

SPECIFICATIONS FOR RAPID TRANSIT CARS

SECTION 13

MATERIALS AND WORKMANSHIP

13.01 General

(a) All materials entering into the construction of these cars shall be of first class quality. All workmanship shall be of high grade and shall conform to the best manufacturing practices in all respects.

(b) Unless otherwise specified, all materials shall conform to A.S.A. and/or A.S.T.M. specifications.

(c) All materials intended for use in these cars shall be marked or stored so as to be readily identified, and shall be adequately protected during handling and storage.

(d) All interior unpainted metal trim shall be satin finish, and all exterior unpainted metal trim shall be bright finish unless otherwise specified.

(e) Lumber shall be thoroughly air seasoned or kiln dried before using and shall be dressed on all surfaces to full dimensions.

(f) Plywood, other than flooring, shall be three-ply poplar, with phenolic resin glue, or equal.

(g) Cotter pins, screws, bolts and nuts shall conform to American National standards and shall be cadmium plated or approved equivalent, unless otherwise specified. Cadmium plating is to conform to the latest revision of A.S.T.M. specification A 135, Type N.S.

(h) All interior exposed screws, #10 or larger, shall be Phillips Head, Reed & Prince or equivalent.

(i) Bolts, nuts, cap screws, machine screws and self-tapping screws shall be suitably locked.

(j) Rivet holes and bolt holes shall be accurately located and aligned, and when necessary during assembly, holes shall be reamed round to specified size in position. Hand driven steel rivets shall be driven hot and shall completely fill the holes. Rivets may be cold driven when adequate mechanical equipment is available therefor. Heads shall be concentric with the shank of the rivet. Exposed heads shall be free from rings, fins, pits and burns.

(k) Huck rivets may be used in locations approved by the Railroad.

(l) Joints shall be properly fitted, whether exposed or concealed.

(m) Where metal is riveted or bolted to metal in the car structure, contact surfaces shall be free of dirt, grease, rust and scale and shall be coated with a suitable metal base primer which will not interfere with later enamel or lacquer applications.

(n) Where wood and metal surfaces are placed together, the wood is to be coated with white lead and oil or approved aluminum paint and the metal is to be coated with a primer of the type specified in (m) above.

(o) Where wood and wood are placed together both abutting surfaces shall be coated with white lead and oil or approved aluminum paint.

(p) All hidden metal shall be given one heavy coat of approved metal base primer and one coat of approved sealer. All hidden wood shall be given two coats of white lead and oil, or two coats of approved aluminum paint.

(q) All bolts or rods passing through wood shall be coated with white lead and oil or approved aluminum paint over those parts imbedded in the wood.

(r) Where roller guides are required for control rods they shall be made of Micarta with the layers of reinforcing fabric at right angles to the axis of the rollers, or approved equal.

(s) Chromium plating shall conform to the latest revision of A.S.T.M. specification A 166, Type F.S.

13.02 Steel

(a) Structural and Sheet Steel

1. The underframe and other parts of the body structure (including equipment compartments) shall be made of the materials known commercially as Corten, Yolroy, Armco HT 50 or Mayari R, or approved equal, except those parts elsewhere specified to be made of aluminum alloy.

2. Side and roof sheets, posts, steps and ducts therein shall be made of material having greater corrosion resisting properties than copper steel, unless otherwise specified by the Railroad.

(b) Axles

1. Axles shall be made of S.A.E. steel of approved quality heat treated to develop a minimum tensile strength of 100,000 lb. per sq. in.; elongation of not less than 20% in 2"; reduction of area of not less than 50%. The endurance limit shall not be less than 50,000 lb. per sq. in. computed in the outermost fiber. The Railroad reserves the right to make fatigue tests on a reasonable number of axles to determine the endurance limit.

2. If such axles are taken from the production line and prove to have the required endurance limit, the Railroad shall reimburse the Manufacturer therefor. If such axles fail, all axles of that heat shall be rejected.

