

(h) Step Lights.

Step lights shall be provided in each doorway. The lights shall be located to adequately illuminate each step well and shall be so connected that they are automatically switched on each time the door is opened - if the saloon lights are switched on.

(i) Destination and Route Number Lighting.

Each destination and route number box shall be illuminated to an approved standard by means of fluorescent lamps. These shall be so located that they may be readily maintained without restricting access to the destination equipment.

Tenderers shall provide full details of the proposed method of illumination.

(k) Inspection Lights.

Inspection lights (or outlets for portable lights) shall be provided in suitable locations for maintenance purposes. The lights (or outlets) shall be supplied from the battery and shall be switched from convenient locations. They shall be available for use when all other circuits on the tram are disconnected.

Tenderers shall provide full details of the proposed installation.

(l) Approval of Lighting Installations.

All lighting installations shall be items for approval by the Board after the Contract is signed.

6-8. VENTILATION AND HEATING.(a) General.

The trams shall be provided with a ventilation system of variable output. The system shall have ample capacity for the required service and shall be so controlled that maximum output is automatically provided whenever the temperature of the air inside the vehicle exceeds 80 degrees Fahrenheit. The output shall be progressively reduced (with falling temperatures) until the minimum output is reached when the air temperature inside the vehicle is 65 degrees Fahrenheit.

Mild heating is required to improve passenger comfort during winter months (when ambient temperatures are in the range 29 degrees to 55 degrees Fahrenheit). It is desired that the temperature inside the tram shall be maintained between 60 degrees and 65 degrees Fahrenheit under these conditions.

The entire ventilation and heating system shall be automatically disconnected when external electric supply to the tram is interrupted.

(b) Waste Heat.

Waste heat from motors and resistors may be used to provide some or all of the required heating; but care shall be taken to ensure that all heated air is discharged to atmosphere when the temperature inside the vehicle exceeds the selected range.

(c) Heaters.

If auxiliary heaters are required (or if the Tenderer considers that a better installation can be provided by separating the equipment ventilation system from the interior ventilation system) the heaters shall be designed with a large surface area which heats ducted air and distributes it throughout the tram. High temperature radiant heaters and individual blower type heaters are not favoured.

(d) Fans.

All fans shall be designed for quiet operation and shall be free from whine.

Fans suspended from the ceiling of the tram are not an acceptable method of ventilation.

(e) Access for Maintenance.

The entire heating and ventilation system shall be so designed that maintenance requirements are a minimum. Any necessary maintenance shall be facilitated by ready access to the equipment.

Tenderers shall provide full details of the heating and ventilation system offered, including the methods of fan and temperature control, location of fans, heaters and ducts and an air flow diagram.

The ventilation and heating system shall be an item for approval by the Board after the Contract is signed.

6-9. DESTINATION AND ROUTE NUMBER SIGNS.(a) General.

Destination and route number signs shall be provided as shown on Drawing T.2500-8.

(b) Destination Signs.

The destination signs shall have capacity for 50 destinations (displayed singly). The letters displayed at the front and at the rear shall be not less than 5 inches (127 millimeters) high. Smaller letters may be used in destination signs on the sides of the tram.

(c) Route Number Signs.

The route number signs shall have capacity for all numbers from 0 to 99. Blank spaces shall also be provided.

The numbers displayed at the front and at the rear shall be as large as is practicable up to a maximum of 9 inches (228.6 millimeters). Smaller numbers may be used in route number signs on the sides of the tram.

(d) Control of Signs.

All signs shall be electrically operated and accurately indexed so that the driver can operate (from either driving position) all route number signs by one set of controls, and all destination signs by a second set of controls. The method of control shall be simple and reliable, and indication shall be provided to the driver so that the signs displayed can be checked.

(e) Type of Signs.

It has been the Board's practice to use silk screened curtains as route number and destination signs. More effective methods of display may be available and Tenderers are invited to submit details of designs which will provide an acceptable standard - both by day and by night. It is, however, important that route numbers and destinations are displayed and operated separately.

Tenderers shall include (in their tender price for the tram) the price of the units complete with blank display material.

Destination and route number signs shall be items for approval by the Board after the Contract is signed.

6-10. SIGNALS.(a) General.

A series of audible and visual signals shall be provided on the tram. They shall be so designed that there is no possibility of confusing the signals once the sounds and methods of display are known.

(b) Stop Signal.

Cords manufactured from an approved, strong, light-coloured, easily cleaned material shall be provided on each side of the tram as shown on Drawing T.2500-8. When the left hand cord (facing in the direction of travel) is pulled, a buzzer shall sound once, a sign at the front of the tram (bearing the words "NEXT STOP") shall be illuminated and a light shall appear on the appropriate driver's panel.

Regardless of the number of times the cord is pulled, the buzzer shall not sound again until the tram has been stopped and the exit doors have been unlocked.

The other cord shall not operate the equipment for this direction of travel.

Buttons at each seated conductor's position shall perform all of the functions of the operating cord. In addition, they shall operate the buzzer repeatedly if necessary.

(c) Door Operation Signals.

When the driver unlocks the exit door, a sign above that door shall be illuminated to indicate to passengers that the door is unlocked. This sign shall also indicate the method of opening the door.

The condition of all doors (whether open, closed and/or locked) shall be indicated by signal lights located on the driver's control panel.

(d) Warning Bell.

Suitable electrically operated bells (one at each end of the tram) shall be provided to warn other road users of the approach of the tram. The appropriate bell shall be operated by depressing a spring-loaded button on the driver's panel and be automatically switched on when the emergency brake is applied.

(e) Recording Speedometer.

The tram shall be equipped with a recording speedometer which shall record the speed of the tram in miles per hour and shall retain a record of this speed until the tram has travelled at least 1,500 feet (457 meters). The trace shall be automatically and progressively erased by further passage of the tram so that a record of the speed over the last 1,500 feet (457 meters) is always available. The instrument shall be locked to prevent unauthorised access and provision shall be made for the ready removal of the plate carrying the trace and the fixing of the record should this be required.

The recording speedometer is required to record the speed in each direction

of travel. If the instrument offered is not capable of providing this facility, two instruments shall be fitted and each shall be connected in circuit only for the direction of travel to which it applies.

(f) Indicating Speedometer.

An indicating speedometer shall be provided at each driver's position and shall indicate the speed of the tram in miles per hour within the limits of accuracy of plus or minus 2 per cent. It may be supplied as part of the recording instrument or as a separate device.

(g) Odometer.

An odometer shall be fitted to provide an accurate record of the total distance travelled by the tram. The register capacity shall be 999,999 miles.

Tenderers shall provide full details of all instruments offered.

6-11. PUBLIC ADDRESS SYSTEM.

(a) General.

A public address system shall be provided on the tram to enable the driver and/or conductor to speak to passengers inside the tram and to intending passengers outside the tram.

(b) Location of Microphones.

Suitable directional dynamic microphones shall be provided at the following locations:

- (i) One microphone (mounted on a flexible arm) at each driver's position. Microphone switches shall be located on the driver's control panel and shall be of the press-to-talk type.
- (ii) One microphone at each seated conductor's position. Microphone switches shall be located on the conductor's control panel and shall be of the press-to-talk type.

(c) Location of Speakers.

Interior speakers shall be mounted in the ceiling of the tram and located to give the most effective distribution of sound without microphone feed-back or interference between speakers. The fittings shall be attractively designed.

Exterior speakers shall be located adjacent to entrance doors.

(d) Amplifier.

A suitable amplifier (supplied from the tram battery) shall be provided. Volume controls shall meet all requirements of the installation.

6-12. CONTROL PANELS.

(a) Driver.

All necessary controls and indicating lights shall be provided in the driver's compartment. They shall be arranged in a logical manner so that those controls which are most frequently operated are located nearest to the driver. Indicating lights shall be so located that they are readily identified with associated controls.

A variety of operating devices (that is, of different shapes) shall be provided to assist the driver in performing the correct operation. The use of internally illuminated push buttons may be an advantage in some applications.

The surface of the control panel shall be non-reflecting and an approved hood shall be provided to eliminate windscreen reflections.

A cover shall be provided at each driver's position so that all controls can be securely and readily locked. One key shall control both covers, and locks shall be so arranged that it is not possible to have both covers open at the same time.

Tenderers shall provide full details of the proposed arrangement of controls. The detailed arrangement of the driver's compartment shall be an item for approval by the Board after the Contract is signed.

(b) Conductor.

All of the controls and equipment required by the conductor shall be assembled in a convenient unit which shall be duplicated at each location. Provision shall be made for controls at the position not in use to be covered and locked.

7. FARE COLLECTION EQUIPMENT.

7-1. DECIMAL CURRENCY.

The Australian decimal currency system employs 6 coins of the following denominations: 1 cent, 2 cents, 5 cents, 10 cents, 20 cents and 50 cents. The dimensions, manufacturing tolerances and weights of the coins are provided in detail in

the following table. (The 50 cent coin is not yet available in quantity and the dimensions listed are the legal maximum sizes.)

Coin Cent	Item	Maximum		Minimum		Weight	
		Inches	Milli-meters	Inches	Milli-meters	Grains	Grammes
1	Diameter	0.693	17.60	0.687	17.45	40	2.592
	Thickness	0.063	1.600	0.056	1.422		
	Stack of 50	2.907	73.84	2.841	72.16		
2	Diameter	0.854	21.69	0.850	21.59	80	5.184
	Thickness	0.079	2.007	0.073	1.854		
	Stack of 50	3.778	95.96	3.771	95.78		
5	Diameter	0.767	19.48	0.762	19.35	43.6	2.825
	Thickness	0.055	1.397	0.051	1.295		
	Stack of 50	2.650	67.31	2.637	66.98		
10	Diameter	0.932	23.67	0.927	23.55	87.3	5.657
	Thickness	0.072	1.829	0.067	1.702		
	Stack of 50	3.493	88.72	3.480	88.39		
20	Diameter	1.124	28.55	1.120	28.45	174.6	11.314
	Thickness	0.094	2.388	0.087	2.210		
	Stack of 50	4.518	114.76	4.496	114.20		
50	Diameter	1.246	31.65				
	Thickness	0.090	2.286				

7-2. FARES AND SECTIONS.

The existing tram fare scale is set out in the following table:

Number of Sections Travelled	Adult Fare	Child's Fare
1	6 Cents	3 Cents
2	10 "	4 "
3	15 "	7 "
4 or 5	20 "	7 "
6 or 7	20 "	10 "
8 or 9	25 "	10 "
10 or 11	25 "	13 "
12	30 "	13 "
13	30 "	15 "

The majority of passengers pay a cash fare - there are no adult periodical tickets or combined bus-tram or train-tram tickets.

The existing pattern of ticket sales is as follows:

Denomination	Percentage of Total Ticket Sales
3 Cents	4
4 "	4
6 "	30
7 "	3
10 "	27
13 "	Less than 1
15 "	11
20 "	20
25 "	1

7-3. CHANGE ISSUING MACHINE.

