IDEA Project No. 24549

KN229976-ARC FLASH STUDY

FF03

Fort Frontenac

Department of National Defence

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INTEGRATED DESIGN
ENGINEERING + ARCHITECTURE

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RECORD OF REVISIONS			
REVISION	**DATE**	**BY**	**COMMENTS**
0	2025-01-10	Nicholas Frayn, P.Eng	Draft for client review
1	2025-03-14	Nicholas Frayn, P.Eng	Final Report



Disclaimer:

The arc flash values in this report have been determined through analysis conducted by IDEA Inc., following industry-recognized standards and utilizing tools that follow these standards. Improper maintenance of the electrical equipment listed within, age and condition of the equipment, modifications to the equipment, system modifications, and protective device settings could render the results of this study invalid. The results of this study assume that the equipment is operating properly as per the manufacturers' specifications. The data collected was provided by 3rd parties involved in the project, obtained onsite from the existing equipment, and when not available derived through recognized industry standards. This report is only to be used by the qualified personnel it was intended for in which IDEA Inc. has sent the original copy to, and IDEA Inc. assumes no liability or responsibility if the report is distributed or copied without consent from IDEA Inc.

Codes and Standards

- CSA C22.2:21 – Canadian Electrical Code, Part 1 (25th Edition)
- CSA Z462:24 – Workplace Electrical Safety
- IEEE 1584-208 – Guide for Performing Arc-Flash Hazard Calculations
- ANSI/IEEE C37.13 – Standard for Low Volage AC Power Breakers Used in Enclosures
- ANSI/IEEE C37.010 Standard Application Guide for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current

UL 489-9 Standard for Safety for Molded Case Circuit Breakers, Molded Case Switches, and Circuit Breaker Enclosures

1. Executive Summary

DCC engaged IDEA Inc to perform an analysis of the existing electrical distribution system at building FF03 located at Fort Frontenac in Kingston Ontario.

The analysis intends to address the following items:

a) Perform a Short Circuit and Coordination study on both the medium voltage and low voltage systems for the building with short circuit results to be provided to confirm Short Circuit rating of the existing equipment.
b) Use the above short circuit results to provide a protective device coordination study utilizing individual time current coordination curves to provide recommended circuit breaker device settings and fuse types to limit incident energy and fault current.
c) Provide an Arc Flash Hazard Analysis as per CSA Z462-21 utilizing IEEE Std 1584 for the arc flash calculations to indicate incident energy from the medium voltage equipment down to the low voltage panels within the building. From these results and the coordination study recommended setting Arc Flash labels will be provided by the end of the project.
d) Provide the single line diagrams used to perform above studies.
e) Provide an Infrared Thermographic Scanning Report for all electrical distribution equipment from the service transformer down to all panel boards. The report will identify all equipment found to be anomalous, with current readings for this equipment provided and recommendations for correcting the equipment.
f) Provide Phase Balance Testing of the electrical distribution under normal load conditions. This will be measured at the incoming service to the building, and at each distribution panel, step down transformer, and low voltage panel board, where deemed safe to do so. Voltage drop measurements from the incoming main service down the furthest distribution equipment.

This report provides our findings associated with the existing equipment and lists the associated recommended work to be performed to bring the existing equipment up to code, reduce fault levels and incident energy to make the equipment safer to work on.

Multiple site visits were conducted by IDEA Inc., Eaton and Drycore Electric as part of the scope of work to investigate the existing electrical distribution system at building FF03 at Fort Frontenac. The equipment was opened and tested to document the equipment ratings, condition, wire sizes and types, perform voltage and current readings, take pictures and perform a thermographic scan while under load. This information was used to produce an updated single line diagram, and was entered into the Power System Software ETAP to perform the Short Circuit, Coordination, and Arc Flash Studies.

During the site visit, due to the condition and lack of maintenance reports on the 4160V equipment, it was deemed unsafe to open this equipment while energized to perform an inspection and analysis. With approval from DND and Kingston Utilities, the equipment was deenergized to perform the investigation.

The information for the electrical equipment used within the report by IDEA Inc. was provided by Drycore Electric and Kingston Utilities.

1.1. Study Introduction

The short circuit study is used to determine whether the SCCR (Short Circuit Current Rating) of the existing equipment is able to withstand the available fault current associated with the incoming service and down stream equipment.

The protective device coordination study analyzes the existing protective device settings and ratings under fault and normal operating conditions. This includes relay/breaker ratings and trip settings, and fuse ratings. The coordination study is used to ensure that during a fault or overload condition, the immediate upstream protective device associated with the equipment clears the anomaly opposed to a device further upstream. This limits the fault clearing time (FCT) and thus the associated incident energy.

The Arc Flash Incident Energy Report is produced based on CSA Z462:24 standard to study the incident energy available at the equipment and determine the Arc Flash Boundary. Per section 4.3.5.1 of CSA Z462:24, 'an arc flash risk assessment shall be performed to identify arc flash hazards, estimate the likelihood of occurrence of injury or damage to health and the potential of severity of injury or damage to health, and determine if additional protective measures are required, including the use of PPE'.

Once the arc flash assessment is performed, this information is used to determine the arc flash boundary and recommended PPE. The incident energy analysis method used in this report is the IEEE 1584 calculation method. With the incident energy and arc flash boundary determined, Table 2 of CSA Z462:24 provides the PPE requirements at that level of incident energy. The PPE, incident energy and boundary information is applied to an Arc Flash label specifically designed for each unique piece of equipment.

The Infrared Thermographic Scanning is performed to observe any temperature anomalies that occur within existing electrical equipment. These anomalies can occur due to many various reasons, including but not limited to:

- Loose connections or lugs
- Overloaded circuits
- Broken or malfunctioning equipment

An infrared thermal scan is a useful and less-invasive test to help keep electrical equipment in good working condition and should be performed at least once every 12 months for adequate maintenance of the equipment.

Phase balance and voltage drop readings are performed to make sure the electrical system is properly balanced, and the system isn't operating above or below nominal operating voltages regulated in Canada. Current readings are taken at the main service, and the down stream equipment while under load to observe the amperage readings on each phase. Voltage readings are taken at the incoming service transformer and then at each down stream piece of equipment such as panel or MCC to determine the voltage drop of the system.

Visual inspection to the interior and exterior of the existing equipment is performed to ensure that the equipment is free from any deterioration, damage, or corrosion. The installation is inspected to ensure the equipment meets or exceeds the current Canadian Electrical Code.

1.2. Recommendations

Recommendations obtained from the **Short Circuit Study**:

No recommendations from this section. Fuse F_TRN-3 fails as it represents the Bay-O-Net fuses which are not designed to protect against the short circuit current.

Further detail of the above recommendations can be found in section 2.6.

Recommendations obtained from the **Protective Device Coordination Study**:

Revise size of fuse F_TRN-3 from 100A to 50A.

Revise style of fuse F_DP-2 from fast acting to time delay.

Further detail of the above recommendations can be found in section 3.6.

Recommendations obtained from the **Arc Flash Incident Energy Report**:

Revise size of fuse F_TRN-3 from 100A to 50A to reduce the incident energy at DP-PRN-3 from Level B (16.208 cal/cm2) to Level A (6.715 cal/cm2).

Further detail of the above recommendations can be found in section 4.6.

Recommendations obtained from the **Infrared Thermographic Scan**:

Transformer TX-2 has conduit routed out the top of it. Top entry is typically not allowed on most transformers due to the funnel effect. Confirm transformer is rated for top entry and if not re-install properly.

DS-Main has possible contamination on the switching mechanism or a loose connection. Corrective action is to investigate further, clean contacts, check torque and re-scan.

P-AB has poor connection to bus or defective breaker. Recommend replacing breaker and investigating bus connection. Re-scan after work has been performed.

Panel P-AA - Check and clean connection for circuit breaker in circuit 13/15/17. Scan breaker again after cleaning.

Further detail of the above recommendations can be found in Appendix B.

Recommendations obtained from the **Phase Balance and Voltage Drop Readings**:

No recommendations from this section.

Further detail of the above recommendations can be found in section 6.

Recommendations obtained from the **Visual and Mechanical Inspection**:

Transformer TX-2:

1. Replace transformer.

Panel DP-MAIN:

2. Remove sand bags obstructing footing to panel. Sand bags must be there for apparent flooding affecting TX-3. Investigate raising TX-3 on a stand to remove requirement of sandbags.
3. Trace branch circuits and provide lamacoid labels.

Panel DP-1:

1. Trace branch circuits and provide lamacoid labels.

Panel DP-2:

1. Trace branch circuits and provide lamacoid labels.

Panel P-JM:

1. Provide knockout covers for panel
2. Provide strapping to properly support conduits
3. Tape or heat shrink wires for proper phase identification

Panel P-BA:

1. Replace all main lugs on panel for proper termination
2. Provide new screws for the panel cover
3. Provide knockout covers
4. Investigate cut wires and remove or cap as required.
5. Replace panel instead of the above.

Panel P-BB:

1. Provide new lamacoids or P-touch labels for panel labelling
2. Provide new screws for the panel
3. Megger the neutral to determine condition of the neutral insulation. Replacement may be required based on results.
4. Perform panel clean
5. Revise neutral to be fed from white wire or tape to identify as neutral.

Panel P-BC:

1. Investigate circuit, provide additional 15A 1P breaker for the second wire.
2. Panel cover has been cut. DND to decide if they want this rectified. No live parts are exposed from the modification.

Panel P-BK:

1. Provide knockout cover.
2. Replace panel.

Panel P-AA:

1. Relocate ice machine
2. Purchase new locking cylinder for panel
3. Order new label from manufacturer for voltage and amperage

Panel P-AB:

1. Tag panel to be monitored and perform thermal scan every one to two years on the panel. Increased corrosion can cause faulty connections.

2. Investigate circuit. Provide new breaker for additional circuit.
3. Replace panel

Panel P-AC:

1. Remove MI cable.
2. Provide new screws for panel interior
3. Replace Pane

Panel P-AD:

1. Investigate circuit. Neutral wire may need to be reduced in size if a modified neutral bar can't be purchased. Remove neutral wire from neutral lug location and re-instate lug.

Panel P-AE:

1. Purchase a new main breaker to be installed

Panel P-AG:

1. Tag panel to be monitored and perform thermal scan every one to two years. Corrosion can cause faulty connections within the panel
2. Tape or heat shrink wires to properly identify phasing
3. Replace panel

Panel P-FF333:

1. Provide knockout covers.
2. Revise neutral to use white wire. Tape blue wire to identify as neutral wire if this can't be modified.

Panel P-QO:

1. Provide limacoid or P-Touch labels for panel circuiting/ Trace circuits and provide panel directory
2. Install set screws in connectors to panel
3. Provide knockout covers
4. Provide strapping to properly support conduits leaving panel.

Main Disconnect Switch:

1. Relocate transformer out of disconnect switch clearance.

General Building:

1. Print and Frame Single Line Diagram as required by CEC.

Exterior Transformer TRN-3:

1. Tag transformer to be monitored and perform thermal scan every one to two years. Moisture and rust can cause faulty connections within the panel

Exterior Panel feeding FF03 and FF08 TRN-3:

1. Tag panel to be monitored and perform thermal scan every one to two years. Moisture and rust can cause faulty connections within the panel.
2. Provide new grounding bar.
3. Provide new door gasket.
4. Replace panel.

Further detail of the above recommendations can be found in section 7.

2. Short Circuit Study

The importance of the short circuit study is to determine whether the existing equipment can withstand the available fault current of the distribution system. If the equipment is underrated, significant damage to the equipment and personnel working near the equipment can occur due to mechanical and electrical forces created during the fault. The Short Circuit Study was performed using the ETAP Power System Software.

2.1. Methodology

Utilizing ETAP, the short circuit coordination study is performed using the ANSI C37 calculation method. From the data obtained within the field from the existing equipment, and fault levels provided by the Local Utilities Company, the single line diagram for the building is created within the software, and the software simulates three phase bolted faults and line to ground bolted faults at every bus included within the system. Critical information needed for the study includes cable impedance and lengths, and transformer X/R ratios to determine how the fault propagates through the system. The equipment analyzes both symmetrical and asymmetrical fault current contributions at each bus. The results are compared to the rating of the equipment to determine if any marginal or critical failures can occur from a fault.

2.2. Information Provided

The field information for the existing equipment was obtained by the electrical contracting company Drycore Electric.

The Hydro Fault information was provided by Kingston Utilities.

2.3. Assumptions

Where device information was not obtainable due to damaged name plates or lack there of, design values and standard values are used and listed within.

2.4. Input Information

The following reports are exported from ETAP to list the input information used within the study:

Cables:

ID	kV	Cond./ Phase	Cond./ Cable	Size AWG/mm²	Z					Length m	Conductor
					Z Ohms / Unit Length	R Ohms / Unit Length	X Ohms / Unit Length	L H / Unit Length	Y S / Unit Length		
CBL_CONDENSATE PUMP	0.6	1	1/C	12	2.00116	2	0.068	0.0001804	0	50	CU
CBL_CU#2	1	1	3/C	6	0.5127	0.51	0.0525	0.0001393	0	2	CU
CBL_DP-MAIN	0.6	1	1/C	600	0.04528	0.023	0.039	0.0001035	0	10	CU
CBL_DS-MAIN	0.6	1	1/C	350	0.05517	0.038	0.04	0.0001061	0	50	CU
CBL_ELEV	1	1	3/C	6	0.5127	0.51	0.0525	0.0001393	0	175	CU
CBL_EXTERIOR CU	0.6	1	1/C	10	1.20165	1.2	0.063	0.0001671	0	40	CU
CBL_FF333	0.6	1	1/C	3/0	0.09458	0.079	0.052	0.0001379	0	110	CU
CBL_HVAC-3	0.6	2	1/C	12	2.00116	2	0.068	0.0001804	0	40	CU
CBL_KIT EF	0.6	1	1/C	12	2.00116	2	0.068	0.0001804	0	10	CU
CBL_METER	0.6	1	1/C	12	2.00116	2	0.068	0.0001804	0	5	CU
CBL_MUA5	0.6	1	1/C	12	2.00116	2	0.068	0.0001804	0	10	CU
CBL_P-AE	0.6	1	1/C	3	0.25687	0.25	0.059	0.0001565	0	80	CU
CBL_P-AF1	0.6	1	1/C	4/0	0.08106	0.063	0.051	0.0001353	0	20	CU
CBL_P-AF2	0.6	1	1/C	4/0	0.08106	0.063	0.051	0.0001353	0	10	CU
CBL_P-AG	0.6	1	1/C	1	0.16985	0.16	0.057	0.0001512	0	100	CU
CBL_P-AH	0.6	1	1/C	1	0.16985	0.16	0.057	0.0001512	0	150	CU
CBL_P-BB	1	1	3/C	6	0.5127	0.51	0.0525	0.0001393	0	150	CU
CBL_P-BC	0.6	1	1/C	400	0.06022	0.035	0.049	0.00013	0	100	CU
CBL_P-BD	0.6	1	1/C	4	0.31575	0.31	0.06	0.0001592	0	150	CU
CBL_P-BK	0.6	1	1/C	4/0	0.08106	0.063	0.051	0.0001353	0	20	CU
CBL_P-JM	1	1	3/C	350	0.0531	0.0378	0.0373	0.0000989	0	10	CU
CBL_P2-TRN4	5	1	1/C	1/0	0.13777	0.1281	0.0507	0.0001345	0	250	CU
CBL_SPLITTER P.H.	0.6	1	1/C	2	0.20796	0.2	0.057	0.0001512	0	350	CU
CBL_TRN4-TRN4a	5	1	1/C	1/0	0.13777	0.1281	0.0507	0.0001345	0	20	CU
CBL_TRN4a-TRN3	5	1	1/C	1/0	0.13777	0.1281	0.0507	0.0001345	0	225	CU
CBL_TX-1 PRI	0.6	1	1/C	2	0.20796	0.2	0.057	0.0001512	0	30	CU
CBL_TX-1 SEC	0.6	1	1/C	2	0.20796	0.2	0.057	0.0001512	0	25	CU
CBL_TX-2 PRI	0.6	1	1/C	3/0	0.09458	0.079	0.052	0.0001379	0	30	CU
CBL_TX-2 SEC	1	1	3/C	3/0	0.08976	0.0805	0.0397	0.0001053	0	25	CU
CBL_TX-3 PRI	0.6	1	1/C	2	0.20796	0.2	0.057	0.0001512	0	10	CU
CBL_TX-3 SEC	0.6	1	1/C	350	0.06341	0.039	0.05	0.0001326	0	13	CU
CBL_UNKNOWN	0.6	1	1/C	8	0.7827	0.78	0.065	0.0001724	0	10	CU

Buses/ Panels/ Switch Gear:

ID	Nominal kV	Type	Bracing Symm. kA	Bracing Asymm. kA	Bracing Peak kA
BUS_HV-SG	4.16	Switchgear		26	43.88
BUS_TRN-3	4.16	Cable Bus		22	37.13
BUS_TRN-4	4.16	Cable Bus		22	37.13
BUS_TRN-4a	4.16	Cable Bus		22	37.13
DP-1	0.208	Panelboard	10	10	
DP-2	0.208	Panelboard	22	22	
DP-MAIN	0.6	Panelboard	200	200	
DP-PRN-3	0.6	Panelboard	14	14	
FF333	0.208	Panelboard	10	10	
P-AE	0.208	Panelboard	10	10	
P-AF1	0.208	Panelboard	10	10	
P-AF2	0.208	Panelboard	10	10	
P-AG	0.208	Panelboard	10	10	
P-AH	0.208	Panelboard	10	10	
P-BB	0.208	Panelboard	10	10	
P-BC	0.208	Panelboard	10	10	
P-BD	0.208	Panelboard	10	10	
P-BK	0.208	Panelboard	10	10	
P-JM	0.208	Panelboard	0	0	
SPLITTER P.H.	0.6	Cable Bus	22	22	
DP-1	0.208	Panelboard	10	10	
DP-2	0.208	Panelboard	22	22	
P-AA	0.208	Panelboard	10	10	
P-AB	0.208	Panelboard	10	10	
P-AC	0.208	Panelboard	10	10	
P-AD	0.208	Panelboard	10	10	
P-AF2	0.208	Panelboard	10	10	
P-BA	0.208	Panelboard	10	10	
P-QO	0.208	Panelboard	10	10	

Circuit Breakers:

ID	kV	Type	Bus	Rated Int. Adj. kA	Rated Int. kA
CB2	0.6	Molded Case	DP-PRN-3	25	25
CB3	0.6	Molded Case	DP-PRN-3	14	14
B_CONDENSATE PUM	0.208	Molded Case	DP-1	10	10
CB_DP-1 MCB	0.208	Molded Case	DP-1	22	22
CB_DP-2 MCB	0.208	Molded Case	DP-2	22	22
CB_ELEVATOR	0.208	Molded Case	DP-1	10	10
CB_FF03	0.6	Molded Case	DP-PRN-3	18	18
CB_FF08	0.6	Molded Case	DP-PRN-3	14	14
CB_FF333	0.208	Molded Case	DP-2	18	18
CB_MCB AE	0.208	Molded Case	P-AE	10	10
CB_MCB BD	0.208	Molded Case	P-BD	25	25
CB_P-AA	0.208	Molded Case	DP-2	10	10
CB_P-AB	0.208	Molded Case	DP-2	10	10
CB_P-AC	0.208	Molded Case	DP-2	10	10
CB_P-AD	0.208	Molded Case	DP-2	18	18
CB_P-AE	0.208	Molded Case	DP-2	10	10
CB_P-AF1	0.208	Molded Case	DP-2	22	22
CB_P-AG	0.208	Molded Case	DP-2	18	18
CB_P-AH	0.208	Molded Case	DP-2	18	18
CB_P-BA	0.208	Molded Case	DP-1	10	10
CB_P-BB	0.208	Molded Case	DP-1	10	10
CB_P-BC	0.208	Molded Case	DP-1	22	22
CB_P-BC_Main	0.208	Molded Case	P-BC	22	22
CB_P-BD	0.208	Molded Case	DP-1	22	22
CB_P-BK	0.208	Molded Case	P-BC	10	10
CB_QO	0.208	Molded Case	P-AF2	10	10
CB_SPARE	0.208	Molded Case	DP-1	10	10
CB_MCB AB	0.208	Molded Case	P-AB	10	10

Fuses:

ID	kV	Type	Bus	Rated Int. Adj. kA	Rated Int. kA
F_DP-1	0.6	Fuse	DP-MAIN	200	200
F_DP-2	0.6	Fuse	DP-MAIN	200	200
F_EXTERIOR CU	0.6	Fuse	DP-MAIN	200	200
F_HV-SG	4.16	Fuse	BUS_HV-SG	26	26
F_HVAC-3	0.6	Fuse	DP-MAIN	200	200
F_P-JM	0.6	Fuse	DP-MAIN	200	200
F_P2	4.16	Fuse	BUS_HV-SG	26	26
F_SPLITTER P.H.	0.6	Fuse	DP-MAIN	200	200
F_TRN-3	4.16	Fuse	BUS_TRN-3	3.5	3.5

Switches:

ID	kV	Type	Bus	Rated Mom. Asymm. kA
DS_SPLITTER P.H.	0.6	SPST Switch	SPLITTER P.H.	10
SW1_TRN-3	4.16	SPST Switch	BUS_TRN-3	22
SW1_TRN-4	4.16	SPST Switch	BUS_TRN-4	22
SW1_TRN-4a	4.16	SPST Switch	BUS_TRN-4a	22
SW2_TRN-4	4.16	SPST Switch	BUS_TRN-4	22
SW2_TRN-4a	4.16	SPST Switch	BUS_TRN-4a	22
SW_DP-1	0.6	SPST Switch	DP-MAIN	200
SW_DP-2	0.6	SPST Switch	DP-MAIN	200
SW_ELEV	0.6	SPST Switch	DP-MAIN	200
SW_EXTERIOR CU	0.6	SPST Switch	DP-MAIN	200
SW_HV-SG	4.16	SPST Switch	BUS_HV-SG	26
SW_HVAC-3	0.6	SPST Switch	DP-MAIN	200
SW_METER	0.6	SPST Switch	DP-MAIN	200
SW_P-JM	0.6	SPST Switch	DP-MAIN	200
SW_P2	4.16	SPST Switch	BUS_HV-SG	26
SW_SPARE 30A	0.6	SPST Switch	DP-MAIN	10
SW_SPARE 60A	0.6	SPST Switch	DP-MAIN	10
SW_SPARE 100A	0.6	SPST Switch	DP-MAIN	200
SW_SPLITTER P.H.	0.6	SPST Switch	DP-MAIN	200

2.5. Results

The following summary tables are exported from ETAP to evaluate the Fault Current Calculations against the Equipment ratings inputted into the software.

Project:	Arc Flash Study Fort Frontenac	**ETAP**		Page:	1
Location:	Fort Frontenac, Kingston	24.0.0C		Date:	01-10-2025
Contract:	KN229976			SN:	IDEAINC-01
Engineer:	Nicholas Frayn	Study Case:	SC FF03	Revision:	Rev 1
Filename:	24549 - DCC Arc Flash - FF03			Config.:	Normal

Momentary Duty Summary Report

3-Phase Fault Currents: (Prefault Voltage = 100 % of the Bus Nominal Voltage)

Bus		Device		Momentary Duty					Device Capability		
ID	kV	ID	Type	Symm. kA rms	X/R Ratio	M.F.	Asymm. kA rms	Asymm. kA Peak	Symm. kA rms	Asymm. kA rms	Asymm. kA Peak
BUS_HV-SG	4.160	BUS_HV-SG	Switchgear	13.265	5.6	1.284	17.027	29.434		26.000	43.880
	4.160	SW_HV-SG	SPST Switch	13.265	5.6	1.284	17.027	29.434		26.000	
	4.160	SW_P2	SPST Switch	13.265	5.6	1.284	17.027	29.434		26.000	
BUS_TRN-3	4.160	BUS_TRN-3	Cable Bus	10.705	2.1	1.051	11.254	18.612		22.000	37.130
	4.160	SW1_TRN-3	SPST Switch	10.705	2.1	1.051	11.254	18.612		22.000	
BUS_TRN-4	4.160	BUS_TRN-4	Cable Bus	11.935	3.0	1.115	13.309	22.769		22.000	37.130
	4.160	SW1_TRN-4	SPST Switch	11.935	3.0	1.115	13.309	22.769		22.000	
	4.160	SW2_TRN-4	SPST Switch	11.935	3.0	1.115	13.309	22.769		22.000	
BUS_TRN-4a	4.160	BUS_TRN-4a	Cable Bus	11.831	2.9	1.107	13.102	22.361		22.000	37.130
	4.160	SW1_TRN-4a	SPST Switch	11.831	2.9	1.107	13.102	22.361		22.000	
	4.160	SW2_TRN-4a	SPST Switch	11.831	2.9	1.107	13.102	22.361		22.000	
DP-1	0.208	DP-1	Panelboard	4.893	2.7	1.093	5.351	9.085	10.000	10.000	
DP-2	0.208	DP-2	Panelboard	4.436	1.5	1.015	4.501	7.036	22.000	22.000	
DP-MAIN	0.600	DP-MAIN	Panelboard	6.684	3.7	1.169	7.815	13.503	200.000	200.000	
	0.600	SW_METER	SPST Switch	6.684	3.7	1.169	7.815	13.503		200.000	
	0.600	SW_SPARE 30A	SPST Switch	6.684	3.7	1.169	7.815	13.503		10.000	
	0.600	SW_SPARE 60A	SPST Switch	6.684	3.7	1.169	7.815	13.503		10.000	
	0.600	SW_HVAC-3	SPST Switch	6.684	3.7	1.169	7.815	13.503		200.000	
	0.600	SW_EXTERIOR CU	SPST Switch	6.684	3.7	1.169	7.815	13.503		200.000	
	0.600	SW_SPARE 100A	SPST Switch	6.684	3.7	1.169	7.815	13.503		200.000	
	0.600	SW_P-JM	SPST Switch	6.684	3.7	1.169	7.815	13.503		200.000	
	0.600	SW_SPLITTER P.H.	SPST Switch	6.684	3.7	1.169	7.815	13.503		200.000	
	0.600	SW_DP-1	SPST Switch	6.684	3.7	1.169	7.815	13.503		200.000	
	0.600	SW_ELEV	SPST Switch	6.684	3.7	1.169	7.815	13.503		200.000	
	0.600	SW_DP-2	SPST Switch	6.684	3.7	1.169	7.815	13.503		200.000	
DP-PRN-3	0.600	DP-PRN-3	Panelboard	7.050	4.2	1.202	8.476	14.675	14.000	14.000	
FF333	0.208	FF333	Panelboard	3.256	1.2	1.005	3.272	4.930	10.000	10.000	
P-AE	0.208	P-AE	Panelboard	2.705	0.8	1.000	2.706	3.892	10.000	10.000	
P-AF1	0.208	P-AF1	Panelboard	4.195	1.4	1.013	4.248	6.601	10.000	10.000	
P-AF2	0.208	P-AF2	Panelboard	4.084	1.4	1.012	4.132	6.403	10.000	10.000	
P-AG	0.208	P-AG	Panelboard	2.862	0.9	1.001	2.865	4.174	10.000	10.000	
P-AH	0.208	P-AH	Panelboard	2.406	0.8	1.000	2.407	3.468	10.000	10.000	

Project:	Arc Flash Study Fort Frontenac	ETAP		Page:	2
Location:	Fort Frontenac, Kingston	24.0.0C		Date:	01-10-2025
Contract:	KN229976			SN:	IDEAINC-01
Engineer:	Nicholas Frayn	Study Case:	SC FF03	Revision:	Rev 1
Filename:	24549 - DCC Arc Flash - FF03			Config.:	Normal

3-Phase Fault Currents: (Prefault Voltage = 100 % of the Bus Nominal Voltage)

Bus		Device		Momentary Duty					Device Capability		
ID	kV	ID	Type	Symm. kA rms	X/R Ratio	M.F.	Asymm. kA rms	Asymm. kA Peak	Symm. kA rms	Asymm. kA rms	Asymm. kA Peak
P-BB	0.208	P-BB	Panelboard	1.327	0.4	1.000	1.327	1.877	10.000	10.000	
P-BC	0.208	P-BC	Panelboard	3.951	2.3	1.065	4.207	7.032	10.000	10.000	
P-BD	0.208	P-BD	Panelboard	1.886	0.6	1.000	1.886	2.679	10.000	10.000	
P-BK	0.208	P-BK	Panelboard	3.772	2.2	1.054	3.977	6.596	10.000	10.000	
P-JM	0.208	P-JM	Panelboard	3.297	2.0	1.044	3.443	5.657			
SPLITTER P.H.	0.600	SPLITTER P.H.	Cable Bus	3.220	0.9	1.001	3.223	4.672	22.000	22.000	
	0.600	DS_SPLITTER P.H.	SPST Switch	3.220	0.9	1.001	3.223	4.672		10.000	

- Method: IEEE - X/R is calculated from separate R & X networks.
- Generator protective device duty is calculated based on maximum through fault current. Other protective device duty is calculated based on total fault current.

- The multiplication factors for high voltage circuit-breaker and high voltage bus momentary duty (asymmetrical and crest values) are calculated based on system X/R.

* Indicates a device with momentary duty exceeding the device capability.

Project:	Arc Flash Study Fort Frontenac	**ETAP**		Page:	3
Location:	Fort Frontenac, Kingston	24.0.0C		Date:	01-10-2025
Contract:	KN229976			SN:	IDEAINC-01
Engineer:	Nicholas Frayn	Study Case:	SC FF03	Revision:	Rev 1
Filename:	24549 - DCC Arc Flash - FF03			Config.:	Normal

Interrupting Duty Summary Report

3-Phase Fault Currents: (Prefault Voltage = 100 % of the Bus Nominal Voltage)

Bus		Device			Interrupting Duty				Device Capability			
ID	kV	ID	Type	CPT (Cy)	Symm. kA rms	X/R Ratio	M.F.	Adj. Sym. kA rms	kV	Test PF	Rated Int.	Adjusted Int.
BUS_HV-SG	4.160	F_HV-SG	Fuse		13.265	5.6	1.000	13.265	4.760	6.65	26.000	26.000
		F_P2	Fuse		13.265	5.6	1.000	13.265	4.760	6.65	26.000	26.000
BUS_TRN-3	4.160	F_TRN-3	Fuse		10.705	2.1	1.000	10.705	4.160	6.65	3.500	3.500 *
DP-1	0.208	CB_DP-1 MCB	Molded Case		4.893	2.7	1.000	4.893	0.240	20.00	22.000	22.000
		CB_P-BA	Molded Case		4.893	2.7	1.066	5.214	0.240	50.00	10.000	10.000
		CB_P-BB	Molded Case		4.893	2.7	1.066	5.214	0.240	50.00	10.000	10.000
		CB_P-BC	Molded Case		4.893	2.7	1.000	4.893	0.240	20.00	22.000	22.000
		CB_P-BD	Molded Case		4.893	2.7	1.000	4.893	0.240	20.00	22.000	22.000
		CB_SPARE	Molded Case		4.893	2.7	1.066	5.214	0.240	50.00	10.000	10.000
		CB_ELEVATOR	Molded Case		4.893	2.7	1.066	5.214	0.240	50.00	10.000	10.000
		CB_CONDENSATE PUMP	Molded Case		4.893	2.7	1.066	5.214	0.240	50.00	10.000	10.000
DP-2	0.208	CB_DP-2 MCB	Molded Case		4.436	1.5	1.000	4.436	0.240	20.00	22.000	22.000
		CB_P-AA	Molded Case		4.436	1.5	1.000	4.436	0.240	50.00	10.000	10.000
		CB_P-AB	Molded Case		4.436	1.5	1.000	4.436	0.240	50.00	10.000	10.000
		CB_P-AC	Molded Case		4.436	1.5	1.000	4.436	0.240	50.00	10.000	10.000
		CB_P-AD	Molded Case		4.436	1.5	1.000	4.436	0.240	30.00	18.000	18.000
		CB_P-AE	Molded Case		4.436	1.5	1.000	4.436	0.240	50.00	10.000	10.000
		CB_P-AF1	Molded Case		4.436	1.5	1.000	4.436	0.240	20.00	22.000	22.000
		CB_P-AG	Molded Case		4.436	1.5	1.000	4.436	0.240	30.00	18.000	18.000
		CB_P-AH	Molded Case		4.436	1.5	1.000	4.436	0.240	30.00	18.000	18.000
		CB_FF333	Molded Case		4.436	1.5	1.000	4.436	0.240	30.00	18.000	18.000
DP-MAIN	0.600	F_HVAC-3	Fuse		6.684	3.7	1.000	6.684	0.600	15.00	200.000	200.000
		F_EXTERIOR CU	Fuse		6.684	3.7	1.000	6.684	0.600	15.00	200.000	200.000
		F_P-JM	Fuse		6.684	3.7	1.000	6.684	0.600	20.00	200.000	200.000
		F_SPLITTER P.H.	Fuse		6.684	3.7	1.000	6.684	0.600	20.00	200.000	200.000
		F_DP-1	Fuse		6.684	3.7	1.000	6.684	0.600	20.00	200.000	200.000
		F_DP-2	Fuse		6.684	3.7	1.000	6.684	0.600	15.00	200.000	200.000
DP-PRN-3	0.600	CB_FF03	Molded Case		7.050	4.2	1.064	7.500	0.600	30.00	18.000	18.000
		CB_FF08	Molded Case		7.050	4.2	1.064	7.500	0.600	30.00	14.000	14.000
		CB2	Molded Case		7.050	4.2	1.000	7.050	0.600	20.00	25.000	25.000
		CB3	Molded Case		7.050	4.2	1.064	7.500	0.600	30.00	14.000	14.000
FF333	0.208				3.256	1.2						

Project:	Arc Flash Study Fort Frontenac	**ETAP**		Page:	4
Location:	Fort Frontenac, Kingston	24.0.0C		Date:	01-10-2025
Contract:	KN229976			SN:	IDEAINC-01
Engineer:	Nicholas Frayn	Study Case:	SC FF03	Revision:	Rev 1
Filename:	24549 - DCC Arc Flash - FF03			Config.:	Normal

3-Phase Fault Currents: (Prefault Voltage = 100 % of the Bus Nominal Voltage)

Bus		Device			Interrupting Duty				Device Capability			
ID	kV	ID	Type	CPT (Cy)	Symm. kA rms	X/R Ratio	M.F.	Adj. Sym. kA rms	kV	Test PF	Rated Int.	Adjusted Int.
P-AE	0.208	CB_MCB AE	Molded Case		2.705	0.8	1.000	2.705	0.240	50.00	10.000	10.000
P-AF1	0.208				4.195	1.4						
P-AF2	0.208	CB_QO	Molded Case		4.084	1.4	1.000	4.084	0.240	50.00	10.000	10.000
P-AG	0.208				2.862	0.9						
P-AH	0.208				2.406	0.8						
P-BB	0.208				1.327	0.4						
P-BC	0.208	CB_P-BC_Main	Molded Case		3.951	2.3	1.000	3.951	0.240	20.00	22.000	22.000
		CB_P-BK	Molded Case		3.951	2.3	1.038	4.099	0.240	50.00	10.000	10.000
P-BD	0.208	CB_MCB BD	Molded Case		1.886	0.6	1.000	1.886	0.240	20.00	25.000	25.000
P-BK	0.208				3.772	2.2						
P-JM	0.208				3.297	2.0						

- Method: IEEE - X/R is calculated from separate R & X networks.
- HV CB interrupting capability is adjusted based on bus nominal voltage.
- Short-circuit multiplying factor for LV Molded Case and Insulated Case Circuit Breakers is calculated based on asymmetrical current.
- Generator protective device duty is calculated based on maximum through fault current. Other protective device duty is calculated based on total fault current.

* Indicates a device with interrupting duty exceeding the device capability

** Indicates that the circuit breaker has been flagged as a generator circuit breaker. However, ETAP could not detect a single path, without a transformer, to the specified generator. Therefore, this circuit breaker is treated as a regular circuit breaker in short-circuit calculations.

\+ The prefault voltage exceeds the rated maximum kV limit of the circuit breaker - The rated interrupting kA must be derated.

Project:	**ETAP**	Page:	1
Location:	24.0.0C	Date:	01-07-2025
Contract:		SN:	IDEAINC-01
Engineer:	Study Case: SC FF03	Revision:	Base
Filename: 24549 - DCC Arc Flash - FF03		Config.:	Normal

Momentary Duty Summary Report

3-Phase & 1-Phase Fault Currents: (Prefault Voltage = 100 % of the Bus Nominal Voltage)

Bus		Device			Momentary Duty					Device Capability		
ID	kV	ID	Ckt #	Type	Symm. kA rms	X/R Ratio	M.F.	Asymm. kA rms	Asymm. kA Peak	Symm. kA rms	Asymm. kA rms	Asymm. kA Peak
DP-1	0.208	DP-1		Panelboard	4.893	2.7	1.093	5.346	9.075	10.000	10.000	
P-BA	0.208	P-BA		Panelboard	2.349	0.9	1.001	2.350	3.408	10.000	10.000	
DP-2	0.208	DP-2		Panelboard	4.436	1.5	1.015	4.501	7.035	22.000	22.000	
P-AA	0.208	P-AA		Panelboard	2.204	0.6	1.000	2.204	3.141	10.000	10.000	
P-AC	0.208	P-AC		Panelboard	1.586	0.5	1.000	1.586	2.246	10.000	10.000	
P-AD	0.208	P-AD		Panelboard	2.615	0.9	1.001	2.616	3.795	10.000	10.000	
P-AB	0.208	P-AB		Panelboard	1.708	0.5	1.000	1.708	2.420	10.000	10.000	
P-AF2	0.208	P-AF2		Panelboard	4.084	1.4	1.012	4.132	6.402	10.000	10.000	
P-QO	0.208	P-QO		Panelboard	3.108	1.1	1.003	3.116	4.621	10.000	10.000	

Method: IEEE - X/R is calculated from separate R & X networks.

Protective device duty is calculated based on total fault current

For 1-Phase 3-Wire systems (fed from center-tap transformers), the calculated momentary duty for panel's main and feeder protective devices are based on max. of 1-pole and 2-pole faults.

