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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

SURFACE VEHICLE RECOMMENDED PRACTICE

SAE J751

REV. APR97

Issued 1951-01
Revised 1997-04

Superseded by J751 APR86

(R) OFF-ROAD TIRE AND RIM CLASSIFICATION—CONSTRUCTION MACHINES

Foreword—Technological advances in construction machine designs and applications have necessitated the inception of numerous special size and design tires. The proliferation of old and new terminology requires organized expression. Specific size, capacity, and other application information should be obtained through tire and rim manufacturers and their organizations.

1. Scope—This SAE Recommended Practice describes the classification of off-road tires and rims for use on construction machines (see SAE J1116), defines related terminology in common use, and shows representative construction details of component parts.

1.1 Purpose—To establish a standard nomenclature for tire classification and tire and rim components.

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 issue of SAE publications shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J1015—Ton-Kilometer Per Hour Test Procedure
SAE J1098—Ton-Kilometer Per Hour Application
SAE J1116—Categories of Off-Road Self-Propelled Work Machines

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

2.2.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J1057—Identification Terminology of Earthmoving Machines
SAE J1440—Off-Road Tire and Rim Classification—Forestry Machines

2.2.2 ISO PUBLICATIONS—Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002.

ISO 3877-1:1978—Tyres, valves and tubes—List of equivalent terms—Part 1: Tyres
ISO 4223-1:1989—Definition of some terms used in the tyre industry—Part 1: Pneumatic tyres
ISO 4250-1—Earthmover tyre and rims—Part 1: Tyre designations and dimensions
ISO 4250-2—Earthmover tyre and rims—Part 2: Loads and inflation pressures

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ISO 4250-3—Earthmover tyre and rims—Rims
ISO 6165:1987—Earthmoving machinery—Basic types—Vocabulary

3. Definitions

3.1 Tire Definition—An off-road tire size created before 1988 will be designated by an alphanumeric sequence: a section width reference, construction indicator, rim diameter designation, a carcass strength rating, and a service code (for example: 27.00-49 42 PR E-4). For tire sizes created in 1988 or after, the tire will also be designated by an alphanumeric sequence: nominal section with reference, aspect ratio, nominal rim diameter designator, a carcass strength rating, and a service code (for example: 48/95R57 ** E-4; or metric 525/80R25 * E-2/E-3).

3.1.1 SECTION WIDTH REFERENCE—There are three commonly accepted designations: conventional, wide base, and low aspect ratio. These designations are based upon the tire aspect ratio (i.e., section height divided by section width). Note that section width reference is not a tire dimension.

3.1.1.1 Conventional—There are two groups of tires designated as conventional.

3.1.1.1.1 The section width reference includes zeros following the decimal point for tires created before 1988 (for example: 24.00); for tire sizes created from 1988 to date, the section width reference is a two-digit number with no decimal point (for example: 48). The aspect ratio for these tires is approximately 0.96.

3.1.1.1.2 There is a limited group of large-diameter tires created before 1988 that fit on single piece drop center rims. The section width reference for these tires is a two-digit number with no decimal point (for example: 27). These tires have equivalents in 3.1.1.1.1 in external dimensions and load carry capacity.

3.1.1.2 Wide Base—For tires created before 1988, the section width reference includes digits other than zero following the decimal point and the aspect ratio is approximately 0.83 (for example: 29.5). For tires created in 1988 or after, the tire will be designated by an alphanumeric sequence: nominal section width reference, aspect ratio, nominal rim diameter designator, a carcass strength rating, and a service code. (For example: 50/80-57 68 PR L-4.)

3.1.1.3 Low Aspect—For tires created before 1988, the section width reference is followed by the aspect ratio and separated by a slash (for example: 41.25/70, 40/65). Some older tires of 0.65 aspect ratio may have the order reversed (for example: 65/40). For tires created in 1988 or after, see 3.1.1.2.

3.2 Construction—There are two basic tire constructions: bias ply and radial. See Figure 1.

3.2.1 BIAS PLY—A bias ply constructed tire is designated by a hyphen (-) after the section width reference (for example: 24.00-) for tires created before 1988 and by a hyphen (-) after the aspect ratio for tires created in 1988 or after (for example: 50/80-).

