

# SIMPLIFIED MEASUREMENT



## TONNAGE GUIDE 1

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## TONNAGE GUIDE 1

### 1. PURPOSE

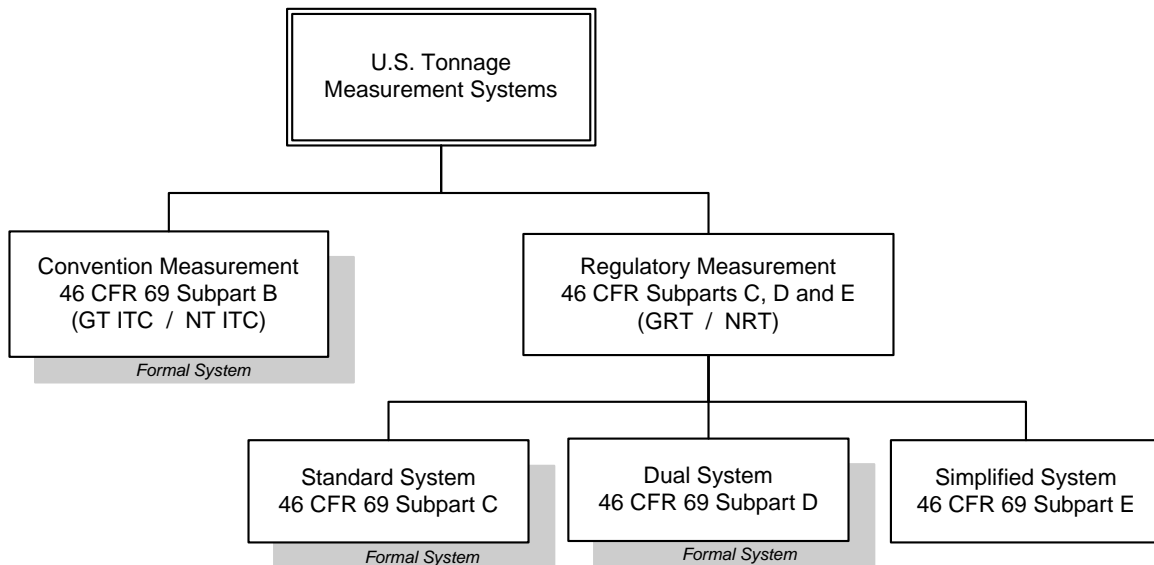
The Guide explains the Simplified tonnage measurement system with regard to: 1) other available tonnage measurement systems; 2) vessel eligibility for Simplified measurement; 3) the use of tonnage in the vessel documentation process; 4) the responsible Coast Guard offices; and 5) calculating Simplified tonnage. This Guide is primarily directed to an audience composed of vessel builders, brokers and owners, mortgage companies and other interested members of the public. This Guide is **not** to be used as the basis for Coast Guard tonnage decisions in response to questions and appeals from the public or government entities. Such decisions will be deferred to applicable law, regulations, and policy documents, such as Marine Safety Center Technical Notes (MTNs).

### 2. GROSS / NET TONNAGE VS. DISPLACEMENT TONNAGE

This Guide addresses gross and net tonnage, which relate to vessel volume and appear on a documented vessel's Certificate of Documentation (COD). Gross and net tonnage is widely used as the basis for vessel regulation and assessment of taxes and fees. Gross and net tonnage is not to be confused with displacement or weight tonnage, often expressed in "pounds", "tons" or "long tons".