* Indicates a device with momentary duty exceeding the device capability

Project:	**ETAP**	Page:	2
Location:	24.0.0C	Date:	01-07-2025
Contract:		SN:	IDEAINC-01
Engineer:	Study Case: SC FF03	Revision:	Base
Filename: 24549 - DCC Arc Flash - FF03		Config.:	Normal

Interrupting Duty Summary Report

3-Phase & 1-Phase Fault Currents: (Prefault Voltage = 100 % of the Bus Nominal Voltage)

Bus		Device				Interrupting Duty				Device Capability			
ID	kV	ID	Ckt #	Type	CPT (Cy)	Symm. kA rms	X/R Ratio	M.F.	Adj. Sym. kA rms	kV	Test PF	Rated Int.	Adjusted Int.
P-AB	0.208	CB_MCB AB		Molded Case		1.708	0.5	1.000	1.708	0.240	50.00	10.000	10.000

Method: IEEE - X/R is calculated from separate R & X networks.

HV CB interrupting capability is adjusted based on bus nominal voltage

Short-Circuit multiplying factor for LV Molded Case and Insulated Case Circuit Breakers is calculated based on asymmetrical current.

Generator protective device duty is calculated based on maximum through fault current. Other protective device duty is calculated based on total fault current.

For 1-Phase 3-Wire systems (fed from center-tap transformers), the calculated interrupting duty for panel's main and feeder protective devices are based on max. of 1-pole and 2-pole faults.

* Indicates a device with interrupting duty exceeding the device capability

+ The prefault voltage exceeds the rated maximum kV limit of the circuit breaker - The rated interrupting kA must be derated.

2.6. Observations and Recommendations

Fuses for transformer TRN-3 were not accessible. The style of fuses are Bay-O-Net fuses and current limiting installed within the transformer, and due to the lack of maintenance records on these transformers, Drycore Electric and Kingston Utilities recommended to not remove these fuses due to the high chance of failure upon reinstallation. The recommendation is to replace these fuses. Standard values from manufacturers loaded within the ETAP software were used. The recommendation is to replace these fuses with the size indicated in the report, at the short circuit and continuous amperage rating indicated within the report. Short circuit to be 12kA or greater for current limiting fuses. Continuous rating to be 50A for TRN-3.

3. Protective Device Coordination Study

The protective device coordination study is performed to ensure appropriate protective device ratings and settings are selected to protect the electrical system. The Canadian Electrical Code gives design standards for overcurrent protection ratings such that the equipment won't trip during operation at rated load and will trip at values greater than the continuous amperage rating. Protective device coordination studies are required when considering protecting the system under fault conditions. Coordination studies help with two main concepts:

1. To stop the entire distribution system from shutting down during a down stream fault depending on the location, and
2. To reduce incident energy at the location of the fault by lowering the fault clearing time (FCT)

The above situations are designed by using time-current characteristics plots to ensure that the nearest upstream overcurrent device clears the fault at the specific location it occurs, rather being cleared from a further upstream device that may serve more loads. This can be illustrated by considering a system with a distribution panel (Panel X) that also feeds three downstream panels (Panel A, Panel B and Panel C) . If fault occurred at Panel B, you would want the breaker for Panel B to clear the fault and only energized Panel B. Poor coordination of the system would have the main breaker for Panel X clearing the fault, which would deenergize all three panels. This further away breaker would also give more time for incident energy build, creating a larger arc flash boundary and a dangerous distribution system.

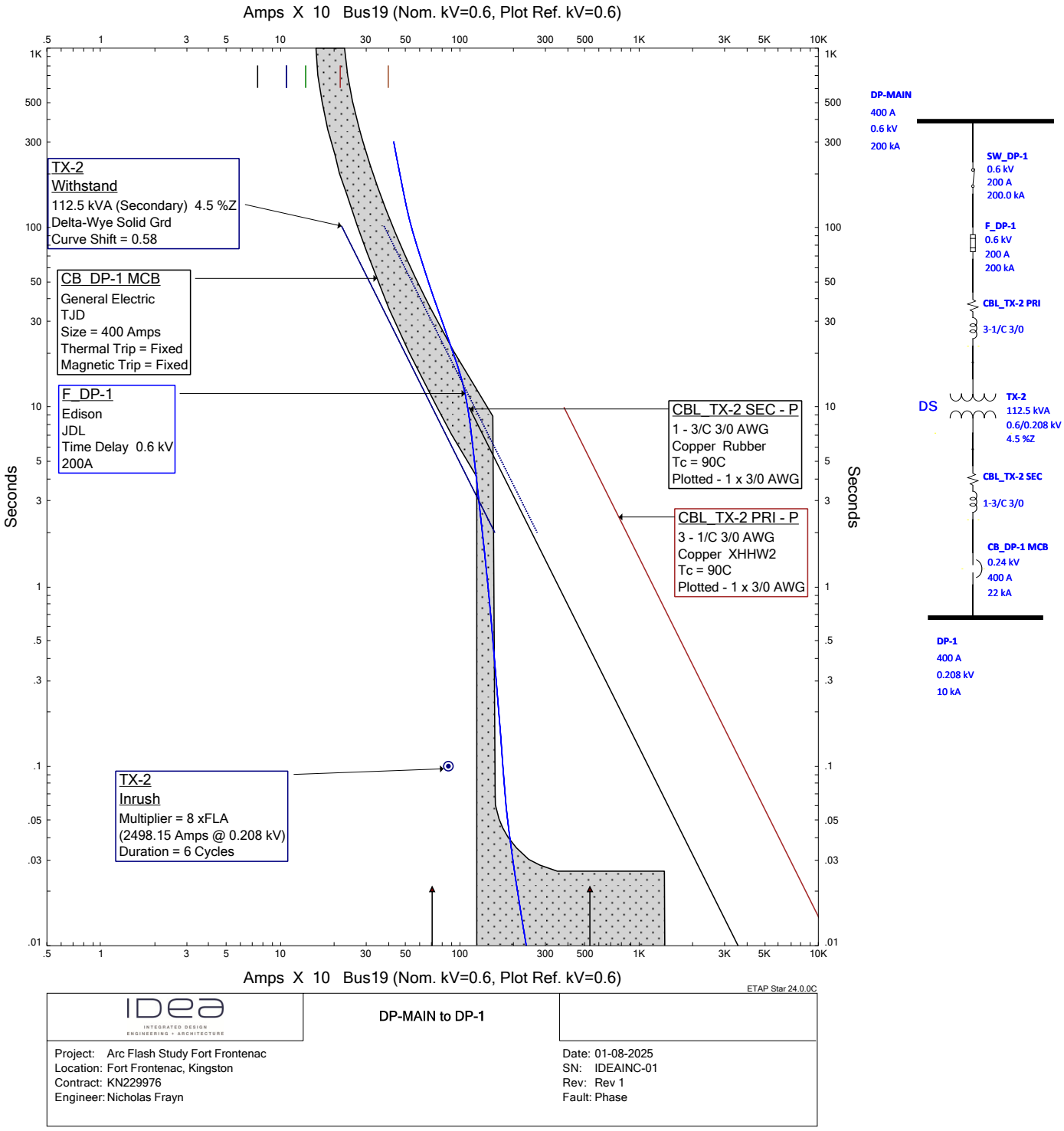
3.1. Methodology

The Protective Device Coordination Study is performed utilizing the ETAP Power System Software. From the modeled distribution system, time-current characteristics curves for protective devices, cables, motors and transformers are plotted on logarithmic time plots (log-log axis). This view is used to visualize the order in which the protective devices will trip in an increasing order of magnitude of time versus current.

ETAP models the exact device make/models and breaker trip settings to show exactly how the device will operate in the field. In addition to protective device time-current plots, transformer damage curves and inrush current are plotted to ensure the transformer is adequately protected but will also not cause nuisance trips due to their magnetizing current. Cable curves are also displayed to show that the feeder and equipment cables are adequately protected.

With the time curves plotted, adequate separation between the downstream protective devices and upstream protective devices must be maintained with minimal overlap to ensure only one device, the nearest device, will trip during a fault.

3.2. Time Current Plots



Amps X 10 Bus19 (Nom. kV=0.6, Plot Ref. kV=0.6)

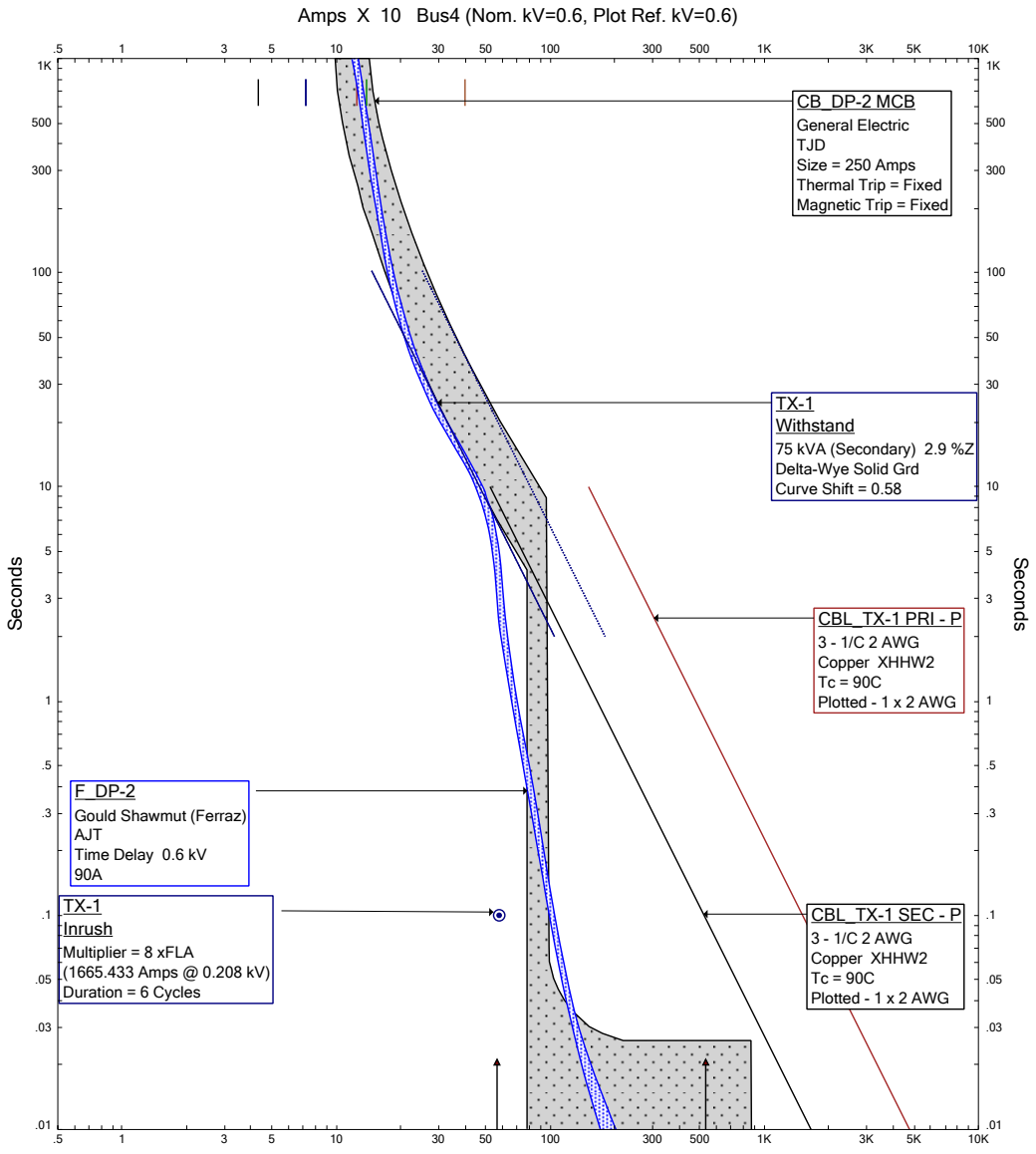
ETAP Star 24.0.0C

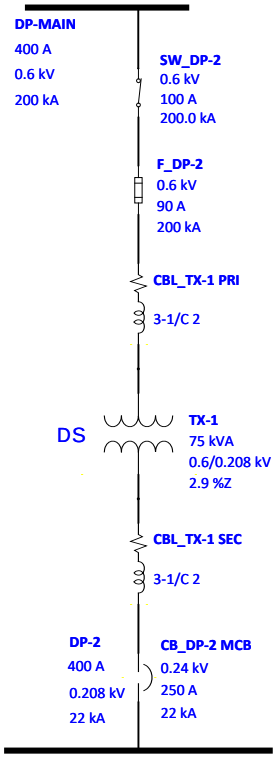
IDEA INTEGRATED DESIGN ENGINEERING + ARCHITECTURE

DP-MAIN to DP-1

Project: Arc Flash Study Fort Frontenac
Location: Fort Frontenac, Kingston
Contract: KN229976
Engineer: Nicholas Frayn

Date: 01-08-2025
SN: IDEAINC-01
Rev: Rev 1
Fault: Phase





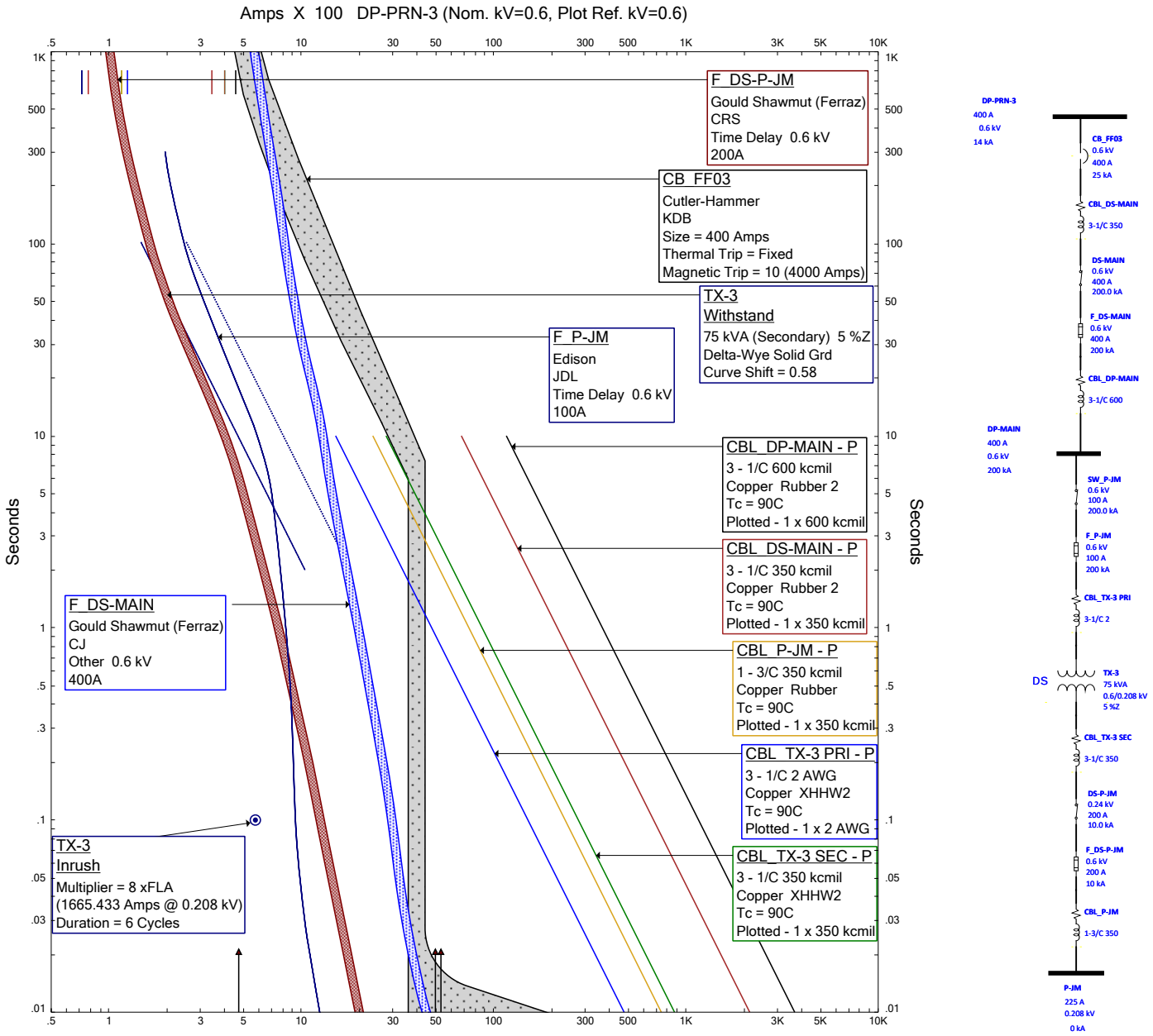
ETAP Star 24.0.0C

IDEA INTEGRATED DESIGN ENGINEERING + ARCHITECTURE

DP-MAIN TO DP-2

Project: Arc Flash Study Fort Frontenac
Location: Fort Frontenac, Kingston
Contract: KN229976
Engineer: Nicholas Frayn

Date: 01-08-2025
SN: IDEAINC-01
Rev: Rev 1
Fault: Phase



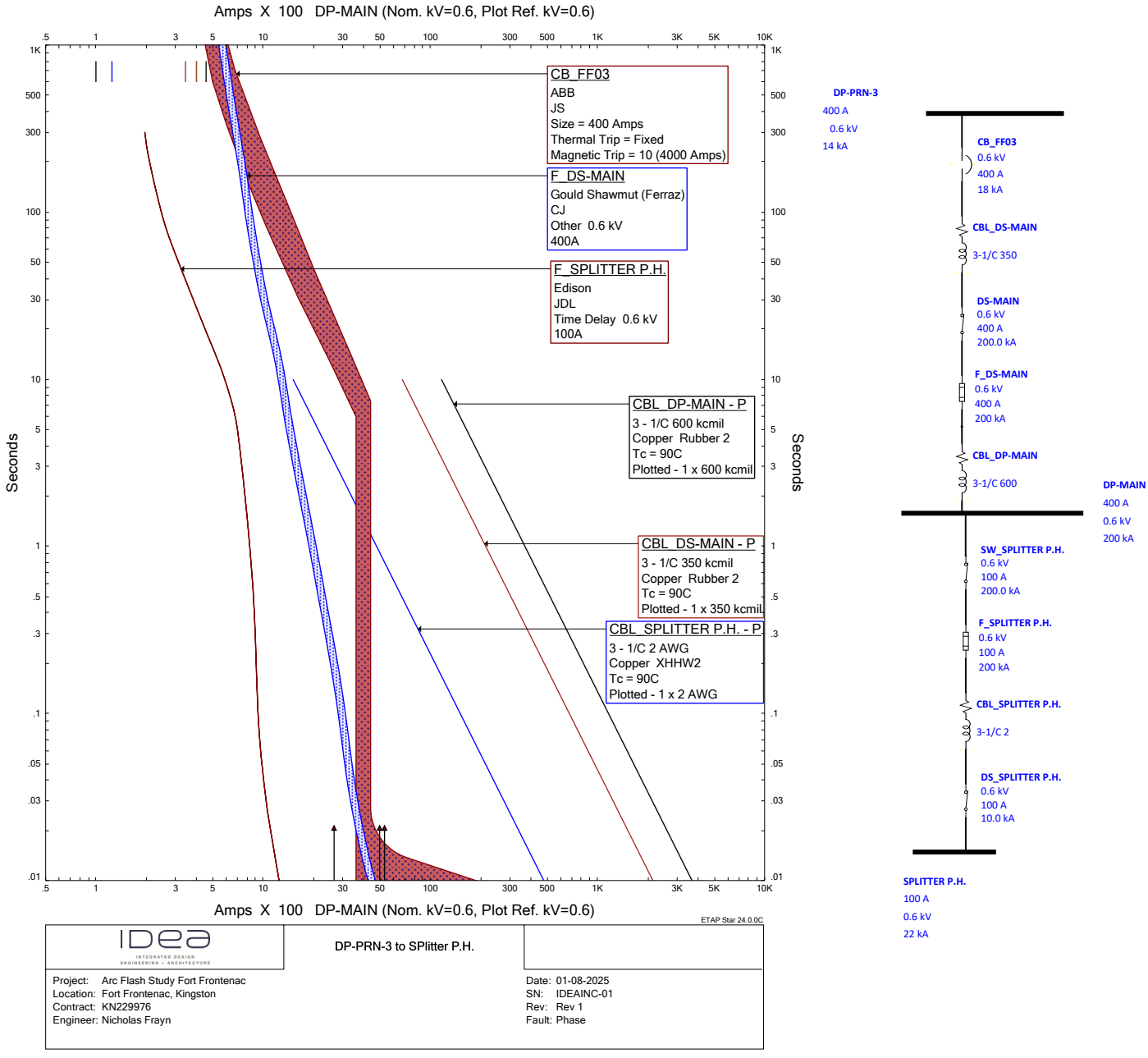
ETAP Star 24.0.0C

IDEA INTEGRATED DESIGN ENGINEERING + ARCHITECTURE

DP-PRN-3 to P-JM

Project: Arc Flash Study Fort Frontenac
Location: Fort Frontenac, Kingston
Contract: KN229976
Engineer: Nicholas Frayn

Date: 01-08-2025
SN: IDEAINC-01
Rev: Rev 1
Fault: Phase

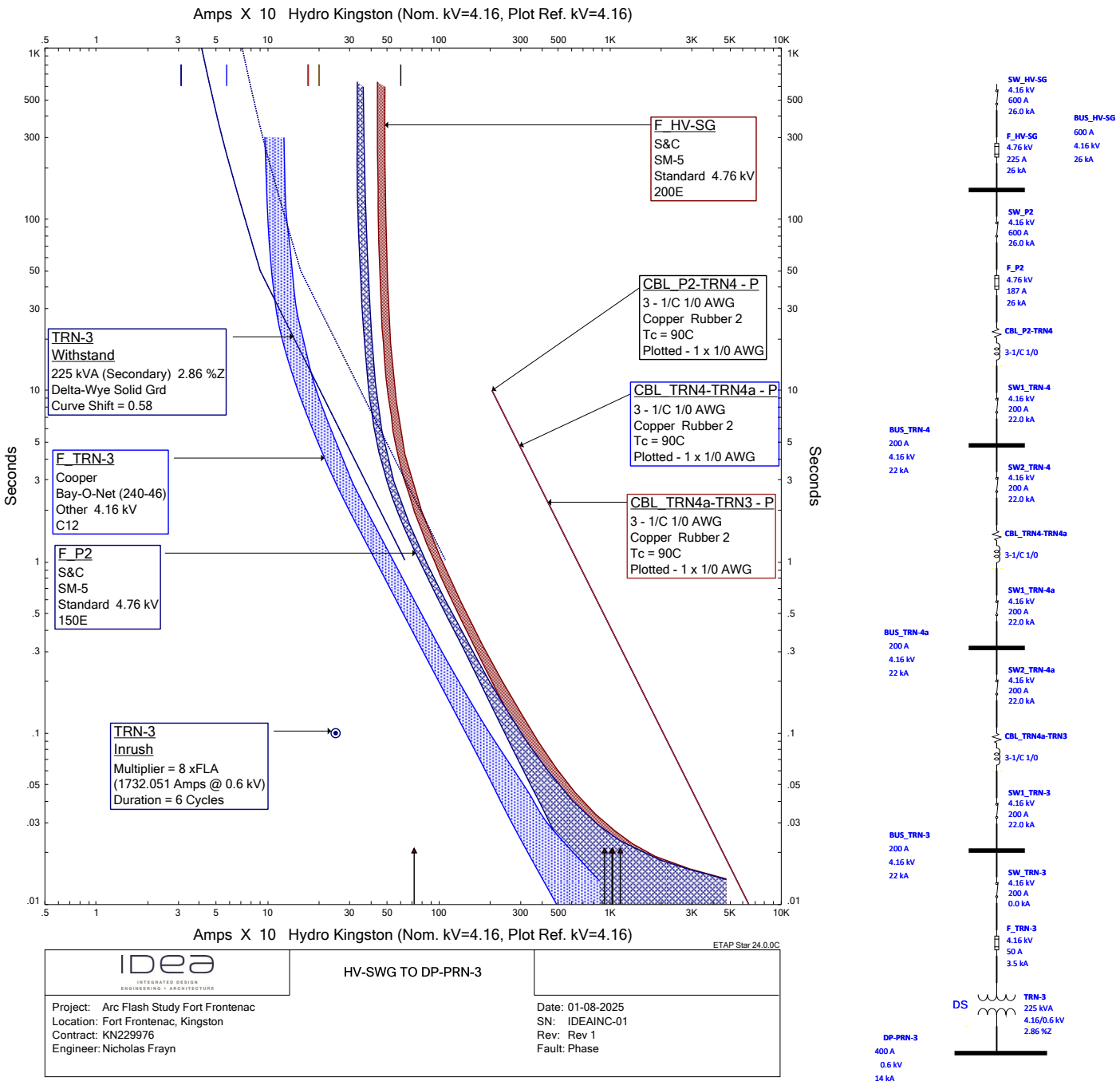


ETAP Star 24.0.0C

DP-PRN-3 to SPlitter P.H.

Project: Arc Flash Study Fort Frontenac
Location: Fort Frontenac, Kingston
Contract: KN229976
Engineer: Nicholas Frayn

Date: 01-08-2025
SN: IDEAINC-01
Rev: Rev 1
Fault: Phase



Amps X 10 Hydro Kingston (Nom. kV=4.16, Plot Ref. kV=4.16)

ETAP Star 24.0.0C

IDEA INTEGRATED DESIGN ENGINEERING + ARCHITECTURE

HV-SWG TO DP-PRN-3

Project: Arc Flash Study Fort Frontenac
Location: Fort Frontenac, Kingston
Contract: KN229976
Engineer: Nicholas Frayn

Date: 01-08-2025
SN: IDEAINC-01
Rev: Rev 1
Fault: Phase

3.3. Recommended Device Ratings and Settings

Protective Device Settings Report

Project:	Arc Flash Study Fort Frontenac	**Date:**	01-10-2025
Location:	Fort Frontenac, Kingston	**Revision:**	Rev 1 vs Base
Contract:	KN229976	When Revision vs Base/Revision is Reported:	
Filename:	H:\2024 Projects\24549 DCC Arc Flash\03 ELEC\ETAP Files\24549 - DCC Arc Flash -		= Revision color

Protective Device Settings - Fuse									
Notes	**Designated Bus**	**Fuse ID**	**Base / Revision ID**	**Manufacturer**	**Model**	**Max kV**	**Speed**	**Size**	**Cont. Amp**
	BUS_TRN-3	F_TRN-3	Base	Cooper	Bay-O-Net (240-46)	4.16	Other	C16	100
1	BUS_TRN-3	F_TRN-3	Rev 1	Cooper	Bay-O-Net (240-46)	4.16	Other	C12	50
	Bus10	F_DS-MAIN	Base	Gould Shawmut (Ferraz)	CJ	0.6	Other	400A	400
	Bus31	F_DS-P-JM	Base	Gould Shawmut (Ferraz)	CRS	0.6	Time Delay	200A	200
	Bus7	Fuse6	Base	Gould Shawmut (Ferraz)	NRN	0.25	Standard	60A	60
	Hydro Kingston	F_HV-SG	Base	S&C	SM-5	4.76	Standard	200E	225
	BUS_HV-SG	F_P2	Base	S&C	SM-5	4.76	Standard	150E	187
	DP-MAIN	F_METER	Base	Gould Shawmut (Ferraz)	CJ	0.6	Other	15A	15
	DP-MAIN	F_HVAC-3	Base	Gould Shawmut (Ferraz)	AJT	0.6	Time Delay	40A	40
	DP-MAIN	F_EXTERIOR CU	Base	Gould Shawmut (Ferraz)	AJT	0.6	Time Delay	25A	25
	DP-MAIN	F_P-JM	Base	Edison	JDL	0.6	Time Delay	100A	100
	DP-MAIN	F_DP-1	Base	Edison	JDL	0.6	Time Delay	200A	200
	DP-MAIN	F_ELEV	Base	Gould Shawmut (Ferraz)	CJ	0.6	Other	15A	15
	DP-MAIN	F_DP-2	Base	Gould Shawmut (Ferraz)	A4J	0.6	Fast	90A	90
1	DP-MAIN	F_DP-2	Rev 1	Gould Shawmut (Ferraz)	AJT	0.6	Time Delay	90A	90
	Bus2	F_CU#2	Base	Gould Shawmut (Ferraz)	CRS	0.6	Time Delay	60A	60
		F_UNKNOWN	Base	Gould Shawmut (Ferraz)	TRS	0.6	Time Delay	15R	15
		F_KIT EF	Base	Gould Shawmut (Ferraz)	TRS	0.6	Time Delay	15R	15
	Bus5	F_MUA5	Base	Bussmann	FRS-R	0.6	Time Delay	20A	20
	DP-MAIN	F_SPLITTER P.H.	Base	Edison	JDL	0.6	Time Delay	100A	100

Notes:

1 Rev 1 settings is different from Base

* Device Rating is different from Library

Protective Device Settings - Low Voltage Circuit Breaker with Thermal-Magnetic Trip Device										
Notes	Designated Bus	LVCB ID	Base / Revision ID	Manufacturer	Breaker		Thermal		Magnetic (Inst.)	
					Model	Size	Setting	Trip (Amps)	Setting	Trip (Amps)
	DP-PRN-3	CB_FF03	Base	ABB	JS	400	Fixed	400.000	10	4000.000
	DP-2	CB_DP-2 MCB	Base	General Electric	TJD	250	Fixed	250.000	Fixed	
	DP-2	CB_P-AA	Base	Federal Pioneer	NA	70	Fixed	70.000	Fixed	
	DP-2	CB_P-AB	Base	General Electric	TEB	60	Fixed	60.000	Fixed	
	DP-2	CB_P-AC	Base	General Electric	TEB	60	Fixed	60.000	Fixed	
	DP-2	CB_P-AD	Base	General Electric	TED	100	Fixed	100.000	Fixed	
	DP-2	CB_P-AE	Base	General Electric	TEB	100	Fixed	100.000	Fixed	
	DP-2	CB_P-AF1	Base	General Electric	THQD	225	Fixed	225.000	Fixed	
	DP-2	CB_P-AG	Base	General Electric	TED	100	Fixed	100.000	Fixed	
	DP-2	CB_P-AH	Base	Federal Pioneer	CE-E4	100	Fixed	100.000	Fixed	
	DP-2	CB_FF333	Base	Federal Pioneer	CE-B	200	Fixed	200.000	Fixed	
	DP-1	CB_DP-1 MCB	Base	General Electric	TJD	400	Fixed	400.000	Fixed	
	DP-1	CB_P-BA	Base	General Electric	TEB	100	Fixed	100.000	Fixed	
	DP-1	CB_P-BB	Base	General Electric	TEB	60	Fixed	60.000	Fixed	
	DP-1	CB_P-BC	Base	General Electric	TJD	300	Fixed	300.000	Fixed	
	DP-1	CB_P-BD	Base	General Electric	THQD	225	Fixed	225.000	Fixed	
	DP-1	CB_SPARE	Base	General Electric	TEB	60	Fixed	60.000	Fixed	
	DP-1	CB_ELEVATOR	Base	General Electric	TEB	60	Fixed	60.000	Fixed	
	DP-1	CB_CONDENSATE PUMP	Base	General Electric	TEB	15	Fixed	15.000	Fixed	
	P-BC	CB_P-BK	Base	General Electric	TQD	200	Fixed	200.000	Fixed	
	P-AF2	CB_QO	Base	Federal Pioneer	NA	40	Fixed	40.000	Fixed	
	P-AB	CB_MCB AB	Base	Siemens	QP	60	Fixed	60.000	Fixed	
	P-AE	CB_MCB AE	Base	General Electric	TEB	100	Fixed	100.000	Fixed	
	P-BD	CB_MCB BD	Base	Federal Pioneer	FKD	225	Fixed	225.000	Fixed	
	P-BC	CB_P-BC_Main	Base	General Electric	TJD	300	Fixed	300.000	Fixed	

Notes:

1 Rev 1 settings is different from Base

* Device Rating is different from Library

4. Arc Flash Incident Energy Report

Arc Flash Risk Assessment has become far more recognized in the electrical industry over the past couple years and more specifically in Ontario as the Occupational Health and Safety Act (OHSA) has become more stringent on workplaces putting together protective measure and safety procedures for working with Electrical Equipment. The OHSA references CSA Z462:24 for good practice in electrical safety requirements and procedures.

Arc Flash Risk Assessment is covered via section 4.3.5 of CSA Z462:24. With respect to the frequency of when this analysis should be performed, the standard indicates that 'the incident energy analysis shall be updated when changes occur in the electrical distribution system that could affect the results of the analysis. The incident energy analysis shall also be review for accuracy at intervals not to exceed 5 years.

Performing the incident energy analysis determines the magnitude of energy available at the equipment and the distance of the arc flash boundary. The incident energy is defined as the amount of energy impressed on a surface, a certain distance from the source, generated during an electrical arcing event. As the incident energy magnitude increases, so does that danger to the personnel working around the equipment. The most common injury to personnel is burns through arcs when the incident energy is released. There are four types of energies released during an arcing event. They are thermal energy, blast pressure energy, acoustic energy, and light energy.

Thermal energy causes the most damage to humans, by causing burns to both the skin and respiratory system. Blast pressure energy can cause damage to humans via physical trauma, such as door ejections or shattered equipment striking the person, causing falls and concussions. Acoustic and light energy cause the least harm to people, however the sound and bright intensity can be of the intensity to cause temporary discomfort.

The arc flash boundary is the distance at which the incident energy equals 1.2 cal/cm^2. People are exposed to multiple hazards within the arc flash boundary as listed above, and therefor need to take the appropriate precautions when entering within the boundary. Only qualified personnel should be allowed to work within the boundary, and they are to protect themselves with the appropriate PPE.

4.1. Personal Protective Equipment

Table 2 of CSA Z462:24 lists the selection of arc flash clothing and other PPE for when within the arc flash boundary. The rating of the clothing must also match or exceed the available arc flash energy at the equipment.

Table 2
Selection of arc-rated clothing and other PPE when the incident energy analysis method or an arc flash PPE selection table method is used
(See Clauses 4.3.5.6.2, H.1, H.2, Q.4, and V.4, and Tables H.1, V.1, V.2, and V.3.)

Incident energy exposures equal to 1.2 cal/cm² (5 J/cm²) up to and including 12 cal/cm² (50 J/cm²)
Arc-rated clothing with an arc rating equal to or greater than the estimated incident energy*
• Arc-rated long-sleeve shirt and pants or arc-rated coverall or arc flash suit (SR)
• Arc-rated faceshield and arc-rated balaclava or arc flash suit hood (SR)†
• Arc-rated outerwear (e.g., jacket, parka, rainwear, hard hat liner, high-visibility apparel) (AN)‡
Heavy-duty leather gloves, arc-rated gloves or rubber insulating gloves with protectors (SR)§
Hard hat
Safety glasses or safety goggles (SR)
Hearing protection
Leather footwear**
Incident energy exposures greater than 12 cal/cm² (50 J/cm²)
Arc-rated clothing with an arc rating equal to or greater than the estimated incident energy*
• Arc-rated long-sleeve shirt and pants or arc-rated coverall or arc flash suit (SR)
• Arc-rated arc flash suit hood
• Arc-rated outerwear (e.g., jacket, parka, rainwear, hard hat liner, high-visibility apparel) (AN)‡
Arc-rated gloves or rubber insulating gloves with protectors (SR)§
Hard hat
Safety glasses or safety goggles (SR)
Hearing protection
Leather footwear**

Legend:
SR = selection of one in group is required
AN = as needed

** Arc ratings can be for a single layer, such as an arc-rated shirt and pants or a coverall, or for an arc flash suit or a multi-layer system if tested as a combination consisting of an arc-rated shirt and pants, coverall, and arc flash suit.*
† Faceshields with a wrap-around guarding to protect the face, chin, forehead, ears, and neck area are required by Clause 4.3.7.3.10 c). Where the back of the head is inside the arc flash boundary, a balaclava or an arc flash hood shall be required for full head and neck protection.
‡ The arc rating of outerwear worn over arc-rated clothing that are not used as part of a layered system shall not be required to be equal to or greater than the estimated incident energy exposure.
§ Rubber insulating gloves with protectors provide arc flash protection in addition to shock protection. Higher class rubber insulating gloves with protectors, due to their increased material thickness, provide increased arc flash protection.
*** Footwear other than leather or dielectric may be used, provided it has been tested for and demonstrates no ignition, melting, or dripping at or greater than the estimated incident energy exposure.*

The equipment selected for use within an Arc Flash Boundary from Table 2 also have to meet the standards of Table 4 from CSA Z462:24.

4.2. Job Safety Planning

The Arc Flash risk assessment is only one portion of the standardized best practice for electrical job safety in accordance with CSA Z462:24. Employers are required to put in place an Electrical Safety Program to ensure for each and every electrical job all hazards are identified. With this program a Job

Safety Plan is to be in place in order to identify the risk for each and every job. Section 4.1.7.9.2 identifies that the Job Safety Plan for each job shall have the following requirements:

1. Be completed by a qualified person,
2. Be documented,
3. Include the following information:
    a. A description of the job and task;
    b. Identification of the electrical hazards associated with each task;
    c. A shock risk assessment in accordance with Clause 4.3.4 for task involving shock hazards
    d. An arc flash risk assessment in accordance with Clause 4.3.5 for tasks involving an arc flash hazard;
    e. Work procedures involved, special precautions, and energy source controls; and
    f. An emergency response plan.

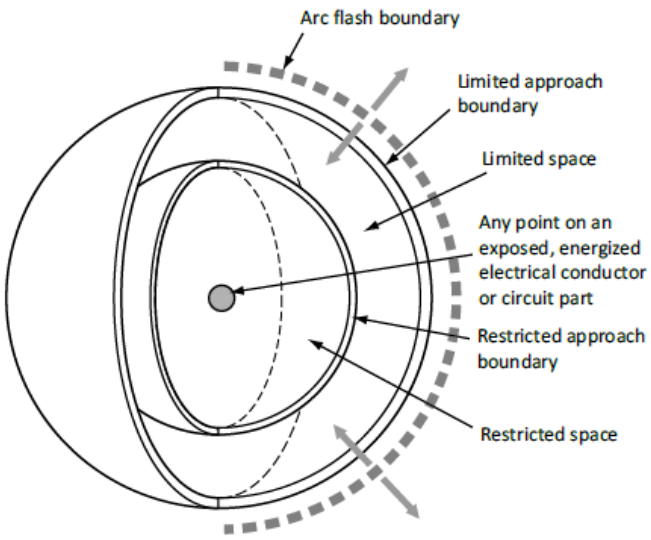
CSA Z462:24 should be reviewed in depth by each employer to create the Job Safety Plan to properly identify the information noted above.

