

Metric Design

- **Policy**

The LANTDIV policy is to support conversion of the United States system of measurement to metric units. Metrication should therefore be viewed as a learning opportunity, to be accepted, planned for and implemented, and not as a liability to be delayed as long as possible.

Our goal at LANTDIV is to use a common sense approach in the application of both hard and soft metric products, such that the facility as designed can be readily built using the metric system of measurement alone with little or no numerical conversions back to the inch-pound system by the construction contractor.

- **What is Hard Metric Conversion versus Soft Metric Conversion?**

- **Definitions:**

Hard Metric conversion means, in addition to expressing of the dimensions of a product under the metric system of measurement, a physical change in the size of that product relative to the size of that product established under existing production practices or capabilities of the appropriate industry.

Various manufactured products used in the building construction industry will require physical change (hard conversion) in material composition or size and configuration. Several examples of these products are concrete masonry units, drop in lighting fixtures, plywood, etc. These will all need a physical change at some point in time to fit within a modular 100mm planning grid. Until hard a metric version of a product is available at reasonable total installed cost soft conversions should be used.

Soft Metric conversion, on the other hand, is based on expressing the dimension of a product under the metric system of measurement without changing the physical size of the product relative to the size of that product established under existing production practices or capabilities of the appropriate industry. In other words, the physical dimensions of the product are unchanged while the measurement units used to describe and specify the product are changed to metric units. For example both ASTM and AASHTO specification are now available for soft metric reinforcement following the recommendations of the Concrete Reinforcing Steel Institute. A #4 is now called a # 13, a # 6 is a # 19, etc. By using this approach to metrication, the existing 11 inch-pound bar sizes physically remain unchanged.

To rephrase the above definitions, hard conversion requires the change in size of an existing quantity or product to obtain a convenient, rounded or rationalized metric dimension. The hard conversion for a 6" slab thickness is 150 mm. Soft conversion on the other hand is simply the result of a mathematical conversion of inch-pounds to SI units. A soft conversion of a 6" slab is 152 mm. Note that the soft conversion has been rounded down from the exact 152.4 to what is called a nominal dimension.

Keep in mind that when a hard metric conversion is used it will accelerate the learning process and acceptability of the metric system. Simple mathematical dimensional conversions should be avoided to the maximum extent possible. When a soft conversion is made, the next step to a rational equivalent nominal dimension would be more

appropriate. The resultant rounded dimension would facilitate the cleanest construction possible. Consider the following common examples:

Product	Inch-Pound Unit	Soft Conversion	Nominal Dimension	Hard Dimension
Concrete Masonry	8" CMU	203.2	203	Not applicable
Cast-in-place Conc	8" Wall	203.2	203	200
Concrete Strength	3000psi	20.68 Mpa	21 Mpa	20 / 25 Mpa*
Reinforcing Steel	#8	25.4	25	Not applicable
Metal roof deck	18 gage	Not applicable	Not applicable	Not applicable
Handrail Height	36"	914.4	915*	900

* Note: If a building code makes a reference to a specified minimum value care and professional judgement must be exercised.

• Metric Requirements

All projects shall be designed and built using metric units of measurement unless directed otherwise. The following shall apply:

- a) All measurements and units shall be shown in System International (SI) metric units exclusively. This includes but is not limited to: Linear measurements, area measurements, volumetric measurements, temperature measurements, pressure requirements, noise requirements, lighting requirements, and all power and energy units.
- b) English system measurements shall not appear in reports, drawings, specifications, cost estimating, or any other submissions. However, any computer program that requires calculations, which are not available in metric, will be allowed. The results of the calculations will be converted into metric units.
- c) The Metric Guide for Federal Construction, NAVFAC Metrication Conversion Policy for Design, Planning and Design Criteria, and NAVFAC Guide Specification shall be used as guidance on drawings, specifications and other elements of metric implementation. The American Institute of Architect (AIA), Metrication of Master Specifications and ASTM E621 the Use of Metric (SI) Units in Building Design and Construction provide additional guidance.