

SHORT CIRCUIT CALCULATIONS (SCC)

Performed by MSB Supplier,
STX Norway Electro, STX-NE

SCC study based on IEC 61363 for marine executed using SKM Power Tools.

Study executed 04.12.2009 by Bjørn Andersen

Project: 75086

Yard: STX-ROB Hull 740/741/742

Switchboard design short circuit rating:

- IEC363 Ip: 187kA
- IEC363 AC T1 (0,5T): 85kA

Breaker with lowest short circuit level:

- MSB690V: 65kA NW..H1
- MSB440V: 35kA NS100N
- MSB230V: 85kA NS100N
- ESB440V: 35kA NS100N
- ESB230V: 85kA, (C60H 30kA)

Checked:

Approved:

General:

Sources used for information.

1. Generator data:

G1,G1,G3, G4: AVK DSG 86K1/4W 2125kVA,690V,60Hz,1800rpm

EMG: STAMFORD HCM434E 360kVA,690V/60Hz, 1800rpm

2. Cable data and general load collected from installer, STX Norway Electro

3. Transformer data is based on technical description from Noratel.

4. Motor contribution is estimated to 1000 kW

5. References made from drawing 75035-871-070 Sheet 1 & 2.

Two studies have been executed.

- Highest Maximum Short Circuit Level: 4 Main Generators in parallel + 1000 kW Motor Contribution and Closed bus-ties.
- Minimum Short Circuit Level: 1 Generator (G1), closed bus-tie and No Motor Contribution.

1. INPUT DATA:

1.1 FEEDER INPUT DATA

Cable					
ComponentName	Qty	Size (mm2)	Conduct.	(Meters)	Voltage
CBL-T2-P	1	35	Copper	8.0	690
CBL-MP3	6	120	Copper	8.0	690
CBL-T4-P	1	95	Copper	10.0	690
CBL-EG	2	70	Copper	4.0	690
CBL-EM-Tb	1	70	Copper	8.0	230
CBL-EM-Ta	1	35	Copper	8.0	690
CBL-G4	6	120	Copper	40.0	690
CBL-LP1	1	25	Copper	80.0	230
CBL-MP1-440	1	25	Copper	60.0	440
CBL-ELP1	1	16	Copper	80.0	230
CBL-G3	6	120	Copper	44.0	690
CBL-G2	6	120	Copper	24.0	690
CBL-G1	6	120	Copper	20.0	690
CBL-MP1	6	120	Copper	12.0	690
CBL-T3-P	1	95	Copper	10.0	690
CBL-T1-P	1	35	Copper	8.0	690
CBL-0085	10	185	Copper	1.0	690
CBL-T2-S	1	95	Copper	6.0	230
CBL-T1-S	1	95	Copper	6.0	230
CBL-T4-S	2	70	Copper	10.0	440
CBL-T3-S	2	70	Copper	10.0	440
CBL-M1	1	70	Copper	60.0	690
CBL-M2	1	70	Copper	60.0	690
CBL-T6-P	1	35	Copper	14.0	690
CBL-EM	1	95	Copper	30.0	690
CBL-MP2	6	120	Copper	8.0	690
CBL-PJ2	2	120	Copper	8.0	690
CBL-PJ1	6	120	Copper	12.0	690
CBL-MP1-441	1	6	Copper	60.0	440

1.2 TRANSFORMER INPUT DATA

2-Winding Transformer					
Component Name	Size (kVA)	Pri RatedVoltage (V)	Sec RatedVoltage (V)	%Z (%)	X/R
T2	99	690	230	4.7011	2.3
T4	315	690	440	5.6171	4.0
EM-T5	80	690	230	3.4986	1.7
T3	315	690	440	5.6171	4.0
T1	99	690	230	4.7011	2.3
T6	99	690	400	4.4944	2.6
T7	16	440	110	2.9682	0.6

