
 <p>Sri Lanka Telecom One Country. One Voice.</p>	<p>Specification for OSP Material Concrete Poles – SLT Reinforced OQMS SGD 002</p>	<p>Issue No. : 01 Date of Issue : 21-Apr-2009 Revision No. : 01 Date of Revision : 06-Aug-2014 Page : 1 of 19</p>
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Table of Contents

Table of Contents.....	1
1 Scope.....	2
2 Materials and Construction	2
3 Process	4
4 Testing and Quality Assurance.....	5
5 Flow chart for strength test of poles (for 101 poles).....	8
6 Finish	8
7 Marking	9
8 Transportation and handling in testing	10
9 Special technical specifications for Lightly Loaded (LL) poles.....	10
10 Drawings	12



 <p>Sri Lanka Telecom One Country. One Voice.</p>	<p align="center">Specification for OSP Material Concrete Poles – SLT Reinforced OQMS SGD 002</p>	<p>Issue No. : 01 Date of Issue : 21-Apr-2009 Revision No. : 01 Date of Revision : 06-Aug-2014 Page : 2 of 19</p>
--	--	---

1 Scope

The concrete pole shall conform to this specification and details of Drawing No. OSP 12A (for 5.6m poles), OSP 13A (for 6.7m poles), OSP 14A (for 7.5m poles), OSP 15A (for 8.0m poles), OSP 16A (for 9.0m poles), OSPA -118 (for 5.6m Lightly Loaded poles) and OSPA-119 (for 6.7m Lightly Loaded poles) relating to reinforced concrete poles. Dimension will be as indicated in respective drawings.

2 Materials and Construction

2.1 Cement

Portland cement conforming to BS12 or equivalent shall have been applied in the making of the poles.

The cement shall be stoked on a manner enabling easy inspection. At all the times, cement shall be kept dry. Open –air storage of cement is not permitted.

Deteriorated cement (in lumps difficult to powder by hand) shall not be used.

2.2 Fine Aggregate

2.2.1 This shall consist of river sand

2.2.2 The fine aggregate shall be uniformly graded and shall meet the grading requirement as shown in **table 1**


Sieve Designation (mm)	% By weight passing Square mesh sieve
10	100
5	95-100
1.2	45-80
0.3	10-30
0.15	2-10

Table 1

The fine aggregate shall be free from mud and any other foreign particles. The fine aggregate shall be stored in such a manner as to prevent mixing with other aggregate or foreign materials / bodies.

2.3 Coarse Aggregate

This shall consist of crushed stones having hard, strong and durable pieces free from adherent coating such as mud or any other slug / material.

 Sri Lanka Telecom One Country. One Voice.	<p>Specification for OSP Material</p> <p>Concrete Poles – SLT Reinforced</p> <p>OQMS SGD 002</p>	<p>Issue No. : 01</p> <p>Date of Issue : 21-Apr-2009</p> <p>Revision No. : 01</p> <p>Date of Revision : 06-Aug-2014</p> <p>Page : 3 of 19</p>
---	---	---

The coarse aggregate shall be graded between a maximum size of 25mm and minimum size corresponding to 5mm sieve. It must free from dirt, following stone dust earth or other any similar material.

The coarse aggregate material shall be stored in such a manner as to prevent mixing with other aggregate or other foreign material.

2.4 Water

All water for mixing and curing of concrete shall be from the public supply. Water from any other source may be used only with the total approval of SLT. Water contaminated with dirt oil, or any other foreign material shall not be used.

2.5 Reinforcing Bar.


All Reinforcing bars shall be confirmed to Sri Lanka standards (SLS 375, SLS26). They shall be free from dirt, oil paint, grease thick must and other defects, and shall confirm the following requirements as per the standards;

- 2.5.1 Minimum tensile stress for tor steel /Non twisted Ribbed steel (RB 500)
- 485N/mm²
- 2.5.2 Minimum yield stress for tor steel / Non twisted Ribbed steel (RB 500)
- 460N/mm²
- 2.5.3 Minimum elongation of fracture for tor steel / Non twisted Ribbed steel (RB 500)
-12%
- 2.5.4 Minimum tensile stress for mild steel - 330N/mm²
- 2.5.5 Minimum yield stress for mild steel - 300N/mm²
- 2.5.6 Minimum elongation of fracture mild tor steel / Non twisted Ribbed steel (RB 500) -16%

Also, prior approval shall be taken for the brand of reinforcements even if that brand has SLS standards. Supplier shall able provide SLS certificates, test results, sheets, etc of the selected brand when ever requested by SLT.

2.6 Composition of concrete

The concrete, that shall be used for casting of poles shall have a characteristic cube strength (at 28 days) not less than 25Mpa (Grade 25 concrete), when made, cured and tested in accordance with SLS 262 methods of sampling ,analysis and testing of concrete. 1: 1.5: 3

 Sri Lanka Telecom One Country. One Voice.	<p>Specification for OSP Material</p> <p>Concrete Poles – SLT Reinforced</p> <p>OQMS SGD 002</p>	<p>Issue No. : 01</p> <p>Date of Issue : 21-Apr-2009</p> <p>Revision No. : 01</p> <p>Date of Revision : 06-Aug-2014</p> <p>Page : 4 of 19</p>
---	---	---

(Cement: Sand: Aggregates) mix shall be recommended if volume batching will be carried out for production of concrete. The water: cement ratio shall be maintained around 0.5.

2.7 Admixtures

Suppliers are allowed to use admixtures (if they wish) with the prior approval of SLT. All technical details, manufactures' specifications relevant to such admixtures shall be submitted for the approval. According to properties of admixtures, composition of concrete, setting times, maturing period, etc shall allow to be changed from this specification and the revised specifications relevant to such cases shall be issued with the prior approval for case by case.

3 Process

3.1 Mixing

The whole of the concrete shall be mixed together first in a dry state, and afterwards with a proper proportion of clean water to ensure maximum density. The quantity of water shall be the minimum, which after thorough mixing will produce a stiff plastic mass of even colour. The final water : cement ratio of the mix shall be maintained around 0.5

3.2 Placing and compaction


Placing of concrete shall be carried out with proper engineering practices to avoid segregation, excessive bleeding of concrete. Also, appropriate methods such as mechanical vibration, Tamping, pressurizing shall be used to consolidate the material within the mould.

