Master Artwork

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Current Transformers for Protection and General Use on the 132 kV, 275 kV and 400 kV Systems

CONTENTS Page

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CURRENT TRANSFORMERS FOR PROTECTION AND GENERAL USE ON THE 132 kV, 275 kV AND 400 kV SYSTEMS

FOREWORD

This Specification defines the functional requirements for current transformers for protection and general use of maximum primary voltage rating 145, 300 and 420 kV for use on the National Grid Company (NGC) Transmission System. It supports the more general conditions defined in the companion documents NGTS 1 and NGTS 2.2.

1 SCOPE

This a Functional Specification for current transformers.

Functional requirements for settlement metering current transformers are separately specified in NGTS 3.2.6.

2 REFERENCES

This Specification makes reference to or must be read in conjunction with:

IEC 185	Current Transformers
IEC 694	Specification for Common Requirements for High Voltage Switchgear and Controlgear Standards
BS 3938	Specification for Current Transformers
NGTS 1	Overview, National Grid System
NGTS 2.1	Substations
NGTS 2.2	Switchgear for the National Grid System
NGTS 2.3	Transformers and Reactors for use on 132, 275 and 400 kV Systems
NGTS 2.6	Protection
NGTS 3.2.6	Current and Voltage Measurement Transformers for Settlement Metering of the 33 kV, 66 kV, 132 kV, 275 kV and 400 kV Systems

3 GENERAL REQUIREMENTS

In addition to the requirements of NGTS 1 and NGTS 2.2 the following clauses apply:

3.1 All Current Transformers

3.1.1 Current transformers shall be designed for a minimum service life of 40 years as detailed in NGTS 2.2 clause 3.1.1.

3.1.2 Current transformers shall be in accordance with IEC 185 (BS 3938).

3.1.3 Secondary ratings and transformation ratios shall be selected from the attached Schedules and shall be specified in the contract.

3.1.4 Current transformer cores shall be arranged in accordance with NGTS 2.1 Appendix B and the positioning of current transformers in the substation shall be in accordance with NGTS 2.1 Appendix C.

3.1.5 Secondary terminals and connections shall be suitable for their required purpose.

3.1.6 Secondary connections shall be identified in accordance with IEC 185 (BS 3938).

3.1.7 The rated continuous primary current of the current transformer shall be chosen to exceed the maximum continuous rating of the associated circuit and shall be selected from the standard values detailed in IEC 185 clause 4.

3.1.8 A thermal short-time current rating (I_{th}) shall be assigned to all current transformers in accordance with clause 8 of IEC 185. The value of I_{th} shall not be less than the corresponding value for the associated switchgear or transformer primary equipment.

3.1.9 For maintenance purposes, current transformer secondary wiring shall be provided with short-circuiting facilities remote from the current transformer.

3.2 Additional Requirements for Post-Type Current Transformers

3.2.1 External porcelain insulation and insulation co-ordination shall meet the requirements of NGTS 2.2.

3.2.2 An insulation test tap shall be provided for the purpose of performing capacitance and dielectric loss (tan δ) measurements of the primary insulation during routine maintenance. The test tap terminals shall be suitably identified.

3.2.3 A single secondary terminal box shall be mounted on the transformer to accommodate the necessary secondary terminal connections.

3.3 Additional Requirements for GIS Current Transformers

3.3.1 Current transformers shall be mounted internally or externally to the GIS enclosure. Adequate protection shall be provided for externally mounted current transformers.

3.3.2 The enclosures of externally mounted current transformers shall be in accordance with NGTS 2.1 clause 4.3.1.

3.4 Additional Requirements for Ring-Type Current Transformers for Oil Immersion (Transformer Application)

3.4.1 Current transformers mounted internally to transformers shall be capable of operating in an environment as detailed in NGTS 2.3.

3.4.2 Current transformers supplied as loose equipment for transformer application shall be equipped with secondary terminals or shall be supplied with leads of suitable length, capable of satisfying the test requirement of clause 5.1 (vii) of this Specification.

3.5 Additional Requirements for Measurement/Protection and Class P Protective Current Transformers

3.5.1 Measurement/protection and class P protective current transformers with a rated primary current of 2500 A or below and with untapped secondary windings shall have a rated secondary current of 1A (as selected from IEC 185 clause 5). The rated secondary current for current transformers of this primary rating with tapped secondary windings shall be 1 A corresponding to the highest transformation ratio.

3.5.2 Measurement/protection and class P protective current transformers with a rated primary current in excess of 2500 A shall have a rated secondary current selected from the values stated in IEC 185 clause 5.