The change issuing machine shall be capable of delivering any required change between 1 cent and 1 dollar (100 cents) by the operation of the minimum number of keys or buttons. To issue 97 cents change, the conductor should be required to operate only two keys - 90 cents and 7 cents. The keyboard shall be so arranged that any required combination of keys can be depressed in one operation.

Because of the small number of 50 cent coins now available, and doubts about the future issue of these coins, provision shall be made for the pre-selection of the composition of change above 50 cents. It shall be possible for the conductor to set the equipment by a simple operation so that this change can include or exclude the 50 cent coin. (For example, 70 cents change would be made up of one 50 cent coin and one 20 cent coin, or of three 20 cent coins and one 10 cent coin, depending on the change available to the conductor.)

The coins in the machine shall always be visible to the conductor and, if possible, an audible signal shall be provided when a coin compartment is emptied.

It would be an advantage if the change issued by the machine is displayed to the conductor before it is discharged.

7-4. FARE COLLECTION TRAY.

A tray shall be provided on the desk so that the conductor can inspect the money offered and readily sort it into separate compartments for each coin denomination. It will be an advantage if the money is automatically stacked ready for transfer to the change issuing machine.

7-5. TICKET PRINTING AND ISSUING MACHINE.

The ticket printing and issuing machine shall have the following features:

- (i) It shall print tickets on a roll of plain paper which shall be readily replaced in less than 20 seconds.
- (ii) The printed ticket shall show the following information:
 

Machine number	
Serial number of ticket	( 0 to 9999 )
Fare	( 0 to 100 cents )
Route code	( 0 to 999 )
Fare stage	(00 to 99 )
Type of transaction	Ordinary or check
Melbourne and Metropolitan Tramways Board	
Ticket must be shown on demand	
Not transferable	
- (iii) The machine shall display the serial number of the last ticket issued and total cash value of tickets issued up to 99,999 cents.
- (iv) The machine shall be designed to be fool-proof in operation and shall be sealed to prevent tampering with registration of serial number or cash value of tickets issued.
- (v) The method of altering the fare scale shall be simple yet positive and the fare chosen shall be displayed to the conductor.
- (vi) Acceptable means of removing the printed ticket from the machine shall be provided.

A means of recording the details of tickets issued, on printed (or punched) tape, will be an advantage.

8. ITEMS FOR APPROVAL.

Schedule "D" nominates those items for approval by the Board after the Contract is signed.

Tenderers shall supply the price per tram included in the tender price for each and every nominated item.

Tenderers are invited to also include in Schedule "D" any other items (or alternatives) which they consider should be nominated for separate pricing.

9. SPARE AND SPECIAL EQUIPMENT.9-1. SPARE PARTS.

Tenderers shall include, in Schedule "D", a complete list of those spare parts which are considered to be necessary for the successful operation of 100 trams for a period of 5 years at an average mileage of 30,000 to 40,000 (48,000 to 64,000 kilometers) per year.

The spare parts shall include complete sub-assemblies and the components necessary to effect repairs to sub-assemblies.

Prices of all spare parts shall be calculated on the assumption that they will be ordered currently with the complete vehicles. Tenderers shall indicate those items which will be significantly more expensive if they are ordered at a later date.

## 9-2. SPECIAL EQUIPMENT.

### (a) Test Equipment.

Tenderers shall offer (as separate items) all test equipment necessary for proper testing and maintenance purposes. A full description of the operation and the function of each item of equipment shall be included in the tender.

Provision of a unit which will provide a ready means of testing all or any of the plug-in components of the control circuits is desired.

### (b) Training Equipment.

Tenderers shall offer (as a separate item) one complete set of electrical equipment and trucks so that the Board can assemble this equipment and use it for the training of maintenance personnel. Tenderers shall state in detail the equipment included in this item. Early delivery of the training equipment is essential.

### (c) Maintenance Equipment.

Tenderers shall offer (as separate items) all necessary special maintenance equipment. This equipment shall include any special jigs or assemblies for the proper dismantling and assembly of tram components.

### (d) Tools.

Tenderers shall list the full range of special tools which will be supplied, including the numbers of each type of tool.

## 9-3. MOULDS.

All moulds necessary for the manufacture of replacement parts for fibre glass sections of the body shall be made available to the Board at the completion of the Contract. The price of these moulds shall be included in the total tender price for the trams. It shall be the Contractor's responsibility to ensure that the moulds are delivered to the Board in good order and condition.

## 10. INSPECTION AND TESTS.

### 10-1. INSPECTION.

Inspections may be undertaken during construction periods to ensure that all work is carried out in accordance with the requirements of this Specification. Details of inspections will be arranged with the Contractor.

### 10-2. TESTS.

#### (a) General.

Tests shall be conducted to determine whether or not the tram (including its components and all materials of construction) complies with the requirements of this Specification and the design and performance data submitted with the tender.

Three classes of tests will be applied - type, routine and investigation.

(Note: Facilities will be made available to the Contractor should he wish to carry out adjustment tests after delivery.)

The locations at which the various tests shall be conducted shall be a matter for agreement between the Board and the Contractor.

Tests on the complete tram shall be carried out in accordance with International Electrotechnical Commission Publication 165 - "Rules for testing rolling stock on completion of construction and before entry into service".

Tests on traction motors shall be those specified in I.E.C. Publication 48 - "Rules for electric traction motors".

Tests on electrical control equipment shall be those specified in I.E.C. Publication 77 - "Specification for Electrical Control Equipment Installed on Motor Vehicles".

Tests on auxiliary motors and/or generators shall be those specified in I.E.C. Publication 101 - "Rules for auxiliary machines on motor vehicles".

Tests on materials of construction and items of equipment shall be those specified by the approved Standards to which they are manufactured. If the Standard which applies to an item of equipment is not specified by the Contractor, the tests on that item of equipment shall be those specified by an appropriate, internationally recognised Standard selected by the Board.

Sound level tests on the complete tram shall be carried out in accordance with details set out in Clause 10-3 of this Schedule.

#### (b) Type Tests.

Type tests shall be carried out on the first tram delivered and on such other trams as the Board may decide.

Type tests shall include all relevant tests specified in I.E.C. Publication 165 and in the Standards to which the various components are manufactured.

The Board may agree to accept components on the evidence of Certified Reports of type tests conducted on equipment similar to that offered; but reserves the right to require the Contractor to arrange for type tests on any components.

(c) Routine Tests.

The Board will undertake routine tests on each tram delivered. These routine tests will include those specified in I.E.C. Publication 165.

(d) Investigation Tests.

Special investigation tests to determine vehicle characteristics, such as rolling resistance and energy consumption, may be conducted as agreed between the Board and the Contractor.

10-3. SOUND LEVEL TESTS.

(a) General.

Sound level tests shall be conducted on each tram before acceptance. Any tram which does not comply with the following requirements shall be modified or adjusted by the Contractor at no cost to the Board.

(b) Acoustical Environment.

Tests of sound levels exterior to the tram will be conducted in an acoustical environment complying with Clause 3 of British Standard 3425:1961.

(c) Measuring Instruments.

Noise will be measured by means of a sound level meter complying with British Standard 3489:1962. All results will be in decibels (dB) above the standard reference pressure of 0.0002 dynes per square centimeter. Octave band analysis will be conducted using octave band filters complying with British Standard 2475:1964 except that band frequencies shall be 37.5-75, 75-150, up to 4,800-9,600 cycles per second.

(d) Test Conditions.

The sound generated by the tram will be tested under three conditions -

- (i) Inside the tram while it is at rest - with all auxiliary equipment operating.
- (ii) Inside the tram while it is travelling under power, at a speed of 25 miles (40 kilometers) per hour, on a section of track with concrete to street surface construction (as shown on Drawing T.2500-5). All doors and windows shall be closed.
- (iii) Outside the tram while it is travelling under power, at a speed of 25 miles (40 kilometers) per hour, over a section of track with concrete to street surface construction (as shown on Drawing T.2500-5). The microphone shall be located 7.5 meters from the centre line of the track and 1.2 meters above the ground.

(e) Maximum Sound Levels.

The maximum permissible sound levels measured under each of the above conditions shall be as follows:

Test	Maximum Sound Level at "A" Weighting (dBA)	Maximum Sound Level at "C" Weighting (dBC)	Maximum Speech Interference Level (dB)
(i)	55	70	44
(ii)	65	75	55
(iii)	72	80	63

For the purpose of this Contract, Speech Interference Level shall be defined as the arithmetic average of the sound pressure levels in the three octave bands 600-1200, 1200-2400 and 2400-4800 cycles per second. However, if the level in the 300-600 band exceeds that in the 600-1200 band by more than 10 dB, the average of the four levels shall be taken.

(f) Gear Noise.

When the tram is being driven at 25 miles (40 kilometers) per hour and power is cut off, there shall be no sustained change in sound level.

(g) Internal Sound Level.

In addition to the sound level tests set out in Clause (d) (ii) above, the sound level inside the tram shall be measured while the tram is driven at varying speeds. The increase in sound level with increase in speed shall be uniform and at a rate not exceeding + 4 dB for every doubling of the speed.

11. GUARANTEES.

Tenderers shall state the period for which the tram is guaranteed against

failure or excessive wear. Fair wear and tear and negligence on the part of the Board's servants are excepted from the guarantee.

Any repairs or replacements which, in the Board's opinion, are necessary under the terms of guarantee shall be carried out by the Contractor free of cost to the Board.

Where the guarantee periods for specific items of equipment do not coincide with the general guarantee, tenders shall include the nominated guarantee period for each item.