3.3 Setting

The concrete shall be used soon after mixing. Not more than 30 minutes shall be allowed between the first wetting time of concrete mixture and the subsequent Placing in the mould. Tamping, pressure or other effective method shall be used to consolidate the material within the mould. After such consolidating, it shall not be disturbed during the period of setting, which would be a minimum of 24 hours. No movement or transportation is allowed first seven (07) days of casting of poles.

3.4 Maturing and Curing

After the initial setting period is over, the moulds will be dismantled and appropriate curing procedure such as immersing in pond, providing wet covering using gunny bags, usage of sprinkles shall be carried out with strict supervision under satisfactory moisture content

 Sri Lanka Telecom One Country. One Voice.	<p>Specification for OSP Material</p> <p>Concrete Poles – SLT Reinforced</p> <p>OQMS SGD 002</p>	<p>Issue No. : 01</p> <p>Date of Issue : 21-Apr-2009</p> <p>Revision No. : 01</p> <p>Date of Revision : 06-Aug-2014</p> <p>Page : 5 of 19</p>
---	---	---

and temperature for hardening of concrete for seven (07) days. Appropriate curing procedure for poles shall be further carried out next 21 days as well.

3.5 Earthing

Electrical continuity shall be provided from the socket (to take in the cap spindle) on the pole top to the bottom of the pole. For this purpose, the cap socket shall be connected to the reinforcing framework by wire and one of the reinforcing bars, arranged to protrude at a point 9 inches from the bottom of the pole. Top bolt fixing arrangement and top bolt shall be provided exactly as standard top bolt detail drawing.

Required dimensions for poles are given in attached drawings

4 Testing and Quality Assurance

4.1 Testing procedure

Poles shall be tested in presence of SLT representatives and a representative of the supplier.

All arrangement to conduct testing shall be arranged by the supplier prior to arrival of SLT representatives and otherwise they shall return without attending to test and expenses incurred by SLT for such incident shall be charged from the supplier.

All poles shall be visually inspected to check marking (as describe in 4.3), surface finishes(as describe in 4.2), etc by the test supervisor as the first step and then electrical conductivity test shall be carried out for poles. Defective poles identified in this inspection shall be rejected as per the specification.

Then poles shall be selected for the strength test from the sub lot as described in 4.1.1.


4.1.1 Selecting samples for strength test

One in every twenty poles or part there of delivered shall be randomly selected for strength testing. Pole test should be carried after 28 days from date of casting of last pole of the batch .

4.1.2 Testing Method

Testing of poles shall be carried as per the procedure described in this specification. The load shall be applied 50cm from the top of the pole.

The table 2 shows the fixing length values, ultimate and breaking load values.

 <p>Sri Lanka Telecom One Country. One Voice.</p>	<p align="center">Specification for OSP Material Concrete Poles – SLT Reinforced OQMS SGD 002</p>	<p>Issue No. : 01 Date of Issue : 21-Apr-2009 Revision No. : 01 Date of Revision : 06-Aug-2014 Page : 6 of 19</p>
--	--	---

Total Height of pole (in meters/feet.)	Fixing (supported) length in strength testing m (inches)	Minimum ultimate transverse load in KN (kgwt) applied 50 cm from top of pole.)	Braking load KN (kgwt)
5.6 (18)	0.90 (36)	2.6(264)	3.6(369)
6.7 (22)	1.10 (44)	3.6(364)	5.0(510)
7.5 (24)	1.20 (48)	3.6(364)	5.0(510)
8.0 (26)	1.40 (56)	3.6(364)	5.0(510)
9.0 (30)	1.50 (60)	3.6(364)	5.0(510)


Table 2

4.1.3 Strength Testing Procedure

Unless otherwise specified with the enquiry or order, a written statement that the number of poles specified for strength test for a 101 number pole batch (identical in all essential feature of design), have passed the test describe under clause 4.1.3 shall be deemed to be sufficient evidence that the all poles of the batch comply with the strength requirements of this manual. The statement shall give the result of all tests and state the age of the poles when tested (the casting schedule shall be available at site before testing).

This testing procedure is meant for 101-poles batch and any 101-poles portion of thereof to be tested as given below. If the number of poles for a sub lot is less than 101 poles, at least one pole shall be subjected to a destructive test out of 20 number sub lots prepared from the sub lot.

- a Select 05 poles out of 101 poles batch containing pole in every 20 poles concerned.
- b The sample 05 poles shall be tested as follows;
The first pole out of selected five (05) sample poles shall be loaded up to the minimum ultimate load as per **table 2** while measuring deflections at 30%, 75% and 100% of defined ultimate load of the pole. Then pole shall be further loaded till the first crack or breaking of pole shall be observed. **The Pole shall achieve a breaking load greater than the defined breaking load for passing of the test.**
- c If the first pole shall pass the test as defined above, remaining four (04) poles shall be loaded **only upto the minimum ultimate load** while measuring deflections at 30%, 75% and 100% of defined ultimate load of the pole. Residual deflection shall also be measured while releasing the ultimate load and residual deflection shall be less than the 10% of ultimate deflections. Also, hair line cracks developed under ultimate load shall be properly closed after releasing the test load.

 <p>Sri Lanka Telecom One Country. One Voice.</p>	<p>Specification for OSP Material Concrete Poles – SLT Reinforced OQMS SGD 002</p>	<p>Issue No. : 01 Date of Issue : 21-Apr-2009 Revision No. : 01 Date of Revision : 06-Aug-2014 Page : 7 of 19</p>
--	---	---

- d If a test pole shall not satisfy the above criteria defined under no.3 (residual deflection shall be less than 10% of ultimate deflection and closing of hair line cracks), that pole shall be load upto the breaking load and pole shall be considered as a pass pole only if it shall achieve a breaking load greater than the defined breaking load.
- e If a test pole shall not achieve a defined breaking load while testing (under no.2 or no.4 of this procedure) testing shall be further carried as per the **flow chart 1**.

4.1.4 Sampling & Inspection

In any batch, all poles of the same dimension shall be grouped together to constitute a lot. Poles should only be placed in two layers for random selection. Supplier shall facilitate by placing and rearranging the inspection of labels of **all poles** by the test supervisor. Supplier shall also facilitate the electrical conductivity test for all poles to check the earthing of poles.