4.3. Shock Risk Assessment

In most cases projects that have an arc flash risk will also have a shock risk component to them in dealing with electrical sources. The shock risk assessment is performed to identify shock hazards, estimate the likelihood of occurrence of injury or damage to health and the potential severity of injury or damage to health, and determine if additional protective measures are required.

By performing a shock risk hazard assessment, the shock protection boundaries will be identified. These are known as the limited and restricted approach boundaries, with each having their own degree of requirements to ensure worker safety. The arc flash boundary, limited approach boundary, and restricted approach boundary are depicted in the image below pulled from CSA Z462.

Limits of approach
(See Clause C.1.3.)



The Arc Flash boundary indicates the proximity to the electrical equipment in which workers are to be wearing arc flash rated clothing.

The limited approach boundary is the area in which no unqualified personnel shall be permitted to approach near energized conductors and circuit parts. Where there is a need for an unqualified person to enter the limited approach boundary, a qualified person shall warn workers of the possible hazards and continuously escort the unqualified person(s) while inside the limited approach boundary.

The restricted approach boundary has the most strict rules for approaching the equipment. Under absolutely no circumstance shall unqualified person(s) be permitted to cross the restricted approach boundary. Qualified persons shall not approach or bring conductive objects closer to the exposed energized electrical conductors or circuit parts operating greater than 30Vac or 60Vdc than the restricted approach boundary specified in Tables 1A and 1B unless at least one of the following applies:

a) The qualified person is insulated or guarded from the energized electrical conductors or circuit parts operating at voltages greater than 30 V ac or 60 V dc. Rubber insulating gloves and sleeves shall be considered insulation only with regard to the energized parts on which work is being performed.

b) The energized electrical conductors or circuit parts are insulated or guarded by a barrier in accordance with Clause 4.3.7.4.8 from the qualified person and from any other conductive object at a different potential.

4.4. Rated Personnel Protective Equipment

In addition to the Arc Flash rating, there are additional standards to the personal protective equipment the qualified personnel are to use within arc flash and shock boundaries. The standards that are to be followed are listed in Table 4 from CSA Z462 below:

Table 4
Standards for personal protective equipment
(See Clause 4.3.7.3.14 and Table A.1.)

Subject	Standard(s)
Apparel — Arc-rated	ASTM F1506
	ASTM F1449
	ASTM F2757
Aprons — Insulating	ASTM F2677
Eye and face protection — General	CSA Z94.3
Face protective products — Arc-rated	ASTM F2178/F2178M
Fall protection	CSA Z259 series of Standards on fall protection
	ASTM F887

Table 4 (Continued)

Subject	Standard(s)
Footwear — Dielectric specification	ASTM F1117
Footwear — Dielectric test method	ASTM F1116
Footwear — Standard performance specification and test method	CSA Z195
Gloves — Arc-rated	ASTM F2675/F2675M
Gloves — Leather protectors	ASTM F696
Gloves and sleeves — Rubber insulating — In-service care	ASTM F496
Gloves – Non-Leather Protectors	ASTM F3258
Gloves — Rubber insulating	ASTM D120
Head protection — Hard hats	CSA Z94.1
Raingear — Arc-rated	ASTM F1891
Rubber protective products — Visual inspection	ASTM F1236
Sleeves — Rubber insulating	ASTM D1051

The shock risk assessment also lists the glove class the qualified worker is to wear when approaching the live equipment. The gloves classifications with respect to equipment voltage are as follows:

Table 3A
Maximum use voltage for rubber insulating gloves
(See Clause 4.3.7.3.7.)

Class designation of glove or sleeve	Maximum AC use Voltage rms, V	Maximum DC use Voltage avg., V	Distances between protector glove cuff and rubber insulating glove cuff, min
00	500	750	13 mm (0.5 in)
0	1000	1500	13 mm (0.5 in)
1	7500	11 250	25 mm (1 in)
2	17 000	25 500	51 mm (2 in)
3	26 500	39 750	76 mm (3 in)
4	36 000	54 000	102 mm (4 in)

Both the protective equipment and gloves listed above are to be maintained on a regular basis, in which CSAZ462 gives guidelines for the appropriate intervals for maintenance of your equipment.

Table 3B
Rubber insulating equipment test intervals
(See Clauses 4.3.7.2.4 and 4.3.7.3.7.)

Type of rubber insulating equipment	When to test	Governing Standard for test voltage
Blankets	Before first issue and every 12 months thereafter	ASTM F479
Covers	Upon indication that insulating value is suspect	ASTM F478
Gloves	Before first issue and every 6 months thereafter	ASTM F496
Line hose	Upon indication that insulating value is suspect	ASTM F478
Sleeves	Before first issue and every 12 months thereafter	ASTM F496

4.5. Methodology

The incident energy analysis method is used in this report to determine the appropriate protective equipment and procedures on is to use during an arc flash, and also produce the arc flash labels stating the ratings of the equipment. The incident energy exposure level is based on the working distance of the worker's face and chest area from a perspective of arc source for the task to be performed. In addition to this the incident energy analysis takes into consideration the characteristics of the overcurrent protective device and its fault clearing time, including its condition of maintenance.

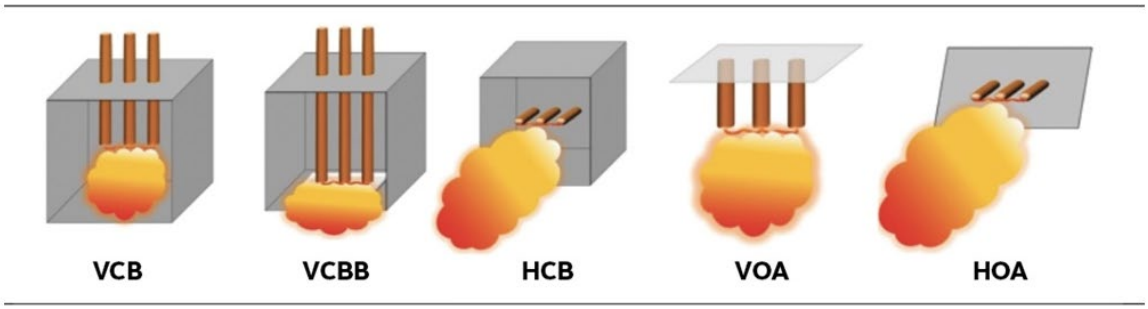
ETAP Power System Software is used to calculate the available arc flash incident energy. The software uses the IEEE 1584 calculation method to determine the available energy and Arc Flash boundary.

The IEEE 1584 method uses updated mathematical models for the calculations. The models take into consideration the system nominal voltage, gap spacing between conductors, electrode configuration, box size, open/enclosed equipment, working distance and coordination information (Time Characteristics Curves). This is why it's important to perform the coordination study and obtain this information for the arc flash analysis.

The electrode configuration is important to take into consideration as it drastically effects how much energy can be released from the equipment. The different types of configurations are:

1. VCB – Vertical conductors/electrodes in a metal box/enclosure
2. VCBB – Vertical conductors/electrodes terminated in a metal box/enclosure's insulating barrier
3. HCB –Horizontal conductors/electrodes in a metal box/enclosure
4. VOA – Vertical conductors/electrodes in open air
5. HOA – Horizontal conductors/electrodes in open air

The five types are illustrated below:



arc flash direction in the various electrode/bus configurations

VCBB, HCB, and HOA were the most recently added configurations to the standard as they were found to greatly increase the incident energy released from the enclosure.

4.6. Arc Incident Energy Summary

Bus Arc Flash Hazard Analysis Summary

Faulted Bus				Fault Current			Trip Device							
ID	Nom. kV	Equipment Type	Gap (mm)	Bolted Fault (kA) Bus	Bolted Fault (kA) PD	PD Arc Fault (kA)	Source Trip Device ID	Trip (cycle)	Open (cycle)	FCT (cycle)	Arc Flash Boundary (ft)	Incident Energy (cal/cm²)	Working Distance (in)	Energy Level
P-AA	0.208	Panelboard	25	2.204	2.204	0.759	CB_P-AA	81.96	0.00	81.96	2.2	2.2	18	Level A
P-AB	0.208	Panelboard	25	1.708	1.708	0.668	CB_P-AB	120.00	0.00	120.00	2.5	2.8	18	Level A
P-AC	0.208	Panelboard	25	1.586	1.586	0.617	CB_P-AC	120.00	0.00	120.00	2.4	2.6	18	Level A
P-AD	0.208	Panelboard	25	2.615	2.615	1.061	CB_P-AD	120.00	0.00	120.00	3.4	4.5	18	Level A
P-BA	0.208	Panelboard	25	2.349	2.349	0.944	CB_P-BA	120.00	0.00	120.00	3.2	4.0	18	Level A
P-QO	0.208	Panelboard	25	3.108	3.108	1.103	CB_QO	23.85	0.00	23.85	1.3	0.9	18	Level A

Bus Arc Flash Hazard Analysis Summary

Faulted Bus				Fault Current			Trip Device							
ID	Nom. kV	Equipment Type	Gap (mm)	Bolted Fault (kA) Bus	Bolted Fault (kA) PD	PD Arc Fault (kA)	Source Trip Device ID	Trip (cycle)	Open (cycle)	FCT (cycle)	Arc Flash Boundary (ft)	Incident Energy (cal/cm²)	Working Distance (in)	Energy Level
BUS_HV-SG	4.160	Switchgear	104	13.265	13.242	11.487	F_HV-SG	1.53	0.00	1.53	1.4	0.3	36	Level A
BUS_TRN-3	4.160	Cable Bus	104	10.705	10.681	9.303	F_P2	1.64	0.00	1.64	1.4	0.4	36	Level A
BUS_TRN-4	4.160	Cable Bus	104	11.935	11.911	10.354	F_P2	1.52	0.00	1.52	1.5	0.4	36	Level A
BUS_TRN-4a	4.160	Cable Bus	104	11.831	11.807	10.265	F_P2	1.53	0.00	1.53	1.4	0.4	36	Level A
DP-1	0.208	Panelboard	25	4.893	1.638	0.703	F_DP-1	120.00	0.00	120.00	5.4	9.3	18	Level A
DP-2	0.208	Panelboard	25	4.436	1.538	0.564	F_DP-2	120.00	0.00	120.00	4.6	7.2	18	Level A
DP-MAIN	0.600	Panelboard	25	6.684	6.516	5.329	F_DS-MAIN	0.60	0.00	0.60	0.4	0.1	18	Level A
DP-PRN-3	0.600	Panelboard	25	7.050	0.993	0.718	F_TRN-3	35.83	0.00	35.83	4.4	6.7	18	Level A
FF333	0.208	Panelboard	25	3.256	3.256	1.347	CB_FF333	120.00	0.00	120.00	4.0	5.8	18	Level A
P-AE	0.208	Panelboard	25	2.705	2.705	1.101	CB_P-AE	120.00	0.00	120.00	3.5	4.7	18	Level A
P-AF1	0.208	Panelboard	25	4.195	1.454	0.616	F_DP-2	120.00	0.00	120.00	4.8	7.8	18	Level A
P-AF2	0.208	Panelboard	25	4.084	1.416	0.598	F_DP-2	120.00	0.00	120.00	4.7	7.5	18	Level A
P-AG	0.208	Panelboard	25	2.862	2.862	1.170	CB_P-AG	120.00	0.00	120.00	3.7	5.0	18	Level A
P-AH	0.208	Panelboard	25	2.406	2.406	0.969	CB_P-AH	110.51	0.00	110.51	3.1	3.8	18	Level A
P-BB	0.208	Panelboard	25	1.327	1.327	0.509	CB_P-BB	120.00	0.00	120.00	2.1	2.1	18	Level A
P-BC	0.208	Panelboard	25	3.951	3.951	1.663	CB_P-BC	120.00	0.00	120.00	4.6	7.2	18	Level A
P-BD	0.208	Panelboard	25	1.886	1.886	0.744	CB_P-BD	120.00	0.00	120.00	2.7	3.1	18	Level A
P-BK	0.208	Panelboard	25	3.772	3.772	1.581	CB_P-BK	120.00	0.00	120.00	4.5	6.9	18	Level A
P-JM	0.208	Panelboard	25	3.297	3.297	1.365	F_DS-P-JM	120.00	0.00	120.00	4.1	5.9	18	Level A
SPLITTER P.H.	0.600	Cable Bus	13	3.220	3.167	2.657	F_SPLITTER P.H.	0.60	0.00	0.60	0.2	0.0	18	Level A

Arc Flash Analysis Results:

The results of the Arc Flash Incident Energy summary indicate all electrical equipment within the study have an Arc Flash Energy Level Classification of Level A. This states that all energy levels are below 12 cal/cm2 and are within the first class of Arc Flash Personal Protective Equipment. No further reduction of Arc Flash Hazard is deemed necessary at this level.

Please note that by revising the size of fuse TRN-3 to 50A, this reduces the Arc Flash Incident Energy at DP-PRN-3 from Level B (16.208 cal/cm2) to Level A (6.715 cal/cm2).

4.7. Arc Flash Labels

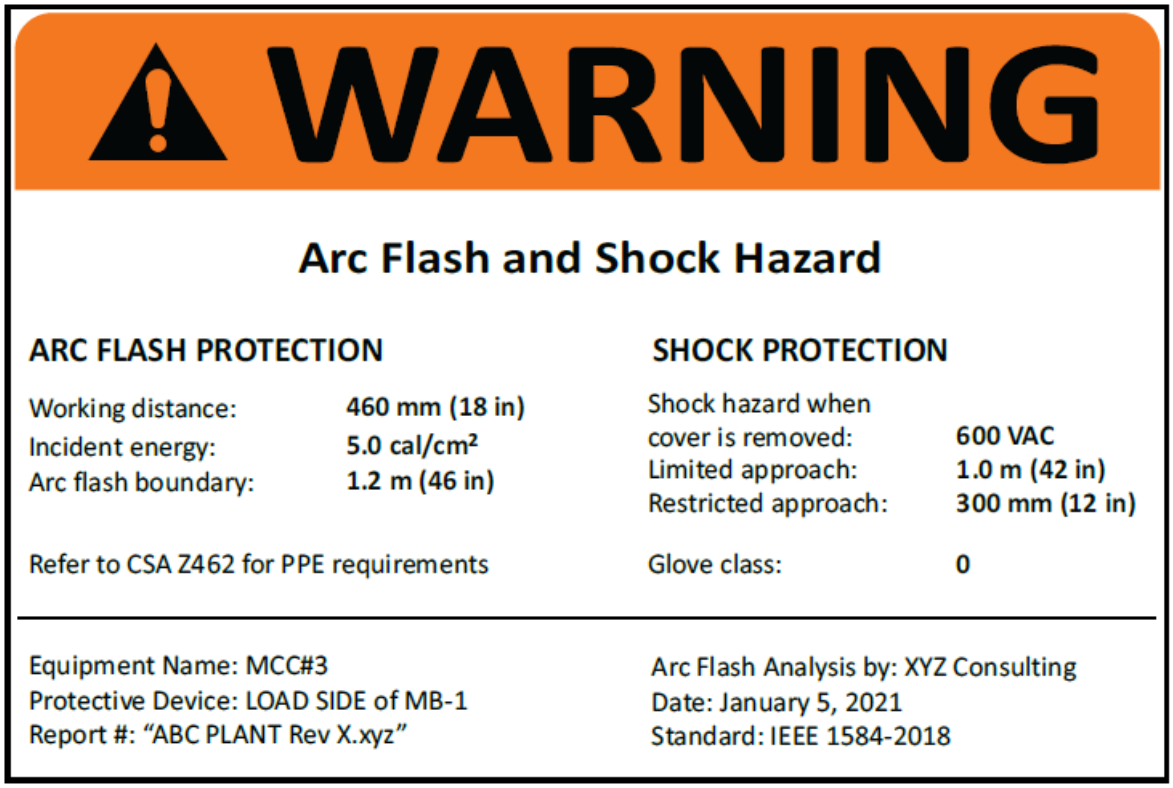
With the incident energy, arc flash boundary, and PPE requirements determined, the information is to be affixed to the equipment in the form of an Arc Flash Label. The Arc Flash labels contain the following information:

1. Nominal System Voltage
2. Arc Flash Boundary
3. At least one of the following:
    a. Available incident energy and the corresponding working distance;
    b. The arc flash PPE minimum arc rating in Table V.1 or V.2 for ac equipment, or V.3 for dc equipment;
    c. Minimum arc-rating of PPE; or
    d. site-specific level of PPE; and
4. date the information required by this Clause was determined.

The label must also:

1. be sufficiently durable to withstand the environment involved.
2. The method of calculation and data to support the information must be documented
3. And the data shall be reviewed for accuracy at intervals not to exceed 5 years

An example of an arc flash label is below:



5. Infrared Thermographic Scanning Report

An infrared thermographic scan should be performed as part of an electrical distribution systems yearly maintenance. Temperature variations can show defects in electrical distribution systems due to the direct correlation of heat loss from current flowing through equipment. Temperature variations can occur because of improper installation (loose connections or lugs), unbalanced loading, undersized equipment due to design error, faulty equipment, and overloaded circuits.

The scan is performed with the equipment covers removed, while under normal operating load to be able to observe any anomalies in temperature variations throughout the internal components and terminations. DCC was notified that the main switchgear was not able to be inspected live, so the two 4160V main switch gear equipment on base were not thermally scanned. The scanning was performed by Eaton personnel with both Arc Flash and Infrared certified training using state of the art equipment exceeding NFPA standards.

The report produced by Eaton highlights any anomalies that were present during thermal scanning. Both a standard photo and infrared photo was taken of the equipment. With an anomaly present, current reading were taken at the point of interest complete with additional photos of the equipment in question. The probable cause of the anomaly is listed complete with the recommended solution. The report is broken up into two sections:

1. Equipment with Anomalies (Eaton Report- Appendix B)
2. Remaining Equipment with no Anomalies (Remaining Thermal Images - in Appendix C)

6. Phase Balancing Analysis and Equipment Testing

Current and voltage readings were taken at every piece of equipment to determine loading of the distribution system and the voltage drop witnessed from the incoming service to the furthest panel installed. The results complete with notable observations and solutions are listed below. The complete list of equipment within FF03 including all current and voltage readings can be found in Appendix E.

Observations:

1. All three phase and single phase panels are appropriately balanced from the readings obtained on-site.
2. The voltage drop readings from the incoming electrical service to the furthest downstream electrical equipment are within the appropriate tolerances to meet the requirements of the Canadian Electrical Code.

7. Visual and Mechanical Inspections

A visual and mechanical inspection was performed while the equipment was scanned and analysed during the site visit. Observations were made to note any corrosion, rust, leaks, safety hazards, violations of the Canadian Electrical Code, grounding issues, physical damage, evidence of moisture, electrical arcing, and the overall general condition of the equipment to ensure it is operating as intended. The internal components were checked for discolouration and proper anchorage. Labelling and panel schedules were also observed on-site and noted for compliance. Lastly the age of the equipment was obtained or estimated from the equipment and included within the report. The results complete with notable observations and solutions are listed below. The complete list of equipment within FF03 including all physical observations can be found in Appendices D & E.

Observations:

Transformer TX-2:

1. Transformer has conduit coming out the top of the enclosure which is not allowed per the manufacturer installation instructions.

Recommendation:

1. **Replace transformer.**

Panel DP-MAIN:

1. One meter of clearance not met per Canadian Electrical Code. Sand bags are placed around TX-3 obstructing footings in front of panel
2. Two identification labels are missing from the branch breakers.

Recommendation:

1. **Remove sand bags obstructing footing to panel. Sand bags must be there for apparent flooding affecting TX-3. Investigate raising TX-3 on a stand to remove requirement of sandbags.**
2. **Trace branch circuits and provide lamacoid labels.**

Panel DP-1:

1. Two breakers are missing limacoid labels.

Recommendation:

1. **Trace branch circuits and provide lamacoid labels.**

Panel DP-2:

1. Two breakers are missing limacoid labels.

Recommendation:

1. **Trace branch circuits and provide lamacoid labels.**

Panel P-JM:

1. Missing panel knockouts.
2. Conduits from panel not properly supported
3. No Phase marking on feeder wires

Recommendation:

1. **Provide knockout covers for panel**
2. **Provide strapping to properly support conduits**
3. **Tape or heat shrink wires for proper phase identification**

Panel P-BA:

1. L2 of the incoming feed has a different lug than the other phases and is creating a bad termination.
2. All cover screws have been damaged for opening the panel.
3. Panel knockouts are missing
4. Cut wires exist at bottom of panel.

Recommendation:

1. **Replace all main lugs on panel for proper termination**
2. **Provide new screws for the panel cover**
3. **Provide knockout covers**
4. **Investigate cut wires and remove or cap as required.**
5. **Replace panel instead of the above.**

Panel P-BB:

1. Panel numbers for panel labelling have worn off.
2. Panel cover is missing screws
3. Neutral insulation of incoming MI feed wire is cracking
4. Excessive Dust and Debris is present within the panel
5. A black wire for the incoming feeder is used as the neutral.

Recommendation:

1. **Provide new lamacoids or P-touch labels for panel labelling**
2. **Provide new screws for the panel**

3. **Megger the neutral to determine condition of the neutral insulation. Replacement may be required based on results.**
4. **Perform panel clean**
5. **Revise neutral to be fed from white wire or tape to identify as neutral.**

Panel P-BC:

1. Two wires are landed on a single pole 15A breaker meant for only 1 wire.
2. Horizon breaker installed within the federal pioneer panel, panel cover had to be cut to make it fit

Recommendation:

1. **Investigate circuit, provide additional 15A 1P breaker for the second wire.**
2. **Replace Panel. DND to decide if they want this rectified. No live parts are exposed from the modification.**

Panel P-BK:

1. 2” knockout missing from panel.
2. Minor Rusting on enclosure

Recommendation:

1. **Provide knockout cover.**
2. **Replace panel**

Panel P-AA:

1. 1 meter of clearance is not met, panel is installed behind ice machine that is plumbed in place
2. Panel cover is missing locking cylinder
3. Manufacturer label for voltage and amperage is missing

Recommendation:

1. **Relocate ice machine**
2. **Purchase new locking cylinder for panel**
3. **Order new label from manufacturer for voltage and amperage**

Panel P-AB:

1. Minimal corrosion at top of panel
2. Two wires on breaker not rated for 2 wires.

Recommendation:

1. **Tag panel to be monitored and perform thermal scan every one to two years on the panel. Increased corrosion can cause faulty connections.**
2. **Investigate circuit. Provide new breaker for additional circuit.**
3. **Panel is outdated with minor rusting, replace.**

Panel P-AC:

1. MI Cable cut on inside and outside of panel

2. Screws missing from panel interiors
3. Replace Panel

Recommendation:

1. **Remove MI cable.**
2. **Provide new screws for panel interior**

Panel P-AD:

1. Oversized neutral wire installed in neutral bar instead of a neutral lug.

Recommendation:

1. **Investigate circuit. Neutral wire may need to be reduced in size if a modified neutral bar can't be purchased. Remove neutral wire from neutral lug location and re-instate lug.**

Panel P-AE:

1. Set screws are corroded on main breaker

Recommendation:

2. **Purchase a new main breaker to be installed**

Panel P-AG:

1. Rust present at bottom of panel
2. Ground wires are starting to oxidize.
3. No phase identification on feeder wires

Recommendation:

1. **Tag panel to be monitored and perform thermal scan every one to two years. Corrosion can cause faulty connections within the panel**
2. **Tape or heat shrink wires to properly identify phasing**
3. **Replace panel**

Panel P-FF333:

1. Open knockouts at top and sides of panel
2. Blue conductor used as neutral

Recommendation:

1. **Provide knockout covers.**
2. **Revise neutral to use white wire. Tape blue wire to identify as neutral wire if this can't be modified.**

Panel P-QO:

1. No Panel labelling or directory
2. No set screws in connectors
3. Knockouts missing from panel
4. Conduits are not strapped leaving the panel

Recommendation:

1. **Provide lamacoid or P-Touch labels for panel label/ Trace circuits and provide panel directory**
2. **Install set screws in connectors to panel**
3. **Provide knockout covers**
4. **Provide strapping to properly support conduits leaving panel.**

Main Disconnect Switch:

1. Transformer installed under panel in required 1m of clearance

Recommendation:

1. **Relocate transformer out of disconnect switch clearance.**

General Building:

1. Single Line Diagram missing from Electrical Room

Recommendation:

1. **Print and Frame Single Line Diagram as required by CEC.**

Exterior Transformer TRN-3:

1. Minor rust on exterior of transformer and small traces of moisture within.

Recommendation:

1. **Tag transformer to be monitored and perform thermal scan every one to two years. Moisture and rust can cause faulty connections within the panel**

Exterior Panel feeding FF03 and FF08 TRN-3:

1. Rust and corrosion present on panel.
2. Ground Bar has corroded.
3. Door gasket is weathered and has failed.

Recommendation:

1. **Tag panel to be monitored and perform thermal scan every one to two years. Moisture and rust can cause faulty connections within the panel.**
2. **Provide new grounding bar.**
3. **Provide new door gasket.**
4. **Replace panel.**

Appendix A – Single Line Diagram



Government of Canada | Gouvernement du Canada

LEVEL OF SECURITY | NIVEAU DE SÉCURITÉ
UNCLASS | NON CLASSIFIÉ

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IDEA
INTEGRATED DESIGN
ENGINEERING + ARCHITECTURE

595 Byron Ave., Ottawa Ont. Ca.
Tele: (613) 728-0008 - Email: info@integrateddesign.ca

NO.	DATE	REVISION	APPR.
1	2025-03-14	ISSUED FOR FINAL REPORT	

SCALE | ÉCHELLE
1:150

LOCATION | EMPLACEMENT
388 ONTARIO STREET
KINGSTON
ONTARIO

PROJECT | PROJET
ARC FLASH STUDY
FORT FRONTENAC
KN299976

TRADE | MÉTIER	DATE
ELECTRICAL	2025-03-14

SUBJECT | SUJET
ELECTRICAL
SITE PLAN

PRODUCTION	REVIEWED | REVU	
DESIGNED | ÉTUDIÉ N.F.	ENG O | O ING	DES O | AGENT CONC
DRAWN | DESSINÉ B.R.	CUSTOMER | CLIENT	PROJ MGR | GEST PROJ
CHECKED | VÉRIFIÉ N.F.	SECT OC | CMDT CSG	DES MGR | GEST CONC
COORDINATION		FIRE | INCENDIE

WBS NO. | NO. OTP	PF NO. | NO. DP
N.700114.23.15	PF500659505

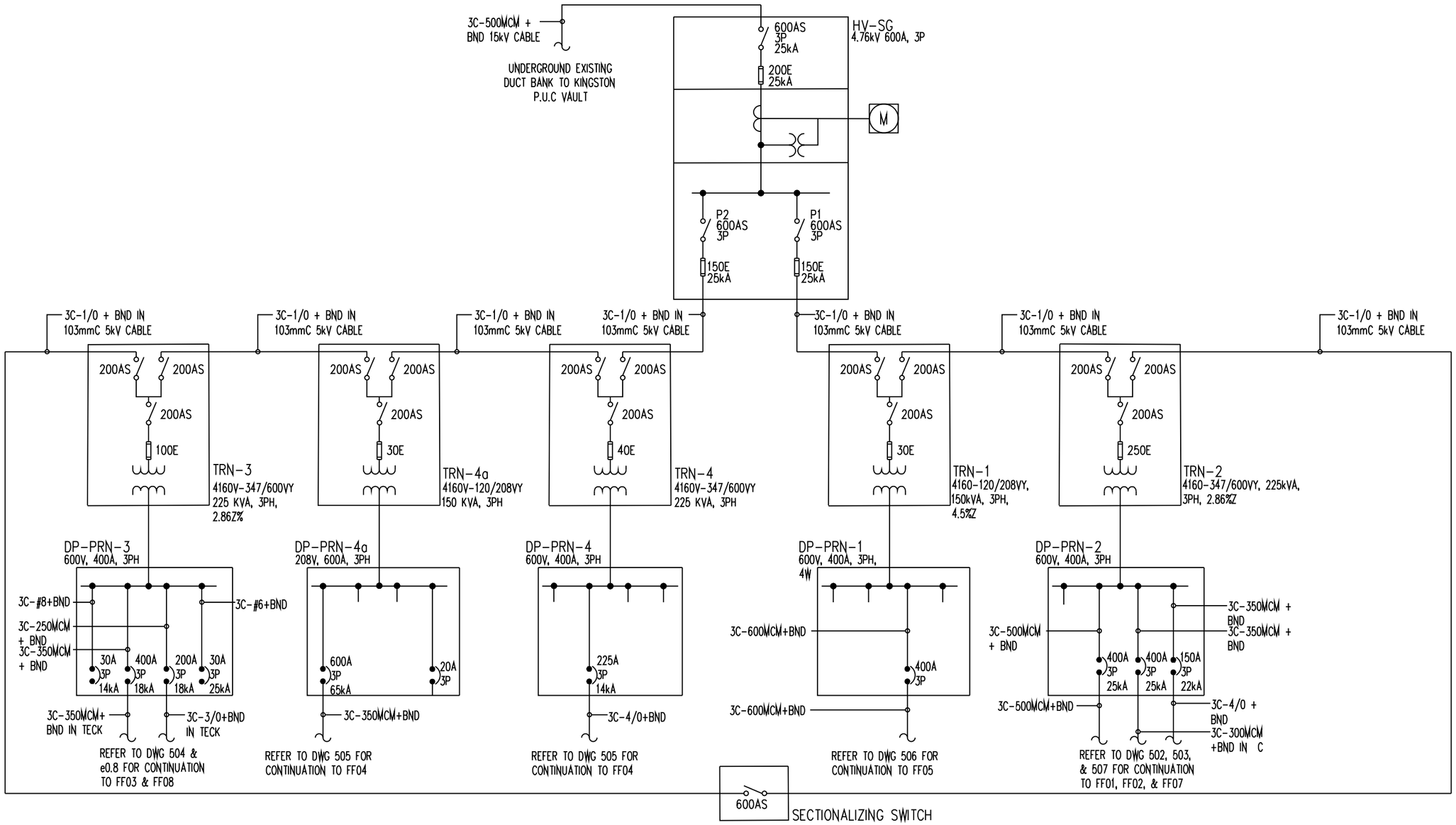
DWG. NO. | NO. DESSIN
K-B35-9306/91-500

Canada

BORDER LAST UPDATED 2012-04-01

2025/Mar/12, 4:50pm nfrayn H:\2024 Projects\24549 DCC Arc Flash\01 A DWGs\5 CADs\04 Electrical\01 Drawing Sheets Electrical\24549 Single Line Diagrams.dwg

Government of Canada / Gouvernement du Canada



BORDER LAST UPDATED 2011-11-11

IDEA
INTEGRATED DESIGN ENGINEERING + ARCHITECTURE
595 Byron Ave., Ottawa Ont. Ca.
Tele: (613) 728-0008 - Email: info@integrateddesign.ca

PROJECT: ARC FLASH STUDY
PROJET: FORT FRONTENAC KN299976
SUBJECT: SINGLE LINE DIAGRAM
SUJET: TRANSFORMER LOOP
DATE: 2025-03-14

APPROVED: / APPROUVÉ PAR:	N.F.	
	N.F.	
SCALE: / ÉCHELLE:	N/A	
WBS NO.: / NO. OTP:	N.700114.23.15	
PF NO.: / NO. DP:	PF500659505	2/10
DWG NO.: / NO. DESSIN:	K-B35-9306/91-501	

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BORDER LAST UPDATED 2011-11-11

BASEMENT

REFER TO DWG 501 FOR CONTINUATION TO DP-PRN-3

3C-350MCM+ BND IN C

DS-MAIN
600V, 400A, 3PH, F/400A

3C-600MCM+ BND IN C

DP-MAIN
400A, 600V, 3PH, 3W

15AF 30AT | ##AF 30AT | ##AF 60AT SPARE | 40AF 60AT | 25AF 60AT | ###AF 100AT | 100AF 100AT | 100AF 100AT | 200AF 200AT | 90AF 100AT

3C-#12+BND IN C → M

2x3C-#12 + BND IN 21mmC → DS-HVAC 600V, 30A, 3PH → HVAC-3

3C-#10 + BND IN 27mmC → DS-EXT CU 600V, 30A, 3PH → EXTERIOR CU

3C-#2 + BND IN 41mmC → TO SPLITTER PENTHOUSE

3C-#2 + BND IN 41mmC

TO DP-MAIN 100A SWITCH

3C-#2 + BND IN 41mmC EMT → DS-SPLITTER PENTHOUSE 600V, 100A, 3PH

3C-#2 + BND IN 41mmC EMT → SPLITTER PENTHOUSE 600V, 100A, 3Ph

3C-#6 + BND IN 27mmC EMT → DS-CU#2 600V, 60A, 3PH, F/60A

3C-#8 + BND IN 21mmC EMT → DS-UNKNOWN 600V, 60A, 3PH, F/15A

3C-#12 + BND IN 21mmC EMT → DS-KITCHEN EF 600V, 30A, 3PH, F/15A

3C-#12 + BND IN 21mmC EMT → DS-MUA5 600V, 30A, 3PH, F/20A

TX-1
600V-120/208V
75 KVA, 3PH, 4W, 2.9%Z

DP-2
120-208V
400A MAINS, 3PH 4W

4C-#2 + BND IN 53mmC

250A, 3P

70A 2P 10KA	60A 2P 10KA	60A 2P 10KA	100A 2P 18KA	100A 3P 10KA	225A 3P 22KA	100A 3P 18KA	100A 3P 18KA	200A 3P 18KA
3C-#6 + BND IN 27mmC	3C-#6 + BND IN 27mmC	3C-#6 + BND IN 27mmC	3C-#3 + BND IN 35mmC	4C-#3 + BND IN 35mmC	4C-4/0 + BND IN 53mmC	4C-#1 + BND IN 53mmC	4C-#1 + BND IN 53mmC	4C-3/0 + BND IN 53mmC
3C-#6 + BND IN 27mmC	3C-#6 + BND IN 27mmC	3C-#6 + BND IN 27mmC	3C-#3 + BND IN 35mmC	4C-#3 + BND IN 35mmC	4C-4/0 + BND IN 53mmC			
P-AA 120/240V 100A 1PH, 3W 42 CCT	P-AB 120/240V 60A 60A MCB 1PH, 3W 20 CCT	P-AC 120/240V 70A 1PH, 3W 12 CCT	P-AD 120/240V 100A 1Ph, 3W 30 CCT	P-AE 120/208V 100A 100A MCB 3PH, 4W 42 CCT	P-AF1 120/208V 225A 225A MCB 3PH, 4W 42 CCT	P-AG 120/208V 225A 3PH, 4W 42 CCT	P-AH 120/208V 225A 3PH, 4W 42 CCT	FF333 120/208V 225A 3PH, 4W 42 CCT

4C-4/0 + BND IN 53mmC → P-AF2 120/240V 225A 3PH, 4W 30 CCT FEED THRU

40A → QO 120/240V 100A 1PH, 3W 8 CCT

3C-#10 + BND IN 16mmC

3C-#3/0 + BND IN 53mm C

TX-2
600V-120/208V
112.5 KVA, 3PH, 4W, 4.5%Z

4C-3/0 + BND IN 53mmC

400A, 3P 22KA

DP-1
120-208V
400A MAINS, 3PH, 4W

100A 3P 10KA	60A 3P 10KA	300A 3P 22KA	225A 3P 22KA	60A 2P 10KA	60A 3P 10KA	15A 1P 10KA
3C-#3 + BND IN 41mmC	3C-#6 + BND IN 27mmC	4C-400MCM + BND IN 91mmC	4C-#4 + BND IN 41mmC		3C-#6 + BND IN 27mmC	2C-#12 + BND IN 21mmC
3C-#3 + BND IN 41mmC	3C-#6 + BND IN 27mmC	4C-400MCM + BND IN 91mmC	4C-#4 + BND IN 41mmC			
P-BA 120/240V 225A 1PH, 3W 42 CCT	P-BB 120/208V 100A 3PH, 4W 12 CCT	P-BC 120/208V 300A 3PH, 4W 42 CCT	P-BD 120/208V 225A 225 MCB 3PH, 4W 42 CCT			

LOCATION: KITCHEN

4 #4/0 in 63mm C → CONTACTOR
CONTROL WIRING FROM WET CHEMICAL SYSTEM GOOD 57. WIRING BY DIV 16

4 #4/0 in 63mm C → P-BK 120/208V 225A 3PH, 4W 42 CCT LOCATION: KITCHEN

3C-#6 + BND IN 27mmC → DS -ELEV 240V 60A F/60A → 15 ELEVATOR

2C-#12 + BND IN 21mmC → DS-CONDENSATE 240V, 30A, 1PH → CONDENSATE PUMP

3C-#2 + BND IN 41mmC → TX-3
600V-120/208V
75kVA, 3Ph, 4W, 5%Z

4C-350MCM + BND IN 63mmC → DS-P-JM 240V 200A 3Ph, 4W, F/200A

4C-350MCM + BND IN 63mmC → P-JM 120/208V 225A 3Ph, 4W 42 CCT

1ST FLOOR

IDEA
INTEGRATED DESIGN ENGINEERING + ARCHITECTURE

595 Byron Ave., Ottawa Ont. Ca.
Tele: (613) 728-0008 - Email: info@integrateddesign.ca

PROJECT: ARC FLASH STUDY
PROJET: FORT FRONTENAC
KN299976

SUBJECT: SINGLE LINE DIAGRAM
SUJET: FF03

DATE: 2025-03-14

APPROVED:	N.F.	
APPROUVÉ PAR:	N.F.	
SCALE: ÉCHELLE:	N/A	
WBS NO.: NO. OTP:	N.700114.23.15	
PF NO.: NO. DP:	PF500659505	5/10
DWG NO.: NO. DESSIN:	K-B35-9306/91-504	

Appendix B – Eaton Thermal Scan Report

Eaton Industries (Canada) Company
Eaton Electrical Services and Systems
100-1407 John Counter Blvd.
Kingston, ON K7K 6A9

November 11, 2024

Drycore Electric
1-5480 Canotek Road,
Ottawa, ON
K1B 5N2

Attention: Fort Frontenac IR Scan 2024

Subject: EOTJ244465

Ref: IR Scan Report

We are pleased to submit our report confirming the results of the Infrared Scanning conducted at Fort Frontenac in Kingston, ON. The survey was conducted the week of October 28th to November 1st, 2024.

Some thermal anomalies were found in the electrical system at this time. The details are included in this report. Any anomalies deemed serious, proper personal were notified immediately to take corrective action.