4 PERFORMANCE REQUIREMENTS

4.1 General

All current transformers shall comply with the requirements of IEC 185 (BS 3938) for the primary ratings detailed in NGTS 1 and NGTS 2.2, and also with the following:

4.2 Protection Type A Current Transformers

Protection type A current transformers shall meet the performance requirements of Class X (BS 3938) and shall provide accurate transformation up to the maximum fault current rating of the associated main plant. This performance shall be maintained under both transient and steady-state conditions without saturation. Type A current transformers shall also meet the performance requirements of Schedule 9 of this Specification.

4.3 Protection Type B Current Transformers

Protection type B current transformers shall meet the performance requirements of Class X (BS 3938) and shall provide accurate steady-state transformation up to the maximum fault current rating of the associated main plant. Type B current transformers shall also meet the performance requirements of Schedule 9 of this Specification.

4.4 Dual Purpose Measurement/Protection Current Transformers

Current transformers intended for the dual purpose of measurement and protection shall meet the performance requirements of BS 3938 clause 4.1.1 and Schedule 9 of this Specification.

4.5 Interposing Current Transformers

Where a short duration overload capability is assigned to the main current transformers then the associated interposing current transformers shall be capable of carrying the corresponding current.

4.6 Line Drop Compensation Current Transformers

Line drop compensation current transformers shall comply with accuracy class 5 of IEC 185.

5 TESTING REQUIREMENTS

5.1 Type Tests

All current transformers shall be tested in accordance with IEC 185 (BS 3938). The following tests shall also be performed:

(i) Temperature Rise - The thermal time constant of all equipment shall be determined on both rising and falling temperature.

(ii) Radio Interference - RIV tests in accordance with IEC 694.

(iii) Accuracy at Short-Term Continuous Current Levels - Current transformers which have a measurement specification shall have their errors determined at a current of 12000 A for 420 kV rating and 7500 A for 300 kV rating respectively.

(iv) Leakage Test on Oil System - For current transformers using an oil insulation system, the supplier shall demonstrate leak-free performance of the transformer.

(v) Leakage Test on Gas System - For current transformers using a gas insulation system, the supplier shall demonstrate compliance with NGTS 2.2 clause 4.7.3.

(vi) Ring-type current transformers for transformer application shall be tested to simulate their immersion in transformer oil. The supplier shall propose a representative test for the agreement of NGC.

(vii) Current transformer leads as detailed in clause 3.4.2 of this Specification shall withstand a power frequency test voltage of 10 kV (peak).

Routine tests shall be performed before and after all type tests. No significant changes between these results is permitted.

5.2 Routine Tests

All current transformers shall be tested in accordance with IEC 185 (BS 3938). The following tests are also required:

(i) Capacitance / dielectric loss (tan δ) measurements over the voltage range 10 kV to rated voltage.

(ii) Measurement of the primary and secondary winding resistances.

6 APPROVAL PROCEDURE

Requirements for the approval of current transformers are as detailed in NGTS 2.2. Where required, Appendix A of this Specification shall be completed by the supplier in support of approval.

LIST OF SCHEDULES

SCHEDULE 1 - OVERHEAD LINE FEEDER CIRCUITS

System Voltage	Rated Current of Switchgear	Class X Protection Current Transformers			Measurement/Protection Current Transformers		
		Rated Continuous Thermal Current	Turns Ratio		Extended Primary Current Rating %		Rated Transformation Ratio
kV	A	A	Main	Busbar	Thermal	Accuracy	
275	2000	2000	1/600/1200	1/600/1200	170	420	1200/600/1
275	2500	2500	1/600/1200	1/600/1200	210	420	1200/600/1
400	4000	4000	1/1000/2000	1/2000	200	500	2000/1000/1

SCHEDULE 2 - SYNCHRONOUS COMPENSATORS ASSOCIATED WITH AUTO-TRANSFORMERS

Compensator Rating	Voltage	Current	Rated Current of Switchgear	Class X Protection Current Transformers					Measurement/Protection Current Transformers			
				Rated Continuous Thermal Current	Turns Ratio				Extended Primary Current Rating %		Rated Transformer Ratio	
MVA	kV	A	A	A	Main	REF*	UEF**	Connections	Thermal	Accuracy	Back Up	Reverse Power
60	13	2665	3000	3000	1/600	1/600	1/300	1/600	-	-	3000/5	3000/5