12. SCHEDULES.

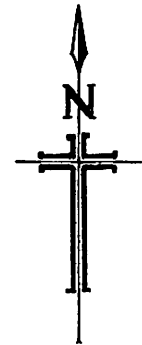
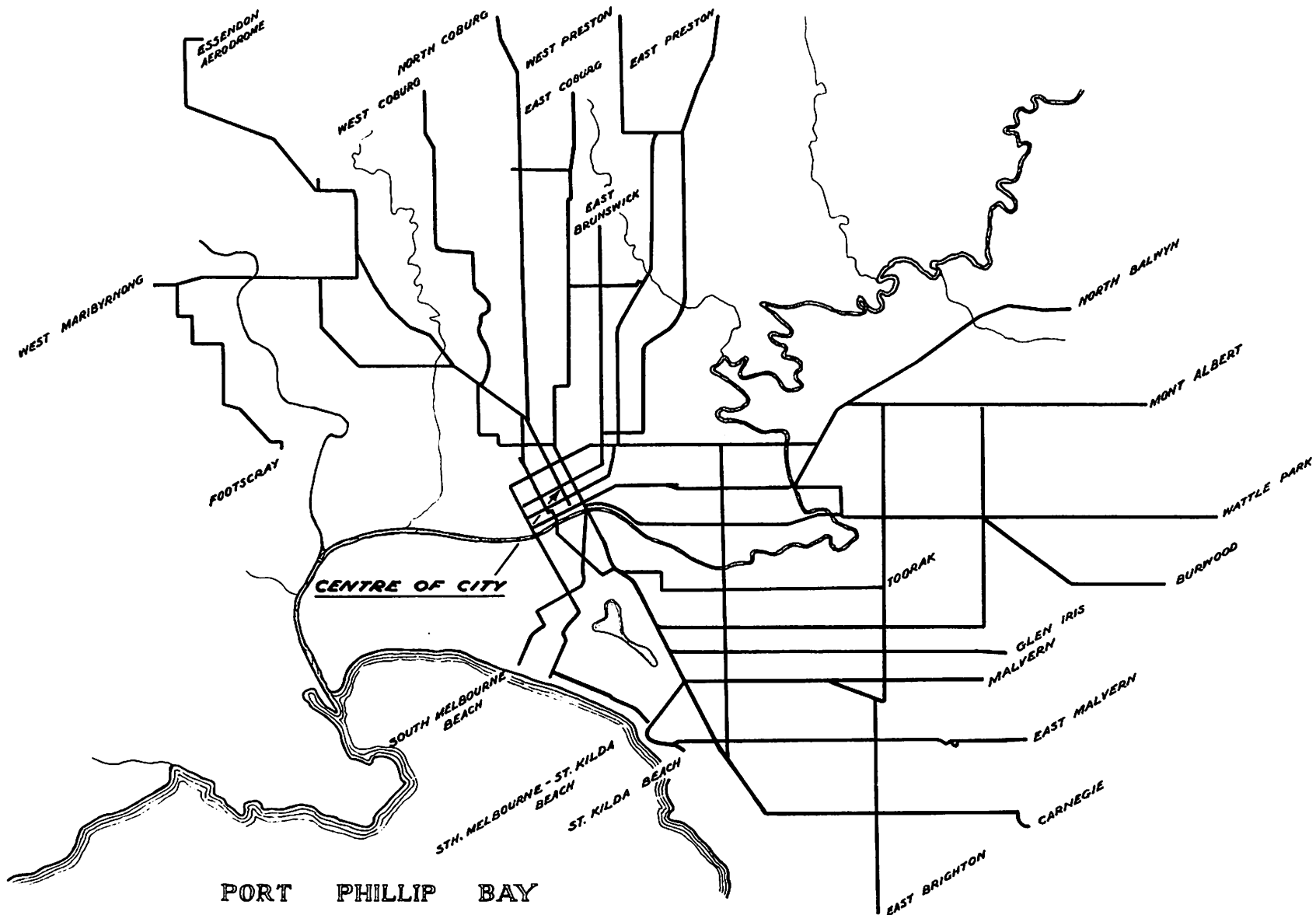
The whole of the information called for in Schedules "D" and "G" of this Specification shall be supplied by the Tenderer.

WITNESS ..... DATE .....

This is the Specification marked "C" referred to in the annexed Agreement with the Board.

WITNESS ..... CONTRACTOR .....



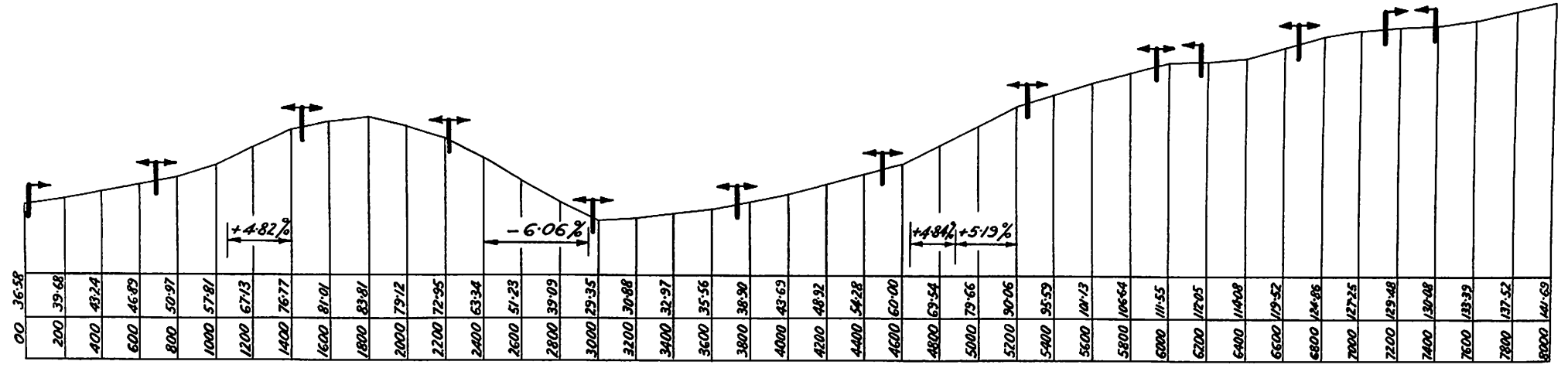


PORT PHILLIP BAY

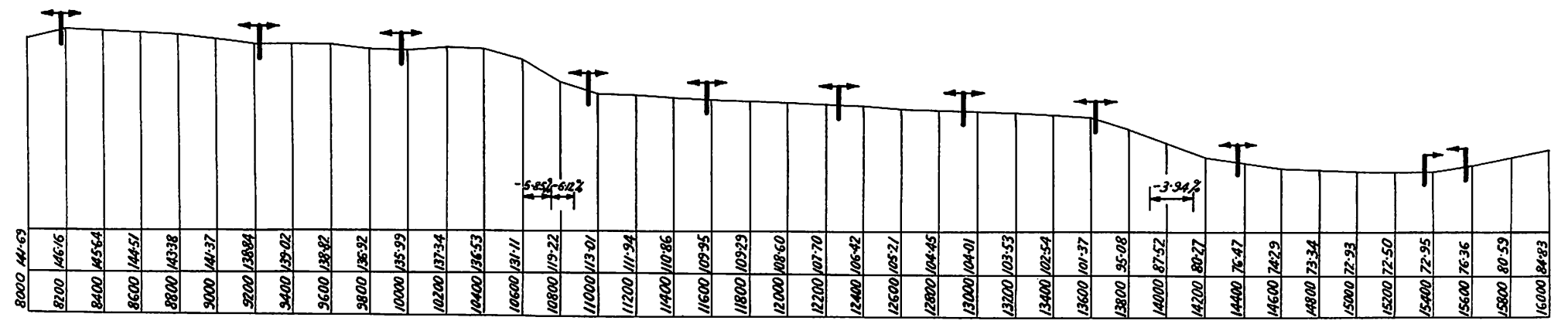
# MELBOURNE'S TRAMWAY SYSTEM

MELBOURNE & METROPOLITAN — TRAMWAYS BOARD —				
DATE 2-3-66		<i>F. R. Kelly</i> DEPUTY CHAIRMAN		
DRAWN J.R.G.	TRACED 10/2/66	CHECKED <i>MR</i> 17/2/66	PASSED <i>MR</i> 18.3.66	APPROVED <i>MR</i> 17/3/66
SCALE: 1:26,720 to 1		T. 2500-1		

DATUM 00'  
 TRACK ELEVATION IN FEET  
 TRACK DISTANCE IN FEET



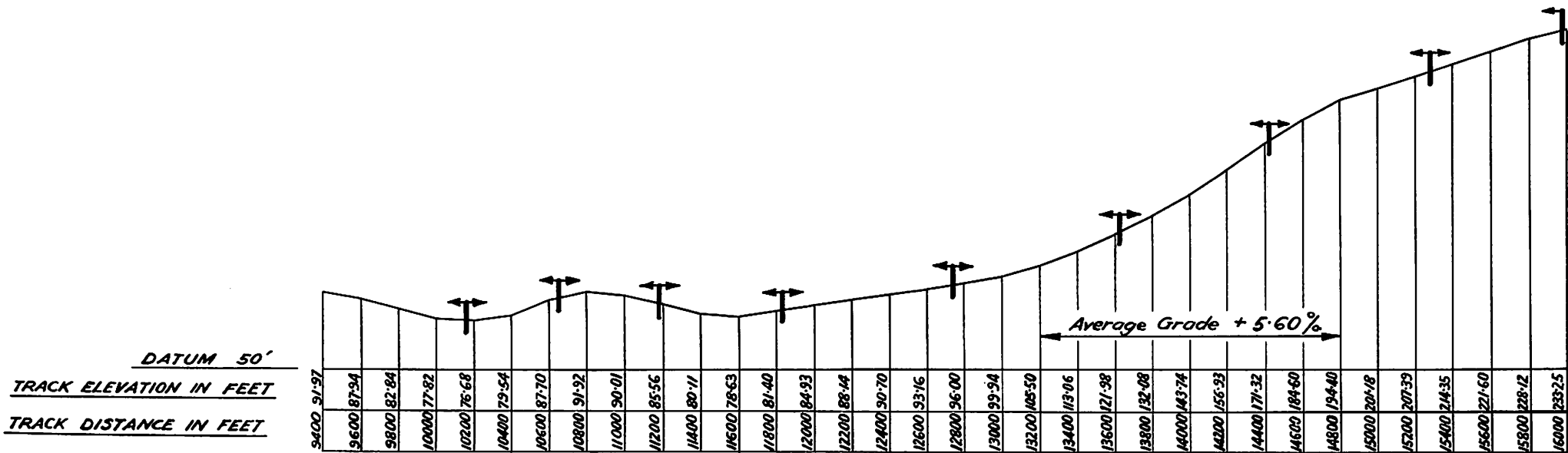
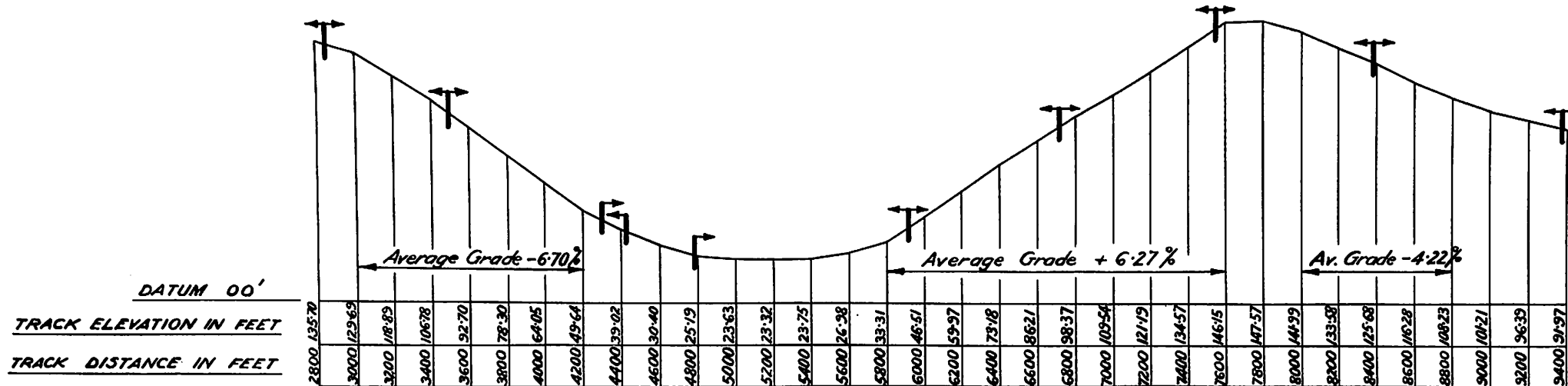
DATUM 40'  
 TRACK ELEVATION IN FEET  
 TRACK DISTANCE IN FEET



