RESISTANCE MUST NOT EXCEED 1 OHM AS MEASURED FROM THE FURTHEST RECEPTACLE IN THE CIRCUIT. BOOTLE GROUNDING IS NEVER ALLOWED. HALO GROUND RINGS USED FOR LIGHTNING PROTECTION MUST NOT BE ALSO USED AS EQUIPMENT GROUNDS.

INDEPENDENT GROUND WIRE SHALL BE A MINIMUM OF #12 AWG, GREEN WITH A YELLOW STRIPE. ALL INDEPENDENT LOW NOISE GROUNDS TO BE CONNECTED TO THE GROUND AT ONE COMMON LOCATION AS CLOSE TO THE MAIN GROUNDING ELECTRODE AS PHYSICALLY POSSIBLE.

PANELBOARD LABELING: ALL PANELBOARDS AND DISCONNECTS SHALL HAVE LABELS AND WARNING SIGNS IN ACCORDANCE WITH ARTICLES 110.16 AND 110.22 OF THE NATIONAL ELECTRICAL CODE. THE MAIN SERVICE DISCONNECT(S) SHALL BE MARKED IN ACCORDANCE WITH ARTICLES 230.66 AND 230.70(B) OF THE NEC. EACH PANELBOARD, LOAD CENTER, AND DISCONNECT SWITCH INSTALLED REMOTELY FROM MAIN DISTRIBUTION CENTER MUST BE LABELED TO IDENTIFY LOCATION OF OVER CURRENT DEVICE SERVING IT. ALL UNDERGROUND CONDUCTORS MUST BE IDENTIFIED PER ARTICLE 210.15(C) AND 215.12 OF THE NEC. ALL LABELS AND IDENTIFICATION TAGS ARE TO CONSIST OF PERMANENTLY ENGRAVED PLASTIC PLAC CARDS AND BE ATTACHED TO EACH PANELBOARD AND MAIN SWITCH GEAR BY MEANS OF SCREWS, OR PERMANENT ADHESIVE. EACH BRANCH CIRCUIT IN EVERY PANELBOARD OR LOAD CENTER MUST CONTAIN A CIRCUIT DIRECTORY SPECIFICALLY CALLING OUT THE LOADS. THE CIRCUIT DIRECTORY SHALL BE TYPED OR LEGIBLY WRITTEN IN PERMANENT INK AND IN ACCORDANCE OF ARTICLE 408.4 OF THE NEC.

SUBSTITUTIONS OF ELECTRICAL EQUIPMENT: UNLESS SPECIFICALLY STATED ON THE DRAWINGS, ALL ELECTRICAL EQUIPMENT AND MATERIALS ARE SUBJECT TO "OF EQUAL" SUBSTITUTION. ELECTRICAL CONTRACTOR MUST STAND BEHIND EACH SUBSTITUTED DEVICE(S). THE SUBSTITUTED DEVICE(S) MUST MEET THE APPROVAL OF THE OWNER, ARCHITECT AND ENGINEER. THE ELECTRICAL CONTRACTOR MUST AGREE TO REPAIR OR REPLACE SUBSTITUTED EQUIPMENT THAT PROVES TO BE FAULTY, INADEQUATE FOR THE JOB OR DOES NOT MEET THE EXPECTATIONS OF THE OWNER, ARCHITECT, AND ENGINEER. THE OWNER, ARCHITECT, OR ENGINEER SHALL NOT INCUR THE COSTS OF SUCH REPAIR OR REPLACEMENT, IF A LESS EXPENSIVE DEVICE IS SUBSTITUTED FOR THE ONE SPECIFIED, THEN THE ELECTRICAL CONTRACTOR MUST AGREE TO CREDIT THE OWNER WITH THE FULL DIFFERENCE IN COST. THE CONTRACTOR AND/OR THOSE SUPPLYING AND INSTALLING SURPLUS EQUIPMENT WILL ASSUME FULL LIABILITY FOR ANYTHING INCURRED BY THE INSTALLATION OF THE SUBSTITUTED EQUIPMENT, SURPLUS OR RECYCLED EQUIPMENT MAY NEVER BE USED UNLESS SPECIFICALLY INDICATED ON THE DRAWINGS. WHEN IT IS INDICATED ON THE DRAWINGS TO USE RECYCLED EQUIPMENT, SUCH EQUIPMENT MUST BE CAREFULLY EXAMINED FOR DAMAGE, CORROSION, AND DETEIORATION OF INSULATION, NON-CODE COMPLIANCE, AND NON-UL COMPLIANCE. EQUIPMENT THAT DOES NOT MEET THESE STANDARDS MUST BE REPAIRED OR DISCARDED AND REPLACED, WHICHEVER IS MORE ECONOMICAL.

