

IEEE Standards Coordinating Committee 14 (Quantities, Units, and Letter Symbols)

2011 April 26 1030 EDT
Tele- and web-conference
Hosted by NIST HQ, Gaithersburg MD

Members in attendance and Call to Order

Gordon J. Aubrecht, Bruce B. Barrow, Albert Censullo, James R. Frysiner, Elizabeth Gentry, Howard Ressel, John T. Scott, Ralph Showers, Ambler Thompson

The Committee was called to order by the Chair at 1030.

1. Adoption of agenda

The agenda was moved, seconded, and adopted.

2. Approval of minutes of meeting of 2010 April 22

The Secretary's minutes of the last meeting were unanimously accepted.

3. Secretary's report

The Secretary had nothing to report since last year's meeting.

4. Chairman's report

a. Chair appointment

The Chair reported that he had been reappointed for another year by the IEEE Standards Board, as stated in an email date/time stamped 2011-01-17 1914 (copy provided prior to meeting).

b. IEEE Patent Policy

IEEE training presentation on patents (an annual requirement) was conducted. The matter of the IEEE patent policy was discussed.

c. Annual report

The last Annual Report was submitted on 2010 August 23 and a copy was provided in the meeting's materials. The next report is due 2011 September 15.

d. Financial Report

The annual financial report was submitted online, indicating that SCC 14 handles no finances. The next report is due 2012 March 31. No backroute of the report was provided by IEEE.

e. Status of standards

The Chair reported on the status of standards, highlighting the reaffirmations and revisions due at this time:

SI 10-2010 published 2011 April 11.

Std 280-1982 (R2003) held in abeyance during development of P80000

Std 260.3-1993 (R2006), American National Standard Mathematical Signs and Symbols for Use in Physical Sciences and Technology — due in 2011

Std 270-2006, IEEE Standard Definitions for Selected Quantities, Units, and Related Terms, with Special Attention to the International System of Units (SI) — due in 2011

5. Reports of subcommittees

a. SCC14.1 – Status of revision of IEEE/ASTM SI 10-2002: Barrow — due 2011

Frysiner posted changes from the 2002 edition to the 2010 version on the committee's web page prior to this meeting (copy attached). Barrow said that there were hundreds of proposals, many tiny.

Barrow was not certain who gets paper copies. Frysiner said only PDFs are distributed. Barrow was perplexed. Frysiner said Barrow must decide whom to distribute SI-10 to, according to emailed correspondence from IEEE. Frysiner said that most SCC 14 members need a copy to do their work. Barrow suggested discussing this later on.

b. SCC14.2 -- Definitions (Std 270-2006): Aubrecht — due 2011; reaffirm?

Aubrecht recommended reaffirmation. None were opposed. Frysiner will walk him through the process to seek reaffirmation.

c. SCC14.3 -- Unit symbols (Std 260.1-2004, reaff. 2010): Frysiner — not an ANSI std?

This is not an American National Standard, said Frysiner. Barrow did not know why IEEE staff had not been listed as a national standard.

Frysiner asked whether there was opposition to making it an American National Standard. None was expressed. Frysiner will investigate the steps needed to seek this.

d. SCC14.4 -- Quantity symbols (Std 280-1985): Barrow — PAR extended; tied to P80000

The PAR has been extended. If 80000 covers everything, we can move to withdraw 280. If there are other things, we can revise. Barrow said that if we did the right job on 80000, we will be able to remove this standard. We can't have inconsistent IEEE Standards, but the working groups need to do their homework.

Thompson said we're doing an adoption of the ISO/IEC 80000 series, and we want to minimize the technical content we change. There must be a strong technical argument for changes; this would make 80000 available in the US. Frysiner added that we need to make sure there's no duplication. Our PAR says we're adopting 80000 with modifications. We have separate remarks on the degree Celsius in SI 10, for example.

Barrow said that we have for a long while used the international standards to help us write our standards. Frysiner sees not more than a handful of things to add. Thompson spoke with Taylor. America will have a single 80000 standard, with individual standards as chapters.

Barrow expressed the idea that these should be issued as separate standards. Thompson said that we were approved for a single standard. Frysiner said we'd asked them to pull back from issuing separate parts to issuing just one multi-chapter standard so we'll have just one review.

Barrow jokingly said it will cost \$375 and paper copies will not be available to the working groups.

Frysiner said SI-10 went from \$60 to \$80. They do print on demand now, a number of printed copies in inventory is zero. SI 10 theoretically could be printed from the PDF files in Kinko's for a few bucks a copy, and bound for a bit more, but there are copyrights on that material precluding that.

Scott said that the 80000 series is emerging over several years. Frysiner said early versions are being amended.

Frysiner said all sections are congruent. In ISO-80000, later parts diverged from earlier parts. Scott wondered whether the process would ever stop. Thompson said that revision of 80000 would be revised to change references to ISO-31 chapters. Frysiner said many changes are in the references.

