

**WHAT WILL CHANGE AND  
WHAT WILL STAY THE SAME?**

**Part II**

This is the second part of a two-part summary of salient metric conversion issues discussed by the Construction Metrication Council in 1992.

**BRICK**

*What will change*

- Standard brick to 90 x 57 x 190 mm
- Mortar joints from 3/8" and 1/2" to 10 mm
- Brick module from 2' x 2' to 600 x 600 mm

*What will stay the same*

- Brick and mortar composition

Of the 100 or so brick sizes currently made, 5 to 10 are within a millimeter of a metric brick so the brick industry will have no trouble supplying metric brick.

**CONCRETE BLOCK**

*What will change*

- Block sizes to 190 x 190 x 390 mm
- Mortar joints from 1/2" to 10 mm
- Block module from 2' x 2' to 600 x 600 mm

*What will stay the same*

- Block and mortar composition

Metric block sizes are distinctly different (3/8 inch shorter in the long dimension) from current block sizes. The block industry will have to buy new mold components.

**SHEET METAL**

*What will change*

- Designation from "gage" to millimeters

*What will stay the same*

- Thickness

In specifications, use millimeters only or millimeters with the gage in parentheses.

## **CONCRETE**

*What will change*

- Strength designation from "psi" to megapascals, rounded to the nearest 5 Mpa

*What will stay the same*

- Strength requirements

## **REBAR**

*What will change*

- Bar sizes may change to metric per ASTM A615M, A616M, A617M, and A706M

*What will stay the same*

- Everything else

## **GLASS**

*What will change*

- Cut sheet dimensions from feet-inches to millimeters

*What will stay the same*

- Sheet thickness, which is already in millimeters

## **ELECTRICAL CONDUIT**

*What will change*

- Nominal conduit designations from inches to millimeters

*What will stay the same*

- Conduit cross sections

## **ELECTRICAL WIRE**

*What will change*

- Nothing at this time

*What will stay the same*

- Existing American Wire Gage (AWG) sizes

## **PIPE AND TUBING**

*What will change*

- Nominal pipe and tubing designations from inches to millimeters
- Threads to metric sizes

*What will stay the same*

- Pipe and tubing cross sections

Pipe and tubing sizes are the same in much of the world, but their names vary as do thread sizes.

#### **STRUCTURAL STEEL**

*What will change*

- Section designations from inches to millimeters and from pounds per foot to kilograms per meter
- Bolts, to metric diameters and threads per ASTM A325M and A490M

*What will stay the same*

- Cross sections

Nominal section designations may change to metric but their dimensions will remain the same. For instance, a 24-inch section may be called a 600 mm section.

#### **STATUS OF FEDERAL METRIC CONSTRUCTION**

The following information was presented at the November 1992 meeting of the Construction Metrication Council by representatives of federal agencies.

##### **General Services Administration (GSA)**

- Design work for metric pilot projects has gone smoothly with no significant problems. Designers report that they find metric units easier to work with after a short adjustment period.
- Cost estimating in metric has been the most critical issue because estimators' data bases are in inch-pound units. New GSA metric cost estimating forms will help estimators make the adjustment.
- GSA construction will be completely metric within two or three years. Small projects with shorter design times probably will lead the bigger projects into construction even though design of the bigger projects started first.
- The Denver warehouse project is in construction now and work is going smoothly. Workmen are using dual-unit measuring tapes.
- The metric versions of Masterspec Divisions 1, 15, and 16 have been put on the NIBS CD-ROM Construction Criteria Base.

##### **GSA, National Capitol Region**

- Design work on the new FBI field office building in Washington, D.C., will be completed in September 1993 with occupancy scheduled for about mid-1996. The 8-story, 52 760 m<sup>2</sup> reinforced concrete frame building has an estimated cost of about \$57 million.
- Design work on a new Federal Protective Service field office building will be completed in 1994 with occupancy scheduled for late 1995. The 3-story, 16 850 m<sup>2</sup> building has an estimated cost of about \$37 million.
- Construction of a small building designed by in-house staff in metric is about 40 percent complete with no problems to date.

