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ARC FLASH STUDY REPORT
OF
HINDUSTAN ZINC LIMITED



ZINC SMELTER DEBARI

By

Sparrow Risk Management Pvt. Ltd.
Cyber City, Gurugram
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DOCUMENT - IDENTIFICATION & DETAILS

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Client	Hindustan Zinc Limited
Location	Zinc Smelter, Debari
Date of site visit	09 th to 11 th August 2023
Study	Arc Flash Study Report
Coordinating Person (Client Side)	Mr. Rahul Khatik
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EXECUTIVE SUMMARY

Arc Flash Study has been carried out by **Sparrow Risk Management Pvt. Ltd.** at **Hindustan Zinc Limited, Debari** from **09th to 11th August 2023**. A detailed report of the findings and recommendations has been formulated hereafter in this report. Findings and recommendations are according to the data collected from the facility and the present scenario of the system.

Scope:

The following are the study sections of this document: -

1. **Arc Flash Analysis**, to calculate incident energy levels on panel and to provide arc flash stickers depicting incident energy, to recommend the electrician to wear suitable PPE while carrying out maintenance activities on panel.

Result:

1. As per Arc Flash Analysis it is found that the maximum Arc Flash level in the facility is **Level 4 (<40 Cal/cm2)**. (Detailed panel list with arc flash level is provided in summary)

Recommendations:

- I. As per mentioned above highest arc flash levels of panels are below 40 Cal/cm2. Hence, Level 4 PPE as per NFPA 70E are recommended for site.
- II. Arc flash stickers provided in report should be displayed on all panels.
- III. Boundary marking of restricted approach and limited approach as provided in report should be marked for all panels.

**1: ARC FLASH STUDY – INFERENCE**

- Arc Flash Level wise total number of panels:-

Arc Flash Level	Total Number of Panels
Level 0	50
Level 1	40
Level 2	13
Level 3	24
Level 4	9

- ARC Flash Analysis Level for different panels is mentioned below.

S.NO	PANEL ID	VOLTAGE(KV)	INCIDENT ENERGY (CAL/CM2)	LEVEL OF PPE REQUIRED
1	6.6KV HT PANEL	6.6	2.90	Level 1
2	132KV HZL BUS S_1	132	36.44	Level 4
3	132KV HZL BUS S_2	132	36.44	Level 4
4	301 A MCC	0.415	4.09	Level 2
5	301B MCC	0.415	0.52	Level 0
6	ABB BUS	11	3.63	Level 1
7	ACID LOAD-ING MCC	0.415	0.53	Level 0
8	ACTUATOR MCC	0.415	0.18	Level 0
9	ADMIN LT ROOM	0.415	0.71	Level 0
10	ANDREW YULE PANEL S_1	11	2.05	Level 1
11	ANDREW YULE PANEL S_2	11	3.80	Level 1
12	BCH MCC PANEL	0.415	5.11	Level 2
13	BCH PCC	0.415	0.97	Level 0
14	BLEND HANDLING MCC	0.415	0.62	Level 0
15	BOILER MCC	0.415	0.69	Level 0



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16	BUS CONTROL ROOM	11	11.08	Level 3
17	CADMUM MCC	0.415	0.90	Level 0
18	CADMUM OLD MCC	0.415	0.66	Level 0
19	CADMUM PCC	0.415	0.42	Level 0
20	CANAL PH	0.415	0.31	Level 0
21	CANAL PUMP MCC	0.415	0.41	Level 0
22	CDSS 3.3KV PANEL S_1	3.3	3.04	Level 1
23	CDSS 3.3KV PANEL S_2	3.3	3.25	Level 1
24	CDSS 11KV PANEL S_1	11	2.07	Level 1
25	CDSS 11KV PANEL S_2	11	2.07	Level 1
26	CLDC MCC S_1	0.415	0.64	Level 0
27	COLONY OVER HEAD LINE	11	1.09	Level 0
28	COMP L&T MCC	0.415	5.03	Level 2
29	COMP. HOUSE MCC	0.415	0.65	Level 0
30	COMPRES-SOR PANEL	0.415	5.05	Level 2
31	COOLING TWR MCC	0.415	0.55	Level 0
32	DG BUS-A	11	4.14	Level 2
33	DG BUS-B	11	4.14	Level 2
34	DM PLANT MCC S_1	0.415	0.50	Level 0
35	DM PLANT MCC S_2	0.415	0.50	Level 0
36	DT SOFT STARTER PNL	0.415	0.82	Level 0
37	ETP OPERATOR MCC	0.415	0.28	Level 0
38	ETP PCC	0.415	11.33	Level 3
39	ETP PUMP MCC	0.415	0.22	Level 0



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40	FAT SOFT STARTER PNL	0.415	2.22	Level 1
41	FILTER WATER MCC S_1	0.415	0.40	Level 0
42	FILTER WATER MCC S_2	0.415	0.33	Level 0
43	FILTERATION MCC-3	0.415	25.23	Level 4
44	GE MCC	0.415	0.50	Level 0
45	IAT SOFT STARTER PNL	0.415	0.96	Level 0
46	INDUCTION FURNACE PCC	0.415	0.35	Level 0
47	INTERLAC MCC	0.415	12.56	Level 3
48	INV. ROOM-1 BUS	11	3.42	Level 1
49	INV. ROOM-2 BUS	11	3.42	Level 1
50	JAROSITE FILTER PRESS MCC	0.415	3.69	Level 1
51	JYOTI PANEL S_1	11	8.87	Level 3
52	JYOTI PANEL S_2	11	12.98	Level 3
53	JYOTI PANEL S_3	11	3.05	Level 1
54	L&P MCC-2	0.415	16.07	Level 3
55	L&T MCC (MCC-3)	0.415	2.75	Level 1
56	L&T PH-1 MCC	0.415	0.41	Level 0
57	LEACHING MCC-1	0.415	0.54	Level 0
58	LEACHING MCC 201B1	0.415	0.73	Level 0
59	LEACHING MCC 201B2	0.415	0.60	Level 0
60	LEACHING MCC 201C	0.415	0.40	Level 0



61	LEECHATE MCC	0.415	0.31	Level 0
62	LIME MCC PANEL	0.415	0.22	Level 0
63	LR MILL	0.415	0.54	Level 0
64	MCC PANEL-1 S_1	0.415	1.53	Level 1
65	MCC PANEL-1 S_2	0.415	1.36	Level 1
66	MCC PANEL-2 S_1	0.415	1.53	Level 1
67	MCC PANEL-2 S_2	0.415	1.36	Level 1
68	MCC PUMP HOUSE-2	0.415	7.09	Level 2
69	MCC PUMP HOUSE-3	0.415	7.52	Level 2
70	MCC-111 S_1	0.415	1.30	Level 1
71	MCC-111 S_2	0.415	1.26	Level 1
72	MCC-112	0.415	1.27	Level 1
73	MCC-112 S_2	0.415	1.30	Level 1
74	MCC-113 RMH S_1	0.415	1.30	Level 1
75	MCC-113 RMH S_2	0.415	1.26	Level 1
76	MCC-114 S_1	0.415	1.25	Level 1
77	MCC-114 S_2	0.415	1.33	Level 1
78	MCC-115 S_1	0.415	1.34	Level 1
79	MCC-115 S_2	0.415	1.30	Level 1
80	MCC-116	0.415	1.30	Level 1
81	MCC-116 S_2	0.415	1.29	Level 1
82	MCTP MCC-1	0.415	0.92	Level 0
83	MCTP MCC-2	0.415	0.97	Level 0
84	MCTP MCC-3	0.415	0.46	Level 0



85	MELTING FURNACE PCC	0.415	10.00	Level 3
86	MG PANEL (SS-1) S_1	0.415	0.87	Level 0
87	MG PANEL (SS-1) S_2	0.415	1.20	Level 0
88	MR MCC PANEL	0.415	0.72	Level 0
89	NEW DM PLANT MCC S_1	0.415	0.55	Level 0
90	NEW DM PLANT MCC S_2	0.415	1.39	Level 1
91	NEW DPH	0.415	0.50	Level 0
92	PAP PCC(SS-3)	0.415	10.16	Level 3
93	PCC-111 S_1	0.415	17.00	Level 3
94	PCC-111 S_2	0.415	17.53	Level 3
95	PCC-112 S_1	0.415	17.07	Level 3
96	PCC-112 S_2	0.415	17.47	Level 3
97	PCC-113 S_1	0.415	17.97	Level 3
98	PCC-113 S_2	0.415	16.90	Level 3
99	PDB-111 S_1	0.415	1.21	Level 1
100	PDB-111 S_2	0.415	1.32	Level 1
101	PDB-112 S_1	0.415	1.33	Level 1
102	PDB-112 S_2	0.415	1.22	Level 1
103	PH-1 MCC PANEL	0.415	0.43	Level 0
104	PURIFICA-TION MCC	0.415	0.48	Level 0
105	PYROTEC LP MCC	0.415	5.26	Level 2
106	PYROTEC PCC	0.415	2.50	Level 1
107	PYROTECH PCC	0.415	4.11	Level 2
108	R-2 ACID PLANT MCC	0.415	23.42	Level 3
109	RO MCC PANEL	0.415	1.38	Level 1
110	RO PLANT MCC	0.415	20.60	Level 3
111	RO ZLD PCC	0.415	20.67	Level 3



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112	ROASTER GE MCC	0.415	5.88	Level 2
113	ROASTER- II L & T MCC	0.415	4.81	Level 2
114	RODPH MCC	0.415	0.64	Level 0
115	SIEMENS BUS-A	11	15.73	Level 3
116	SIEMENS BUS-B	11	11.60	Level 3
117	SOLAR 11KV HT PNL	11	9.16	Level 3
118	STG MCC- 118 S_1	0.415	0.75	Level 0
119	STG MCC- 118 S_2	0.415	0.76	Level 0
120	SUBSTA-TION PHE PCC	0.415	5.38	Level 2
121	SUBSTA-TION-2 PCC S_1	0.415	35.37	Level 4
122	SUBSTA-TION-2 PCC S_2	0.415	38.30	Level 4
123	SUBSTA-TION-4 PCC S_1	0.415	29.27	Level 4
124	SUBSTA-TION-4 PCC S_2	0.415	26.99	Level 4
125	SUBSTA-TION-5 PCC S_1	0.415	27.54	Level 4
126	SUBSTA-TION-5 PCC S_2	0.415	3.24	Level 1
127	SUBSTA-TION-5 PCC S_3	0.415	15.34	Level 3
128	SUBSTA-TION-6 PCC	0.415	13.90	Level 3
129	SUBSTA-TION-7 PCC	0.415	14.17	Level 3
130	SULZER MCC	0.415	0.70	Level 0
131	TGT MCC PANEL	0.415	28.10	Level 4



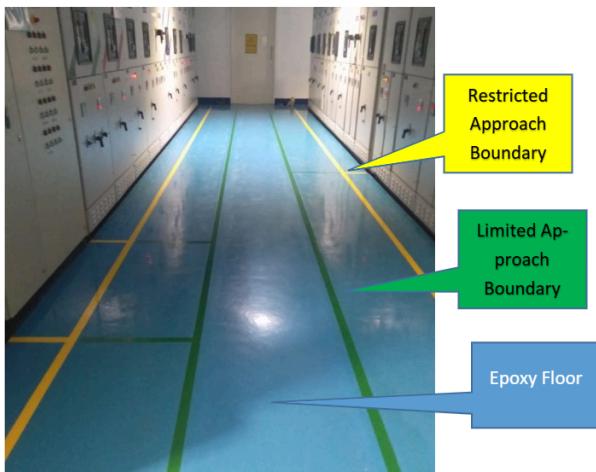
132	VFD PANEL-1 S_1	0.415	1.49	Level 1
133	VFD PANEL-1 S_2	0.415	1.49	Level 1
134	VFD PANEL-2 S_1	0.415	1.52	Level 1
135	VFD PANEL-2 S_2	0.415	1.52	Level 1
136	WARTSILA-CISF	0.415	0.40	Level 0
137	WATER CLARIFIER MCC	0.415	0.25	Level 0
138	ZE PYROTEC MCC	0.415	14.58	Level 3

❖ Conclusion/Actionable points:

1. As per mentioned above highest arc flash levels of panels are below 40 cal/cm². Hence, Level 4 PPE as per NFPA 70E are recommended for site.
2. Arc Flash training to be provided, where in workers are explained about the Approach boundary markings and PPE's to be worn during maintenance/housekeeping on Electrical Panel.
3. Arc flash stickers provided in report should be displayed on all panels.



4. Boundary marking of restricted approach and limited approach as provided in report should be marked for all panels.



Note: Boundary Marking colour can be different as per site.

PPE Requirement:

Multilayer FR flash jacket and FR bib overalls (minimum arc rating of 40 or FR long-sleeve shirt and FR pants (minimum arc rating of 40) worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt.



INTRODUCTION

Hindustan Zinc Limited had requested Sparrow RMS, New Delhi to carry out the Arc Flash Study for the Debari Smelter Facility.

The study includes.

- Arc Flash Study

Sparrow Risk Management Services (SRMS) has modelled the system based on the data collected from the site and data received from the client. The SLD are attached with this report as the basis of creating the ETAP Model and the study. The ETAP Project is named as "HZL DEBARI". SRMS created a new stand-alone ETAP model starting with EB supply as Normal operating Case.

OBJECTIVE

Objective of the project is to study the characteristics of electrical power system under this project, and demonstrate its capabilities to supply loads, without any abnormality in supply conditions as well as this shall help to suffice the selection of equipment, thus ensuring the safety of the personnel.

The following are the study sections of this document:-

- Arc Flash Analysis, to provide arc flash stickers depicting incident energy, to recommend the electrician to wear suitable PPE while doing online trouble shooting work.

METHODOLOGY

Methodology adopted in carrying out the Electrical System Assessment Study is as follows:

DATA COLLECTION FROM SITE

ETAP SIMULATION

ARC FLASH ANALYSIS

**Software used**

The software ETAP version 19.0.1 is used here to develop the power model and carry out simulation studies for Arc Flash.

**CODES AND STANDARDS**

Reference	Title
IEEE 242 - 2001	Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
IEEE 141 - 1998	Recommended Practice for Electric Power Distribution for Industrial Plants
IEC 60076 - 2018	Transformers
IEC 60909 - 2016	Short Circuit Current Calculation
IEEE 1584 - 2018	Guide for performing Arc Flash Hazard Calculations
NFPA 70E - 2021	Standard for Electrical Safety in the workplace
ASTM D120-14a	Standard Specification for Rubber Insulating Gloves

ASSUMPTIONS / CONSIDERATIONS FOR STUDY

The study has been carried out based on following assumptions:

- All the calculations are based on typical data from catalogues & as available with Software- ETAP 19.0.1 .
- Arc Flash study case has been considered with all bus faulted.
- GRID transmission losses(X/R) have been considered as 14 and Short Circuit Current of the Grid is taken as 31.5 KA.

**ETAP SYSTEM STUDIES:****ARC FLASH ANALYSIS**

The primary objectives of arc flash analysis are to define the working distance as "the dimension between the possible arc point and the head and body of the worker positioned in place to perform the assigned task."

When incident energy is calculated as part of an analysis, it corresponds to a specific distance from the prospective arc flash source, making the working distance a very important piece of information. If a person is located closer than the working distance, the incident energy increases dramatically.

Arc Flash analysis Significance:

- To protect workers from the hazards of electricity, the NFPA 70E establishes approach limits at specific distances from exposed energized parts or potential arc sources. These approach limit distances are also referred to as "approach boundaries."
- The two approach boundaries for shock protection are the Limited Approach Boundary and the Restricted Approach Boundary.
- The Limited Approach Boundary is the shock protection boundary farthest away from the energized parts and is established to keep unqualified persons a safe distance from exposed live parts.
- Unqualified workers may not cross the Limited Approach Boundary unless briefed on the hazards and continuously escorted by a qualified person.
- The Restricted Approach Boundary is the shock protection boundary closest to the energized parts and may only be crossed by qualified electrical workers following safe electrical work-practices which include wearing appropriate shock protection PPE and using insulated tools.
- The distance from an energized part or conductor to the each of these boundaries increases as the nominal voltage increases.
- There is also an approach boundary established to protect workers from exposure to an arc flash, the Arc Flash Boundary.
- When an arc flash hazard exists, the arc flash boundary is typically the outermost of all approach boundaries and must be marked with barricading and hazard signage.
- One method used to meet this requirement is using red "DANGER HIGH VOLTAGE" barricade tape which serves the dual purpose of being both a barricade and a danger sign.
- Workers may not cross the Arc Flash Boundary unless they are briefed on the hazards and are wearing arc-rated clothing and protective equipment appropriate for the job task they intend to perform.



FOR QUALIFIED ELECTRICAL WORKERS

- One important principle of electrical safety is that an electrical worker must be "qualified" for the work to be performed.
- The 2018 NFPA 70E defines a qualified person as follows: "A qualified person is one who has demonstrated skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training to identify and avoid the hazards involved."
- The words "has demonstrated" and "identify" are new 2018 additions to the definition of qualified person.
- This change requires an electrical worker to demonstrate their skills and knowledge to a qualified observer, including the ability to identify electrical hazards. Recordkeeping and documentation of this skill demonstration should be maintained by the employer or organization.
- Some skills that a qualified electrical worker should be able to demonstrate include:
- Distinguish exposed energized conductors and circuit parts from other parts of the equipment;
- Determine the nominal voltage of exposed energized conductors and circuit parts;
- Determine the approach boundary distances;
- And demonstrate the decision-making process necessary to perform job safety planning, hazard identification, risk assessment and the selection of appropriate risk control methods including personal protective equipment.

Description About the Approach Boundaries as per NFPA 70E:

- To protect workers from the hazards of electricity, the NFPA 70E establishes approach limits at specific distances from exposed energized parts or potential arc sources. These approach limit distances are also referred to as "approach boundaries."
- **Limited Approach Def.:** An approach limit at a distance from an exposed energized electrical conductor or circuit part within which a shock hazard exists
 - **Limited Approach Boundary:** - No unqualified person shall be permitted to approach nearer than the limited approach boundary of energized conductors and circuit parts.
- **Restricted Approach Def.:** An approach limit at a distance from an exposed energized electrical conductor or circuit part within which there is an increased likelihood of electric shock, due to electrical arc-over combined with inadvertent movement.
 - **Restricted Approach Boundary:** - No qualified person shall approach or take any conductive object closer to exposed energized electrical conductors or circuit parts operating at 50 volts or more than the restricted approach boundary.



- **Arc Flash Definition:** When an arc flash hazard exists, an approach limit from an arc source at which incident energy equals 1.2 cal/cm² (5 J/cm²).

Informational Note: According to the Stoll skin burn injury model, the onset of a second degree burn on unprotected skin is likely to occur at an exposure of 1.2 cal/cm² (5 J/cm²) for one second.

- **Arc Flash Boundary:** - Linear distance to prevent any more than 2nd burns from a potential arc flash.



PPE DESCRIPTION:

NFPA 70E 2018 Table 130.7 (C)(15)(c) – Arc-Flash PPE Category

Risk Category	Min. Arc Rating of PPE	PPE Requirements – NFPA -70E 2018
1	4 Cal/cm ²	<ol style="list-style-type: none">1. Arc-rated long-sleeve shirt and pants or arc-rated coverall2. Arc-rated face shield ^b or arc flash suit hood3. Arc-rated jacket, parka, rainwear, or hard hat liner (AN)4. Hard hat5. Safety glasses or safety goggles (SR)6. Hearing protection (ear canal inserts)^c7. Heavy-duty leather gloves ^d8. Leather footwear (AN) <p>Protective Equipment</p> <ol style="list-style-type: none">4. Hard hat
2	8 Cal/cm ²	<ol style="list-style-type: none">1. Arc-rated long-sleeve shirt and pants or Arc-rated coverall2. Arc-rated flash suit hood or arc-rated face shield^b and arc-rated balaclava3. Arc-rated jacket, parka, rainwear, or hard hat liner (AN)4. Hard hat



		5. Safety glasses or safety goggles (SR) 6. Hearing protection (ear canal inserts) ^c 7. Heavy-duty leather gloves ^d 8. Leather footwear (AN)
3	25 Cal/cm ²	1. Arc-rated long-sleeve shirt (AR) 2. Arc-rated pants (AR) 3. Arc-rated coverall (AR) 4. Arc-rated flash suit jacket (AR) 5. Arc-rated flash suit pants (AR) 6. Arc-rated flash suit hood 7. Arc-rated gloves ^d 8. Arc-rated jacket, parka, rainwear, or hard hat liner (AN) Protective Equipment 9. Hard hat 10. Safety glasses or safety goggles (SR) 11. Hearing protection (ear canal inserts) ^c 12. Heavy-duty leather gloves ^d 13. Leather footwear (AN)
4	40 Cal/cm ²	1. Arc-rated long-sleeve shirt (AR) 2. Arc-rated pants (AR) 3. Arc-rated coverall (AR) 4. Arc-rated flash suit jacket (AR) 5. Arc-rated flash suit pants (AR) 6. Arc-rated flash suit hood 7. Arc-rated gloves ^d 8. Arc-rated jacket, parka, rainwear, or hard hat liner (AN) Protective Equipment 9. Hard hat 10. Safety glasses or safety goggles (SR) 11. Hearing protection (ear canal inserts) ^c 12. Heavy-duty leather gloves ^d 13. Leather footwear (AN)

AN: As needed (optional).

AR: As required.

SR: Selection required

^a Arc rating is defined in Article 100.

^b Face shields are to have wrap-around guarding to protect not only the face but also the forehead, ears, and neck, or, alternatively, an arc-rated arc flash suit hood is required to be worn.

^c other types of hearing protection are permitted to be used in lieu of or in addition to ear canal inserts provided they are worn under an arc-rated arc flash suit hood.

^d If rubber insulating gloves with leather protectors are used, additional leather or arc-rated gloves are not required. The combination of rubber insulated gloves with leather protectors satisfies the arc flash protection requirement.



Level 0 Requirement As per NFPA 2015: Protective clothing, non-melting or untreated natural fiber (Shirt (long sleeve) and pants (long) or coverall)
PPE -
Face shield for projectile protection (AN)
Safety glasses or safety goggles (SR)

Figure 1: Voltages for Insulated Rubber Gloves as per ASTM D120-14a

Rubber Glove Class	Protection Against Voltage Up To:
00	500 V
0	1,000 V
1	7,500 V
2	17,000 V
3	26,500 V
4	36,000 V

Note:

a) Arc rating is defined in Article 100 as the value attributed to materials that describes their performance to exposure to an electrical arc discharge. The arc rating is expressed in Cal/cm² and is derived from the determined value of the arc thermal performance value (ATPV) or energy of breakopen threshold (EBT) (should a material system exhibit a breakopen response below the ATPV value). Arc rating is reported as either ATPV or EBT, whichever is the lower value.

Informational Note No. 1: Arc-rated clothing or equipment indicates that it has been tested for exposure to an electric arc. Flame resistant clothing without an arc rating has not been tested for exposure to an electric arc. All arc-rated clothing is also flame-resistant.

Informational Note No. 2: Breakopen is a material response evidenced by the formation of one or more holes in the innermost layer of arc-rated material that would allow flame to pass through the material.

Informational Note No. 3: ATPV is defined in ASTM F1959/ F1959M, Standard Test Method for Determining the Arc Rating of Materials for Clothing, as the incident energy (Cal/cm²) on a material or a multilayer system of materials that results in a 50 percent probability that sufficient heat transfer through the tested specimen is predicted to cause the onset of a second-degree skin burn injury based on the Stoll curve.

Informational Note No. 4: EBT is defined in ASTM F1959/ F1959M, Standard Test Method for Determining the Arc Rating of Materials for Clothing, as the incident energy (Cal/cm²) on a material or a material system that results in a 50 percent probability of breakopen. Breakopen is defined as a hole with an area of 1.6 cm² (0.5 in²) or an opening of 2.5 cm (1.0 in.) in any dimension.



- b) Face shields are to have wrap-around guarding to protect not only the face but also the forehead, ears, and neck, or, alternatively, an arc-rated arc flash suit hood is required to be worn.
- c) other types of hearing protection are permitted to be used in lieu of or in addition to ear canal inserts provided they are worn under an arc-rated arc flash suit hood.
- d) If rubber insulating gloves with leather protectors are used, additional leather or arc-rated gloves are not required. The combination of rubber insulating gloves with leather protectors satisfies the arc flash protection requirement

**DISCLAIMER**

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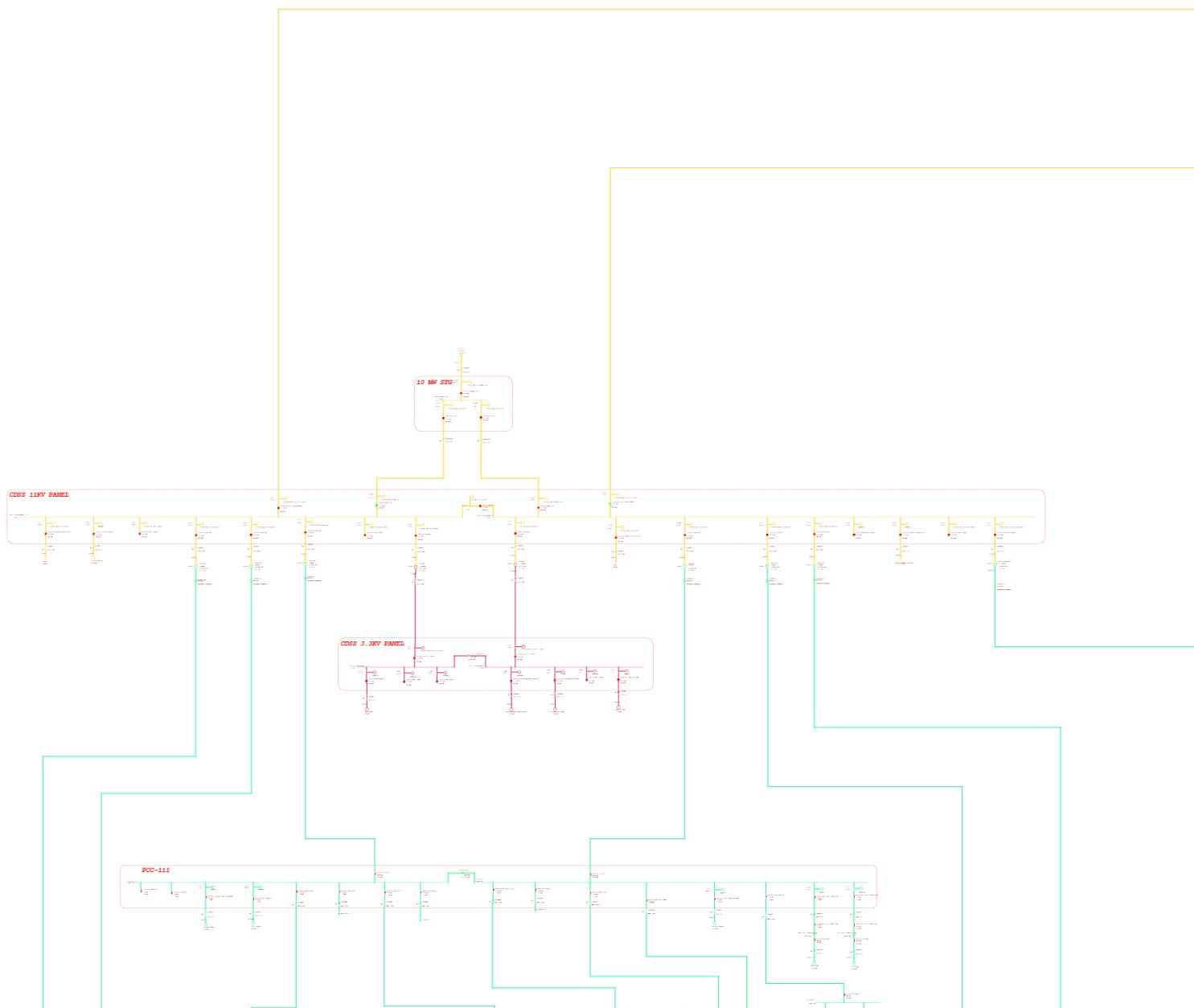
**ANNEXURE DETAILS**

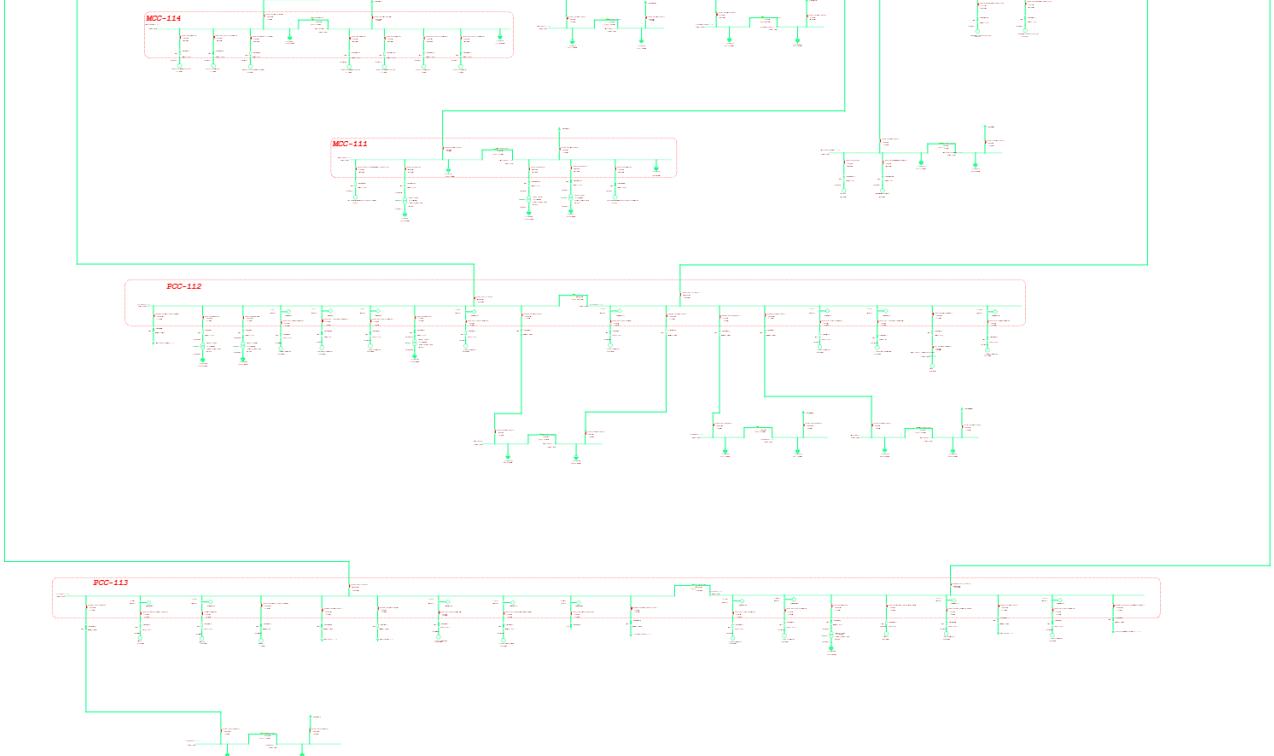
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2.	Annexure-2.0 ARC FLASH SLD
3.	Annexure-2.1 ARC FLASH STICKERS
4.	Annexure-2.2 ARC FLASH ANALYSIS REPORT



ANNEXURE: 1

SLD OF THE UNIT

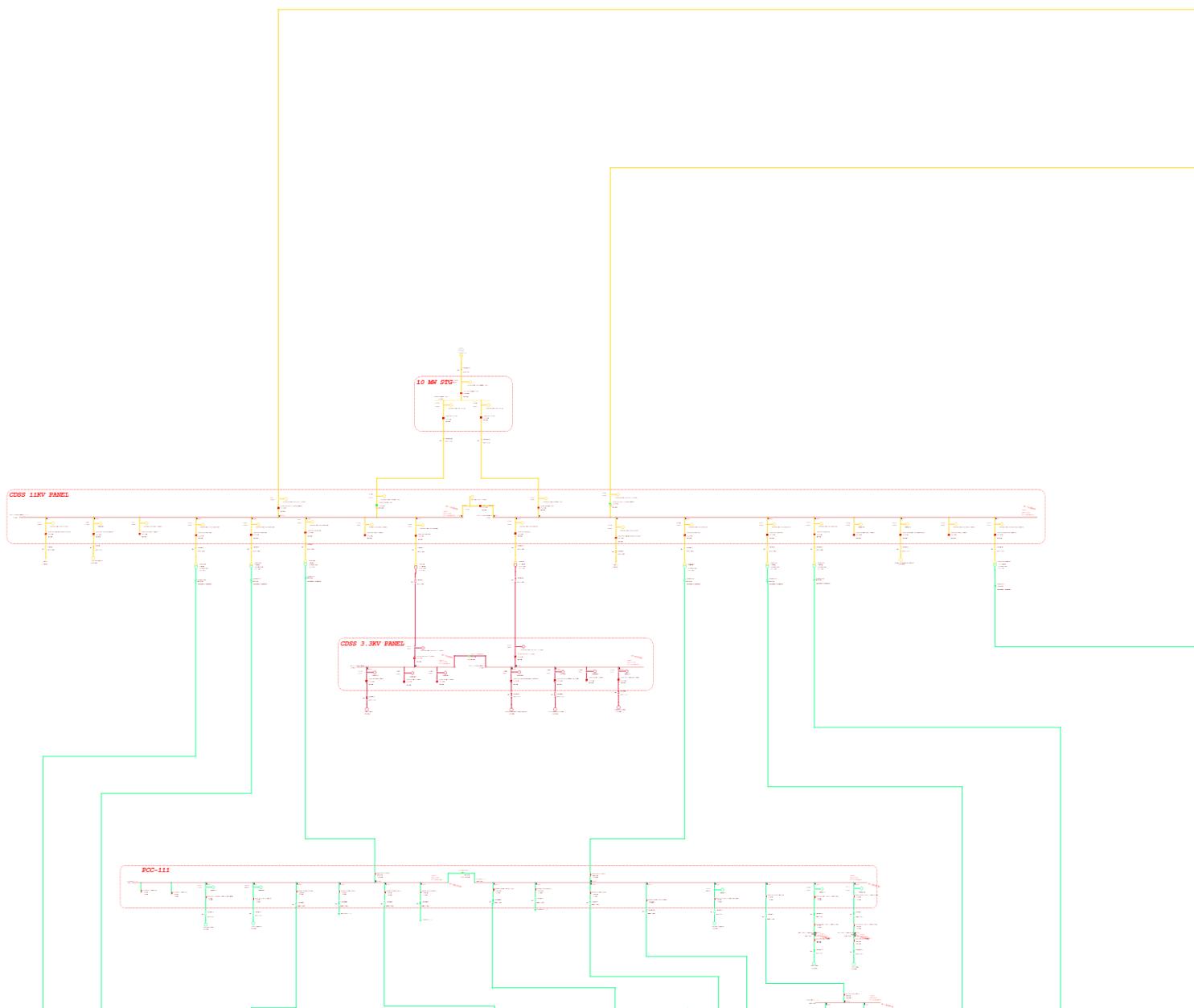


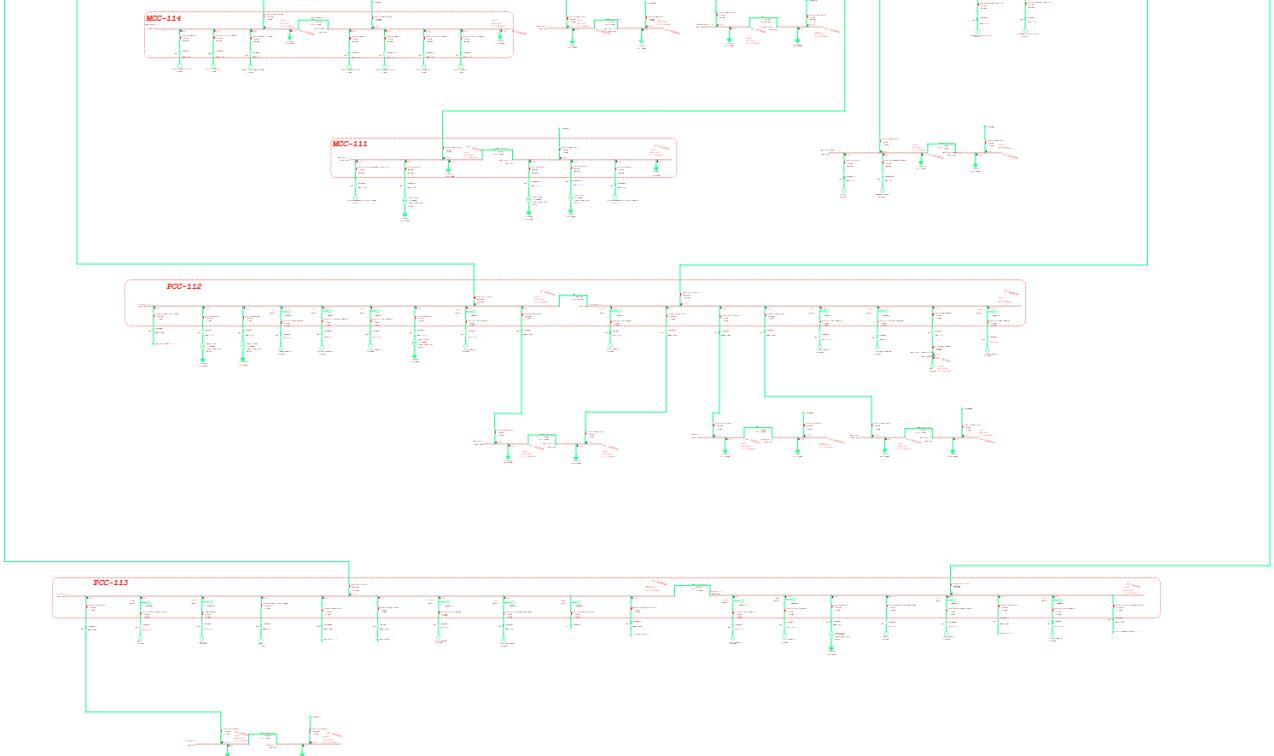




ANNEXURE: 2.0

ARC FLASH SLD







ANNEXURE: 2.1

ARC FLASH STICKERS



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **6.73 m**
Incident Energy (cal/cm²) **36.4**
Working Distance **121.9 cm**

Level 4

Multilayer FR flash jacket and FR bib overalls (minimum arc rating of 40 or FR long-sleeve shirt and FR pants (minimum arc rating of 40) worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure **132000 VAC**

Shock Hazard **when covers removed**

Limited Approach **3.05 m** Class
Restricted Approach **1.17 m** Insulating Gloves
V-rating **132000 VAC**

Equipment Name:
Source Protective Device:
132KV HZL BUS S_1



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **6.73 m**
Incident Energy (cal/cm²) **36.4**
Working Distance **121.9 cm**

Level 4

Multilayer FR flash jacket and FR bib overalls (minimum arc rating of 40 or FR long-sleeve shirt and FR pants (minimum arc rating of 40) worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure **132000 VAC**

Shock Hazard **when covers removed**

Limited Approach **3.05 m** Class
Restricted Approach **1.17 m** Insulating Gloves
V-rating **132000 VAC**

Equipment Name:
Source Protective Device:
132KV HZL BUS S_2



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.98 m**
Incident Energy (cal/cm²) **4.1**
Working Distance **45.7 cm**

Level 2

FR long-sleeve shirt (minimum arc rating of 8), worn over untreated cotton T-shirt with FR pants (minimum arc rating of 8)

Shock Hazard Exposure **415 VAC**

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**

Equipment Name:
Source Protective Device: **O/G TO AUX. TR-2 CNTR 301 A MCC**



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.27 m**
Incident Energy (cal/cm²) **0.5**
Working Distance **45.7 cm**

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure **415 VAC**
Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves

V-rating **500 VAC**

Equipment Name:

Source Protective Device: **I/C TO 301B MCC 301B MCC**



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **1.60 m**
Incident Energy (cal/cm²) **2.9**
Working Distance **91.4 cm**

Level 1

FR long-sleeve shirt (minimum arc rating of 4), worn over untreated cotton T-shirt with FR pants (minimum arc rating of 4)

Shock Hazard Exposure **6600 VAC**
Shock Hazard **when covers removed**

Limited Approach **1.52 m** Class 1
Restricted Approach **0.66 m** Insulating Gloves

V-rating **7500 VAC**

Equipment Name:

Source Protective Device: **O/G TO 5 MVA TRAFO 6.6KV HT PANEL**



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **1.85 m**
Incident Energy (cal/cm²) **3.6**
Working Distance **91.4 cm**

Level 1

FR long-sleeve shirt (minimum arc rating of 4), worn over untreated cotton T-shirt with FR pants (minimum arc rating of 4)

Shock Hazard Exposure **11000 VAC**
Shock Hazard **when covers removed**

Limited Approach **1.52 m** Class 2
Restricted Approach **0.66 m** Insulating Gloves

V-rating **17000 VAC**

Equipment Name:

Source Protective Device: **O/G TO TRAFO CP-9 ABB BUS**



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.28 m
Incident Energy (cal/cm²) 0.5
Working Distance 45.7 cm

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: I/C TO ACID LOADING M
ACID LOADING MCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.11 m
Incident Energy (cal/cm²) 0.1
Working Distance 45.7 cm

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: I/C TO ACTUATOR MCC
ACTUATOR MCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.33 m
Incident Energy (cal/cm²) 0.7
Working Distance 45.7 cm

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: I/C TO ADMIN LT ROOM
ADMIN LT ROOM



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 1.29 m
Incident Energy (cal/cm²) 2.1
Working Distance 91.4 cm

Level 1

FR long-sleeve shirt (minimum arc rating of 4),
worn over untreated cotton T-shirt with FR pants
(minimum arc rating of 4)

Shock Hazard Exposure 11000 VAC
Shock Hazard **when covers removed**

Limited Approach 1.52 m Class 2
Restricted Approach 0.66 m Insulating Gloves
V-rating 17000 VAC
Equipment Name:
Source Protective Device: I/C-1 TO ANDREW YULE
ANDREW YULE PANEL S_1



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 1.91 m
Incident Energy (cal/cm²) 3.8
Working Distance 91.4 cm

Level 1

FR long-sleeve shirt (minimum arc rating of 4),
worn over untreated cotton T-shirt with FR pants
(minimum arc rating of 4)

Shock Hazard Exposure 11000 VAC
Shock Hazard **when covers removed**

Limited Approach 1.52 m Class 2
Restricted Approach 0.66 m Insulating Gloves
V-rating 17000 VAC
Equipment Name:
Source Protective Device: I/C-1 TO DG BUS
ANDREW YULE PANEL S_2



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 1.13 m
Incident Energy (cal/cm²) 5.1
Working Distance 45.7 cm

Level 2

FR long-sleeve shirt (minimum arc rating of 8),
worn over untreated cotton T-shirt with FR pants
(minimum arc rating of 8)

Shock Hazard Exposure 415 VAC
Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: O/G TO CANAL + BCH M
BCH MCC PANEL



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.53 m
Incident Energy (cal/cm²) 1.0
Working Distance 61.0 cm

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: I/C TO BCH PCC
BCH PCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.30 m
Incident Energy (cal/cm²) 0.6
Working Distance 45.7 cm

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: I/C TO BLEND HANDLIN
BLEND HANDLING MCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.32 m
Incident Energy (cal/cm²) 0.7
Working Distance 45.7 cm

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: I/C TO BOILER MCC
BOILER MCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 3.77 m
Incident Energy (cal/cm²) 11.1
Working Distance 91.4 cm

Level 3

Multilayer FR flash jacket and FR bib overalls (minimum arc rating of 25) or FR long-sleeve shirt and FR pants (minimum arc rating of 25) worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure 11000 VAC
Shock Hazard **when covers removed**

Limited Approach 1.52 m Class 2
Restricted Approach 0.66 m Insulating Gloves
V-rating 17000 VAC
Equipment Name:
Source Protective Device: JYOTI B/C-2
BUS CONTROL ROOM



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.38 m
Incident Energy (cal/cm²) 0.9
Working Distance 45.7 cm

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure 415 VAC
Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: I/C-2 TO MG PANEL SS-1
CADMIUM MCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.32 m
Incident Energy (cal/cm²) 0.7
Working Distance 45.7 cm

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure 415 VAC
Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: I/C-1 TO MG PNL SS-1
CADMIUM OLD MCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.32 m
Incident Energy (cal/cm²) 0.4
Working Distance 61.0 cm

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: I/C TO CADMIUM PCC
CADMIUM PCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.20 m
Incident Energy (cal/cm²) 0.3
Working Distance 45.7 cm

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: I/C TO CANAL PH
CANAL PH



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.23 m
Incident Energy (cal/cm²) 0.4
Working Distance 45.7 cm

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: I/C TO CANAL PUMP MC
CANAL PUMP MCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 1.29 m
Incident Energy (cal/cm²) 2.1
Working Distance 91.4 cm

Level 1

FR long-sleeve shirt (minimum arc rating of 4),
worn over untreated cotton T-shirt with FR pants
(minimum arc rating of 4)

Shock Hazard Exposure 11000 VAC
Shock Hazard **when covers removed**

Limited Approach 1.52 m Class 2
Restricted Approach 0.66 m Insulating Gloves
V-rating 17000 VAC
Equipment Name:
Source Protective Device: I/C-1 TO CDSS 11KV PAN
CDSS 11KV PANEL S_1



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 1.29 m
Incident Energy (cal/cm²) 2.1
Working Distance 91.4 cm

Level 1

FR long-sleeve shirt (minimum arc rating of 4),
worn over untreated cotton T-shirt with FR pants
(minimum arc rating of 4)

Shock Hazard Exposure 11000 VAC
Shock Hazard **when covers removed**

Limited Approach 1.52 m Class 2
Restricted Approach 0.66 m Insulating Gloves
V-rating 17000 VAC
Equipment Name:
Source Protective Device: CDSS 11KV B/C
CDSS 11KV PANEL S_2



Arc Flash and Shock Hazard Appropriate PPE Required

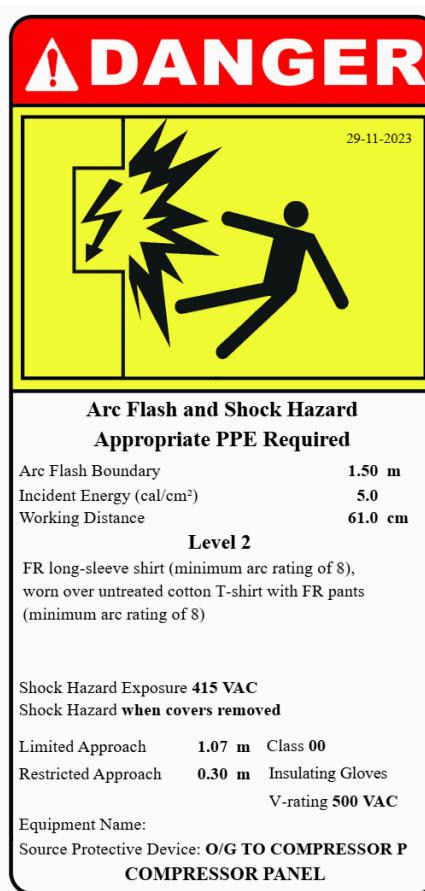
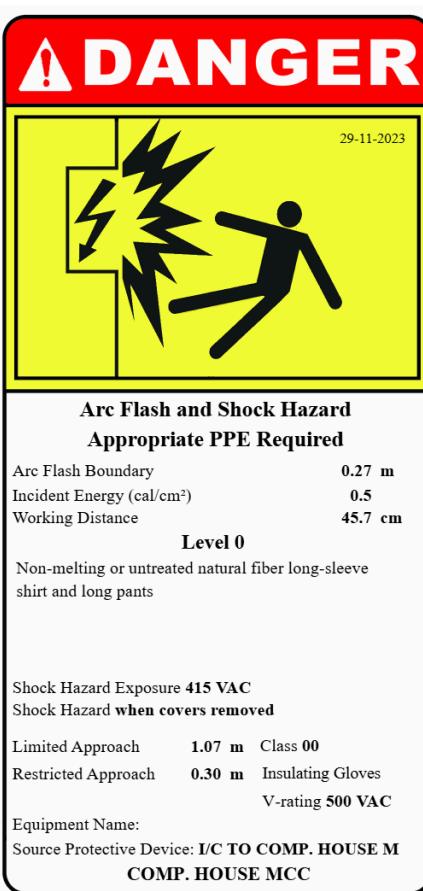
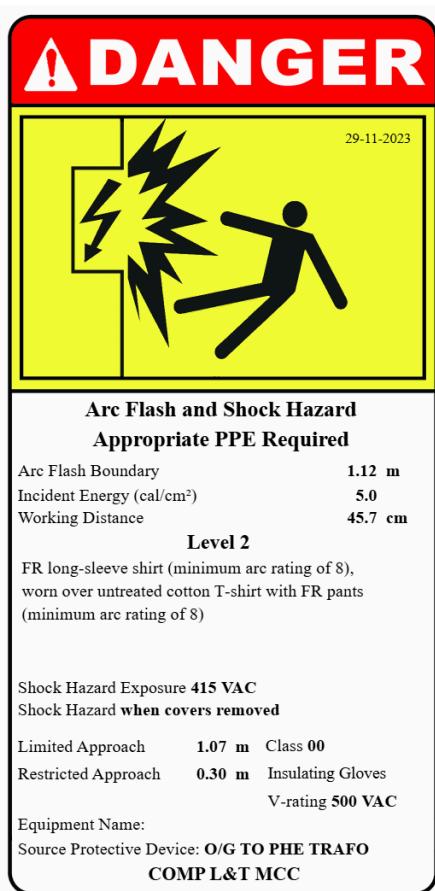
Arc Flash Boundary 1.65 m
Incident Energy (cal/cm²) 3.0
Working Distance 91.4 cm

Level 1

FR long-sleeve shirt (minimum arc rating of 4),
worn over untreated cotton T-shirt with FR pants
(minimum arc rating of 4)

Shock Hazard Exposure 3300 VAC
Shock Hazard **when covers removed**

Limited Approach 1.52 m Class 1
Restricted Approach 0.66 m Insulating Gloves
V-rating 7500 VAC
Equipment Name:
Source Protective Device: I/C -1 TO CDSS 3.3KV
CDSS 3.3KV PANEL S_1







Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.19 m**
Incident Energy (cal/cm²) **0.3**
Working Distance **45.7 cm**

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure **415 VAC**

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class **00**
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: **I/C TO ETP OPERATOR**
ETP OPERATOR MCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **2.48 m**
Incident Energy (cal/cm²) **11.3**
Working Distance **61.0 cm**

Level 3

Multilayer FR flash jacket and FR bib overalls (minimum arc rating of 25) or FR long-sleeve shirt and FR pants (minimum arc rating of 25) worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure **415 VAC**

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class **00**
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: **O/G TO ETP TRAFO**
ETP PCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.16 m**
Incident Energy (cal/cm²) **0.2**
Working Distance **45.7 cm**

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure **415 VAC**

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class **00**
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: **I/C TO ETP PUMP MCC**
ETP PUMP MCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.58 m**
Incident Energy (cal/cm²) **1.8**
Working Distance **45.7 cm**

Level 1

FR long-sleeve shirt (minimum arc rating of 4), worn over untreated cotton T-shirt with FR pants (minimum arc rating of 4)

Shock Hazard Exposure **415 VAC**
Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class **00**
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: **O/G TO FAT SOFT STAR**
FAT SOFT STARTER PNL



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.23 m**
Incident Energy (cal/cm²) **0.4**
Working Distance **45.7 cm**

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure **415 VAC**
Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class **00**
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: **I/C-1 FILTER WATER MC**
FILTER WATER MCC S_1



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.20 m**
Incident Energy (cal/cm²) **0.3**
Working Distance **45.7 cm**

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure **415 VAC**
Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class **00**
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: **FILTER WATER MCC B/**
FILTER WATER MCC S_2



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **3.07 m**
Incident Energy (cal/cm²) **25.2**
Working Distance **45.7 cm**

Level 4

Multilayer FR flash jacket and FR bib overalls (minimum arc rating of 40 or FR long-sleeve shirt and FR pants (minimum arc rating of 40) worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure **415 VAC**

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: **O/G TO SS-1 TR-1**
FILTERATION MCC-3



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.26 m**
Incident Energy (cal/cm²) **0.5**
Working Distance **45.7 cm**

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure **415 VAC**

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: **I/C-2 TO GE MCC**
GE MCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.35 m**
Incident Energy (cal/cm²) **0.8**
Working Distance **45.7 cm**

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure **415 VAC**

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: **O/G TO IAT PANEL**
IAT SOFT STARTER PNL



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.28 m**
Incident Energy (cal/cm²) **0.4**
Working Distance **61.0 cm**

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure **415 VAC**

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: **I/C-1 TO IND. FURNACE**
INDUCTION FURNACE PCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **1.99 m**
Incident Energy (cal/cm²) **12.6**
Working Distance **45.7 cm**

Level 3

Multilayer FR flash jacket and FR bib overalls (minimum arc rating of 25) or FR long-sleeve shirt and FR pants (minimum arc rating of 25) worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure **415 VAC**

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: **I/C TO INTERLAC MCC**
INTERLAC MCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **1.78 m**
Incident Energy (cal/cm²) **3.4**
Working Distance **91.4 cm**

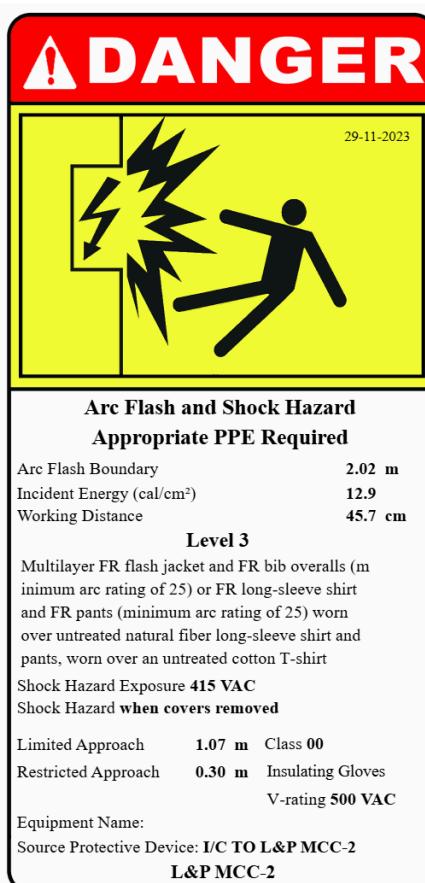
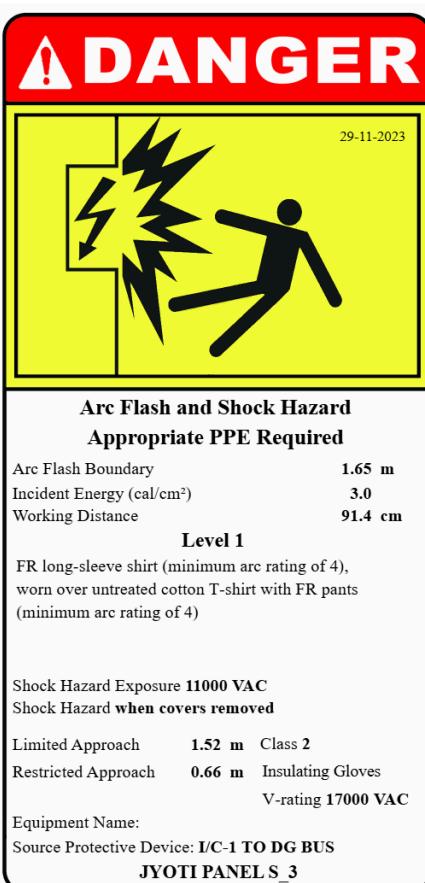
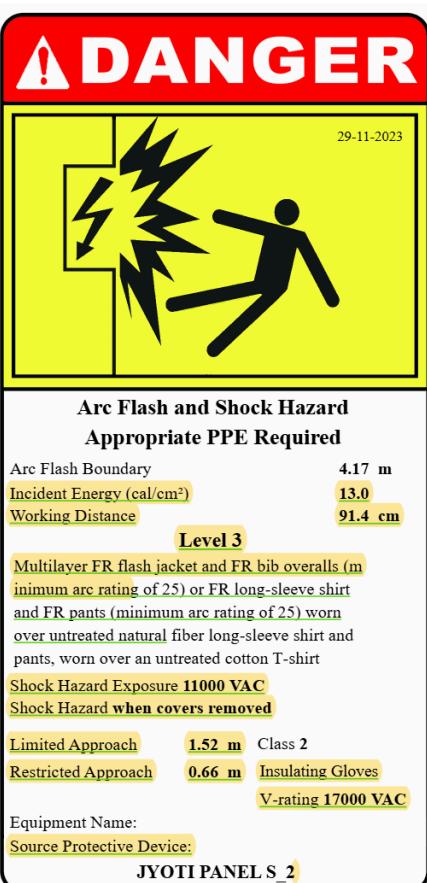
Level 1

