

SPECIFICATIONS FOR RAPID TRANSIT CARS

SECTION 1

DEFINITIONS, SCOPE, INSPECTIONS AND TESTS

1.01 Definition of Terms

As used in these Specifications:

"Railroad" means the purchasing organization or its authorized representatives.

"Builder" means the builder of the car body and assembler of the complete car.

"Truck Builder" means the manufacturer of the car trucks.

"Manufacturer" means the manufacturer supplying materials, equipment or apparatus for installation on the car.

"T.R.C." means Transit Research Corporation.

"P.C.C." refers to Electric Railway President's Conference Committee which developed the general specifications and design of the P.C.C. car, and various improvements incorporated therein, and which has been succeeded by the Transit Research Corporation.

"A.A.R." means Association of American Railroads.

"I.C.C." means Interstate Commerce Commission.

"Approved Type" means type, material and design as approved by the Railroad.

1.02 Scope and Purpose

(a) These specifications are intended to cover a general description of proposed P.C.C. rapid transit passenger motor cars, including equipment, for high-speed, multiple unit operation on the lines operated by the Hudson & Manhattan Railroad Company.

(b) These specifications cover:

(1) Single-car units, with operating cabs at both ends, and

completely equipped for independent operation, and

(2) Two-car units, comprising an "A" and a "B" car, with operating cabs at one end of each unit, each two-car unit equipped for independent operation.

(c) Both single-car and two-car units shall be arranged for multiple-unit operation in trains of from one to ten cars, comprised of single-car units, two-car units, or a combination of both.

(d) The cars are to be generally similar to the P.C.C. rapid transit type car designed by Transit Research Corporation, modified as necessary to meet the operating requirements of the Railroad, and requirements of the I.C.C., and other governmental regulations where applicable.

(e) The cars must comply with all applicable I.C.C. regulations and Safety Appliance Act regulations.

(f) These specifications are intended to cover all labor, tools, materials, parts, apparatus and equipment required for the construction and assembly of the number of single-car and two-car units indicated in the Railroad's contract, completely tested and ready for service when accepted by the Railroad.

1.03 Responsibilities

(a) It is understood that the Builder shall do all work necessary for the detailed design of the car, and prepare all necessary detail drawings. He shall submit all drawings and schedules of equipment, material and specialties to the Railroad for approval before ordering or manufacturing any parts. It is understood that approval of the Railroad does not in any way relieve the Builder of responsibility for the adequacy of the design.

(b) The car body, trucks and equipment supplied must be of the best engineered design for the service intended. The Builder will use his best judgment and experience, consistent with compliance with I.C.C. and other governmental regulations, in determining the stresses imposed by the type of operation, and in the structure and equipment he supplies, he shall provide for these stresses with an adequate margin of safety. In the selection of the type of material to be used, the Builder will be guided by the necessity for obtaining the maximum strength and reliability with the minimum weight which is obtainable at reasonable cost.

(c) Each item of equipment or apparatus, including trucks and completely equipped car body, shall be designed and built strictly in accordance with these Specifications.

(d) The Builder shall furnish all labor, tools, materials, parts and apparatus necessary for constructing a complete car, and shall assume responsibility for the proper working and fitting together of all parts and specialties, with necessary clearances for successful operation.

(e) It shall be specifically understood that the omission of any reference to any part or item from these Specifications, which is required to make the car complete and suitable for successful performance of the function intended, shall not relieve the Builder from furnishing the required parts or items under these Specifications.

(f) Reproducible tracings on cloth of all drawings must be supplied by the Builder to the Railroad, for the Railroad's files. All drawings must be on Railroad standard drawing sizes.

(g) The Builder shall furnish 100 copies of all Service Manuals and Parts Catalogs. The originals shall be maintained, including all

current revisions by the Builder, for the life of the cars, and he shall furnish additional copies therefrom at a nominal cost.

1.04 Substitutes and Changes

(a) When the Builder desires to offer substitute items, parts, materials or equipment for those designated herein, in accordance with the term "or equal", he shall obtain approval in writing from the Railroad.

(b) No departure shall be made from these Specifications, nor any change made in items, parts, materials, equipment or design approved hereunder, without written approval of the Railroad.

(c) In the event that changes are agreed upon in items, parts, materials, equipment or design that will affect the price of the completed units, the price shall be adjusted upward or downward accordingly at the time the change is agreed upon.

(d) All approvals and authorizations on behalf of the Railroad shall be made by Herman T. Stichman, Trustee, or designated representative.

1.05 Inspections

(a) Authorized representatives of the Railroad shall have access at all times to those parts of the plants of the Builder and manufacturers who supply materials, equipment or parts for these cars, for the purpose of inspecting materials and workmanship during the progress of the work.

(b) Builders and Manufacturers shall extend to the Railroad's representative full cooperation and necessary facilities to permit the convenient inspection of all materials, equipment and parts, including

copies of all drawings, diagrams and other data which may be required properly to inspect and check the design, construction, assembly, installation, workmanship, clearance, tolerance and functioning of the cars and equipment.

(c) The presence of the Railroad's representatives in the plant of the Builder or Manufacturer shall not in any manner lessen the responsibility of said Builder or Manufacturer in respect to meeting all requirements of these Specifications. The Railroad shall have the right to reject all material and workmanship which do not fully conform to these Specifications.

