

SURFACE VEHICLE INFORMATION REPORT

SAE J763

REV.
APR91

Issued 1961-05
Revised 1991-04

Superseding J763 JAN82

Submitted for recognition as an American National Standard

(R) AGING OF CARBON STEEL SHEET AND STRIP

1. Scope—This SAE Information Report briefly covers the aging of hot rolled, cold rolled, and coated carbon steel sheet and strip. Its purpose is to provide general information concerning the phenomenon of aging so that associated problems may be recognized.

2. References

2.1 Related Publications—The following publications are provided for information purposes only and are not a required part of this document:

1. Kenyon, R.L. and Burns, R.S., "Aging in Iron and Steel," ASM Preprint 40, 1939 Meeting Iron and Steel, 13, April 1940, p. 227; May 1940, p. 260.
2. Epstein, S., "Aging of Iron and Steel," Metals Handbook, 1948, p. 438.
3. Shoenberger, L.R., and Paliwoda, E.J., "Accelerated Strain Aging of Commercial Sheet Steels," Transactions ASM, 45, 1953, p. 344.
4. Leslie, W.C. and Rickett, R.L., "Influence of Aluminum and Silicon Deoxidation on the Strain Aging of Low-Carbon Steels," Transactions AIME, 197, 1953, p. 1021.
5. Morgan, E.R., and Shyne, J.C., "The Strain Aging of Boron-Treated Low-Carbon Steels," Journal Iron and Steel Institute, 185, 1957, p. 156.
6. Morgan, Eric R., "Can an Improved Non-Aging Steel Be Produced Commercially," Metal Progress, 73, June 1958, p. 88.
7. "Strain Aging" and "Stretcher Strains," Metals Handbook, 9th Edition, Vol. 1, 1978, p. 157.
8. "Control of Flatness," Metals Handbook, 9th Edition, Vol. 1, 1978, pp. 157, 160."
9. "Selection of Steel for Forming," "Stretcher Strains," and "Strain Aging," Metals Handbook, 8th Edition, Vol. 4, 1969, pp. 115, 116.

3. Definitions

3.1 Aging—A term applied to changes in physical and mechanical properties of low-carbon steel that occur with the passage of time. These changes adversely affect formability. Aging accelerates as the temperature is raised.

3.2 Strain Aging—A term applied to changes in properties which occur after cold working. Rimmed steel is particularly susceptible to strain aging.

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3.3 Quench Aging—A term applied to those changes in properties which occur after rapid cooling of the product.

NOTE—Rapid cooling as a process is normally performed by the producer and is not a factor for consideration by the fabricator; therefore, this explanation is for reference purposes only and quench aging is not further considered in this report.

3.4 Temper Rolling or Skin Passing—Denotes cold rolling of sheets to improve flatness, impart a desired surface finish or reduce the tendency to stretcher strain and flute. Temper rolling should not be confused with the term "cold reduction," which involves a substantial reduction in thickness.

4. Effects—Among the easily recognizable effects resulting from strain aging of temper-rolled carbon steel sheet and strip are the following:

4.1 Surface Irregularities—Strain aging is manifested during forming by visible surface irregularities commonly known as stretcher strains (Luder's Lines) or fluting. These may render the material unsuitable for use on exposed or external parts.

4.2 Ductility Reduction

4.3 Hardness Increase

4.4 Tensile Test Properties Changes

- a. Increase in yield point
- b. Increase in yield point elongation
- c. Decrease in total elongation

5. Guides—The adverse effects of strain aging may be controlled by:

5.1 The use of special killed or stabilized steels.

5.2 Sheets which have not been temper passed should be used for unexposed parts.

5.3 Rotation of stock by application in order of receipt (inventory control by "first-in, first-out").

6. Notes

6.1 Marginal Indicia—The change bar (I) located in the left margin is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. An (R) symbol to the left of the document title indicates a complete revision of the report.

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SHEET AND STRIP STEEL