The following changes in the tender documents are effective immediately. This Addendum will form part of the contract documents.

Questions and Answers

Q1. As per drawing E-003, Div. 26 to provide temporary power only to Bldg. #15 for switching of incoming power from existing 3 x 75KVA Pole Mtd. Transformer to new Kiosk – MDP-6A. May I know if there are other critical loads / bldgs. (other than Bldg.15) that require temporary power supply in transitioning from existing power supply point to Proposed Kiosks ? if yes, may we know what are those ?

A1. For tendering purposes, assume only building 15 require temporary power for switching of incoming power.

Q2. May we request the operational schedules of New Ice Plant Bldg and other bldgs. - 12, Atagi Marina Shed, RCMP Float and Brittania Marina Enclosure ?

- ✓ **are they running:**
  - **24/7 ?, 8 hrs / day ?, 5 days a week ?**

A2. They do not have consistent operational schedule. Coordinate with the departmental representative and provide 2 weeks notice prior to any deactivation of existing power. For tendering purposes, assume operational disruption (provided that 2 week notice is given) can happen during regular working hours (Mon – Fri)

Q3. We can't reference it to the issued SLD, May we know if there is an emergency generator available at New Ice Plant ? if yes, may we know the ratings ?

A3. There isn't any emergency generator available at New Ice Plant.

Q4. They are requiring a full fault calculation and protective coordination study which should have been done by the electrical designer and if not, it is a major cost for me to model the complete site One Lines for the Arc Flash modelling. Is this required?

Q4. Yes, this is required to update the existing for the new distribution. (attached Appendix A - 8777_Liquid Transformer VFI inspection R4.0, dated 19th October 2020)

Q5. There is no information/drawing for the existing grounding and the grounding for the new main substation which is needed to model for Safe Touch and Step. The complexity of the grid determines the time to build the model. Can this information be provided?

A5. Drawing E303 shows new and existing grounding. Main substation is existing. Ground analysis report attached, Appendix C – Ground Grid Analysis, dated 21st December 2020.

Q6. BC Hydro's fault levels and X/R ratio data is not supplied. Can this be provided?

A6. See attached study –Appendix B - 10104 Short Circuit and Coordination Summary 2.0, dated 18th November 2020.

----End of Addendum----

Appendix A - 8777_Liquid Transformer VFI inspection R4.0

SITE:	STEVESTON HARBOUR	LOCATION:	12470 TRITES RD
CLIENT:	DFO	DATE:	10/19/2020
TECHNICIAN:	M.STEFANOVIC	JOB:	8777

VFI - TRANSFORMER INSPECTION					
MANUFACTURER:	EATON	MFG. DATE:	Sep-20	SERIAL #:	2050009176
CIRCUIT ID:	T1	FEEDS TO:	-	KVA:	2000
TYPE:	KNAN	CONNECTION:	D-Y	TEMP. RISE:	-
TAP AS FOUND:	3	TAP AS LEFT:	3	PERCENT. IMPED:	5.7%
HIGH VOLTAGE:	24940	LOW VOLTAGE:	600/347	PHASES:	3
HIGH SIDE B.I.L.:	125	LOW SIDE B.I.L.	30		

TRANSFORMER GENERAL CONDITION AND INDICATIONS			
ITEM	PASS/FAIL/N/A	NOTES	
OVERALL CONDITION:	PASS		
BREATHER:	NA		
LEAKS:	PASS	None visible	
PCB LABEL:	PASS	Contains less than 1 PPM	
BOND CONNECTIONS:	PASS		
GASKETS:	PASS		
RELIEF VENT DIAPHRAMS:	NA		
MOTOR TAP CHANGER:	NA		
CONTROL SPACE HEATER:	NA		
TAP CHANGER COMPARTMENT SEALS:	NA		
RADIATOR CONDITION:	PASS	No damage or leaks or rust	
BUSHINGS & CLAMP GASKETS:	PASS		
FAN OPERATION:	NA		
CIRCULATION PUMP:	NA		
TAP CHANGER TYPE:	PASS	DETC	
LIQUID LEVEL:	PASS	Found @ 25 C level	
BUSHINGS LIQUID LEVEL:	NA		
TEMPERATURE CONTACTS:	NA		
CONSERVATOR LEVEL:	NA		
SUDDEN PRESSURE RELAY:	PASS		
WINDING TEMP RESET FROM X TO Y:	PASS		
PRESSURE – VACUUM:	PASS	AMBIENT TEMP:	+1.25 psi @ 10C
TAP CHANGER COUNTER:	NA		
OFFLOAD TAP CHANGER POSITION:	NA		
TAP CHANGER LIQUID LEVEL:	NA		
PRESSURE RELIEF DEVICE INDICATOR:	PASS		

ALL TESTING PERFORMED AS PER NETA ATS-2003 USING EQUIPMENT CALIBRATED TO NATIONAL TRACEABLE STANDARDS AS PER THE NATIONAL RESEARCH COUNCIL OF CANADA. CERTIFICATES OF CALIBRATION ARE AVAILABLE UPON REQUEST.