3. Axles which show any sign of surface cracking after finishing shall not be accepted.

4. Heat numbers of all axles shall be recorded by the truck Manufacturer and he

shall mark each axle on one end with an individual serial number which shall identify the heat number from which the axle was made.

(c) Steel Castings

1. Steel castings shall be commercially sound throughout. The Railroad reserves the right to cut up one or more of each shape from time to time to determine the character of metal in parts not exposed by the various machining operations. If castings are found to be porous or otherwise commercially unsound, the material destroyed shall be at Manufacturer's expense.

2. All steel castings used in the truck structure shall be made of electric furnace steel, heat treated to produce the following physical properties or better:

Tensile strength - 80,000 lb. per sq.in.min.

Yield point - 50,000 " " " " "

Elongation in 2" - 22%

Reduction of area - 30%

3. The king pin and the base thereof which form part of the body bolster structure shall be made of electric furnace steel conforming to the physical characteristics in (2) above.

4. The upper member of the center bearings shall be made of cast steel corresponding to S.A.E. 1035 in composition and shall be heat treated for Brinell hardness of about 225. It shall be finish ground after heat treatment on the bearing surface.

5. Steel castings used in locations not referred to herein shall be selected for composition and characteristics best suited to the application, by the Manufacturer or Builder concerned, but shall be subject to approval by the Railroad.

(d) Stainless Steel

1. Stainless steel shall conform to the latest revision of those parts of A.S.T.M. specification A 167 covering Grade 3, type 302 material with an approved finish.

2. Buffing and polishing of stainless steel, where required, shall be done in an approved manner and without the use of any composition containing iron or iron oxide.

13.05 Aluminum

(a) Aluminum shall be used only when and as specified within these Specifications or by the Railroad.

(b) The aluminum materials shall be identified by

the designations used by Aluminum Company of America and shall conform to the specifications given therefor in the latest revision of the publication "Alcoa Aluminum and Its Alloys."

(c) The forming of aluminum parts, joining by riveting and welding, and the protection of contact surfaces shall follow instructions given by Aluminum Company of America for specific alloys and specific parts.

13.04 Rubber

(a) General

1. All rubber specified shall be so compounded and cured that it will perform satisfactorily in car operation at any temperature between -40°F and 120°F . and shall have the longest possible commercial life consistent with obtaining the other characteristics specified.

2. Unless otherwise specifically stated herein, all tests shall be conducted according to the latest revisions of A.S.T.M. test procedures for rubber goods. Certified copies of results of all tests shall be furnished to the Railroad.

3. Specimens shall be tested two to ten days after manufacture.

4. When tests are specified to be made at any particular temperature, the Railroad and Manufacturer shall agree in advance on the factor to be applied to readings obtained at any other temperature.

5. When tests for drift under load are specified they may be made at any convenient temperature between 50°F. and 80°F. provided that the temperature at the beginning and end of the test is the same. The test shall be made under conditions subjecting the rubber specimen to continuous vibration. This may be obtained from vibration of the building caused by operating machinery, or it may be produced artificially by a small motor carrying an off-center weight, or by equivalent means. If produced artificially the frequency of vibration shall be between 1000 and 2000 cycles per minute.

6. The Manufacturer shall guarantee all rubber parts to be free from defects of material and workmanship. For all parts made by curing rubber to metal, any premature failure between metal and cement or cement and rubber occurring when the part is used in normal service and according to the provisions of this specification, shall be considered as caused by a defect of material

and/or workmanship.

7. Unless otherwise specifically provided or agreed upon between Manufacturer and Railroad, metal parts to which rubber is cured shall be made of S.A.E. 1020 hot rolled steel and shall be suitable for brass plating after pickling.

8. Synthetic rubber may not be substituted for natural rubber unless so specified hereinafter.

(b) Rubber Truck Springs

1. Rubber truck springs shall be so compounded, designed and cured as to meet the load and other requirements of these Specifications.

