SPECIFICATION NO. C.E.C. 1556

FOR

100 ALL ELECTRIC TRAMS

FOR

MELBOURNE AND METROPOLITAN TRAMWAYS BOARD

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INTRODUCTION

This Specification C.E.C. 1556 follows the same layout as Specification by the Melbourne and Metropolitan Tramways Board Contract No. 2500 and is in the form of a Clause by Clause commentary on that Specification.

INTERPRETATION

In this Specification C.E.C. 1556 the terms used will have the following interpretation:-

"Customer" is to be taken as the Melbourne and Metropolitan Tramways Board.

"ComEng" is to be taken as Commonwealth Engineering (Vic.) Pty. Ltd.

All drawings referred to in this Specification C.E.C. 1556 are to be taken as Commonwealth Engineering (Vic.) Pty. Ltd., unless stated to the contrary.

The words "Noted and accepted" are to be taken as meaning Specification Contract 2500 relevant clause noted and agreed to and will be worked to subject to any modification listed in this Specification C.E.C. 1556.

Reference should also be made to our Letter of Tender.

The words "An item for approval by the Board after the Contract is signed" are taken as meaning that such an Item as quoted by us is subject to approval but the price quoted in our Tender is that included by ComEng for the Item described.

Should the Board wish to substitute the article described for a different article then the difference in cost between the quoted article and that required by the Board will vary the quoted price.

The price for the article required by the Board will be the price quoted by ComEng to the Board for the requested article.

FORM OF CONSTRUCTION

The method of design of this tram is that used by HAGGLUND but adapted to suit Double Ended operation and the door configuration required by your specification. This design utilises a stressed shear panel between the side sills and the windows but this panel is on the inside of the pillars thus allowing the use of outside panels riveted in place which are not carrying any load. If in minor collisions these panels are damaged then no weakening of the structure is experienced and the damaged panels are quickly and easily replaced.

The equipment offered with this body construction is designed and built by A.S.E.A. who own HAGGLUND and have a considerable experience in this field.

The bogie design is from LINKOPING another subsidiary of A.S.E.A. and is the one which is designed to operate with the HAGGLUND tram and A.S.E.A. Equipment.

Thus the complete design is one including all major components of a known and successfully proven design.

CONDITIONS OF TENDERING

For comments on Section A refer to our Letter of Tender.

CONDITIONS OF CONTRACT

1. Interpretation of Terms

Noted and accepted subject to any comments in our Letter of Tender.

2. Contract Drawings

Noted and accepted subject to the availability of information from Suppliers of electrical equipment and to the Board's final acceptance of our proposed equipment which is subject to the Board's approval. Two sets of Contract drawings will be supplied for maintenance purposes only. Production Contract drawing information is listed in Clause 1.9.

3. Extent of Contract

Noted and accepted subject to any comments in our Letter of Tender.

4. Country of Manufacture

Noted and accepted subject to any comments in our Letter of Tender.

5. Contractor to inform himself fully

Noted and accepted. All descriptions in this Specification nominate our interpretation of your Specification and therefore indicate our intent.

6. Patent Rights

Noted and accepted subject to any comments in our Letter of Tender.

7. Security

Noted and accepted subject to any comments in our Letter of Tender.

8. Inspection and Testing

Noted and accepted provided the tests requested by the Board are within the tests nominated in your Specification.

9. Contractor not to assign or sublet Contract

Noted and accepted subject to any comments in our Letter of Tender.

10. Rates of Wages

Noted and accepted subject to any comments in our Letter of Tender.

CONDITIONS OF CONTRACT (CONT'D)

11. Replacement of Defective Work or Materials

Noted subject to any comments in our Letter of Tender.

12. Maintenance of Work

Noted and accepted subject to any comments in our Letter of Tender.

13. Insurance

Noted and accepted subject to any comments in our Letter of Tender.

14. Time Fixed for Completion

Noted subject to any comments in our Letter of Tender.

15. Damage for Delay in Completion

Noted subject to any comments in our Letter of Tender.

16. Cancellation of Contract

Noted subject to any comments in our Letter of Tender.

17. Settlement of Disputes

Noted and accepted subject to any comments in our Letter of Tender.

18. Notices and Certificates

Noted and accepted.

19. Terms of Payment

Noted subject to any comments in our Letter of Tender.

NOTES FOR TENDERERS

Noted and accepted.