SITE:	STEVESTON HARBOUR	LOCATION:	12470 TRITES RD
CLIENT:	DFO	DATE:	10/19/2020
TECHNICIAN:	M.STEFANOVIC	JOB:	8777

VFI CONDITION AND INDICATIONS		
ITEM	PASS/FAIL/N/A	NOTES
OVERALL CONDITION:	PASS	
WINDOW:	PASS	Sticky film on glass
BCH LOCKS:	NA	To be applied after commissioning
GROUND BLOCK PLATE:	NA	To be Installed
BLADE OPERATING ARMS & ALIGNMENT:	PASS	To be Applied
WARNING SIGNS/STICKERS:	NA	To be Applied
OIL TEST AS PER D877 (26KV)	NA	Oil Sample Taken
CONTROL WIRING:	-	Completed after commissioning
MOTOR OPERATOR:	NA	
KEY INTERLOCK NUMBER:	NA	
MECHANICAL INTERLOCK:	PASS	
OPERATING HANDLES:	PASS	Lanyard wire
BONDING COMPLETE:	NA	
BATTERY CONNECTED/ VOLTS:	-	Battery wire lifted
LIVE LINE INDICATORS:	NA	
OIL LEVEL:	PASS	
NO OIL LEAKS PRESENT:	PASS	

EQUIPMENT ID
NA

GENERAL COMMENTS
1) Control Cabinet VB1 handle requires cable lanyard
2) Control Cabinet door slightly sags. It needs to be lifted to close
3) Control cabinet penta-bolt does not thread. No apparent visible deformation or damage. Thread length is 1.5". 1.75" thread length is better
4) Surge arrestors left in control cabinet

PRIME ENGINEERING – REVISION #4.0

Short Circuit and Coordination Summary 2.0.0

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TO	Tyler Davidson	**DATE:**	2020-11-18
COMPANY	WSP	**FROM:**	Prime Engineering
ADDRESS	3600 Uptown Boulevard, Suite 301 Victoria, BC	**Project #**	**10104**
PHONE	(250) 389-8033	**PAGE**	1 **OF** 10
EMAIL	Tyler.davidson@wsp.com		
PROJECT	Richmond DFO		
SUBJECT	Short Circuit and Coordination Results		

Prime Engineering Ltd. has completed the short circuit and coordination analyses for the DFO Richmond site. The scope of this study includes all new equipment in the South Substation, as outlined on WSP Engineering drawing E-101 (as high lighted in blue in the attachments).

The short circuit analysis determined that all new equipment have the proper withstand or interrupting ratings for the fault current available at their respective locations, based on information provided. Note: Downstream motor contributions have not been included in this analysis. The results of the short circuit analysis, including the ½ Cycle Short Circuit summary and the Equipment Duty summary which includes both Momentary Duty as well as Interrupting Duty summaries, can be found in the attachments.

The protection device coordination analysis has determined settings which will provide the best possible coordination with existing equipment. It can be seen in TCC 1.0 that the MV VFI settings overlap slightly with the 600V LV main breaker CB Ice Plant; as these devices are in series the outage area would be the same regardless of which device tripped first. Although not within the scope of this report, recommended settings for the 600V LV main breaker CB Ice Plant have been included. If loading permits, increasing the ground protection settings as shown in TCC 1.0 may prevent nuisance ground tripping.

The coordination curves and recommended settings can be found in the attachments.

Cable lengths for incoming cables (shown in orange in the ETAP Single Line Model) were derived from takeoffs from WSP drawing E-002.

Summary of Attachments:

#	DWG/DOC #/NAME	REV.#	COMMENTS
1.	Single Line	-	ETAP Model Single Line
2.	½ Cycle Short Circuit Summary	2.0	Half cycle short circuit results based on ultimate fault levels
3.	Equipment Duty Summary	2.0	Equipment Duty summary including Momentary Duty and Interrupting Duty summaries
4.	Coordination Curves	2.0	Time current curves
5.	Arc Flash Analysis	2.0	Summary of incident energy exposure
6.	Device Settings	2.0	Protective device setting summary
7.	Arc Flash Reference Information	-	-

Thank you for choosing Prime Engineering Ltd.

Sincerely,

Brent Hughes, P. Eng.