Pole should be properly cleaned including edges of the poles prior to testing.

4.1.5 Number of Tests

The number of poles to be tested for dimensional requirements (overall length, cross section, and uprightness) and strength shall be in accordance with the **table 3**.


Size of lot or Sub lot up to 100	Dimensional requirements		Number of poles for strength test
01-101	Sample size	Permissible defectives	
	10	01	05

Table 3

4.1.6 Criterion for conformity

Before the strength tests, pole shall check for dimensional requirements (as cl. 4.1.5), finishes (cl. 4.2) and marking (cl. 4.3) and other parameters describe in specification. Acceptance of poles under above criteria shall be as per the specification in under respective clauses.

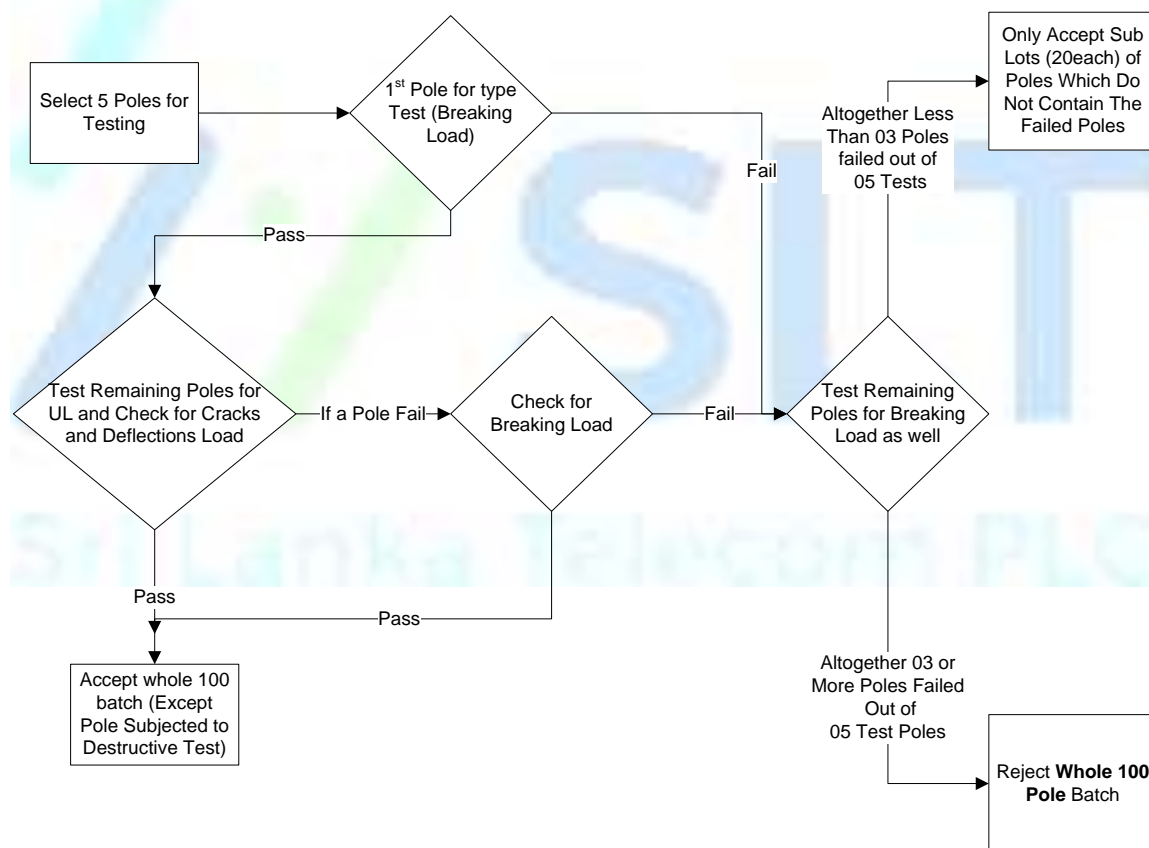
Strength testing shall be carried out as procedure defined under 4.1.3 and accepting criteria under strength testing is given in flow chart 1.

 <p>Sri Lanka Telecom One Country. One Voice.</p>	<p align="center">Specification for OSP Material Concrete Poles – SLT Reinforced OQMS SGD 002</p>	<p>Issue No. : 01 Date of Issue : 21-Apr-2009 Revision No. : 01 Date of Revision : 06-Aug-2014 Page : 8 of 19</p>
--	--	---

Further, All test poles that shall be loaded to it's breaking loads shall be fully demolished after testing and type of reinforcements, diameter of reinforcements, curtailment points, spacing of stirrups, etc shall be checked by the test supervisor. If such parameters shall not be complied to the specifications and respective drawings of the pole, all poles selected for testing from the batch (poles subjected to non destructive testing)shall be demolished and reinforcement cages shall be checked (even if such pole satisfy the strength test requirements). Sub lots, which contain defective poles which shall not comply to specifications for reinforcement, shall be rejected accordingly.

Strength testing shall be carried out as procedure defined under 4.1.3 and accepting criteria under strength testing is given in flow chart 1.

5 Flow chart for strength test of poles (for 101 poles)



Flow Chart 1

6 Finish

 Sri Lanka Telecom One Country. One Voice.	Specification for OSP Material Concrete Poles – SLT Reinforced OQMS SGD 002	Issue No. : 01 Date of Issue : 21-Apr-2009 Revision No. : 01 Date of Revision : 06-Aug-2014 Page : 9 of 19
---	--	--

- 6.1 The poles shall have a smooth finish and shall not discoloured.
- 6.2 The poles shall be free from any damage.e.g. Broken corners, hair cracks.
- 6.3 The holes for arm bolts shall not be fouled by concrete, cement, etc.
- 6.4 The bolt fixed on the cap shall be removable.
- 6.5 If any pole of the batch shall be having above defects, it shall be notified by the testing officer and reported to the supplier such poles shall be rejected.

