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# **MEDIUM VOLTAGE SWITCHGEAR RELAY RECONFIGURATION PROJECT**

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**Edition: December 2019**

**Reference Number: ORT/RELProt**

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## **1. DETAIL TECHNICAL SPECIFICATIONS**

### **1.1 SCOPE OF WORK**

The scope of the project is as follows:

- 1.1.1 Replacement of the existing faulty Overcurrent and Earth Fault Relays. (4 off)
- 1.1.2 Replacement of existing incorrect Current Transformers in MV panels. (15 off)
- 1.1.3 The Relays and Current Transformers shall be free issued by ACSA.
- 1.1.4 The work in MV panels shall be done per substation with pre-arrangements with ACSA to switch off where necessary. LV bus coupling may be done to avoid total shut down of a substation where possible. Where bus-coupling can be done, the work may be done during normal hours. Where a substation must be totally shut down, the work can only be done after hours.
- 1.1.5 New OC/EF protection relay settings shall be done for the entire airport as per the information provided. There are 35 MV Substations and 151 relays to be set.
- 1.1.6 After the new settings of the relays have been done, secondary injection tests of the relays shall be done with an approved "Secondary Current Injection Test Set" calibrated and in accordance with the prescriptions of the relay manufacturer. Test certificates of all panels shall be issued by the contractor.

### **1.2. Employer's Objectives and Purpose of The Works**

The Employer's objective with the project is to ensure the correct MV protection discrimination is achieved throughout all the airport MV networks.

### **1.3 Replacement of Faulty Protection Relays**

The following protection relays were identified to be faulty and need to be replaced with the similar type as the existing ARCUS C relay:

Terminal Buildings Main Intake Station North: Panel N3 PFC feeder  
Terminal Buildings Substation 4: Panel 4 Transformer 1 feeder  
Terminal Buildings Substation 11: Panel 5 Transformer 1 feeder  
Airfield New OPS Substation: Panel 9 Transformer B feeder

The relay replacements must be done after hours with pre-arrangements with all stakeholders as dictated by the Employer.

## 1.4 Replacement of Current Transformers

The Contractor shall do an audit of all the CT's to be replaced to ensure the correct CT's for the various types of MV panels be procured. The CT's must easily fit into the correct positions. The ring type CT's should be installed where ever possible.

Passenger Terminal Buildings							
Substation No	Panel No	Incorrect CT's to be removed			New CT's to be installed		
		CT Ratio	CT Accuracy	CT Rating [VA]	CT Ratio	CT Accuracy	CT Rating [VA]
1	3	100/1	10	10P20	200/1	10P20	10
1	4	100/1	10	10P20	200/1	10P20	10
1	5	100/1	10	10P20	200/1	10P20	10
3	1	100/1	10	10P20	200/1	10P20	10
3	2	100/1	10	10P20	200/1	10P20	10
3	3	100/1	10	10P20	200/1	10P20	10
8	3	80/5	10	10P20	200/1	10P20	10
8	4	80/5	10	10P20	200/1	10P20	10
9	10	100/1	10	10P20	200/1	10P20	10
15	3	100/1	10	10P20	200/1	10P20	10
15	4	100/1	10	10P20	200/1	10P20	10

Airfield							
Airfield SS	7	100/1	10P20	10	300/1	10P20	10

Cargo Terminal							
2	2	100/1	10P10	10	200/1	10P20	10
2	4	100/1	10P10	10	200/1	10P20	10
2	5	100/1	10P10	10	200/1	10P20	10

## 1.5 Proposed CT Replacement Implementation Method Statement

### Terminal Buildings Substations

#### 1.5.1 Substation 1 (Partially after hours work)

- Check the LV load on both transformers 1 & 2. Should the combined LV load be less than 2300A, the LV bus coupling can be done by isolating the transformer incomer from one transformer and supplying the entire load from the other transformer.
- Isolate the MV feeder to the LV isolated transformer and replace the existing protection CT's in the feeder panel during normal working hours. Set the protection relay to the new setting as specified.
- Do the secondary injections tests and provide the test certificates.
- Go through a similar exercise with the other transformer MV feeder panel.
- Isolate the MV feeder to transformer 3 after hours and replace the protection CT's in the feeder panel after hours. Set the protection relay to the new setting as specified. Do the secondary injection tests and provide the test certificates. Prior notification to be given to all stakeholders.

- f) Should the combined LV load of transformers 1 & 2 be more than 2300A a power shut down must be arranged and the protection CT's be replaced and relays be set to the specified settings during a power shut down after hours. Do the secondary injection tests and provide the test certificates. Prior notification to be given to all stakeholders.

#### 1.5.2 Substation 3 (After hours work)

- a) Isolate all three (3) MV feeder panels after hours with pre-arrangements with all stakeholders.
- b) Replace the protection CT's of panels 1, 2 & 3 in all 3 panels after hours. Set the protection relays to the new setting as specified.
- c) Do the secondary injection tests and provide the test certificates.
- d) Switch all 3 MV feeders back on as soon as possible.