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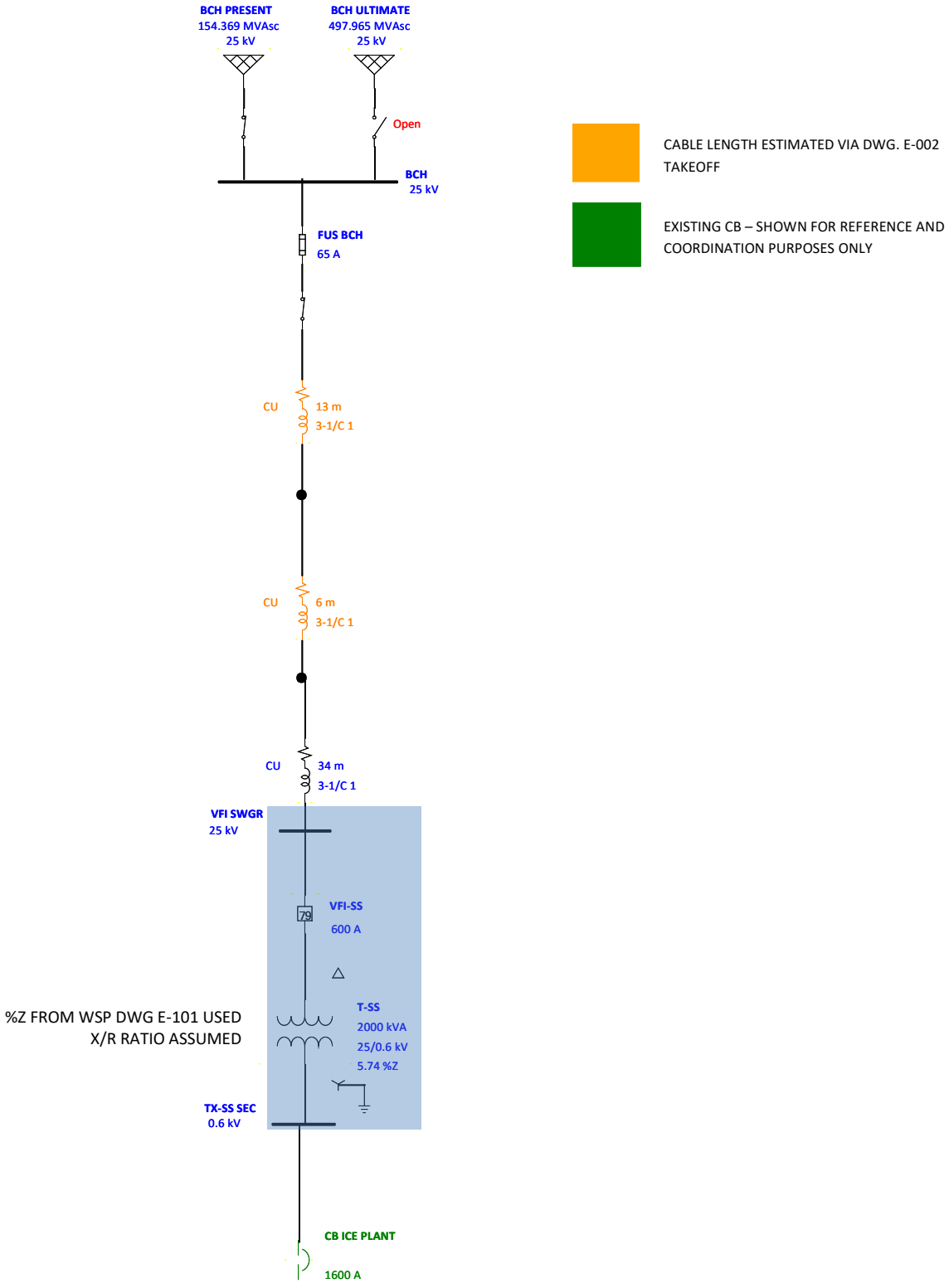
REVISION HISTORY				
Revision:	**Prepared By:**	**Reviewed By:**	**Comments**	**Date**
2.0.0	Brent Hughes	Jen Magdalenich	For Client Review	2020/11/18

1. ETAP Single Line Model

Area highlighted in blue represents scope of study.



2. Half Cycle Short Circuit Summary

Project:	DFO- SCH Steveston	ETAP		Page:	1
Location:	12740 Trites Rd, Richmond BC	20.0.0C		Date:	11-16-2020
Contract:	10104			SN:	PRIME-ENG6
Engineer:	Prime Engineering Ltd.	Study Case:	SC	Revision:	Base
Filename:	10104 - Richmond DFO			Config.:	Ultimate

Short-Circuit Summary Report

1/2 Cycle - 3-Phase, LG, LL, & LLG Fault Currents

Prefault Voltage = 100 % of the Bus Nominal Voltage

Bus		3-Phase Fault			Line-to-Ground Fault			Line-to-Line Fault			*Line-to-Line-to-Ground		
ID	kV	Real	Imag.	Mag.	Real	Imag.	Mag.	Real	Imag.	Mag.	Real	Imag.	Mag.
TX-SS SEC	0.600	4.776	-30.966	31.332	4.751	-31.678	32.032	26.818	4.136	27.135	24.458	20.347	31.815
VFI SWGR	25.000	3.731	-10.641	11.276	3.653	-10.562	11.176	9.215	3.231	9.765	7.426	8.473	11.267

All fault currents are symmetrical (1/2 Cycle network) values in rms kA.
* LLG fault current is the larger of the two faulted line currents.