##### **GSA Region 3, Philadelphia**

- The following publications have been completed: draft Region 3 metric version of PBS PQ-100, *Facilities Standards for the Public Building Service*; the metric interim Region 3 version of the *U.S. Courts Design Guide*; and the metric version of the *Border Station Design Guide*.
- Construction has begun on the renovation of 4 floors of an 8-story federal building in Baltimore, Maryland. Work is in metric. The construction award was 15 percent below the government cost estimate (in line with bids in recent non-metric projects) so there has been no detectable cost premium for using metric on this job to date.
- About \$100 million in metric construction will be advertised in FY 1993.
- Region 3 has converted 65 of the most commonly used Masterspec sections (in addition to Divisions 1, 15, and 16) and 50 more will be completed in January 1993 (the AIA will convert the balance later in 1993). Region 3 is aiding other federal agencies in converting their specifications.
- GSA continues to receive metric literature from product manufacturers. A recent arrival: information on hard metric resilient floor and carpet tile.
- January 1994 is viewed as a feasible date for doing all GSA work over \$1 million in metric.

#### **Army Corps of Engineers**

- Six metric pilot projects with a total program value of \$28 million are now under way. Overseas Corps metric projects total about \$525 million. Ten U.S. building projects with a total value of about \$100 million have been selected for the FY 1995 metric construction program.

#### **Naval Facilities Engineering Command (NAVFAC)**

- NAVFAC is preparing a metric transition and implementation plan for Navy construction. NAVFAC does all its overseas work in metric. For the past year NAVFAC has been converting its specifications and criteria to metric as they are updated. A separate metric edition is being created for each document.

#### **Air Force**

- The Air Force has two metric pilot projects in planning, two being bid, and one in construction. There have been no problems to date with these projects. All overseas Air Force projects are in metric. Each major Air Force Command is to have one military construction project in metric under way by January 1994.

#### **Office of the Secretary of Defense**

- Five small Washington area projects are being designed in metric. The first phase of the multiyear, \$1 billion Pentagon renovation is planned to be in metric.

#### **Coast Guard**

- The Coast Guard's Facilities Standards Section has a metric transition plan that begins in 1995 and is to be completed in 1997. The *Shore Facilities Standards Manual* contains a prototype metric multi-mission station and the *Space Components Standards Manual* includes metric units. A metric coordinator for shore facilities construction is being selected.

#### **Department of the Treasury**

- Treasury has a three-phase metric transition plan. In Phase I, building drawings will be put on CAD and their dimensions converted to metric. In Phase II (FY 1993), A/Es will be notified that all future plans, specifications, and related construction documents must be prepared in metric. In Phase III (FY 1994), all work will be performed in metric.

#### **Department of State**

- State is doing all of its design work in metric. It is receiving help from GSA on finding U.S. suppliers for metric or metric-labeled products. A/E guidelines are being changed to require all contract deliverables to be in metric.

#### **Department of Agriculture**

- The Facilities Management Division plans to be completely metric by 1995. A \$500,000 metric construction project is due to be completed by July 1993. It came in below the government cost estimate. Two additional metric projects will be completed in 1994, and all projects will be in metric after 1995.

#### **U.S. Forest Service**

- The Division of Engineering plans to follow the Federal Highway Administration's (FHWA) metrication schedule requiring all construction to be in metric after October 1, 1996. Design work is being started in metric.

#### **National Science Foundation (NSF)**

- All proposals for grants, cooperative agreements, and contracts submitted to NSF are required to be in metric as are all related reports, publications, and correspondence.

#### **Internal Revenue Service (IRS)**

- CRSS Architects has completed the working draft of the new IRS *Regional Service Centers Design Criteria Manual*, which contains metric units.

#### **Federal Highway Administration**

- The FHWA metric conversion plan was approved in 1991. September 30, 1996 is the target date for full conversion of the agency's annual \$16 billion construction program.
- FHWA is working closely with the AASHTO metric task force. The University of Alabama is preparing the AASHTO *Guide to Metric Conversion* for release in March 1993. Highway signage is the most controversial issue; an advanced notice of proposed rulemaking on signage plans will be published in the *Federal Register* in 1993.
- FHWA is developing a one-day metric training course for federal and state highway agency personnel that will begin in mid-1993. FHWA Region 9 (California, Nevada, Arizona, and Hawaii) held a metric coordinating meeting in November; other regions plan to hold similar meetings.

