Volume 9, Issue 2 2nd Quarter 2000

WHY METRICATION?

With the U.S. economy still barreling along and the construction industry going full tilt, this may not seem like a good time to question our use of the inch-pound measurement system. But 95.4 percent of the world uses a different system of measurement and most construction projects worldwide are built using metric measures. So, as a refresher, here are some metric facts:

- The metric system is the international system of measurement—5.719 billion people use it every day, for everything. The rest of us buy cola in liters, video tape and film in millimeters, light bulbs in watts, and aspirin in milligrams. We use metric tools on our cars, trucks, and power equipment.
- Our largest trading partners and closest neighbors, Canada and Mexico, are metric countries.
- Most major U.S. industries—including the automobile, construction equipment, machine tool, electronics, soft drink, liquor, pharmaceutical, and health care industries—are primarily or completely metricated.
- The metric system is based on decimal arithmetic, just like dollars and cents. Once learned, it's simpler to use and less prone to error.
- In 1988, Congress made the metric system the preferred system of measurement in the United States.
- Since 1994, billions of dollars of federal, state, and local construction projects of all kinds have been built using the metric system with **no** appreciable cost or schedule problems.
- Metric construction is performed in the same way as conventional construction by the same people with the same skills and the same experience and with almost all of the same tools, products, and equipment. Little changes but the measurement units.
- Sometimes it's hard for experienced construction personnel to gain the kind of "feel" for metric units that they have for inches and feet, but with on-the-job practice, thousands have made the change successfully.
- Adopting the metric system is a good deal for the construction industry. Metrication increases both efficiency and quality and helps American workers stay technologically competitive with their foreign counterparts.
- Construction metrication brings a large and important part of our economy into the world standard of measurement to benefit all Americans.
- We only need to make the change ***once***. The benefits are perpetual.

Inside: **The Construction Trades**

News Flash: USMA's (and everyone's) beloved metric advocate on Capitol Hill, Max Tinsley, has been injured in a fall. Send cards to P.O. Box 4, Kensington MD 20895. Get well soon, Max.!

Construction Metrication is the newsletter of the Construction Metrication Council of the National Institute of Building Sciences, Washington, D.C. Reproduction and distribution of its contents is encouraged provided the Council receives attribution. This and previous newsletters are available upon request and may be viewed at **www.nibs.org**.

METRIC AND THE TRADES

Perhaps it should be no surprise that the construction trades are proving to be the most adaptable sector of the construction industry in converting to the metric system. People in the trades tend to be technically oriented and many already use metric tools to maintain their vehicles and equipment. On a metric construction job, they are immersed in metric measures, the fastest way to learn. And as a tile setter explained, "My kids are using metric in school and I want to keep up with them."

Many trades people use only linear measures; therefore, the change is an easy and positive one for them -- from three kinds of units (feet, inches, and inch-fractions) to one (millimeters). A metric tape measure usually is the only new tool they require and classroom work is rarely needed.

Plumbing and HVAC personnel must learn the additional metric measures for mass, volume, pressure, force and temperature; however, most seem to welcome the change to a simpler, decimal-based system. Electricians, of course, have always worked in the metric world of volts, amps, and watts.

Here are some training tips:

G Determine what metric units each trade needs to use. Train with the goal of "enabling people to perform their jobs with the same or greater degree of efficiency using metric units."

G Train at the right time. Training should take place just prior to when metric measures are first used on the job; earlier training is usually ineffective.

G Train only as necessary to meet the goal of enabling employees to perform their jobs with the same or greater degree of efficiency using metric. In fact, training often can be performed completely on-the-job.

G Train people to "think" metric." Link metric measurements to familiar objects. Use tools that show only metric units.

G Teach in a way that allows people to develop the same "feel" for metric units that they have for the units they use now.

Recent metric projects have shown that trades people learn to think in metric measures in two to four weeks on the job and prefer working in the metric system thereafter.

Stan Jakuba, a metric management and training consultant in Hartford, Connecticut, served as technical advisor for this issue. He can be reached at 203-521-7924 or 860-521-7924.