2. All rubber truck springs shall be capable of meeting the following drift test: When the spring is subjected to a load corresponding to its maximum static load applied continuously for a period of 240 hours, the increment of deflection between the end of the 24th and the end of the 240th hour shall not be greater than 0.010" per in. of total final deflection. The Manufacturer shall supply test equipment and shall test for drift, at his expense, one spring in each lot of 200 or fraction thereof. Certified copies of the test results shall be furnished to the Railroad.

(c) Rubber Stops for Track Brake Sreader, for
Bolster Bumpers and for Rubber Snubbers

1. These stops may be made of natural or synthetic (GRS) rubber.

2. The rubber parts shall be so compounded, fabricated and cured that the durometer hardness, measured with a Shore Type A durometer on the end of stop in the free condition, shall be 60 ± 3 at a temperature between 70°F. and 90°F.

3. The rubber shall have the highest resistance to abrasion which is compatible with the other characteristics herein specified.

(d) Rubber Axle Housing Sleeves

1. The axle housing sleeves, if used, shall be made of natural rubber, 60 durometer, subject to the permanent set test given in (b)(2) above.

(e) Rubber Door Edges

1. All U-shaped door edges must be made of natural rubber.

2. They shall be free of major defects of material and workmanship. A slightly roughened surface shall not be considered a defect.

3. The Manufacturer shall supply test equipment and test specimens, and shall perform at his expense such tests as are specified hereinafter.

4. When fabric insert is omitted, the Manufacturer shall furnish an adequate number of test pieces 6" x 6" x 3/32" of the same material as used in the door edges and with equivalent cure. These pieces shall be so selected that they are representative of each batch of rubber used during the production of the order, and there shall be at least one set of test pieces for every 400 door edges, or part thereof.

5. When using the 6" x 1/2" A.S.T.M. dumbbell type test specimen as given in latest revision of A.S.T.M. specification D 15, Methods of Sample Preparation for Physical Testing of Rubber Products (General Requirements)", and in latest revision of A.S.T.M. specification D 412, "Methods of Tension Testing of Vulcanized Rubber", the tensile strength shall not be less than 3500 lb. per sq. in. nor the elongation less than 55%.

6. The tensile strength of the rubber shall not be reduced more than 25% when subjected to 96 hours of accelerated aging in an air oven at 70° C (158° F.), the aging and testing being done as provided in the latest revision of A.S.T.M. specification D 573, "Method of Test for Accelerated Aging of Vulcanized Rubber by the Oven Method".

(f) Rubber for Door and Window Seals and Glazing Strips

1. All rubber for door and window seals and glazing strips shall be extruded and shall be free of major defects of material and workmanship. This must be natural rubber.

2. The durometer hardness measured with a Shore Type A durometer at a temperature between 70° F. and 90° F. shall be not greater than 50.

3. The Manufacturer shall supply test equipment and test specimens and shall perform at his expense such tests as are specified hereinafter.

4. The test specimens shall be cut from the extruded material, and at least one tensile strength and elongation test and one accelerated aging test shall be made on the material used for each car order of 25 cars or part thereof. If the compound or cure, or both, are changed during the production of material for one car order, at least one test of each type shall be made for each different batch.

5. When using the 6" x $\frac{1}{2}$ " A.S.T.M. dumbbell type test specimen (or smaller size if the size of the part necessitates) by the methods specified in 13.04(e)(5) for rubber door edges.

, the tensile

strength and elongation shall not be less than the following:

	Tensile Strength	Elongation
Door and window seals	2000 lb/sq. in.	500%
Glazing strips	2700 lb/sq. in.	450%

6. The tensile strength of the rubber shall not be reduced more than 25% when subjected to accelerated aging by the methods specified in 13.04(E)(6) for rubber door edges.

13.05 Safety Glass

(a) All safety glass shall be of the laminated type, consisting of two pieces of glass bonded with "Flexigum" or a plasticized polyvinyl butyral resin membrane approximately 0.015" thick and resistant to ultra-violet light and heat. Glass used in front cab windows must be free of optical strains.