THIRD HARMONIC DISTORTION: IT MAY EXIST FOR ELECTRONIC EQUIPMENT TO CAUSE THIRD HARMONIC CURRENT TO APPEAR ON THE NEUTRAL CONDUCTOR. TO MINIMIZE EFFECTS OF DISTORTIONS, THE FOLLOWING INSTALLATION METHODS MUST BE PRACTICED: ALL PANELBOARD LOADS MUST BE BALANCED TO LESS THAN 10% BETWEEN PHASES. THE NEUTRAL CONDUCTOR IS TO BE THE SAME SIZE AS THE THREE PHASE CONDUCTORS. PANELBOARDS AND LOAD CENTERS ARE TO BE RATED FOR USE WITH NON-LINEAR LOADS. IF A HARMONIC FILTER OR TRANSFORMER DESIGNED FOR USE WITH NON-LINEAR LOADS IS SPECIFIED, THIS DEVICE MUST BE INSTALLED AND WIRED EXACTLY PER MANUFACTURER'S INSTRUCTIONS. NEUTRAL TO GROUND VOLTAGE MUST NOT EXCEED 2 VOLTS. EXCESSIVE VOLTAGE INDICATES THIRD HARMONIC VOLTAGES ON THE NEUTRAL LEG. CONTRACTOR MUST VERIFY THAT THE ACTUAL PANELBOARD LOADS ARE BALANCED TO LESS THAN 10% BETWEEN PHASES.

CONDUIT REQUIREMENTS: ROUTE CONDUIT AS SPECIFIED AND AS REQUIRED FOR A COMPLETE ELECTRICAL INSTALLATION. CONDUIT OFFSETS, JUNCTION BOXES, PULL BOXES, AND FITTINGS ARE NOT NECESSARILY SHOWN; HOWEVER, PROVIDE THESE AS REQUIRED BY THE CONDITIONS INVOLVED AND APPLICABLE CODES FOR A CORRECT AND COMPLETE INSTALLATION. ALL WIRING ABOVE 50 VOLTS SHALL BE INSTALLED IN CONDUITS, UNLESS SPECIFICALLY NOTED OTHERWISE. THE USE OF ROMEX TYPE WIRING IS NOT PERMITTED. ALL CONDUIT AND RACEWAY SHALL HAVE A SEPARATE GROUND CONDUCTOR.

FINISHED AREAS: CONCEAL CONDUITS BELOW FLOORS, WITHIN SLABS ONLY WHERE INDICATED, WITHIN WALLS, WITHIN PIPE CHASES, ABOVE SUSPENDED CEILING, AND WITHIN OTHER BUILDING CONSTRUCTION, UNLESS OTHERWISE INDICATED. CONDUITS SHALL NOT BE RUN IN FLOOR SLABS EXCEPT WHERE OTHERWISE INDICATED.

UNFINISHED AREAS: INSTALL ABOVE-FLOOR CONDUITS EXPOSED IN AREAS WHERE PIPE CHASES OR SUSPENDED CEILING ARE NOT INDICATED OR CONCEALING IS OTHERWISE IMPRACTICABLE, IN MECHANICAL AND ELECTRICAL EQUIPMENT ROOMS, STORAGE AREAS, AND OTHER UNFINISHED AREAS.