#### 1.5.3 Substation 8

- a) Check the LV load on both transformers 1 & 2. Should the combined LV load be less than 2300A, the LV bus coupling can be done by isolating the transformer incomer from one transformer and supplying the entire load from the other transformer.
- b) Isolate the MV feeder to the LV isolated transformer and replace the protection CT's in the feeder panel during normal working hours. Set the protection relay to the new setting as specified. Do the necessary secondary injection tests and provide the test certificates.
- c) Go through a similar exercise with the other transformer MV feeder panel.
- d) Should the combined LV load of transformers 1 & 2 be more than 2300A a power shut down must be arranged and the MV relays be replaced during a power shut down after hours. Set the protection relays to the new setting as specified, do the necessary secondary injection tests and provide the test certificates.

#### 1.5.4 Substation 9 (After hours work)

- a) Isolate MV feeder panel 10 after hours with pre-arrangements with all stakeholders.
- b) Replace the protection CT's of panel 10 as specified after hours. Set the protection relay to the new setting as specified. Do the secondary injection tests and provide the test certificates.
- c) Switch the MV feeder panel 10 back on as soon as possible.

#### 1.5.5 Substation 15 (After hours work)

- a) Isolate both (2) MV transformer feeder panels after hours with pre-arrangements with all stakeholders – Hotel included.
- b) Replace the protection CT's of both panels 2 & 3 after hours. Set the protection relays to the new settings as specified. Do the secondary injection tests and provide the test certificates.
- c) Switch both MV feeders back on as soon as possible.

### **Airfield Substations**

#### 1.5.6 Airfield Switching Station (After hours work)

- a) Isolate MV feeder panel 7 after hours with pre-arrangements with all stakeholders.
- b) Replace the protection CT's of panel 7 as specified after hours. Set the protection relay to the new setting as specified. Do the secondary injection tests and provide the test certificates.
- c) Switch the MV feeder panel 7 back on as soon as possible.

### **Cargo Substations**

#### 1.5.7 Substations 2 (After hours work)

- a) Arrange with all stakeholders that the supplies from Substation 1 & 2 including the minisub MV feeder could be switched off after hours.
- b) Isolate MV panels 2, 4 & 5 in Substation 2, replace the protection CT's and set the 3x relays in the isolated MV feeder panels as specified.
- c) Do the secondary injection tests and provide the test certificates after hours and switch on.

## 1.6 Schedules of Proposed Relay Settings

The new relay settings are required to achieve the correct time discrimination between protection devices to prevent downstream faults operating upstream MV breakers.

The minimum grading margins between protection devices must be 0.25 seconds.

Adjustments to grading is primarily specified to be done with the Time Multiplier Settings (TMS) and to leave the Current Pick-up values unaltered. Current Pick-Up values must be adjusted where CT's are replaced.

The following schedule reflects the new protection relay settings to be done:

J8251E09	ORTIA: Relay Configuration Project				<b>CA du Toit (Pty) Ltd</b>	
Proposed Relay Settings: Passenger Terminals			J8251E09-PT-PRS	Rev 00	31-08-2019	Page 1 of 2

No	Substation	Panel ID	Feed	Protection CT		Relay Setting			
				Prim (A)	Sec (A)	Overcurrent		Earth Fault	
						Pickup	TMS	Pickup	TMS
1	Main Intake	A	Cargo Main Intake	1500	1	105%	0.35	10%	0.6
1	Main Intake	N1	BC		1				
2	Main Intake	N2	EM Supersub	1500	1	120%	0.33	13%	0.55
3	Main Intake	N3	PFC	300	1	100%	0.3	10%	0.15
4	Main Intake	N4	Sub 1	300	1	120%	0.3	30%	0.4
5	Main Intake	N5	Sub 4	300	1	120%	0.3	30%	0.4
6	Main Intake	N6	Sub 3	300	1	120%	0.3	30%	0.4
7	Main Intake	N7	Sub 8	300	1	120%	0.3	30%	0.4
8	Main Intake	N8	Airfield SS	300	1	110%	0.34	15%	0.65
9	Main Intake	N9	Sub 9	600	1	60%	0.3	15%	0.4
10	Main Intake	S1	BC						
11	Main Intake	S2	EM Supersub	1500	1	120%	0.33	13%	0.55
12	Main Intake	S3	PFC	300	1	100%	0.3	10%	0.15
13	Main Intake	S4	Sub 2	300	1	120%	0.3	30%	0.4
14	Main Intake	S5	Sub 7	300	1	120%	0.3	30%	0.4
15	Main Intake	S6	Sub 12	300	1	120%	0.3	30%	0.4
16	Main Intake	S7	Sub 15	300	1	120%	0.3	30%	0.4
17	Main Intake	S8	Airfield SS	300	1	110%	0.34	15%	0.65
18	Main Intake	S9		600	1	60%	0.3	15%	0.4
19	Sub 1	P1	Incomer						
20	Sub 1	P2	Incomer						
21	Sub 1	P3	Trf 1	200	1	60%	0.15	20%	0.15