FR long-sleeve shirt (minimum arc rating of 4), worn over untreated cotton T-shirt with FR pants (minimum arc rating of 4)

Shock Hazard Exposure **11000 VAC**

Shock Hazard **when covers removed**

Limited Approach **1.52 m** Class 2
Restricted Approach **0.66 m** Insulating Gloves
V-rating **17000 VAC**
Equipment Name:
Source Protective Device: **INV. ROOM-1 BUS**





Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.77 m
Incident Energy (cal/cm²) 2.8
Working Distance 45.7 cm

Level 1

FR long-sleeve shirt (minimum arc rating of 4),
worn over untreated cotton T-shirt with FR pants
(minimum arc rating of 4)

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: O/G TO AUX. TR-2 CNTR
L&T MCC (MCC-3)



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.23 m
Incident Energy (cal/cm²) 0.4
Working Distance 45.7 cm

Level 0

Non-melting or untreated natural fiber long-sleeve
shirt and long pants

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: I/C TO L&T PH-1 MCC
L&T PH-1 MCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.34 m
Incident Energy (cal/cm²) 0.7
Working Distance 45.7 cm

Level 0

Non-melting or untreated natural fiber long-sleeve
shirt and long pants

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: I/C TO LEACHING MCC
LEACHING MCC 201B1



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.29 m
Incident Energy (cal/cm²) 0.6
Working Distance 45.7 cm

Level 0

Non-melting or untreated natural fiber long-sleeve
shirt and long pants

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: I/C-1 TO LEACH MCC 20
LEACHING MCC 201B2



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.23 m
Incident Energy (cal/cm²) 0.4
Working Distance 45.7 cm

Level 0

Non-melting or untreated natural fiber long-sleeve
shirt and long pants

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: I/C-1 TO LEACH MCC 20
LEACHING MCC 201C



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.28 m
Incident Energy (cal/cm²) 0.5
Working Distance 45.7 cm

Level 0

Non-melting or untreated natural fiber long-sleeve
shirt and long pants

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: I/C-1 TO LEACHING MC
LEACHING MCC-1



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.20 m
Incident Energy (cal/cm²) 0.3
Working Distance 45.7 cm

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: I/C TO LEECHATE MCC
LEECHATE MCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.16 m
Incident Energy (cal/cm²) 0.2
Working Distance 45.7 cm

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: I/C TO LIME MCC
LIME MCC PANEL



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.28 m
Incident Energy (cal/cm²) 0.5
Working Distance 45.7 cm

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: I/C TO LR MILL
LR MILL



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.49 m
Incident Energy (cal/cm²) 1.4
Working Distance 45.7 cm

Level 1

FR long-sleeve shirt (minimum arc rating of 4),
worn over untreated cotton T-shirt with FR pants
(minimum arc rating of 4)

Shock Hazard Exposure 415 VAC
Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: MCC-1 B/C
MCC PANEL -1 S_2



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.49 m
Incident Energy (cal/cm²) 1.4
Working Distance 45.7 cm

Level 1

FR long-sleeve shirt (minimum arc rating of 4),
worn over untreated cotton T-shirt with FR pants
(minimum arc rating of 4)

Shock Hazard Exposure 415 VAC
Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: MCC-2 B/C
MCC PANEL -2 S_2



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.53 m
Incident Energy (cal/cm²) 1.5
Working Distance 45.7 cm

Level 1

FR long-sleeve shirt (minimum arc rating of 4),
worn over untreated cotton T-shirt with FR pants
(minimum arc rating of 4)

Shock Hazard Exposure 415 VAC
Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: I/C-1 TO MCC PANEL-1
MCC PANEL-1 S_1





Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.48 m**
Incident Energy (cal/cm²) **1.3**
Working Distance **45.7 cm**

Level 1

FR long-sleeve shirt (minimum arc rating of 4),
worn over untreated cotton T-shirt with FR pants
(minimum arc rating of 4)

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: I/C-2 TO MCC-112
MCC-112 S_2



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.48 m**
Incident Energy (cal/cm²) **1.3**
Working Distance **45.7 cm**

Level 1

FR long-sleeve shirt (minimum arc rating of 4),
worn over untreated cotton T-shirt with FR pants
(minimum arc rating of 4)

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: I/C-1 TO MCC-113
MCC-113 RMH S_1



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.47 m**
Incident Energy (cal/cm²) **1.3**
Working Distance **45.7 cm**

Level 1

FR long-sleeve shirt (minimum arc rating of 4),
worn over untreated cotton T-shirt with FR pants
(minimum arc rating of 4)

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: I/C-2 TO MCC-113
MCC-113 RMH S_2



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.47 m**
Incident Energy (cal/cm²) **1.3**
Working Distance **45.7 cm**

Level 1

FR long-sleeve shirt (minimum arc rating of 4),
worn over untreated cotton T-shirt with FR pants
(minimum arc rating of 4)

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: O/G-1 TO MCC-114
MCC-114 S_1



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.49 m**
Incident Energy (cal/cm²) **1.3**
Working Distance **45.7 cm**

Level 1

FR long-sleeve shirt (minimum arc rating of 4),
worn over untreated cotton T-shirt with FR pants
(minimum arc rating of 4)

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: I/C-2 TO MCC-114
MCC-114 S_2



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.49 m**
Incident Energy (cal/cm²) **1.3**
Working Distance **45.7 cm**

Level 1

FR long-sleeve shirt (minimum arc rating of 4),
worn over untreated cotton T-shirt with FR pants
(minimum arc rating of 4)

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: I/C-1 TO MCC-115
MCC-115 S_1



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.48 m**
Incident Energy (cal/cm²) **1.3**
Working Distance **45.7 cm**

Level 1

FR long-sleeve shirt (minimum arc rating of 4),
worn over untreated cotton T-shirt with FR pants
(minimum arc rating of 4)

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: I/C-2 TO MCC-115
MCC-115 S_2



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.48 m**
Incident Energy (cal/cm²) **1.3**
Working Distance **45.7 cm**

Level 1

FR long-sleeve shirt (minimum arc rating of 4),
worn over untreated cotton T-shirt with FR pants
(minimum arc rating of 4)

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: I/C-1 TO MCC-116
MCC-116



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.48 m**
Incident Energy (cal/cm²) **1.3**
Working Distance **45.7 cm**

Level 1

FR long-sleeve shirt (minimum arc rating of 4),
worn over untreated cotton T-shirt with FR pants
(minimum arc rating of 4)

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: I/C-2 TO MCC-116
MCC-116 S_2



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.39 m**
Incident Energy (cal/cm²) **0.9**
Working Distance **45.7 cm**

Level 0

Non-melting or untreated natural fiber long-sleeve
shirt and long pants

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: I/C TO MCTP MCC-1
MCTP MCC-1



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.40 m**
Incident Energy (cal/cm²) **1.0**
Working Distance **45.7 cm**

Level 0

Non-melting or untreated natural fiber long-sleeve
shirt and long pants

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: I/C TO MCTP MCC-2
MCTP MCC-2



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.22 m**
Incident Energy (cal/cm²) **0.4**
Working Distance **45.7 cm**

Level 0

Non-melting or untreated natural fiber long-sleeve
shirt and long pants

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: I/C TO MCTP MCC-3
MCTP MCC-3



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **2.30 m**
Incident Energy (cal/cm²) **10.0**
Working Distance **61.0 cm**

Level 3

Multilayer FR flash jacket and FR bib overalls (minimum arc rating of 25) or FR long-sleeve shirt and FR pants (minimum arc rating of 25) worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure **415 VAC**

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class **00**
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: **O/G TO ZINC MELTING MELTING FURNACE PCC**



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.37 m**
Incident Energy (cal/cm²) **0.9**
Working Distance **45.7 cm**

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure **415 VAC**

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class **00**
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: **I/C-1 TO MG PNL SS-1 MG PANEL (SS-1) S_1**



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.46 m**
Incident Energy (cal/cm²) **1.2**
Working Distance **45.7 cm**

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure **415 VAC**

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class **00**
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: **I/C-2 TO MG PANEL SS-1 MG PANEL (SS-1) S_2**



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.33 m**
Incident Energy (cal/cm²) **0.7**
Working Distance **45.7 cm**

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure **415 VAC**
Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class **00**
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: **I/C TO MR MCC PNL MR MCC PANEL**



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.28 m**
Incident Energy (cal/cm²) **0.6**
Working Distance **45.7 cm**

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure **415 VAC**
Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class **00**
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: **I/C-1 TO NEW DM PLAN NEW DM PLANT MCC S_1**



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.50 m**
Incident Energy (cal/cm²) **1.4**
Working Distance **45.7 cm**

Level 1

FR long-sleeve shirt (minimum arc rating of 4), worn over untreated cotton T-shirt with FR pants (minimum arc rating of 4)

Shock Hazard Exposure **415 VAC**
Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class **00**
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: **O/G TO AUX. TR-2 CNTR NEW DM PLANT MCC S_2**



29-11-2023

**Arc Flash and Shock Hazard
Appropriate PPE Required**

Arc Flash Boundary 0.26 m
Incident Energy (cal/cm²) 0.5
Working Distance 45.7 cm

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: I/C TO NEW DPH
NEW DPH



29-11-2023

**Arc Flash and Shock Hazard
Appropriate PPE Required**

Arc Flash Boundary 2.32 m
Incident Energy (cal/cm²) 10.2
Working Distance 61.0 cm

Level 3

Multilayer FR flash jacket and FR bib overalls (minimum arc rating of 25) or FR long-sleeve shirt and FR pants (minimum arc rating of 25) worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: O/G TO MCTP TR-5
PAP PCC(SS-3)



29-11-2023

**Arc Flash and Shock Hazard
Appropriate PPE Required**

Arc Flash Boundary 3.20 m
Incident Energy (cal/cm²) 17.0
Working Distance 61.0 cm

Level 3

Multilayer FR flash jacket and FR bib overalls (minimum arc rating of 25) or FR long-sleeve shirt and FR pants (minimum arc rating of 25) worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: O/G TO TR-111A
PCC-111 S_1



29-11-2023

**Arc Flash and Shock Hazard
Appropriate PPE Required**

Arc Flash Boundary 3.26 m
Incident Energy (cal/cm²) 17.5
Working Distance 61.0 cm

Level 3

Multilayer FR flash jacket and FR bib overalls (minimum arc rating of 25) or FR long-sleeve shirt and FR pants (minimum arc rating of 25) worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: O/G TO TR-111B
PCC-111 S_2



29-11-2023

**Arc Flash and Shock Hazard
Appropriate PPE Required**

Arc Flash Boundary 3.21 m
Incident Energy (cal/cm²) 17.1
Working Distance 61.0 cm

Level 3

Multilayer FR flash jacket and FR bib overalls (minimum arc rating of 25) or FR long-sleeve shirt and FR pants (minimum arc rating of 25) worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: O/G TO TR-112A
PCC-112 S_1



29-11-2023

**Arc Flash and Shock Hazard
Appropriate PPE Required**

Arc Flash Boundary 3.26 m
Incident Energy (cal/cm²) 17.5
Working Distance 61.0 cm

Level 3

Multilayer FR flash jacket and FR bib overalls (minimum arc rating of 25) or FR long-sleeve shirt and FR pants (minimum arc rating of 25) worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: O/G TO TR-112B
PCC-112 S_2



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **3.31 m**
Incident Energy (cal/cm²) **18.0**
Working Distance **61.0 cm**

Level 3

Multilayer FR flash jacket and FR bib overalls (minimum arc rating of 25) or FR long-sleeve shirt and FR pants (minimum arc rating of 25) worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure **415 VAC**

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class **00**
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**

Equipment Name:

Source Protective Device: **O/G TO TR-113A**
PCC-113 S_1



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **3.19 m**
Incident Energy (cal/cm²) **16.9**
Working Distance **61.0 cm**

Level 3

Multilayer FR flash jacket and FR bib overalls (minimum arc rating of 25) or FR long-sleeve shirt and FR pants (minimum arc rating of 25) worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure **415 VAC**

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class **00**
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**

Equipment Name:

Source Protective Device: **O/G TO TR-113B**
PCC-113 S_2



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.46 m**
Incident Energy (cal/cm²) **1.2**
Working Distance **45.7 cm**

Level 1

FR long-sleeve shirt (minimum arc rating of 4), worn over untreated cotton T-shirt with FR pants (minimum arc rating of 4)

Shock Hazard Exposure **415 VAC**

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class **00**
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**

Equipment Name:

Source Protective Device: **I/C-1 TO PDB-111**
PDB-111 S_1



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.48 m**
Incident Energy (cal/cm²) **1.3**
Working Distance **45.7 cm**

Level 1

FR long-sleeve shirt (minimum arc rating of 4), worn over untreated cotton T-shirt with FR pants (minimum arc rating of 4)

Shock Hazard Exposure **415 VAC**
Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class **00**
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**

Equipment Name:

Source Protective Device: **I/C-2 TO PDB-111**
PDB-111 S_2



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.49 m**
Incident Energy (cal/cm²) **1.3**
Working Distance **45.7 cm**

Level 1

FR long-sleeve shirt (minimum arc rating of 4), worn over untreated cotton T-shirt with FR pants (minimum arc rating of 4)

Shock Hazard Exposure **415 VAC**
Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class **00**
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**

Equipment Name:

Source Protective Device: **I/C-1 TO PDB-112**
PDB-112 S_1



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.46 m**
Incident Energy (cal/cm²) **1.2**
Working Distance **45.7 cm**

Level 1

FR long-sleeve shirt (minimum arc rating of 4), worn over untreated cotton T-shirt with FR pants (minimum arc rating of 4)

Shock Hazard Exposure **415 VAC**
Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class **00**
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**

Equipment Name:

Source Protective Device: **I/C-2 TO PDB-112**
PDB-112 S_2



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.24 m
Incident Energy (cal/cm²) 0.4
Working Distance 45.7 cm

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: I/C TO PH-1 MCC PNL
PH-1 MCC PANEL



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.26 m
Incident Energy (cal/cm²) 0.5
Working Distance 45.7 cm

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: I/C TO PURIFICATION M
PURIFICATION MCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 1.15 m
Incident Energy (cal/cm²) 5.3
Working Distance 45.7 cm

Level 2

FR long-sleeve shirt (minimum arc rating of 8),
worn over untreated cotton T-shirt with FR pants
(minimum arc rating of 8)

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: O/G TO PYROTEC LP M
PYROTEC LP MCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.72 m
Incident Energy (cal/cm²) 2.5
Working Distance 45.7 cm

Level 1

FR long-sleeve shirt (minimum arc rating of 4),
worn over untreated cotton T-shirt with FR pants
(minimum arc rating of 4)

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: I/C TO PYROTEC PCC
PYROTEC PCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 1.32 m
Incident Energy (cal/cm²) 4.1
Working Distance 61.0 cm

Level 2

FR long-sleeve shirt (minimum arc rating of 8),
worn over untreated cotton T-shirt with FR pants
(minimum arc rating of 8)

Shock Hazard Exposure 415 VAC

Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: O/G TO AUX. TR-2 CNTR
PYROTECH PCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 2.93 m
Incident Energy (cal/cm²) 23.4
Working Distance 45.7 cm

Level 3

Multilayer FR flash jacket and FR bib overalls (minimum arc rating of 25) or FR long-sleeve shirt and FR pants (minimum arc rating of 25) worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure 415 VAC
Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: O/G TO AUX. TR-3
R-2 ACID PLANT MCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.50 m**
Incident Energy (cal/cm²) **1.4**
Working Distance **45.7 cm**

Level 1

FR long-sleeve shirt (minimum arc rating of 4),
worn over untreated cotton T-shirt with FR pants
(minimum arc rating of 4)

Shock Hazard Exposure **415 VAC**
Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class **00**
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: **I/C TO RO MCC PANEL**
RO MCC PANEL



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **2.71 m**
Incident Energy (cal/cm²) **20.6**
Working Distance **45.7 cm**

Level 3

Multilayer FR flash jacket and FR bib overalls (m
inimum arc rating of 25) or FR long-sleeve shirt
and FR pants (minimum arc rating of 25) worn
over untreated natural fiber long-sleeve shirt and
pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure **415 VAC**
Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class **00**
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: **O/G TO SS-1 TR-1**
RO PLANT MCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **3.62 m**
Incident Energy (cal/cm²) **20.7**
Working Distance **61.0 cm**

Level 3

Multilayer FR flash jacket and FR bib overalls (m
inimum arc rating of 25) or FR long-sleeve shirt
and FR pants (minimum arc rating of 25) worn
over untreated natural fiber long-sleeve shirt and
pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure **415 VAC**
Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class **00**
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: **O/G TO RO ZLD TRAFO**
RO ZLD PCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **1.24 m**
Incident Energy (cal/cm²) **5.9**
Working Distance **45.7 cm**

Level 2

FR long-sleeve shirt (minimum arc rating of 8),
worn over untreated cotton T-shirt with FR pants
(minimum arc rating of 8)

Shock Hazard Exposure **415 VAC**
Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class **00**
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: **O/G TO PHE TRAFO**
ROASTER GE MCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **1.09 m**
Incident Energy (cal/cm²) **4.8**
Working Distance **45.7 cm**

Level 2

FR long-sleeve shirt (minimum arc rating of 8),
worn over untreated cotton T-shirt with FR pants
(minimum arc rating of 8)

Shock Hazard Exposure **415 VAC**
Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class **00**
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: **I/C-1 TO L & T MCC**
ROASTER- II L & T MCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.31 m**
Incident Energy (cal/cm²) **0.6**
Working Distance **45.7 cm**

Level 0

Non-melting or untreated natural fiber long-sleeve
shirt and long pants

Shock Hazard Exposure **415 VAC**
Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class **00**
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: **I/C TO RODPH MCC**
RODPH MCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **4.71 m**
Incident Energy (cal/cm²) **15.7**
Working Distance **91.4 cm**

Level 3

Multilayer FR flash jacket and FR bib overalls (minimum arc rating of 25) or FR long-sleeve shirt and FR pants (minimum arc rating of 25) worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure **11000 VAC**

Shock Hazard **when covers removed**

Limited Approach **1.52 m** Class 2
Restricted Approach **0.66 m** Insulating Gloves
V-rating **17000 VAC**

Equipment Name:

Source Protective Device: **I/C TO SIEMENS BUS-A**
SIEMENS BUS-A



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.34 m**
Incident Energy (cal/cm²) **0.7**
Working Distance **45.7 cm**

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure **415 VAC**
Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**

Equipment Name:

Source Protective Device: **I/C-1 TO MCC-118**
STG MCC-118 S_1



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **3.88 m**
Incident Energy (cal/cm²) **11.6**
Working Distance **91.4 cm**

Level 3

Multilayer FR flash jacket and FR bib overalls (minimum arc rating of 25) or FR long-sleeve shirt and FR pants (minimum arc rating of 25) worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure **11000 VAC**

Shock Hazard **when covers removed**

Limited Approach **1.52 m** Class 2
Restricted Approach **0.66 m** Insulating Gloves
V-rating **17000 VAC**

Equipment Name:

Source Protective Device: **I/C TO SIEMENS BUS-B**
SIEMENS BUS-B



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **3.34 m**
Incident Energy (cal/cm²) **9.2**
Working Distance **91.4 cm**

Level 3

Multilayer FR flash jacket and FR bib overalls (minimum arc rating of 25) or FR long-sleeve shirt and FR pants (minimum arc rating of 25) worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure **11000 VAC**

Shock Hazard **when covers removed**

Limited Approach **1.52 m** Class 2
Restricted Approach **0.66 m** Insulating Gloves
V-rating **17000 VAC**

Equipment Name:

Source Protective Device: **SOLAR 11KV HT PNL**



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.34 m**
Incident Energy (cal/cm²) **0.7**
Working Distance **45.7 cm**

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure **415 VAC**
Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**

Equipment Name:

Source Protective Device: **I/C-2 TO MCC-118**
STG MCC-118 S_2



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **0.34 m**
Incident Energy (cal/cm²) **0.8**
Working Distance **45.7 cm**

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure **415 VAC**
Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**

Equipment Name:

Source Protective Device: **I/C-2 TO MCC-118**
STG MCC-118 S_2



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **1.56 m**
Incident Energy (cal/cm²) **5.4**
Working Distance **61.0 cm**

Level 2

FR long-sleeve shirt (minimum arc rating of 8), worn over untreated cotton T-shirt with FR pants (minimum arc rating of 8)

Shock Hazard Exposure **415 VAC**
Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**

Equipment Name:

Source Protective Device: **O/G TO PHE TRAFO**
SUBSTATION PHE PCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **5.06 m**
Incident Energy (cal/cm²) **35.4**
Working Distance **61.0 cm**

Level 4

Multilayer FR flash jacket and FR bib overalls (minimum arc rating of 40 or FR long-sleeve shirt and FR pants (minimum arc rating of 40) worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure **415 VAC**

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: O/G TO AUX. TR-3
SUBSTATION-2 PCC S_1



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **5.32 m**
Incident Energy (cal/cm²) **38.3**
Working Distance **61.0 cm**

Level 4

Multilayer FR flash jacket and FR bib overalls (minimum arc rating of 40 or FR long-sleeve shirt and FR pants (minimum arc rating of 40) worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure **415 VAC**

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: O/G TO AUX. TR-4
SUBSTATION-2 PCC S_2



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **4.50 m**
Incident Energy (cal/cm²) **29.3**
Working Distance **61.0 cm**

Level 4

Multilayer FR flash jacket and FR bib overalls (minimum arc rating of 40 or FR long-sleeve shirt and FR pants (minimum arc rating of 40) worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure **415 VAC**

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: O/G TO AUX. TR-7
SUBSTATION-4 PCC S_1



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **4.27 m**
Incident Energy (cal/cm²) **27.0**
Working Distance **61.0 cm**

Level 4

Multilayer FR flash jacket and FR bib overalls (minimum arc rating of 40 or FR long-sleeve shirt and FR pants (minimum arc rating of 40) worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure **415 VAC**

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: O/G TO AUX. TR-6
SUBSTATION-4 PCC S_2



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **4.33 m**
Incident Energy (cal/cm²) **27.5**
Working Distance **61.0 cm**

Level 4

Multilayer FR flash jacket and FR bib overalls (minimum arc rating of 40 or FR long-sleeve shirt and FR pants (minimum arc rating of 40) worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure **415 VAC**

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: O/G TO AUX. TR-6
SUBSTATION-5 PCC S_1



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary **1.13 m**
Incident Energy (cal/cm²) **3.2**
Working Distance **61.0 cm**

Level 1

FR long-sleeve shirt (minimum arc rating of 4), worn over untreated cotton T-shirt with FR pants (minimum arc rating of 4)

Shock Hazard Exposure **415 VAC**

Shock Hazard **when covers removed**

Limited Approach **1.07 m** Class 00
Restricted Approach **0.30 m** Insulating Gloves
V-rating **500 VAC**
Equipment Name:
Source Protective Device: O/G TO SS-5 TRAFO
SUBSTATION-5 PCC S_2



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 3.00 m
Incident Energy (cal/cm²) 15.3
Working Distance 61.0 cm

Level 3

Multilayer FR flash jacket and FR bib overalls (minimum arc rating of 25) or FR long-sleeve shirt and FR pants (minimum arc rating of 25) worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure 415 VAC

Shock Hazard when covers removed

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC

Equipment Name:

Source Protective Device: O/G TO SS-1 TR-1
SUBSTATION-5 PCC S_3



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 2.82 m
Incident Energy (cal/cm²) 13.9
Working Distance 61.0 cm

Level 3

Multilayer FR flash jacket and FR bib overalls (minimum arc rating of 25) or FR long-sleeve shirt and FR pants (minimum arc rating of 25) worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure 415 VAC

Shock Hazard when covers removed

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC

Equipment Name:

Source Protective Device: O/G TO SS-1 TR-1
SUBSTATION-6 PCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 2.86 m
Incident Energy (cal/cm²) 14.2
Working Distance 61.0 cm

Level 3

Multilayer FR flash jacket and FR bib overalls (minimum arc rating of 25) or FR long-sleeve shirt and FR pants (minimum arc rating of 25) worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure 415 VAC

Shock Hazard when covers removed

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC

Equipment Name:

Source Protective Device: O/G TO SS-1 TR-1
SUBSTATION-7 PCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.33 m
Incident Energy (cal/cm²) 0.7
Working Distance 45.7 cm

Level 0

Non-melting or untreated natural fiber long-sleeve shirt and long pants

Shock Hazard Exposure 415 VAC
Shock Hazard when covers removed

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC

Equipment Name:

Source Protective Device: I/C TO SULZER MCC
SULZER MCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 3.29 m
Incident Energy (cal/cm²) 28.1
Working Distance 45.7 cm

Level 4

Multilayer FR flash jacket and FR bib overalls (minimum arc rating of 40 or FR long-sleeve shirt and FR pants (minimum arc rating of 40) worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure 415 VAC

Shock Hazard when covers removed

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC

Equipment Name:

Source Protective Device: O/G TO AUX. TR-7
TGT MCC PANEL



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.52 m
Incident Energy (cal/cm²) 1.5
Working Distance 45.7 cm

Level 1

FR long-sleeve shirt (minimum arc rating of 4), worn over untreated cotton T-shirt with FR pants (minimum arc rating of 4)

Shock Hazard Exposure 415 VAC
Shock Hazard when covers removed

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC

Equipment Name:

Source Protective Device: I/C-1 TO VFD PANEL-1
VFD PANEL-1 S_1



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.52 m
Incident Energy (cal/cm²) 1.5
Working Distance 45.7 cm

Level 1

FR long-sleeve shirt (minimum arc rating of 4),
worn over untreated cotton T-shirt with FR pants
(minimum arc rating of 4)

Shock Hazard Exposure 415 VAC
Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: VFD PANEL-1 B/C
VFD PANEL-1 S_2



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.53 m
Incident Energy (cal/cm²) 1.5
Working Distance 45.7 cm

Level 1

FR long-sleeve shirt (minimum arc rating of 4),
worn over untreated cotton T-shirt with FR pants
(minimum arc rating of 4)

Shock Hazard Exposure 415 VAC
Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: I/C-1 TO VFD PANEL-2
VFD PANEL-2 S_1



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.53 m
Incident Energy (cal/cm²) 1.5
Working Distance 45.7 cm

Level 1

FR long-sleeve shirt (minimum arc rating of 4),
worn over untreated cotton T-shirt with FR pants
(minimum arc rating of 4)

Shock Hazard Exposure 415 VAC
Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: VFD PANEL-2 B/C
VFD PANEL-2 S_2



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.23 m
Incident Energy (cal/cm²) 0.4
Working Distance 45.7 cm

Level 0

Non-melting or untreated natural fiber long-sleeve
shirt and long pants

Shock Hazard Exposure 415 VAC
Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: I/C TO WARTSILA + CIS
WARTSILA-CISF



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 0.17 m
Incident Energy (cal/cm²) 0.3
Working Distance 45.7 cm

Level 0

Non-melting or untreated natural fiber long-sleeve
shirt and long pants

Shock Hazard Exposure 415 VAC
Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: I/C TO WTR CLARIFIER
WATER CLARIFIER MCC



Arc Flash and Shock Hazard Appropriate PPE Required

Arc Flash Boundary 2.18 m
Incident Energy (cal/cm²) 14.6
Working Distance 45.7 cm

Level 3

Multilayer FR flash jacket and FR bib overalls (m
inimum arc rating of 25) or FR long-sleeve shirt
and FR pants (minimum arc rating of 25) worn
over untreated natural fiber long-sleeve shirt and
pants, worn over an untreated cotton T-shirt

Shock Hazard Exposure 415 VAC
Shock Hazard **when covers removed**

Limited Approach 1.07 m Class 00
Restricted Approach 0.30 m Insulating Gloves
V-rating 500 VAC
Equipment Name:
Source Protective Device: I/C-1 TO ZE PYROTEC M
ZE PYROTEC MCC



ANNEXURE: 2.2

ARC FLASH ANALYSIS REPORT

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	1
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Electrical Transient Analyzer Program

Arc Flash Analysis

IEEE 1584-2018
IEC Short-Circuit

	Swing	V-Control	Load	Total
Number of Buses:	3	0	380	383

	XFMR2	XFMR3	Reactor	Line/Cable	Impedance	Tie PD	Total
Number of Branches:	38	8	0	314	0	12	372

	Synchronous Generator	Power Grid	Synchronous Motor	Induction Machines	Lumped Load	Total
Number of Machines:	2	1	0	115	93	211

System Frequency: 50.00
 Unit System: Metric
 Project Filename: HZL DEBARI SMELTER
 Output Filename: C:\Users\samba\OneDrive - Sparrow Risk Management Pvt. Ltd SAMBA PROJECTS\ETAP FINAL OTTS Sumit Jha HZL DEBARI OTT DEBARI AF IAFS

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	2
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Adjustments

Tolerance	Apply Adjustments	Individual /Global	Percent
Transformer Impedance:	Yes	Individual	
Reactor Impedance:	Yes	Individual	
Overload Heater Resistance:	No		
Transmission Line Length:	No		
Cable / Busway Length:	No		

Temperature Correction	Apply Adjustments	Individual /Global	Degree C
Transmission Line Resistance:	Yes	Global	20
Cable / Busway Resistance:	Yes	Global	20

Energy Levels

NFPA 70E 2012 to 2018 / User-Defined

Level ID	cal/cm ²
Level 0	1.20
Level 1	4.00
Level 2	8.00
Level 3	25.00
Level 4	40.00

Project: ARC FLASH STUDY HZL -DEBARI
 Location: DEBARI
 Contract: SPARROW RMS
 Engineer: MR. SUMIT KUMAR JHA
 Filename: HZL DEBARI SMELTER

ETAP
 19.0.1C
 Study Case: A_SC

Page: 3
 Date: 29-11-2023
 SN:
 Revision: Base
 Config.: Normal

Bus Input Data

Bus		Initial Voltage			
ID	Type	Nom. kV	Base kV	Sub-sys	%Mag.
					Ang.
6.6KV HT PANEL	Load	6.600	6.600	1	100.00
11KV 10 MW STG	Load	11.000	11.500	1	100.00
132KV HZL BUS S_1	SWNG	132.000	132.000	1	100.00
132KV HZL BUS S_2	Load	132.000	132.000	1	100.00
301 A MCC	Load	0.415	0.433	1	100.00
301B MCC	Load	0.415	0.433	1	100.00
ABB BUS	Load	11.000	11.000	2	100.00
ACID LOADING MCC	Load	0.415	0.433	1	100.00
ACTUATOR MCC	Load	0.415	0.433	1	100.00
ADMIN LT ROOM	Load	0.415	0.433	1	100.00
ANDREW YULE PANEL S_1	Load	11.000	11.000	1	100.00
ANDREW YULE PANEL S_2	Load	11.000	11.000	2	100.00
BCH MCC PANEL	Load	0.415	0.433	2	100.00
BCH PCC	Load	0.415	0.433	1	100.00
BLEND HANDLING MCC	Load	0.415	0.433	1	100.00
BOILER MCC	Load	0.415	0.433	1	100.00
BUS CONTROL ROOM	Load	11.000	11.000	1	100.00
Bus1	Load	11.000	11.500	1	100.00
Bus2	Load	11.000	11.500	1	100.00
Bus3	Load	11.000	11.500	1	100.00
Bus4	Load	0.415	0.433	1	100.00
Bus5	Load	11.000	11.500	1	100.00
Bus6	Load	11.000	11.500	1	100.00
Bus7	Load	0.415	0.433	1	100.00
Bus8	Load	11.000	11.500	1	100.00
Bus9	Load	3.300	3.450	1	100.00
Bus10	Load	0.415	0.433	1	100.00
Bus11	Load	0.415	0.433	1	100.00
Bus12	Load	3.300	3.450	1	100.00
Bus13	Load	11.000	11.500	1	100.00
Bus14	Load	0.415	0.433	1	100.00
Bus15	Load	11.000	11.500	1	100.00
Bus16	Load	0.415	0.433	1	100.00
Bus17	Load	11.000	11.500	1	100.00
Bus18	Load	11.000	11.500	1	100.00
Bus19	Load	0.415	0.433	1	100.00
Bus20	Load	11.000	11.500	1	100.00
Bus21	Load	0.415	0.433	1	100.00
Bus22	Load	11.000	11.500	1	100.00
Bus23	Load	0.415	0.433	1	100.00
Bus24	Load	0.415	0.433	1	100.00

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	4
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

ID	Type	Bus		Initial Voltage		
		Nom. kV	Base kV	Sub-sys	%Mag.	Ang.
Bus25	Load	11.000	11.500	1	100.00	0.00
Bus26	Load	3.300	3.450	1	100.00	0.00
Bus27	Load	0.415	0.453	1	100.00	0.00
Bus28	Load	3.300	3.450	1	100.00	0.00
Bus29	Load	0.415	0.453	1	100.00	0.00
Bus30	Load	3.300	3.450	1	100.00	0.00
Bus31	Load	0.415	0.453	1	100.00	0.00
Bus32	Load	3.300	3.450	1	100.00	0.00
Bus33	Load	0.415	0.453	1	100.00	0.00
Bus34	Load	0.415	0.453	1	100.00	0.00
Bus35	Load	0.415	0.453	1	100.00	0.00
Bus36	Load	0.415	0.453	1	100.00	0.00
Bus37	Load	0.415	0.453	2	100.00	0.00
Bus38	Load	0.415	0.453	1	100.00	0.00
Bus39	Load	0.415	0.453	1	100.00	0.00
Bus40	Load	0.415	0.453	1	100.00	0.00
Bus41	Load	0.415	0.453	1	100.00	0.00
Bus42	Load	0.415	0.453	1	100.00	0.00
Bus43	Load	0.415	0.453	1	100.00	0.00
Bus44	Load	11.000	11.000	1	100.00	0.00
Bus45	Load	11.000	11.000	1	100.00	0.00
Bus46	Load	11.000	11.000	1	100.00	0.00
Bus47	Load	11.000	11.000	1	100.00	0.00
Bus48	Load	11.000	11.000	1	100.00	0.00
Bus49	Load	11.000	11.000	1	100.00	0.00
Bus50	Load	11.000	11.000	1	100.00	0.00
Bus51	Load	11.000	11.000	1	100.00	0.00
Bus52	Load	11.000	11.000	1	100.00	0.00
Bus53	Load	0.415	0.453	1	100.00	0.00
Bus54	Load	0.415	0.453	1	100.00	0.00
Bus55	Load	0.415	0.453	1	100.00	0.00
Bus56	Load	0.415	0.453	1	100.00	0.00
Bus57	Load	11.000	11.000	1	100.00	0.00
Bus58	Load	0.415	0.453	1	100.00	0.00
Bus59	Load	0.415	0.453	1	100.00	0.00
Bus60	Load	0.415	0.453	1	100.00	0.00
Bus61	Load	0.415	0.453	1	100.00	0.00
Bus62	Load	0.415	0.453	1	100.00	0.00
Bus63	Load	0.415	0.453	1	100.00	0.00
Bus64	Load	0.415	0.453	1	100.00	0.00
Bus65	Load	0.415	0.453	1	100.00	0.00
Bus66	Load	0.415	0.453	1	100.00	0.00
Bus67	Load	0.415	0.453	1	100.00	0.00
Bus68	Load	0.415	0.453	1	100.00	0.00
Bus69	Load	0.415	0.453	1	100.00	0.00

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	5
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

ID	Type	Bus		Initial Voltage		
		Nom. kV	Base kV	Sub-sys	%Mag.	Ang.
Bus70	Load	0.415	0.453	1	100.00	0.00
Bus71	Load	0.415	0.453	1	100.00	0.00
Bus72	Load	0.415	0.453	1	100.00	0.00
Bus73	Load	0.415	0.453	1	100.00	0.00
Bus74	Load	0.415	0.453	1	100.00	0.00
Bus75	Load	0.415	0.453	1	100.00	0.00
Bus76	Load	0.415	0.453	1	100.00	0.00
Bus77	Load	0.415	0.453	1	100.00	0.00
Bus78	Load	0.415	0.453	1	100.00	0.00
Bus79	Load	0.415	0.453	1	100.00	0.00
Bus80	Load	0.415	0.453	1	100.00	0.00
Bus81	Load	0.415	0.433	1	100.00	0.00
Bus82	Load	0.415	0.433	2	100.00	0.00
Bus83	Load	0.415	0.433	2	100.00	0.00
Bus84	Load	0.415	0.433	2	100.00	0.00
Bus85	Load	0.415	0.433	2	100.00	0.00
Bus86	Load	0.415	0.433	2	100.00	0.00
Bus87	Load	0.415	0.433	2	100.00	0.00
Bus88	Load	0.415	0.453	1	100.00	0.00
Bus89	Load	0.415	0.433	2	100.00	0.00
Bus90	Load	0.415	0.453	1	100.00	0.00
Bus91	Load	0.415	0.433	2	100.00	0.00
Bus92	Load	0.415	0.453	1	100.00	0.00
Bus93	Load	0.415	0.433	1	100.00	0.00
Bus94	Load	0.415	0.453	1	100.00	0.00
Bus95	Load	0.415	0.433	1	100.00	0.00
Bus96	Load	0.415	0.453	1	100.00	0.00
Bus97	Load	0.415	0.433	1	100.00	0.00
Bus98	Load	0.415	0.453	1	100.00	0.00
Bus99	Load	0.415	0.433	1	100.00	0.00
Bus100	Load	0.415	0.453	1	100.00	0.00
Bus101	Load	0.415	0.433	1	100.00	0.00
Bus102	Load	0.415	0.433	1	100.00	0.00
Bus103	Load	0.415	0.433	1	100.00	0.00
Bus104	Load	0.415	0.433	1	100.00	0.00
Bus105	Load	0.415	0.433	1	100.00	0.00
Bus106	Load	0.415	0.433	1	100.00	0.00
Bus107	Load	0.415	0.433	1	100.00	0.00
Bus108	Load	0.415	0.433	1	100.00	0.00
Bus109	Load	0.415	0.433	1	100.00	0.00
Bus110	Load	0.415	0.433	1	100.00	0.00
Bus111	Load	0.415	0.433	1	100.00	0.00
Bus112	Load	0.415	0.433	1	100.00	0.00
Bus113	Load	0.415	0.433	1	100.00	0.00
Bus114	Load	0.415	0.433	1	100.00	0.00

Project: ARC FLASH STUDY HZL -DEBARI

ETAP

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Location: DEBARI

19.0.1C

Date: 29-11-2023

Contract: SPARROW RMS

SN:

Engineer: MR. SUMIT KUMAR JHA

Revision: Base

Filename: HZL DEBARI SMELTER

Study Case: A_SC

Config.: Normal

Bus				Initial Voltage		
ID	Type	Nom. kV	Base kV	Sub-sys	%Mag.	Ang.
Bus115	Load	0.415	0.433	1	100.00	0.00
Bus116	Load	0.415	0.433	1	100.00	0.00
Bus117	Load	0.415	0.433	1	100.00	0.00
Bus118	Load	0.415	0.433	1	100.00	0.00
Bus119	Load	0.415	0.433	1	100.00	0.00
Bus120	Load	0.415	0.433	1	100.00	0.00
Bus121	Load	0.415	0.433	1	100.00	0.00
Bus122	Load	0.415	0.433	1	100.00	0.00
Bus123	Load	0.415	0.433	1	100.00	0.00
Bus124	Load	0.415	0.433	1	100.00	0.00
Bus125	Load	0.415	0.433	1	100.00	0.00
Bus126	Load	0.415	0.433	1	100.00	0.00
Bus127	Load	0.415	0.433	1	100.00	0.00
Bus128	Load	0.415	0.433	1	100.00	0.00
Bus129	Load	11.000	11.000	1	100.00	0.00
Bus130	Load	6.600	6.600	1	100.00	0.00
Bus131	Load	0.415	0.433	1	100.00	0.00
Bus132	Load	0.415	0.433	1	100.00	0.00
Bus133	Load	11.000	11.000	1	100.00	0.00
Bus134	Load	0.415	0.433	1	100.00	0.00
Bus135	Load	11.000	11.000	1	100.00	0.00
Bus136	Load	0.415	0.433	1	100.00	0.00
Bus137	Load	0.415	0.433	1	100.00	0.00
Bus138	Load	0.415	0.433	1	100.00	0.00
Bus139	Load	0.415	0.433	1	100.00	0.00
Bus140	Load	6.600	6.600	1	100.00	0.00
Bus141	Load	0.415	0.433	1	100.00	0.00
Bus142	Load	11.000	11.000	2	100.00	0.00
Bus143	Load	0.415	0.433	1	100.00	0.00
Bus144	Load	11.000	11.000	2	100.00	0.00
Bus145	Load	0.415	0.433	1	100.00	0.00
Bus146	Load	6.600	6.600	1	100.00	0.00
Bus147	Load	0.415	0.433	1	100.00	0.00
Bus148	Load	0.415	0.433	1	100.00	0.00
Bus149	Load	0.415	0.433	1	100.00	0.00
Bus150	Load	0.415	0.433	1	100.00	0.00
Bus151	Load	0.415	0.433	1	100.00	0.00
Bus152	Load	0.415	0.433	1	100.00	0.00
Bus153	Load	0.415	0.433	1	100.00	0.00
Bus154	Load	11.000	11.000	2	100.00	0.00
Bus155	Load	0.415	0.433	1	100.00	0.00
Bus156	Load	11.000	11.000	2	100.00	0.00
Bus157	Load	0.415	0.433	1	100.00	0.00
Bus158	Load	11.000	11.000	2	100.00	0.00
Bus159	Load	0.415	0.433	1	100.00	0.00

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	7
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Bus			Initial Voltage		
ID	Type	Nom. kV	Base kV	Sub-sys	%Mag.
					Ang.
Bus160	Load	0.415	0.433	1	100.00
Bus161	Load	0.415	0.433	1	100.00
Bus162	Load	11.000	11.000	2	100.00
Bus163	Load	0.415	0.433	1	100.00
Bus164	Load	0.415	0.433	1	100.00
Bus165	Load	0.415	0.433	1	100.00
Bus166	Load	0.415	0.433	1	100.00
Bus167	Load	0.415	0.433	1	100.00
Bus168	Load	0.415	0.433	2	100.00
Bus169	Load	0.415	0.433	2	100.00
Bus170	Load	6.600	6.600	1	100.00
Bus171	Load	6.600	6.600	1	100.00
Bus173	Load	11.000	11.000	2	100.00
Bus174	Load	11.000	11.000	2	100.00
Bus175	Load	11.000	11.000	2	100.00
Bus176	Load	0.415	0.415	2	100.00
Bus177	Load	0.415	0.415	2	100.00
Bus178	Load	0.415	0.415	2	100.00
Bus179	Load	11.000	11.500	1	100.00
Bus180	Load	11.000	11.000	1	100.00
Bus181	Load	11.000	11.500	1	100.00
Bus182	Load	11.000	11.500	1	100.00
Bus183	Load	11.000	11.000	1	100.00
Bus184	Load	11.000	11.500	1	100.00
Bus185	Load	11.000	11.000	1	100.00
Bus186	SWNG	11.000	11.000	2	100.00
Bus187	SWNG	11.000	11.000	3	100.00
Bus188	Load	11.000	11.000	2	100.00
Bus189	Load	11.000	11.000	2	100.00
Bus190	Load	11.000	11.000	2	100.00
Bus191	Load	11.000	11.000	2	100.00
Bus192	Load	11.000	11.000	2	100.00
Bus193	Load	11.000	11.000	2	100.00
Bus194	Load	11.000	11.000	1	100.00
Bus195	Load	0.415	0.453	1	100.00
Bus196	Load	0.415	0.453	1	100.00
Bus197	Load	0.415	0.453	1	100.00
Bus198	Load	0.415	0.453	1	100.00
Bus199	Load	0.415	0.453	1	100.00
Bus200	Load	0.415	0.453	1	100.00
Bus201	Load	0.415	0.453	1	100.00
Bus202	Load	0.415	0.453	1	100.00
Bus203	Load	0.415	0.433	2	100.00
Bus204	Load	0.380	0.380	1	100.00
Bus205	Load	0.380	0.380	1	100.00

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	8
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Bus			Initial Voltage		
ID	Type	Nom. kV	Base kV	Sub-sys	%Mag.
					Ang.
Bus206	Load	0.380	0.380	1	100.00
Bus210	Load	0.380	0.380	1	100.00
Bus211	Load	0.380	0.380	1	100.00
Bus212	Load	0.380	0.380	1	100.00
Bus219	Load	0.380	0.380	1	100.00
Bus220	Load	0.380	0.380	1	100.00
Bus221	Load	0.380	0.380	1	100.00
Bus222	Load	0.380	0.380	1	100.00
Bus223	Load	0.380	0.380	1	100.00
Bus224	Load	0.380	0.380	1	100.00
Bus230	Load	0.380	0.380	1	100.00
Bus231	Load	0.380	0.380	1	100.00
Bus232	Load	0.380	0.380	1	100.00
Bus233	Load	0.380	0.380	1	100.00
Bus234	Load	0.380	0.380	1	100.00
Bus235	Load	0.380	0.380	1	100.00
Bus236	Load	11.000	11.000	1	100.00
Bus237	Load	11.000	11.000	1	100.00
Bus238	Load	0.380	0.380	1	100.00
Bus239	Load	0.380	0.380	1	100.00
Bus240	Load	0.380	0.380	1	100.00
Bus241	Load	0.380	0.380	1	100.00
Bus242	Load	0.380	0.380	1	100.00
Bus243	Load	0.380	0.380	1	100.00
Bus244	Load	0.380	0.380	1	100.00
Bus245	Load	0.380	0.380	1	100.00
Bus246	Load	0.380	0.380	1	100.00
Bus247	Load	0.380	0.380	1	100.00
Bus248	Load	0.380	0.380	1	100.00
Bus249	Load	0.380	0.380	1	100.00
Bus250	Load	11.000	11.000	1	100.00
Bus251	Load	11.000	11.000	1	100.00
Bus252	Load	0.380	0.380	1	100.00
Bus253	Load	0.380	0.380	1	100.00
Bus254	Load	0.380	0.380	1	100.00
Bus255	Load	0.380	0.380	1	100.00
Bus256	Load	0.380	0.380	1	100.00
Bus257	Load	0.380	0.380	1	100.00
CADMUM MCC	Load	0.415	0.433	1	100.00
CADMUM OLD MCC	Load	0.415	0.433	1	100.00
CADMUM PCC	Load	0.415	0.433	1	100.00
CANAL PH	Load	0.415	0.433	2	100.00
CANAL PUMP MCC	Load	0.415	0.433	2	100.00
CDSS 3.3KV PANEL S_1	Load	3.300	3.450	1	100.00
CDSS 3.3KV PANEL S_2	Load	3.300	3.450	1	100.00

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	9
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

ID	Type	Bus		Initial Voltage	
		Nom. kV	Base kV	Sub-sys	%Mag.
CDSS 11KV PANEL S_1	Load	11.000	11.500	1	100.00
CDSS 11KV PANEL S_2	Load	11.000	11.500	1	100.00
CLDC MCC S_1	Load	0.415	0.433	1	100.00
COLONY OVER HEAD LINE	Load	11.000	11.000	2	100.00
COMP L&T MCC	Load	0.415	0.433	1	100.00
COMP. HOUSE MCC	Load	0.415	0.433	1	100.00
COMPRESSOR PANEL	Load	0.415	0.433	1	100.00
COOLING TWR MCC	Load	0.415	0.433	1	100.00
DG BUS-A	Load	11.000	11.000	2	100.00
DG BUS-B	Load	11.000	11.000	2	100.00
DM PLANT MCC S_1	Load	0.415	0.433	1	100.00
DM PLANT MCC S_2	Load	0.415	0.433	1	100.00
DT SOFT STARTER PNL	Load	0.415	0.433	1	100.00
ETP OPERATOR.MCC	Load	0.415	0.433	2	100.00
ETP PCC	Load	0.415	0.433	2	100.00
ETP PUMP MCC	Load	0.415	0.433	2	100.00
FAT SOFT STARTER PNL	Load	0.415	0.433	1	100.00
FILTER WATER MCC S_1	Load	0.415	0.433	1	100.00
FILTER WATER MCC S_2	Load	0.415	0.433	1	100.00
FILTRATION MCC-3	Load	0.415	0.433	1	100.00
GE MCC	Load	0.415	0.433	1	100.00
LAT SOFT STARTER PNL	Load	0.415	0.433	1	100.00
INDUCTION FURNACE PCC	Load	0.415	0.433	1	100.00
INTERLAC MCC	Load	0.415	0.433	1	100.00
INV. ROOM-1 BUS	Load	11.000	11.000	1	100.00
INV. ROOM-2 BUS	Load	11.000	11.000	1	100.00
JAROSITE FILTER PRESS MCC	Load	0.415	0.433	1	100.00
JYOTI PANEL S_1	Load	11.000	11.000	1	100.00
JYOTI PANEL S_2	Load	11.000	11.000	1	100.00
JYOTI PANEL S_3	Load	11.000	11.000	2	100.00
L&P MCC-2	Load	0.415	0.433	1	100.00
L&T MCC (MCC-3)	Load	0.415	0.433	1	100.00
L&T PH-1 MCC	Load	0.415	0.433	1	100.00
LEACHING MCC-1	Load	0.415	0.433	1	100.00
LEACHING MCC 201B1	Load	0.415	0.433	1	100.00
LEACHING MCC 201B2	Load	0.415	0.433	1	100.00
LEACHING MCC 201C	Load	0.415	0.433	1	100.00
LEECHATE MCC	Load	0.415	0.433	2	100.00
LIME MCC PANEL	Load	0.415	0.433	2	100.00
LR MILL	Load	0.415	0.433	1	100.00
MCC PANEL-1 S_1	Load	0.415	0.433	1	100.00
MCC PANEL-1 S_2	Load	0.415	0.433	1	100.00
MCC PANEL-2 S_1	Load	0.415	0.433	1	100.00

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	10
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Bus			Initial Voltage		
ID	Type	Nom. kV	Base kV	Sub-sys	%Mag.
					Ang.
MCC PANEL -2 S_2	Load	0.415	0.453	1	100.00
MCC PUMP HOUSE-2	Load	0.415	0.433	1	100.00
MCC PUMP HOUSE-3	Load	0.415	0.433	1	100.00
MCC-111 S_1	Load	0.415	0.453	1	100.00
MCC-111 S_2	Load	0.415	0.453	1	100.00
MCC-112	Load	0.415	0.453	1	100.00
MCC-112 S_2	Load	0.415	0.453	1	100.00
MCC-113 RMH S_1	Load	0.415	0.453	1	100.00
MCC-113 RMH S_2	Load	0.415	0.453	1	100.00
MCC-114 S_1	Load	0.415	0.453	1	100.00
MCC-114 S_2	Load	0.415	0.453	1	100.00
MCC-115 S_1	Load	0.415	0.453	1	100.00
MCC-115 S_2	Load	0.415	0.453	1	100.00
MCC-116	Load	0.415	0.453	1	100.00
MCC-116 S_2	Load	0.415	0.453	1	100.00
MCTP MCC-1	Load	0.415	0.433	1	100.00
MCTP MCC-2	Load	0.415	0.433	1	100.00
MCTP MCC-3	Load	0.415	0.433	1	100.00
MELTING FURNACE PCC	Load	0.415	0.453	2	100.00
MG PANEL (SS-1) S_1	Load	0.415	0.433	1	100.00
MG PANEL (SS-1) S_2	Load	0.415	0.433	1	100.00
MR MCC PANEL	Load	0.415	0.433	1	100.00
NEW DM PLANT MCC S_1	Load	0.415	0.433	1	100.00
NEW DM PLANT MCC S_2	Load	0.415	0.433	1	100.00
NEW DPH	Load	0.415	0.433	1	100.00
PAP PCC/(SS-3)	Load	0.415	0.433	1	100.00
PCC-111 S_1	Load	0.415	0.453	1	100.00
PCC-111 S_2	Load	0.415	0.453	1	100.00
PCC-112 S_1	Load	0.415	0.453	1	100.00
PCC-112 S_2	Load	0.415	0.453	1	100.00
PCC-113 S_1	Load	0.415	0.453	1	100.00
PCC-113 S_2	Load	0.415	0.453	1	100.00
PDB-111 S_1	Load	0.415	0.453	1	100.00
PDB-111 S_2	Load	0.415	0.453	1	100.00
PDB-112 S_1	Load	0.415	0.453	1	100.00
PDB-112 S_2	Load	0.415	0.453	1	100.00
PH-1 MCC PANEL	Load	0.415	0.433	1	100.00
PURIFICATION MCC	Load	0.415	0.433	1	100.00
PYROTEC LP MCC	Load	0.415	0.433	1	100.00
PYROTEC PCC	Load	0.415	0.433	2	100.00
PYROTECH PCC	Load	0.415	0.433	1	100.00
R-2 ACID PLANT MCC	Load	0.415	0.433	1	100.00
RO MCC PANEL	Load	0.415	0.433	2	100.00
RO PLANT MCC	Load	0.415	0.433	1	100.00
RO ZLD PCC	Load	0.415	0.453	1	100.00

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	11
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Bus			Initial Voltage		
ID	Type	Nom. kV	Base kV	Sub-sys	%Mag.
ROASTER GE MCC	Load	0.415	0.433	1	100.00
ROASTER- II L & TMCC	Load	0.415	0.433	1	100.00
RODPHI MCC	Load	0.415	0.433	1	100.00
SIEMENS BUS-A	Load	11.000	11.500	1	100.00
SIEMENS BUS-B	Load	11.000	11.500	1	100.00
SOLAR 11KV HT PNL	Load	11.000	11.000	1	100.00
STG MCC-118 S_1	Load	0.415	0.433	1	100.00
STG MCC-118 S_2	Load	0.415	0.453	1	100.00
SUBSTATION PHE PCC	Load	0.415	0.433	1	100.00
SUBSTATION-2 PCC S_1	Load	0.415	0.433	1	100.00
SUBSTATION-2 PCC S_2	Load	0.415	0.433	1	100.00
SUBSTATION-4 PCC S_1	Load	0.415	0.433	1	100.00
SUBSTATION-4 PCC S_2	Load	0.415	0.433	1	100.00
SUBSTATION-5 PCC S_1	Load	0.415	0.433	1	100.00
SUBSTATION-5 PCC S_2	Load	0.415	0.433	1	100.00
SUBSTATION-5 PCC S_3	Load	0.415	0.433	1	100.00
SUBSTATION-6 PCC	Load	0.415	0.433	1	100.00
SUBSTATION-7 PCC	Load	0.415	0.433	1	100.00
SULZER MCC	Load	0.415	0.433	1	100.00
TGT MCC PANEL	Load	0.415	0.433	1	100.00
VFD PANEL-1 S_1	Load	0.415	0.453	1	100.00
VFD PANEL-1 S_2	Load	0.415	0.453	1	100.00
VFD PANEL-2 S_1	Load	0.415	0.453	1	100.00
VFD PANEL-2 S_2	Load	0.415	0.453	1	100.00
WARTSILA-CISF	Load	0.415	0.433	1	100.00
WATER CLARIFIER MCC	Load	0.415	0.433	1	100.00
ZE PYROTEC MCC	Load	0.415	0.433	1	100.00
TR-1A BHEL~3	Load	11.000	11.000	1	100.00
TR-2A BHEL~3	Load	11.000	11.000	1	100.00

383 Buses Total

All voltages reported by ETAP are in % of bus Nominal kV.
Base kV values of buses are calculated and used internally by ETAP.