INSTALL CONDUITS RUN EXPOSED OR CONCEALED ABOVE CEILING OR IN WALLS IN STRAIGHT, LEVEL AND PLUMB LINES, PARALLEL WITH AND AT RIGHT ANGLES WITH BEAMS, WALL, CEILING AND OTHER BUILDING LINES. ROUTE CONDUIT IN SLABS ABOVE GRADE AND IN AND UNDER SLABS ON GRADE FROM POINT-TO-POINT OR SHORTEST PRACTICAL PATH.

UNDERGROUND INSTALLATION: MORE THAN FIVE FEET FROM FOUNDATION WALL: USE RIGID METAL CONDUIT, INTERMEDIATE METAL CONDUIT, PLASTIC COATED CONDUIT OR RIGID NONMETALLIC CONDUIT APPROVED FOR DIRECT BURIAL. WITHIN FIVE FEET FROM FOUNDATION WALL: USE RIGID METAL CONDUIT, INTERMEDIATE METAL CONDUIT, PLASTIC COATED CONDUIT, OR RIGID NONMETALLIC CONDUIT APPROVED FOR DIRECT BURIAL. IN OR UNDER SLAB ON GRADE: USE RIGID METAL CONDUIT, INTERMEDIATE METAL CONDUIT, PLASTIC COATED CONDUIT, OR RIGID NONMETALLIC CONDUIT APPROVED FOR DIRECT BURIAL. ALL UNDERGROUND INSTALLATIONS TO COMPLY WITH ARTICLE 300.5 OF THE NEC.

OUTDOOR LOCATIONS ABOVE GRADE: USE RIGID METAL CONDUIT OR INTERMEDIATE METAL CONDUIT. IN SLAB ABOVE GRADE: USE RIGID METAL CONDUIT, INTERMEDIATE METAL CONDUIT, OR RIGID NONMETALLIC CONDUIT.

WET AND DAMP LOCATIONS: USE RIGID METAL CONDUIT, INTERMEDIATE METAL CONDUIT, AND RIGID NONMETALLIC CONDUIT.

DRY LOCATIONS: CONCEALED IN CONCRETE OR MASONRY CONSTRUCTION ABOVE GRADE, COLLUMNS, WALLS AND ABOVE SUSPENDED CEILING: USE RIGID METAL CONDUIT, INTERMEDIATE METAL CONDUIT, AND ELECTRICAL METALLIC TUBING. NOT CONCEALED IN ANY APPARATUS: USE RIGID METAL CONDUIT, INTERMEDIATE METAL CONDUIT, OR ELECTRICAL METALLIC TUBING.

LOCATIONS SUBJECT TO PHYSICAL DAMAGE: USE RIGID METAL CONDUIT OR INTERMEDIATE METAL CONDUIT.

CORROSIVE ENVIRONMENTS: PVC COATED RIGID METAL CONDUIT. IN REFRIGERATED OR HAZARDOUS AREAS: USE RIGID METAL CONDUIT OR INTERMEDIATE METAL CONDUIT.

SERVICE ENTRANCE CONDUIT - OVERHEAD (600 VOLTS OR LESS): USE RIGID METAL CONDUIT, INTERMEDIATE METAL CONDUIT, OR PVC FROM THE SERVICE ENTRANCE EQUIPMENT TO THE SERVICE ENTRANCE FITTING OR WEATHER HEAD OUTSIDE THE BUILDING.

