DEVIER CONSTRUCTION

P.O. Box 9150, Mandeville, LA 70470 ~ 1932 Surgi Drive, Suite F, Mandeville, LA 70448
Main Office (985)612-2900 ~ Main Fax (985)612-2901
www.DevierConstruction.com

LETTER OF TRANSMITTAL

Date 02/18/2010	Job No. 837
Attention: Kirt Dammon	
Reference No. 1480	
RE: NOLA City Park Admin Bldg. Project #01-107-05B-13 Part BZ #1 Palm Drive New Orleans LA 70124	

TO **Gulf Coast Electric Co LLC**
1095 Florida Ave.
Slidell LA 70458

WE ARE SENDING/RETURNING YOU ☐ **Attached**
☐ **Under separate cover via** US Mail **the following items:**

☐ **Submittal**

Item	Quantity	Description	Date Required
1	1	Electrical Coordination Study Submittal Package	

THESE ARE TRANSMITTED: ☐ **For your Use**

Date Sent: 02/18/2010
Date Returned:

REMARKS:

RECEIVED BY	DATE	SIGNED BY	DATE

If enclosures are not as noted, please notify us at once.

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Main Office (985)612-2900 ~ Main Fax (985)612-2901
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Submittal

Submittal#: 837-70

Submittal Date: 02/02/2010

License: 35478

To: Waggonner & Ball Architects, APC
2200 Prytania Street
New Orleans LA 70130

Project: 837
NOLA City Park Admin Bldg.
Project #01-107-05B-13 Part BZ
#1 Palm Drive
New Orleans LA 70124

Prepared By: Jayme Guerra

Item	Description	Action Required	Date Required
1	16052-01 Electrical Coordination Study	Approved	02/09/2010

Please sign and date this form as proof that you are in receipt of the above listed items.
Return form to Devier Construction LLC

Signed: ______________________ Date: __________

NU-LITE *Electrical* WHOLESALERS, LLC

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NAED MEMBER

☒ NO EXCEPTION TAKEN ☐ MAKE CORRECTION NOTED
☐ REJECTED ☐ REVISE AND RESUBMIT
☐ SUBMIT SPECIFIED ITEM

Checking is only for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Any action shown is subject to the requirements of the plans and specifications. Contractor is responsible for: dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction; coordination of his work with that of all other trades, and the satisfactory performance of his work.

ASSOCIATED DESIGN GROUP, INC.
CONSULTING ENGINEERS

DATE 2/9/10 BY [signature]

JOB: CITY PARK ADMINISTRATION BUILDING
NEW ORLEANS, LOUISIANA
ELEC. CONTR.: GULF COAST ELECTRIC COMPANY LLC
SUBMITTAL: DISTRIBUTION EQUIPMENT (COORDINATION STUDY)

Project # 01-10725 B-13 Part B2

DEVIER CONSTRUCTION, L.L.C.
WE HAVE REVIEWED THE FOLLOWING MATERIALS & PLANS FOR COMPLIANCE & CONFORMANCE PER THE ARCHITECT AND DESIGN ENGINEERS PLANS & SPECIFICATIONS

JOB#: 837 JOB NAME:
SPEC SECTION: 16052 01

DEVIER ACTION:
☒ REVIEWED
☐ REVIEWED AS NOTED
☐ RETURN & RESUBMIT

SUBMITTED FOR:
☒ APPROVAL
☐ REVIEW & COMMENT
☐ AS REQUESTED

DATE: 2-2-10 BY: [signature]

02-01-10

P. O. BOX 23581 • HARAHAN, LOUISIANA 70183 • (504) 733-3300

SQUARE D

by Schneider Electric

Square D Engineering Services

2365 Harrodsburg Road, Suite B325
Lexington, KY 40504
(859) 296-3600

DATE: January 20, 2010

TO: Mike Slobodzian / New Orleans Field Office

FROM: Michael King / Square D Engineering Services

SUBJECT: New Orleans City Park Administration Building
New Orleans, LA
F.O.# 26886800-038
Project# 9639

Dear Mike,

The report for a Square D Engineering Services analysis performed for this site has been completed.

I appreciate the opportunity to have worked with you on this project. If you have questions, concerns, or require further assistance, please do not hesitate to contact me.

Regards,

Michael King

SQUARE D

by Schneider Electric

Square D Engineering Services

2365 Harrodsburg Road, Suite B325
Lexington, KY 40504
(859) 296-3600

SHORT-CIRCUIT & OVERCURRENT DEVICE COORDINATION ANALYSES

New Orleans City Park Administration Building
New Orleans, LA

Prepared by
Michael King

Reviewed by
Antony C. Parsons, P.E.
Square D Engineering Services

Square D Engineering Services Job Numbers	-	January 20, 2010
Q2C: 26886800-038	Rev. 1	-
Project: 9639	Rev. 2	-
	Rev. 3	-

ELECTRICAL CONTRACTOR — Gulf Coast Electric

DISTRIBUTOR — Nu-Lite Electrical Wholesalers Inc.

SQUARE D FIELD ENGINEER — Mike Slobodzian / New Orlean:

FILE: 9639 Report

STATE OF LOUISIANA
ANTONY C. PARSONS
License No. 33780
PROFESSIONAL ENGINEER
IN
ELECTRICAL ENGINEERING

P.E.
1/25/2010

The following power systems engineering report was prepared by Square D Engineering Services utilizing industry-accepted standards, practices, methodologies, and analysis tools. Data used in this analysis was acquired by Square D Engineering Services and provided by others, through onsite discovery, published information, equipment nameplates, manufacturer ratings, testing, analysis, or other means. Square D Engineering Services assumes no responsibility for inaccuracies in data provided by others. The study is intended for use by qualified individuals to facilitate the installation, operation, maintenance, and safety of the electrical power system depicted. Modification of equipment, changes to system configuration, adjustment of protective device settings, or failure to properly maintain equipment may invalidate these results.

TABLE OF CONTENTS

1 EXECUTIVE SUMMARY

1.1 Introduction

This report documents the results of a Square D Engineering Services analysis for the New Orleans City Park Administration Building in New Orleans, LA. All studies were performed using the Power*Tools for Windows Software, version 6.5.1.4.

Data was obtained from the sources listed in the "REFERENCES" section at the end of the report. Abbreviations and trademarks referenced throughout this report are also listed in an appendix.

The system short-circuit analysis evaluates the adequacy of the distribution equipment shown on the enclosed one-line diagram to withstand or to interrupt the calculated maximum available short-circuit current at its location.

The overcurrent device time-current coordination analysis determines the suggested settings and, where appropriate, the ampere ratings and types for the electrical power system protective devices to achieve the desired system protection and electrical service continuity goals.

This report supersedes and invalidates results from any study, performed by Square D Engineering Services or any other entity, for the scope of equipment being reviewed.

Electrical system changes within the facility or in the utility system can have a significant impact on the results of this power system analysis, which is a "snapshot" of as-found system conditions. As such, it is recommended that this analysis be re-evaluated on a regular basis, not to exceed 5 years, to account for electrical system changes. Failure to properly maintain equipment may invalidate these results.

1.2 Scope of Work

The scope of this study is limited to that equipment shown on the study one-line diagram located in the back of the report. Unless specifically required by job specifications, branch circuit utilization equipment, as defined per NEC Article 100, was not included in this study (this may consist of small equipment, 100A and less, such as: safety switches, industrial control panels, and enclosed starters/drives).

This study does not include future generator equipment.

1.3 Results and Recommendations

Short-circuit:

The results of the short-circuit analysis show that the equipment considered in the study is adequately rated for the projected fault current levels.

For further discussion regarding these results, please refer to the Short Circuit Analysis Results and Recommendations section.

Coordination:

The coordination study showed that for the most part, a high degree of selectivity was achieved among devices in the system except for TCCs: 01.tcc and 02.tcc.

The breakers in the system should be set to the recommended levels. For further discussion regarding these results, please refer to the Time Current Coordination Analysis of Results and Recommendations.

Other:

Other issues, which are not formally in the scope of work, were observed in the course of analysis. These could be NEC compliance issues, equipment having poor condition of maintenance, or some other critical factor.

Refer to <u>each</u> subsequent “Analysis of Results and Recommendations” section for further details. If these issues are addressed by equipment, conductor, or device settings changes, the power system study results may need to be re-evaluated in a revision to this study.

2 SHORT-CIRCUIT ANALYSIS

2.1 General Procedure

An electrical system short-circuit analysis is used for the following:

1) To compare the calculated maximum fault current with the interrupting ratings of overcurrent protective devices such as fuses and circuit breakers.

2) To investigate applicable short-circuit series ratings and the protection of electrical equipment by current-limiting devices.

3) To verify the adequacy of other equipment, such as switches and equipment bussing, to withstand the effects of the calculated maximum fault current levels.

4) To assist in the selection and/or determination of settings for relays, fuses and circuit breakers.

This analysis was made utilizing SKM Power Tools software. The software was programmed to calculate the maximum available three-phase, RMS symmetrical, short-circuit amperes at each piece of equipment in the system. The calculation procedures are based on recommendations included in ANSI/IEEE standards C37.13, C37.010, and C37.5.

The AFAULT module of the Power*Tools software simulates a bolted three-phase fault at each point of consideration in the system and calculates the maximum available short-circuit current at that point without any reduction due to current-limiting overcurrent devices which may be present. (However, the effects of current-limiting devices are considered when determining the adequacy of the equipment.) The calculated short-circuit values are RMS symmetrical amperes and are comparable with the RMS symmetrical short-circuit ratings of electrical equipment.

Electrical distribution equipment must be able to withstand and/or interrupt the most severe fault duty that it may be subjected to at its location in the system. In particular, NEC Section 110.9 requires circuit breakers to have a rating sufficient for interrupting the maximum available fault current present at their line side terminals. For locations where calculated fault currents exceed the ratings of the equipment, recommendations for corrective actions are provided.

Equipment short-circuit withstand and interrupting ratings are expressed in symmetrical RMS current. However, fault currents are not purely symmetrical in practice, as system inductance introduces a degree of asymmetry for at least the first few cycles of a fault. The magnitude and duration of this asymmetrical component depends on several factors, including characteristics of system components (conductors, transformers, and loads) and the exact point on the current waveform that the fault begins—the level of asymmetry even differs from phase to phase in a three-phase system. Because of the uncertainty in asymmetry for a given fault event, the capability of devices to interrupt asymmetrical fault current is based on the maximum possible asymmetrical fault current level at the point of application. The more inductive the circuit, as measured by the calculated system X/R ratio, the more asymmetrical the fault current can be. If the calculated X/R level exceeds a certain level, then the increased asymmetrical duty must be taken into account when breaker ratings are assessed.

Low-voltage circuit breakers and fuses are tested to establish their interrupting ratings based on a circuit with a fixed X/R ratio, as defined in the various product standards (UL and ANSI). For example, an ANSI low-voltage power circuit breaker is tested in a circuit with an X/R ratio of 6.591. If such a breaker is applied at a system bus with a calculated X/R ratio of 6.591 or less and the calculated RMS symmetrical fault current is within the symmetrical interrupting rating of the breaker, then it is assumed that the breaker is also able to interrupt and withstand the asymmetrical current resulting from a fault at that location. If a low voltage breaker is applied at a location with an X/R ratio greater than that of the design test circuit, the calculated fault current must be multiplied by an adjustment factor that accounts for this. This resultant "fault duty," which is greater than the calculated fault current, is then compared to the breaker's interrupting rating in order to determine if the breaker is adequately rated. Different classes of low-voltage breakers have different test X/R values, and each type has its own set of multiplication factors. Design test circuit power factors and associated X/R ratios are as shown in Table 1. The SKM low-voltage short-circuit output report shows the calculated fault duty levels calculated at each bus, and when these values differ from the calculated short-circuit current levels, they are used in the device evaluation tables. See IEEE 1015-1997, *IEEE Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems*, for additional details.

Table 1: Summary of Test Power Factor and X/R Values for LV Devices.

Device	pf	X/R Ratio
Power circuit breaker, unfused	0.15	6.591
Power circuit breaker, fused	0.20	4.899
Molded case breaker, interrupting rating greater than 20000 A	0.15-0.20	6.591-4.899
Molded case breaker, interrupting rating 10001 to 20000 A	0.25-0.30	3.9-3.18
Molded case breaker, interrupting rating 10000 A and less	0.45-0.50	2.0-1.732

For power circuit breakers, the power factors are taken from ANSI/IEEE C37.13. For molded case breakers, the power factors are taken from NEMA standard AB1. Since the NEMA standard specifies a range of test circuit power factors, the highest value (lowest X/R ratio) is used to determine the multiplying factor. This produces the most conservative (largest) factor.

The included one-line diagram is a simplified version of the system drawings, showing only those parts of the electrical system under consideration. The various circuit locations on the diagram have been labeled with bus identification numbers so input data could be supplied to the computer and the computer output could be readily interpreted.

2.2 Data Used in the Calculations

2.2.1 Power Company Data

Entergy has advised that their system is capable of delivering a maximum available three-phase short-circuit current of 18,518A at 14,440V with an assumed X/R ratio of 8. These values determined the starting point for the analysis.

