MAHARASHTRA STATE ELECTRICITY DISTRIBUTION COMPANY LTD

SCHEDULE ' A'

(26-03-2008)

TECHNICAL SPECIFICATION

FOR

11 kV & 22 kV

(PROTECTION & METERING)

INSTRUMENT TRANSFORMERS

FOR

VARIOUS CONSUMERS

IN

MAHARASHTRA

(SPECIFICATION NO.: DIST/ MM/I/ 11& 22 kV CT & PT/2008)

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INDEX

SCHEDULE ' A '
TECHNICAL SPECIFICATION FOR INSTRUMENT TRANSFORMERS
(SPECIFICATION NO.: DIST/ MM/I/ 11& 22 kV CT & PT/2008)

1.0 SCOPE:

1.1 This specification covers design, manufacture, assembly, testing at manufacturer's works, packing and delivery of outdoor instrument transformers for protection and metering services in 11 kV & 22 kV substations in Maharashtra State (India).

1.2 It is not the intent to specify completely herein all details of the design and construction of equipments. However, the equipment shall conform in all respects to high standards of engineering, design and workmanship mentioned in clause 4.0 and shall be capable of performing in continuous commercial operation up to the supplier's guarantee in a manner acceptable to the purchaser, who will interpret the meanings of drawings and specification and shall have the power to reject any work or material which, in his judgment, is not in accordance therewith.

1.3 The equipments offered shall be complete with all components necessary for their effective and trouble free operation. Such components shall be deemed to be within the scope of supplier's supply irrespective of whether those are specifically brought out in this specification and/or the commercial order or not.

2.0 SERVICE CONDITIONS:

2.1 Equipment to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

2.1.1	Maximum ambient temperature in open air (°C):	50.00
2.1.2	Maximum ambient temperature in shade (°C)	45.00
2.1.3	Minimum temperature in shade(°C):	03.50
2.1.4	Relative humidity (%)	10 to 100
2.1.5	Maximum annual rainfall (mm)	1450
2.1.6	Maximum wind pressure (Kg/ Sqmtr)	150
2.1.7	Maximum altitude above mean sea level (Mtrs)	1000
2.1.8	Isoceraunic level (days/year)	50
2.1.9	Seismic level (Horizontal acceleration)	0.3 g.
2.1.10	General nature of climate :	Moderately hot and humid tropical climate, conducive to rust and fungus growth.

3.0 STANDARDS

Unless otherwise specified elsewhere in this specification, the rating, performance and testing of the instrument transformers and accessories shall conform to the latest revisions, of all relevant standards listed in Annexure-II (A & B).

4.0 PRINCIPAL TECHNICAL PARAMETERS:

The Current transformers and Voltage transformers covered in this specification shall meet the technical requirements listed in Annexure IIIA & IIIB respectively.

5.0 GENERAL TECHNICAL REQUIREMENTS:

5.1 COMMON FOR ALL INSTRUMENT TRANSFORMERS

5.1.1. The insulation of the current / potential transformers shall be so designed that the internal insulation shall have higher electrical withstand capability than the external insulation. The designed dielectric withstand values of external and internal insulations shall be clearly brought out in the GTP (Guaranteed Technical particulars). The dielectric withstand values specified in this specification are meant for fully assembled instrument transformer.

5.1.2 PORCELAIN HOUSING:

5.1.2.1. The porcelain housing shall be of a single piece construction without any joint or coupling .The housing shall be made of homogeneous, vitreous porcelain of high mechanical and dielectric strength. Glazing of porcelain shall be of uniform brown or dark brown colour with a smooth surface arranged to shed away rainwater or condensed water particles (fog.). The profile of porcelain shall be aerodynamic type as per IEC 815.

5.1.2.2. The vertical clearance of porcelain housing shall be atleast 370mm & 450 mm for 11 kV & 22 kV respectively.

5.1.2.3. Details of attachment of metallic flanges to the porcelain for pressure release valve, and primary/secondary terminals shall be brought out in the offer.

5.1.2.4. Nuts and bolts or screws used for the fixation of inter facing porcelain component for taking out the terminals shall be provided on flanges and not on porcelain.

5.1.3 METAL TANKS:

5.1.3.1. The metal tanks shall have bare minimum number of welded joints so as to minimize possible locations of oil leakage. The metal tanks shall be made out of mild steel. The thickness of metal tank shall be minimum 3.00 mm. Actual thickness provided shall be specified by the tenderer.

5.1.3.2. The bottom of the tank shall be adequately accessible for periodical maintenance of open surface.

5.1.4. SURFACE FINISH :

The metal tanks shall be coated with atleast two coats of zinc rich epoxy painting. All the ferrous hardware, exposed to atmosphere, shall be hot dip galvanized. All other fixing nuts, bolts, washers in the electrical current path shall be made out of stainless steel.

5.1.5. INSULATING OIL:

Insulating oil required for first filling of the instrument transformer shall be covered in bidder's scope of supply. The oil shall meet the requirements of latest edition of IS- 335. The equipment shall be completely oil filled type and use of insulating materials such as quartz and marble etc. is not permissible.

5.1.6. PREVENTION OF OIL LEAKAGES & ENTRY OF MOISTURE:

5.1.6.1. As specified elsewhere in this specification, the instrument transformer shall be guaranteed for a trouble free and maintenance - free performance for a period as specified. Therefore, the bidder shall ensure that the sealing of instrument transformer is properly achieved. In this connection the arrangement provided by the bidder at various locations including the following ones shall be described, supported by sectional drawings.

i) Locations of emergence of primary and secondary terminals.

ii) Interface between porcelain housing and metal tanks

iii) Cover of the secondary terminal box

5.1.6.2. Nuts and bolts or screws used for fixation of the interfacing porcelain bushings for taking out terminals shall be provided on flanges cemented to the bushings and not on the porcelain.

5.1.6.3. For gasket joints, wherever used nitrite butyl rubber gaskets shall be used. The gasket shall be fitted in properly machined groove with adequate space for accommodating the gasket under compression.

5.1.7. OIL LEVEL INDICATORS:

5.1.7.1. For compensation of variation in volume of the oil due to temperature variation, nitrogen cushion or Stainless Steel bellows shall be used. Rubber diaphragms shall not be permitted for this purpose.