3.2.2 RADIAL—A radial constructed tire is designated by an upper case R after the section width reference or aspect ratio (for example: 24.00R, 50/80R).

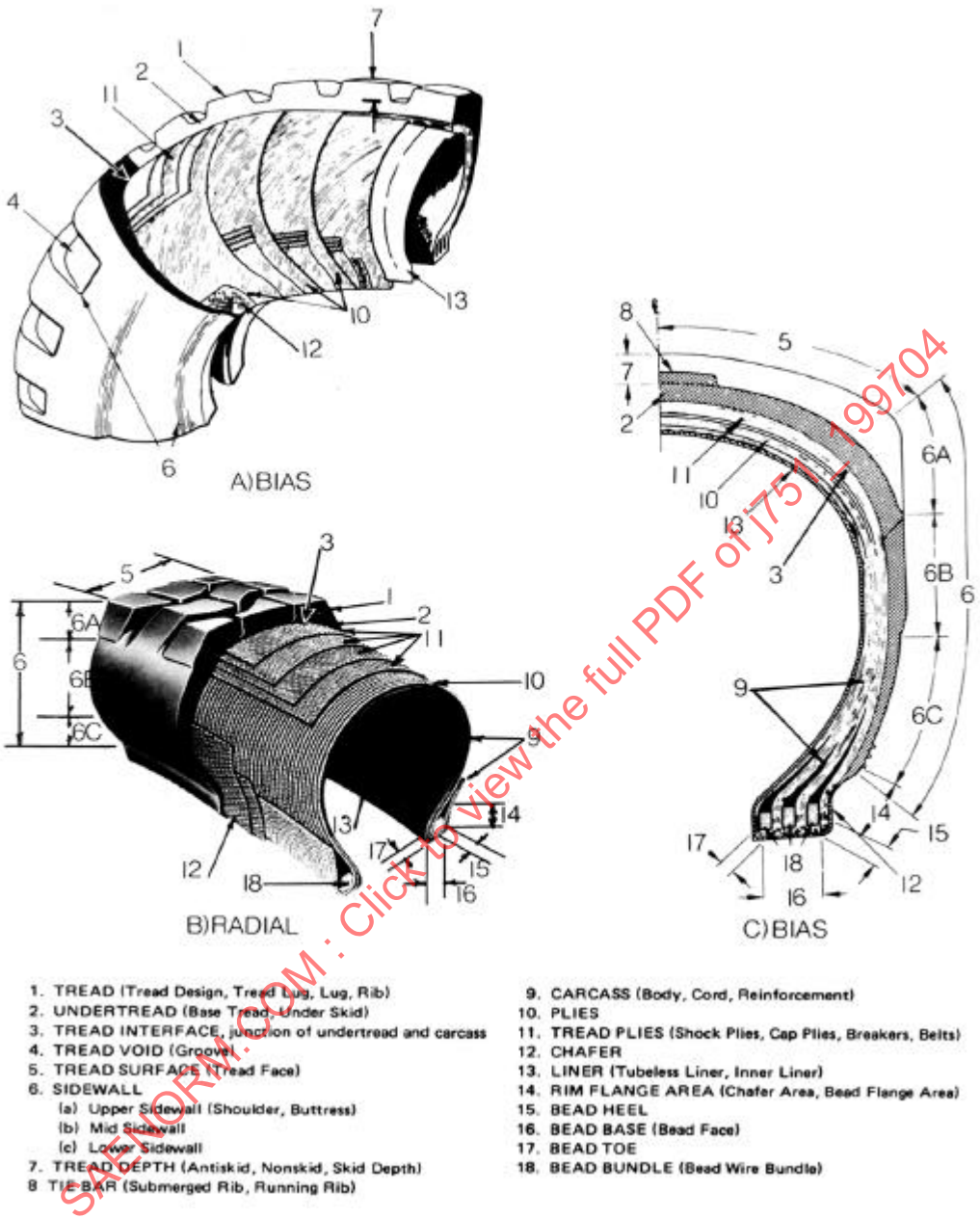


FIGURE 1—NOMENCLATURE FOR OFF-ROAD TIRES

3.3 Rim Diameter Designation—The rim designation follows the section width reference or aspect ratio and construction indicator and specifies the appropriate diameter rim (for example: 24.00-49, 24.00R49, 48/95R57).