SERVICE ENTRANCE CONDUIT - UNDERGROUND (600 VOLTS OR LESS): USE PVC COATED RIGID METAL CONDUIT OR SCHEDULE 80 PVC WITH THE UNDERGROUND PORTION ENCASED IN A MINIMUM OF 2 INCHES OF CONCRETE AND PER THE INSTALLATION METHODS ON TABLE 300.5 OF THE NEC 2005. CONVERT PVC CONDUIT TO PVC COATED RIGID METAL CONDUIT BEFORE RISING THROUGH THE FLOOR SLAB OR GRADE. THE PVC COATED RIGID METAL CONDUIT SHALL EXTEND A MINIMUM OF 8 INCHES ABOVE THE FLOOR OR GRADE.

FLEXIBLE METAL CONDUIT SHALL BE INSTALLED FOR: CONNECTIONS FROM THE CONDUIT SYSTEM TO RECESSED LIGHTING FIXTURES, MAXIMUM OF 6 FEET IN LENGTH. CONNECTIONS TO MOTORS, MAXIMUM OF 2 FEET IN LENGTH. CONNECTIONS TO OTHER ELECTRICAL EQUIPMENT THAT IS SUBJECT TO MOVEMENT OR VIBRATION.

LIQUID-TIGHT FLEXIBLE METAL CONDUIT SHALL BE INSTALLED FOR: CONNECTIONS TO MOTOR OR EQUIPMENT SUBJECT TO MOVEMENT OR VIBRATION WHERE EXPOSED TO RAIN, SPRAY, OR A CORROSIVE ATMOSPHERE. CONNECTIONS TO EQUIPMENT SUBJECT TO OIL OR GREASE. CONNECTIONS TO FIRE PUMPS AND AUXILIARY EQUIPMENT.

LIGHTING SPECIFICATIONS

INDOOR LIGHTING: ALL INDOOR LIGHTING IS TO CONFORM TO THE SPECIFIED FIXTURES CALLED OUT ON THE LUMINAIRE SCHEDULE. CONTRACTOR IS TO REFER TO ARCHITECTURAL DRAWINGS FOR REFLECTED CEILING PLANS FOR EXACT LOCATION OF LIGHTING FIXTURES OR OTHER CEILING MOUNTED DEVICES. THE FOLLOWING MANUFACTURERS SHALL BE CONSIDERED AS SUPPLIERS FOR LIGHT FIXTURES. MANUFACTURERS NOT LISTED BELOW MAY BE CONSIDERED BY SUBMITTING CUT-SHEETS INDICATING THEIR PRODUCT IS EQUAL OR SUPERIOR TO THAT SPECIFIED. MANUFACTURERS LISTED BELOW ARE NOT IN ANY ORDER OF PREFERENCE.

INDOOR LUMINAIRES (HIGH BAY) COLUMBIA HOLOPHANE HUBBELL LITHONIA SPORLITE

INDOOR LUMINAIRES (FLUORESCENT TROFFERS) COLUMBIA HOLOPHANE COOPER LIGHTING LITHONIA METALUX

INDOOR LUMINAIRES (RECESSED, INCANDESCENT, COMPACT FLUORESCENT & HID) PRESCOLITE CON-TECH KOWAT

DECORATIVE INDOOR LIGHTING (TRACK LIGHTING SYSTEMS, DECORATIVE FIXTURES, ETC.) INDOOR DECORATIVE LIGHTING WILL BE SPECIFIED ON THE LUMINAIRE SCHEDULE. INDOOR DECORATIVE LIGHTING HAS BEEN SELECTED AFTER CAREFUL CONSULTATION WITH THE ARCHITECT AND THE OWNER AND IS NOT SUBJECT TO SUBSTITUTION.

EMERGENCY AND EXIT LIGHTING ASTRIALITE PRESCOLITE DUAL LIFE COOPER LIGHTING

OUTDOOR LIGHTING

OUTDOOR DECORATIVE LIGHTING: OUTDOOR DECORATIVE LIGHTING TO BE INSTALLED ON THE BUILDING OR ON THE GROUNDS WILL BE SPECIFIED ON THE LUMINAIRE SCHEDULE. SUCH LIGHTING HAS BEEN SELECTED AFTER CAREFUL CONSULTATION WITH THE ARCHITECT AND THE OWNER AND IS NOT SUBJECT TO SUBSTITUTION.