2.2.2 Cable Data

The "FEEDER INPUT DATA" computer printouts list the conductor (cable and/or busway) data used for each circuit segment. Included are lengths, number per phase, size, conductor material, cable insulation type, conduit material and resistance and reactance values. Also, conductor lengths, number per phase, and size and conductor material are recorded on the one-line diagram.

Resistance values are based on 25 degrees Celsius (room temperature) rather than the full load temperature usually shown in descriptive literature since short-circuits can occur when the circuit is initially energized or lightly loaded as well as when fully loaded. The resistance and reactance values are typical values obtained from a study of data from various conductor manufactures. Values are tabulated according to whether several single conductors or one multiple conductor is used and whether the conduit is steel, aluminum or plastic.

2.2.3 Transformer Data

Square D transformer percent impedance and typical X/R ratio values were used for all transformers. The exact R and X component values used are shown on the "TRANSFORMER INPUT DATA" printouts.

2.2.4 Motor Contribution To Short-Circuit Current

Motor contribution to the short-circuit current is taken into account in this short-circuit analysis. During the first few cycles of a fault, running motors act as generators and produce a current which will combine with the source short-circuit current flowing to the fault as illustrated in Figure 1. Sources may be, but are not limited to, the Power Company, local generators, or both.

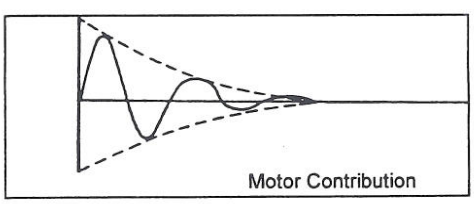


Figure 1: Example motor contribution.

Connected motors shown on the study one-line were assumed to be running at the time of the fault. Motors fed by adjustable speed drives equipped with bypass contactors were considered to contribute to system fault currents as well. However, motors fed by drives without bypass contactors were not considered since they do not contribute to fault current. Redundant motors shown on the study one-line were also assumed to be running at the time of the fault unless operating controls prohibit these conditions.

A motor's contribution to a fault *at its terminals* is equal to the full-load ampere (FLA) rating of the motor divided by its per-unit subtransient reactance, similar to the contribution from a generator. However, at the upstream switchboard, panelboard, or motor-control center, the fault contribution from the individual motors is reduced by the impedance of the motor branch circuit conductors. Since data on motor subtransient reactances and branch-circuit conductor lengths is often difficult to obtain, assumptions regarding the motors' subtransient reactances are typically made when the system model is built.

For calculation of low-voltage fault duty, the contribution from induction motors and synchronous motors in the system are considered. For small induction motors (less than 50 hp) where the impedance of the installation (i.e., motor and conductor) is not known, an equivalent subtransient reactance of 0.25 pu, resulting in a fault contribution of 4 times rated current, is assumed. Larger motors (50 hp and above) have an assumed subtransient reactance of 0.2 pu, resulting in a fault contribution of 5 times rated current. This is consistent with recommendations in IEEE Std. 141, *IEEE Recommended Practice for Electric Power Distribution for Industrial Plants* (the IEEE Red Book).

If applicable, multiplying factors are adjusted per Table 7 of ANSI/IEEE C37.010, *IEEE Application Guide for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis for* medium/high voltage fault duty. The table also shows contributions from induction motors less than 50 hp to be neglected.

The motor short-circuit contribution is determined and included in the computer short-circuit analysis so that the results should represent the highest short-circuit current to which the equipment might be subjected.

Unless otherwise indicated in the "CONTRIBUTION DATA" computer printouts, some motor loads are modeled as lumped induction motors connected directly to the low voltage buses using the recommended subtransient reactance values from C37.010, C37.13, and IEEE Std. 141. These modeled values appear on the "CONTRIBUTION DATA" and the "FAULT REPORT" computer printouts.

2.2.5 Assumptions

Some assumptions for input data were required and may affect the results of this study. In general, assumptions are needed because of lack of documentation. Significant differences between the assumptions listed here and actual values will require that this power system analysis be revised.

The following assumptions were made:

1. Motor loads located at 005 MSWB were assumed to be 100HP.
2. Where conductor lengths were not available, a length of 10 feet was assumed.
3. Where conductor sizes could not be determined, cables sized per NEC 2008 Edition table 310.16 were used in the analysis. These estimates are noted on the one-line diagram.

2.3 Short-Circuit Analysis Results and Recommendations

After making the calculations, the distribution equipment was checked to determine its adequacy to interrupt or withstand the effects of the calculated maximum short-circuit current at its location. For some solidly-grounded systems, like close-coupled unit substations and generator gear, it is possible the bolted three-phase fault current is not the maximum fault current. The power systems engineer performing the study considered applicable buses and has reported bolted line-to-ground fault current when required. The results are listed in the "SHORT-CIRCUIT EVALUATION TABLE".

Listed in the tables are the calculated short-circuit currents at each piece of equipment and the ratings of the lowest rated device in the equipment enclosure. Comparing the two sets of values shows that all of the equipment examined is either adequate by itself or when used in series with another circuit breaker or protected by a line side current-limiting fuse or circuit breaker.

The short-circuit evaluation table shows buses with #N/A in the "NOTES" column. This is defined at the bottom of the table as #N/A = Number not available. Some of these buses do not require evaluation and may correspond to equipment such as transformer windings or motor terminals.

The table also lists some equipment that was not evaluated because the equipment's rating could not be determined at the time of study preparation. These are identified by note number '1' in the far right hand column of the table. The study recommends a field evaluation of this equipment by the customer to verify the equipment's short-circuit current rating is greater than the calculated fault duty which can be evaluated by referring to the short-circuit output report. For each bus modeled, that report contains evaluations for UL and ANSI equipment and if necessary Square D Engineering Services can assist in this evaluation.

Input data and short-circuit output data pages are included in separate appendices.

2.4 Short-Circuit Evaluation Table

SQUARE D by Schneider Electric

SQUARE D ENGINEERING SERVICES

SHORT-CIRCUIT EVALUATION TABLE

New Orleans City Park Administration Building
New Orleans, LA
ML# 9639

BUS NO.	EQUIP. DESCRIPTION PER SYSTEM ONE LINE DIAGRAM(S)	NOMINAL L-L VOLTS	LOWEST RATED DEVICE IN EQUIPMENT ENCLOSURE TYPE	AIC OR WCR	MAXIMUM AVAILABLE SCA OR DUTY	X/R RATIO	LINE SIDE MAXIMUM DEVICE	LINE SIDE SERIES RATING	NOTES EVALUATION	#
001	UTIL TRANS PRIM	14400		#N/A	18,533	8.00			#N/A	
002	UTIL TRANS SEC	480		#N/A	7,451	3.14			#N/A	
003	CT CABINET	480		#N/A	7,414	3.13			#N/A	1
004	MDS	480	HEV DUTY SS-L	200,000	7,130	3.07			Adequate	
005	MSWB	480	HJ	65,000	6,332	2.87			Adequate	
006	MTS	480		#N/A	6,180	2.79			#N/A	1
007	2EM	480	FH(3P)	25,000	6,114	2.75			Adequate	
008	2H	480	EDB(1P)	18,000	5,664	2.14			Adequate	
009	2HQ	480	EGB(1P)	35,000	5,686	2.34			Adequate	
010	CHP	480	EJB(1P)	65,000	4,386	1.61			Adequate	
011	2TL PRIM	480		#N/A	5,721	2.31			#N/A	
012	2TL SEC	208		#N/A	5,148	1.91			#N/A	
013	2LD	208	QOB	10,000	5,004	1.91			Adequate	
014	1LA	208	QOB	10,000	4,250	1.65			Adequate	
015	1LB	208	QOB	10,000	3,590	1.21			Adequate	
016	2L	208	QOB	10,000	4,332	1.55			Adequate	
017	1H	480	EDB(1P)	18,000	5,253	1.69			Adequate	
018	1HQ	480	EGB(1P)	35,000	5,545	2.25			Adequate	

Notes:
1. Device should be evaluated by the customer. Data was not available at the time of the study.

#N/A = Number not available.

3 OVERCURRENT DEVICE COORDINATION ANALYSIS

3.1 General Procedure

An overcurrent device time-current coordination analysis is an organized effort to determine the settings and, where appropriate, the ampere ratings and types for the over-current protective devices in an electrical system. The objective of the coordination analysis is to effect a time-current coordination among the devices, thereby achieving the desired system protection and electrical service continuity goals.

Maximum protection requires that the overcurrent protective devices be rated, selected, and adjusted to allow the normal load currents to flow while instantaneously opening the circuit when abnormal currents flow.

However, maximum service continuity requires that the overcurrent protective devices be rated, selected, and adjusted so that only the overcurrent protective device nearest the fault opens and isolates the faulted circuit from the system, permitting the rest of the system to remain in operation. Protective devices farther from the fault location should therefore essentially act as backup protection for the devices nearer to the fault, allowing the fault to be cleared with a minimum of disruption to the system. This is referred to as "selective coordination" between the protective devices. This may allow longer duration faults when the fault point is nearer the service entrance; however, such faults are not as common, and setting the protective devices to operate in this manner is generally more desirable than deenergizing most or all of the system for a fault near one of the loads.

Selecting and setting the overcurrent devices is a procedure where the time-current characteristic curves of the various devices in series are compared with one another on a log-log graph. This procedure should take into account boundaries defined by load currents, short-circuit currents, and ANSI and NEC requirements.

Selective coordination usually will be obtained when the log-log plots of time-current characteristics show sufficient clear space or no overlap between the curves for the protective devices operating in series. Coordination will often stop short of complete selectivity when an acceptable compromise is reached between the various boundaries imposed on the selecting and setting procedure.

The CAPTOR module of the SKM Power*Tools software was used to complete the device coordination analysis. As shown on the one-line diagram, each overcurrent protective device or motor under consideration by the program has been assigned an identification number so that the computer output could be readily interpreted.

3.2 Specific Procedure

3.2.1 Short-Circuit Current Considerations

All protective device characteristic curves shown on the time-current graphs end at the calculated maximum short-circuit current at that device.

3.2.2 Molded Case Breaker Coordination

A molded case circuit breaker will trip with no intentional time delay for short-circuit currents above its instantaneous trip setting. Because of this, molded case breakers in series can only be selectively coordinated with each other if there is sufficient impedance between them so that the maximum available short-circuit current at the downstream breaker is less than the instantaneous trip setting of the upstream breaker. In Figure 2, breaker "C" illustrates this principle.

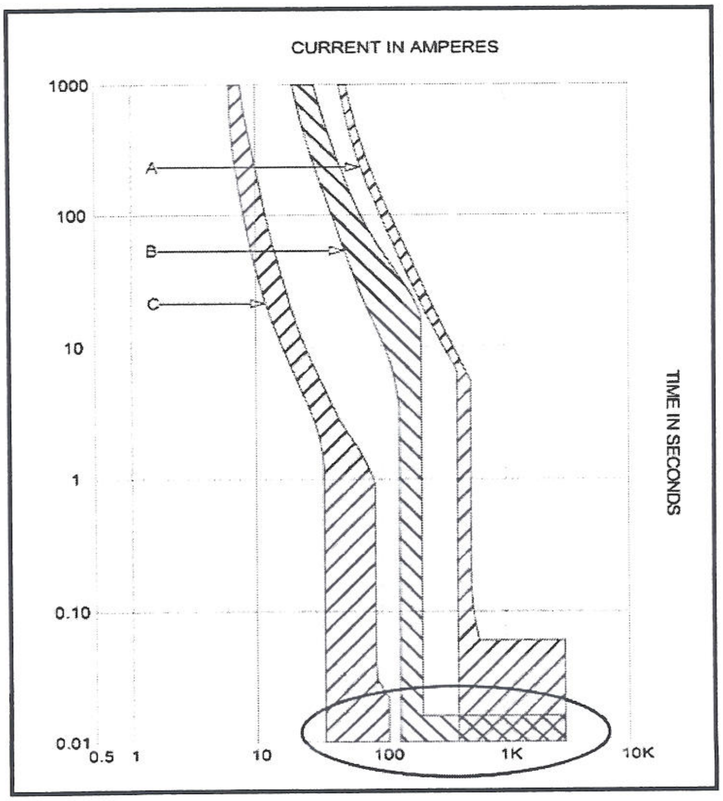


Figure 2: Example molded case breaker coordination.