3.4 Carcass Strength Rating—Carcass strength is identified by two methods: ply rating (PR) bias tires and a symbol mark type of rating (star [*]) for radial tires. Ply rating is an index of tire strength and does not necessarily represent the number or cord plies in a tire. For the meaning of symbols on symbol marked tires, refer to the respective tire manufacturer.

3.5 Service Code—Service code is an alphanumeric identification for off-road tires in terms of type of tire intended service and tire-tread. The identification consists of a letter designating service category, followed by a numeral indicating the tread. The recommended code identification is given in Table 1.

TABLE 1—RECOMMENDED CODE IDENTIFICATION FOR OFF-ROAD TIRES (TUBE OR TUBELESS TYPES)

Category	Tread Type	Code Number(1)
C—Compactor Service	Smooth	C-1
	Grooved	C-2
E–Earthmover Service	Rib Regular	E-1
	Traction Regular	E-2
	Rock Regular	E-3
	Rock Deep Tread	E-4
	Flotation	E-7
G–Grader Service	Rib Regular	G-1
	Traction Regular	G-2
	Rock Regular	G-3
	Rock Deep Tread	G-4
L—Loader and Dozer Service	Traction Regular	L-2
	Rock Regular	L-3
	Rock Deep Tread	L-4
	Rock Extra Deep Tread	L-5
	Smooth Regular	L-3S
	Smooth Deep Tread	L-4S
	Smooth Extra Deep Tread	L-5S
	Half Track Regular Tread	L-3/L-3S
	Half Track Deep Tread	L-4/L-4S
	Half Track Extra Deep Tread	L-5/L-5S

1. Dual designation tires can also be used. (For example: E-3/L-3)

3.5.1 A COMPACTOR TIRE—Category C can be defined as: A tire utilizing a wide, smooth tread surface for smooth road work and a button design for compaction in loose soils. The tires are load capacity rated for operation, basically up to 10 km/h.

3.5.2 AN EARTHMOVER TIRE—Category E can be defined as: A tire designed for haulage machines at medium to higher speeds. These tires are load capacity rated for short haul operation, up to 4 km (2.5 miles) one way at speeds up to both 50 km/h (30 mph) and 65 km/h (40 mph). They are also rated for TKPH (ton-kilometer per hour) and TMPH (ton-mile per hour) capacity (SAE J1015 and SAE J1098).

3.5.3 A GRADER TIRE—Category G can be defined as: A tire which is generally provided with both a rib-type tread for resistance to lateral forces caused by blade and by turning, and with a lug-type tread having superior traction and self-cleaning abilities for operation in both soft soils and rugged terrains. These tires are load capacity rated for operations up to 40 km/h (25 mph).

3.5.4 A LOADER AND DOZER TIRE—Category L can be defined as: A thick, heavy tread and sidewall tire for maximum protection against cutting. These tires are load capacity rated for operation up to 10 km/h.

3.6 Load Index—A numerical code associated with the maximum load a tire can carry at the speed indicated by its Speed Symbol under service conditions specified by the tire manufacturer.

(188E - 188 = 10,000 kgs & E = 70 km/h)

3.7 Speed Symbol—The speed at which the tire can carry a load corresponding to its Load Index under severe conditions specified by the tire manufacturer. (188E - 188 = 10,000 kgs & E = 70 km/h)

4. Machine Clearances—When designing for machine clearances, the maximum dimensions for grown tires in service should be used (see Figure 2). Where specific tire dimensions are required, the alpha dimensions and definitions in Figure 2 are the recommended nomenclature for communication with the tire manufacturer.