### 3. TONNAGE MEASUREMENT SYSTEMS

There are two basic tonnage measurement systems presently available in the United States, namely the Convention and Regulatory systems. The primary system is the Convention or international system, which is derived from the provisions of the International Convention on Tonnage Measurement of Ships, 1969, to which the United States is a party. The Regulatory or national system has three subset systems, namely Standard, Dual and Simplified. The Standard is the oldest system, dating back to the 1860's, and is based on the British "Moorsom" system. Dual measurement was developed in the mid 20<sup>th</sup> century to benefit shelter deck vessels by providing alternatives to fitting them with tonnage openings. The Simplified system was initially authorized by Congress in 1966 for recreational vessels to reduce the measurement cost burden for owners and the measurement workload on the government. Later, the Simplified system was extended to certain commercial vessels. Convention tonnage is dimensionless and expressed as GT ITC (or simply GT) for gross tonnage and NT ITC (or simply NT) for net tonnage. Regulatory tonnage is calculated in units of register tons of 100 cubic feet per ton and expressed as GRT for gross register tons and NRT for net register tons.



#### **4. FORMAL VS. SIMPLIFIED MEASUREMENT**

“Formal” measurement is the process by which a vessel owner employs an authorized tonnage measurement organization and its surveyors to measure the vessel under the Convention, Standard or Dual systems. For “formal” measurement, the measurement organization performs an onboard survey, uses a series of detailed volumetric calculations to determine the tonnage, and issues appropriate tonnage certificates. This work is done for a fee, which is paid by the vessel owner. Fees vary, but generally range from several hundred to several thousand dollars, depending on the vessel's size, complexity and/or other factors. For documented vessels, the measurement organization also sends copies of tonnage certificates to the National Vessel Documentation Center (NVDC), so that tonnage information can be entered into the Coast Guard's Marine Information for Safety and Law Enforcement (MISLE) computer system and printed on the COD. Simplified measurement is the process by which tonnages are based on the vessel's principal dimensions and other characteristics provided by the vessel owner. For documented vessels, the required information is submitted to the NVDC for entry into MISLE. MISLE calculates the tonnages, which are printed on the COD. For undocumented vessels, Simplified tonnage is calculated on an “as-needed” basis by interested parties, and is not certified on Coast Guard documents.

#### **5. MEASUREMENT SYSTEM APPLICABILITY**

A vessel is eligible to be measured under the Simplified measurement system if it is either: 1) under 79 feet in length; or 2) a non-self-propelled or recreational vessel. Some vessels that are 79 feet or over in length may also require measurement under the Convention measurement system. This includes vessels that engage on foreign voyages, as well as recreational vessels that engage on voyages outside the Great Lakes and have keel laid dates after December 31, 1985. The Convention measurement system does not apply to vessels less than 79 feet in length, whereas vessels of any length can be measured under the Standard and Dual systems. For complete requirements on tonnage measurement system applicability, refer to Navigation and Vessel Circular (NVIC) 11-93, Applicability of Tonnage Measurement Systems to U.S. Flag Vessels.

#### **6. MEASUREMENT SYSTEM HEIRARCHY**

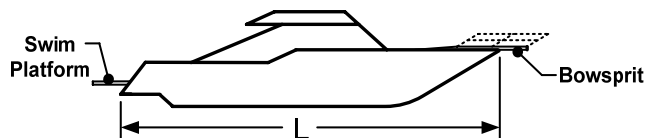
For most vessels 79 feet and over in length, the Convention system is the primary tonnage measurement system under the law in the United States. However, law permits vessels to also be measured under the “optional” Regulatory system regardless of length, if requested by the vessel owner, for purposes of applying domestic laws in effect prior to July 19, 1994. For vessels less than 79 feet in length, the Regulatory system is used in all cases.

#### **7. REGISTERED DIMENSIONS**

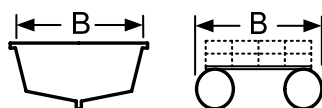
Registered dimensions (i.e., registered length, registered breadth and registered depth) are assigned to a vessel as part of the tonnage measurement process, and appear on tonnage certificates, and/or CODs. Registered dimensions are sometimes used as a basis for regulating a vessel, and/or applying fees. Two different sets of definitions of registered dimensions have been used for vessels that are formally measured, depending on when the vessel was measured. For vessels that are measured only under the Simplified system, the registered dimensions are the overall dimensions of the vessel as defined in this Guide.