(b) When an individual light is laid on a truly flat surface, the glass shall not indicate a bow of more than 0.030" per lineal foot.

(c) The overlap of one sheet of glass with respect to the other at an edge shall not exceed 1/32". Corners and burrs shall be ground smooth and all edges shall be seamed.

(d) The over-all dimensions of individual lights as supplied shall be held within 1/16" of the dimensions ordered.

(e) The bond between the two sheets of glass and the membrane shall be of such quality that when the glass is broken by shock, by twisting or by direct impact, there will be no material separation between the laminations.

(f) There shall be no appreciable variation in color in the individual lights of laminated plate or sheet glass when examined over a white background.

(g) All lights of laminated plate shall be so nearly free from haze that the laminated glass shall have approximately the same clarity as a light of the same nominal thickness of plate glass when viewed against a north light.

(h) Occasional specks of foreign material or scratches are permissible provided such specks do not exceed 0.020" in greatest dimensions, or scratches do not exceed a total of 3" in length, and are not within the central three-quarters of the area of the light.

(i) No lights containing unbonded areas (let-goes) shall be accepted.

(j) Safety sheet glass shall produce no apparent distortion on a line at right angles to the plane of the glass.

(k) All questions regarding the quality of safety glass shall be settled by the test methods prescribed

in the American Standards Association's latest revision of American Standard Z 26.1, "Safety Code for Safety Glass for Glazing Motor Vehicles Operating on Land Highways."

13.06 Wire and Cable

(a) Conductor Material

1. All conductors shall be of soft annealed copper, properly tinned, and shall have the properties and characteristics specified in the latest revision of A.S.T.M. specifications D 27.

2. Wires for control and auxiliary circuits shall not be smaller than No. 12, except for special apparatus such as heat or ventilation control equipment, where special types of wires are recommended for use by the manufacturers for interconnection of their various pieces of equipment.

(b) A paper separator shall be used between copper and rubber insulation, except that the separator may be omitted if a free stripping type of insulation is used. The paper separator is not required on asbestos insulated wire and cable.

(c) Rubber Insulation

1. Rubber insulation shall conform to the latest revision of A.S.T.M. specification D 755, "Insulated Wire and Cables Performance Synthetic Rubber Compound."

2. The thickness of rubber insulation and the number and type of coverings over the insulation shall be as

given or recommended by the electrical manufacturers approved by the Company, but not less than the dimensions indicated by the A.S.T.M. specifications referred to herein.

3. Braids or sheaths used with rubber insulation shall be at least equal to A.S.T.M standard braid or sheath compound as covered in the latest revision of A.S.T.M. specification D 27 or D 752. Braids shall be thoroughly saturated with black flame retarding and moisture resisting compound.

4. Motor lead terminals shall have rubber insulation of the type specified in paragraph (1) above.

5. An oil resistant synthetic jacket which has been approved by the Underwriters' Laboratories for car and trolley bus wiring shall be used for the outer jacket of track brake and motor leads.

6. All insulated wire and cable shall meet the Underwriter's approval.

(d) Asbestos Insulation

1. The thickness of the component parts of asbestos insulation shall be as given or recommended by the electrical manufacturers approved by the Railroad. The minimum thickness shall be not less than 90% of the average thickness.

2. Felted asbestos or braid shall consist of best

quality, long-fibre, chrysotile asbestos commercially free from foreign particles of dirt, cotton seed and metallic oxides. It shall be well carded to prevent lumps and irregularities in the finished cable.

After extraction of impregnating compound it shall contain not less than 80% by weight of asbestos.

The total iron content shall not exceed 4% by weight of asbestos and the magnetic iron content shall not exceed 2% by weight of asbestos.