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	12
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Bus / Enclosure Input Data

Faulted Bus			Arc Flash Ratings								
Enclosure ID	ID	Nom. kV	Equipment Type	Electrode Configuration	Conductor		Enclosure Dimensions (mm)			Working Distance (cm)	Avail. Protection cal/cm²
					Type	Gap (mm)	Height	Width	Depth		
	6.6KV HT PANEL	6.600	Switchgear	VCB	Aluminum	152	1143	762	762	91	
	132KV HZL BUS S_1	132.000	Switchrack	VCB	Aluminum					122	
	132KV HZL BUS S_2	132.000	Switchgear	VCB	Aluminum					122	
	301A MCC	0.415	MCC	VCB	Aluminum	25	356	305	204	46	
	301B MCC	0.415	MCC	VCB	Aluminum	25	356	305	204	46	
	ABB BUS	11.000	Switchgear	VCB	Aluminum	152	1143	762	762	91	
	ACID LOADING MCC	0.415	MCC	VCB	Aluminum	25	356	305	204	46	
	ACTUATOR MCC	0.415	Other	VCB	Copper	13	356	305	204	46	
	ADMIN LT ROOM	0.415	MCC	VCB	Aluminum	25	356	305	204	46	
	ANDREW YULE PANEL S_1	11.000	Switchgear	VCB	Aluminum	152	1143	762	762	91	
	ANDREW YULE PANEL S_2	11.000	Switchgear	VCB	Aluminum	152	1143	762	762	91	
	BCH MCC PANEL	0.415	MCC	VCB	Aluminum	25	356	305	204	46	
	BCH PCC	0.415	Switchgear	VCB	Aluminum	32	508	508	508	61	
	BLEND HANDLING MCC	0.415	MCC	VCB	Aluminum	25	356	305	204	46	
	BOILER MCC	0.415	MCC	VCB	Aluminum	25	356	305	204	46	
	BUS CONTROL ROOM	11.000	Switchgear	VCB	Aluminum	152	1143	762	762	91	
	CADIUM MCC	0.415	MCC	VCB	Aluminum	25	356	305	204	46	
	CADIUM OLD MCC	0.415	MCC	VCB	Aluminum	25	356	305	204	46	
	CADIUM PCC	0.415	Switchgear	VCB	Aluminum	32	508	508	508	61	
	CANAL PH	0.415	MCC	VCB	Aluminum	25	356	305	204	46	

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Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Faulted Bus			Arc Flash Ratings								
Enclosure ID	ID	Nom. kV	Equipment Type	Electrode Configuration	Conductor		Enclosure Dimensions (mm)			Working Distance (cm)	Avail. Protection cal/cm²
					Type	Gap (mm)	Height	Width	Depth		
	CANAL PUMP MCC	0.415	MCC	VCB	Aluminum	25	356	305	204	46	
	CDSS 3.3KV PANEL S_1	3.300	Switchgear	VCB	Aluminum	104	914	914	914	91	
	CDSS 3.3KV PANEL S_2	3.300	Switchgear	VCB	Aluminum	104	914	914	914	91	
	CDSS 11KV PANEL S_1	11.000	Switchgear	VCB	Aluminum	152	1143	762	762	91	
	CDSS 11KV PANEL S_2	11.000	Switchgear	VCB	Aluminum	152	1143	762	762	91	
	CLDC MCC S_1	0.415	MCC	VCB	Aluminum	25	356	305	204	46	
	COLONY OVER HEAD LINE	11.000	Switchgear	VCB	Aluminum	152	1143	762	762	91	
	COMP L&T MCC	0.415	MCC	VCB	Aluminum	25	356	305	204	46	
	COMP. HOUSE MCC	0.415	MCC	VCB	Copper	25	356	305	204	46	
	COMPRESSOR PANEL	0.415	Switchgear	VCB	Aluminum	32	508	508	508	61	
	COOLING TWR MCC	0.415	MCC	VCB	Aluminum	25	356	305	204	46	
	DG BUS-A	11.000	Switchgear	VCB	Aluminum	152	1143	762	762	91	
	DG BUS-B	11.000	Switchgear	VCB	Aluminum	152	1143	762	762	91	
	DM PLANT MCC S_1	0.415	MCC	VCB	Aluminum	25	356	305	204	46	
	DM PLANT MCC S_2	0.415	MCC	VCB	Aluminum	25	356	305	204	46	
	DT SOFT STARTER PNL	0.415	MCC	VCB	Copper	25	356	305	204	46	
	ETP OPERATOR MCC	0.415	MCC	VCB	Aluminum	25	356	305	204	46	
	ETP PCC	0.415	Switchgear	VCB	Aluminum	32	508	508	508	61	
	ETP PUMP MCC	0.415	MCC	VCB	Aluminum	25	356	305	204	46	
	FAT SOFT STARTER PNL	0.415	MCC	VCB	Copper	25	356	305	204	46	
	FILTER WATER MCC S_1	0.415	MCC	VCB	Aluminum	25	356	305	204	46	
	FILTER WATER MCC S_2	0.415	Other	VCB	Aluminum	13	356	305	204	46	
	FILTERATION MCC-3	0.415	MCC	VCB	Aluminum	25	356	305	204	46	

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Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Faulted Bus			Arc Flash Ratings								
Enclosure ID	ID	Nom. kV	Equipment Type	Electrode Configuration	Conductor		Enclosure Dimensions (mm)			Working Distance (cm)	Avail. Protection cal/cm²
					Type	Gap (mm)	Height	Width	Depth		
GE MCC		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
IAT SOFT STARTER PNL		0.415	MCC	VCB	Copper	25	356	305	204	46	
INDUCTION FURNACE PCC		0.415	Switchgear	VCB	Aluminum	32	508	508	508	61	
INTERLAC MCC		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
INV. ROOM-1 BUS		11.000	Switchgear	VCB	Aluminum	152	1143	762	762	91	
INV. ROOM-2 BUS		11.000	Switchgear	VCB	Aluminum	152	1143	762	762	91	
JAROSITE FILTER PRESS MCC		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
JYOTI PANEL S_1		11.000	Switchgear	VCB	Copper	152	1143	762	762	91	
JYOTI PANEL S_2		11.000	Switchgear	VCB	Copper	152	1143	762	762	91	
JYOTI PANEL S_3		11.000	Switchgear	VCB	Copper	152	1143	762	762	91	
L&P MCC-2		0.415	MCC	VCB	Copper	25	356	305	204	46	
L&T MCC (MCC-3)		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
L&T PH-1 MCC		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
LEACHING MCC-1		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
LEACHING MCC 201B1		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
LEACHING MCC 201B2		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
LEACHING MCC 201C		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
LEECHATE MCC		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
LIME MCC PANEL		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
LR MILL		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
MCC PANEL-1 S_1		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
MCC PANEL-1 S_2		0.415	Other	VCB	Aluminum	13	356	305	204	46	
MCC PANEL-2 S_1		0.415	MCC	VCB	Aluminum	25	356	305	204	46	

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Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Faulted Bus			Arc Flash Ratings								
Enclosure ID	ID	Nom. kV	Equipment Type	Electrode Configuration	Conductor		Enclosure Dimensions (mm)			Working Distance (cm)	Avail. Protection cal/cm²
					Type	Gap (mm)	Height	Width	Depth		
MCC PANEL -2 S_2		0.415	Other	VCB	Aluminum	13	356	305	204	46	
MCC PUMP HOUSE-2		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
MCC PUMP HOUSE-3		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
MCC-111 S_1		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
MCC-111 S_2		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
MCC-112		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
MCC-112 S_2		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
MCC-113 RMH S_1		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
MCC-113 RMH S_2		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
MCC-114 S_1		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
MCC-114 S_2		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
MCC-115 S_1		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
MCC-115 S_2		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
MCC-116		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
MCC-116 S_2		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
MCTP MCC-1		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
MCTP MCC-2		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
MCTP MCC-3		0.415	MCC	VCB	Copper	25	356	305	204	46	
MELTING FURNACE PCC		0.415	Switchgear	VCB	Aluminum	32	508	508	508	61	
MG PANEL (SS-1) S_1		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
MG PANEL (SS-1) S_2		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
MR MCC PANEL		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
NEW DM PLANT MCC S_1		0.415	MCC	VCB	Aluminum	25	356	305	204	46	

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Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Faulted Bus			Arc Flash Ratings									
Enclosure ID	ID	Nom. kV	Equipment Type	Electrode Configuration	Conductor			Enclosure Dimensions (mm)			Working Distance (cm)	Avail. Protection cal/cm²
					Type	Gap (mm)	Height	Width	Depth			
NEW DM PLANT MCC S_2		0.415	MCC	VCB	Aluminum	25	356	305	204	46		
NEW DPH		0.415	MCC	VCB	Aluminum	25	356	305	204	46		
PAP PCC(SS-3)		0.415	Switchgear	VCB	Aluminum	32	508	508	508	61		
PCC-111 S_1		0.415	Switchgear	VCB	Aluminum	32	508	508	508	61		
PCC-111 S_2		0.415	Switchgear	VCB	Aluminum	32	508	508	508	61		
PCC-112 S_1		0.415	Switchgear	VCB	Aluminum	32	508	508	508	61		
PCC-112 S_2		0.415	Switchgear	VCB	Aluminum	32	508	508	508	61		
PDB-112 S_2		0.415	MCC	VCB	Aluminum	25	356	305	204	46		
PH-1 MCC PANEL		0.415	MCC	VCB	Aluminum	25	356	305	204	46		
PURIFICATION MCC		0.415	MCC	VCB	Aluminum	25	356	305	204	46		
PYROTEC LP MCC		0.415	MCC	VCB	Aluminum	25	356	305	204	46		
PCC-113 S_1		0.415	Switchgear	VCB	Aluminum	32	508	508	508	61		
PCC-113 S_2		0.415	Switchgear	VCB	Aluminum	32	508	508	508	61		
PDB-111 S_1		0.415	MCC	VCB	Aluminum	25	356	305	204	46		
PDB-111 S_2		0.415	MCC	VCB	Aluminum	25	356	305	204	46		
PDB-112 S_1		0.415	MCC	VCB	Aluminum	25	356	305	204	46		
PYROTEC PCC		0.415	MCC	VCB	Aluminum	25	356	305	204	46		
PYROTECH PCC		0.415	Switchgear	VCB	Aluminum	32	508	508	508	61		
R-2 ACID PLANT MCC		0.415	MCC	VCB	Aluminum	25	356	305	204	46		
RO MCC PANEL		0.415	MCC	VCB	Aluminum	25	356	305	204	46		
SIEMENS BUS-A		11.000	Switchgear	VCB	Aluminum	152	1143	762	762	91		
SIEMENS BUS-B		11.000	Switchgear	VCB	Aluminum	152	1143	762	762	91		
SOLAR 11KV HT PNL		11.000	Switchgear	VCB	Aluminum	152	1143	762	762	91		

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Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Faulted Bus			Arc Flash Ratings									
Enclosure ID	ID	Nom. kV	Equipment Type	Electrode Configuration	Conductor			Enclosure Dimensions (mm)			Working Distance (cm)	Avail. Protection cal/cm²
					Type	Gap (mm)	Height	Width	Depth			
STG MCC-118 S_1		0.415	MCC	VCB	Aluminum	25	356	305	204	46		
STG MCC-118 S_2		0.415	MCC	VCB	Aluminum	25	356	305	204	46		
RO ZLD MCC		0.415	MCC	VCB	Aluminum	25	356	305	204	46		
RO ZLD PCC		0.415	Switchgear	VCB	Aluminum	32	508	508	508	61		
ROASTER GE MCC		0.415	MCC	VCB	Aluminum	25	356	305	204	46		
ROASTER-II L & T MCC		0.415	MCC	VCB	Aluminum	25	356	305	204	46		
RODPH MCC		0.415	MCC	VCB	Aluminum	25	356	305	204	46		
SUBSTATION PHE PCC		0.415	Switchgear	VCB	Aluminum	32	508	508	508	61		
SUBSTATION-2 PCC S_1		0.415	Switchgear	VCB	Aluminum	32	508	508	508	61		
SUBSTATION-2 PCC S_2		0.415	Switchgear	VCB	Aluminum	32	508	508	508	61		
SUBSTATION-4 PCC S_1		0.415	Switchgear	VCB	Aluminum	32	508	508	508	61		
SUBSTATION-4 PCC S_2		0.415	Switchgear	VCB	Aluminum	32	508	508	508	61		
VFD PANEL-2 S_2		0.415	MCC	VCB	Aluminum	25	356	305	204	46		
WARTSILA-CISF		0.415	MCC	VCB	Aluminum	25	356	305	204	46		
WATER CLARIFIER MCC		0.415	MCC	VCB	Aluminum	25	356	305	204	46		
ZE PYROTEC MCC		0.415	MCC	VCB	Aluminum	25	356	305	204	46		
SUBSTATION-5 PCC S_1		0.415	Switchgear	VCB	Aluminum	32	508	508	508	61		
SUBSTATION-5 PCC S_2		0.415	Switchgear	VCB	Aluminum	32	508	508	508	61		
SUBSTATION-5 PCC S_3		0.415	Switchgear	VCB	Aluminum	32	508	508	508	61		
SUBSTATION-6 PCC		0.415	Switchgear	VCB	Aluminum	32	508	508	508	61		
SUBSTATION-7 PCC		0.415	Switchgear	VCB	Aluminum	32	508	508	508	61		
SULZER MCC		0.415	MCC	VCB	Aluminum	25	356	305	204	46		
TGT MCC PANEL		0.415	MCC	VCB	Aluminum	25	356	305	204	46		

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Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Faulted Bus			Arc Flash Ratings								
Enclosure ID	ID	Nom. kV	Equipment Type	Electrode Configuration	Conductor		Enclosure Dimensions (mm)			Working Distance (cm)	Avail. Protection cal/cm²
					Type	Gap (mm)	Height	Width	Depth		
VFD PANEL-1 S_1		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
VFD PANEL-1 S_2		0.415	MCC	VCB	Aluminum	25	356	305	204	46	
VFD PANEL-2 S_1		0.415	MCC	VCB	Aluminum	25	356	305	204	46	

The Gap is not utilized if the theoretically derived Lee method was used to determine the incident energy and arc flash boundary.
The Lee method is used if the bus voltage and/or short-circuit parameters are outside the range covered by the IEEE 1584 empirical equations.

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Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Line/Cable/Busway Input Data

ohms or siemens/1000 m per Conductor (Cable) or per Phase (Line/Busway)

Line/Cable/Busway	ID	Library	Size	Length				R	X	Y
				Adj. (m)	% Tol.	#Phase	T (°C)			
Cable1		11NALN3	240	70.0	0	1	20	0.12635	0.10200	0.0000000
Cable2		1.1NALN4	240	40.0	0	1	20	0.13260	0.07200	0.0000000
Cable3		1.1NALN4	300	30.0	0	1	20	0.10641	0.07100	0.0000000
Cable4		1.1NALN4	240	50.0	0	4	20	0.13260	0.07200	0.0000000
Cable5		11NALN3	185	50.0	0	1	20	0.16457	0.10500	0.0000000
Cable6		1.1NALN4	185	40.0	0	1	20	0.17271	0.07200	0.0000000
Cable7		1.1NALN4	150	35.0	0	1	20	0.21691	0.07200	0.0000000
Cable8		1.1NALN4	150	35.0	0	1	20	0.21691	0.07200	0.0000000
Cable9		11NALN3	240	70.0	0	1	20	0.12635	0.10200	0.0000000
Cable10		1.1NALN3	185	510.0	0	1	20	0.16457	0.07200	0.0000000
Cable11		11NALN3	240	80.0	0	1	20	0.12635	0.10200	0.0000000
Cable12		11NALN3	240	90.0	0	1	20	0.12635	0.10200	0.0000000
Cable13		11NALS1	630	1000.0	0	2	20	0.04992	0.09610	0.0000000
Cable14		1.1NALN4	95	20.0	0	1	20	0.33642	0.07400	0.0000000
Cable15		11NALN3	240	70.0	0	1	20	0.12635	0.10200	0.0000000
Cable16		3.3NALN3	240	70.0	0	1	20	0.12635	0.07300	0.0000000
Cable17		1.1NALN3	185	510.0	0	1	20	0.16457	0.07200	0.0000000
Cable18		1.1NALN4	150	35.0	0	1	20	0.21691	0.07200	0.0000000
Cable19		3.3NALN3	240	70.0	0	1	20	0.12635	0.07300	0.0000000
Cable20		11NALN3	240	70.0	0	1	20	0.12635	0.10200	0.0000000
Cable21		1.1NALN3	185	510.0	0	1	20	0.16457	0.07200	0.0000000
Cable22		11NALN3	240	70.0	0	1	20	0.12635	0.10200	0.0000000
Cable23		1.1NALN4	240	40.0	0	4	20	0.13260	0.07200	0.0000000
Cable24		11NALN3	185	20.0	0	1	20	0.16457	0.10500	0.0000000
Cable25		1.1NALN3	185	510.0	0	1	20	0.16457	0.07200	0.0000000
Cable26		11NALN3	240	70.0	0	1	20	0.12635	0.10200	0.0000000
Cable27		11NALN3	240	80.0	0	1	20	0.12635	0.10200	0.0000000
Cable28		1.1NALN4	240	70.0	0	4	20	0.13260	0.07200	0.0000000
Cable29		11NALN3	240	90.0	0	1	20	0.12635	0.10200	0.0000000
Cable30		1.1NALN4	240	50.0	0	4	20	0.13260	0.07200	0.0000000
Cable31		11NALN3	150	10.0	0	1	20	0.20669	0.10800	0.0000000
Cable32		1.1NALN4	240	55.0	0	4	20	0.13260	0.07200	0.0000000
Cable33		1.1NALN3	185	510.0	0	1	20	0.16457	0.07200	0.0000000
Cable34		11NALS1	500	2000.0	0	2	20	0.06518	0.09980	0.0000000
Cable35		1.1NALN4	95	20.0	0	1	20	0.33642	0.07400	0.0000000
Cable36		3.3NALN3	150	20.0	0	1	20	0.20669	0.07600	0.0000000
Cable37		1.1NALN4	185	30.0	0	1	20	0.17271	0.07200	0.0000000
Cable38		1.1NALN3	185	510.0	0	1	20	0.16457	0.07200	0.0000000

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Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

ohms or siemens/1000 m per Conductor (Cable) or per Phase (Line/Busway)

Line/Cable/Busway	ID	Library	Size	Length				R	X	Y
				Adj. (m)	% Tol.	# Phase	T (°C)			
Cable39		3.3NALN3	150	30.0	0	1	20	0.20669	0.07600	0.0000000
Cable41		1.1NALN4	240	54.0	0	4	20	0.13260	0.07200	0.0000000
Cable42		11NALN3	95	50.0	0	1	20	0.31978	0.11600	0.0000000
Cable43		3.3NALN3	150	20.0	0	1	20	0.20669	0.07600	0.0000000
Cable44		1.1NALN4	240	40.0	0	4	20	0.13260	0.07200	0.0000000
Cable45		1.1NALN4	240	30.0	0	4	20	0.13260	0.07200	0.0000000
Cable47		3.3NALN3	150	35.0	0	1	20	0.20669	0.07600	0.0000000
Cable48		1.1NALN4	240	35.0	0	4	20	0.13260	0.07200	0.0000000
Cable49		1.1NALN4	240	40.0	0	4	20	0.13260	0.07200	0.0000000
Cable50		1.1NALN4	240	70.0	0	4	20	0.13260	0.07200	0.0000000
Cable51		1.1NALN3	95	200.0	0	1	20	0.32056	0.07400	0.0000000
Cable52		1.1NALN4	240	50.0	0	4	20	0.13260	0.07200	0.0000000
Cable53		1.1NALN3	185	510.0	0	1	20	0.16457	0.07200	0.0000000
Cable54		1.1NALN4	240	50.0	0	4	20	0.13260	0.07200	0.0000000
Cable55		1.1NALN4	240	40.0	0	4	20	0.13260	0.07200	0.0000000
Cable56		1.1NALN3	95	200.0	0	1	20	0.32056	0.07400	0.0000000
Cable57		1.1NALN4	120	40.0	0	1	20	0.26603	0.07200	0.0000000
Cable58		11NALN3	300	50.0	0	1	20	0.10139	0.09900	0.0000000
Cable59		11NALN3	95	50.0	0	1	20	0.31978	0.11600	0.0000000
Cable60		11NALN3	95	50.0	0	1	20	0.31978	0.11600	0.0000000
Cable61		1.1NALN4	300	10.0	0	10	20	0.10641	0.07100	0.0000000
Cable62		11NALN3	300	70.0	0	1	20	0.10139	0.09900	0.0000000
Cable63		11NALN3	95	50.0	0	1	20	0.31978	0.11600	0.0000000
Cable64		1.0NALN1	600	50.0	0	3	20	0.09668	0.10663	0.0000000
Cable65		11NALN3	95	50.0	0	1	20	0.31978	0.11600	0.0000000
Cable66		11NALN3	95	50.0	0	1	20	0.31978	0.11600	0.0000000
Cable67		11NALN3	95	50.0	0	1	20	0.31978	0.11600	0.0000000
Cable68		11NALN3	95	50.0	0	1	20	0.31978	0.11600	0.0000000
Cable69		1.1NALN4	120	42.0	0	1	20	0.26603	0.07200	0.0000000
Cable70		1.1NALN4	240	50.0	0	4	20	0.13260	0.07200	0.0000000
Cable71		1.1NALN3	185	50.0	0	1	20	0.16457	0.07200	0.0000000
Cable72		1.1NALN3	185	510.0	0	1	20	0.16457	0.07200	0.0000000
Cable73		1.1NALN4	95	40.0	0	4	20	0.33642	0.07400	0.0000000
Cable74		1.1NALN4	240	55.0	0	4	20	0.13260	0.07200	0.0000000
Cable75		1.1NALN4	240	54.0	0	4	20	0.13260	0.07200	0.0000000
Cable76		1.1NALN3	185	510.0	0	1	20	0.16457	0.07200	0.0000000
Cable77		1.1NALN4	185	200.0	0	4	20	0.17271	0.07200	0.0000000
Cable79		1.1NALN4	240	40.0	0	4	20	0.13260	0.07200	0.0000000
Cable80		1.1NALN3	185	510.0	0	1	20	0.16457	0.07200	0.0000000
Cable81		1.1NALN3	185	510.0	0	1	20	0.16457	0.07200	0.0000000
Cable82		1.1NALN4	185	50.0	0	4	20	0.17271	0.07200	0.0000000

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	21
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

ohms or siemens/1000 m per Conductor (Cable) or per Phase (Line/Busway)

Line/Cable/Busway	ID	Library	Size	Length				R	X	Y
				Adj. (m)	% Tol.	# Phase	T (°C)			
Cable83		1.INALN3	95	25.0	0	1	20	0.32056	0.07400	0.0000000
Cable84		1.INALN3	185	200.0	0	1	20	0.16457	0.07200	0.0000000
Cable85		1.INALN4	240	50.0	0	4	20	0.13260	0.07200	0.0000000
Cable86		1.INALN3	185	510.0	0	1	20	0.16457	0.07200	0.0000000
Cable89		1.INALN4	120	55.0	0	1	20	0.26603	0.07200	0.0000000
Cable90		1.INALN4	70	40.0	0	1	20	0.46411	0.07700	0.0000000
Cable91		1.INALN4	120	48.0	0	1	20	0.26603	0.07200	0.0000000
Cable92		11NALN3	95	50.0	0	1	20	0.31978	0.11600	0.0000000
Cable93		11NALN3	300	70.0	0	1	20	0.10139	0.09900	0.0000000
Cable94		1.INALN4	300	50.0	0	1	20	0.10641	0.07100	0.0000000
Cable96		1.INALN4	300	80.0	0	2	20	0.10641	0.07100	0.0000000
Cable97		1.INALN4	400	20.0	0	4	20	0.08374	0.07000	0.0000000
Cable98		1.INALN4	300	30.0	0	2	20	0.10641	0.07100	0.0000000
Cable99		1.INALN4	120	40.0	0	1	20	0.26603	0.07200	0.0000000
Cable100		1.INALN4	120	40.0	0	1	20	0.26603	0.07200	0.0000000
Cable101		1.INALN4	300	30.0	0	1	20	0.10641	0.07100	0.0000000
Cable105		1.INALN4	300	80.0	0	1	20	0.10641	0.07100	0.0000000
Cable106		1.INALN3	185	40.0	0	1	20	0.16457	0.07200	0.0000000
Cable107		1.INALN4	150	30.0	0	1	20	0.21691	0.07200	0.0000000
Cable108		1.INALN4	150	48.0	0	1	20	0.21691	0.07200	0.0000000
Cable109		1.INALN4	150	30.0	0	1	20	0.21691	0.07200	0.0000000
Cable110		1.INALN4	150	30.0	0	1	20	0.21691	0.07200	0.0000000
Cable111		1.INALN4	120	40.0	0	1	20	0.26603	0.07200	0.0000000
Cable112		1.INALN4	70	40.0	0	1	20	0.46411	0.07700	0.0000000
Cable113		1.INALN4	120	45.0	0	1	20	0.26603	0.07200	0.0000000
Cable114		1.INALN4	70	40.0	0	1	20	0.46411	0.07700	0.0000000
Cable115		1.INALN4	150	50.0	0	1	20	0.21691	0.07200	0.0000000
Cable116		1.INALN3	185	60.0	0	1	20	0.16457	0.07200	0.0000000
Cable117		1.INALN4	185	50.0	0	1	20	0.17271	0.07200	0.0000000
Cable118		1.INALN4	120	48.0	0	1	20	0.26603	0.07200	0.0000000
Cable119		1.INALN4	70	40.0	0	1	20	0.46411	0.07700	0.0000000
Cable120		1.INALN4	240	40.0	0	1	20	0.13260	0.07200	0.0000000
Cable121		1.INALN4	70	42.0	0	1	20	0.46411	0.07700	0.0000000
Cable122		1.INALN4	300	200.0	0	1	20	0.10641	0.07100	0.0000000
Cable123		1.INALN4	120	50.0	0	1	20	0.26603	0.07200	0.0000000
Cable124		1.INALN4	120	44.0	0	1	20	0.26603	0.07200	0.0000000
Cable125		1.INALN4	120	40.0	0	1	20	0.26603	0.07200	0.0000000
Cable126		1.INALN4	400	40.0	0	4	20	0.08374	0.07000	0.0000000
Cable127		1.INALN4	70	46.0	0	1	20	0.46411	0.07700	0.0000000
Cable128		1.INALN4	95	50.0	0	1	20	0.33642	0.07400	0.0000000
Cable129		1.INALN4	300	20.0	0	2	20	0.10641	0.07100	0.0000000

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Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

ohms or siemens/1000 m per Conductor (Cable) or per Phase (Line/Busway)

Line/Cable/Busway	ID	Library	Size	Length				R	X	Y
				Adj. (m)	% Tol.	# Phase	T (°C)			
Cable130		1.INALN4	300	25.0	0	1	20	0.10641	0.07100	0.0000000
Cable131		1.INALN4	240	60.0	0	4	20	0.13260	0.07200	0.0000000
Cable132		1.INALN4	240	62.0	0	4	20	0.13260	0.07200	0.0000000
Cable133		1.INALN4	95	20.0	0	1	20	0.33642	0.07400	0.0000000
Cable134		1.INALN4	120	45.0	0	1	20	0.26603	0.07200	0.0000000
Cable135		1.INALN4	70	40.0	0	1	20	0.46411	0.07700	0.0000000
Cable136		1.INALN4	185	50.0	0	1	20	0.17271	0.07200	0.0000000
Cable137		1.INALN4	120	40.0	0	1	20	0.26603	0.07200	0.0000000
Cable138		1.INALN4	70	40.0	0	1	20	0.46411	0.07700	0.0000000
Cable139		1.INALN4	120	40.0	0	1	20	0.26603	0.07200	0.0000000
Cable140		1.INALN4	300	120.0	0	4	20	0.10641	0.07100	0.0000000
Cable141		1.INALN4	300	20.0	0	2	20	0.10641	0.07100	0.0000000
Cable142		1.INALN4	185	100.0	0	1	20	0.17271	0.07200	0.0000000
Cable143		1.INALN4	95	30.0	0	1	20	0.33642	0.07400	0.0000000
Cable144		1.INALN4	95	50.0	0	1	20	0.33642	0.07400	0.0000000
Cable145		1.INALN4	240	5.0	0	1	20	0.13260	0.07200	0.0000000
Cable146		1.INALN4	300	55.0	0	2	20	0.10641	0.07100	0.0000000
Cable147		1.INALN4	70	40.0	0	1	20	0.46411	0.07700	0.0000000
Cable149		1.INALN4	120	45.0	0	1	20	0.26603	0.07200	0.0000000
Cable150		1.INALN4	150	40.0	0	1	20	0.21691	0.07200	0.0000000
Cable151		1.INALN4	70	40.0	0	1	20	0.46411	0.07700	0.0000000
Cable152		1.INALN4	95	20.0	0	1	20	0.33642	0.07400	0.0000000
Cable153		1.INALN4	240	100.0	0	1	20	0.13260	0.07200	0.0000000
Cable154		1.INALN4	240	50.0	0	4	20	0.13260	0.07200	0.0000000
Cable155		1.INALN4	240	50.0	0	4	20	0.13260	0.07200	0.0000000
Cable156		1.INALN4	120	45.0	0	1	20	0.26603	0.07200	0.0000000
Cable157		1.INALN4	300	110.0	0	2	20	0.10641	0.07100	0.0000000
Cable158		1.INALN4	300	180.0	0	5	20	0.10641	0.07100	0.0000000
Cable159		1.INALN4	120	45.0	0	1	20	0.26603	0.07200	0.0000000
Cable160		1.INALN4	150	30.0	0	1	20	0.21691	0.07200	0.0000000
Cable161		1.INALN4	300	35.0	0	1	20	0.10641	0.07100	0.0000000
Cable162		1.INALN4	150	30.0	0	1	20	0.21691	0.07200	0.0000000
Cable163		1.INALN4	150	40.0	0	1	20	0.21691	0.07200	0.0000000
Cable164		1.INALN4	120	45.0	0	1	20	0.26603	0.07200	0.0000000
Cable165		1.INALN4	300	30.0	0	3	20	0.10641	0.07100	0.0000000
Cable166		1.INALN4	185	44.0	0	1	20	0.17271	0.07200	0.0000000
Cable167		1.INALN4	95	20.0	0	1	20	0.33642	0.07400	0.0000000
Cable168		1.INALN4	95	35.0	0	1	20	0.33642	0.07400	0.0000000
Cable169		1.INALN4	300	70.0	0	1	20	0.10641	0.07100	0.0000000
Cable170		1.INALN4	95	50.0	0	1	20	0.33642	0.07400	0.0000000
Cable171		1.INALN4	300	20.0	0	1	20	0.10641	0.07100	0.0000000

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	23
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Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

ohms or siemens/1000 m per Conductor (Cable) or per Phase (Line/Busway)

Line/Cable/Busway	ID	Library	Size	Length						
				Adj. (m)	% Tol.	# Phase	T (°C)	R	X	Y
Cable172		1.INALN4	95	50.0	0	1	20	0.33642	0.07400	0.0000000
Cable173		1.INALN4	95	20.0	0	1	20	0.33642	0.07400	0.0000000
Cable174		1.INALN4	185	30.0	0	1	20	0.17271	0.07200	0.0000000
Cable175		1.INALN4	95	30.0	0	1	20	0.33642	0.07400	0.0000000
Cable176		1.INALN4	300	40.0	0	2	20	0.10641	0.07100	0.0000000
Cable177		1.INALN4	95	30.0	0	1	20	0.33642	0.07400	0.0000000
Cable178		1.INALN4	150	30.0	0	1	20	0.21691	0.07200	0.0000000
Cable179		1.INALN4	120	45.0	0	1	20	0.26603	0.07200	0.0000000
Cable180		11NALN3	300	20.0	0	3	20	0.10139	0.09900	0.0000000
Cable181		1.INALN4	185	30.0	0	1	20	0.17271	0.07200	0.0000000
Cable182		1.INALN4	120	45.0	0	1	20	0.26603	0.07200	0.0000000
Cable183		1.INALN4	150	30.0	0	1	20	0.21691	0.07200	0.0000000
Cable184		1.INALN4	120	45.0	0	1	20	0.26603	0.07200	0.0000000
Cable185		1.INALN4	185	30.0	0	1	20	0.17271	0.07200	0.0000000
Cable186		1.INALN4	300	80.0	0	3	20	0.10641	0.07100	0.0000000
Cable187		1.INALN4	300	55.0	0	2	20	0.10641	0.07100	0.0000000
Cable188		1.INALN4	120	45.0	0	1	20	0.26603	0.07200	0.0000000
Cable189		1.INALN4	300	100.0	0	4	20	0.10641	0.07100	0.0000000
Cable190		1.INALN4	120	45.0	0	1	20	0.26603	0.07200	0.0000000
Cable191		1.INALN4	150	30.0	0	1	20	0.21691	0.07200	0.0000000
Cable192		1.INALN4	120	45.0	0	1	20	0.26603	0.07200	0.0000000
Cable193		1.INALN4	300	55.0	0	2	20	0.10641	0.07100	0.0000000
Cable194		1.INALN4	240	70.0	0	3	20	0.13260	0.07200	0.0000000
Cable195		1.INALN4	95	30.0	0	1	20	0.33642	0.07400	0.0000000
Cable196		1.INALN4	120	45.0	0	1	20	0.26603	0.07200	0.0000000
Cable197		1.INALN4	300	50.0	0	4	20	0.10641	0.07100	0.0000000
Cable198		1.INALN4	300	60.0	0	3	20	0.10641	0.07100	0.0000000
Cable199		1.INALN4	185	30.0	0	1	20	0.17271	0.07200	0.0000000
Cable201		1.INALN4	300	30.0	0	3	20	0.10641	0.07100	0.0000000
Cable202		1.INALN4	185	30.0	0	1	20	0.17271	0.07200	0.0000000
Cable203		1.INALN4	95	30.0	0	1	20	0.33642	0.07400	0.0000000
Cable204		1.INALN4	95	30.0	0	1	20	0.33642	0.07400	0.0000000
Cable206		1.INALN4	95	30.0	0	1	20	0.33642	0.07400	0.0000000
Cable207		1.INALN4	150	30.0	0	1	20	0.21691	0.07200	0.0000000
Cable208		1.INALN4	300	80.0	0	2	20	0.10641	0.07100	0.0000000
Cable209		1.INALN4	95	30.0	0	1	20	0.33642	0.07400	0.0000000
Cable210		1.INALN4	95	30.0	0	1	20	0.33642	0.07400	0.0000000
Cable211		1.INALN4	300	55.0	0	2	20	0.10641	0.07100	0.0000000
Cable212		1.INALN4	95	30.0	0	1	20	0.33642	0.07400	0.0000000
Cable214		1.INALN4	95	30.0	0	1	20	0.33642	0.07400	0.0000000
Cable215		1.INALN4	300	55.0	0	2	20	0.10641	0.07100	0.0000000

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	24
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

ohms or siemens/1000 m per Conductor (Cable) or per Phase (Line/Busway)

Line/Cable/Busway	ID	Library	Size	Length				R	X	Y
				Adj. (m)	% Tol.	# Phase	T (°C)			
Cable216		1.INALN4	95	30.0	0	1	20	0.33642	0.07400	0.0000000
Cable217		1.INALN4	300	120.0	0	1	20	0.10641	0.07100	0.0000000
Cable218		1.INALN4	300	100.0	0	1	20	0.10641	0.07100	0.0000000
Cable219		1.INALN4	95	30.0	0	1	20	0.33642	0.07400	0.0000000
Cable220		1.INALN4	300	150.0	0	4	20	0.10641	0.07100	0.0000000
Cable221		1.INALN4	240	150.0	0	1	20	0.13260	0.07200	0.0000000
Cable222		1.INALN4	300	100.0	0	2	20	0.10641	0.07100	0.0000000
Cable225		1.INALN4	95	30.0	0	1	20	0.33642	0.07400	0.0000000
Cable227		1.INALN4	300	55.0	0	1	20	0.10641	0.07100	0.0000000
Cable228		1.INALN4	300	30.0	0	5	20	0.10641	0.07100	0.0000000
Cable229		1.INALN4	95	30.0	0	2	20	0.33642	0.07400	0.0000000
Cable230		1.INALN4	185	150.0	0	2	20	0.17271	0.07200	0.0000000
Cable231		1.INALN4	300	80.0	0	3	20	0.10641	0.07100	0.0000000
Cable232		1.INALN4	300	80.0	0	1	20	0.10641	0.07100	0.0000000
Cable234		1.INALN4	300	80.0	0	5	20	0.10641	0.07100	6.7500000
Cable235		1.INALN4	300	300.0	0	5	20	0.10641	0.07100	0.0000000
Cable236		1.INALN4	300	200.0	0	1	20	0.10641	0.07100	0.0000000
Cable237		1.INALN4	300	80.0	0	2	20	0.10641	0.07100	0.0000000
Cable238		1.INALN4	400	70.0	0	2	20	0.08374	0.07000	0.0000000
Cable239		1.INALN4	300	40.0	0	3	20	0.10641	0.07100	0.0000000
Cable240		1.INALN4	300	110.0	0	2	20	0.10641	0.07100	0.0000000
Cable242		1.INALN4	300	250.0	0	3	20	0.10641	0.07100	0.0000000
Cable243		1.INALN4	300	100.0	0	1	20	0.10641	0.07100	0.0000000
Cable244		1.INALN4	300	100.0	0	1	20	0.10641	0.07100	0.0000000
Cable245		1.INALN4	400	50.0	0	3	20	0.08374	0.07000	0.0000000
Cable247		1.INALN4	300	50.0	0	1	20	0.10641	0.07100	0.0000000
Cable248		1.INALN4	240	150.0	0	3	20	0.13260	0.07200	0.0000000
Cable250		1.INALN4	300	20.0	0	2	20	0.10641	0.07100	0.0000000
Cable252		1.INALN4	300	10.0	0	2	20	0.10641	0.07100	0.0000000
Cable254		1.INALN4	120	130.0	0	1	20	0.26603	0.07200	0.0000000
Cable255		1.INALN4	300	100.0	0	1	20	0.10641	0.07100	0.0000000
Cable256		1.INALN4	300	20.0	0	2	20	0.10641	0.07100	0.0000000
Cable257		1.INALN4	300	50.0	0	1	20	0.10641	0.07100	0.0000000
Cable258		1.ONALN1	600	70.0	0	1	20	0.09668	0.10663	0.0000000
Cable259		1.INALN4	120	45.0	0	1	20	0.26603	0.07200	0.0000000
Cable260		1.INALN4	300	100.0	0	4	20	0.10641	0.07100	0.0000000
Cable261		1.INALN4	400	70.0	0	2	20	0.08374	0.07000	0.0000000
Cable262		1.INALN4	120	30.0	0	1	20	0.26603	0.07200	0.0000000
Cable263		11NALN3	95	200.0	0	1	20	0.31978	0.11600	0.0000000
Cable264		1.INALN4	300	110.0	0	4	20	0.10641	0.07100	0.0000000
Cable265		1.INALN4	95	50.0	0	1	20	0.33642	0.07400	0.0000000

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Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

ohms or siemens/1000 m per Conductor (Cable) or per Phase (Line/Busway)

Line/Cable/Busway	ID	Library	Size	Length				R	X	Y
				Adj. (m)	% Tol.	# Phase	T (°C)			
Cable266		11NALN3	95	50.0	0	1	20	0.31978	0.11600	0.0000000
Cable267		11NALN3	95	50.0	0	1	20	0.31978	0.11600	0.0000000
Cable268		11NALS1	630	90.0	0	4	20	0.04992	0.09610	0.0000000
Cable269		11NALN3	300	5.0	0	1	20	0.10139	0.09900	0.0000000
Cable270		1.1NALN4	120	45.0	0	1	20	0.26603	0.07200	0.0000000
Cable271		1.1NALN4	300	100.0	0	4	20	0.10641	0.07100	0.0000000
Cable272		1.1NALN4	120	30.0	0	1	20	0.26603	0.07200	0.0000000
Cable273		1.1NALN4	300	110.0	0	4	20	0.10641	0.07100	0.0000000
Cable274		1.1NALN4	120	45.0	0	1	20	0.26603	0.07200	0.0000000
Cable275		11NALN3	300	5.0	0	1	20	0.10139	0.09900	0.0000000
Cable276		11NALN3	300	5.0	0	1	20	0.10139	0.09900	0.0000000
Cable277		1.1NALN4	300	20.0	0	2	20	0.10641	0.07100	0.0000000
Cable278		1.1NALN4	300	250.0	0	5	20	0.10641	0.07100	0.0000000
Cable279		1.1NALN4	300	100.0	0	4	20	0.10641	0.07100	0.0000000
Cable281		1.1NALN4	300	120.0	0	4	20	0.10641	0.07100	0.0000000
Cable282		11NALN3	300	85.0	0	8	20	0.10139	0.09900	0.0000000
Cable283		1.1NALN4	300	110.0	0	4	20	0.10641	0.07100	0.0000000
Cable284		1.1NALN4	300	110.0	0	4	20	0.10641	0.07100	0.0000000
Cable285		11NALN3	95	50.0	0	1	20	0.31978	0.11600	0.0000000
Cable286		11NALN3	95	50.0	0	1	20	0.31978	0.11600	0.0000000
Cable287		11NALN3	95	50.0	0	1	20	0.31978	0.11600	0.0000000
Cable288		11NALN3	95	50.0	0	1	20	0.31978	0.11600	0.0000000
Cable290		11NALN3	300	20.0	0	3	20	0.10139	0.09900	0.0000000
Cable292		6.6NALN3	95	70.0	0	1	20	0.31978	0.10200	0.0000000
Cable293		11NALS1	630	90.0	0	4	20	0.04992	0.09610	0.0000000
Cable295		6.6NALN3	95	70.0	0	1	20	0.31978	0.10200	0.0000000
Cable297		6.6NALN3	95	70.0	0	1	20	0.31978	0.10200	0.0000000
Cable298		11NALS1	300	500.0	0	2	20	0.10139	0.10500	0.0000000
Cable299		11NALN3	185	20.0	0	1	20	0.16457	0.10500	0.0000000
Cable305		11NALN3	185	20.0	0	1	20	0.16457	0.10500	0.0000000
Cable307		11NALS1	300	70.0	0	5	20	0.10139	0.10500	0.0000000
Cable308		11NALS1	630	100.0	0	1	20	0.04992	0.09610	0.0000000
Cable310		11NALN3	95	500.0	0	1	20	0.31978	0.11600	0.0000000
Cable311		11NALS1	300	70.0	0	5	20	0.10139	0.10500	0.0000000
Cable312		11NALN3	95	50.0	0	1	20	0.31978	0.11600	0.0000000
Cable313		11NALN3	185	3000.0	0	1	20	0.16457	0.10500	0.0000000
Cable316		11NALN3	95	50.0	0	1	20	0.31978	0.11600	0.0000000
Cable317		11NALN3	95	50.0	0	1	20	0.31978	0.11600	0.0000000
Cable319		11NALS1	400	50.0	0	2	20	0.07955	0.10100	0.0000000
Cable321		11NALS1	400	50.0	0	2	20	0.07955	0.10100	0.0000000
Cable322		11NALN3	300	20.0	0	1	20	0.10139	0.09900	0.0000000

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Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

ohms or siemens/1000 m per Conductor (Cable) or per Phase (Line/Busway)

Line/Cable/Busway	ID	Library	Size	Length				R	X	Y
				Adj. (m)	% Tol.	# Phase	T (°C)			
Cable324		11NALN3	300	20.0	0	1	20	0.10139	0.09900	0.0000000
Cable327		1.1NALN4	300	20.0	0	1	20	0.10641	0.07100	0.0000000
Cable330		1.1NALN4	300	20.0	0	1	20	0.10641	0.07100	0.0000000
Cable333		1.1NALN4	300	20.0	0	1	20	0.10641	0.07100	0.0000000
Cable334		1.1NALN4	300	20.0	0	1	20	0.10641	0.07100	0.0000000
Cable337		1.1NALN4	300	20.0	0	1	20	0.10641	0.07100	0.0000000
Cable338		1.1NALN4	300	20.0	0	1	20	0.10641	0.07100	0.0000000
Cable339		1.1NALN4	300	20.0	0	1	20	0.10641	0.07100	0.0000000
Cable340		1.1NALN4	300	20.0	0	1	20	0.10641	0.07100	0.0000000
Cable341		1.1NALN4	300	20.0	0	1	20	0.10641	0.07100	0.0000000
Cable342		1.1NALN4	300	20.0	0	1	20	0.10641	0.07100	0.0000000
Cable343		1.1NALN4	300	20.0	0	1	20	0.10641	0.07100	0.0000000
Cable344		1.1NALN4	300	20.0	0	1	20	0.10641	0.07100	0.0000000
Cable345		11NALN3	185	20.0	0	1	20	0.16457	0.10500	0.0000000
Cable347		11NALN3	185	20.0	0	1	20	0.16457	0.10500	0.0000000
Cable348		1.1NALN4	300	20.0	0	1	20	0.10641	0.07100	0.0000000
Cable349		1.1NALN4	300	20.0	0	1	20	0.10641	0.07100	0.0000000
Cable350		1.1NALN4	300	20.0	0	1	20	0.10641	0.07100	0.0000000
Cable351		1.1NALN4	300	20.0	0	1	20	0.10641	0.07100	0.0000000
Cable352		1.1NALN4	300	20.0	0	1	20	0.10641	0.07100	0.0000000
Cable353		1.1NALN4	300	20.0	0	1	20	0.10641	0.07100	0.0000000
Cable354		1.1NALN4	300	20.0	0	1	20	0.10641	0.07100	0.0000000
Cable355		1.1NALN4	300	20.0	0	1	20	0.10641	0.07100	0.0000000
Cable356		11NALN3	185	20.0	0	1	20	0.16457	0.10500	0.0000000
Cable357		11NALN3	185	20.0	0	1	20	0.16457	0.10500	0.0000000
Cable358		11NALN3	185	20.0	0	1	20	0.16457	0.10500	0.0000000
Cable359		1.1NALN4	300	20.0	0	1	20	0.10641	0.07100	0.0000000
Cable360		1.1NALN4	300	20.0	0	1	20	0.10641	0.07100	0.0000000
Cable361		1.1NALN4	300	20.0	0	1	20	0.10641	0.07100	0.0000000
Cable362		1.1NALN4	300	20.0	0	1	20	0.10641	0.07100	0.0000000

Line / Cable / Busway resistances are listed at the specified temperatures.