* REF - restricted earth fault

** UEF - unrestricted earth fault

SCHEDULE 3 - STATIC COMPENSATORS (REACTORS AND CAPACITORS) ASSOCIATED WITH AUTO-TRANSFORMERS

Compensator Rating	Voltage	Current	Rated Current of Switch-gear	Class X Protection Current Transformers					Measurement/Protection Current Transformers		
				Rated Continuous Thermal Current	Turns Ratio				Extended Primary Current Rating %		Rated Transformation Ratio
					HV Connections	Compensator Protection	REF*	UEF** and Instantaneous Earth Fault	Thermal	Accuracy	
MVA	kV	A	A	A							
60	13	2665	3000	3000	1/600	1/600	1/600	1/1500 #	-	-	3000/5
30+30	13	1335 + 1335	2000	2000	1/600	1/1500	1/1500	1/300 + 1/1500 #	-	-	3000/5

* REF - restricted earth fault

** UEF - unrestricted earth fault

\# A relay may be required

\+ 300/1 ratio to be specified when earth fault current is restricted to 300 A by NER.
1500/1 ratio to be specified when earth fault current is restricted by impedance of earthing transformer only.

SCHEDULE 4 - SERIES REACTORS

Rating	System Voltage	Current	Rated Current of Switchgear	Class X Protection Current Transformers			Measurement/Protection Current Transformers		
				Rated Continuous Thermal Current	Turns Ratio		Extended Primary Current Rating %		Rated Transformation Ratio
MVA	kV	A	A	A	Main	Busbar	Thermal	Accuracy	
90	132	395	800	800	1/500/1000	1/500/1000	-	-	1200/600/1
750	275	1575	2000	2000	1/600/1200	1/600/1200	170	170	1200/600/1
750	275	1575	2500	2500	1/600/1200	1/600/1200	210	210	1200/600/1
1320	400	1905	4000	4000	1/1000/2000	1/2000	200	200	2000/1000/1
2000	400	2890	4000	4000	1/1000/2000	1/2000	200	290	2000/1000/1

SCHEDULE 5 - SHUNT REACTORS

Rating	System Voltage	Current	Rated Current of Switchgear	Class X Protection Current Transformers					Measurement/Protection Current Transformers		
				Rated Continuous Thermal Current A		Turns Ratio			Extended Primary Current Rating Thermal and Accuracy %		Rated Transformation Ratio
MVA	kV	A	A	Located near Switchgear	Located in Bushing	Main Protection	Feeder Protection or if Applicable	Connections Protection if Applicable	Located near Switchgear	Located in Bushing	
100	275	210	2000	2000	500	1/600/1200	1/600/1200	1/600/1200	170	-	1200/600/1 *
100	275	210	2500	2500	500	1/600/1200	1/600/1200	1/600/1200	210	-	1200/600/1 *
200	400	290	4000	4000	500	1/1000	1/1000/2000	1/2000	200	-	2000/1000/1 *

* 0.5 A relay to be specified.

SCHEDULE 6 - BUS SECTIONS AND BUS COUPLERS

System Voltage	Rated Current of Switchgear	Class X Protection Current Transformers		Measurement/Protection Current Transformers		
		Rated Continuous Thermal Current	Turns Ratio	Extended Primary Curent Rating %		Rated Transformation Ratio
			Busbar			
kV	A	A		Thermal	Accuracy	
275	2000	2000	1/600/1200	170	420	1200/600/1
275	2500	2500	1/600/1200	210	420	1200/600/1
400	4000	4000	1/1000/2000	200	500	2000/1000/1

SCHEDULE 7 - AUTO TRANSFORMER CIRCUITS

Nominal Rating	System Voltage	Current	Rated Current of Switchgear	Class X Protection Current Transformers						Measurement/Protection Current Transformer				
				Rated Continuous Thermal Current A*		Turns Ratio				Extended Primary Current Rating %				Rated Transformation Ratio
						Main	HV and LV Connections	Busbar	Back Up LV	Thermal *		Accuracy **		
MVA	kV	A	A	Located near Sw/gear	Located in Bushing					Located near Sw/gear	Located in Bushing	Located near Sw/gear	Located in Bushing	
120	275	250	2500	2500	450	1/600/1200	1/600/1200	1/600/1200		210	-	210	-	1200/600/1
	132	530	800	800	800	1/600/1200	1/500/1000	1/500/1000	1/500/1000#	-	-	-	-	1200/600/1
180	275	380	2500	2500	660	1/600/1200	1/600/1200	1/600/1200		210	-	210	-	1200/600/1
	132	790	1250	1250	1200	1/600/1200	1/500/1000	1/500/1000	1/500/1000#	110	-	130	130	1200/600/1
240	275	500	2500	2500	870	1/600/1200	1/600/1200	1/600/1200		210	-	210	-	1200/600/1
	132	1050	2000	2000	1600	1/600/1200	1/500/1000	1/500/1000	1/500/1000#	170	135	180	180	1200/600/1
240	400	350	4000	4000	610	1/600/1200	1/1000/2000	1/2000		200	-	200	-	2000/1000/1
	132	1050	2000	2000	1600	1/600/1200	1/500/1000	1/500/1000	1/500/1000#	170	135	180	180	1200/600/1

* Designed to cater for 150% overload

** Designed to cater for 200% overload

\# At busbar stations where post-type CT housings are installed and LV connection protection is specified, the back-up protection is to be supplied from the Type A 1/600/1200 CT.