22	Sub 1	P4	Trf 2	200	1	55%	0.15	20%	0.15
23	Sub 1	P5	Trf 3	200	1	60%	0.15	20%	0.15
24	Sub 2	P1	Incomer						
25	Sub 2	P2	Incomer						
26	Sub 2	P3	Trf 1	100	1	150%	0.15	20%	0.15
27	Sub 2	P4	Trf 2	100	1	150%	0.15	20%	0.15
28	Sub 2	P5	Trf 3	100	1	150%	0.15	20%	0.15
29	Sub 2	P6	Trf 4	100	1	150%	0.15	20%	0.15
30	Sub 2	P7	Trf 5	100	1	150%	0.15	20%	0.15
31	Sub 2	P8	Trf 6	100	1	150%	0.15	20%	0.15
32	Sub 2	P9	Reservoir Sub	100	1	125%	0.15	20%	0.15
33	Sub 3	P1	Trf 1	200	1	40%	0.15	10%	0.15
34	Sub 3	P2	MS Feeder	200	1	50%	0.15	10%	0.15
35	Sub 3	P3	MS Feeder	200	1	50%	0.15	10%	0.15
36	Sub 3	P4	Incomer						
37	Sub 3	P5	Incomer						
38	Sub 4	P1	Incomer						
39	Sub 4	P2	Incomer						
40	Sub 4	P3	Trf 1	200	1	60%	0.15	10%	0.15
41	Sub 4	P4	Trf 2	200	1	60%	0.15	10%	0.15
42	Sub 4	P5	Trf 3	200	1	60%	0.15	10%	0.15
43	Sub 5	P1	Incomer						
44	Sub 5	P2	Incomer						
45	Sub 5	P3	Trf 1	300	1	34%	0.15	10%	0.15
46	Sub 5	P4	Trf 2	300	1	34%	0.15	10%	0.15
47	Sub 5	P5	Cable Feed	300	1	108%	0.15	20%	0.15
48	Sub 6	P1	Incomer						
49	Sub 6	P2	Incomer						
50	Sub 6	P3	Trf 1 - 2MVA	200	1	50%	0.15	10%	0.15
51	Sub 6	P4	Trf 2 - 2MVA	200	1	50%	0.15	10%	0.15
52	Sub 6	P5	Trf 3 - 1.6MVA	200	1	40%	0.15	10%	0.15
53	Sub 6	P6	MS MR7 Feeder	400	1	55%	0.15	10%	0.15
54	Sub 6	P7	MS MR5 Feeder	400	1	50%	0.15	10%	0.15
55	Sub 7	P1	Incomer						
56	Sub 7	P2	Incomer						
57	Sub 7	P3	Trf 1	200	1	40%	0.15	10%	0.15
58	Sub 7	P4	Trf 2	200	1	40%	0.15	10%	0.15

59	Sub 8	P1	Incomer						
60	Sub 8	P2	Incomer						
61	Sub 8	P3	Trf 1	200	1	50%	0.15	10%	0.15
62	Sub 8	P4	Trf 2	200	1	50%	0.15	10%	0.15
63	Sub 9	P3	MS F;G Feeder	300	1	50%	0.15	10%	0.15
64	Sub 9	P4	MS D; EFeeder	300	1	100%	0.15	10%	0.15
65	Sub 9	P9	MS Charlie Feeder	200	1	100%	0.15	10%	0.15
66	Sub 9	P10	MS A12 Feeder	200	1	60%	0.15	10%	0.15
67	Sub 9	P5	Trf 1	200	1	50%	0.15	10%	0.15
68	Sub 9	P6	Trf 2	200	1	50%	0.15	10%	0.15
69	Sub 9	P7	Trf 3	200	1	50%	0.15	10%	0.15
70	Sub 9	P8	Trf 4	200	1	50%	0.15	10%	0.15
71	Sub 9	P13	Trf 5	200	1	50%	0.15	10%	0.15
72	Sub 9	P14	Incomer						
73	Sub 9	P1	Incomer						
74	Sub 10	P1	Incomer						
75	Sub 10	P2	Incomer						
76	Sub 10	P3	Trf 1	200	1	75%	0.15	15%	0.15
77	Sub 10	P4	Trf 2	200	1	75%	0.15	15%	0.15
78	Sub 10	P5	MS Charlie Feeder	200	1	50%	0.15	10%	0.15
79	Sub 11	P1	Incomer						
80	Sub 11	P2	Incomer						
81	Sub 11	P3	Trf 1	200	1	75%	0.15	10%	0.15
82	Sub 11	P4	Trf 2	200	1	75%	0.15	10%	0.15
83	Sub 11	P5	MS F3 Feeder	200	1	50%	0.15	10%	0.15
84	Sub 11	P6	MS A4 Feeder	200	1	125%	0.15	15%	0.15
85	Sub 12	P1	Incomer						
86	Sub 12	P2	Incomer						
87	Sub 12	P3	Trf 1	200	1	75%	0.15	10%	0.15
88	Sub 12	P4	Trf 2	200	1	75%	0.15	10%	0.15
89	Sub 12	P5	Trf 3	200	1	75%	0.15	10%	0.15
90	Sub 13	P1	Incomer						
91	Sub 13	P2	Incomer						
92	Sub 13	P3	Trf 1	200	1	75%	0.15	10%	0.15
93	Sub 13	P4	Trf 2	200	1	75%	0.15	10%	0.15
94	Sub 13	P5	Trf 3	200	1	75%	0.15	10%	0.15

