



# SURFACE VEHICLE RECOMMENDED PRACTICE

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Nomenclature - Wheels for Passenger Cars,  
Light Trucks, and Multipurpose Vehicles

## RATIONALE

This document was revised to reflect the new definitions from SAE J3204.

### 1. SCOPE

This SAE Recommended Practice establishes uniform engineering nomenclature for the most common wheel constructions, and their components used on passenger cars, light trucks, and multipurpose vehicles. These wheel constructions are welded disc wheels, cast wheels, forged wheels, composite wheels and hybrid wheels. This nomenclature and the accompanying drawings are intended to define fundamental wheel terms rather than to provide a comprehensive tabulation of all wheel design types.

### 2. REFERENCES

#### 2.1 Related Publications

The following publications are provided for information purposes only and are not required part of this SAE Technical Report.

##### 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 +1 724-776-4970 (outside USA), [www.sae.org](http://www.sae.org).

|           |                                                                                                                                                             |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SAE J393  | Nomenclature - Wheels, Hubs, and Rims for Commercial Vehicles                                                                                               |
| SAE J694  | Disc Wheel and Hub or Drum Interface Dimensions - Truck and Bus                                                                                             |
| SAE J851  | Dimensions - Wheels for Demountable Rims, Demountable Rims, and Spacer Bands - Truck and Bus                                                                |
| SAE J1986 | Balance Weight and Rim Flange Design Specifications, Test Procedures, and Performance Recommendations                                                       |
| SAE J1992 | Wheel/Rims - Military Vehicles - Test Procedures and Performance Requirements                                                                               |
| SAE J3204 | Aftermarket Composite Wheels Made of Matrix Material and Fiber Reinforcement Intended for Normal Highway Use - Test Procedures and Performance Requirements |

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### 2.1.2 ISO Publications

Copies of these documents are available online at <https://webstore.ansi.org/>.

ISO 3911      Wheels/Rims - Nomenclature, Designation, and Marking

### 2.1.3 Other Publications

Tire Guide - Complete tire and wheel information for cars and trucks available at [www.tireguides.com](http://www.tireguides.com), Tel: (561-997-9229)

## 3. DEFINITIONS

### 3.1 Wheel

A rotating load-carrying member supporting the tire and affixed to the hub. Disc wheels usually consist of two major components: (a) the rim, as shown in Figure 1; (b) the disc, as shown in Figure 2. The rim and wheel disc may be integral, permanently attached, or detachable. Cast wheels or forged wheels typically have a one-piece construction, as shown in Figure 3.

#### 3.1.1 Rim

That part of the wheel on which the tire is mounted and supported. (See Figure 1.)

#### 3.1.2 Wheel Disc

That part of the wheel which is the supporting member between the hub and the rim. (See Figure 2.)