#### **National Aeronautics and Space Administration (NASA)**

- The NASA physical plant is worth about \$15 billion and its annual design and construction budget is \$500 million. Each of the 12 NASA centers

selected a metric pilot project last November for the 1994 construction program. Projects total \$17 million.

- A two-day seminar was held last July to review the status of the pilot projects and to conduct metric cost estimating training. A meeting will be held in mid-1993 to review the pilot project results. If they are going well, the number of pilot projects will be doubled in 1994. If the 1994 projects go well, NASA construction will go 100 percent metric in 1995.

#### **Department of Labor**

- The Employment and Training Administration (ETA) focuses on Job Corps programs. Its metric transition plan includes the development of a pilot curriculum for teaching metric at two Job Corps centers by the end of 1993; if successful, metric will be taught at all centers by the end of 1994. A steering group will meet monthly to review the progress of the metric transition program.
- In 1993, ETA will require engineering support contractors to use dual units in facilities and site surveys and utilization studies. In 1994, ETA will have its contract documents prepared in dual units; if these are successful, they will be changed to metric-only.

#### **Tennessee Valley Authority (TVA)**

- The corporate design and development staff is planning to design its first metric building in 1993. The facilities services group is gearing up to use metric in facilities modification work. Some parts of the TVA already make extensive use of metric equipment.

#### **Small Business Administration (SBA)**

- All procedures, regulations, and publications are being reviewed for conversion to metric. Video training tapes on metric will be circulated to SBA offices in early 1993.
- A new publication, *Converting to Metric: A Guide for Small Business*, and a one-page handout, *Focus on the Facts: Converting to Metric*, have been recently published.

#### **Department of Energy (DOE)**

- DOE's metric transition plan was published in April 1992 and set January 1994 as the target for all major construction projects to be in metric. All non-metric work first must be cleared by a waiver from the appropriate Assistant Secretary.
- In May 1992 the DOE metric construction working group met in Washington. Project managers were eager to begin work in metric. All new and revised DOE standards will include metric units. DOE will show preference for non-government standards that are in metric. Revisions of DOE design criteria to include metric begin in November 1992. Some agency programs will go metric immediately without pilot projects and will rely on requests for proposals for metric services and surveys of available metric products and equipment.
- DOE controls many of the facility and equipment standards in the *Code of Federal Regulations* and will convert them metric in the next revision cycle.
- Equipment for DOE's \$8.2 billion Super Collider project is primarily in metric. Tunnels and buildings were started prior to metric conversion and therefore are being built using inch-pound units. The Yucca Mountain nuclear waste repository will have 22 km of tunnels bored in metric dimen-

sions. Its related MRS interim storage facility will be built primarily in metric.

#### **Public Health Service**

- Several small metric pilot projects are under way. Project planning documents are being converted to metric. Facilities reports to the Department of Health and Human Services are beginning to be submitted in metric.

#### **National Institute of Standards and Technology (NIST)**

- Approximately \$110 million in new and renovated laboratory facility projects at the NIST Gaithersburg, Maryland, and Boulder, Colorado, campuses most likely will be built in metric. This is the first phase of an extensive 10-year program to modernize and expand NIST facilities.
- The Metric Program Office has prepared a six-panel metric style guide to augment the American National Metric Council's *Metric Editorial Guide*.

#### **Federal Bureau of Prisons**

- Metric transition guidelines are being prepared for the Design and Construction Branch by an A/E consultant. The bureau is committed to the January 1994 date for the construction of new facilities in metric. Several pilot projects are being considered for 1993. Project managers are "raring to go" metric.

#### **Central Intelligence Agency**

- All design and construction documents are being converted to dual units. Designers and contractors working for the agency have been positive about metric conversion.

#### **Department of the Interior (DOI)**

- DOI agencies involved in construction are the Bureau of Reclamation, the Fish and Wildlife Service, the National Park Service, the Bureau of Land Management, and the Bureau of Indian Affairs. Each is in a different stage of metric transition.
- The Bureau of Land Management is conducting a \$50 thousand metric pilot project at La Ventana.
- The National Park Service has a \$1 million pilot project under way at the Thurmond Depot in New River Gorge, West Virginia.
- The Fish and Wildlife Service is adding dual units to its specifications and criteria.
- In 1978, the Bureau of Reclamation began construction of a \$260 million desalinization plant in Yuma, Arizona. It was designed and built in metric because so much of the technology was foreign. The plant is the largest of its kind in the world and is now about 50 percent operational. No problems associated with the use of metric have been reported. The Bureau of Reclamation undertakes many overseas projects, all of which are built in metric. Included is a \$40 million project at Aswan, Egypt.