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Location: DEBARI

Date: 29-11-2023

Contract: SPARROW RMS

SN:

Engineer: MR. SUMIT KUMAR JHA

Revision: Base

Filename: HZL DEBARI SMEETER

Config.: Normal

2-Winding Transformer Input Data

Transformer	Rating					Z Variation			% Tap Setting		Adjusted	
	ID	MVA	Prm. kV	Sec. kV	% Z	X/R	+ 5%	- 5%	% Tol.	Prim.	Sec.	% Z
SMVA TRAFO		5.000	11.000	6.600	5.87	8.50	0	0	0	0	0	5.8700
AUX TRAFO-1		1.000	11.000	6.600	5.00	3.50	0	0	0	0	0	5.0000
AUX TRAFO-2		1.000	11.000	6.600	5.00	3.50	0	0	0	0	0	5.0000
AUX TRAFO-2 CNTRL		1.800	11.000	0.433	6.25	6.00	0	0	0	0	0	6.2500
AUX TRAFO-3		1.800	11.000	0.433	6.25	6.00	0	0	0	0	0	6.2500
AUX TRAFO-4		1.800	11.000	0.433	6.25	6.00	0	0	0	0	0	6.2500
AUX TRAFO-6		1.800	11.000	0.433	6.25	6.00	0	0	0	0	0	6.2500
AUX TRAFO-7		1.800	11.000	0.433	6.25	6.00	0	0	0	0	0	6.2500
COLONY TRAFO-1		0.150	11.000	0.415	4.00	1.50	0	0	0	0	0	4.0000
COLONY TRAFO-2		0.150	11.000	0.415	4.00	1.50	0	0	0	0	0	4.0000
CP-9 TRAFO		40.000	11.000	11.000	12.50	45.00	0	0	0	0	0	12.5000
CP-10 TRAFO		40.000	11.000	11.000	12.50	45.00	0	0	0	0	0	12.5000
DARIBA PH TRAFO		0.750	11.000	0.433	5.00	3.50	0	0	0	0	0	5.0000
ETP TRAFO		1.250	11.000	0.433	5.00	3.50	0	0	0	0	0	5.0000
G/H DISP. TRAFO		0.150	11.000	0.415	4.00	1.50	0	0	0	0	0	4.0000
HGP TR-1		0.600	0.415	0.415	4.00	1.50	0	0	0	0	0	4.0000
HGP TR-2		0.600	0.415	0.415	4.00	1.50	0	0	0	0	0	4.0000
HGP TR-3		0.600	0.415	0.415	4.00	1.50	0	0	0	0	0	4.0000
MCTP TR-5		1.800	11.000	0.433	6.25	6.00	0	0	0	0	0	6.2500
PHE TRAFO		2.000	11.000	0.433	6.25	6.00	0	0	0	0	0	6.2500
RO ZLD TRAFO		3.150	11.000	0.433	6.25	6.00	0	0	0	0	0	6.2500
SS-1 TR-1		1.800	11.000	0.433	6.25	6.00	0	0	0	0	0	6.2500
SS-5 TRAFO		2.000	11.000	0.433	6.25	6.00	0	0	0	0	0	6.2500
TR-11A		2.500	11.000	3.300	6.25	6.00	0	0	0	0	0	6.2500
TR-11B		2.500	11.000	3.300	6.25	6.00	0	0	0	0	0	6.2500
TR-11IA		2.000	11.000	0.433	6.25	6.00	0	0	0	0	0	6.2500
TR-11IB		2.000	11.000	0.433	6.25	6.00	0	0	0	0	0	6.2500
TR-112A		2.000	11.000	0.433	6.25	6.00	0	0	0	0	0	6.2500
TR-112B		2.000	11.000	0.433	6.25	6.00	0	0	0	0	0	6.2500
TR-113A		2.000	11.000	0.433	6.25	6.00	0	0	0	0	0	6.2500
TR-113B		2.000	11.000	0.433	6.25	6.00	0	0	0	0	0	6.2500
TRANSFORMER-1		25.000	132.000	11.500	10.00	20.00	0	0	0	0	0	10.0000
TRANSFORMER-2		25.000	132.000	11.500	10.00	20.00	0	0	0	0	0	10.0000
WGP TR-1		0.600	0.415	0.415	4.00	1.50	0	0	0	0	0	4.0000
WGP TR-2		0.600	0.415	0.415	4.00	1.50	0	0	0	0	0	4.0000
WGP TR-3		0.600	0.415	0.415	4.00	1.50	0	0	0	0	0	4.0000

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Filename:	HZL DEBARI SMELTER		Config.:	Normal

Transformer	Rating				Z Variation			% Tap Setting		Adjusted		
	ID	MVA	Prim. kV	Sec. kV	% Z	X/R	+ 5%	- 5%	% Tol.	Prim.	Sec.	% Z
WGP TR-4		0.600	0.415	0.415	4.00	1.50	0	0	0	0	0	4.0000
ZINC MELTING TRAFO		1.800	11.000	0.433	6.25	6.00	0	0	0	0	0	6.2500

3-Winding Transformer Input Data

Transformer	Rating			Tap		Impedance			Z Variation		
	ID	Winding	MVA	kV	%	% Z	X/R	MVAb	% Tol.	+ 5%	- 5%
INVERTER TRAFO-1	Primary:	2.200	11.000	0	Zps =	6.25	6.00	2.200	0	0	0
	Secondary:	2.200	0.380	0	Zpt =	6.25	6.00	2.200	0		
	Tertiary:	2.200	0.380	0	Zst =	6.25	6.00	2.200	0		
INVERTER TRAFO-2	Primary:	2.200	11.000	0	Zps =	6.25	6.00	2.200	0	0	0
	Secondary:	2.200	0.380	0	Zpt =	6.25	6.00	2.200	0		
	Tertiary:	2.200	0.380	0	Zst =	6.25	6.00	2.200	0		
INVERTER TRAFO-3	Primary:	2.200	11.000	0	Zps =	6.25	6.00	2.200	0	0	0
	Secondary:	2.200	0.380	0	Zpt =	6.25	6.00	2.200	0		
	Tertiary:	2.200	0.380	0	Zst =	6.25	6.00	2.200	0		
INVERTER TRAFO-4	Primary:	2.200	11.000	0	Zps =	6.25	6.00	2.200	0	0	0
	Secondary:	2.200	0.380	0	Zpt =	6.25	6.00	2.200	0		
	Tertiary:	2.200	0.380	0	Zst =	6.25	6.00	2.200	0		
INVERTER TRAFO-5	Primary:	2.200	11.000	0	Zps =	6.25	6.00	2.200	0	0	0
	Secondary:	2.200	0.380	0	Zpt =	6.25	6.00	2.200	0		
	Tertiary:	2.200	0.380	0	Zst =	6.25	6.00	2.200	0		
INVERTER TRAFO-6	Primary:	2.200	11.000	0	Zps =	6.25	6.00	2.200	0	0	0
	Secondary:	2.200	0.380	0	Zpt =	6.25	6.00	2.200	0		
	Tertiary:	2.200	0.380	0	Zst =	6.25	6.00	2.200	0		
TR-1A BHEL	Primary:	30.000	132.000	0	Zps =	12.50	45.00	30.000	0	0	0
	Secondary:	30.000	11.000	0	Zpt =	12.50	45.00	30.000	0		
	Tertiary:	30.000	11.000	0	Zst =	12.50	45.00	30.000	0		
TR-2A BHEL	Primary:	30.000	132.000	0	Zps =	12.50	45.00	30.000	0	0	0
	Secondary:	30.000	11.000	0	Zpt =	12.50	45.00	30.000	0		
	Tertiary:	30.000	11.000	0	Zst =	12.50	45.00	30.000	0		

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Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Branch Connections

Ckt/Branch		Connected Bus ID		% Impedance, Pos. Seq., 100 MVA _b			
ID	Type	From Bus	To Bus	R	X	Z	Y
5MVA TRAFO	2W XFMR	Bus46	Bus146	13.85	117.72	118.54	
AUX TRAFO-1	2W XFMR	Bus44	Bus130	139.52	488.31	507.85	
AUX TRAFO-2	2W XFMR	Bus45	Bus140	139.52	488.31	507.85	
AUX TRAFO-2 CNTRL	2W XFMR	Bus51	Bus54	54.91	329.46	334.00	
AUX TRAFO-3	2W XFMR	Bus48	Bus58	54.91	329.46	334.00	
AUX TRAFO-4	2W XFMR	Bus47	Bus56	54.91	329.46	334.00	
AUX TRAFO-6	2W XFMR	Bus57	Bus60	54.91	329.46	334.00	
AUX TRAFO-7	2W XFMR	Bus49	Bus59	54.91	329.46	334.00	
COLONY TRAFO-1	2W XFMR	Bus173	Bus176	1446.62	2169.92	2607.92	
COLONY TRAFO-2	2W XFMR	Bus175	Bus178	1446.62	2169.92	2607.92	
CP-9 TRAFO	2W XFMR	Bus189	Bus191	0.67	30.37	30.38	
CP-10 TRAFO	2W XFMR	Bus188	Bus190	0.67	30.37	30.38	
DARIBA PH TRAFO	2W XFMR	Bus154	Bus203	177.57	621.49	646.36	
EIP TRAFO	2W XFMR	Bus156	Bus168	106.54	372.89	387.81	
GHDISP TRAFO	2W XFMR	Bus174	Bus177	1446.62	2169.92	2607.92	
HGP TR-1	2W XFMR	Bus64	Bus65	303.95	455.93	547.95	
HGP TR-2	2W XFMR	Bus69	Bus68	303.95	455.93	547.95	
HGP TR-3	2W XFMR	Bus71	Bus70	303.95	455.93	547.95	
MCTP TR-5	2W XFMR	Bus129	Bus166	54.91	329.46	334.00	
PHE TRAFO	2W XFMR	Bus52	Bus53	49.42	296.51	300.60	
RO ZLD TRAFO	2W XFMR	Bus25	Bus100	28.71	172.25	174.62	
SS-1 TR-1	2W XFMR	Bus133	Bus167	54.91	329.46	334.00	
SS-5 TRAFO	2W XFMR	Bus50	Bus55	49.42	296.51	300.60	
TR-11A	2W XFMR	Bus8	Bus9	37.89	227.36	230.50	
TR-11B	2W XFMR	Bus13	Bus12	37.89	227.36	230.50	
TR-111A	2W XFMR	Bus3	PCC-111 S_1	45.21	271.29	275.03	
TR-111B	2W XFMR	Bus17	PCC-111 S_2	45.21	271.29	275.03	
TR-112A	2W XFMR	Bus5	PCC-112 S_1	45.21	271.29	275.03	
TR-112B	2W XFMR	Bus18	PCC-112 S_2	45.21	271.29	275.03	
TR-113A	2W XFMR	Bus6	PCC-113 S_1	45.21	271.29	275.03	
TR-113B	2W XFMR	Bus20	PCC-113 S_2	45.21	271.29	275.03	
TRANSFORMER-1	2W XFMR	132KV HZL BUS S_1	Bus182	1.97	39.39	39.44	
TRANSFORMER-2	2W XFMR	132KV HZL BUS S_1	Bus184	1.97	39.39	39.44	
WGP TR-1	2W XFMR	Bus200	Bus199	303.95	455.93	547.95	
WGP TR-2	2W XFMR	Bus202	Bus201	303.95	455.93	547.95	
WGP TR-3	2W XFMR	Bus196	Bus195	303.95	455.93	547.95	
WGP TR-4	2W XFMR	Bus198	Bus197	303.95	455.93	547.95	
ZINC MELTING TRAFO	2W XFMR	Bus162	Bus169	54.91	329.46	334.00	

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Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

CKT/Branch		Connected Bus ID		% Impedance, Pos. Seq., 100 MVAb			
ID	Type	From Bus	To Bus	R	X	Z	Y
INVERTER TRAFO-1	3W Xfmr	Bus183	Bus212	67.39	404.33	409.91	
	3W Xfmr	Bus183	Bus206	67.39	404.33	409.91	
	3W Xfmr	Bus212	Bus206	67.39	404.33	409.91	
INVERTER TRAFO-2	3W Xfmr	Bus194	Bus221	67.39	404.33	409.91	
	3W Xfmr	Bus194	Bus222	67.39	404.33	409.91	
	3W Xfmr	Bus221	Bus222	67.39	404.33	409.91	
INVERTER TRAFO-3	3W Xfmr	Bus237	Bus240	67.39	404.33	409.91	
	3W Xfmr	Bus237	Bus241	67.39	404.33	409.91	
	3W Xfmr	Bus240	Bus241	67.39	404.33	409.91	
INVERTER TRAFO-4	3W Xfmr	Bus236	Bus232	67.39	404.33	409.91	
	3W Xfmr	Bus236	Bus235	67.39	404.33	409.91	
	3W Xfmr	Bus232	Bus235	67.39	404.33	409.91	
INVERTER TRAFO-5	3W Xfmr	Bus251	Bus254	67.39	404.33	409.91	
	3W Xfmr	Bus251	Bus255	67.39	404.33	409.91	
	3W Xfmr	Bus254	Bus255	67.39	404.33	409.91	
INVERTER TRAFO-6	3W Xfmr	Bus250	Bus246	67.39	404.33	409.91	
	3W Xfmr	Bus250	Bus249	67.39	404.33	409.91	
	3W Xfmr	Bus246	Bus249	67.39	404.33	409.91	
TR-1A BHEL	3W Xfmr	132KV HZL BUS S_2	Bus180	1.35	60.74	60.76	
	3W Xfmr	132KV HZL BUS S_2	TR-1A BHEL~3	1.35	60.74	60.76	
	3W Xfmr	Bus180	TR-1A BHEL~3	1.35	60.74	60.76	
TR-2A BHEL	3W Xfmr	132KV HZL BUS S_2	Bus185	1.35	60.74	60.76	
	3W Xfmr	132KV HZL BUS S_2	TR-2A BHEL~3	1.35	60.74	60.76	
	3W Xfmr	Bus185	TR-2A BHEL~3	1.35	60.74	60.76	
BusDuct5	Bus Duct	Bus100	RO ZLD PCC				
Cable1	Cable	CDSS 11KV PANEL S_1	Bus1	0.67	0.54	0.86	
Cable2	Cable	VFD PANEL ~2 S_1	Bus36	258.84	140.54	294.53	
Cable3	Cable	MG PANEL (SS-1) S_2	301B MCC	170.27	113.61	204.69	
Cable4	Cable	PCC-112 S_1	MCC-113 RMH S_2	80.89	43.92	92.04	
Cable5	Cable	CDSS 11KV PANEL S_1	Bus2	0.62	0.40	0.74	
Cable6	Cable	PCC-111 S_2	DT SOFT STARTER PNL	337.13	140.54	365.25	
Cable7	Cable	PCC-112 S_1	Bus196	370.48	122.97	390.36	
Cable8	Cable	PCC-112 S_1	Bus198	370.48	122.97	390.36	
Cable9	Cable	CDSS 11KV PANEL S_1	Bus3	0.67	0.54	0.86	
Cable10	Cable	PCC-112 S_1	Bus4	4095.71	1791.91	4470.55	
Cable11	Cable	CDSS 11KV PANEL S_1	Bus5	0.76	0.62	0.98	
Cable12	Cable	CDSS 11KV PANEL S_1	Bus6	0.86	0.69	1.11	
Cable13	Cable	SIEMENS BUS-A	CDSS 11KV PANEL S_1	1.89	3.63	4.09	
Cable14	Cable	PCC-112 S_1	Bus7	328.34	72.22	336.19	
Cable15	Cable	CDSS 11KV PANEL S_1	Bus8	0.67	0.54	0.86	

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	31
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

CKT/Branch		Connected Bus ID		% Impedance, Pos. Seq., 100 MVAb			
ID	Type	From Bus	To Bus	R	X	Z	Y
Cable16	Cable	Bus9	CDSS 3.3KV PANEL S_1	7.43	4.29	8.58	
Cable17	Cable	PCC-112 S_1	Bus10	4095.71	1791.91	4470.55	
Cable18	Cable	PCC-112 S_1	Bus200	370.48	122.97	390.36	
Cable19	Cable	Bus12	CDSS 3.3KV PANEL S_2	7.43	4.29	8.58	
Cable20	Cable	CDSS 11KV PANEL S_2	Bus13	0.67	0.54	0.86	
Cable21	Cable	PCC-112 S_1	Bus11	4095.71	1791.91	4470.55	
Cable22	Cable	CDSS 11KV PANEL S_2	Bus15	0.67	0.54	0.86	
Cable23	Cable	PCC-112 S_1	MCC-116	64.71	35.14	73.63	
Cable24	Cable	Bus183	INV. ROOM-1 BUS	0.27	0.17	0.32	
Cable25	Cable	PCC-112 S_2	Bus14	4095.71	1791.91	4470.55	
Cable26	Cable	CDSS 11KV PANEL S_2	Bus17	0.67	0.54	0.86	
Cable27	Cable	CDSS 11KV PANEL S_2	Bus18	0.76	0.62	0.98	
Cable28	Cable	PCC-112 S_2	PDB-111 S_1	113.24	61.49	128.86	
Cable29	Cable	CDSS 11KV PANEL S_2	Bus20	0.86	0.69	1.11	
Cable30	Cable	PCC-112 S_2	MCC-116 S_2	80.89	43.92	92.04	
Cable31	Cable	CDSS 11KV PANEL S_2	Bus22	0.16	0.08	0.18	
Cable32	Cable	PCC-112 S_2	MCC-112	88.98	48.31	101.25	
Cable33	Cable	PCC-112 S_2	Bus16	4095.71	1791.91	4470.55	
Cable34	Cable	CDSS 11KV PANEL S_2	Bus25	4.78	7.55	8.93	
Cable35	Cable	PCC-112 S_2	Bus19	328.54	72.22	336.19	
Cable36	Cable	CDSS 3.3KV PANEL S_1	Bus26	3.47	1.28	3.70	
Cable37	Cable	PCC-112 S_2	IAT SOFT STARTER PNL	252.85	105.41	273.94	
Cable38	Cable	PCC-112 S_2	Bus23	4095.71	1791.91	4470.55	
Cable39	Cable	CDSS 3.3KV PANEL S_2	Bus28	5.21	1.92	5.55	
Cable41	Cable	PCC-111 S_1	MCC-114 S_1	87.36	47.43	99.40	
Cable42	Cable	BUS CONTROL ROOM	Bus50	1.32	0.48	1.41	
Cable43	Cable	CDSS 3.3KV PANEL S_2	Bus30	3.47	1.28	3.70	
Cable44	Cable	PCC-111 S_1	MCC-112 S_2	64.71	35.14	73.63	
Cable45	Cable	PCC-111 S_1	MCC-115 S_1	48.53	26.35	55.22	
Cable47	Cable	CDSS 3.3KV PANEL S_2	Bus32	6.08	2.23	6.48	
Cable48	Cable	PCC-111 S_1	PDB-111 S_2	56.62	30.74	64.43	
Cable49	Cable	PCC-111 S_2	STG MCC-118 S_1	64.71	35.14	73.63	
Cable50	Cable	PCC-111 S_2	PDB-112 S_2	113.24	61.49	128.86	
Cable51	Cable	PCC-111 S_1	Bus33	3128.59	722.23	3210.87	
Cable52	Cable	PCC-111 S_2	MCC-111 S_1	80.89	43.92	92.04	
Cable53	Cable	PCC-111 S_1	Bus34	4095.71	1791.91	4470.55	
Cable54	Cable	PCC-111 S_2	MCC-113 RMH S_1	80.89	43.92	92.04	
Cable55	Cable	PCC-111 S_2	CLDC MCC S_1	64.71	35.14	73.63	
Cable56	Cable	PCC-111 S_2	Bus35	3128.59	722.23	3210.87	
Cable57	Cable	MCC-114 S_1	Bus66	519.28	140.54	537.96	

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	32
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

CKT/Branch		Connected Bus ID		% Impedance, Pos. Seq., 100 MVAb			
ID	Type	From Bus	To Bus	R	X	Z	Y
Cable58	Cable	JYOTI PANEL S_1	BUS CONTROL ROOM	0.42	0.41	0.59	
Cable59	Cable	BUS CONTROL ROOM	Bus51	1.32	0.48	1.41	
Cable60	Cable	BUS CONTROL ROOM	Bus52	1.32	0.48	1.41	
Cable61	Cable	Bus53	SUBSTATION PHE PCC	5.68	3.79	6.82	
Cable62	Cable	JYOTI PANEL S_3	ANDREW YULE PANEL S_2	0.59	0.57	0.82	
Cable63	Cable	JYOTI PANEL S_1	Bus44	1.32	0.48	1.41	
Cable64	Cable	Bus54	PYROTECH PCC	85.94	94.79	127.95	
Cable65	Cable	JYOTI PANEL S_1	Bus45	1.32	0.48	1.41	
Cable66	Cable	JYOTI PANEL S_1	Bus46	1.32	0.48	1.41	
Cable67	Cable	JYOTI PANEL S_1	Bus47	1.32	0.48	1.41	
Cable68	Cable	JYOTI PANEL S_1	Bus48	1.32	0.48	1.41	
Cable69	Cable	MCC-114 S_1	Bus67	545.24	147.57	564.86	
Cable70	Cable	PCC-113 S_1	PDB-112 S_1	80.89	43.92	92.04	
Cable71	Cable	PCC-113 S_1	Bus43	401.54	175.68	438.29	
Cable72	Cable	PCC-113 S_1	Bus42	4095.71	1791.91	4470.55	
Cable73	Cable	PCC-113 S_1	Bus41	164.17	36.11	168.10	
Cable74	Cable	PCC-113 S_1	MCC-115 S_2	88.98	48.31	101.25	
Cable75	Cable	PCC-113 S_1	MCC-114 S_2	87.36	47.43	99.40	
Cable76	Cable	PCC-113 S_1	Bus40	4095.71	1791.91	4470.55	
Cable77	Cable	PCC-113 S_1	Bus39	421.41	175.68	456.56	
Cable79	Cable	PCC-113 S_1	STG MCC-118 S_2	64.71	35.14	73.63	
Cable80	Cable	PCC-113 S_2	Bus38	4095.71	1791.91	4470.55	
Cable81	Cable	PCC-113 S_2	Bus31	4095.71	1791.91	4470.55	
Cable82	Cable	PCC-113 S_2	Bus202	105.35	43.92	114.14	
Cable83	Cable	PCC-113 S_2	Bus29	391.07	90.28	401.36	
Cable84	Cable	PCC-113 S_2	Bus27	1606.16	702.71	1753.16	
Cable85	Cable	PCC-113 S_2	MCG-111 S_2	80.89	43.92	92.04	
Cable86	Cable	PCC-113 S_2	Bus24	4095.71	1791.91	4470.55	
Cable89	Cable	MCC-111 S_1	Bus61	714.00	193.25	739.69	
Cable90	Cable	MCC-114 S_1	Bus72	905.94	150.30	918.32	
Cable91	Cable	MCC-114 S_2	Bus75	623.13	168.65	645.55	
Cable92	Cable	JYOTI PANEL S_2	Bus49	1.32	0.48	1.41	
Cable93	Cable	JYOTI PANEL S_2	ANDREW YULE PANEL S_1	0.59	0.57	0.82	
Cable94	Cable	MG PANEL (SS-1) S_2	LR MILL	283.78	189.34	341.15	
Cable96	Cable	PYROTECH PCC	301 A MCC	227.02	151.48	272.92	
Cable97	Cable	PYROTECH PCC	MG PANEL (SS-1) S_2	22.33	18.67	29.11	
Cable98	Cable	PYROTECH PCC	COOLING TWR MCC	85.13	56.80	102.34	
Cable99	Cable	MCC-111 S_2	Bus63	519.28	140.54	537.96	
Cable100	Cable	MCC-114 S_2	Bus73	519.28	140.54	537.96	
Cable101	Cable	MG PANEL (SS-1) S_1	CADMIUM OLD MCC	170.27	113.61	204.69	

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	33
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

CKT/Branch		Connected Bus ID		% Impedance, Pos. Seq., 100 MVAb			
ID	Type	From Bus	To Bus	R	X	Z	Y
Cable105	Cable	MG PANEL (SS-1) S_2	WARTSILA-CISF	454.04	302.95	545.83	
Cable106	Cable	DT SOFT STARTER PNL	Bus21	321.23	140.54	350.63	
Cable107	Cable	MCC-111 S_1	Bus64	317.56	105.41	334.59	
Cable108	Cable	CLDC MCC S_1	Bus77	508.09	168.65	535.35	
Cable109	Cable	MCC-111 S_2	Bus69	317.56	105.41	334.59	
Cable110	Cable	MCC-111 S_2	Bus71	317.56	105.41	334.59	
Cable111	Cable	MCC-114 S_2	Bus74	519.28	140.54	537.96	
Cable112	Cable	MCC-113 RMH S_1	Bus78	905.94	150.30	918.32	
Cable113	Cable	MCC-114 S_2	Bus76	584.19	158.11	605.20	
Cable114	Cable	MCC-113 RMH S_1	Bus80	905.94	150.30	918.32	
Cable115	Cable	CLDC MCC S_1	Bus79	529.26	175.68	557.66	
Cable116	Cable	FAT SOFT STARTER PNL	Bus62	481.85	210.81	525.95	
Cable117	Cable	PCC-111 S_2	FAT SOFT STARTER PNL	421.41	175.68	456.56	
Cable118	Cable	BCH MCC PANEL	Bus37	681.07	184.33	705.57	
Cable119	Cable	BCH MCC PANEL	Bus82	990.17	164.28	1003.70	
Cable120	Cable	VFD PANEL-2 S_2	Bus88	258.84	140.54	294.53	
Cable121	Cable	BCH MCC PANEL	Bus83	1039.67	172.49	1053.89	
Cable122	Cable	MG PANEL (SS-1) S_2	NEW DM PLANT MCC S_2	1135.11	757.38	1364.59	
Cable123	Cable	BCH MCC PANEL	Bus84	709.44	192.01	734.97	
Cable124	Cable	BCH MCC PANEL	Bus85	624.31	168.97	646.77	
Cable125	Cable	VFD PANEL-1 S_1	Bus90	519.28	140.54	537.96	
Cable126	Cable	PAP PCC(SS-3)	JAROSITE FILTER PRESS MCC	44.66	37.34	58.21	
Cable127	Cable	BCH MCC PANEL	Bus87	1138.69	188.92	1154.26	
Cable128	Cable	BCH MCC PANEL	ETP PUMP MCC	897.17	197.34	918.62	
Cable129	Cable	Bus86	BCH MCC PANEL	56.76	37.87	68.23	
Cable130	Cable	Bus86	CANAL PUMP MCC	141.89	94.67	170.57	
Cable131	Cable	RO ZLD PCC	VFD PANEL-2 S_1	97.06	52.70	110.45	
Cable132	Cable	RO ZLD PCC	VFD PANEL-1 S_1	100.30	54.46	114.13	
Cable133	Cable	R-2 ACID PLANT MCC	Bus99	358.87	78.94	367.45	
Cable134	Cable	JAROSITE FILTER PRESS MCC	Bus93	638.50	172.81	661.47	
Cable135	Cable	RO MCC PANEL	Bus89	990.17	164.28	1003.70	
Cable136	Cable	MCTP MCC-2	Bus95	460.59	192.01	499.01	
Cable137	Cable	VFD PANEL-1 S_1	Bus96	519.28	140.54	537.96	
Cable138	Cable	RO MCC PANEL	Bus91	990.17	164.28	1003.70	
Cable139	Cable	VFD PANEL-1 S_2	Bus98	519.28	140.54	537.96	
Cable140	Cable	PAP PCC(SS-3)	MCTP MCC-2	170.27	113.61	204.69	
Cable141	Cable	ETP PCC	PYROTEC PCC	56.76	37.87	68.23	
Cable142	Cable	ETP PCC	ETP OPERATOR MCC	921.19	384.02	998.03	
Cable143	Cable	MCC PUMP HOUSE-3	Bus108	538.30	118.41	551.17	
Cable144	Cable	BCH MCC PANEL	LIME MCC PANEL	897.17	197.34	918.62	

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	34
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

CKT/Branch		Connected Bus ID		% Impedance, Pos. Seq., 100 MVAb			
ID	Type	From Bus	To Bus	R	X	Z	Y
Cable145	Cable	RO ZLD PCC	Bus92	32.35	17.57	36.82	
Cable146	Cable	MG PANEL (SS-1) S_2	CADMIDIUM MCC	156.08	104.14	187.63	
Cable147	Cable	PYROTEC PCC	LEECHATE MCC	990.17	164.28	1003.70	
Cable149	Cable	JAROSITE FILTER PRESS MCC	Bus102	638.50	172.81	661.47	
Cable150	Cable	RO ZLD PCC	Bus94	423.41	140.54	446.13	
Cable151	Cable	PYROTEC PCC	CANAL PH	990.17	164.28	1003.70	
Cable152	Cable	R-2 ACID PLANT MCC	Bus110	358.87	78.94	367.45	
Cable153	Cable	ETP PCC	RO MCC PANEL	707.26	384.02	804.79	
Cable154	Cable	RO ZLD PCC	MCC PANEL-1 S_1	80.89	43.92	92.04	
Cable155	Cable	RO ZLD PCC	MCC PANEL-2 S_1	80.89	43.92	92.04	
Cable156	Cable	JAROSITE FILTER PRESS MCC	Bus97	638.50	172.81	661.47	
Cable157	Cable	PAP PCC(SS-3)	ACID LOADING MCC	312.16	208.28	375.26	
Cable158	Cable	PAP PCC(SS-3)	MCTP MCC-1	204.32	136.33	245.63	
Cable159	Cable	JAROSITE FILTER PRESS MCC	Bus107	638.50	172.81	661.47	
Cable160	Cable	MCTP MCC-1	Bus101	347.08	115.21	365.70	
Cable161	Cable	MG PANEL (SS-1) S_2	NEW DPH	198.64	132.54	238.80	
Cable162	Cable	MCC PUMP HOUSE-3	Bus124	347.08	115.21	365.70	
Cable163	Cable	MCTP MCC-1	Bus103	462.78	153.61	487.60	
Cable164	Cable	JAROSITE FILTER PRESS MCC	Bus104	638.50	172.81	661.47	
Cable165	Cable	SUBSTATION PHE PCC	MCC PUMP HOUSE-3	56.76	37.87	68.23	
Cable166	Cable	ROASTER- II L & T MCC	Bus109	405.32	168.97	439.13	
Cable167	Cable	R-2 ACID PLANT MCC	Bus112	358.87	78.94	367.45	
Cable168	Cable	MCTP MCC-1	Bus105	628.02	138.14	643.04	
Cable169	Cable	MG PANEL (SS-1) S_2	L&T MCC (MCC-3)	397.29	265.08	477.61	
Cable170	Cable	ROASTER- II L & T MCC	Bus111	897.17	197.34	918.62	
Cable171	Cable	MCTP MCC-1	MCTP MCC-3	113.51	75.74	136.46	
Cable172	Cable	MCTP MCC-2	Bus106	897.17	197.34	918.62	
Cable173	Cable	R-2 ACID PLANT MCC	Bus113	358.87	78.94	367.45	
Cable174	Cable	MCC PUMP HOUSE-3	Bus126	276.36	115.21	299.41	
Cable175	Cable	MCC PUMP HOUSE-3	Bus115	538.30	118.41	551.17	
Cable176	Cable	SUBSTATION-2 PCC S_2	PYROTEC LP MCC	113.51	75.74	136.46	
Cable177	Cable	MCC PUMP HOUSE-3	Bus122	538.30	118.41	551.17	
Cable178	Cable	MCC PUMP HOUSE-3	Bus123	347.08	115.21	365.70	
Cable179	Cable	TGT MCC PANEL	Bus114	638.50	172.81	661.47	
Cable180	Cable	SIEMENS BUS-B	Bus179	0.05	0.05	0.07	
Cable181	Cable	MCC PUMP HOUSE-3	Bus137	276.36	115.21	299.41	
Cable182	Cable	TGT MCC PANEL	Bus116	638.50	172.81	661.47	
Cable183	Cable	FILTRATION MCC-3	Bus81	347.08	115.21	365.70	
Cable184	Cable	TGT MCC PANEL	Bus117	638.50	172.81	661.47	
Cable185	Cable	L&T MCC (MCC-3)	Bus118	276.36	115.21	299.41	

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	35
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

CKT/Branch		Connected Bus ID		% Impedance, Pos. Seq., 100 MVAb			
ID	Type	From Bus	To Bus	R	X	Z	Y
Cable186	Cable	SUBSTATION-7 PCC	NEW DM PLANT MCC S_1	151.35	100.98	181.95	
Cable187	Cable	SUBSTATION-2 PCC S_2	ZE PYROTEC MCC	156.08	104.14	187.63	
Cable188	Cable	TGT MCC PANEL	Bus119	638.50	172.81	661.47	
Cable189	Cable	Bus166	PAP PCC(SS-3)	141.89	94.67	170.57	
Cable190	Cable	TGT MCC PANEL	Bus120	638.50	172.81	661.47	
Cable191	Cable	ZE PYROTEC MCC	Bus125	347.08	115.21	365.70	
Cable192	Cable	TGT MCC PANEL	Bus121	638.50	172.81	661.47	
Cable193	Cable	SUBSTATION-7 PCC	RODPH MCC	156.08	104.14	187.63	
Cable194	Cable	SUBSTATION-7 PCC	RO PLANT MCC	165.03	89.61	187.79	
Cable195	Cable	ZE PYROTEC MCC	Bus128	538.30	118.41	551.17	
Cable196	Cable	TGT MCC PANEL	ACTUATOR MCC	638.50	172.81	661.47	
Cable197	Cable	SUBSTATION PHE PCC	MCC PUMP HOUSE-2	70.94	47.34	85.29	
Cable198	Cable	SUBSTATION-7 PCC	BOILER MCC	113.51	75.74	136.46	
Cable199	Cable	MCC PUMP HOUSE-3	Bus141	276.36	115.21	299.41	
Cable201	Cable	SUBSTATION PHE PCC	BCH PCC	56.76	37.87	68.23	
Cable202	Cable	MCC PUMP HOUSE-3	Bus143	276.36	115.21	299.41	
Cable203	Cable	ZE PYROTEC MCC	Bus131	538.30	118.41	551.17	
Cable204	Cable	MCC PUMP HOUSE-3	Bus136	538.30	118.41	551.17	
Cable206	Cable	MCC PUMP HOUSE-2	Bus145	538.30	118.41	551.17	
Cable207	Cable	MCC PUMP HOUSE-3	Bus138	347.08	115.21	365.70	
Cable208	Cable	SUBSTATION PHE PCC	COMP L&T MCC	227.02	151.48	272.92	
Cable209	Cable	ZE PYROTEC MCC	Bus132	538.30	118.41	551.17	
Cable210	Cable	MCC PUMP HOUSE-2	Bus147	538.30	118.41	551.17	
Cable211	Cable	SUBSTATION PHE PCC	ROASTER GE MCC	156.08	104.14	187.63	
Cable212	Cable	MCC PUMP HOUSE-2	Bus148	538.30	118.41	551.17	
Cable214	Cable	MCC PUMP HOUSE-2	Bus149	538.30	118.41	551.17	
Cable215	Cable	PURIFICATION MCC	LEACHING MCC 201C	156.08	104.14	187.63	
Cable216	Cable	MCC PUMP HOUSE-2	Bus150	538.30	118.41	551.17	
Cable217	Cable	SUBSTATION-2 PCC S_1	Bus151	681.07	454.43	818.75	
Cable218	Cable	SUBSTATION-5 PCC S_1	INTERLAC MCC	567.56	378.69	682.29	
Cable219	Cable	COOLING TWR MCC	Bus134	538.30	118.41	551.17	
Cable220	Cable	SUBSTATION-2 PCC S_1	ROASTER- II L & T MCC	212.83	142.01	255.86	
Cable221	Cable	SUBSTATION-2 PCC S_1	R.2 ACID PLANT MCC	1060.89	576.03	1207.19	
Cable222	Cable	SUBSTATION-2 PCC S_1	CADMIDIUM PCC	283.78	189.34	341.15	
Cable225	Cable	COOLING TWR MCC	Bus139	538.30	118.41	551.17	
Cable227	Cable	SUBSTATION-2 PCC S_2	Bus127	312.16	208.28	375.26	
Cable228	Cable	SUBSTATION PHE PCC	COMPRESSOR PANEL	34.05	22.72	40.94	
Cable229	Cable	COMPRESSOR PANEL	Bus152	269.15	59.20	275.59	
Cable230	Cable	SUBSTATION-5 PCC S_1	WATER CLARIFIER MCC	690.89	288.02	748.52	
Cable231	Cable	SUBSTATION-7 PCC	DM PLANT MCC S_1	151.35	100.98	181.95	

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Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

CKT/Branch		Connected Bus ID		% Impedance, Pos. Seq., 100 MVAb			
ID	Type	From Bus	To Bus	R	X	Z	Y
Cable232	Cable	SUBSTATION PHE PCC	DM PLANT MCC S_2	454.04	302.95	545.83	
Cable234	Cable	SUBSTATION-4 PCC S_2	SUBSTATION-5 PCC S_1	90.81	60.59	109.17	
Cable235	Cable	SUBSTATION-4 PCC S_1	MR MCC PANEL	340.53	227.21	409.38	
Cable236	Cable	SUBSTATION-4 PCC S_1	TGT MCC PANEL	1135.11	757.38	1364.59	
Cable237	Cable	SUBSTATION-4 PCC S_1	BLEND HANDLING MCC	227.02	151.48	272.92	
Cable238	Cable	SUBSTATION-4 PCC S_1	Bus153	156.32	130.67	203.74	
Cable239	Cable	SUBSTATION-4 PCC S_1	LEACHING MCC 201B1	75.67	50.49	90.97	
Cable240	Cable	SUBSTATION-4 PCC S_1	LEACHING MCC 201B2	312.16	208.28	375.26	
Cable242	Cable	SUBSTATION-4 PCC S_2	PURIFICATION MCC	472.96	315.57	568.58	
Cable243	Cable	SUBSTATION-4 PCC S_2	GE MCC	567.56	378.69	682.29	
Cable244	Cable	SUBSTATION-4 PCC S_2	FILTER WATER MCC S_1	567.56	378.69	682.29	
Cable245	Cable	SUBSTATION-4 PCC S_2	L&P MCC-2	74.44	62.23	97.02	
Cable247	Cable	Bus153	L&T PH-1 MCC	283.78	189.34	341.15	
Cable248	Cable	SUBSTATION-5 PCC S_1	LEACHING MCC-1	353.63	192.01	402.40	
Cable250	Cable	SUBSTATION-5 PCC S_1	Bus161	56.76	37.87	68.23	
Cable252	Cable	SUBSTATION-5 PCC S_3	Bus160	28.38	18.93	34.11	
Cable254	Cable	SUBSTATION-5 PCC S_3	ADMIN LT ROOM	1844.56	499.23	1910.92	
Cable255	Cable	SUBSTATION-5 PCC S_3	FILTERATION MCC-3	567.56	378.69	682.29	
Cable256	Cable	SUBSTATION-5 PCC S_3	SULZER MCC	56.76	37.87	68.23	
Cable257	Cable	SUBSTATION-5 PCC S_3	INDUCTION FURNACE PCC	283.78	189.34	341.15	
Cable258	Cable	Bus167	SUBSTATION-6 PCC	360.95	398.10	537.37	
Cable259	Cable	SULZER MCC	Bus155	638.50	172.81	661.47	
Cable260	Cable	Bus55	SUBSTATION-5 PCC S_2	141.89	94.67	170.57	
Cable261	Cable	SUBSTATION-2 PCC S_2	COMP. HOUSE MCC	156.32	130.67	203.74	
Cable262	Cable	SULZER MCC	Bus157	425.67	115.21	440.98	
Cable263	Cable	ANDREW YULE PANEL S_1	Bus129	5.29	1.92	5.62	
Cable264	Cable	Bus56	SUBSTATION-2 PCC S_2	156.08	104.14	187.63	
Cable265	Cable	SULZER MCC	Bus159	897.17	197.34	918.62	
Cable266	Cable	ANDREW YULE PANEL S_1	Bus133	1.32	0.48	1.41	
Cable267	Cable	JYOTI PANEL S_2	Bus57	1.32	0.48	1.41	
Cable268	Cable	Bus182	SIEMENS BUS-A	0.08	0.16	0.18	
Cable269	Cable	ANDREW YULE PANEL S_1	Bus135	0.04	0.04	0.06	
Cable270	Cable	MR.MCC PANEL	Bus163	638.50	172.81	661.47	
Cable271	Cable	Bus168	ETP PCC	141.89	94.67	170.57	
Cable272	Cable	MR MCC PANEL	Bus164	425.67	115.21	440.98	
Cable273	Cable	Bus58	SUBSTATION-2 PCC S_1	156.08	104.14	187.63	
Cable274	Cable	MR MCC PANEL	Bus165	638.50	172.81	661.47	
Cable275	Cable	ANDREW YULE PANEL S_2	Bus142	0.04	0.04	0.06	
Cable276	Cable	ANDREW YULE PANEL S_2	Bus144	0.04	0.04	0.06	
Cable277	Cable	SUBSTATION-6 PCC	MG PANEL (SS-1) S_1	56.76	37.87	68.23	

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Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

CKT/Branch		Connected Bus ID		% Impedance, Pos. Seq., 100 MVAb			
ID	Type	From Bus	To Bus	R	X	Z	Y
Cable278	Cable	SUBSTATION-6 PCC	SUBSTATION-5 PCC S_3	283.78	189.34	341.15	
Cable279	Cable	SUBSTATION-6 PCC	SUBSTATION-7 PCC	141.89	94.67	170.57	
Cable281	Cable	Bus169	MELTING FURNACE PCC	170.27	113.61	204.69	
Cable282	Cable	Bus180	JYOTI PANEL S_2	0.09	0.09	0.12	
Cable283	Cable	Bus59	SUBSTATION-4 PCC S_1	156.08	104.14	187.63	
Cable284	Cable	Bus60	SUBSTATION-4 PCC S_2	156.08	104.14	187.63	
Cable285	Cable	ANDREW YULE PANEL S_2	Bus154	1.32	0.48	1.41	
Cable286	Cable	ANDREW YULE PANEL S_2	Bus156	1.32	0.48	1.41	
Cable287	Cable	ANDREW YULE PANEL S_2	Bus158	1.32	0.48	1.41	
Cable288	Cable	ANDREW YULE PANEL S_2	Bus162	1.32	0.48	1.41	
Cable290	Cable	SIEMENS BUS-A	Bus181	0.05	0.05	0.07	
Cable292	Cable	Bus146	6.6KV HT PANEL	5.14	1.64	5.39	
Cable293	Cable	Bus184	SIEMENS BUS-B	0.08	0.16	0.18	
Cable295	Cable	6.6KV HT PANEL	Bus170	5.14	1.64	5.39	
Cable297	Cable	6.6KV HT PANEL	Bus171	5.14	1.64	5.39	
Cable298	Cable	Bus186	DG BUS-A	2.09	2.17	3.02	
Cable299	Cable	Bus194	INV. ROOM-1 BUS	0.27	0.17	0.32	
Cable305	Cable	INV. ROOM-1 BUS	SOLAR 11KV HT PNL	0.27	0.17	0.32	
Cable307	Cable	DG BUS-A	Bus188	0.12	0.12	0.17	
Cable308	Cable	11KV 10 MW STG	CDSS 11KV PANEL S_2	0.38	0.73	0.82	
Cable310	Cable	ANDREW YULE PANEL S_2	COLONY OVER HEAD LINE	13.21	4.79	14.06	
Cable311	Cable	DG BUS-B	Bus189	0.12	0.12	0.17	
Cable312	Cable	COLONY OVER HEAD LINE	Bus173	1.32	0.48	1.41	
Cable313	Cable	SOLAR 11KV HT PNL	JYOTI PANEL S_2	40.80	26.03	48.40	
Cable316	Cable	COLONY OVER HEAD LINE	Bus174	1.32	0.48	1.41	
Cable317	Cable	COLONY OVER HEAD LINE	Bus175	1.32	0.48	1.41	
Cable319	Cable	Bus190	JYOTI PANEL S_3	0.16	0.21	0.27	
Cable321	Cable	Bus191	ABB BUS	0.16	0.21	0.27	
Cable322	Cable	ABB BUS	Bus192	0.17	0.16	0.23	
Cable324	Cable	Bus192	Bus193	0.17	0.16	0.23	
Cable327	Cable	Bus204	Bus205	147.38	98.34	177.18	
Cable330	Cable	Bus205	Bus206	147.38	98.34	177.18	
Cable333	Cable	Bus210	Bus212	147.38	98.34	177.18	
Cable334	Cable	Bus211	Bus210	147.38	98.34	177.18	
Cable337	Cable	Bus230	Bus231	147.38	98.34	177.18	
Cable338	Cable	Bus231	Bus232	147.38	98.34	177.18	
Cable339	Cable	Bus219	Bus220	147.38	98.34	177.18	
Cable340	Cable	Bus220	Bus221	147.38	98.34	177.18	
Cable341	Cable	Bus223	Bus222	147.38	98.34	177.18	
Cable342	Cable	Bus224	Bus223	147.38	98.34	177.18	

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Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

CKT/Branch		Connected Bus ID		% Impedance, Pos. Seq., 100 MVAb			
ID	Type	From Bus	To Bus	R	X	Z	Y
Cable343	Cable	Bus233	Bus234	147.38	98.34	177.18	
Cable344	Cable	Bus234	Bus235	147.38	98.34	177.18	
Cable345	Cable	Bus236	SOLAR 11KV HT PNL	0.27	0.17	0.32	
Cable347	Cable	Bus237	SOLAR 11KV HT PNL	0.27	0.17	0.32	
Cable348	Cable	Bus238	Bus239	147.38	98.34	177.18	
Cable349	Cable	Bus239	Bus240	147.38	98.34	177.18	
Cable350	Cable	Bus242	Bus241	147.38	98.34	177.18	
Cable351	Cable	Bus243	Bus242	147.38	98.34	177.18	
Cable352	Cable	Bus244	Bus245	147.38	98.34	177.18	
Cable353	Cable	Bus245	Bus246	147.38	98.34	177.18	
Cable354	Cable	Bus247	Bus248	147.38	98.34	177.18	
Cable355	Cable	Bus248	Bus249	147.38	98.34	177.18	
Cable356	Cable	Bus250	INV. ROOM-2 BUS	0.27	0.17	0.32	
Cable357	Cable	INV. ROOM-2 BUS	SOLAR 11KV HT PNL	0.27	0.17	0.32	
Cable358	Cable	Bus251	INV. ROOM-2 BUS	0.27	0.17	0.32	
Cable359	Cable	Bus252	Bus253	147.38	98.34	177.18	
Cable360	Cable	Bus253	Bus254	147.38	98.34	177.18	
Cable361	Cable	Bus256	Bus255	147.38	98.34	177.18	
Cable362	Cable	Bus257	Bus256	147.38	98.34	177.18	
CDSS 11KV B/C	Tie Breaker	CDSS 11KV PANEL S_1	CDSS 11KV PANEL S_2				
DG BUS COUPLER	Tie Breaker	DG BUS-A	DG BUS-B				
FILTER WATER MCC B/C	Tie Breaker	FILTER WATER MCC S_1	FILTER WATER MCC S_2				
I/C TO PH-1 MCC PNL	Tie Breaker	Bus153	PH-1 MCC PANEL				
JYOTI B/C-2	Tie Breaker	JYOTI PANEL S_1	JYOTI PANEL S_2				
MCC-1 B/C	Tie Breaker	MCC PANEL-1 S_1	MCC PANEL-1 S_2				
MCC-2 B/C	Tie Breaker	MCC PANEL-2 S_1	MCC PANEL-2 S_2				
O/G TO CANAL + BCH MCC	Tie Breaker	ETP PCC	Bus86				
VFD PANEL-1 B/C	Tie Breaker	VFD PANEL-1 S_1	VFD PANEL-1 S_2				
VFD PANEL-2 B/C	Tie Breaker	VFD PANEL-2 S_1	VFD PANEL-2 S_2				
SW4	Tie Switch	132KV HZL BUS S_1	132KV HZL BUS S_2				

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Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Power Grid Input Data

Power Grid	Connected Bus	% Impedance					
		100 MVA Base			R	X*	R/X
ID	ID	MVASC	kV				
132KV GRID SUPPLY	132KV HZL BUS S_1	7201.867	132.000	0.09893	1.38500	0.07	

Total Connected Power Grids (= 1): 7201.867 MVA

Synchronous Generator Input Data

Synchronous Generator	Connected Bus	% Impedance in Machine Base						Excitation				
		Xd"			R	Adj.	Tol.	R/X	Xd, sat			
ID	Type	ID	MVA	kV	RPM	% PF						
DG-01	Steam Turbo	Bus186	7.400	11.000	1500	\$5.00	1.000	19.00	0.0	0.05	155.00	Turbine 130%
DG-2	Steam Turbo	Bus187	7.400	11.000	1500	\$5.00	1.000	19.00	0.0	0.05	155.00	Turbine 130%

Total Connected Synchronous Generators (= 2): 14.800 MVA

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Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Induction Machine Input Data

Induction Machine			Connected Bus		Rating			% Impedance (Motor Base)			mFact.		
ID	Type	Qty	ID		HP/kW	kVA	kV	Amp	PF	R	X"	R/X"	MW/PP
SO2 BLOWER	Motor	1	Bus2		2800.00	3494.34	11.000	183.41	0.85	1.66	15.29	0.11	1.40
ROASTER AIR BLOWER	Motor	1	Bus22		1320.00	1654.18	11.000	86.82	0.85	2.05	15.25	0.13	0.66
BALL MILL	Motor	1	Bus26		300.00	379.06	3.300	66.32	0.85	3.09	15.07	0.20	0.15
CIRCULATING PUMP WHRB	Motor	1	Bus28		220.00	257.63	3.300	45.07	0.87	3.36	15.01	0.22	0.11
FEED WATER PUMP	Motor	1	Bus30		200.00	234.44	3.300	41.02	0.83	3.45	14.99	0.23	0.10
STARTUP FAN	Motor	1	Bus32		250.00	292.42	3.300	51.16	0.92	3.25	15.04	0.22	0.13
SO2 GAS BLOWER	Motor	1	Bus170		500.00	580.81	6.600	50.81	0.92	2.68	15.15	0.18	0.25
ROASTER AIR BLOWER 6.6 KV	Motor	1	Bus171		275.00	321.34	6.600	28.11	0.96	3.16	15.06	0.21	0.14
CT-4 PUMP-1	Motor	1	Bus4		200.00	234.44	0.415	326.15	0.83	3.74	16.24	0.23	0.10
SCREW COMP-3	Motor	1	Bus7		160.00	188.00	0.415	261.54	0.73	3.98	16.18	0.25	0.08
CT-2 PUMP-1	Motor	1	Bus10		200.00	234.44	0.415	326.15	0.83	3.74	16.24	0.23	0.10
CT-1 PUMP-3	Motor	1	Bus11		200.00	234.44	0.415	326.15	0.83	3.74	16.24	0.23	0.10
CT-1 PUMP-2	Motor	1	Bus14		200.00	234.44	0.415	326.15	0.83	3.74	16.24	0.23	0.10
CT-2 PUMP-2	Motor	1	Bus16		200.00	234.44	0.415	326.15	0.83	3.74	16.24	0.23	0.10
SCREW COMP-4	Motor	1	Bus19		160.00	188.00	0.415	261.54	0.73	3.98	16.18	0.25	0.08
DT PUMP	Motor	1	Bus21		110.00	141.51	0.415	196.87	0.58	4.41	16.07	0.27	0.06
CT-4 PUMP-3	Motor	1	Bus23		185.00	217.04	0.415	301.95	0.79	3.82	16.22	0.24	0.09
CT-1 PUMP-1	Motor	1	Bus24		200.00	234.44	0.415	326.15	0.83	3.74	16.24	0.23	0.10
IR COMP-5	Motor	1	Bus27		200.00	234.44	0.415	326.15	0.83	3.74	16.24	0.23	0.10
Mfr3	Motor	1	Bus29		45.00	61.70	0.415	85.84	0.83	5.89	15.59	0.38	0.02
CT-5 PUMP-2	Motor	1	Bus31		200.00	234.44	0.415	326.15	0.83	3.74	16.24	0.23	0.10
SCREW COMP.	Motor	1	Bus33		160.00	202.88	0.415	282.25	0.80	3.98	16.18	0.25	0.08
CT-3 PUMP-1	Motor	1	Bus34		200.00	253.28	0.415	352.36	0.80	3.74	16.24	0.23	0.10
SCREW COMP-2	Motor	1	Bus35		160.00	188.00	0.415	261.54	0.73	3.98	16.18	0.25	0.08
ZLD VAPOUR COMP-1	Motor	1	Bus36		305.00	385.33	0.415	536.08	0.85	3.33	16.33	0.20	0.15
CLOTH WASH	Motor	1	Bus37		75.00	76.49	0.415	106.41	0.93	5.51	15.73	0.35	0.03
CT-2 PUMP-3	Motor	1	Bus38		200.00	234.44	0.415	326.15	0.83	3.74	16.24	0.23	0.10
COOL AIR FAN	Motor	1	Bus39		200.00	234.44	0.415	326.15	0.83	3.74	16.24	0.23	0.10
CT-1 PUMP-4	Motor	1	Bus40		200.00	234.44	0.415	326.15	0.83	3.74	16.24	0.23	0.10
GA-55	Motor	1	Bus41		55.00	80.82	0.415	112.44	0.80	5.54	15.72	0.35	0.03
Mfr10	Motor	1	Bus42		200.00	234.44	0.415	326.15	0.83	3.74	16.24	0.23	0.10
Mfr1	Motor	1	Bus43		160.00	188.00	0.415	261.54	0.73	3.98	16.18	0.25	0.08
RETURN WATER COOL PUMP	Motor	1	Bus61		50.00	51.79	0.415	72.05	0.39	6.21	15.47	0.40	0.02
FAT PUMP	Motor	1	Bus62		110.00	141.51	0.415	196.87	0.58	4.41	16.07	0.27	0.06
RETURN WATER COOL PUMP-3	Motor	1	Bus63		60.00	61.35	0.415	85.35	0.82	5.90	15.59	0.38	0.02
QUECH WATER P-3	Motor	1	Bus66		75.00	106.89	0.415	148.70	0.80	4.91	15.93	0.31	0.04
PGCT PUMP-1	Motor	1	Bus67		55.00	75.24	0.415	104.66	0.31	5.54	15.72	0.35	0.03
WGP FLUSHING PUMP	Motor	1	Bus72		37.00	54.64	0.415	76.01	0.80	6.23	15.46	0.40	0.02
QUECH WATER P-2	Motor	1	Bus73		75.00	106.89	0.415	148.70	0.80	4.91	15.93	0.31	0.04

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Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Induction Machine Input Data

Induction Machine	Connected Bus			Rating				% Impedance (Motor Base)			mFact.		
	ID	Type	Qty	ID	HP/kW	kVA	kV	Amp	PF	R	X'		
QUECH WATER P-1	Motor	1	Bus74		75.00	106.89	0.415	148.70	85.00	4.91	15.93	0.31	0.04
PGCT PUMP-2	Motor	1	Bus75		55.00	75.24	0.415	104.66	91.31	5.54	15.72	0.35	0.03
PGCT PUMP-3	Motor	1	Bus76		55.00	75.24	0.415	104.66	91.31	5.54	15.72	0.35	0.03
DRUM COOLLER P-1	Motor	1	Bus77		100.00	98.79	0.415	137.45	92.04	5.01	15.90	0.32	0.04
BC-11	Motor	1	Bus78		45.00	61.70	0.415	85.84	90.83	5.89	15.59	0.38	0.02
DRUM COOLLER P-2	Motor	1	Bus79		100.00	98.79	0.415	137.45	92.04	5.01	15.90	0.32	0.04
HAMMER MILL	Motor	1	Bus80		45.00	61.70	0.415	85.84	90.83	5.89	15.59	0.38	0.02
NEW REACTOR	Motor	1	Bus81		100.00	98.79	0.415	137.45	92.04	5.01	15.90	0.32	0.04
FO-1	Motor	1	Bus82		40.00	41.43	0.415	57.64	89.85	6.60	15.31	0.43	0.01
LAGOON NO.5	Motor	1	Bus83		30.00	31.87	0.415	44.34	89.17	7.10	15.08	0.47	0.01
NEW ZEROSITE PUMP	Motor	1	Bus84		60.00	61.35	0.415	85.35	90.82	5.90	15.59	0.38	0.02
DO6-B	Motor	1	Bus85		60.00	61.35	0.415	85.35	90.82	5.90	15.59	0.38	0.02
FO-2	Motor	1	Bus87		40.00	41.43	0.415	57.64	89.85	6.60	15.31	0.43	0.01
ZLD VAPOUR COMP-2	Motor	1	Bus88		283.00	330.59	0.415	459.91	91.97	3.40	16.32	0.21	0.14
RO_03_G031_M001	Motor	1	Bus89		40.00	41.43	0.415	57.64	89.85	6.60	15.31	0.43	0.01
RO-2 HP PUMP-B	Motor	1	Bus90		85.00	113.06	0.415	157.29	91.47	4.74	15.98	0.30	0.04
TREATED WATER SUPPLY	Motor	1	Bus91		40.00	41.43	0.415	57.64	89.85	6.60	15.31	0.43	0.01
GA-90 COMP.	Motor	1	Bus93		75.00	99.38	0.415	138.26	91.42	4.91	15.93	0.31	0.04
AIR COMP.	Motor	1	Bus94		90.00	119.89	0.415	166.80	91.50	4.67	16.00	0.29	0.05
ID FAN	Motor	1	Bus95		280.00	353.94	0.415	492.40	85.00	3.41	16.31	0.21	0.14
RO-2 HP PUMP-A	Motor	1	Bus96		85.00	113.06	0.415	157.29	91.47	4.74	15.98	0.30	0.04
CLOTH WASH PUMP-1	Motor	1	Bus97		55.00	75.24	0.415	104.66	91.31	5.54	15.72	0.35	0.03
RO-1 HP PUMP	Motor	1	Bus98		92.00	122.63	0.415	170.61	91.51	4.64	16.01	0.29	0.05
SO2 BLOWER OIL PUMP	Motor	1	Bus99		45.00	61.70	0.415	85.84	90.83	5.89	15.59	0.38	0.02
ROTARY KILN	Motor	1	Bus101		132.00	182.51	0.415	253.90	85.00	4.20	16.13	0.26	0.07
FEED PUMP-1	Motor	1	Bus102		55.00	75.24	0.415	104.66	91.31	5.54	15.72	0.35	0.03
BURNER SYSTEM	Motor	1	Bus103		93.00	133.49	0.415	185.72	85.00	4.63	16.01	0.29	0.05
CLOTH WASH PUMP-2	Motor	1	Bus104		55.00	75.24	0.415	104.66	91.31	5.54	15.72	0.35	0.03
FEED BELT CONVEYER	Motor	1	Bus105		55.00	80.82	0.415	112.44	85.00	5.54	15.72	0.35	0.03
GRAB BUCKET CRANE	Motor	1	Bus106		45.00	65.93	0.415	91.72	85.00	5.89	15.59	0.38	0.02
FEED PUMP-2	Motor	1	Bus107		55.00	75.24	0.415	104.66	91.31	5.54	15.72	0.35	0.03
300-D	Motor	1	Bus108		35.00	36.65	0.415	50.99	89.53	6.83	15.20	0.45	0.01
FEED WATER PUM	Motor	1	Bus109		110.00	141.51	0.415	196.87	91.58	4.41	16.07	0.27	0.06
DT PUMP MOTOR	Motor	1	Bus110		45.00	61.70	0.415	85.84	90.83	5.89	15.59	0.38	0.02
COOLING AIR FAN	Motor	1	Bus111		31.00	43.06	0.415	59.90	89.94	6.53	15.33	0.43	0.02
IPAT PUMP	Motor	1	Bus112		45.00	61.70	0.415	85.84	90.83	5.89	15.59	0.38	0.02
FAT PUMP MOTOR	Motor	1	Bus113		45.00	61.70	0.415	85.84	90.83	5.89	15.59	0.38	0.02
RC/TK-RE CIRCU PUMP-A	Motor	1	Bus114		55.00	75.24	0.415	104.66	91.31	5.54	15.72	0.35	0.03
FAN-311	Motor	1	Bus115		35.00	36.65	0.415	50.99	89.53	6.83	15.20	0.45	0.01
RC/TK-RE CIRCU PUMP-B	Motor	1	Bus116		55.00	75.24	0.415	104.66	91.31	5.54	15.72	0.35	0.03

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Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Induction Machine Input Data