Thank you for your continued interests in our products and services.

Please do not hesitate to call our office should you require further information in this or any other matter.

Sincerely,

John McDonald
Field Service Representative
Eaton Industries Canada Company
mobile: (613) 305-8447
JohnHMcDonald@eaton.com

Eaton Industries (Canada) Company
Eaton Electrical Services and Systems
100-1407 John Counter Blvd.
Kingston, ON K7K 6A9

Job Summary:

Project Name:	Fort Frontenac IR Scan 2024
Eaton Job Number:	EOTJ244465
Service Location:	Fort Frontenac, 317 Ontario St, Kingston, ON
Performed For:	Drycore Electric, 1-5480 Canotek Road, Ottawa, ON K1B 5N2
Customer Order Number:	**24- 348-0918**
Customer Contact:	Andrew Beuman
Service Performed by:	Eaton Industries (Canada) Company Eaton Electrical Services and Systems 1407 John Counter BLVD, #100 Kingston, Ontario
Field Service Representative:	John McDonald
Prepared By:	John McDonald
Date of Report:	November 11, 2024
Date of Service:	October 28th through November 1st, 2024

Eaton Industries (Canada) Company
Eaton Electrical Services and Systems
100-1407 John Counter Blvd.
Kingston, ON K7K 6A9

Test Procedures:

Infrared Thermographic Inspection

The intent of the thermographic survey is to identify potential electrical and/or mechanical defects in the equipment as surveyed and recommend probable solutions to defects encountered. By evaluating the equipment in this manner, a proactive maintenance program is developed which decreases the potential of equipment failure and increases personnel safety.

The thermal abnormalities identified during this inspection are presented on individual report pages complete with the thermal and real life image. In order to determine the severity of the defect, the temperature rise from the normal component to the faulty component is recorded along with the measured load.

Electrical thermographic inspections should be conducted during normal full load conditions. When the devices are not under sufficient load at the time of inspection the client must take this into consideration when assessing the urgency to response. For example, if a device has a 10°C temperature rise at 1/3 load and the load increases later to 3/4 load, the temperature rise will be by the square of the current increase. In this example the urgency would go from a priority level “D” (investigate at next scheduled maintenance period) response to priority level “B” (repair as soon as possible) response.

The following guide will help determine the urgency of response.

Temperature Rise – Phase to Phase	**Priority**	**Response**
Greater than 50°C	**A**	**Immediate Repair Required**
30°C to 50°C	**B**	**Repair As Soon As Possible**
10°C to 29°C	**C**	**Attended to at First Opportunity**
1°C to 10°C	**D**	**Investigate at Next Scheduled Maintenance**

Only the customer can determine the priority of response and the importance of the defective equipment.

For every defect identified, always inspect connected components for stress or thermal damage to insulation.

Eaton Industries (Canada) Company
Eaton Electrical Services and Systems
100-1407 John Counter Blvd.
Kingston, ON K7K 6A9

Electrical Services & Systems

Equipment Scanned List

EOTJ244499

Drycore Electric, Fort Frontenac

Eaton Industries (Canada) Company
Eaton Electrical Services and Systems
100-1407 John Counter Blvd.
Kingston, ON K7K 6A9

Building FF03				
Main Electrical Rom				
	XFRMR	TX3 Transformer	2040	Scanned From Exterior
	XFRMR	Transformer #1 Lighting Panels	2042	Scanned From Exterior
	PNL	Panel JM / Panel A	2044	
	XFRMR	TX2 Transformer	2046	See Incident Analysis Form
	MCC	DP-Main	2050	*not all doors would open
	DISC	Main Disconnect 600V	2052	See Incident Analysis Form
	DISC	Feed to New Panel	2054	
	DISC	HVAC 3 Disconnect	2056	
Room 036				
	PNL	Panel AF1	2058	See Incident Analysis Form
	PNL	Panel AF2	2060	
	PNL	Panel DP2	2062	
	PNL	Panel DP1	2064	
Basement Hallway				
	PNL	Lighting Panel AD	2066	
Room 037				
	PNL	Panel AE	2068	
Room 015				
	PNL	Panel-AB	2070	See Incident Analysis Form

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Room 023A				
	PNL	Panel AC	2072	
	PNL	Panel QO	2074	
Room 006				
	PNL	Panel AG	2076	
Kitchen				
	PNL	FF333	2078	
	PNL	Panel BB	2082	
	PNL	Panel BC	2086	
	PNL	Panel BK	2088	
	PNL	Panel BD	2092	
Serving Area				
	PNL	PNL-BAA	2080	
Commandant's Suite				
	PNL	LP-AH	2094	
	PNL	Panel AA	2098	
Elevator Room				
	DISC	Elevator Disconnect	2100	

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Eaton Electrical Services and Systems
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Kingston, ON K7K 6A9

Electrical Services & Systems

INCIDENT ANALYSIS FORMS

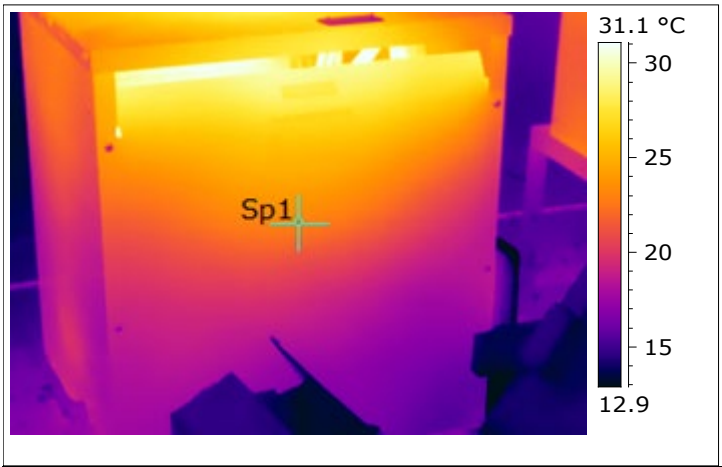
EOTJ244499

Drycore Electric, Fort Frontenac

Eaton Industries (Canada) Company
Eaton Electrical Services and Systems
100-1407 John Counter Blvd.
Kingston, ON K7K 6A9

Customer	Drycore Electric
Location	Fort Frontenac
Area	Building FF03 Main Electrical Room
Component	TX2 Transformer

Phase	Load In Amps
A Phase	N/A
B Phase	N/A
C Phase	N/A
Neutral	N/A





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Image Time	10:36:22 AM
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Sp2 Temperature	-
Sp3 Temperature	-
Sp4 Temperature	-

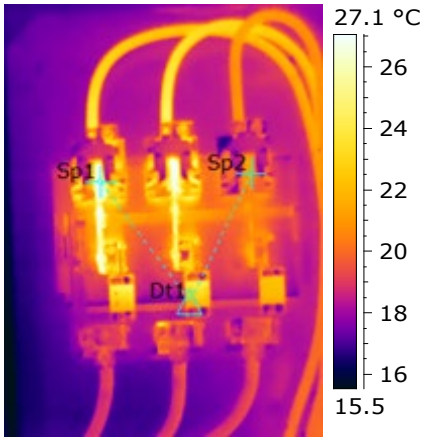
Probable Cause:	Top entry is not allowed on most transformers due to funnel effect
Corrective Action:	Verify if transformer is rated for top entry, if not then reinstall properly
Date Repaired:	
Repaired By:	

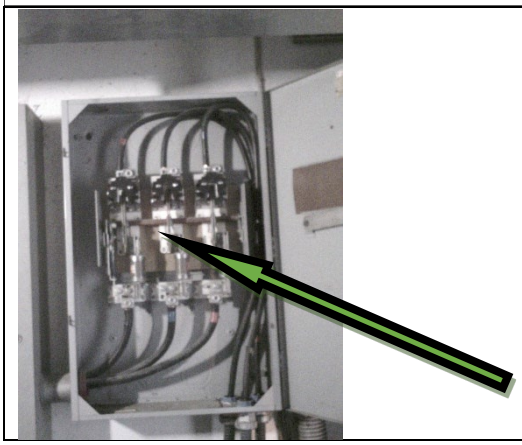
Notes: The heat from the transformer may rise up the conduit and slowly cook the conductor
Insulation over time. This is not an IR anomaly but an improper installation.
Priority D

Eaton Industries (Canada) Company
Eaton Electrical Services and Systems
100-1407 John Counter Blvd.
Kingston, ON K7K 6A9

Customer	Drycore Electric
Location	Fort Frontenac
Area	Building FF03 Main Electrical Room
Component	Main Disconnect 600V

Phase	Load In Amps
A Phase	48A
B Phase	48A
C Phase	47A
Neutral	N/A





File name	FLIR2052.jpg
Date	2024-10-28
Image Time	10:56:31 AM
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Image Serial Number	79310355
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Sp2 Temperature	21.2 °C
Sp3 Temperature	-
Sp4 Temperature	-
Dt1 Rise Above Ref.	6.2 °C

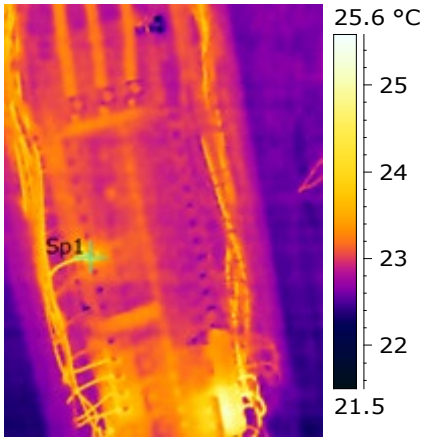
Probable Cause:	Contamination of switching mechanism
Corrective Action:	Investigate further, clean contacts, check torque then rescan
Date Repaired:	
Repaired By:	

Notes:
Priority D

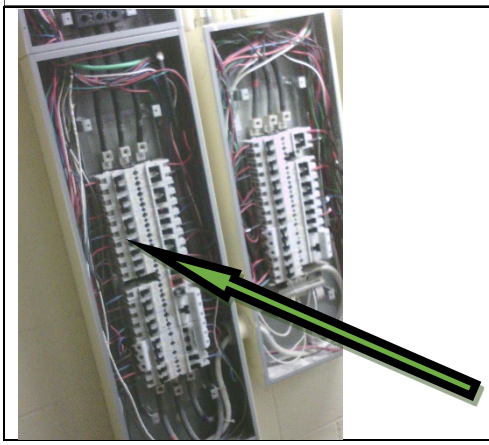
Eaton Industries (Canada) Company
Eaton Electrical Services and Systems
100-1407 John Counter Blvd.
Kingston, ON K7K 6A9

Customer	Drycore Electric
Location	Fort Frontenac
Area	Building FF03 Room 036
Component	Panel AF1

Phase	Load In Amps
A Phase	N/A
B Phase	N/A
C Phase	N/A
Neutral	N/A



File name	FLIR2058.jpg
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Image Serial Number	79310355
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Object Distance	1.4 m
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Sp2 Temperature	-
Sp3 Temperature	-
Sp4 Temperature	-



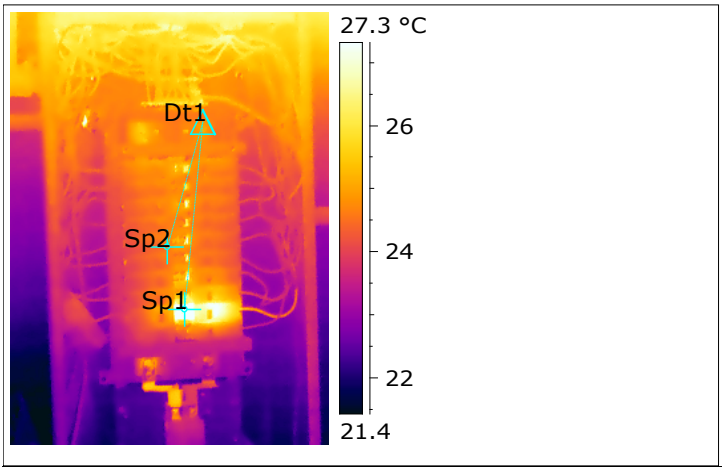
Probable Cause:	CCT 13 Loose
Corrective Action:	Fixed During Scan
Date Repaired:	
Repaired By:	

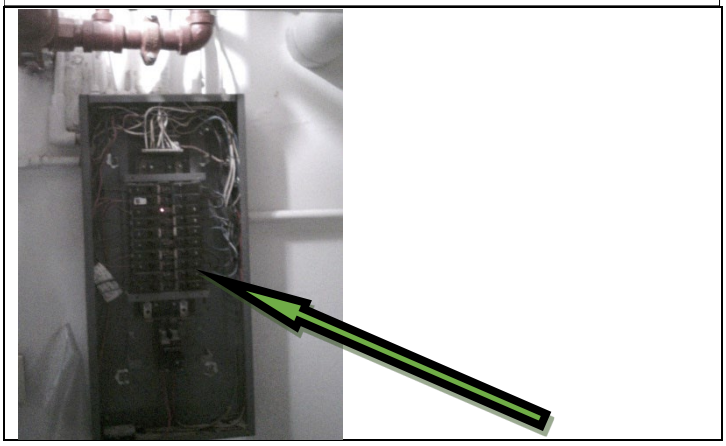
Notes: ¼ Turn on CCT 13 Screw (fixed by Drycore)
Priority D

Eaton Industries (Canada) Company
Eaton Electrical Services and Systems
100-1407 John Counter Blvd.
Kingston, ON K7K 6A9

Customer	Drycore Electric
Location	Fort Frontenac
Area	Building FF03 Room 015
Component	Panel-AB

Phase	Load In Amps
A Phase	N/A
B Phase	N/A
C Phase	4.9A
Neutral	N/A





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Sp3 Temperature	-
Sp4 Temperature	-
Dt1 Rise Above Ref.	3.6 °C

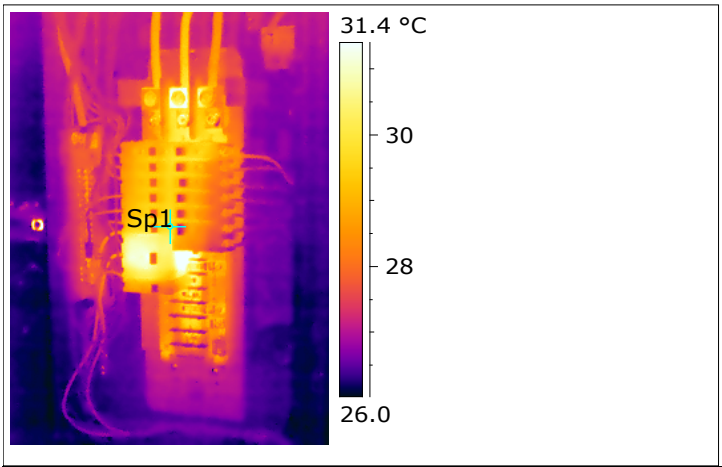
Probable Cause:	Poor connection to bus or defective breaker (CCT 18)
Corrective Action:	Recommend replacing breaker and investigating bus connection
Date Repaired:	
Repaired By:	

Notes: Rescan after corrective action has been taken.
Priority D

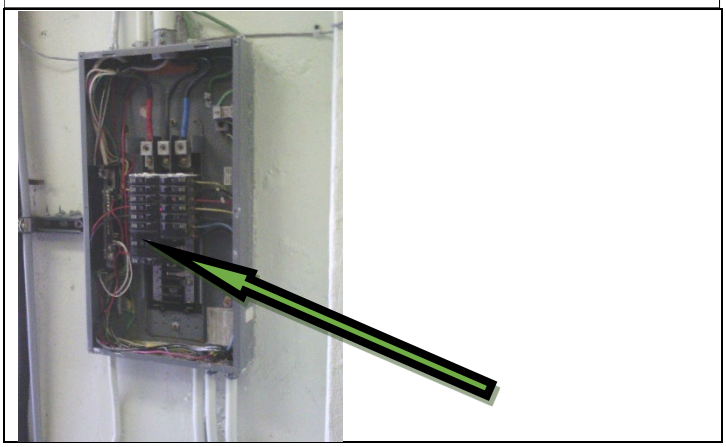
Eaton Industries (Canada) Company
Eaton Electrical Services and Systems
100-1407 John Counter Blvd.
Kingston, ON K7K 6A9

Customer	Drycore Electric
Location	Fort Frontenac
Area	Building FF03 Annex / Bell Room
Component	Panel AA

Phase	Load In Amps
A Phase	N/A
B Phase	N/A
C Phase	N/A
Neutral	N/A



File name	FLIR2138.jpg
Date	2024-10-29
Image Time	12:08:39 PM
Image Camera Type	FLIR T530
Image Serial Number	79310355
Emissivity	0.85
Object Distance	1.3 m
Sp1 Temperature	29.8 °C
Sp2 Temperature	-
Sp3 Temperature	-
Sp4 Temperature	-



Probable Cause:	Clean and check connections for Bell Canda CB (CCTS 13, 15, 17)
Corrective Action:	Investigate further
Date Repaired:	
Repaired By:	

Notes:
Priority D

Appendix C – Remaining Thermal Scan Images

DRYCORE
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[redacted]

INFRARED SCAN AND EQUIPMENT PICTURES

[redacted]

FORT FRONTENAC

388 ONTARIO ST.

KINGSTON, ONTARIO

K7K 2X9

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Job Summary

Project Name: Fort Frontenac IR Scan October 2024

Drycore Job Number: 24-348

Service Location: Fort Frontenac 388 Ontario St. Kingston Ontario

Performed for:
Idea Integrated Design
595 Byron Ave.
Ottawa Ontario
K2A 4C4

Customer Contact: Nick Frayn

Performed By:
Drycore Electric,
1-5480 Canotek Rd.
Ottawa Ontario
K1B 5N2

Field Representative: Andrew Beuman

Date of Scan: October 28th to November 1st, 2024

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Floor/ Room Number	Equipment Type	Equipment Identification	IR File Number	Picture File Number
BUILDING FF03				
Main Electrical Room	Transformer	TX3	2040	2041
	Transformer	TX1	2042	2043
	PANEL	JM/A Panel	2044	2045
	Transformer	TX2	2046	2047
	MCC	DP-Main	2050	2051
	DISC	Main Disc 600V	2052	2053
	DISC	To New Panel	2054	2055
	DISC	HVAC 3 DISC	2056	2057

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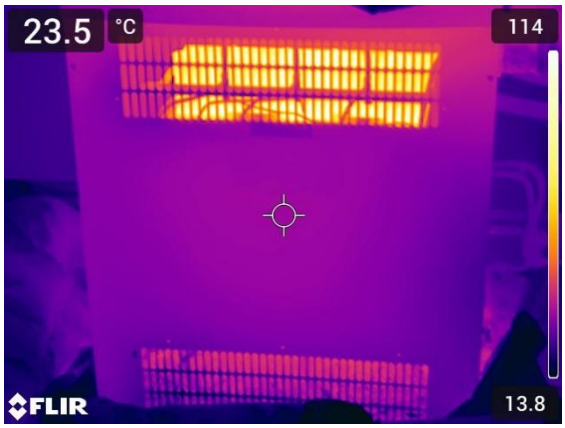
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Floor/ Room Number	Equipment Type	Equipment Identification	IR File Number	Picture File Number
Room 036	PANEL	AF1 Panel	2058	2059
	PANEL	AF2 Panel	2060	2061
	PANEL	DP2 Panel	2062	2063
	PANEL	DP1 Panel	2064	2065
Basement Hall	PANEL	AD Lighting	2066	2067
Room 037	PANEL	AE Panel	2068	2069
Room 015	PANEL	AB Panel	2070	2071
Room 023A	PANEL	AC Panel	2072	2073
	PANEL	QO Panel	2074	2075
Room 006	PANEL	AG Panel	2076	2077
Kitchen	PANEL	FF333	2078	2079
	PANEL	BB Panel	2082	2083
	PANEL	BC Panel	2086	2087
	PANEL	BK Panel	2088	2089
	PANEL	BD Panel	2092	2093
Serving Area	PANEL	PBA Panel	2080	2081
Hall second Floor	PANEL	AH Lighting	2094	2095
	PANEL	AA	2098	2099
Elevator Room	DISC	Elevator	2100	2101
Penthouse	DISC	Penthouse Splitter	2280	2281
	SPLITTER	600V	2278	2279
	DISC	CONDENSOR UNIT 2	2282	2283
	DISC	KITCHEN EXHAUST	2286	2287
	DISC	MAU-5	2288	2289

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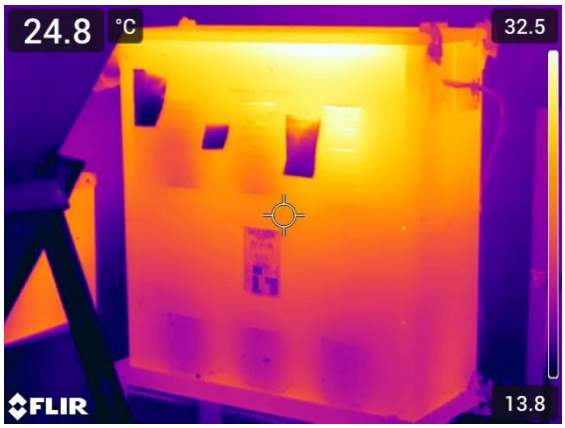
Location	Building FF03 MAIN ELECTRICAL ROOM
Component	TRANSFORMER TX3
IR File Name	FLIR2040
Picture File Name	FLIR2041
Date	Monday October 28th
Image time	11:29 AM





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Location	Building FF03 MAIN ELECTRICAL ROOM
Component	TRANSFORMER TX1
IR File Name	FLIR2042
Picture File Name	FLIR2043
Date	Monday October 28th
Image time	11:32 AM

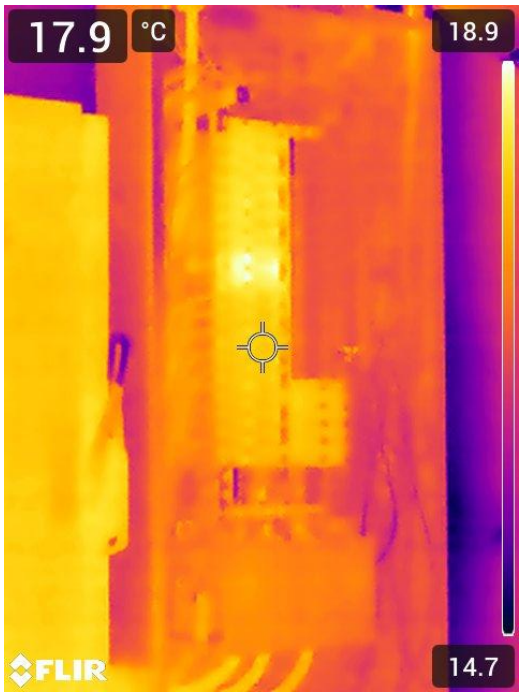




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Location	Building FF03 MAIN ELECTRICAL ROOM
Component	PANEL JM/A PANEL
IR File Name	FLIR2044
Picture File Name	FLIR2045
Date	Monday October 28th
Image time	11:34 AM



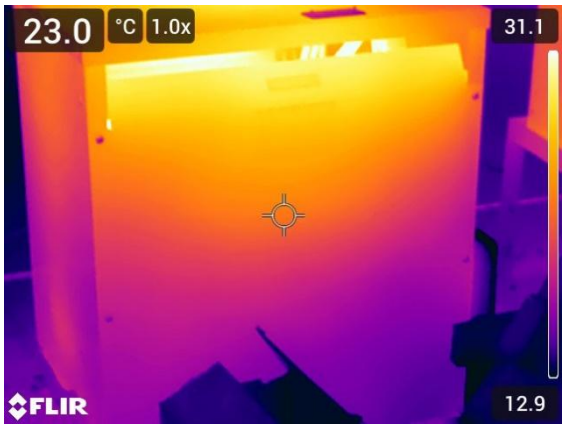


PHASE	LOAD IN AMPS	PHASE	VOLTS
A PHASE	2.2	**A-N**	348
B PHASE	3.6	**B-N**	347
C PHASE	3	**C-N**	348
NEUTRAL	1.1	**A-B**	601
		A-C	600
		B-C	600

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Location	Building FF03 MAIN ELECTRICAL ROOM
Component	TRANSFORMER TX2
IR File Name	FLIR2046
Picture File Name	FLIR2047
Date	Monday October 28th
Image time	11:36 AM

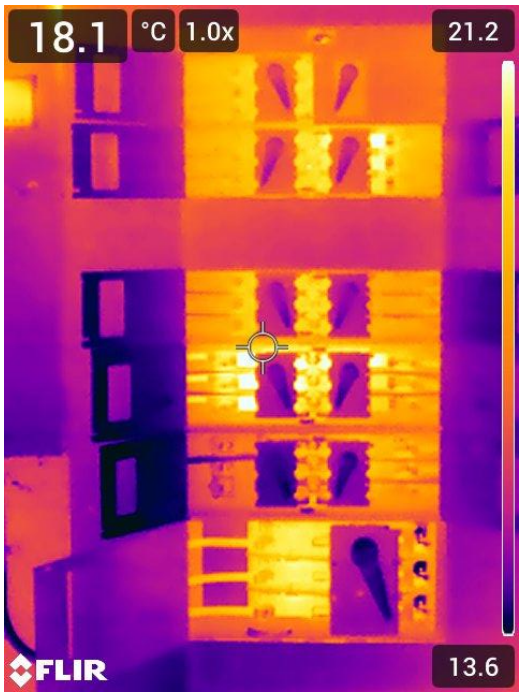




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Location	Building FF03 MAIN ELECTRICAL ROOM
Component	DP-MAIN
IR File Name	FLIR2050
Picture File Name	FLIR2051
Date	Monday October 28th
Image time	11:51 AM

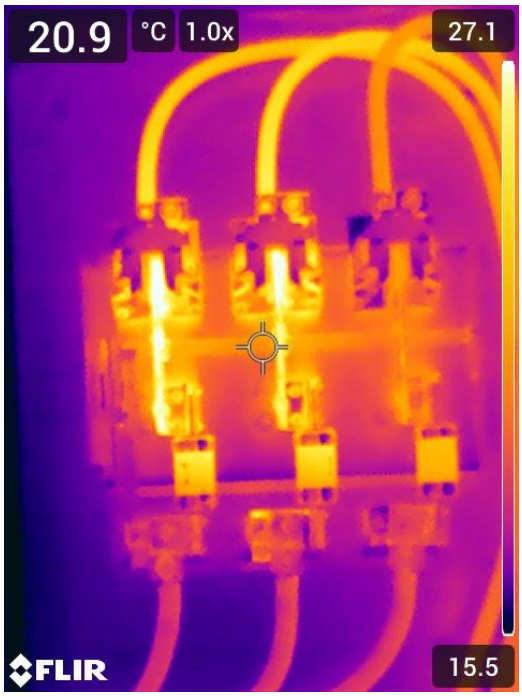


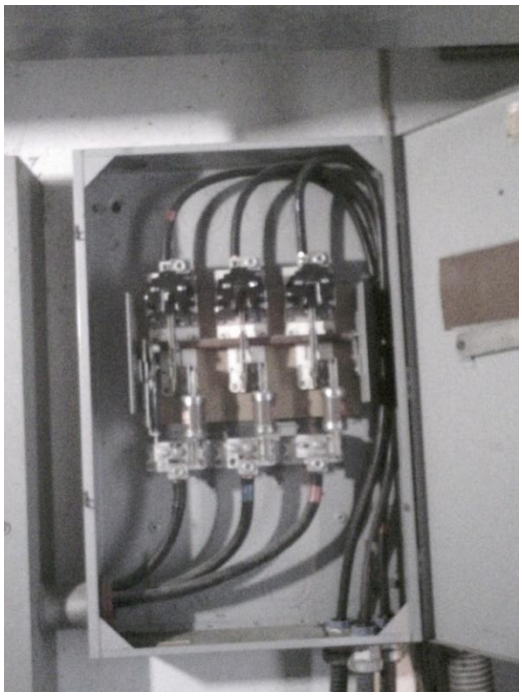


PHASE	LOAD IN AMPS	PHASE	VOLTS
A PHASE	91.4	**A-N**	344
B PHASE	95.8	**B-N**	345
C PHASE	95.2	**C-N**	345
NEUTRAL	N/A	**A-B**	595
		A-C	596
		B-C	598

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Location	Building FF03 MAIN ELECTRICAL ROOM
Component	DP-MAIN DISCONNECT
IR File Name	FLIR2052
Picture File Name	FLIR2053
Date	Monday October 28th
Image time	11:56 AM

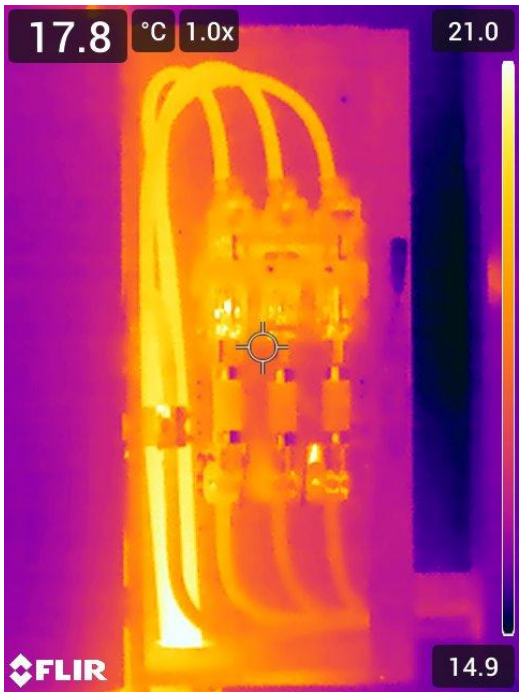


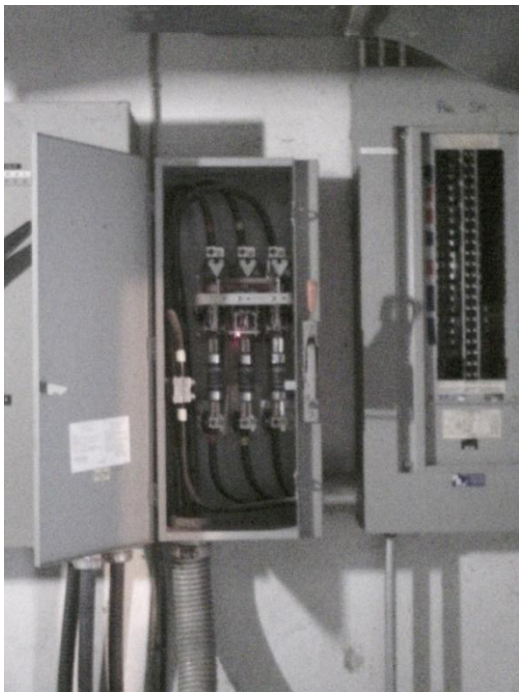


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Location	Building FF03 MAIN ELECTRICAL ROOM
Component	NEW PANEL DISCONNECT
IR File Name	FLIR2054
Picture File Name	FLIR2055
Date	Monday October 28th
Image time	12:04 PM

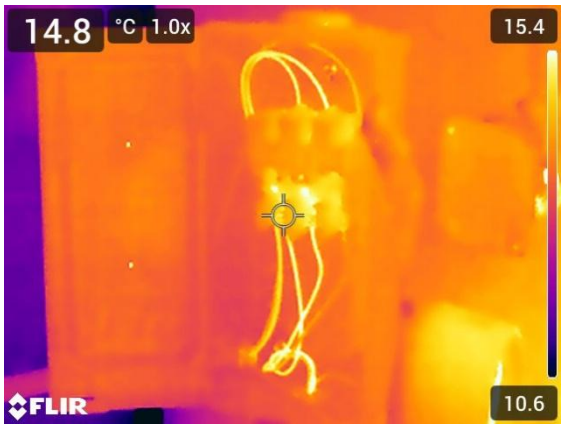




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Location	Building FF03 MAIN ELECTRICAL ROOM
Component	HVAC 3 DISCONNECT
IR File Name	FLIR2056
Picture File Name	FLIR2057
Date	Monday October 28th
Image time	12:10 PM

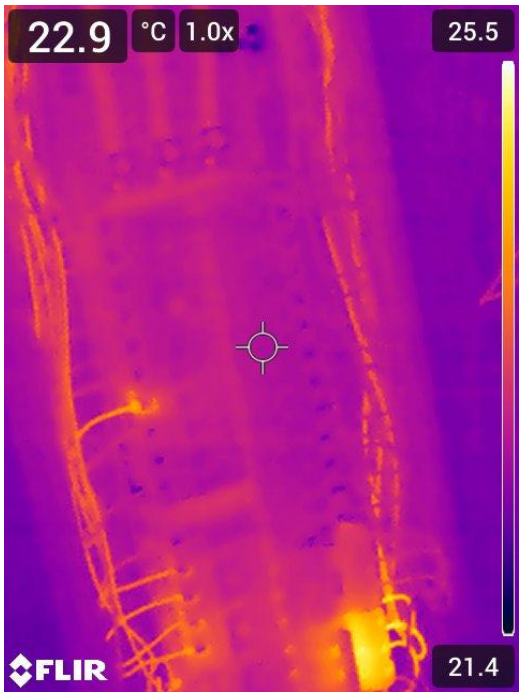


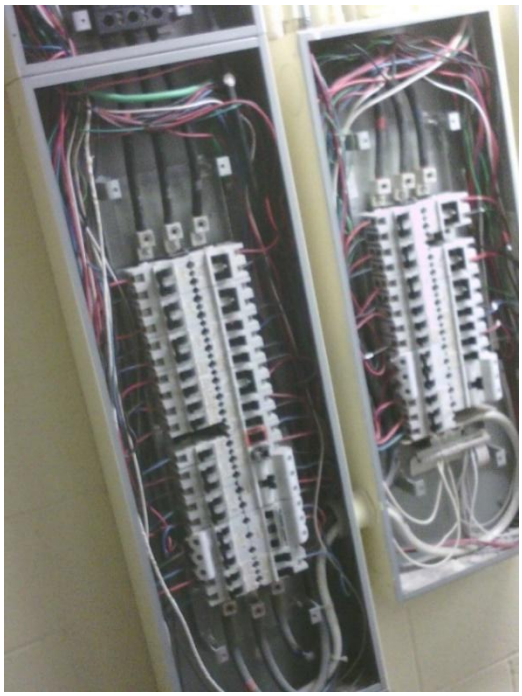


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Location	Building FF03 ROOM 036
Component	PANEL AF1
IR File Name	FLIR2058
Picture File Name	FLIR2059
Date	Monday October 28th
Image time	12:29 PM



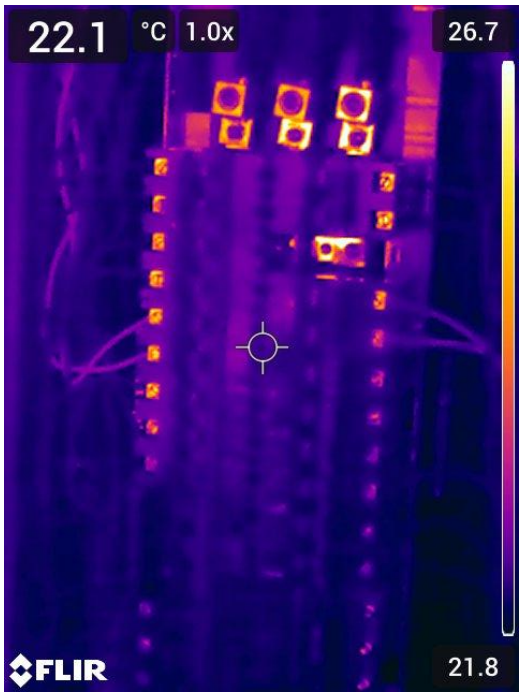


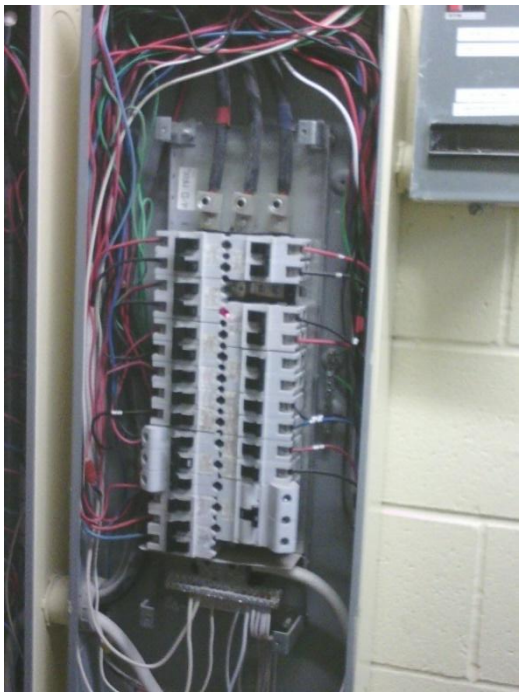
PHASE	LOAD IN AMPS	PHASE	VOLTS
A PHASE	9.4	**A-N**	124
B PHASE	7.8	**B-N**	124
C PHASE	12.3	**C-N**	123
NEUTRAL	4.2	**A-B**	216
		A-C	215
		B-C	215

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Location	Building FF03 ROOM 036
Component	PANEL AF2
IR File Name	FLIR2060
Picture File Name	FLIR2061
Date	Monday October 28th
Image time	12:30 PM



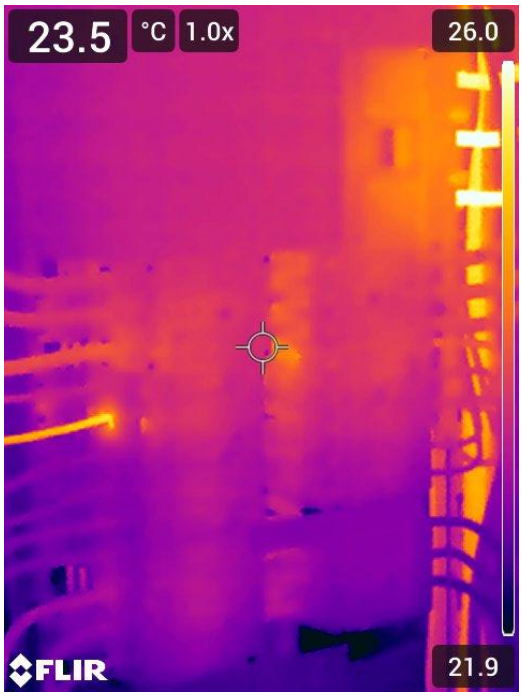


PHASE	LOAD IN AMPS	PHASE	VOLTS
A PHASE	1.7	**A-N**	124
B PHASE	2	**B-N**	124
C PHASE	0	**C-N**	123
NEUTRAL	2	**A-B**	216
		A-C	214
		B-C	215