5.1.7.2. Instrument transformer provided with nitrogen cushion for Compensation of oil volume variation shall be provided with prismatic type oil sight window at suitable location so that the oil level is clearly visible with naked eye to an observer standing at ground level. If metal bellow is used for the above purpose, a ground glass window shall be provided to monitor the position of metal bellow.

5.1.8. EARTHING:

Metal tank of the instrument transformer shall be provided with two separate earthing terminals for bolted connection to 50 mm x 8 mm MS flat to be provided by the purchaser, for connection to station earth-mat. The size of two numbers of earthing terminals shall be 16 mm dia x30 mm length, HDG, with one plain washer and one nut.

5.1.9. Instrument transformers shall be provided with suitable lifting arrangement, to lift the entire unit. The lifting arrangement (lifting eye) shall be positioned in such a way as to avoid any damage to the porcelain housing, primary terminals or the tanks during the process of lifting for installation/transport. The general arrangement drawing shall show clearly. the lifting arrangements provided such as lifting eye, lug, guides etc.

5.1.10. NAME PLATE:

The instrument transformer shall be provided with non-corrosive, legible nameplates, with the information specified in relevant standards, duly engraved/punched on it and shall be attached to the main tank , forming integral part of the instrument transformer , as per enclosed sketch No. G3-584-01 and G3-585-01 for Metering CT and PT respectively.

5.1.11. Mounting details for fixing the instrument transformer on purchaser's supporting structure shall be strictly in accordance with the mounting details shown in enclosed sketch No. G3-583-01 . Base M.S.channels of

75 mm x 40 mm x 5 mm of instrument transformers shall have four equidistant holes at 350 plus or minus 5 mm center.

5.1.12. The terminal connectors required for connection of the instrument transformer to purchaser's bus bar, shall be arranged by the purchaser.

5.1.13. Enamel, if used for conductor insulation, shall be either polyvinyl acetate type or amide type and shall meet the requirements of IS- 4800. Polyester enamel shall not be used. Double cotton cover, if used, shall be suitably covered to ensure that it does not come in contact with oil.

5.1.14. Oil filling and/or oil sampling cocks, if provided to facilitate factory processing, shall be permanently sealed before dispatch of the Instrument Transformers.

5.1.15. Test Tap shall not be provided.

5.2. CURRENT TRANSFORMER (C.T.):

5.2.1. The C.T. shall be of dead tank design and shall be so constructed that it can be easily transported to site within the allowable transport limitation, even in horizontal position, if the transport limitation so demands. The C.T. shall be hermetically sealed and method of such sealing shall be detailed in the offer and shall be subject to the approval of the Purchaser.

5.2.2. The C.T. secondary terminals shall be brought out in a weatherproof terminal box. The terminal box shall be provided with removable plate and cable glands. The cable glands shall be suitable for 1100 volts grade PVC insulated, PVC sheathed multi core stranded 6 sq.mm copper conductor cable. This terminal box shall be dust and vermin proof. The dimensions of the terminal box and its opening shall be adequate to enable easy access and working space with the use of normal tools.

5.2.3. Polarity shall be invariably marked in each primary and secondary terminal. Facility shall be provided for short circuiting and grounding of the CT secondary terminals inside the terminal box.

5.2.4. The CT shall be provided with a rating plate with dimensions and marking as per IS- 2705. The markings shall be punched and not painted.

The serial number and code of the supplier shall also be punched on the tank to identify the unit in case of loss or damage to the rating plate.

5.2.5. The Current Transformer shall be vacuum filled with oil after processing and thereafter hermitically sealed to eliminate breathing and to prevent air and moisture entering into the tank. Oil filling and/or oil sampling cocks, if

provided to facilitate factory processing should be permanently sealed before dispatching the CT. The method adopted for hermetic sealing shall be described in the offer.

5.2.6. The casting of base collar etc. shall be die-cast and tested before assembly to detect cracks and voids if any.

5.2.7. The instrument security factor of metering core shall be low enough, but not greater than 5. This shall be demonstrated on all the ratios of metering core in accordance with procedure specified in IEC-185 or IS-2705.

5.2.8 PRIMARY WINDING:

5.2.8.1. Primary winding shall be bar type or wound type made out of high conductive copper. Specific reasons for selection of particular metal/alloy and its merits shall be clearly brought out in the offer. Conductors used for the primary winding shall be rigid or housed in rigid metallic shell. Unavoidable joints in the primary winding shall be welded type. The details of such welded joints shall be indicated in the drawings submitted with the offer. For primary winding, current densities shall not exceed the limit 1.65 A/Sq.mm. for highest current ratio.

The design density for short circuit current as well as conductivity of the metal used for primary winding shall meet the relevant requirement of IS-2705. The tenderer shall, in his offer furnish detailed calculations for selection of winding cross sections.

The cross section area of primary winding , cross section area of secondary winding, number of primary turns , number of secondary turns, current density etc. shall be mentioned by the tenderer.

5.2.8.2 The primary winding shall be designed for extended primary current at 120% of rated primary current.

5.2.9 PRIMARY TERMINALS:

Primary terminal shall be made out of 1 rod (stud) of 30 mm dia x 80 mm length. The primary terminal shall be of heavily tinned electrolytic copper of 99.9% conductivity. The minimum thickness of tinning shall be 15 microns.

5.2.10 SECONDARY WINDING:

Suitably insulated copper wire of electrolytic grade shall be used for secondary windings. Type of insulations used shall be described in the offer. For multi-ratio design, the multi-ratio shall be achieved by reconnection of the secondary windings.

5.2.11. The excitation current of the CT shall be as low as possible. The tenderer shall furnish, along with his offer, the magnetizing curves for all the cores.

5.2.12. SECONDARY TERMINALS:

Secondary terminal studs shall be provided with atleast 3 nuts and adequate plain and spring washer for fixing the leads. The studs, nuts and washer shall be made of brass duly nickel-plated. The minimum outside diameter of stud shall be 6 mm. The length of atleast 15 mm shall be available on the studs for inserting the leads. Horizontal spacing between centres of adjacent studs shall be atleast 1.5 times the circum dia of the nuts.

