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Product Description of Interior Panel

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1. Introduction

This document describes technical specification, repair procedure and scope of upgrading of interior panels to be supplied for TUVASAS DMU Coaches. The interior panels of upgrading provide aesthetically pleasing and modern giving due consideration to passenger comfort, safety and security and as well as minimizing noise in the saloon.

The new interior panels are made of GRP(it might be called "FRP"), which it is meet with fire and mechanical requirements of PS and more excellent than existing one.

2. Application Standards

- UIC 566 Loadings of coach bodies and their components

- DIN 5510-2:2009 Preventive fire protection in railway vehicle-Part 2: Fire behavior and fire side effects of materials and parts-Classification, requirements and test methods

- EN 45545-2:2013 Railway applications- Fire protection on railway vehicles-Parts 2: - Requirements for fire behavior of materials and components

- ASTM D2563 Classifying Visual Defects in Glass-Reinforced Plastic

3. Construction of Interior Panels

3.1. General

Side interior panel is made of 2.5mm thick FRP with gel-coated, and ceiling panels 2.0mm thick aluminum with painting.

Partition panel is made of 18mm thick honeycomb panel with painting and corner panel is made of the aluminum extrusion.

3.2. Side panel

3.2.1. Application

The FRP interior panels are applied to the side interior panels.

3.2.2. Design criteria

The interior panels are designed as following criteria.

All side panel material (F.R.P) will satisfy the requirements of EN 45545-2:2013 or DIN 5510-2:2009.

All side panel surfaces must be finished with good fire resistance and good slow aging properties

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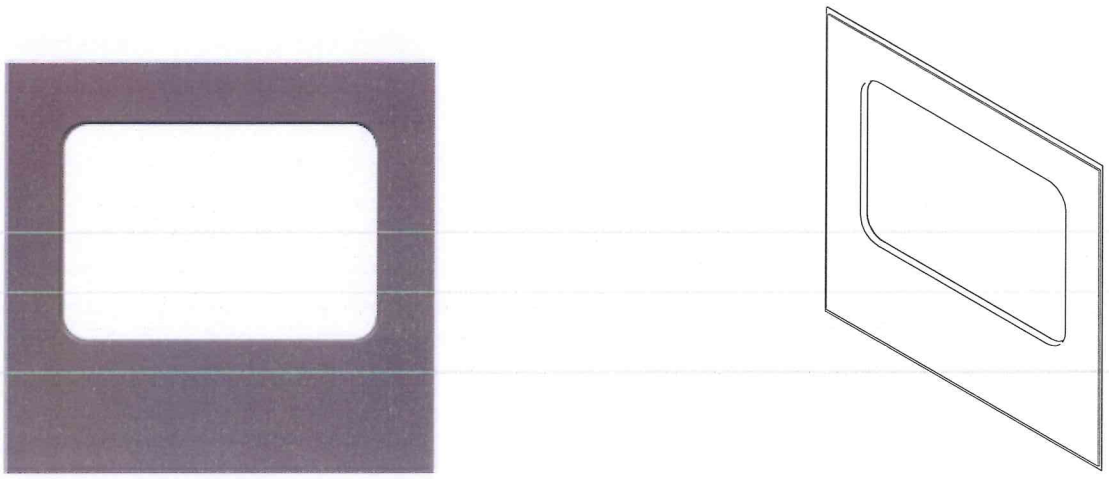
to provide high-quality interior and for ease of cleaning and maintenance.



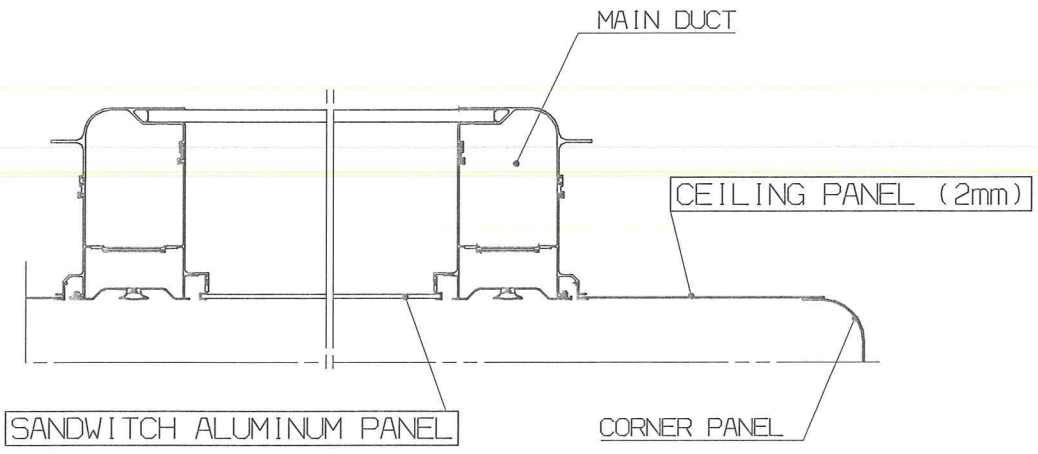
FRONT VIEW ISO VIEW

Fig.1. Side Panel (Window)