3. The felted asbestos shall be applied to form a smooth wall of uniform thickness with the conductor well-centered. It shall be thoroughly dried and completely saturated with a flame, heat and moisture resisting compound. This compound shall retain its initial qualities during the normal life of the cable. The compound shall develop no injurious chemical action within itself or with any component parts of the completed cable.

4. Varnished cambric insulation in asbestos insulated wires and cables shall consist of a high grade varnished cloth, substantially free from blisters or other imperfections, applied with a lubricating compound between layers. It shall comply in all respects with the requirements for varnished cloth outlined in the latest revision of the "Standard for Varnished Cambric Insulated Cable" of Insulated Power Cable Engineers Association.

5. All asbestos insulated wire and cable shall meet the Underwriters' approval.

(e) Varnished cambric insulated cables shall conform to the latest revision of the "Standards for Varnished Cambric Insulated Cables" of the Insulated Power Cable Engineers Association, and shall meet the Underwriters' approval.

(f) The sizes, stranding and types of insulation shall be suitable for the uses and type of service described in these Specifications.

13.07 Wiring

(a) General

1. The work shall be performed by or under the direction of an experienced wireman. The wireman shall be provided with appropriate tools for skinning insulation, cutting, tinning, soldering and attaching mechanical or compression type terminals to the conductors.

2. Care must be taken in removing insulation from the conductor to avoid nicking of the wire or strands of the conductor cable. Wire in ducts shall be free of kinks.

(b) Solder shall be at least equal in quality to that designated as S.A.E. No. 1, Class B. A flux of non-corrosive type shall be applied before soldering. An automatic temperature controlled solder pot shall be used.

(c) Insulating tape or splicing compound shall consist of a good quality unvulcanized rubber insulation of a minimum thickness

of 0.010" and shall fuse quickly when applied. Friction tape shall be made of a good quality cotton tape filled with a heavy rubber compound that will resist aging. When properly applied, an approved polyvinyl chloride electrical tape with Buna "S" type adhesive, 0.007" overall thickness, may be substituted for the combination of friction and insulating tapes. The above materials shall be suitable for use with the conductor insulation without discoloring or corroding the copper wires and shall provide 600 volt insulation.

(d) Ends of conductors shall be thoroughly cleaned and tinned by immersion in molten solder. Care must be exercised to prevent burning the insulation and excessive flowing of the solder along the conductor. Terminals which are attached by soldering shall be thoroughly cleaned and recently tinned before attachment to the conductor.

(e) Conductors may be soldered to terminals or they may be attached by mechanical means where the use of an approved type of solderless terminal has been authorized. Where possible the terminal used shall be of the type which will securely grip and hold the insulation on the conductor of No. 10 size or smaller. Conductors which will be subjected to motion relative to the terminal shall be protected by suitable means to minimize breakage of the conductor at or near the terminal.

(f) Motor terminals shall be attached to the motor leads either by means of an approved type solderless compression

terminal or with silver-cadmium solder having a melting point of about 740⁰F. The terminal cup shall contain only sufficient molten solder to fill the cup after the conductor has been inserted.

(g) Splicing and Tapping

1. Splicing of conductors is not recommended.

Where it is unavoidable, the spliced joint shall be mechanically as strong as any other part of the conductor, without use of solder. However, the joint shall be soldered to insure electrical continuity and wiped or filed to remove fins and burrs of hard solder. Approved solderless connectors may be used for splicing. The joint shall be insulated with tape so as to be at least equivalent to the insulation on the conductor. The outside diameter of the spliced portion of the cable after the tape insulation is applied shall not exceed the outside diameter of the unspliced portion by more than 40%. The finished splice shall be painted with one coat of approved insulating compound.

2. A conductor shall be tapped on to another conductor only when approved by the Railroad and then the method of attachment and insulation described in (1) above shall apply.

13.08 Welding

(a) The Builder, and each Manufacturer shall be responsible for the quality of the welding done by his organization, and all welders employed in the making of welds on structures or products built under these Specifications shall have been tested to determine their ability to operate the welding equipment to be used in making the types of welds required hereunder and to produce satisfactory welds therewith.