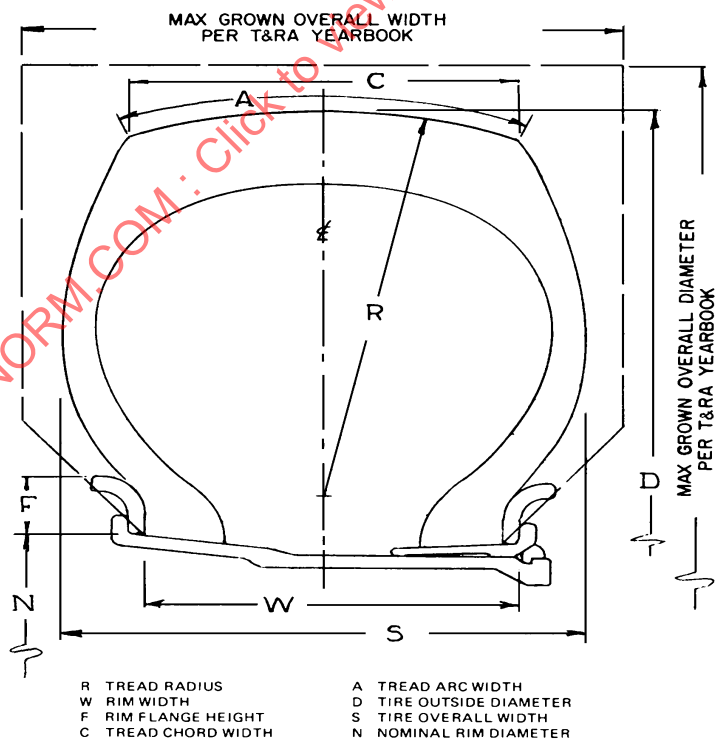


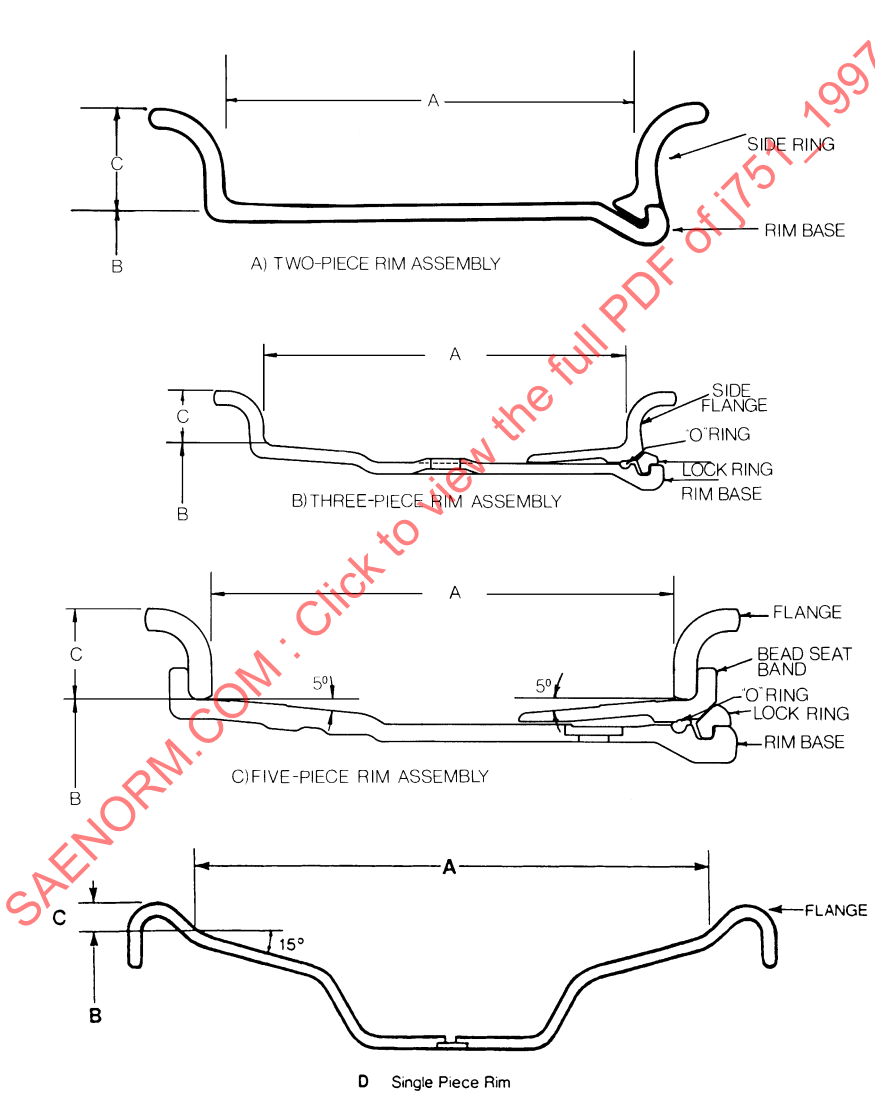
FIGURE 2—INDUSTRY METHOD FOR DEPICTING MAXIMUM DIMENSIONS FOR GROWN TIRES IN SERVICE

5. ***Rim Definition—***The rim assembly is that member on which the tire is mounted and supported.