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Location	Building FF03 ROOM 036
Component	PANEL DP2
IR File Name	FLIR2062
Picture File Name	FLIR2063
Date	Monday October 28th
Image time	12:41 PM



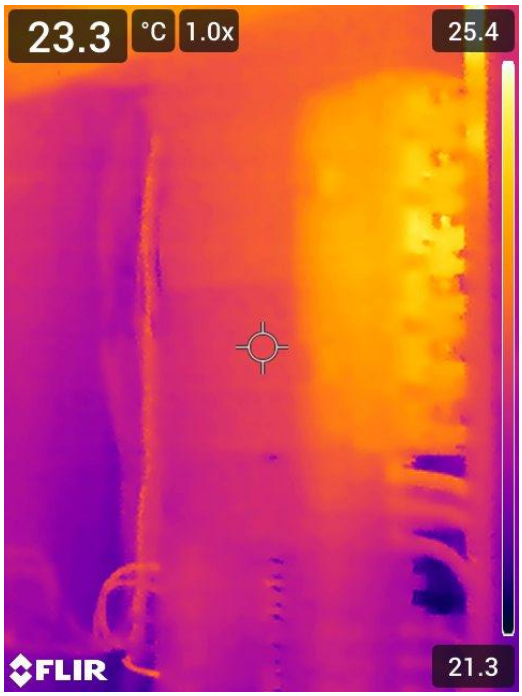


PHASE	LOAD IN AMPS	PHASE	VOLTS
A PHASE	55.6	**A-N**	123
B PHASE	34.9	**B-N**	124
C PHASE	58.1	**C-N**	123
NEUTRAL	23.2	**A-B**	215
		A-C	214
		B-C	216

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Location	Building FF03 ROOM 036
Component	PANEL DP1
IR File Name	FLIR2064
Picture File Name	FLIR2065
Date	Monday October 28th
Image time	1:00 PM



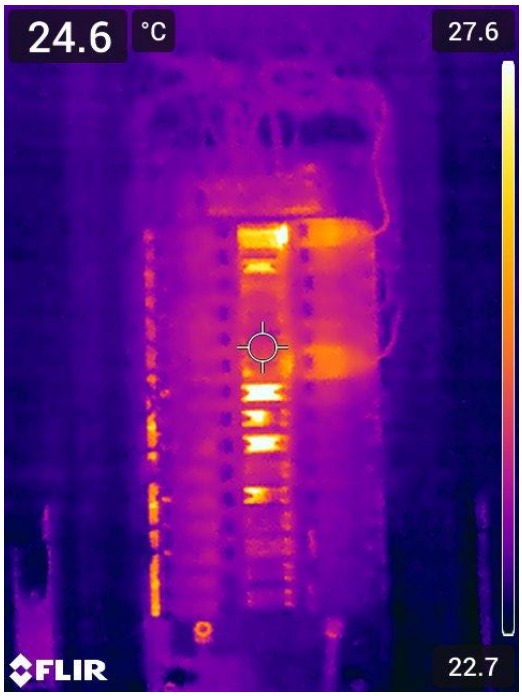


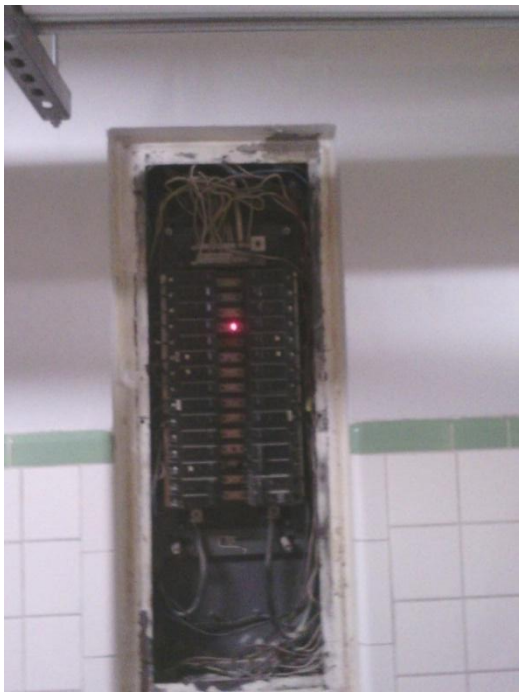
PHASE	LOAD IN AMPS	PHASE	VOLTS
A PHASE	35.6	**A-N**	118
B PHASE	36.9	**B-N**	118
C PHASE	50.8	**C-N**	118
NEUTRAL	13.9	**A-B**	205
		A-C	205
		B-C	205

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Location	Building FF03 BASEMENT HALLWAY
Component	PANEL AD
IR File Name	FLIR2066
Picture File Name	FLIR2067
Date	Monday October 28th
Image time	1:22 PM



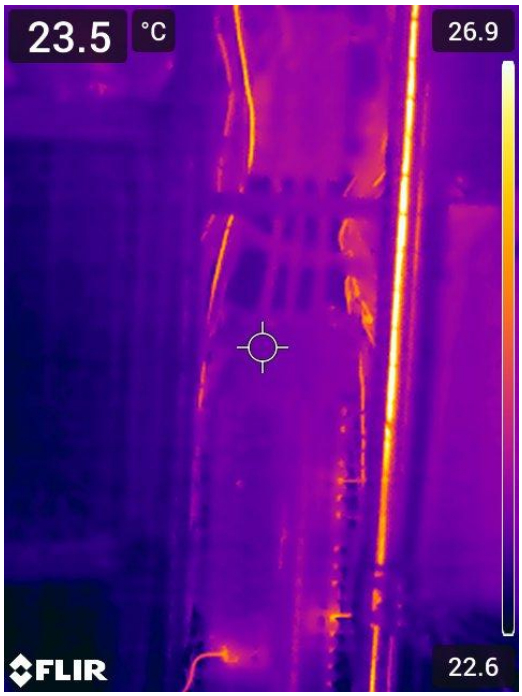


PHASE	LOAD IN AMPS	PHASE	VOLTS
A PHASE	5	**A-N**	124
B PHASE	6.2	**B-N**	123
C PHASE	N/A	**C-N**	N/A
NEUTRAL	1.2	**A-B**	215
		A-C	N/A
		B-C	N/A

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Location	Building FF03 ROOM 037
Component	PANEL AE
IR File Name	FLIR2068
Picture File Name	FLIR2069
Date	Monday October 28th
Image time	1:29 PM



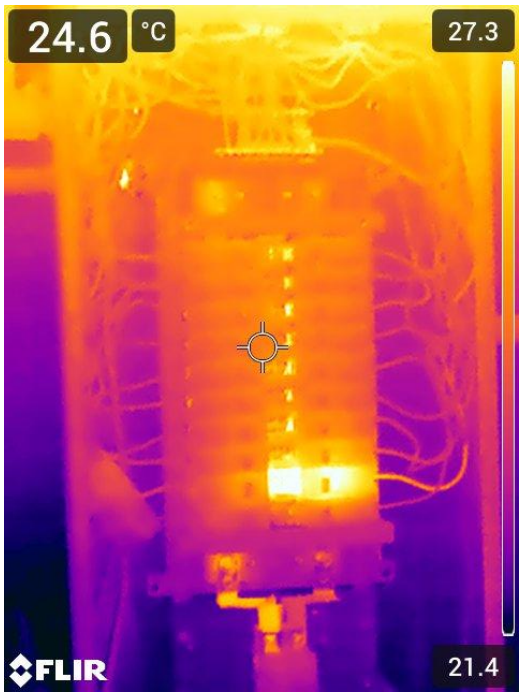


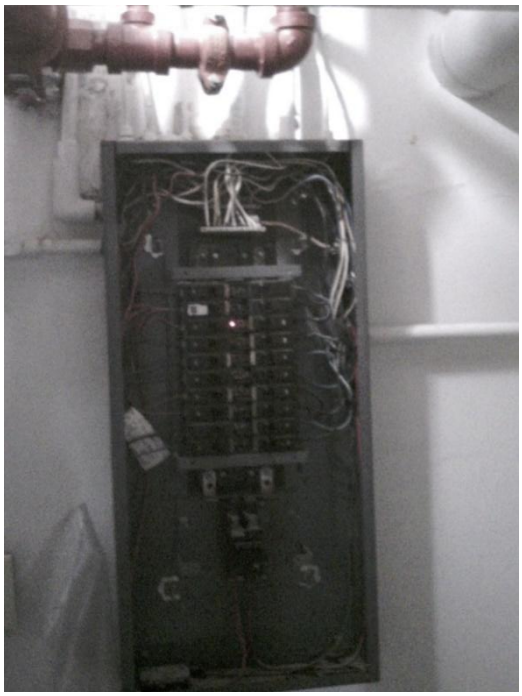
PHASE	LOAD IN AMPS	PHASE	VOLTS
A PHASE	12.1	**A-N**	124
B PHASE	7.3	**B-N**	123
C PHASE	11	**C-N**	123
NEUTRAL	5.1	**A-B**	216
		A-C	214
		B-C	215

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Location	Building FF03 ROOM 015
Component	PANEL AB
IR File Name	FLIR2070
Picture File Name	FLIR2071
Date	Monday October 28th
Image time	1:43 PM



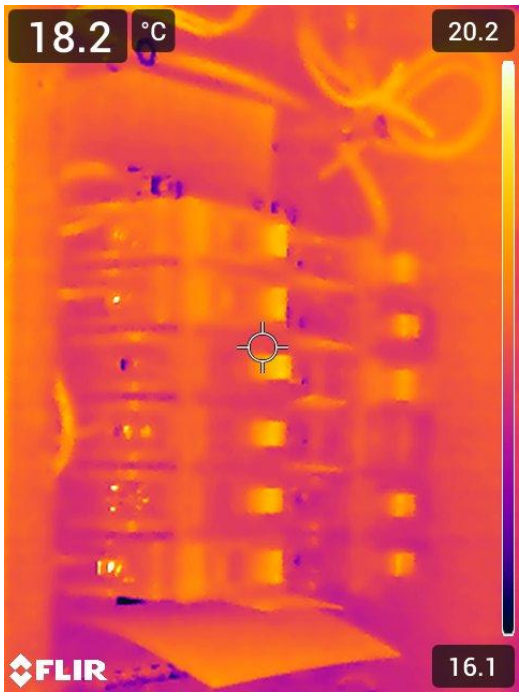


PHASE	LOAD IN AMPS	PHASE	VOLTS
A PHASE	4.7	**A-N**	123
B PHASE	.7	**B-N**	124
C PHASE	N/A	**C-N**	N/A
NEUTRAL	4	**A-B**	215
		A-C	N/A
		B-C	N/A

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Location	Building FF03 ROOM 023A
Component	PANEL AC
IR File Name	FLIR2072
Picture File Name	FLIR2073
Date	Monday October 28th
Image time	1:48 PM



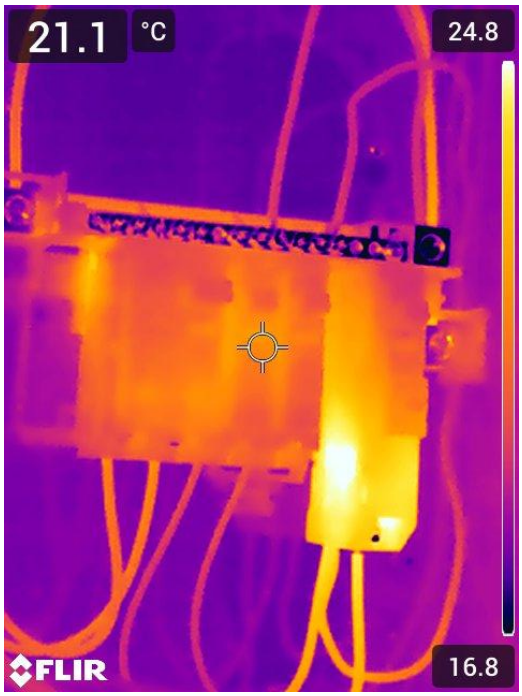


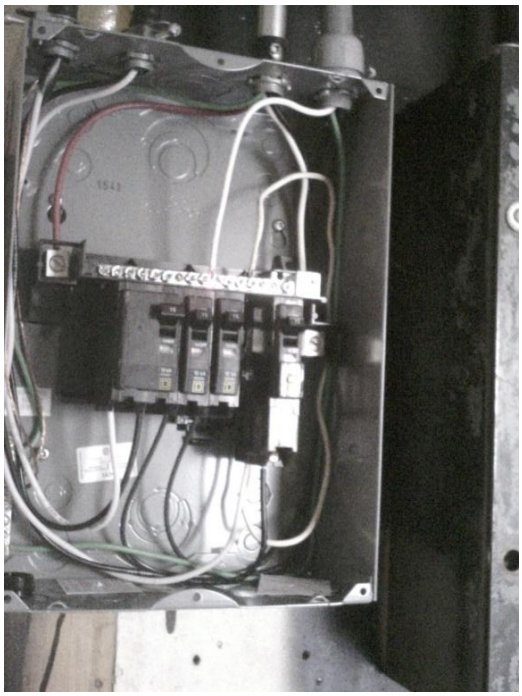
PHASE	LOAD IN AMPS	PHASE	VOLTS
A PHASE	0	**A-N**	124
B PHASE	0	**B-N**	124
C PHASE	N/A	**C-N**	N/A
NEUTRAL	0	**A-B**	215
		A-C	N/A
		B-C	N/A

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Location	Building FF03 ROOM 023A
Component	PANEL QO
IR File Name	FLIR2074
Picture File Name	FLIR2075
Date	Monday October 28th
Image time	1:56 PM



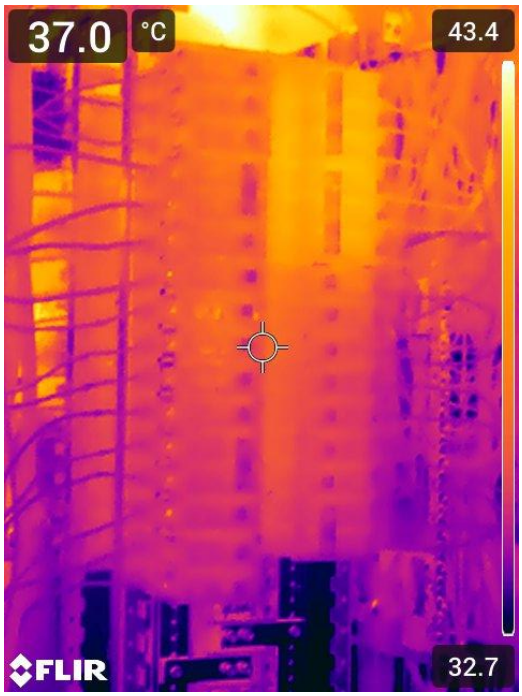


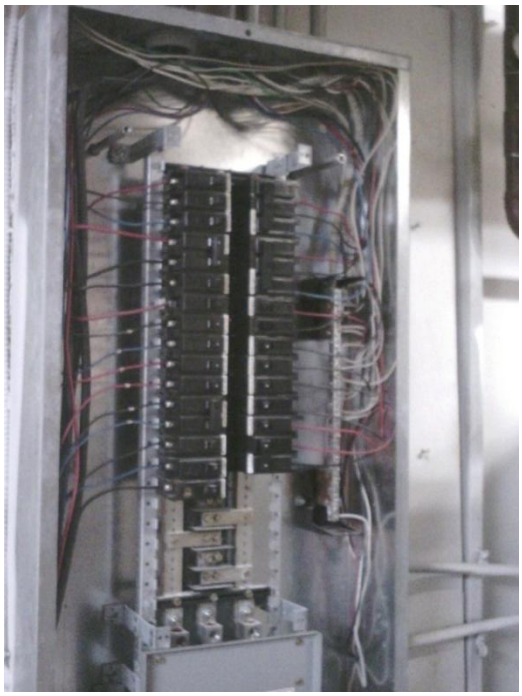
PHASE	LOAD IN AMPS	PHASE	VOLTS
A PHASE	1.8	**A-N**	124
B PHASE	.6	**B-N**	124
C PHASE	N/A	**C-N**	N/A
NEUTRAL	1	**A-B**	216
		A-C	N/A
		B-C	N/A

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Location	Building FF03 ROOM 006
Component	PANEL AG
IR File Name	FLIR2076
Picture File Name	FLIR2077
Date	Monday October 28th
Image time	2:42 PM



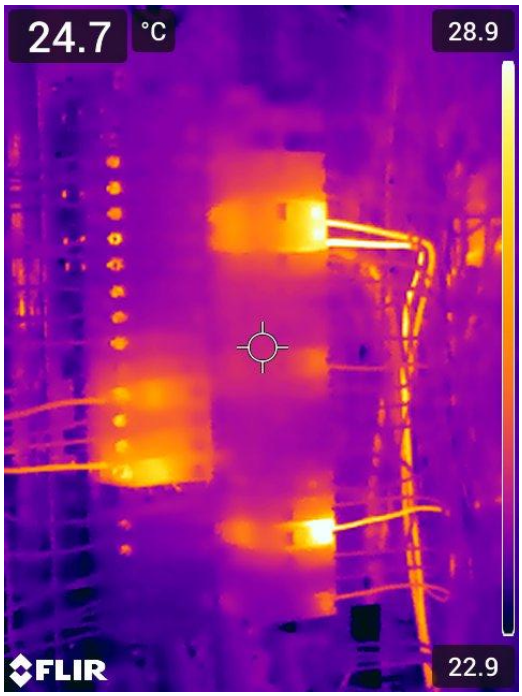


PHASE	LOAD IN AMPS	PHASE	VOLTS
A PHASE	9.1	**A-N**	122
B PHASE	8.5	**B-N**	121
C PHASE	10.4	**C-N**	122
NEUTRAL	1.8	**A-B**	212
		A-C	212
		B-C	212

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Location	Building FF03 KITCHEN
Component	PANEL FF333
IR File Name	FLIR2078
Picture File Name	FLIR2079
Date	Monday October 28th
Image time	2:55 PM



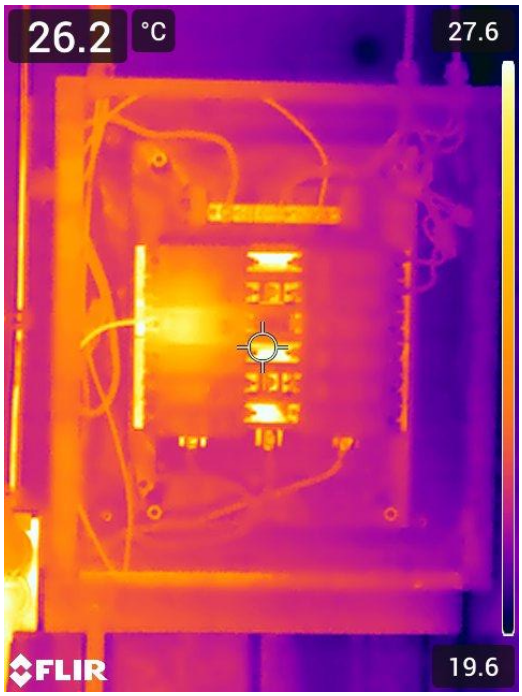


PHASE	LOAD IN AMPS	PHASE	VOLTS
A PHASE	5.3	**A-N**	122
B PHASE	14.5	**B-N**	122
C PHASE	27.5	**C-N**	121
NEUTRAL	22.1	**A-B**	213
		A-C	212
		B-C	212

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DRYCORE
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Location	Building FF03 KITCHEN
Component	PANEL BB
IR File Name	FLIR2082
Picture File Name	FLIR2083
Date	Monday October 28th
Image time	3:02 PM





PHASE	LOAD IN AMPS	PHASE	VOLTS
A PHASE	.1	**A-N**	348
B PHASE	0	**B-N**	347
C PHASE	.2	**C-N**	348
NEUTRAL	.1	**A-B**	601
		A-C	600
		B-C	600

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Location	Building FF03 KITCHEN
Component	PANEL BC
IR File Name	FLIR2086
Picture File Name	FLIR2087
Date	Monday October 28th
Image time	3:22 PM



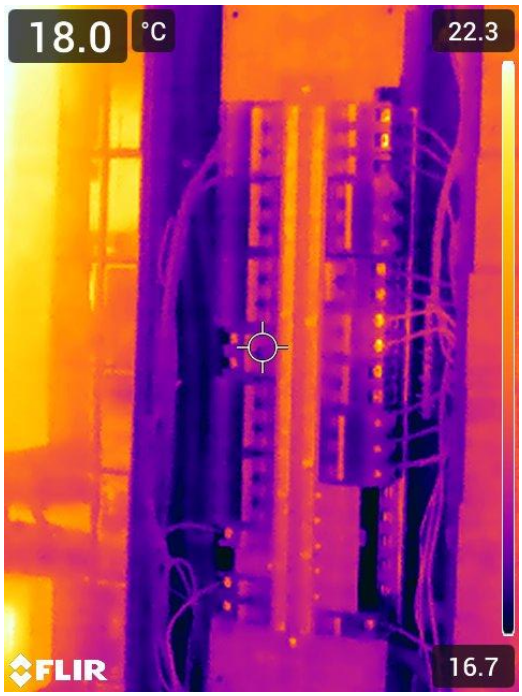


PHASE	LOAD IN AMPS	PHASE	VOLTS
A PHASE	.29	**A-N**	117
B PHASE	.6	**B-N**	118
C PHASE	.7	**C-N**	117
NEUTRAL	.4	**A-B**	204
		A-C	203
		B-C	203

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Location	Building FF03 KITCHEN
Component	PANEL BK
IR File Name	FLIR2088
Picture File Name	FLIR2089
Date	Monday October 28th
Image time	3:30 PM





PHASE	LOAD IN AMPS	PHASE	VOLTS
A PHASE	.29	**A-N**	117
B PHASE	.6	**B-N**	118
C PHASE	.7	**C-N**	117
NEUTRAL	.4	**A-B**	204
		A-C	204
		B-C	205

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Location	Building FF03 KITCHEN
Component	PANEL BD
IR File Name	FLIR2092
Picture File Name	FLIR2093
Date	Monday October 28th
Image time	3:33 PM



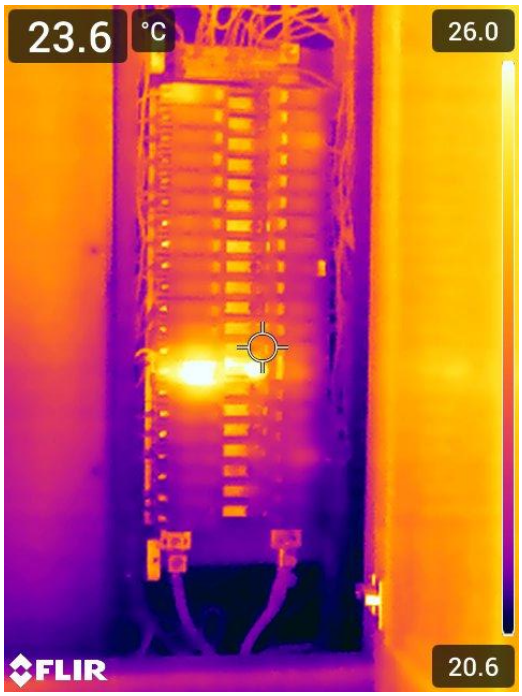


PHASE	LOAD IN AMPS	PHASE	VOLTS
A PHASE	.29	**A-N**	117
B PHASE	.6	**B-N**	118
C PHASE	.7	**C-N**	117
NEUTRAL	.4	**A-B**	205
		A-C	204
		B-C	205

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Location	Building FF03 SERVING AREA
Component	PANEL PBA
IR File Name	FLIR2080
Picture File Name	FLIR2081
Date	Monday October 28th
Image time	2:59 PM



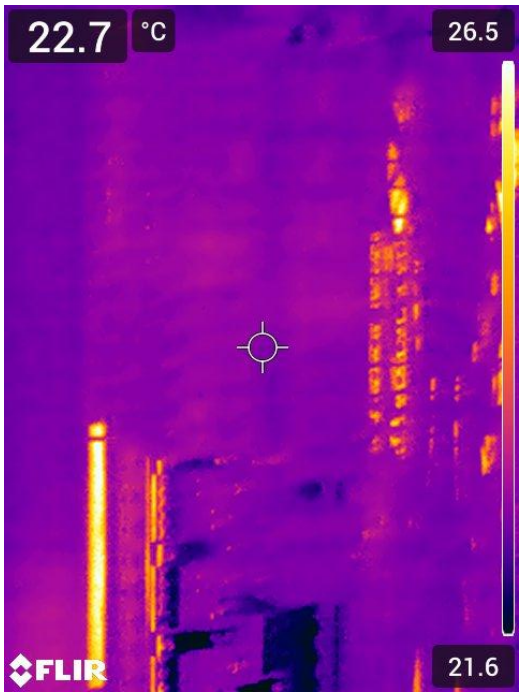


PHASE	LOAD IN AMPS	PHASE	VOLTS
A PHASE	26.9	**A-N**	117
B PHASE	13.4	**B-N**	117
C PHASE	N/A	**C-N**	N/A
NEUTRAL	12	**A-B**	205
		A-C	N/A
		B-C	N/A

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Location	Building FF03 HALL SECOND FLOOR
Component	PANEL AH
IR File Name	FLIR2094
Picture File Name	FLIR2095
Date	Monday October 28th
Image time	3:54 PM



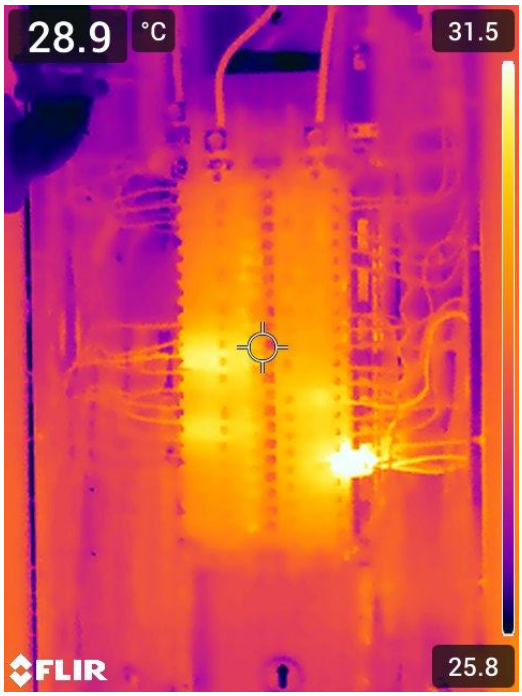


PHASE	LOAD IN AMPS	PHASE	VOLTS
A PHASE	2.4	**A-N**	122
B PHASE	3.9	**B-N**	122
C PHASE	3.5	**C-N**	122
NEUTRAL	1.2	**A-B**	212
		A-C	213
		B-C	212

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Location	Building FF03 BASEMENT BAR
Component	PANEL AA
IR File Name	FLIR2098
Picture File Name	FLIR2099
Date	Monday October 28th
Image time	4:04 PM



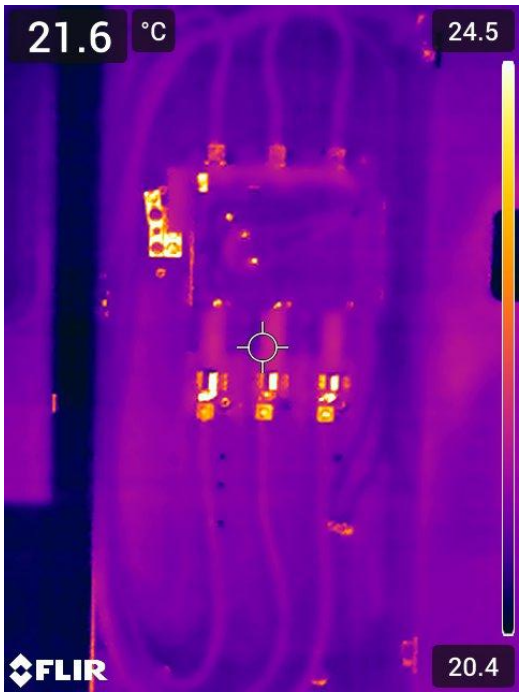


PHASE	LOAD IN AMPS	PHASE	VOLTS
A PHASE	.9	**A-N**	122
B PHASE	6.1	**B-N**	122
C PHASE	N/A	**C-N**	N/A
NEUTRAL	4	**A-B**	212
		A-C	N/A
		B-C	N/A

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Location	Building FF03 ELEVATOR ROOM
Component	ELEVATOR DISCONNECT
IR File Name	FLIR2100
Picture File Name	FLIR2101
Date	Monday October 28th
Image time	4:18 PM

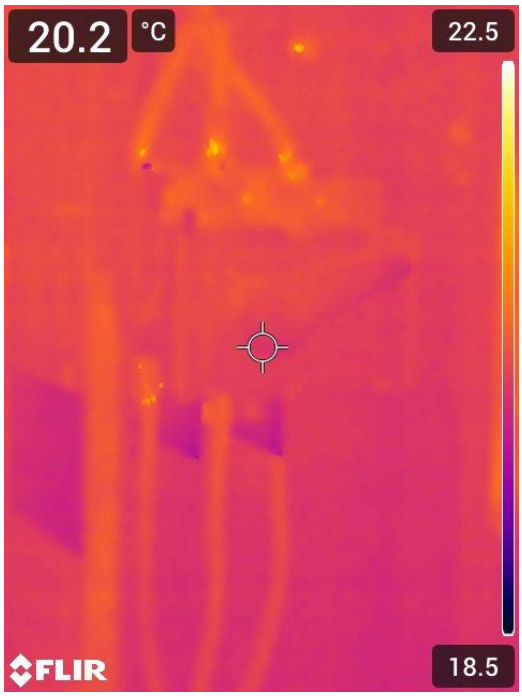




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Location	Building FF03 PENTHOUSE
Component	SPLITTER DISCONNECT
IR File Name	FLIR2280
Picture File Name	FLIR2281
Date	FRIDAY November 1st
Image time	10:09 AM

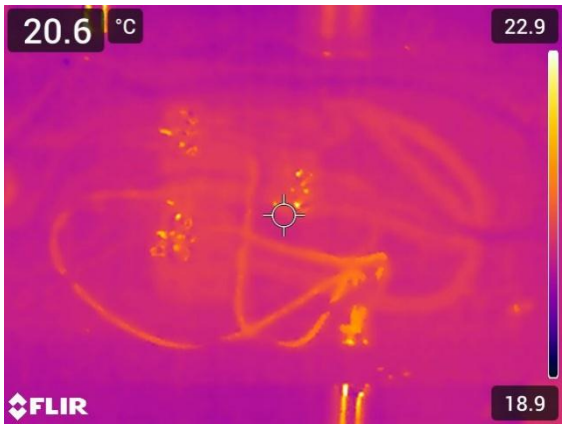


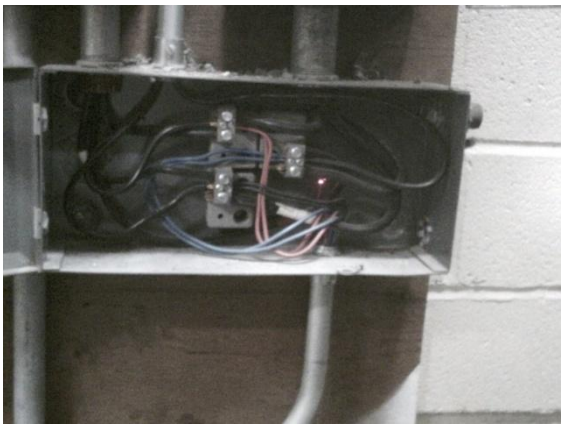


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Location	Building FF03 PENTHOUSE
Component	SPLITTER 600V
IR File Name	FLIR2278
Picture File Name	FLIR2279
Date	FRIDAY November 1st
Image time	10:09 AM

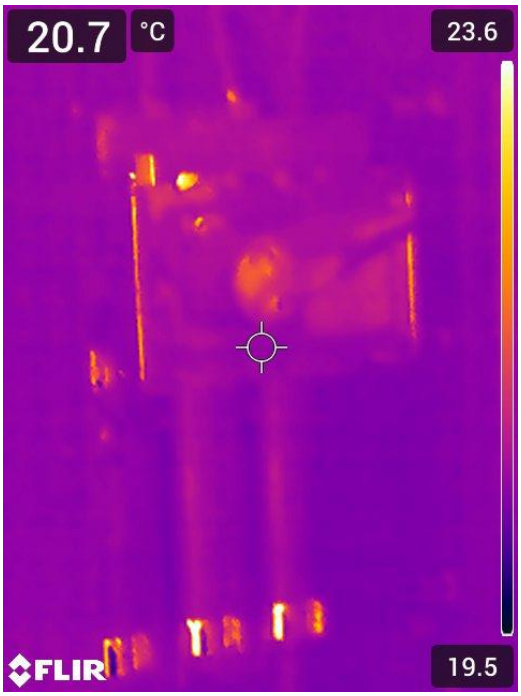




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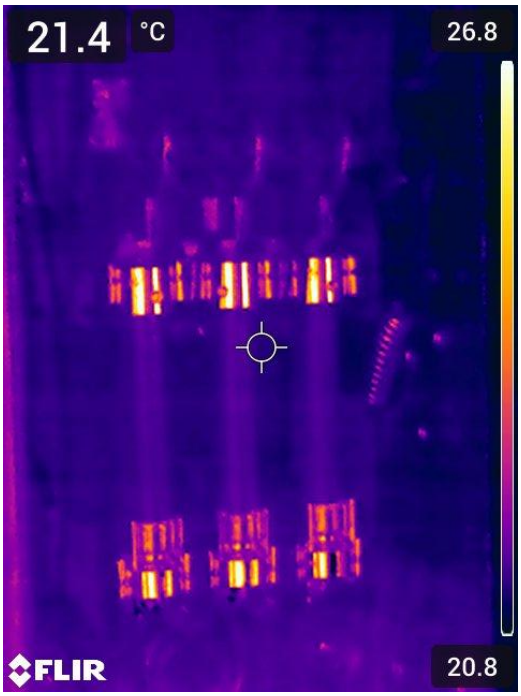
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Location	Building FF03 PENTHOUSE
Component	CONDENSOR UNIT 2 DISCONNECT
IR File Name	FLIR2282
Picture File Name	FLIR2283
Date	FRIDAY November 1st
Image time	10:12 AM





Location	Building FF03 PENTHOUSE
Component	UNLABLED 60A DISCONNECT
IR File Name	FLIR2284
Picture File Name	FLIR2285
Date	FRIDAY November 1st
Image time	10:15 AM

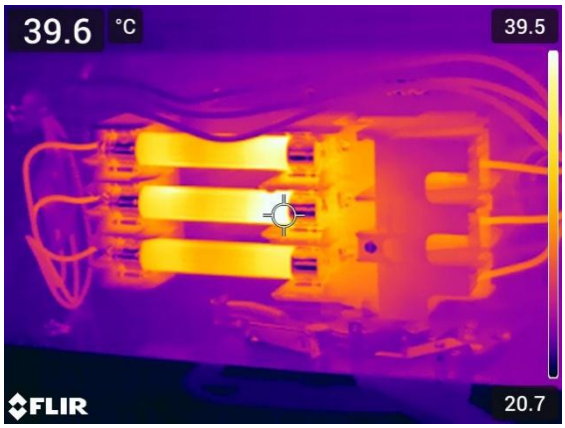




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Location	Building FF03 PENTHOUSE
Component	KITCHEN EXHAUST DISCONNECT
IR File Name	FLIR2286
Picture File Name	FLIR2287
Date	FRIDAY November 1st
Image time	10:18 AM

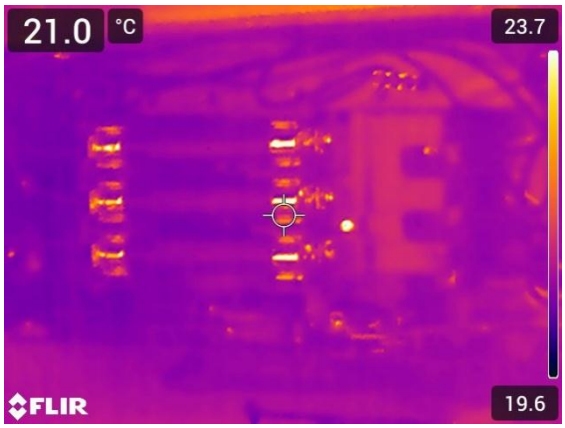




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Location	Building FF03 PENTHOUSE
Component	MAU 5 DISCONNECT
IR File Name	FLIR2288
Picture File Name	FLIR2289
Date	FRIDAY November 1st
Image time	10:22 AM

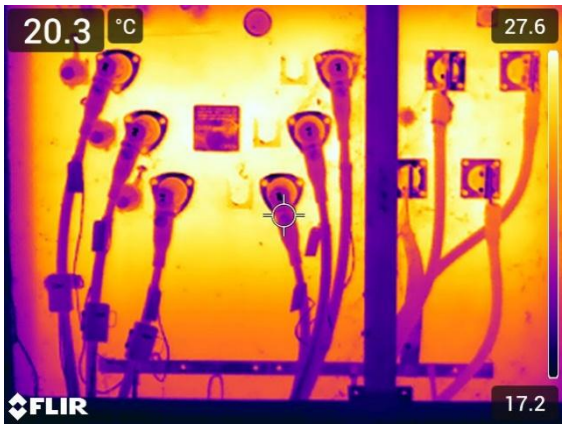




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Location	EXTERIOR BEHIND FF03
Component	TRANSFORMER TRN-3
IR File Name	FLIR2200
Picture File Name	FLIR2201
Date	THURDSAY October 31th
Image time	9:29 AM





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Location	EXTERIOR BEHIND FF03
Component	TAP BOX DP-PRN3
IR File Name	FLIR2198
Picture File Name	FLIR2199
Date	THURDSAY October 31th
Image time	9:29 AM