Induction Machine	Connected Bus			Rating				% Impedance (Motor Base)			mFact.			
	ID	Type	Qty	ID	HP/kW	kVA	kV	Amp	PF	R	X ^r			
RC-TANK PUMP-A		Motor	1	Bus117		55.00	75.24	0.415	104.67	91.31	5.54	15.72	0.35	0.03
NEW HBF VACUUM PUMP		Motor	1	Bus118		150.00	143.41	0.415	199.52	91.59	4.39	16.08	0.27	0.06
RC-TANK PUMP-B		Motor	1	Bus119		55.00	75.24	0.415	104.67	91.31	5.54	15.72	0.35	0.03
RC-TANK PUMP-C		Motor	1	Bus120		55.00	75.24	0.415	104.67	91.31	5.54	15.72	0.35	0.03
COMPRESSOR		Motor	1	Bus121		55.00	75.24	0.415	104.67	91.31	5.54	15.72	0.35	0.03
FAN-312		Motor	1	Bus122		35.00	36.65	0.415	50.99	89.53	6.83	15.20	0.45	0.01
300-E		Motor	1	Bus123		100.00	98.79	0.415	137.45	92.04	5.01	15.90	0.32	0.04
300-F		Motor	1	Bus124		100.00	98.79	0.415	137.45	92.04	5.01	15.90	0.32	0.04
316-R PUMP		Motor	1	Bus125		120.00	119.19	0.415	165.82	91.49	4.67	16.00	0.29	0.04
300-A		Motor	1	Bus126		150.00	143.41	0.415	199.52	91.59	4.39	16.08	0.27	0.06
IR COMP		Motor	1	Bus127		250.00	292.42	0.415	406.81	91.92	3.52	16.29	0.22	0.13
316-S PUMP		Motor	1	Bus128		60.00	61.35	0.415	85.35	90.82	5.90	15.59	0.38	0.02
310 ST PUMP		Motor	1	Bus131		60.00	61.35	0.415	85.35	90.82	5.90	15.59	0.38	0.02
317 PUMP		Motor	1	Bus132		60.00	61.35	0.415	85.35	90.82	5.90	15.59	0.38	0.02
SOFT WATER PUMP-1		Motor	1	Bus134		40.00	41.43	0.415	57.64	89.85	6.60	15.31	0.43	0.01
FAN-313		Motor	1	Bus136		35.00	36.65	0.415	50.99	89.53	6.83	15.20	0.45	0.01
300-B		Motor	1	Bus137		150.00	143.41	0.415	199.52	91.59	4.39	16.08	0.27	0.06
300-H		Motor	1	Bus138		100.00	98.79	0.415	137.45	92.04	5.01	15.90	0.32	0.04
SOFT WATER PUMP-2		Motor	1	Bus139		40.00	41.43	0.415	57.64	89.85	6.60	15.31	0.43	0.01
300-C		Motor	1	Bus141		150.00	143.41	0.415	199.52	91.59	4.39	16.08	0.27	0.06
300-G		Motor	1	Bus143		150.00	143.41	0.415	199.52	91.59	4.39	16.08	0.27	0.06
200-A		Motor	1	Bus145		35.00	36.65	0.415	50.99	89.53	6.83	15.20	0.45	0.01
200-E		Motor	1	Bus147		35.00	36.65	0.415	50.99	89.53	6.83	15.20	0.45	0.01
200-B		Motor	1	Bus148		35.00	36.65	0.415	50.99	89.53	6.83	15.20	0.45	0.01
200-C		Motor	1	Bus149		35.00	36.65	0.415	50.99	89.53	6.83	15.20	0.45	0.01
200-D		Motor	1	Bus150		35.00	36.65	0.415	50.99	89.53	6.83	15.20	0.45	0.01
ID FAN-II		Motor	1	Bus151		175.00	205.42	0.415	285.79	91.77	3.88	16.21	0.24	0.09
COMPRESSOR GA-60		Motor	1	Bus152		215.00	251.83	0.415	350.35	91.86	3.67	16.26	0.23	0.11
SULZER 225-B PUMP		Motor	1	Bus155		75.00	99.38	0.415	138.26	91.42	4.91	15.93	0.31	0.04
SULZER 227-A PUMP		Motor	1	Bus157		75.00	99.38	0.415	138.26	91.42	4.91	15.93	0.31	0.04
PUMP-.36		Motor	1	Bus159		45.00	65.93	0.415	91.72	85.00	5.89	15.59	0.38	0.02
REACTOR-27		Motor	1	Bus163		75.00	99.38	0.415	138.26	91.42	4.91	15.93	0.31	0.04
REACTOR-28		Motor	1	Bus164		75.00	99.38	0.415	138.26	91.42	4.91	15.93	0.31	0.04
REACTOR-29		Motor	1	Bus165		75.00	99.38	0.415	138.26	91.42	4.91	15.93	0.31	0.04
CANAL PUMP		Motor	1	CANAL PUMP MCC		60.00	61.35	0.415	85.35	90.82	5.90	15.59	0.38	0.02
IAT		Motor	1	IAT SOFT STARTER PNL		200.00	234.44	0.415	326.15	91.83	3.74	16.24	0.23	0.10

Total Connected Induction Machines (= 115): 20030.9 kVA

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Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Lumped Load Input Data

Lumped Load				Motor Loads									
Lumped Load	Connected Bus	Rating			% Load		Loading		% Impedance			Machine Base	
		ID	ID	kVA	kV	Amp	% PF	MTR	STAT	kW	kvar	R	X*
Lump1	MCC-111 S_1	170.6	0.415	237.32	85.00	80	20	116.0	71.9	6.46	15.37	0.42	0.12
Lump2	Bus65	58.8	0.415	81.84	85.00	80	20	40.0	24.8	6.46	15.37	0.42	0.04
Lump3	MCC-115 S_1	176.5	0.415	245.51	85.00	80	20	120.0	74.4	6.46	15.37	0.42	0.12
Lump4	Bus68	58.8	0.415	81.84	85.00	80	20	40.0	24.8	6.46	15.37	0.42	0.04
Lump5	Bus70	58.8	0.415	81.84	85.00	80	20	40.0	24.8	6.46	15.37	0.42	0.04
Lump6	MCC-111 S_2	100.0	0.415	139.12	85.00	80	20	68.0	42.1	6.46	15.37	0.42	0.07
Lump7	MCC-114 S_1	58.8	0.415	81.84	85.00	80	20	40.0	24.8	6.46	15.37	0.42	0.04
Lump8	MCC-114 S_2	35.3	0.415	49.10	85.00	80	20	24.0	14.9	6.46	15.37	0.42	0.02
Lump9	MCC-115 S_2	176.5	0.415	245.51	85.00	80	20	120.0	74.4	6.46	15.37	0.42	0.12
Lump10	MCC-112	188.2	0.415	261.87	85.00	80	20	128.0	79.3	6.46	15.37	0.42	0.13
Lump11	MCC-112 S_2	188.2	0.415	261.87	85.00	80	20	128.0	79.3	6.46	15.37	0.42	0.13
Lump12	PDB-111 S_1	176.5	0.415	245.51	85.00	80	20	120.0	74.4	6.46	15.37	0.42	0.12
Lump13	PDB-111 S_2	176.5	0.415	245.51	85.00	80	20	120.0	74.4	6.46	15.37	0.42	0.12
Lump14	PDB-112 S_1	235.3	0.415	327.34	85.00	80	20	160.0	99.2	6.46	15.37	0.42	0.16
Lump15	PDB-112 S_2	235.3	0.415	327.34	85.00	80	20	160.0	99.2	6.46	15.37	0.42	0.16
Lump16	ETP PUMP MCC	64.7	0.415	90.02	85.00	80	20	44.0	27.3	6.46	15.37	0.42	0.04
Lump17	RO MCC PANEL	317.6	0.415	441.91	85.00	80	20	216.0	133.9	6.46	15.37	0.42	0.22
Lump18	ETP OPERATOR MCC	117.6	0.415	163.67	85.00	80	20	80.0	49.6	6.46	15.37	0.42	0.08
Lump19	VFD PANEL-1 S_2	144.7	0.415	201.32	85.00	80	20	98.4	61.0	6.46	15.37	0.42	0.10
Lump20	LIME MCC PANEL	64.7	0.415	90.02	85.00	80	20	44.0	27.3	6.46	15.37	0.42	0.04
Lump21	MCC-113 RMH S_1	82.4	0.415	114.57	85.00	80	20	56.0	34.7	6.46	15.37	0.42	0.06
Lump22	MCC-113 RMH S_2	188.2	0.415	261.87	85.00	80	20	128.0	79.3	6.46	15.37	0.42	0.13
Lump23	MCC PANEL-1 S_1	176.5	0.415	245.51	85.00	80	20	120.0	74.4	6.46	15.37	0.42	0.12
Lump24	MCC PANEL -1 S_2	176.5	0.415	245.51	85.00	80	20	120.0	74.4	6.46	15.37	0.42	0.12
Lump25	STG MCC-118 S_2	117.6	0.415	163.67	85.00	80	20	80.0	49.6	6.46	15.37	0.42	0.08
Lump26	STG MCC-118 S_1	117.6	0.415	163.67	85.00	80	20	80.0	49.6	6.46	15.37	0.42	0.08
Lump27	LEECHATE MCC	58.8	0.415	81.84	85.00	80	20	40.0	24.8	6.46	15.37	0.42	0.04
Lump28	MCTP MCC-2	117.6	0.415	163.67	85.00	80	20	80.0	49.6	6.46	15.37	0.42	0.08
Lump29	MCC-116 S_2	188.2	0.415	261.87	85.00	80	20	128.0	79.3	6.46	15.37	0.42	0.13
Lump30	MCC-116	188.2	0.415	261.87	85.00	80	20	128.0	79.3	6.46	15.37	0.42	0.13
Lump31	MCC PANEL -2 S_2	176.5	0.415	245.51	85.00	80	20	120.0	74.4	6.46	15.37	0.42	0.12
Lump32	MCC PANEL -2 S_1	176.5	0.415	245.51	85.00	80	20	120.0	74.4	6.46	15.37	0.42	0.12
Lump33	CANAL PH	58.8	0.415	81.84	85.00	80	20	40.0	24.8	6.46	15.37	0.42	0.04
Lump34	JAROSITE FILTER PRESS MCC	188.2	0.415	261.87	85.00	80	20	128.0	79.3	6.46	15.37	0.42	0.13

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	44
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Lumped Load Input Data

Lumped Load	Connected Bus	Lumped Load										Motor Loads					
		ID	ID	Rating			% Load		Loading		% Impedance				Machine Base		
				kVA	kV	Amp	% PF	MTR	STAT	kW	kvar	R	X"	R/X"	MW/PP		
Lump35	ROASTER- II L & T MCC	141.2	0.415	196.41	85.00	80	20	96.0	59.5	6.46	15.37	0.42	0.10				
Lump36	ACID LOADING MCC	94.1	0.415	130.94	85.00	80	20	64.0	39.7	6.46	15.37	0.42	0.06				
Lump37	MCTP MCC-3	94.1	0.415	130.94	85.00	80	20	64.0	39.7	6.46	15.37	0.42	0.06				
Lump38	MCTP MCC-1	35.3	0.415	49.10	85.00	80	20	24.0	14.9	6.46	15.37	0.42	0.02				
Lump39	TGT MCC PANEL	141.2	0.415	196.41	85.00	80	20	96.0	59.5	6.46	15.37	0.42	0.10				
Lump40	ACTUATOR.MCC	94.1	0.415	130.94	85.00	80	20	64.0	39.7	6.46	15.37	0.42	0.06				
Lump41	R-2 ACID PLANT MCC	94.1	0.415	130.94	85.00	80	20	64.0	39.7	6.46	15.37	0.42	0.06				
Lump42	MCC PUMP HOUSE-3	94.1	0.415	130.94	85.00	80	20	64.0	39.7	6.46	15.37	0.42	0.06				
Lump43	MCC PUMP HOUSE-2	129.4	0.415	180.04	85.00	80	20	88.0	54.5	6.46	15.37	0.42	0.09				
Lump44	DM PLANT MCC S_1	94.1	0.415	130.94	85.00	80	20	64.0	39.7	6.46	15.37	0.42	0.06				
Lump45	DM PLANT MCC S_2	94.1	0.415	130.94	85.00	80	20	64.0	39.7	6.46	15.37	0.42	0.06				
Lump46	BLEND HANDLING MCC	94.1	0.415	130.94	85.00	80	20	64.0	39.7	6.46	15.37	0.42	0.06				
Lump47	PH-1 MCC PANEL	117.6	0.415	163.67	85.00	80	20	80.0	49.6	6.46	15.37	0.42	0.08				
Lump48	L&T PH-1 MCC	117.6	0.415	163.67	85.00	80	20	80.0	49.6	6.46	15.37	0.42	0.08				
Lump49	SULZER MCC	141.2	0.415	196.41	85.00	80	20	96.0	59.5	6.46	15.37	0.42	0.10				
Lump50	WATER CLARIFIER MCC	70.6	0.415	98.20	85.00	80	20	48.0	29.7	6.46	15.37	0.42	0.05				
Lump51	MR. MCC PANEL	141.2	0.415	196.41	85.00	80	20	96.0	59.5	6.46	15.37	0.42	0.10				
Lump52	FILTER WATER MCC S_1	117.6	0.415	163.67	85.00	80	20	80.0	49.6	6.46	15.37	0.42	0.08				
Lump53	FILTER WATER MCC S_2	117.6	0.415	163.67	85.00	80	20	80.0	49.6	6.46	15.37	0.42	0.08				
Lump54	CLOUDING TWR MCC	94.1	0.415	130.94	85.00	80	20	64.0	39.7	6.46	15.37	0.42	0.06				
Lump55	301B MCC	141.2	0.415	196.41	85.00	80	20	96.0	59.5	6.46	15.37	0.42	0.10				
Lump56	LR MILL	94.1	0.415	130.94	85.00	80	20	64.0	39.7	6.46	15.37	0.42	0.06				
Lump57	GE MCC	235.3	0.415	327.34	85.00	80	20	160.0	99.2	6.46	15.37	0.42	0.16				
Lump58	INDUCTION FURNACE PCC	324.2	0.416	450.00	85.00	80	20	220.5	136.6	6.46	15.37	0.42	0.22				
Lump59	PYROTEC LP MCC	235.3	0.415	327.34	85.00	80	20	160.0	99.2	6.46	15.37	0.42	0.16				
Lump60	FILTRATION MCC-3	129.4	0.415	180.04	85.00	80	20	88.0	54.5	6.46	15.37	0.42	0.09				
Lump61	INTERLAC MCC	164.7	0.415	229.14	85.00	80	20	112.0	69.4	6.46	15.37	0.42	0.11				
Lump62	L&P MCC-2	188.2	0.415	261.87	85.00	80	20	128.0	79.3	6.46	15.37	0.42	0.13				
Lump63	LEACHING MCC-1	211.8	0.415	294.61	85.00	80	20	144.0	89.2	6.46	15.37	0.42	0.14				
Lump64	LEACHING MCC 201B1	176.5	0.415	245.51	85.00	80	20	120.0	74.4	6.46	15.37	0.42	0.12				
Lump65	LEACHING MCC 201B2	235.3	0.415	327.34	85.00	80	20	160.0	99.2	6.46	15.37	0.42	0.16				
Lump66	ZE PYROTEC MCC	129.4	0.415	180.04	85.00	80	20	88.0	54.5	6.46	15.37	0.42	0.09				
Lump67	ADMIN LT ROOM	70.6	0.415	98.20	85.00	80	20	48.0	29.7	6.46	15.37	0.42	0.05				
Lump68	L&T MCC (MCC-3)	105.9	0.415	147.30	85.00	80	20	72.0	44.6	6.46	15.37	0.42	0.07				
Lump69	PURIFICATION MCC	176.5	0.415	245.51	85.00	80	20	120.0	74.4	6.46	15.37	0.42	0.12				

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Lumped Load Input Data

Lumped Load	Lumped Load		Motor Loads											
	ID	Connected Bus ID	Rating			% Load		Loading		% Impedance Machine Base				
			kVA	kV	Amp	% PF	MTR	STAT	kW	kvar	R	X"	R/X"	MW/PP
Lump70	301 A MCC		235.3	0.415	327.34	85.00	80	20	160.0	99.2	6.46	15.37	0.42	0.16
Lump71	NEW DM PLANT MCC S_2		94.1	0.415	130.94	85.00	80	20	64.0	39.7	6.46	15.37	0.42	0.06
Lump72	NEW DM PLANT MCC S_1		94.1	0.415	130.94	85.00	80	20	64.0	39.7	6.46	15.37	0.42	0.06
Lump73	Bus176		117.6	0.415	163.67	85.00	80	20	80.0	49.6	6.46	15.37	0.42	0.08
Lump74	NEW DPH		141.2	0.415	196.41	85.00	80	20	96.0	59.5	6.46	15.37	0.42	0.10
Lump75	CADMUUM MCC		235.3	0.415	327.34	85.00	80	20	160.0	99.2	6.46	15.37	0.42	0.16
Lump76	Bus177		117.6	0.415	163.67	85.00	80	20	80.0	49.6	6.46	15.37	0.42	0.08
Lump77	WARTSILA-CISF		94.1	0.415	130.94	85.00	80	20	64.0	39.7	6.46	15.37	0.42	0.06
Lump78	RODPH MCC		176.5	0.415	245.51	85.00	80	20	120.0	74.4	6.46	15.37	0.42	0.12
Lump79	RO PLANT MCC		211.8	0.415	294.61	85.00	80	20	144.0	89.2	6.46	15.37	0.42	0.14
Lump80	BOILER.MCC		235.3	0.415	327.34	85.00	80	20	160.0	99.2	6.46	15.37	0.42	0.16
Lump81	BCH PCC		294.1	0.415	409.18	85.00	80	20	200.0	123.9	6.46	15.37	0.42	0.20
Lump82	COMP L&T MCC		176.5	0.415	245.51	85.00	80	20	120.0	74.4	6.46	15.37	0.42	0.12
Lump83	ROASTER GE MCC		235.3	0.415	327.34	85.00	80	20	160.0	99.2	6.46	15.37	0.42	0.16
Lump84	LEACHING MCC 201C		117.6	0.415	163.67	85.00	80	20	80.0	49.6	6.46	15.37	0.42	0.08
Lump85	CADMUUM OLD MCC		176.5	0.415	245.51	85.00	80	20	120.0	74.4	6.46	15.37	0.42	0.12
Lump86	COMP. HOUSE MCC		211.8	0.415	294.61	85.00	80	20	144.0	89.2	6.46	15.37	0.42	0.14
Lump87	MELTING FURNACE PCC		572.5	0.415	796.49	87.33	80	20	400.0	223.1	6.46	15.37	0.42	0.40
Lump88	Bus178		117.6	0.415	163.67	85.00	80	20	80.0	49.6	6.46	15.37	0.42	0.08
Lump90	Bus195		58.8	0.415	81.84	85.00	80	20	40.0	24.8	6.46	15.37	0.42	0.04
Lump91	Bus197		58.8	0.415	81.84	85.00	80	20	40.0	24.8	6.46	15.37	0.42	0.04
Lump92	Bus199		58.8	0.415	81.84	85.00	80	20	40.0	24.8	6.46	15.37	0.42	0.04
Lump93	Bus201		58.8	0.415	81.84	85.00	80	20	40.0	24.8	6.46	15.37	0.42	0.04
Lump94	Bus203		100.0	0.433	133.34	100.00	80	20	80.0	0.0	6.46	15.37	0.42	0.08

Total Connected Lumped Loads (= 93) : 13541.5 kVA

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Arc Flash Analysis
Initial Symmetrical Calculation Method

Arc Fault Location		Correction								Incident Energy			
		Factors				Source PD				FCT	Source PD ID	IE (cal/cm²)	AFB (m)
Element ID	Connected Bus ID	Enclosure		Electrode Config	Prefault	I _{arc}	Encl.	I _{a''} (kA)	I _{a''} (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
		Bus Arc Fault	VCB		7.260	0	Var. (%)						
6.6KV HT PANEL	6.6KV HT PANEL	Bus Arc Fault	VCB		7.260	0	0.777	6.723	5.998	3.297	15.7	O/G TO 5 MVA TRAFO	2.896
										FCT =	15.7		Total = 2.896 1.60
I/C-3 TO 6.6 KV PNL	6.6KV HT PANEL	Source PD Line Side	VCB		7.260	0	0.777	6.723	5.998	3.297	15.7	O/G TO 5 MVA TRAFO	2.896
										FCT =	15.7		Total = 2.896 1.60
O/G TO SO2 GAS BLOWER	6.6KV HT PANEL	Load PD Line Side	VCB		7.260	0	0.777	6.723	5.998	3.297	15.7	O/G TO 5 MVA TRAFO	2.896
										FCT =	15.7		Total = 2.896 1.60
O/G TO RAB	6.6KV HT PANEL	Load PD Line Side	VCB		7.260	0	0.777	6.723	5.998	3.297	15.7	O/G TO 5 MVA TRAFO	2.896
										FCT =	15.7		Total = 2.896 1.60
132KV HZL BUS S_1	132KV HZL BUS S_1	Bus Arc Fault	VCB		0			32.046	32.046	0.000	1.3		36.438
										FCT =	1.3		(+) Total = 36.438 6.73
SW2	132KV HZL BUS S_1	Source PD Line Side	VCB		0	0.000		32.046	0.000	0.000			0.000
													(+) Total = 0.000 0.00

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Arc Fault Location		Correction								Incident Energy			
		Factors				Source PD				FCT	Source PD ID	IE (cal/cm²)	AFB (m)
Element ID	Connected Bus ID	Enclosure		Electrode Config	Prefault	I _{arc}	Encl.	I _{a''} (kA)	I _{a''} (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
		Source PD Line Side	VCB		0	0.000	Var. (%)						
I/C TO 132KV HZL BUS	132KV HZL BUS S_1	Source PD Line Side	VCB		0	0.000		32.046	0.000			0.000	
													(+) Total = 0.000 0.00
SW1	132KV HZL BUS S_1	Source PD Line Side	VCB		0	0.000		32.046	0.000			0.000	
													(+) Total = 0.000 0.00
SW3	132KV HZL BUS S_1	Load PD Line Side	VCB		0			32.046	32.046	0.000	1.3		36.438
										FCT =	1.3		(+) Total = 36.438 6.73
O/G TO TR-1	132KV HZL BUS S_1	Load PD Line Side	VCB		0			32.046	32.046	0.000	1.3		36.438
										FCT =	1.3		(+) Total = 36.438 6.73
SW5	132KV HZL BUS S_1	Load PD Line Side	VCB		0			32.046	32.046	0.000	1.3		36.438
										FCT =	1.3		(+) Total = 36.438 6.73
O/G TO TR-2	132KV HZL BUS S_1	Load PD Line Side	VCB		0			32.046	32.046	0.000	1.3		36.438
										FCT =	1.3		(+) Total = 36.438 6.73
SW4	132KV HZL BUS S_1	Source PD Line Side	VCB		0			32.046	32.046	2.799	741.1	I/C-2 TO JYOTTI PANEL	21602.780
										FCT =	741.1		(+) Total = 21602.780 163.89

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Arc Fault Location		Correction								Incident Energy				
		Factors				Source PD								
Element ID	Connected Bus ID	ID	Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
132KV HZL BUS S_2	132KV HZL BUS S_2		Bus Arc Fault	VCB		0		32.046	32.046	0.000	1.3		36.438	
											FCT =	1.3	(+) Total =	36.438 6.73
SW7	132KV HZL BUS S_2		Source PD Line Side	VCB		0		32.046	32.046	2.799	741.1	I/C-2 TO JYOTI PANEL	21602.780	
											FCT =	741.1	(+) Total =	21602.780 163.89
O/G TO TR-1A BHEL	132KV HZL BUS S_2		Source PD Line Side	VCB		0		32.046	32.046	2.799	741.1	I/C-2 TO JYOTI PANEL	21602.780	
											FCT =	741.1	(+) Total =	21602.780 163.89
SW9	132KV HZL BUS S_2		Load PD Line Side	VCB		0		32.046	32.046	0.000	1.3		36.438	
											FCT =	1.3	(+) Total =	36.438 6.73
O/G TO TR-2A BHEL	132KV HZL BUS S_2		Load PD Line Side	VCB		0		32.046	32.046	0.000	1.3		36.438	
											FCT =	1.3	(+) Total =	36.438 6.73
301A MCC	301A MCC		Bus Arc Fault	VCB	0.436	0	1.000	23.679	17.172	0.482	4.0	O/G TO AUX. TR-2 CNTRL RO	4.091	
											FCT =	4.0	Total =	4.091 0.98
I/C-1 TO 301A MCC	301A MCC		Source PD Line Side	VCB	0.436	0	1.000	23.679	17.172	0.482	4.0	O/G TO AUX. TR-2 CNTRL RO	4.091	
											FCT =	4.0	Total =	4.091 0.98

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Arc Fault Location		Correction								Incident Energy				
		Factors				Source PD								
Element ID	Connected Bus ID	ID	Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
301B MCC	301B MCC		Bus Arc Fault	VCB	0.436	0	1.000	25.063	18.062	17.360	0.5	I/C TO 301B MCC	0.516	
											FCT =	0.5	Total =	0.516 0.27
I/C TO 301B MCC	301B MCC		Source PD Line Side	VCB	0.436	0	1.000	25.063	18.062	14.252	0.8	I/C-2 TO MG PANEL SS-1	0.864	
											FCT =	0.8	Total =	0.864 0.37
ABB BUS	ABB BUS		Bus Arc Fault	VCB	12.100	0	0.774	2.373	2.196	2.196	51.2	O/G TO TRAFO CP-9	3.634	
											FCT =	51.2	Total =	3.634 1.85
O/G TO CAPACITOR BUS	ABB BUS		Load PD Line Side	VCB	12.100	0	0.774	2.373	2.196	2.196	51.2	O/G TO TRAFO CP-9	3.634	
											FCT =	51.2	Total =	3.634 1.85
I/C-1 TO ABB BUS	ABB BUS		Source PD Line Side	VCB	12.100	0	0.774	2.373	2.196	2.196	51.2	O/G TO TRAFO CP-9	3.634	
											FCT =	51.2	Total =	3.634 1.85
ACID LOADING MCC	ACID LOADING MCC		Bus Arc Fault	VCB	0.436	0	1.000	20.172	14.811	14.350	0.6	I/C TO ACID LOADING MCC	0.534	
											FCT =	0.6	Total =	0.534 0.28
I/C TO ACID LOADING MCC	ACID LOADING MCC		Source PD Line Side	VCB	0.436	0	1.000	20.172	14.811	0.383	14.1	O/G TO MCTP TR-5	12.336	
											FCT =	14.1	Total =	12.336 1.96

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Arc Fault Location		Correction										Incident Energy		
		Factors					Source PD							
Element ID	Connected Bus ID	ID	Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
ACTUATOR MCC	ACTUATOR MCC		Bus Arc Fault	VCB	0.436	0	1.000	8.627	6.816	6.359	0.5	I/C TO ACTUATOR MCC	0.124	
												FCT =	0.5	
												Total =	0.124	0.11
I/C TO ACTUATOR MCC	ACTUATOR MCC		Source PD Line Side	VCB	0.436	0	1.000	8.627	6.816	6.359	0.5	O/G TO ACTUATOR MCC	0.124	
												FCT =	0.5	
												Total =	0.124	0.11
ADMIN LT ROOM	ADMIN LT ROOM		Bus Arc Fault	VCB	0.436	13	1.000	5.926	3.697	3.463	3.5	I/C TO ADMIN LT ROOM	0.711	
												FCT =	3.5	
												Total =	0.711	0.33
I/C TO ADMIN LT ROOM	ADMIN LT ROOM		Source PD Line Side	VCB	0.436	13	1.000	5.926	3.697	0.067	175.9	O/G TO SS-1 TR-1	35.681	
												FCT =	175.9	
												Total =	35.681	3.82
ANDREW YULE PANEL S_1	ANDREW YULE PANEL S_1		Bus Arc Fault	VCB	12.100	0	0.774	16.620	15.274	14.665	4.5	I/C-1 TO ANDREW YULE PNL	2.054	
												FCT =	4.5	
												Total =	2.054	1.29
I/C-1 TO ANDREW YULE PNL	ANDREW YULE PANEL S_1		Source PD Line Side	VCB	12.100	0	0.774	16.620	15.274	14.665	7.6	O/G-1 TO ANDREW YULE	3.447	
												FCT =	7.6	
												Total =	3.447	1.79
O/G TO MCTP TR-5	ANDREW YULE PANEL S_1		Load PD Line Side	VCB	12.100	0	0.774	16.620	15.274	14.665	4.5	I/C-1 TO ANDREW YULE PNL	2.054	
												FCT =	4.5	
												Total =	2.054	1.29

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Arc Fault Location		Correction										Incident Energy		
		Factors					Source PD							
Element ID	Connected Bus ID	ID	Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
O/G TO SS-1 TR-1	ANDREW YULE PANEL S_1		Load PD Line Side	VCB	12.100	0	0.774	16.620	15.274	14.665	4.5	I/C-1 TO ANDREW YULE PNL	2.054	
												FCT =	4.5	
												Total =	2.054	1.29
O/G TO CAP.3	ANDREW YULE PANEL S_1		Load PD Line Side	VCB	12.100	0	0.774	16.620	15.274	14.665	4.5	I/C-1 TO ANDREW YULE PNL	2.054	
												FCT =	4.5	
												Total =	2.054	1.29
ANDREW YULE PANEL S_2	ANDREW YULE PANEL S_2		Bus Arc Fault	VCB	12.100	0	0.774	2.487	2.301	1.838	51.2	I/C-1 TO DG BUS	3.802	
												FCT =	51.2	
												Total =	3.802	1.91
I/C-2 TO ANDREW YULE PNL	ANDREW YULE PANEL S_2		Source PD Line Side	VCB	12.100	0	0.774	2.487	2.301	1.838	51.2	I/C-1 TO DG BUS	3.802	
												FCT =	51.2	
												Total =	3.802	1.91
O/G TO CAP.2	ANDREW YULE PANEL S_2		Load PD Line Side	VCB	12.100	0	0.774	2.487	2.301	1.838	51.2	I/C-1 TO DG BUS	3.802	
												FCT =	51.2	
												Total =	3.802	1.91
O/G TO CAP.1	ANDREW YULE PANEL S_2		Load PD Line Side	VCB	12.100	0	0.774	2.487	2.301	1.838	51.2	I/C-1 TO DG BUS	3.802	
												FCT =	51.2	
												Total =	3.802	1.91
O/G TO DARIBA PUMP HOUSE	ANDREW YULE PANEL S_2		Load PD Line Side	VCB	12.100	0	0.774	2.487	2.301	1.838	51.2	I/C-1 TO DG BUS	3.802	
												FCT =	51.2	
												Total =	3.802	1.91

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Arc Fault Location		Correction								Source PD				Incident Energy		
		Factors				Source PD										
Element ID	Connected Bus ID	ID	Enclosure	Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)	
O/G TO ETP TRAFO	ANDREW YULE PANEL S_2		Load PD Line Side	VCB	12.100	0	0.774	2.487	2.301	1.838	51.2	I/C-1 TO DG BUS	3.802			
												FCT =	51.2	Total = 3.802	1.91	
O/G TO CRDL TRAFO	ANDREW YULE PANEL S_2		Load PD Line Side	VCB	12.100	0	0.774	2.487	2.301	1.838	51.2	I/C-1 TO DG BUS	3.802			
												FCT =	51.2	Total = 3.802	1.91	
O/G TO ZINC MELTING TRAFO	ANDREW YULE PANEL S_2		Load PD Line Side	VCB	12.100	0	0.774	2.487	2.301	1.838	51.2	I/C-1 TO DG BUS	3.802			
												FCT =	51.2	Total = 3.802	1.91	
O/G TO COLONY BUS	ANDREW YULE PANEL S_2		Load PD Line Side	VCB	12.100	0	0.774	2.487	2.301	1.838	51.2	I/C-1 TO DG BUS	3.802			
												FCT =	51.2	Total = 3.802	1.91	
BCH MCC PANEL	BCH MCC PANEL		Bus Arc Fault	VCB	0.436	0	1.000	23.682	17.174	14.214	5.0	O/G TO CANAL + BCH MCC	5.114			
												FCT =	5.0	Total = 5.114	1.13	
I/C TO BCH MCC PANEL	BCH MCC PANEL		Source PD Line Side	VCB	0.436	0	1.000	23.682	17.174	14.214	5.0	O/G TO CANAL + BCH MCC	5.114			
												FCT =	5.0	Total = 5.114	1.13	
O/G TO FO-1	BCH MCC PANEL		Load PD Line Side	VCB	0.436	0	1.000	23.682	17.174	14.214	5.0	O/G TO CANAL + BCH MCC	5.114			
												FCT =	5.0	Total = 5.114	1.13	

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Arc Fault Location		Correction								Source PD				Incident Energy		
		Factors				Source PD										
Element ID	Connected Bus ID	ID	Enclosure	Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)	
O/G TO LAGOON NO-5	BCH MCC PANEL		Load PD Line Side	VCB	0.436	0	1.000	23.682	17.174	14.214	5.0	O/G TO CANAL + BCH MCC	5.114			
												FCT =	5.0	Total = 5.114	1.13	
O/G TO DO6-B	BCH MCC PANEL		Load PD Line Side	VCB	0.436	0	1.000	23.682	17.174	14.214	5.0	O/G TO CANAL + BCH MCC	5.114			
												FCT =	5.0	Total = 5.114	1.13	
O/G TO FO-2	BCH MCC PANEL		Load PD Line Side	VCB	0.436	0	1.000	23.682	17.174	14.214	5.0	O/G TO CANAL + BCH MCC	5.114			
												FCT =	5.0	Total = 5.114	1.13	
O/G TO CLOTH WASH	BCH MCC PANEL		Load PD Line Side	VCB	0.436	0	1.000	23.682	17.174	14.214	5.0	O/G TO CANAL + BCH MCC	5.114			
												FCT =	5.0	Total = 5.114	1.13	
O/G TO NEW ZERO PUMP	BCH MCC PANEL		Load PD Line Side	VCB	0.436	0	1.000	23.682	17.174	14.214	5.0	O/G TO CANAL + BCH MCC	5.114			
												FCT =	5.0	Total = 5.114	1.13	
O/G TO LIME MCC	BCH MCC PANEL		Load PD Line Side	VCB	0.436	0	1.000	23.682	17.174	14.214	5.0	O/G TO CANAL + BCH MCC	5.114			
												FCT =	5.0	Total = 5.114	1.13	
O/G TO ETP PUMP MCC	BCH MCC PANEL		Load PD Line Side	VCB	0.436	0	1.000	23.682	17.174	14.214	5.0	O/G TO CANAL + BCH MCC	5.114			
												FCT =	5.0	Total = 5.114	1.13	

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	54
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Arc Fault Location		Correction										Incident Energy			
		Factors					Source PD								
Element ID	Connected Bus ID	ID	Enclosure	Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
BCH PCC	BCH PCC		Bus Arc Fault	VCB		0.436	0	1.000	47.973	28.117	26.908	0.8	I/C TO BCH PCC	0.965	
												FCT =	0.8	Total =	0.965 0.53
I/C TO BCH PCC	BCH PCC		Source PD Line Side	VCB		0.436	0	1.000	47.973	28.117	0.740	4.0	O/G TO PHE TRAFO	4.826	
												FCT =	4.0	Total =	4.826 1.46
BLEND HANDLING MCC	BLEND HANDLING MCC		Bus Arc Fault	VCB		0.436	0	1.000	22.643	16.491	16.029	0.6	I/C TO BLEND HANDLING MCC	0.617	
												FCT =	0.6	Total =	0.617 0.30
I/C TO BLEND HANDLING MCC	BLEND HANDLING MCC		Source PD Line Side	VCB		0.436	13	1.000	22.643	14.419	0.385	51.2	O/G TO AUX. TR-7	44.121	
												FCT =	51.2	Total =	44.121 4.36
BOILER MCC	BOILER MCC		Bus Arc Fault	VCB		0.436	0	1.000	19.891	14.616	13.439	0.8	I/C TO BOILER MCC	0.688	
												FCT =	0.8	Total =	0.688 0.32
I/C TO BOILER MCC	BOILER MCC		Source PD Line Side	VCB		0.436	13	1.000	19.891	12.780	0.255	27.3	O/G TO SS-1 TR-1	20.638	
												FCT =	27.3	Total =	20.638 2.71

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Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Arc Fault Location		Correction										Incident Energy			
		Factors					Source PD								
Element ID	Connected Bus ID	ID	Enclosure	Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
BUS CONTROL ROOM	BUS CONTROL ROOM		Bus Arc Fault	VCB		12.100	0	0.774	16.702	15.349	13.811	24.2	JYOTI B/C-2	11.082	
												FCT =	24.2	Total =	11.082 3.77
I/C TO BUS CNTRL ROOM	BUS CONTROL ROOM		Source PD Line Side	VCB		12.100	0	0.774	16.702	15.349	13.811	24.2	JYOTI B/C-2	11.082	
												FCT =	24.2	Total =	11.082 3.77
O/G TO SS-5 TRAFO	BUS CONTROL ROOM		Load PD Line Side	VCB		12.100	0	0.774	16.702	15.349	13.811	24.2	JYOTI B/C-2	11.082	
												FCT =	24.2	Total =	11.082 3.77
O/G TO AUX. TR-2 CNTRL RO	BUS CONTROL ROOM		Load PD Line Side	VCB		12.100	0	0.774	16.702	15.349	13.811	24.2	JYOTI B/C-2	11.082	
												FCT =	24.2	Total =	11.082 3.77
O/G TO PHE TRAFO	BUS CONTROL ROOM		Load PD Line Side	VCB		12.100	0	0.774	16.702	15.349	13.811	24.2	JYOTI B/C-2	11.082	
												FCT =	24.2	Total =	11.082 3.77
CADMNIUM MCC	CADMNIUM MCC		Bus Arc Fault	VCB		0.436	0	1.000	26.107	18.716	14.670	0.8	I/C-2 TO MG PANEL SS-1	0.898	
												FCT =	0.8	Total =	0.898 0.38
I/C-1 TO CADMIUM MCC	CADMNIUM MCC		Source PD Line Side	VCB		0.436	0	1.000	26.107	18.716	14.670	0.8	I/C-2 TO MG PANEL SS-1	0.898	
												FCT =	0.8	Total =	0.898 0.38

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Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Arc Fault Location		Correction								Incident Energy				
		Factors				Source PD				FCT	Source PD ID	IE (cal/cm²)	AFB (m)	
Element ID	Connected Bus ID	Enclosure		Electrode Config.	Prefault	Iarc	Encl.	I ^k * (kA)	I ^a * (kA)	I ^a * (kA)	FCT	Source PD ID	IE (cal/cm²)	AFB (m)
		ID	Type		kV	Var. (%)	CF (pu)	I ^k * (kA)	I ^a * (kA)	I ^a * (kA)	FCT			
CADMIDIUM OLD MCC	CADMIDIUM OLD MCC	Bus Arc Fault	VCB	0.436	0	1.000	19.174	14.113	13.234	0.8	I/C-1 TO MG PNL SS-1	0.663		
											FCT =	0.8	Total = 0.663	0.32
I/C TO CADMIUM OLD MCC	CADMIDIUM OLD MCC	Source PD Line Side	VCB	0.436	0	1.000	19.174	14.113	13.234	0.8	I/C-1 TO MG PNL SS-1	0.663		
											FCT =	0.8	Total = 0.663	0.32
CADMIDIUM PCC	CADMIDIUM PCC	Bus Arc Fault	VCB	0.436	0	1.000	18.493	13.226	13.226	0.8	I/C TO CADMIUM PCC	0.423		
											FCT =	0.8	Total = 0.423	0.32
I/C TO CADMIUM PCC	CADMIDIUM PCC	Source PD Line Side	VCB	0.436	0	1.000	18.493	13.226	0.418	51.2	O/G TO AUX. TR-3	27.096		
											FCT =	51.2	Total = 27.096	4.29
CANAL PH	CANAL PH	Bus Arc Fault	VCB	0.436	0	1.000	9.726	7.115	6.875	0.8	I/C TO CANAL PH	0.308		
											FCT =	0.8	Total = 0.308	0.20
I/C TO CANAL PH	CANAL PH	Source PD Line Side	VCB	0.436	0	1.000	9.726	7.115	6.875	0.8	O/G TO CANAL PH	0.308		
											FCT =	0.8	Total = 0.308	0.20

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Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Arc Fault Location		Correction								Incident Energy				
		Factors				Source PD				FCT	Source PD ID	IE (cal/cm²)	AFB (m)	
Element ID	Connected Bus ID	Enclosure		Electrode Config.	Prefault	Iarc	Encl.	I ^k * (kA)	I ^a * (kA)	I ^a * (kA)	FCT	Source PD ID	IE (cal/cm²)	AFB (m)
		ID	Type		kV	Var. (%)	CF (pu)	I ^k * (kA)	I ^a * (kA)	I ^a * (kA)	FCT			
CANAL PUMP MCC	CANAL PUMP MCC	Bus Arc Fault	VCB	0.436	0	1.000	20.115	14.772	14.382	0.5	I/C TO CANAL PUMP MCC	0.414		
											FCT =	0.5	Total = 0.414	0.23
I/C TO CANAL PUMP MCC	CANAL PUMP MCC	Source PD Line Side	VCB	0.436	0	1.000	20.115	14.772	12.345	5.0	O/G TO CANAL + BCH MCC	4.349		
											FCT =	5.0	Total = 4.349	1.02
CDSS 3.3KV PANEL S_1	CDSS 3.3KV PANEL S_1	Bus Arc Fault	VCB	3.630	0	0.809	7.033	6.144	5.730	16.5	I/C-1 TO CDSS 3.3KV	3.040		
											FCT =	16.5	Total = 3.040	1.65
O/G TO BALL MILL	CDSS 3.3KV PANEL S_1	Load PD Line Side	VCB	3.630	0	0.809	7.033	6.144	5.730	16.5	I/C-1 TO CDSS 3.3KV	3.040		
											FCT =	16.5	Total = 3.040	1.65
I/C-1 TO CDSS 3.3KV	CDSS 3.3KV PANEL S_1	Source PD Line Side	VCB	3.630	0	0.809	7.033	6.144	1.719	16.5	O/G TO TR-11A	3.040		
											FCT =	16.5	Total = 3.040	1.65
CDSS 3.3KV PANEL S_2	CDSS 3.3KV PANEL S_2	Bus Arc Fault	VCB	3.630	0	0.809	7.533	6.574	5.719	16.5	I/C-2 TO CDSS 3.3KV	3.247		
											FCT =	16.5	Total = 3.247	1.72
I/C-2 TO CDSS 3.3KV	CDSS 3.3KV PANEL S_2	Source PD Line Side	VCB	3.630	0	0.809	7.533	6.574	1.716	16.5	O/G TO TR-11B	3.247		
											FCT =	16.5	Total = 3.247	1.72

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Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Element ID	Connected Bus ID	Correction										IE (cal/cm²)	AFB (m)		
		Factors					Incident Energy								
		Enclosure		Electrode	Prefault	Iarc	Encl.	Source PD	FCT	Source PD ID					
ID	Type	Config.	kV	Var. (%)	CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	(Cycles)						
O/G TO CIRCULATING P WHRB	CDSS 3.3KV PANEL S_2	Load PD Line Side	VCB	3.630	0	0.809	7.533	6.574	5.719	16.5	I/C-2 TO CDSS 3.3KV	3.247			
											FCT =	16.5	Total = 3.247 1.72		
O/G TO FEED WATER PUMP	CDSS 3.3KV PANEL S_2	Load PD Line Side	VCB	3.630	0	0.809	7.533	6.574	5.719	16.5	I/C-2 TO CDSS 3.3KV	3.247			
											FCT =	16.5	Total = 3.247 1.72		
O/G TO STARTUP FAN	CDSS 3.3KV PANEL S_2	Load PD Line Side	VCB	3.630	0	0.809	7.533	6.574	5.719	16.5	I/C-2 TO CDSS 3.3KV	3.247			
											FCT =	16.5	Total = 3.247 1.72		
CDSS 11KV PANEL S_1	CDSS 11KV PANEL S_1	Bus Arc Fault	VCB	12.100	0	0.774	16.745	15.388	10.816	4.5	I/C-1 TO CDSS 11KV PANEL	2.068			
											FCT =	4.5	Total = 2.068 1.29		
I/C-1 TO CDSS 11KV PANEL	CDSS 11KV PANEL S_1	Source PD Line Side	VCB	12.100	0	0.774	16.745	15.388	10.816	4.5	O/G TO ROASTER SECTION -1	2.068			
											FCT =	4.5	Total = 2.068 1.29		
O/G TO CAPACITOR PFIC- 11	CDSS 11KV PANEL S_1	Load PD Line Side	VCB	12.100	0	0.774	16.745	15.388	10.816	4.5	I/C-1 TO CDSS 11KV PANEL	2.068			
											FCT =	4.5	Total = 2.068 1.29		
O/G TO SO2 BLOWER	CDSS 11KV PANEL S_1	Load PD Line Side	VCB	12.100	0	0.774	16.745	15.388	10.816	4.5	I/C-1 TO CDSS 11KV PANEL	2.068			
											FCT =	4.5	Total = 2.068 1.29		

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Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Element ID	Connected Bus ID	Correction										IE (cal/cm²)	AFB (m)		
		Factors					Incident Energy								
		Enclosure		Electrode	Prefault	Iarc	Encl.	Source PD	FCT	Source PD ID					
ID	Type	Config.	kV	Var. (%)	CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	(Cycles)						
O/G TO TR-111A	CDSS 11KV PANEL S_1	Load PD Line Side	VCB	12.100	0	0.774	16.745	15.388	10.816	4.5	I/C-1 TO CDSS 11KV PANEL	2.068			
											FCT =	4.5	Total = 2.068 1.29		
O/G TO TR-112A	CDSS 11KV PANEL S_1	Load PD Line Side	VCB	12.100	0	0.774	16.745	15.388	10.816	4.5	I/C-1 TO CDSS 11KV PANEL	2.068			
											FCT =	4.5	Total = 2.068 1.29		
O/G TO TR-113A	CDSS 11KV PANEL S_1	Load PD Line Side	VCB	12.100	0	0.774	16.745	15.388	10.816	4.5	I/C-1 TO CDSS 11KV PANEL	2.068			
											FCT =	4.5	Total = 2.068 1.29		
O/G TO TR-11A	CDSS 11KV PANEL S_1	Load PD Line Side	VCB	12.100	0	0.774	16.745	15.388	10.816	4.5	I/C-1 TO CDSS 11KV PANEL	2.068			
											FCT =	4.5	Total = 2.068 1.29		
CDSS 11KV B/C	CDSS 11KV PANEL S_1	Load PD Line Side	VCB	12.100	0	0.774	16.745	15.388	10.816	4.5	I/C-1 TO CDSS 11KV PANEL	2.068			
											FCT =	4.5	Total = 2.068 1.29		
CDSS 11KV PANEL S_2	CDSS 11KV PANEL S_2	Bus Arc Fault	VCB	12.100	0	0.774	16.745	15.388	13.120	4.5	CDSS 11KV B/C	2.068			
											FCT =	4.5	Total = 2.068 1.29		
O/G TO TR-11B	CDSS 11KV PANEL S_2	Load PD Line Side	VCB	12.100	0	0.774	16.745	15.388	13.120	4.5	CDSS 11KV B/C	2.068			
											FCT =	4.5	Total = 2.068 1.29		

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Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location		Correction Factors								Incident Energy			
		Enclosure		Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Source PD	FCT (Cycles)	Source PD ID	IE (cal/cm²)
Element ID	Connected Bus ID	ID	Type										
O/G TO CAPACITOR PFIC-12	CDSS 11KV PANEL S_2		Load PD Line Side	VCB	12.100	0	0.774	16.745	15.388	13.120	4.5	CDSS 11KV B/C	2.068
										FCT =	4.5		Total = 2.068 1.29
I/C-2 FROM STG	CDSS 11KV PANEL S_2		Load Side	VCB	12.100	0	0.774	16.745	15.388	13.120	4.5	CDSS 11KV B/C	2.068
										FCT =	4.5		Total = 2.068 1.29
O/G TO TR-111B	CDSS 11KV PANEL S_2		Load PD Line Side	VCB	12.100	0	0.774	16.745	15.388	13.120	4.5	CDSS 11KV B/C	2.068
										FCT =	4.5		Total = 2.068 1.29
O/G TO TR-112B	CDSS 11KV PANEL S_2		Load PD Line Side	VCB	12.100	0	0.774	16.745	15.388	13.120	4.5	CDSS 11KV B/C	2.068
										FCT =	4.5		Total = 2.068 1.29
O/G TO TR-113B	CDSS 11KV PANEL S_2		Load PD Line Side	VCB	12.100	0	0.774	16.745	15.388	13.120	4.5	CDSS 11KV B/C	2.068
										FCT =	4.5		Total = 2.068 1.29
O/G TO ROASTER AIR BLR	CDSS 11KV PANEL S_2		Load PD Line Side	VCB	12.100	0	0.774	16.745	15.388	13.120	4.5	CDSS 11KV B/C	2.068
										FCT =	4.5		Total = 2.068 1.29
O/G TO RO ZLD TRAFO	CDSS 11KV PANEL S_2		Load PD Line Side	VCB	12.100	0	0.774	16.745	15.388	13.120	4.5	CDSS 11KV B/C	2.068
										FCT =	4.5		Total = 2.068 1.29

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	61
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location		Correction Factors								Incident Energy			
		Enclosure		Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Source PD	FCT (Cycles)	Source PD ID	IE (cal/cm²)
Element ID	Connected Bus ID	ID	Type										
CLDC MCC S_1	CLDC MCC S_1		Bus Arc Fault	VCB	0.436	0	1.000	42.364	26.907	25.834	0.4	I/C TO CLDC MCC	0.644
										FCT =	0.4		Total = 0.644 0.31
I/C TO CLDC MCC	CLDC MCC S_1		Source PD Line Side	VCB	0.436	0	1.000	42.364	26.907	25.834	0.8	O/G TO CLDC MCC-1	1.341
										FCT =	0.8		Total = 1.341 0.49
O/G TO DRUM COOL P-1	CLDC MCC S_1		Load PD Line Side	VCB	0.436	0	1.000	42.364	26.907	25.834	0.4	I/C TO CLDC MCC	0.644
										FCT =	0.4		Total = 0.644 0.31
O/G TO DRUM COOL P-2	CLDC MCC S_1		Load PD Line Side	VCB	0.436	0	1.000	42.364	26.907	25.834	0.4	I/C TO CLDC MCC	0.644
										FCT =	0.4		Total = 0.644 0.31
COLONY OVER HEAD LINE	COLONY OVER HEAD LINE		Bus Arc Fault	VCB	12.100	0	0.774	2.423	2.241	2.164	15.0	O/G TO COLONY BUS	1.087
										FCT =	15.0		Total = 1.087 0.86
SW6	COLONY OVER HEAD LINE		Load PD Line Side	VCB	12.100	0	0.774	2.423	2.241	2.164	15.0	O/G TO COLONY BUS	1.087
										FCT =	15.0		Total = 1.087 0.86
SW10	COLONY OVER HEAD LINE		Load PD Line Side	VCB	12.100	0	0.774	2.423	2.241	2.164	15.0	O/G TO COLONY BUS	1.087
										FCT =	15.0		Total = 1.087 0.86
SW11	COLONY OVER HEAD LINE		Load PD Line Side	VCB	12.100	0	0.774	2.423	2.241	2.164	15.0	O/G TO COLONY BUS	1.087
										FCT =	15.0		Total = 1.087 0.86

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	62
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location		Correction								Incident Energy				
		Factors				Source PD								
Element ID	Connected Bus ID	ID	Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia" (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
COMP L&T MCC	COMP L&T MCC		Bus Arc Fault	VCB	0.436	0	1.000	29.571	20.780	0.542	4.0	O/G TO PHE TRAFO	5.032	
											FCT =	4.0	Total =	5.032 1.12
I/C TO COMP. L&T MCC	COMP L&T MCC		Source PD Line Side	VCB	0.436	0	1.000	29.571	20.780	0.542	4.0	O/G TO PHE TRAFO	5.032	
											FCT =	4.0	Total =	5.032 1.12
COMP. HOUSE MCC	COMP. HOUSE MCC		Bus Arc Fault	VCB	0.436	0	1.000	24.177	17.495	16.437	0.6	I/C TO COMP. HOUSE MCC	0.519	
											FCT =	0.6	Total =	0.519 0.27
I/C TO COMP. HOUSE MCC	COMP. HOUSE MCC		Source PD Line Side	VCB	0.436	13	1.000	24.177	15.297	0.441	63.4	O/G TO AUX. TR-4	46.563	
											FCT =	63.4	Total =	46.563 4.51
COMPRESSOR PANEL	COMPRESSOR PANEL		Bus Arc Fault	VCB	0.436	0	1.000	51.717	29.211	27.993	4.0	O/G TO COMPRESSOR PANEL	5.046	
											FCT =	4.0	Total =	5.046 1.50
I/C TO COMPRESSOR PANEL	COMPRESSOR PANEL		Source PD Line Side	VCB	0.436	0	1.000	51.717	29.211	27.993	4.0	O/G TO COMPRESSOR PANEL	5.046	
											FCT =	4.0	Total =	5.046 1.50
O/G TO COMP. HOUSE GA -60	COMPRESSOR PANEL		Load PD Line Side	VCB	0.436	0	1.000	51.717	29.211	27.993	4.0	O/G TO COMPRESSOR PANEL	5.046	
											FCT =	4.0	Total =	5.046 1.50

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	63
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location		Correction								Incident Energy				
		Factors				Source PD								
Element ID	Connected Bus ID	ID	Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia" (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
COOLING TWR MCC	COOLING TWR MCC		Bus Arc Fault	VCB	0.436	0	1.000	31.086	21.628	20.670	0.4	I/C-1 TO COOLING TWR MCC	0.546	
											FCT =	0.4	Total =	0.546 0.28
I/C-1 TO COOLING TWR MCC	COOLING TWR MCC		Source PD Line Side	VCB	0.436	0	1.000	31.086	21.628	0.618	4.0	O/G TO AUX. TR-2 CNTRL RO	5.257	
											FCT =	4.0	Total =	5.257 1.15
O/G TO SWP-1	COOLING TWR MCC		Load PD Line Side	VCB	0.436	0	1.000	31.086	21.628	20.670	0.4	I/C-1 TO COOLING TWR MCC	0.546	
											FCT =	0.4	Total =	0.546 0.28
O/G TO SWP-2	COOLING TWR MCC		Load PD Line Side	VCB	0.436	0	1.000	31.086	21.628	20.670	0.4	I/C-1 TO COOLING TWR MCC	0.546	
											FCT =	0.4	Total =	0.546 0.28
DG BUS-A	DG BUS-A		Bus Arc Fault	VCB	12.100	0	0.774	2.715	2.513	2.061	51.2	I/C-1 TO DG BUS	4.137	
											FCT =	51.2	Total =	4.137 2.01
I/C-1 TO DG BUS	DG BUS-A		Source PD Line Side	VCB	12.100	0	0.000	2.715	0.000	0.000			0.000	
													0.000	0.00
DG BUS COUPLER	DG BUS-A		Load PD Line Side	VCB	12.100	0	0.774	2.715	2.513	2.061	51.2	I/C-1 TO DG BUS	4.137	
											FCT =	51.2	Total =	4.137 2.01
O/G TO TRAFO CP-10	DG BUS-A		Load PD Line Side	VCB	12.100	0	0.774	2.715	2.513	2.061	51.2	I/C-1 TO DG BUS	4.137	
											FCT =	51.2	Total =	4.137 2.01

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	64
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Arc Fault Location		Correction								Incident Energy				
		Factors				Source PD								
Element ID	Connected Bus ID	ID	Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
DG BUS-B	DG BUS-B		Bus Arc Fault	VCB	12.100	0	0.774	2.715	2.513	2.513	51.2	DG BUS COUPLER	4.137	
O/G TO TRAFO CP-9	DG BUS-B		Load PD Line Side	VCB	12.100	0	0.774	2.715	2.513	2.513	51.2	DG BUS COUPLER	4.137	
DM PLANT MCC S_1	DM PLANT MCC S_1		Bus Arc Fault	VCB	0.436	0	1.000	18.499	13.636	13.166	0.6	I/C-1 TO DM PLANT MCC	0.496	
I/C-1 TO DM PLANT MCC	DM PLANT MCC S_1		Source PD Line Side	VCB	0.436	13	1.000	18.499	11.923	0.239	29.1	O/G TO SS-1 TR-1	20.410	
DM PLANT MCC S_2	DM PLANT MCC S_2		Bus Arc Fault	VCB	0.436	0	1.000	18.907	13.925	13.472	0.6	I/C-2 TO DM PLANT MCC	0.502	
I/C-2 TO DM PLANT MCC	DM PLANT MCC S_2		Source PD Line Side	VCB	0.436	0	1.000	18.907	13.925	0.364	4.0	O/G TO PHE TRAFO	3.267	
												Total =	20.410	2.69
												Total =	3.267	0.86