SCHEDULE 7 - AUTO TRANSFORMER CIRCUITS (Cont'd)

Nominal Rating	System Voltage	Current	Rated Current of Switchgear	Class X Protection Current Transformers						Measurement/Protection Current Transformer				
				Rated Continuous Thermal Current A*		Turns Ratio				Extended Primary Current Rating %				Rated Transformation Ratio
						Main	HV and LV Connections	Busbar	Back Up LV	Thermal *		Accuracy **		
MVA	kV	A	A	Located near Sw/gear	Located in Bushing					Located near Sw/gear	Located in Bushing	Located near Sw/gear	Located in Bushing	
500	400 275	720 1050	4000 2500	4000 2500	1100 1600	1/600/1200 1/600/1200	1/1000/2000 1/600/1200	1/2000 1/600/1200	1/600/1200	200 210	- 135	200 210	- 180	2000/1000/1 1200/600/1
750	400 275	1080 1580	4000 2500	4000 2500	1700 2500	1/600/1200 1/600/1200	1/1000/2000 1/600/1200	1/2000 1/600/1200	1/600/1200	200 210	- 210	200 270	110 270	2000/1000/1 1200/600/1
1000	400 275	1440 2100	4000 2500	4000 2500	2200 3200	1/600/1200 1/600/1200	1/1000/2000 1/600/1200	1/2000 1/600/1200	1/600/1200	200 210	110 270	200 350	150 350	2000/1000/1 1200/600/1

* Designed to cater for 150% overload.

** Designed to cater for 200% overload.

SCHEDULE 8 - TRANSFORMER NEUTRAL AND NEUTRAL END CURRENT TRANSFORMER UNITS FOR USE WITH SUPERGRID AUTO TRANSFORMERS AND SHUNT REACTORS

TABLE A - NEUTRAL CURRENT TRANSFORMERS

275/132 kV, 400/275 kV and 400/132 kV auto-transformers and 400 kV and 275 kV Shunt Reactors (11 kV primary insulation)

Type	Primary Conductor Rating for 3 secs (A)	Turns Ratio	Function
Transformer 275/132 kV (Up to 360 MVA)	8200	1/600/1200	At Least 2 Secondaries, Neutral Earth Fault Check, Fault recorder etc
Transformer 400/275 kV (Up to 1000 MVA)	6600	1/1000/2000	"
Transformer 400/132 kV (Up to 360 MVA)	10 600	1/1000/2000	"
Shunt Reactor 275 kV (Up to 100 MVA)	2100	1/600/1200	Neutral Earth Fault Check
Shunt Reactor 400 kV (Up to 200 MVA)	2900	1/1000/2000	"

SCHEDULE 8 (Cont'd)

TABLE B - NEUTRAL END CURRENT TRANSFORMERS (3 SINGLE PHASE WINDINGS STARRED)

275/132 kV, 400/275 kV and 400/132 kV auto-transformers and 400 kV and 275 kV Shunt Reactors (11 kV Primary Insulation)			
Type	Primary Conductor CMR (I_{hv} - I_{lv}) amp	Turns ratio	Function
Transformer 275/132 kV (Up to 360 MVA)	820	1/600/1200	Auto Transformer Overall Protection
Transformer 400/275 kV (Up to 1000 MVA)	660	1/600/1200	"
Transformer 400/132 kV (Up to 360 MVA)	1060	1/600/1200	"
Shunt Reactor 275 kV (Up to 100 MVA)	210	1/600/1200	Shunt Reactor Overall Protection
Shunt Reactor 400 kV (Up to 200 MVA)	290	1/1000	"