There is enough cable impedance to limit the maximum available short-circuit current at "C" to less than the instantaneous trip setting of either "A" or "B". When molded case breakers are in series without sufficient impedance between them to permit complete coordination, e.g., a panel main breaker and one of the branch devices in the panel, the time-current curves will overlap in the high-current instantaneous trip region. This is illustrated by the overlap between the curves for devices "A" and "B" in Figure 2. Most molded case breakers exhibit some degree of current limitation that will often result in selective operation in the overlap region. Time-current coordination curves included in this report do not match the results from Square D's data bulletin (0100DB0501R3). The software used to generate the curves is incapable of accounting for the dynamic impedance the system has when two or more devices in series "see" a fault. The data bulletin takes the dynamic impedance introduced by the downstream device into account. Greater separation between the instantaneous settings may increase the likelihood that the two devices will operate selectively. The potential lack of coordination is generally not considered critical and can be avoided only by adopting a different and, in general, less economically practical design especially when the following are considered:

- Most faults occur in equipment such as motors, lighting panels, and process control panels which typically are located at the end of branch circuits, significantly reducing fault level and thereby reducing or eliminating the possibility of non-selective operation.
- Lower magnitude arcing faults in rotating machinery and lighting panels are statistically more common than bolted three-phase faults.
- Ground faults are more common than three-phase faults.
- Maximum fault current is a random event depending on point-on-wave of the fault occurrence and other factors.
- The device cutoff points on time-current coordination graphs are based on bolted fault current levels which correspond to zero impedance. Typical fault current impedance is usually greater than zero so the actual fault current seen by overcurrent devices can be less than what is shown on the time-current coordination graphs.

Recommended breaker trip settings are given in the "OVERCURRENT DEVICE SETTING TABLE – LV CIRCUIT BREAKERS". In addition, an illustration of the actual magnetic trip adjustment dials for Square D circuit breakers is included in the REFERENCES section to aid the setting process.

3.2.3 Transformer Protective Devices

If in the project scope, medium- and/or low-voltage transformer primary overcurrent protective devices were checked for compliance with NEC Article 450. Also, medium voltage protective devices, primary, secondary and secondary feeder, were evaluated with respect to the applicable ANSI/IEEE Through Fault Guides (C57.12.59 for dry and cast resin type and C57.109 for liquid immersed type) and the Appendix for ANSI/IEEE C37.91. Transformer standards define low-voltage transformers as having a primary voltage less than or equal to 600V. Transformer full load currents and magnetizing inrush currents were also considered.

If a transformer is subject to a through fault, thermal damage occurs to conductors and insulation due to resistive heating. Mechanical damage occurs to windings and structural components due to large magnetic forces associated with the fault current. In general, smaller transformers are assigned a single damage characteristic that accounts for both thermal and mechanical damage. Larger transformers are assigned a two-part characteristic with a thermal characteristic and a more restrictive mechanical characteristic. For the most conservative protection, the thermal-mechanical limits should be used. In many cases, it may be acceptable to use only the thermal characteristic, especially if the transformer is not subject to frequent through faults. Transformers connected to overhead secondary feeders should be considered to be subject to frequent through faults.

To evaluate through fault protection according to the ANSI Guides, the applicable curve was plotted representing a transformer's projected damage threshold for the cumulative effects of through faults. However, this ANSI through fault curve must be reduced for certain unbalanced secondary faults, because even though full short-circuit current is flowing in one or more secondary windings, the primary overcurrent device experiences less current.

Secondary line-to-neutral faults on delta-wye connected transformers produce only 0.577 of the maximum 3-phase fault current in the primary overcurrent device while one secondary winding experiences the full short-circuit current as illustrated in Figure 3 below. Therefore, to account for this fault condition, the ANSI through fault curve has been adjusted by a factor of 0.577. Both curves (three phase line-to-line and single phase line-to-neutral) are plotted on the time-current graphs.

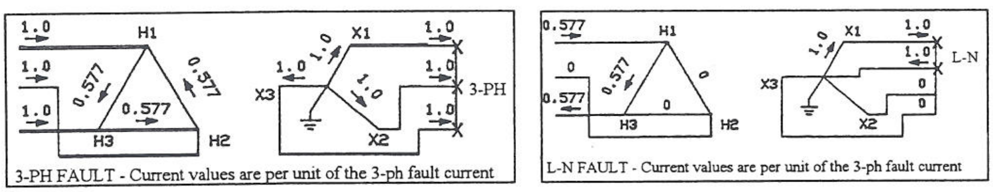


Figure 3: Delta–Wye 3-PH and L-N fault current per unit values.

Since the through fault curves represent a transformer's projected damage threshold for the cumulative mechanical and thermal effects of through faults, all applicable primary and secondary overcurrent devices were checked to ensure interruption before these through fault curves were reached.

Further, to avoid nuisance interruptions, the primary overcurrent devices were also checked to ensure they will carry the transformers rated full load and equivalent magnetic inrush currents which are plotted on the time-current graphs.

Because of the restrictions mentioned above, complete selective coordination between the transformer primary and secondary main devices may not exist for any transformers examined as shown by the overlapping of their characteristics on the time-current graphs. However, this is judged acceptable, because the opening of either device results in the same extent of service interruption.

3.2.4 Cable Protection

Feeder overcurrent protective devices were reviewed to verify the protection of their load side cables as shown on the one-line diagram in accordance with NEC Article 240. If the adjustable low-voltage protective devices are set as suggested in this report, then the cables reviewed will be properly protected, unless noted otherwise in the *NEC Compliance Issues* section.

However, the above analysis does not include any aspects of cable ampacity adjustment factors such as derating for conduit fill, elevated ambient temperature, and so on allowed by the NEC.

3.3 Analysis of Results and Recommendations

The basic results of an overcurrent device coordination analysis are the time-current coordination graphs which are plotted to illustrate the degree of selective coordination achieved in the system. Two (2) graphs are included in this report. Settings for all devices which have adjustable characteristics are summarized in the appropriate overcurrent device setting tables. Smaller devices with fixed time-current characteristics are not shown on the graphs unless they directly affect the setting of an adjustable upstream device or are protective devices for transformers rated 75 kVA and larger.

To generate the time-current graphs, a computer program was used which allows the power system engineer to determine optimum coordination, after first insuring that loading and protection requirements are satisfied. The engineer's objective is to determine the best coordination for the entire system. This approach necessitates tradeoffs in selectivity for some parts of the system to achieve maximum coordination in more critical areas. Regions in which coordination has been sacrificed are as previously discussed involving transformer primary and secondary main devices, high current regions of molded case breakers, etc.

3.3.1 NEC Compliance Issues

It is not the purpose of this report to verify that the electrical system design conforms to the NEC. Nevertheless, some apparent violations of the NEC were noticed in the process of performing the power system analysis and recommendations are made for compliance. However, this does not imply that all possible NEC violations were found. In all cases, determination of NEC interpretation and compliance rests with the local Authority Having Jurisdiction.

If these issues are addressed by equipment, conductor, or device settings changes, the analysis results may need to be re-evaluated in a revision to this study.

Possible NEC violations have been listed below:

- It should be noted a cable appears to be in violation of NEC 240.21, which is commonly referred to as the tap rule. Essentially ten-foot taps are allowed for minimal requirements for overcurrent protection. Twenty-five foot taps are allowed when terminating into an appropriate overcurrent device. An appropriate line side protective device should protect taps over twenty-five feet. The following taps should be reviewed, and proper protection installed where necessary.

  - Drawing D-ML-09-639-1, feeder tap from secondary terminals of the low-voltage transformer 2TL (bus 012) to 2LD (bus 013), downstream panel.

  RECOMMENDATION: Review affected tap location against Art. 240.21 and install proper conductor protection.

3.3.2 TCC Plot Remarks

The following comments refer to the graphs shown in the Time Current Coordination Graphs section of this report.

Time-current coordination graph 02.tcc shows the primary and secondary devices of transformer 2TL. As shown by the graph, the maximum equivalent magnetic inrush point lies slightly within the operating band of the primary breaker. This indicates the possibility of this breaker occasionally tripping on transformer energization if this "worst case" inrush current is produced. This situation is only noted here so that any nuisance tripping which should occur may be correctly diagnosed as such. In addition, this project uses transformers designed to meet the 2007 energy efficiency standards and it should be recognized that inrush values tend to increase when transformer efficiency is increased. The design data used in this report for transformer inrush does not have field (real world) history and may be overly conservative.

Time-current coordination graphs 01.tcc and 02.tcc show device numbers 004-01 MDS FUSE and 005-01 MSWB MAIN as well as other devices. As shown by the graphs, upstream coordination with Entergy could not be determined due to lacking transformer fuse data.

Time-current coordination graphs 01.tcc and 02.tcc show device numbers 004-01 MDS FUSE and 005-01 MSWB MAIN, 005-02 MTS and 007-01 2EM MAIN as well as other devices. As shown by the graphs, these two sets of devices overlap. However, 004-01 MDS FUSE and 005-01 MSWB MAIN are in series and 005-02 MTS and 007-01 2EM MAIN are in series and the loss of selectivity is acceptable as operation of either device affects the same portion of the system and full coordination is not required. This allows better coordination between these devices and the ones upstream and downstream.

Time-current coordination graphs 01.tcc and 02.tcc show device numbers 004-01 MDS FUSE, 005-01 MSWB MAIN, 005-02 MTS, and 007-01 2EM MAIN as well as other devices. As shown by the graphs, these devices do not selectively coordinate well. If achieving better coordination is desired for this particular circuit, then we recommend the customer upgrade to solid-state types. These devices have been adjusted to obtain the highest level of selectively possible for the protection level required.

Time-current coordination graph 01.tcc shows device numbers 007-04 CHP and 010-01 CHP MAIN as well as other devices. As shown by the graph, these devices overlap. However, these devices are in series and the loss of selectivity is acceptable as operation of either device affects the same portion of the system and full coordination is not required. This allows better coordination between these devices and the ones upstream and downstream.

Time-current coordination graph 01.tcc shows device numbers 007-01 2EM MAIN, 007-04 CHP, and 010-01 CHP MAIN as well as other devices. As shown by the graph, these devices do not selectively coordinate well. If achieving selective coordination is absolutely required for this particular circuit, then we recommend the customer upgrade to solid-state types. These devices have been adjusted to obtain the highest level of selectively possible for the protection level required.

Time-current coordination graph 02.tcc shows device numbers 013-02 1LA and 014-01 1LA MAIN as well as other devices. As shown by the graph, these devices overlap. However, these devices are in series and the loss of selectivity is acceptable as operation of either device affects the same portion of the system and full coordination is not required. This allows better coordination between these devices and the ones upstream and downstream.