Project:	DFO- SCH Steveston	ETAP		Page:	2
Location:	12740 Trites Rd, Richmond BC	20.0.0C		Date:	11-16-2020
Contract:	10104			SN:	PRIME-ENG6
Engineer:	Prime Engineering Ltd.	Study Case:	SC	Revision:	Base
Filename:	10104 - Richmond DFO			Config.:	Ultimate

Sequence Impedance Summary Report

Bus		Positive Seq. Imp. (ohm)			Negative Seq. Imp. (ohm)			Zero Seq. Imp. (ohm)			Fault Zf (ohm)		
ID	kV	Resistance	Reactance	Impedance	Resistance	Reactance	Impedance	Resistance	Reactance	Impedance	Resistance	Reactance	Impedance
TX-SS SEC	0.600	0.00169	0.01093	0.01106	0.00169	0.01093	0.01106	0.00144	0.01023	0.01033	0.00000	0.00000	0.00000
VFI SWGR	25.000	0.42353	1.20800	1.28009	0.42353	1.20800	1.28009	0.41940	1.24556	1.31428	0.00000	0.00000	0.00000

3. Equipment Duty Summary

Momentary Duty Summary:

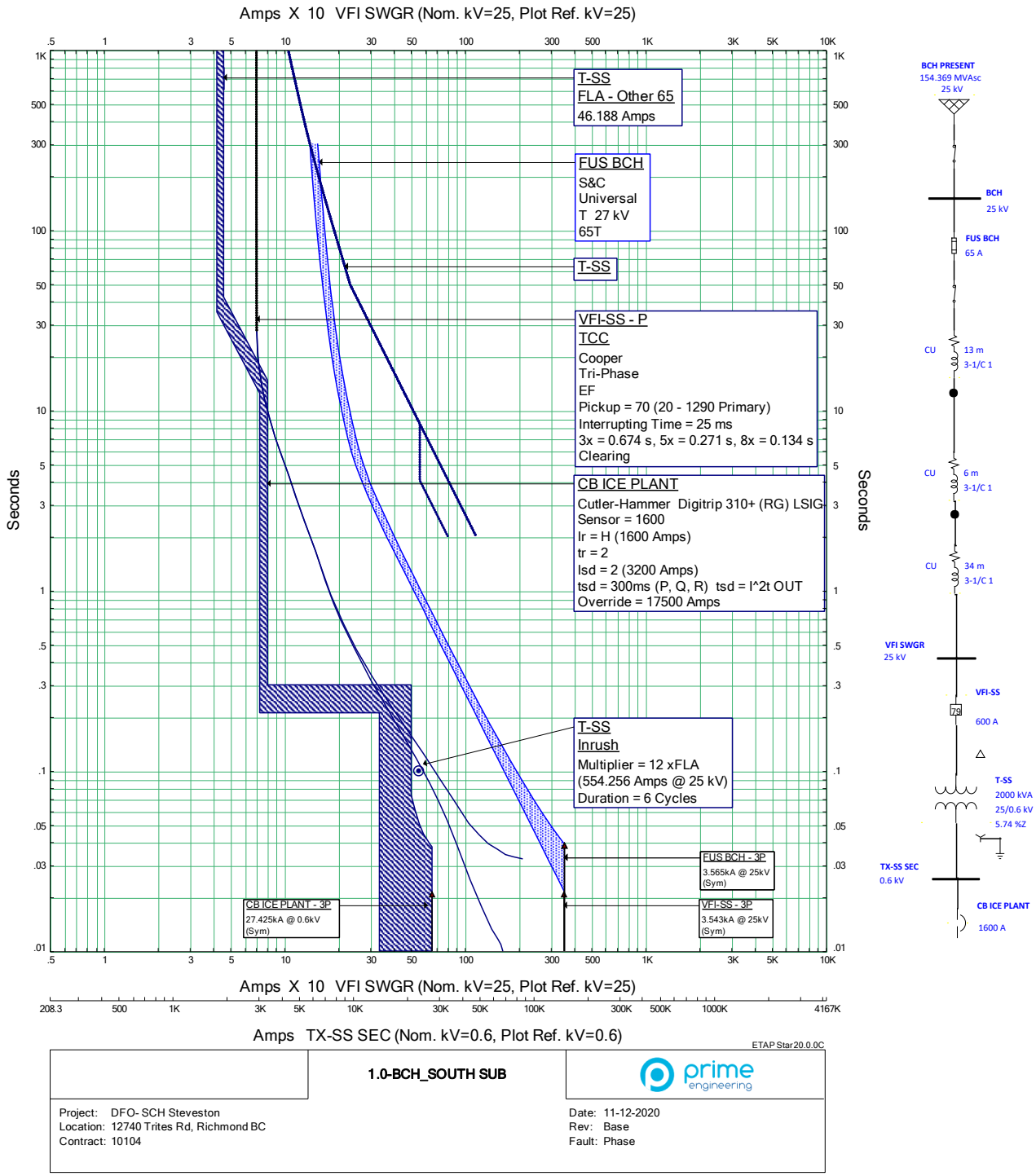
Device				Momentary Duty: PRES			Momentary Duty: ULT			Device Capability	
ID	Nominal kV	Type		Symm. kA rms	Asymm. kA rms		Symm. kA rms	Asymm. kA rms		Symm. kA rms	Asymm. kA rms
VFI SWGR	25.000	Switchgear		3.54	3.85		11.28	12.46		12.00	20.00
TX-SS SEC*	0.600	--		27.42	35.05		31.33	41.55		--	--