SECTION I - NATURE OF CONTRACT

1.1 CONTRACT

Noted and accepted. The trams offered are based on design information supplied by A.S.E.A. who have designed all the Electrical Equipment associated with the traction. The body design is based on the HAGGLUND design but modified to suit Double End operation and the door configuration required by your specification.

1.2 ACCEPTANCE

Noted and accepted.

1.3 OPERATIONAL REQUIREMENTS

Noted and accepted.

1.4 COUNTRY OF ORIGIN

Noted and accepted.

1.5 PLACE OF DELIVERY

Noted and accepted.

1.6 DATE OF DELIVERY

Noted and accepted subject to any comments in our Letter of Tender.

1.7 CONDITION OF DELIVERY

Noted and accepted. However it may be practical to transport the tram and trucks separately and make the final assembly at a convenient point on the tracks in your system.

1.8 INFORMATION TO BE SUPPLIED BY TENDERERS

Noted and accepted.

1.9 INFORMATION TO BE SUPPLIED BY CONTRACTOR

The production design will be submitted progressively to the Board for their approval. The design period will follow the requirements of the Letter of Tender. The drawings for approval will be submitted on airmail blackline printing paper.

Three instruction manuals will be supplied prior to delivery of the first tram. Such manuals will include wiring schematics and other relevant data.

After delivery of the 6th tram one set of plastic transparencies (0.003" thick) of the tram production drawings will be supplied to the Board for maintenance purposes only.

SECTION I - NATURE OF CONTRACT (CONT'D)

1.9 INFORMATION TO BE SUPPLIED BY CONTRACTOR (CONT'D)

All the above information shall be complete in all respects.

SECTION II - BACKGROUND INFORMATION

Noted and accepted.

SECTION III - SPECIFICATION

3. DESIGN PARAMETERS

3.1 GENERAL

(a) Noted and accepted.

The trams offered in this specification are based on the proven designs of HAGGLUND and LINKOPING who are now both owned by A.S.E.A. All the above firms are widely experienced in the manufacture of tram cars in Sweden. The modifications required to the body to meet your system requirements and door configuration have been undertaken by us in the light of our own experience as Passenger Rolling Stock manufacturers. However, should an order eventuate then these modifications would be referred to A.S.E.A. for their examination and approval.

(b) Noted and accepted. The design offered incorporates the features required as is shown within the various sections of this specification.

(c) Noted and accepted.

(d) Noted and accepted.

3.2 DIMENSIONS

(a) Clearance Limits

Noted and accepted. It is understood that in shed areas the radius of curvature of the track may in some cases be as small as 45 ft. and we have designed the tram so that it can negotiate this curve.

(b) Noted and accepted. The overall shape has been developed to remain within the clearance limits specified, as shown on drawing G.SCH. 9288 attached. As may be seen, a fairly narrow end results and only slight curvature of the panels is practical, which would not gain any significant internal space.

SECTION III - SPECIFICATION (CONT'D)

3. DESIGN PARAMETERS (CONT'D)

3.3 WEIGHT AND LOADING

(a) Weight

Noted and accepted.

(b) Passenger Loading

Noted and accepted.

(c) Dynamic Loading

Noted and accepted.

(d) Standing Load

Noted and accepted.

(e) Overload

Noted and accepted.

(f) Axle Load

Noted and accepted.

3.4 OPERATING PERFORMANCE

(a) General

Noted and accepted. Refer to Performance Data specified elsewhere in the specification.

(b) Maximum Speed

Noted and accepted. Refer to the Performance Data specified elsewhere in the specification.

(c) Safe Motor Speed

Noted and accepted.

(d) Acceleration

Noted and accepted. Refer to Acceleration Data specified elsewhere in the specification.

(e) Acceleration Speed-Time Curve

Noted and accepted. Refer to Technical Data.

(f) Deceleration

Noted and accepted. Refer to attached Technical Details.

(g) Deceleration Speed-Time Curves

Noted and accepted. Refer to attached Technical information.

SECTION III - SPECIFICATION (CONT'D)

3. DESIGN PARAMETERS (CONT'D)

3.4 OPERATING PERFORMANCE (CONT'D)

(h) Low Speed Control

Noted and accepted.

(j) Performance Data

Refer to Section 6 of specification.

3.5 STANDARDS

(a) General

Noted and accepted. See Schedule 'G'.

(b) Screw Threads

Noted and accepted. As the Electrical Equipment is of European design the screw threads will be metric standards. All components manufactured in Australia will have Australian standard screw threads.