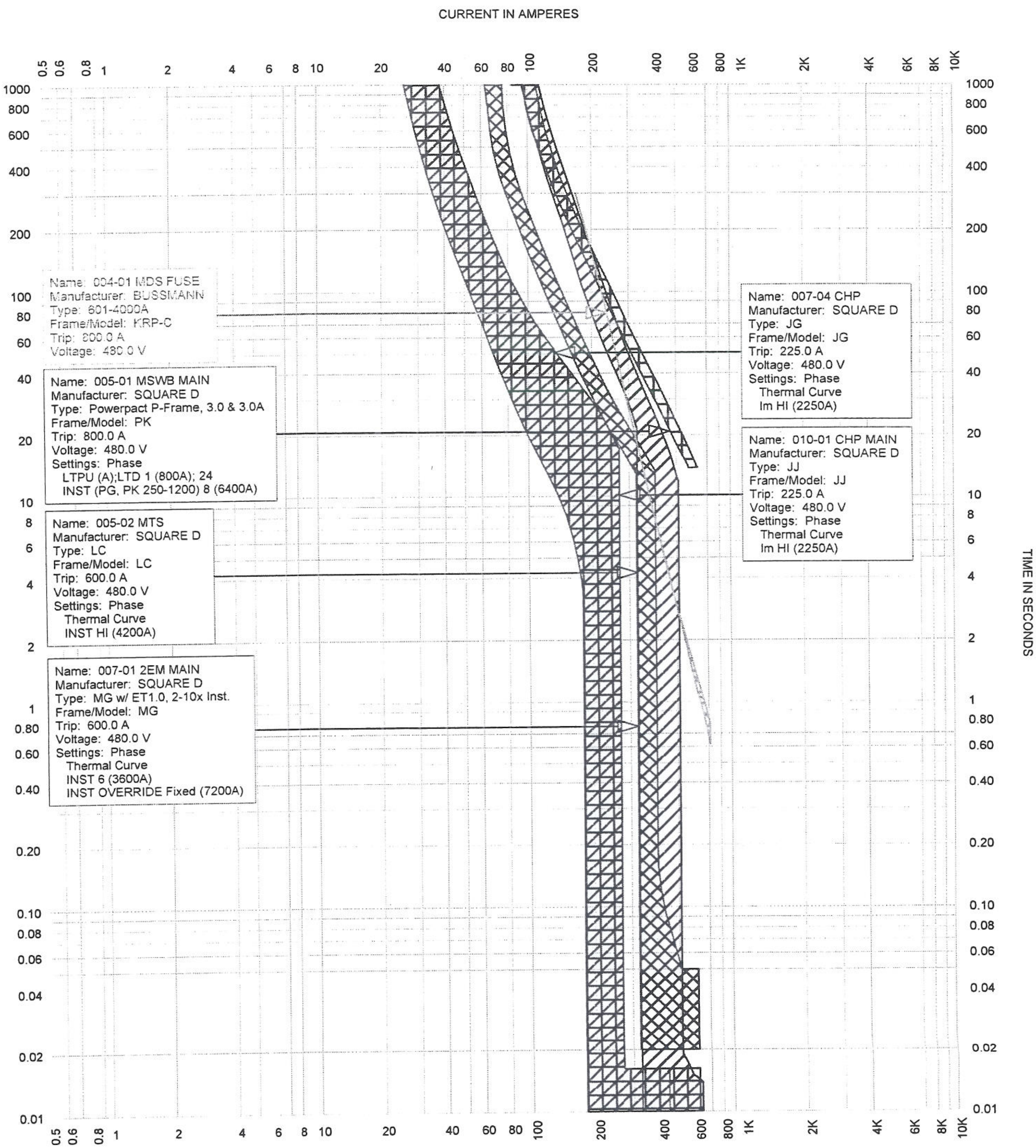
3.4 Overcurrent Device Setting Table

DEVICE SETTING TABLE
LV CIRCUIT BREAKERS

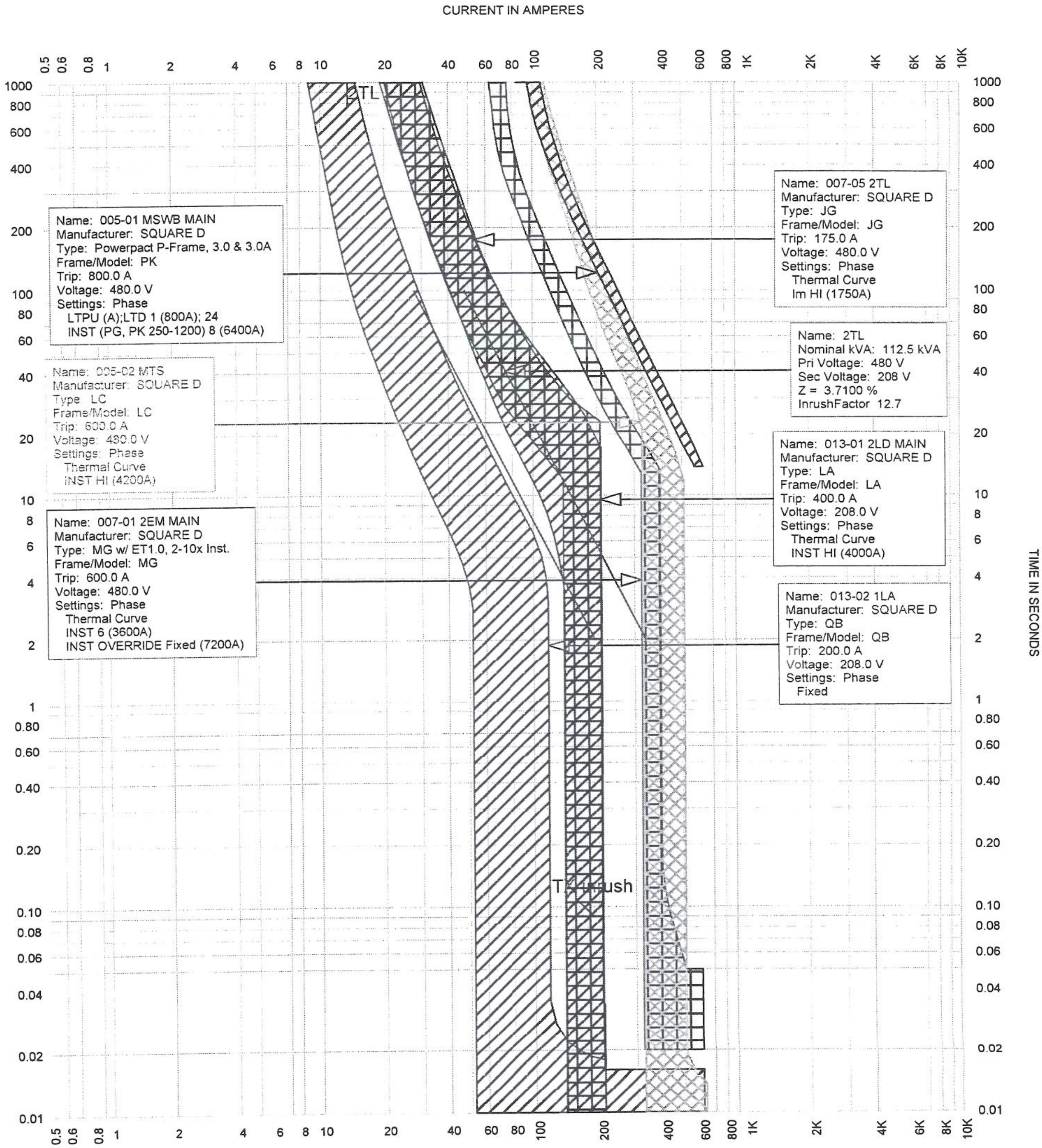
BUS NUMBER & NAME	DEVICE NUMBER & NAME DEVICE TYPE	MANUFACTURER DESCRIPTION	BUS VOLTS DEV. VOLTS	FRAME SENSOR PLUG	SETTINGS
005 MSWB	005-01 MSWB MAIN Static Trip	SQUARE D Powerpact P-Frame, 3.0 & 3.0A LI, 250-1200A, UL	480.0V 600V	1200.0A 800.0A	LTPU (A);LTD 1 (800A); 24 INST (PG, PK 250-1200) 8 (6400A)
005 MSWB	005-02 MTS Thermal Magnetic	SQUARE D LC 300-600A	480.0V 600V	600.0A 600.0A	Thermal Curve INST HI (4200A)
005 MSWB	005-04 1HQ Thermal Magnetic	SQUARE D JJ 150-250A	480.0V 600V	250.0A 225.0A	Thermal Curve Im HI (2250A)
007 2EM	007-01 2EM MAIN Thermal Magnetic	SQUARE D MG w/ ET1.0, 2-10x Inst. 300-800A	480.0V 600V	800.0A 600.0A	Thermal Curve INST 6 (3600A)
007 2EM	007-03 2HQ Thermal Magnetic	SQUARE D JG 150-250A	480.0V 600V	250.0A 200.0A	Thermal Curve Im HI (2000A)
007 2EM	007-04 CHP Thermal Magnetic	SQUARE D JG 150-250A	480.0V 600V	250.0A 225.0A	Thermal Curve Im HI (2250A)
007 2EM	007-05 2TL Thermal Magnetic	SQUARE D JG 150-250A	480.0V 600V	250.0A 175.0A	Thermal Curve Im HI (1750A)
008 2H	008-01 2H MAIN Thermal Magnetic	SQUARE D JG 150-250A	480.0V 600V	250.0A 200.0A	Thermal Curve Im HI (2000A)
009 2HQ	009-01 2HQ MAIN Thermal Magnetic	SQUARE D JG 150-250A	480.0V 600V	250.0A 200.0A	Thermal Curve Im HI (2000A)
010 CHP	010-01 CHP MAIN Thermal Magnetic	SQUARE D JJ 150-250A	480.0V 600V	250.0A 225.0A	Thermal Curve Im HI (2250A)
013 2LD	013-01 2LD MAIN Thermal Magnetic	SQUARE D LA 125-400A	208.0V 600V	400.0A 400.0A	Thermal Curve INST HI (4000A)

Frame, Sensor and Plug types must be verified to agree with this list prior to installing settings. I2t dial settings follow In = On and Out = Off.

3.5 Time-Current Coordination Graphs - Recommended Settings



Name: 01.tcc	Current Scale x 10	Reference Voltage: 480
9639 New Orleans City Park Administration Building		Square D



Name: 02.tcc	Current Scale x 10	Reference Voltage: 480
9639 New Orleans City Park Administration Building		Square D

APPENDIX A: ABBREVIATIONS AND TRADEMARKS

Organizations and Standards

ANSI	- American National Standards Institute
IEEE	- Institute of Electrical and Electronics Engineers
ICEA	- Insulated Cable Engineers Association
NEC	- National Electrical Code (NFPA No. 70)
NEMA	- National Electrical Manufacturers Association
UL	- Underwriters' Laboratories, Inc.

Other Abbreviations

A	- Amperes (RMS symmetrical)
AFIE	- Arc Flash Incident Energy (cal/cm^2)
AIC	- Amperes Interrupting Capacity (Three-Phase RMS sym.)
ASD	- Adjustable Speed ac Drive
ATPV	- Protective Clothing Arc Rating
ATS	- Automatic Transfer Switch
C/B	- Circuit Breaker
CHP	- Combined Horsepower
CFLA	- Combined Full Load Amperes
CT	- Current Transformer
FLA	- Full Load Amperes
FPB	- Flash Protection Boundary
HP	- Horsepower
I_L	- Max. Demand Load Current at PCC
I_{SC}	- Short-Circuit Current at PCC
kVA	- Kilovolt-Ampere
kVAm	- Kilovolt-Amperes of Motor Short Circuit contribution
kW	- Kilowatt
L-L	- Line-To-Line
LRA	- Locked-Rotor Amperes
L.V.	- Low Voltage
LSIG.	- L = Long Time, S = Short time, I = Instantaneous, G = Ground fault protection
MCC	- Motor Control Center
MCS	- Molded Case Switch
Mohms	- Milliohms
M.V.	- Medium Voltage
OCPD	- Overcurrent Protective Device
O.L.	- Overload
PCC	- Point of Common Coupling
PF	- Power Factor
PPE	- Personal Protective Equipment
PWM	- Pulse Width Modulated
R	- Resistance
RMS	- Root-Mean-Square
SCA	- Short-Circuit Amperes
SCAm	- Short-Circuit Amperes of Motor Contribution
SCCR	- Short-Circuit Current Rating
S.F.	- Service Factor
sym.	- Symmetrical
TCC.	- Time Current Coordination graph
TCR	- Trip Current Rating
TDD	- Total Demand Distortion
THD	- Total Harmonic Distortion
V	- Line-To-Line Volts (RMS sym.)
WCR	- Withstand Current Rating
X	- Reactance
Z	- Impedance
%Z	- Percent Impedance

Trademarks

BOLT-LOC, ECONOPAK, EZ METER-PAK, GROUND CENSOR, I-LIMITER, I-LINE, ISO-FLEX, MAG-GARD, MICROLOGIC, MINI POWER-ZONE, OMEGAPAK, POWER-CAST, POWER STYLE, POWER ZONE, QF, QO, QWIK-GARD, SORGEL, SPEED-D, SQUARE D, VACARC and WATCHDOG are registered trademarks of Square D Company. I-75,000, METER-PAK, and PZ-8 are trademarks of Square D Company.

Company Abbreviations

Allen-Bradley	A-B
Allis-Chalmers	A-C
ASEA Brown Boveri	ABB
Automatic Switch Co	ASCO
Basler	BAS
Bussmann	BUSS
Challenger	CHA
Cooper	COOP
Cutler – Hammer	C-H
Economy Fuse	ECON
Federal Pacific Electric	FPE
G & W Electric	G&W
General Electric	GE
Gould Shawmut	GS
I-T-E Imperial	ITE
Kearney	KEA
Klockner	KLO
Littlefuse	LIT
McGraw Edison	ME
Merlin Gerin	MG
Powell	POW
Reliance	REL
RTE Corp.	RTE
Russelectric	RUSS
S & C Electric	S&C
Schweitzer Engr. Labs	SEL
Siemens	SIE
Square D	SQD
Thomas Betts	T-B
Toshiba	TOS
Westinghouse	WEST
Zenith	Z

APPENDIX B: SHORT CIRCUIT INPUT TABULATIONS

ALL PU VALUES ARE EXPRESSED ON A 100 MVA BASE.