7 Marking

7.1 Introduction marks

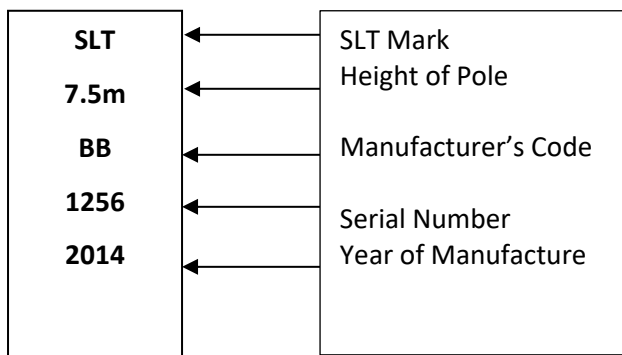
For the purpose of identification, the following marking shall be provided at a height of 3 meters from the pole.


- 7.1.1 SLT Mark
- 7.1.2 Height of poles in meters.
- 7.1.3 Manufactures code.
- 7.1.4 Manufacturer serial number.
- 7.1.5 English letter to describe serial number series

There serial number shall consist of 4 digits number starting from 0001 to 9999.

- 7.1.6 Year of manufacture.
- 7.1.7 The sizes of the figure and letter shall b 2.5cm by 2.5cm the depth of the lettering shall be 3mm.
- 7.1.8 Introduction mark of pole shall be properly embossed and writing the making by hand shall not be accepted.
- 7.1.9 Testing officer shall have authority to reject any pole if the identification marks of pole shall be unreadable or tampered.

The sample of introduction mark is given below



 <p>Sri Lanka Telecom One Country. One Voice.</p>	<p align="center">Specification for OSP Material Concrete Poles – SLT Reinforced OQMS SGD 002</p>	<p>Issue No. : 01 Date of Issue : 21-Apr-2009 Revision No. : 01 Date of Revision : 06-Aug-2014 Page : 10 of 19</p>
--	--	--

However, for 5.6m poles serial number shall be allowed to be cast in vertical direction

Further, pole number shall be marked in red ink at the bottom of each pole for easy identification in stacking

7.1.10 Pole depth identification marks

For the purpose of safety, the following marking shall be provided at a height given in the **table 4.**

It is required to make two marks having a width of 5cm in one side of pole.

The colours shall be **Red.**

The depth of the engraved mark shall be 3mm.

Total height of pole in (meters/feet)	Height of the first indicator from bottom end of the pole (meters/feet)	Height of the second indicator from bottom end of the pole(meters/feet)
5.6 (18)	1.12 (3.60)	2.12 (6.80)
6.7 (22)	1.34 (4.30)	2.34 (7.60)
7.5 (24)	1.50 (4.70)	2.50 (8.07)
8.0 (26)	1.60 (5.10)	2.60 (8.40)
9.0 (30)	1.80 (5.90)	2.80 (9.20)

Table 4


8 Transportation and handling in testing

Poles shall be stored, transported, handled in care with all times. The poles shall be transported on a suitable vehicle supported full length or with minimum overhanging length.

While lifting the poles, poles shall be held from a point close to a center of gravity of pole . When stacking at pole shall be separated by timber bearers placed between each unit. Timber bearers shall be placed only in lines vertically above each other.

9 Special technical specifications for Lightly Loaded (LL) poles

In the production of Lightly Loaded (LL) 6.7m and 5.6m poles, such poles shall comply with following special technical specifications. however, other than facts given below,

 Sri Lanka Telecom One Country. One Voice.	Specification for OSP Material Concrete Poles – SLT Reinforced OQMS SGD 002	Issue No. : 01 Date of Issue : 21-Apr-2009 Revision No. : 01 Date of Revision : 06-Aug-2014 Page : 11 of 19
--	--	---

these poles shall comply to the specifications and conditions given under clause no.01 to no.05 of this specification

- 9.1 Grade 25 (1:1.5:3 (3/4)) concrete with 10% extra cement content shall use for casting of poles.
- 9.2 Reinforcement details for poles shall be provided as per attached drawings (OSPA -118 for 5.6m pole and OSPA-119 for 6.7m pole)and Reinforcements having strength grade of RB 500 (Non twisted Ribbed steel bars) having minimum yield strength of 500N/mm² shall be used for poles.
- 9.3 Under testing of poles, Minimum ultimate transverse load and minimum breaking load shall be as follows;

Total Height of pole (in meters /feet.)	Fixing length in testing m (inches)	Minimum Ultimate transverse load in KN (Kg) applied 50 cm from top of pole.)	Breaking load KN (Kg)
5.6 (18)	0.9 (36)	1.6 (163)	1.85 (188)
6.7 (22)	1.10 (44)	2.4 (244)	2.85 (290)


Table 5

- 9.4 The testing procedure and compliance requirements are same for these poles also other than the load values given in table 5
- 9.5 In the identification marking of these poles, “ LL ” shall be embossed immediately below height of pole in meters in present identification marking for purpose of identification of these pole in the field. Further, a single blue line at the front face of the pole (having width of 5cm) shall be painted at the top level of the pole.
- 9.6 Since these different types of poles, new serial number series shall be used in the production by the respective suppliers.

9.7 Finish of LL Poles

- 9.7.1 The poles shall have a smooth finish and shall not discoloured.
- 9.7.2 The poles shall be free from any damage.e.g. Broken corners, hair cracks.
- 9.7.3 The holes for arm bolts shall not be fouled by concrete, cement, etc.
- 9.7.4 The bolt fixed on the cap shall be removable.
- 9.7.5 If any pole of the batch shall be having above defects, it shall be notified by the testing officer and reported to the supplier such poles shall be rejected.

9.8 Marking

 Sri Lanka Telecom One Country. One Voice.	<p>Specification for OSP Material</p> <p>Concrete Poles – SLT Reinforced</p> <p>OQMS SGD 002</p>	<p>Issue No. : 01</p> <p>Date of Issue : 21-Apr-2009</p> <p>Revision No. : 01</p> <p>Date of Revision : 06-Aug-2014</p> <p>Page : 12 of 19</p>
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9.8.1 Introduction marks

For the purpose of identification, the following marking shall be provided at a height of 3 meters from the pole.

- a SLT Mark
- b Height of poles in meters.
- c Manufacturer's code.
- d Manufacturer's serial number.
- e English letter to describe serial number series

There serial number shall consist of 4 digits number starting from 0001 to 9999.

- f Year of manufacture.

The sizes of the figure and letter shall b 2.5cm by 2.5cm the depth of the lettering shall be 3mm.

- g Introduction mark of pole shall be properly embossed and writing the marking by hand shall not be accepted.**

Testing officer shall have authority to reject any pole if the identification marks of pole shall be unreadable or tampered.