** - Included for reference only.*

Interrupting Duty Summary:

Device					Interrupting Duty: Pres		Interrupting Duty: Ult		Device Capability
ID	Voltage	Bus	Device		Int. Adj. Symm. kA		Int. Adj. Symm. kA		Rated Int. kA
VFI-SS	25.000	VFI SWGR	RECLOSER		3.54		11.28		12.00

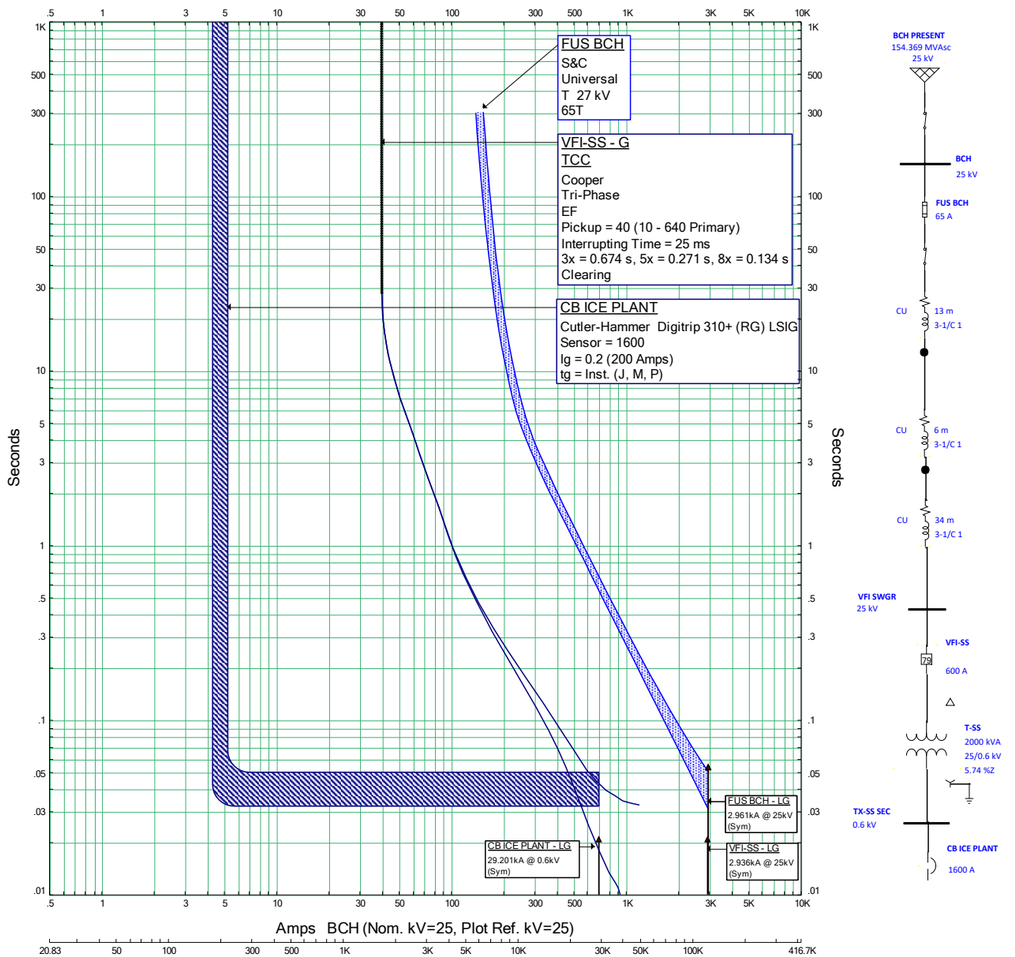
4. Co-ordination Summary



ETAP Star20.0.0C

	1.0-BCH_SOUTH SUB	prime engineering
Project: DFO- SCH Steveston Location: 12740 Trites Rd, Richmond BC Contract: 10104		Date: 11-12-2020 Rev: Base Fault: Phase