5.2.13. The current transformer shall be provided with CT ratio changing facility on secondary side only.

5.2.14. Current transformer characteristic shall be such as to provide satisfactory performance for burdens ranging from 25 % to 100% of rated burden over a range of 5 % to120% of rated current in case of metering CTs and up to accuracy limit factor / knee point voltage in case of protection CTs.

5.2.15. Expansion chamber at the top of porcelain insulator should be suitable for expansion of oil.

5.2.16. Following accessories / fittings shall, but not restricted to, be supplied along with the Current Transformers.

(i) Pressure release device.
(ii) Oil level indicator.
(iii) Lifting lugs.
(iv) The CT shall be so constructed that it can be easily transported to the site within the allowable transport limitations even in horizontal position, if the transport limitations so demand.

5.3 POTENTIAL TRANSFORMER (PT):

5.3.1 The PT shall be vacuum filled with oil after processing and hermetically sealed to eliminate breathing and to prevent air and moisture entering the tanks. Method adopted for hermetic sealing shall be described in the offer and shall be subject to approval of the purchaser.

5.3.2 The PT shall be so constructed that it can be easily transported to site within the allowable transport limitations, even in horizontal position, if the transport limitations so demand.

5.3.3 PRIMARY WINDING:

5.3.3.1. Primary winding shall be made of suitably insulated electrolytic copper wire. Type of insulation used shall be described in the offer. The neutral end of primary winding shall be earthed internally. The method of achieving uniform distribution of surge voltage stress on primary winding shall be given clearly in the offer. There will not be fuse for primary windings.

5.3.3.2. The rating and the diagram plates specified elsewhere in this specification should also indicate the above reconnection arrangement.

5.3.4 SECONDARY WINDING:

5.3.4.1 Suitably insulated copper wire of electrolytic grade shall be used for secondary windings. Type of insulation used shall be described in the offer. There will not be fuse for secondary windings.

5.3.4.2 The PT secondary terminal shall be brought out to a weatherproof terminal box. The terminal box shall be provided with removable gland plate and cable glands suitable for 1100 volts grade PVC insulated, PVC sheathed multi-core 4 sq.mm. stranded copper conductor cable. The terminal box shall be dust and vermin proof. Suitable arrangement space heater shall be provided for drying the air inside the terminal box. The dimensions of the opening of terminal box shall be adequate to enable easy access and working space with the use of normal tools.

5.3.4.3 Polarity shall be invariably marked at the secondary terminals in the terminal box.

5.3.5. The PT shall be provided with a rating plate with dimensions and markings as per IS- 3156. The markings shall be punched and not painted.

5.3.6. PRIMARY TERMINALS:

The primary terminal shall be of size 30 mm dia x 80 mm length for all PTs. The primary terminal shall be of heavily tinned electrolytic copper of 99.9% conductivity. The minimum thickness of tinning shall be 15 microns.

5.3.7 SECONDARY TERMINALS:

For external connection of secondary windings, terminal studs shall be provided with atleast 3 nuts and adequate plain and spring washers. The studs, nuts and washers shall be of brass properly nickel-plated. The size of stud shall be 6 mm outside dia. A length of alteast 15 mm shall be available on the studs for inserting the leads. Horizontal spacing between the centers of adjustant stud shall be atleast 1.5 times the circum dia of the nuts.

6.0. TESTS

6.1. TYPE TESTS:

6.1.1. The equipment / material offered in the tender should have been successfully type tested in line with the relevant Indian standards and technical specification, within the last five years from the date of opening of the tender. The bidder shall be required to submit copies of the type test report alongwith the offer, without which the offer shall be liable for rejection.

6.1.2. The list of type tests required to be conducted on the offered equipment is as per Annexure-I for CT/PT*. In respect of these tests, if the reports are already approved by the Chief Engineer (Dist) Section against past Purchase Order, the reports of such tests need not be furnished alongwith offer. Only the copy of approval letter shall be furnished. If the approved test reports are for tests carried out earlier than 5 years, all the type tests as per relevant standards shall be carried out, and result submitted for approval of type test, before commencement of supply. Undertaking to this effect shall be furnished alongwith the offer without which the offer shall be liable for rejection.

*The type test shall be carried out at Laboratories accredited by National Accreditation Board for testing and calibration Laboratories (NABL).

6.1.3. The Purchaser reserves the right to conduct tests included in the list of type tests as per IS on requisite number of samples / items from any of the lots during the tenure of the supply at purchaser's cost in the presence of Purchaser's representative. If the equipment / material does not withstand the type test, then the equipment / material supplied till then will be liable for rejection. The supplier, in such an eventuality shall be allowed to modify the equipment and type test the same again at his cost in the presence of the purchaser's representative. These type tests shall however be conducted by the supplier within a reasonable time. After successful passing of the type tests, all the equipments / material supplied earlier shall be modified in the line with equipment / materials which has successfully passed the type test. In case supplier fails to carry out the type test within reasonable time or does not agree to carry out the type test at his cost, his equipment/ materials supplied earlier shall be rejected and order placed shall be cancelled and payments made earlier for these suppliers shall be recovered by the purchaser.

6.2 Acceptance and Routine Tests

6.2.1 All acceptance and routine tests as stipulated in the relevant standards shall be carried out by the supplier in presence of purchaser's representative.

6.2.2 Immediately after finalization of the programme of type /acceptance /routine testing, the supplier shall give three weeks advance intimation to the purchaser, to enable him to depute his representative for witnessing the tests.

7. INSPECTION:

7.1 The inspection may be carried out by the purchaser at any stage of manufacture. The successful bidder shall grant free access to the purchaser's representative at any reasonable time when the work is in progress. All facilities must be made available by supplier/ manufactures for unrestricted inspection of the works, raw material, manufacture of all the accessories and for conducting necessary tests as declared herein.

7.2 The supplier shall keep the purchaser informed, in advance, of the time of starting and of the progress of manufacture of equipment in its various stages so that arrangement should be made for inspection.

7.3. No material shall be dispatched from its point of manufacture unless the material has been satisfactorily inspected and tested.