Note: Stopping places and direction of travel shown thus

# TYPICAL CITY ROUTE LONGITUDINAL SECTION

MELBOURNE & METROPOLITAN TRAMWAYS BOARD				
DATE 2-3-66		<i>J. N. Kelly</i> DEPUTY CHAIRMAN		
DRAWN J.R.G.	TRACED 8/2/66	CHECKED W.N.L.	PASSED K.C.P. 18.2.66	APPROVED <i>[Signature]</i>
SCALE: HOR. 3600 ft / VER. 360 ft /				T.2500-2

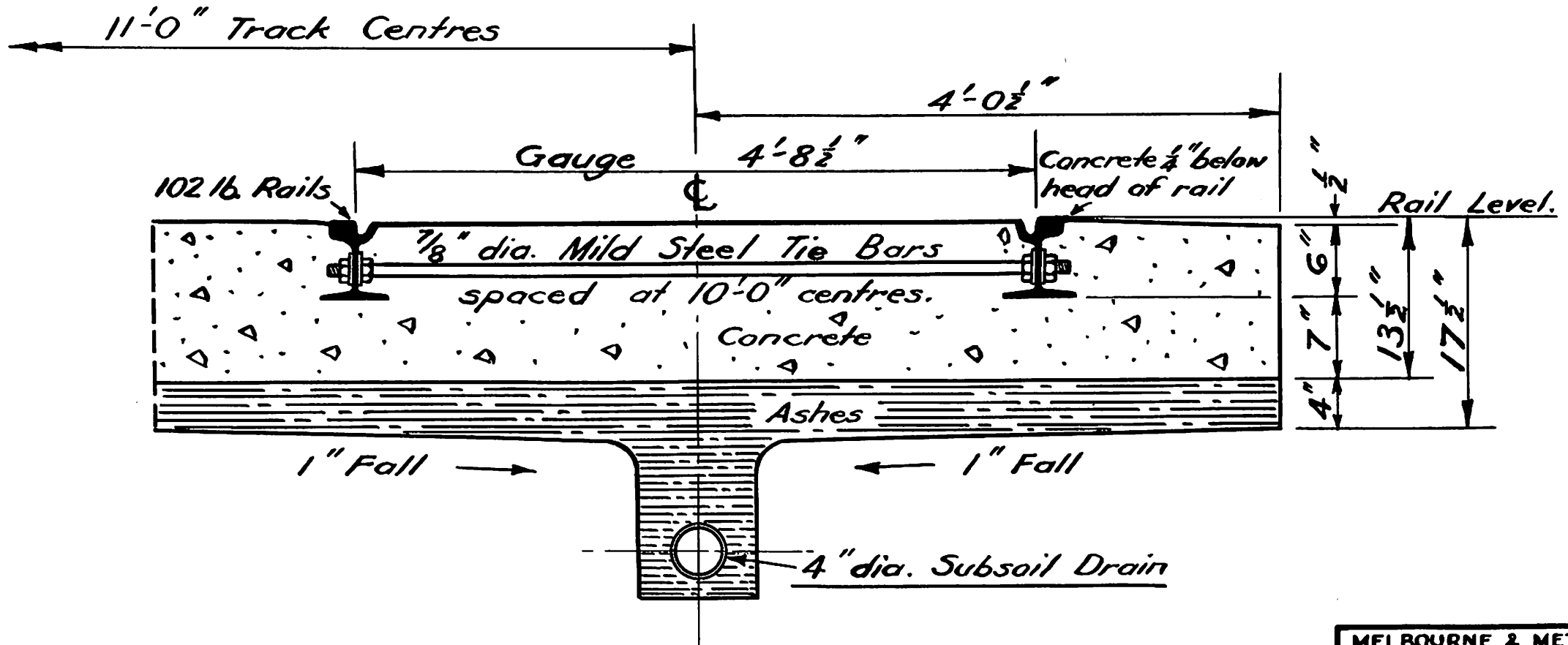


Note:  
Stopping places and direction  
of travel shown thus →

## GLENFERRIE ROAD ROUTE - LONGITUDINAL SECTION TOORAK ROAD TO COTHAM ROAD

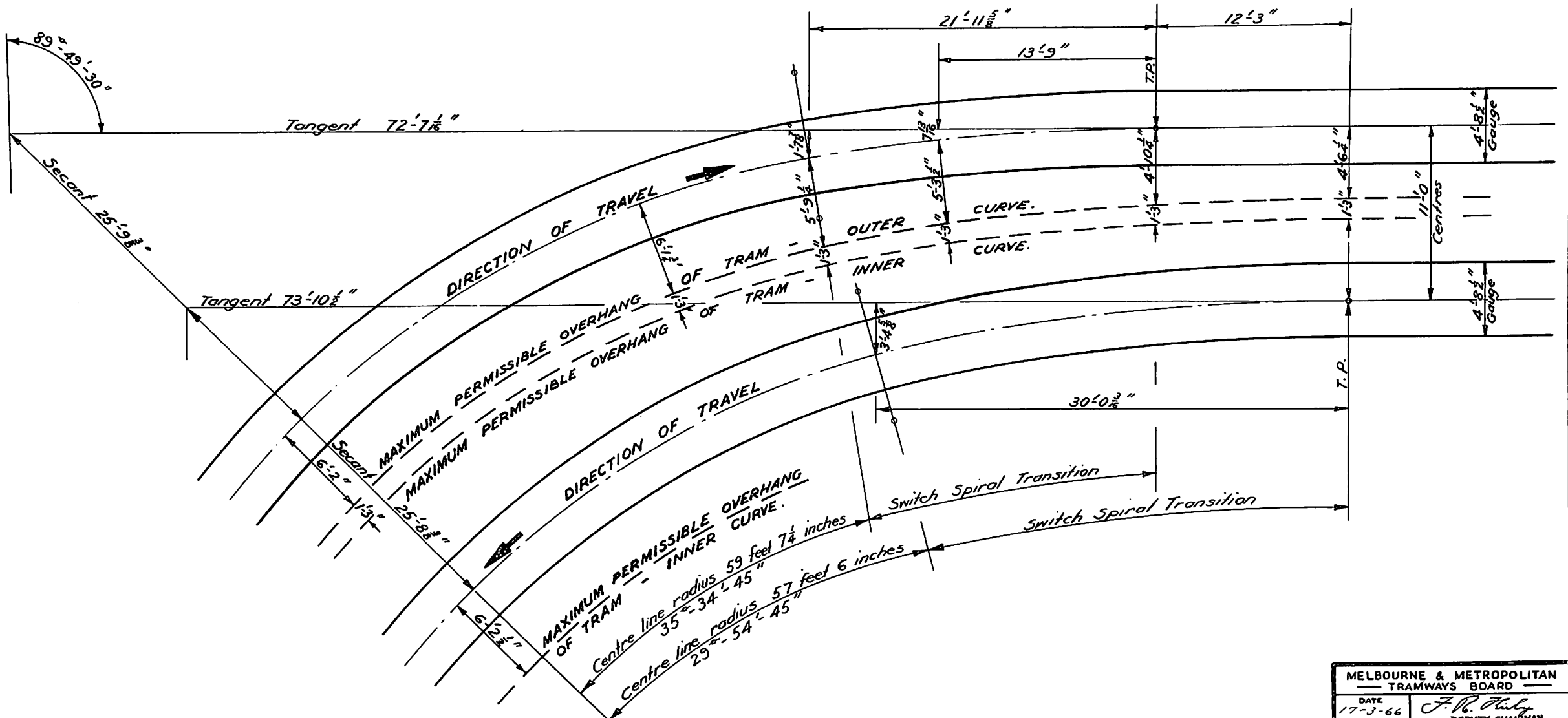
<b>MELBOURNE &amp; METROPOLITAN TRAMWAYS BOARD</b>				
DATE	<i>J. R. King</i>			
2-3-66	DEPUTY CHAIRMAN			
DRAWN	TRACED	CHECKED	PASSED	APPROVED
J.R.G.	26/1/66	W.H.L. 17-3-66	K.G.P. 18-3-66	<i>[Signature]</i>
SCALE: HOR. 9600 1/1 VER. 960 1/1				<b>T.2500-3</b>





