## 2.3 CLASSIFICATION AND PROPERTIES

In the past, steels were supplied to make the part where the steel representative determined the required grade that would perform well in the stamping operation. In a cooperative effort by SAE, AISI, and representatives of the auto industry and North American steel industry, specifications were established based on mechanical properties that affect manufacturing.

The Society of Automotive Engineers (SAE) has reclassified formable and high strength sheet steels for automotive use in recent years. Instead of the former system, which was based on commercial description and deoxidation practice, the new system is based on formability and strength levels as used in the automotive industry. The SAE recommended practice furnishes a categorization procedure to aid in the selection of low carbon sheet steels for identified parts and fabrication processes.

The new SAE specifications J2329 and J2340 identify the properties that the steel company can produce in controlling formability. These are the new guidelines that automotive companies want to use, thereby identifying the strengths and formability of the materials from which parts are produced.

There are two new SAE specifications covering automotive sheet steels:

- 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.

Following is an approximate comparison of the former commercial description, based on deoxidation practice, with the new SAE classification:

**Table 2.3-1** SAE J2329 categorization and properties of low carbon automotive sheet steels

| **Old AISI Description** | | **New SAE Classification** | | **Property** |
|---|---|---|---|---|
| | | **Hot Rolled Steels** | | |
| CQ | Commercial Quality | SAE J2329 | Grade 1 | N/A |
| DQ | Drawing Quality | SAE J2329 | Grade 2 | Yield: 180-290 MPa<br>**n** value: 0.16 min. |
| DDQ | Deep Drawing Quality | SAE J2339 | Grade 3 | Yield: 180-240 MPa<br>**n** value: 0.18 min. |
| | | **Cold Rolled Steels** | | |
| CQ | Commercial Quality | SAE J2329 | Grade 1 | N/A |
| DQ | Drawing Quality | SAE J2329 | Grade 2 | Yield: 140-260 MPa<br>**n** value: 0.16 min. |
| DQ | Drawing Quality | SAE J-2329 | Grade 3 | Yield: 140-205 MPa<br>**n** value: 0.18 min. |
| DDQ | Deep Drawing Quality | SAE J-2329 | Grade 4 | Yield: 140-185 MPa<br>**n** value 0.20 min. |
| EDDQ | Extra Deep Drawing Quality | SAE J2329 | Grade 5 | Yield: 110-170 MPa<br>**n** value 0.22 min |

**Table 2.3-2** SAE J2340 categorization and properties of dent resistant, high strength, and ultra high strength automotive sheet steel

| Old AISI Description | New SAE Classification |
|---|---|
| **Cold Rolled Steels** | |
| Dent Resistant (DR) | SAE J2340 Grades 180A, 210A, 250A, 280A<br>Dent Resistant Non Bake Hardenable |
| Bake Hardenable (BH) | SAE J2340 Grades 180B, 210B, 250B, 280B<br>Dent Resistant Bake Hardenable |
| High Strength Solution Strengthened | SAE J2340 Grades 300S, 340S<br>High Strength Solution Strengthened |
| High Strength Low Alloy (HSLA) | SAE J2340 Grades 300X,Y; 340X,Y;380X,Y<br>High strength low alloy 20X,Y;490X,Y;550X,Y |
| High Strength Recovery Annealed | SAE J2340 Grades 490R, 550R, 700R, 830R<br>High Strength Recovery Annealed |
| Dual Phase (DP) (HSS) | SAE J2340 Grades DH/DL 500-1000 MPa Tensile<br>Ultra High Strength Dual Phase |
| Martensitic Grade M, HSS | SAE J2340 Grade M 800-1500 MPa Tensile<br>Ultra High Strength Low Carbon Martensite |

These are approximate comparisons, as steelmaking practice varies from producer to producer to make a specific grade. The old AISI classifications are based on deoxidation practice and yield strength level, whereas the new classifications are based on formability. The formable high strength steels are listed with minimum yield and **n** values, whereas the ultra high strength steels are listed with minimum tensile values. Specification details can be found in SAE J2329 for formable steels, and SAE J2340 for high strength steels.