CHPTER FIVE

CONCLUSION & RECOMMENDATION

5.1 Conclusion

Designing of a new substation starts from selecting the numbers of incoming lines and outgoing feeders, this is based on load calculation and site selection of substation which is totally affected by location of substation to center of loads. In this project rating of bus bars, capacity of transformers, CTs ratios were determined according to the load flow and short circuit analysis. These studies results are helpful and should be considered mainly in technical design and manufacturer equipment's design in S.H substation.

5.2 Recommendation

The following studies are recommended for a complete substation design:

- Structure design of holders and site for equipment.
- Protection coordination of substation.
- Control system design of substation.
- DC and auxiliary system design.
- Communication system design of substation.
- SCADA system design of substation.
- Earthing system of the substation.
- Substation cyber security system.

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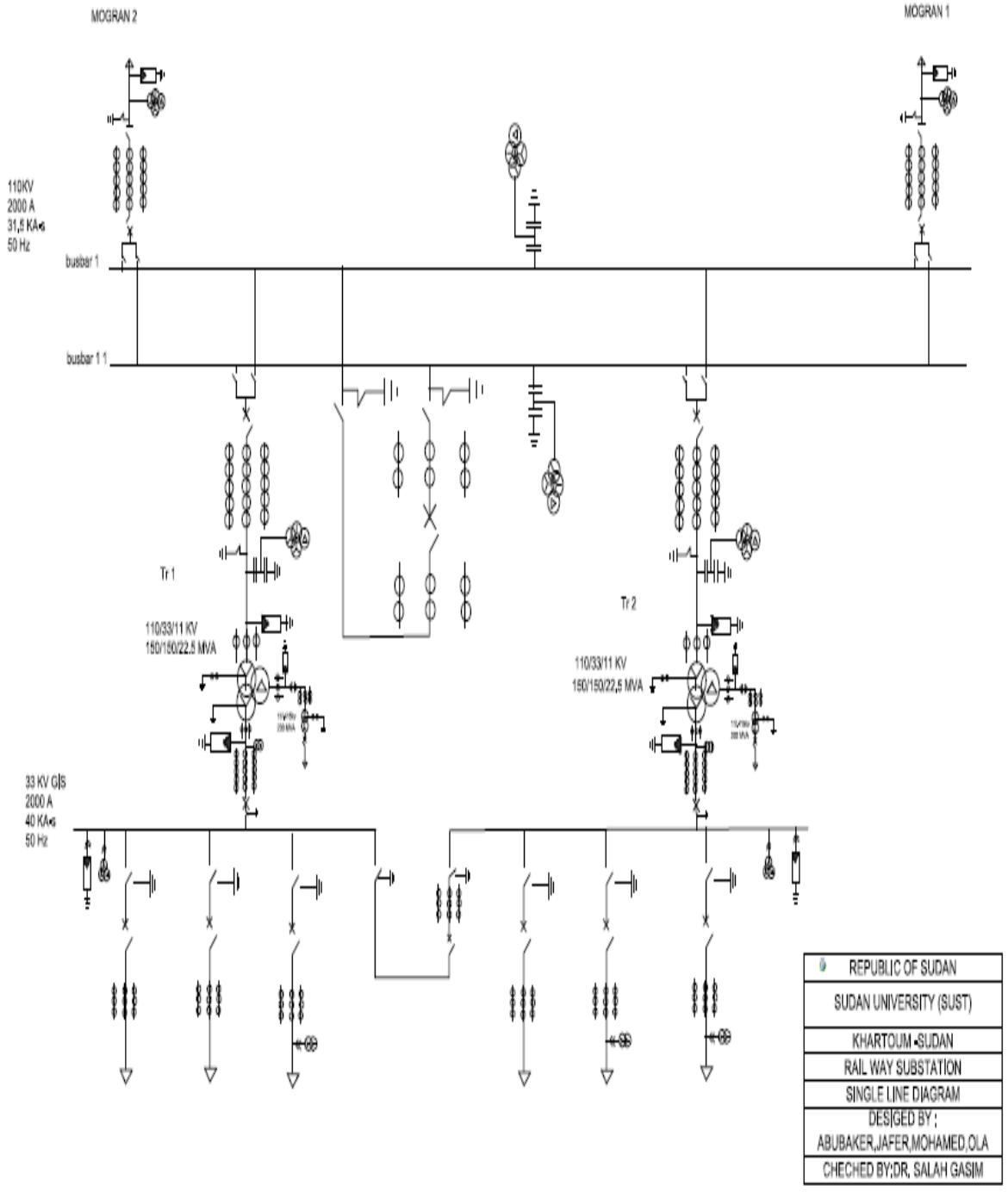
APPENDIX(A)

Single Line Diagram



APPENDIX(B)