OUTDOOR LIGHTING (BUILDING) KIM LIGHTING KENALL LIGHTING DEWINE LIGHTING LUMINAIRE LIGHTING SPAULDING

OUTDOOR LIGHTING (LANDSCAPE/PARKING AREA) SPAULDING HOLOPHANE STERNER BETA LIGHTING LITHONIA MCGRAW EDISON

OUTDOOR POLE (FOR LIGHTING) STEEL TO MATCH LUMINAIRE MANUFACTURER FIBERGLASS REINFORCED COMPOST SHAWSPFARE REINFORCED CONCRETE AMERON

POWER SYSTEMS

ELECTRICALLY HELD POWER CONTACTORS: MANUFACTURERS: GENERAL ELECTRIC ORBOND, SQUARE D CLASS 8903 TYPE S, OR APPROVED EQUAL. PROVIDE NUMBER OF POLES AS INDICATED. LOAD CONTACTS RATED FOR THE CONTINUOUS AMPERAGE AND VOLTAGE AS INDICATED. COIL VOLTAGE 120 VAC, NEMA TYPE 1 ENCLOSURE; CODE GAUGE STEEL WITH MANUFACTURER'S STANDARD GRAY ENAMEL FINISH. INCLUDE A HAND/OFF/AUTO SELECTOR SWITCH.

MECHANICALLY OR MAGNETICALLY HELD POWER CONTACTORS: MANUFACTURERS: G.E. CR360MA, SQUARE D CLASS 8903, OR APPROVED EQUAL. PROVIDE NUMBER OF POLES AS INDICATED, LOAD CONTACTS RATED FOR THE CONTINUOUS AMPERAGE AND VOLTAGE AS INDICATED, CONTROL VOLTAGE 120 VAC, CONTROL RELAY OR MODULE FOR TWO WIRE CONTROL. COIL CLEARING CONTACTS SO THAT CONTACTS COILS SHALL BE ENERGIZED ONLY DURING THE INSTANCE OF OPERATION. INDICATE THE ENCLOSURE TYPE, NEMA TYPE 1 ENCLOSURE; CODE GAUGE STEEL WITH MANUFACTURER'S STANDARD GRAY ENAMEL FINISH. INCLUDE A HAND/OFF/AUTO SELECTOR SWITCH.

TEMPORARY POWER: ELECTRICAL CONTRACTOR SHALL SUPPLY TEMPORARY POWER ON SITE. TEMPORARY POWER SHALL CONFORM WITH THE REQUIREMENTS OF THE NEC.

ELECTRICAL EQUIPMENT MANUFACTURERS: THE FOLLOWING MANUFACTURERS SHALL BE CONSIDERED AS SUPPLIERS OF ELECTRICAL EQUIPMENT AND HARDWARE FOR THIS PROJECT. MANUFACTURERS NOT LISTED HERE MAY BE CONSIDERED BY SUBMITTING CUT-SHEETS INDICATING THAT THEIR PRODUCT IS EQUAL OR SUPERIOR TO THAT SPECIFIED. ONLY PRODUCTS FROM WELL-ESTABLISHED MANUFACTURERS WILL BE CONSIDERED. THE ITEMS ON THIS LIST ARE NOT LISTED IN ANY ORDER OF PREFERENCE.