FEEDER INPUT DATA

CABLE NAME	FEEDER FROM NAME	FEEDER TO NAME	QTY /PH	VOLTS L-L	LENGTH		FEEDER SIZE	FEEDER TYPE
CBL-003	002 UTIL TRANS	003 CT CABINET	2	480	10.0	FEET	600	Copper
	Duct Material:	Magnetic	Insulation Type:				THHN	Insulation Class:
	+/- Impedance:	0.0200 + J 0.0382 Ohms/1000 ft					0.0434 + J 0.0829 PU	
	Z0 Impedance:	0.0630 + J 0.0941 Ohms/1000 ft					0.1367 + J 0.2042 PU	
CBL-004	003 CT CABINET	004 MDS	2	480	80.0	FEET	600	Copper
	Duct Material:	Magnetic	Insulation Type:				THHN	Insulation Class:
	+/- Impedance:	0.0200 + J 0.0382 Ohms/1000 ft					0.3472 + J 0.6632 PU	
	Z0 Impedance:	0.0630 + J 0.0941 Ohms/1000 ft					1.09 + J 1.63 PU	
CBL-005	004 MDS	005 MSWB	2	480	325.0	FEET	600	Copper
	Duct Material:	Plastic	Insulation Type:				THHN	Insulation Class:
	+/- Impedance:	0.0185 + J 0.0305 Ohms/1000 ft					1.30 + J 2.15 PU	
	Z0 Impedance:	0.0294 + J 0.0776 Ohms/1000 ft					2.07 + J 5.47 PU	
CBL-006	005 MSWB	MTS N	2	480	45.0	FEET	350	Copper
	Duct Material:	Magnetic	Insulation Type:				THHN	Insulation Class:
	+/- Impedance:	0.0333 + J 0.0388 Ohms/1000 ft					0.3252 + J 0.3789 PU	
	Z0 Impedance:	0.1050 + J 0.0956 Ohms/1000 ft					1.03 + J 0.9336 PU	
CBL-007	006 MTS	007 2EM	2	480	20.0	FEET	350	Copper
	Duct Material:	Magnetic	Insulation Type:				THHN	Insulation Class:
	+/- Impedance:	0.0333 + J 0.0388 Ohms/1000 ft					0.1445 + J 0.1684 PU	
	Z0 Impedance:	0.1050 + J 0.0956 Ohms/1000 ft					0.4557 + J 0.4149 PU	
L-008	007 2EM	008 2H	1	480	40.0	FEET	1	Copper
	Duct Material:	Magnetic	Insulation Type:				THHN	Insulation Class:
	+/- Impedance:	0.1303 + J 0.0427 Ohms/1000 ft					2.26 + J 0.7413 PU	
	Z0 Impedance:	0.4107 + J 0.1052 Ohms/1000 ft					7.13 + J 1.83 PU	
CBL-009	007 2EM	009 2HQ	1	480	55.0	FEET	3/0	Copper
	Duct Material:	Magnetic	Insulation Type:				THHN	Insulation Class:
	+/- Impedance:	0.0668 + J 0.0400 Ohms/1000 ft					1.59 + J 0.9549 PU	
	Z0 Impedance:	0.2105 + J 0.0985 Ohms/1000 ft					5.02 + J 2.35 PU	
CBL-010	007 2EM	010 CHP	1	480	350.0	FEET	4/0	Copper
	Duct Material:	Plastic	Insulation Type:				THHN	Insulation Class:
	+/- Impedance:	0.0511 + J 0.0314 Ohms/1000 ft					7.76 + J 4.77 PU	
	Z0 Impedance:	0.0812 + J 0.0799 Ohms/1000 ft					12.34 + J 12.14 PU	
CBL-011	007 2EM	011 2TL PRIM	1	480	45.0	FEET	2/0	Copper
	Duct Material:	Magnetic	Insulation Type:				THHN	Insulation Class:
	+/- Impedance:	0.0835 + J 0.0409 Ohms/1000 ft					1.63 + J 0.7988 PU	
	Z0 Impedance:	0.2632 + J 0.1007 Ohms/1000 ft					5.14 + J 1.97 PU	

FEEDER INPUT DATA

CABLE NAME	FEEDER FROM NAME		FEEDER TO NAME		QTY /PH	VOLTS L-L	LENGTH		FEEDER SIZE		FEEDER TYPE	
CBL-013	012 2TL SEC		013 2LD		1	208	30.0	FEET	600		Copper	
	Duct Material:		Magnetic		Insulation Type:				THHN		Insulation Class:	
	+/-	Impedance:	0.0200 + J	0.0382	Ohms/1000 ft				1.39 + J	2.65	PU	
	Z0	Impedance:	0.0630 + J	0.0941	Ohms/1000 ft				4.37 + J	6.53	PU	
CBL-014	013 2LD		014 1LA		1	208	60.0	FEET	4/0		Copper	
	Duct Material:		Magnetic		Insulation Type:				THHN		Insulation Class:	
	+/-	Impedance:	0.0534 + J	0.0393	Ohms/1000 ft				7.41 + J	5.45	PU	
	Z0	Impedance:	0.1683 + J	0.0968	Ohms/1000 ft				23.34 + J	13.42	PU	
CBL-015	013 2LD		015 1LB		1	208	95.0	FEET	1/0		Copper	
	Duct Material:		Magnetic		Insulation Type:				THHN		Insulation Class:	
	+/-	Impedance:	0.1040 + J	0.0417	Ohms/1000 ft				22.84 + J	9.16	PU	
	Z0	Impedance:	0.3278 + J	0.1027	Ohms/1000 ft				71.98 + J	22.55	PU	
CBL-016	013 2LD		016 2L		1	208	35.0	FEET	1/0		Copper	
	Duct Material:		Magnetic		Insulation Type:				THHN		Insulation Class:	
	+/-	Impedance:	0.1040 + J	0.0417	Ohms/1000 ft				8.41 + J	3.37	PU	
	Z0	Impedance:	0.3278 + J	0.1027	Ohms/1000 ft				26.52 + J	8.31	PU	
CBL-017	005 MSWB		017 1H		1	480	95.0	FEET	1		Copper	
	Duct Material:		Magnetic		Insulation Type:				THHN		Insulation Class:	
	+/-	Impedance:	0.1303 + J	0.0427	Ohms/1000 ft				5.37 + J	1.76	PU	
	Z0	Impedance:	0.4107 + J	0.1052	Ohms/1000 ft				16.93 + J	4.34	PU	
L-018	005 MSWB		018 1HQ		1	480	110.0	FEET	4/0		Copper	
	Duct Material:		Magnetic		Insulation Type:				THHN		Insulation Class:	
	+/-	Impedance:	0.0534 + J	0.0393	Ohms/1000 ft				2.55 + J	1.88	PU	
	Z0	Impedance:	0.1683 + J	0.0968	Ohms/1000 ft				8.04 + J	4.62	PU	

TRANSFORMER INPUT DATA

```
==========================================================================================
TRANSFORMER    PRIMARY RECORD     VOLTS   * SECONDARY RECORD    VOLTS  FULL-LOAD    NOMINAL
NAME           NO NAME            L-L       NO NAME             L-L    KVA          KVA
==========================================================================================
2TL            011 2TL PRIM   D  480.00   012 2TL SEC    YG   208.00  112.50       112.50
               Pos. Seq. Z%:      1.87 + J   3.20    (Zpu  16.65 + j  28.47 )   Shell Type
               Zero Seq. Z%:     0.000 + J  0.000    (Sec  0.000 + j  0.000 Pri  Open)
               Taps  Pri. 0.000 %  Sec. 0.000 %  Phase Shift (Pri. Leading Sec.):  30.00 Deg.

UTIL TRANS     001 UTIL TRANS YG 14400.0  002 UTIL TRANS YG   480.00  100.00       100.00
               Pos. Seq. Z%:     0.537 + J   1.61    (Zpu   5.38 + j  16.13 )   Shell Type
               Zero Seq. Z%:     0.000 + J  0.000    (     Pri - Sec: 0.000 + j  0.000 )
               Taps  Pri. 0.000 %  Sec. 0.000 %  Phase Shift (Pri. Leading Sec.):  0.000 Deg.
```

GENERATION CONTRIBUTION DATA

BUS NAME	CONTRIBUTION NAME	VOLTAGE L-L	MVA	X"d	X/R
001 UTIL TRANS	ENTERGY	14400.0	461.87		

Three Phase Contribution: 18518.0 AMPS 8.00
Pos Sequence Impedance (100 MVA Base) 0.0269 + J 0.2148 PU
Zero Sequence Impedance (100 MVA Base) 10000000 + J 10000000 PU

MOTOR CONTRIBUTION DATA

BUS NAME	CONTRIBUTION NAME	VOLTAGE L-L	BASE kVA	X"d	X/R	Motor Number
005 MSWB	LUMPED MOTOR L	480	100.00	0.25	5.00	1.00
	Pos Sequence Impedance (100 MVA Base) 50.00 + j 250.00 PU					

APPENDIX C: SHORT CIRCUIT OUTPUT TABULATIONS

NEW ORLEANS CITY PARK ADMINISTRATION BUILDING
NEW ORLEANS, LA
ML# 9639
Jan 19, 2010 10:05:31

NEW ORLEANS CITY PARK ADMINISTRATION BUILDING
~W ORLEANS, LA
L# 9639

THREE PHASE FAULT REPORT
(FOR APPLICATION OF LOW VOLTAGE BREAKERS)
PRE FAULT VOLTAGE: 1.0000
MODEL TRANSFORMER TAPS: NO

```
==============================================================================

001 UTIL TRANS 3P Duty: 18.533 KA AT  -82.87 DEG ( 462.23 MVA)  X/R:    8.00
               VOLTAGE:  14400.  EQUIV. IMPEDANCE=  0.0557 + J  0.4451  OHMS
               CONTRIBUTIONS:  ENTERGY            18.518 KA      ANG:   -82.87
               UTIL TRANS      002 UTIL TRANS      0.015 KA      ANG:  -258.02

002 UTIL TRANS 3P Duty:  7.451 KA AT  -72.13 DEG (   6.19 MVA)  X/R:    3.14
               VOLTAGE:    480.  EQUIV. IMPEDANCE=  0.0114 + J  0.0354  OHMS
               LOW VOLTAGE POWER CIRCUIT BREAKER     7.451 KA
               MOLDED CASE CIRCUIT BREAKER < 10KA    8.761 KA
               MOLDED CASE CIRCUIT BREAKER < 20KA    7.451 KA
               MOLDED CASE CIRCUIT BREAKER > 20KA    7.451 KA
               UTIL TRANS      001 UTIL TRANS      6.988 KA      ANG:  -251.71
               CBL-003         003 CT CABINET      0.466 KA      ANG:   101.55

003 CT CABINET 3P Duty:  7.414 KA AT  -72.08 DEG (   6.16 MVA)  X/R:    3.13
               VOLTAGE:    480.  EQUIV. IMPEDANCE=  0.0115 + J  0.0356  OHMS
               LOW VOLTAGE POWER CIRCUIT BREAKER     7.414 KA
               MOLDED CASE CIRCUIT BREAKER < 10KA    8.711 KA
               MOLDED CASE CIRCUIT BREAKER < 20KA    7.414 KA
               MOLDED CASE CIRCUIT BREAKER > 20KA    7.414 KA
               CBL-003         002 UTIL TRANS      6.951 KA      ANG:   -71.66
               CBL-004         004 MDS             0.466 KA      ANG:   -78.45

004 MDS        3P Duty:  7.130 KA AT  -71.74 DEG (   5.93 MVA)  X/R:    3.07
               VOLTAGE:    480.  EQUIV. IMPEDANCE=  0.0122 + J  0.0369  OHMS
               LOW VOLTAGE POWER CIRCUIT BREAKER     7.130 KA
               MOLDED CASE CIRCUIT BREAKER < 10KA    8.337 KA
               MOLDED CASE CIRCUIT BREAKER < 20KA    7.130 KA
               MOLDED CASE CIRCUIT BREAKER > 20KA    7.130 KA
               CBL-004         003 CT CABINET      6.666 KA      ANG:  -251.27
               CBL-005         005 MSWB            0.467 KA      ANG:   101.50

005 MSWB       3P Duty:  6.332 KA AT  -70.41 DEG (   5.26 MVA)  X/R:    2.87
               VOLTAGE:    480.  EQUIV. IMPEDANCE=  0.0147 + J  0.0412  OHMS
               LOW VOLTAGE POWER CIRCUIT BREAKER     6.332 KA
               MOLDED CASE CIRCUIT BREAKER < 10KA    7.269 KA
               MOLDED CASE CIRCUIT BREAKER < 20KA    6.332 KA
               MOLDED CASE CIRCUIT BREAKER > 20KA    6.332 KA
               CONTRIBUTIONS:  LUMPED MOTOR L      0.472 KA      ANG:   -78.69
               CBL-005         004 MDS             5.865 KA      ANG:   -69.75

006 MTS        3P Duty:  6.180 KA AT  -69.88 DEG (   5.14 MVA)  X/R:    2.79
               VOLTAGE:    480.  EQUIV. IMPEDANCE=  0.0154 + J  0.0421  OHMS
```