CONSTRUCTION METRICATION COUNCIL

National Institute of Building Sciences
1090 Vermont Avenue, N.W., Suite 700
Washington, D.C. 20005-4905
Telephone 202-289-7800; fax 202-289-1092
E-mail: bbrenner@nibs.org
Internet: www.nibs.org

Construction Metrication is a quarterly newsletter published by the Construction Metrication Council to disseminate information about construction metrication activities. The National Institute of Building Sciences created the Council in 1992 to provide industry-wide, public and private sector support for the metrication of federal construction and to promote the adoption and use of the metric system of measurement as a means of increasing the international competitiveness, productivity, and quality of the U.S. construction industry.

The National Institute of Building Sciences is a nonprofit, nongovernmental organization authorized by Congress to serve as an authoritative source on issues of building science and technology.

The Council is an outgrowth of the Construction Subcommittee of the Metrication Operating Committee of the federal Interagency Council on Metric Policy. The Construction Subcommittee was formed in 1988 to further the objectives of the 1975 *Metric Conversion Act*, as amended by the 1988 *Omnibus Trade and Competitiveness Act*. To foster effective private sector participation, the activities of the Subcommittee were transferred to the Council in April 1992.

Membership in the Council is open to all public and private organizations and individuals with a substantial interest in and commitment to the Council's purposes. The Council publishes the *Metric Guide for Federal Construction* and this newsletter. It is funded primarily by contributions from federal agencies but also receives private sector support.

Chairman: Thomas R. Rutherford, P.E., Department of Defense
Executive Director: William A. Brenner, AIA
Board of Direction: William Aird, P.E., National Society of Professional Engineers; Gertraud Breitkopf, R.A., GSA Public Buildings Service; David Cox, P.E., Federal Highway Administration; Garner W. Duvall, P.E., National Capitol Region, General Services Administration; James Gross, P.E., National Institute of Standards and Technology, retired; Debbie Nauta-Rodriguez, AIA, Smithsonian Institution; Arnold Prima, FAIA, Washington Building Congress; Mary Fenelon, Construction Information Group/McGraw-Hill; Gerald Underwood, American National Metric Council; Dwain Warne, P.E., GSA Public Buildings Service, retired; Lorelle Young, U.S. Metric Association; Werner Quasebarth, American Institute of Steel Construction.

This newsletter is available at no charge. To obtain a subscription, send a fax (*do not call*) to 202-289-1092 or an e-mail message to *cchittum@nibs.org* with the words "Metric newsletter" and your name and *most concise* mailing address. Please, only one subscription per office. Back issues of the newsletter and information about other Council publications will be included in your first mailing.

METRIC UNITS USED BY THE CONSTRUCTION TRADES

	Quantity	Unit	Symbol
Surveying	length	kilometer, meter	km, m
	area	square kilometer hectare (10 000 m^2) square meter	km^2 ha (hm^2) m^2
	plane angle	degree minute second percent	° ' " %
Excavating	length	meter, millimeter	m, mm
	volume	cubic meter	m^3
Paving	length	meter, millimeter	m, mm
	area	square meter	m^2
Concrete	length	meter, millimeter	m, mm
	area	square meter	m^2
	volume	cubic meter	m^3
	temperature	degree Celsius	°C
	water capacity	liter (cubic decimeter)	L (dm^3)
	mass	megagram (metric ton) kilogram	Mg (t) kg
	cross-sectional area	square millimeter	mm^2
Masonry	length	meter, millimeter	m, mm
	area	square meter	m^2
	mortar volume	cubic meter	m^3
Steel	length	meter, millimeter	m, mm
	mass mass per unit length	megagram (metric ton) kilogram kilogram per meter	Mg (t) kg kg/m
Carpentry	length	meter, millimeter	m, mm
Plastering	length	meter, millimeter	m, mm
	area	square meter	m^2
	water capacity	liter (cubic decimeter)	L (dm^3)
Glazing	length	meter, millimeter	m, mm
	area	square meter	m^2
Painting	length	meter, millimeter	m, mm
	area	square meter	m^2
	capacity	liter (cubic decimeter) milliliter (cubic centimeter)	L (dm^3) mL (cm^3)
Roofing	length	meter, millimeter	m, mm
	area	square meter	m^2
	slope	percent ratio of lengths	% mm/mm, mm/m