3.6 NOISE LEVEL

Noted and accepted. Refer to Section 10 of this specification.

4. BODY

4.1 GENERAL

Noted and accepted. As previously stated the body design is of a standard which has proved to be sound and has stood the test of time. The design utilises the inner panels as shear panels. The outside panels are pop riveted into place thus should they get damaged in a minor collision they are readily replaced and the fact that they are damaged does not impair the strength of the tram. The floor height offered is 33" from Rail as shown on Cross Section Drawing G.SCH. 9120.

The roof will be insulated from hip line to hip line by a rubber-like sheet with the joints taped. This material has excellent resistance to weathering and a thickness of 1/8" gives the required insulation value of ground for the 600 volt system. The proof testing of the roof insulation may be by means of applying a voltage of 3 KV between a plate placed on the insulation and a connection to the tram body. This voltage being applied for 1 minute without the insulation breaking down.

The roof end canopies and front panel below the Driver's window will be of moulded fibreglass reinforced polyester. The F.R.P. will be made in accordance with ComEng Specification S-4217. Brackets and tapping plates will be moulded into the F.R.P. as required for the retention of equipment etc.

SECTION III - SPECIFICATION (CONT'D)

4. BODY (CONT'D)

4.1 GENERAL (CONT'D)

The tests proposed for verifying design stress calculations are strain gauge testing of the complete body shell up to full load and overload, also End, Side and diagonal jacking will be applied to the shell to simulate re-railing procedures. The results of these tests will be used to check design calculations and modify all trams of the Contract, should any structural weakness be found.

The loading will be by means of water contained in a plastic lined "swimming pool" erected inside the body. This technique has been used several times by ComEng with complete success.

Structural steel members will be formed from AS A186:250 rolled steel or steel sheet to AS G16. Aluminium panels will be alloy 5152-H38.

4.2 FLOOR

(a) General

The floor height will be as shown on Cross Section Drawing L.SCH. 9261 i.e. 33" top of rail to top of floor finish.

A level floor will be provided throughout the passenger section.

(b) Type of Construction

The floor will be constructed as follows.

1. 1/4" thick x 2" wide rubber strips will be laid on the top face of all transverse and longitudinal underframe members to which the floor is attached.

2. Floor panels will consist of 7/8" thick, water, rotproof and fire retarded plywood, in accordance with ComEng Specification S-4224, a copy of which is included in the Tender Documents. The underside of the plywood will be faced with a resin impregnated paper facing, hot bonded under pressure to the face of the plywood.

3. In addition to normal paint procedure, the underside of the plywood, and all underframe structural members not visible from the exterior of the tram, will be sprayed with a bitumastic sound deadening compound, 1/8" thick, measured when wet.

SECTION III - SPECIFICATION (CONT'D)

4. BODY (CONT'D)

4.2 GENERAL (CONT'D)

(b) Type of Construction (Cont'd)

4. Plywood floor panels will be securely fixed to the underframe structure, by means of metal thread and thread rolling or cutting, countersunk head screws. The heads of the fixings will seat in special countersunk type metal washers. These washers will be let into the plywood approximately 1/16" below the surface. The resulting depression will be filled with an epoxy filler. When dry the epoxy will be sanded back flush with the face of the plywood. This will present a smooth surface for the laying of the floor finish.

The floor will have ample strength to meet the specified load requirements.

(c) Floor Covering

The floor finish offered is ·125" thick Armstrong Nylex "Polyfloor". Refer to Section 15 Annex No. A for alternative floor finish offer.

The floor finish will comply with the requirement of M.M.T.B. Specification No. 2500, Para: 4.2(b) (I) to (VII) inclusive.

The "Polyfloor" will be laid in sheet form, firmly attached to the plywood floor, with a suitable waterproof permanent adhesive. All joints in the floor finish will be welded and dressed flush. Literature and samples of this material are included in the ComEng Tender. Coving 4" high will be provided on all vertical faces adjacent to the floor.

The floor covering will be supplied in the one thickness only.

(d) Floor Hatches

Due to the design of the traction motors, floor hatches are required for maintenance purposes. The hatch and its latch are shown on our Drawing H53-10866. This method of latching the hatch has been used by us on many occasions and has proved most satisfactory.

4.3 INTERIOR LINING

4.3.1 Ceiling

Ceiling panels will consist of Corinthian Industries Pty. Ltd., Corinite Dafora Decorative Laminated Plastic-faced 1/8" thick plywood.