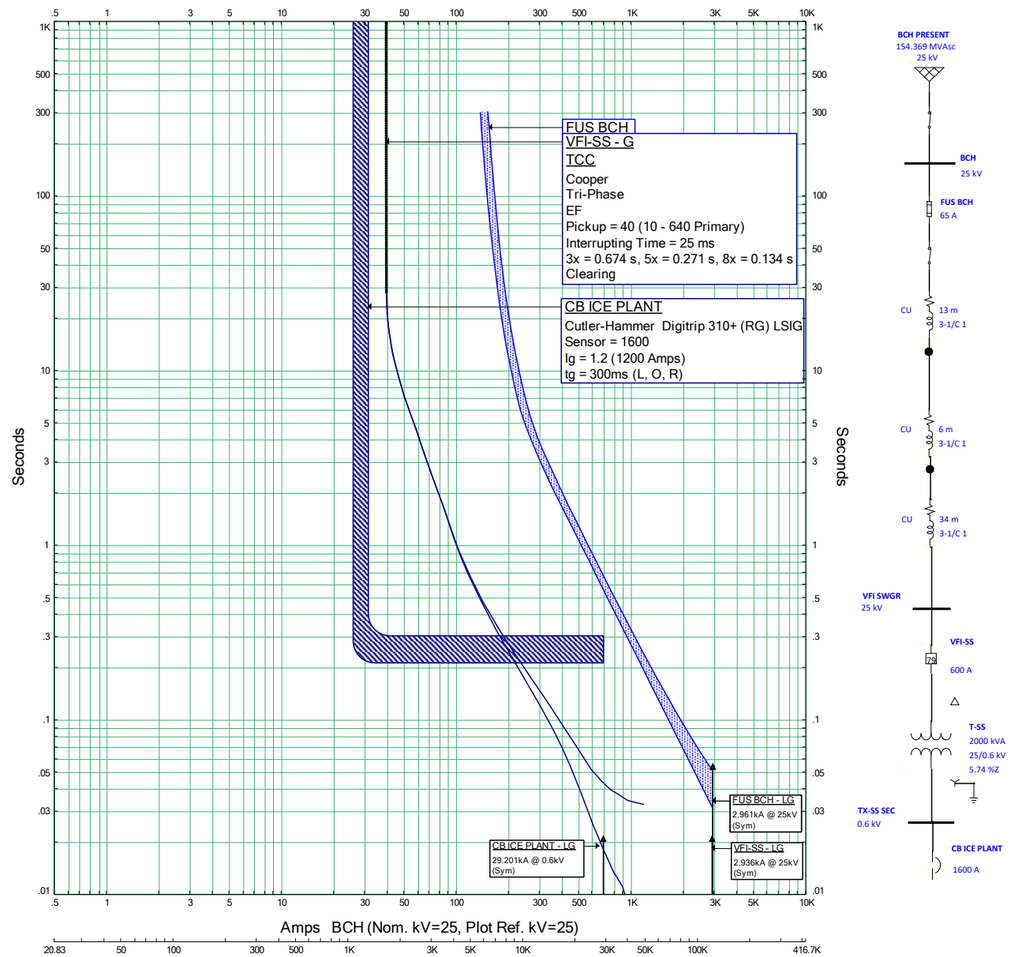
Existing CB Ice Plant Settings



ETAP Star 20.0.0C

	1.0-BCH_SOUTH SUB	prime engineering
Project: DFO- SCH Steveston Location: 12740 Trites Rd, Richmond BC Contract: 10104		Date: 11-12-2020 Rev: Base Fault: Ground

Recommended CB Ice Plant Settings



ETAP Star 20.0.0C

	1.0-BCH_SOUTH SUB	prime engineering
Project: DFO- SCH Steveston Location: 12740 Trites Rd, Richmond BC Contract: 10104		Date: 11-12-2020 Rev: Rec Fault: Ground

5. Recommended Device Settings

						Controller					Tap (Pickup)		
Recloser ID	Adjacent Bus	Manufacturer	Model	Amps	Interrupting kA	Manufacturer	Model	Level	Trip Element	Curve	Range	Setting	Primary (A)
VFI-SS	VFI SWGR	Cooper	VFI (25kV)	600	12	Cooper	Tri-Phase	TCC	Phase	EF	20 - 1290 Primary	70.000	70.000
VFI-SS	VFI SWGR	Cooper	VFI (25kV)	600	12	Cooper	Tri-Phase	TCC	Ground	EF	10 - 640 Primary	40.000	40.000

The following settings are the recommended settings for CB Ice Plant. Although settings for this breaker are not within the scope of this study, if loading permits, increasing the ground protection settings as shown in TCC 1.0 may prevent nuisance ground tripping.

									Long-Time					Short-Time / Ground						
LVCB ID	Adjacent Bus	Man.	Model	Size /Frame	Man.	Model	Sensor /Frame	Funct.	Pickup Label	Pickup Setting	Trip (Amps)	Band Label	Band	Pickup Label	Pickup Setting	Trip (Amps)	Curve Label	Curve	Band Label	Band
CB ICE PLANT	TX-SS SEC	Cutler-Hammer	RGH	1600	Cutler-Hammer	Digitrip 310+ (RG) LSIG	1600	Phase	Ir	H	1600	tr	2	Isd	2	3200	tsd	I^2t OUT	tsd	300ms (P, Q, R)
CB ICE PLANT	TX-SS SEC	Cutler-Hammer	RGH	1600	Cutler-Hammer	Digitrip 310+ (RG) LSIG	1600	Ground						Ig	1.2	1200			tg	300ms (L, O, R)