7.4. Inspection and acceptance of any equipment under this specification by the purchaser shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specification and shall not prevent subsequent rejection, if the equipment is found to be defective.

8.0. QUALIFYING REQUIREMENTS:

8.1. The tenderer should have proven experience of not less than 5 years in design, manufacture, supply, and testing at works for the equipment /material offered of equal or higher voltage class. The equipment / material offered by the tenderer should be in successful operation atleast for 2 years as on the date of submission of the tender.

8.2. The bidder not meeting the requirement at Clause No.8.1 can also participate provided they have valid on going collaboration with a manufacturer who has alteast 10 years experience in the design, manufacture and testing of equipment of the type and class offered, which have been in satisfactory service for a period of atleast 7 years. In such an event, the bidder shall have to furnish alongwith the bid, the documentary evidence for the same and undertaking from the bidder and collaborator accepting joint and several liability for all obligations under the contract.

8.3. The bidder should have adequate in-house testing facilities for conducting acceptance test in accordance with relevant IS.

8.4. The bidder should have a minimum turnover of 60% of the value of the material offered in any one financial year during the previous three years.

8.5. The bidder should furnish all the relevant documentary evidence to establish the fulfillment of the above requirement.

8.6. The bidder who does not meet the above qualifying requirement of experience (Clause No.8.1 and 8.2) may be considered for a “Trial Order” subject to fulfilling the following requirement alongwith Clause 8.3 to 8.5.

a) The bidder should have type tested the equipment offered.

b) The bidder shall have the basic infrastructure for the design, manufacture and supply of the item offered, like machinery, technical manpower and production capacity etc.

c) The purchaser is satisfied with the designing, manufacturing, supplying and financial capacities of the bidder, after inspecting the supplier’s work.

8.7. Notwithstanding anything stated above, the purchaser’s decision in this regard will be final.

9.0. QUALITY ASSURANCE PLAN:

9.1. The tenderer shall invariably furnish the following information alongwith his offer, failing which his offer shall be liable for rejection. Information shall be separately given for each type instrument transformer.

i) Statement giving list of important raw materials, including but not limited to:

a) Conductor

b) Insulation

c) Core

d) Porcelain

e) Oil

f) Sealing material

g) Insulated wire

Names of sub suppliers for the raw materials, list of standards according to which the raw materials are tested, list of tests normally carried out on raw materials in presence of bidder's representative, copies of test certificates.

(ii) Information and copies of test certificates as in (i) above in respect of bought out accessories.

(iii) List of manufacturing facilities available. In this list the bidder shall specifically mention whether lapping machine, vacuum drying plant, air-conditioned dust free room with positive air pressure for provision of insulation, oil leakage testing facility, facility for testing tan delta of insulation at rated voltage etc.are available.

(iv) Level of automation achieved and list of areas where manual processing still exists.

(v) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.

(vi) Special features provided in the equipment to make it maintenance free

(vii) List of testing equipments available with the bidder for final testing of instrument transformer and test plant limitation, if any, vis-a-vis the type, special, acceptance and routine tests specified in the relevant standards and the tests listed and Annexure I.

9.2 The successful tenderer shall, within 30 days of placement of Order, submit following information to the purchaser.

(i) List of raw materials as well as bought out accessories and the names of sub suppliers selected from those furnished alongwith offer.

(ii) Type test certificates of the raw material and bought out accessories.

(iii) Quality assurance plan (QAP) with hold points for purchaser's inspection. The quality assurance plan and purchaser's hold points shall be discussed between the purchaser and supplier, before the QAP is finalized.

9.3. The successful tenderer shall submit the routine test certificates of bought out accessories at the time of routine testing of the fully assembled instrument transformer. The successful bidder shall also be required to submit copies of central excise gate passes for raw material viz., oil, copper, aluminium, insulating material, core material etc.

10.0. PERFORMANCE GUARANTEE:

The equipment offered shall be guaranteed for satisfactory performance for a period of 30 months from the date of receipt of complete equipment at site in good condition, or 24 months from the date of satisfactory commissioning, whichever is earlier. In case of failure within this period, the supplier shall make good the faulty equipment at no extra cost to the purchaser.

11.0. DOCUMENTATION:

11.1. All drawings shall conform to international standards organisation (ISO) 'A' series of drawing sheet/Indian Standards specification IS-656. All drawings shall be in ink and suitable for microfilming. All dimensions and data shall be in System International Units.

11.2. List of drawings and documents

The bidder shall furnish the following drawings and documents alongwith his offer:

a) General outline and assembly drawings of the equipments

b) Graphs showing the performance of equipments in regard to magnetization characteristics.

c) Sectional views showing -

(i) General constructional features of the instrument transformer and dimensions of conductor, depth of insulation, clearance between paper insulation and the inner side of porcelain, grading stages used for primary insulation, whether and how a semi conducting tape is used to cover metal foils etc.

(ii) The Sectional view shall show the materials /gaskets/ sealing used for perfect hermetic sealing and arrangement for compensation of oil volume variation.

(iii) The insulation, the winding arrangements, method of connection of the primary/secondary winding to the primary /secondary terminals etc.

(iv) Porcelain housing used and its dimensions alongwith the mechanical and electrical characteristics, as well as volume of oil.

d) Arrangement of secondary terminal box and details of connection studs provided.

e) Name plate.

f) Schematic drawing

g) Type test reports in case the equipment has already been type tested.

h) Test reports, literature, pamphlets of the bought out items, and raw material.

i) Bill of material and packing list.

j) Pressure release device/SS Bellow , Note on PRD & SS Bellow.

k) Oil level indicator.

l) Drain plug.

m) Bushing Drawing.

11.3. The successful bidder shall submit three sets of final versions of all the above said drawings for purchaser's approval after placement of LOI. The purchaser shall communicate his comments/approval on the drawings to the supplier within two weeks. The supplier shall, if necessary, modify the drawings and resubmit three copies of the modified drawings for purchaser's approval within two weeks from the date of purchaser's comments. After receipt of purchaser's approval, the supplier shall, within three weeks, submit 10 prints and one good quality reproducibles of the approved drawings and a set of drawings drawn in latest version of AutoCAD on CD for purchaser's use.