## 8. DEFINITIONS

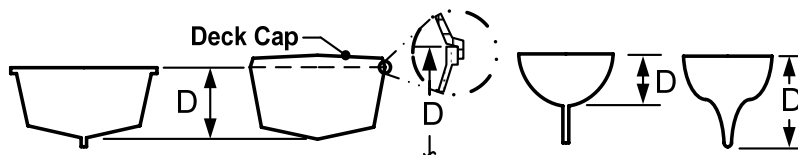
**Overall Length (L)** is the horizontal distance between the outboard side of the foremost part (bow) of the hull and the outboard side of the aftermost part (stern) of the hull. It does not include bowsprits, rudders, outboard motor brackets, swim platforms that do not contain buoyant volume, and other similar fittings and attachments that are not part of the buoyant hull envelope.



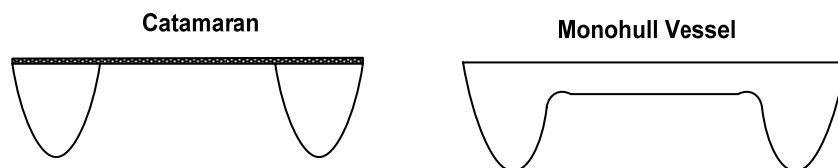
**Overall Breadth** means the horizontal distance taken at the widest part of the hull, excluding rub rails, from the outboard side of the skin (outside planking or plating) on one side of the hull to the outboard side of the skin on the other side of the hull.



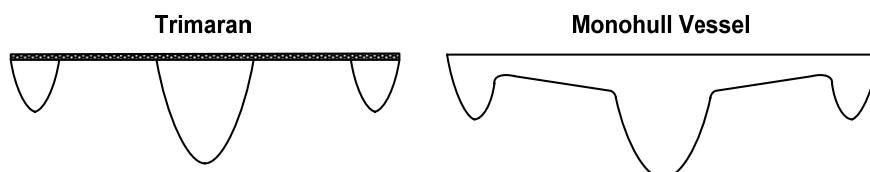
**Overall Depth** means the vertical distance taken **at or near amidships** from a line drawn horizontally through the uppermost edges of the skin (outside planking or plating) at the side of the hull (excluding the cap rail, trunks, cabins and deckhouses, and deck caps) to the outboard face of the bottom skin of the hull, excluding the keel. **For a vessel that is designed for sailing where the interface between the “keel” and the “bottom skin of the hull” is not clearly defined (as is the case with an “integral” or “faired” keel), the keel is included in the “overall depth”.**



**Twin Hull Vessel (e.g., Catamaran)** means a vessel having two hulls connected only with structure that is **not** part of the vessel's buoyant hull envelope, such as structural tubing or beams. If the connecting structure is part of the buoyant hull envelope, the vessel as a whole is treated as if it were a single hull (i.e., monohull) vessel.