95	Sub 14	P1	Incomer						
96	Sub 14	P2	Incomer						
97	Sub 14	P3	Trf 1	200	1	75%	0.15	15%	0.15
98	Sub 15	P1	Incomer						
99	Sub 15	P2	Incomer						
100	Sub 15	P3	Trf 1	200	1	50%	0.15	10%	0.15
101	Sub 15	P4	Trf 2	200	1	50%	0.15	10%	0.15

J8251E09	ORTIA: Relay Configuration Project				<b>CA du Toit (Pty) Ltd</b>	
Proposed Relay Settings: Airfield			J8251E09-AF-PRS	Rev 00	31-08-2019	Page 1 of 2

No	Substation	Panel ID	Feed	Protection CT		Relay Setting			
				Prim (A)	Sec (A)	Overcurrent		Earth Fault	
						Pickup	TMS	Pickup	TMS
1	Airfield SS	P1	L-Band	300	1	44%	0.6	10%	0.5
2	Airfield SS	P2	New Ops	500	1	70%	0.45	15%	0.4
3	Airfield SS	P3	Main Intake						
4	Airfield SS	P4	B/C						
5	Airfield SS	P5	Main Intake						
6	Airfield SS	P6	New Ops	500	1	70%	0.45	15%	0.4
7	Airfield SS	P7	21R	300	1	44%	0.6	10%	0.5
8	New Ops	P1	03R	600	1	15%	0.4	5%	0.25
9	New Ops	P2	ANTS W	600	1	15%	0.4	5%	0.25
10	New Ops	P3	Trf A	100	1	150%	0.4	30%	0.25
11	New Ops	P4	Airfield SS	600	1	47%	0.45	7%	0.45
12	New Ops	P5	MS Ring	100	1	150%	0.4	30%	0.25
13	New Ops	P6	B/C						
14	New Ops	P7	21L	600	1	15%	0.4	5%	0.25
15	New Ops	P8	Airfield SS	600	1	47%	0.45	7%	0.45
16	New Ops	P9	Trf B	100	1	150%	0.4	30%	0.25
17	New Ops	P10	ANTS E	600	1	15%	0.4	5%	0.25
18	L-Band	P1	03L	600	1	18%	0.6	10%	0.5
19	L-Band	P2	Airfield SS	600	1	18%	0.6	10%	0.5
20	L-Band	P3	Trf 1	100	1	30%	0.15	5%	0.15
21	L-Band	P4	B/C						
22	L-Band	P5	Trf 2	100	1	30%	0.15	5%	0.15
23	L-Band	P6	03L	600	1	18%	0.6	10%	0.5
24	03L	P1	15/33	600	1	18%	0.6	10%	0.5
25	03L	P2	Trf 1	100	1	30%	0.15	5%	0.15

26	03L	P3	B/C						
27	03L	P4	Trf 2	100	1	30%	0.15	5%	0.15
28	03L	P5	L-Band	600	1	18%	0.6	10%	0.5
29	15/33	P1	03L	600	1	18%	0.6	10%	0.5
30	15/33	P2	Trf 1	100	1	30%	0.15	5%	0.15
31	15/33	P3	B/C						
32	15/33	P4	Trf 2	100	1	30%	0.15	5%	0.15
33	15/33	P5	21R	600	1	18%	0.6	10%	0.5
34	21R	P1	Airfield SS	600	1	18%	0.6	10%	0.5
35	21R	P2	Trf 2	100	1	30%	0.15	5%	0.15
36	21R	P3	B/C						
37	21R	P4	Trf 1	100	1	30%	0.15	5%	0.15
38	21R	P5	15/33	600	1	18%	0.6	10%	0.5
39	03R	P1	21L	600	1	15%	0.4	5%	0.25
40	03R	P2	Trf 1	100	1	50%	0.15	5%	0.05
41	03R	P3	B/C						
42	03R	P4	Trf 2	100	1	50%	0.15	5%	0.05
43	03R	P5	New Ops	600	1	15%	0.4	5%	0.25
44	21L	P1	21L	600	1	15%	0.4	5%	0.25
45	21L	P2	Trf 1	100	1	50%	0.15	5%	0.05
46	21L	P3	B/C						
47	21L	P4	Trf 2	100	1	50%	0.15	5%	0.05
48	21L	P5	New Ops	600	1	15%	0.4	5%	0.25
49	ANTS W	P1	ANTS E	600	1	35%	0.4	10%	0.25
50	ANTS W	P2	Trf 1	100	1	50%	0.15	10%	0.05
51	ANTS W	P3	New Ops	600	1	35%	0.4	10%	0.25
52	ANTS E	P1	New Ops	600	1	35%	0.4	10%	0.25
53	ANTS E	P2	Trf 1	100	1	50%	0.15	10%	0.05
54	ANTS E	P3	ANTS W	600	1	35%	0.4	10%	0.25
55	Fuel Farm	P1	TB Sub 9	600	1	15%	0.4	5%	0.25
56	Fuel Farm	P2	Trf 1	100	1	100%	0.15	10%	0.05
57	Fuel Farm	P3	Trf 2	100	1	100%	0.15	10%	0.05
58	Fuel Farm	P4	Fuel Pump	100	1	100%	0.15	10%	0.05
59	Fuel Farm	P5	EM Boksb	600	1				