1.06 Tests and Adjustments

(a) Facilities and Requirements

(1) The Builder shall use a suitably level test track of proper gauge, length and alignment to permit the acceleration and deceleration, and other operating tests specified below. This track shall be equipped with suitable means providing not less than 600 volts D.C. potential measured at the car during full acceleration.

(2) All working and moving parts, and all operating devices and controls of each car and its equipment, shall be tested and put in proper operating condition by the Builder and approved by the Railroad before cars are accepted. The Builder shall perform all of the tests and shall make all of the adjustments specified hereinbelow.

(b) Car Wiring Tests

(1) Ring out all wiring circuits to insure continuity and polarity

after assembly and installation of all equipment.

(2) Make a direct current ground insulation test on each car as follows:

- (a) Disconnect all ground wires;
- (b) Disconnect the storage battery at its terminals;
- (c) Connect all circuits together and then connect to a 600 volt D.C. source through a voltmeter. If this test shows freedom from ground connection, the A.C. test specified below shall be applied. If the D.C. test does not show freedom from ground connection, the point or points at which such ground occurs shall be determined and the insulation made satisfactory to the Railroad before the A.C. test is applied.

(3) Make an alternating current ground insulation test on each car after separating the connection between nominal 600 volt circuits and nominal 32 volt circuits required above. Apply for one minute an alternating current of 800 volts to all 32 volt circuits, and of 680 volts with 32 volt apparatus, including the generator of the motor generator set, connected in circuit. Apply for one minute an alternating current of 2200 volts to all 600 volt circuits ^{and} apparatus, including the motor of the motor generator set, connected in circuit. In each case a circuit breaker, set to open at a current slightly greater than the charging current, shall be connected in series. If this circuit breaker remains closed, the insulation to ground shall be considered satisfactory. All wires, cables and/or equipment that do not meet the require-

ments of the tests shall be removed and replaced by the Builder. After replacement of any such defective parts, materials or equipment, the car shall be subject to retesting.

(4) Reconnect ground connection and storage battery and then test all 32 volt and all 600 volt circuits on each car for proper functioning.

(c) Motor and Brake Controller

(1) Without the motor current, test the propulsion motor controllers of the unit for correct sequence of operation by operating each master controller and observing the functioning of the various pieces of equipment involved. Rectify any failure to function in proper sequence before proceeding with the remaining tests.

(2) Without the motor current, operate each brake controller and check functioning of brake controller and equipment for both proper sequence and the relationships between braking systems.

(d) Air Brakes

(1) Adjust the governor of the air compressor on each unit to the pressure range specified in Section 11.03 (e) of these Specifications.

(2) Adjust feed valve to the setting specified in (1) above.

(3) With all drain valves closed and the brake valve in "full service" position, pump up the air pressure to the cutout pressure of the governor. Allow at least five minutes for the temperature equalization and reduce the main reservoir pressure to 135 lbs. If the pressure drops within a period of 15 minutes, system shall be tightened.

(4) Determine the pump-up time by reducing the pressure in the main reservoirs to atmospheric. With the brake handle in the "handle-off" position, close the compressor switch and measure

the time which elapses between the closing of the switch and the build-up of air pressure on the main reservoir gauge to 140 lbs. The time required shall not exceed 4 minutes at 550 volts.

(c) Car Performance Tests

(1) On each unit, make acceleration tests over the test track with a recording accelerometer, indicating ammeters in the main motor circuits, and an indicating voltmeter across the motor circuit. If adjustments are required to obtain the current values corresponding to the rates of acceleration specified,

these adjustments shall be made by a representative of the electrical manufacturer. Accelerometer charts shall become the property of the Railroad.

(2) On each unit, make deceleration tests over the test track with such meters, including recording accelerometer, as may be needed to measure separate and combined friction and dynamic brakes. Make all necessary adjustments to obtain proper synchronization of the various forms of braking and the rates of deceleration, except that if adjustments of the dynamic brake control should be found necessary, these adjustments shall be made by a representative of the electrical manufacturer.

Accelerometer charts shall become the property of the Railroad.

(3) All performance characteristics shall comply with the requirements of these Specifications and shall be held within such limitations as to prevent undue surging in train operation. If the car or any equipment fails to satisfy these objectives, the necessary adjustments shall be made and the car shall be subjected to retest

as directed by the Railroad.

(4) Performance charts shall be furnished, showing traction motor characteristic curves, including tractive effort, speed-distance-current vs. time, schedule speed and energy consumption.

(f) Miscellaneous Body Tests and Adjustments

(1) Check one or more completed units, as may be determined by the Railroad, for truck clearance on a curve having a radius as specified in Section 2.02 (b). This shall be done by running the unit around a curve of that radius or by other equivalent means.

(2) Test roof and windows of each car for weather tightness, with motor generator set operating, by subjecting them to a jet of water at 40 lb. pressure from an open end 3/4" I.D. hose at a distance of 6' for a duration of 15 minutes. Any leaking parts shall be made weather-tight to the satisfaction of the Railroad.

(3) Check and adjust the doors and their operating mechanism on each unit to assure smooth functioning, attainment of the speed specified in Section 3.12 (d), and proper functioning of interlocks and door signals.

(4) Adjust the headlights of each unit to meet the beam characteristics specified in Section 5.03 (b).

(5) Check heating, ventilating and air-conditioning controls on each car to give the desired functions as specified in Section

4.03 and for even distribution of heat and re-circulated air.