NEW ORLEANS CITY PARK ADMINISTRATION BUILDING
⁻W ORLEANS, LA
_# 9639

```
           T H R E E   P H A S E   F A U L T   R E P O R T
              (FOR APPLICATION OF LOW VOLTAGE BREAKERS)
                   PRE FAULT VOLTAGE: 1.0000
                   MODEL TRANSFORMER TAPS: NO
================================================================================
             LOW VOLTAGE POWER CIRCUIT BREAKER    6.180 KA
             MOLDED CASE CIRCUIT BREAKER < 10KA   7.036 KA
             MOLDED CASE CIRCUIT BREAKER < 20KA   6.180 KA
             MOLDED CASE CIRCUIT BREAKER > 20KA   6.180 KA
             MANUAL TRANSFE  MTS N              6.180 KA      ANG:  110.12

 007 2EM     3P Duty:  6.114 KA AT  -69.66 DEG (  5.08 MVA)  X/R:     2.75
             VOLTAGE:    480.   EQUIV. IMPEDANCE=  0.0158 + J  0.0425  OHMS
             LOW VOLTAGE POWER CIRCUIT BREAKER    6.114 KA
             MOLDED CASE CIRCUIT BREAKER < 10KA   6.938 KA
             MOLDED CASE CIRCUIT BREAKER < 20KA   6.114 KA
             MOLDED CASE CIRCUIT BREAKER > 20KA   6.114 KA
             CBL-007         006 MTS            6.114 KA      ANG:   -69.66

 008 2H      3P Duty:  5.664 KA AT  -64.62 DEG (  4.71 MVA)  X/R:     2.14
             VOLTAGE:    480.   EQUIV. IMPEDANCE=  0.0210 + J  0.0442  OHMS
             LOW VOLTAGE POWER CIRCUIT BREAKER    5.664 KA
             MOLDED CASE CIRCUIT BREAKER < 10KA   5.993 KA
             MOLDED CASE CIRCUIT BREAKER < 20KA   5.664 KA
             MOLDED CASE CIRCUIT BREAKER > 20KA   5.664 KA
             CBL-008         007 2EM            5.664 KA      ANG:   -64.62

 009 2HQ     3P Duty:  5.686 KA AT  -66.51 DEG (  4.73 MVA)  X/R:     2.34
             VOLTAGE:    480.   EQUIV. IMPEDANCE=  0.0194 + J  0.0447  OHMS
             LOW VOLTAGE POWER CIRCUIT BREAKER    5.686 KA
             MOLDED CASE CIRCUIT BREAKER < 10KA   6.165 KA
             MOLDED CASE CIRCUIT BREAKER < 20KA   5.686 KA
             MOLDED CASE CIRCUIT BREAKER > 20KA   5.686 KA
             CBL-009         007 2EM            5.686 KA      ANG:   -66.51

 010 CHP     3P Duty:  4.386 KA AT  -57.83 DEG (  3.65 MVA)  X/R:     1.60
             VOLTAGE:    480.   EQUIV. IMPEDANCE=  0.0336 + J  0.0535  OHMS
             LOW VOLTAGE POWER CIRCUIT BREAKER    4.386 KA
             MOLDED CASE CIRCUIT BREAKER < 10KA   4.386 KA
             MOLDED CASE CIRCUIT BREAKER < 20KA   4.386 KA
             MOLDED CASE CIRCUIT BREAKER > 20KA   4.386 KA
             CBL-010         007 2EM            4.386 KA      ANG:   -57.83

 011 2TL PRIM 3P Duty:  5.721 KA AT  -66.25 DEG (  4.76 MVA)  X/R:     2.31
             VOLTAGE:    480.   EQUIV. IMPEDANCE=  0.0195 + J  0.0443  OHMS
             LOW VOLTAGE POWER CIRCUIT BREAKER    5.721 KA
             MOLDED CASE CIRCUIT BREAKER < 10KA   6.181 KA
             MOLDED CASE CIRCUIT BREAKER < 20KA   5.721 KA
             MOLDED CASE CIRCUIT BREAKER > 20KA   5.721 KA
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THREE PHASE FAULT REPORT
(FOR APPLICATION OF LOW VOLTAGE BREAKERS)
PRE FAULT VOLTAGE: 1.0000
MODEL TRANSFORMER TAPS: NO

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================================================================================

            CONTRIBUTIONS TO  011 2TL PRIM   (CONTINUED)
            CBL-011          007 2EM            5.721 KA     ANG:   -66.25

 012 2TL SEC  3P Duty:  5.148 KA AT  -62.24 DEG (   1.85 MVA)  X/R:     1.91
              VOLTAGE:    208.   EQUIV. IMPEDANCE=  0.0109 + J  0.0206  OHMS
              LOW VOLTAGE POWER CIRCUIT BREAKER    5.148 KA
              MOLDED CASE CIRCUIT BREAKER < 10KA   5.281 KA
              MOLDED CASE CIRCUIT BREAKER < 20KA   5.148 KA
              MOLDED CASE CIRCUIT BREAKER > 20KA   5.148 KA
              2TL            011 2TL PRIM       5.148 KA     ANG:  -242.24

 013 2LD      3P Duty:  4.878 KA AT  -62.24 DEG (   1.76 MVA)  X/R:     1.91
              VOLTAGE:    208.   EQUIV. IMPEDANCE=  0.0115 + J  0.0218  OHMS
              LOW VOLTAGE POWER CIRCUIT BREAKER    4.878 KA
              MOLDED CASE CIRCUIT BREAKER < 10KA   5.003 KA
              MOLDED CASE CIRCUIT BREAKER < 20KA   4.878 KA
              MOLDED CASE CIRCUIT BREAKER > 20KA   4.878 KA
              CBL-013        012 2TL SEC        4.878 KA     ANG:   117.76

 014 1LA      3P Duty:  4.250 KA AT  -58.72 DEG (   1.53 MVA)  X/R:     1.65
              VOLTAGE:    208.   EQUIV. IMPEDANCE=  0.0147 + J  0.0241  OHMS
              LOW VOLTAGE POWER CIRCUIT BREAKER    4.250 KA
              MOLDED CASE CIRCUIT BREAKER < 10KA   4.250 KA
              MOLDED CASE CIRCUIT BREAKER < 20KA   4.250 KA
              MOLDED CASE CIRCUIT BREAKER > 20KA   4.250 KA
              CBL-014        013 2LD            4.250 KA     ANG:   -58.72

 015 1LB      3P Duty:  3.590 KA AT  -50.34 DEG (   1.29 MVA)  X/R:     1.21
              VOLTAGE:    208.   EQUIV. IMPEDANCE=  0.0213 + J  0.0257  OHMS
              LOW VOLTAGE POWER CIRCUIT BREAKER    3.590 KA
              MOLDED CASE CIRCUIT BREAKER < 10KA   3.590 KA
              MOLDED CASE CIRCUIT BREAKER < 20KA   3.590 KA
              MOLDED CASE CIRCUIT BREAKER > 20KA   3.590 KA
              CBL-015        013 2LD            3.590 KA     ANG:   -50.34

 016 2L       3P Duty:  4.332 KA AT  -56.98 DEG (   1.56 MVA)  X/R:     1.54
              VOLTAGE:    208.   EQUIV. IMPEDANCE=  0.0151 + J  0.0232  OHMS
              LOW VOLTAGE POWER CIRCUIT BREAKER    4.332 KA
              MOLDED CASE CIRCUIT BREAKER < 10KA   4.332 KA
              MOLDED CASE CIRCUIT BREAKER < 20KA   4.332 KA
              MOLDED CASE CIRCUIT BREAKER > 20KA   4.332 KA
              CBL-016        013 2LD            4.332 KA     ANG:   -56.98

 017 1H       3P Duty:  5.253 KA AT  -59.15 DEG (   4.37 MVA)  X/R:     1.69
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            T H R E E   P H A S E   F A U L T   R E P O R T
              (FOR APPLICATION OF LOW VOLTAGE BREAKERS)
                   PRE FAULT VOLTAGE: 1.0000
                   MODEL TRANSFORMER TAPS: NO
=============================================================================
            VOLTAGE:   480.  EQUIV. IMPEDANCE=  0.0271 + J  0.0453  OHMS
            LOW VOLTAGE POWER CIRCUIT BREAKER    5.253 KA
            MOLDED CASE CIRCUIT BREAKER < 10KA   5.253 KA
            MOLDED CASE CIRCUIT BREAKER < 20KA   5.253 KA
            MOLDED CASE CIRCUIT BREAKER > 20KA   5.253 KA
            CBL-017        005 MSWB          5.253 KA      ANG:   -59.15

018 1HQ     3P Duty:  5.545 KA AT  -65.72 DEG (   4.61 MVA)  X/R:     2.25
            VOLTAGE:   480.  EQUIV. IMPEDANCE=  0.0205 + J  0.0456  OHMS
            LOW VOLTAGE POWER CIRCUIT BREAKER    5.545 KA
            MOLDED CASE CIRCUIT BREAKER < 10KA   5.949 KA
            MOLDED CASE CIRCUIT BREAKER < 20KA   5.545 KA
            MOLDED CASE CIRCUIT BREAKER > 20KA   5.545 KA
            CBL-018        005 MSWB          5.545 KA      ANG:   -65.72
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NEW ORLEANS CITY PARK ADMINISTRATION BUILDING
'W ORLEANS, LA
.# 9639

F A U L T S T U D Y S U M M A R Y
(FOR APPLICATION OF LOW VOLTAGE BREAKERS)
PRE FAULT VOLTAGE: 1.0000
MODEL TRANSFORMER TAPS: NO

BUS RECORD	VOLTAGE	A V A I L A B L E		F A U L T	D U T I E S (KA)
NO NAME	L-L	3 PHASE	X/R	LINE/GRND	X/R
001 UTIL TRANS	14400.	18.533	8.00		
002 UTIL TRANS	480.	7.451	3.14		
003 CT CABINET	480.	7.414	3.13		
004 MDS	480.	7.130	3.07		
005 MSWB	480.	6.332	2.87		
006 MTS	480.	6.180	2.79		
007 2EM	480.	6.114	2.75		
008 2H	480.	5.664	2.14		
009 2HQ	480.	5.686	2.34		
010 CHP	480.	4.386	1.60		
011 2TL PRIM	480.	5.721	2.31		
012 2TL SEC	208.	5.148	1.91		
013 2LD	208.	4.878	1.91		
014 1LA	208.	4.250	1.65		
015 1LB	208.	3.590	1.21		
016 2L	208.	4.332	1.54		
017 1H	480.	5.253	1.69		
018 1HQ	480.	5.545	2.25		

19 FAULTED BUSES, 20 BRANCHES, 2 CONTRIBUTIONS

*** SHORT CIRCUIT STUDY COMPLETE ***

APPENDIX D: REFERENCES

I. UTILITY COMPANY INFORMATION

1 Fault Current at Service Point

II. ELECTRICAL CONTRACTOR INFORMATION

1 Conductor Run Data

2 Other Electrical System Data

III. SQUARE D ENGINEERING SERVICES

1 Trip Dials for Micrologic 3.0, 3.0A

2 Trip Dials for Molded Case Breakers

3 Square D Conditions of Sale

SQUARE D

Schneider Electric

October 2009

ENGINEERING SERVICES

ML 9639
JOB NAME: New Orleans City Park

SOURCE DATA

1. Power Company Name Entergy
2. Maximum Available 3-Phase RMS Sym. Fault Current 18,518 Amps
3. X/R Ratio Z_1 → 1.89 ohms Z_0 → 1.96 ohms (Entergy side of transformer)
4. Location at which Items 2 and 3 are given_
5. Source Transformer:
   - KVA 100
   - Primary Connection (Delta or Wye-grounded) Wye-grounded
   - Secondary Connection (Delta or Wye-grounded) Wye-grounded
   - Rated Primary Voltage 14400
   - Rated Secondary Voltage 277/480
   - Percent Impedance (%Z) 1.7%
   - X/R Ratio Z_1 → 2.16 ohms Z_0 → 2.0 ohms

UPSTREAM OVERCURRENT DEVICE NEAREST SERVICE POINT

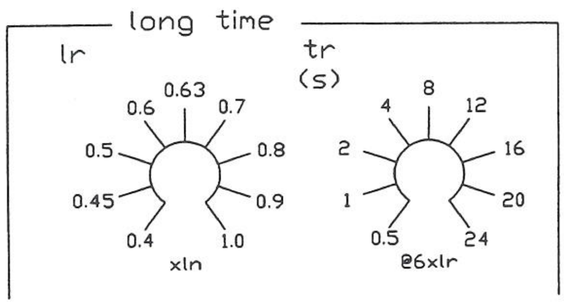
6. If FUSES:
   - Fuse Manufacturer
   - Fuse Type and Class
   - Continuous Current Rating
7. If OVERCURRENT RELAYS:
   - Relay Manufacturer
   - Phase Relay Type
   - Ground Relay Type
   - Please Complete the Following Relay Setting Table:

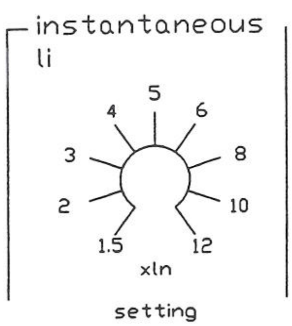
RELAY	C.T. RATIO	AMPERE TAP RANGE	AMPERE TAP SETTING	TIME DIAL SETTING	INSTANTANEOUS RANGE	INSTANTANEOUS SETTING
PHASE						
GROUND						

COMMENTS:

From Equipment	To Equipment	Condustor Material	Conductor Length in Feet	Cables per Phase	Size AWG	Insulation type (THHN)	Conduit Type(steel,plastic,Al)
MDS	MSWB	CU	325	2(3/0 4W)	600 MCM	THHN	PLASTIC
2EM	2H	CU	40	3/0 4W	#1	THHN	EMT
MSWP	1H	CU	95	3/0 4W	#1	THHN	EMT
2LD	2L	CU	35	3/0 4W	1/0	THHN	EMT
2LD	1LB	CU	95	3/0 4W	1/0	THHN	EMT
2EM	2HQ	CU	55	3/0 4W	3/0	THHN	EMT
MSWB	1HQ	CU	110	3/0 4W	4/0	THHN	EMT
2LD	1LA	CU	60	3/0 4W	4/0	THHN	EMT
2TL	2LD	CU	30	3/0 4W	600 MCM	THHN	EMT
2EM	2TL	CU	45	3/0 3W	2/0	THHN	EMT
MTS	2EM	CU	20	2(3/0 4W)	350MCM	THHN	EMT
MTS	MSWB	CU	145	2(3/0 4W)	350MCM	THHN	EMT
GDS	MTS	CU	40	2(3/0 4W)	350MCM	THHN	EMT
MDS	CT CAN	CU	80	2(3/0 4W)	600MCM	THHN	STEEL
2EM	CHP	CU	350	3/0 4W	4/0	THHN	PLASTIC

TRIP ADJUSTMENT DIALS FOR MICROLOGIC 3.0 & 3.0A TRIP UNITS





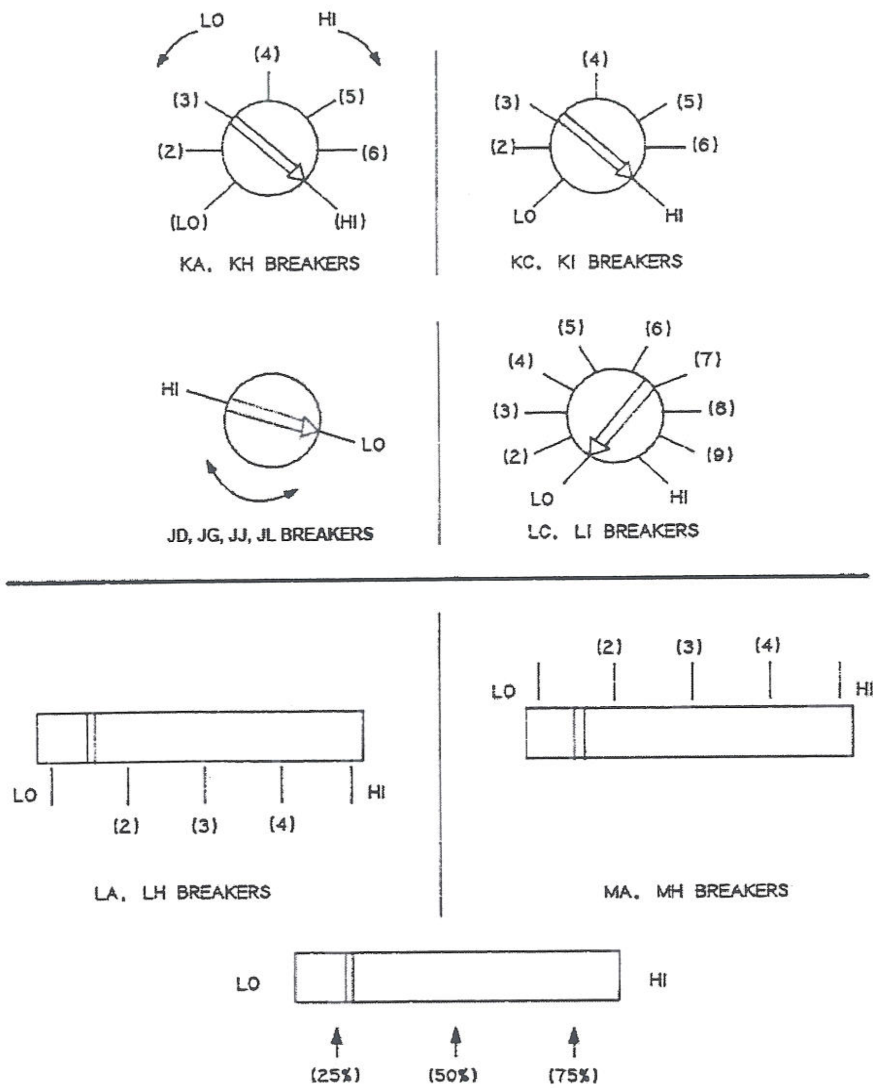
Notes

In = sensor
Ir = long time pickup setting
tr = long time delay setting
Isd = short time pickup setting
tsd = short time delay setting
Ii = instantaneous setting

1) Eight interchangeable rating plugs are available to limit the long-time pickup setting range for greater versatility. (Type A is the standard plug and corresponds to settings shown above.)

MOLDED CASE CIRCUIT BREAKERS

MAGNETIC (INSTANTANEOUS) TRIP ADJUSTMENT DIALS
(ON FRONT OF BREAKER)



PERCENTAGE OF DISTANCE
FROM LO TO HI SETTINGS

NA, NH, PA, PH, PC BREAKERS

NOTE: THE "LO" AND "HI" MARKINGS APPEAR ON THE DIAL FACES. THE MARKINGS IN PARENTHESES DO NOT.

SETTINGS SHOWN ARE FOR ILLUSTRATION ONLY

Square D Conditions of Sale

Standard

NOTE: The following Conditions of Sale are subject to change. All transactions for products sold by Square D Company are subject to the latest published Conditions of Sale of the Square D Company and to any Special Conditions of Sale which may be contained in applicable Square D quotations and acknowledgments.