3.3. Ceiling panel

The sandwich aluminum panel which continuously joined the corrugated core between AL (A5052) is applied to the material of ceiling panel as the lower panel for main duct. The thick 2mm aluminum panel is applied to the side panel of ceiling and corner panel is made of the aluminum extrusion.

The ceiling panel of the service room is made of the sandwich aluminum panel.



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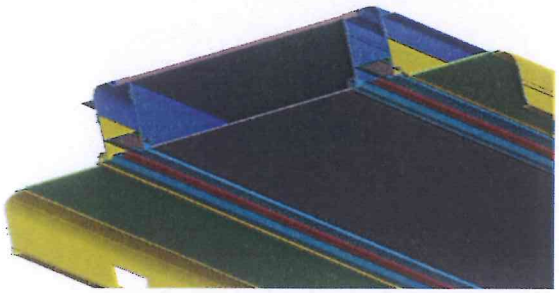
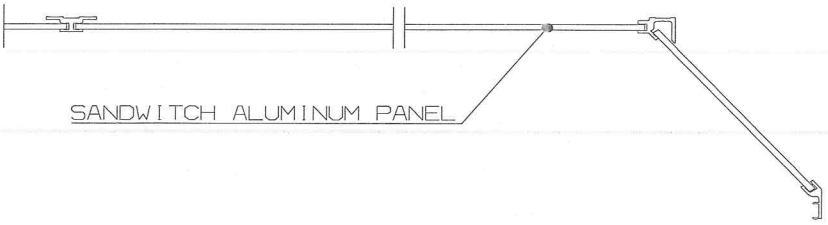


Fig. 2. Ceiling Panel of Passenger Room



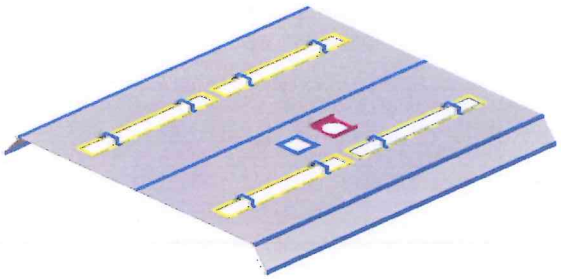


Fig. 3. Ceiling Panel of Service Room

3.4. Partition panel

The thick 18mm sandwich aluminum panel which continuously joined the honeycomb core between AL (A5052) is applied to the material of partition panel.

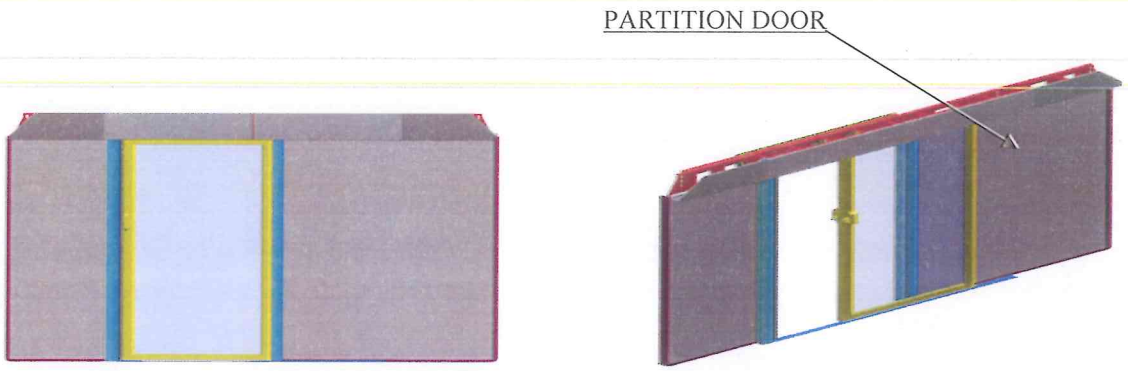


Fig.4. Partition Wall with Electrical Partition Door

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4. Specification of Interior Panels

4.1. General

The interior panels in the passenger compartment are of low smoke and self-extinguishing lightweight Glass Reinforced Plastic composite panel.

The fire performance of the GRP(Glass Reinforced Plastics) interior panels shall comply with the standard of EN 45545-2:2013 or DIN 5510-2:2009.