SCHEDULE 9 - TABLE OF PARTICULARS FOR 420 kV, 300 kV AND 145 kV CURRENT TRANSFORMERS

Reference Clauses	CT Designation	Ratio		Knee-Point Voltage (V_k) or IEC Rating and Class	Magnetising Current (mA)	Max Sec Res (ohms)
		Turns	Current			
4.2 to 4.4	420 kV, 4000 A					
	(i) Prot A	1/1000/2000		300 (R_{ct} + 7.5)		
	(ii) Prot B	1/2000		60 (R_{ct} + 5)	40 at $\frac{V_k}{2}$	5.0 at 75°C
	(iii) Prot B Special Ratio	1/600/1200		82 (R_{ct} +3)	60 at $\frac{V_k}{2}$	2.4 at 75°C
	(iv) Measure-ment/Protection	1/1000/2000	2000/1	30 VA Class 1 5P20		
			1000/1	30 VA Class 1 5P10		
4.2 to 4.4	300 kV, 2000 or 2500 A					
	(i) Prot A	1/600/1200		160 (R_{ct} + 7.5)		
	(ii) Prot B	1/600/1200		82 (R_{ct} + 3)	60 at $\frac{V_k}{2}$	2.4 at 75°C
	(iii) Measure-ment/Protection	1/600/1200	1200/1	30 VA Class 1 5P20		
			600/1	30 VA Class 1 5P10		

Note: For tapped current transformers the knee-point voltage, magnetising current and secondary resistance are specified for the full winding, shown underlined.

SCHEDULE 9 (Cont'd)

Reference Clauses	CT Designation	Ratio		Knee-Point Voltage (V_k) or IEC Rating and Class	Magnetising Current (mA)	Max Sec Res (ohms)
		Turns	Current			
4.2 to 4.4	145 kV, 2000A					
	(i) Prot A	1/600/<u>1200</u> 1/500/<u>1000</u>		50 (R_{ct} + 17) 60 (R_{ct} + 12)		
	(ii) Prot B	1/500/<u>1000</u>		95 (R_{ct} + 2.5)	60 at $\frac{Vk}{2}$	2.4 at 75°C
	(iii) Measure-ment/Protection	1/600/1200	1200/1	30VA Class 1 5P20		
			600/1	30VA Class 1 5P10		

Note: For tapped current transformers the knee-point voltage, magnetising current and secondary resistance are specified for the full winding, shown underlined.

APPENDIX A

INFORMATION TO BE SUPPLIED BY THE TENDERER

A1 GENERAL DETAILS

1	Manufacturer	
2	Type reference Drawing reference (s)	
3	Production commencement	
4	Type test report number (s)	
5	Test specification (s)	
6	Category and date of approval	

A2 GENERAL TECHNICAL DATA

1	Rated voltage	kV	
	Maximum operating voltage	kV	
2	Rated primary current	A	
3	Rated short-time current, thermal (1 second)	kA	
	Rated short-time current, dynamic (peak)	kA	
4	Capacitance / dielectric loss	pF	
5	Power frequency withstand voltage (dry/wet)	kV	
	Lightning impulse withstand voltage (dry)	kV	
	Switching impulse withstand voltage (dry/wet)	kV	
6	Admissible static load (primary terminals)	kN	
	Admissible dynamic load (primary terminals)	kN	
	Cantilever test load (primary terminals)	kN	
	Declared porcelain breaking strength	kNm	
7	Insulation test tapping (Yes/No)		
8	Porcelain insulator creepage distance	mm	
	Porcelain insulator arcing distance	mm	
9	Primary insulation:		
	(a) Insulating medium		
	(b) Quantity	m^3	
	(c) Type of insulating oil (if applicable)		
	(d) Gas insulation (if applicable)		
	(i) Maximum operating pressure	MPa	
	(ii) Minimum operating pressure	MPa	
	(iii) Normal operating pressure	MPa	
	(iv) Leakage rate	torr l/s	
	(v) Maximum permissible dew point temperature	°C	
10	Total Weight	kg	

A3 TRANSFORMER SECONDARY DETAILS

Winding Number	1	2	3	4	5
Ratio					
Secondary current (A)					
Rated burden (VA)					
Measurement class					
Protection class					
Extended current rating (A)					

Date 04 June 1996

Our Ref

Your Ref

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ENGINEERING DOCUMENT DESPATCH

Please find enclosed the following document(s) for insertion into your NGTS 2.2 ring-binder:

NGTS 3.2.9 Issue 1
Post Insulators for Substations

Number of copies: 10

Please confirm receipt of the above document(s) by either returning a photocopy of this letter to the above address, or via E-mail to JSC at BURYMEAD.

PP D Cooper

JONATHAN COOPER
Administration Services

NMS 3.2.9 Issue 1

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C FERGUSON
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QA - CALVERLEY
TSD Business Man.
TSD Ops Man.
TSD TxC Man.

Sent on 11/6/96.