Current Of Short Circuit Fault At Normal Operation

Bus		3-Phase Fault			Line-to-Ground Fault				Line-to-Line Fault				*Line-to-Line-to-Ground			
ID	kV	I"k	ip	Ik	I"k	ip	Ib	Ik	I"k	ip	Ib	Ik	I"k	ip	Ib	Ik
Bus(1).415	0.415	21.975	52.690	14.758	19.330	46.347	19.330	19.330	19.031	45.631	19.031	19.031	21.527	51.615	21.527	21.527
Bus2(.415)	0.415	21.969	52.677	14.761	19.327	46.341	19.327	19.327	19.026	45.620	19.026	19.026	21.522	51.604	21.522	21.522
Sika haded11 Kv BB1	11.000	21.686	55.069	11.359	22.238	56.470	22.238	22.238	18.780	47.691	18.780	18.780	22.154	56.258	22.154	22.154
Sika haded11 Kv BB2	11.000	21.794	55.336	11.308	22.314	56.655	22.314	22.314	18.874	47.922	18.874	18.874	22.246	56.483	22.246	22.246
Sika haded33 Kv BB1	33.000	22.000	54.154	10.054	27.556	67.831	27.556	27.556	19.053	46.899	19.053	19.053	26.661	65.627	26.661	26.661
Sika haded 33 Kv BB2	33.000	21.849	53.807	9.891	27.339	67.327	27.339	27.339	18.922	46.598	18.922	18.922	26.444	65.123	26.444	26.444
Sika haded110 Kv BB1	110.000	8.853	21.379	5.980	10.694	25.823	10.694	10.694	7.667	18.515	7.667	7.667	10.222	24.684	10.222	10.222
Sika haded 110 Kv BB2-2	110.000	8.821	21.300	5.980	10.654	25.726	10.654	10.654	7.639	18.446	7.639	7.639	10.183	24.589	10.183	10.183

All fault currents are in rms kA. Current ip is calculated using Method C.

* LLG fault current is the larger of the two faulted line currents.

APPENDIX (C)

Current Of Short Circuit Fault At Parallel Operation (1)

Bus		3-Phase Fault			Line-to-Ground Fault				Line-to-Line Fault				*Line-to-Line-to-Ground			
ID	kV	I"k	ip	Ik	I"k	ip	Ib	Ik	I"k	ip	Ib	Ik	I"k	ip	Ib	Ik
Bus(1).415	0.415	22.175	53.238	15.131	19.432	46.651	19.432	19.432	19.205	46.106	19.205	19.205	21.690	52.073	21.690	21.690
Bus2(.415)	0.415	22.172	53.231	15.131	19.430	46.648	19.430	19.430	19.201	46.099	19.201	19.201	21.686	52.066	21.686	21.686
Sika haded11 Kv BB1	11.000	43.480	110.405	22.669	44.551	113.125	44.551	44.551	37.655	95.613	37.655	37.655	44.400	112.741	44.400	44.400
Sika haded11 Kv BB2	11.000	43.480	110.405	22.669	44.551	113.125	44.551	44.551	37.655	95.613	37.655	37.655	44.400	112.741	44.400	44.400
Sika haded33 Kv BB1	33.000	43.851	107.966	19.947	54.898	135.165	54.898	54.898	37.976	93.502	37.976	37.976	53.108	130.757	53.108	53.108
Sika haded 33 Kv BB2	33.000	43.851	107.966	19.947	54.898	135.165	54.898	54.898	37.976	93.502	37.976	37.976	53.108	130.757	53.108	53.108
Sika haded110 Kv BB1	110.000	17.675	42.680	11.960	21.348	51.551	21.348	21.348	15.307	36.962	15.307	15.307	20.405	49.275	20.405	20.405
Sika haded 110 Kv BB2-2	110.000	17.675	42.680	11.960	21.348	51.551	21.348	21.348	15.307	36.962	15.307	15.307	20.405	49.275	20.405	20.405

APPENDIX(D)

Current Of Short Circuit Fault At Parallel Operation (2)

Bus		3-Phase Fault			Line-to-Ground Fault				Line-to-Line Fault				*Line-to-Line-to-Ground			
ID	kV	I"k	ip	Ik	I"k	ip	Ib	Ik	I"k	ip	Ib	Ik	I"k	ip	Ib	Ik
Bus(1).415	0.415	22.175	53.238	15.131	19.432	46.651	19.432	19.432	19.205	46.106	19.205	19.205	21.690	52.073	21.690	21.690
Bus2(.415)	0.415	22.172	53.231	15.131	19.430	46.648	19.430	19.430	19.201	46.099	19.201	19.201	21.686	52.066	21.686	21.686
Sika haded11 Kv BB1	11.000	43.480	110.405	22.669	44.551	113.125	44.551	44.551	37.655	95.613	37.655	37.655	44.400	112.741	44.400	44.400
Sika haded11 Kv BB2	11.000	43.480	110.405	22.669	44.551	113.125	44.551	44.551	37.655	95.613	37.655	37.655	44.400	112.741	44.400	44.400
Sika haded33 Kv BB1	33.000	43.851	107.966	19.947	54.898	135.165	54.898	54.898	37.976	93.502	37.976	37.976	53.108	130.757	53.108	53.108
Sika haded 33 Kv BB2	33.000	43.851	107.966	19.947	54.898	135.165	54.898	54.898	37.976	93.502	37.976	37.976	53.108	130.757	53.108	53.108
Sika haded110 Kv BB1	110.000	17.675	42.680	11.960	21.348	51.551	21.348	21.348	15.307	36.962	15.307	15.307	20.405	49.275	20.405	20.405
Sika haded 110 Kv BB2-2	110.000	17.675	42.680	11.960	21.348	51.551	21.348	21.348	15.307	36.962	15.307	15.307	20.405	49.275	20.405	20.405

APPENDIX(E)

Low Voltage Supplied From S.H Substation

Name	**Capacity(MVA)**	**Load(MVA)**
Almk nimer	30	26.8
Alwaha	40	4.8
Almlk	20	15.5
Alsoug alarbi	40	23.3
Alomla alwaregia	20	16
Algdaia	40	21.2
SEDC	20	12.9
Total	210	120.5