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Appendix D – Site Checklist

FF03

Line #	Tasks	Confirmation of Completion	Results/Notes
1	DS-MAIN		
2	Confirm amperage rating	☐	400A
3	Confirm voltage rating	☐	575
4	Remove cover plate	☐	
5	Perform thermal scanning, record photo's for report	☐	
6	Confirm if fused or unfused	☐	FUSED
7	Confirm fuse ratings (if applicable)	☐	400A
8	Confirm fuse type, series, & manufacturer	☐	JA4
9	Confirm SCCR rating	☐	
10	Confirm wire size, number of cables per phase, & cable type (Cu/Al) from TRN-3 to DS-MAIN	☐	350 MCM CU 1 WIRE PER PHASE
11	Confirm wire size, number of cables per phase, & cable type (Cu/Al) from DS-MAIN to DP-MAIN	☐	600 MCM CU 1 WIRE PER PHASE
12	Confirm wire length, conduit type, & conduit size from TRN-3 to DS-MAIN	☐	UNKNOWN FROM PAD MOUNT
13	Confirm wire length, conduit type, & conduit size from DS-MAIN to DP-MAIN	☐	10' IN 2.5" NIPPLE
14			
15	DP-MAIN		
16	Refer to panel information sheet & perform visual testing for DP-MAIN	☐	
17	Remove panel coverplate	☐	
18	Perform thermal scanning, record photo's for report	☐	
19	Refer to panel information sheet and perform panel testing	☐	
20	Trace and verify all down stream equipment	☐	
21			
22	FUSE PANEL WITH DISCONNECTS *Confirm breaker ratings, SCCR ratings, Trip plug settings for the following:*		
23	Breaker 1	☐	200A
24	Breaker 2	☐	100A
25	Breaker 3	☐	100A
26	Breaker 4	☐	100A
27	Breaker 5	☐	60A
28	Breaker 6	☐	60A
29	Breaker 7	☐	60A
30	Breaker 8	☐	60A
31	Breaker 9	☐	20A
32	Breaker 10	☐	30A
33	Breaker 11	☐	
34			
35	*Confirm the following wire sizes, number of cables per phase, & cable type (Cu/Al):*		
36	DP-MAIN to Meter	☐	#12 WIRE WITH JAM 15A FUSE
37	DP-MAIN to DS-HVAC3	☐	2 X #12 WIRES WITH AJT 40A FUSE
38	DP-MAIN to DS-EXTERIOR CU	☐	#10 WIRE WITH AJT 25A FUSE
39	DP-MAIN to TX-3	☐	#2 WIRE WITH CLASS J 100A FUSE
40	DP-MAIN to SPLITTER PENTHOUSE	☐	#2 WIRE WITH CLASS J 100A FUSE
41	DP-MAIN to TX-2	☐	3/0 WIRE WITH 200A FUSE RATED 200KA
42	DP-MAIN to DS-ELEV	☐	#12 WIRE WITH 15A FUSE, UNREADABLE
43	DP-MAIN to TX-1	☐	#2 WIRE WITH 90A JAI FUSE
44			
45	*Confirm the following lengths of wire, conduit type, & conduit size:*		
46	DP-MAIN to Meter	☐	5' THROUGH 1" NIPPLE
47	DP-MAIN to DS-HVAC3	☐	40' THROUGH 1" RIGID STEEL
48	DP-MAIN to DS-EXTERIOR CU	☐	40' THROUGH 1' RIGID STEEL
49	DP-MAIN to TX-3	☐	10' THROUGH 1 1/2 METALLIC FLEX
50	DP-MAIN to SPLITTER PENTHOUSE	☐	350' THROUGH 1 1/2" EMT
51	DP-MAIN to TX-2	☐	30' THROUGH 2" EMT
52	DP-MAIN to DS-ELEV	☐	
53	DP-MAIN to TX-1	☐	30' THROUGH 1 1/2 EMT

54			
55	DS-HVAC-3		
56	Confirm amperage rating	☐	30A
57	Confirm voltage rating	☐	600V
58	Remove cover plate	☐	
59	Perform thermal scanning, record photo's for report	☐	
60	Confirm if fused or unfused	☐	UNFUSED
61	Confirm fuse ratings (if applicable)	☐	
62	Confirm fuse type, series, & manufacturer	☐	
63	Confirm SCCR rating	☐	
64	Confirm wire size, number of cables per phase, & cable type (Cu/Al) from DS-HVAC-3 to HVAC-3 unit	☐	#12 CU 1 WIRE PER PHASE
65	Confirm wire length, conduit type, & conduit size from DS-HVAC-3 to HVAC-3 unit	☐	5' THROUGH 3/4" LIQUID TIGHT FLEX
66			
67	DS-EXTERIOR CU		
68	Confirm amperage rating	☐	30A
69	Confirm voltage rating	☐	600V
70	Remove cover plate	☐	
71	Perform thermal scanning, record photo's for report	☐	
72	Confirm if fused or unfused	☐	UNFUSED
73	Confirm fuse ratings (if applicable)	☐	
74	Confirm fuse type, series, & manufacturer	☐	
75	Confirm SCCR rating	☐	
76	Confirm wire size, number of cables per phase, & cable type (Cu/Al) from DS-EXTERIOR CU to CU unit	☐	#10 CU 1 WIRE PER PHASE
77	Confirm wire length, conduit type, & conduit size from DS-EXTERIOR CU to CU unit	☐	40' THROUGH 1" RIGID STEEL
78			
79	TX-3		
80	Perform thermal scanning, record photo's for report	☐	
81	Confirm wire size, number of cables per phase, & cable type (Cu/Al) from TX-3 to DS-P-JM	☐	350 MCM 1 WIRE PER PHASE
82	Confirm wire length, conduit type, & conduit size from TX-3 to DS-P-JM	☐	10' THROUGH 2 1/2" RIGID 3' THROUGH 2 1/2" METTALIC FLEX
83	Confirm kVA rating	☐	75KVA
84	Confirm winding configurations	☐	DELTA/WYE
85	Confirm impedance rating & X/R ratio	☐	5%
86			
87	DS-P-JM		
88	Confirm amperage rating	☐	200A
89	Confirm voltage rating	☐	240V
90	Remove cover plate	☐	
91	Perform thermal scanning, record photo's for report	☐	
92	Confirm if fused or unfused	☐	FUSED
93	Confirm fuse ratings (if applicable)	☐	200A
94	Confirm fuse type, series, & manufacturer	☐	TYPE D
95	Confirm SCCR rating	☐	
96			
97	P-JM		
98	Refer to panel information sheet & perform visual testing for P-JM	☐	
99	Remove panel coverplate	☐	
100	Perform thermal scanning, record photo's for report	☐	
101	Refer to panel information sheet and perform panel testing	☐	
102	Confirm all breaker ratings	☐	
103	Confirm all breaker SCCR ratings	☐	
104	Confirm incoming wire size, number of cables per phase, & cable type (Cu/Al):	☐	350 MCM 1 WIRE PER PHASE
105	Confirm wire length, conduit type, & conduit size from DS-P-JM to P-JM	☐	10 THROUGH 2 1/2" METTALIC FLEX
106			
107	TX-2		
108	Perform thermal scanning, record photo's for report	☐	
109	Confirm wire size, number of cables per phase, & cable type (Cu/Al) from TX-2 to DP-1	☐	3/0 CU 1 WIRE PER PHASE

110	Confirm wire length, conduit type, & conduit size from TX-2 to DP-1	☐	25' THROUGH 2" EMT
111	Confirm kVA rating	☐	112.5 KVA
112	Confirm winding configurations	☐	DELTA/WYE
113	Confirm impedance rating & X/R ratio	☐	4.5%
114			
115	DP-1		
116	Refer to panel information sheet & perform visual testing for DP-MAIN	☐	
117	Remove panel coverplate	☐	
118	Perform thermal scanning, record photo's for report	☐	
119	Refer to panel information sheet and perform panel testing	☐	
120	Trace and verify all down stream equipment	☐	
121			
122	*Confirm breaker ratings, SCCR ratings, Trip plug settings for the following:*		
123	MCB	☐	400A
124	Breaker 1	☐	100A
125	Breaker 2	☐	300A
126	Breaker 3	☐	225A
127	Breaker 4	☐	60A
128	Breaker 5	☐	60A
129	Breaker 6	☐	60A
130	Breaker 7	☐	15A
131			
132	*Confirm the following wire sizes, number of cables per phase, & cable type (Cu/Al):*		
133	DP-1 to P-BA ONLY 2 WIRES ON 3 POLE BREAKER	☐	#3 CU 1 WIRE PER PHASE
134	DP-1 to P-BB	☐	#6 CU 1 WIRE PER PHASE
135	DP-1 to P-BC	☐	400 MCM CU 1 WIRE PER PHASE
136	DP-1 to P-BD	☐	#4 CU 1 WIRE PER PHASE
137	DP-1 to P-BK	☐	NOT FED FROM THIS PANEL
138	DP-1 to P-C	☐	WIRES NOT ON BREAKER
139	DP-1 to Unknown TAG AS ELEVATOR	☐	#6 CU 1 WIRE PER PHASE
140	DP-1 to Condensate Pump	☐	#12 CU 1 WIRE PER PHASE
141			
142	*Confirm the following lengths of wire, conduit type, & conduit size:*		
143	DP-1 to P-BA	☐	100' THROUGH 1 1/2" EMT
144	DP-1 to P-BB	☐	150' THROUGH 1" EMT
145	DP-1 to P-BC	☐	100' THROUGH 3 1/2" EMT
146	DP-1 to P-BD	☐	150' THROUGH 1 1/2" EMT
147	DP-1 to P-BK	☐	NOT FED FROM THIS PANEL
148	DP-1 to P-C	☐	NO WIRES ON BREAKER
149	DP-1 to Unknown TAG AS ELEVATOR	☐	175' THROUGH 1" EMT
150	DP-1 to Condensate Pump	☐	50' THROUGH 3/4" EMT
151			
152	P-BA		
153	Refer to panel information sheet & perform visual testing for P-BA	☐	
154	Remove panel coverplate	☐	
155	Perform thermal scanning, record photo's for report	☐	
156	Refer to panel information sheet and perform panel testing	☐	
157	Confirm all breaker ratings	☐	10KA
158	Confirm all breaker SCCR ratings	☐	
159			
160	P-BB		
161	Refer to panel information sheet & perform visual testing for P-BB	☐	
162	Remove panel coverplate	☐	
163	Perform thermal scanning, record photo's for report	☐	
164	Refer to panel information sheet and perform panel testing	☐	
165	Confirm all breaker ratings	☐	10KA
166	Confirm all breaker SCCR ratings	☐	
167			
168	P-BC		
169	Refer to panel information sheet & perform visual testing for P-BC	☐	
170	Remove panel coverplate	☐	
171	Perform thermal scanning, record photo's for report	☐	

172	Refer to panel information sheet and perform panel testing	☐	
173	Confirm all breaker ratings	☐	150A 18KA, 100A 65KA,
174	Confirm all breaker SCCR ratings	☐	
175			
176	P-BD		
177	Refer to panel information sheet & perform visual testing for P-BD	☐	
178	Remove panel coverplate	☐	
179	Perform thermal scanning, record photo's for report	☐	
180	Refer to panel information sheet and perform panel testing	☐	
181	Confirm all breaker ratings	☐	10KA
182	Confirm all breaker SCCR ratings	☐	
183			
184	P-BK		
185	Refer to panel information sheet & perform visual testing for P-BK	☐	
186	Remove panel coverplate	☐	
187	Perform thermal scanning, record photo's for report	☐	
188	Refer to panel information sheet and perform panel testing	☐	
189	Confirm all breaker ratings	☐	10KA
190	Confirm all breaker SCCR ratings	☐	
191			
192	P-C DOES NOT EXISIT		
193	Refer to panel information sheet & perform visual testing for P-C	☐	
194	Remove panel coverplate	☐	
195	Perform thermal scanning, record photo's for report	☐	
196	Refer to panel information sheet and perform panel testing	☐	
197	Confirm all breaker ratings	☐	
198	Confirm all breaker SCCR ratings	☐	
199			
200	DS (CONDENSATE PUMP)		
201	Confirm amperage rating	☐	30A
202	Confirm voltage rating	☐	240V
203	Remove cover plate	☐	
204	Perform thermal scanning, record photo's for report	☐	
205	Confirm if fused or unfused	☐	UNFUSED
206	Confirm fuse ratings (if applicable)	☐	
207	Confirm fuse type, series, & manufacturer	☐	
208	Confirm SCCR rating	☐	
209	Confirm wire size, number of cables per phase, & cable type (Cu/Al) from DS-CONDENSATE PUMP to Condensate pump	☐	#12CU WIRE 1 WIRE PER PHASE
210	Confirm wire length, conduit type, & conduit size from DS-CONDENSATE PUMP to Condensate pump	☐	50' THROUGH 3/4" EMT
211			
212	DS-ELE		
213	Confirm amperage rating	☐	60A
214	Confirm voltage rating	☐	240V
215	Remove cover plate	☐	
216	Perform thermal scanning, record photo's for report	☐	
217	Confirm if fused or unfused	☐	FUSED
218	Confirm fuse ratings (if applicable)	☐	60A
219	Confirm fuse type, series, & manufacturer	☐	NRN CLASS P GOULD NRN
220	Confirm SCCR rating	☐	
221	Confirm wire size, number of cables per phase, & cable type (Cu/Al) from DS-ELE to Elevator	☐	#6 CU WIRE 1 WIRE PER PHASE
222	Confirm wire length, conduit type, & conduit size from DS-ELE to Elevator	☐	5' THROUGH 1" EMT
223			
224	TX-1		
225	Perform thermal scanning, record photo's for report	☐	
226	Confirm wire size, number of cables per phase, & cable type (Cu/Al) from TX-1 to DP-2	☐	#2 CU WIRE 1 WIRE PER PHASE
227	Confirm wire length, conduit type, & conduit size from TX-1 to DP-2	☐	EMT 2"
228	Confirm kVA rating	☐	75KVA
229	Confirm winding configurations	☐	DELTA/WYE
230	Confirm impedance rating & X/R ratio	☐	2.9%
231			

232	DP-2		
233	Refer to panel information sheet & perform visual testing for DP-2	☐	
234	Remove panel coverplate	☐	
235	Perform thermal scanning, record photo's for report	☐	
236	Refer to panel information sheet and perform panel testing	☐	
237	Trace and verify all down stream equipment	☐	
238			
239	*Confirm breaker ratings, SCCR ratings, Trip plug settings for the following:*		
240	MCB	☐	250A
241	Breaker 1	☐	70A
242	Breaker 2	☐	60A
243	Breaker 3	☐	60A
244	Breaker 4	☐	100A
245	Breaker 5	☐	100A
246	Breaker 6	☐	225A
247	Breaker 7	☐	100A
248	Breaker 8	☐	100A
249	Breaker 9	☐	200A
250			
251	*Confirm the following wire sizes, number of cables per phase, & cable type (Cu/Al):*		
252	DP-2 to P-AA	☐	#6 WIRE CU 1 WIRE PER PHASE
253	DP-2 to P-AB	☐	#6 WIRE CU 1 WIRE PER PHASE
254	DP-2 to P-AC	☐	#6 WIRE CU 1 WIRE PER PHASE
255	DP-2 to P-AD	☐	#3 WIRE CU 1 WIRE PER PHASE
256	DP-2 to P-AE	☐	#3 WIRE CU 1 WIRE PER PHASE
257	DP-2 to P-AF1	☐	4/0 WIRE CU 1 WIRE PER PHASE
258	DP-2 to P-AG	☐	#1 WIRE CU 1 WIRE PER PHASE
259	DP-2 to P-AH	☐	#1 WIRE CU 1 WIRE PER PHASE
260	DP-2 to FF333	☐	3/0 WIRE CU 1 WIRE PER PHASE
261			
262	*Confirm the following lengths of wire, conduit type, & conduit size:*		
263	DP-2 to P-AA	☐	50' THROUGH 1" EMT
264	DP-2 to P-AB	☐	80' THROUGH 1" EMT
265	DP-2 to P-AC	☐	90' THROUGH 1"EMT
266	DP-2 to P-AD	☐	60' THROUGH 1 1/4" EMT
267	DP-2 to P-AE	☐	80' THROUGH 1 1/4" EMT
268	DP-2 to P-AF1	☐	20' THROUGH 2" EMT
269	DP-2 to P-AG	☐	100' THROUGH 2" EMT
270	DP-2 to P-AH	☐	150' THROUGH 2" EMT
271	DP-2 to FF333	☐	110' THROUGH 2" EMT
272			
273	P-AA		
274	Refer to panel information sheet & perform visual testing for P-AA	☐	
275	Remove panel coverplate	☐	
276	Perform thermal scanning, record photo's for report	☐	
277	Refer to panel information sheet and perform panel testing	☐	
278	Confirm all breaker ratings	☐	10KA
279	Confirm all breaker SCCR ratings	☐	
280			
281	P-AB		
282	Refer to panel information sheet & perform visual testing for P-AB	☐	
283	Remove panel coverplate	☐	
284	Perform thermal scanning, record photo's for report	☐	
285	Refer to panel information sheet and perform panel testing	☐	
286	Confirm all breaker ratings	☐	10KA
287	Confirm all breaker SCCR ratings	☐	
288			
289	P-AC		
290	Refer to panel information sheet & perform visual testing for P-AC	☐	
291	Remove panel coverplate	☐	
292	Perform thermal scanning, record photo's for report	☐	
293	Refer to panel information sheet and perform panel testing	☐	
294	Confirm all breaker ratings	☐	10KA

295	Confirm all breaker SCCR ratings	☐	
296			
297	P-AD		
298	Refer to panel information sheet & perform visual testing for P-AD	☐	
299	Remove panel coverplate	☐	
300	Perform thermal scanning, record photo's for report	☐	
301	Refer to panel information sheet and perfrom panel testing	☐	
302	Confirm all breaker ratings	☐	10KA
303	Confirm all breaker SCCR ratings	☐	
304			
305	P-AE		
306	Refer to panel information sheet & perform visual testing for P-AE	☐	
307	Remove panel coverplate	☐	
308	Perform thermal scanning, record photo's for report	☐	
309	Refer to panel information sheet and perform panel testing	☐	
310	Confirm all breaker ratings	☐	10KA
311	Confirm all breaker SCCR ratings	☐	
312			
313	P-AF1		
314	Refer to panel information sheet & perform visual testing for P-AF1	☐	
315	Remove panel coverplate	☐	
316	Perform thermal scanning, record photo's for report	☐	
317	Refer to panel information sheet and perform panel testing	☐	
318	Confirm all breaker ratings	☐	10KA
319	Confirm all breaker SCCR ratings	☐	
320			
321	P-AF2		
322	Refer to panel information sheet & perform visual testing for P-AF2	☐	
323	Remove panel coverplate	☐	
324	Perform thermal scanning, record photo's for report	☐	
325	Refer to panel information sheet and perform panel testing	☐	
326	Confirm all breaker ratings	☐	10KA
327	Confirm all breaker SCCR ratings	☐	
328	Confirm wire size, number of cables per phase, & cable type (Cu/Al) from P-AF1 to P-AF2	☐	4/0 CU WIRE 1 WIRE PER PHASE
329	Confirm wire length, conduit type, & conduit size from P-AF1 to P-AF2	☐	3" NIPPLE BETWEEN PANELS, 10' OR WIRE
330			
331	P-AG		
332	Refer to panel information sheet & perform visual testing for P-AG	☐	
333	Remove panel coverplate	☐	
334	Perform thermal scanning, record photo's for report	☐	
335	Refer to panel information sheet and perform panel testing	☐	
336	Confirm all breaker ratings	☐	10KA
337	Confirm all breaker SCCR ratings	☐	
338			
339	P-AH		
340	Refer to panel information sheet & perform visual testing for P-AH	☐	
341	Remove panel coverplate	☐	
342	Perform thermal scanning, record photo's for report	☐	
343	Refer to panel information sheet and perform panel testing	☐	
344	Confirm all breaker ratings	☐	10KA
345	Confirm all breaker SCCR ratings	☐	
346			
347	FF333		
348	Confirm where panel FF333 is being fed from	☐	
349	Refer to panel information sheet & perform visual testing for FF333	☐	
350	Remove panel coverplate	☐	
351	Perform thermal scanning, record photo's for report	☐	
352	Refer to panel information sheet and perform panel testing	☐	
353	Confirm all breaker ratings	☐	10KA
354	Confirm all breaker SCCR ratings	☐	
355			
356	QO		
357	Confirm where panel QO is being fed from	☐	

358	Refer to panel information sheet & perform visual testing for QO	☐	
359	Remove panel coverplate	☐	
360	Perform thermal scanning, record photo's for report	☐	
361	Refer to panel information sheet and perform panel testing	☐	
362	Confirm all breaker ratings	☐	10KA
363	Confirm all breaker SCCR ratings	☐	
364			
365	Equipment/General		
366	Confirm if elevator is fed from DP-MAIN or DP-1	☐	FED FROM DP-1
367	Confirm HP rating of HVAC-3	☐	
368	Confirm HP rating of Exterior CU	☐	
369	Confirm HP rating of Condensate Pump	☐	
370	Confirm location and existance "Splitter Penthouse"	☐	
371	Confirm all down stream equipment of Splitter Penthouse. Perform all appropirate check list and panel information items for all down stream equipment.	☐	
372	Aquire meter specifications off of DP-MAIN	☐	
373	Ensure all relays are located and captured	☐	
374	Locate/trace all unknown information and equipment bubbled on the SLD. Perform all appropriate check list and panel information items for all unknowns located.	☐	
375	Measure current on all phases of any piece of equipment found to be anomalous during thermal scans	☐	

PENTHOUSE
DISCONNECT PENTHOUSE SPLITTER
600V 100A RATED 3 PHASE UNFUSED DISCONNECT
1 1/4" NIPPLE WITH #2 CU WIRE TO SPLITTER

DISCONNECT CONDENSOR UNIT #2
575V 60A RATED 3 PHASE FUSED DISCONNECT - TIME DELAY TEMPORISE TYPE D CRS 60AMP FUSE FERRA SHAWMETT
FROM SPLITTER 1" NIPPLE 2' OF #6 CU WIRE

UN LABELED DISCONNECT
575V 60A RATED 3 PHASE FUSED DISCONNECT - GOULD 15A TIME DELAY TR5S15
FROM SPLITTER 3/4" EMT CONDUIT #8 CU WIRE 10'

KITCHEN EXHAUST DISCONNECT
575V 30A RATED 3 PHASE FUSED DISCONNECT - FERREZ SHAWETT 15AMP TRS15R
FROM SPLITTER 3/4" EMT CONDUIT #12 CU WIRE 10'

MAU5 DISCONNECT
575V 30A RATED DISCONNECT - 20M FRS-R-20 200KA RATED
FROM SPLITTER 3/4" EMT CONDUIT #12 CU WIRE 10'

TRANSFORMERS USE BAYONET FUSES THAT ARE UNREADABLE WITHOUT DE-ENERGIZATION AND REMOVAL
WE WERE ADVISED BY EATON AND UTILITIES KINGSTON NOT TO TOUCH

Exterior Inspection

Line #	Tasks	Confirmation of Completion	Results/Notes
1	HV Switchgear		
2	*Confirm the following wire sizes, number of cables per phase, & cable type (Cu/Al):*		
3	Incoming service 1 CABLE IN 3 DIFFERENT CONDUITS	☐	500 MCM 15KV CABLE 1 WIRE PER PHASE
4	Feeder P1 to TRN 1	☐	1/0, 5 KV CABLE 1 WIRE PER PHASE
5	Feeder TRN 1 to TRN 2	☐	1/0, 5KV CABLE 1 WIRE PER PHASE
6	Feeder P2 to TRN 3	☐	1/0, 5 KV CABLE 1 WIRE PER PHASE
7	Feeder TRN 3 to TRN 4	☐	1/0, 5 KV CABLE 1 WIRE PER PHASE
8	Feeder TRN 4 to TRN 4a	☐	1/0 5 KV CABLE 1 WIRE PER PHASE
9	Feeder TRN 4a to Sectionaliazing Switch	☐	1/0, 5KV CABLE 1 WIRE PER PHASE
10	Feeder TRN 2 to Sectionaliazing Switch	☐	1/0, 5KV CABLE 1 WIRE PER PHASE
11			
12	*Confirm the following lengths of wire, conduit type, & conduit size:*		
13	HV Switchgear to upstream equipment/location	☐	UNKNOWN
14	Feeder P1 to TRN 1	☐	40' THROUGH 4" DB2
15	Feeder TRN 1 to TRN 2	☐	375' THROUGH 4" DB2
16	Feeder P2 to ~~TRN 3~~ TRN4	☐	250' THROUGH 4" DB2
17	Feeder TRN 3 to TRN 4	☐	225' THROUGH 4" DB2
18	Feeder TRN 4 to TRN 4a	☐	20' THROUGH 4" DB2
19	Feeder TRN 4a to Sectionaliazing Switch	☐	300' THROUGH 4" DB2
20	Feeder TRN 2 to Sectionaliazing Switch	☐	500' THROUGH 4" DB2
21			
22	Refer to panel information sheet & perform visual testing for HV Switchgear	☐	
23	Refer to panel information sheet & perform primary conductor testing	☐	
24	Confirm all upstream equipment from switchgear	☐	KINGSTON UTILITIES EQUIPMENT UNKNOWN
25	Confirm voltage rating	☐	4.76 KV
26	Confirm amperage rating	☐	600A
27	Confirm fuse ratings	☐	200A
28	Confirm fuse type, series, & manufacturers	☐	S&C ELECTRIC CANADA LTD.
29	Confirm fuse SCCR rating	☐	25000 A
30	Confirm main switch amperage rating	☐	200A
31	Confirm main switch SCCR rating	☐	25000A
32	Confirm feeder P1 amperage rating	☐	150A
33	Confirm feeder P1 SCCR rating	☐	25000A
34	Confirm feeder P2 amperage rating	☐	150A
35	Confirm feeder P2 SCCR rating	☐	25000A
36	Open incoming main feeder enclosure and perfrom thermal scanning, record photo's for report	☐	
37	Open main switch enclosure and perfrom thermal scanning, record photo's for report	☐	
38	Open metering enclosure and perform thermal scanning, record photo's for report	☐	
39	Open feeder P1 enclosure and perform thermal scanning, record photo's for report	☐	
40	Open feeder P2 enclosure and perform thermal scanning, record photo's for report	☐	
41			
42	TRN 01		
43	Refer to panel information sheet & perform visual testing for TRN 01	☐	
44	Refer to panel information sheet and perform transformer primary and secondary testing	☐	

45	Confirm primary voltage rating	☐	4161/2400V
46	Confirm secondary voltage rating	☐	120/208V
47	Confirm kVA rating	☐	150KVA
48	Confirm winding configurations	☐	DELTA/WYE
49	Confirm impedance rating & X/R ratio	☐	4.5%
50	Open TRN 01 enclosure and perform thermal scanning, record photo's for report	☐	
51	Confirm over current protection device	☐	Fuses are bayonet fuses: UK advise not to touch
52	Confirm if FF05 is supplied by main tap at TRN 01 or if its fed from distribution panel PRN-1	☐	Fed through DP-PRN-1
53	Remove cover panel from PRN-1 and perform thermal scanning, record photo's for report	☐	
54	Confirm breaker ratings within PRN-1	☐	
55	Confirm breaker SCCR ratings within PRN-1	☐	
56			
57	DP-PRN-1		
58	Refer to panel information sheet & perform visual testing for DP-PRN-1	☐	
59	Remove panel coverplate	☐	
60	Perform thermal scanning, record photo's for report	☐	
61	Refer to panel information sheet and perform panel testing	☐	
62	Confirm all breaker ratings	☐	
63	Confirm all breaker SCCR ratings	☐	60KA @ 220VAC
64			
65	TRN 02		
66	Refer to panel information sheet & perform visual testing for TRN 01	☐	
67	Refer to panel information sheet and perform transformer primary and secondary testing	☐	
68	Confirm primary voltage rating	☐	4160/2400V
69	Confirm secondary voltage rating	☐	347/600V
70	Confirm kVA rating	☐	225KVA
71	Confirm winding configurations	☐	DELTA/ WYE
72	Confirm impedance rating & X/R ratio	☐	2.86%
73	Open TRN 02 enclosure and perfrom thermal scanning, record photo's for report	☐	
74	Confirm over current protection device	☐	250A Fuses AMPTRAMP Dual Element Time Delay
75	Confirm if FF01, 02, & 07 are supplied by main tap at TRN 02 or if they're fed from distribution panel	☐	FED THROUGH DP-PRN-2
76	If TRN 02 feeds a pad mount distribution panel (PRN-#) perfrom the following:	☐	
77	Remove cover panel from PRN and perform thermal scanning, record photo's for report	☐	
78	Confirm breaker ratings within PRN	☐	
79	Confirm breaker SCCR ratings within PRN	☐	
80			
81	DP-PRN-2		
82	Refer to panel information sheet & perform visual testing for DP-PRN-2	☐	
83	Remove panel coverplate	☐	
84	Perform thermal scanning, record photo's for report	☐	
85	Refer to panel information sheet and perform panel testing	☐	
86	Confirm all breaker ratings	☐	
87	Confirm all breaker SCCR ratings	☐	
88			
89	TRN 03		
90	Refer to panel information sheet & perform visual testing for TRN 01	☐	
91	Refer to panel information sheet and perform transformer primary and secondary testing	☐	

92	Confirm primary voltage rating	☐	4160/2400V
93	Confirm secondary voltage rating	☐	347/600V
94	Confirm kVA rating	☐	225 KVA
95	Confirm winding configurations	☐	DELTA/ WYE
96	Confirm impedance rating & X/R ratio	☐	2.86%
97	Open TRN 03 enclosure and perform thermal scanning, record photo's for report	☐	
98	Confirm over current protection device	☐	BAYONET Fuses: UK advised not to touch
99	Confirm if FF03 & 08 is supplied by main tap at TRN 03 or if its fed from distribution panel PRN-3	☐	DP-PRN-3
100	Remove cover panel from PRN-3 and perform thermal scanning, record photo's for report	☐	
101	Confirm breaker ratings within PRN-3	☐	PANEL INFORMATION SHEETS
102	Confirm breaker SCCR ratings within PRN-3	☐	
103			
104	DP-PRN-3		
105	Refer to panel information sheet & perform visual testing for DP-PRN-3	☐	INFORMATION ON INFORMATION SHEETS
106	Remove panel coverplate	☐	
107	Perform thermal scanning, record photo's for report	☐	
108	Refer to panel information sheet and perform panel testing	☐	
109	Confirm all breaker ratings	☐	
110	Confirm all breaker SCCR ratings	☐	
111			
112	TRN 04		
113	Refer to panel information sheet & perform visual testing for TRN 01	☐	LABEL WAS NOT VISIBLE AS WEATHERED
114	Refer to panel information sheet and perform transformer primary and secondary testing	☐	
115	Confirm primary voltage rating	☐	
116	Confirm secondary voltage rating	☐	347/600V
117	Confirm kVA rating	☐	
118	Confirm winding configurations	☐	DELTA/ WYE
119	Confirm impedance rating & X/R ratio	☐	
120	Open TRN 04 enclosure and perform thermal scanning, record photo's for report	☐	
121	Confirm over current protection device	☐	Bayonet Fuses: advised by UK not to touch
122	Confirm if FF04 is supplied by main tap at TRN 03 or if its fed from distribution panel PRN-4	☐	DP-PRN-4
123	Remove cover panel from PRN-4 and perform thermal scanning, record photo's for report	☐	
124	Confirm breaker ratings within PRN-4	☐	
125	Confirm breaker SCCR ratings within PRN-4	☐	
126			
127	DP-PRN-4		
128	Refer to panel information sheet & perform visual testing for DP-PRN-4	☐	
129	Remove panel coverplate	☐	
130	Perform thermal scanning, record photo's for report	☐	
131	Refer to panel information sheet and perform panel testing	☐	
132	Confirm all breaker ratings	☐	
133	Confirm all breaker SCCR ratings	☐	
134			
135	TRN 04a		
136	Refer to panel information sheet & perform visual testing for TRN 01	☐	
137	Refer to panel information sheet and perform transformer primary and secondary testing	☐	
138	Confirm primary voltage rating	☐	4160/2400V
139	Confirm secondary voltage rating	☐	120/208V

Appendix E – Site Panel Information

Arc Flash Study Fort Frontenac – KN299976
Visual Inspection Sheet
388 Ontario St, Kingston, Ontario, K7K 2X9
IDEA #24549

NOTE: These sequences of operation and the test parameters are written to convey the general sequence of events and the expected minimum test parameters measured and testes. This testing document does not convey or attempt to convey the requirements for the contractor's safety program, lockout/tagout or compliance with the CSA Standard Z462 for Arc Flash and Low Voltage Safety. Safety procedures and protocols are the responsibility of the constructor to develop and implement.

PANEL INSPECTION NOTES:

1. Electrician to ensure interior pictures have been recorded for all panels within this inspection document. All recorded pictures are to be sent to IDEA Inc. alongside this completed document.
2. CEC violations inspection is to include the presence of any stored equipment obstructing all electrical equipment listed below.