J8251E09	ORTIA: Relay Configuration Project			<b>CA du Toit (Pty) Ltd</b>	
Proposed Relay Settings: Cargo Terminal		J8251E09-CT-PRS	Rev 00	31-08-2019	Page 1 of 1

No	Substation	Panel ID	Feed	Protection CT		Relay Setting			
				Prim (A)	Sec (A)	Overcurrent		Earth Fault	
						Pickup	TMS	Pickup	TMS
1	Cargo SS	P1	Sub 2	300	1	120%	0.4	20%	0.5
2	Cargo SS	P2	EM Cargo	1500	1	105%	0.35	10%	0.6
3	Cargo SS	P3	B/C						
4	Cargo SS	P4	TB MI	1500	1	105%	0.35	10%	0.6
5	Cargo SS	P5	Sub 4	300	1	120%	0.4	20%	0.5
6	Sub 2	P1	EM Cargo	600	1	50%	0.4	8%	0.5
7	Sub 2	P2	Trf 2T1	100	1	30%	0.15	10%	0.15
8	Sub 2	P3	B/C						
9	Sub 2	P4	Trf Load	100	1	30%	0.15	10%	0.15
10	Sub 2	P5	Trf 2T2	100	1	30%	0.15	10%	0.15
11	Sub 2	P6	Sub 3	600	1	50%	0.4	8%	0.5
12	Sub 3	P1	Sub 2	600	1	50%	0.4	8%	0.5
13	Sub 3	P2	Spare						
14	Sub 3	P3	Trf 372	100	1	60%	0.15	20%	0.15
15	Sub 3	P4	Sub 5	600	1	30%	0.25	5%	0.3
16	Sub 3	P5	B/C						
17	Sub 3	P6	Trf 3 T1	100	1	60%	0.15	20%	0.15
18	Sub 3	P7	Sub 4	600	1	50%	0.4	8%	0.5
19	Sub 4	P1	Cargo SS	600	1	50%	0.4	8%	0.5
20	Sub 4	P2	Trf 4T1	100	1	60%	0.15	20%	0.15
21	Sub 4	P3	B/C						
22	Sub 4	P4	Sub 6	600	1	30%	0.25	5%	0.3
23	Sub 4	P5	Spare						
24	Sub 4	P6	Sub 3	600	1	50%	0.4	8%	0.5
25	Sub 5	P1	Sub 7	200	1	80%	0.25	10%	0.3
26	Sub 5	P2	Anglo Feed	200	1				
27	Sub 5	P3	B/C						
28	Sub 5	P4	Trf 1	200	1	55%	0.05	10%	0.05
29	Sub 5	P5	Sub 3	200	1	80%	0.25	10%	0.3
30	Sub 6	P1	Trf 1	200	1	55%	0.05	10%	0.05
31	Sub 6	P2	Sub 4						

32	Sub 6	P3	Sub 7						
33	Sub 6	P4	MS Feed	100	1	60%	0.05	5%	0.05
34	Sub 7	P1	Trf Local	100	1	10%	0.05	5%	0.05
35	Sub 7	P2	Sub 5	200	1	80%	0.25	10%	0.3
36	Sub 7	P3	Feeder no 4	200	1	30%	0.05	5%	0.05
37	Sub 7	P4	Feeder no 3	200	1	Not Used			
38	Sub 7	P5	Feeder no 2	200	1	Not Used			
39	Sub 7	P6	Feeder no 1	200	1	Not Used			
40	Sub 7	P7	Sub 5	200	1	80%	0.25	10%	0.3
41	Res Sub	P1	TB Sub 2	300	1	Not Set			
42	Res Sub	P2	Trf 1	100	1	50%	0.05	15%	0.05

## 1.7 List of Drawings

### Drawings issued

The following is the list of all the drawings related to the project:

DRAWING NUMBER	TITLE
J8251E09/PT1/PR	Passenger Terminal: Sub 1 & 2 Ring
J8251E09/PT2/PR	Passenger Terminal: Sub 4 & 7 Ring
J8251E09/PT3/PR	Passenger Terminal: Sub 3 & 12 Ring
J8251E09/PT4/PR	Passenger Terminal: Sub 9 & 10 Ring
J8251E09/PT5/PR	Passenger Terminal: Sub 8 & 15 Ring
J8251E09/AF1/PR	Airfield: New Ops Network
J8251E09/AF2/PR	Airfield: Old Airfield Network
J8251E09/CT/PR	Cargo Terminal

## 1.8 Schedule of Equipment and Specialists Proposed

The following schedule must be completed with the quotation in order to adjudicate all aspects of the proposals.