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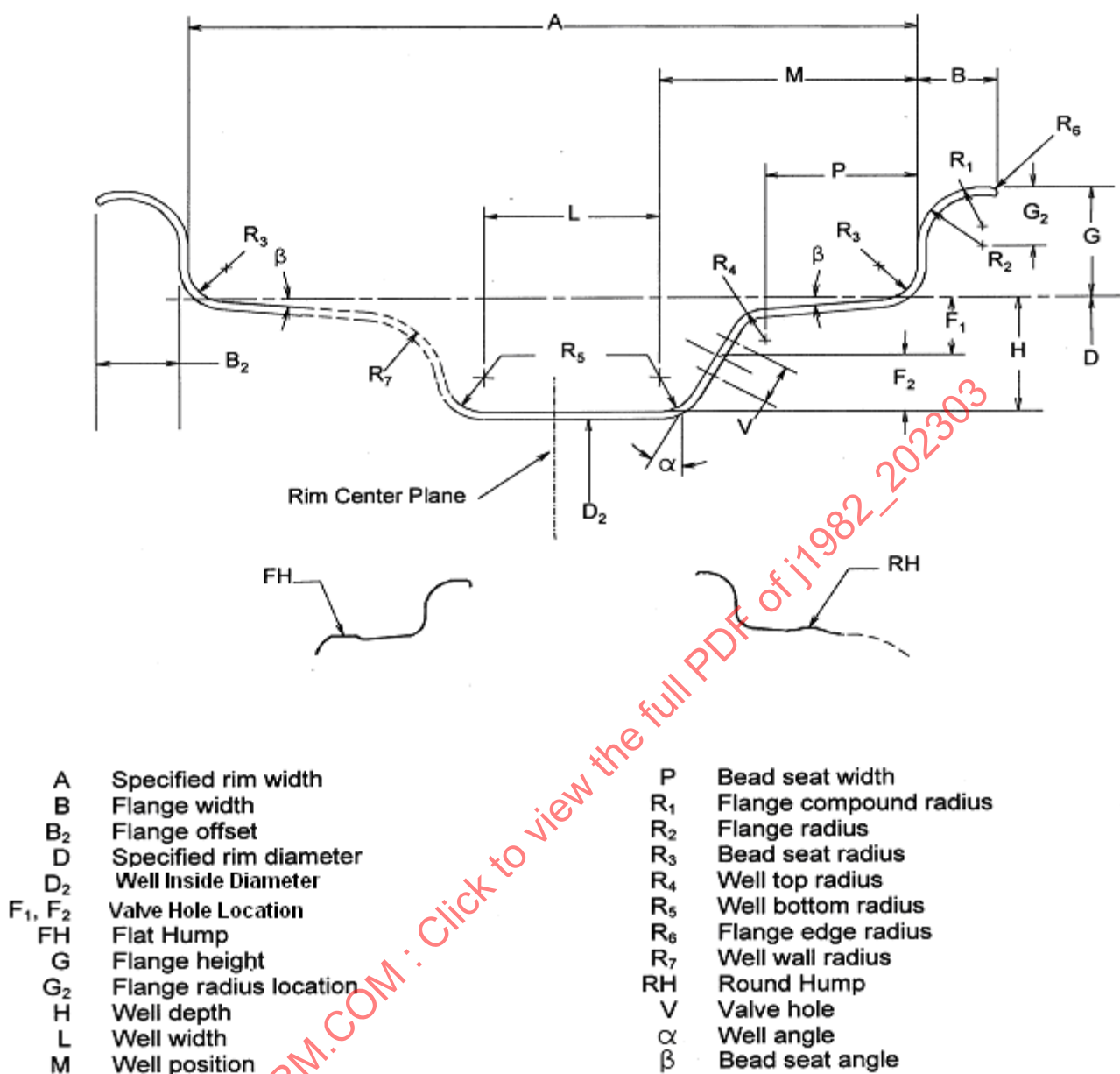
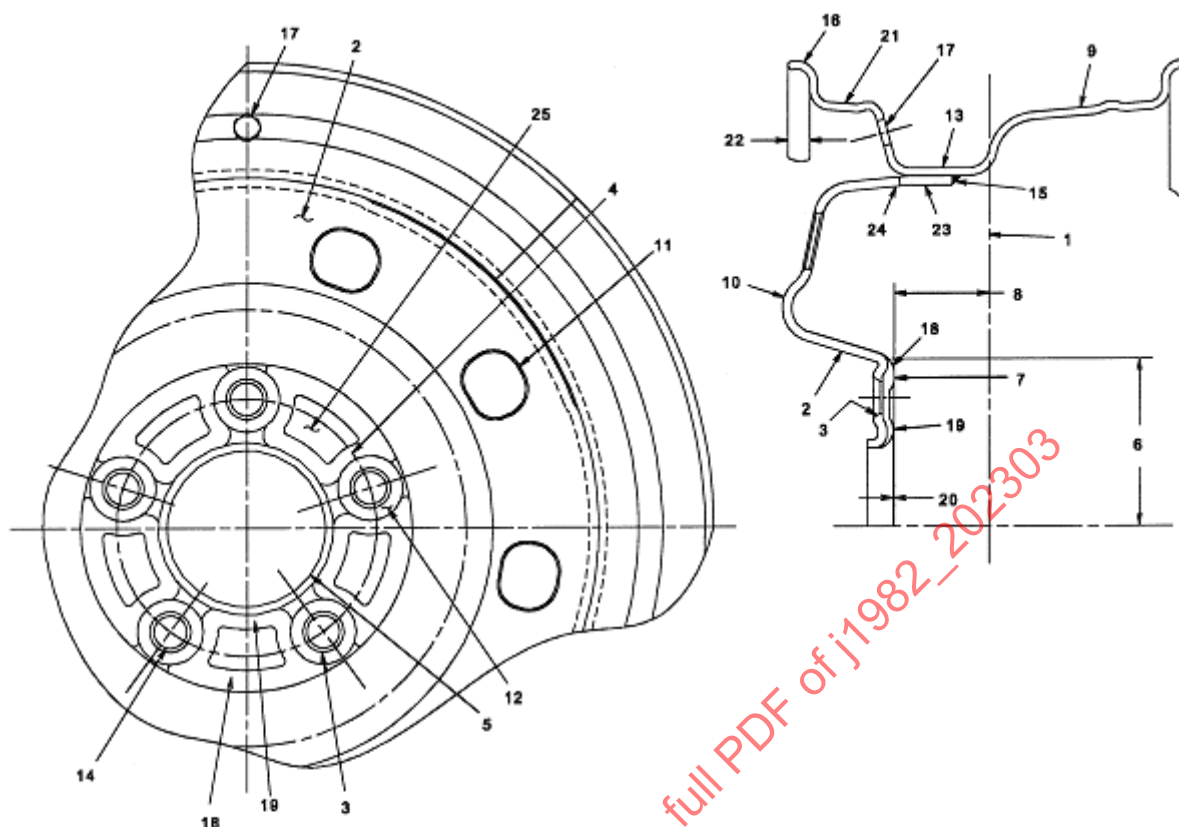