5.1 A multi-piece off-highway rim contour is designated by a numeric or alphanumeric sequence: a rim width designator, a rim diameter designation, and a flange height designation or rim profile designation (for example: 49x17.00/3.5).

5.2 A single-piece rim contour is designated by a numeric sequence which uses rim diameter designation and rim width designation (for example: 56.5x20.0). See 5.3 and 5.4.

5.3 **Rim Width Designation—**The rim width designation is the width as measured by inches between flanges of the rim (for example: 17.00), see Figure 3.



A RIM WIDTH
B NOMINAL RIM DIAMTER
C FLANGE HEIGHT

FIGURE 3—RIM CONTOUR

5.4 Rim Diameter Designation—The rim diameter designation is the diameter of the rim as measured in inches at the intersection point of the bead taper and the vertical tangent of the flange (for example: 49x17.00), see Figure 3.

5.5 Flange Height Designation—The flange height designation is the height of the flange, as measured in inches from the intersection point of the bead taper and the vertical tangent of the flange contour to the horizontal tangent of the uppermost portion of the flange (for example: 49x17.00/3.5), see Figure 3.

5.6 Rim Profile Designation—The rim profile designation is one or more letters which signify the rim contour at the tire to rim interface. This designation is used instead of the nominal flange height designation on certain rim contours, and follows the rim width (for example: 24x10.00VA, 24x8.00TG).

6. Typical Off-Highway Rim Construction and Component Identification—There are four types of off-highway rim constructions.

6.1 The two-piece type (refer to Figure 3A).

6.2 The three-piece type (refer to Figure 3B).

6.3 The five-piece type (refer to Figure 3C).

6.4 The single-piece type (refer to Figure 3D).

7. Rim Marking—Single-piece rims and each component of multi-piece rim assemblies are identified by legible alphanumeric marking. The origin of the numeric marking is in inch units. The marking is to be visible after the tire is inflated.

7.1 Single-Piece—The single-piece rim marking consists of 3 digits denoting rim diameter, 4 digits denoting rim width, a letter denoting rim type, and 2 digits denoting the taper of the mounting surface (for example: 56.5-20.00-E15°). There are also single-piece rims available for conventional and wide base tires used in Grader applications. These rims feature 5 degrees drop center rim contours and are designated by the rim width, followed by the letters “DC” (for example: 9.00DC, 12.00DC, 13.00DC, 14.00DC).

7.2 Multi-Piece—The five-piece assembly is the only multi-piece construction for which a standard method of component marking is established, as detailed in 7.2.1 through 7.2.5. Consult rim manufacturers’ catalogs for the marking of other rim constructions.

CAUTION—Rim components are not necessarily interchangeable; therefore, consult rim manufacturers for proper matching and assembly instructions.

7.2.1 RIM BASE MARKING—The rim base marking consists of a prefix letter B, denoting a rim base, followed by 2 digits denoting rim width, 2 digits denoting rim diameter, and one or more numbers or letters denoting rim type or style designation. In cases where the rim design width contains decimal fractions, the decimal portion is deleted from the rim marking. The rim type or style designation indicates certain design details or features of the rim assembly, and does not relate to the tire to rim contour. The use and meaning of the suffix letters and numbers is at the discretion of the rim manufacturer.

EXAMPLE—B1751 HDTD

B1533 EM

7.2.2 BEAD SEAT BAND MARKING—The bead seat band marking consists of prefix letters BB, and two or three digits, followed by one or more letters. The BB denotes bead seat band. The latter two digits denote nominal rim diameter. Where a third digit is present, it denotes the bead taper width to the smallest whole inch. The suffix letters denote type or style designations.

EXAMPLE—BB35 HTG

BB25 STN

BB425 EMO

BB539 EH

7.2.3 FLANGE MARKING—The flange marking consists of a prefix letter, usually S or H, followed by four digits. The prefix letter denotes flange. The first two digits denote flange height to the nearest tenth of an inch, and the last two digits denote nominal rim diameter. Suffix letters, when shown, denote type or style.