Item No.	Description of equipment/specialist work	Manufacturer/ Trade Name	Specifications/experience of
1.	Secondary Current Injection Test Set that will be utilised to do the functional tests on the relay settings.		
2.	New CT's to be installed.		
3.	Installer of CT's		
4.	Relay specialist to set & test the relays.		

## 1.9 General

Work shall be carried out during normal Airport hours as well as after-hours where necessary.

The work shall at all times for the duration of contract be carried out under the supervision of a skilled and competent representative of the contractor, who will be able and authorized to receive and carry out instructions on behalf of the contractor.

## 1.10 Program, Completion, Testing and Commissioning

### 1.10.1 Work to be done by the Completion Date

On or before the Completion Date, which is **31 March 2020**, the *Contractor* shall have done everything required to Complete All the Works as Specified. The *Supervisor* cannot certify Completion until all the work has been done, free of Defects and all certificates issued. **A detailed works program shall be issued within two (2) weeks after the appointment for the work by the Employer.**

### 1.10.2 Hand-over Procedures

Hand-over will be after or at the same time as Completion and will be a once off event.

### 1.10.3 Acceptance Test Plan

The contractor shall submit a preliminary draft of a recommended acceptance test plan for commissioning of the installation two (2) weeks before such tests are to be performed. This plan shall include any specific requirements and test procedures as specified in this specification.

The Engineer will consider the acceptance test plan and, if necessary, submit to the contractor an alternative test procedure and/or testing methods and plans. Such a revised test plan shall be incorporated by the Contractor in the final acceptance test plan, scheduling the test procedure on site.

In general the preliminary acceptance test plan must include the following:

- i. Detail test procedures.

- ii. Tabulated results which should be obtained during tests including tolerances, limits and reach (range) of certain components.
- iii. Test equipment required.
- iv. Tests to determine the performance of individual components of the installation.

Preliminary test plan relating to this test procedure must be submitted to the Engineer one (1) week before such tests are to be performed. The tests executed shall indicate that all components of the installation function effectively and that the equipment fully complies with the requirements of this specification. The Engineer reserves the right to attend these tests.

Copies of all results of tests conducted on site must be submitted on request.

#### **1.10.4 Test Equipment**

The contractor shall provide properly calibrated standard test equipment for testing equipment on site in accordance with the acceptance test plan. Valid calibration certificates of test equipment shall be provided. The contractor shall supply, where necessary, all the temporary cables and interconnecting wires for performing tests.

All tests on a substation must be executed directly after the installation has been completed in the substation and before energising the switchgear.

#### **1.10.5 Training of Personnel**

A suitably qualified person (his qualifications to be submitted to the Engineer), preferably one who has been involved with the installation during the final commissioning of the installation and conversant with English or Afrikaans, shall be made available by the contractor to train and instruct operators employed by the Client with regards to operation, routine maintenance and inspection of the installation.

The Operator's Manuals to be provided by the contractor must be explained in detail to the operators.

#### **1.10.6 Guarantee**

The contractor shall guarantee the complete system for a period of twelve months from the date it has been taken over in running order.

If during this period the system is not in working order, or not working satisfactorily owing to faulty material, design, or workmanship, the contractor will be notified, and immediate steps shall be taken by him to rectify the defects and/or replace the effected parts on site, at his own expense.

#### **1.10.7 Maintenance**

The contractor shall maintain the complete system in good running order for a period of twelve months after the plant has been taken over by the client. The cost of this maintenance must be included in the quoted price. Maintenance shall be based on two services per annum for afterhours work. Detailed service reports shall be provided after services have been carried out.

After the lapse of this 12 month period, the contractor may be required to enter into a maintenance agreement with the client. This agreement will initially be for one year, and may subsequently be renewed for one year periods thereafter.

The contractor shall be able to render a 24 hour maintenance and repair service at all times, including statutory holidays. Full details of the firm's standby service facilities in Kempton Park shall be submitted at the time of tendering.

## **2. GENERAL TECHNICAL REQUIREMENTS**

### **2.1 PLANT, MATERIALS AND WORKMANSHIP – ELECTRICAL ENGINEERING WORKS**

#### **2.1.1 Compliance with Regulations**

The installation shall be erected and commissioned in compliance with the following acts and regulations:

- (1) The Occupational Health and Safety Act No 83 of 1993, as amended. The Code of practice for the Wiring of Premises: SANS 10142, as amended and SANS 10142-2 for MV installations as amended.
- (2) The local Municipal bye-laws and regulations as well as the regulations of the local Supply Authority.
- (3) The local Fire Regulations.
- (4) The National Building Regulations and Building Standards Act including the Code of Practice for the Application of the Regulations, SANS 10400.
- (5) International Civil Aviation Organization (ICAO) rules & regulations.
- (6) The standard regulations of any Government Department or public service company, where applicable.