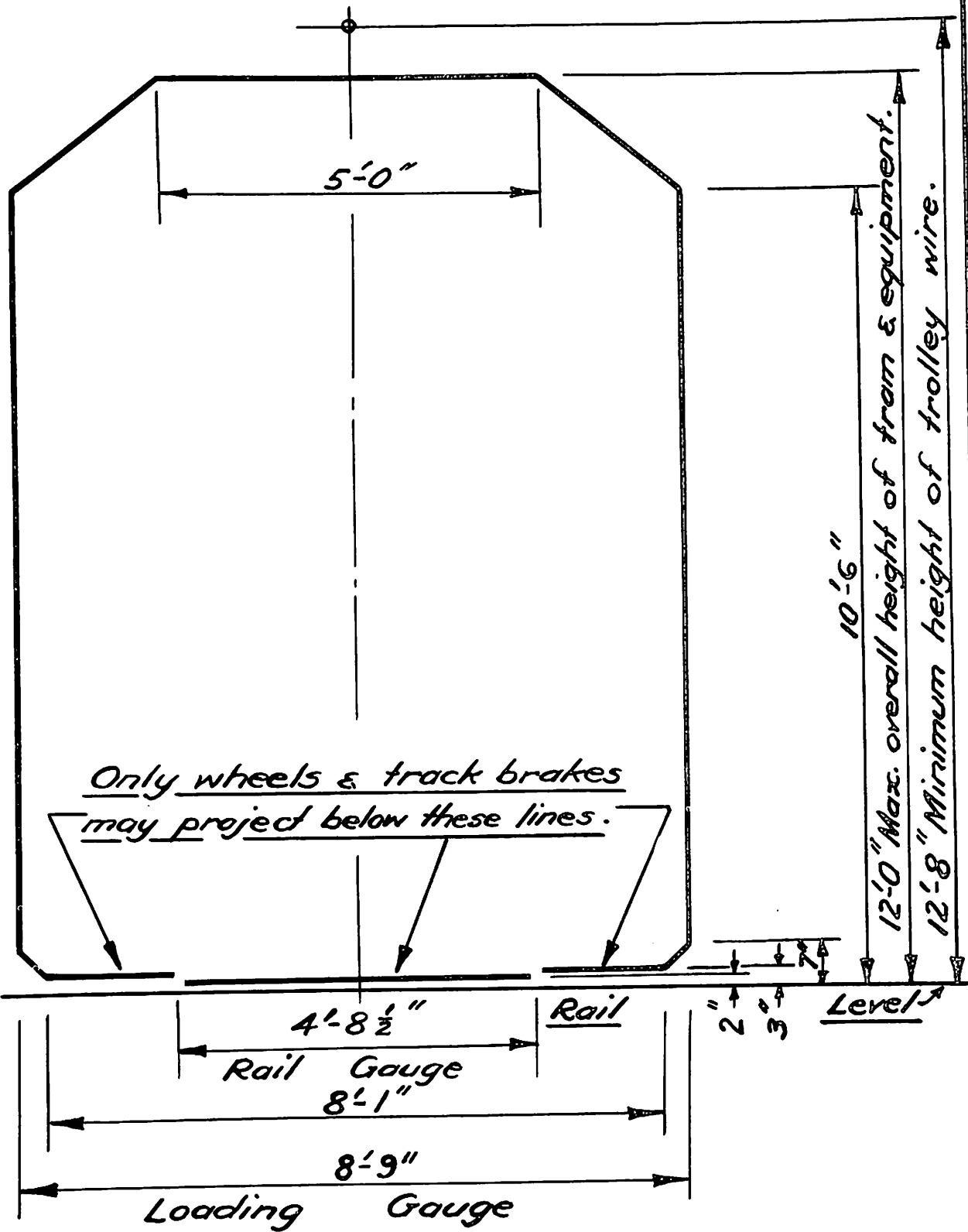
# CONCRETE TRACK CONSTRUCTION

MELBOURNE & METROPOLITAN — TRAMWAYS BOARD —				
DATE 17/3/66	F. B. Finlay DEPUTY CHAIRMAN			
DRAWN J.R.G.	TRACED 19/1/66	CHECKED <del>S.P.</del> 20.1.66	PASSED K.C.P. 20.1.66	APPROVED P. Finlay 1/1/66
SCALE: 1/2" to 1'		T.2500-5		



**MINIMUM RADIUS SERVICE CURVES TO GIVE  
MINIMUM CLEARANCE BETWEEN TRAMS**

MELBOURNE & METROPOLITAN TRAMWAYS BOARD					
DATE		F. W. Philby DEPUTY CHAIRMAN			
17-3-66					
DRAWN	TRACED	CHECKED	PASSED	APPROVED	
J.R.G.	1/2/66	17/2/66	K.C.P. 18.2.66	17/2/66	
SCALE: 96 to 1			T.2500-6		

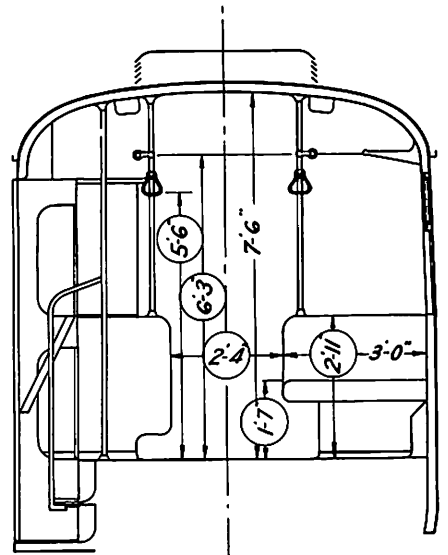
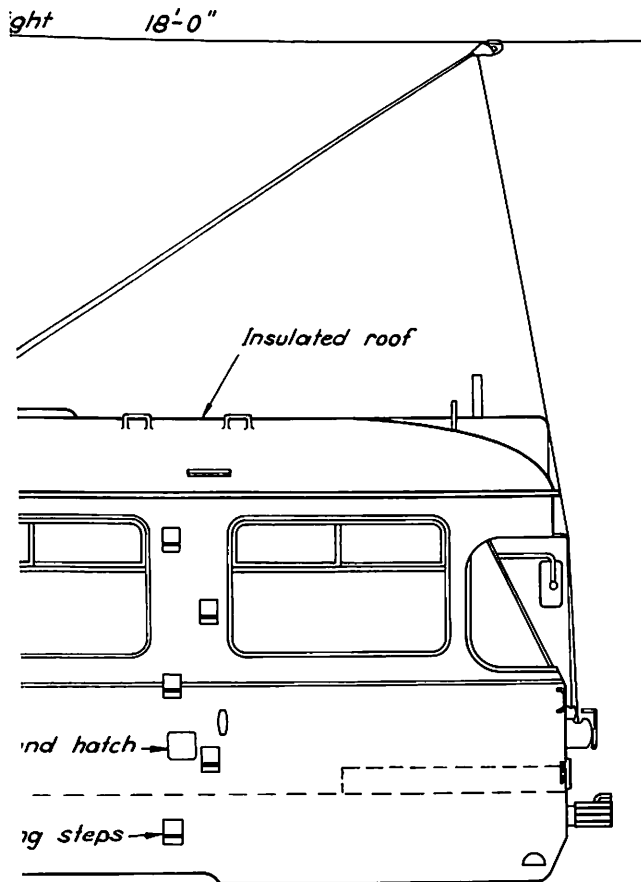


**LOADING GAUGE**

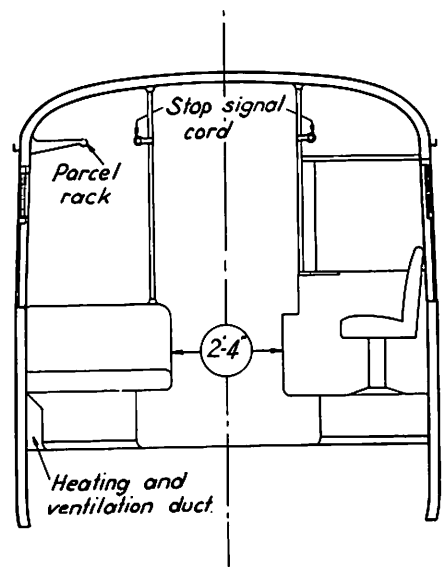
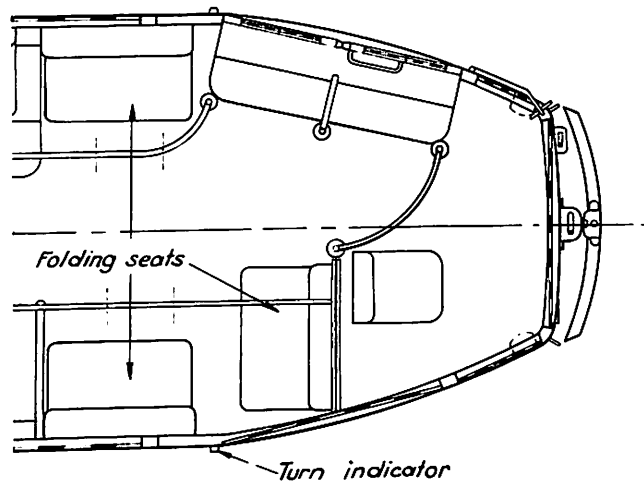
**PROPOSED**

**ELECTRIC TRAMCARS**

MELBOURNE & METROPOLITAN — TRAMWAYS BOARD —				
DATE	F. B. Kirby DEPUTY CHAIRMAN			
17/3/66				
DRAWN E.H.	TRACED J.R.G. 27/1/66	CHECKED	PASSED	APPROVED K.D.A.
SCALE: 24 to 1		T.2500-7		