1.3 DIESEL GENERATOR INPUT DATA

Marking of generator: G1,G1,G3, G4,

Type: AVK DSG 86K1/4W 2125kVA,690V,60Hz,1800rpm

The screenshot shows the configuration window for a Synchronous Generator named 'G4'. The 'Name' field is 'G4' and it is checked as 'In Service'. The 'Rated Voltage' is 690 Volts (L-L), 'Rated Size' is 2125.0 kVA, and 'Power Factor' is 0.900. The 'Synchronous rpm' is 1800.00. The 'Initial Operating Conditions' section shows 'Schedule' as 'Volts & Angle (SB)', 'Angle' as 0.00 Deg, and 'Voltage' as 1.000 pu. The 'Synchronous Generator Contribution Data (IEC Format)' section includes 'Per Unit Impedance' values: $x_d'' = 0.1490$, $x_q'' = 0.1640$, $x_0 = 0.0340$, $R_g = 0.0100$, and $r_0 = 0.0100$. The 'kVA Base' is 2125.0 and 'Voltage Base' is 690. The 'Steady State AC Decay Specification (Ik)' section has 'Included in Steady State' checked, 'Excitation Limits' at 1.3, and 'Xdsat' at 1.60. The 'Transient and Steady State Fault Study Parameters' section shows $x_d = 0.2560$, $x_d' = 2.0000$, $R_a = 0.0083$, $T_d' = 14.00$ ms, $T_d'' = 360.00$ ms, and $T_{dc} = 47.00$ ms.

Marking of generator: EMG/HG

Type: STAMFORD HCM434E 360kVA,690V/60Hz, 1800rpm

The screenshot shows the configuration window for a Synchronous Generator named 'EG'. The 'Name' field is 'EG' and it is checked as 'In Service'. The 'Rated Voltage' is 690 Volts (L-L), 'Rated Size' is 238.0 kW, and 'Power Factor' is 0.800. The 'Synchronous rpm' is 1800.00. The 'Initial Operating Conditions' section shows 'Schedule' as 'Volts & Angle (SB)', 'Angle' as 0.00 Deg, and 'Voltage' as 1.000 pu. The 'Synchronous Generator Contribution Data (IEC Format)' section includes 'Per Unit Impedance' values: $x_d'' = 0.0900$, $x_q'' = 0.2600$, $x_0 = 0.0600$, $R_g = 0.0100$, and $r_0 = 0.0100$. The 'kVA Base' is 297.5 and 'Voltage Base' is 690. The 'Steady State AC Decay Specification (Ik)' section has 'Included in Steady State' checked, 'Excitation Limits' at 1.3, and 'Xdsat' at 1.60. The 'Transient and Steady State Fault Study Parameters' section shows $x_d = 0.1400$, $x_d' = 2.2400$, $R_a = 0.0150$, $T_d' = 19.00$ ms, $T_d'' = 80.00$ ms, and $T_{dc} = 18.00$ ms.

2. SHORT CIRCUIT LEVEL

2.1 Highest Maximum Short Circuit Level

- Highest Maximum Short Circuit Level: 4DG + 1000 kW Motor Contribution and Closed bus-ties.

Bus		
ComponentName	IEC363 AC T1 (A)	IEC363 Ip (A)
MBB-PS-690	47108	123734
MBB-StB-690	47112	123739
440V SWBD-PS	11864	23669
440V SWBD-StB	11863	23669
230V SW.BD PS	9357	16091
230V SWBD-StB	9357	16091
BUS-EM690V	28335	43514
BUS-EM230V	4865	7561
400VAC DECK OUTLET	3001	5407
BUS-110V DECK OUTLET	1730	2448

Tab. 1 Highest Maximum Short Circuit Level: 4DG + 1000 kW Motor Contribution and Closed bus-ties.

2.2 Minimum Short Circuit Level:

- 1DG, Closed bus-tie and No Motor Contribution.

Bus		
ComponentName	IEC363 AC T1 (A)	IEC363 Ip (A)
MBB-PS-690	5339	12646
MBB-StB-690	5339	12646
440V SWBD-PS	3837	8061
440V SWBD-StB	3837	8061
230V SW.BD PS	3843	6909
230V SWBD-StB	3843	6909
BUS-EM690V	5051	10768
BUS-EM230V	3914	6423
400VAC DECK OUTLET	2341	4433
BUS-110V DECK OUTLET	1657	2346

Tab. 2 Minimum Short Circuit Level: 1 DG and Closed bus-tie.