SERVICE ENTRANCE EQUIPMENT SQUARE D AMERICAN MIDWEST POWER SIEMENS GENERAL ELECTRIC PANELBOARDS & LOAD CENTERS SQUARE D SIEMENS GENERAL ELECTRIC SIEMENS CUTLER HAMMER

ALL WIRING DEVICES: (RECEPTACLES, GFCI, & SWITCHES) INTERLEC, HUBBELL, OR PASS & SEYMOUR

ALL OUTDOOR RECEPTACLES TO BE GFCI, 20 AMP AND BE OF THE FOLLOWING: PASS & SEYMOUR SPECIFICATION GRADE DUPLEX GFCI 2095-LA (LIGHT ALMOND) HUBBELL WIRING, AUTOGRADE COMMERCIAL GRADE SELF TEST GFCI, GFC5320ZWS7 (OFFICE WHITE)

ISOLATED GROUNDED RECEPTACLES (IG) SHALL BE OF THE FOLLOWING: LEVITON 16382-IG ISOLATED GROUND, 120V, 20 AMP ORANGE WALL COVER PLATE: LEVITON 8041-IG ORANGE

WEATHERPROOF IN USE COVERS: OF EQUAL MANUFACTURERS ARE OF THE FOLLOWING: INTERLEC, LEVITON, OR HUBBELL. ALL OUTDOOR RECEPTACLES TO USE ONE OF THE FOLLOWING COVERS:

ARLINGTON DBV5IC (FOR VINYL SIDING) VERTICAL MOUNT, CLEAR COVER ARLINGTON DBH51C (FOR VINYL SIDING) HORIZONTAL MOUNT, CLEAR COVER

ARLINGTON DBV1C (FOR RIGID SIDING) VERTICAL MOUNT, CLEAR COVER ARLINGTON DBH11C (FOR RIGID SIDING) HORIZONTAL MOUNT, CLEAR COVER

ARLINGTON DBH1C-77628 (FOR BRICK SIDING) HORIZONTAL MOUNT, CLEAR COVER

TELECOMMUNICATION EQUIPMENT: THE FOLLOWING IS A LIST OF THE TELEPHONE AND DATA REQUIREMENTS. SOME MANUFACTURERS ARE LISTED, BUT OF EQUAL MANUFACTURERS ARE ALSO ACCEPTABLE PROVIDED THEY CONFORM TO THE REQUIREMENTS AS LISTED.

INTERIOR TELEPHONE AND DATA: ELECTRICAL CONTRACTOR SHALL PROVIDE EMPTY CONDUITS, OUTLET AND PULL BOXES, BACKBOARDS TERMINAL CABINETS, CABLE SUPPORTS, CABLE, OUTLET DEVICES, TERMINATION EQUIPMENT AND VARIOUS SERVICE FITTINGS AS INDICATED ON THE DRAWINGS AND AS SPECIFIED.

THE DISTRIBUTION SYSTEM SHALL BE INSTALLED AND TESTED SO THAT THE SYSTEM IS FULLY OPERATIONAL WHEN THE TELEPHONE EQUIPMENT IS INSTALLED AND CONNECTED TO IT.

STATION CABLE: CATEGORY 3 CABLE: 4 PAIR, NO. 24 AWG, SOLID COPPER, UNSHIELDED, TWISTED PAIR, COLOR CODED, WITH PVC CONDUCTOR INSULATION AND OVERALL JACKET. THE CABLE SHALL CONFORM TO THE REQUIREMENTS OF EA/TIA-568 AND SHALL BE UL CERTIFIED TO MEET THE REQUIREMENTS OF EA/TIA TSB-36, AND SHALL BE UL CERTIFIED TO MEET THE REQUIREMENTS OF EA/TIA TSB-36 FOR CATEGORY 3 CABLE. THE CABLE SHALL BE PLENUM RATED.

CATEGORY 5 CABLE: 4 PAIR, NO. 24 AWG, SOLID COPPER, UNSHIELDED, TWISTED PAIR, COLOR CODED, WITH PVC CONDUCTOR INSULATION AND OVERALL JACKET. THE CABLE SHALL CONFORM TO THE REQUIREMENTS OF EA/TIA-568 AND ICSA 580-576 AND SHALL BE UL CERTIFIED TO MEET THE REQUIREMENTS OF EA/TIA TSB-36 FOR CATEGORY 5 CABLE. THE CABLE SHALL BE PLENUM RATED.