(b) The Railroad shall have the right to require the making of test welds by any operator to determine his ability to produce satisfactory welds of any given type. The Railroad shall also have the right to require the making of test welds to settle any question which may arise as to the suitability of any welding method or procedure used during production. The recommendations of the American Welding Society as contained in the latest revision of their "Standard Qualification Procedure" shall be followed in the making of tests and the settlement of other questions which may arise hereunder regarding welding practice.

(c) Before welding of any sort is started, parts to be joined shall be properly cleaned. All corrosion or rust, oil, water and other foreign material shall be removed by an approved process or method.

(d) All parts which are to be joined by welding shall be adequately supported in proper interrelation by tables, jigs, or fixtures.

(e) Welding rod or wire or filler metal shall be chosen with respect to make, type and size by Builder or Manufacturer, as the case may be, who shall assume full responsibility for the character of the work produced.

(f) Filler metal shall be purchased in packages of convenient sizes, and shall be marked with the following information:

Make

Specification number

Diameter

Net Weight

This material shall be stored so as to protect it from damage, and so that it can be easily identified. Filler metal shall be issued and handled in such a way as to prevent materials of a given specification being mixed with those of another specification.

(g) In case a question shall arise regarding the suitability of given electrodes, shielding material or filler metal for the work covered by these Specifications, the latest revision of the joint American Welding Society and A.S.T.M. tentative specifications for Filler Metal, Iron and Steel, shall govern.

(h) Current, voltage, distance, flame and other variables shall be so controlled as to give a reasonably smooth weld free of gas pockets, oxide inclusions, excessive variations in width and thickness, excessive wandering, and spattering.

(i) Penetration of weld metal into the bottoms of angles and vees, and fusion at these points shall be complete. Weld metal shall run into the base metal at the finished surface of the weld in a smooth curve approximateing tangency to the surface of the base metal so as to avoid sudden change of section and resultant concentration of stress.

(j) The method used in depositing weld metal shall be chosen so as to minimize warpage and locked-up stresses. To this end, tack welding, skip welding, offset welding and other devices and sequences now well known in the art shall be used where necessary.

(k) Parts rotating at high speed and other parts in which locked-up stresses serve as a source of danger shall be heat treated after welding for stress relief. When the base metal contains .03% carbon or less, this shall be done by heating the structure slowly in a furnace to a temperature of 1100° F. to 1200° F., holding for one hour per inch of thickness at that temperature, and then cooling slowly to at least 250° F. before removal from

the furnace. When the carbon content of the base metal is above 0.3% the annealing temperature shall be 1425°F. to 1475°F.

(l) Finished welds which have a thickness greater than 1/4" shall be made with at least two beads. The scale shall be completely cleaned off the underlying bead and surrounding metal after cooling and before the next bead is deposited.

(m) The following requirements shall be met by welding rod or wire used for the various types of welding indicated:

1. For manual electric fusion welding, electrodes shall be of the heavily coated, shielded arc type, unless otherwise specifically approved by the Railroad.

- (2) For automatic electric fusion welding, uncoated electrode wire may be used when necessary.

(n) For carbon arc welding, a shielded carbon arc shall be used. The method and material for shielding and the filler metal, if used, shall be best suited to provide welds of good quality under the conditions encountered.

(o) Manual fusion welding by the gas process may be used in butt welding of sheets 3/32" and less in thickness and, at the option of the Railroad, in other work.

(p) Spot or Plug Welding

1. Spot or plug welding to produce welds which carry structural stresses, as for example those fastening side sheets to structural members, shall be done only with equipment fitted with time, current and pressure control.

2. The Builder or Manufacturer shall determine experimentally, or in other acceptable fashion, the proper setting of the controls and shall then provide against unauthorized changes.

3. The size, shape, and surface conditions of electrodes required to give satisfactory welding and acceptable finish shall be determined similarly and a complete record made thereof. Thereafter the electrodes shall be dressed to these conditions as frequently as the character of the work requires.

