

SECTION 109—MEASUREMENT OF QUANTITIES

109.01 MEASUREMENT—

(a) **Units of Measure.** Work performed under this contract will be measured in the following units shown in the Measurement and Payment sections of the Specifications and in the Design Items in the proposal, unless otherwise specified:

- **Lump Sum.** Not measured. Indicates complete construction of the item of work, as specified.
- **Each.** Measured by the number of individual items of work completed.
- **Meter (Linear Foot).** Measured parallel to the longitudinal base or foundation upon which items are placed, or along the longitudinal surface of the item.
- **(M. Linear Feet.** 1,000 Linear Feet, to the nearest 0.01 M. feet.)
- **Vertical Meter (Vertical Foot).** Measured vertically to the nearest 0.01 m (0.1 foot), with a minimum vertical measurement of 0.10 m (1 foot), at each unit.
- **Square Meter (Square Foot, Square Yard).** Measured by a two-dimensional area method on the surface of the item.
- **Cubic Meter (Cubic Yard).** Measured by a three-dimensional volume method.
- **Hectare (Acre).** Measured by a two-dimensional area method on the surface to the nearest 0.05 hectare (0.1 acre).
- **Kilogram (Pound).** Measured by actual item net mass (weight) (avoirdupois).
- **Tonne (Ton).** Measured by actual item net mass (weight in short tons) consisting of 1000 kg (2,000 pounds, avoirdupois).
- **Liter (Gallon).** Measured by actual item liquid volume.
- **1000 Liters (M. Gallon).** Measured by actual item liquid volume consisting of 1000 L (1,000 gallons, to the nearest 0.1 M. gallon).
- **(Foot Board Measure.** Measurement by a three-dimensional method of the actual item lumber board foot.)
- **(M. Feet Board Measure.** 1,000 feet board, to the nearest 0.01 M. feet board.)
- **Set.** Measured as an item unit set, consisting of two or more parts together, as specified.
- **Bag.** Measured as an item unit bag.
- **(Bushel.** Measured by actual item dry measure consisting of 32 quarts.)

(b) **General.** Measurement will be according to the current edition of International System of Units (SI) (the Modernized Metric System) (measurement will be according to the system of weights and measures) recognized by the United States Bureau of Standards. Method of measurement and computation of quantities will conform to generally recognized engineering and construction practice. Computer generated or electronic digital measuring and computing devices are acceptable methods.

A station, when used as a definition or term of measurement, will be a kilometer (100 linear feet), horizontal measurement.

When required, weigh material on accurate, acceptable scales, using competent, qualified personnel at locations designated. When material is shipped by rail, the car mass (weight) may be accepted, if only the actual mass (weight) of material is measured. However, car mass (weights) will not be acceptable, for material passed through mixing plants. Weigh empty trucks used to haul material measured by mass (weight) daily, as directed. Mark each truck with a distinct, legible identification. Trucks may be selected at random and weighed, as directed, to verify the mass (weight) of material by weighing the truck empty and loaded on other acceptable scales.

Use acceptable vehicles to haul material to be measured by volume at the delivery point. Use acceptable vehicles of any size or type, provided the actual body contents can be readily and accurately determined. Load vehicles to at least their water level capacity. Level the loads at the delivery point.

If requested, material measured by the cubic meter (cubic yard) may be weighed and converted to tonnes (tons), if approved in writing by the District Executive. Factors to be used for conversion from mass (weight) measurement to volume measurement or mass (weight) measurement to area measurement will be determined by the Representative and agreed to by the Contractor before using this method of measurement.

Measure bituminous material by the liter (gallon) or tonne (ton), as indicated. Measure volumes at 15 °C (60F) or correct to volume at 15 °C (60F), using [ASTM D 1250](#) for asphalts or [ASTM D 633](#) for tars. Net certified scale mass (weights), or mass (weights) based on certified volumes for rail shipments, will be used as a measurement basis. Mass (weights) will be subject to correction when bituminous material has been lost from the car or by the distributor, wasted, or otherwise not incorporated in the work. If bituminous materials are shipped by truck, the net certified mass (weight) or volume, subject to correction for loss or foaming, may be used for computing quantities.