11.4. Six sets of the type test reports, duly approved by the purchaser, shall be submitted by the supplier for distribution, before commencement of supply. Adequate copies of acceptance and routine test certificates, duly approved by the purchaser, shall accompany the despatched consignment.

11.5. The manufacturing of the equipments shall be strictly in accordance with the approved drawings and no deviation shall be permitted without the written approval of the purchaser. All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawing shall be at the supplier's risk.

11.6. Sixteen sets of nicely printed and bound volumes of operation, maintenance and erection manuals in English language per instrument transformer of each voltage rating shall be submitted by the supplier for distribution, prior to the despatch of the equipment. The manual shall contain all the drawings and information required for erection, operation and maintenance of the instrument transformer. The manual shall also contain a set of all the approved drawings, type test reports etc.

11.7. Approval of drawings/work by purchaser shall not relieve the supplier of his responsibility and liability for ensuring correctness and correct interpretation of the drawings for meeting the requirement of the latest revision of applicable standards, rules and codes of practices. The equipment shall conform in all respects to high standards of engineering, design, workmanship and latest revisions of relevant standards at the time of ordering and purchaser shall have the power to reject any work or materials which, in his judgment, is not in full accordance therewith.

12.0. PACKING AND FORWARDING :

12.1. The equipments shall be packed in wooden crates of good quality and shall be suitable for vertical/horizontal transportation as the case may be, and suitable to withstand handling during transport and outdoor storage during transit and outdoor storage in stores before erecting. The supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate packing. The easily damageable material shall be carefully packed and marked with the appropriate caution symbols. Wherever necessary, proper arrangement for lifting, such as lifting hooks etc. shall be provided. Any material found short inside the packing cases shall be supplied by supplier without any extra cost.

12.2. Each consignment shall be accompanied by a detailed packing list containing the following information:

a) Name of the consignee.

b) Details of consignment.

c) Destination.

d) Total weight of consignment.

e) Sign showing upper/lower side of the crate.

f) Handling and unpacking instructions.

g) Bill of material indicating contents of each package.

12.3. The supplier shall ensure that the packing list and bill of material are approved by the purchaser before despatch.

13.0. SCHEDULES:

13.1. The bidder shall fill in the following schedule which from part of the tender specification and offer. If the schedules are not submitted duly filled in with the offer, the offer shall be liable for rejection.

1. Guaranteed technical particulars of the instrument transformers.

2. Schedule - 'C ' - Bidder's Experience.

13.2. The tenderer shall submit the list of orders for similar type equipments executed or under execution during last five years, with full details, in the schedule of tenderers experience (Schedule "C") to enable the purchaser to evaluate the tender. In case the equipments are being designed and manufactured in collaboration with other manufacturer, the following additional information shall be submitted by the tenderer along with his offer.

(i) Copy of collaboration agreement executed between the tenderer and the collaborator.

(ii) List of orders for similar equipments, executed/being executed by the collaborator during last ten years and performance certificate for seven years of satisfactory operation.

ANNEXURE-I

List of type tests (Current Transformer)*

Sr.No.	Particulars
1)	Short time current tests.
2)	Temperature rise test.
3)	Lightning impulse test for service in electrically exposed installation.
4)	High voltage power frequency wet withstand voltage test
5)	Determination of error or other characteristics secondary to the requirements of the appropriate designation or accuracy class.

List of type tests (Potential Transformer)*

Sr.No.	Particulars
1)	Lightning impulse voltage withstand test.
2)	High voltage power frequency wet withstand voltage test.
3)	Temperature rise test.

* see page No.11 in clause No.6.1.2.

ANNEXURE-II-A

CURRENT TRANSFORMERS
LIST OF STANDARDS

Sr.No.	Standard No.	Title
1)	IS-2165	Insulation co-ordination of highest voltages for equipments .
2)	IS-2705(I-IV)/1992	Current Transformers
3)	IS-2099	High voltage porcelain bushing.
4)	IS-3347	Dimensions of porcelain transformer bushing.
5)	IS-2071	Method of high voltage testing.
6)	IS-335	Insulation oil for transformers and switchgears.
7)	IS-2147	Degree of protection provided by enclosures for low voltages, switchgear and control.
8)	IEC-185	Current transformers.
9)	IEC-270	Partial discharge measurement.
10)	IEC-44(4)	Instrument transformer measurement of PDs.
11)	IEC-171	Insulation co-ordination.
12)	IEC-60	High voltage test techniques.
13)	IEC-8263	Method of RIV tests on high voltage insulators.
14)		Indian Electricity Rules, 1956.
15	IEC-815	Porcelain housing for instrument transformers

ANNEXURE-II-B

POTENTIAL TRANSFORMERS

Sr.No.	Standard Reference No.	Title
1)	IS 3156 (I-III)/1992	Voltage transformers.
2)	IS-2099	High voltage porcelain bushings.
3)	IS-3347	Dimensions of porcelain transformer bushing.
4)	IS-335	Insulating oil for transformers and switchgears.
5)	IS-3202	Code of practice for climate proofing of electrical equipments.
6)	IS-2147	Degree of protection provided by enclosures for low voltage switchgears and controls.
7)	IEC-186	Voltage transformers.
8)	IEC-815	Porcelain housing for instrument Transformers.
9)		Indian Electricity Rules, 1956.