BACKBONE CABLE (CATEGORY 5): 25 PAIR, NO. 24 AWG, SOLID COPPER, UNSHIELDED, TWISTED PAIR, COLOR CODED WITH PVC CONDUCTOR INSULATION AND OVERALL JACKET. THE CABLE SHALL CONFORM TO THE REQUIREMENTS OF EA/TIA-568 AND ICSA 580-576 AND SHALL BE UL CERTIFIED TO MEET THE REQUIREMENTS OF EA/TIA TSB-36 FOR CATEGORY 5 CABLE. THE CABLE SHALL BE NON PLENUM OR PLENUM RATED AS REQUIRED.

CONNECTOR BLOCKS: 68 OR 110 STYLE, HIGH-IMPACT, FIRE-RETARDANT MOLDED PLASTIC. THE CABLE PAIR CAPACITY SHALL BE AS INDICATED. PROVIDE STANDOFF WALL MOUNT BRACKETS, BRIDGING CLIP, LABELING PROVISIONS, ETC. AS REQUIRED FOR A COMPLETE INSTALLATION.

PATCH PANELS: UL LISTED CATEGORY 5, [PRINTED CIRCUIT BOARD TYPE WITH 110 STYLE WIRE CONNECTIONS] [DISCRETE WIRED TYPE], WITH THE NUMBER AND TYPE OF JACKS AS INDICATED. PROVIDE A HINGED STANDOFF WALL MOUNT BRACKET AS REQUIRED FOR THE CABLE CAPACITY OF THE PATCH PANEL, LABELING PROVISIONS, ETC. REQUIRED FOR A COMPLETE INSTALLATION.

MODULAR JACKS: T568A, T568B, RJ45, RJ61, RJ11 AS INDICATED, PLASTIC, SIMPLEX, SNAP-IN TYPE. THE JACKS SHALL BE LEAD WIRE OR PRINTED CIRCUIT BOARD TYPE, WITH 110 STYLE WIRE TERMINATIONS FOR NO. 24 AWG WIRE. THE CONTACTS SHALL HAVE MINIMUM 50 MICRO INCH GOLD PLATING OVER 100 MICRO-INCH NICKEL UNDERPLATE. THEY SHALL BE UL LISTED FOR CATEGORY 3 AND CATEGORY 5 AS REQUIRED FOR THEIR INDICATED APPLICATION AND THEY SHALL MEET FCC PART 68 AND TIA 568 REQUIREMENTS.

FOR THE DATA/PHONE CONNECTION POINTS, USE THE FOLLOWING MANUFACTURER: QUICK PORT SNAP IN CONNECTORS BY LEVITON DATA: LEVITON 8 CONDUCTOR GIGAMAX 5e CHANNEL RATED CONNECTOR, 56105-T5 LIGHT ALMOND PHONE: LEVITON VOICE GRADE CONNECTORS 6 CONDUCTOR USOC CONNECTOR, 41108-T6 LIGHT ALMOND WALL PLATE: LEVITON QUICK PORT SINGLE GANG INSERTS, 41080-Z1P LIGHT ALMOND

WALL PLATES: MODULAR JACK MANUFACTURER'S STANDARD PLASTIC PLATE, OR 302 STAINLESS STEEL WITH SMOOTH FINISH AND BEVELED EDGES. WALL PLATES TO MATCH THE POWER RECEPTACLE AND SWITCH PLATES. PLATES SHALL HAVE PRE STAMPED HOLES FOR MODULAR JACKS. THE NUMBER AND TYPE OF MODULAR JACK PROVISIONS SHALL BE AS INDICATED. ATTACHMENT SCREW HEADS SHALL MATCH THE PLATE.

PROJECT SPECIFIC REQUIREMENTS: SURGE SUPPRESSERS (TVSS): THIS FACILITY IS TO BE FURNISHED WITH A TRANSIENT VOLTAGE SURGE SUPPRESSER (TVSS) AT THE MAIN SERVICE DISCONNECT. THIS UNIT IS INTENDED TO PROTECT THE ELECTRICAL SYSTEM, INCLUDING DELICATE ELECTRONIC EQUIPMENT CONNECTED TO THE SYSTEM, FROM LARGE VOLTAGE AND CURRENT SURGES DUE TO NEARBY LIGHTNING STRIKES. THE TVSS UNIT SELECTED MUST HAVE THE FOLLOWING CHARACTERISTICS:

- UNIT MUST BE INTEGRALLY AND INTERNALLY MOUNTED TO THE PANELBOARD BUS.
- THE UNIT MUST MATCH THE MANUFACTURER OF THE PANELBOARD THAT IS TO BE INSTALLED. FOR EXAMPLE, IF A SQUARE-D, I-LINE PANELBOARD IS TO BE USED FOR THE MAIN SERVICE, THEN A SQUARE-D I-LINE "SURGLOGIC" TVSS UNIT SHALL BE FURNISHED.
- IF A PANELBOARD IS SUBSTITUTED FOR WHICH THE MANUFACTURER DOES NOT OFFER AN INTEGRALLY MOUNTED TVSS UNIT, THEN A STAND-ALONE, EXTERNALLY MOUNTED UNIT SHALL BE USED.
- THE EXTERNALLY MOUNTED UNIT SHALL BE INSTALLED SUCH THAT THE LEADS CONNECTED TO THE MAIN SERVICE BUS ARE NOT MORE THAN 8 FEET LONG.
- THE LEADS BETWEEN THE MAIN SERVICE BUS AND THE TVSS UNIT SHALL BE A MINIMUM OF #6AWG AND PROTECTED BY A 60A, 3-POLE CIRCUIT BREAKER.
- ALL TVSS UNITS SHALL PROVIDE BOTH LINE-TO-LINE AND LINE-TO-GROUND PROTECTION FOR ALL PHASES.
- THE TVSS SYSTEM DESIGN, INCLUDING CLAMPING VOLTAGES AND REPETITIVE SURGE CURRENT CAPACITIES, MUST COMPLY WITH NEMA LS 1-1992 (R2000). TVSS SYSTEM MUST BE SINGLE IMPULSE TESTED IN ALL MODES AT RATED CURRENTS BY AN INDUSTRY-RECOGNIZED TEST LABORATORY. PER IEEE C62.41.1-2002, C62.41.2-2002 AND C62.45-2002. TVSS SYSTEM MUST BE REPETITIVE SURGE TESTED PER MODE UTILIZING THE IEEE C62.41.2-2002 C3 COMBINATION WAVE AT ONE MINUTE INTERVALS WITHOUT SUFFERING MORE THAN 10% DEVIATION OF CLAMPING VOLTAGE AT A SPECIFIED SURGE CURRENT.

NEGEN ARCHITECTS 22517 178th Ave. Suite 200 Cold Spring, Minnesota 55320 TELEPHONE 320.685.3304 FACSIMILE 320.685.4039

DUFFY ENGINEERING AND ASSOCIATES, INC. STRUCTURAL - CIVIL - SURVEYING - MECHANICAL - ELECTRICAL 350 Highway 10 South Suite 101 St. Cloud, MN 56304 Phone: (320) 259-6575 Fax: (320) 259-6991 Email: mail@duffyeng.com

Mount Olivet Assembly of God 14201 Cedar Avenue South Apple Valley, MN 55124 952.432.4332

Table with 2 columns: REVISION, DATE. Multiple empty rows for revisions.

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 Engineer under the laws of the state of Minnesota. R. Scott Jones, P.E. 02/09/2007 25399 License No.

ELECTRICAL SPECIFICATIONS PROJECT NO: 06782 SCALE: NONE DATE: 02/09/2007 DRAWN BY: ALR CHECKED BY: RSJ DESIGN DEVELOPMENT E0.2 Duffy Project File: 06782