1. **GOVERNING PROVISIONS AND ACCEPTANCE:** All quotations are subject to these conditions of sale. Acceptance of an order by Square D shall be expressly conditioned on Purchaser's assent to these conditions. Purchaser's direction to proceed with engineering, manufacture or shipment by Square D shall be deemed evidence of this assent. No modified or other conditions will be applicable unless those conditions are so stated in Square D's proposal or are specifically agreed to in writing and signed by an authorized official of Square D. Failure to object to provisions contained in any Purchase Order or other communication from the Purchaser (including, without limitation, penalty clauses of any kind) shall not be construed as a waiver of these Conditions nor an acceptance of any other provisions. These terms are a complete statement of the parties' agreement and may only be modified in writing signed by both parties. These terms may not be modified by course of dealing, course of performance or usage of trade. These terms supersede all previous written or oral quotations, statements or agreements. Any contract for sale by and between the parties shall be governed by and construed according to the laws of the State of Illinois without regard to its rules on the conflict of laws. The Convention on the International Sale of Goods is expressly excluded.

2. **QUOTATIONS:** Quotations shall be valid for no more than thirty (30) days from their date, unless otherwise stated in the quotation. All quotations are subject to change by Square D Company at any time upon notice to Purchaser. It is Purchaser's obligation to review the quotation carefully and to immediately advise Square D of any differing interpretation Purchaser has so any necessary change can be made.

3. **PRICE POLICY:** All prices are subject to change without notice. In the event of a net price change and unless otherwise agreed to in writing, prices for orders scheduled for immediate release shall be those in effect at time of order entry. Prices for orders placed for future shipment without an agreed price and ship date will be billed at the pricing in effect as of the shipment date. All clerical errors are subject to correction.

4. **SUBSTITUTION:** Square D may furnish suitable substitutes for material unobtainable because of priorities or regulations established by governmental authority or non-availability of materials from suppliers, provided such substitutions do not adversely affect the technical soundness of the equipment. Square D assumes no liability for deviation from published dimensions and descriptive information not essential to proper performance of the product.

5. **TAXES:** Any manufacturer's tax, retailer's tax, occupation tax, use tax, sales tax, excise tax, (except federal excise tax on vehicles), duty, customs, inspecting or testing fee, or other tax, fee or charge of any nature whatsoever, imposed by any governmental authority or measured by any transaction between Square D and Purchaser, shall be paid by the Purchaser in addition to the prices quoted or invoiced, and such charges will appear as a separate line item on the invoice. In the event Square D will be required to pay any such tax, fee, or charge, Purchaser shall reimburse Square D or, in lieu of such payment, Purchaser shall supply Square D at the time the order is submitted with an exemption certificate or other document acceptable to the tax authority. Purchase Orders must state the existence and amount of any such tax, fee or charge for which Purchaser claims an exemption.

6. **TERMS OF PAYMENT:** Acceptance of all Purchase Orders is subject to Purchaser meeting Square D credit standards. Terms are subject to change for failure to meet such standards. Terms are net thirty (30) days from date of invoice of each shipment, unless otherwise stated in Square D's quotation. For an authorized distributor or authorized reseller order, applicable terms of payment are stated in the quotation or applicable discount schedule. Square D reserves the right at any time to demand full or partial payment before proceeding with a contract of sale if, in its sole judgment, as a result of changes in the financial condition of the Purchaser the terms of payment originally specified are no longer justified.

7. **PAYMENTS:** If delivery is delayed or deferred by the Purchaser beyond the scheduled date, payment shall be due in full when Square D is prepared to ship. The equipment may be stored at the risk and expense of the Purchaser. If the Purchaser defaults when any payment is due, then the whole contract price shall become due and payable upon demand, or Square D at its option, without prejudice to other lawful remedies, may defer delivery or cancel the contract for sale. If Purchaser becomes insolvent, or bankrupt or in the event any proceeding is brought against the Purchaser, voluntarily or involuntarily under the bankruptcy or any insolvency law, Square D may cancel any order outstanding at any time and recover its applicable cancellation charges from the Purchaser or the Purchaser's estate.

8. **DELIVERY:**
A: **F.O.B. POINT OF SHIPMENT:** When the Square D quotation is based on delivery F.O.B. point of shipment, freight prepaid and allowed for delivery within the continental United States, product is sold F.O.B. point of shipment, freight prepaid and allowed. A shipping and handling charge of twenty-five dollars ($25) will be added to all orders having a total net invoice price of less than one thousand dollars ($1,000). Delivery by Square D to the point of shipment constitutes delivery to the Purchaser; and title and all risk of loss or damage in transit shall pass to the Purchaser at time of delivery at the F.O.B. point. Square D is not responsible for breakage after having received "in good order" receipts from the carrier. Purchaser is responsible for pursuing any damage claims with the carrier. No allowance will be made in lieu of transportation if the Purchaser accepts shipment at factory, warehouse or freight station or otherwise supplies its own transportation. Freight prepaid is defined as: A) Shipments to destinations within the continental United States to the accessible common carrier point nearest the first destination. B) Shipments to U.S. destinations outside the continental United States shall be to the common carrier free delivery point in the United States nearest the original port of embarkation. All charges associated with F.A.S., C.I.F., or other charges such as pier transfer, lift, ocean freight, and marine or war insurance shall be paid by the Purchaser, unless otherwise specifically agreed in a specific Purchase Order. In no event will Square D be responsible for demurrage or detention charges.
B: **DELIVERY:** F.O.B. DESTINATION: When the Square D quotation is based on delivery F.O.B. Destination, for shipments for delivery within the continental United States, Square D will retain title and all risk of loss or damage in transit to the common carrier free delivery point in the United States nearest the first destination for a price addition of 2% of the net price. If the Purchaser elects this option, Purchaser's obligations shall be as follows: A) Purchaser shall have the responsibility of inspecting the equipment for apparent loss or damage immediately upon its arrival at the free delivery point. B) In the event of apparent shipping loss or damage, Purchaser shall make written notation of the loss on the carrier's delivery receipt and, within 72 hours of delivery shall notify the Square D Customer Information Center. Purchaser shall not remove product from the point of examination and shall retain the shipping container and packing material. Purchaser shall request the carrier to make an inspection and send Square D a copy of the carrier's inspection report. C) In the event of concealed damage which occurred during transit and is discovered by the Purchaser after delivery, Purchaser shall report such damage immediately, but in no event later than 15 days after delivery, to the delivering carrier, and within

72 hours of discovery, shall notify the local Square D field office. If such notification is not made, Square D shall not be liable for loss or damage in transit.
C: **SHIPMENT AND ROUTING:** Square D shall select the point of origin of shipment, the method of transportation and the routing of the shipment. Purchasers that request expedited or special modes of transportation or routing involving air, premium or any other non-standard Square D shipping shall be assessed additional charges for shipping, handling, freight and expediting. Any rebates, allowances, discounts or incentives received by Square D from its carriers shall be retained by Square D. All prices include domestic packaging only. When other than domestic packaging is required, contact your local Square D field office. Purchaser specified packaging and marking may be subject to additional charges.

9. **SHORTAGES:** Claims for shortages or errors must be submitted to Square D within 30 days after invoice date, and failure to give such notice shall constitute unqualified acceptance and a waiver of all such claims by the Purchaser.

10. **INSTALLMENTS:** Square D reserves the right to make shipments in installments, unless otherwise expressly stipulated in a specific Purchase Order; and all such installments when separately invoiced shall be paid for when due per invoice without regard to subsequent shipments. Delay in shipment of any installment shall not relieve Purchaser of its obligation to accept remaining shipments.

11. **FORCE MAJEURE:** Square D shall not be liable for any damages as a result of any delays due to any causes beyond Square D's control, including, without limitation, an act of God; act of Purchaser or Square D supplier; embargo or other governmental act; regulation or request; fire; accident; strike; slowdown; flood; fuel or energy shortage; sabotage; war; riot; delay in transportation and inability to obtain necessary labor, materials or manufacturing facilities from usual sources. In the event of any such delay, the date of delivery shall be extended for a period of time reasonably necessary to overcome the effect of such delay.

12. **STANDARD WARRANTY:** Square D warrants equipment manufactured by it and sold through authorized sales channels to be free from defects in materials and workmanship for eighteen (18) months from date of invoice by Square D or its authorized sales channel. If within such period any such equipment shall be proved to Square D's satisfaction to be nonconforming, such equipment shall be repaired or replaced at Square D's option. This warranty shall not apply (a) to equipment not manufactured by Square D, (b) to equipment that has been repaired or altered by other than Square D so as, in its judgment, to affect the same adversely, or (c) to equipment that has been subjected to negligence, accident, or damage by circumstances beyond Square D's control, or improper operation, maintenance or storage, or to other than normal use or service. With respect to equipment not manufactured by Square D, the warranty obligations of Square D shall in all respects conform and be limited to the warranty actually extended to Square D by its supplier. Non-conforming products must be returned at Square D's expense for evaluation unless this is waived in writing. Replacement products may be new or reconditioned. The foregoing warranties do not cover reimbursement for labor, transportation, removal, installation, temporary power, or any other expenses that may be incurred in connection with repair or replacement.

13. **OPTIONAL WARRANTIES:** (Only available on equipment to be located in the U.S.) Option 1 - Extended - 2 or 3 years from Shipment. If requested by the Purchaser and specifically accepted in writing by Square D, the standard warranty will be extended to two (2) years from date of invoice for a price addition of 1% of the net face value of the Purchase Order or will be extended for three (3) years from date of invoice for a price addition of 3% of the net face value of the Purchase Order. Option 2 - Special Warranty: If requested by the Purchaser and specifically accepted in writing by Square D, the standard warranty will be extended, for a price addition of