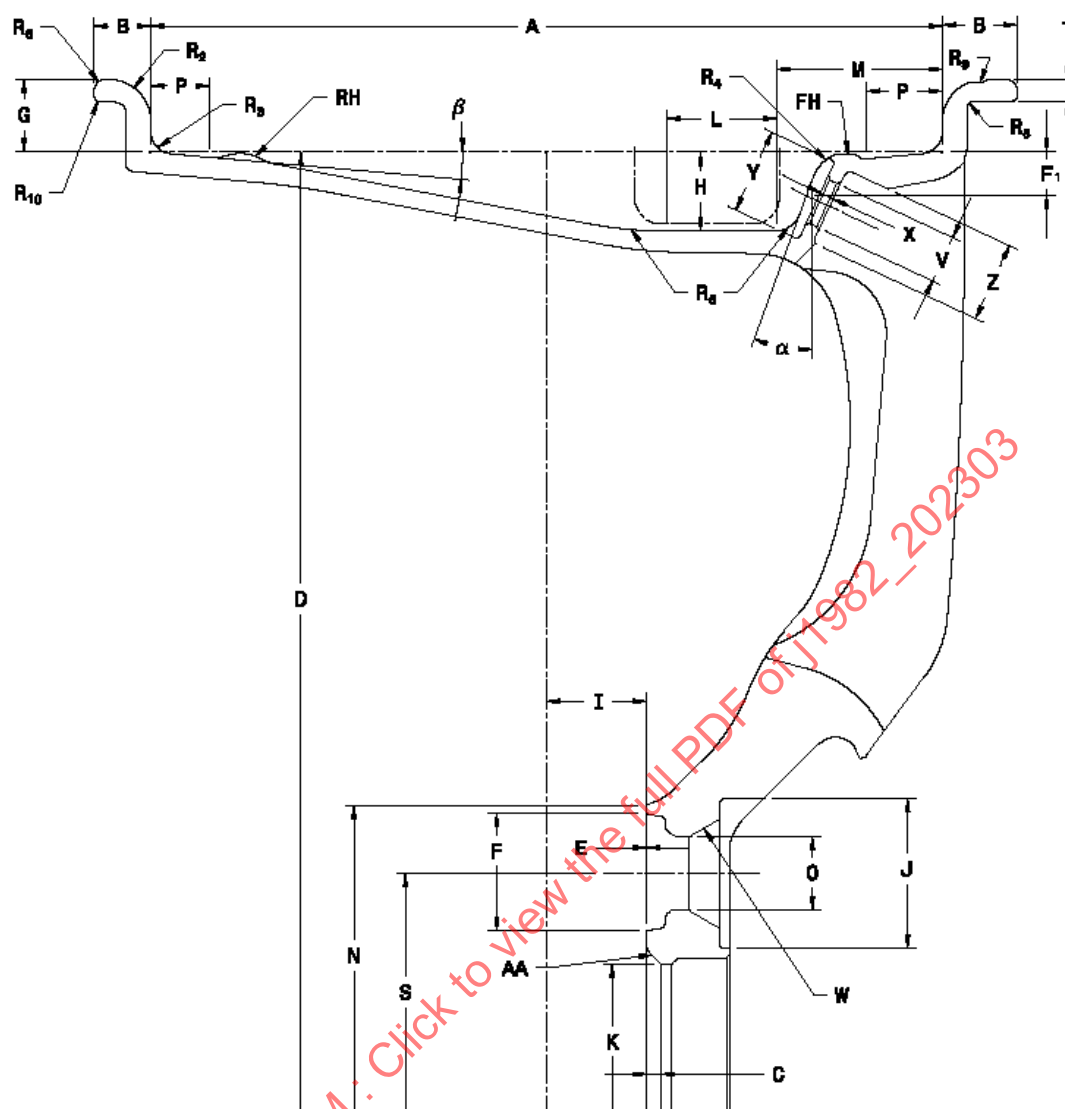