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	65
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Arc Fault Location		Correction								Incident Energy				
		Factors				Source PD								
Element ID	Connected Bus ID	ID	Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
DT SOFT STARTER PNL	DT SOFT STARTER PNL		Bus Arc Fault	VCB	0.436	0	1.000	23.604	17.123	16.347	0.8	I/C TO DT SOFT START PNL	0.653	
O/G TO DT PUMP	DT SOFT STARTER PNL		Load PD Line Side	VCB	0.436	0	1.000	23.604	17.123	16.347	0.8	I/C TO DT SOFT START PNL	0.653	
I/C TO DT SOFT START PNL	DT SOFT STARTER PNL		Source PD Line Side	VCB	0.436	0	1.000	23.604	17.123	16.347	2.5	O/G TO DT SOFT START PNL	2.039	
ETP OPERATOR MCC	ETP OPERATOR MCC		Bus Arc Fault	VCB	0.436	0	1.000	10.093	7.395	6.861	0.7	I/C TO ETP OPERATOR MCC	0.283	
I/C TO ETP OPERATOR MCC	ETP OPERATOR MCC		Source PD Line Side	VCB	0.436	0	1.000	10.093	7.395	6.861	5.0	O/G TO ETP OPERATOR MCC	2.083	
ETP PCC	ETP PCC		Bus Arc Fault	VCB	0.436	0	1.000	25.520	17.813	0.475	15.6	O/G TO ETP TRAFO	11.326	
I/C-1 TO ETP PCC	ETP PCC		Source PD Line Side	VCB	0.436	0	1.000	25.520	17.813	0.475	15.6	O/G TO ETP TRAFO	11.326	
												Total =	11.326	2.48
												Total =	11.326	2.48

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	66
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Arc Fault Location		Correction										Incident Energy			
		Factors					Source PD ID								
Element ID	Connected Bus ID	ID	Enclosure	Type	Electrode Config.	Prefault KV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
O/G TO SIEMENS RO MCC	ETP PCC		Load PD Line Side	VCB	0.436	0	1.000	25.520	17.813	0.475	15.6	O/G TO ETP TRAFO	11.326		
												FCT =	15.6	Total = 11.326 2.48	
O/G TO PYROTEC PCC	ETP PCC		Load PD Line Side	VCB	0.436	0	1.000	25.520	17.813	0.475	15.6	O/G TO ETP TRAFO	11.326		
												FCT =	15.6	Total = 11.326 2.48	
O/G TO ETP OPERATOR MCC	ETP PCC		Load PD Line Side	VCB	0.436	0	1.000	25.520	17.813	0.475	15.6	O/G TO ETP TRAFO	11.326		
												FCT =	15.6	Total = 11.326 2.48	
O/G TO CANAL + BCH MCC	ETP PCC		Load PD Line Side	VCB	0.436	0	1.000	25.520	17.813	0.475	15.6	O/G TO ETP TRAFO	11.326		
												FCT =	15.6	Total = 11.326 2.48	
ETP PUMP MCC	ETP PUMP MCC		Bus Arc Fault	VCB	0.436	13	1.000	10.316	6.615	6.374	0.6	I/C TO ETP PUMP MCC	0.216		
												FCT =	0.6	Total = 0.216 0.16	
I/C TO ETP PUMP MCC	ETP PUMP MCC		Source PD Line Side	VCB	0.436	0	1.000	10.316	7.565	7.290	0.8	O/G TO ETP PUMP MCC	0.322		
												FCT =	0.8	Total = 0.322 0.20	
FAT SOFT STARTER PNL	FAT SOFT STARTER PNL		Bus Arc Fault	VCB	0.436	0	1.000	20.512	15.046	14.286	2.5	O/G TO FAT SOFT STAR PNL	1.774		
												FCT =	2.5	Total = 1.774 0.58	

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	67
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Arc Fault Location		Correction										Incident Energy			
		Factors					Source PD ID							IE (cal/cm²)	AFB (m)
Element ID	Connected Bus ID	ID	Enclosure	Type	Electrode Config.	Prefault KV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
O/G TO FAT PUMP	FAT SOFT STARTER PNL		Load PD Line Side	VCB	0.436	0	1.000	20.512	15.046	14.286	2.5	O/G TO FAT SOFT STAR PNL	1.774		
												FCT =	2.5	Total = 1.774 0.58	
I/C TO FAT SOFT START PNL	FAT SOFT STARTER PNL		Source PD Line Side	VCB	0.436	0	1.000	20.512	15.046	14.286	2.5	O/G TO FAT SOFT STAR PNL	1.774		
												FCT =	2.5	Total = 1.774 0.58	
FILTER WATER MCC S_1	FILTER WATER MCC S_1		Bus Arc Fault	VCB	0.436	0	1.000	14.418	10.661	9.524	0.7	I/C-1 FILTER WATER MCC	0.400		
												FCT =	0.7	Total = 0.400 0.23	
I/C-1 FILTER WATER MCC	FILTER WATER MCC S_1		Source PD Line Side	VCB	0.436	0	1.000	14.418	10.661	0.290	75.0	O/G TO AUX. TR-6	46.061		
												FCT =	75.0	Total = 46.061 4.48	
FILTER WATER MCC B/C	FILTER WATER MCC S_1		Load PD Line Side	VCB	0.436	0	1.000	14.418	10.661	9.524	0.7	I/C-1 FILTER WATER MCC	0.400		
												FCT =	0.7	Total = 0.400 0.23	
FILTER WATER MCC S_2	FILTER WATER MCC S_2		Bus Arc Fault	VCB	0.436	0	1.000	14.418	11.585	10.965	0.6	FILTER WATER MCC B/C	0.328		
												FCT =	0.6	Total = 0.328 0.20	

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	68
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config:	Normal

Correction														
Arc Fault Location				Factors				Incident Energy						
Element ID	Connected Bus ID	Enclosure		Electrode Config.	Prefault kV	I _{arc} Var. (%)	Encl. CF (pu)	I _k ^a (kA)	I _a ^a (kA)	I _{a'} (kA)	Source PD FCT (Cycles)	Source PD ID	IE (cal/cm ²)	AFB (m)
		ID	Type										Total =	3.07
FILTERATION MCC-3	FILTERATION MCC-3	Bus Arc Fault	VCB	0.436	13	1.000	11.776	7.585	0.131	58.1	O/G TO SS-1 TR-1	25.225	Total = 25.225	3.07
I/C TO FILTERATION MCC-3	FILTERATION MCC-3		Source PD Line Side	VCB	0.436	13	1.000	11.776	7.585	0.131	58.1	O/G TO SS-1 TR-1	25.225	
O/G TO NEW REACTOR	FILTERATION MCC-3	Load PD Line Side	VCB	0.436	13	1.000	11.776	7.585	0.131	58.1	O/G TO SS-1 TR-1	25.225	Total = 25.225	3.07
GE MCC	GE MCC		Bus Arc Fault	VCB	0.436	0	1.000	14.418	10.661	9.524	0.8	I/C-2 TO GE MCC	0.501	
I/C-2 TO GE MCC	GE MCC	Source PD Line Side	VCB	0.436	13	1.000	14.418	9.321	0.254	91.8	O/G TO AUX TR-6	49.603	Total = 49.603	4.69
IAT SOFT STARTER PNL	IAT SOFT STARTER PNL		Bus Arc Fault	VCB	0.436	0	1.000	28.110	19.930	18.636	0.8	O/G TO IAT PANEL	0.769	
I/C TO IAT PANEL	IAT SOFT STARTER PNL	Source PD Line Side	VCB	0.436	0	1.000	28.110	19.930	18.636	0.8	O/G TO IAT PANEL	0.769	Total = 0.769	0.35

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	69
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

		Correction											
Arc Fault Location				Factors					Incident Energy				
Element ID	Connected Bus ID	Enclosure		Electrode Config	Prefault	I _{arc}	Encl.	Source PD	FCT	Source PD ID	IE	AFB	
		ID	Type		kV	Var. (%)	CF (pu)		I _k " (kA)		(cal/cm ²)	(m)	
INDUCTION FURNACE PCC	INDUCTION FURNACE PCC		Bus Arc Fault	VCB	0.436	0	1.000	15.491	11.115	9.566	0.8	I-C-1 TO IND. FURNACE	0.351
										FCT =	0.8		
										Total =	0.351	0.28	
I/C-1 TO IND. FURNACE	INDUCTION FURNACE PCC		Source PD Line Side	VCB	0.436	13	1.000	15.491	9.718	0.171	41.8	O/G TO SS-1 TR-1	16.156
										FCT =	41.8		
										Total =	16.156	3.10	
INTERLAC MCC	INTERLAC MCC		Bus Arc Fault	VCB	0.436	0	1.000	12.934	9.549	8.762	23.0	I/C TO INTERLAC MCC	12.564
										FCT =	23.0		
										Total =	12.564	1.99	
I/C TO INTERLAC MCC	INTERLAC MCC		Source PD Line Side	VCB	0.436	13	1.000	12.934	8.349	7.661	103.9	O/G TO INTERLAC MCC	49.891
										FCT =	103.9		
										Total =	49.891	4.71	
INV. ROOM-1 BUS	INV. ROOM-1 BUS		Bus Arc Fault	VCB	12.100	0	0.774	8.015	7.415	0.000	15.0		3.422
										FCT =	15.0		
										Total =	3.422	1.78	
I/C-1 TO INVE. ROOM-1	INV. ROOM-1 BUS		Source PD Line Side	VCB	12.100	0	0.000	8.015	0.000	0.000			0.000
												Total =	0.000
I/C-2 TO INVE. ROOM-1	INV. ROOM-1 BUS		Source PD Line Side	VCB	12.100	0	0.000	8.015	0.000	0.000			0.000
												Total =	0.000

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	70
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location		Correction								Incident Energy		
		Factors				Source PD				FCT	Source PD ID	IE (cal/cm²)
Element ID	Connected Bus ID	ID	Enclosure Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)		
O/G TO INVERTER ROOM-1	INV. ROOM-1 BUS		Source PD Line Side	VCB	12.100	0	0.000	8.015	0.000	0.000		0.000
											Total =	0.000 0.00
INV. ROOM-2 BUS	INV. ROOM-2 BUS		Bus Arc Fault	VCB	12.100	0	0.774	8.015	7.415	0.000	15.0	
											FCT =	15.0 Total = 3.422 1.78
I/C-1 TO INVE. ROOM-2	INV. ROOM-2 BUS		Source PD Line Side	VCB	12.100	0	0.000	8.015	0.000	0.000		
											Total =	0.000 0.00
I/C-2 TO INVE. ROOM-2	INV. ROOM-2 BUS		Source PD Line Side	VCB	12.100	0	0.000	8.015	0.000	0.000		
											Total =	0.000 0.00
O/G TO INVERTER ROOM-2	INV. ROOM-2 BUS		Source PD Line Side	VCB	12.100	0	0.000	8.015	0.000	0.000		
											Total =	0.000 0.00
JAROSITE FILTER PRESS MCC	JAROSITE FILTER PRESS MCC		Bus Arc Fault	VCB	0.436	0	1.000	35.743	24.029	20.847	2.5	I/C TO JAROSITE FILT PRES
											FCT =	2.5 Total = 3.690 0.92
I/C TO JAROSITE FILT PRES	JAROSITE FILTER PRESS MCC		Source PD Line Side	VCB	0.436	0	1.000	35.743	24.029	20.847	2.5	I/C TO JAROSITE FILT PRES
											FCT =	2.5 Total = 3.690 0.92

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	71
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location		Correction								Incident Energy		
		Factors				Source PD				FCT	Source PD ID	IE (cal/cm²)
Element ID	Connected Bus ID	ID	Enclosure Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)		
O/G TO CAP.	JAROSITE FILTER PRESS MCC		Load PD Line Side	VCB	0.436	0	1.000	35.743	24.029	20.847	2.5	I/C TO JAROSITE FILT PRES
											FCT =	2.5 Total = 3.690 0.92
O/G TO CLOTH WASH P-1	JAROSITE FILTER PRESS MCC		Load PD Line Side	VCB	0.436	0	1.000	35.743	24.029	20.847	2.5	I/C TO JAROSITE FILT PRES
											FCT =	2.5 Total = 3.690 0.92
O/G TO CLOTH WASH P-2	JAROSITE FILTER PRESS MCC		Load PD Line Side	VCB	0.436	0	1.000	35.743	24.029	20.847	2.5	I/C TO JAROSITE FILT PRES
											FCT =	2.5 Total = 3.690 0.92
O/G TO GA-90 COMP	JAROSITE FILTER PRESS MCC		Load PD Line Side	VCB	0.436	0	1.000	35.743	24.029	20.847	2.5	I/C TO JAROSITE FILT PRES
											FCT =	2.5 Total = 3.690 0.92
O/G TO FEED PUMP-1	JAROSITE FILTER PRESS MCC		Load PD Line Side	VCB	0.436	0	1.000	35.743	24.029	20.847	2.5	I/C TO JAROSITE FILT PRES
											FCT =	2.5 Total = 3.690 0.92
O/G TO FEED PUMP-2	JAROSITE FILTER PRESS MCC		Load PD Line Side	VCB	0.436	0	1.000	35.743	24.029	20.847	2.5	I/C TO JAROSITE FILT PRES
											FCT =	2.5 Total = 3.690 0.92

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	72
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location		Correction										Incident Energy			
		Factors					Source PD								
Element ID	Connected Bus ID	ID	Enclosure	Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
JYOTI PANEL S_1	JYOTI PANEL S_1		Bus Arc Fault	VCB		12.100	0	0.774	16.890	15.520	13.976	23.9	JYOTI B/C-2	8.866	
												FCT =	23.9	Total =	8.866 3.27
O/G TO CONTROL ROOM BUS	JYOTI PANEL S_1		Load PD Line Side	VCB		12.100	0	0.774	16.890	15.520	13.976	23.9	JYOTI B/C-2	8.866	
												FCT =	23.9	Total =	8.866 3.27
O/G TO AUX. TR-1	JYOTI PANEL S_1		Load PD Line Side	VCB		12.100	2	0.000	16.890	15.324	0.000			0.000	
														Total =	0.000 0.00
O/G TO AUX TR-2	JYOTI PANEL S_1		Load PD Line Side	VCB		12.100	0	0.774	16.890	15.520	13.976	23.9	JYOTI B/C-2	8.866	
												FCT =	23.9	Total =	8.866 3.27
O/G TO 5 MVA TRAFO	JYOTI PANEL S_1		Load PD Line Side	VCB		12.100	0	0.774	16.890	15.520	13.976	23.9	JYOTI B/C-2	8.866	
												FCT =	23.9	Total =	8.866 3.27
O/G TO AUX. TR-4	JYOTI PANEL S_1		Load PD Line Side	VCB		12.100	0	0.774	16.890	15.520	13.976	23.9	JYOTI B/C-2	8.866	
												FCT =	23.9	Total =	8.866 3.27
O/G TO AUX. TR-3	JYOTI PANEL S_1		Load PD Line Side	VCB		12.100	0	0.774	16.890	15.520	13.976	23.9	JYOTI B/C-2	8.866	
												FCT =	23.9	Total =	8.866 3.27

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Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location		Correction										Incident Energy			
		Factors					Source PD								
Element ID	Connected Bus ID	ID	Enclosure	Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
JYOTI PANEL S_2	JYOTI PANEL S_2		Bus Arc Fault	VCB		12.100	0	0.774	16.890	15.520	0.000	35.0		12.975	
												FCT =	35.0	Total =	12.975 4.17
JYOTI B/C-2	JYOTI PANEL S_2		Load PD Line Side	VCB		12.100	0	0.774	16.890	15.520	0.000	35.0		12.975	
												FCT =	35.0	Total =	12.975 4.17
12 MW SUPPLY FROM SOLAR	JYOTI PANEL S_2		Source PD Line Side	VCB		12.100	0	0.000	16.890	0.000	0.000			0.000	
														Total =	0.000 0.00
O/G TO AUX. TR-7	JYOTI PANEL S_2		Load PD Line Side	VCB		12.100	0	0.774	16.890	15.520	0.000	35.0		12.975	
												FCT =	35.0	Total =	12.975 4.17
O/G TO ANDREW YULU	JYOTI PANEL S_2		Load PD Line Side	VCB		12.100	0	0.774	16.890	15.520	0.000	35.0		12.975	
												FCT =	35.0	Total =	12.975 4.17
O/G TO AUX. TR-6	JYOTI PANEL S_2		Load PD Line Side	VCB		12.100	0	0.774	16.890	15.520	0.000	35.0		12.975	
												FCT =	35.0	Total =	12.975 4.17
I/C-2 TO JYOTI PANEL	JYOTI PANEL S_2		Source PD Line Side	VCB		12.100	0	0.000	16.890	0.000	0.000			0.000	
														Total =	0.000 0.00

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Filename:	HZL DEBARI SMELTER		Config.:	Normal

Arc Fault Location		Correction								Incident Energy					
		Factors				Source PD									
Element ID	Connected Bus ID	ID	Enclosure	Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
JYOTI PANEL S_3	JYOTI PANEL S_3		Bus Arc Fault	VCB		12.100	0	0.774	2.490	2.304	1.842	51.2	I-C-1 TO DG BUS	3.046	
												FCT =	51.2	Total =	3.046 1.65
O/G-2 TO ANDREW YULU	JYOTI PANEL S_3		Load PD Line Side	VCB		12.100	0	0.774	2.490	2.304	1.842	51.2	I-C-1 TO DG BUS	3.046	
												FCT =	51.2	Total =	3.046 1.65
I/C FROM CP-10	JYOTI PANEL S_3		Source PD Line Side	VCB		12.100	0	0.774	2.490	2.304	1.842	51.2	I-C-1 TO DG BUS	3.046	
												FCT =	51.2	Total =	3.046 1.65
L&P MCC-2	L&P MCC-2		Bus Arc Fault	VCB		0.436	0	1.000	29.009	20.456	19.533	13.0	I/C TO L&P MCC-2	12.859	
												FCT =	13.0	Total =	12.859 2.02
I/C TO L&P MCC-2	L&P MCC-2		Source PD Line Side	VCB		0.436	0	1.000	29.009	20.456	19.533	23.0	O/G TO L&P MCC-2	22.750	
												FCT =	23.0	Total =	22.750 2.88
L&T MCC (MCC-3)	L&T MCC (MCC-3)		Bus Arc Fault	VCB		0.436	13	1.000	18.132	11.694	0.315	4.0	O/G TO AUX. TR-2 CNTRL RO	2.751	
												FCT =	4.0	Total =	2.751 0.77
I/C TO L&T MCC (MCC-3)	L&T MCC (MCC-3)		Source PD Line Side	VCB		0.436	13	1.000	18.132	11.694	0.315	4.0	O/G TO AUX. TR-2 CNTRL RO	2.751	
												FCT =	4.0	Total =	2.751 0.77

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Filename:	HZL DEBARI SMELTER		Config.:	Normal

Arc Fault Location		Correction								Incident Energy					
		Factors				Source PD									
Element ID	Connected Bus ID	ID	Enclosure	Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
O/G TO NEW HBF VACU. PUMP	L&T MCC (MCC-3)		Load PD Line Side	VCB		0.436	13	1.000	18.132	11.694	0.315	4.0	O/G TO AUX. TR-2 CNTRL RO	2.751	
												FCT =	4.0	Total =	2.751 0.77
L&T PH-1 MCC	L&T PH-1 MCC		Bus Arc Fault	VCB		0.436	0	1.000	16.258	12.019	11.445	0.6	I/C TO L&T PH-1 MCC	0.410	
												FCT =	0.6	Total =	0.410 0.23
I/C TO L&T PH-1 MCC	L&T PH-1 MCC		Source PD Line Side	VCB		0.436	0	1.000	16.258	12.019	0.313	51.2	O/G TO AUX. TR-7	35.756	
												FCT =	51.2	Total =	35.756 3.82
LEACHING MCC-1	LEACHING MCC-1		Bus Arc Fault	VCB		0.436	0	1.000	17.110	12.639	11.619	0.7	I/C-1 TO LEACHING MCC-1	0.544	
												FCT =	0.7	Total =	0.544 0.28
I/C-1 TO LEACHING MCC-1	LEACHING MCC-1		Source PD Line Side	VCB		0.436	13	1.000	17.110	11.051	0.305	70.0	O/G TO AUX. TR-6	45.313	
												FCT =	70.0	Total =	45.313 4.43
LEACHING MCC 201B1	LEACHING MCC 201B1		Bus Arc Fault	VCB		0.436	0	1.000	31.342	21.769	20.920	0.6	I/C TO LEACHING MCC 201 B1	0.732	
												FCT =	0.6	Total =	0.732 0.34
I/C TO LEACHING MCC 201B1	LEACHING MCC 201B1		Source PD Line Side	VCB		0.436	13	1.000	31.342	19.034	0.510	36.9	O/G TO AUX. TR-7	42.991	
												FCT =	36.9	Total =	42.991 4.29

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Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location		Correction							Incident Energy				
Element ID	Connected Bus ID	Enclosure		Electrode Config.	Prefault kV	Iarc Var. (%)	Factors		Source PD	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
		ID	Type				Encl. CF (pu)	I ^{a*} (kA)					
LEACHING MCC 201B2	LEACHING MCC 201B2		Bus Arc Fault	VCB	0.436	0	1.000	20.291	14.894	13.742	0.7	I/C-1 TO LEACH MCC 201B 2	0.596
									FCT =	0.7		Total =	0.596 0.29
I/C-1 TO LEACH MCC 201B 2	LEACHING MCC 201B2		Source PD Line Side	VCB	0.436	0	1.000	20.291	14.894	0.388	50.9	O/G TO AUX. TR-7	44.710
									FCT =	50.9		Total =	44.710 4.40
LEACHING MCC 201C	LEACHING MCC 201C		Bus Arc Fault	VCB	0.436	0	1.000	13.579	10.033	9.466	0.7	I/C-1 TO LEACH MCC 201C	0.398
									FCT =	0.7		Total =	0.398 0.23
I/C-1 TO LEACH MCC 201C	LEACHING MCC 201C		Source PD Line Side	VCB	0.436	0	1.000	13.579	10.033	9.466	0.7	O/G TO LEACHING MCC 201C	0.398
									FCT =	0.7		Total =	0.398 0.23
LEECHATE MCC	LEECHATE MCC		Bus Arc Fault	VCB	0.436	0	1.000	9.726	7.115	6.875	0.8	I/C TO LEECHATE MCC	0.308
									FCT =	0.8		Total =	0.308 0.20
I/C TO LEECHATE MCC	LEECHATE MCC		Source PD Line Side	VCB	0.436	0	1.000	9.726	7.115	6.875	0.8	O/G TO LEECHATE MCC	0.308
									FCT =	0.8		Total =	0.308 0.20

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Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location		Correction							Incident Energy				
Element ID	Connected Bus ID	Enclosure		Electrode Config.	Prefault kV	Iarc Var. (%)	Factors		Source PD	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
		ID	Type				Encl. CF (pu)	I ^{a*} (kA)					
LIME MCC PANEL	LIME MCC PANEL		Bus Arc Fault	VCB	0.436	13	1.000	10.316	6.615	6.374	0.6	I/C TO LIME MCC	0.216
									FCT =	0.6		Total =	0.216 0.16
I/C TO LIME MCC	LIME MCC PANEL		Source PD Line Side	VCB	0.436	0	1.000	10.316	7.565	7.290	0.8	O/G TO LIME MCC	0.322
									FCT =	0.8		Total =	0.322 0.20
LR MILL	LR MILL		Bus Arc Fault	VCB	0.436	0	1.000	20.338	14.926	14.459	0.6	I/C TO LR MILL	0.538
									FCT =	0.6		Total =	0.538 0.28
I/C TO LR MILL	LR MILL		Source PD Line Side	VCB	0.436	0	1.000	20.338	14.926	14.459	0.6	O/G TO LR MILL	0.538
									FCT =	0.6		Total =	0.538 0.28
MCC PANEL-1 S_1	MCC PANEL-1 S_1		Bus Arc Fault	VCB	0.436	0	1.000	52.499	30.207	28.790	0.8	I/C-1 TO MCC PANEL-1	1.534
									FCT =	0.8		Total =	1.534 0.53
I/C-1 TO MCC PANEL-1	MCC PANEL-1 S_1		Source PD Line Side	VCB	0.436	0	1.000	52.499	30.207	28.790	0.8	O/G TO MCC PANEL-1	1.534
									FCT =	0.8		Total =	1.534 0.53
MCC-1 B/C	MCC PANEL-1 S_1		Load PD Line Side	VCB	0.436	0	1.000	52.499	30.207	28.790	0.8	I/C-1 TO MCC PANEL-1	1.534
									FCT =	0.8		Total =	1.534 0.53

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Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location				Correction Factors								Incident Energy		
Element ID	Connected Bus ID	Enclosure		Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Source PD Ia* (kA)	FCT (Cycles)	Source PD ID	IE	AFB
		ID	Type										(cal/cm²)	(m)
MCC PANEL -1 S_2	MCC PANEL -1 S_2		Bus Arc Fault	VCB	0.436	0	1.000	52.499	32.449	31.688	0.8	MCC-1 B/C	1.358	
								FCT =			0.8		Total =	1.358 0.49
MCC PANEL -2 S_1	MCC PANEL -2 S_1		Bus Arc Fault	VCB	0.436	0	1.000	52.499	30.207	28.790	0.8	I/C-1 TO MCC PANEL -2	1.534	
								FCT =			0.8		Total =	1.534 0.53
I/C-1 TO MCC PANEL -2	MCC PANEL -2 S_1		Source PD Line Side	VCB	0.436	0	1.000	52.499	30.207	28.790	0.8	O/G TO MCC PANEL -2	1.534	
								FCT =			0.8		Total =	1.534 0.53
MCC -2 B/C	MCC -2 S_1		Load PD Line Side	VCB	0.436	0	1.000	52.499	30.207	28.790	0.8	I/C-1 TO MCC PANEL -2	1.534	
								FCT =			0.8		Total =	1.534 0.53
MCC PANEL -2 S_2	MCC PANEL -2 S_2		Bus Arc Fault	VCB	0.436	0	1.000	52.499	32.449	31.688	0.8	MCC-2 B/C	1.358	
								FCT =			0.8		Total =	1.358 0.49
MCC PUMP HOUSE-2	MCC PUMP HOUSE-2		Bus Arc Fault	VCB	0.436	0	1.000	46.042	28.249	0.740	4.0	O/G TO PHE TRAFO	7.091	
								FCT =			4.0		Total =	7.091 1.39
I/C-1 TO MCC PH-2	MCC PUMP HOUSE-2		Source PD Line Side	VCB	0.436	0	1.000	46.042	28.249	0.740	4.0	O/G TO PHE TRAFO	7.091	
								FCT =			4.0		Total =	7.091 1.39

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Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location				Correction Factors								Incident Energy		
Element ID	Connected Bus ID	Enclosure		Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Source PD Ia* (kA)	FCT (Cycles)	Source PD ID	IE	AFB
		ID	Type										(cal/cm²)	(m)
O/G TO 200-A	MCC PUMP HOUSE-2		Load PD Line Side	VCB	0.436	0	1.000	46.042	28.249	0.740	4.0	O/G TO PHE TRAFO	7.091	
								FCT =			4.0		Total =	7.091 1.39
O/G TO 200-E	MCC PUMP HOUSE-2		Load PD Line Side	VCB	0.436	0	1.000	46.042	28.249	0.740	4.0	O/G TO PHE TRAFO	7.091	
								FCT =			4.0		Total =	7.091 1.39
O/G TO 200-B	MCC PUMP HOUSE-2		Load PD Line Side	VCB	0.436	0	1.000	46.042	28.249	0.740	4.0	O/G TO PHE TRAFO	7.091	
								FCT =			4.0		Total =	7.091 1.39
O/G TO 200-C	MCC PUMP HOUSE-2		Load PD Line Side	VCB	0.436	0	1.000	46.042	28.249	0.740	4.0	O/G TO PHE TRAFO	7.091	
								FCT =			4.0		Total =	7.091 1.39
O/G TO 200-D	MCC PUMP HOUSE-2		Load PD Line Side	VCB	0.436	0	1.000	46.042	28.249	0.740	4.0	O/G TO PHE TRAFO	7.091	
								FCT =			4.0		Total =	7.091 1.39
MCC PUMP HOUSE-3	MCC PUMP HOUSE-3		Bus Arc Fault	VCB	0.436	0	1.000	50.673	29.701	0.759	4.0	O/G TO PHE TRAFO	7.520	
								FCT =			4.0		Total =	7.520 1.44
I/C-1 TO MCC PH-3	MCC PUMP HOUSE-3		Source PD Line Side	VCB	0.436	0	1.000	50.673	29.701	0.759	4.0	O/G TO PHE TRAFO	7.520	
								FCT =			4.0		Total =	7.520 1.44

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Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location		Correction Factors							Incident Energy					
Element ID	Connected Bus ID	Enclosure		Electrode Config.	Prefault KV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Source PD Ia* (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
		ID	Type											
O/G TO FAN-311	MCC PUMP HOUSE-3	Load PD Line Side	VCB	0.436	0	1.000	50.673	29.701	0.759	4.0	O/G TO PHE TRAFO	7.520		
										FCT =	4.0	Total =	7.520 1.44	
O/G TO FAN-312	MCC PUMP HOUSE-3	Load PD Line Side	VCB	0.436	0	1.000	50.673	29.701	0.759	4.0	O/G TO PHE TRAFO	7.520		
										FCT =	4.0	Total =	7.520 1.44	
O/G TO 300 E	MCC PUMP HOUSE-3	Load PD Line Side	VCB	0.436	0	1.000	50.673	29.701	0.759	4.0	O/G TO PHE TRAFO	7.520		
										FCT =	4.0	Total =	7.520 1.44	
O/G TO FAN-313	MCC PUMP HOUSE-3	Load PD Line Side	VCB	0.436	0	1.000	50.673	29.701	0.759	4.0	O/G TO PHE TRAFO	7.520		
										FCT =	4.0	Total =	7.520 1.44	
O/G TO 300 H	MCC PUMP HOUSE-3	Load PD Line Side	VCB	0.436	0	1.000	50.673	29.701	0.759	4.0	O/G TO PHE TRAFO	7.520		
										FCT =	4.0	Total =	7.520 1.44	
O/G TO 300-D	MCC PUMP HOUSE-3	Load PD Line Side	VCB	0.436	0	1.000	50.673	29.701	0.759	4.0	O/G TO PHE TRAFO	7.520		
										FCT =	4.0	Total =	7.520 1.44	
O/G TO 300 F	MCC PUMP HOUSE-3	Load PD Line Side	VCB	0.436	0	1.000	50.673	29.701	0.759	4.0	O/G TO PHE TRAFO	7.520		
										FCT =	4.0	Total =	7.520 1.44	
O/G TO 300 A	MCC PUMP HOUSE-3	Load PD Line Side	VCB	0.436	0	1.000	50.673	29.701	0.759	4.0	O/G TO PHE TRAFO	7.520		
										FCT =	4.0	Total =	7.520 1.44	

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Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location		Correction Factors							Incident Energy					
Element ID	Connected Bus ID	Enclosure		Electrode Config.	Prefault KV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Source PD Ia* (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
		ID	Type											
O/G TO 300 B	MCC PUMP HOUSE-3	Load PD Line Side	VCB	0.436	0	1.000	50.673	29.701	0.759	4.0	O/G TO PHE TRAFO	7.520		
										FCT =	4.0	Total =	7.520 1.44	
O/G TO 300 C	MCC PUMP HOUSE-3	Load PD Line Side	VCB	0.436	0	1.000	50.673	29.701	0.759	4.0	O/G TO PHE TRAFO	7.520		
										FCT =	4.0	Total =	7.520 1.44	
O/G TO 300 G	MCC PUMP HOUSE-3	Load PD Line Side	VCB	0.436	0	1.000	50.673	29.701	0.759	4.0	O/G TO PHE TRAFO	7.520		
										FCT =	4.0	Total =	7.520 1.44	
MCC-111 S_1	MCC-111 S_1	Bus Arc Fault	VCB	0.436	0	1.000	40.679	26.232	24.914	0.8	I/C-1 TO MCC-111	1.303		
										FCT =	0.8	Total =	1.303 0.48	
O/G TO RETURN WAT COOL PU	MCC-111 S_1	Load PD Line Side	VCB	0.436	0	1.000	40.679	26.232	24.914	0.8	I/C-1 TO MCC-111	1.303		
										FCT =	0.8	Total =	1.303 0.48	
O/G TO HZP-1	MCC-111 S_1	Load PD Line Side	VCB	0.436	0	1.000	40.679	26.232	24.914	0.8	I/C-1 TO MCC-111	1.303		
										FCT =	0.8	Total =	1.303 0.48	
I/C-1 TO MCC-111	MCC-111 S_1	Source PD Line Side	VCB	0.436	0	1.000	40.679	26.232	24.914	0.8	O/G-1 TO MCC-111	1.303		
										FCT =	0.8	Total =	1.303 0.48	

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Filename:	HZL DEBARI SMELTER		Config.:	Normal

Element ID	Connected Bus ID	Correction										Source PD ID	IE (cal/cm²)	AFB (m)			
		Arc Fault Location					Factors										
		ID	Type	Electrode Config.	Prefault KV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia" (kA)	FCT (Cycles)						
MCC-111 S_2	MCC-111 S_2	Bus Arc Fault	VCB	0.436	0	1.000	38.766	25.419	24.085	0.8	I/C-2 TO MCC-111	1.257					
O/G TO RWP-3	MCC-111 S_2	Load PD Line Side	VCB	0.436	0	1.000	38.766	25.419	24.085	0.8	I/C-2 TO MCC-111	1.257					
O/G TO HGP-2	MCC-111 S_2	Load PD Line Side	VCB	0.436	0	1.000	38.766	25.419	24.085	0.8	I/C-2 TO MCC-111	1.257					
O/G TO HGP-3	MCC-111 S_2	Load PD Line Side	VCB	0.436	0	1.000	38.766	25.419	24.085	0.8	I/C-2 TO MCC-111	1.257					
I/C-2 TO MCC-111	MCC-111 S_2	Source PD Line Side	VCB	0.436	0	1.000	38.766	25.419	24.085	0.8	O/G-2 TO MCC-111	1.257					
MCC-112	MCC-112	Bus Arc Fault	VCB	0.436	0	1.000	39.242	25.626	24.766	0.8	I/C-1 TO MCC-112	1.269					
I/C-1 TO MCC-112	MCC-112	Source PD Line Side	VCB	0.436	0	1.000	39.242	25.626	24.766	0.8	O/G-1 TO MCC-112	1.269					

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Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Element ID	Connected Bus ID	Correction										Source PD ID	IE (cal/cm²)	AFB (m)			
		Arc Fault Location					Factors										
		ID	Type	Electrode Config.	Prefault KV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia" (kA)	FCT (Cycles)						
MCC-112 S_2	MCC-112 S_2	Bus Arc Fault	VCB	0.436	0	1.000	40.522	26.167	25.315	0.8	I/C-2 TO MCC-112	1.299					
I/C-2 TO MCC-112	MCC-112 S_2	Source PD Line Side	VCB	0.436	0	1.000	40.522	26.167	25.315	0.8	O/G-2 TO MCC-112	1.299					
MCC-113 RMH S_1	MCC-113 RMH S_1	Bus Arc Fault	VCB	0.436	0	1.000	40.493	26.156	25.099	0.8	I/C-1 TO MCC-113	1.299					
I/C-1 TO MCC-113	MCC-113 RMH S_1	Source PD Line Side	VCB	0.436	0	1.000	40.493	26.156	25.099	0.8	O/G-1 TO MCC-113 RMH	1.299					
O/G TO BC-11	MCC-113 RMH S_1	Load PD Line Side	VCB	0.436	0	1.000	40.493	26.156	25.099	0.8	I/C-1 TO MCC-113	1.299					
O/G TO HAMMER MILL	MCC-113 RMH S_1	Load PD Line Side	VCB	0.436	0	1.000	40.493	26.156	25.099	0.8	I/C-1 TO MCC-113	1.299					

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Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Element ID	Connected Bus ID	Correction										Source PD ID	IE (cal/cm²)	AFB (m)	
		Factors					Incident Energy								
		Arc Fault Location		Enclosure		Electrode Config.	Prefault KV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia'' (kA)	FCT (Cycles)		
MCC-113 RMH S_2	MCC-113 RMH S_2	Bus Arc Fault	VCB	0.436	0	1.000	38.960	25.504	24.640	0.8	I/C-2 TO MCC-113		1.262		
										FCT =	0.8		Total =	1.262 0.47	
I/C-2 TO MCC-113	MCC-113 RMH S_2	Source PD Line Side	VCB	0.436	0	1.000	38.960	25.504	24.640	0.8	O/G-2 TO MCC-113 RMH		1.262		
										FCT =	0.8		Total =	1.262 0.47	
MCC-114 S_1	MCC-114 S_1	Bus Arc Fault	VCB	0.436	0	1.000	38.617	25.354	23.752	0.8	O/G-1 TO MCC-114		1.254		
										FCT =	0.8		Total =	1.254 0.47	
I/C-1 TO MCC-114	MCC-114 S_1	Source PD Line Side	VCB	0.436	0	1.000	38.617	25.354	23.752	0.8	O/G-1 TO MCC-114		1.254		
										FCT =	0.8		Total =	1.254 0.47	
O/G TO QWP-3	MCC-114 S_1	Load PD Line Side	VCB	0.436	0	1.000	38.617	25.354	23.752	0.8	O/G-1 TO MCC-114		1.254		
										FCT =	0.8		Total =	1.254 0.47	
O/G TO PGCT PUMP-1	MCC-114 S_1	Load PD Line Side	VCB	0.436	0	1.000	38.617	25.354	23.752	0.8	O/G-1 TO MCC-114		1.254		
										FCT =	0.8		Total =	1.254 0.47	
O/G TO WGP F PUMP	MCC-114 S_1	Load PD Line Side	VCB	0.436	0	1.000	38.617	25.354	23.752	0.8	O/G-1 TO MCC-114		1.254		
										FCT =	0.8		Total =	1.254 0.47	

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Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Element ID	Connected Bus ID	Correction										Source PD ID	IE (cal/cm²)	AFB (m)	
		Factors					Incident Energy								
		Arc Fault Location		Enclosure		Electrode Config.	Prefault KV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia'' (kA)	FCT (Cycles)		
MCC-114 S_2	MCC-114 S_2	Bus Arc Fault	VCB	0.436	0	1.000	41.804	26.687	24.544	0.8	I/C-2 TO MCC-114		1.328		
										FCT =	0.8		Total =	1.328 0.49	
I/C-2 TO MCC-114	MCC-114 S_2	Source PD Line Side	VCB	0.436	0	1.000	41.804	26.687	24.544	0.8	O/G-2 TO MCC-114		1.328		
										FCT =	0.8		Total =	1.328 0.49	
O/G TO QWP-1	MCC-114 S_2	Load PD Line Side	VCB	0.436	0	1.000	41.804	26.687	24.544	0.8	I/C-2 TO MCC-114		1.328		
										FCT =	0.8		Total =	1.328 0.49	
O/G TO QWP-2	MCC-114 S_2	Load PD Line Side	VCB	0.436	0	1.000	41.804	26.687	24.544	0.8	I/C-2 TO MCC-114		1.328		
										FCT =	0.8		Total =	1.328 0.49	
O/G TO PGCT PUMP-3	MCC-114 S_2	Load PD Line Side	VCB	0.436	0	1.000	41.804	26.687	24.544	0.8	I/C-2 TO MCC-114		1.328		
										FCT =	0.8		Total =	1.328 0.49	
O/G TO PGCT PUMP-2	MCC-114 S_2	Load PD Line Side	VCB	0.436	0	1.000	41.804	26.687	24.544	0.8	I/C-2 TO MCC-114		1.328		
										FCT =	0.8		Total =	1.328 0.49	
MCC-115 S_1	MCC-115 S_1	Bus Arc Fault	VCB	0.436	0	1.000	42.338	26.897	26.112	0.8	I/C-1 TO MCC-115		1.340		
										FCT =	0.8		Total =	1.340 0.49	
I/C-1 TO MCC-115	MCC-115 S_1	Source PD Line Side	VCB	0.436	0	1.000	42.338	26.897	26.112	0.8	O/G-1 TO MCC-115		1.340		
										FCT =	0.8		Total =	1.340 0.49	

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Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Arc Fault Location		Correction										Incident Energy		
		Factors					Source PD							
Element ID	Connected Bus ID	ID	Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik" (kA)	Ia" (kA)	Ia" (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
MCC-115 S_2	MCC-115 S_2		Bus Arc Fault	VCB	0.436	0	1.000	40.621	26.208	25.412	0.8	I/C-2 TO MCC-115	1.302	
											FCT =	0.8	Total =	1.302 0.48
I/C-2 TO MCC-115	MCC-115 S_2		Source PD Line Side	VCB	0.436	0	1.000	40.621	26.208	25.412	0.8	O/G-2 TO MCC-115	1.302	
											FCT =	0.8	Total =	1.302 0.48
MCC-116	MCC-116		Bus Arc Fault	VCB	0.436	0	1.000	40.717	26.248	25.397	0.8	I/C-1 TO MCC-116	1.304	
											FCT =	0.8	Total =	1.304 0.48
I/C-1 TO MCC-116	MCC-116		Source PD Line Side	VCB	0.436	0	1.000	40.717	26.248	25.397	0.8	O/G-1 TO MCC-116	1.304	
											FCT =	0.8	Total =	1.304 0.48
MCC-116 S_2	MCC-116 S_2		Bus Arc Fault	VCB	0.436	0	1.000	40.138	26.007	25.153	0.8	I/C-2 TO MCC-116	1.290	
											FCT =	0.8	Total =	1.290 0.48
I/C-2 TO MCC-116	MCC-116 S_2		Source PD Line Side	VCB	0.436	0	1.000	40.138	26.007	25.153	0.8	O/G-2 TO MCC-116	1.290	
											FCT =	0.8	Total =	1.290 0.48

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Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Arc Fault Location		Correction										Incident Energy		
		Factors					Source PD							
Element ID	Connected Bus ID	ID	Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik" (kA)	Ia" (kA)	Ia" (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
MCTP MCC-1	MCTP MCC-1		Bus Arc Fault	VCB	0.436	0	1.000	26.695	19.079	16.132	0.8	I/C TO MCTP MCC-1	0.917	
											FCT =	0.8	Total =	0.917 0.39
I/C TO MCTP MCC-1	MCTP MCC-1		Source PD Line Side	VCB	0.436	0	1.000	26.695	19.079	16.132	5.0	O/G TO MCTP MCC-1	5.730	
											FCT =	5.0	Total =	5.730 1.22
O/G TO ROTARY KILN	MCTP MCC-1		Load PD Line Side	VCB	0.436	0	1.000	26.695	19.079	16.132	0.8	I/C TO MCTP MCC-1	0.917	
											FCT =	0.8	Total =	0.917 0.39
O/G TO BURNER SYSTEM	MCTP MCC-1		Load PD Line Side	VCB	0.436	0	1.000	26.695	19.079	16.132	0.8	I/C TO MCTP MCC-1	0.917	
											FCT =	0.8	Total =	0.917 0.39
O/G TO FEED BELT	MCTP MCC-1		Load PD Line Side	VCB	0.436	0	1.000	26.695	19.079	16.132	0.8	I/C TO MCTP MCC-1	0.917	
											FCT =	0.8	Total =	0.917 0.39
O/G TO MCTP MCC-3	MCTP MCC-1		Load PD Line Side	VCB	0.436	0	1.000	26.695	19.079	16.132	0.8	I/C TO MCTP MCC-1	0.917	
											FCT =	0.8	Total =	0.917 0.39
MCTP MCC-2	MCTP MCC-2		Bus Arc Fault	VCB	0.436	0	1.000	28.240	20.006	17.080	0.8	I/C TO MCTP MCC-2	0.965	
											FCT =	0.8	Total =	0.965 0.40
I/C TO MCTP MCC-2	MCTP MCC-2		Source PD Line Side	VCB	0.436	0	1.000	28.240	20.006	17.080	5.0	O/G TO MCTP MCC-2	6.034	
											FCT =	5.0	Total =	6.034 1.26

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Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location		Correction Factors								Incident Energy			
		Enclosure		Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Source PD	FCT (Cycles)	Source PD ID	IE (cal/cm²)
Element ID	Connected Bus ID	ID	Type										
O/G TO ID FAN	MCTP MCC-2		Load PD Line Side	VCB	0.436	0	1.000	28.240	20.006	17.080	0.8	I/C TO MCTP MCC-2	0.965
										FCT =	0.8	Total =	0.965 0.40
O/G TO GRAB BUCKET CRANE	MCTP MCC-2		Load PD Line Side	VCB	0.436	0	1.000	28.240	20.006	17.080	0.8	I/C TO MCTP MCC-2	0.965
										FCT =	0.8	Total =	0.965 0.40
O/G TO CAP. BANK	MCTP MCC-2		Load PD Line Side	VCB	0.436	0	1.000	28.240	20.006	17.080	0.8	I/C TO MCTP MCC-2	0.965
										FCT =	0.8	Total =	0.965 0.40
MCTP MCC-3	MCTP MCC-3		Bus Arc Fault	VCB	0.436	0	1.000	21.493	15.718	15.254	0.5	I/C TO MCTP MCC-3	0.372
										FCT =	0.5	Total =	0.372 0.22
I/C TO MCTP MCC-3	MCTP MCC-3		Source PD Line Side	VCB	0.436	0	1.000	21.493	15.718	15.254	0.5	O/G TO MCTP MCC-3	0.372
										FCT =	0.5	Total =	0.372 0.22
MELTING FURNACE PCC	MELTING FURNACE PCC		Bus Arc Fault	VCB	0.436	0	1.000	22.285	15.772	0.509	15.7	O/G TO ZINC MELTING TRAFO	9.998
										FCT =	15.7	Total =	9.998 2.30
I/C-1 TO PCC MELTING FURN	MELTING FURNACE PCC		Source PD Line Side	VCB	0.436	0	1.000	22.285	15.772	0.509	15.7	O/G TO ZINC MELTING TRAFO	9.998
										FCT =	15.7	Total =	9.998 2.30

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Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location		Correction Factors								Incident Energy			
		Enclosure		Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Source PD	FCT (Cycles)	Source PD ID	IE (cal/cm²)
Element ID	Connected Bus ID	ID	Type										
MG PANEL (SS-1) S_1	MG PANEL (SS-1) S_1		Bus Arc Fault	VCB	0.436	0	1.000	25.349	18.243	17.375	0.8	I/C-1 TO MG PNL SS-1	0.873
										FCT =	0.8	Total =	0.873 0.37
O/G TO CADMIUM OLD MCC	MG PANEL (SS-1) S_1		Load PD Line Side	VCB	0.436	0	1.000	25.349	18.243	17.375	0.8	I/C-1 TO MG PNL SS-1	0.873
										FCT =	0.8	Total =	0.873 0.37
I/C-1 TO MG PNL SS-1	MG PANEL (SS-1) S_1		Source PD Line Side	VCB	0.436	0	1.000	25.349	18.243	0.389	18.4	O/G TO SS-1 TR-1	20.108
										FCT =	18.4	Total =	20.108 2.67
MG PANEL (SS-1) S_2	MG PANEL (SS-1) S_2		Bus Arc Fault	VCB	0.436	0	1.000	36.470	24.375	19.459	0.8	I/C-2 TO MG PANEL SS-1	1.200
										FCT =	0.8	Total =	1.200 0.46
O/G TO 301B MCC	MG PANEL (SS-1) S_2		Load PD Line Side	VCB	0.436	0	1.000	36.470	24.375	19.459	0.8	I/C-2 TO MG PANEL SS-1	1.200
										FCT =	0.8	Total =	1.200 0.46
O/G TO LR MILL	MG PANEL (SS-1) S_2		Load PD Line Side	VCB	0.436	0	1.000	36.470	24.375	19.459	0.8	I/C-2 TO MG PANEL SS-1	1.200
										FCT =	0.8	Total =	1.200 0.46
O/G TO WARTSILA + CISF	MG PANEL (SS-1) S_2		Load PD Line Side	VCB	0.436	0	1.000	36.470	24.375	19.459	0.8	I/C-2 TO MG PANEL SS-1	1.200
										FCT =	0.8	Total =	1.200 0.46
O/G-1 DM PLANT	MG PANEL (SS-1) S_2		Load PD Line Side	VCB	0.436	0	1.000	36.470	24.375	19.459	0.8	I/C-2 TO MG PANEL SS-1	1.200
										FCT =	0.8	Total =	1.200 0.46

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Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Arc Fault Location		Correction Factors								Incident Energy				
Element ID	Connected Bus ID	Enclosure		Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Source PD	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
		ID	Type											
O/G-1 TO CADMIUM MCC	MG PANEL (SS-1) S_2	Load PD Line Side	VCB	0.436	0	1.000	36.470	24.375	19.459	0.8	I/C-2 TO MG PANEL SS-1	1.200		
								FCT =	0.8		Total =	1.200	0.46	
O/G TO NEW DPH	MG PANEL (SS-1) S_2	Load PD Line Side	VCB	0.436	0	1.000	36.470	24.375	19.459	0.8	I/C-2 TO MG PANEL SS-1	1.200		
								FCT =	0.8		Total =	1.200	0.46	
O/G TO L&T MCC (MCC-3)	MG PANEL (SS-1) S_2	Load PD Line Side	VCB	0.436	0	1.000	36.470	24.375	19.459	0.8	I/C-2 TO MG PANEL SS-1	1.200		
								FCT =	0.8		Total =	1.200	0.46	
I/C-2 TO MG PANEL SS-1	MG PANEL (SS-1) S_2	Source PD Line Side	VCB	0.436	0	1.000	36.470	24.375	0.692	4.0	O/G TO AUX. TR-2 CNTRL RO	6.000		
								FCT =	4.0		Total =	6.000	1.25	
MR MCC PANEL	MR MCC PANEL	Bus Arc Fault	VCB	0.436	0	1.000	20.831	15.266	12.823	0.8	I/C TO MR.MCC PNL	0.721		
								FCT =	0.8		Total =	0.721	0.33	
I/C TO MR MCC PNL	MR MCC PANEL	Source PD Line Side	VCB	0.436	0	1.000	20.831	15.266	12.823	23.0	O/G TO MR.MCC	20.724		
								FCT =	23.0		Total =	20.724	2.72	
O/G TO REACTOR-27	MR MCC PANEL	Load PD Line Side	VCB	0.436	0	1.000	20.831	15.266	12.823	0.8	I/C TO MR.MCC PNL	0.721		
								FCT =	0.8		Total =	0.721	0.33	

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Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Arc Fault Location		Correction Factors								Incident Energy				
Element ID	Connected Bus ID	Enclosure		Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Source PD	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
		ID	Type											
O/G TO REACTOR-28	MR MCC PANEL	Load PD Line Side	VCB	0.436	0	1.000	20.831	15.266	12.823	0.8	I/C TO MR.MCC PNL	0.721		
								FCT =	0.8		Total =	0.721	0.33	
O/G TO REACTOR-29	MR MCC PANEL	Load PD Line Side	VCB	0.436	0	1.000	20.831	15.266	12.823	0.8	I/C TO MR.MCC PNL	0.721		
								FCT =	0.8		Total =	0.721	0.33	
O/G TO CAPACITOR	MR MCC PANEL	Load PD Line Side	VCB	0.436	0	1.000	20.831	15.266	12.823	0.8	I/C TO MR.MCC PNL	0.721		
								FCT =	0.8		Total =	0.721	0.33	
NEW DM PLANT MCC S_1	NEW DM PLANT MCC S_1	Bus Arc Fault	VCB	0.436	0	1.000	18.499	13.636	13.166	0.7	I/C-1 TO NEW DM PLANT	0.554		
								FCT =	0.7		Total =	0.554	0.28	
I/C-1 TO NEW DM PLANT	NEW DM PLANT MCC S_1	Source PD Line Side	VCB	0.436	13	1.000	18.499	11.923	0.239	29.1	O/G TO SS-1 TR-1	20.410		
								FCT =	29.1		Total =	20.410	2.69	
NEW DM PLANT MCC S_2	NEW DM PLANT MCC S_2	Bus Arc Fault	VCB	0.436	0	1.000	8.574	6.237	0.169	4.0	O/G TO AUX. TR-2 CNTRL RO	1.392		
								FCT =	4.0		Total =	1.392	0.50	
I/C-2 TO NEW DM PLANT	NEW DM PLANT MCC S_2	Source PD Line Side	VCB	0.436	0	1.000	8.574	6.237	0.169	4.0	O/G TO AUX. TR-2 CNTRL RO	1.392		
								FCT =	4.0		Total =	1.392	0.50	

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	92
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location		Correction								Incident Energy				
		Factors				Source PD				FCT	Source PD ID	IE (cal/cm²)	AFB (m)	
Element ID	Connected Bus ID	Enclosure		Electrode Config.	Prefault	Iarc	Encl.	I ^k * (kA)	I ^a * (kA)	I ^a * (kA)	FCT =	Source PD ID	IE (cal/cm²)	AFB (m)
		ID	Type		kV	Var. (%)	CF (pu)	I ^k * (kA)	I ^a * (kA)	I ^a * (kA)				
NEW DPH	NEW DPH		Bus Arc Fault	VCB	0.436	0	1.000	23.772	17.233	16.530	0.5	I/C TO NEW DPH	0.502	
											FCT =	0.5	Total =	0.502 0.26
I/C TO NEW DPH	NEW DPH		Source PD Line Side	VCB	0.436	0	1.000	23.772	17.233	13.572	0.8	I/C-2 TO MG PANEL SS-1	0.821	
											FCT =	0.8	Total =	0.821 0.36
PAP PCC(SS-3)	PAP PCC(SS-3)		Bus Arc Fault	VCB	0.436	0	1.000	39.984	25.226	0.660	9.5	O/G TO MCTP TR-5	10.164	
											FCT =	9.5	Total =	10.164 2.32
I/C TO PAP PCC	PAP PCC(SS-3)		Source PD Line Side	VCB	0.436	0	1.000	39.984	25.226	0.660	9.5	O/G TO MCTP TR-5	10.164	
											FCT =	9.5	Total =	10.164 2.32
O/G TO JAROSITE FILT PRES	PAP PCC(SS-3)		Load PD Line Side	VCB	0.436	0	1.000	39.984	25.226	0.660	9.5	O/G TO MCTP TR-5	10.164	
											FCT =	9.5	Total =	10.164 2.32
O/G TO MCTP MCC-2	PAP PCC(SS-3)		Load PD Line Side	VCB	0.436	0	1.000	39.984	25.226	0.660	9.5	O/G TO MCTP TR-5	10.164	
											FCT =	9.5	Total =	10.164 2.32
O/G TO ACID LOADING MCC	PAP PCC(SS-3)		Load PD Line Side	VCB	0.436	0	1.000	39.984	25.226	0.660	9.5	O/G TO MCTP TR-5	10.164	
											FCT =	9.5	Total =	10.164 2.32
O/G TO MCTP MCC-1	PAP PCC(SS-3)		Load PD Line Side	VCB	0.436	0	1.000	39.984	25.226	0.660	9.5	O/G TO MCTP TR-5	10.164	
											FCT =	9.5	Total =	10.164 2.32