FF03

Distribution Panel – DP-MAIN:

Visual Testing

1.	Make/Model/Age of Equipment	Federal Pioneer/QMQB 02-034740/
2.	Voltage Rating	600V
3.	Amperage Rating	400A
4.	Number of Circuits	11 3 PHASE DISCONNECTS
5.	Phase (1/3)	3
6.	MLO or MCB	MLO
7.	MCB Rating (If Applicable)	
8.	Short Circuit Current Rating (kA)	
9.	Corrosion/Rust/Leaks Present?	NO
10.	Panel Location (Floor #, Room #)	Basement
11.	Physical Damage Present?	NO
12.	Evidence of Moisture or Intrusions?	NO
13.	General Condition of Components	GOOD
14.	Bus Bar Condition	GOOD
15.	Verify Panel Labeling	MISSING 2 INDENTIFICATIONS
16.	Verify Panel Directories	LAMACOIDS
17.	Condition of Cable Connections	GOOD
18.	CEC Violations Present?	CLEAR FOOTING IN FRONT OF PANEL
19.	Insulation Bushing at Entrance	YES
20.	Appropriate Anchoring Present?	YES
21.	Evidence of Arcing?	NO
22.	Notes	SAND BAGS AROUND TX-3 OBSTRUCTING FOOTING IN FRONT OF PANEL

Panel Testing

1.	Voltage Phase A to Neutral	344
2.	Voltage Phase B to Neutral	345
3.	Voltage Phase C to Neutral	345
4.	Voltage Phase A to B	595
5.	Voltage Phase A to C	596
6.	Voltage Phase B to C	598
7.	Current Phase A	91.4
8.	Current Phase B	95.8
9.	Current Phase C	95.2
10.	Current on Neutral	NA
11.	Current on Ground	
12.	Notes	

Distribution Panel – DP-1:

Visual Testing

1.	Make/Model/Age of Equipment	Federal Pioneer/CDP/
2.	Voltage Rating	120/208V
3.	Amperage Rating	400A
4.	Number of Circuits	
5.	Phase (1/3)	3
6.	MLO or MCB	MCB
7.	MCB Rating (If Applicable)	400A
8.	Short Circuit Current Rating (kA)	
9.	Corrosion/Rust/Leaks Present?	NO
10.	Panel Location (Floor #, Room #)	1ST 036
11.	Physical Damage Present?	NO
12.	Evidence of Moisture or Intrusions?	NO
13.	General Condition of Components	GOOD
14.	Bus Bar Condition	GOOD
15.	Verify Panel Labeling	2 BREAKERS MISSING LABELING
16.	Verify Panel Directories	LAMACOIDS
17.	Condition of Cable Connections	GOOD
18.	CEC Violations Present?	NO
19.	Insulation Bushing at Entrance	YES
20.	Appropriate Anchoring Present?	YES
21.	Evidence of Arcing?	NONE
22.	Notes	

Panel Testing

1.	Voltage Phase A to Neutral	118
2.	Voltage Phase B to Neutral	118
3.	Voltage Phase C to Neutral	118
4.	Voltage Phase A to B	205
5.	Voltage Phase A to C	205
6.	Voltage Phase B to C	206
7.	Current Phase A	35.6
8.	Current Phase B	36.9
9.	Current Phase C	50.8
10.	Current on Neutral	13.9
11.	Current on Ground	
12.	Notes	

Distribution Panel – DP-2:

Visual Testing

1.	Make/Model/Age of Equipment	Federal Pioneer/CDP/
2.	Voltage Rating	120/208V
3.	Amperage Rating	250A
4.	Number of Circuits	
5.	Phase (1/3)	3
6.	MLO or MCB	MCB
7.	MCB Rating (If Applicable)	400A
8.	Short Circuit Current Rating (kA)	
9.	Corrosion/Rust/Leaks Present?	NO
10.	Panel Location (Floor #, Room #)	1ST FLOOR, 036
11.	Physical Damage Present?	NO
12.	Evidence of Moisture or Intrusions?	NO
13.	General Condition of Components	GOOD
14.	Bus Bar Condition	GOOD
15.	Verify Panel Labeling	2 BREAKERS NOT LABELED
16.	Verify Panel Directories	LAMACOIDS
17.	Condition of Cable Connections	GOOD
18.	CEC Violations Present?	NO
19.	Insulation Bushing at Entrance	YES
20.	Appropriate Anchoring Present?	YES
21.	Evidence of Arcing?	NONE
22.	Notes	

Panel Testing

1.	Voltage Phase A to Neutral	123
2.	Voltage Phase B to Neutral	124
3.	Voltage Phase C to Neutral	123
4.	Voltage Phase A to B	215
5.	Voltage Phase A to C	214
6.	Voltage Phase B to C	216
7.	Current Phase A	55.6
8.	Current Phase B	34.9
9.	Current Phase C	58.1
10.	Current on Neutral	23.2
11.	Current on Ground	
12.	Notes	

Branch Panel – P-JM:

Visual Testing

1. Make/Model/Age of Equipment	FPE / AGE UNKNOWN
2. Voltage Rating	120/208V
3. Amperage Rating	225A
4. Number of Circuits	42cct
5. Phase (1/3)	3
6. MLO or MCB	MLO
7. MCB Rating (If Applicable)	NA
8. Short Circuit Current Rating (kA)	
9. Corrosion/Rust/Leaks Present?	NO
10. Panel Location (Floor #, Room #)	Mechanical Room
11. Physical Damage Present?	NO
12. Evidence of Moisture or Intrusions?	NO
13. General Condition of Components	GOOD
14. Bus Bar Condition	GOOD
15. Verify Panel Labeling	PRESENT
16. Verify Panel Directories	PRESENT
17. Condition of Cable Connections	GOOD
18. CEC Violations Present?	CONDUITS NOT SUPPORTED UNDER PANEL KNOCKOUTS MISSING
19. Insulation Bushing at Entrance	YES
20. Appropriate Anchoring Present?	YES
21. Evidence of Arcing?	NONE
22. Notes	NO PHASE MARKINGS ON WIRES

Panel Testing

1. Voltage Phase A to Neutral	118
2. Voltage Phase B to Neutral	119
3. Voltage Phase C to Neutral	118
4. Voltage Phase A to B	206
5. Voltage Phase A to C	205
6. Voltage Phase B to C	206
7. Current Phase A	2.2
8. Current Phase B	3.6
9. Current Phase C	3
10. Current on Neutral	1.1
11. Current on Ground	
12. Notes	

Branch Panel – P-BA:

Visual Testing

1. Make/Model/Age of Equipment	General Electric/ANLB2/
2. Voltage Rating	120/240V
3. Amperage Rating	225A
4. Number of Circuits	42cct
5. Phase (1/3)	3 1 PHASE
6. MLO or MCB	MLO
7. MCB Rating (If Applicable)	NA
8. Short Circuit Current Rating (kA)	10KA
9. Corrosion/Rust/Leaks Present?	NO
10. Panel Location (Floor #, Room #)	SERVERY
11. Physical Damage Present?	NO
12. Evidence of Moisture or Intrusions?	NO
13. General Condition of Components	GOOD
14. Bus Bar Condition	1 Bad termination L2 has modified lugs
15. Verify Panel Labeling	PRESENT
16. Verify Panel Directories	PRESENT
17. Condition of Cable Connections	L2 HAS DIFFERENT LUG CONNECTION
18. CEC Violations Present?	ACCESSIBILITY -all screws bad, missing knockouts in panel
19. Insulation Bushing at Entrance	YES
20. Appropriate Anchoring Present?	YES
21. Evidence of Arcing?	NONE
22. Notes	RANDOM cut off wires at bottom of panel, no screws in bottom of cover

Panel Testing

1. Voltage Phase A to Neutral	117
2. Voltage Phase B to Neutral	117
3. Voltage Phase C to Neutral	
4. Voltage Phase A to B	205
5. Voltage Phase A to C	
6. Voltage Phase B to C	
7. Current Phase A	26.9
8. Current Phase B	13.4
9. Current Phase C	
10. Current on Neutral	12
11. Current on Ground	
12. Notes	

Branch Panel – P-BB:

Visual Testing

1. Make/Model/Age of Equipment	General Electric/ANLB/
2. Voltage Rating	120/208V
3. Amperage Rating	100A
4. Number of Circuits	12cct
5. Phase (1/3)	3
6. MLO or MCB	MLO
7. MCB Rating (If Applicable)	
8. Short Circuit Current Rating (kA)	
9. Corrosion/Rust/Leaks Present?	NO
10. Panel Location (Floor #, Room #)	KITCHEN
11. Physical Damage Present?	NO
12. Evidence of Moisture or Intrusions?	NONE
13. General Condition of Components	GOOD
14. Bus Bar Condition	GOOD
15. Verify Panel Labeling	PANEL NUMBERS WORN OFF
16. Verify Panel Directories	YES
17. Condition of Cable Connections	GOOD
18. CEC Violations Present?	Missing screws from cover, feed wire is MI neutral insulation cracking
19. Insulation Bushing at Entrance	YES
20. Appropriate Anchoring Present?	NO
21. Evidence of Arcing?	NONE
22. Notes	Needs cleaning, MI cable feeding, black wire used as Neutral

Panel Testing

1. Voltage Phase A to Neutral	117
2. Voltage Phase B to Neutral	117
3. Voltage Phase C to Neutral	117
4. Voltage Phase A to B	202
5. Voltage Phase A to C	203
6. Voltage Phase B to C	203
7. Current Phase A	0
8. Current Phase B	.7
9. Current Phase C	.1
10. Current on Neutral	.5
11. Current on Ground	
12. Notes	

Branch Panel – P-BC:

Visual Testing

1.	Make/Model/Age of Equipment	Federal Pioneer/CDP/
2.	Voltage Rating	120/208V
3.	Amperage Rating	300A
4.	Number of Circuits	42CCT
5.	Phase (1/3)	3
6.	MLO or MCB	MCB
7.	MCB Rating (If Applicable)	300A
8.	Short Circuit Current Rating (kA)	10 KA
9.	Corrosion/Rust/Leaks Present?	NO
10.	Panel Location (Floor #, Room #)	2ND FLOOR KITCHEN
11.	Physical Damage Present?	NO
12.	Evidence of Moisture or Intrusions?	NO
13.	General Condition of Components	GOOD
14.	Bus Bar Condition	GOOD
15.	Verify Panel Labeling	P-TOUCH LABELS
16.	Verify Panel Directories	PRESENT
17.	Condition of Cable Connections	GOOD
18.	CEC Violations Present?	2 Wires on 15A single pole breaker not rated for 2 wires
19.	Insulation Bushing at Entrance	YES
20.	Appropriate Anchoring Present?	YES
21.	Evidence of Arcing?	NONE
22.	Notes	Horizon breaker in Federal pioneer panel, cover cut to make fit

Panel Testing

1.	Voltage Phase A to Neutral	117
2.	Voltage Phase B to Neutral	118
3.	Voltage Phase C to Neutral	117
4.	Voltage Phase A to B	204
5.	Voltage Phase A to C	203
6.	Voltage Phase B to C	203
7.	Current Phase A	.29
8.	Current Phase B	.6
9.	Current Phase C	.7
10.	Current on Neutral	.4
11.	Current on Ground	
12.	Notes	

Branch Panel – P-BD:

Visual Testing

1. Make/Model/Age of Equipment	Federal Pioneer/BENBLP42B-4CST/
2. Voltage Rating	120/208V
3. Amperage Rating	225A
4. Number of Circuits	42cct
5. Phase (1/3)	3
6. MLO or MCB	MCB
7. MCB Rating (If Applicable)	225A
8. Short Circuit Current Rating (kA)	10KA
9. Corrosion/Rust/Leaks Present?	NO
10. Panel Location (Floor #, Room #)	2ND FLOOR KITCHEN
11. Physical Damage Present?	NO
12. Evidence of Moisture or Intrusions?	NO
13. General Condition of Components	GOOD
14. Bus Bar Condition	GOOD
15. Verify Panel Labeling	PRESENT
16. Verify Panel Directories	PRESENT
17. Condition of Cable Connections	GOOD
18. CEC Violations Present?	NONE
19. Insulation Bushing at Entrance	YES
20. Appropriate Anchoring Present?	YES
21. Evidence of Arcing?	NONE
22. Notes	

Panel Testing

1. Voltage Phase A to Neutral	117
2. Voltage Phase B to Neutral	118
3. Voltage Phase C to Neutral	117
4. Voltage Phase A to B	205
5. Voltage Phase A to C	204
6. Voltage Phase B to C	205
7. Current Phase A	.1
8. Current Phase B	0
9. Current Phase C	.2
10. Current on Neutral	.1
11. Current on Ground	
12. Notes	

Branch Panel – P-BK: P-BD

Visual Testing

1.	Make/Model/Age of Equipment	Federal Pioneer/NBLP42B-4LCI/
2.	Voltage Rating	120/208V
3.	Amperage Rating	225A
4.	Number of Circuits	42cct
5.	Phase (1/3)	3
6.	MLO or MCB	MLO
7.	MCB Rating (If Applicable)	225A
8.	Short Circuit Current Rating (kA)	22KA
9.	Corrosion/Rust/Leaks Present?	NO
10.	Panel Location (Floor #, Room #)	2ND FLOOR KITCHEN
11.	Physical Damage Present?	NO
12.	Evidence of Moisture or Intrusions?	NO
13.	General Condition of Components	GOOD
14.	Bus Bar Condition	GOOD
15.	Verify Panel Labeling	PRESENT
16.	Verify Panel Directories	PRESENT
17.	Condition of Cable Connections	GOOD
18.	CEC Violations Present?	2" Knockout missing
19.	Insulation Bushing at Entrance	YES
20.	Appropriate Anchoring Present?	YES
21.	Evidence of Arcing?	NONE
22.	Notes	

Panel Testing

1.	Voltage Phase A to Neutral	117
2.	Voltage Phase B to Neutral	118
3.	Voltage Phase C to Neutral	117
4.	Voltage Phase A to B	204
5.	Voltage Phase A to C	204
6.	Voltage Phase B to C	205
7.	Current Phase A	17
8.	Current Phase B	2.4
9.	Current Phase C	3.5
10.	Current on Neutral	13
11.	Current on Ground	
12.	Notes	

DOES NOT EXIST

Branch Panel – P-C:

Visual Testing

1. Make/Model/Age of Equipment _____
2. Voltage Rating _____
3. Amperage Rating _____
4. Number of Circuits _____
5. Phase (1/3) _____
6. MLO or MCB _____
7. MCB Rating (If Applicable) _____
8. Short Circuit Current Rating (kA) _____
9. Corrosion/Rust/Leaks Present? _____
10. Panel Location (Floor #, Room #) _____
11. Physical Damage Present? _____
12. Evidence of Moisture or Intrusions? _____
13. General Condition of Components _____
14. Bus Bar Condition _____
15. Verify Panel Labeling _____
16. Verify Panel Directories _____
17. Condition of Cable Connections _____
18. CEC Violations Present? _____
19. Insulation Bushing at Entrance _____
20. Appropriate Anchoring Present? _____
21. Evidence of Arcing? _____
22. Notes _____
_____

Panel Testing

1. Voltage Phase A to Neutral _____
2. Voltage Phase B to Neutral _____
3. Voltage Phase C to Neutral _____
4. Voltage Phase A to B _____
5. Voltage Phase A to C _____
6. Voltage Phase B to C _____
7. Current Phase A _____
8. Current Phase B _____
9. Current Phase C _____
10. Current on Neutral _____
11. Current on Ground _____
12. Notes _____
_____

Branch Panel – P-AA:

Visual Testing

1.	Make/Model/Age of Equipment	Square D/NC38S/
2.	Voltage Rating	240V
3.	Amperage Rating	100A
4.	Number of Circuits	42cct
5.	Phase (1/3)	1 PHASE
6.	MLO or MCB	
7.	MCB Rating (If Applicable)	
8.	Short Circuit Current Rating (kA)	10KA
9.	Corrosion/Rust/Leaks Present?	NO
10.	Panel Location (Floor #, Room #)	GROUND FLOOR 009
11.	Physical Damage Present?	NO
12.	Evidence of Moisture or Intrusions?	NO
13.	General Condition of Components	GOOD
14.	Bus Bar Condition	GOOD
15.	Verify Panel Labeling	PRESENT
16.	Verify Panel Directories	PRESENT
17.	Condition of Cable Connections	GOOD
18.	CEC Violations Present?	1 M working space, behind ice machine that is plumbed in place
19.	Insulation Bushing at Entrance	YES
20.	Appropriate Anchoring Present?	YES
21.	Evidence of Arcing?	NONE
22.	Notes	panel cover missing licking cylinder missing manufacturer label for voltage and amperage of the panel

Panel Testing

1.	Voltage Phase A to Neutral	122
2.	Voltage Phase B to Neutral	122
3.	Voltage Phase C to Neutral	
4.	Voltage Phase A to B	212
5.	Voltage Phase A to C	
6.	Voltage Phase B to C	
7.	Current Phase A	.9
8.	Current Phase B	6.1
9.	Current Phase C	
10.	Current on Neutral	4
11.	Current on Ground	0
12.	Notes	

Branch Panel – P-AB:

Visual Testing

1.	Make/Model/Age of Equipment	I.T.E/NLAB320A/
2.	Voltage Rating	120/240V
3.	Amperage Rating	60A
4.	Number of Circuits	20cct
5.	Phase (1/3)	1
6.	MLO or MCB	MCB
7.	MCB Rating (If Applicable)	60A
8.	Short Circuit Current Rating (kA)	10KA
9.	Corrosion/Rust/Leaks Present?	Minimal corrosion at the top of the panel
10.	Panel Location (Floor #, Room #)	1st floor 015
11.	Physical Damage Present?	NO
12.	Evidence of Moisture or Intrusions?	MINIMAL CORROSION AT TOP OF PANEL
13.	General Condition of Components	GOOD
14.	Bus Bar Condition	GOOD
15.	Verify Panel Labeling	PRESENT
16.	Verify Panel Directories	PRESENT
17.	Condition of Cable Connections	GOOD
18.	CEC Violations Present?	2 Wires on breaker not rated for 2 wires
19.	Insulation Bushing at Entrance	YES
20.	Appropriate Anchoring Present?	YES
21.	Evidence of Arcing?	NONE
22.	Notes	

Panel Testing

1.	Voltage Phase A to Neutral	123
2.	Voltage Phase B to Neutral	124
3.	Voltage Phase C to Neutral	
4.	Voltage Phase A to B	215
5.	Voltage Phase A to C	
6.	Voltage Phase B to C	
7.	Current Phase A	4.7
8.	Current Phase B	.7
9.	Current Phase C	
10.	Current on Neutral	4
11.	Current on Ground	
12.	Notes	

Branch Panel – P-AC:

Visual Testing

1.	Make/Model/Age of Equipment	Amalgamated/142151/
2.	Voltage Rating	120/240V
3.	Amperage Rating	70A
4.	Number of Circuits	12cct
5.	Phase (1/3)	1
6.	MLO or MCB	MLO
7.	MCB Rating (If Applicable)	
8.	Short Circuit Current Rating (kA)	
9.	Corrosion/Rust/Leaks Present?	NO
10.	Panel Location (Floor #, Room #)	1ST FLOOR 015
11.	Physical Damage Present?	NO
12.	Evidence of Moisture or Intrusions?	NO
13.	General Condition of Components	GOOD
14.	Bus Bar Condition	GOOD
15.	Verify Panel Labeling	PRESENT
16.	Verify Panel Directories	PRESENT
17.	Condition of Cable Connections	GOOD
18.	CEC Violations Present?	MI cable cut on inside and outside of the panel rather then being removed
19.	Insulation Bushing at Entrance	YES - was fed with MI cable,
20.	Appropriate Anchoring Present?	YES
21.	Evidence of Arcing?	NONE
22.	Notes	

Panel Testing

1.	Voltage Phase A to Neutral	124
2.	Voltage Phase B to Neutral	124
3.	Voltage Phase C to Neutral	
4.	Voltage Phase A to B	215
5.	Voltage Phase A to C	
6.	Voltage Phase B to C	
7.	Current Phase A	0
8.	Current Phase B	0
9.	Current Phase C	
10.	Current on Neutral	0
11.	Current on Ground	
12.	Notes	

Branch Panel – P-AD:

Visual Testing

1.	Make/Model/Age of Equipment	General Electric/ANLB/
2.	Voltage Rating	120/240V
3.	Amperage Rating	100A
4.	Number of Circuits	30cct
5.	Phase (1/3)	1
6.	MLO or MCB	MLO
7.	MCB Rating (If Applicable)	
8.	Short Circuit Current Rating (kA)	
9.	Corrosion/Rust/Leaks Present?	NO
10.	Panel Location (Floor #, Room #)	1ST FLOOR OUTSIDE 023
11.	Physical Damage Present?	NO
12.	Evidence of Moisture or Intrusions?	NO
13.	General Condition of Components	GOOD
14.	Bus Bar Condition	GOOD
15.	Verify Panel Labeling	PRESENT
16.	Verify Panel Directories	PRESENT
17.	Condition of Cable Connections	GOOD
18.	CEC Violations Present?	Oversized neutral wire in neutral bar rather than neutral lug
19.	Insulation Bushing at Entrance	YES
20.	Appropriate Anchoring Present?	YES
21.	Evidence of Arcing?	NONE
22.	Notes	

Panel Testing

1.	Voltage Phase A to Neutral	124
2.	Voltage Phase B to Neutral	123
3.	Voltage Phase C to Neutral	
4.	Voltage Phase A to B	215
5.	Voltage Phase A to C	
6.	Voltage Phase B to C	
7.	Current Phase A	5
8.	Current Phase B	6.2
9.	Current Phase C	
10.	Current on Neutral	1.2
11.	Current on Ground	
12.	Notes	

Branch Panel – P-AE:

Visual Testing

1.	Make/Model/Age of Equipment	Federal Electric/BENBLP42B-4CST/
2.	Voltage Rating	120/208V
3.	Amperage Rating	100A
4.	Number of Circuits	42cct
5.	Phase (1/3)	3
6.	MLO or MCB	MCB
7.	MCB Rating (If Applicable)	100A
8.	Short Circuit Current Rating (kA)	
9.	Corrosion/Rust/Leaks Present?	main breaker set screws seem corroded
10.	Panel Location (Floor #, Room #)	1ST FLOOR 037
11.	Physical Damage Present?	NO
12.	Evidence of Moisture or Intrusions?	NO
13.	General Condition of Components	GOOD
14.	Bus Bar Condition	GOOD
15.	Verify Panel Labeling	PRESENT
16.	Verify Panel Directories	PRESENT
17.	Condition of Cable Connections	GOOD
18.	CEC Violations Present?	-Set screws corroded on main breaker
19.	Insulation Bushing at Entrance	YES
20.	Appropriate Anchoring Present?	YES
21.	Evidence of Arcing?	NONE
22.	Notes	

Panel Testing

1.	Voltage Phase A to Neutral	124
2.	Voltage Phase B to Neutral	123
3.	Voltage Phase C to Neutral	123
4.	Voltage Phase A to B	216
5.	Voltage Phase A to C	214
6.	Voltage Phase B to C	215
7.	Current Phase A	12.1
8.	Current Phase B	7.3
9.	Current Phase C	11
10.	Current on Neutral	5.1
11.	Current on Ground	
12.	Notes	

Branch Panel – P-AF1:

Visual Testing

1.	Make/Model/Age of Equipment	Federal Pioneer/BENBLP42B-4AB/
2.	Voltage Rating	120/240V
3.	Amperage Rating	225A
4.	Number of Circuits	42cct
5.	Phase (1/3)	3
6.	MLO or MCB	MCB
7.	MCB Rating (If Applicable)	225A
8.	Short Circuit Current Rating (kA)	
9.	Corrosion/Rust/Leaks Present?	NO
10.	Panel Location (Floor #, Room #)	1ST FLOOR 036
11.	Physical Damage Present?	NO
12.	Evidence of Moisture or Intrusions?	NO
13.	General Condition of Components	GOOD
14.	Bus Bar Condition	GOOD
15.	Verify Panel Labeling	PRESENT
16.	Verify Panel Directories	PRESENT
17.	Condition of Cable Connections	GOOD
18.	CEC Violations Present?	NONE
19.	Insulation Bushing at Entrance	YES
20.	Appropriate Anchoring Present?	YES
21.	Evidence of Arcing?	NONE
22.	Notes	

Panel Testing

1.	Voltage Phase A to Neutral	124
2.	Voltage Phase B to Neutral	124
3.	Voltage Phase C to Neutral	123
4.	Voltage Phase A to B	216
5.	Voltage Phase A to C	215
6.	Voltage Phase B to C	215
7.	Current Phase A	9.4
8.	Current Phase B	7.8
9.	Current Phase C	12.3
10.	Current on Neutral	4.2
11.	Current on Ground	
12.	Notes	

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Branch Panel – P-AF2:

Visual Testing

1.	Make/Model/Age of Equipment	Federal Pioneer/NBLP30B-4LCI/
2.	Voltage Rating	120/240V
3.	Amperage Rating	225A
4.	Number of Circuits	30cct
5.	Phase (1/3)	3
6.	MLO or MCB	MLO
7.	MCB Rating (If Applicable)	
8.	Short Circuit Current Rating (kA)	
9.	Corrosion/Rust/Leaks Present?	NO
10.	Panel Location (Floor #, Room #)	1ST FLOOR 036
11.	Physical Damage Present?	NO
12.	Evidence of Moisture or Intrusions?	NO
13.	General Condition of Components	GOOD
14.	Bus Bar Condition	GOOD
15.	Verify Panel Labeling	PRESENT
16.	Verify Panel Directories	PRESENT
17.	Condition of Cable Connections	GOOD
18.	CEC Violations Present?	NONE
19.	Insulation Bushing at Entrance	YES
20.	Appropriate Anchoring Present?	YES
21.	Evidence of Arcing?	NONE
22.	Notes	

Panel Testing

1.	Voltage Phase A to Neutral	124
2.	Voltage Phase B to Neutral	124
3.	Voltage Phase C to Neutral	123
4.	Voltage Phase A to B	216
5.	Voltage Phase A to C	214
6.	Voltage Phase B to C	215
7.	Current Phase A	1.7
8.	Current Phase B	2
9.	Current Phase C	0
10.	Current on Neutral	2
11.	Current on Ground	
12.	Notes	

Branch Panel – P-AG:

Visual Testing

1. Make/Model/Age of Equipment	WESTING HOUSE CUTLER HAMMER
2. Voltage Rating	120/208V
3. Amperage Rating	225A
4. Number of Circuits	42cct
5. Phase (1/3)	3
6. MLO or MCB	
7. MCB Rating (If Applicable)	
8. Short Circuit Current Rating (kA)	10KA
9. Corrosion/Rust/Leaks Present?	Rust at bottom of panel, ground wires oxidizing
10. Panel Location (Floor #, Room #)	1st floor sump pump room
11. Physical Damage Present?	NO
12. Evidence of Moisture or Intrusions?	YES
13. General Condition of Components	GOOD
14. Bus Bar Condition	GOOD
15. Verify Panel Labeling	PRESENT
16. Verify Panel Directories	PRESENT
17. Condition of Cable Connections	GOOD
18. CEC Violations Present?	NO - no phase identification on wires
19. Insulation Bushing at Entrance	YES
20. Appropriate Anchoring Present?	YES
21. Evidence of Arcing?	NONE
22. Notes	

Panel Testing

1. Voltage Phase A to Neutral	122
2. Voltage Phase B to Neutral	121
3. Voltage Phase C to Neutral	122
4. Voltage Phase A to B	212
5. Voltage Phase A to C	212
6. Voltage Phase B to C	212
7. Current Phase A	9.1
8. Current Phase B	8.5
9. Current Phase C	10.4
10. Current on Neutral	1.8
11. Current on Ground	
12. Notes	

Branch Panel – P-AH:

Visual Testing

1.	Make/Model/Age of Equipment	CUTLER HAMMER/ AGE UNKNOWN
2.	Voltage Rating	120/208V
3.	Amperage Rating	225A
4.	Number of Circuits	42cct
5.	Phase (1/3)	3
6.	MLO or MCB	MLO
7.	MCB Rating (If Applicable)	
8.	Short Circuit Current Rating (kA)	10KA
9.	Corrosion/Rust/Leaks Present?	NO
10.	Panel Location (Floor #, Room #)	3RD FLOOR OUTSIDE COMMANDANTS SUITE
11.	Physical Damage Present?	NO
12.	Evidence of Moisture or Intrusions?	NO
13.	General Condition of Components	GOOD
14.	Bus Bar Condition	GOOD
15.	Verify Panel Labeling	PRESENT
16.	Verify Panel Directories	PRESENT
17.	Condition of Cable Connections	GOOD
18.	CEC Violations Present?	NONE
19.	Insulation Bushing at Entrance	YES
20.	Appropriate Anchoring Present?	YES
21.	Evidence of Arcing?	NO
22.	Notes	

Panel Testing

1.	Voltage Phase A to Neutral	122
2.	Voltage Phase B to Neutral	122
3.	Voltage Phase C to Neutral	122
4.	Voltage Phase A to B	212
5.	Voltage Phase A to C	213
6.	Voltage Phase B to C	212
7.	Current Phase A	2.4
8.	Current Phase B	3.9
9.	Current Phase C	3.5
10.	Current on Neutral	1.2
11.	Current on Ground	
12.	Notes	

Branch Panel – P-FF333:

Visual Testing

1.	Make/Model/Age of Equipment	Square D/NQOD442L225CU/
2.	Voltage Rating	120/208V
3.	Amperage Rating	225A
4.	Number of Circuits	42cct
5.	Phase (1/3)	3
6.	MLO or MCB	MLO
7.	MCB Rating (If Applicable)	
8.	Short Circuit Current Rating (kA)	
9.	Corrosion/Rust/Leaks Present?	NO
10.	Panel Location (Floor #, Room #)	1ST FLOOR KITCHEN
11.	Physical Damage Present?	NO
12.	Evidence of Moisture or Intrusions?	NO
13.	General Condition of Components	GOOD
14.	Bus Bar Condition	GOOD
15.	Verify Panel Labeling	PRESENT
16.	Verify Panel Directories	PRESENT
17.	Condition of Cable Connections	GOOD
18.	CEC Violations Present?	Open Knockouts in top and sides, blue conductor used as neutral
19.	Insulation Bushing at Entrance	YES
20.	Appropriate Anchoring Present?	YES
21.	Evidence of Arcing?	NONE
22.	Notes	

Panel Testing

1.	Voltage Phase A to Neutral	122
2.	Voltage Phase B to Neutral	122
3.	Voltage Phase C to Neutral	121
4.	Voltage Phase A to B	213
5.	Voltage Phase A to C	212
6.	Voltage Phase B to C	212
7.	Current Phase A	5.3
8.	Current Phase B	14.5
9.	Current Phase C	27.5
10.	Current on Neutral	22.1
11.	Current on Ground	
12.	Notes	

Branch Panel – QO:

Visual Testing

1. Make/Model/Age of Equipment	Square D/QO6L100/
2. Voltage Rating	120/240V
3. Amperage Rating	100A
4. Number of Circuits	8cct
5. Phase (1/3)	1
6. MLO or MCB	MLO
7. MCB Rating (If Applicable)	NONE
8. Short Circuit Current Rating (kA)	
9. Corrosion/Rust/Leaks Present?	NO
10. Panel Location (Floor #, Room #)	1ST FLOOR 023A
11. Physical Damage Present?	NO
12. Evidence of Moisture or Intrusions?	NO
13. General Condition of Components	GOOD
14. Bus Bar Condition	GOOD
15. Verify Panel Labeling	NO LABELING
16. Verify Panel Directories	NO LABELING
17. Condition of Cable Connections	GOOD
18. CEC Violations Present?	no set screw in connectors, knockouts missing
19. Insulation Bushing at Entrance	YES
20. Appropriate Anchoring Present?	YES
21. Evidence of Arcing?	NONE
22. Notes	Poly conduits not strapped leaving panel

Panel Testing

1. Voltage Phase A to Neutral	124
2. Voltage Phase B to Neutral	124
3. Voltage Phase C to Neutral	
4. Voltage Phase A to B	216
5. Voltage Phase A to C	
6. Voltage Phase B to C	
7. Current Phase A	1.8
8. Current Phase B	.6
9. Current Phase C	
10. Current on Neutral	1
11. Current on Ground	
12. Notes	

Transformer – TRN-3:

Visual Testing

1. Make/Model/Age of Equipment	CES MARKHAM	
2. Voltage Rating	4160/2400V	347/600V
3. Amperage Rating		
4. Number of Circuits	NA	
5. Phase (1/3)	3	
6. MLO or MCB		
7. MCB Rating (If Applicable)		
8. Short Circuit Current Rating (kA)		
9. Corrosion/Rust/Leaks Present?	RUST	
10. Panel Location (Floor #, Room #)		
11. Physical Damage Present?	NO	
12. Evidence of Moisture or Intrusions?	MINOR MOISTURE	
13. General Condition of Components	GOOD	
14. Bus Bar Condition	GOOD	
15. Verify Panel Labeling	NA	
16. Verify Panel Directories	NA	
17. Condition of Cable Connections	GOOD	
18. CEC Violations Present?	NO	
19. Insulation Bushing at Entrance	NO	
20. Appropriate Anchoring Present?	YES	
21. Evidence of Arcing?	NONE	
22. Notes	Most rust is surface and on the outside of the enclosure	

Transformer Testing (Primary)

1. Voltage Phase A to B	NO VOLTAGE DUE TO HIGH VOLTAGE TERMINATIONS
2. Voltage Phase A to C	
3. Voltage Phase B to C	
4. Current Phase A	
5. Current Phase B	
6. Current Phase C	
7. Current on Ground	
8. Notes	

Transformer Testing (Secondary)

1. Voltage Phase A to Neutral 346
2. Voltage Phase B to Neutral 350
3. Voltage Phase C to Neutral 343
4. Voltage Phase A to B 598
5. Voltage Phase A to C 594
6. Voltage Phase B to C 595
7. Current Phase A 67.2
8. Current Phase B 66.1
9. Current Phase C 49.2
10. Current on Neutral
11. Current on Ground .1
12. Notes

Sault Ste. Marie
705.949.5291
421 Bay St. Suite 507
Sault Ste. Marie, ON, P6A 1X3

info@integrateddesign.ca
www.integrateddesign.ca

Ottawa
613.728.0008
595 Byron Ave.
Ottawa, ON, K2A 4C4

Distribution Panel – DP-PRN-3:

Visual Testing

1.	Make/Model/Age of Equipment	unknown
2.	Voltage Rating	requires field evaluation
3.	Amperage Rating	
4.	Number of Circuits	room for 4 circuit breakers
5.	Phase (1/3)	3
6.	MLO or MCB	MLO
7.	MCB Rating (If Applicable)	
8.	Short Circuit Current Rating (kA)	
9.	Corrosion/Rust/Leaks Present?	YES
10.	Panel Location (Floor #, Room #)	OUTDOORS BY FF03
11.	Physical Damage Present?	NO
12.	Evidence of Moisture or Intrusions?	YES
13.	General Condition of Components	ACCEPTABLE
14.	Bus Bar Condition	GROUND BAR CORRODED
15.	Verify Panel Labeling	NONE
16.	Verify Panel Directories	3 OUT OF 4
17.	Condition of Cable Connections	GROUNDS NEED ATTENTION
18.	CEC Violations Present?	NEEDS NEW DOOR GASKET
19.	Insulation Bushing at Entrance	NO
20.	Appropriate Anchoring Present?	YES
21.	Evidence of Arcing?	NONE
22.	Notes	

WIRE 250MCM CU

CB1
LIFT
3 PHASE
30A CB
SEIMENS
HFD 600V
25KA
LINE #6 CU
LOAD #8 CU

CB2
UNLABELED
3 PHASE
POWER CB
30A
HD06
14KA
LINE #8 CU
LOAD #8 CU

CB3
FEEDS BUILDING 8
ALAN BRADLEY
AS
200A
20KA/15KA
LINE 250 MCM CU
LOAD 3/0 CU TECK

CB4
BUILDING 3
ALAN BRADLY
18KA/15KA
400A
LINE 350MCM CU
LOAD SINGLE
CONDUCTOR 300MCM CU
TECK

Panel Testing

1.	Voltage Phase A to Neutral	345.8
2.	Voltage Phase B to Neutral	349.9
3.	Voltage Phase C to Neutral	343
4.	Voltage Phase A to B	597
5.	Voltage Phase A to C	594
6.	Voltage Phase B to C	595
7.	Current Phase A	67.2
8.	Current Phase B	66.1
9.	Current Phase C	49.2
10.	Current on Neutral	
11.	Current on Ground	
12.	Notes	Breaker 2 is too big for enclosure inner door does not close well

Main High Voltage Switch Gear at TRN1 Location:

Visual Testing

1. Make/Model/Age of Equipment	S&C ELECTRIC CANADA LTD.
2. Voltage Rating	4.76 KV
3. Amperage Rating	600
4. Number of Circuits	
5. Phase (1/3)	3
6. MLO or MCB	FUSED
7. MCB Rating (If Applicable)	FUSED AT 200A FUSES ARE SMU-40 S&C ELECTRIC FUSES
8. Short Circuit Current Rating (kA)	25KA STANDARD SPEED FUSES
9. Corrosion/Rust/Leaks Present?	RUST ON INTERIOR OF DOOR MAIN SWITCH, SW1 AND SW2
10. Panel Location (Floor #, Room #)	OUTSIDE BEHIND FF05
11. Physical Damage Present?	NO
12. Evidence of Moisture or Intrusions?	MINOR RUST AT REAR VENT
13. General Condition of Components	GOOD
14. Bus Bar Condition	GOOD
15. Verify Panel Labeling	GOOD
16. Verify Panel Directories	YES
17. Condition of Cable Connections	GOOD
18. CEC Violations Present?	NO
19. Insulation Bushing at Entrance	NO
20. Appropriate Anchoring Present?	YES
21. Evidence of Arcing?	NO
22. Notes	

SW1
FUSED AT 150 E
SW2
FUSED AT 150 E

FUSES ARE THE SAME
S&C ELECTRIC CANADA
KV NOMINAL 4.8
KV NOMINAL 5.5
AMPS INT 25,000
STANDARD SPEED
TCC 153-2

Primary Conductor Testing

1. Voltage Phase A to Neutral	NO VOLTAGE DUE TO KINGSTON UTILITIES SHUTDOWN
2. Voltage Phase B to Neutral	
3. Voltage Phase C to Neutral	
4. Voltage Phase A to B	
5. Voltage Phase A to C	
6. Voltage Phase B to C	
7. Current Phase A	
8. Current Phase B	
9. Current Phase C	
10. Current on Neutral	
11. Current on Ground	
12. Notes	

Appendix F – Kingston Utilities Information

Short Circuit Study Report

Service Address: 317 St, Kingston, Ontario

Study Location: Primary side of the transformer for 317 Ontario St.

Date: September 12, 2024

Max. Short-circuit Info.

LLL,Amp	LLG,Amp	LL,Amp	LG,Amp
13242	11920	11499	7720
R1, ohm	X1,ohm	R0,ohm	X0,ohm
0.0336	0.1875	0.0773	0.5954

Min. Short-circuit Info.