The sample of introduction mark is given below

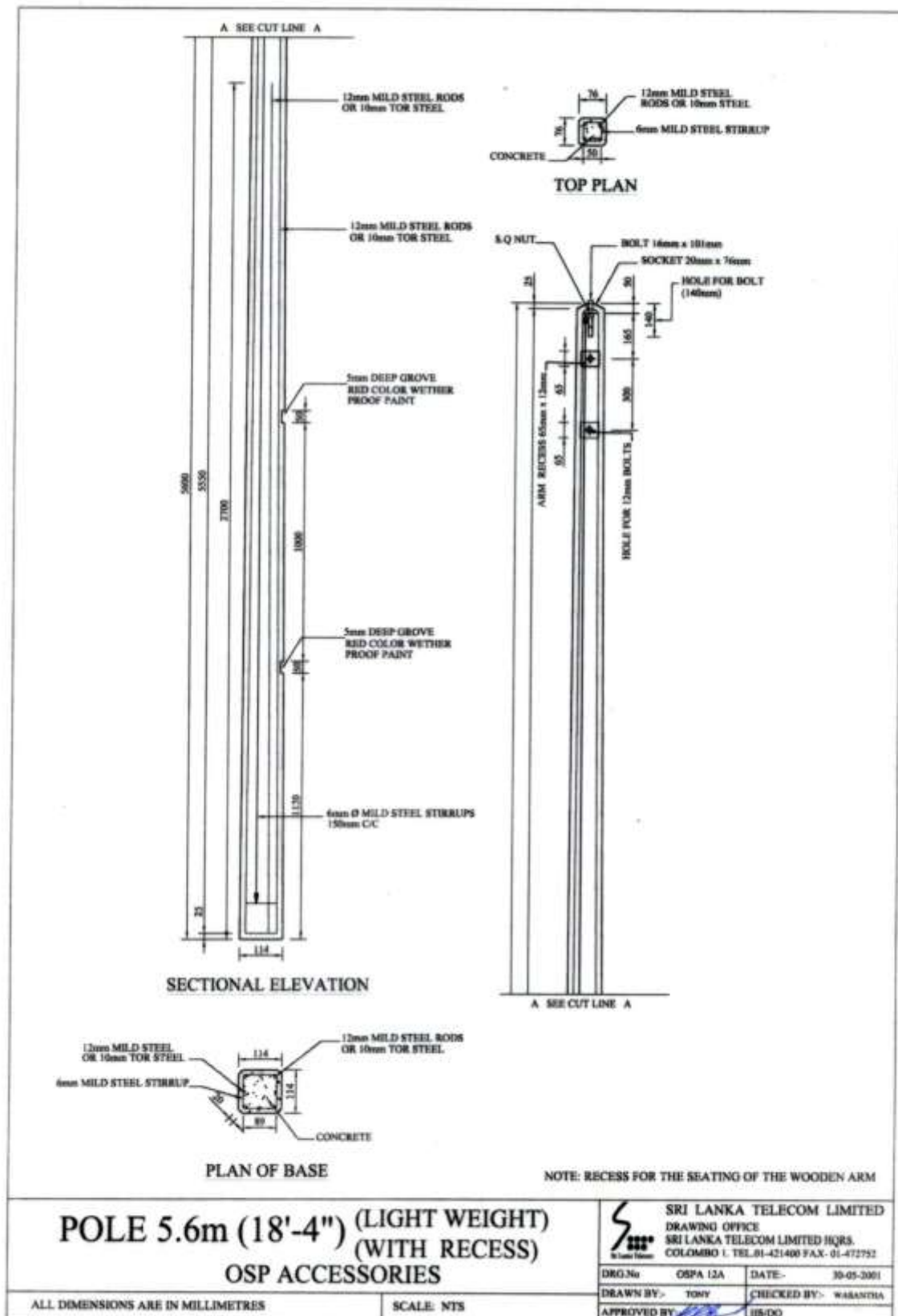
SLT	← SLT Mark
7.5m	← Height of the Pole
LL	← Lightly Loaded Pole Indication
BB	← Manufacturer's Code
1256	← Serial Number
2014	← Year of Manufacture