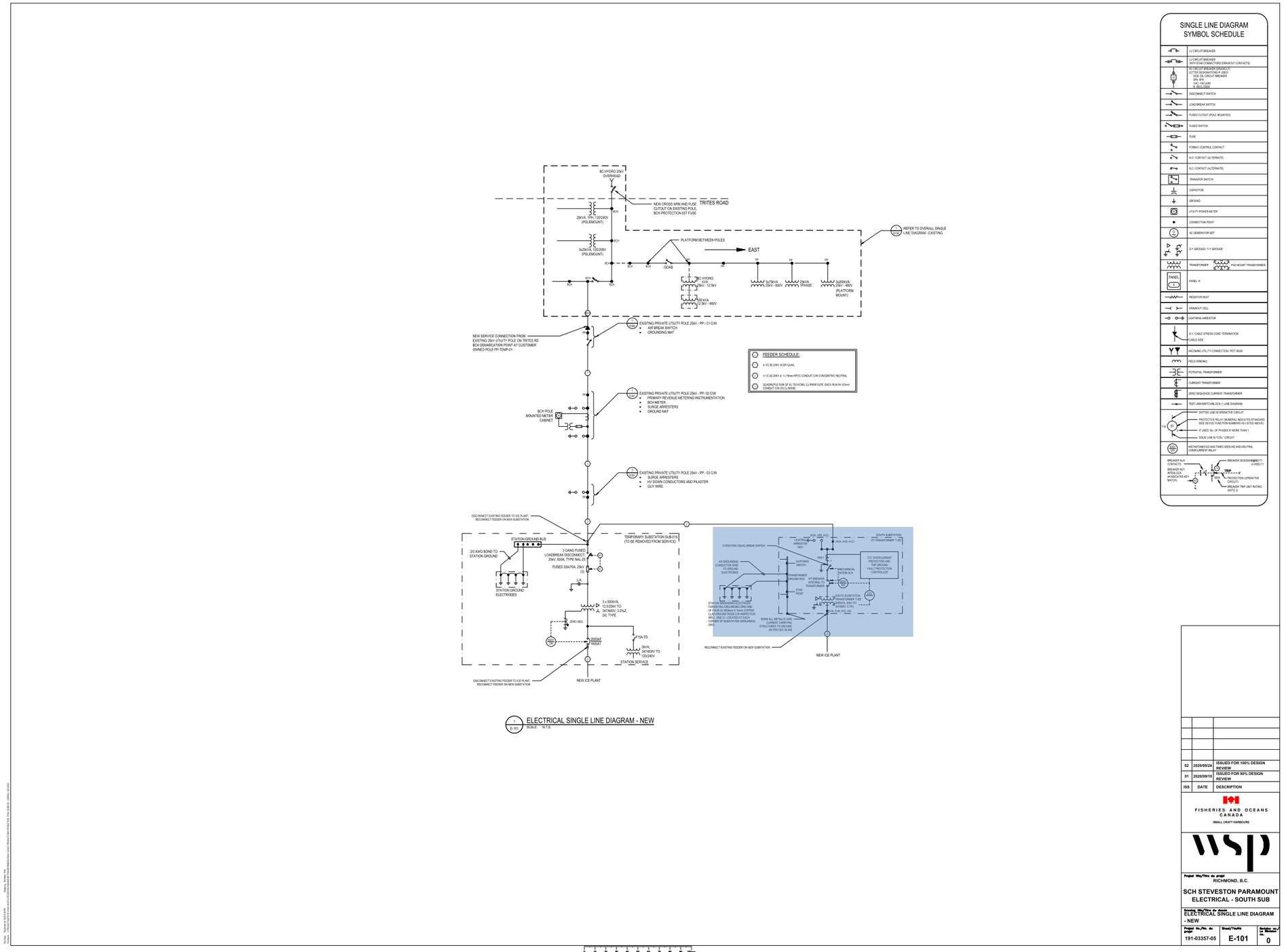
Reference Information – Utility Fault Data

BC hydro

Fault Level Information for Primary Customers					
Customer Name:	DFO Ice Plant				
Service Address:	12580 Trites Road, Richmond BC				
Point used for Fault Level Calculation:	Pole 2129109				
Upstream Protection:	S&C Positrol 65T				
Date Issued:	September 26, 2018				
Estimated Fault Current (Symmetrical Amps)		**Nominal System Voltage**			
		3 ph ☐ 4.16 kV ☐ 12.47 kV ☒ 24.94 kV ☐ 34.5 kV			
		1 ph ☐ 2.4 kV ☐ 7.2 kV ☐ 14.4 kV ☐ 19.92 kV			
LLL	3565 A				
LLG	3404 A	Equivalent System Impedance at point of fault (Ohms)			
LL	3087 A	R1	1.4169	X1	3.7827
LG	2961 A	R0	2.7480	X0	5.9136

The information provided is based on the BC Hydro system configuration as of the date this form is issued at normal system operating conditions and does not consider any customer motor contribution and fault impedance. The fault values provided should be considered accurate within +/-25%. This margin includes 10% for voltage fluctuations from 1.0 p.u and 15% allowance for data accuracy. This fault level can increase or decrease at any time without notification. This data is provided for the purpose of conducting power system studies only (i.e. arc flash, coordination, motor starting) and should not be used for equipment specification. For equipment specification and all other requirements, please refer to the BCH Primary Guide which can be found at https://www.bchydro.com/accounts-billing/new-electrical-connections/forms-guides.html.