3% of the net face value of the Purchase Order, to cover reimbursement of the direct costs of: A) Removal of non-conforming equipment or part thereof; B) Transporting equipment or parts to and from the place of repair; C) Off-loading of truck and reinstallation at the original site. Such special warranty, which may be chosen to cover a period not exceeding that of the standard or extended warranty (see above) selected, will not include the cost of providing temporary power or removing or replacing other apparatus or structures, or costs of transportation beyond a common carrier free delivery point in the continental United States. Further, the obligation of Square D for expenses and costs arising under this special warranty coverage will not exceed 50% of the net invoice price on the equipment being repaired. This warranty does not change or affect the allocation of risk or loss during shipment. Option 3 - Extended Warranty – Preventative Maintenance Agreements: If requested by the Purchaser, and specifically accepted by Square D, a Preventative Maintenance Agreement is available to provide preventative maintenance on equipment covered by the agreement. Terms of the Preventative Maintenance Agreement shall be as defined in a separate Services Agreement agreed to by the parties.

14. **RETURN OF EQUIPMENT:** NO EQUIPMENT MAY BE RETURNED WITHOUT FIRST OBTAINING SQUARE D'S WRITTEN PERMISSION AND A RETURNED MATERIAL IDENTIFICATION TAG. Returned equipment must be of current manufacture, in the original packaging, unused, undamaged and in saleable condition. Returned equipment must be securely packed to reach Square D without damage and labeled with the return authorization number. Any cost incurred by Square D to put equipment in first class condition will be charged to the Purchaser. Returns must originate from the original purchaser account number. Returns will be credited at the original price paid as indicated on the invoice or purchase order associated to the equipment being returned as provided by the Purchaser. If no invoice number or purchase order number is provided, then credit will be issued based on the into stock price in effect 12 months prior to date of return authorization and will also have an additional 25% processing fee applied.

Square D stocked equipment (which is defined as equipment stocked within Square D's Distribution Center) and non-stocked equipment, which are listed in the current product list as returnable and which are accepted for credit, not involving a Square D error, shall be assessed a restocking fee of 25% of the invoice price.

NOTE: Special Order and Custom equipment is not returnable Each line item returned must have an extended line item value of $25.00 or greater. Square D shall bear the cost of returns resulting from Square D error, and method and route of return will be at the discretion of Square D. Costs incurred by failure to follow Square D direction will be borne by the Purchaser.

15. **SOFTWARE:** Any software or computer information, in whatever form that is provided with equipment manufactured by Square D, is licensed to Purchaser solely pursuant to standard licenses of Square D or its supplier of such software or computer information which licenses are hereby incorporated by reference. Square D does not warrant that such software or computer information will operate error free or without interruption, and warrants only that during the warranty period applicable to the equipment that the software will perform its essential functions. If such software or computer information fails to conform to such warranty, Square D will, at its option, provide an update to correct the non-conformance or replace the software or computer information with the latest available version containing a correction. Square D shall have no other obligation to provide updates or revisions.

16. **LIMITATIONS:** These disclaimers and limitations of remedies apply to all warranties offered to Purchaser and to all Purchase Orders. THE WARRANTIES SET FORTH ABOVE ARE EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESSED OR IMPLIED WARRANTIES (EXCEPT WARRANTIES OF TITLE), INCLUDING, BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Except as may be expressly provided in an authorized writing by Square D, Square D shall not be subject to any other obligations or liabilities whatsoever, other than as stated above with respect to equipment sold or services rendered by Square D. Notwithstanding anything to the contrary herein contained SQUARE D COMPANY, ITS CONTRACTORS AND SUPPLIERS OF ANY TIER, SHALL NOT BE LIABLE IN CONTRACT, IN TORT (INCLUDING NEGLIGENCE OR STRICT LIABILITY) OR OTHERWISE FOR LOST TIME, LOST PROFITS, OR SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND WHATSOEVER. The remedies of the Purchaser are exclusive and the total cumulative liability of Square D, its contractors and suppliers of any tier, with respect to this contract or anything done in connection therewith, such as the use of any product covered by or furnished under the contract, whether in contract, in tort (including negligence or strict liability) or otherwise, shall not exceed the price of the product, part, or service on which such liability is based.

17. **INTELLECTUAL PROPERTY:** As to equipment proposed and furnished by Square D, Square D shall defend any suit or proceeding brought against Purchaser so far as based on a claim that such equipment constitutes an infringement of any copyright, trademark or patent of the United States. This obligation shall be effective only if Purchaser shall have made all payments then due hereunder and if Square D is notified promptly in writing and given authority, information, and assistance at Square D's expense for the defense of the same. In the event the use of such equipment by Purchaser is enjoined in such a suit, Square D shall, at its expense, and at its sole option, either (a) procure for the Purchaser the right to continue using such equipment (b) modify such equipment to render it non-infringing (c) replace such equipment with non-infringing equipment, or (d) refund the purchase price (less depreciation) and the transportation and installation costs of such equipment. Square D will not be responsible for any compromise or settlement made without its written consent. The foregoing states the entire liability of Square D for patent, trademark or copyright infringement, and in no event shall Square D be liable if any infringement charge is based on the use of Square D equipment for a purpose other than that for which it was sold by Square D. As to any equipment furnished by Square D to Purchaser and manufactured in accordance with designs proposed by Purchaser, the Purchaser shall indemnify Square D against any award made against Square D for patent, trademark, or copyright infringements.

18. **WITNESS OF TESTS AND FACTORY INSPECTIONS:** Normal production schedules do not provide the opportunity for Purchaser to witness routine factory tests on equipment or make factory inspections. Witnessing of tests or factory inspections by the Purchaser may result in delays of production for which Square D will not be responsible. Witness testing and factory inspections must be requested at time of quotation, are subject to additional costs and must be confirmed at order entry. Standard Square D factory testing and inspection will apply. Square D will notify Purchaser fourteen (14) calendar days prior to scheduled witness testing or inspection. In the event Purchaser is unable to attend, the Parties may mutually agree on a rescheduled date. However, Square D, at its sole option, may consider the witness tests and/or inspection waived, and ship and invoice the Products and the witness testing charges. Purchaser will be responsible for paying for all scheduled witness testing, whether or not Purchaser attends.

19. **NUCLEAR APPLICATIONS TERMS AND CONDITIONS:** Unless otherwise agreed in writing by a duly authorized representative of Square D, products sold hereunder are not intended for use in or in connection with any nuclear facility or activity. If so used, Square D disclaims all liability for any damage, injury or contamination; and Purchaser shall indemnify Square D against any such liability, whether arising as a result of breach of contract, warranty or tort (including negligence) or otherwise.

20. **PATTERNS AND TOOLS:** Notice will be given if special patterns or tools are required to complete any order. Charges for such patterns or tools do not convey title thereto or the right to

remove them from Square D's plant. If patterns or tools are not used for a period of two years, Square D shall have the right to scrap them without notice.

21. **PRODUCT NOTICES:** Purchaser shall promptly supply the user (including its employees) of the product with all Square D supplied product notices, warnings, instructions, recommendations and similar materials.

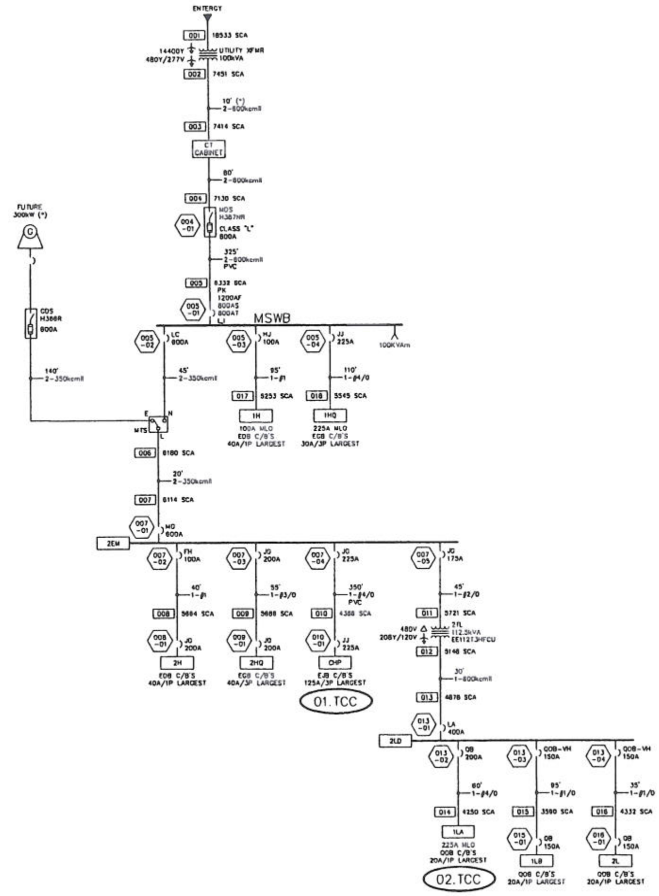
22. **ERRORS:** Square D reserves the right to correct errors or omissions in quotations, acknowledgments, invoices, or other
documents.

23. **OSHA COMPLIANCE:** Compliance with OSHA or similar federal, state or local laws during the operation or use of the product(s) is the sole responsibility of the Purchaser.

24. **TERMINATION:** Any order may be terminated by the Purchaser only upon notice to Square D and upon payment of reasonable and proper termination charges based on the price of the terminated order and reimbursement of all direct costs and expenses associated with the order caused by such termination and shall include a reasonable profit. Special or custom ordered equipment is not cancelable after final acceptance of approval drawings for the commencement of manufacturing.

25. **CANCELLATION:** Square D shall have the right to cancel any order or contract at any time by written notice for any material breach of the contract by the Purchaser, including material delays in releasing equipment for manufacture or approval drawings and excessive changes to specifications or drawings.

APPENDIX E: SYSTEM STUDY ONE-LINE DIAGRAM



NOTES:

1) SCA - MAXIMUM AVAILABLE THREE-PHASE RMS SYMMETRICAL SHORT-CIRCUIT AMPERES.

2) ▭ - BUS IDENTIFICATION NUMBER USED BY COMPUTER PROGRAM WHEN PERFORMING SHORT-CIRCUIT ANALYSIS.

3) ⬡ - DEVICE IDENTIFICATION NUMBER USED BY COMPUTER PROGRAM WHEN PERFORMING TIME-CURRENT COORDINATION ANALYSIS.

4) ——— ALL LOW-VOLTAGE CABLES WERE CONSIDERED TO BE TYPE THHN, SINGLE CONDUCTOR COPPER, RUN IN STEEL CONDUIT, UNLESS OTHERWISE NOTED.

5) ——— ALL DEVICES WERE CONSIDERED TO BE THREE-POLE UNLESS OTHERWISE NOTED.

6) ——— AF DENOTES AMPERE FRAME RATING
AS DENOTES AMPERE SENSOR RATING
AP DENOTES AMPERE PLUG RATING
AT DENOTES AMPERE TRIP RATING

7) ——— L DENOTES LONG TIME FUNCTION
S DENOTES SHORT TIME FUNCTION
I DENOTES INSTANTANEOUS FUNCTION
G DENOTES GROUND FUNCTION

8) KVAm - CONNECTED MOTOR KVA USED FOR FAULT CALCULATIONS (1 HP = 1 KVAm).

9) (TCC#) TIME-CURRENT CURVE SERIES CIRCUITS ILLUSTRATED IN REPORT.

10)—(*)— DENOTES ASSUMED INFORMATION.

REV.	DATE	DESCRIPTION	DRAWN	CHKD
5				
4				
3				
2				
1	01/19/10	ADDED BUS NUMBERS AND SCC VALUES	JLM	JMK
-	1/5/10		ESM	MK

SQUARE D by Schneider Electric

TITLE: NEW ORLEANS CITY PARK
ADMINISTRATIVE BUILDING
NEW ORLEANS, LA

Square D
Engineering Services
SUITE B-325
2385 HARRODSBURG ROAD
LEXINGTON, KENTUCKY 40504

ONE - LINE DIAGRAM | SCALE NTS

DWG. NO. D-ML-09-639-1