4. The Builder or Manufacturer shall so treat surface marks resulting from welding as to eliminate all visible defects in the finished surface.

13.09 Paint and Painting

(a) Materials and General Requirements

1. The interior and exterior of the car body shall be painted in accordance with instructions of the Railroad as to color scheme, striping and lettering, using products supplied or recommended by the paint Manufacturer approved

by the Railroad, unless modified by the written recommendations of said paint Manufacturer, which shall in turn be approved by the Railroad. The preparation of the surfaces, the number of coats, and their method of application shall be as recommended by the paint Manufacturer.

2. The entire metal frame after completion shall be sandblasted, cleaned and immediately painted with the first coat of primer. If pickled and oiled steel is used exclusively, the completed structure may be cleaned with solvent or detergent and primed immediately thereafter.

3. During construction, the requirements of Section 13.01(p) regarding protection of all hidden surfaces, including metal doors, shall be fully met. After erection, the interior shall be given one coat of primer with a sealer coat on the back of the sheets. The underside of the car shall be sprayed with an approved undercoating. This material must retain its plasticity and be resistant to acids, salts, and alkalis. It must be fire resistant and be capable of softening with a torch for removal. Equipment cover latches, hinges and other moving parts shall be masked while the undercoating is applied.

4. Before painting of the finished car body structure, all dents, roughness or other surface imperfections shall be removed by straightening, filing and sanding.

5. Painting materials shall be either brushed or sprayed as provided hereinbelow or as modified therefrom by recommendations of paint Manufacturer. Each coat shall be uniformly applied over all surfaces to be covered and shall be free from runs, sags or other application defects. Painting shall be done by experienced labor, using proper equipment under competent supervision. Painting of the completed body structure shall be done in a clean dry atmosphere at a temperature not less than 68° F.

(b) Exterior Painting

1. The entire exterior, including roof, underframe, underside of flooring and equipment shall be given at least two coats of an approved primer after properly cleaning all surfaces. Exterior surfaces except roof and underframe shall then be given a coat of an approved surfacer after which the surface shall be properly knifed and major imperfections filled and the entire surface properly rubbed. These surfaces shall then receive

at least two coats of an approved synthetic enamel or lacquer. The roof shall be given two or more coats of an approved roof paint.

2. Equipment outside the car end shall be painted the same as the car body. The end sills, underframe, underside of floor and all equipment except control equipment, shall be given one or more coats of an approved paint.

3. The control equipment compartment shall receive at least one coat of an approved insulating varnish and the inside shall be white to reflect light.

4. The battery compartment shall be given one coat of an approved acid resisting paint.

(c) Interior Painting

1. The entire interior, except unpainted hardware and trim, shall be given two coats of primer, proper surfacing and two coats of synthetic enamel or lacquer as described above.

(d) Rust Protection

1. All surfaces shall be completely free of rust, scale, grease and other foreign matters immediately preceding the first priming coat. All joints shall be properly sealed with an approved water-proofing compound. Spot welded connections shall be thoroughly coated with an approved spot weld sealer.

2. Surfaces that are concealed after assembly shall be properly cleaned and painted with two coats of an approved preservative paint especially up to a height of one foot from bottom of side sill.

3. All aluminum surfaces shall be given a coat of an approved zinc chromate paint and all joints between the aluminum and steel shall be suitably insulated with tar paper or an approved compound.

(e) Trucks

1. The truck Manufacturer shall apply one coat of approved metal primer on all exposed surfaces of trucks.

2. Before installation under the car, the Builder shall clean off all accumulated dust, dirt or other foreign matter by means appropriate to the purpose and shall then spray a final coat of approved truck paint, and air dry.

(f) Lettering and Numbering

1. Lettering and numbering shall be applied to the exterior and interior of the car as directed by the Railroad.

2. Necessary ownership plates with serial numbers and Builder's name plates shall be furnished.