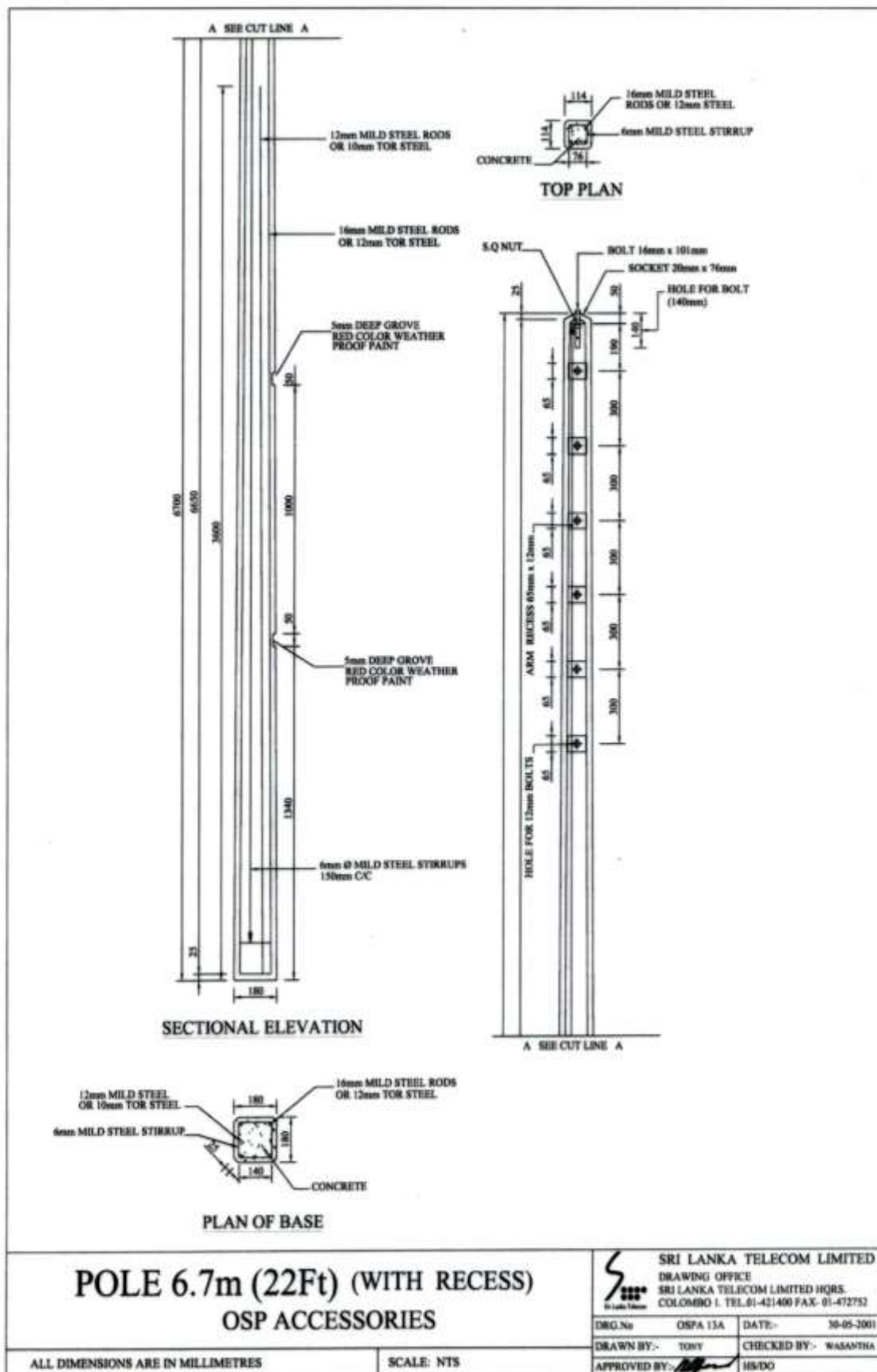
10 Drawings

See next page.

Specification for OSP Material Concrete Poles – SLT Reinforced OQMS SGD 002

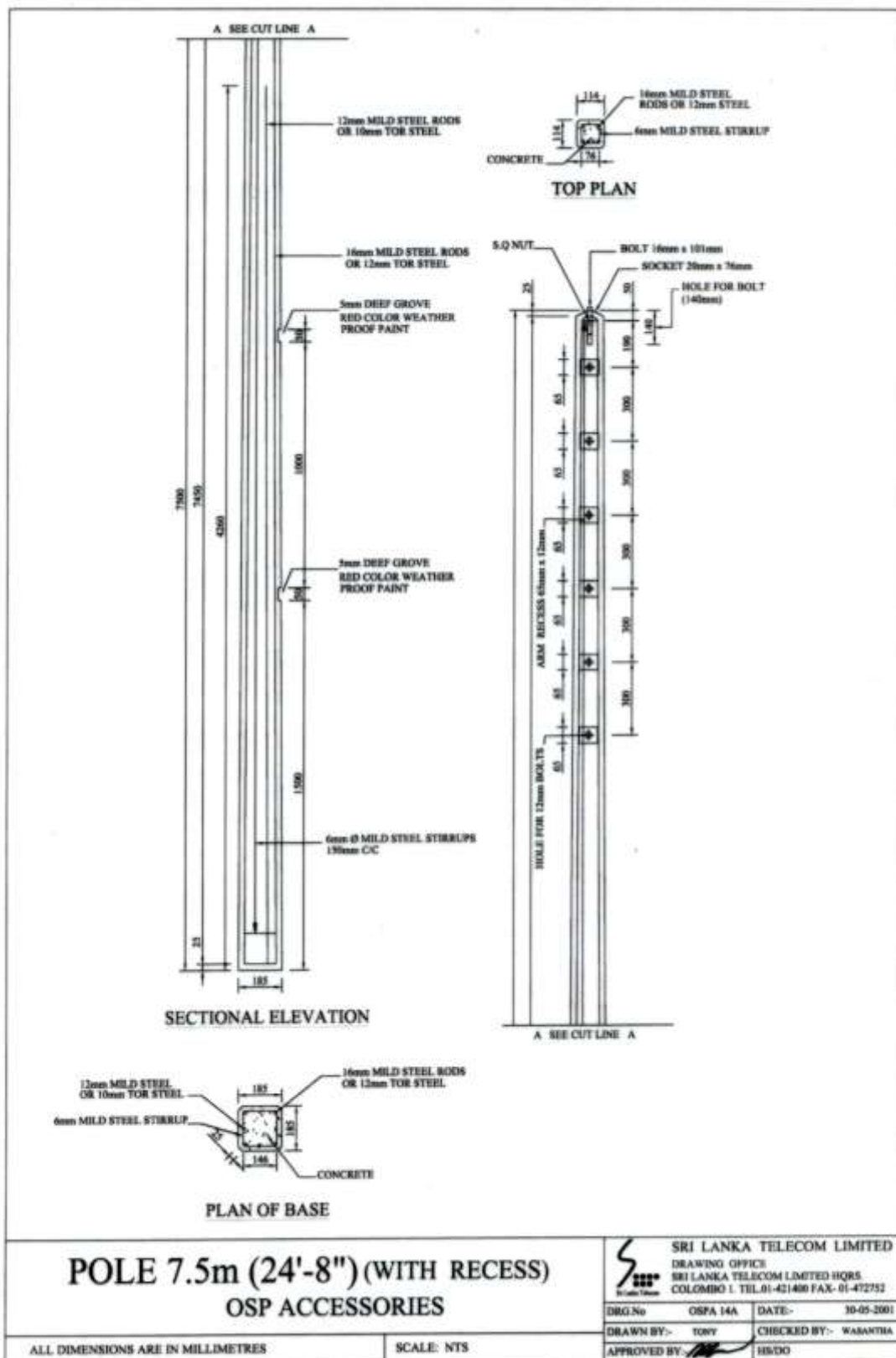
Issue No. : 01
Date of Issue : 21-Apr-2009
Revision No. : 01
Date of Revision : 06-Aug-2014
Page : 13 of 19