#### **The Smithsonian Institution**

- The Smithsonian metric transition plan has three objectives: the use of metric in daily operations, especially procurement; the education of the Smithsonian staff; and the incorporation of metric in all public programs. A new requisitions handbook will be released that will require the use of metric units.

- All planning and design work will be conducted in metric after January 1994. The \$25 million National Museum of the American Indian Suitland Facility will be designed in metric, with design beginning in February 1993. The \$77 million National Museum of the American Indian also will be designed in metric. The A/E is being selected.
- An Institution-wide accessibility master plan is being prepared in metric.

**Naval Sea Systems Command**

- The new LX amphibious assault ship will be a metric and inch-pound hybrid. About 100 other ship building projects are being constructed in metric. Some offices have converted all specifications and drawings to metric. The Navy's implementation of metric has been uneven but work is being performed in metric in many areas.

**National Oceanic and Atmospheric Administration (NOAA)**

- NOAA went metric on October 1, 1992, and is actively pro-metric. Procurement guidelines mandate that all new procurement actions be made in metric. Exceptions for non-metric procurements must be submitted in writing. NOAA has requested that GSA use metric to build the new \$32 million National Climate Data Center in Asheville, North Carolina.

**Architect of the Capitol**

- The Architect of the Capitol plans to construct future buildings in metric even though none are being considered by Congress at this time.

**National Institutes of Health (NIH)**

- A \$1 million addition to the primate building at NIH is being designed in metric. A/E contractors have been alerted that after January 1994 new work will be performed in metric. In 1992, the Division of Engineering Services provided metric orientation training to all its managers and supervisors. The balance of the 670 person staff will be trained over the next few months.

**Department of Housing and Urban Development (HUD)**

- There has been little official movement toward metric by the agency but there is interest in "retailing" metric to the states and cities through the HUD grants program. The revised HUD guide specifications being prepared by CHK Architects and Planners include dual units, with metric units listed first.

**\$8.5 BILLION IN METRIC CONSTRUCTION**

Here are the January 1993 totals, by agency, for federal metric projects in the planning, design, and construction stages:

	<u>\$ Million</u>
Army Corps of Engineers (domestic and overseas).....	653
Bureau of Land Management.....	under 1
Bureau of Reclamation (domestic only).....	260
Department of Agriculture.....	under 1
Department of Energy (Super Collider only).....	6000
General Services Administration.....	1281



NASA.....	17
NAVFAC (overseas).....	65
National Institute of Standards and Technology.....	110
National Park Service.....	1
Office of the Secretary of Defense.....	1
Public Health Service.....	1
Smithsonian Institution.....	103
Air Force.....	5

**ATTENTION FEDERAL CONSTRUCTION MANAGERS**

Please submit information about your federal metric programs to Joe Sacco at the Pentagon, 703-614-4879.

Joe is maintaining a database of metric projects, products, and findings. He can help you and you can help others smooth the way for metric.

**METRIC FACTS: Velocity**

How fast will it go? The metric measure applied to questions of velocity is the meter per second (m/s). It is made up of the base units meter and second. One meter per second is equal to 3.281 feet per second.

The meter per second should be used in engineering calculations except for very low velocities where the millimeter per second (mm/s) may be used.

**Problem:** The water velocity in a boiler tube is 7 ft/sec. What is this velocity in m/s?

**Solution:**  $(7 \text{ ft}/1 \text{ s}) \times (1 \text{ m}/3.281 \text{ ft}) = 2.1 \text{ m/s}$ .

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*Metric in Construction* is a bimonthly newsletter published by the Construction Metrication Council to inform the building community about metrication in U.S. construction. The Construction Metrication Council was created by the National Institute of Building Sciences 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 meets monthly in Washington, D.C.; publishes the *Metric Guide for Federal Construction* and this bimonthly newsletter; and coordinates a variety of industry metrication task groups. For membership information, call the Council at the above phone number.

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