Figure 1 - Rim



- |                                        |                        |
|----------------------------------------|------------------------|
| 1. Rim Center Plane                    | 14. Bolt Hole          |
| 2. Disc                                | 15. Assembly Weld      |
| 3. Nut Seat                            | 16. Rim Flange         |
| 4. Pitch Circle Diameter of Bolt Holes | 17. Valve Hole         |
| 5. Center Hole Diameter                | 18. Outer Mounting Pad |
| 6. Attachment Face Diameter            | 19. Inner Mounting Pad |
| 7. Attachment Face                     | 20. Step               |
| 8. Offset (Figure 4 - Detail)          | 21. Bead Seat          |
| 9. Rim                                 | 22. Flange Offset      |
| 10. Hat                                | 23. Disc Flange        |
| 11. Window                             | 24. Disc Scallop       |
| 12. Nut Boss                           | 25. Rib                |
| 13. Well                               |                        |

**Figure 2 - Disc wheel**



|          |                                 |          |                                           |
|----------|---------------------------------|----------|-------------------------------------------|
| A        | Specified rim width             | P        | Bead seat width                           |
| $\alpha$ | Well angle                      | $R_2$    | Flange radius                             |
| $\beta$  | Bead seat angle                 | $R_3$    | Bead seat radius                          |
| B        | Flange width                    | $R_4$    | Well top radius                           |
| C        | Center hole height              | $R_5$    | Well bottom radius                        |
| D        | Specified rim diameter          | $R_6$    | Flange edge radius                        |
| E        | Step                            | $R_8$    | Flange radius, balance weight side        |
| F        | Rotor/drum retainer clip pocket | $R_9$    | Balance weight retention groove           |
| $F_1$    | Valve hole location             | $R_{10}$ | Flange corner radius, balance weight side |
| FH       | Flat hump                       | RH       | Round hump                                |
| G        | Flange height                   | S        | Pitch circle diameter of bolt holes       |
| H        | Well depth                      | T        | Flange thickness                          |
| I        | Inset                           | V        | Valve hole diameter                       |
| J        | Nut seat counterbore            | W        | Nut seat                                  |
| K        | Center hole diameter            | X        | Valve hole thickness                      |
| L        | Well width                      | Y        | Valve hole counterbore diameter tire side |
| M        | Well position                   | Z        | Valve hole counterbore diameter           |
| N        | Attachment face diameter        | AA       | Center hole chamfer                       |
| O        | Bolt hole diameter              |          |                                           |

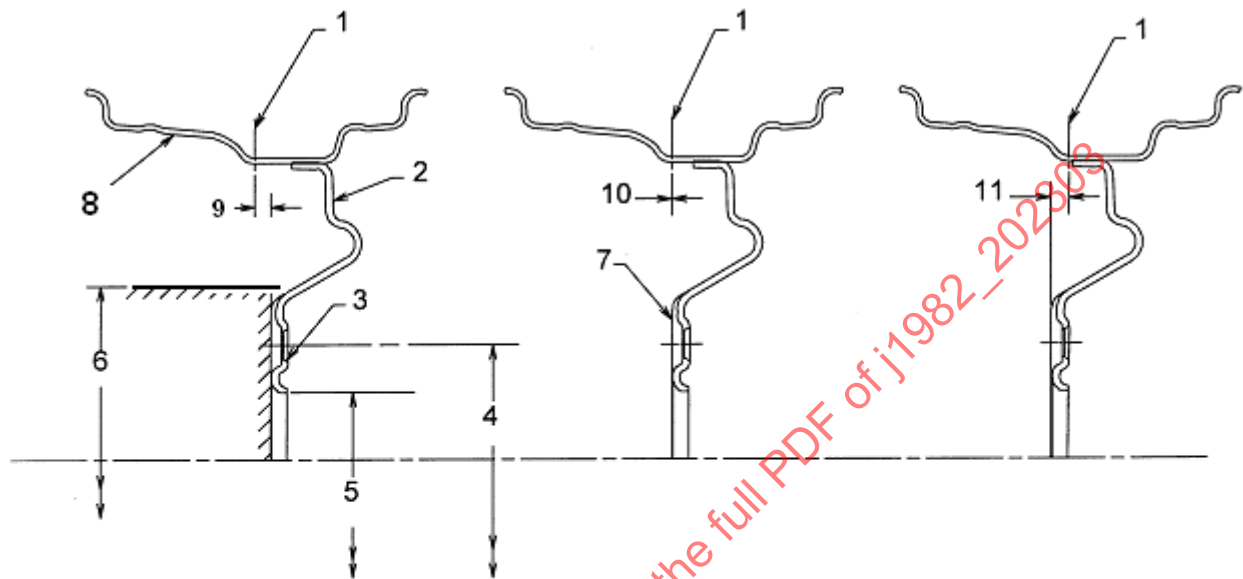
**Figure 3 - Cast/forged wheel**

### 3.1.3 Hub

The rotating member to which the wheel is attached.

### 3.1.4 Inset Wheel

A wheel so constructed that the center plane of the rim is located inboard of the wheel attachment face. Inset is the distance from the wheel attachment face to the center plane of the rim. (See Figure 4.)



- |                                        |                    |
|----------------------------------------|--------------------|
| 1. Rim Center Plane                    | 7. Attachment Face |
| 2. Disc                                | 8. Rim             |
| 3. Nut Seat                            | 9. Inset           |
| 4. Pitch Circle Diameter of Bolt Holes | 10. Zero set       |
| 5. Center Hole Diameter                | 11. Outset         |
| 6. Attachment Face Diameter            |                    |

**Figure 4 - Rim to disc location**

### 3.1.5 Zero set Wheel

A wheel so constructed that the center plane of the rim is coincident with the wheel attachment face. (See Figure 4.)