32/11274	1	A	32/11274	132kV Static - Capacitor Maintenance Vehicle Store General arrangement and details **
32/10908	1	0	32/10908	275kV substation static capacitors switch hpuse details Sheet 4
32/10907	1	A	32/10907	13kV switch house general details - sheet 2 **
32/10906	1	A	32/10906	13kV switch-house sheet 1 details - General. **
32/10905	1	C	32/10905	13kV switch-house general arrangement **
32/10904	1	A	32/10904	Reactive compensator compound - Plant building **
32/10227	1	3	X2578120	Current transformer assembly in High voltage housing. **
32/10226	1	1	X2430616	Current transformer housing. **
32/10216	1	0	07065/2	Detail of builders work showing pockets required. **
32/10215	1	0	07065/1	Proposed arrangement of pipework and equipment and details of builders work. **

DNO	SHT	REV	ORIG_NO	TITLE
32/8830	1	2	A2399051	Compressor room foundation plan. **
32/8809	1	0	D2/4393/5	Partitions at first floor
32/8807	1	0	DP85	Lighting heating and power for oil plant building. **
32/8773	1	0	G/M228/2	Details of Timber frames
32/8772	1	0	G/M228/1	Warm air ductwork details
32/8771	1	0	D2/4393/3	Substation control building
32/8770	1	0	D2/4393/2	Substation control building
32/8733	1	A	32/8733	132kV substation elevations of oil plant building. **
32/8732	1	B	32/8732	132kV substation details of oil plant building. **
32/8731	1	A	32/8731	275kV substation elevations of plant building. **
32/8730	1	C	32/8730	275kV substation - Details of plant building. **
32/8572	1	0	SK1792	Foundation location Rolls Royce C6NFL brush SOA 7-25 alternator. **
32/7849	1	3	E5440315	OPR and tank foundations. **
32/7507	1	0	8/782/2/A	Detail layout of computer room floor panels. first floor **

DNO	SHT	REV	ORIG_NO	TITLE
32/7506	1	0	8/782/2/B	Layout of computer floor panels **
32/7505	1	0	8/782/2/C	Building details **
32/6934	1	G	32/6934	275/132kV substation control building sections **
32/6753	1	0	32/6753	Details of prefabricated light building mark II **
32/6733	1	0	32/6733	275/132kv substation control building modification to control room floor **
32/6719	1	0	32/6719	Isometric view of rationalised control building **
32/6717	1	0	32/6717	Metering master clock mounting details **
32/6699	1	0	32/6699	Foundation details and location of site hut **
32/6695	1	K	32/6695	275/132kV substation control building ground floor plan and foundation details **
32/6679	1	J	32/6679	275/132kV substation control building - First floor plan and roof plan **
32/6616	1	G	32/6616	275/132kV substation control building plans and elevations **

DNO	SHT	REV	ORIG_NO	TITLE
32/5123	1	0	32/5123	Relay building additional access to relay room **
32/5072	1	A	32/5072	Relay building extension - Elevations **
32/4631	1	A	32/4631	Relay building extension **
32/3811	1	A	32/3811	Relay building additional trenchwork **
32/3216	1	0	32/3216	275kV substation - Details of modifications to existing relay building **
32/3194	1	C	32/3194	275kV substation oil plant building - Plan and sections **
32/3193	1	A	32/3193	275kV substation oil plant - Building elevations **
32/3192	1	A	32/3192	275kV substation oil plant building - Building details **
32/2674	1	A	32/2674	Relay buiding elevations. **
32/2670	1	A	32/2670	Relay building, Details of windows and door surrouds. **
32/2669	1	A	32/2669	Relay building details. **
32/2668	1	A	32/2668	Relay building sections. **

DNO	SHT	REV	ORIG_NO	TITLE
32/2667	1	A	32/2667	relay building plan showing clerestery lighting. **
32/2666	1	B	32/2666	Relay building general plan. **
32/2367	1	0	66.1/2.239	Details of 11kV switch house
32/151	1	J	33.1/134.24	Arrangement of building to accomodate auxiliary equipment, stores, offices and etc **
32/127	1	0	32/127	Single circuit tower type S2. **
31/67106	1	B	AB06	GENERAL ARRANGEMENT SURGE ARRESTER STRUCTURE Norton s/s
31/67105	1	A	AA03/T1/L1	GENERAL ARRANGEMENT OF ACCESS LADDER Norton s/s
31/67104	1	A	AA03/T1	GENERAL ARRANGEMENT SINGLE BAY GANTRY TOWER T1 Norton s/s
31/67103	1	A	AA3/G1	GENERAL ARRANGEMENT CROSS GANTRY G1 FOR SINGLE SPAN GANTRY AA03
31/67102	1	A	AA01/T2/SC1	GENERAL ARRANGEMENT OF INTER BAY SCREEN FOT TOWER T2 STRUCTURE AA01 Norton s/s
31/17310	1	A	63321KA60328	General Assembly support structure MKIV & V CVT
31/16847	1	A	F201484	Frame Assembling T155 Point D ##