ANNEXURE-IIIA
PRINCIPAL TECHNICAL PARAMETERS OF CURRENT TRANSFORMERS
(Protection & Metering)

Sr.: No.	Item		SPECIFICATION
1.	Type of CT/ Installation	:	Single phase, **multi core,** dead tank Outdoor, oil filled and hermetically sealed
2.	Type of mounting	:	Pedestal type
3.	Suitable for system frequency	:	50 Hz plus or minus 1.5 %
4.	Method of earth-ing the system to be connected to	:	Solidly Effectively earthed
5.	Rated continuous thermal current(A)	:	120% of the rated primary current
6.	Acceptable limit of temperature rise above the specified ambient temperatures for continuous operation at rated current	:	As per IS 2705 (Part-I)/1992.
7.	Acceptable partial discharge level at 1.1 times the rated voltage	:	N.A. as per I.S. 2705 (part-I)/1992.
8.	Max. radio interfe-rence voltage at 1.1 times the rated voltage	:	Less than 500 micro volts

9. Core Details:-

Particulars	11 kV CT		22 kV CT	
	Incomer	**O/G Feeder**	**Incomer**	**O/G Feeder**
Purpose of Core	Core-I & II for Protection and Core-III for Metering	Core-I for Protection and Core-II for Metering	Core-I & II for Protection and Core-III for Metering	Core-I for Protection and Core-II for Metering
CT Ratio	600-300/5-5-5 A	400-200/5-5 A	300-150/5-5-5 A	200-100/5-5 A
VA Burden	-- / -- / 15	- / 15	-- / -- / 15	- / 15
Class of Accuracy	PS / 5P10 / 0.5	5P10 / 0.5	PS / 5P10 / 0.5	5P10 / 0.5
Minimum Knee Point Voltage at lowest ratio.(Volt)	15x(Rct+19) for Protection Core only.	15x(Rct+19) for Protection Core only.	15x(Rct+19) for Protection Core only.	15x(Rct+19) for Protection Core only.
Maximum magnetizing current at guarantee knee point voltage (mA)	100 mA for Protection Core only.	100 mA for Protection Core only	100 mA for Protection Core only	100 mA for Protection Core only

	Technical Particulars	11 kV	22 kV
10.	Highest System Voltage (kV rms)	12	24
11.	Lightning Impulse withstand Voltage (kVp)	75	125
12.	One minute dry /wet power frequency withstand voltage primary (kV rms)	28	50
13.	Rated short time withstand current for 1 second duration (kA rms)	13.1	26.2
14.	Rated dynamic withstand current (kAp)	65.5	65.5
15.	Minimum creepage distance of porcelain housing (mm)	300	600
16.	Power frequency over voltage with- stand requirement for Secondary winding (kV rms)	As per clause 9.4 and 9.5 of IS 2705(Part-I)	
17.	Type of oil compensation provided	Nitrogen cushion or SS Bellow	
18.	Instrument security factor	**5 or less for Metering Core.**	
19.	The die-electric withstand values of external and internal insulation	**70kV/170kVp**	
20.	Suitable test tap for measurement of capacitance, tan-delta.	Not to be provided.	

ANNEXURE-III-B
PRINCIPAL TECHNICAL PARAMETERS OF POTENTIAL TRANSFORMERS
(PROTECTION & METERING)

Sr.No.	Item	Specification	
1)	Type	Single phase, **Dual Core**,Outdoor type of oil filled and hermetically sealed.	
2)	Type of mounting	Pedestal type	
3)	Rated voltage factor	1.2 Continuous & 1.5 for 30 seconds.	
4)	Core details and purpose	Core-I for Protection & Core-II for metering	
5)	Class of accuracy	PS / 0.5	
6)	**Voltage ratio**		
	Nominal System voltage	**11 kV**	**22 kV**
	Voltage ratio	$\frac{11\ kV}{\sqrt{3}} / \frac{110\ V}{\sqrt{3}}, \frac{110V}{\sqrt{3}}$	$\frac{22KV}{\sqrt{3}} / \frac{110\ V}{\sqrt{3}}, \frac{110V}{\sqrt{3}}$
7)	Highest system voltage (kV rms.)	12	24
8)	Lightning Impluse withstand Voltage (kVp)	75	125
9)	One minute power frequency withstand voltage dry/wet (kV rms.)	28	50
10)	Minimum Creepage distance (mm).	300	600
11)	Burden (VA)	50 / 50	
12)	Acceptable limits of temperature rise.	As per Annexure-IV	
13)	Type of oil compensation provided	Nitrogen cushion or SS bellow	

Note : - 1) Neutral end of the primary winding shall be earthed internally.
2) Fuse will not be provided on primary and secondary winding.

ANNEXURE-IV

LIMITS OF TEMPERATURE RISE

The temperature rise on any part of equipment shall not exceed the maximum temperature rise specified below under the conditions specified in Test clauses.

Sr.No.	Item	Specification	
	Nature of the part of the liquid	Maximum values of	
		Temperature (Deg.C)	Temperature rise at a max. ambient air temperature not exceeding 50 Deg.C (Deg.C)
1)	Contacts in air: Silver-faced copper, copper alloy or aluminium alloy (See Notes i and ii)	105	55
	Bare copper or tinned aluminium	75	25
2)	Contacts in oil:		
	Silver-faced copper, copper alloy or aluminium alloy (See Note ii)	90	40
	Rare copper or tinned aluminium alloy	80	30
3)	Terminals to be connected to external conductors by screws or bolts silver-faced (See Note iii)	105	55
	Bare	90	40
4)	Metal parts acting as springs	See Note iv)	(See Note iv)
5)	Metal parts in contact with insulation of the following classes:		
	Class Y : (For non-impregnated materials)	90	40
	Class A: (For materials immersed in oil or impregnated)	100	50
	Class E: in air	120	70
	In oil	100	50

	Class B: in air In oil Class F: in air In oil Enamel: oil base Synthetic, in air Synthetic, in oil	130 100 155 100 100 120 100	80 50 105 50 50 70 50
6)	Any part of metal or of insulating material in contact with oil, except contacts.	100	50
7)	Oil.	90	40

NOTES:

i) When applying the temperature rise of 55 deg.C, care should be taken to ensure that no damage is caused to the surrounding insulating materials.

ii) The quality of the silver facing shall be such that a layer of silver remains at the points of contact after the mechanical endurance test. Otherwise, the contacts shall be regarded as "bare".

iii) The values of temperature and temperature rise are valid whether or not the conductor connected to the terminals is silver-faced.

iv) The temperature shall not reach a value where the elasticity of the materials is impaired. For pure copper, this implies a temperature limit of 75 deg.C.

ANNEXURE-V

LIST OF DRAWINGS

Sr.No.	Drawing No.	Details
1)	G3-583-01(R-1)	Sketch for General arrangement of Current Transformer and Potential Transformer
2)	G3-584-01	Rating and diagram plate for Current Transformer.
3)	G3-585-01	Rating and diagram plate for Potential Transformer.