EXAMPLE—H5051

S3535 E

S4049 HS

7.2.4 LOCK RING MARKING—The lock ring marking consists of letters LR, denoting lock ring, followed by two digits denoting the nominal rim diameter, and one or more letters denoting type or style.

EXAMPLE—LR29 HTM

LR49 EML

7.2.5 O-RING MARKING—The O-ring marking consists of the prefix letters OR, followed by three digits and one or more letters. The prefix letters denote O-ring. The first digit indicates cross section diameter in eighths of an inch. The latter two digits denote nominal rim diameter. The suffix letters denote type or style.

EXAMPLE—OR329EM

OR457 T

8. Rim and Wheel Nomenclature—Refer to Figure 4.

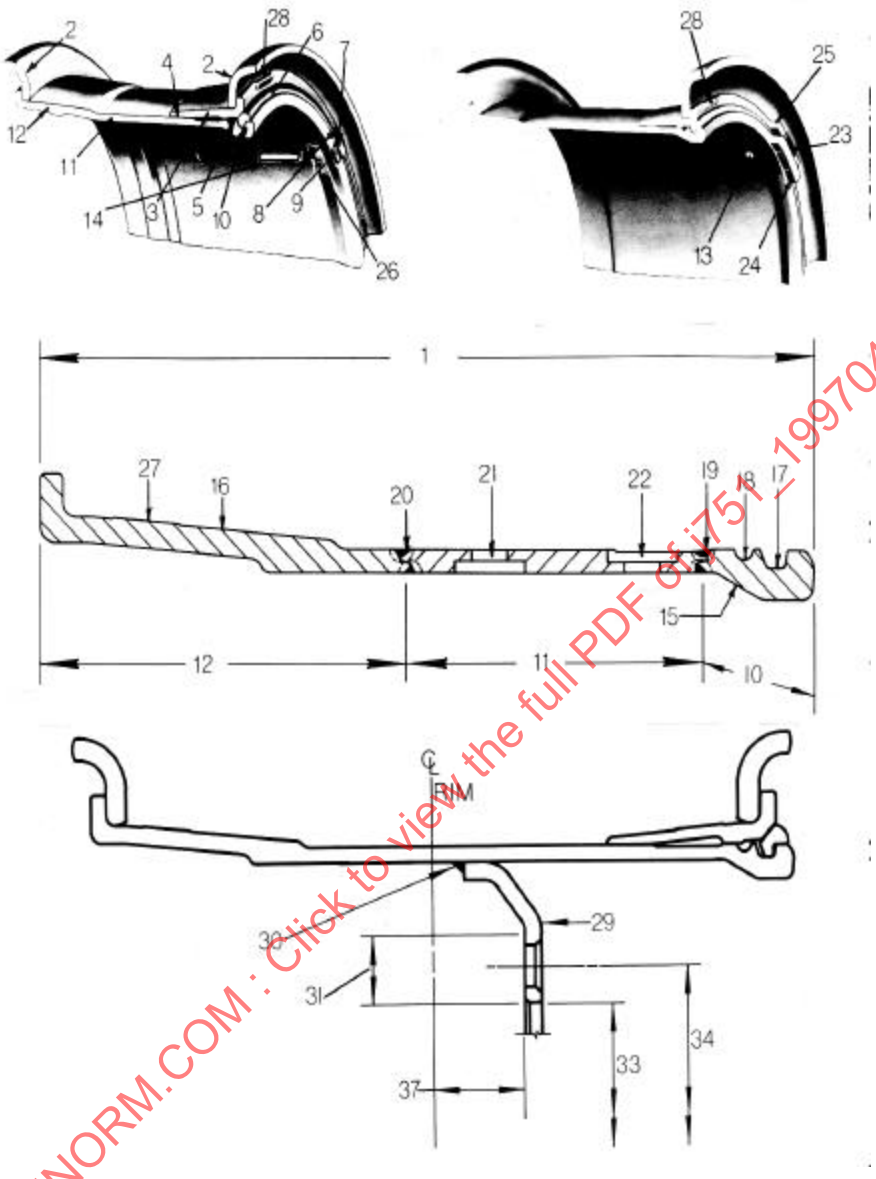


FIGURE 4A—RIM AND WHEEL NOMENCLATURE COMMON TO LARGE OR GIANT HEAVY SERVICE TIRES