SECTION A-A



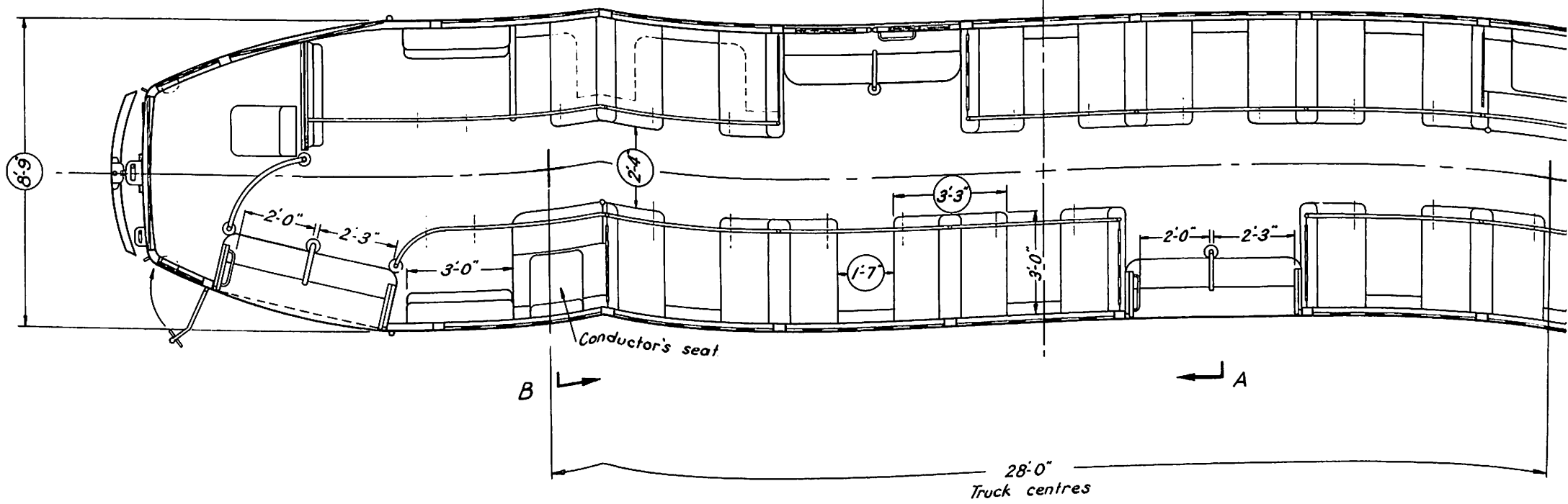
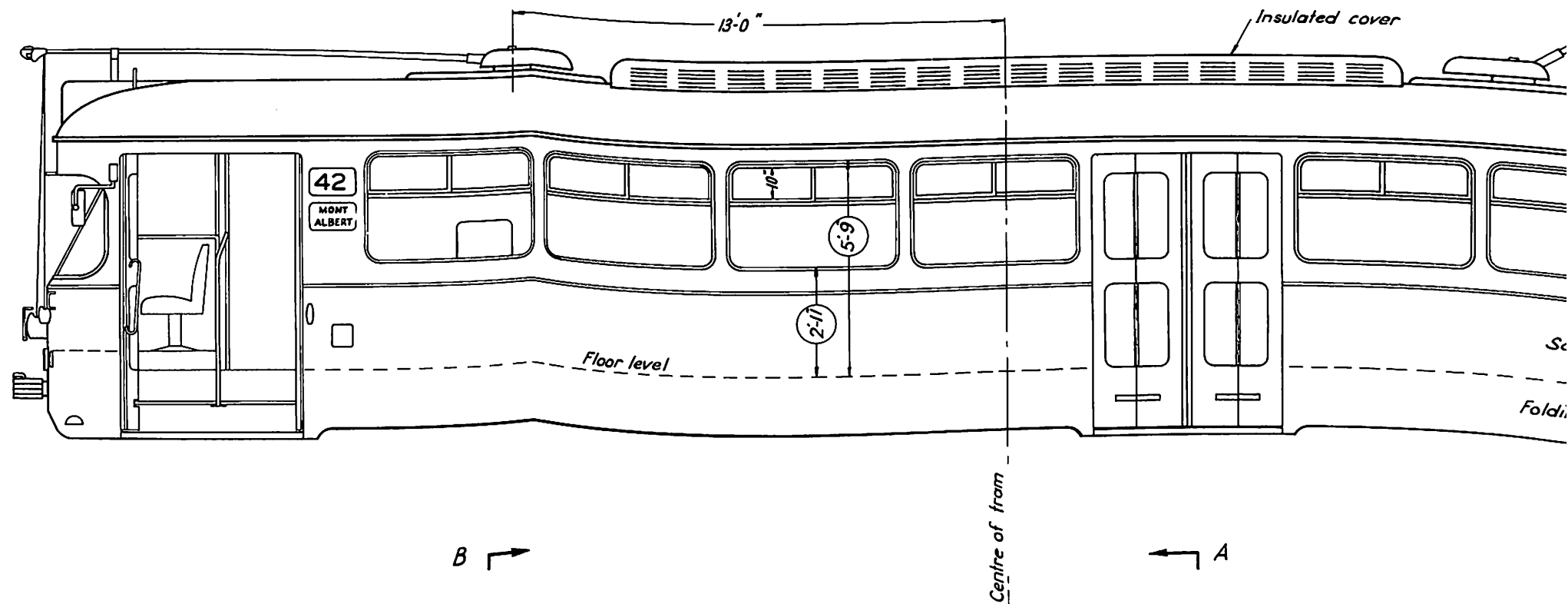
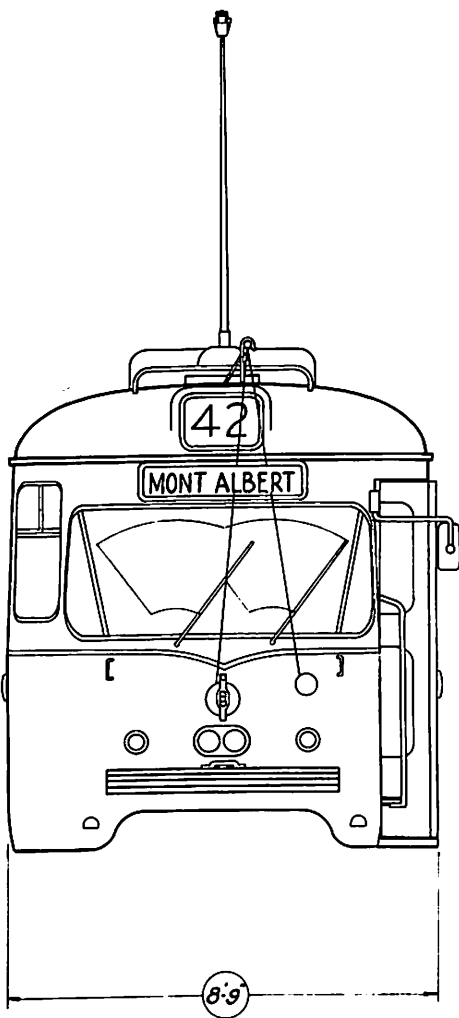
SECTION B-B

# ALL-ELECTRIC TRAM

## A POSSIBLE ARRANGEMENT

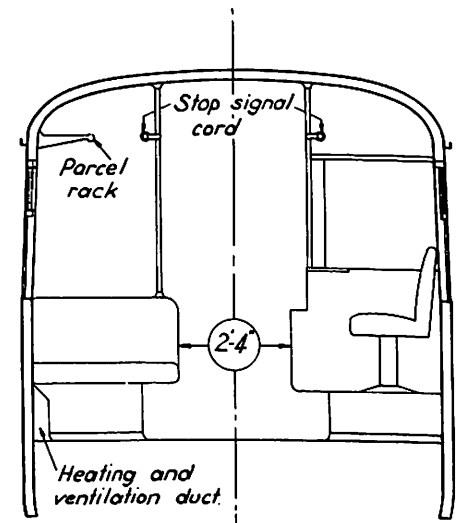
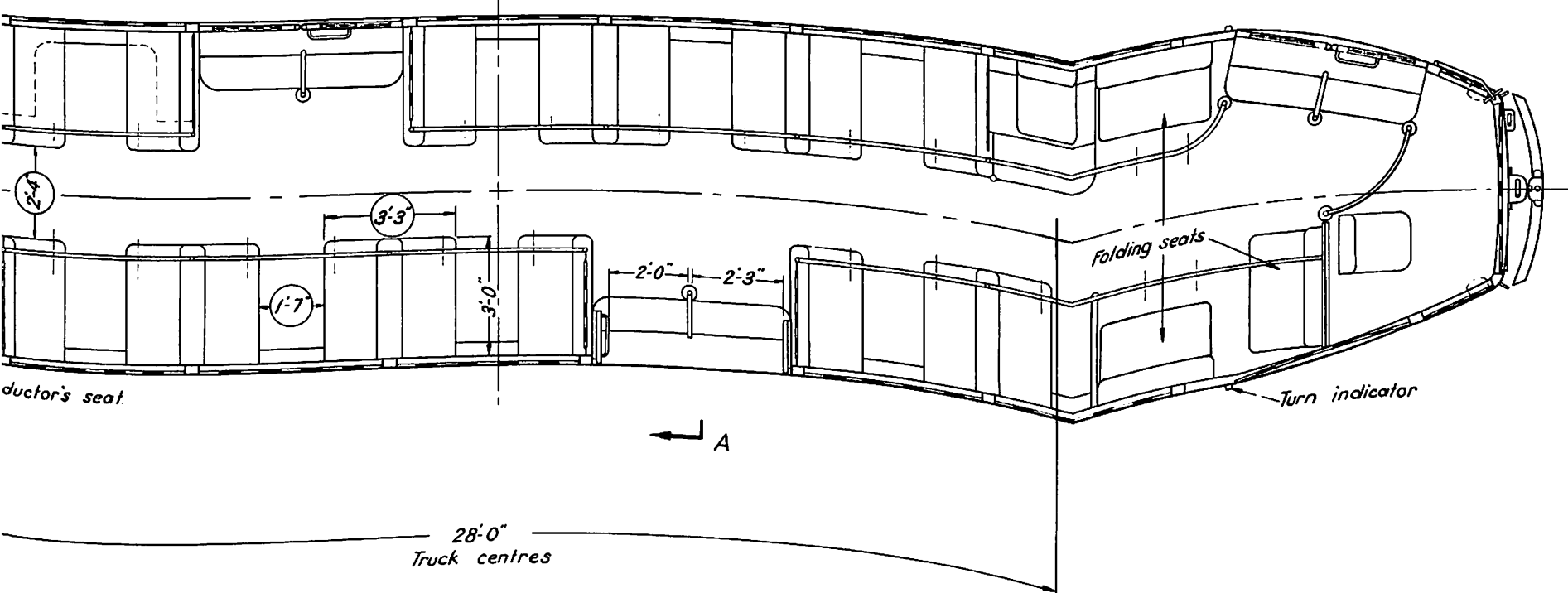
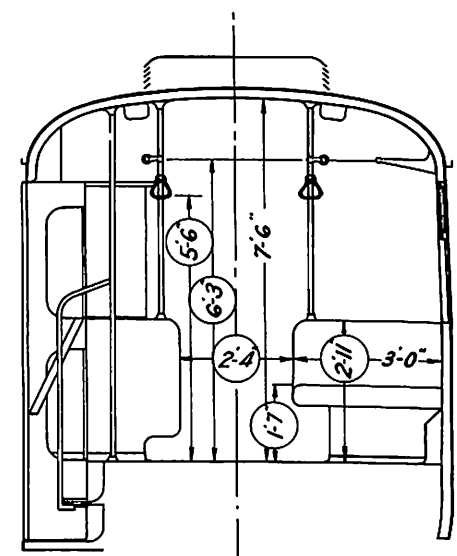
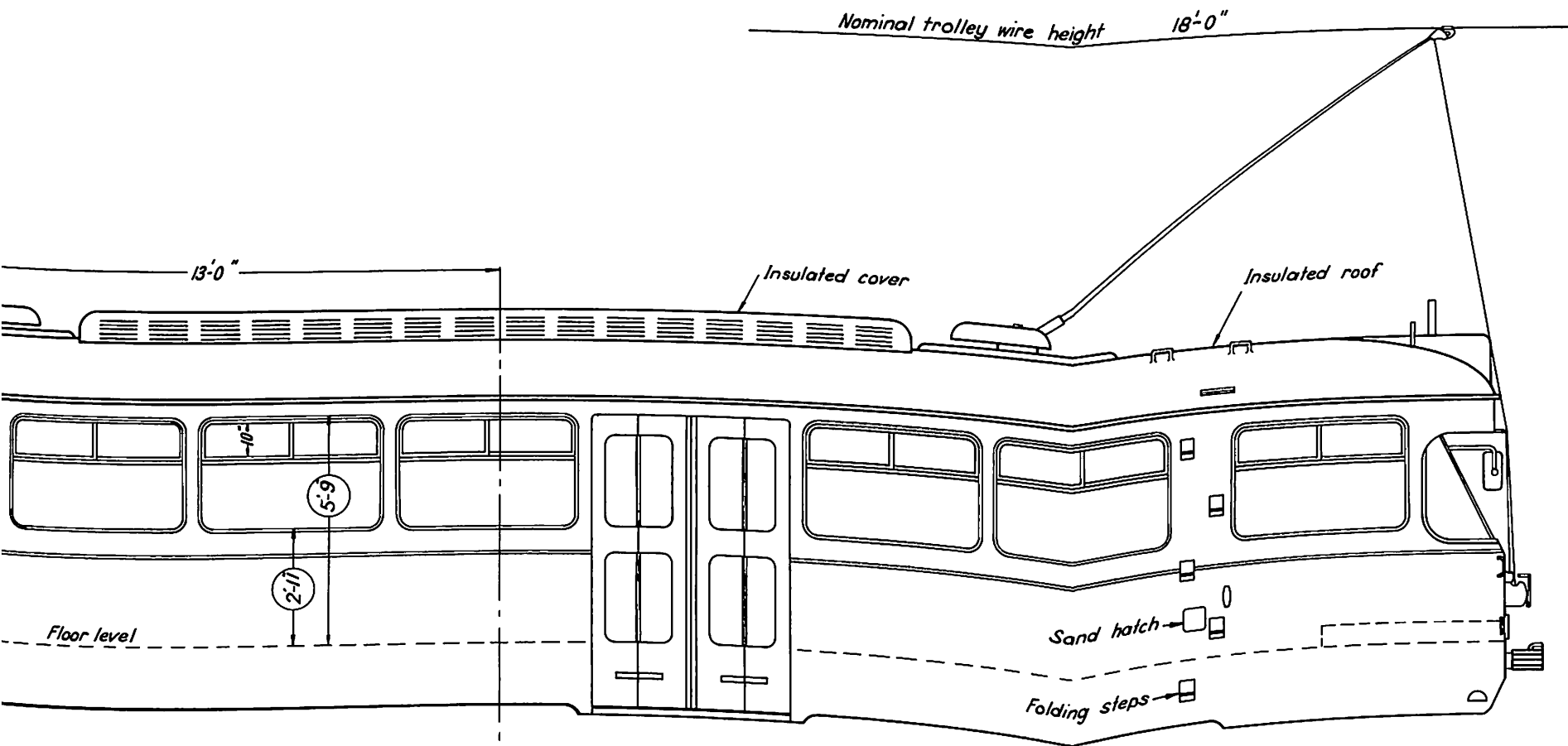
MELBOURNE & METROPOLITAN TRAMWAYS BOARD				
DATE	F. P. Kelly DEPUTY CHAIRMAN			
15-4-66				
DRAWN	TRACED	CHECKED	PASSED	APPROVED
K.T.H.	B.T.W.	21	[Signature]	K.P.A.
SCALE: 48 to 1				7.2500-8