### 3.1.6 Outset Wheel

A wheel so constructed that the center plane of the rim is located outboard of the wheel attachment face. Outset is the distance from the wheel attachment face to the center plane of the rim. (See Figure 4.)

## 3.2 Wheel Types

### 3.2.1 Disc Wheel

A permanent combination of a rim and wheel disc. (See Figure 2.)

### 3.2.2 Cast Wheel

A wheel formed by a casting, and subsequent machining, process. (See Figure 3.)

### 3.2.3 Forged Wheel

A wheel that has been forged from a billet and subsequently machined (as necessary) to create functional features for balance, tire mounting, balance weight retention, and hub attachment. (See Figure 3.)

### 3.2.4 Composite Wheel

A wheel made of matrix material and fiber reinforcement in both the rim and center area.

### 3.2.5 Hybrid Wheel

A wheel with a metallic center section attached to composite rim.

### 3.2.6 Composite Rim

A rim made of matrix material and fiber reinforcement.

## 3.3 Rim Types

### 3.3.1 One-Piece (Drop Center)

A rim which is of one-piece construction and incorporates a well. (See Figure 1.)

### 3.3.2 Two-Piece

A rim with two pieces that are not permanently attached.

### 3.3.3 Average Radial Runout

The average radial run-out of the inner and outer bead seats measured simultaneously. Measurements are taken adjacent to the  $R_3$  radii.

### 3.3.4 Average Lateral Runout

The average lateral runout of the inner and outer flanges measured simultaneously. Measurements are taken adjacent to the  $R_3$  radii.

## 3.4 Rim Nomenclature

(See Figures 1 and 3.)

### 3.4.1 Flange

That part of the rim which provides lateral support to the tire and a means for attaching balance weights and decorative trim components.

### 3.4.2 Bead Seat

That part of the rim which provides radial support to the tire and air pressure seal for tubeless tires.

### 3.4.3 Well

That part of the rim so located with sufficient depth and width to enable the tire beads to be mounted and dismounted over the mounting side rim flange.

#### 3.4.4 Valve Hole

The hole or slot in the rim which accommodates the valve for tire inflation.

#### 3.4.5 Balance Weight Retention Groove

A circumferential groove located on the rim flanges to improve balance weight retention.

### 3.5 Disc Nomenclature

(See Figure 2.)

#### 3.5.1 Disc Flange

The part of the disc that supports the rim (disc wheels only).

#### 3.5.2 Hat

The transition area in the disc between the disc flange and the attachment area (disc wheels only).

#### 3.5.3 Attachment Face

The surface of the disc supported by the hub face or other components mounted to the hub face.

#### 3.5.4 Inner Mounting Pad

The surface of the attachment face that is located inside the pitch circle diameter of bolt holes.

#### 3.5.5 Outer Mounting Pad

The surface of the attachment face that is located outside the pitch circle diameter of bolt holes.

#### 3.5.6 Nut Boss

The portion of the attachment face in which the lug nut, or wheel bolt contacts the wheel.

#### 3.5.7 Step

The axial distance between the datum of the outer mounting pad and the inner mounting pad.

#### 3.5.8 Bolt Hole

Clearance hole for the wheel stud or wheel bolt.

#### 3.5.9 Nut Seat

The portion of the disc at the bolt hole that is the bearing surface for the wheel nut.

#### 3.5.10 Pitch Circle Diameter of Bolt Holes

A circle locating the centers of the bolt holes that are used to attach the wheel to the hub.

#### 3.5.11 Rib

The raised area between bolt holes.

#### 3.5.12 Center Hole

The clearance hole for the pilot of the hub.