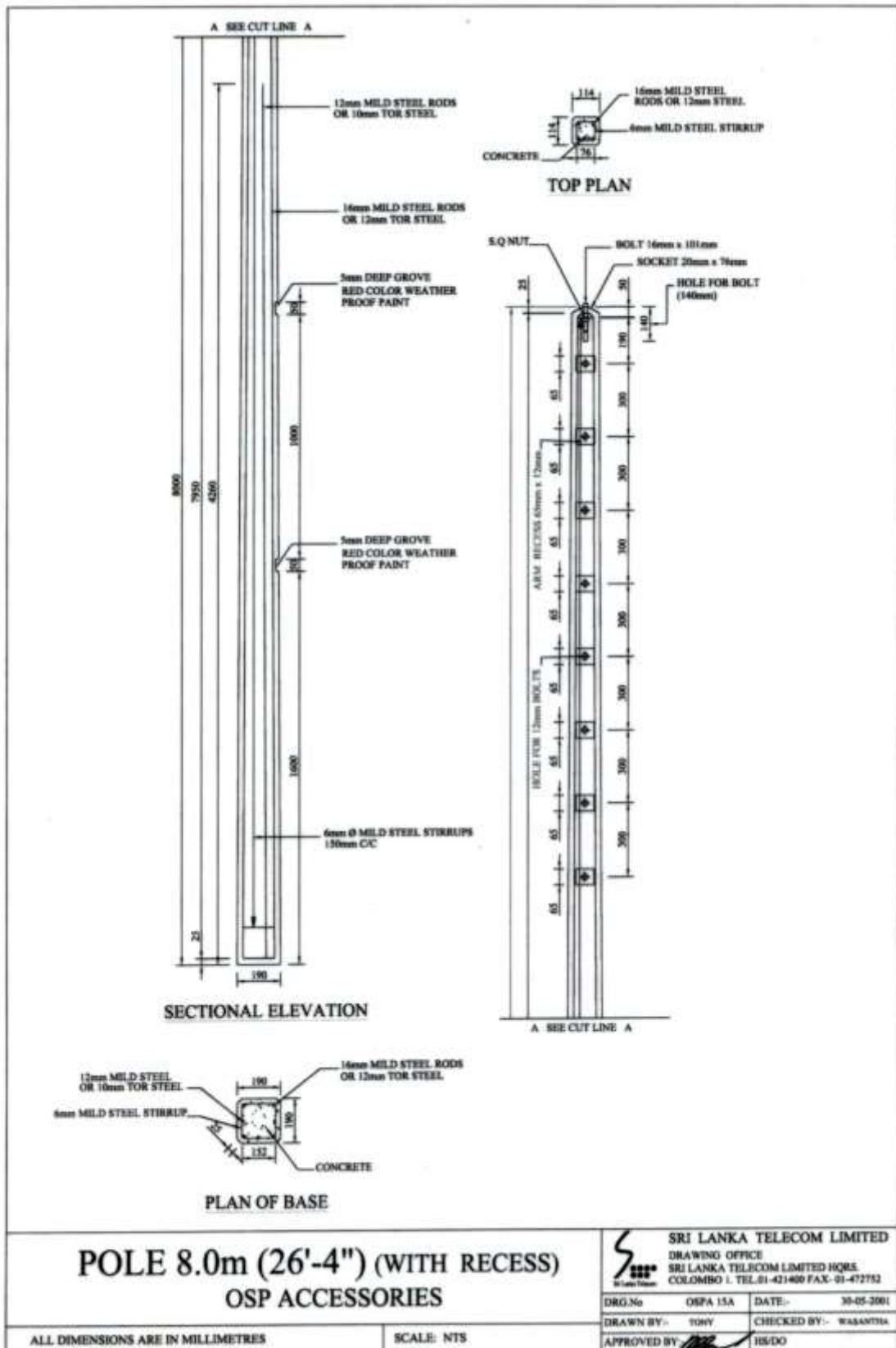
Specification for OSP Material
Concrete Poles – SLT Reinforced
OQMS SGD 002

Issue No. : 01
 Date of Issue : 21-Apr-2009
 Revision No. : 01
 Date of Revision : 06-Aug-2014
 Page : 15 of 19



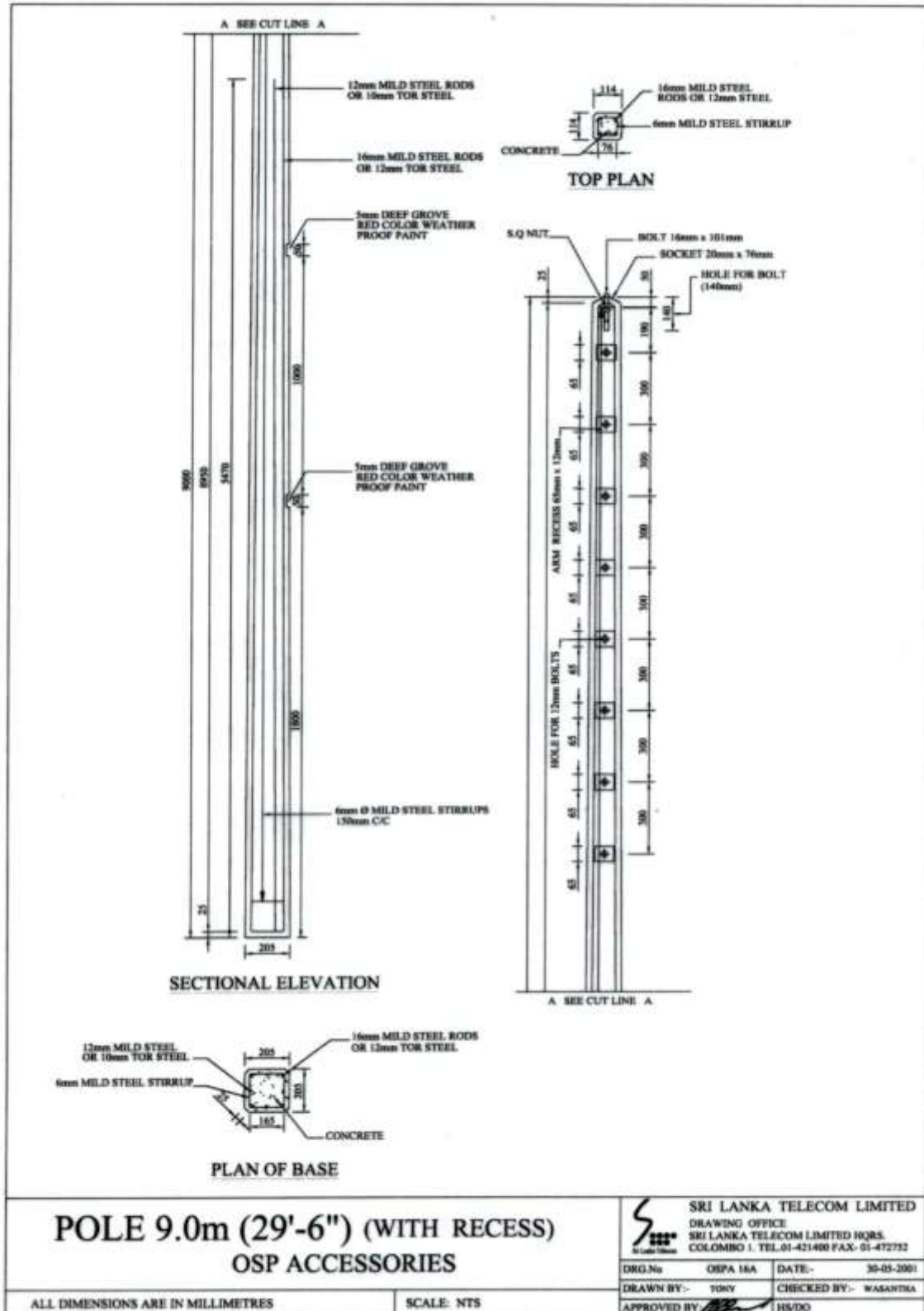
Specification for OSP Material Concrete Poles – SLT Reinforced OQMS SGD 002