SCHEDULE-C

SCHEDULE OF TENDERER'S EXPERIENCE

Tenderer shall furnish here a list of similar orders executed/under execution by him to whom a reference may be made by Purchaser in case he considers such a reference necessary.

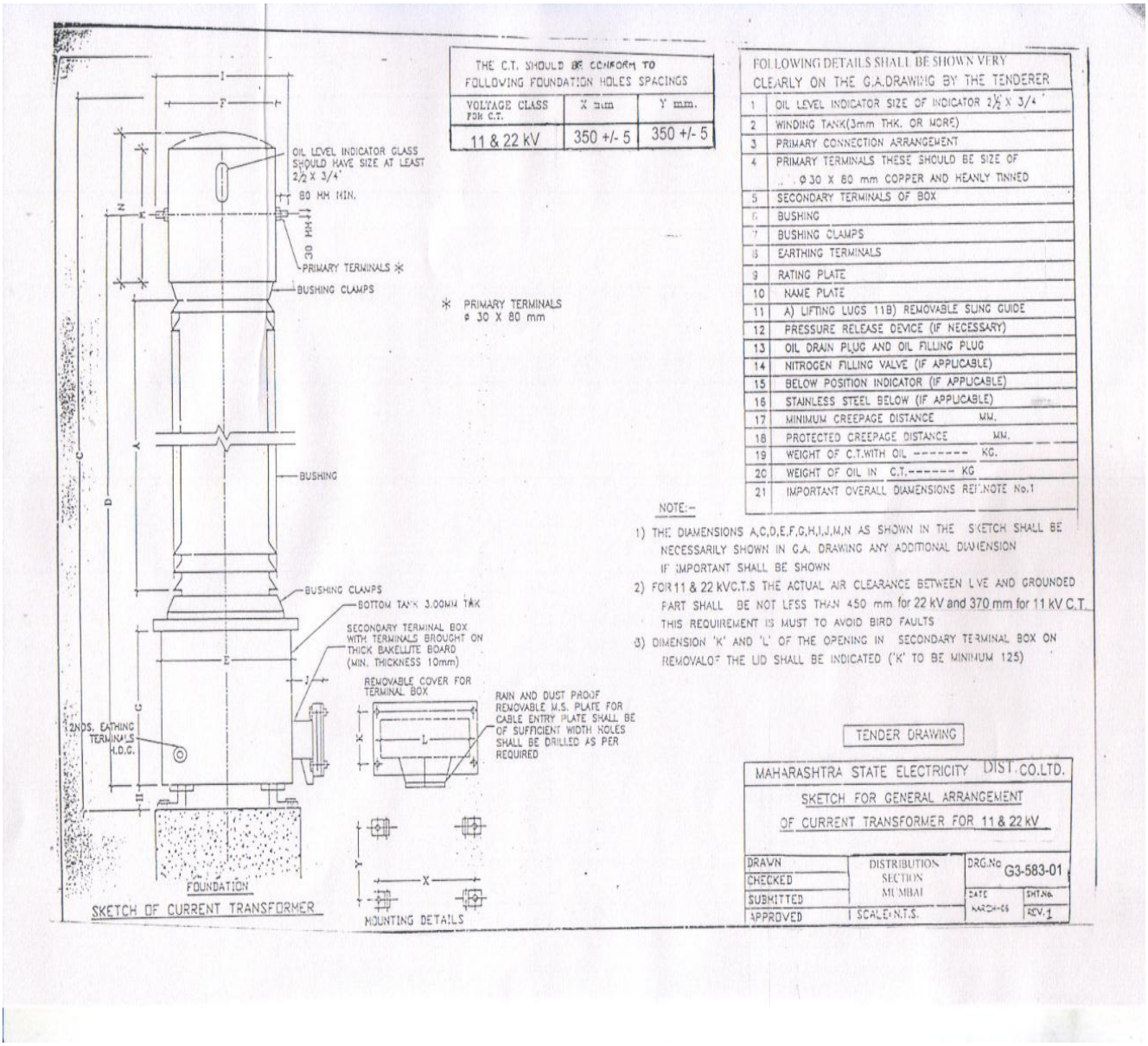
Sr. No.	Name of client & Description of order	Value of order	Period of supply and commissioning	Names & Addresses to whom reference may be made

Name of the firm_____

Signature of the tenderer_____

Designation_____

Date_____



THE C.T. SHOULD BE CONFORM TO FOLLOWING FOUNDATION HOLES SPACINGS		
VOLTAGE CLASS FOR C.T.	X mm	Y mm.
11 & 22 kV	350 +/- 5	350 +/- 5

FOLLOWING DETAILS SHALL BE SHOWN VERY CLEARLY ON THE G.A.DRAWING BY THE TENDERER	
1	OIL LEVEL INDICATOR SIZE OF INDICATOR 2½ X 3/4"
2	WINDING TANK(3mm THK. OR MORE)
3	PRIMARY CONNECTION ARRANGEMENT
4	PRIMARY TERMINALS THESE SHOULD BE SIZE OF Ø 30 X 80 mm COPPER AND HEANLY TINNED
5	SECONDARY TERMINALS OF BOX
6	BUSHING
7	BUSHING CLAMPS
8	EARTHING TERMINALS
9	RATING PLATE
10	NAME PLATE
11	A) LIFTING LUGS 11B) REMOVABLE SLING GUIDE
12	PRESSURE RELEASE DEVICE (IF NECESSARY)
13	OIL DRAIN PLUG AND OIL FILLING PLUG
14	NITROGEN FILLING VALVE (IF APPLICABLE)
15	BELOW POSITION INDICATOR (IF APPLICABLE)
16	STAINLESS STEEL BELOW (IF APPLICABLE)
17	MINIMUM CREEPAGE DISTANCE MM.
18	PROTECTED CREEPAGE DISTANCE MM.
19	WEIGHT OF C.T.WITH OIL ------- KG.
20	WEIGHT OF OIL IN C.T.------ KG
21	IMPORTANT OVERALL DIAMENSIONS REF.NOTE No.1

NOTE:-

1) THE DIAMENSIONS A,C,D,E,F,G,H,I,J,M,N AS SHOWN IN THE SKETCH SHALL BE NECESSARILY SHOWN IN G.A. DRAWING ANY ADDITIONAL DIMENSION IF IMPORTANT SHALL BE SHOWN
2) FOR 11 & 22 kVC.T.S THE ACTUAL AIR CLEARANCE BETWEEN LVE AND GROUNDED FART SHALL BE NOT LESS THAN 450 mm for 22 kV and 370 mm for 11 kV C.T. THIS REQUIREMENT IS MUST TO AVOID BIRD FAULTS
3) DIMENSION 'K' AND 'L' OF THE OPENING IN SECONDARY TERMINAL BOX ON REMOVALOF THE LID SHALL BE INDICATED ('K' TO BE MINIMUM 125)

TENDER DRAWING

MAHARASHTRA STATE ELECTRICITY DIST.CO.LTD.

