



SURFACE VEHICLE RECOMMENDED PRACTICE

J3105™/1

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Superseding J3105/1 JAN2020

Electric Vehicle Power Transfer System Using
Conductive Automated Connection Devices
Infrastructure-Mounted Pantograph (Cross-Rail) Connection

RATIONALE

The original document was initially intended for on-route charging and not necessarily in a depot setting with vehicles charging adjacent to one another. The significant change in this current update is that an RFID system is added, including the logic to ensure that the correct vehicle is paired with the correct infrastructure prior to enabling infrastructure-side connection (ISC) movement in close proximity. The vehicle height and minimum articulation span requirements were modified to correct an oversight. Keep out zone on the vehicle roof was modified. Finally, miscellaneous grammar and typo were corrected.

INTRODUCTION

Conductive automated connection device (ACD) solutions are attractive to heavy-duty applications in which downtime resulting from charge operations needs to be minimized and the operator prefers to make the connection without leaving the operator's seat. The infrastructure-mounted pantograph is suitable for power transfer up to 600 A with Level 1 and up to 1200 A for Level 2. It is hands-free, vertically engaged, and positioned on the infrastructure above the vehicle.

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1. SCOPE

This document details one of the connections of the SAE J3105 document. The connections are referenced in the scope of the main document SAE J3105. SAE J3105/1 details the infrastructure-mounted pantograph, or cross-rail connection. All the common requirements are defined in the main document; the current document provides the details of the connection.

This document covers the connection interface relevant requirements for an electric vehicle power transfer system using a conductive automated connection device (ACD) based on a cross-rail design. To allow interoperability for on-road vehicles (in particular, buses and coaches), one configuration is described in this document. Other configurations may be used for non-standard applications (for example, mining trucks or port vehicles).

2. REFERENCES

Refer to the main SAE J3105 recommended practice.

3. DEFINITIONS

Refer to the main SAE J3105 recommended practice.

4. ABBREVIATIONS AND SYMBOLS (ALL)

Refer to the main SAE J3105 recommended practice.

5. GENERAL SYSTEM REQUIREMENTS AND INTERFACE

5.1 General ACD Charging System Requirements

According to SAE J3105, the infrastructure-mounted pantograph is one type of ACD charging system that transfers power between the infrastructure and the vehicle. This power transfer occurs when the correct alignment is complete and the ACD moves into place to electrically connect the infrastructure and the vehicle through conductive connection.

To accommodate all the needs of the fleet, two power levels are required for the infrastructure-mounted pantograph (cross-rail) system:

- Level 1: The current capability is up to 600 A.
- Level 2: The capability will be up to 1200 A.

Both levels will be compatible with one another.

Level 2 is not documented in SAE J3105. It is reserved for a future revision.

The infrastructure-side connection (ISC) will have the moving connection on the infrastructure. The vehicle-side connection (VSC) will be stationary on the roof of the vehicle.

5.2 Functional/Physical Requirements of the VSC

5.2.1 Vehicle Rail Dimensioning

Rail dimensioning shall be according to the measurements outlined in Figure 1.

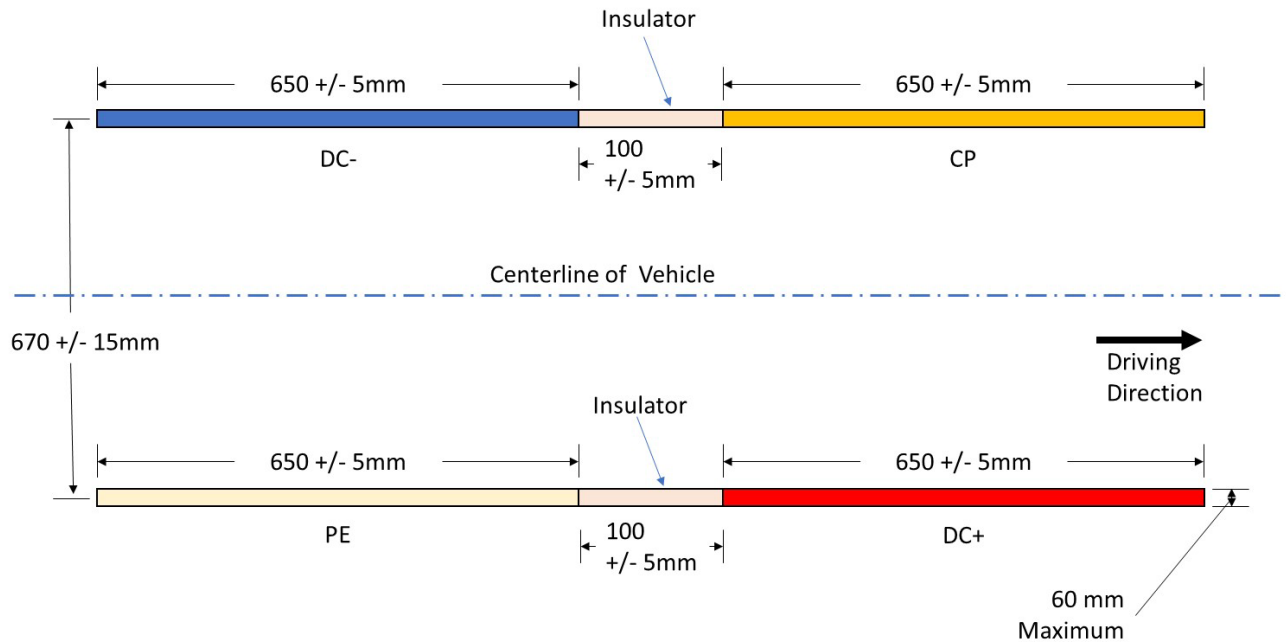


Figure 1 - VSC rail dimensioning

The contact surface of the roof rails shall be rounded with radius R (4 to 100 mm) (see Figure 2).

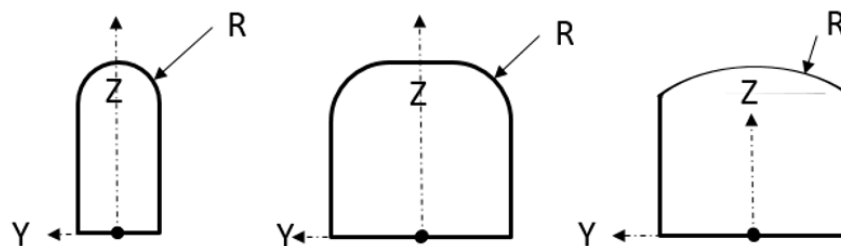


Figure 2 - Roof rail shapes with rounded surface

Each rail consists of two conductors with an insulating material between them.

The cross-section of the roof rails shall be able to transmit requested current to the electric vehicle.

The vehicle will communicate the maximum power rating to the ISC to help prevent the rail rating from being exceeded.

Nominally, the rails shall be parallel with the centerline of the vehicle (see Figure 1).

Each VSC rail conductor is separated by a gap. This gap of the rail conductors shall be designed for rated insulation voltage of 1000 VDC, pollution degree PD4, Material Group I (CTI $\geq$ 600) according to railway standard EN50124-1.

The rail material composition shall be such that it maintains compatibility with any silver-coated copper contact system.

5.2.2 Vehicle Rail Positioning

In the longitudinal direction, the centerline of the rails shall be positioned such that the location is “A,” rearward of the direct centerline of the front entrance door of the vehicle. See Figure 3 and Table 1.

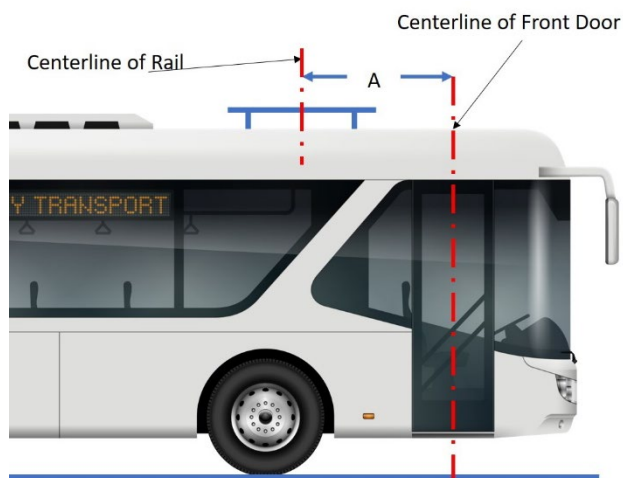


Figure 3 - Longitudinal vehicle rail positioning

In the latitudinal direction, the transverse center of the rails shall be positioned in the direct centerline of the vehicle with a location of “B.” See Figure 4 and Table 1.

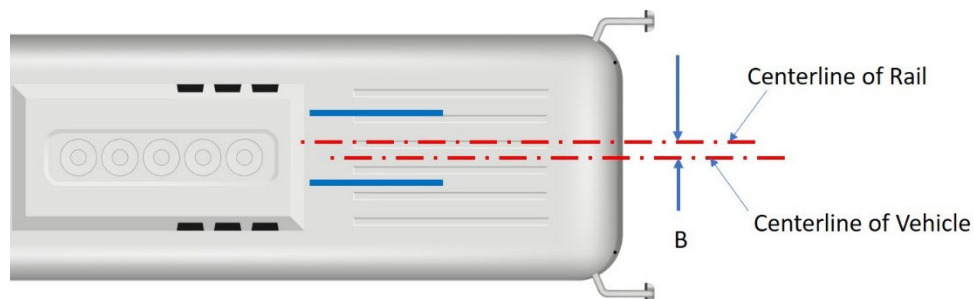


Figure 4 - Latitudinal vehicle rail positioning

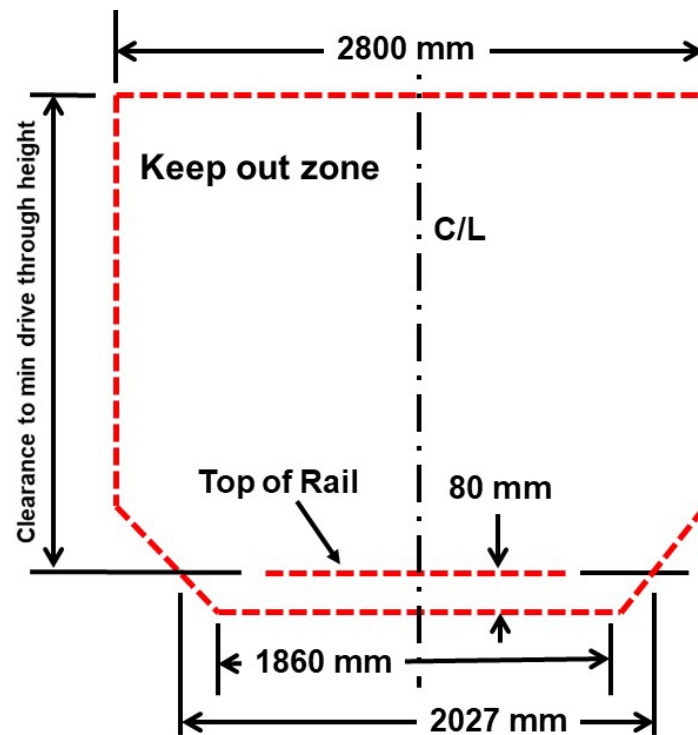
NOTE: The center of door is referenced to allow each vehicle to stop within a designated stopping zone for ADA and minimizing pole interference.

Table 1 provides dimensions for Figures 3 and 4.

Table 1 - Dimensions for Figures 3 and 4

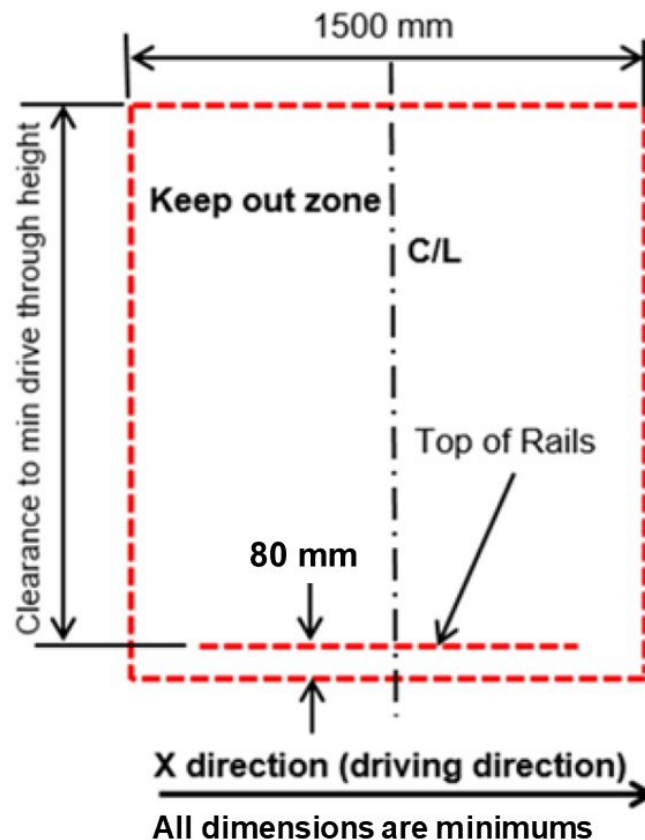
	Dimension (mm)	Tolerance (mm)
A	1170	±150
B	0	±25

Figures 5 and 6 illustrate front and side views, respectively, of the keep-out zone on the roof of the vehicle.



All dimensions are minimums

Figure 5 - Keep-out zone on roof of vehicle (front view)



All dimensions are minimums

Figure 6 - Keep-out zone on roof of vehicle (side view)



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