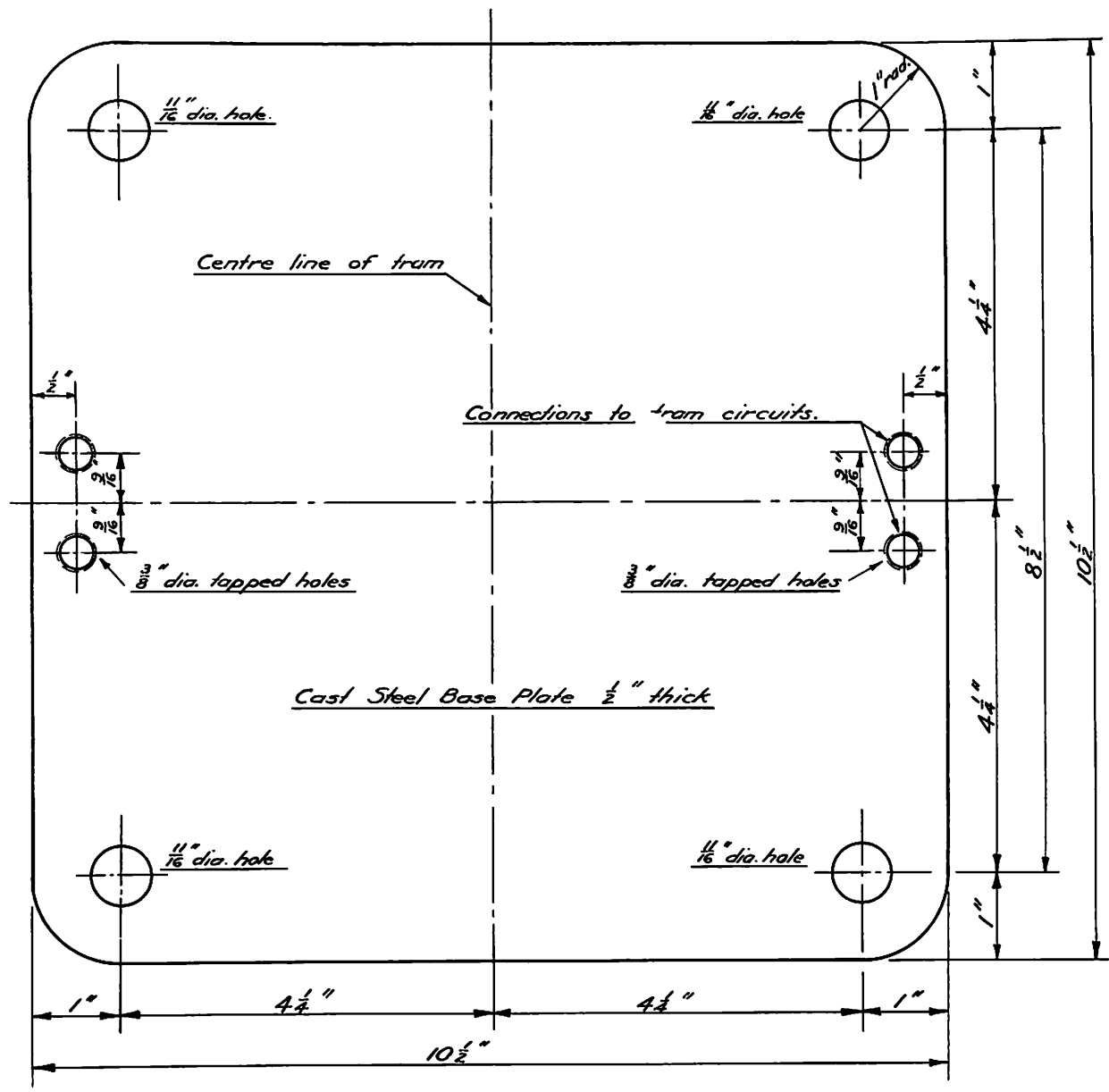


Notes: 1. This drawing illustrates one arrangement which complies with specified clearances. The truck centre dimension is not critical.

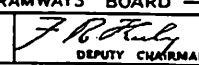

2. Critical dimensions are shown thus - (8'9")



Notes: 1. This drawing illustrates one arrangement which



**MOUNTING DETAILS**  
**FOR**  
**TROLLEY POLE BASE**

MELBOURNE & METROPOLITAN TRAMWAYS BOARD				
DATE		 DEPUTY CHAIRMAN		
22/3/66				
DRAWN	TRACED	CHECKED	PASSED	APPROVED
K. C.	J. A. G. 2/3/66			K. J. N.
SCALE: 2 to 1			7.2500-9	

# Melbourne & Metropolitan Tramways Board

Melbourne, Victoria

MANUFACTURE, SUPPLY AND DELIVERY

OF

100 ALL-ELECTRIC TRAMS.

CONTRACT NO. 2500.

SCHEDULE OF PRICES.

Price of <u>100</u> All-electric Trams complete as specified	\$A.....
Amount included for duty	\$A.....
Is payment on extended terms offered? (If 'Yes' append full details)	YES/NO
Guaranteed delivery date of first tram (assuming firm order is placed by 1st December, 1966)	.....
Guaranteed delivery date of fifth tram	.....
Time required for delivery of sixth tram (after advice that tests on first five trams are satisfactory)	.....
Guaranteed delivery rate for remaining trams	.....

ITEMS FOR APPROVAL. (Price per tram included in tender price.)

Item	Price per Tram \$A	Amount Included for Duty \$A
Floor covering material	.....	.....
Lining material	.....	.....
Interior cover strips	.....	.....
Windows - (a) Windscreen	.....	.....
(b) Side windows	.....	.....
Doors	.....	.....
Steps and step well	.....	.....
Passengers' seats - (a) Fixed	.....	.....
(b) Folding	.....	.....
Driver's seats	.....	.....
Conductor's seats	.....	.....
Rear vision mirrors	.....	.....
Strap hangers	.....	.....
Roof drainage system	.....	.....
Roof access steps	.....	.....
Sun blinds	.....	.....
Luggage racks	.....	.....
Litter baskets	.....	.....
Exterior painting	.....	.....
Interior painting	.....	.....
Trolley retriever	.....	.....

ITEMS FOR APPROVAL - Continued.

Item	Price per Tram \$A	Amount Included for Duty \$A
Axle speed monitoring equipment	.....	.....
Door control equipment	.....	.....
Lighting installation -		
(a) Fluorescent lights	.....	.....
(b) Exterior lights	.....	.....
(c) Emergency lights	.....	.....
(d) Destination and route number lights	.....	.....
Battery	.....	.....
Ventilation and heating system	.....	.....
Destination and route number signs	.....	.....
Public address system	.....	.....

EQUIPMENT EXCLUDED FROM TENDER PRICE.

Price of one conductor's desk (excluding fare and ticket equipment)	\$A.....
Amount included for duty	\$A.....
Price of one ticket printing and issuing machine	\$A.....
Amount included for duty	\$A.....
Price of one change issuing machine	\$A.....
Amount included for duty	\$A.....
Price of one fare collection tray	\$A.....
Amount included for duty	\$A.....
Price of one complete set of electrical equipment and trucks (for training purposes)	\$A.....
Amount included for duty	\$A.....

Tenderers shall set out in separate tables (under the headings shown below) the prices of:

- Test equipment - as specified in Clause 9-2 (a)
- Maintenance equipment - as specified in Clause 9-2 (c)
- Spare parts - as specified in Clause 9-1

Item	Recommended Number	Price for One Item \$A	Amount Included for Duty \$A

Guarantee period .....

.....

Country or State of origin of -

- (a) Mechanical equipment .....
- (b) Electrical equipment .....
- (c) Body .....

TENDERER'S NAME AND ADDRESS .....

WITNESS ..... DATE .....

This is the Schedule of Prices marked "D" referred to in the annexed Agreement with the Board.

WITNESS ..... CONTRACTOR .....

# Melbourne & Metropolitan Tramways Board

Melbourne, Victoria

MANUFACTURE, SUPPLY AND DELIVERY

OF

100 ALL-ELECTRIC TRAMS.

CONTRACT NO. 2500.

TENDER FORM.

TO THE SECRETARY,  
MELBOURNE AND METROPOLITAN TRAMWAYS BOARD,  
MELBOURNE. VICTORIA. AUSTRALIA.

Under and subject to the Conditions of Tendering, Conditions of Contract, Specification and Schedule of Prices herein attached, I/we the undersigned hereby tender and offer to supply and deliver to the Melbourne and Metropolitan Tramways Board, Victoria, Australia, the material described in the Specification hereto attached.

I/We undertake, in the event of this tender being accepted, to execute when called upon by you to do so, a formal Contract for the due supply and delivery of such material in the terms of the Form of Contract hereto attached.

I/We further undertake that this tender shall not be withdrawn before ninety days from the date specified for opening the tenders, and may be accepted by you at any time within such period.

Witness my/our hand this \_\_\_\_\_ day of \_\_\_\_\_ 19\_\_\_\_

TENDERER'S NAME AND ADDRESS .....

.....

WITNESS .....

This is the Form of Tender marked "E" referred to in the annexed Contract with the Board.

WITNESS ..... CONTRACTOR .....

# Melbourne & Metropolitan Tramways Board

Melbourne, Victoria

MANUFACTURE, SUPPLY AND DELIVERY

OF

100 ALL-ELECTRIC TRAMS.

CONTRACT NO. 2500.

FORM OF CONTRACT.

