Point to Point Method of Short-Circuit Calculation (Three Phase)

Project Name – Demeris Barbecue

Starting Point – POLE TRANSFORMER

Ending Point – Service Disconnect

Step 1
AFC – Assumes Unlimited Primary Short-Circuit Current (Infinite Bus)
Transformer FLA – Formula (150 KVA x 1,000) ÷ (208 SV x 1.732) = 416 FLA
Transformer Multiplier TM – Formula (100) ÷ (0.9 x 2.0 %Z) = 55.56 TM
Transformer Let-Through Current TLC – Formula (((416 FLA x 55.56 TM) x 1.0 UA) ÷ 0 MC) = 23,113 TLC

Step 2
Conductor Factor CF – Formula (1.732 x 40 L x 23,113 TLC) ÷ (19,704 C x 2 N x 208 SV) = 0.195 CF
Conductor Multiplier CM – Formula (1) ÷ (1 + 0.195 CF) = 0.837 CM
Conductor Let-Through Current CLC – Formula (23,113 TLC x 0.837 CM) = 19,346 CLC

Start > | < AFC – Assumes Unlimited Primary Short-Circuit Current (Infinite Bus)

Transformer
< 150 KVA
verify with power company
< 23,113 TLC

< Length 40'
Steel Conduit
2 Conductor(s) Per Phase
350 MCM Cable CU

End > | < 19,346 CLC

KEY

%Z – Transformer Impedance Value Nameplate %Z
AFC – Available Fault Current
C – Conductor Constant
CF – Conductor Factor
CLC – Conductor Let-Through Current
CM – Conductor Multiplier
FLA – Transformer Full Load Amps
KVA – Kilovolt Amps
L – Length of Conductor
MC – Motor Short-Circuit Contribution
N – Number of Conductors Per Phase
SV – Secondary Voltage
TLC – Transformer Let-Through Current
TM – Transformer Multiplier
UA – Utility Adjustment 1.1 (Voltages May Vary 10%)

Prepared with Short-Circuit 2007 – Copyright Durand & Associates

6 SHORT CIRCUIT CALCULATION

LOAD ANALYSIS SERVICE

208 VOLT P–P
120 VOLT P–N
3 PHASE
4 WIRE

DESCRIPTION	LOAD CON. (KVA)	NEC (KVA)	PHASE A (AMPS)	PHASE B (AMPS)	PHASE C (AMPS)	NEUTRAL (AMPS)	REMARKS ON NEC CALCULATION
ELECTRIC HEAT	0.0	0.0	0.0	0.0	0.0	0.0	LESS THAN A/C
A/C REFRIGERATION	68.7	68.7	190.7	190.7	190.7	0.0	100% of CONNECTED
MISCELLANEOUS MOTORS	14.8	14.8	41.1	41.1	41.1	0.0	100% of CONNECTED
WATER HEATING	0.0	0.0	0.0	0.0	0.0	0.0	100% of CONNECTED
OUTDOOR LIGHTING	2.4	3.0	8.3	8.3	8.3	8.3	125% of CONNECTED
INDOOR LIGHTING	3.2	4.0	11.0	11.0	11.0	11.0	125% of the LARGER of CONNECTED OR TABLE 220–3(b)
RECEPTACLES	6.1	6.1	16.8	16.8	16.8	16.8	NEC TABLE 220–13
WINDOW LIGHTS	0.0	0.0	0.0	0.0	0.0	0.0	125% of CONNECTED
MISCELLANEOUS CONTINUOUS	1.8	2.3	6.3	6.3	6.3	6.3	125% of CONNECTED
MISCELLANEOUS NON–CONTINUOUS	1.8	1.8	5.1	5.1	5.1	5.1	100% of CONNECTED
KITCHEN EQUIPMENT	52.1	33.9	94.0	94.0	94.0	94.0	65% of CONNECTED
25% LARGEST MOTOR	7.3	7.3	20.3	20.3	20.3	0.0	25% of LARGEST MOTOR ADDED
*** TOTALS ***	158.2	141.8	393.7	393.7	393.7	141.6	
*** CAPACITY ***			600.0	600.0	600.0	600.0	
*** SPARE CAPACITY ***			206.3	206.3	206.3	458.4	

4 LOAD ANALYSIS

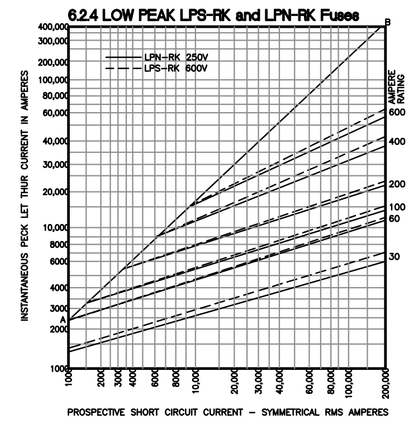
Short Circuit Notes:

1. NEW MAIN FUSED DISCONNECTS TO BE SYMMETRICAL RMS AMPERES RATED AT NO LESS THAN 65,000.
2. ALL ELECTRICAL PANELS AND PROTECTION DEVICES DOWN STREAM OF MAIN FUSED DISCONNECT TO BE NOT LESS THAN 14,000 AIC SYMMETRICAL RATED.
3. EXISTING 120/208 VOLT 3 phase TRANSFORMER AVAILABLE FAULT (SHORT CIRCUIT) CURRENT AS PER THE LIGHT COMPANY CALCULATIONS TO BE 19,346 AMPS. RELIANT ENERGY POWER REP.
4. CALCULATIONS HAVE BEEN DETERMINED WITH OUT IMPEDECNCE OF EXISTING AND NEW CONDUCTORS. PROSPECTIVE SHORT CIRCUIT DIAGRAM ILLUSTRATES NOT MORE THAN 10,000 AMPS WILL BE FEED THRU MAIN FUSED DISCONNECT UPON SHORT CIRCUIT.
5. ALL FUSES TO BE CURRENT LIMITING – LOW PEAK FUSES. TYPE AS SCHEDULED ON THIS SHEET. NO TIMED DELAY FUSES ARE ACCEPTABLE.
6. ALL ELECTRICAL SERVICE CONNECTIONS TO MEET LOCAL LIGHTING AND POWER MIN. SERVICE STANDARDS. NO EXCEPTIONS.

Current Limiting Effects:

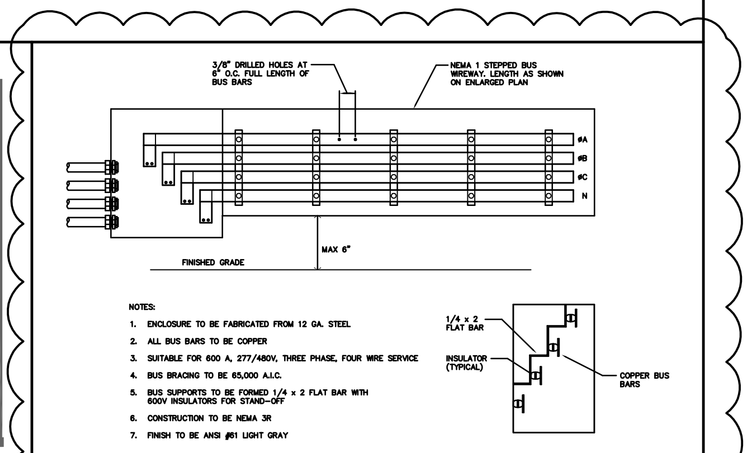
Current–Limiting Effects of RK1 Low–Peak Fuses						
*Prosp. S.C.C.	*Let–Thru Current (Apparent RMS Symmetrical) LPN–RK (600V) Fuse Ratings					
	30A	60A	100A	200A	400A	600A
5,000	980	1600	2100	3200	5000	5000
10,000	1200	2000	2550	4000	6750	9150
15,000	1400	2300	2900	4800	7850	10200
20,000	1500	2500	3150	5200	8350	11300
25,000	1600	2650	3400	5450	9150	12200
30,000	1650	2850	3550	5650	9550	12800
35,000	1750	2950	3750	5850	10000	13500
40,000	1850	3100	3900	6100	10450	13900
50,000	1950	3300	4150	6500	11300	15000
60,000	2050	3500	4350	6950	11950	16100
80,000	2250	3850	4800	7850	13000	17400
100,000	2450	4050	5200	8250	13900	18700
150,000	2750	4800	6100	9550	15900	21300
200,000	3000	5200	6500	10000	17400	23500
Current–Limiting Effects of RK1 Low–Peak Fuses						
*Prosp. S.C.C.	*Let–Thru Current (Apparent RMS Symmetrical) LPN–RK (250V) Fuse Ratings					

Peak Let Thru Current:



Low Peak LPS-RK + LPN-RK Fuses:

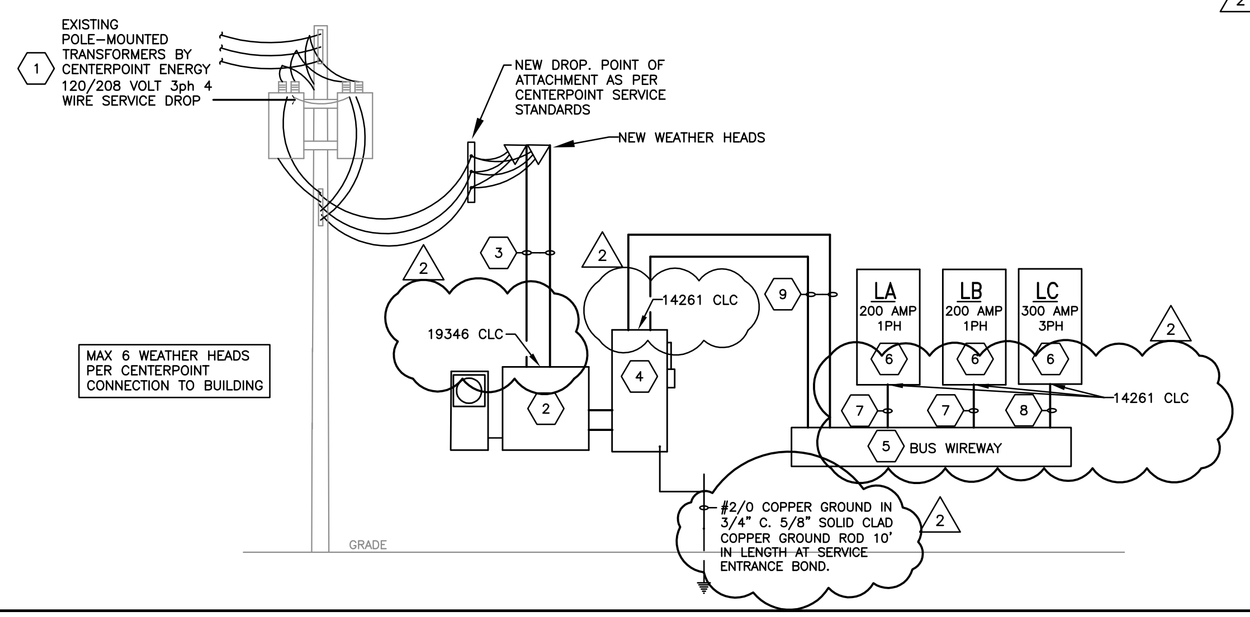
3 ELECTRICAL FUSES



2 STEPPED 600A BUS WIREWAY DETAIL

ELECTRICAL RISER KEYED NOTES

1. NEW 120/208 VOLT 3 PH 4 WIRE SERVICE RISER TO EXISTING TRANSFORMER BANK
2. NEW METER AND CT CAN AS PER CENTERPOINT ENERGY SPECIFICATIONS
3. NEW TWO SETS OF 4 #350 KCMIL IN 3" CONDUIT. ROUTE AT REAR OF BUILDING
4. NEW 600 AMP FUSED SERVICE DISCONNECT 600/600/3 NEMA 3R U.L. LISTED 65,000 AIC RATING
5. NEW 10"X10"X6 FT. WIREWAY SERVING ALL PANELS SERVICE SIDE OPEN TO SPACE BELOW PANELS
6. NEW PANEL. REFER TO SHEET E–4 FOR SCHEDULES
7. NEW 3 #3/0 AWG AND 1 #6 GND. IN 2" CONDUIT.
8. NEW TWO SETS OF 4 #1/0 AWG & #6 GND. IN 1–1/2" CONDUIT.
9. NEW TWO SETS OF 4 #350 KCMIL IN 3" CONDUIT. ROUTE #1 AWG GROUND AS PER DETAIL.



5 ELECTRICAL RISER DIAGRAM

OVERCURRENT and SAFETY DISCONNECT DEVICES FOR HVAC EQUIPMENT:

OVERCURRENT & DISCONNECT DEVICES SHOWN ON PLAN ARE BASED ON A SPECIFIC HVAC EQUIPMENT MANUFACTURER. HVAC CONTRACTOR MAY SUBMIT OTHER MANUFACTURERS. IT IS THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR TO COORDINATE OC/DISCONNECT DEVICES WITH THE HVAC CONTRACTOR PRIOR TO SUBMITTING SUCH DEVICES FOR ENGINEER'S REVIEW. ANY DEVIATIONS FROM SIZES SHOWN ON DRAWINGS MUST BE NOTED IN THE SUBMITTALS. THE ELECTRICAL CONTRACTOR MUST CERTIFY THAT HE HAS REVIEWED AND COORDINATED WITH HVAC CONTRACTOR AND THAT ALL OC/DISCONNECT DEVICES SUBMITTED MATCH THE HVAC EQUIPMENT REQUIREMENTS. SHOP DRAWINGS WITHOUT SUCH CERTIFICATION WILL BE RETURNED TO THE CONTRACTOR. ONLY SUBMITTALS WITH SUCH CERTIFICATION WILL BE REVIEWED

PAINT ALL ELECTRICAL DEVICES OUTSIDE OF BUILDING TO MATCH BUILDING COLOR. COODINATE WITH ARCHITECTURAL COLOR SPECS.

ELECTRICAL CONTRACTOR: COORDINATE ROUTING OF ELECTRICAL SERVICE WITH LOCAL LIGHTING & POWER COMPANY PRIOR TO CONSTRUCTION. GENERAL CONTRACTOR/ OR OWNER TO OBTAIN SERVICE OUTLET AGREEMENT WITH LOCAL POWER COMPANY PRIOR TO INSTALLATION

NOTE:

1. ELECTRICAL CONTRACTOR SHALL PROVIDE ALL STRUCTURAL SUPPORTS, BRACING AND UNISTRUT (HOT DIPPED GALVANIZED) NECESSARY TO ATTACH PANELS, METERS, WEATHERHEAD AND EQUIPMENT TO BUILDING WALL. ALL SUCH STRUCTURAL SHALL BE LOCATED AS REQUIRED ON BUILDING.
2. ALL ELECTRICAL EQUIPMENT CABINETS TO HAVE SAFETY EARTH ELECTRODE SYSTEM GROUND WITH 2AL–CU RATED CLAMPS OR CADWELDED CONNECTIONS. ALL ELECTRICAL EQUIPMENT CABINETS TO BE GROUNDED TOGETHER.
3. ELECTRICAL CONTRACTOR SHALL PAINT ALL STRUCTURAL SUPPORTS, BRACING AND UNISTRUT AND ALL ELECTRICAL DEVICES PANELS, METERS, WEATHERHEAD AND EQUIPMENT COLOR TO MATCH BUILDING COLOR. VERIFY WITH ARCHITECT.
4. ELECTRICAL CONTRACTOR COORDINATE ROUTING OF ELECTRICAL SERVICE WITH LOCAL POWER COMPANY PRIOR TO CONSTRUCTION.
5. CONTRACTOR SHALL USE FACTORY–PROVIDED ITEMS WHEREVER POSSIBLE. FABRICATED ITEMS SHALL NOT BE USED UNLESS APPROVED PRIOR TO INSTALLATION BY THE ENGINEER/ARCHITECT.

PART I. GENERAL PROVISIONS

1. SCOPE: PROVIDE ALL LABOR, MATERIAL AND EQUIPMENT IN ACCORDANCE WITH THESE SPECIFICATIONS, AND THE ACCOMPANYING DRAWING TO PROVIDE A COMPLETE AND PROPERLY AND PROPERLY OPERATING ELECTRICAL SYSTEM FOR THE BUILDING.

A. THE CONTRACTOR SHALL FURNISH AND INSTALL ALL OF THE FOLLOWING MATERIAL AND EQUIPMENT UNDER THIS DIVISION OF THE SPECIFICATIONS, UNLESS NOTED OTHERWISE: PANELBOARDS; LIGHTING FIXTURES; LAMPS; RACEWAYS; 600 VOLT WIRE AND CABLE; WIRING DEVICES; DEVICE PLATES; DEVICE, PULL AND JUNCTION BOXES; SAFETY SWITCHES; MOTOR STARTERS; LIGHTING CONTROLS; CIRCUIT BREAKERS; FUSES; TIME CLOCKS; EQUIPMENT IDENTIFICATIONS (NAMEPLATES AND DIRECTORIES); WIRE AND CABLE TERMINATIONS.

B. THE FOLLOWING MATERIAL AND EQUIPMENT WILL BE FURNISHED AND/OR INSTALLED BY OTHERS, OR UNDER OTHER DIVISIONS OF THE SPECIFICATIONS, UNLESS NOTED OTHERWISE: COMMUNICATION DEVICES, SECURITY COMMUNICATION DEVICES, SECURITY EQUIPMENT, POINT OF SCALE (POS) EQUIPMENT.

2. GENERAL REQUIREMENTS; ALL WORK SHALL PERFORMED BY SKILLED LICENSED ELECTRICIANS IN ACCORDANCE WITH THE BEST PRACTICES OF THE TRADE, MEETING THE REQUIREMENTS OF THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE, APPLICABLE FEDERAL, STATE AND LOCAL CODES AND THE REQUIREMENTS OF THE ELECTRICAL UTILITY COMPANY FURNISHING THE SERVICES. ALL NECESSARY CONSTRUCTION PERMITS AND CERTIFICATES OF INSPECTION SHALL BE PURCHASED AND OBTAINED UNDER THIS CONTRACT.

A. COORDINATION: ALL OUTLETS MUST BE ACCURATELY LOCATED, REVIEW THE ARCHITECTURAL, PLUMBING AND HEATING AND VENTILATING PLANS IN ORDER TO COORDINATE THIS WORK WITH OTHER TRADES, AND COOPERATE WITH THEM IN THE ENTIRE INSTALLATION.

PART II. MATERIALS

1. MATERIALS; ALL MATERIALS SHALL BE NEW AND OF THE QUALITY INDICATED BY THE SPECIFIED BRAND NAMES. SUBSTITUTIONS OF MATERIAL OF EQUAL QUALITY BY OTHER MAJOR MANUFACTURERS OF COMMERCIAL EQUIPMENT MAY BE ACCEPTABLE PROVIDED A LIST OF SUCH SUBSTITUTIONS IS APPROVED IN WRITING BY THE ARCHITECT AND ENGINEER. THE CONTRACTOR SHALL SUBMIT A SUBSTITUTION LIST FOR APPROVAL.

A. PANEL BOARDS: PANEL BOARDS SHALL BE BOLT–IN CIRCUIT BREAKER TYPE, AS SHOWN ON THE PLANS. PANELS SHALL BE OF PANEL BOARD CONSTRUCTION, 20 INCHES WIDE (MINIMUM), 5–3/4" TO 6–1/2" DEEP, UL LISTED, AND MEET UL 67, UL 50, AND FEDERAL SPECIFICATION W–P–115B AS TYPE 1, CLASS 1, WITH BOLT–ON CIRCUIT BREAKERS, COPPER OR TIN–PLATED ALUMINUM BUS BARS, NEUTRAL BUS, GROUND BUS AND A HINGED LOCKABLE DOOR. CABINETS SHALL BE CODE GAUGE, GALVANIZED STEEL, MOUNTED AS SHOWN. PROVIDE TYPEWRITTEN CIRCUIT DIRECTORIES WITH CLEAR PLASTIC PROTECTORS IN ALL PANELS, ALL WIRES SHALL BE TAGGED WITH PANEL AND CIRCUIT NUMBERS. APPROVED MANUFACTURERS PANELS ARE SQUARE D/TELEMECHANIQUE, CUTLER–HAMMER, GENERAL ELECTRIC, AND SIEMENS (1–T–E).

B. LIGHTING FIXTURES: ALL LIGHTING FIXTURES SHALL BE UL LISTED, COMMERCIAL QUALITY. FLUORESCENT LIGHTING FIXTURES SHALL BE METALUX, DAYBRITE, COLUMBIA, LIGHTOLIER OR EQUAL. INCANDESCENT LIGHTING FIXTURES SHALL BE HALO, OMEGA, CAPRI, PRESCOLITE, LIGHTOLIER, MARCO, OR EQUAL. HID LIGHTING FIXTURES SHALL BE, EMCO, GENERAL ELECTRIC, HADCO, HUBBELL OR EQUAL. EXIT/EMERGENCY LIGHTING FIXTURES SHALL BE SURE–LITES, CHLORIDE, LIGHTOLIER, DUAL–LITE, EMERGINCY–LITE, HUBBELL, OR EQUAL.

C. LAMPS: ALL NEW FLUORESCENT LAMPS (F32T8) SHALL BE 3500 DEGREE K COLOR TEMPERATURE, 2950 MIN INITIAL LUMENS, 20,000 HOURS RATED LIFE, AND 78 MIN CRI, UNLESS NOTED OTHERWISE.

D. WIRING DEVICES: ALL WIRING DEVICES SHALL BE UL LISTED, COMMERCIAL SPECIFICATION GRADE, SWITCHES SHALL BE RATED 20 AMPS AT 120/277 VOLTS, AC. STANDARD RECEPTACLES SHALL BE 15 AMP, DUPLEX, GROUNDING TYP, IN NEMA CONFIGURATIONS, UNLESS NOTED OTHERWISE. SWITCHES IN THE SAME LOCATION SHALL BE STAINLESS STEEL. APPROVED MANUFACTURERS OF SWITCHES AND RECEPTACLES ARE HUBBELL, ARROW HART, BRYANT, LEVITON, PASS & SEYMOUR. GENERAL ELECTRIC, SLATER, OR EQUAL.

1. SWITCHES RE; SCHEDULE
   a. SINGLE POLE: BRYANT 4521–I, OR EQUAL.
   b. THREE WAY: HUBBELL CS320–I, OR EQUAL.
2. RECEPTACLES RE; SCHEDULE
   a. NEMA 5–15R: ARROW HART CR151, OR EQUAL.
   b. NEMA 5–15R–IG: HUBBELL IG–5262–I, OR EQUAL.
   c. NEMA 5–15R–IG/SS: PASS & SEYMOUR IG–6262–OSP, OR EQUAL.
   d. NEMA 5–15R–GFCI: LEVITON 6598–I, OR EQUAL.
   e. NEMA 6–20R: BRYANT 5451–I, OR EQUAL.
   f. SAFETY (TAMPER RESISTANT): ARROW HART 63521, OR EQUAL.
   g. OTHERS: COMMERCIAL OR INDUSTRIAL GRADE, UL LISTED.
3. WP PLATES: WEATHERPROOF OUTLET COVERS THAT ARE WEATHERPROOF ONLY WHEN A SELF–CLOSING COVER IS CLOSED ARE PERMITTED UNDER NEC ARTICLE 410.

E. MOTOR STARTERS: ALL NEW MOTOR CONTROLLERS SHALL BE UNDERWRITERS LABORATORIES (UL) LISTENED AND LABELED, AND CONFORM WITH APPLICABLE STANDARDS OF UL (PUBLICATION #508), ANSI/NEMA ICS1, ANSI/NEMA ICS2, IEEE, NFPA, FEDERAL SPECIFICATIONS, AND OTHER APPLICABLE INDUSTRY STANDARDS. MOTOR STARTERS SHALL BE COMBINATION, AC, MAGNETIC, FULL VOLTAGE, NON–REVERSING (FNVR), RATED IN ACCORDANCE WITH NEMA (NOT IEC) STANDARDS IN THE SIZES REQUIRED. EACH STARTER SHALL BE SUPPLIED IN A NEMA 1 ENCLOSURE, WITH A LOCKABLE DISCONNECT HANDLE. EACH STARTER SHALL HAVE EITHER A MOTOR CIRCUIT PROTECTOR (MCP), OR A FUSIBLE DISCONNECT WITH DUAL ELEMENT CURRENT LIMITING FUSES. OVERLOAD RELAYS SHALL BE MANUAL RESET, MELTING ALLOY TYPE WITH THERMAL UNITS SIZED FOR THE ACTUAL MOTOR NAMEPLATE FULL LOAD AMPS. EACH STARTER SHALL BE CAPABLE OF ACCEPTING UP TO FOUR ADDITIONAL EXTERNAL NUMBER OF AUXILIARY CONTACTS. STARTERS SHALL BE FURNISHED OR AT LEAST TWO AND HORSEPOWER SHOWN ON THE DRAWINGS. CONTROL POWER SHALL BE 120 VOLT AC AND FUSED. ALL CONTROLS FOR THE STARTERS SHALL BE REMOTE, EACH MOTOR STARTER SHALL A UL LISTED WITHSTAND RATING THAT MEETS OR EXCEEDS THAT OF THE UPSTREAM PANEL. CUTLER–HAMMER/EATON, FURNACE ELECTRIC, GENERAL ELECTRIC, SIEME/SITE, SQUARE D/TELEMECHINIQUE, WESTINGHOUSE ELECTRIC, OR EQUAL.

F. MOTOR CONTROL DEVICES: CONTROL DEVICES SHALL BE HEAVY DUTY, OIL–TIGHT, WATERTIGHT, 60 AMPS MAKE, 6 AMPS BREAK, 600 VOLT AC, I IN A NEMA 4 ENCLOSURE ON THE HOOD. SELECTOR SWITCHES SHALL HAVE MULTIPLE CONTACT BLOCKS AS REQUIRED. CONTROLS SHALL BE SQUARE D CLASS 9001. TYPE K, ALLEN–BRADLEY, FURNACE, CUTLER HAMMER, OR EQUAL.

G. TRANSFORMER TO BE DRY–TYPE WITH NATURAL DRAFT VENTILATION. UNITS TO BE RATED FOR 480 VOLTS, 3 PHASE, 3 WIRE PRIMARY, AND 120/208 VOLTS, 3 PHASE, 4 WIRE SECONDARY, UNLESS OTHERWISE INDICATED. UNITS TO BE DESIGNED FOR 60 HERTZ OPERATION, WITH KVA CAPACITIES AS SHOWN ON DRAWINGS. TRANSFORMERS TO CONFORM WITH APPLICABLE NEMA AND ANSI STANDARDS, AND BE UL LISTED. TRANSFORMERS TO HAVE CLASS H INSULATION, HIGH GRADE SILICONE STEEL CORES, AND BE RATED FOR A MAXIMUM TEMPERATURE RISE OF 115 DEGREES C. UNITS RATED 30 KVA AND LARGER SHALL HAVE FOUR 2–1/2% TAPS BELOW NORMAL AND TWO 2–1/2% TAPS ABOVE NORMAL. UNITS RATED LESS THAN 30 KVA TO TWO 5% TAPS BELOW NORMAL. SOUND LEVELS GENERATED BY TRANSFORMERS ARE NOT TO EXCEED THE FOLLOWING VALUES: 9 KVA AND LESS –40 db, 10 TO 45 KVA –42 db, 50 TO 150 KVA –45 db. ACCEPTABLE MANUFACTURERS

2. CONDUIT AND FITTINGS: CONDUIT Permitted (A) RIGID GALVANIZED, (B) EMT, (C) PVC, AND (D) EMT. TYPES UTILIZED SHALL BE RUN ONLY AS PERMITTED PER CODE, ALL WIRING SHALL BE RUN IN CONDUIT. CONDUIT PLACED IN CONCRETE OR RUN UNDERGROUND SHALL BE RIGID WALLS ABOVE GRADE MAY BE PVC. CONDUIT EXPOSED OR RUN IN MASONRY WALLS ABOVE GRADE MAY BE PVC OR EMT HERE ALLOWED BY LOCAL CODES. IF EMT IS NOT PERMITTED, RIGID SCREWED GALVANIZED PIPE CONDUIT AND FITTINGS SHALL BE USED. OF SHIELDED CABLE IS REQUIRED FOR CONTROL CIRCUITRY, IT SHALL BE TAN, GREY OR ANY NEUTRAL COLOR OTHER THAN THAT AS SPECIFIED FOR POWER DISTRIBUTION. NO CONDUIT SMALLER THAN 3/4" SHALL BE INSTALLED EXCEPT FOR TWO–WIRE SWITCH LEGS. ALL CONDUIT BENDS SHALL BE FREE FROM DENTS AND KINKS. ALL CONDUITS SHALL BE ELECTRICALLY CONTINUOS FROM THE SERVICE EQUIPMENT TO ALL OUTLETS, AND SHALL BE SECURED TO ALL METAL BOXES WITH ONE LOCK NUT OUTSIDE, AND ONE INSIDE THE BOX WITH A REINFORCED BAKELITE BUSHING. IF PVC, OR ENT, IS USED, THEN APPROPRIATE SIZED, ELECTRICALLY CONTINUOS, BOND WIRES SHALL BE RUN FROM THE SERVICE EQUIPMENT TO ALL OUTLETS, AND SHALL BE SECURED TO EACH WIRING DEVICE PER THE NATIONAL ELECTRICAL CODE. WHERE CONNECTIONS ARE TO BE MADE BETWEEN CONDUIT TERMINATION'S AND MOTORS, EQUIPMENT, OR APPARATUS NECESSITATING FLEXIBLE CONNECTIONS, APPROVED FLEXIBLE CONDUIT SHALL BE USED. OUTDOOR CONNECTIONS TO FANS, HVAC UNITS, OR ROTATING EQUIPMENT SHALL BE MADE WITH HELICAL WOUND, LIQUID TIGHT, FLEXIBLE STEEL CONDUIT. EXCEED FIVE (5) FEET. DURING CONSTRUCTION, CONDUIT SHALL BE KEPT FREE OF ALL FOREIGN MATTER BY USE OF CAPPED BUSHINGS ON ALL TURNED UP ENDS. PAPER OR WOOD PLUGS ARE NOT ACCEPTABLE FOR THIS PURPOSE.

3. WIRE AND CABLES: ALL WIRE AND CABLES SHALL BE UNDERWRITERS LABORATORIES LISTED, AND LABELED. AND CONFORM WITH APPLICABLE STANDARDS OF UL (44, AND 83), NEMA (WC–5, AND WC–7), IPCEA (S–61–402, AND S–66–524), FEDERAL SPECIFICATIONS (J–C–30A(1), AND HH–I–595C), AND OTHER APPLICABLE INDUSTRY STANDARDS. CONNECTORS AND LUGS SHALL MEET UL PUBLICATIONS 486. ALL BRANCH CIRCUIT WIRING SHALL BE 600 VOLT, COPPER, 60 DEGREE C (MIN), TYPE THHN/THWN WITH A MINIMUM SIZE OF #12 AWG, UNLESS NOTED OTHERWISE. WIRE SIZES OF #6 AWG AND LARGER SHALL BE STRANDED. SERVICE AND FEEDER CABLES SHALL BE 600 VOLT, STRANDED COPPER, 75 DEGREE C (MIN), TYPE XHHW. ALL KITCHEN EQUIPMENT CIRCUITS SHALL HAVE A SEPARATE GROUND CONDUCTORS. PROVIDE BARE OR GREEN–INSULATED GROUND WIRE IN ALL RACEWAYS, CABLE ASSEMBLIES, AND WHERE NOTED. SIZE EQUIPMENT GROUNDS PER TABLE 250–95 OF THE NATIONAL ELECTRICAL CODE. INSULATION COLOR CODES SHALL BE PER N.E.C.

A. ALL WIRING SHALL BE INSTALLED IN CONDUIT, EXCEPT WHERE SPECIFICALLY SHOWN ON THE DRAWINGS. NONMETALLIC (TYPE NM) CABLE IS NOT PERMITTED.

B. ALL BRANCH CIRCUIT COMMUNICATION, SIGNALING, AND CONTROL BE ROUTED ABOVE THE CEILING. VERIFY WHETHER OR NOT THE SPACE WIRING TO THE KITCHEN, FIRE PROTECTION, AND OTHER EQUIPMENT SHALL ABOVE THE CEILING IS USED AS A SPACE FOR RETURN AIR FOR THE ENVIRONMENTAL AIR SYSTEM. IF IT IS USED FOR RETURN AIR, PROVIDE APPROVED RACEWAYS FOR ALL OVERHEAD WIRING PER NEC ARTICLE 300, IF IT IS NOT "OTHER SPACE USED FOR ENVIRONMENTAL OF NEC ARTICLES 725 AND 760 MAY BE RUN WITHOUT RACEWAYS, UNO. ALL SAFETY CONTROL WIRING FOR FIRE PROTECTION SYSTEMS, SHUNT TRIPS, ETC. SHALL BE RUN IN A RACEWAY IN ACCORDANCE WITH NEC ARTICLE 725.

4. SITE Lighting THE G.C. WILL FURNISH THE SITE LIGHTING PACKAGE, AS REQUIRED FOR THE SPECIFIC LOCATION, UNDER THIS SPECIFICATION SECTION, PROVIDE 1" RIGID GALVANIZED STEEL ELECTRICAL CONDUIT, AND THE REQUIRED WIRING FROM THE PANEL TO THE POLE. SET FIXTURES AND POLES ON CONCRETE BASES, AS PROVIDED UNDER SPECIFICATION SECTION 3A: CONCRETE. GROUND/BOND ALL SUIT LIGHTING FIXTURES/POLES FOR PER THE NEC. THE BRANCH CIRCUIT CONDUCTORS SHALL BE INCREASED FROM #10 AWG TO #8 AWG IF THE HORIZONTAL DISTANCE FROM THE PANEL TO THE POLE IS GREATER THAN EIGHTY (80) FEET. ALL SITE LIGHTING SHALL BE CONTROLLED THROUGH THE LIGHTING CONTROL SYSTEM SHOWN ON THE DRAWINGS. REFER TO THE SITE PLAN FOR QUANTITY AND LOCATION OF ALL SITE LIGHTING. SET FIXTURES AS SPECIFIED, AND AIM AFTER DARK FOR UNIFORM LIGHT DISTRIBUTION.

5. EMPTY CONDUIT: LEAVE A #12 AWG PULL WIRE IN ALL EMPTY CONDUITS.

6. BOXES AND WIRE WAYS: ALL JUNCTION BOXES, PULL BOXES, WIRE WAYS, ETC, SHALL BE SIZED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE.

7. EQUIPMENT IDENTIFICATION: PROVIDE NAMEPLATES FOR ALL PANEL BOARDS, MOTOR STARTERS, CONTROLS, AND OTHER ELECTRICAL EQUIPMENT. EQUIPMENT VISIBLE TO THE PUBLIC SHALL BE IDENTIFIED WITH ENGRAVED LAMINATED NAMEPLATES ATTACHED WITH STAINLESS STEEL FASTENERS, ELECTRICAL EQUIPMENT. EQUIPMENT VISIBLE TO THE PUBLIC SHALL BE IDENTIFIED WITH ENGRAVED LAMINATED NAMEPLATES ATTACHED WITH STAINLESS STEEL FASTENERS. ELECTRICAL EQUIPMENT NOT VISIBLE TO THE PUBLIC MAY BE NEATLY IDENTIFIED WITH BLACK PERMANENT MARKERS TO MATCH EXISTING FACILITY DEVICES (EST). COORDINATE EXACT REQUIREMENTS.

PART III. EXECUTION

1. TESTS: MAKE ALL TEST NECESSARY TO ENSURE THAT THE ENTIRE INSTALLATION IS FREE FROM IMPROPER GROUNDS, AND FROM SHORTED AND/OR OPEN CONDUCTORS. VOLTAGE, CURRENT, AND ROTATION TESTS SHALL BE MADE BEFORE ANY MOTORS ARE PLACE IN OPERATION. ALL LOADS SHALL BE BALANCED ACROSS PHASES. CHECK TO SEE THAT ALL LIGHTS WORK, AND ARE CONTROLLED BY SWITCHES INDICATED ON DRAWINGS, OR CIRCUIT BREAKERS SO INDICATED ON PANEL SCHEDULE.

2. GUARANTEE: FURNISH A GUARANTEE IN WRITING TO THE OWNER THAT ALL MATERIAL SAND WORKMANSHIP FOR A PERIOD OF ONE (1) YEAR FROM DATE WORK EXECUTED UNDER THIS SECTION IS FREE FROM DEFECTS OF FINAL ACCEPTANCE. IN ADDITION, DURING THE TERM OF THIS GUARANTEE, THE REPAIR AND/OR REPLACEMENT OF ANY DEFECTIVE WORK, AND ALL RESULTING DAMAGES SHALL BE MADE AT NO ADDITIONAL EXPENSE TO THE OWNER.

3. CLEANUP: LEAVE THE ELECTRICAL PORTION OF THE WORK IN A CLEAN AND FINISHED CONDITION.

4. SHOP DRAWINGS: PROVIDE SHOP DRAWINGS FOR THE FOLLOWINGS ITEMS: PANEL BOARDS, LIGHTING FIXTURES, MOTOR STARTERS, TWO STAGE LIGHTING CONTROL UNIT.

5. AS–BUILT DRAWINGS: MAINTAIN AS–BUILT DRAWINGS, UPDATED DAILY DURING CONSTRUCTION, AND PRESENT THE OWNER WITH ONE SET UPON COMPLETION. PROVIDE THE OWNER'S PERSONNEL WITH ON–SITE INSTRUCTION IN THE OPERATION AND MAINTENANCE OF THE COMPLETED ELECTRICAL SYSTEM. PROVIDE THE OWNER WITH A OPERATION AND MAINTENANCE (O & M) MANUAL COVERING THE FOLLOWING ITEMS OF ELECTRICAL EQUIPMENT: MOTOR STARTERS.

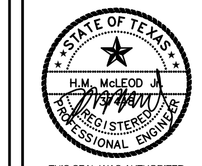
1 ELECTRICAL SPECS

ISSUE	DATE	DESCRIPTION
	06/29/11	PERMIT / CONSTRUCTION
1	10/13/11	PERMIT / CONSTRUCTION
2	11/16/11	CITY COMMENTS

PROJECT:

CONSTRUCTION FOR
Demeris Barbecue
1702 West Loop North
Houston, Texas 77092

ENGINEER:



THIS SEAL WAS AUTHORIZED THIS DATE: 11/16/11

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