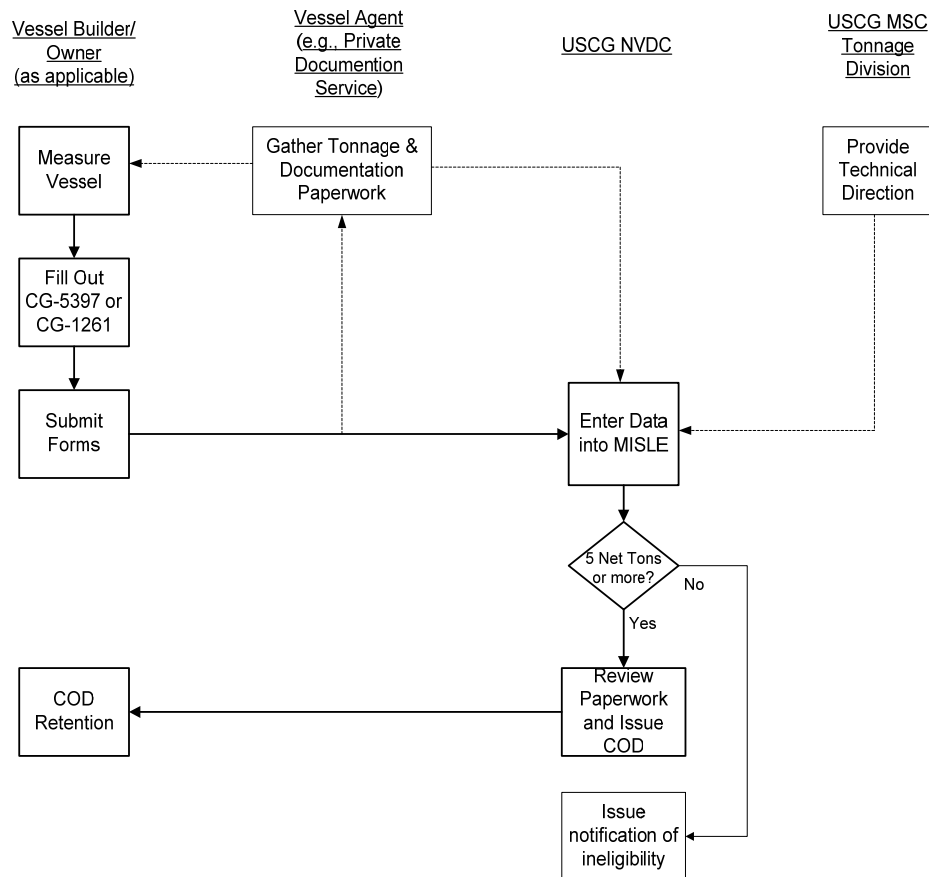
**Tri-Hull Vessel (e.g., Trimaran)** means a vessel having three hulls connected only with structure that is **not** part of the vessel's buoyant hull envelope, such as structural tubing or beams. If the connecting structure is part of the buoyant hull envelope, the vessel as a whole is treated as if it were a single hull (i.e., monohull) vessel.



## 9. SIMPLIFIED MEASUREMENT PROCESS

For documented vessels, Simplified tonnage is calculated using vessel dimensions and characteristics provided by the owner. This information is obtained from either of the following two forms: 1) Form CG-1261 “Builder Certification and First Transfer of Title”, Revision 2-92 or later, which is completed by the builder; or 2) Form CG-5397 “Application for Simplified Measurement”, which is completed by the vessel owner, sometimes with the assistance of an agent such as a private documentation service. In cases where the vessel dimensions and characteristics on Form CG-1261 are found to be in error, or do not agree with information on Form CG-5397, the information on Form CG-5397 will take precedence. Forms are submitted to the NVDC along with appropriate documentation forms and fees. Instructions, forms and fees for documenting vessels can be found on the NVDC Website. Upon receipt of the appropriate forms and fees, the NVDC enters the vessel data from either Form CG-1261 or 5397 into the MISLE computer system, which calculates the tonnage. If the vessel tonnage is 5 net tons or more and other documentation requirements are met, the NVDC issues a COD showing the gross and net tonnage and registered dimensions, which is mailed to the owner.

### Simplified Measurement Process (Documented Vessels Only)



## 10. FIVE NET TON THRESHOLD

The significance of the five (5) net ton (5 NRT or 5 NT ITC) threshold is related to and derived from the regulations in Title 46, Code of Federal Regulations (CFR), Part 67 regarding vessel eligibility and requirements for vessel documentation. Basically, vessels less than 5 net tons are not eligible for documentation, while vessels engaged in certain trades in the U.S. that are 5 net tons or more must be documented. Many recreational vessel owners wish to have their vessel measure over 5 net tons and thus be eligible for documentation as a “vessel of the United States”. Refer to the Coast Guard Boating Safety

Division for more information on requirements on registration of recreational vessels, including the advantages and disadvantages for documenting such vessels.

### 11. SIMPLIFIED TONNAGE CALCULATION

Vessel owners who wish to calculate the tonnage of their vessel may do so using either: 1) the interactive Form CG-5397 found on the Coast Guard's Homeport website (<http://homeport.uscg.mil>) by searching on *Tonnage Measurement*; or 2) the Simplified formulation found below. This is especially recommended for smaller vessels being documented (e.g., those under 35 feet in length), in order to avoid submitting forms and paying fees if the vessel is found to be ineligible for documentation because it measures under 5 net tons. All dimensions used in Simplified tonnage calculations are in decimal feet to the nearest tenth of a foot.

### 12. GROSS TONNAGE FORMULATION (MONOHULL VESSELS)

The basic Simplified tonnage formula for **gross register tons** of a **monohull** vessel is:

$$\text{GRT} = (\text{Hull Volume} + \text{Deckhouse Volume})/100$$

Where:

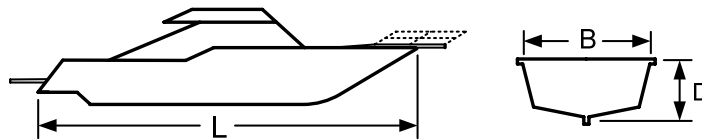
$$\text{Hull Volume} = S \times K \times L \times B \times D$$

$$\text{Deck Structure Volume} = L_s \times B_s \times D_s$$

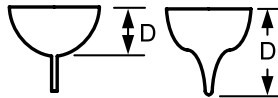
**Note:** For vessels with small deckhouses and other deck structures, the deck structure volume is ignored (treated as "zero" value). Deck structure volume is accounted for only if the volume of the principal deck structure is equal to or greater than the hull volume.

The overall dimensions of the hull are as follows:

- L** = Overall Length
- B** = Overall Breadth
- D** = Overall Depth

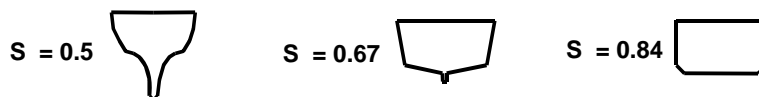


**Note:** **D** is normally measured from the deck edge down to where the hull meets the keel, except for vessels designed for sailing where the interface between the "keel" and the "bottom skin of the hull" is not clearly defined (as is the case with an "integral" or "faired" keel), for which the depth is measured to the bottom of the keel.



The shape factor (**S**) is as follows:

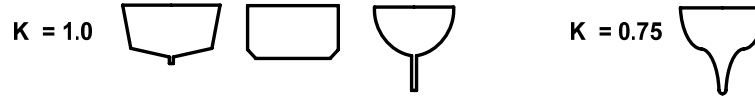
- S** = 0.5 for hulls designed for sailing (finest hull form)
- S** = 0.67 for powerboats, ship-shape and circular hulls
- S** = 0.84 for barges and boxed-shaped hulls (fullest hull form)



The keel factor (**K**) is as follows:

**K** = 1.0 for all hull configurations **except** those designed for sailing wherein the Overall Depth includes the keel.

**K** = 0.75 for hulls designed for sailing wherein the Overall Depth includes the keel.

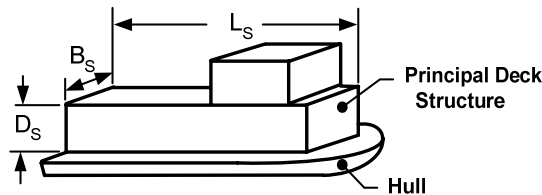


The deck structure dimensions are defined as:

**L<sub>s</sub>** = The average length of the principal deck structure

**B<sub>s</sub>** = The average breadth of the principal deck structure

**D<sub>s</sub>** = The average depth of the principal deck structure



### 13. GROSS TONNAGE FORMULATION (TWIN HULL VESSELS)

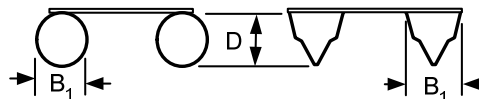
The basic Simplified tonnage formula for **gross register tons** of a **twin hull** vessel is:

$$\text{GRT} = (2 \times \text{Hull Volume} + \text{Deckhouse Volume})/100$$

Where all parameters are the same as monohulls above, except that:

$$\text{Hull Volume} = S \times K \times L \times B_1 \times D$$

**B<sub>1</sub>** = breadth of the individual hulls



### 14. GROSS TONNAGE FORMULATION (TRI-HULL VESSELS)

$$\text{GRT} = [(\text{Center Hull Volume} + 2 \times \text{Outer Hull Volume} + \text{Deckhouse Volume})]/100$$

Where all parameters are the same as monohulls above, except that:

$$\text{Center Hull Volume} = S \times K \times L_1 \times B_1 \times D$$

$$\text{Outer Hull Volume} = S \times K \times L_2 \times B_2 \times D_1$$

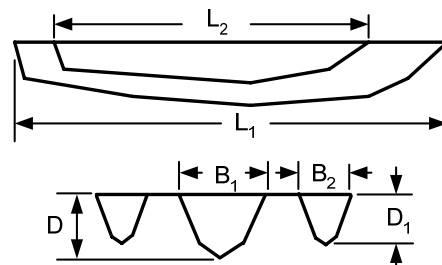
**L<sub>1</sub>** = length of the center hull

**B<sub>1</sub>** = breadth of the center hull

**L<sub>2</sub>** = length of the outer hulls

**B<sub>2</sub>** = breadth of the outer hulls

**D<sub>1</sub>** = depth of the outer hulls





## 15. NET TONNAGE FORMULATION

The Simplified tonnage formula for **net register tons** for any vessel is:

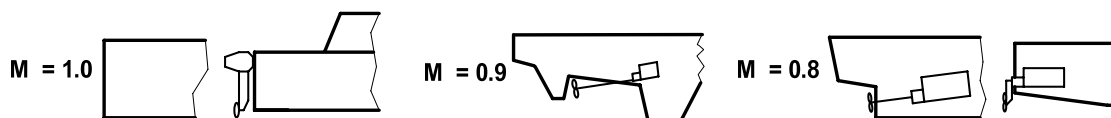
$$\text{NRT} = \text{M} \times \text{GRT}$$

The machinery factor (**M**) is as follows:

**M** = 1.0 for non-self-propelled vessels **or** propulsion machinery **outside** the hull

**M** = 0.9 for vessels **designed for sailing** with propulsion machinery **inside** the hull

**M** = 0.8 for vessels **not designed for sailing** with propulsion machinery **inside** the hull



## 16. GUIDANCE ON DIMENSIONS

Use the following guidance in obtaining dimensions and calculating tonnages.

- a. **Obtaining Principal Dimensions.** Measure all lengths and depths in (or projected to) a vertical plane on the vessel centerline axis, and breadths in (or projected to) a vertical plane at right angles to that axis. Measure the principal dimensions in feet and inches to the nearest inch, or in decimal feet to the nearest tenth of a foot.
- b. **Rounding Dimensions.** If the measured dimensions are in feet and inches, and/or if more accurate measurements than specified in paragraph a. were obtained, follow the rounding procedures in the Appendix to express all dimensions in decimal feet to the nearest tenth of a foot, before using the dimensions to calculate tonnage.
- c. **Truncating Tonnage Values.** Both gross and net tonnage are truncated (not rounded up or down) to the nearest whole number. Truncation means dropping whatever decimals remain to the right of the decimal point, if any, without changing the integer values. In calculating the net tonnage, apply the machinery factor (**M**) to the gross register tonnage before truncation. For example, if the gross tonnage is calculated to be 6.99 (before truncation), and **M** is 0.8, the net tonnage (before truncation) is 5.592. This gives a gross tonnage of 6 and a net tonnage of 5.