Reference Information – Single Line Diagram



1 E-101 ELECTRICAL SINGLE LINE DIAGRAM - NEW
SCALE: N.T.S.

ISS	DATE	DESCRIPTION
02	2020/09/24	ISSUED FOR 100% DESIGN REVIEW
01	2020/09/10	ISSUED FOR 90% DESIGN REVIEW

FISHERIES AND OCEANS CANADA
SMALL CRAFT HARBOURS

Project title/Titre du projet: RICHMOND, B.C.

SCH STEVESTON PARAMOUNT ELECTRICAL - SOUTH SUB

Drawing title/Titre du dessin: ELECTRICAL SINGLE LINE DIAGRAM - NEW

Project No./No. du projet	Sheet/Feuille	Revision no./ No. de révision
191-03357-05	E-101	0

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Project Name
10104 – Ground Grid Analysis
Client: 

REVISION HISTORY				
Revision:	**Prepared By:**	**Reviewed By:**	**Date**	**Comments**
2.0.0	Brent Hughes, P. Eng	Jen Magdalenich, P. Eng	2020/12/09	For Client Review
5.0.0	Brent Hughes, P. Eng	Brent Hughes, P. Eng	2020/12/21	For Record – Deficiencies have been addressed and updated in this report

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DATE: 2020-12-21 **PROJECT #** 10104

Attention: Tyler Davidson
WSP
3600 Uptown Blvd, Suite 301
Victoria, BC V8Z 0B9

Project: **Richmond DFO Ice Plant**
Reference: **Ground Grid Analysis**

Prime Engineering Ltd. has completed the ground grid analysis at the Richmond DFO Ice Plant. The scope of this analysis is limited to ground potential rise calculations and, step and touch calculations within 3m of the unit-substation. Hence, it does not include the assessment of any potential safety risks, such as transferred touch potentials, related to any objects, equipment or buildings outside this area.

The ground grid analysis is based on the following design details:

- Unit substation ground grid consists of 4/0 AWG copper counterpoise and 4/0 AWG copper conductors installed around the unit sub equipment. Four 10 ft copper clad ground rods have been driven from the depth of the conductor. The grid is bonded to pad rebars.
- The fence nearby the ground grid is NOT connected to the ground grid.
- The results of the ground grid analysis are representative of the final installation, as outlined in WSP Engineering electrical drawing E-304 [09/24/2020] as well as markups provided by site contractor. Where site conditions differ, further analysis may be required to ensure the step and touch potentials are within tolerable limits.
- Upstream protective device consisting of 65T speed BCH Vista.

The ground grid analysis is based on the following assumptions:

- Unit substation ground grid is assumed to be electrically continuous with any and all bonded equipment in the electrical room such as cable trays, piping and buildings.
- Approved compression connectors have been used to bond the various grounding conductors, rods and other equipment.

The ground grid calculations are included in the table below.

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GROUND GRID CALCULATIONS per IEEE Standard 80, CEC Rule 36-304		
Date:	2020-12-09	
Project Name:	Richmond DFO – Ice Plant	
Client:	WSP	
Site Location:	Richmond, BC	
Field Measurements		
Covering Medium Type:	Crushed Rock	
Covering Medium Depth:	0.15	Meters
Covering Medium Resistivity[1]:	3000	Ω-meters
Top Soil Resistivity:	1000	Ω-meters
Top Soil Depth:	0.2	Meters
Middle Soil Resistivity:	141.3	Ω-meters
Middle Soil Depth:	1.08	Meters
Middle Soil Resistivity:	52.6	Ω-meters
Middle Soil Depth:	1.7	Meters
Bottom Soil Resistivity:	19.0	Ω-meters
Ground Grid Resistance[2]:	1.68	Ω
Fault Duty Information		
Fault Level at Site for L-G fault[3]	2961	Symmetrical Amperes
Fault Duration	0.2	Seconds
IEEE 80 Acceptable Levels		
Tolerable Ground Potential Rise:	5000	Volts
Tolerable Touch Voltage:	1238.0	Volts
Tolerable Step Voltage:	4220.4	Volts
Software Mathematical Calculations[4]		
Calculated Ground Potential Rise:	1905.2	Volts
Calculated Maximum Touch Voltage:	1152.6	Volts
Calculated Maximum Step Voltage:	703.4	Volts

[1] Covering layer resistivity must meet or exceed this level or calculations are void. Confirmation and testing of covering layer material resistivity is by others.
[2] Calculated value
[3] Based on utility present fault level, not the ultimate fault level
[4] Calculations assume a bolted connection to the system neutral, and fault current split between the system neutral and installed ground grid

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The analysis of the grounding systems at present fault levels, has found the calculated step and touch potentials to be within tolerable limits. Ground potential rise was found to be within tolerable limits.

Thank-you for choosing Prime Engineering Ltd. We hope to work with you again in the near future.

Sincerely,

Brent Hughes, P. Eng

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p: (250) 590-8912