#### **2.1.2 Standards and Samples**

- (1) All materials and apparatus used shall be new and of good quality and, if applicable, shall comply in respect of quality, manufacture, tests and performance with the relevant current specification of at least one (1) of the following standards institutes:
  - (a) The South African Bureau of Standards (SANS).
  - (b) The British Standards Organization (BS).
  - (c) The International Standards Organization (ISO).
  - (d) Die Deutsche Industrie Normen (DIN).
- (2) The aim must be to standardize component types, series and make, thus reducing the number of items to be held by the Employer as spare parts.

#### **2.1.3 Standard of Craftsmanship**

- (1) All work for this installation shall be executed according to the latest professional standards.
- (2) Site staff shall be experienced and competent personnel, adequately trained to execute the various duties assigned to them.
- (3) Before equipment is installed, all installed wiring shall be checked to ensure that routes are correctly followed, category segregation is maintained, and that no accidental damage has occurred to the wiring during installation.
- (4) Crimping connections shall be made using only tools designed for the particular crimp connectors and with calibrated pressure setting where appropriate, to achieve a specified standard of connection.

Conductors prepared for crimping shall be stripped in accordance with the manufacturer's specification and shall only be terminated with crimps of the correct size to suit the wire gauge.

- (5) In general, terminated conductors shall be mechanically supported independent of their terminations.
- (6) Sufficient slack wiring shall be allowed at terminations to allow easy removal of relays for maintenance and rewiring where necessary.

#### 2.1.4 Quality Control

- (1) The contract shall be executed with the best workmanship in a workmanlike manner to the satisfaction of the *Supervisor* or his representative.
- (2) The contractor shall apply the codes of practice for quality systems as outlined in SANS 9000 to SANS 9004.
- (3) The particular codes of practice for quality systems to be applied during all stages of design, development, production, installation and servicing to be carried out by the contractor are as follows:

SANS 9000: 2005	Quality management and quality assurance standards - Guidelines for selection and use. (ISO 9000: 2005)
SANS 9001:	Quality Management systems - Requirements
SANS ISO 9002:	Quality systems - Model for quality assurance in production and installation.
SANS ISO 9003:	Quality systems - Model for quality assurance in final inspection and test.
SANS 9004:	Managing for the sustained success of an organization A quality management approach. (ISO 9004: 2009).

- (4) Material or workmanship which is not to the satisfaction of the *Supervisor*, shall be rectified at the cost of the contractor. All rejected material shall be removed from site at the cost of the contractor.
- (5) The contractor shall be responsible for the correct and complete erection of the installation to comply with the requirements of the Project Specification for the installation.

### 3. SITE INFORMATION

The site is the entire OR Tambo International Airport.

#### 3.1 Description of the Site and its surroundings

The site is accessible from various positions on landside and on airside.

#### ACSA CONSTRUCTION CONDITIONS AND HOUSE RULES

##### 3.1.1 CONSTRUCTION RULES

- 1. All deliveries that will obstruct portions of the roadways or public routes for any period of time are to be restricted between 22h00 and 04h00. No construction related vehicles are allowed on the roads alongside the

terminal buildings. No queuing of delivery vehicles will be permitted on any part of the route to your site. All logistics affecting operations are to be approved by the relevant ACSA Managers.

2. All work resulting in high levels of noise or disruption to airport operations will be restricted to hours between 22h00 and 04h00. ACSA shall be notified of all substation shut downs 72 hours before shut down.
3. All dust and debris resulting from construction work is to be contained within the hoarded site. Any materials and rubble outside the hoarded site will be removed by ACSA from the Airport without notice to yourselves and will be for your account.
4. All active services are to be protected.
5. Work will be allowed at night provided that the site is adequately illuminated and with pre-arrangements.
6. All vehicles related to the contractors works are to be parked within the contractors hoarded site or in public parking with costs for the contractors account. Any contractor vehicle towed for illegal parking will be for the contractors account.
7. The site is to be maintained in a reasonable state of tidiness at all times.
8. Rubble may not be accumulated on site. Suitable skips are to be provided for the works.
9. A health and safety plan is to be tabled with ACSA Safety for approval prior to works proceeding.
10. Access to the site is subject to the current security policy in effect.  
All work is to comply with the current ACSA Environment Management Plan.
11. Contractors are limited to their actual site establishment areas and places of work and under no circumstances will materials, equipment, tools, cooking or any other disturbance be allowed in public areas and delivery of materials via the normal airport traffic routes is strictly prohibited.
  - Use of the public people mover infrastructure is prohibited.
12. Contractor's will ensure the proper handling and carting away of spoil material, and the cleaning of ablution areas set aside for the use of the contractors staff.
13. Contractor's employees are to be clearly identifiable and they must be discouraged from visiting the public areas of the airport.
14. All works are to be insured as per the current ACSA policy and confirmation on insurance by the insurer to be supplied to the ACSA lease administrator prior to works proceeding.
- 15a. The contractor is to ensure that acceptable Works, Public Liability (not less than R100m) and Professional Indemnity (not less than R5m) insurances are effected.
- 15b. In the event of a claim occurring for which indemnity is provided in terms of the Public Liability which results in loss of or damage to aircraft or death or injury to Passengers of such aircraft then the limit of liability stated is increased to **R5,000,000,000**.
16. The contractor is to verify the current ACSA liability requirements with the ACSA administrator.