DNO	SHT	REV	ORIG_NO	TITLE
31/16846	1	A	F200980	Charpente T155 Components of Frame ##
31/16845	1	B	F201467	Frame Assembling T155. Slippering Support Support Tripolaire Glissant (Fluoduc Superpose) ##

32/11274	1	A	32/11274	132kV Static - Capacitor Maintenance Vehicle Store General arrangement and details **
32/10908	1	0	32/10908	275kV substation static capacitors switch hpuse details Sheet 4
32/10907	1	A	32/10907	13kV switch house general details - sheet 2 **
32/10906	1	A	32/10906	13kV switch-house sheet 1 details - General. **
32/10905	1	C	32/10905	13kV switch-house general arrangement **
32/10904	1	A	32/10904	Reactive compensator compound - Plant building **
32/10227	1	3	X2578120	Current transformer assembly in High voltage housing. **
32/10226	1	1	X2430616	Current transformer housing. **
32/10216	1	0	07065/2	Detail of builders work showing pockets required. **
32/10215	1	0	07065/1	Proposed arrangement of pipework and equipment and details of builders work. **

DNO	SHT	REV	ORIG_NO	TITLE
32/8830	1	2	A2399051	Compressor room foundation plan. **
32/8809	1	0	D2/4393/5	Partitions at first floor
32/8807	1	0	DP85	Lighting heating and power for oil plant building. **
32/8773	1	0	G/M228/2	Details of Timber frames
32/8772	1	0	G/M228/1	Warm air ductwork details
32/8771	1	0	D2/4393/3	Substation control building
32/8770	1	0	D2/4393/2	Substation control building
32/8733	1	A	32/8733	132kV substation elevations of oil plant building. **
32/8732	1	B	32/8732	132kV substation details of oil plant building. **
32/8731	1	A	32/8731	275kV substation elevations of plant building. **
32/8730	1	C	32/8730	275kV substation - Details of plant building. **
32/8572	1	0	SK1792	Foundation location Rolls Royce C6NFL brush SOA 7-25 alternator. **
32/7849	1	3	E5440315	OPR and tank foundations. **
32/7507	1	0	8/782/2/A	Detail layout of computer room floor panels. first floor **

DNO	SHT	REV	ORIG_NO	TITLE
32/7506	1	0	8/782/2/B	Layout of computer floor panels **
32/7505	1	0	8/782/2/C	Building details **
32/6934	1	G	32/6934	275/132kV substation control building sections **
32/6753	1	0	32/6753	Details of prefabricated light building mark II **
32/6733	1	0	32/6733	275/132kv substation control building modification to control room floor **
32/6719	1	0	32/6719	Isometric view of rationalised control building **
32/6717	1	0	32/6717	Metering master clock mounting details **
32/6699	1	0	32/6699	Foundation details and location of site hut **
32/6695	1	K	32/6695	275/132kV substation control building ground floor plan and foundation details **
32/6679	1	J	32/6679	275/132kV substation control building - First floor plan and roof plan **
32/6616	1	G	32/6616	275/132kV substation control building plans and elevations **

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32/5123	1	0	32/5123	Relay building additional access to relay room **
32/5072	1	A	32/5072	Relay building extension - Elevations **
32/4631	1	A	32/4631	Relay building extension **
32/3811	1	A	32/3811	Relay building additional trenchwork **
32/3216	1	0	32/3216	275kV substation - Details of modifications to existing relay building **
32/3194	1	C	32/3194	275kV substation oil plant building - Plan and sections **
32/3193	1	A	32/3193	275kV substation oil plant - Building elevations **
32/3192	1	A	32/3192	275kV substation oil plant building - Building details **
32/2674	1	A	32/2674	Relay buiding elevations. **
32/2670	1	A	32/2670	Relay building, Details of windows and door surrouds. **
32/2669	1	A	32/2669	Relay building details. **
32/2668	1	A	32/2668	Relay building sections. **

DNO	SHT	REV	ORIG_NO	TITLE
32/2667	1	A	32/2667	relay building plan showing clerestery lighting. **
32/2666	1	B	32/2666	Relay building general plan. **
32/2367	1	0	66.1/2.239	Details of 11kV switch house
32/151	1	J	33.1/134.24	Arrangement of building to accomodate auxiliary equipment, stores, offices and etc **
32/127	1	0	32/127	Single circuit tower type S2. **
31/67106	1	B	A806	GENERAL ARRANGEMENT SURGE ARRESTER STRUCTURE Norton s/s
31/67105	1	A	AA03/T1/L1	GENERAL ARRANGEMENT OF ACCESS LADDER Norton s/s
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THE NATIONAL GRID COMPANY PLC

NATIONAL GRID TECHNICAL SPECIFICATIONS

TRANSMISSION PLANT SPECIFICATION (APPLICATION)

FINAL APPROVAL 792

Jon
6 June
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GROUP Switchgear & Power Electronics

TITLE Post Insulators for Substn

NUMBER NGTS 3.2.9 Issue 1 May '96

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3. Authorisation	Mike Humphries (General Manager) Technology & Science Division	M B Humphries - subject to marked up changes	MBH
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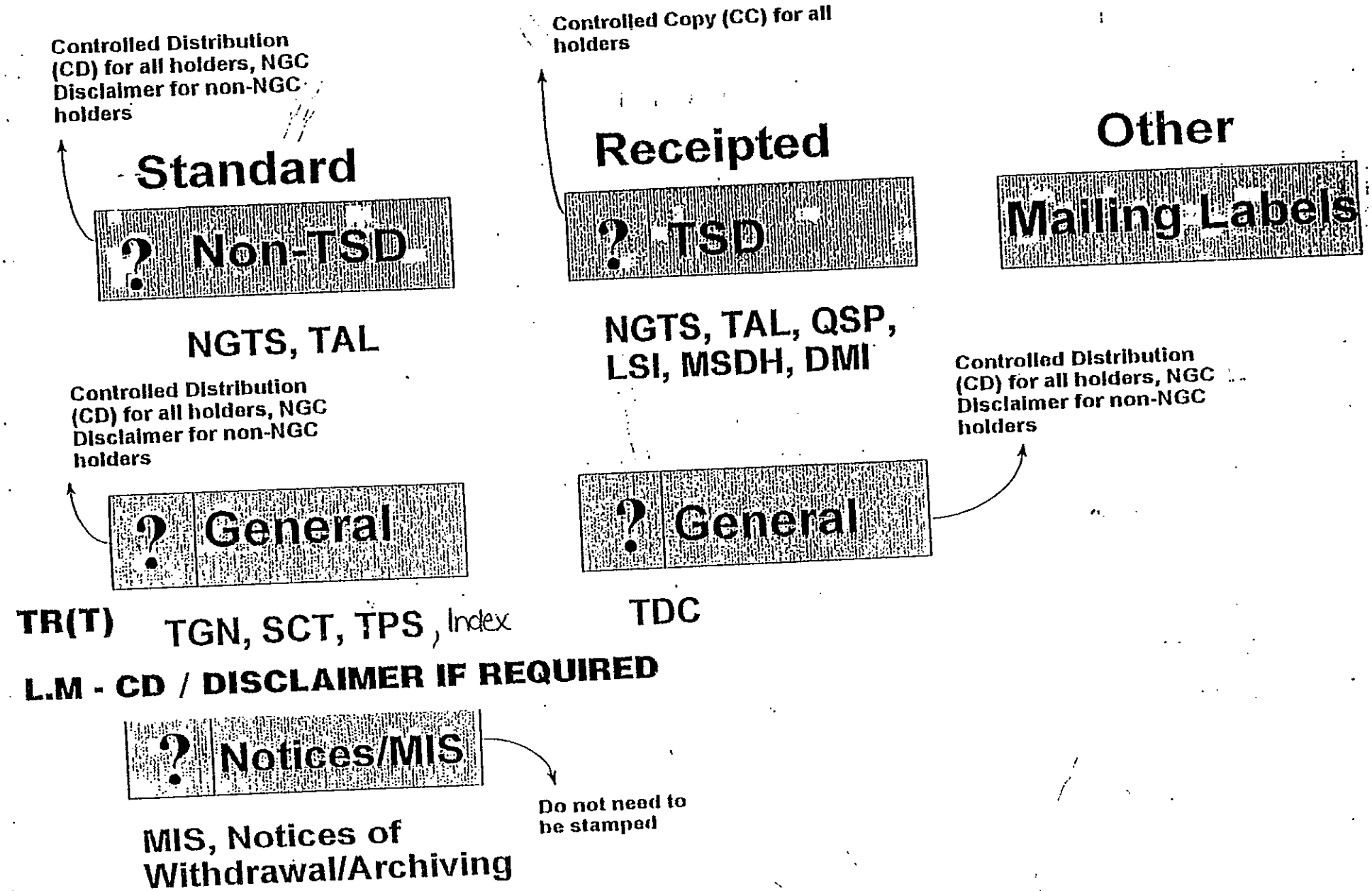
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TRANSMISSION PLANT SPECIFICATION (APPLICATION)

FINAL APPROVAL

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TITLE CURRENT TRANSFORMERS FOR PROTECTION & GENERAL USE

NUMBER NGTS 3.2.4

ISSUE 3

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