Issue No. : 01
Date of Issue : 21-Apr-2009
Revision No. : 01
Date of Revision : 06-Aug-2014
Page : 16 of 19



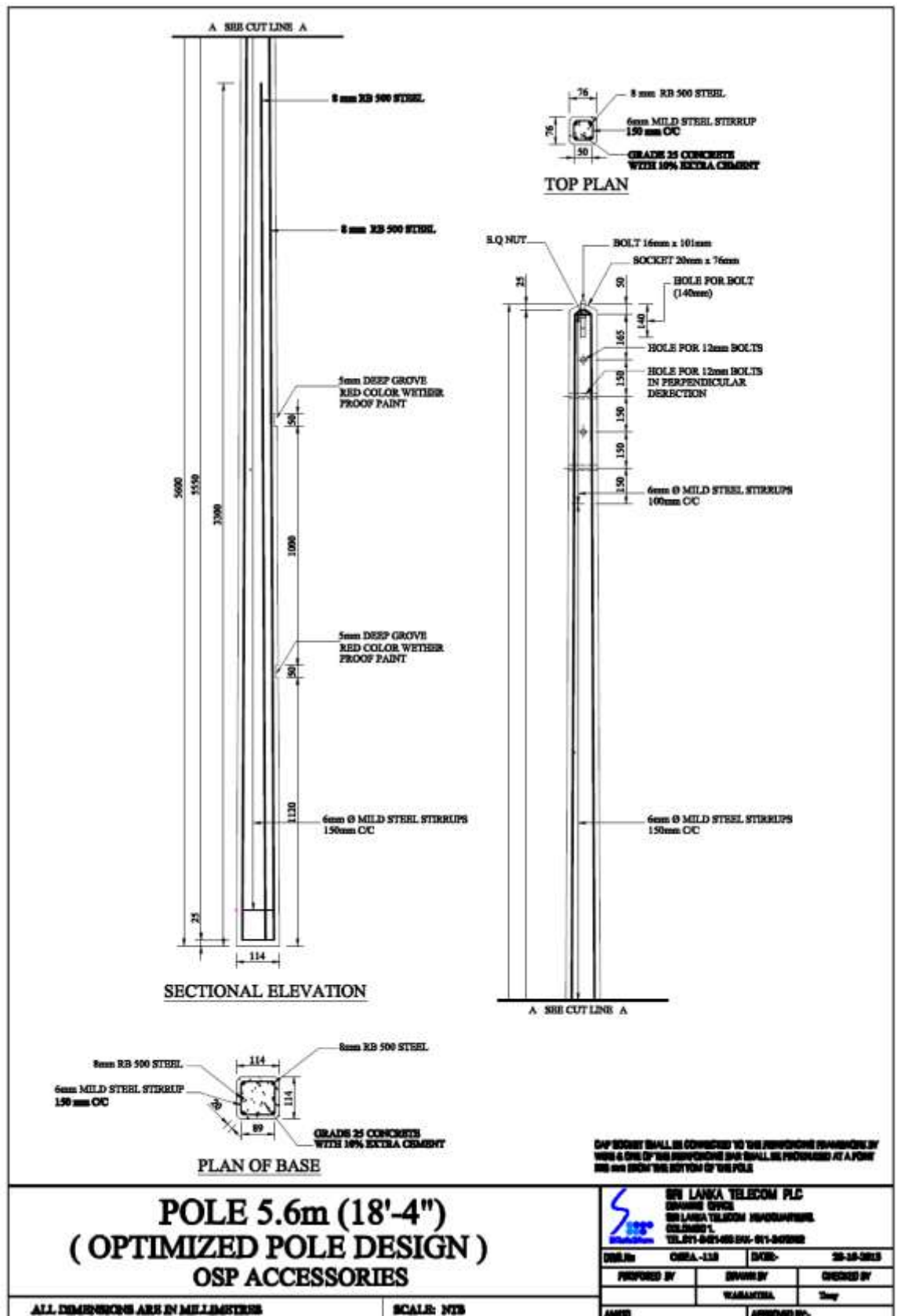
Specification for OSP Material
Concrete Poles – SLT Reinforced
OQMS SGD 002

Issue No. : 01
 Date of Issue : 21-Apr-2009
 Revision No. : 01
 Date of Revision : 06-Aug-2014
 Page : 17 of 19



Specification for OSP Material Concrete Poles – SLT Reinforced OQMS SGD 002

Issue No. : 01
Date of Issue : 21-Apr-2009
Revision No. : 01
Date of Revision : 06-Aug-2014
Page : 18 of 19



Specification for OSP Material Concrete Poles – SLT Reinforced OQMS SGD 002

Issue No. : 01
Date of Issue : 21-Apr-2009
Revision No. : 01
Date of Revision : 06-Aug-2014
Page : 19 of 19