SKETCH FOR GENERAL ARRANGEMENT OF CURRENT TRANSFORMER FOR 11 & 22 kV

DRAWN	DISTRIBUTION SECTION MUMBAI	DRG.No G3-583-01
CHECKED		
SUBMITTED		DATE MARCH-06 / SHT.No.
APPROVED	SCALE:N.T.S.	REV.1

CURRENT TRANSFORMER

STANDARD		RATED CT RATIO (AMPS)	
HIGHEST SYSTEM VOLTAGE (KV)		SHORT TIME CURRENT (KA/SEC)	
NOMINAL SYSTEM VOLTAGE (KV)		RATED DYNAMIC CURRENT (KA)	
INSULATION LEVEL (KV)		WT. OF OIL (KG)	
FREQUENCY (HZ)		OIL IN LTR.	
DRAWING NO.		TOTAL WT. (KG)	
MIN. TOTAL CREEPAGE (mm)		SERIAL NO.	
		RATED THERMAL CURRENT (120 % OF RATED PRY. CURRENT)	

SUITABLE FOR HOT LINE WASHING

CAUTION: SECONDARY TERMINALS MUST BE SHORT CIRCUITED BEFORE THE BURDEN IS DISCONNECTED.

-------- DIAGRAM FOR CONNECTION OF PRIMARY AND SECONDARY TERMINALS ----

CORE	TERMINALS	RATIO AMPS.	RATING CLASS OF		K. P. V. / EX. AMPS.	SECONDARY RESISTANCE AT 75 ° C (RCT)
			VA	ACCURACY		
I	1S1-1S2					
	1S1-1S3					
	1S1-1S4					
II	2S1-2S2					
	2S1-2S3					
	2S1-2S4					
III	3S1-3S2					
	3S1-3S3					
	3S1-3S4					

---------- **DETAILS OF SECONDARY CONNECTIONS FOR RATIO SELECTION** ----------

CLINT :- MAHARASHTRA STATE ELECTRICITY DISTRIBUTION CO. LTD.

NAME OF THE MANUFACTURER: PLACE:
ORDER REFERENCE: DT.OF MFG.:

NOTE:-

1) CAUTION TO BE IN RED LETTERS.
2) MIN.THICKNESS OF RATING CUM DIAGRAM AL. PLATE = 1.5 MM
3) CLIENT NAME i.e. MAHARASHTRA STATE ELECTRICITY DIST. CO. LTD. TO BE IN 1/2 " SIZE LETTER.
4) DIMENSIONS OF NAME PLATE SHALL BE 210 X 300 MM.

MAHARASHTRA STATE ELECTRICITY DISTIBUTION CO. LTD.				
RATING AND DIAGRAM PLATE FOR 11 KV / 22 KV CT				
DRAWN		DISTRIBUTION SECTION, HEAD OFFICE, MUMBAI		DRG. NO.: G3-584-01
CHECKED				
SUBMITTED				REV.: 0
APPROVED		SCALE:	N.T.S.	DATE:

POTENTIAL TRANSFORMER

STANDARD	
HIGHEST SYSTEM VOLTAGE (KV)	
NOMINAL SYSTEM VOLTAGE (KV)	
INSULATION LEVEL (KV)	
FREQUENCY (HZ)	
R.V.F. / TIME	
NEUTRAL	
DRAWING NO.	
WEIGHT OF OIL (KG)	
TOTAL WEIGHT (KG)	
MIN. TOTAL CREEPAGE (mm)	

	PRY. VOLTS	
SECY. WINDING - I	VOLTS	
	V.A.	
	CLASS	
SECY. WINDING - II	VOLTS	
	V.A.	
	CLASS	
	SR. NO.	

SUITABLE FOR HOT LINE WASHING

---------- **DIAGRAM FOR CONNECTION OF PRIMARY AND SECONDARY TERMINALS** ----------

VOLTAGE RATIO	PRIMARY TERMINALS	SECONDARY TERMINALS

CAUTION : DO NOT REMOVE EARTH LINK WHEN H.V. TERMINAL IS LIVE.

CLINT :- MAHARASHTRA STATE ELECTRICITY DISTRIBUTION CO. LTD.

NAME OF THE MANUFACTURER: PLACE:
ORDER REFERENCE: DT.OF MFG.:

NOTE:-

1) CAUTION TO BE IN RED LETTERS.
2) MIN.THICKNESS OF RATING CUM DIAGRAM AL. PLATE = 1.5 MM
3) CLIENT NAME i.e. MAHARASHTRA STATE ELECTRICITY DIST. CO. LTD. TO BE IN 1/2 " SIZE LETTER.
4) ALL NEUTRAL ENDS OF EACH SECONDARY TERMINALS WINDING TO BE EARTHED THROUGH SEPARATE EARTH LINK WITH ONE COMMON EARTHING POINT. THIS ARRANGENMENT TO BE INDICATED IN THE CONNECTION DIAGRAM.
5) DIMENSIONS OF NAME PLATE SHALL BE 210 X 300 MM.

MAHARASHTRA STATE ELECTRICITY DISTIBUTION CO. LTD.				
RATING AND DIAGRAM PLATE FOR 11 KV / 22 KV PT				
DRAWN		DISTRIBUTION SECTION, HEAD OFFICE, MUMBAI.		DRG. NO.: G3-585-01
CHECKED				
SUBMITTED				REV.: 0
APPROVED		SCALE :	N.T.S.	DATE: