



SURFACE VEHICLE RECOMMENDED PRACTICE

J1562

APR2015

Issued 1999-12
Reaffirmed 2015-04

Superseding J1562 JAN2009

Selection of Zinc and Zinc-Alloy (Hot-Dipped and Electrodeposited) Coated Steel Sheet

RATIONALE

J1562 has been reaffirmed to comply with the SAE five-year review policy.

1. SCOPE

Zinc and zinc-alloy coated steel is used to enhance a structure's protection against corrosion degradation. For the purpose of this SAE Recommended Practice, a galvanized coating is defined as a zinc or zinc-alloy metallic coating. The selection of the optimum galvanized steel sheet product depends on many factors, the most important being: desired corrosion protection, formability, weldability, surface characteristics, and paintability. The trade-offs of these product characteristics are more complex than is the case with uncoated steel sheet products.

1.1 Purpose

This document defines preferred product characteristics. It also explains the various manufacturing processes, presents the advantages and disadvantages of the resulting product characteristics, and discusses the trade-offs between corrosion protection properties and fabricating, assembling, and finish-coating process.

2. REFERENCES

2.1 Applicable Publications

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest version of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J1392	Steel, High Strength, Hot Rolled Sheet and Strip, Cold Rolled Sheet, and Coated Sheet
SAE J2329	Categorization and Properties of Low-Carbon Automotive Sheet Steels
SAE J2340	Categorization and Properties of Dent Resistant, High Strength, and Ultra High Strength Automotive Sheet Steel
SAE J2745	Categorization and Properties of Advanced High Strength Automotive Sheet Steels

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be revised, reaffirmed, stabilized, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2015 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
<http://www.sae.org>

SAE WEB ADDRESS:

Full document details: [SAE J1562_201504](http://www.sae.org/technical/standards/J1562_201504)

SAE values your input. To provide feedback on this Technical Report, please visit http://www.sae.org/technical/standards/J1562_201504

Documents

Document Sharing Hub

2.1.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM A90/A90M	Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
ASTM A653/A653M	Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A754/A754M	Test Method for Coating Thickness by X-Ray Fluorescence
ASTM A879/A879M	Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface
ASTM A924/A924M	General Requirements for Sheet Steel, Metallic Coated by Hot Dip Process

3. THE GALVANIZING PROCESS

Two generic processes for metallic coated steels are currently used in the automotive industry: (1) hot-dipped coating and (2) electrolytic coating. Coating line conditions can be adjusted to produce a variety of coating masses and coating compositions.

3.1 The Hot-Dip Process

The uncoated coil product is usually annealed in-line or in a separate furnace. The steel is then passed continuously through a molten metal bath. Upon emergence from the bath, the molten metal coating mass is controlled by air (or other gas) knives or mechanical wipers before the coating solidifies. This produces the commonly used two-side zinc-coated sheet.

3.2 The Electrodeposition Process

Electrolytic coating is done in a continuous coating process using cells in which the metals are electrodeposited on pre-annealed steel. Coating mass is controlled by the electrodeposition rate in the plating cells. This product is available in one or two side coated sheet.

4. THE GALVANIZED COATING

The galvanized coating is applied to the steel sheet prior to delivery to the fabricating plant. The coating remains substantially intact through subsequent forming, and painting operations. The coating provides both barrier and sacrificial protection.

4.1 Composition of Coatings

4.1.1 Types of Coatings¹

Types of commercially produced coatings include: (1) zinc, (2) zinc-iron (<20% iron) alloys, (3) aluminum-zinc silicon (55, 43, and 2 weight percent respectively) alloy, (4) zinc-aluminum (5% aluminum) alloy, and (5) zinc-nickel (<20% nickel) alloy. Coatings (1) and (2) can be applied by either electroplating or hot-dip coating. Coatings (3) and (4) are applied by hot-dip coating while coating (5) is applied by electroplating.

¹ All coating compositions included in this section are approximate values in mass percent.

4.1.2 Zinc Coatings

Coatings that are considered essentially pure zinc coatings are typically referred to as hot-dip galvanized or electrogalvanized. Hot-dip galvanized coatings may contain small amounts of aluminum, lead, and antimony which are added to enhance coating properties. Electrogalvanized coatings are typically high-purity zinc and control only trace amounts of other elements.

4.1.3 Alloy Coatings

The most common alloy coatings are zinc-iron alloys. They are used to enhance spot welding and certain aspects of paintability. Zinc-iron coatings can be produced by the electroplating process in which zinc and iron are codeposited onto the steel sheet surface. The iron content of the coating is controlled by adjustment of electrolytic solution and plating current.

When processed on a hot-dip coating line, the zinc-iron coating is called Galvannealed and is produced using a thermal process after hot dipping. This process promotes diffusion of iron from the steel base into the coating which typically contains an average of 8 to 12% iron.

Aluminum-zinc-silicon and zinc-aluminum hot-dip alloyed coatings are produced by conventional hot-dip coating processes. The molten coating bath contains approximately the same composition as the coating on the steel.

Zinc-nickel (<20% nickel) alloy electroplated coatings are produced by conventional electroplating techniques. The plating electrolyte contains zinc and nickel ions that are codeposited as an alloy mixture.

4.2 Coating Mass

This document addresses the needs of automotive engineering by identifying the coating masses most commonly used in component design and by expressing the coating mass measurements as a minimum and maximum single-spot test for a given side. For example, 70 g/m² is the minimum coating mass on a single-spot test for the designated side of coating Category 70. The maximum coating mass for this Category is 100 g/m² for hot-dip galvanized products, or 90 g/m² for electroplated products.

This definition of coating mass represents a departure from the practice described in ASTM methods A653/A653M for hot-dipped galvanized steel sheet, and ASTM method A879/A879M, except for Table 1, for electrolytic zinc-coated steel sheet. The ASTM Standard Specifications have been the principal public standards prior to the publication of this document.

The thickness of the coating is not an acceptable practice for specifying the quantity of coating to be deposited on the base steel.

4.3 Coating Designation

This document uses a nine-character designation that identifies the coating process, coating mass, and coating composition of each side, and the intended use of the coated steel with regard to the surface appearance quality required, i.e., exposed and unexposed. The terms “exposed” and “unexposed” are not related to corrosion requirements. The coating designation shall be stated using the following procedure:

- a. 1st and 2nd Character—represent the coating process where HD = hot dip galvanized, and EG = electrogalvanized
- b. 3rd and 4th Character—The numbers shown in the “Coating Mass Category” column of Table 1 indicates the coating mass of the unexposed side
- c. 5th Character—Coating composition of the unexposed side where G = zinc coating, A = zinc-iron coating, N = zinc-nickel coating, X = other than G, A, or N
- d. 6th and 7th Character—The numbers shown in the “Coating Mass Category” column of Table 1 indicates the coating mass of the other side (exposed side, if applicable)