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	93
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location		Correction								Incident Energy				
		Factors				Source PD				FCT	Source PD ID	IE (cal/cm²)	AFB (m)	
Element ID	Connected Bus ID	Enclosure		Electrode Config.	Prefault	Iarc	Encl.	I ^k * (kA)	I ^a * (kA)	I ^a * (kA)	FCT =	Source PD ID	IE (cal/cm²)	AFB (m)
		ID	Type		kV	Var. (%)	CF (pu)	I ^k * (kA)	I ^a * (kA)	I ^a * (kA)				
PCC-111 S_1	PCC-111 S_1		Bus Arc Fault	VCB	0.436	0	1.000	48.476	28.273	0.916	14.0	O/G TO TR-111A	16.997	
											FCT =	14.0	Total =	16.997 3.20
I/C-1 TO PCC-111	PCC-111 S_1		Source PD Line Side	VCB	0.436	0	1.000	48.476	28.273	0.916	14.0	O/G TO TR-111A	16.997	
											FCT =	14.0	Total =	16.997 3.20
O/G TO SCREW COMP.PN EUMAT	PCC-111 S_1		Load PD Line Side	VCB	0.436	0	1.000	48.476	28.273	0.916	14.0	O/G TO TR-111A	16.997	
											FCT =	14.0	Total =	16.997 3.20
O/G TO CT-5 PUMP-1	PCC-111 S_1		Load PD Line Side	VCB	0.436	0	1.000	48.476	28.273	0.916	14.0	O/G TO TR-111A	16.997	
											FCT =	14.0	Total =	16.997 3.20
O/G-1 TO MCC-114	PCC-111 S_1		Load PD Line Side	VCB	0.436	0	1.000	48.476	28.273	0.916	14.0	O/G TO TR-111A	16.997	
											FCT =	14.0	Total =	16.997 3.20
O/G-2 TO MCC-112	PCC-111 S_1		Load PD Line Side	VCB	0.436	0	1.000	48.476	28.273	0.916	14.0	O/G TO TR-111A	16.997	
											FCT =	14.0	Total =	16.997 3.20
O/G-1 TO MCC-115	PCC-111 S_1		Load PD Line Side	VCB	0.436	0	1.000	48.476	28.273	0.916	14.0	O/G TO TR-111A	16.997	
											FCT =	14.0	Total =	16.997 3.20

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	94
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Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location		Correction										Incident Energy			
		Factors					Source PD								
Element ID	Connected Bus ID	ID	Enclosure	Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik" (kA)	Ia" (kA)	Ia" (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
O/G-2 TO PDB-111	PCC-111 S_1		Load PD Line Side	VCB	0.436	0	1.000	48.476	28.273	0.916	14.0	O/G TO TR-111A	16.997		
												FCT =	14.0	Total = 16.997 3.20	
PCC-111 S_2	PCC-111 S_2		Bus Arc Fault	VCB	0.436	0	1.000	51.037	29.023	0.892	14.0	O/G TO TR-111B	17.528		
												FCT =	14.0	Total = 17.528 3.26	
O/G-1 TO MCC-118(STG)	PCC-111 S_2		Load PD Line Side	VCB	0.436	0	1.000	51.037	29.023	0.892	14.0	O/G TO TR-111B	17.528		
												FCT =	14.0	Total = 17.528 3.26	
O/G-2 TO PDB-112	PCC-111 S_2		Load PD Line Side	VCB	0.436	0	1.000	51.037	29.023	0.892	14.0	O/G TO TR-111B	17.528		
												FCT =	14.0	Total = 17.528 3.26	
O/G-1 TO MCC-111	PCC-111 S_2		Load PD Line Side	VCB	0.436	0	1.000	51.037	29.023	0.892	14.0	O/G TO TR-111B	17.528		
												FCT =	14.0	Total = 17.528 3.26	
O/G-1 TO MCC-113 RMH	PCC-111 S_2		Load PD Line Side	VCB	0.436	0	1.000	51.037	29.023	0.892	14.0	O/G TO TR-111B	17.528		
												FCT =	14.0	Total = 17.528 3.26	
O/G TO SCRE COMP NEUM-2	PCC-111 S_2		Load PD Line Side	VCB	0.436	0	1.000	51.037	29.023	0.892	14.0	O/G TO TR-111B	17.528		
												FCT =	14.0	Total = 17.528 3.26	

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Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location		Correction										Incident Energy			
		Factors					Source PD								
Element ID	Connected Bus ID	ID	Enclosure	Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik" (kA)	Ia" (kA)	Ia" (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
O/G TO CLDC MCC-1	PCC-111 S_2		Load PD Line Side	VCB	0.436	0	1.000	51.037	29.023	0.892	14.0	O/G TO TR-111B	17.528		
												FCT =	14.0	Total = 17.528 3.26	
O/G TO FAT SOFT STAR PNL	PCC-111 S_2		Load PD Line Side	VCB	0.436	0	1.000	51.037	29.023	0.892	14.0	O/G TO TR-111B	17.528		
												FCT =	14.0	Total = 17.528 3.26	
O/G TO DT SOFT START PNL	PCC-111 S_2		Load PD Line Side	VCB	0.436	0	1.000	51.037	29.023	0.892	14.0	O/G TO TR-111B	17.528		
												FCT =	14.0	Total = 17.528 3.26	
I/C-2 TO PCC-111	PCC-111 S_2		Source PD Line Side	VCB	0.436	0	1.000	51.037	29.023	0.892	14.0	O/G TO TR-111B	17.528		
												FCT =	14.0	Total = 17.528 3.26	
PCC-112 S_1	PCC-112 S_1		Bus Arc Fault	VCB	0.436	0	1.000	48.811	28.375	0.912	14.0	O/G TO TR-112A	17.069		
												FCT =	14.0	Total = 17.069 3.21	
O/G-2 TO MCC-113 RMH	PCC-112 S_1		Load PD Line Side	VCB	0.436	0	1.000	48.811	28.375	0.912	14.0	O/G TO TR-112A	17.069		
												FCT =	14.0	Total = 17.069 3.21	
O/G TO WGP-3	PCC-112 S_1		Load PD Line Side	VCB	0.436	0	1.000	48.811	28.375	0.912	14.0	O/G TO TR-112A	17.069		
												FCT =	14.0	Total = 17.069 3.21	

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Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Arc Fault Location		Correction										Incident Energy			
		Factors					Source PD								
Element ID	Connected Bus ID	ID	Enclosure	Type	Electrode Config.	Prefault KV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
O/G TO WGP-4	PCC-112 S_1		Load PD Line Side	VCB	0.436	0	1.000	48.811	28.375	0.912	14.0	O/G TO TR-112A	17.069		
												FCT =	14.0	Total = 17.069 3.21	
O/G TO CT-4 PUMP-1	PCC-112 S_1		Load PD Line Side	VCB	0.436	0	1.000	48.811	28.375	0.912	14.0	O/G TO TR-112A	17.069		
												FCT =	14.0	Total = 17.069 3.21	
O/G TO SCREW COMP-3	PCC-112 S_1		Load PD Line Side	VCB	0.436	0	1.000	48.811	28.375	0.912	14.0	O/G TO TR-112A	17.069		
												FCT =	14.0	Total = 17.069 3.21	
O/G TO CT-2 PUMP-1	PCC-112 S_1		Load PD Line Side	VCB	0.436	0	1.000	48.811	28.375	0.912	14.0	O/G TO TR-112A	17.069		
												FCT =	14.0	Total = 17.069 3.21	
O/G TO WGP-1	PCC-112 S_1		Load PD Line Side	VCB	0.436	0	1.000	48.811	28.375	0.912	14.0	O/G TO TR-112A	17.069		
												FCT =	14.0	Total = 17.069 3.21	
O/G TO CT-1 PUMP-3	PCC-112 S_1		Load PD Line Side	VCB	0.436	0	1.000	48.811	28.375	0.912	14.0	O/G TO TR-112A	17.069		
												FCT =	14.0	Total = 17.069 3.21	
O/G-1 TO MCC-116	PCC-112 S_1		Load PD Line Side	VCB	0.436	0	1.000	48.811	28.375	0.912	14.0	O/G TO TR-112A	17.069		
												FCT =	14.0	Total = 17.069 3.21	
I/C-1 TO PCC-112	PCC-112 S_1		Source PD Line Side	VCB	0.436	0	1.000	48.811	28.375	0.912	14.0	O/G TO TR-112A	17.069		
												FCT =	14.0	Total = 17.069 3.21	

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	97
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Arc Fault Location		Correction										Incident Energy			
		Factors					Source PD								
Element ID	Connected Bus ID	ID	Enclosure	Type	Electrode Config.	Prefault KV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
PCC-112 S_2	PCC-112 S_2		Bus Arc Fault	VCB	0.436	0	1.000	50.763	28.946	0.895	14.0	O/G TO TR-112B	17.473		
												FCT =	14.0	Total = 17.473 3.26	
O/G TO CT-1 PUM-2	PCC-112 S_2		Load PD Line Side	VCB	0.436	0	1.000	50.763	28.946	0.895	14.0	O/G TO TR-112B	17.473		
												FCT =	14.0	Total = 17.473 3.26	
O/G-1 TO PDB-111	PCC-112 S_2		Load PD Line Side	VCB	0.436	0	1.000	50.763	28.946	0.895	14.0	O/G TO TR-112B	17.473		
												FCT =	14.0	Total = 17.473 3.26	
O/G-2 TO MCC-116	PCC-112 S_2		Load PD Line Side	VCB	0.436	0	1.000	50.763	28.946	0.895	14.0	O/G TO TR-112B	17.473		
												FCT =	14.0	Total = 17.473 3.26	
O/G-1 TO MCC-112	PCC-112 S_2		Load PD Line Side	VCB	0.436	0	1.000	50.763	28.946	0.895	14.0	O/G TO TR-112B	17.473		
												FCT =	14.0	Total = 17.473 3.26	
O/G TO CT-2 PUMP-2	PCC-112 S_2		Load PD Line Side	VCB	0.436	0	1.000	50.763	28.946	0.895	14.0	O/G TO TR-112B	17.473		
												FCT =	14.0	Total = 17.473 3.26	
O/G TO SCREW COMP-4	PCC-112 S_2		Load PD Line Side	VCB	0.436	0	1.000	50.763	28.946	0.895	14.0	O/G TO TR-112B	17.473		
												FCT =	14.0	Total = 17.473 3.26	

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	98
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Arc Fault Location		Correction								Incident Energy				
		Factors				Source PD				FCT	Source PD ID	IE (cal/cm²)	AFB (m)	
Element ID	Connected Bus ID	Enclosure		Electrode Config.	Prefault	Iarc	Encl.	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT	Source PD ID	IE (cal/cm²)	AFB (m)
		ID	Type		kV	Var. (%)	CF (pu)				FCT =			
O/G TO IAT PANEL	PCC-112 S_2		Load PD Line Side	VCB	0.436	0	1.000	50.763	28.946	0.895	14.0	O/G TO TR-112B	17.473	
											FCT =		Total =	17.473 3.26
O/G TO CT-4 PUMP-3	PCC-112 S_2		Load PD Line Side	VCB	0.436	0	1.000	50.763	28.946	0.895	14.0	O/G TO TR-112B	17.473	
											FCT =		Total =	17.473 3.26
I/C-2 TO PCC-112	PCC-112 S_2		Source PD Line Side	VCB	0.436	0	1.000	50.763	28.946	0.895	14.0	O/G TO TR-112B	17.473	
											FCT =		Total =	17.473 3.26
PDB-112 S_2	PDB-112 S_2		Bus Arc Fault	VCB	0.436	0	1.000	37.106	24.672	23.580	0.8	I/C-2 TO PDB-112	1.216	
											FCT =		Total =	1.216 0.46
I/C-2 TO PDB-112	PDB-112 S_2		Source PD Line Side	VCB	0.436	0	1.000	37.106	24.672	23.580	0.8	O/G-2 TO PDB-112	1.216	
											FCT =		Total =	1.216 0.46
PH-1 MCC PANEL	PH-1 MCC PANEL		Bus Arc Fault	VCB	0.436	0	1.000	25.557	18.373	17.792	0.4	I/C TO PH-1 MCC PNL	0.434	
											FCT =		Total =	0.434 0.24
I/C TO PH-1 MCC PNL	PH-1 MCC PANEL		Source PD Line Side	VCB	0.436	13	1.000	25.557	16.065	0.424	45.6	O/G TO AUX. TR-7	44.163	
											FCT =		Total =	44.163 4.36

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	99
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Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Arc Fault Location		Correction								Incident Energy				
		Factors				Source PD				FCT	Source PD ID	IE (cal/cm²)	AFB (m)	
Element ID	Connected Bus ID	Enclosure		Electrode Config.	Prefault	Iarc	Encl.	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT	Source PD ID	IE (cal/cm²)	AFB (m)
		ID	Type		kV	Var. (%)	CF (pu)				FCT =			
PURIFICATION MCC	PURIFICATION MCC		Bus Arc Fault	VCB	0.436	0	1.000	16.289	12.042	10.611	0.7	I/C TO PURIFICATION MCC	0.479	
											FCT =		Total =	0.479 0.26
I/C TO PURIFICATION MCC	PURIFICATION MCC		Source PD Line Side	VCB	0.436	13	1.000	16.289	10.529	0.286	76.7	O/G TO AUX. TR-6	47.185	
											FCT =		Total =	47.185 4.55
O/G TO LEACHING MCC 201C	PURIFICATION MCC		Load PD Line Side	VCB	0.436	0	1.000	16.289	12.042	10.611	0.7	I/C TO PURIFICATION MCC	0.479	
											FCT =		Total =	0.479 0.26
PYROTEC LP MCC	PYROTEC LP MCC		Bus Arc Fault	VCB	0.436	0	1.000	27.259	19.421	18.261	4.5	O/G TO PYROTEC LP MCC	5.258	
											FCT =		Total =	5.258 1.15
I/C TO PYROTEC LP MCC	PYROTEC LP MCC		Source PD Line Side	VCB	0.436	0	1.000	27.259	19.421	18.261	4.5	O/G TO PYROTEC LP MCC	5.258	
											FCT =		Total =	5.258 1.15
PCC-113 S_1	PCC-113 S_1		Bus Arc Fault	VCB	0.436	0	1.000	53.322	29.634	0.871	14.0	O/G TO TR-113A	17.967	
											FCT =		Total =	17.967 3.31
O/G-1 TO PDB-112	PCC-113 S_1		Load PD Line Side	VCB	0.436	0	1.000	53.322	29.634	0.871	14.0	O/G TO TR-113A	17.967	
											FCT =		Total =	17.967 3.31

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	100
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Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location		Correction										Incident Energy			
		Factors					Source PD								
Element ID	Connected Bus ID	ID	Enclosure	Type	Electrode Config.	Prefault KV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
O/G TO IR-3 COMP. HOUSE	PCC-113 S_1		Load PD Line Side	VCB	0.436	0	1.000	53.322	29.634	0.871	14.0	O/G TO TR-113A	17.967		
												FCT =	14.0	Total = 17.967 3.31	
CT-4 PUMP-2	PCC-113 S_1		Load PD Line Side	VCB	0.436	0	1.000	53.322	29.634	0.871	14.0	O/G TO TR-113A	17.967		
												FCT =	14.0	Total = 17.967 3.31	
O/G TO GA-55 R-3 COM-6	PCC-113 S_1		Load PD Line Side	VCB	0.436	0	1.000	53.322	29.634	0.871	14.0	O/G TO TR-113A	17.967		
												FCT =	14.0	Total = 17.967 3.31	
O/G-2 TO MCC-115	PCC-113 S_1		Load PD Line Side	VCB	0.436	0	1.000	53.322	29.634	0.871	14.0	O/G TO TR-113A	17.967		
												FCT =	14.0	Total = 17.967 3.31	
O/G-2 TO MCC-114	PCC-113 S_1		Load PD Line Side	VCB	0.436	0	1.000	53.322	29.634	0.871	14.0	O/G TO TR-113A	17.967		
												FCT =	14.0	Total = 17.967 3.31	
O/G TO CT-1 PUMP-4	PCC-113 S_1		Load PD Line Side	VCB	0.436	0	1.000	53.322	29.634	0.871	14.0	O/G TO TR-113A	17.967		
												FCT =	14.0	Total = 17.967 3.31	
O/G TO COOLING AIR FAN	PCC-113 S_1		Load PD Line Side	VCB	0.436	0	1.000	53.322	29.634	0.871	14.0	O/G TO TR-113A	17.967		
												FCT =	14.0	Total = 17.967 3.31	
O/G-2 TO MCC-118(STG)	PCC-113 S_1		Load PD Line Side	VCB	0.436	0	1.000	53.322	29.634	0.871	14.0	O/G TO TR-113A	17.967		
												FCT =	14.0	Total = 17.967 3.31	

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	101
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location		Correction										Incident Energy			
		Factors					Source PD								
Element ID	Connected Bus ID	ID	Enclosure	Type	Electrode Config.	Prefault KV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
I/C-1 TO PCC-113	PCC-113 S_1		Source PD Line Side	VCB	0.436	0	1.000	53.322	29.634	0.871	14.0	O/G TO TR-113A	17.967		
												FCT =	14.0	Total = 17.967 3.31	
PCC-113 S_2	PCC-113 S_2		Bus Arc Fault	VCB	0.436	0	1.000	48.015	28.130	0.919	14.0	O/G TO TR-113B	16.897		
												FCT =	14.0	Total = 16.897 3.19	
O/G-2 TO PCC-113	PCC-113 S_2		Source PD Line Side	VCB	0.436	0	1.000	48.015	28.130	0.919	14.0	O/G TO TR-113B	16.897		
												FCT =	14.0	Total = 16.897 3.19	
O/G TO CT-2 PUMP-3	PCC-113 S_2		Load PD Line Side	VCB	0.436	0	1.000	48.015	28.130	0.919	14.0	O/G TO TR-113B	16.897		
												FCT =	14.0	Total = 16.897 3.19	
O/G TO CT-5 PUMP-2	PCC-113 S_2		Load PD Line Side	VCB	0.436	0	1.000	48.015	28.130	0.919	14.0	O/G TO TR-113B	16.897		
												FCT =	14.0	Total = 16.897 3.19	
O/G TO WGP-2	PCC-113 S_2		Load PD Line Side	VCB	0.436	0	1.000	48.015	28.130	0.919	14.0	O/G TO TR-113B	16.897		
												FCT =	14.0	Total = 16.897 3.19	
O/G TO NEW COOL AIR FAN	PCC-113 S_2		Load PD Line Side	VCB	0.436	0	1.000	48.015	28.130	0.919	14.0	O/G TO TR-113B	16.897		
												FCT =	14.0	Total = 16.897 3.19	

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	102
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Arc Fault Location		Correction								Incident Energy							
		Factors															
Element ID	Connected Bus ID	Enclosure		Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik" (kA)	Ia" (kA)	Source PD	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)			
O/G TO IR COMP-5 R-III	PCC-113 S_2	Load PD Line Side						48.015	28.130	0.919	14.0	O/G TO TR-113B	16.897				
										FCT =	14.0	Total =	16.897	3.19			
OG-2 TO MCC-111	PCC-113 S_2	Load PD Line Side		VCB	0.436	0	1.000	48.015	28.130	0.919	14.0	O/G TO TR-113B	16.897				
										FCT =	14.0	Total =	16.897	3.19			
O/G TO CT-1 PUMP-1	PCC-113 S_2	Load PD Line Side		VCB	0.436	0	1.000	48.015	28.130	0.919	14.0	O/G TO TR-113B	16.897				
										FCT =	14.0	Total =	16.897	3.19			
PDB-111 S_1	PDB-111 S_1	Bus Arc Fault		VCB	0.436	0	1.000	36.689	24.478	23.657	0.8	I/C-1 TO PDB-111	1.205				
										FCT =	0.8	Total =	1.205	0.46			
I/C-1 TO PDB-111	PDB-111 S_1	Source PD Line Side		VCB	0.436	0	1.000	36.689	24.478	23.657	0.8	O/G-1 TO PDB-111	1.205				
										FCT =	0.8	Total =	1.205	0.46			
PDB-111 S_2	PDB-111 S_2	Bus Arc Fault		VCB	0.436	0	1.000	41.402	26.526	25.734	0.8	I/C-2 TO PDB-111	1.319				
										FCT =	0.8	Total =	1.319	0.48			
I/C-2 TO PDB-111	PDB-111 S_2	Source PD Line Side		VCB	0.436	0	1.000	41.402	26.526	25.734	0.8	O/G-2 TO PDB-111	1.319				
										FCT =	0.8	Total =	1.319	0.48			

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Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Arc Fault Location		Correction								Incident Energy							
		Factors															
Element ID	Connected Bus ID	Enclosure		Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik" (kA)	Ia" (kA)	Source PD	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)			
PDB-112 S_1	PDB-112 S_1	Bus Arc Fault						41.786	26.680	25.628	0.8	I/C-1 TO PDB-112	1.328				
										FCT =	0.8	Total =	1.328	0.49			
I/C-1 TO PDB-112	PDB-112 S_1	Source PD Line Side		VCB	0.436	0	1.000	41.786	26.680	25.628	0.8	O/G-1 TO PDB-112	1.328				
										FCT =	0.8	Total =	1.328	0.49			
PYROTEC PCC	PYROTEC PCC	Bus Arc Fault		VCB	0.436	0	1.000	23.149	16.825	16.235	2.5	I/C TO PYROTEC PCC	2.501				
										FCT =	2.5	Total =	2.501	0.72			
I/C TO PYROTEC PCC	PYROTEC PCC	Source PD Line Side		VCB	0.436	0	1.000	23.149	16.825	16.235	5.0	O/G TO PYROTEC PCC	5.002				
										FCT =	5.0	Total =	5.002	1.12			
O/G TO LEECHATE MCC	PYROTEC PCC	Load PD Line Side		VCB	0.436	0	1.000	23.149	16.825	16.235	2.5	I/C TO PYROTEC PCC	2.501				
										FCT =	2.5	Total =	2.501	0.72			
O/G TO CANAL PH	PYROTEC PCC	Load PD Line Side		VCB	0.436	0	1.000	23.149	16.825	16.235	2.5	I/C TO PYROTEC PCC	2.501				
										FCT =	2.5	Total =	2.501	0.72			

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Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Element ID	Connected Bus ID	Correction										IE (cal/cm²)	AFB (m)	
		Arc Fault Location					Factors							
		ID	Type	Electrode Config.	Prefault KV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ja* (kA)	Source PD	FCT (Cycles)	Source PD ID		
PYROTECH PCC	PYROTECH PCC		Bus Arc Fault	VCB	0.436	0	1.000	38.017	24.388	0.702	4.0	O/G TO AUX. TR-2 CNTRL RO	4.106	
											FCT =	4.0	Total =	4.106 1.32
O/G-1 TO 301A MCC	PYROTECH PCC		Load PD Line Side	VCB	0.436	0	1.000	38.017	24.388	0.702	4.0	O/G TO AUX. TR-2 CNTRL RO	4.106	
											FCT =	4.0	Total =	4.106 1.32
O/G TO SS-1 MG PANEL	PYROTECH PCC		Load PD Line Side	VCB	0.436	0	1.000	38.017	24.388	0.702	4.0	O/G TO AUX. TR-2 CNTRL RO	4.106	
											FCT =	4.0	Total =	4.106 1.32
O/G-1 TO COOLING TWR MCC	PYROTECH PCC		Load PD Line Side	VCB	0.436	0	1.000	38.017	24.388	0.702	4.0	O/G TO AUX. TR-2 CNTRL RO	4.106	
											FCT =	4.0	Total =	4.106 1.32
I/C TO SS-1 PCC	PYROTECH PCC		Source PD Line Side	VCB	0.436	0	1.000	38.017	24.388	0.702	4.0	O/G TO AUX. TR-2 CNTRL RO	4.106	
											FCT =	4.0	Total =	4.106 1.32
R-2 ACID PLANT MCC	R-2 ACID PLANT MCC		Bus Arc Fault	VCB	0.436	0	1.000	10.982	8.071	0.213	51.2	O/G TO AUX. TR-3	23.419	
											FCT =	51.2	Total =	23.419 2.93
I/C TO R-2 ACID PLANT MCC	R-2 ACID PLANT MCC		Source PD Line Side	VCB	0.436	0	1.000	10.982	8.071	0.213	51.2	O/G TO AUX. TR-3	23.419	
											FCT =	51.2	Total =	23.419 2.93
O/G TO SO2 BLOWER PUMP	R-2 ACID PLANT MCC		Load PD Line Side	VCB	0.436	0	1.000	10.982	8.071	0.213	51.2	O/G TO AUX. TR-3	23.419	
											FCT =	51.2	Total =	23.419 2.93

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	105
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Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Element ID	Connected Bus ID	Correction										IE (cal/cm²)	AFB (m)	
		Arc Fault Location					Factors							
		ID	Type	Electrode Config.	Prefault KV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ja* (kA)	Source PD	FCT (Cycles)	Source PD ID		
O/G TO DT PUM	R-2 ACID PLANT MCC		Load PD Line Side	VCB	0.436	0	1.000	10.982	8.071	0.213	51.2	O/G TO AUX. TR-3	23.419	
											FCT =	51.2	Total =	23.419 2.93
O/G TO IPAT PUMP	R-2 ACID PLANT MCC		Load PD Line Side	VCB	0.436	0	1.000	10.982	8.071	0.213	51.2	O/G TO AUX. TR-3	23.419	
											FCT =	51.2	Total =	23.419 2.93
O/G TO FAT PUM	R-2 ACID PLANT MCC		Load PD Line Side	VCB	0.436	0	1.000	10.982	8.071	0.213	51.2	O/G TO AUX. TR-3	23.419	
											FCT =	51.2	Total =	23.419 2.93
RO MCC PANEL	RO MCC PANEL		Bus Arc Fault	VCB	0.436	0	1.000	13.043	9.631	7.577	2.5	I/C TO RO MCC PANEL	1.378	
											FCT =	2.5	Total =	1.378 0.50
I/C TO RO MCC PANEL	RO MCC PANEL		Source PD Line Side	VCB	0.436	0	1.000	13.043	9.631	7.577	5.0	O/G TO SIEMENS RO MCC	2.756	
											FCT =	5.0	Total =	2.756 0.77
O/G TO RO_03_GO31_M0_01	RO MCC PANEL		Load PD Line Side	VCB	0.436	0	1.000	13.043	9.631	7.577	2.5	I/C TO RO MCC PANEL	1.378	
											FCT =	2.5	Total =	1.378 0.50
O/G TO TREATED WATER SU	RO MCC PANEL		Load PD Line Side	VCB	0.436	0	1.000	13.043	9.631	7.577	2.5	I/C TO RO MCC PANEL	1.378	
											FCT =	2.5	Total =	1.378 0.50

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	106
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location			Correction Factors								Incident Energy				
Element ID	Connected Bus ID	ID	Enclosure		Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Source PD	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
			Type												
SIEMENS BUS-A	SIEMENS BUS-A		Bus Arc Fault	VCB	12.100	2	0.774	17.605	15.967	11.651	33.0	I/C TO SIEMENS BUS-A	15.727		
											FCT =	33.0	Total =	15.727 4.71	
I/C TO SIEMENS BUS-A	SIEMENS BUS-A		Source PD Line Side	VCB	12.100	2	0.774	17.605	15.967	1.015	45.1	O/G TO TR-1	21.454		
											FCT =	45.1	Total =	21.454 5.75	
O/G TO CAPACITOR BANK -4	SIEMENS BUS-A		Load PD Line Side	VCB	12.100	2	0.774	17.605	15.967	11.651	33.0	I/C TO SIEMENS BUS-A	15.727		
											FCT =	33.0	Total =	15.727 4.71	
O/G TO ROASTER SECTION-1	SIEMENS BUS-A		Load PD Line Side	VCB	12.100	2	0.774	17.605	15.967	11.651	33.0	I/C TO SIEMENS BUS-A	15.727		
											FCT =	33.0	Total =	15.727 4.71	
SIEMENS BUS-B	SIEMENS BUS-B		Bus Arc Fault	VCB	12.100	2	0.774	12.851	11.693	11.693	32.9	I/C TO SIEMENS BUS-B	11.602		
											FCT =	32.9	Total =	11.602 3.88	
I/C TO SIEMENS BUS-B	SIEMENS BUS-B		Source PD Line Side	VCB	12.100	2	0.774	12.851	11.693	1.019	44.9	O/G TO TR-2	15.852		
											FCT =	44.9	Total =	15.852 4.74	
O/G TO CAPACITOR BANK -2	SIEMENS BUS-B		Load PD Line Side	VCB	12.100	2	0.774	12.851	11.693	11.693	32.9	I/C TO SIEMENS BUS-B	11.602		
											FCT =	32.9	Total =	11.602 3.88	

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	107
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Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location			Correction Factors								Incident Energy				
Element ID	Connected Bus ID	ID	Enclosure		Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Source PD	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
			Type												
SOLAR 11KV HT PNL	SOLAR 11KV HT PNL		Bus Arc Fault	VCB	12.100	0	0.774	8.047	7.445	0.000	40.0		9.161		
											FCT =	40.0	Total =	9.161 3.34	
I/C FROM TRAFO-4	SOLAR 11KV HT PNL		Source PD Line Side	VCB	12.100	0	0.000	8.047	0.000	0.000			0.000		
													Total =	0.000 0.00	
I/C FROM INVERTER ROOM-2	SOLAR 11KV HT PNL		Source PD Line Side	VCB	12.100	0	0.000	8.047	0.000	0.000			0.000		
													Total =	0.000 0.00	
O/G TO 11KV JYOTI PNL	SOLAR 11KV HT PNL		Source PD Line Side	VCB	12.100	0	0.000	8.047	0.000	0.000			0.000		
													Total =	0.000 0.00	
I/C FROM INV. ROOM-1	SOLAR 11KV HT PNL		Source PD Line Side	VCB	12.100	0	0.000	8.047	0.000	0.000			0.000		
													Total =	0.000 0.00	
I/C FROM INV. TRAFO-3	SOLAR 11KV HT PNL		Source PD Line Side	VCB	12.100	0	0.000	8.047	0.000	0.000			0.000		
													Total =	0.000 0.00	
STG MCC-118 S_1	STG MCC-118 S_1		Bus Arc Fault	VCB	0.436	0	1.000	42.062	26.789	26.263	0.4	I/C-1 TO MCC-118	0.747		
											FCT =	0.4	Total =	0.747 0.34	
I/C-1 TO MCC-118	STG MCC-118 S_1		Source PD Line Side	VCB	0.436	0	1.000	42.062	26.789	26.263	0.8	O/G-1 TO MCC-118(STG)	1.334		
											FCT =	0.8	Total =	1.334 0.49	

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	108
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location		Correction								Incident Energy					
		Factors				Source PD									
Element ID	Connected Bus ID	ID	Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik" (kA)	Ia" (kA)	Ia* (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)	
STG MCC-118 S_2	STG MCC-118 S_2		Bus Arc Fault	VCB	0.436	0	1.000	43.493	27.338	26.819	0.4	I/C-2 TO MCC-118	0.759	0.34	
											FCT =	0.4	Total =	0.759	0.34
I/C-2 TO MCC-118	STG MCC-118 S_2		Source PD Line Side	VCB	0.436	0	1.000	43.493	27.338	26.819	0.8	O/G-2 TO MCC-118(STG)	1.366		
											FCT =	0.8	Total =	1.366	0.50
RO PLANT MCC	RO PLANT MCC		Bus Arc Fault	VCB	0.436	13	1.000	18.810	12.116	0.241	28.8	O/G TO SS-1 TR-1	20.605		
											FCT =	28.8	Total =	20.605	2.71
I/C TO RO PLANT MCC	RO PLANT MCC		Source PD Line Side	VCB	0.436	13	1.000	18.810	12.116	0.241	28.8	O/G TO SS-1 TR-1	20.605		
											FCT =	28.8	Total =	20.605	2.71
RO ZLD PCC	RO ZLD PCC		Bus Arc Fault	VCB	0.436	0	1.000	72.340	33.110	1.027	14.0	O/G TO RO ZLD TRAFO	20.667		
											FCT =	14.0	Total =	20.667	3.62
I/C TO RO ZLD PCC	RO ZLD PCC		Source PD Line Side	VCB	0.436	0	1.000	72.340	33.110	1.027	14.0	O/G TO RO ZLD TRAFO	20.667		
											FCT =	14.0	Total =	20.667	3.62
O/G TO CAP BANK	RO ZLD PCC		Load PD Line Side	VCB	0.436	0	1.000	72.340	33.110	1.027	14.0	O/G TO RO ZLD TRAFO	20.667		
											FCT =	14.0	Total =	20.667	3.62

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	109
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location		Correction								Incident Energy					
		Factors				Source PD									
Element ID	Connected Bus ID	ID	Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik" (kA)	Ia" (kA)	Ia* (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)	
O/G TO VFD PANEL-2	RO ZLD PCC		Load PD Line Side	VCB	0.436	0	1.000	72.340	33.110	1.027	14.0	O/G TO RO ZLD TRAFO	20.667		
											FCT =	14.0	Total =	20.667	3.62
O/G TO VF PANEL-1	RO ZLD PCC		Load PD Line Side	VCB	0.436	0	1.000	72.340	33.110	1.027	14.0	O/G TO RO ZLD TRAFO	20.667		
											FCT =	14.0	Total =	20.667	3.62
O/G TO MCC PANEL-1	RO ZLD PCC		Load PD Line Side	VCB	0.436	0	1.000	72.340	33.110	1.027	14.0	O/G TO RO ZLD TRAFO	20.667		
											FCT =	14.0	Total =	20.667	3.62
O/G TO MCC PANEL-2	RO ZLD PCC		Load PD Line Side	VCB	0.436	0	1.000	72.340	33.110	1.027	14.0	O/G TO RO ZLD TRAFO	20.667		
											FCT =	14.0	Total =	20.667	3.62
O/G TO AIR COMP.	RO ZLD PCC		Load PD Line Side	VCB	0.436	0	1.000	72.340	33.110	1.027	14.0	O/G TO RO ZLD TRAFO	20.667		
											FCT =	14.0	Total =	20.667	3.62
ROASTER GE MCC	ROASTER GE MCC		Bus Arc Fault	VCB	0.436	0	1.000	35.567	23.944	0.625	4.0	O/G TO PHE TRAFO	5.882		
											FCT =	4.0	Total =	5.882	1.24
I/C-2 TO RO GE MCC	ROASTER GE MCC		Source PD Line Side	VCB	0.436	0	1.000	35.567	23.944	0.625	4.0	O/G TO PHE TRAFO	5.882		
											FCT =	4.0	Total =	5.882	1.24

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	110
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location		Correction								Incident Energy				
		Factors				Source PD								
Element ID	Connected Bus ID	ID	Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
ROASTER- II L & T MCC	ROASTER- II L & T MCC		Bus Arc Fault	VCB	0.436	0	1.000	22.254	16.231	14.426	5.0	I-C-1 TO L & T MCC	4.812	
											FCT =	5.0	Total =	4.812 1.09
I/C-1 TO L & T MCC	ROASTER- II L & T MCC		Source PD Line Side	VCB	0.436	0	1.000	22.254	16.231	0.493	51.2	O/G TO AUX. TR-3	49.320	
											FCT =	51.2	Total =	49.320 4.68
O/G TO FEED WATER PUM	ROASTER- II L & T MCC		Load PD Line Side	VCB	0.436	0	1.000	22.254	16.231	14.426	5.0	I/C-1 TO L & T MCC	4.812	
											FCT =	5.0	Total =	4.812 1.09
O/G TO COOLING AIR FA	ROASTER- II L & T MCC		Load PD Line Side	VCB	0.436	0	1.000	22.254	16.231	14.426	5.0	I/C-1 TO L & T MCC	4.812	
											FCT =	5.0	Total =	4.812 1.09
RODPH MCC	RODPH MCC		Bus Arc Fault	VCB	0.436	0	1.000	18.594	13.704	12.824	0.8	I/C TO RODPH MCC	0.642	
											FCT =	0.8	Total =	0.642 0.31
I/C TO RODPH MCC	RODPH MCC		Source PD Line Side	VCB	0.436	13	1.000	18.594	11.982	0.239	29.1	O/G TO SS-1 TR-1	20.560	
											FCT =	29.1	Total =	20.560 2.70

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	111
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location		Correction								Incident Energy				
		Factors				Source PD								
Element ID	Connected Bus ID	ID	Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
SUBSTATION PHE PCC	SUBSTATION PHE PCC		Bus Arc Fault	VCB	0.436	0	1.000	58.232	30.777	0.816	4.0	O/G TO PHE TRAFO	5.376	
											FCT =	4.0	Total =	5.376 1.56
I/C TO SUBSTATION PHE PCC	SUBSTATION PHE PCC		Source PD Line Side	VCB	0.436	0	1.000	58.232	30.777	0.816	4.0	O/G TO PHE TRAFO	5.376	
											FCT =	4.0	Total =	5.376 1.56
O/G TO PUP HOUSE-3	SUBSTATION PHE PCC		Load PD Line Side	VCB	0.436	0	1.000	58.232	30.777	0.816	4.0	O/G TO PHE TRAFO	5.376	
											FCT =	4.0	Total =	5.376 1.56
O/G TO COMP L&T MCC	SUBSTATION PHE PCC		Load PD Line Side	VCB	0.436	0	1.000	58.232	30.777	0.816	4.0	O/G TO PHE TRAFO	5.376	
											FCT =	4.0	Total =	5.376 1.56
O/G TO PUMP HOUSE-2	SUBSTATION PHE PCC		Load PD Line Side	VCB	0.436	0	1.000	58.232	30.777	0.816	4.0	O/G TO PHE TRAFO	5.376	
											FCT =	4.0	Total =	5.376 1.56
O/G-2 TO DM PLANT	SUBSTATION PHE PCC		Load PD Line Side	VCB	0.436	0	1.000	58.232	30.777	0.816	4.0	O/G TO PHE TRAFO	5.376	
											FCT =	4.0	Total =	5.376 1.56
O/G TO NEW GE MCC	SUBSTATION PHE PCC		Load PD Line Side	VCB	0.436	0	1.000	58.232	30.777	0.816	4.0	O/G TO PHE TRAFO	5.376	
											FCT =	4.0	Total =	5.376 1.56
O/G TO COMPRESSOR PANEL	SUBSTATION PHE PCC		Load PD Line Side	VCB	0.436	0	1.000	58.232	30.777	0.816	4.0	O/G TO PHE TRAFO	5.376	
											FCT =	4.0	Total =	5.376 1.56

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	112
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Element ID	Connected Bus ID	Correction										IE (cal/cm²)	AFB (m)	
		Factors					Incident Energy							
		ID	Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia" (kA)	FCT (Cycles)	Source PD ID		
O/G TO BCH PCC	SUBSTATION-2 PCC S_1	Load PD Line Side	VCB	0.436	0	1.000	58.232	30.777	0.816	4.0	O/G TO PHE TRAFO	5.376		
											FCT =	4.0	Total = 5.376 1.56	
SUBSTATION-2 PCC S_1	SUBSTATION-2 PCC S_1	Bus Arc Fault	VCB	0.436	13	1.000	32.457	18.999	0.600	44.5	O/G TO AUX. TR-3	35.372		
											FCT =	44.5	Total = 35.372 5.06	
O/G TO RO-2 L&T MCC	SUBSTATION-2 PCC S_1	Load PD Line Side	VCB	0.436	13	1.000	32.457	18.999	0.600	44.5	O/G TO AUX. TR-3	35.372		
											FCT =	44.5	Total = 35.372 5.06	
O/G TO R-2 ACID PLANT MCC	SUBSTATION-2 PCC S_1	Load PD Line Side	VCB	0.436	13	1.000	32.457	18.999	0.600	44.5	O/G TO AUX. TR-3	35.372		
											FCT =	44.5	Total = 35.372 5.06	
I/C-1 TO SS-2 PCC	SUBSTATION-2 PCC S_1	Source PD Line Side	VCB	0.436	13	1.000	32.457	18.999	0.600	44.5	O/G TO AUX. TR-3	35.372		
											FCT =	44.5	Total = 35.372 5.06	
O/G TO ID FAN-II	SUBSTATION-2 PCC S_1	Load PD Line Side	VCB	0.436	13	1.000	32.457	18.999	0.600	44.5	O/G TO AUX. TR-3	35.372		
											FCT =	44.5	Total = 35.372 5.06	
O/G TO CADMIUM PCC	SUBSTATION-2 PCC S_1	Load PD Line Side	VCB	0.436	13	1.000	32.457	18.999	0.600	44.5	O/G TO AUX. TR-3	35.372		
											FCT =	44.5	Total = 35.372 5.06	

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	113
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Element ID	Connected Bus ID	Correction										IE (cal/cm²)	AFB (m)	
		Factors					Incident Energy							
		ID	Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia" (kA)	FCT (Cycles)	Source PD ID		
SUBSTATION-2 PCC S_2	SUBSTATION-2 PCC S_2	Bus Arc Fault	VCB	0.436	13	1.000	34.883	20.060	0.589	45.4	O/G TO AUX. TR-4	38.300		
											FCT =	45.4	Total = 38.300 5.32	
O/G TO IR COMP-1	SUBSTATION-2 PCC S_2	Load PD Line Side	VCB	0.436	13	1.000	34.883	20.060	0.589	45.4	O/G TO AUX. TR-4	38.300		
											FCT =	45.4	Total = 38.300 5.32	
I/C-2 TO SS-2 PCC	SUBSTATION-2 PCC S_2	Source PD Line Side	VCB	0.436	13	1.000	34.883	20.060	0.589	45.4	O/G TO AUX. TR-4	38.300		
											FCT =	45.4	Total = 38.300 5.32	
O/G-1 TO ZE PYROTEC MCC	SUBSTATION-2 PCC S_2	Load PD Line Side	VCB	0.436	13	1.000	34.883	20.060	0.589	45.4	O/G TO AUX. TR-4	38.300		
											FCT =	45.4	Total = 38.300 5.32	
O/G TO COMP. HOUSE MCC	SUBSTATION-2 PCC S_2	Load PD Line Side	VCB	0.436	13	1.000	34.883	20.060	0.589	45.4	O/G TO AUX. TR-4	38.300		
											FCT =	45.4	Total = 38.300 5.32	
O/G TO PYROTEC LP MCC	SUBSTATION-2 PCC S_2	Load PD Line Side	VCB	0.436	13	1.000	34.883	20.060	0.589	45.4	O/G TO AUX. TR-4	38.300		
											FCT =	45.4	Total = 38.300 5.32	
SUBSTATION-4 PCC S_1	SUBSTATION-4 PCC S_1	Bus Arc Fault	VCB	0.436	13	1.000	37.984	21.311	0.574	32.5	O/G TO AUX. TR-7	29.269		
											FCT =	32.5	Total = 29.269 4.50	
I/C-1 TO SS-4	SUBSTATION-4 PCC S_1	Source PD Line Side	VCB	0.436	13	1.000	37.984	21.311	0.574	32.5	O/G TO AUX. TR-7	29.269		
											FCT =	32.5	Total = 29.269 4.50	

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	114
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Element ID	Connected Bus ID	Correction										IE (cal/cm²)	AFB (m)	
		Arc Fault Location					Factors							
		ID	Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT (Cycles)	Source PD ID		
O/G TO MR MCC	SUBSTATION-4 PCC S_1		Load PD Line Side	VCB	0.436	13	1.000	37.984	21.311	0.574	32.5	O/G TO AUX. TR-7	29.269	
												FCT =	32.5	Total = 29.269 4.50
O/G TO TGT MCC	SUBSTATION-4 PCC S_1		Load PD Line Side	VCB	0.436	13	1.000	37.984	21.311	0.574	32.5	O/G TO AUX. TR-7	29.269	
												FCT =	32.5	Total = 29.269 4.50
O/G TO BLEND HANDLING MCC	SUBSTATION-4 PCC S_1		Load PD Line Side	VCB	0.436	13	1.000	37.984	21.311	0.574	32.5	O/G TO AUX. TR-7	29.269	
												FCT =	32.5	Total = 29.269 4.50
O/G TO PH-1 NEW MCC	SUBSTATION-4 PCC S_1		Load PD Line Side	VCB	0.436	13	1.000	37.984	21.311	0.574	32.5	O/G TO AUX. TR-7	29.269	
												FCT =	32.5	Total = 29.269 4.50
O/G TO LEACHING MCC 201B1	SUBSTATION-4 PCC S_1		Load PD Line Side	VCB	0.436	13	1.000	37.984	21.311	0.574	32.5	O/G TO AUX. TR-7	29.269	
												FCT =	32.5	Total = 29.269 4.50
O/G-1 TO LEACH MCC 201B2	SUBSTATION-4 PCC S_1		Load PD Line Side	VCB	0.436	13	1.000	37.984	21.311	0.574	32.5	O/G TO AUX. TR-7	29.269	
												FCT =	32.5	Total = 29.269 4.50

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	115
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Element ID	Connected Bus ID	Correction										IE (cal/cm²)	AFB (m)	
		Arc Fault Location					Factors							
		ID	Type	Electrode Config.	Prefault kV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT (Cycles)	Source PD ID		
SUBSTATION-4 PCC S_2	SUBSTATION-4 PCC S_2		Bus Arc Fault	VCB	0.436	13	1.000	35.277	20.226	0.587	31.7	O/G TO AUX. TR-6	26.987	
												FCT =	31.7	Total = 26.987 4.27
O/G TO PURIFICATION MCC	SUBSTATION-4 PCC S_2		Load PD Line Side	VCB	0.436	13	1.000	35.277	20.226	0.587	31.7	O/G TO AUX. TR-6	26.987	
												FCT =	31.7	Total = 26.987 4.27
O/G-2 TO GE MCC	SUBSTATION-4 PCC S_2		Load PD Line Side	VCB	0.436	13	1.000	35.277	20.226	0.587	31.7	O/G TO AUX. TR-6	26.987	
												FCT =	31.7	Total = 26.987 4.27
O/G TO FILTER WATER MCC	SUBSTATION-4 PCC S_2		Load PD Line Side	VCB	0.436	13	1.000	35.277	20.226	0.587	31.7	O/G TO AUX. TR-6	26.987	
												FCT =	31.7	Total = 26.987 4.27
O/G TO L&P MCC-2	SUBSTATION-4 PCC S_2		Load PD Line Side	VCB	0.436	13	1.000	35.277	20.226	0.587	31.7	O/G TO AUX. TR-6	26.987	
												FCT =	31.7	Total = 26.987 4.27
TIE TO SS-5	SUBSTATION-4 PCC S_2		Load PD Line Side	VCB	0.436	13	1.000	35.277	20.226	0.587	31.7	O/G TO AUX. TR-6	26.987	
												FCT =	31.7	Total = 26.987 4.27
I/C-2 TO SS-4	SUBSTATION-4 PCC S_2		Source PD Line Side	VCB	0.436	13	1.000	35.277	20.226	0.587	31.7	O/G TO AUX. TR-6	26.987	
												FCT =	31.7	Total = 26.987 4.27

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	116
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location			Correction Factors								Incident Energy				
Element ID	Connected Bus ID	ID	Enclosure		Electrode Config.	Prefault KV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Source PD	FCT (Cycles)	Source PD ID	IE	AFB
			Type										(cal/cm²)	(m)	
VFD PANEL-2 S_2	VFD PANEL-2 S_2		Bus Arc Fault	VCB	0.436	0	1.000	51.369	29.899	28.335	0.8	VFD PANEL-2 B/C	1.516		
											FCT =	0.8	Total =	1.516 0.53	
O/G TO ZLD VAPOUR COMP-2	VFD PANEL-2 S_2		Load PD Line Side	VCB	0.436	0	1.000	51.369	29.899	28.335	0.8	VFD PANEL-2 B/C	1.516		
											FCT =	0.8	Total =	1.516 0.53	
WARTSILA-CISF	WARTSILA-CISF		Bus Arc Fault	VCB	0.436	0	1.000	15.920	11.771	11.310	0.6	I/C TO WARTSILA + CISF	0.403		
											FCT =	0.6	Total =	0.403 0.23	
I/C TO WARTSILA + CISF	WARTSILA-CISF		Source PD Line Side	VCB	0.436	13	1.000	15.920	10.292	0.287	4.0	O/G TO AUX. TR-2 CNTRL RO	2.401		
											FCT =	4.0	Total =	2.401 0.71	
WATER CLARIFIER MCC	WATER CLARIFIER MCC		Bus Arc Fault	VCB	0.436	0	1.000	12.035	8.870	8.556	0.5	I/C TO WTR CLARIFIER MCC	0.253		
											FCT =	0.5	Total =	0.253 0.17	
I/C TO WTR CLARIFIER MCC	WATER CLARIFIER MCC		Source PD Line Side	VCB	0.436	13	1.000	12.035	7.756	7.481	107.2	O/G TO WTR CLARIFIER MCC	47.617		
											FCT =	107.2	Total =	47.617 4.57	

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	117
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Arc Fault Location			Correction Factors								Incident Energy				
Element ID	Connected Bus ID	ID	Enclosure		Electrode Config.	Prefault KV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Source PD	FCT (Cycles)	Source PD ID	IE	AFB
			Type											(cal/cm²)	(m)
ZE PYROTEC MCC	ZE PYROTEC MCC		Bus Arc Fault	VCB	0.436	0	1.000	26.079	18.699	16.231	13.0	I/C-1 TO ZE PYROTEC MCC	14.578		
											FCT =	13.0	Total =	14.578 2.18	
I/C-1 TO ZE PYROTEC MCC	ZE PYROTEC MCC		Source PD Line Side	VCB	0.436	13	1.000	26.079	16.350	0.462	60.0	O/G TO AUX. TR-4	59.137		
											FCT =	60.0	Total =	59.137 5.24	
O/G TO 316-R.PUMP	ZE PYROTEC MCC		Load PD Line Side	VCB	0.436	0	1.000	26.079	18.699	16.231	13.0	I/C-1 TO ZE PYROTEC MCC	14.578		
											FCT =	13.0	Total =	14.578 2.18	
O/G TO 316-S.PUMP	ZE PYROTEC MCC		Load PD Line Side	VCB	0.436	0	1.000	26.079	18.699	16.231	13.0	I/C-1 TO ZE PYROTEC MCC	14.578		
											FCT =	13.0	Total =	14.578 2.18	
O/G TO 310 ST PUMP	ZE PYROTEC MCC		Load PD Line Side	VCB	0.436	0	1.000	26.079	18.699	16.231	13.0	I/C-1 TO ZE PYROTEC MCC	14.578		
											FCT =	13.0	Total =	14.578 2.18	
O/G TO 317 PUMP	ZE PYROTEC MCC		Load PD Line Side	VCB	0.436	0	1.000	26.079	18.699	16.231	13.0	I/C-1 TO ZE PYROTEC MCC	14.578		
											FCT =	13.0	Total =	14.578 2.18	
SUBSTATION-5 PCC S_1	SUBSTATION-5 PCC S_1		Bus Arc Fault	VCB	0.436	13	1.000	29.242	17.484	0.497	38.0	O/G TO AUX. TR-6	27.539		
											FCT =	38.0	Total =	27.539 4.33	
I/C-1 TIE TO SS-5 FR SS-4	SUBSTATION-5 PCC S_1		Source PD Line Side	VCB	0.436	13	1.000	29.242	17.484	0.497	38.0	O/G TO AUX. TR-6	27.539		
											FCT =	38.0	Total =	27.539 4.33	

Project:	ARC FLASH STUDY HZL -DEBARI	ETAP	Page:	118
Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Arc Fault Location		Correction										Incident Energy		
Element ID	Connected Bus ID	Enclosure		Electrode Config.	Prefault KV	Iarc Var. (%)	Factors			Source PD	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
		ID	Type				Encl. CF (pu)	I ^k (kA)	I ^a (kA)					
O/G TO INTERLAC MCC	SUBSTATION-5 PCC S_1		Load PD Line Side	VCB	0.436	13	1.000	29.242	17.484	0.497	38.0	O/G TO AUX. TR-6	27.539	
										FCT =	38.0	Total =	27.539 4.33	
O/G TO WTR CLARIFIER MCC	SUBSTATION-5 PCC S_1		Load PD Line Side	VCB	0.436	13	1.000	29.242	17.484	0.497	38.0	O/G TO AUX. TR-6	27.539	
										FCT =	38.0	Total =	27.539 4.33	
O/G-1 TO LEACHING MCC -1	SUBSTATION-5 PCC S_1		Load PD Line Side	VCB	0.436	13	1.000	29.242	17.484	0.497	38.0	O/G TO AUX. TR-6	27.539	
										FCT =	38.0	Total =	27.539 4.33	
O/G TO CAP. CNTRL PNL	SUBSTATION-5 PCC S_1		Load PD Line Side	VCB	0.436	13	1.000	29.242	17.484	0.497	38.0	O/G TO AUX. TR-6	27.539	
										FCT =	38.0	Total =	27.539 4.33	
SUBSTATION-5 PCC S_2	SUBSTATION-5 PCC S_2		Bus Arc Fault	VCB	0.436	0	1.000	28.611	19.639	0.773	4.0	O/G TO SS-5 TRAFO	3.236	
										FCT =	4.0	Total =	3.236 1.13	
I/C-2 TO SS-5	SUBSTATION-5 PCC S_2		Source PD Line Side	VCB	0.436	0	1.000	28.611	19.639	0.773	4.0	O/G TO SS-5 TRAFO	3.236	
										FCT =	4.0	Total =	3.236 1.13	

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Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Arc Fault Location		Correction										Incident Energy		
Element ID	Connected Bus ID	Enclosure		Electrode Config.	Prefault KV	Iarc Var. (%)	Factors			Source PD	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
		ID	Type				Encl. CF (pu)	I ^k (kA)	I ^a (kA)					
SUBSTATION-5 PCC S_3	SUBSTATION-5 PCC S_3		Bus Arc Fault	VCB	0.436	13	1.000	21.784	13.504	0.249	27.9	O/G TO SS-1 TR-1	15.341	
										FCT =	27.9	Total =	15.341 3.00	
O/G TO CAP PNL RHS	SUBSTATION-5 PCC S_3		Load PD Line Side	VCB	0.436	13	1.000	21.784	13.504	0.249	27.9	O/G TO SS-1 TR-1	15.341	
										FCT =	27.9	Total =	15.341 3.00	
O/G TO ADMIN LT ROOM	SUBSTATION-5 PCC S_3		Load PD Line Side	VCB	0.436	13	1.000	21.784	13.504	0.249	27.9	O/G TO SS-1 TR-1	15.341	
										FCT =	27.9	Total =	15.341 3.00	
O/G TO FILTERATION MCC -3	SUBSTATION-5 PCC S_3		Load PD Line Side	VCB	0.436	13	1.000	21.784	13.504	0.249	27.9	O/G TO SS-1 TR-1	15.341	
										FCT =	27.9	Total =	15.341 3.00	
O/G TO SULZER MCC	SUBSTATION-5 PCC S_3		Load PD Line Side	VCB	0.436	13	1.000	21.784	13.504	0.249	27.9	O/G TO SS-1 TR-1	15.341	
										FCT =	27.9	Total =	15.341 3.00	
O/G TO INDUCTION FUR PCC	SUBSTATION-5 PCC S_3		Load PD Line Side	VCB	0.436	13	1.000	21.784	13.504	0.249	27.9	O/G TO SS-1 TR-1	15.341	
										FCT =	27.9	Total =	15.341 3.00	
I/C-3 TIE TO SS-5 FR SS-6	SUBSTATION-5 PCC S_3		Source PD Line Side	VCB	0.436	13	1.000	21.784	13.504	0.249	27.9	O/G TO SS-1 TR-1	15.341	
										FCT =	27.9	Total =	15.341 3.00	

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Engineer:	MR. SUMIT KUMAR JHA			Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case:	A_SC	Config.:	Normal