### **3.1.2 BUILDING WORK**

1. All plumbing connections are to be approved by ACSA Maintenance Division (HOD -(011) 921-6059).
2. All hoarding are to comply with the ACSA standard (HOD – (011) 921 6226).

3. The hoarding is to be maintained to ACSA's specifications at all times. Any costs incurred by ACSA for repairing your hoarding will be forwarded to yourselves for payment. To avoid this, ensure that the hoarding is maintained on a daily basis.  
No existing finishes outside the defined site are to be changed without prior approval by ACSA.

### **3.1.3 ELECTRICAL**

1. All electrical installations and loading being approved by ACSA Electrical Division (HOD - (011) 921 6883) prior to any work being executed.
2. All cable installation to comply with the ACSA specification as a minimum and be approved by ACSA IT and Electrical.

### **3.1.4 MECHANICAL**

1. All mechanical alterations or impact thereon, i.e. air-conditioning, be approved by the ACSA Mechanical Division (HOD - (011) 921 6225) prior to any work being executed.
  - The use of any people mover infrastructure for delivery is to be approved by Mechanical Division (HOD).

### **3.1.5 FIRE PROTECTION**

1. All alterations to fire detectors and sprinklers or impact thereon to be approved by ACSA Mechanical Division (HOD - (011) 921 6225) prior to any work commencing.

### **3.1.6 SIGNAGE**

1. All neon signage are to have fireman's switches connected.
2. All signage and advertising are to be contained within the facilities lease line and approved by ACSA prior to installation.

### **3.1.7 APPROVAL / CERTIFICATION**

1. All electrical works are to be certified by a registered electrical engineer or electrician in terms of legislation with a Certificate of Compliance issued.
2. All structural works are to be certified by a registered structural engineer in terms of legislation.
3. All drawings are to be submitted to Manager Security for approval.
4. Plans are to be submitted to the Ekurhuleni Metropolitan Municipality for approval and a reference number obtained. This reference number must be supplied to ACSA Commercial Client Manager involved. No work is to proceed without formal approval or exemption by the local Authority.
5. Tenant to provide copy of occupancy certificate to ACSA Commercial Manager.
6. The tenant is to ensure the design is fully integrated in terms of operations, emergency evacuations and disabled access.
7. The contractor is to ensure that all relevant legislation is complied with.
8. All installations are to be approved prior to operations by the relevant ACSA divisions.

### **3.1.8 SPOT FINES**

1. Under no circumstances will the contractor be allowed to make use of any baggage trolley or other airport equipment. Should the contractor be seen making use of the aforementioned equipment, an immediate spot fine of **R 3,000.00 per occurrence** will apply and such monies will automatically be invoiced to the Lessee.
2. The contractor is to respect the operational environment in which their work will be performed. All conditions of approval are to be observed by the Lessee. A spot fine of **R2 500.00 per occurrence** of non-compliance will be charged to the Lessee.
3. Deposit for building works: A construction deposit of **R50,000.00** excl. VAT per month of construction is to be lodged with ACSA prior to work commencement. Penalties and spot fines will be reconciled against this deposit and the balance credit/debited to the Lessees account on completion of the project.

4. Deposit for cable installation: An installation deposit of **R10,000.00** excl VAT per week of installation is to be lodged with ACSA prior to work commencement. Penalties and spot fines will be reconciled against this deposit and the balance credit/debited to the Lessees account on completion of the installation.
5. Deposit for kiosk/marketing installations: An installation deposit of **R10,000.00** excl VAT per day of installation is to be lodged with ACSA prior to work commencement. Penalties and spot fines will be reconciled against this deposit and the balance credit/debited to the Lessees account.
6. The Contractor will lodge additional deposit payments once 50% of the initial deposit is used or risk having access to the site restricted.
7. All costs incurred to comply with the conditions stated are for the Contractor's account.

**3.1.9 GENERAL**

The ACSA lease administrator is to ensure that all the conditions of approval are adhered to and that documentary records are kept on file.

- Unless otherwise notified in writing the ACSA Project Leader is the ACSA lease/contract administrator.
- All conditions apply unless otherwise agreed to in writing.
- This document is to be read in conjunction with the contract governing ACSA's relationship with the contractor.

**Signatures:**

Lessee:

.....  
ACSA Property / Retail:

**Notified to:**

- ACSA IT
- ACSA Mechanical
- ACSA Electrical
- ACSA Safety
- ACSA Cleaning
- ACSA Security