The interior panels are fitted on the car body mounting frame by concealed fasteners for easy maintenance and aesthetics. Lightweight equipment such as Passenger Information Sign, Emergency Device and Grab handle are mounted on the interior panels. The mean thickness of interior panel is approximate 2.5~3.0mm and the surface of the outer panel is gel coat finished.

4.2. Comprising and Structure

4.2.1. Structure

Manually laminated lay-up GRP construction, approximate 2.5mm in thickness.

==========

Gel Coat
Mat
Resign
Resign

==========

2.5~3.0mm

Back Stiffness : Sandwich resin 3 - 7.0mm

4.2.2. Comprising

a) Polyester gel coat

The gel coat will be resistant to scuffing, fire, weather, water absorption, cleaning agents, etc. The gel coat shall have thickness of approx. 0.4mm. The finished gel-coated surfaces will have embossing pattern, and behind of it shall not appear out or it shall not have any appreciable orange peel.

b) Polyester resin

The resin will be a good commercial grade, polyester, thermosetting, vinyl-ester or acrylic material selected to meet the physical and fire resistance requirements of this Performance Specification, while being compatible with the molding process requirements.

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c) Fiberglass Reinforcement

The fiberglass reinforcement will be mat, fabric woven roving, continuous roving, chopped spun roving, or swirl mat, as required to meet the physical properties cited herein and to be compatible with the molding process requirements. The glass content will be a minimum of 20% by weight.

d) Additives

Additives, fillers, monomers, catalysts, activators, pigments, fire retardants and smoke inhibitors shall be added to the resin mixes to obtain finished products with the physical characteristics and fire resistance specified herein. Antimony Trioxide shall not be used.

5. Manufacturing Procedure

5.1. Basic Mold

a. Recognize drawing

b. Sketch on the wood mold

c. Cutting wood according to sketch

d. Putty and sanding on the surface

e. Cleaning

5.2. Make Master Mold

a. Spray Gel-coat

b. Check the clack & damage on the Gel-coat surface

5.3. Production Goods

a. Waxing

- Cleaning on the surface of Master mold
- Coat wax on the Master mold

b. Chopped stand mat

- Pile up mat on the Gel coat surface
- Lay up resign on the mat by roller tool
- Check close adherence with Gel coat
- Check evenly resign and bubble (blowhole)

c. Hardening

- Time : During 3~4Hr
- Temperature : More than 15°c

d. Separation

- Separate goods from Master mold by rubber hammer

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- Caution : When the separation, must carefully corner

e. Cutting

- According to the drawing, the goods to be cut by grinder and saw

f. Assembly

- Assembly Tap seats and brackets for connect with carbody structure

g. Inspection

- Check on the surface and dimensions
- Check assembly status of Tap seats and brackets
- Inspect color and gloss level

6. Inspection and Test

6.1. Inspection for uninstalled panels

All interior panels to be inspected and checked accordance with inspection and check sheet by Quality control inspector.

And these recorded sheets have to be managed and kept.

6.2. Inspection for installed panels

6.2.1. Side & Ceiling Panel

The matching edge level, lining and gaps between the panels and panels:

The matching lines are continuous straight line. The edge level matched.

- Gap : Less than 2mm
- Level flush and not exceed : ± 0.5mm.

6.2.2. Cab Back Wall

Criteria for the mating edge level and gaps between the inspection covers and panels:

- Gap : Less than 2mm .
- Level flush and not exceed ± 0.5mm.

6.2.3. Fire Performance

GRP and rubber section used for the interior panels shall be designed to meet following criteria:

-EN 45545-2:2013 / R1-HL2 or DIN 5510-2:2009 / S3-SR2-ST2-FED≤1(30 minute)

6.2. Physical Strength Requirements

All material shall provide independent certification that each of the production batches meets the following standards, or similar. The test specimens shall be conditioned in accordance with ASTM D618, or similar.

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a. Tensile Strength

- Standard : ASTM D638
- Criteria

= Open moldings : 70MN/m2

= Matched Die Moldings : 85MN/m2

b. Compressive Strength

- Standard : ASTM D695
- Criteria

= Open moldings : 125MN/m2

= Matched Die Moldings : 155MN/m2

c. Flexural Strength

- Standard : ASTM D790
- Criteria

= Open moldings : 105MN/m2

= Matched Die Moldings : 155MN/m2

d. Impact Strength

- Standard : ASTM D256
- Criteria

= Open moldings : 8Nm per 25mm of notch

= Matched Die Moldings : 11Nm per 25mm of notch

e. Hardness

- Criteria : 45 Barcol

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