Arc Fault Location		Correction										Incident Energy		
		Factors					Source PD							
Element ID	Connected Bus ID	ID	Type	Electrode Config.	Prefault KV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
SUBSTATION-6 PCC	SUBSTATION-6 PCC		Bus Arc Fault	VCB	0.436	0	1.000	28.328	19.477	0.417	17.3	O/G TO SS-1 TR-1	13.903	
I/C TO SS-6 PCC	SUBSTATION-6 PCC		Source PD Line Side	VCB	0.436	0	1.000	28.328	19.477	0.417	17.3	O/G TO SS-1 TR-1	13.903	2.82
O/G-1 TO MG SS-1	SUBSTATION-6 PCC		Load PD Line Side	VCB	0.436	0	1.000	28.328	19.477	0.417	17.3	O/G TO SS-1 TR-1	13.903	
TIE TO SS-5 FR SS-6	SUBSTATION-6 PCC		Load PD Line Side	VCB	0.436	0	1.000	28.328	19.477	0.417	17.3	O/G TO SS-1 TR-1	13.903	
O/G TO SS-7	SUBSTATION-6 PCC		Load PD Line Side	VCB	0.436	0	1.000	28.328	19.477	0.417	17.3	O/G TO SS-1 TR-1	13.903	2.82
SUBSTATION-7 PCC	SUBSTATION-7 PCC		Bus Arc Fault	VCB	0.436	0	1.000	23.723	16.695	0.337	20.9	O/G TO SS-1 TR-1	14.174	
I/C-1 TO SS-7 PCC	SUBSTATION-7 PCC		Source PD Line Side	VCB	0.436	0	1.000	23.723	16.695	0.337	20.9	O/G TO SS-1 TR-1	14.174	2.86
O/G TO RODPH MCC	SUBSTATION-7 PCC		Load PD Line Side	VCB	0.436	0	1.000	23.723	16.695	0.337	20.9	O/G TO SS-1 TR-1	14.174	

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Filename:	HZL DEBARI SMELTER	Study Case:	A_SC	Config.:	Normal

Arc Fault Location		Correction										Incident Energy		
		Factors					Source PD							
Element ID	Connected Bus ID	ID	Type	Electrode Config.	Prefault KV	Iarc Var. (%)	Encl. CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT (Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
O/G TO RO PLANT MCC	SUBSTATION-7 PCC		Load PD Line Side	VCB	0.436	0	1.000	23.723	16.695	0.337	20.9	O/G TO SS-1 TR-1	14.174	
O/G TO BOILER MCC	SUBSTATION-7 PCC		Load PD Line Side	VCB	0.436	0	1.000	23.723	16.695	0.337	20.9	O/G TO SS-1 TR-1	14.174	
O/G-1 TO DM PLANT MCC	SUBSTATION-7 PCC		Load PD Line Side	VCB	0.436	0	1.000	23.723	16.695	0.337	20.9	O/G TO SS-1 TR-1	14.174	
O/G-1 NEW TO DM PLANT	SUBSTATION-7 PCC		Load PD Line Side	VCB	0.436	0	1.000	23.723	16.695	0.337	20.9	O/G TO SS-1 TR-1	14.174	
SULZER MCC	SULZER MCC		Bus Arc Fault	VCB	0.436	0	1.000	20.277	14.884	12.572	0.8	I/C TO SULZER MCC	0.702	
O/G TO SULZER 227-A PUMP	SULZER MCC		Load PD Line Side	VCB	0.436	0	1.000	20.277	14.884	12.572	0.8	I/C TO SULZER MCC	0.702	0.33
O/G TO PUMP-36	SULZER MCC		Load PD Line Side	VCB	0.436	0	1.000	20.277	14.884	12.572	0.8	I/C TO SULZER MCC	0.702	

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Filename:	HZL DEBARI SMELTER		Config.:	Normal

Arc Fault Location		Correction									Source PD					Incident Energy		
		Factors				Source PD												
Element ID	Connected Bus ID	ID	Enclosure	Electrode	Prefault	Iarc	Encl.	CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT	(Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)		
I/C TO SULZER MCC	SULZER MCC		Source PD Line Side	VCB	0.436	0	1.000	20.277	14.884	12.572	23.0	O/G TO SULZER MCC		20.169				
												FCT =	23.0	Total =	20.169	2.67		
O/G TO SULZER 225-B PUMP	SULZER MCC		Load PD Line Side	VCB	0.436	0	1.000	20.277	14.884	12.572	0.8	O/G TO SULZER MCC		0.702				
												FCT =	0.8	Total =	0.702	0.33		
TGT MCC PANEL	TGT MCC PANEL		Bus Arc Fault	VCB	0.436	0	1.000	12.980	9.583	0.174	51.2	O/G TO AUX. TR-7		28.100				
												FCT =	51.2	Total =	28.100	3.29		
I/C TO TGT MCC PANEL	TGT MCC PANEL		Source PD Line Side	VCB	0.436	0	1.000	12.980	9.583	0.174	51.2	O/G TO AUX. TR-7		28.100				
												FCT =	51.2	Total =	28.100	3.29		
O/G TO RC/TK-RE CIRC P-A	TGT MCC PANEL		Load PD Line Side	VCB	0.436	0	1.000	12.980	9.583	0.174	51.2	O/G TO AUX. TR-7		28.100				
												FCT =	51.2	Total =	28.100	3.29		
O/G TO RC/TK-RE CIRC P-B	TGT MCC PANEL		Load PD Line Side	VCB	0.436	0	1.000	12.980	9.583	0.174	51.2	O/G TO AUX. TR-7		28.100				
												FCT =	51.2	Total =	28.100	3.29		
RC-TANK PUMP-A	TGT MCC PANEL		Load PD Line Side	VCB	0.436	0	1.000	12.980	9.583	0.174	51.2	O/G TO AUX. TR-7		28.100				
												FCT =	51.2	Total =	28.100	3.29		

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Filename:	HZL DEBARI SMELTER		Config.:	Normal

Arc Fault Location		Correction									Source PD					Incident Energy		
		Factors				Source PD												
Element ID	Connected Bus ID	ID	Enclosure	Electrode	Prefault	Iarc	Encl.	CF (pu)	Ik* (kA)	Ia* (kA)	Ia* (kA)	FCT	(Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)		
RC-TANK PUMP-B	TGT MCC PANEL		Load PD Line Side	VCB	0.436	0	1.000	12.980	9.583	0.174	51.2	O/G TO AUX. TR-7		28.100				
												FCT =	51.2	Total =	28.100	3.29		
RC-TANK PUMP-C	TGT MCC PANEL		Load PD Line Side	VCB	0.436	0	1.000	12.980	9.583	0.174	51.2	O/G TO AUX. TR-7		28.100				
												FCT =	51.2	Total =	28.100	3.29		
O/G TO COMPRESSOR	TGT MCC PANEL		Load PD Line Side	VCB	0.436	0	1.000	12.980	9.583	0.174	51.2	O/G TO AUX. TR-7		28.100				
												FCT =	51.2	Total =	28.100	3.29		
O/G TO ACTUATOR MCC	TGT MCC PANEL		Load PD Line Side	VCB	0.436	0	1.000	12.980	9.583	0.174	51.2	O/G TO AUX. TR-7		28.100				
												FCT =	51.2	Total =	28.100	3.29		
VFD PANEL-1 S_1	VFD PANEL-1 S_1		Bus Arc Fault	VCB	0.436	0	1.000	49.812	29.450	27.128	0.8	I/C-1 TO VFD PANEL-1		1.489				
												FCT =	0.8	Total =	1.489	0.52		
O/G TO RO-2 HP PUMP-B	VFD PANEL-1 S_1		Load PD Line Side	VCB	0.436	0	1.000	49.812	29.450	27.128	0.8	I/C-1 TO VFD PANEL-1		1.489				
												FCT =	0.8	Total =	1.489	0.52		
I/C-1 TO VFD PANEL-1	VFD PANEL-1 S_1		Source PD Line Side	VCB	0.436	0	1.000	49.812	29.450	27.128	0.8	O/G TO VF PANEL-1		1.489				
												FCT =	0.8	Total =	1.489	0.52		

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Filename:	HZL DEBARI SMELTER		Config.:	Normal

Arc Fault Location		Correction										Source PD		Incident Energy		
		Factors					Source PD									
Element ID	Connected Bus ID	ID	Enclosure	Electrode	Prefault	Iarc	Encl.	CF (pu)	Ik* (kA)	Ia* (kA)	Ia" (kA)	FCT	(Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
VFD PANEL-1 B/C	VFD PANEL-1 S_1		Load PD Line Side	VCB	0.436	0	1.000	49.812	29.450	27.128	0.8	I/C-1 TO VFD PANEL-1		1.489		
												FCT =	0.8	Total =	1.489 0.52	
O/G TO RO-2 HP PUMP-A	VFD PANEL-1 S_1		Load PD Line Side	VCB	0.436	0	1.000	49.812	29.450	27.128	0.8	I/C-1 TO VFD PANEL-1		1.489		
												FCT =	0.8	Total =	1.489 0.52	
VFD PANEL-1 S_2	VFD PANEL-1 S_2		Bus Arc Fault	VCB	0.436	0	1.000	49.812	29.450	28.248	0.8	VFD PANEL-1 B/C		1.489		
												FCT =	0.8	Total =	1.489 0.52	
O/G TO RO-1 HP PUMP	VFD PANEL-1 S_2		Load PD Line Side	VCB	0.436	0	1.000	49.812	29.450	28.248	0.8	VFD PANEL-1 B/C		1.489		
												FCT =	0.8	Total =	1.489 0.52	
VFD PANEL-2 S_1	VFD PANEL-2 S_1		Bus Arc Fault	VCB	0.436	0	1.000	51.369	29.899	26.531	0.8	I/C-1 TO VFD PANEL-2		1.516		
												FCT =	0.8	Total =	1.516 0.53	
I/C-1 TO VFD PANEL-2	VFD PANEL-2 S_1		Source PD Line Side	VCB	0.436	0	1.000	51.369	29.899	26.531	0.8	O/G TO VFD PANEL-2		1.516		
												FCT =	0.8	Total =	1.516 0.53	
VFD PANEL-2 B/C	VFD PANEL-2 S_1		Load PD Line Side	VCB	0.436	0	1.000	51.369	29.899	26.531	0.8	I/C-1 TO VFD PANEL-2		1.516		
												FCT =	0.8	Total =	1.516 0.53	

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Arc Fault Location		Correction										Source PD		Incident Energy		
		Factors					Source PD									
Element ID	Connected Bus ID	ID	Enclosure	Electrode	Prefault	Iarc	Encl.	CF (pu)	Ik* (kA)	Ia* (kA)	Ia" (kA)	FCT	(Cycles)	Source PD ID	IE (cal/cm²)	AFB (m)
O/G TO ZLD VAPOUR COMP-1	VFD PANEL-2 S_1		Load PD Line Side	VCB	0.436	0	1.000	51.369	29.899	26.531	0.8	I/C-1 TO VFD PANEL-2		1.516		
												FCT =	0.8	Total =	1.516 0.53	

The FCT (fault clearing time) has been limited to the maximum value allowed in the study case. The incident energy is calculated using this value.
+ The theoretically derived Lee method was used to determine the incident energy and flash protection boundary for this location since the bolted fault current or nominal voltage or gap values are outside the empirical IEEE 1584-2018 method range.

0 The incident energy has been automatically assigned at this location (i.e. 2000 A/240 Volt limit guideline) based on actual study case settings.

1 The user-defined fault clearing PD, as specified in the bus/enclosure editor, is outside the region for calculating short-circuit contributions.

2 The user-defined Relay, as specified in the bus/enclosure editor, is not connected to an energized phase CT or has no interlock PDs.

3 The user-defined fault clearing PD, as specified in the bus/enclosure editor, is not energized.

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Bus Incident Energy Summary

Bus			Total Fault Current (kA)				Arc-Flash Analysis Results			
	ID	Nom. kV	Type	Bolted	Arcing	FCT	Incident E (cal/cm²)	AFB (m)	Energy Level	
6.6KV HT PANEL		6.600	Switchgear	6.723	5.998	15.694	2.896	1.60	Level 1	
# 132KV HZL BUS S_1		132.000	Switchgear	32.046	32.046	1.250	36.438	6.73	Level 4	
# 132KV HZL BUS S_2		132.000	Switchgear	32.046	32.046	1.250	36.438	6.73	Level 4	
301 A MCC		0.415	MCC	23.679	17.172	4.001	4.091	0.98	Level 2	
301B MCC		0.415	MCC	25.063	18.062	0.478	0.516	0.27	Level 0	
ABB BUS		11.000	Switchgear	2.373	2.196	51.245	3.634	1.85	Level 1	
ACID LOADING MCC		0.415	MCC	20.172	14.811	0.612	0.534	0.28	Level 0	
ACTUATOR MCC		0.415	Other	8.627	6.816	0.500	0.124	0.11	Level 0	
ADMIN LT ROOM		0.415	MCC	5.926	3.697	3.507	0.711	0.33	Level 0	
ANDREW YULE PANEL S_1		11.000	Switchgear	16.620	15.274	4.500	2.054	1.29	Level 1	
ANDREW YULE PANEL S_2		11.000	Switchgear	2.487	2.301	51.245	3.802	1.91	Level 1	
BCH MCC PANEL		0.415	MCC	23.682	17.174	5.000	5.114	1.13	Level 2	
BCH PCC		0.415	Switchgear	47.973	28.117	0.800	0.965	0.53	Level 0	
BLEND HANDLING MCC		0.415	MCC	22.643	16.491	0.630	0.617	0.30	Level 0	
BOILER MCC		0.415	MCC	19.891	14.616	0.800	0.688	0.32	Level 0	
BUS CONTROL ROOM		11.000	Switchgear	16.702	15.349	24.170	11.082	3.77	Level 3	
CADMIUM MCC		0.415	MCC	26.107	18.716	0.800	0.898	0.38	Level 0	
CADMIUM OLD MCC		0.415	MCC	19.174	14.113	0.800	0.663	0.32	Level 0	
CADMIUM PCC		0.415	Switchgear	18.493	13.226	0.800	0.423	0.32	Level 0	
CANAL PH		0.415	MCC	9.726	7.115	0.770	0.308	0.20	Level 0	
CANAL PUMP MCC		0.415	MCC	20.115	14.772	0.475	0.414	0.23	Level 0	
CDSS 3.3KV PANEL S_1		3.300	Switchgear	7.033	6.144	16.500	3.040	1.65	Level 1	
CDSS 3.3KV PANEL S_2		3.300	Switchgear	7.533	6.574	16.500	3.247	1.72	Level 1	
CDSS 11KV PANEL S_1		11.000	Switchgear	16.745	15.388	4.500	2.068	1.29	Level 1	
CDSS 11KV PANEL S_2		11.000	Switchgear	16.745	15.388	4.500	2.068	1.29	Level 1	
CLDC MCC S_1		0.415	MCC	42.364	26.907	0.384	0.644	0.31	Level 0	
COLONY OVER HEAD LINE		11.000	Switchgear	2.423	2.241	15.028	1.087	0.86	Level 0	
COMP L&T MCC		0.415	MCC	29.571	20.780	4.001	5.032	1.12	Level 2	
COMP. HOUSE MCC		0.415	MCC	24.177	17.495	0.622	0.519	0.27	Level 0	
COMPRESSOR PANEL		0.415	Switchgear	51.717	29.211	4.000	5.046	1.50	Level 2	
COOLING TWR MCC		0.415	MCC	31.086	21.628	0.416	0.546	0.28	Level 0	
DG BUS-A		11.000	Switchgear	2.715	2.513	51.245	4.137	2.01	Level 2	
DG BUS-B		11.000	Switchgear	2.715	2.513	51.245	4.137	2.01	Level 2	
DM PLANT MCC S_1		0.415	MCC	18.499	13.636	0.622	0.496	0.26	Level 0	
DM PLANT MCC S_2		0.415	MCC	18.907	13.925	0.615	0.502	0.26	Level 0	

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Filename:	HZL DEBARI SMELTER		Config.:	Normal

Bus			Arc-Flash Analysis Results							
	ID	Nom. kV	Type	Total Fault Current (kA)	Bolted	Arcing	FCT (cycles)	Incident E (cal/cm²)	AFB (m)	Energy Level
DT SOFT STARTER PNL	0.415	MCC		23.604	17.123		0.800	0.653	0.31	Level 0
ETP OPERATOR MCC	0.415	MCC		10.093	7.395		0.679	0.283	0.19	Level 0
ETP PCC	0.415	Switchgear		25.520	17.813		15.564	11.326	2.48	Level 3
ETP PUMP MCC	0.415	MCC		10.316	6.615		0.576	0.216	0.16	Level 0
FAT SOFT STARTER PNL	0.415	MCC		20.512	15.046		2.500	1.774	0.58	Level 1
FILTER WATER MCC S_1	0.415	MCC		14.418	10.661		0.651	0.400	0.23	Level 0
FILTER WATER MCC S_2	0.415	Other		14.418	11.585		0.602	0.328	0.20	Level 0
FILTERATION MCC-3	0.415	MCC		11.776	7.585		58.145	25.225	3.07	Level 4
GE MCC	0.415	MCC		14.418	10.661		0.816	0.501	0.26	Level 0
IAT SOFT STARTER PNL	0.415	MCC		28.110	19.930		0.800	0.769	0.35	Level 0
INDUCTION FURNACE PCC	0.415	Switchgear		15.491	11.115		0.800	0.351	0.28	Level 0
INTERLAC MCC	0.415	MCC		12.934	9.549		23.000	12.564	1.99	Level 3
INV. ROOM-1 BUS	11.000	Switchgear		8.015	7.415		15.000	3.422	1.78	Level 1
INV. ROOM-2 BUS	11.000	Switchgear		8.015	7.415		15.000	3.422	1.78	Level 1
JAROSITE FILTER PRESS MCC	0.415	MCC		35.743	24.029		2.500	3.690	0.92	Level 1
JYOTI PANEL S_1	11.000	Switchgear		16.890	15.520		23.914	8.866	3.27	Level 3
JYOTI PANEL S_2	11.000	Switchgear		16.890	15.520		35.000	12.975	4.17	Level 3
JYOTI PANEL S_3	11.000	Switchgear		2.490	2.304		51.245	3.046	1.65	Level 1
L&P MCC-2	0.415	MCC		29.009	20.456		13.000	12.859	2.02	Level 3
L&T MCC (MCC-3)	0.415	MCC		18.132	11.694		4.001	2.751	0.77	Level 1
L&T PH-1 MCC	0.415	MCC		16.258	12.019		0.587	0.410	0.23	Level 0
LEACHING MCC-1	0.415	MCC		17.110	12.639		0.739	0.544	0.28	Level 0
LEACHING MCC 201B1	0.415	MCC		31.342	21.769		0.553	0.732	0.34	Level 0
LEACHING MCC 201B2	0.415	MCC		20.291	14.894		0.679	0.596	0.29	Level 0
LEACHING MCC 201C	0.415	MCC		13.579	10.033		0.691	0.398	0.23	Level 0
LEECHATE MCC	0.415	MCC		9.726	7.115		0.770	0.308	0.20	Level 0
LIME MCC PANEL	0.415	MCC		10.316	6.615		0.576	0.216	0.16	Level 0
LR MILL	0.415	MCC		20.338	14.926		0.611	0.538	0.28	Level 0
MCC PANEL-1 S_1	0.415	MCC		52.499	30.207		0.800	1.534	0.53	Level 1
MCC PANEL-1 S_2	0.415	Other		52.499	32.449		0.800	1.358	0.49	Level 1
MCC PANEL-2 S_1	0.415	MCC		52.499	30.207		0.800	1.534	0.53	Level 1
MCC PANEL-2 S_2	0.415	Other		52.499	32.449		0.800	1.358	0.49	Level 1
MCC PUMP HOUSE-2	0.415	MCC		46.042	28.249		4.001	7.091	1.39	Level 2
MCC PUMP HOUSE-3	0.415	MCC		50.673	29.701		4.001	7.520	1.44	Level 2
MCC-111 S_1	0.415	MCC		40.679	26.232		0.800	1.303	0.48	Level 1
MCC-111 S_2	0.415	MCC		38.766	25.419		0.800	1.257	0.47	Level 1
MCC-112	0.415	MCC		39.242	25.626		0.800	1.269	0.47	Level 1

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Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Bus			Arc-Flash Analysis Results						
	ID	Nom. kV	Type	Total Fault Current (kA)		FCT (cycles)	Incident E (cal/cm²)	AFB (m)	Energy Level
				Bolted	Arcing				
MCC-112 S_2	0.415	MCC		40.522	26.167	0.800	1.299	0.48	Level 1
MCC-113 RMH S_1	0.415	MCC		40.493	26.156	0.800	1.299	0.48	Level 1
MCC-113 RMH S_2	0.415	MCC		38.960	25.504	0.800	1.262	0.47	Level 1
MCC-114 S_1	0.415	MCC		38.617	25.354	0.800	1.254	0.47	Level 1
MCC-114 S_2	0.415	MCC		41.804	26.687	0.800	1.328	0.49	Level 1
MCC-115 S_1	0.415	MCC		42.338	26.897	0.800	1.340	0.49	Level 1
MCC-115 S_2	0.415	MCC		40.621	26.208	0.800	1.302	0.48	Level 1
MCC-116	0.415	MCC		40.717	26.248	0.800	1.304	0.48	Level 1
MCC-116 S_2	0.415	MCC		40.138	26.007	0.800	1.290	0.48	Level 1
MCTP MCC-1	0.415	MCC		26.695	19.079	0.800	0.917	0.39	Level 0
MCTP MCC-2	0.415	MCC		28.240	20.006	0.800	0.965	0.40	Level 0
MCTP MCC-3	0.415	MCC		21.493	15.718	0.500	0.372	0.22	Level 0
MELTING FURNACE PCC	0.415	Switchgear		22.285	15.772	15.662	9.998	2.30	Level 3
MG PANEL (SS-1) S_1	0.415	MCC		25.349	18.243	0.800	0.873	0.37	Level 0
MG PANEL (SS-1) S_2	0.415	MCC		36.470	24.375	0.800	1.200	0.46	Level 0
MR MCC PANEL	0.415	MCC		20.831	15.266	0.800	0.721	0.33	Level 0
NEW DM PLANT MCC S_1	0.415	MCC		18.499	13.636	0.694	0.554	0.28	Level 0
NEW DM PLANT MCC S_2	0.415	MCC		8.574	6.237	4.001	1.392	0.50	Level 1
NEW DPH	0.415	MCC		23.772	17.233	0.489	0.502	0.26	Level 0
PAP PCC(SS-3)	0.415	Switchgear		39.984	25.226	9.536	10.164	2.32	Level 3
PCC-111 S_1	0.415	Switchgear		48.476	28.273	14.000	16.997	3.20	Level 3
PCC-111 S_2	0.415	Switchgear		51.037	29.023	14.000	17.528	3.26	Level 3
PCC-112 S_1	0.415	Switchgear		48.811	28.375	14.000	17.069	3.21	Level 3
PCC-112 S_2	0.415	Switchgear		50.763	28.946	14.000	17.473	3.26	Level 3
PDB-112 S_2	0.415	MCC		37.106	24.672	0.800	1.216	0.46	Level 1
PH-1 MCC PANEL	0.415	MCC		25.557	18.373	0.395	0.434	0.24	Level 0
PURIFICATION MCC	0.415	MCC		16.289	12.042	0.685	0.479	0.26	Level 0
PYROTEC LP MCC	0.415	MCC		27.259	19.421	4.500	5.258	1.15	Level 2
PCC-113 S_1	0.415	Switchgear		53.322	29.634	14.000	17.967	3.31	Level 3
PCC-113 S_2	0.415	Switchgear		48.015	28.130	14.000	16.897	3.19	Level 3
PDB-111 S_1	0.415	MCC		36.689	24.478	0.800	1.205	0.46	Level 1
PDB-111 S_2	0.415	MCC		41.402	26.526	0.800	1.319	0.48	Level 1
PDB-112 S_1	0.415	MCC		41.786	26.680	0.800	1.328	0.49	Level 1
PYROTEC PCC	0.415	MCC		23.149	16.825	2.500	2.501	0.72	Level 1
PYROTECH PCC	0.415	Switchgear		38.017	24.388	4.001	4.106	1.32	Level 2
R-2 ACID PLANT MCC	0.415	MCC		10.982	8.071	51.245	23.419	2.93	Level 3
RO MCC PANEL	0.415	MCC		13.043	9.631	2.500	1.378	0.50	Level 1

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Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Bus	Arc-Flash Analysis Results								
	ID	Nom. kV	Type	Total Fault Current (kA)		FCT	Incident E (cal/cm²)	AFB (m)	Energy Level
				Bolted	Arcing	(cycles)			
SIEMENS BUS-A		11.000	Switchgear	17.605	15.967	33.038	15.727	4.71	Level 3
SIEMENS BUS-B		11.000	Switchgear	12.851	11.693	32.862	11.602	3.88	Level 3
SOLAR 11KV HT PNL		11.000	Switchgear	8.047	7.445	40.000	9.161	3.34	Level 3
STG MCC-118 S_1		0.415	MCC	42.062	26.789	0.448	0.747	0.34	Level 0
STG MCC-118 S_2		0.415	MCC	43.493	27.338	0.444	0.759	0.34	Level 0
RO PLANT MCC		0.415	MCC	18.810	12.116	28.845	20.605	2.71	Level 3
RO ZLD PCC		0.415	Switchgear	72.340	33.110	14.000	20.667	3.62	Level 3
ROASTER GE MCC		0.415	MCC	35.567	23.944	4.001	5.882	1.24	Level 2
ROASTER- II L & T MCC		0.415	MCC	22.254	16.231	5.000	4.812	1.09	Level 2
RODPH MCC		0.415	MCC	18.594	13.704	0.800	0.642	0.31	Level 0
SUBSTATION PHE PCC		0.415	Switchgear	58.232	30.777	4.001	5.376	1.56	Level 2
SUBSTATION-2 PCC S_1		0.415	Switchgear	32.457	18.999	44.528	35.372	5.06	Level 4
SUBSTATION-2 PCC S_2		0.415	Switchgear	34.883	20.060	45.416	38.300	5.32	Level 4
SUBSTATION-4 PCC S_1		0.415	Switchgear	37.984	21.311	32.452	29.269	4.50	Level 4
SUBSTATION-4 PCC S_2		0.415	Switchgear	35.277	20.226	31.711	26.987	4.27	Level 4
VFD PANEL-2 S_2		0.415	MCC	51.369	29.899	0.800	1.516	0.53	Level 1
WARTSILA-CISF		0.415	MCC	15.920	11.771	0.591	0.403	0.23	Level 0
WATER CLARIFIER MCC		0.415	MCC	12.035	8.870	0.500	0.253	0.17	Level 0
ZE PYROTEC MCC		0.415	MCC	26.079	18.699	13.000	14.578	2.18	Level 3
SUBSTATION-5 PCC S_1		0.415	Switchgear	29.242	17.484	37.965	27.539	4.33	Level 4
SUBSTATION-5 PCC S_2		0.415	Switchgear	28.611	19.639	4.001	3.236	1.13	Level 1
SUBSTATION-5 PCC S_3		0.415	Switchgear	21.784	13.504	27.949	15.341	3.00	Level 3
SUBSTATION-6 PCC		0.415	Switchgear	28.328	19.477	17.345	13.903	2.82	Level 3
SUBSTATION-7 PCC		0.415	Switchgear	23.723	16.695	20.888	14.174	2.86	Level 3
SULZER MCC		0.415	MCC	20.277	14.884	0.800	0.702	0.33	Level 0
TGT MCC PANEL		0.415	MCC	12.980	9.583	51.245	28.100	3.29	Level 4
VFD PANEL-1 S_1		0.415	MCC	49.812	29.450	0.800	1.489	0.52	Level 1
VFD PANEL-1 S_2		0.415	MCC	49.812	29.450	0.800	1.489	0.52	Level 1
VFD PANEL-2 S_1		0.415	MCC	51.369	29.899	0.800	1.516	0.53	Level 1

The theoretically-derived Lee method was used to determine the incident energy and arc-flash boundary for this location since some of the input parameters may be outside the range of the IEEE 1584 methods.

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Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Bus Arc Flash Hazard Analysis Summary

Faulted Bus				Fault Current			Trip Device			Arc Flash Boundary (m)	Incident Energy (cal/cm²)	Working Distance (cm)	Energy Level		
ID	Nom. kV	Equipment Type	Gap (mm)	Bolted Fault (kA)	PD Bus	PD Fault (kA)	Source Trip Device ID	Trip (cycle)	Open (cycle)	FCT (cycle)					
6.6KV HT PANEL	6.600	Switchgear	152	6.723	3.696	3.297	O G TO 5 MVA TRAFO	11.69	4.00	15.69	1.6	2.9	91	Level 1	
# 132KV HZL BUS S_1	132.000	Switchrack		32.046							1.25	6.7	36.4	122	Level 4
# 132KV HZL BUS S_2	132.000	Switchgear		32.046							1.25	6.7	36.4	122	Level 4
301A MCC	0.415	MCC	25	23.679	0.665	0.482	O G TO AUX. TR-2 CNTRL RO	0.00	4.00	4.00	1.0	4.1	46	Level 2	
301B MCC	0.415	MCC	25	23.063	24.090	17.360	I/C TO 301B MCC	0.48	0.00	0.48	0.3	0.5	46	Level 0	
ABB BUS	11.000	Switchgear	152	2.373	2.373	2.196	O G TO TRAFO CP-9	47.25	4.00	51.25	1.9	3.6	91	Level 1	
ACID LOADING MCC	0.415	MCC	25	20.172	19.544	14.350	I/C TO ACID LOADING MCC	0.61	0.00	0.61	0.3	0.5	46	Level 0	
ACTUATOR MCC	0.415	Other	13	8.627	8.049	6.359	I/C TO ACTUATOR MCC	0.50	0.00	0.50	0.1	0.1	46	Level 0	
ADMIN LT ROOM	0.415	MCC	25	5.926	5.551	3.463	I/C TO ADMIN LT ROOM	3.51	0.00	3.51	0.3	0.7	46	Level 0	
ANDREW YULE PANEL S_1	11.000	Switchgear	152	16.620	15.957	14.665	I/C-1 TO ANDREW YULE PNL	0.50	4.00	4.50	1.3	2.1	91	Level 1	
ANDREW YULE PANEL S_2	11.000	Switchgear	152	2.487	1.986	1.838	I/C-1 TO DG BUS	47.25	4.00	51.25	1.9	3.8	91	Level 1	
BCH MCC PANEL	0.415	MCC	25	23.682	19.600	14.214	O G TO CANAL + BCH MCC	5.00	0.00	5.00	1.1	5.1	46	Level 2	
BCH PCC	0.415	Switchgear	32	47.973	45.910	26.908	I/C TO BCH PCC	0.80	0.00	0.80	0.5	1.0	61	Level 0	
BLEND HANDLING MCC	0.415	MCC	25	22.643	22.010	16.029	I/C TO BLEND HANDLING MCC	0.63	0.00	0.63	0.3	0.6	46	Level 0	
BOILER MCC	0.415	MCC	25	19.891	18.290	13.439	I/C TO BOILER MCC	0.80	0.00	0.80	0.3	0.7	46	Level 0	
BUS CONTROL ROOM	11.000	Switchgear	152	16.702	15.028	13.811	JYOTI B/C-2	20.17	4.00	24.17	3.8	11.1	91	Level 3	
CADMIUM MCC	0.415	MCC	25	26.107	20.463	14.670	I/C-2 TO MG PANEL SS-1	0.80	0.00	0.80	0.4	0.9	46	Level 0	
CADMIUM OLD MCC	0.415	MCC	25	19.174	17.980	13.234	I/C-1 TO MG PNL SS-1	0.80	0.00	0.80	0.3	0.7	46	Level 0	
CADMIUM PCC	0.415	Switchgear	32	18.493	18.493	13.226	I/C TO CADMIUM PCC	0.80	0.00	0.80	0.3	0.4	61	Level 0	
CANAL PH	0.415	MCC	25	9.726	9.398	6.875	I/C TO CANAL PH	0.77	0.00	0.77	0.2	0.3	46	Level 0	
CANAL PUMP MCC	0.415	MCC	25	20.115	19.585	14.382	I/C TO CANAL PUMP MCC	0.48	0.00	0.48	0.2	0.4	46	Level 0	
CDSS 3.3KV PANEL S_1	3.300	Switchgear	104	7.033	6.559	5.730	I/C-1 TO CDSS 3.3KV	12.50	4.00	16.50	1.7	3.0	91	Level 1	
CDSS 3.3KV PANEL S_2	3.300	Switchgear	104	7.533	6.553	5.719	I/C-2 TO CDSS 3.3KV	12.50	4.00	16.50	1.7	3.2	91	Level 1	
CDSS 11KV PANEL S_1	11.000	Switchgear	152	16.745	11.770	10.816	I/C-1 TO CDSS 11KV PANEL	0.50	4.00	4.50	1.3	2.1	91	Level 1	
CDSS 11KV PANEL S_2	11.000	Switchgear	152	16.745	14.277	13.120	CDSS 11KV B/C	0.50	4.00	4.50	1.3	2.1	91	Level 1	
CLDC MCC S_1	0.415	MCC	25	42.364	40.674	25.834	I/C TO CLDC MCC	0.38	0.00	0.38	0.3	0.6	46	Level 0	
COLONY OVER HEAD LINE	11.000	Switchgear	152	2.423	2.340	2.164	O G TO COLONY BUS	11.03	4.00	15.03	0.9	1.1	91	Level 0	
COMP L&T MCC	0.415	MCC	25	29.571	0.771	0.542	O G TO PHE TRAFO	0.00	4.00	4.00	1.1	5.0	46	Level 2	
COMP. HOUSE MCC	0.415	MCC	25	24.177	22.715	16.437	I/C TO COMP. HOUSE MCC	0.62	0.00	0.62	0.3	0.5	46	Level 0	

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Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA		Revision:	Base
Filename:	HZL DEBARI SMELTER	Study Case: A_SC	Config.:	Normal

Bus Arc Flash Hazard Analysis Summary

Faulted Bus				Fault Current			Trip Device				Arc Flash Boundary (m)	Incident Energy (cal/cm²)	Working Distance (cm)	Energy Level	
ID	Nom. kV	Equipment Type	Gap (mm)	Bolted Fault (kA)	PD Bus	PD Fault (kA)	Source Trip Device ID	Trip (cycle)	Open (cycle)	FCT (cycle)					
COMPRESSOR PANEL	0.415	Switchgear	32	51.717	49.561	27.993	O/G TO COMPRESSOR PANEL	4.00	0.00	4.00	1.5	5.0	61	Level 2	
COOLING TWR MCC	0.415	MCC	25	31.086	29.709	20.670	I/C-1 TO COOLING TWR MCC	0.42	0.00	0.42	0.3	0.5	46	Level 0	
DG BUS-A	11.000	Switchgear	152	2.715	2.226	2.061	I/C-1 TO DG BUS	47.25	4.00	51.25	2.0	4.1	91	Level 2	
DG BUS-B	11.000	Switchgear	152	2.715	2.715	2.513	DG BUS COUPLER	47.25	4.00	51.25	2.0	4.1	91	Level 2	
DM PLANT MCC S_1	0.415	MCC	25	18.499	17.862	13.166	I/C-1 TO DM PLANT MCC	0.62	0.00	0.62	0.3	0.5	46	Level 0	
DM PLANT MCC S_2	0.415	MCC	25	18.907	18.292	13.472	I/C-2 TO DM PLANT MCC	0.61	0.00	0.61	0.3	0.5	46	Level 0	
DT SOFT STARTER PNL	0.415	MCC	25	23.604	22.533	16.347	I/C TO DT SOFT START PNL	0.80	0.00	0.80	0.3	0.7	46	Level 0	
ETP OPERATOR MCC	0.415	MCC	25	10.093	9.364	6.861	I/C TO ETP OPERATOR MCC	0.68	0.00	0.68	0.2	0.3	46	Level 0	
ETP PCC	0.415	Switchgear	32	25.520	0.681	0.475	O/G TO ETP TRAFO	11.56	4.00	15.56	2.5	11.3	61	Level 3	
ETP PUMP MCC	0.415	MCC	25	10.316	9.941	6.374	I/C TO ETP PUMP MCC	0.58	0.00	0.58	0.2	0.2	46	Level 0	
FAT SOFT STARTER PNL	0.415	MCC	25	20.512	19.475	14.286	O/G TO FAT SOFT STAR PNL	2.50	0.00	2.50	0.6	1.8	46	Level 1	
FILTER WATER MCC S_1	0.415	MCC	25	14.418	12.881	9.524	I/C-1 FILTER WATER MCC	0.65	0.00	0.65	0.2	0.4	46	Level 0	
FILTER WATER MCC S_2	0.415	Other	13	14.418	13.646	10.965	FILTER WATER MCC B/C	0.60	0.00	0.60	0.2	0.3	46	Level 0	
FILTERATION MCC-3	0.415	MCC	25	11.776	0.203	0.131	O/G TO SS-1 TR-1	54.15	4.00	58.15	3.1	25.2	46	Level 4	
GE MCC	0.415	MCC	25	14.418	12.881	9.524	I/C-2 TO GE MCC	0.82	0.00	0.82	0.3	0.5	46	Level 0	
IAT SOFT STARTER PNL	0.415	MCC	25	28.110	26.284	18.636	O/G TO IAT PANEL	0.80	0.00	0.80	0.3	0.8	46	Level 0	
INDUCTION FURNACE PCC	0.415	Switchgear	32	15.491	13.333	9.566	I/C-1 TO IND FURNACE	0.80	0.00	0.80	0.3	0.4	61	Level 0	
INTERLAC MCC	0.415	MCC	25	12.934	11.868	8.762	I/C TO INTERLAC MCC	23.00	0.00	23.00	2.0	12.6	46	Level 3	
INV. ROOM-1 BUS	11.000	Switchgear	152	8.015							15.00	1.8	3.4	91	Level 1
INV. ROOM-2 BUS	11.000	Switchgear	152	8.015							15.00	1.8	3.4	91	Level 1
JAROSITE FILTER PRESS MCC	0.415	MCC	25	35.743	31.010	20.847	I/C TO JAROSITE FILT PRES	2.50	0.00	2.50	0.9	3.7	46	Level 1	
JYOTI PANEL S_1	11.000	Switchgear	152	16.890	15.210	13.976	IYOTI B/C-2	19.91	4.00	23.91	3.3	8.9	91	Level 3	
JYOTI PANEL S_2	11.000	Switchgear	152	16.890							35.00	4.2	13.0	91	Level 3
JYOTI PANEL S_3	11.000	Switchgear	152	2.490	1.990	1.842	I/C-1 TO DG BUS	47.25	4.00	51.25	1.7	3.0	91	Level 1	
L&P MCC-2	0.415	MCC	25	29.009	27.700	19.533	I/C TO L&P MCC-2	13.00	0.00	13.00	2.0	12.9	46	Level 3	
L&T MCC (MCC-3)	0.415	MCC	25	18.132	0.489	0.315	O/G TO AUX. TR-2 CNTRL RO	0.00	4.00	4.00	0.8	2.8	46	Level 1	
L&T PH-1 MCC	0.415	MCC	25	16.258	15.482	11.445	I/C TO L&T PH-1 MCC	0.59	0.00	0.59	0.2	0.4	46	Level 0	
LEACHING MCC-1	0.415	MCC	25	17.110	15.729	11.619	I/C-1 TO LEACHING MCC-1	0.74	0.00	0.74	0.3	0.5	46	Level 0	
LEACHING MCC 201B	0.415	MCC	25	31.342	30.120	20.920	I/C TO LEACHING MCC 201B1	0.55	0.00	0.55	0.3	0.7	46	Level 0	

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Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Bus Arc Flash Hazard Analysis Summary

Faulted Bus				Fault Current			Trip Device		Arc Flash Boundary (m)	Incident Energy (cal/cm²)	Working Distance (cm)	Energy Level		
ID	Nom. kV	Equipment Type	Gap (mm)	Bolted Fault (kA)	PD Bus	PD Fault (kA)	Source Trip Device ID	Trip (cycle)	Open (cycle)	FCT (cycle)				
LEACHING MCC 201B_2	0.415	MCC	25	20.291	18.722	13.742	I/C-1 TO LEACH MCC 201B2	0.68	0.00	0.68	0.3	0.6	46	Level 0
LEACHING MCC 201C	0.415	MCC	25	13.579	12.811	9.466	I/C-1 TO LEACH MCC 201C	0.69	0.00	0.69	0.2	0.4	46	Level 0
LEECHATE MCC	0.415	MCC	25	9.726	9.398	6.875	I/C TO LEECHATE MCC	0.77	0.00	0.77	0.2	0.3	46	Level 0
LIME MCC PANEL	0.415	MCC	25	10.316	9.941	6.374	I/C TO LIME MCC	0.58	0.00	0.58	0.2	0.2	46	Level 0
LR MILL	0.415	MCC	25	20.338	19.701	14.459	I/C TO LR MILL	0.61	0.00	0.61	0.3	0.5	46	Level 0
MCC PANEL-1 S_1	0.415	MCC	25	52.499	50.036	28.790	I/C-1 TO MCC PANEL	0.80	0.00	0.80	0.5	1.5	46	Level 1
MCC PANEL-1 S_2	0.415	Other	13	52.499	51.267	31.688	I/C-1 B/C	0.80	0.00	0.80	0.5	1.4	46	Level 1
MCC PANEL-2 S_1	0.415	MCC	25	52.499	50.036	28.790	I/C-1 TO MCC PANEL	0.80	0.00	0.80	0.5	1.5	46	Level 1
MCC PANEL-2 S_2	0.415	Other	13	52.499	51.267	31.688	I/C-2 B/C	0.80	0.00	0.80	0.5	1.4	46	Level 1
MCC PUMP HOUSE-2	0.415	MCC	25	46.042	1.207	0.740	O/G TO PHE TRAFO	0.00	4.00	4.00	1.4	7.1	46	Level 2
MCC PUMP HOUSE-3	0.415	MCC	25	50.673	1.296	0.759	O/G TO PHE TRAFO	0.00	4.00	4.00	1.4	7.5	46	Level 2
MCC-111 S_1	0.415	MCC	25	40.679	38.635	24.914	I/C-1 TO MCC-111	0.80	0.00	0.80	0.5	1.3	46	Level 1
MCC-111 S_2	0.415	MCC	25	38.766	36.731	24.085	I/C-2 TO MCC-111	0.80	0.00	0.80	0.5	1.3	46	Level 1
MCC-112	0.415	MCC	25	39.242	37.925	24.766	I/C-1 TO MCC-112	0.80	0.00	0.80	0.5	1.3	46	Level 1
MCC-112 S_2	0.415	MCC	25	40.522	39.202	25.315	I/C-2 TO MCC-112	0.80	0.00	0.80	0.5	1.3	46	Level 1
MCC-113 RMH S_1	0.415	MCC	25	40.493	38.858	25.099	I/C-1 TO MCC-113	0.80	0.00	0.80	0.5	1.3	46	Level 1
MCC-113 RMH S_2	0.415	MCC	25	38.960	37.641	24.640	I/C-2 TO MCC-113	0.80	0.00	0.80	0.5	1.3	46	Level 1
MCC-114 S_1	0.415	MCC	25	38.617	36.177	23.752	O/G-1 TO MCC-114	0.80	0.00	0.80	0.5	1.3	46	Level 1
MCC-114 S_2	0.415	MCC	25	41.804	38.448	24.544	I/C-2 TO MCC-114	0.80	0.00	0.80	0.5	1.3	46	Level 1
MCC-115 S_1	0.415	MCC	25	42.338	41.102	26.112	I/C-1 TO MCC-115	0.80	0.00	0.80	0.5	1.3	46	Level 1
MCC-115 S_2	0.415	MCC	25	40.621	39.387	25.412	I/C-2 TO MCC-115	0.80	0.00	0.80	0.5	1.3	46	Level 1
MCC-116	0.415	MCC	25	40.717	39.398	25.397	I/C-1 TO MCC-116	0.80	0.00	0.80	0.5	1.3	46	Level 1
MCC-116 S_2	0.415	MCC	25	40.138	38.819	25.153	I/C-2 TO MCC-116	0.80	0.00	0.80	0.5	1.3	46	Level 1
MCTP MCC-1	0.415	MCC	25	26.695	22.572	16.132	I/C TO MCTP MCC-1	0.80	0.00	0.80	0.4	0.9	46	Level 0
MCTP MCC-2	0.415	MCC	25	28.240	24.109	17.080	I/C TO MCTP MCC-2	0.80	0.00	0.80	0.4	1.0	46	Level 0
MCTP MCC-3	0.415	MCC	25	21.493	20.859	15.254	I/C TO MCTP MCC-3	0.50	0.00	0.50	0.2	0.4	46	Level 0
MELTING FURNACE PCC	0.415	Switchgear	32	22.285	0.719	0.509	O/G TO ZINC MELTING TRAFO	11.66	4.00	15.66	2.3	10.0	61	Level 3
MG PANEL (SS-1) S_1	0.415	MCC	25	25.349	24.144	17.375	I/C-1 TO MG PNL SS-1	0.80	0.00	0.80	0.4	0.9	46	Level 0
MG PANEL (SS-1) S_2	0.415	MCC	25	36.470	29.114	19.459	I/C-2 TO MG PANEL SS-1	0.80	0.00	0.80	0.5	1.2	46	Level 0
MR MCC PANEL	0.415	MCC	25	20.831	17.498	12.823	I/C TO MR MCC PNL	0.80	0.00	0.80	0.3	0.7	46	Level 0
NEW DM PLANT MCC S_1	0.415	MCC	25	18.499	17.862	13.166	I/C-1 TO NEW DM PLANT	0.69	0.00	0.69	0.3	0.6	46	Level 0
NEW DM PLANT MCC S_2	0.415	MCC	25	8.574	0.233	0.169	O/G TO AUX. TR-2 CNTRL RO	0.00	4.00	4.00	0.5	1.4	46	Level 1

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Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Bus Arc Flash Hazard Analysis Summary

Faulted Bus				Fault Current				Trip Device				Arc Flash Boundary (m)	Incident Energy (cal/cm²)	Working Distance (cm)	Energy Level
ID	Nom. kV	Equipment Type	Gap (mm)	Bolted Fault (kA)	PD Bus	PD Fault (kA)	Source Trip Device ID	Trip (cycle)	Open (cycle)	FCT (cycle)	0.49	0.3	0.5	46	Level 0
NEW DPH	0.415	MCC	25	23.772	22.803	16.530	I/C TO NEW DPH	0.49	0.00	0.49	0.3	0.5	46	Level 0	
PAP PCC(SS-3)	0.415	Switchgear	32	39.984	1.046	0.660	O/G TO MCTP TR-5	5.54	4.00	9.54	2.3	10.2	61	Level 3	
PCC-111 S_1	0.415	Switchgear	32	48.476	1.570	0.916	O/G TO TR-111A	10.00	4.00	14.00	3.2	17.0	61	Level 3	
PCC-111 S_2	0.415	Switchgear	32	51.037	1.569	0.892	O/G TO TR-111B	10.00	4.00	14.00	3.3	17.5	61	Level 3	
PCC-112 S_1	0.415	Switchgear	32	48.811	1.570	0.912	O/G TO TR-112A	10.00	4.00	14.00	3.2	17.1	61	Level 3	
PCC-112 S_2	0.415	Switchgear	32	50.763	1.569	0.895	O/G TO TR-112B	10.00	4.00	14.00	3.3	17.5	61	Level 3	
PDB-112 S_2	0.415	MCC	25	37.106	35.464	23.580	I/C-2 TO PDB-112	0.80	0.00	0.80	0.5	1.2	46	Level 1	
PH-1 MCC PANEL	0.415	MCC	25	25.557	24.748	17.792	I/C TO PH-1 MCC	0.39	0.00	0.39	0.2	0.4	46	Level 0	
PURIFICATION MCC	0.415	MCC	25	16.289	14.355	10.611	PNL	0.69	0.00	0.69	0.3	0.5	46	Level 0	
PYROTEC LP MCC	0.415	MCC	25	27.259	25.631	18.261	I/C TO PURIFICATION MCC	4.50	0.00	4.50	1.2	5.3	46	Level 2	
PCC-113 S_1	0.415	Switchgear	32	53.322	1.568	0.871	O/G TO TR-113A	10.00	4.00	14.00	3.3	18.0	61	Level 3	
PCC-113 S_2	0.415	Switchgear	32	48.015	1.569	0.919	O/G TO TR-113B	10.00	4.00	14.00	3.2	16.9	61	Level 3	
PDB-111 S_1	0.415	MCC	25	36.689	35.459	23.657	I/C-1 TO PDB-111	0.80	0.00	0.80	0.5	1.2	46	Level 1	
PDB-111 S_2	0.415	MCC	25	41.402	40.165	25.734	I/C-2 TO PDB-111	0.80	0.00	0.80	0.5	1.3	46	Level 1	
PDB-112 S_1	0.415	MCC	25	41.786	40.138	25.628	I/C-1 TO PDB-112	0.80	0.00	0.80	0.5	1.3	46	Level 1	
PYROTEC PCC	0.415	MCC	25	23.149	22.338	16.235	I/C TO PYROTEC PCC	2.50	0.00	2.50	0.7	2.5	46	Level 1	
PYROTECH PCC	0.415	Switchgear	32	38.017	1.095	0.702	O/G TO AUX. TR-2	0.00	4.00	4.00	1.3	4.1	61	Level 2	
R-2 ACID PLANT MCC	0.415	MCC	25	10.982	0.289	0.213	O/G TO AUX. TR-3	47.25	4.00	51.25	2.9	23.4	46	Level 3	
RO MCC PANEL	0.415	MCC	25	13.043	10.262	7.577	I/C TO RO MCC	2.50	0.00	2.50	0.5	1.4	46	Level 1	
SIEMENS BUS-A	11.000	Switchgear	152	17.605	12.846	11.651	I/C TO SIEMENS BUS-A	29.04	4.00	33.04	4.7	15.7	91	Level 3	
SIEMENS BUS-B	11.000	Switchgear	152	12.851	12.851	11.693	I/C TO SIEMENS BUS-B	28.86	4.00	32.86	3.9	11.6	91	Level 3	
SOLAR 11KV HT PNL	11.000	Switchgear	152	8.047							40.00	3.3	9.2	91	Level 3
STG MCC-118 S_1	0.415	MCC	25	42.062	41.237	26.263	I/C-1 TO MCC-118	0.45	0.00	0.45	0.3	0.7	46	Level 0	
STG MCC-118 S_2	0.415	MCC	25	43.493	42.668	26.819	I/C-2 TO MCC-118	0.44	0.00	0.44	0.3	0.8	46	Level 0	
RO PLANT MCC	0.415	MCC	25	18.810	0.375	0.241	O/G TO SS-1 TR-1	24.84	4.00	28.84	2.7	20.6	46	Level 3	
RO ZLD PCC	0.415	Switchgear	32	72.340	2.243	1.027	O/G TO RO ZLD	10.00	4.00	14.00	3.6	20.7	61	Level 3	
ROASTER GE MCC	0.415	MCC	25	35.567	0.928	0.625	O/G TO PHE TRAFO	0.00	4.00	4.00	1.2	5.9	46	Level 2	
ROASTER-II L & T MCC	0.415	MCC	25	22.254	19.780	14.426	I/C-1 TO L & T.MCC	5.00	0.00	5.00	1.1	4.8	46	Level 2	
RODPM MCC	0.415	MCC	25	18.594	17.400	12.824	I/C TO RODPM MCC	0.80	0.00	0.80	0.3	0.6	46	Level 0	
SUBSTATION PHE PCC	0.415	Switchgear	32	58.232	1.545	0.816	O/G TO PHE TRAFO	0.00	4.00	4.00	1.6	5.4	61	Level 2	
SUBSTATION-2 PCC S_1	0.415	Switchgear	32	32.457	1.024	0.600	O/G TO AUX. TR-3	40.53	4.00	44.53	5.1	35.4	61	Level 4	
SUBSTATION-2 PCC S_2	0.415	Switchgear	32	34.883	1.024	0.589	O/G TO AUX. TR-4	41.42	4.00	45.42	5.3	38.3	61	Level 4	

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Location:	DEBARI	19.0.1C	Date:	29-11-2023
Contract:	SPARROW RMS		SN:	
Engineer:	MR. SUMIT KUMAR JHA	Study Case: A_SC	Revision:	Base
Filename:	HZL DEBARI SMELTER		Config.:	Normal

Bus Arc Flash Hazard Analysis Summary

Faulted Bus				Fault Current			Trip Device			Arc Flash Boundary (m)	Incident Energy (cal/cm²)	Working Distance (cm)	Energy Level	
ID	Nom. kV	Equipment Type	Gap (mm)	Bolted Fault (kA)	PD Arc Fault (kA)	Source Trip Device ID	Trip (cycle)	Open (cycle)	FCT (cycle)					
SUBSTATION-4 PCC S_1	0.415	Switchgear	32	37.984	1.024	0.574	O/G TO AUX. TR-7	28.45	4.00	32.45	4.5	29.3	61	Level 4
SUBSTATION-4 PCC S_2	0.415	Switchgear	32	35.277	1.024	0.587	O/G TO AUX. TR-6	27.71	4.00	31.71	4.3	27.0	61	Level 4
VFD PANEL-2 S_2	0.415	MCC	25	51.369	48.683	28.335	VFD PANEL-2 B/C	0.80	0.00	0.80	0.5	1.5	46	Level 1
WARTSILA-CISF	0.415	MCC	25	15.920	15.297	11.310	I/C TO WARTSILA + CISF	0.59	0.00	0.59	0.2	0.4	46	Level 0
WATER CLARIFIER MCC	0.415	MCC	25	12.035	11.609	8.556	I/C TO WTR CLARIFIER MCC	0.50	0.00	0.50	0.2	0.3	46	Level 0
ZE PYROTEC MCC	0.415	MCC	25	26.079	22.637	16.231	I/C-1 TO ZE PYROTEC MCC	13.00	0.00	13.00	2.2	14.6	46	Level 3
SUBSTATION-5 PCC S_1	0.415	Switchgear	32	29.242	0.832	0.497	O/G TO AUX. TR-6	33.97	4.00	37.97	4.3	27.5	61	Level 4
SUBSTATION-5 PCC S_2	0.415	Switchgear	32	28.611	1.126	0.773	O/G TO SS-5 TRAFO	0.00	4.00	4.00	1.1	3.2	61	Level 1
SUBSTATION-5 PCC S_3	0.415	Switchgear	32	21.784	0.401	0.249	O/G TO SS-1 TR-1	23.95	4.00	27.95	3.0	15.3	61	Level 3
SUBSTATION-6 PCC	0.415	Switchgear	32	28.328	0.606	0.417	O/G TO SS-1 TR-1	13.34	4.00	17.34	2.8	13.9	61	Level 3
SUBSTATION-7 PCC	0.415	Switchgear	32	23.723	0.479	0.337	O/G TO SS-1 TR-1	16.89	4.00	20.89	2.9	14.2	61	Level 3
SULZER MCC	0.415	MCC	25	20.277	17.127	12.572	I/C TO SULZER MCC	0.80	0.00	0.80	0.3	0.7	46	Level 0
TGT MCC PANEL	0.415	MCC	25	12.980	0.236	0.174	O/G TO AUX. TR-7	47.25	4.00	51.25	3.3	28.1	46	Level 4
VFD PANEL-1 S_1	0.415	MCC	25	49.812	45.885	27.128	I/C-1 TO VFD PANEL-1	0.80	0.00	0.80	0.5	1.5	46	Level 1
VFD PANEL-1 S_2	0.415	MCC	25	49.812	47.779	28.248	VFD PANEL-1 B/C	0.80	0.00	0.80	0.5	1.5	46	Level 1
VFD PANEL-2 S_1	0.415	MCC	25	51.369	45.583	26.531	I/C-1 TO VFD PANEL-2	0.80	0.00	0.80	0.5	1.5	46	Level 1

The theoretically-derived Lee method was used to determine the incident energy and arc -flash boundary for this location since some of the input parameters may be outside the range of the IEEE 1584 methods.