## 17. TONNAGE MEASUREMENT QUESTIONS

Direct questions regarding interpretation of this Guide or any other questions related to tonnage measurement and certification to the Tonnage Division of the Marine Safety Center in Washington, DC. Before contacting the Marine Safety Center, we encourage you to visit our website found on the Coast Guard's Homeport website (<http://homeport.uscg.mil>) by searching on *Tonnage Measurement*, which provides links to various policy documents, answers to frequently asked questions, and other information which may assist you.

## 18. REFERENCES

The following are useful references related to Simplified Measurement, and are all available on the Marine Safety Center's web site (except as noted):

- a. 46 U.S.C. Chapter 145 – “Regulatory Measurement”, Subchapter III – “Simplified System”
- b. 46 CFR 69, “Measurement of Vessels”
- c. MTN 01-99, “Tonnage Technical Policy”
- d. NVIC 11-93, “Applicability of Tonnage Measurement Systems to U.S. Flag Vessels”
- e. CG-5397 “Application for Simplified Measurement”
- f. CG-1261 “Builder Certification and First Transfer of Title” (available on the NVDC's web site)



P. D. EARECKSON  
Chief, Tonnage Division  
U.S. Coast Guard  
By direction

## APPENDIX

### English Unit Rounding

1. Fractions of an inch should be rounded to the nearest half inch, and then converted to tenths of a foot from the conversion table.

**Example 1:**  $2' - 5 \frac{7}{16}'' = 2' - 5 \frac{1}{2}'' = 2.5 \text{ ft}$

**Example 2:**  $2' - 5 \frac{1}{2}'' = 2' - 6'' = 2.5 \text{ ft}$

**Example 3:**  $2' - 0 \frac{1}{4}'' = 2' - 0'' = 2.0 \text{ ft}$

2. Decimals given in hundredths and thousandths should be rounded to the nearest tenth as in the following examples:

**Example 1:**  $10.750 \text{ ft} = 10.8 \text{ ft}$

**Example 2:**  $10.349 \text{ ft} = 10.3 \text{ ft}$

3. Engineering standards should be used for rounding decimals, i.e., 0.05 should be rounded up to 0.1.

### English Fraction to Decimal Conversion Table

| Inches           | Feet |
|------------------|------|
| $\frac{1}{2}$    | 0.0  |
| 1                | 0.1  |
| $1 \frac{1}{2}$  | 0.1  |
| 2                | 0.2  |
| $2 \frac{1}{2}$  | 0.2  |
| 3                | 0.3  |
| $3 \frac{1}{2}$  | 0.3  |
| 4                | 0.3  |
| $4 \frac{1}{2}$  | 0.4  |
| 5                | 0.4  |
| $5 \frac{1}{2}$  | 0.5  |
| 6                | 0.5  |
| $6 \frac{1}{2}$  | 0.5  |
| 7                | 0.6  |
| $7 \frac{1}{2}$  | 0.6  |
| 8                | 0.7  |
| $8 \frac{1}{2}$  | 0.7  |
| 9                | 0.8  |
| $9 \frac{1}{2}$  | 0.8  |
| 10               | 0.8  |
| $10 \frac{1}{2}$ | 0.9  |
| 11               | 0.9  |
| $11 \frac{1}{2}$ | 1.0  |

### Metric to English Conversion

If dimensions are given in metric units, the factor 0.3048 should be used to convert meters to feet.

**METERS/0.3048 = FEET**

**CENTIMETERS/30.48 = FEET**

**Example: 4.58 m = 15.0 ft**

**Example: 213.56 cm = 7.0 ft**