LLL,Amp	LLG,Amp	LL,Amp	LG,Amp
2256	2242	1954	1786
R1, ohm	X1,ohm	R0,ohm	X0,ohm
0.5000	0.9517	0.3532	1.9399

This report was prepared by Utilities Kingston on behalf of Kingston Hydro for IDEA. The material in it reflects Utilities Kingston's best judgement in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on decisions to be mad based on it, are the responsibility of such third parties, Utilities Kingston accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Appendix G – Arc Flash Labels

Arc Flash and Shock Hazard Present

ARC FLASH PROTECTION			SHOCK PROTECTION		
Working Distance	**36**	**in**	Shock Hazard when covers removed	**4160**	**VAC**
Incident Energy in cal/cm²	**0.3**				
Arc Flash Boundary	**1.4**	**ft**	Limited approach	**5.0**	**ft**
			Restricted approach	**2.2**	**ft**
Refer to CSA Z462 for PPE requirements			Gloves class	**1**	

Equipment: **BUS_HV-SG** 03-09-2025 Std. IEEE 1584

Arc Flash Analysis by: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Arc Flash and Shock Hazard Present

ARC FLASH PROTECTION			SHOCK PROTECTION		
Working Distance	**36**	**in**	Shock Hazard when covers removed	**4160**	**VAC**
Incident Energy in cal/cm²	**0.4**				
Arc Flash Boundary	**1.4**	**ft**	Limited approach	**5.0**	**ft**
			Restricted approach	**2.2**	**ft**
Refer to CSA Z462 for PPE requirements			Gloves class	**1**	

Equipment: **BUS_TRN-3** 03-09-2025 Std. IEEE 1584

Arc Flash Analysis by: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Arc Flash and Shock Hazard Present

ARC FLASH PROTECTION			SHOCK PROTECTION		
Working Distance	**36**	**in**	Shock Hazard when covers removed	**4160**	**VAC**
Incident Energy in cal/cm²	**0.4**				
Arc Flash Boundary	**1.5**	**ft**	Limited approach	**5.0**	**ft**
			Restricted approach	**2.2**	**ft**
Refer to CSA Z462 for PPE requirements			Gloves class	**1**	

Equipment: **BUS_TRN-4** 03-09-2025 Std. IEEE 1584

Arc Flash Analysis by: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Arc Flash and Shock Hazard Present

ARC FLASH PROTECTION			SHOCK PROTECTION		
Working Distance	**36**	**in**	Shock Hazard when covers removed	**4160**	**VAC**
Incident Energy in cal/cm²	**0.4**				
Arc Flash Boundary	**1.4**	**ft**	Limited approach	**5.0**	**ft**
			Restricted approach	**2.2**	**ft**
Refer to CSA Z462 for PPE requirements			Gloves class	**1**	

Equipment: **BUS_TRN-4a** 03-09-2025 Std. IEEE 1584

Arc Flash Analysis by: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Arc Flash and Shock Hazard Present

ARC FLASH PROTECTION			SHOCK PROTECTION		
Working Distance	**18**	**in**	Shock Hazard when covers removed	**208**	**VAC**
Incident Energy in cal/cm²	**9.3**				
Arc Flash Boundary	**5.4**	**ft**	Limited approach	**3.5**	**ft**
			Restricted approach	**1.0**	**ft**
Refer to CSA Z462 for PPE requirements			Gloves class	**00**	

Equipment: **DP-1** 03-09-2025 Std. IEEE 1584

Arc Flash Analysis by: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Arc Flash and Shock Hazard Present

ARC FLASH PROTECTION			SHOCK PROTECTION		
Working Distance	**18**	**in**	Shock Hazard when covers removed	**208**	**VAC**
Incident Energy in cal/cm²	**0.3**				
Arc Flash Boundary	**0.6**	**ft**	Limited approach	**3.5**	**ft**
			Restricted approach	**1.0**	**ft**
Refer to CSA Z462 for PPE requirements			Gloves class	**00**	

Equipment: **DP-2** 03-09-2025 Std. IEEE 1584

Arc Flash Analysis by: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Arc Flash and Shock Hazard Present

ARC FLASH PROTECTION			SHOCK PROTECTION		
Working Distance	**18**	**in**	Shock Hazard when covers removed	**600**	**VAC**
Incident Energy in cal/cm²	**0.1**				
Arc Flash Boundary	**0.4**	**ft**	Limited approach	**3.5**	**ft**
			Restricted approach	**1.0**	**ft**
Refer to CSA Z462 for PPE requirements			Gloves class	**0**	

Equipment: **DP-MAIN** 03-09-2025 Std. IEEE 1584

Arc Flash Analysis by: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Arc Flash and Shock Hazard Present

ARC FLASH PROTECTION			SHOCK PROTECTION		
Working Distance	**18**	**in**	Shock Hazard when covers removed	**600**	**VAC**
Incident Energy in cal/cm²	**16.2**				
Arc Flash Boundary	**7.6**	**ft**	Limited approach	**3.5**	**ft**
			Restricted approach	**1.0**	**ft**
Refer to CSA Z462 for PPE requirements			Gloves class	**0**	

Equipment: **DP-PRN-3** 03-09-2025 Std. IEEE 1584

Arc Flash Analysis by: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Arc Flash and Shock Hazard Present

ARC FLASH PROTECTION			SHOCK PROTECTION		
Working Distance	**18**	**in**	Shock Hazard when covers removed	**208**	**VAC**
Incident Energy in cal/cm²	**1.5**		Limited approach	**3.5**	**ft**
Arc Flash Boundary	**1.7**	**ft**	Restricted approach	**1.0**	**ft**
Refer to CSA Z462 for PPE requirements			Gloves class	**00**	

Equipment: **FF333** 03-09-2025 Std. IEEE 1584

Arc Flash Analysis by: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Arc Flash and Shock Hazard Present

ARC FLASH PROTECTION			SHOCK PROTECTION		
Working Distance	**18**	**in**	Shock Hazard when covers removed	**208**	**VAC**
Incident Energy in cal/cm²	**4.1**		Limited approach	**3.5**	**ft**
Arc Flash Boundary	**3.2**	**ft**	Restricted approach	**1.0**	**ft**
Refer to CSA Z462 for PPE requirements			Gloves class	**00**	

Equipment: **P-AE** 03-09-2025 Std. IEEE 1584

Arc Flash Analysis by: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Arc Flash and Shock Hazard Present

ARC FLASH PROTECTION			SHOCK PROTECTION		
Working Distance	**18**	**in**	Shock Hazard when covers removed	**208**	**VAC**
Incident Energy in cal/cm²	**0.4**				
Arc Flash Boundary	**0.7**	**ft**	Limited approach	**3.5**	**ft**
			Restricted approach	**1.0**	**ft**
Refer to CSA Z462 for PPE requirements			Gloves class	**00**	

Equipment: **P-AF1** 03-09-2025 Std. IEEE 1584

Arc Flash Analysis by: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Arc Flash and Shock Hazard Present

ARC FLASH PROTECTION			SHOCK PROTECTION		
Working Distance	**18**	**in**	Shock Hazard when covers removed	**208**	**VAC**
Incident Energy in cal/cm²	**0.4**				
Arc Flash Boundary	**0.8**	**ft**	Limited approach	**3.5**	**ft**
			Restricted approach	**1.0**	**ft**
Refer to CSA Z462 for PPE requirements			Gloves class	**00**	

Equipment: **P-AF2** 03-09-2025 Std. IEEE 1584

Arc Flash Analysis by: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Arc Flash and Shock Hazard Present

ARC FLASH PROTECTION			SHOCK PROTECTION		
Working Distance	**18**	**in**	Shock Hazard when covers removed	**208**	**VAC**
Incident Energy in cal/cm²	**3.1**				
Arc Flash Boundary	**2.7**	**ft**	Limited approach	**3.5**	**ft**
			Restricted approach	**1.0**	**ft**
Refer to CSA Z462 for PPE requirements			Gloves class	**00**	

Equipment: **P-AG** 03-09-2025 Std. IEEE 1584

Arc Flash Analysis by: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Arc Flash and Shock Hazard Present

ARC FLASH PROTECTION			SHOCK PROTECTION		
Working Distance	**18**	**in**	Shock Hazard when covers removed	**208**	**VAC**
Incident Energy in cal/cm²	**3.8**				
Arc Flash Boundary	**3.1**	**ft**	Limited approach	**3.5**	**ft**
			Restricted approach	**1.0**	**ft**
Refer to CSA Z462 for PPE requirements			Gloves class	**00**	

Equipment: **P-AH** 03-09-2025 Std. IEEE 1584

Arc Flash Analysis by: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Arc Flash and Shock Hazard Present

ARC FLASH PROTECTION			SHOCK PROTECTION		
Working Distance	**18**	**in**	Shock Hazard when		
Incident Energy in cal/cm²	**2.1**		covers removed	**208**	**VAC**
Arc Flash Boundary	**2.1**	**ft**	Limited approach	**3.5**	**ft**
			Restricted approach	**1.0**	**ft**
Refer to CSA Z462 for PPE requirements			Gloves class	**00**	

Equipment: **P-BB** 03-09-2025 Std. IEEE 1584

Arc Flash Analysis by: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Arc Flash and Shock Hazard Present

ARC FLASH PROTECTION			SHOCK PROTECTION		
Working Distance	**18**	**in**	Shock Hazard when		
Incident Energy in cal/cm²	**7.2**		covers removed	**208**	**VAC**
Arc Flash Boundary	**4.6**	**ft**	Limited approach	**3.5**	**ft**
			Restricted approach	**1.0**	**ft**
Refer to CSA Z462 for PPE requirements			Gloves class	**00**	

Equipment: **P-BC** 03-09-2025 Std. IEEE 1584

Arc Flash Analysis by: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Arc Flash and Shock Hazard Present

ARC FLASH PROTECTION			SHOCK PROTECTION		
Working Distance	**18**	**in**	Shock Hazard when covers removed	**208**	**VAC**
Incident Energy in cal/cm²	**3.1**				
Arc Flash Boundary	**2.7**	**ft**	Limited approach	**3.5**	**ft**
			Restricted approach	**1.0**	**ft**
Refer to CSA Z462 for PPE requirements			Gloves class	**00**	

Equipment: **P-BD** 03-09-2025 Std. IEEE 1584

Arc Flash Analysis by: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Arc Flash and Shock Hazard Present

ARC FLASH PROTECTION			SHOCK PROTECTION		
Working Distance	**18**	**in**	Shock Hazard when covers removed	**208**	**VAC**
Incident Energy in cal/cm²	**6.9**				
Arc Flash Boundary	**4.5**	**ft**	Limited approach	**3.5**	**ft**
			Restricted approach	**1.0**	**ft**
Refer to CSA Z462 for PPE requirements			Gloves class	**00**	

Equipment: **P-BK** 03-09-2025 Std. IEEE 1584

Arc Flash Analysis by: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Arc Flash and Shock Hazard Present

ARC FLASH PROTECTION			SHOCK PROTECTION		
Working Distance	**18**	**in**	Shock Hazard when covers removed	**208**	**VAC**
Incident Energy in cal/cm²	**5.9**				
Arc Flash Boundary	**4.1**	**ft**	Limited approach	**3.5**	**ft**
			Restricted approach	**1.0**	**ft**
Refer to CSA Z462 for PPE requirements			Gloves class	**00**	

Equipment: **P-JM** 03-09-2025 Std. IEEE 1584

Arc Flash Analysis by: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Arc Flash and Shock Hazard Present

ARC FLASH PROTECTION			SHOCK PROTECTION		
Working Distance	**18**	**in**	Shock Hazard when covers removed	**600**	**VAC**
Incident Energy in cal/cm²	**0.0**				
Arc Flash Boundary	**0.2**	**ft**	Limited approach	**3.5**	**ft**
			Restricted approach	**1.0**	**ft**
Refer to CSA Z462 for PPE requirements			Gloves class	**0**	

Equipment: **SPLITTER P.H.** 03-09-2025 Std. IEEE 1584

Arc Flash Analysis by: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Arc Flash and Shock Hazard Present

ARC FLASH PROTECTION			SHOCK PROTECTION		
Working Distance	**18**	**in**	Shock Hazard when covers removed	**208**	**VAC**
Incident Energy in cal/cm²	**2.2**				
Arc Flash Boundary	**2.2**	**ft**	Limited approach	**3.5**	**ft**
			Restricted approach	**1.0**	**ft**
Refer to CSA Z462 for PPE requirements			Gloves class	**00**	

Equipment: **P-AA** 03-09-2025 Std. IEEE 1584

Arc Flash Analysis by: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Arc Flash and Shock Hazard Present

ARC FLASH PROTECTION			SHOCK PROTECTION		
Working Distance	**18**	**in**	Shock Hazard when covers removed	**208**	**VAC**
Incident Energy in cal/cm²	**2.8**				
Arc Flash Boundary	**2.5**	**ft**	Limited approach	**3.5**	**ft**
			Restricted approach	**1.0**	**ft**
Refer to CSA Z462 for PPE requirements			Gloves class	**00**	

Equipment: **P-AB** 03-09-2025 Std. IEEE 1584

Arc Flash Analysis by: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Arc Flash and Shock Hazard Present

ARC FLASH PROTECTION			SHOCK PROTECTION		
Working Distance	**18**	**in**	Shock Hazard when covers removed	**208**	**VAC**
Incident Energy in cal/cm²	**2.6**				
Arc Flash Boundary	**2.4**	**ft**	Limited approach	**3.5**	**ft**
			Restricted approach	**1.0**	**ft**
Refer to CSA Z462 for PPE requirements			Gloves class	**00**	

Equipment: **P-AC** 03-09-2025 Std. IEEE 1584

Arc Flash Analysis by: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Arc Flash and Shock Hazard Present

ARC FLASH PROTECTION			SHOCK PROTECTION		
Working Distance	**18**	**in**	Shock Hazard when covers removed	**208**	**VAC**
Incident Energy in cal/cm²	**4.5**				
Arc Flash Boundary	**3.4**	**ft**	Limited approach	**3.5**	**ft**
			Restricted approach	**1.0**	**ft**
Refer to CSA Z462 for PPE requirements			Gloves class	**00**	

Equipment: **P-AD** 03-09-2025 Std. IEEE 1584

Arc Flash Analysis by: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Arc Flash and Shock Hazard Present

ARC FLASH PROTECTION			SHOCK PROTECTION		
Working Distance	**18**	**in**	Shock Hazard when covers removed	**208**	**VAC**
Incident Energy in cal/cm²	**4.0**				
Arc Flash Boundary	**3.2**	**ft**	Limited approach	**3.5**	**ft**
			Restricted approach	**1.0**	**ft**
Refer to CSA Z462 for PPE requirements			Gloves class	**00**	

Equipment: **P-BA** 03-09-2025 Std. IEEE 1584

Arc Flash Analysis by: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Arc Flash and Shock Hazard Present

ARC FLASH PROTECTION			SHOCK PROTECTION		
Working Distance	**18**	**in**	Shock Hazard when covers removed	**208**	**VAC**
Incident Energy in cal/cm²	**0.9**				
Arc Flash Boundary	**1.3**	**ft**	Limited approach	**3.5**	**ft**
			Restricted approach	**1.0**	**ft**
Refer to CSA Z462 for PPE requirements			Gloves class	**00**	

Equipment: **P-QO** 03-09-2025 Std. IEEE 1584

Arc Flash Analysis by: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Risque d’éclats d’arcs et de choc électrique ÉPI approprié requis

PROTECTION D’ÉCLATS D’ARCS			PROTECTION DE CHOC ÉLECTRIQUE		
Distance de travail	**36**	**in**	Choc électrique quand		
Énergie incidente cal/cm²	**0.3**		couvercles enlevés	**4160**	**VAC**
Périmètre d’éclats d’arcs	**1.4**	**ft**	Périmètre d’accès limite	**5.0**	**ft**
			Périmètre d’accès restreint	**2.2**	**ft**
Se référer à Z462 pour ÉPI approprié requis			Classe de gants	**1**	

Équipement: **BUS_HV-SG** 03-09-2025 Std. IEEE 1584

Étude d’éclats d’arcs par: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Risque d’éclats d’arcs et de choc électrique ÉPI approprié requis

PROTECTION D’ÉCLATS D’ARCS			PROTECTION DE CHOC ÉLECTRIQUE		
Distance de travail	**36**	**in**	Choc électrique quand		
Énergie incidente cal/cm²	**0.4**		couvercles enlevés	**4160**	**VAC**
Périmètre d’éclats d’arcs	**1.4**	**ft**	Périmètre d’accès limite	**5.0**	**ft**
			Périmètre d’accès restreint	**2.2**	**ft**
Se référer à Z462 pour ÉPI approprié requis			Classe de gants	**1**	

Équipement: **BUS_TRN-3** 03-09-2025 Std. IEEE 1584

Étude d’éclats d’arcs par: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Risque d’éclats d’arcs et de choc électrique ÉPI approprié requis

PROTECTION D’ÉCLATS D’ARCS			PROTECTION DE CHOC ÉLECTRIQUE		
Distance de travail	**36**	**in**	Choc électrique quand		
Énergie incidente cal/cm²	**0.4**		couvercles enlevés	**4160**	**VAC**
Périmètre d’éclats d’arcs	**1.5**	**ft**	Périmètre d’accès limite	**5.0**	**ft**
			Périmètre d’accès restreint	**2.2**	**ft**
Se référer à Z462 pour ÉPI approprié requis			Classe de gants	**1**	

Équipement: **BUS_TRN-4** 03-09-2025 Std. IEEE 1584

Étude d’éclats d’arcs par: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Risque d’éclats d’arcs et de choc électrique ÉPI approprié requis

PROTECTION D’ÉCLATS D’ARCS			PROTECTION DE CHOC ÉLECTRIQUE		
Distance de travail	**36**	**in**	Choc électrique quand		
Énergie incidente cal/cm²	**0.4**		couvercles enlevés	**4160**	**VAC**
Périmètre d’éclats d’arcs	**1.4**	**ft**	Périmètre d’accès limite	**5.0**	**ft**
			Périmètre d’accès restreint	**2.2**	**ft**
Se référer à Z462 pour ÉPI approprié requis			Classe de gants	**1**	

Équipement: **BUS_TRN-4a** 03-09-2025 Std. IEEE 1584

Étude d’éclats d’arcs par: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Risque d’éclats d’arcs et de choc électrique ÉPI approprié requis

PROTECTION D’ÉCLATS D’ARCS			PROTECTION DE CHOC ÉLECTRIQUE		
Distance de travail	**18**	**in**	Choc électrique quand		
Énergie incidente cal/cm²	**9.3**		couvercles enlevés	**208**	**VAC**
Périmètre d’éclats d’arcs	**5.4**	**ft**	Périmètre d’accès limite	**3.5**	**ft**
			Périmètre d’accès restreint	**1.0**	**ft**
Se référer à Z462 pour ÉPI approprié requis			Classe de gants	**00**	

Équipement: **DP-1** 03-09-2025 Std. IEEE 1584

Étude d’éclats d’arcs par: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Risque d’éclats d’arcs et de choc électrique ÉPI approprié requis

PROTECTION D’ÉCLATS D’ARCS			PROTECTION DE CHOC ÉLECTRIQUE		
Distance de travail	**18**	**in**	Choc électrique quand		
Énergie incidente cal/cm²	**0.3**		couvercles enlevés	**208**	**VAC**
Périmètre d’éclats d’arcs	**0.6**	**ft**	Périmètre d’accès limite	**3.5**	**ft**
			Périmètre d’accès restreint	**1.0**	**ft**
Se référer à Z462 pour ÉPI approprié requis			Classe de gants	**00**	

Équipement: **DP-2** 03-09-2025 Std. IEEE 1584

Étude d’éclats d’arcs par: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Risque d’éclats d’arcs et de choc électrique ÉPI approprié requis

PROTECTION D’ÉCLATS D’ARCS			PROTECTION DE CHOC ÉLECTRIQUE		
Distance de travail	**18**	**in**	Choc électrique quand		
Énergie incidente cal/cm²	**0.1**		couvercles enlevés	**600**	**VAC**
Périmètre d’éclats d’arcs	**0.4**	**ft**	Périmètre d’accès limite	**3.5**	**ft**
			Périmètre d’accès restreint	**1.0**	**ft**
Se référer à Z462 pour ÉPI approprié requis			Classe de gants	**0**	

Équipement: **DP-MAIN** 03-09-2025 Std. IEEE 1584

Étude d’éclats d’arcs par: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Risque d’éclats d’arcs et de choc électrique ÉPI approprié requis

PROTECTION D’ÉCLATS D’ARCS			PROTECTION DE CHOC ÉLECTRIQUE		
Distance de travail	**18**	**in**	Choc électrique quand		
Énergie incidente cal/cm²	**16.2**		couvercles enlevés	**600**	**VAC**
Périmètre d’éclats d’arcs	**7.6**	**ft**	Périmètre d’accès limite	**3.5**	**ft**
			Périmètre d’accès restreint	**1.0**	**ft**
Se référer à Z462 pour ÉPI approprié requis			Classe de gants	**0**	

Équipement: **DP-PRN-3** 03-09-2025 Std. IEEE 1584

Étude d’éclats d’arcs par: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Risque d’éclats d’arcs et de choc électrique ÉPI approprié requis

PROTECTION D’ÉCLATS D’ARCS			PROTECTION DE CHOC ÉLECTRIQUE		
Distance de travail	**18**	**in**	Choc électrique quand		
Énergie incidente cal/cm²	**1.5**		couvercles enlevés	**208**	**VAC**
Périmètre d’éclats d’arcs	**1.7**	**ft**	Périmètre d’accès limite	**3.5**	**ft**
			Périmètre d’accès restreint	**1.0**	**ft**
Se référer à Z462 pour ÉPI approprié requis			Classe de gants	**00**	

Équipement: **FF333** 03-09-2025 Std. IEEE 1584

Étude d’éclats d’arcs par: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Risque d’éclats d’arcs et de choc électrique ÉPI approprié requis

PROTECTION D’ÉCLATS D’ARCS			PROTECTION DE CHOC ÉLECTRIQUE		
Distance de travail	**18**	**in**	Choc électrique quand		
Énergie incidente cal/cm²	**4.1**		couvercles enlevés	**208**	**VAC**
Périmètre d’éclats d’arcs	**3.2**	**ft**	Périmètre d’accès limite	**3.5**	**ft**
			Périmètre d’accès restreint	**1.0**	**ft**
Se référer à Z462 pour ÉPI approprié requis			Classe de gants	**00**	

Équipement: **P-AE** 03-09-2025 Std. IEEE 1584

Étude d’éclats d’arcs par: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Risque d’éclats d’arcs et de choc électrique ÉPI approprié requis

PROTECTION D’ÉCLATS D’ARCS			PROTECTION DE CHOC ÉLECTRIQUE		
Distance de travail	**18**	**in**	Choc électrique quand		
Énergie incidente cal/cm²	**0.4**		couvercles enlevés	**208**	**VAC**
Périmètre d’éclats d’arcs	**0.7**	**ft**	Périmètre d’accès limite	**3.5**	**ft**
			Périmètre d’accès restreint	**1.0**	**ft**
Se référer à Z462 pour ÉPI approprié requis			Classe de gants	**00**	

Équipement: **P-AF1** 03-09-2025 Std. IEEE 1584

Étude d’éclats d’arcs par: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Risque d’éclats d’arcs et de choc électrique ÉPI approprié requis

PROTECTION D’ÉCLATS D’ARCS			PROTECTION DE CHOC ÉLECTRIQUE		
Distance de travail	**18**	**in**	Choc électrique quand		
Énergie incidente cal/cm²	**0.4**		couvercles enlevés	**208**	**VAC**
Périmètre d’éclats d’arcs	**0.8**	**ft**	Périmètre d’accès limite	**3.5**	**ft**
			Périmètre d’accès restreint	**1.0**	**ft**
Se référer à Z462 pour ÉPI approprié requis			Classe de gants	**00**	

Équipement: **P-AF2** 03-09-2025 Std. IEEE 1584

Étude d’éclats d’arcs par: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Risque d’éclats d’arcs et de choc électrique ÉPI approprié requis

PROTECTION D’ÉCLATS D’ARCS			PROTECTION DE CHOC ÉLECTRIQUE		
Distance de travail	**18**	**in**	Choc électrique quand		
Énergie incidente cal/cm²	**3.1**		couvercles enlevés	**208**	**VAC**
Périmètre d’éclats d’arcs	**2.7**	**ft**	Périmètre d’accès limite	**3.5**	**ft**
			Périmètre d’accès restreint	**1.0**	**ft**
Se référer à Z462 pour ÉPI approprié requis			Classe de gants	**00**	

Équipement: **P-AG** 03-09-2025 Std. IEEE 1584

Étude d’éclats d’arcs par: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Risque d’éclats d’arcs et de choc électrique ÉPI approprié requis

PROTECTION D’ÉCLATS D’ARCS			PROTECTION DE CHOC ÉLECTRIQUE		
Distance de travail	**18**	**in**	Choc électrique quand		
Énergie incidente cal/cm²	**3.8**		couvercles enlevés	**208**	**VAC**
Périmètre d’éclats d’arcs	**3.1**	**ft**	Périmètre d’accès limite	**3.5**	**ft**
			Périmètre d’accès restreint	**1.0**	**ft**
Se référer à Z462 pour ÉPI approprié requis			Classe de gants	**00**	

Équipement: **P-AH** 03-09-2025 Std. IEEE 1584

Étude d’éclats d’arcs par: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Risque d’éclats d’arcs et de choc électrique ÉPI approprié requis

PROTECTION D’ÉCLATS D’ARCS			PROTECTION DE CHOC ÉLECTRIQUE		
Distance de travail	**18**	**in**	Choc électrique quand		
Énergie incidente cal/cm²	**2.1**		couvercles enlevés	**208**	**VAC**
Périmètre d’éclats d’arcs	**2.1**	**ft**	Périmètre d’accès limite	**3.5**	**ft**
			Périmètre d’accès restreint	**1.0**	**ft**
Se référer à Z462 pour ÉPI approprié requis			Classe de gants	**00**	

Équipement: **P-BB** 03-09-2025 Std. IEEE 1584

Étude d’éclats d’arcs par: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Risque d’éclats d’arcs et de choc électrique ÉPI approprié requis

PROTECTION D’ÉCLATS D’ARCS			PROTECTION DE CHOC ÉLECTRIQUE		
Distance de travail	**18**	**in**	Choc électrique quand		
Énergie incidente cal/cm²	**7.2**		couvercles enlevés	**208**	**VAC**
Périmètre d’éclats d’arcs	**4.6**	**ft**	Périmètre d’accès limite	**3.5**	**ft**
			Périmètre d’accès restreint	**1.0**	**ft**
Se référer à Z462 pour ÉPI approprié requis			Classe de gants	**00**	

Équipement: **P-BC** 03-09-2025 Std. IEEE 1584

Étude d’éclats d’arcs par: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Risque d’éclats d’arcs et de choc électrique ÉPI approprié requis

PROTECTION D’ÉCLATS D’ARCS			PROTECTION DE CHOC ÉLECTRIQUE		
Distance de travail	**18**	**in**	Choc électrique quand		
Énergie incidente cal/cm²	**3.1**		couvercles enlevés	**208**	**VAC**
Périmètre d’éclats d’arcs	**2.7**	**ft**	Périmètre d’accès limite	**3.5**	**ft**
			Périmètre d’accès restreint	**1.0**	**ft**
Se référer à Z462 pour ÉPI approprié requis			Classe de gants	**00**	

Équipement: **P-BD** 03-09-2025 Std. IEEE 1584

Étude d’éclats d’arcs par: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Risque d’éclats d’arcs et de choc électrique ÉPI approprié requis

PROTECTION D’ÉCLATS D’ARCS			PROTECTION DE CHOC ÉLECTRIQUE		
Distance de travail	**18**	**in**	Choc électrique quand		
Énergie incidente cal/cm²	**6.9**		couvercles enlevés	**208**	**VAC**
Périmètre d’éclats d’arcs	**4.5**	**ft**	Périmètre d’accès limite	**3.5**	**ft**
			Périmètre d’accès restreint	**1.0**	**ft**
Se référer à Z462 pour ÉPI approprié requis			Classe de gants	**00**	

Équipement: **P-BK** 03-09-2025 Std. IEEE 1584

Étude d’éclats d’arcs par: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Risque d’éclats d’arcs et de choc électrique ÉPI approprié requis

PROTECTION D’ÉCLATS D’ARCS			PROTECTION DE CHOC ÉLECTRIQUE		
Distance de travail	**18**	**in**	Choc électrique quand		
Énergie incidente cal/cm²	**5.9**		couvercles enlevés	**208**	**VAC**
Périmètre d’éclats d’arcs	**4.1**	**ft**	Périmètre d’accès limite	**3.5**	**ft**
			Périmètre d’accès restreint	**1.0**	**ft**
Se référer à Z462 pour ÉPI approprié requis			Classe de gants	**00**	

Équipement: **P-JM** 03-09-2025 Std. IEEE 1584

Étude d’éclats d’arcs par: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Risque d’éclats d’arcs et de choc électrique ÉPI approprié requis

PROTECTION D’ÉCLATS D’ARCS			PROTECTION DE CHOC ÉLECTRIQUE		
Distance de travail	**18**	**in**	Choc électrique quand		
Énergie incidente cal/cm²	**0.0**		couvercles enlevés	**600**	**VAC**
Périmètre d’éclats d’arcs	**0.2**	**ft**	Périmètre d’accès limite	**3.5**	**ft**
			Périmètre d’accès restreint	**1.0**	**ft**
Se référer à Z462 pour ÉPI approprié requis			Classe de gants	**0**	

Équipement: **SPLITTER P.H.** 03-09-2025 Std. IEEE 1584

Étude d’éclats d’arcs par: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Risque d’éclats d’arcs et de choc électrique ÉPI approprié requis

PROTECTION D’ÉCLATS D’ARCS			PROTECTION DE CHOC ÉLECTRIQUE		
Distance de travail	**18**	**in**	Choc électrique quand		
Énergie incidente cal/cm²	**2.2**		couvercles enlevés	**208**	**VAC**
Périmètre d’éclats d’arcs	**2.2**	**ft**	Périmètre d’accès limite	**3.5**	**ft**
			Périmètre d’accès restreint	**1.0**	**ft**
Se référer à Z462 pour ÉPI approprié requis			Classe de gants	**00**	

Équipement: **P-AA** 03-09-2025 Std. IEEE 1584

Étude d’éclats d’arcs par: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Risque d’éclats d’arcs et de choc électrique ÉPI approprié requis

PROTECTION D’ÉCLATS D’ARCS			PROTECTION DE CHOC ÉLECTRIQUE		
Distance de travail	**18**	**in**	Choc électrique quand		
Énergie incidente cal/cm²	**2.8**		couvercles enlevés	**208**	**VAC**
Périmètre d’éclats d’arcs	**2.5**	**ft**	Périmètre d’accès limite	**3.5**	**ft**
			Périmètre d’accès restreint	**1.0**	**ft**
Se référer à Z462 pour ÉPI approprié requis			Classe de gants	**00**	

Équipement: **P-AB** 03-09-2025 Std. IEEE 1584

Étude d’éclats d’arcs par: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Risque d’éclats d’arcs et de choc électrique ÉPI approprié requis

PROTECTION D’ÉCLATS D’ARCS			PROTECTION DE CHOC ÉLECTRIQUE		
Distance de travail	**18**	**in**	Choc électrique quand		
Énergie incidente cal/cm²	**2.6**		couvercles enlevés	**208**	**VAC**
Périmètre d’éclats d’arcs	**2.4**	**ft**	Périmètre d’accès limite	**3.5**	**ft**
			Périmètre d’accès restreint	**1.0**	**ft**
Se référer à Z462 pour ÉPI approprié requis			Classe de gants	**00**	

Équipement: **P-AC** 03-09-2025 Std. IEEE 1584

Étude d’éclats d’arcs par: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Risque d’éclats d’arcs et de choc électrique ÉPI approprié requis

PROTECTION D’ÉCLATS D’ARCS			PROTECTION DE CHOC ÉLECTRIQUE		
Distance de travail	**18**	**in**	Choc électrique quand		
Énergie incidente cal/cm²	**4.5**		couvercles enlevés	**208**	**VAC**
Périmètre d’éclats d’arcs	**3.4**	**ft**	Périmètre d’accès limite	**3.5**	**ft**
			Périmètre d’accès restreint	**1.0**	**ft**
Se référer à Z462 pour ÉPI approprié requis			Classe de gants	**00**	

Équipement: **P-AD** 03-09-2025 Std. IEEE 1584

Étude d’éclats d’arcs par: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Risque d’éclats d’arcs et de choc électrique ÉPI approprié requis

PROTECTION D’ÉCLATS D’ARCS			PROTECTION DE CHOC ÉLECTRIQUE		
Distance de travail	**18**	**in**	Choc électrique quand		
Énergie incidente cal/cm²	**4.0**		couvercles enlevés	**208**	**VAC**
Périmètre d’éclats d’arcs	**3.2**	**ft**	Périmètre d’accès limite	**3.5**	**ft**
			Périmètre d’accès restreint	**1.0**	**ft**
Se référer à Z462 pour ÉPI approprié requis			Classe de gants	**00**	

Équipement: **P-BA** 03-09-2025 Std. IEEE 1584

Étude d’éclats d’arcs par: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Risque d’éclats d’arcs et de choc électrique ÉPI approprié requis

PROTECTION D’ÉCLATS D’ARCS			PROTECTION DE CHOC ÉLECTRIQUE		
Distance de travail	**18**	**in**	Choc électrique quand		
Énergie incidente cal/cm²	**0.9**		couvercles enlevés	**208**	**VAC**
Périmètre d’éclats d’arcs	**1.3**	**ft**	Périmètre d’accès limite	**3.5**	**ft**
			Périmètre d’accès restreint	**1.0**	**ft**
Se référer à Z462 pour ÉPI approprié requis			Classe de gants	**00**	

Équipement: **P-QO** 03-09-2025 Std. IEEE 1584

Étude d’éclats d’arcs par: IDEA Inc. File: 24549 - DCC Arc Flash - FF03

Appendix H – Cost Estimate

Project: **Arc Flash Study Fort Frontenac - KN229976** Date: 14-Mar-25

Phase **Class D Budget Cost Estimate - Building FF03** File Ref: 24549

SECTIONAL COST SUMMARY

Group Item	Element	Element Subtotal	Subtotal	-20.00%	20.00%
1	**TRN-3**		**$ 3,000**	**$ 2,400.0**	**$ 3,600.0**
1.1	Revise size of fuses in TRN-3 (Bay-o-net and CLF) from 100A to 50A	$ 3,000		$ 2,400.0	$ 3,600.0
1.2	Tag transfromer to be monitored with IR scan every one to two years as increased corrosion can cause failed connections	$ -		$ -	$ -
2	**DP-PRN-3**		**$ 50,870**	**$ 40,696.0**	**$ 61,044.0**
2.1	Tag panel to be monitored with IR scan every one to two years as increased corrosion can cause failed connections	$ -		$ -	$ -
2.2	Provide new grounding lug	$ 570		$ 456.0	$ 684.0
2.3	Provide new door gasket	$ 300		$ 240.0	$ 360.0
2.4	Replace panel	$ 50,000		$ 40,000.0	$ 60,000.0
3	**Panel DP-MAIN**		**$ 2,210**	**$ 1,768.0**	**$ 2,652.0**
3.1	Remove sand bags obstructing footing to panel. Sand bags must be there for apparent flooding affecting TX-3. Investigate raising TX-3 on a stand to remove requirement of sandbags. Price for putting on stand.	$ 600		$ 480.0	$ 720.0
3.2	Trace branch circuits and provide lamacoid labels	$ 1,200		$ 960.0	$ 1,440.0
3.3	Revise style of fuse for DP-2 from fast acting to time delay	$ 410		$ 328.0	$ 492.0
4	**Panel DP-1**		**$ 400**	**$ 320.0**	**$ 480.0**
4.1	Trace 2 branch circuits and provide lamacoid labels	$ 400		$ 320.0	$ 480.0
5	**Panel DP-2**		**$ 400**	**$ 320.0**	**$ 480.0**
5.1	Trace 2 branch circuits and provide lamacoid labels	$ 400		$ 320.0	$ 480.0
6	**Panel P-JM**		**$ 750**	**$ 600.0**	**$ 900.0**
6.1	Provide knockout covers for panel	$ 150		$ 120.0	$ 180.0
6.2	Provide strapping to properly support conduits	$ 300		$ 240.0	$ 360.0
6.3	Tape or heat shrink feeder wires for proper phase identification	$ 300		$ 240.0	$ 360.0
7	**Panel P-BA**		**$ 7,020**	**$ 5,616.0**	**$ 8,424.0**
7.1	Replace all main lugs on panel for proper termination	$ 570		$ 456.0	$ 684.0
7.2	Provide new screws for panel cover	$ 150		$ 120.0	$ 180.0
7.3	Provide knockout covers	$ 150		$ 120.0	$ 180.0
7.4	Investigate cut wires within panel and remove or cap as required	$ 150		$ 120.0	$ 180.0
7.5	Replace panel instead of the above	$ 6,000		$ 4,800.0	$ 7,200.0
8	**Panel P-BB**		**$ 900**	**$ 720.0**	**$ 1,080.0**
8.1	Provide new lamacoids or P-touch labels for panel labelling	$ 50		$ 40.0	$ 60.0
8.2	Provide new screws for the panel cover	$ 150		$ 120.0	$ 180.0
8.3	Megger the neutral to determine condition of the neutral insulation. Replacement may be required based on the results. Price is for insluation testing service.	$ 250		$ 200.0	$ 300.0
8.4	Perform panel clean	$ 150		$ 120.0	$ 180.0
8.5	Revise neutral to be fed from white wire or tape to identify as neutral	$ 300		$ 240.0	$ 360.0
9	**Panel P-BC**		**$ 17,950**	**$ 14,360.0**	**$ 21,540.0**
9.1	Investigate circuit with two wires landed on single pole breaker, provide additional 15A 1P breaker for the second wire.	$ 450		$ 360.0	$ 540.0

Project: **Arc Flash Study Fort Frontenac - KN229976** Date: 14-Mar-25

Phase **Class D Budget Cost Estimate - Building FF03** File Ref: 24549

SECTIONAL COST SUMMARY

Group Item	Element	Element Subtotal	Subtotal	-20.00%	20.00%
9.2	Replace Panel. Panel cover has been cut. DND to decide if they want this rectified. No live parts are exposed from the modification.	$ 17,500		$ 14,000.0	$ 21,000.0
10	**Panel P-BK**		**$ 6,150**	**$ 4,920.0**	**$ 7,380.0**
10.1	Provide knockout covers	$ 150		$ 120.0	$ 180.0
10.2	Replace panel	$ 6,000			
11	**Panel P-AA**		**$ 6,410**	**$ 5,128.0**	**$ 7,692.0**
11.1	Relocate ice machine in-front of panel.	$ 5,000		$ 4,000.0	$ 6,000.0
11.2	Install new locking cylinder for panel	$ 360		$ 288.0	$ 432.0
11.3	Order new label from manufacturer for voltage and amperage	$ 50		$ 40.0	$ 60.0
11.4	Check and clean connection for circuit breaker in circuit 13/15/17. Scan breaker again after cleaning.	$ 1,000		$ 800.0	$ 1,200.0
12	**Panel P-AB**		**$ 6,450**	**$ 5,160.0**	**$ 7,740.0**
12.1	Tag panel to be monitored with IR scan every one to two years as increased corrosion can cause failed connections	$ -		$ -	$ -
12.2	Two wires are landed on a breaker not rated for 2 wires. Investigate circuit. Provide new breaker for the additional circuit.	$ 450		$ 360.0	$ 540.0
12.3	Replace panel	$ 6,000		$ 4,800.0	$ 7,200.0
13	**Panel P-AC**		**$ 4,300**	**$ 3,440.0**	**$ 5,160.0**
13.1	Remove cut MI cable from panel.	$ 150		$ 120.0	$ 180.0
13.2	Provide new screws for panel interior	$ 150		$ 120.0	$ 180.0
13.3	Replace Panel	$ 4,000		$ 3,200.0	$ 4,800.0
14	**Panel P-AD**		**$ 570**	**$ 456.0**	**$ 684.0**
14.1	An oversized neutral wire is installed in the neutral bar instead of a neutral lug. Investigate the circuit. Neutral wire may need to be reduced in size if a modified neutral bar can't be purchased. Remove neutral wire from neutral lug location and re-instate lug.	$ 570		$ 456.0	$ 684.0
15	**Panel P-AE**		**$ 2,000**	**$ 1,600.0**	**$ 2,400.0**
15.1	Purchase a new main breaker to be installed	$ 2,000		$ 1,600.0	$ 2,400.0
16	**Panel-AG**		**$ 6,300**	**$ 5,040.0**	**$ 7,560.0**
16.1	Tag panel to be monitored with IR scan every one to two years as increased corrosion can cause failed connections	$ -		$ -	$ -
16.2	Tape or heat shrink feeder wires for proper phase identification	$ 300		$ 240.0	$ 360.0
16.3	Replace panel	$ 6,000		$ 4,800.0	$ 7,200.0
17	**Panel P-FF333**		**$ 450**	**$ 360.0**	**$ 540.0**
17.1	Provide knockout covers	$ 150		$ 120.0	$ 180.0
17.2	Blue conductor used as neutral. Revise neutral wire to use white conductor. Tape or heat shrink blue wire to identify as neutral wire if this can't be modified.	$ 300		$ 240.0	$ 360.0
18	**Panel P-QO**		**$ 1,600**	**$ 1,280.0**	**$ 1,920.0**
18.1	Provide lamacoid or P-touch labels for panel label. Trace circuits and provide panel directory.	$ 1,000		$ 800.0	$ 1,200.0
18.2	Install set screws in connectors to panel	$ 150		$ 120.0	$ 180.0
18.3	Provide knockout covers	$ 150		$ 120.0	$ 180.0

Project: **Arc Flash Study Fort Frontenac - KN229976** Date: 14-Mar-25

Phase **Class D Budget Cost Estimate - Building FF03** File Ref: 24549

SECTIONAL COST SUMMARY

Group Item	Element	Element Subtotal	Subtotal	-20.00%	20.00%
18.4	Provide strapping to properly secure EMT leaving panel	$ 300		$ 240.0	$ 360.0
19	**DS-MAIN**		**$ 6,000**	**$ 4,800.0**	**$ 7,200.0**
19.1	Relocate transformer infront of disconnect switch to provide 1m clearance	$ 5,000		$ 4,000.0	$ 6,000.0
19.2	DS-Main has possible contamination on the switching mechanism or a loose connection. Corrective action is to investigate further, clean contacts, check torque and re-scan	$ 1,000		$ 800.0	$ 1,200.0
20	**TX-2**		**$ 12,000**	**$ 9,600.0**	**$ 14,400.0**
20.1	Transformer TX-2 has conduit routed out the top of it. Top entry is typically not allowed on most transformers due to th.e funnel effect. Replace Transformer	$ 12,000		$ 9,600.0	$ 14,400.0
21	**General Building**		**$ 150**	**$ 120.0**	**$ 180.0**
21.1	Print and frame Single Line Diagram as required by CEC.	$ 150		$ 120.0	$ 180.0
	TOTAL BUDGET ESTIMATE		**$ 135,880** (+/- 20%)	$108,704	$163,056

Note: The above estimates are exclusive of the following:

Professional Design Fees

Hydro utility company charges and levies

US / Canada Tarrifs