Plumbing	length	meter, millimeter	m, mm
	mass	kilogram, gram	kg, g
	capacity	liter (cubic decimeter)	L (dm^3)
	pressure	kilopascal	kPa
Drainage	length	meter, millimeter	m, mm
	area	hectare (10 000 m^2) square meter	ha m^2
	volume	cubic meter	m^3
	slope	percent ratio of lengths	% mm/mm, mm/m
HVAC	length	meter, millimeter	m, mm
	volume (capacity)	cubic meter liter (cubic decimeter)	m^3 L (dm^3)
	air velocity	meter/second	m/s
	volume flow	cubic meter/second liter/second (cubic decimeter per second)	m^3/s L/s (dm^3/s)
	temperature	degree Celsius	°C
	force	newton, kilonewton	N, kN
	pressure	pascal, kilopascal	Pa, kPa
	energy	kilojoule, megajoule	kJ, MJ
	rate of heat flow	watt, kilowatt	W, kW
Electrical	length	millimeter, meter, kilometer	mm, m, km
	frequency	hertz	Hz
	power	watt, kilowatt	W, kW
	energy	megajoule kilowatt hour	MJ kWh
	electric current	ampere	A
	electric potential	volt, kilovolt	V, kV
	resistance	milliohm, ohm	mS, S
Trucking	distance	kilometer	km
	volume	cubic meter	m^3
	mass	megagram (metric ton)	Mg (t)

Address Service Requested

The Construction Metrication Newsletter

English is the international language of business.
Metric is the international language of measurement.

Smart Metrication Tips

P Obtain a metric tape measure right away. So equipped, you readily can adapt to metric usage. Unequipped, you can't do your job. Some advocate dual unit tapes, others metric-only tapes. Take your pick.

P You won't need many other metric tools. There is no such thing as a metric hammer, saw, screwdriver, chisel, pliers, power drill, level, or trowel. You probably already have a set of metric wrenches.

P If you scale dimensions off drawings, use a metric scale. One 3-sided metric scale can be used for both architectural and engineering drawings. Don't use an inch scale—you're measurements will be incorrect.

P Try to use only metric measures right from the start. It might be hard at first but you'll soon get the hang of it. Talk "metric-only" on the work site and adopt a pro-metric tone. Experience has shown that a positive, professional attitude about metrication minimizes problems.

P Do not convert metric drawings and specs back to conventional units. This "shortcut" invariably leads to mistakes, so *resist the temptation*. Execute all work in metric units with metric tape measures and you'll learn faster, too.

P Conversions are unnecessary except, perhaps, when dealing with some suppliers or comparing unit costs. Double check any conversions you do make.

P Be prepared to submit shop drawings and product information in metric units.

Metric Rules-of-Thumb

If you can remember these ***first four*** rules-of-thumb, you will be able to read metric drawings. The rest are for specifications.

Q 1 mm = about 1/25 inch = thickness of a dime

Q 25 mm = about 1 inch (1" = 25.4 mm)

Q 300 mm = about 1 foot (12" = 304.8 mm)

Q 1000 mm = 1 m = 3 feet + 10% more (very roughly, a yard)

Q 1 m^2 = roughly 10 square feet ($1m^2$ = 10.76 ft^2)

Q 1 L = about 1 quart (1L = 1.06 qt)

Q 1 m^3 = about 35 cubic feet (about 1 **a** cubic yards)

Q 1 kg = about 2.2 pounds

Q 1000 kg = 1Mg = 1 metric ton = about 2200 pounds

Q 100 kPa = about 15 psi; 1 MPa = about 150 psi

Celsius Temperature Rhyme

30 is hot, (86 °F)

20 is nice, (68 °F)

10 is cool, (50 °F)

and 0 is ice. (32 °F)