THIS CONTRACT made the \_\_\_\_\_ day of \_\_\_\_\_ 19\_\_\_\_

between

(in this Contract and in the Specifications and General Conditions respectively this day signed by the parties called "the Contractor") of the one part and THE MELBOURNE AND METROPOLITAN TRAMWAYS BOARD (in this Contract and in the said Specifications and General Conditions of Contract called "the Board") of the other part WITNESSETH that the Contractor covenants with the Board to execute perform and deliver to the Board the works matters and things shown described and referred to in the Tender and Schedule of Prices Specifications Drawings and Conditions of Contract hereto respectively annexed and signed by the parties hereto for identification in conformity with the said Schedule of Prices Specifications and Drawings for the price or prices and at the time or within the time or times set out in the said Tender and Schedule of Prices and such price or prices being payable at the times and in manner and in the events mentioned in the said General Conditions of Contract AND each of the parties hereto covenants with the other of them to perform fulfil observe and comply with and submit to all and singular the conditions stipulations and requisitions and all matters and things on the part of each of them respectively contained expressed and shown in or reasonably to be inferred from the said Tender Schedule of Prices Specifications Drawings and Conditions of Contract and by and on the part of each of them respectively to be performed fulfilled and observed.

IN WITNESS whereof the parties hereto have executed these presents the day and year first above written.

.....  
.....  
.....  
.....  
Secretary.

This is the document marked "F" referred to in the annexed Table of Contents.

WITNESS ..... CONTRACTOR .....



# Melbourne & Metropolitan Tramways Board

## Melbourne, Victoria

### MANUFACTURE, SUPPLY AND DELIVERY

#### OF

### 100 ALL-ELECTRIC TRAMS.

#### CONTRACT NO. 2500.

#### SCHEDULE OF INFORMATION TO BE PROVIDED BY TENDERER

The information requested in this Schedule will be used to assess tenders. Tenderers shall also provide all of the detailed information specified in Schedule "G". Dimensions may be expressed in British or Metric units provided the system used is clearly indicated.

Any alternative proposal for a major item of equipment requires a separate Schedule of Information.

#### A. DIMENSIONS.

1. Length over bumper bars.
2. Length over body.
3. Length of parallel sides.
4. Length of passenger loading space (between driver's bulkheads).
5. Overall width (excluding mirrors and turn indicators).
6. Interior width (between interior panels).
7. Height of trolley base mounting above rail (tare weight).
8. Height above rail excluding trolley pole and base (tare weight).
9. Height of floor above rail - (a) full standing load  
(b) tare weight.
10. Heights of first steps above rail (tare weight).
11. Heights of subsequent steps - (a) entrance  
(b) exit.
12. Depth of tread of first step - (a) entrance  
(b) exit.
13. Depths of tread of subsequent steps - (a) entrance  
(b) exit.
14. Height of bottom of first step framing above rail (tare weight).
15. Height of skirt above rail (tare weight).
16. Height of window sill above floor.
17. Height of lower glass line above floor.
18. Height of top glass line above floor.
19. Window pillar spacing.
20. Dimensions of glass in side windows - (a) fixed section (i) width  
(ii) height  
(iii) thickness  
(b) moving section (i) width  
(ii) height  
(iii) thickness.
21. Distance between door pillars.
22. Clear opening of doors (hand rail to face of door).
23. Clear opening of front half of door (hand rail to centre stanchion).
24. Clear opening of rear half of door (centre stanchion to face of door).
25. Height of doorway (top of first step to bottom of door head).
26. Depth of door motor enclosure (outside of tram to inside face of enclosure).
27. Width of aisle at top of seat back.
28. Width of aisle at seat cushion or frame.
29. Height of front of seat cushion above floor.
30. Width of seat cushions.
31. Length of seat cushions.
32. Distance between centres of seat backs.
33. Height of seat backs above floor.
34. Height of grab rail above floor.

A. DIMENSIONS - Continued.

35. Height of stop cord bracket above floor.
36. Diameter of grab rail.
37. Diameter of stanchions.
38. Height of driver's compartment floor above tram floor.
39. Height of conductor's enclosure floor above tram floor.
40. Angle of windscreen.
41. Thickness of exterior panels - (a) ends  
(b) sides.
42. Distance between truck centres.
43. Distance between axle centres.
44. Diameter of wheels (new).
45. Diameter of wheels (condemning size).
46. Overall length of truck.
47. Overall width of truck.
48. Diagonal dimension of truck.
49. Clearance of truck above rail (wheels at condemning diameter, full standing load on tram).
50. Clearance of motor case above rail (wheels at condemning diameter, full standing load on tram).

B. WEIGHTS.

1. Weight of complete tram ready for service.
2. Weight of complete body.
3. Weight of one truck.
4. Weight of one traction motor.
5. Weight of one wheel and axle set.
6. Weight of one resilient wheel.

C. CAPACITY.

1. Number of fixed passenger seats.
2. Number of folding passenger seats.
3. Number of standing passengers - calculated as in Clause 3-2 (d) -  
(a) in front of conductor's enclosure  
(b) in fixed seat section  
(c) at rear.

D. PERFORMANCE.

All information listed in items 1 to 10 applies to a tram fitted with wheels of design diameter operating on level track with full seated load.

1. Maximum speed.
2. Transition time from zero to maximum acceleration.
3. Maximum acceleration.
4. Average acceleration.
5. Transition time from zero to maximum deceleration (with dynamic brake only).
6. Maximum deceleration (dynamic brake only).
7. Average deceleration (dynamic brake only).
8. Maximum rate of change of deceleration (dynamic brake only).
9. Maximum deceleration (mechanical brake only).
10. Maximum deceleration (full emergency braking).

In addition, the following information shall be supplied:

11. Speed of tram (with wheels at condemning diameter when motors are operating at maximum safe speed).
12. Total rolling resistance.
13. Rolling resistance of one resilient wheel.

E. BODY.

1. Description of method of body construction.
2. Material proposed for structural members.
3. Material proposed for exterior panels.
4. Method of fixing exterior panels.
5. Material proposed for interior lining.
6. Method of fixing interior lining.
7. Material proposed for interior cover strips.
8. Material proposed for roof.
9. Method of electrical insulation of roof.
10. Proof tests which may be applied to the insulated roof.
11. Material proposed for thermal insulation.
12. Material proposed for floor.
13. Material proposed for floor covering.
14. Method of fixing floor covering (including details of adhesive).
15. Material proposed for seat covers.
16. Material proposed for upholstery.
17. Material proposed for stanchions and grab rails.
18. Strap hangers - (a) type  
(b) number.
19. Material proposed for step wells.
20. Type of doors.
21. Method of door construction.
22. Side window glass specification - (a) visible light transmitted  
(b) total radiation transmitted.
23. Description of side window construction.
24. Material proposed for sand boxes.
25. Location of sand filling points.

F. TRUCKS.

1. Type of wheel.
2. Specification for tire steel.
3. Recommended tire hardness.
4. Acceptable range of tire hardness.
5. Estimated tire life.
6. Can tire be changed while axle is in truck?
7. Description of drive.
8. Gear ratio.
9. Type of bearings.
10. Description of method of suspension.
11. Method of fixing trucks to body.
12. Method of applying sand to rails.
13. Material proposed for sand hoses.
14. Description of mechanical brake.
15. Method of mounting track brake.

G. ELECTRICAL EQUIPMENT.

1. Type of traction motor.
2. Number of motors per tram.
3. Motor voltage.
4. Kilowatt rating of motor.
5. Method of ventilating motor.
6. Type of insulation - (a) stator  
(b) rotor.
7. Motor speed at maximum tram speed (new wheels, full seated load, level track).
8. Maximum safe motor speed.
9. Can motor be removed without removing tram from its trucks?
10. Method of motor isolation.
11. Type of drive proposed.

G. ELECTRICAL EQUIPMENT - Continued.

12. Description of acceleration and braking controls.
13. Number of acceleration steps.
14. Number of braking steps.
15. Is control equipment mounted in plug-in units?
16. Description of axle speed monitoring equipment.
17. Motor generator - (a) output voltage  
(b) output current  
(c) output frequency  
(d) input current  
(e) range of input voltages over which output voltage can be maintained within 5 per cent of nominal voltage.
18. Batteries - (a) type  
(b) number.
19. Battery voltages.
20. Battery capacities (in ampere hours at 10 hour rate).
21. Auxiliary supply details.  
Tenderers shall supply for each of the following items -
  - (i) voltage
  - (ii) frequency
  - (iii) current rating
  - (a) Control equipment
  - (b) Track brake
  - (c) Door motors
  - (d) Fluorescent lights
  - (e) Exterior lights
  - (f) Emergency lights
  - (g) Windscreen wiper
  - (h) Ventilating fans
  - (j) Auxiliary heaters.
22. Maximum current drawn from overhead trolley wire with accelerator in "off" position and all auxiliary equipment operating.
23. Description of method of operation of destination control equipment.
24. Minimum supply voltage at which tram can operate on a level track with a seated load.
25. Rupturing capacity of main contactor.
26. Description of ventilation and heating system.

H. MAINTENANCE SCHEDULE.

Tenderers shall append a maintenance schedule recommended for the tram based on an annual operating mileage of 30,000 to 40,000 miles (48,000 to 64,000 kilometers) per year. This shall include an accurate estimate of manhour content of each scheduled operation; and shall indicate that work which should be undertaken in the depot and that work which should be undertaken at a base workshop.

J. LIST OF EQUIPMENT MANUFACTURERS.

- Tenderers shall supply for each of the following items -  
(a) name of manufacturer  
(b) location of manufacturer's works
- |                       |   |
|-----------------------|---|
| 1. Body               | 16. Gears   |
| 2. Doors              | 17. Traction Motors                               |
| 3. Windows            | 18. Electrical control equipment                  |
| 4. Glass              | 19. Axle speed monitoring equipment               |
| 5. Interior lining    | 20. Door control equipment                        |
| 6. Floor covering     | 21. Motor generator                               |
| 7. Seat covering      | 22. Battery                                       |
| 8. Windscreen wipers  | 23. Battery charger                               |
| 9. Windscreen washers | 24. Light fittings - (a) internal<br>(b) external |
| 10. Paint             | 25. Destination signs                             |
| 11. Driver's seat     | 26. Ventilation system                            |
| 12. Trucks            | 27. Public address system                         |
| 13. Wheels            | 28. Recording speedometer                         |
| 14. Axles             | 29. Trolley retriever                             |
| 15. Bearings          |   |

K. EQUIPMENT NOW IN SERVICE.

Tenderers shall supply for each of the following items -  
(a) name of Transport Undertaking operating the  
equipment now tendered  
(b) number of units in service  
(c) date first unit was placed in service

1. Trucks
2. Traction motors
3. Motor control equipment
4. Axle speed monitoring equipment
5. Motor generator
6. Doors and door operating equipment
7. Destination and route number signs.

WITNESS .....

DATE .....

This is the Schedule marked "G" referred to in the annexed Agreement  
with the Board.

WITNESS .....

CONTRACTOR .....