The handbook must be bought from Geneva, but now it will be available in the US with US changes, probably for a large price.

Only the working group can get free (electronic) copies of the standards.

Frysinger deems it essential that members of SCC 14 have SI-10 to do their work. Frysinger also got IEEE to budge to give chairs copies of SI-10 without a request; they say they will be more proactive in providing them to chairs of standards-writing committees.

Frysinger says that he's decided that any member of SCC 14 who is in a working group will get a PDF copy of SI 10 and will provide a copy to any member of SCC 14 member to do the committee's work.

Gordon moved and Howard Ressel seconded that SI-10 appear on our private page. The motion passed unanimously

e. SCC14.5 -- Acoustics (Std 260.4-1996, reaff. 2008): Ehrlich — action due 2013

Ehrlich could not attend. Frysinger said that at this point, Ehrlich expects to seek reaffirmation in 2013. The Acoustical Society looks to this committee on 260. This might become part of 80000, as a chapter on acoustics. Thompson said that they had corresponded with a person from the Acoustical Society.

f. SCC14.6 -- Mathematical Symbols (Std 260.3-1993): New Chair needed — due 2011; reaffirm?

Action to seek reaffirmation was accepted unanimously. Gordon Aubrecht will chair this working group and Frysinger will walk him through the process of seeking reaffirmation.

g. SCC14.7: Thompson — PAR80000 approved 2009 March (copy provided); PAR80000-3 superseded; PAR80000-4 withdrawn; sample based on ISO 80000-3 drafted.

These are available as Word files and will become individual chapters. Thompson has made the obvious revisions. We need to check against PDFs. They are on the private TAG page, which Thompson demonstrated. The 80000 and 80003 series (on physiological units) are being worked on. 80000-14 will eventually become part of the 80003 series. The 60027 series is among current work items.

Thompson said that we would develop a table that lets people download drafts of standards. Things will be pulled to the SCC 14 private page. Anyone in SCC 14 can become a member of any TAG. Then access to the private page would be available. It runs similarly to SCC 14.

We're working on 80000 through part 13 or 14. We may develop the 80003 for IEEE.

h. SCC14-Int – International: Thompson

Ambler submitted a report (copy attached) that was distributed before this meeting; all should have read it.

(1) IEC TC25 and ISO TC12

IEC/TC 25 and ISO/TC 12 are revising the 80000 series to remove references to ISO-31. Thompson and Frysinger attended the Seattle meeting, and Frysinger was appointed deputy technical advisor for the U.S. TAGs to those Technical Committees.

(2) Consultative Committee on Units

Frysinger got a lot of feedback from the USMA mailing list regarding what the CCU is calling the "new SI". The consensus was that it should not be called the "new SI" since only the way the current units are defined is being changed. Mail list correspondents were concerned, due to this appellation, that the units themselves might be changing. Frysinger forwarded the main thrusts of the mail list comments to contacts in the CCU. The CCU was very responsive and developed an FAQ page which is now posted on that BIPM "new SI" page. However, they are unwilling to change the "new" label. There was discussion about what the new definitions would mean for teaching. This would be applicable only at upper-level courses since the definitions are too obscure to be understood by anyone

in lower division science courses or below.

Thompson remarked we might also be redefining the second along with the other changes. Draft resolution A sets proposed changes out. SCC 14 has acted as a test bed, and has played a role in shaping the discussion. CGPM meets 17 to 24 October 2011. This stops the debate about defining the kilogram in terms of the Boltzmann constant.

i. SCC14-Rev -- Review: Barrow — volunteers needed!!!

Barrow thinks he has not been active enough. Coordination is absolutely important and he has been unable to do it on an ongoing basis. He has resigned as subcommittee chair. Conformation to SI-10 has not been happening very well; the power engineering society needs to use the term reactive power instead of var, for example. There were other examples of problems adduced.

We need volunteers, including for chair. None present volunteered.

There is discussion of the kilowatthour and the var at the CCU level, according to Thompson. The var is involved with major commercial interests.

j. SCC14-Leg -- Legislative: Young, Gentry

Reports (attached) by Lorelle Young (President, U.S. Metric Association) and Elizabeth Gentry (NIST, Weights and Measures Division, Laws and Metric Group) were distributed prior to the meeting and everyone was given an opportunity to read them.

(1) Report of the NIST Metric Program Office submitted by Elizabeth Gentry (copy attached)

The first element gives a map to navigate the NIST bureaucracy. Lots of changes on the website has occurred. Redirection of pages has been a problem in some cases. NIST would appreciate feedback on problems.

UPLR: The most exciting is the recent proposal to allow metric labeling. He's gotten a proposal introduced in both houses to allow metric measures. This was initiated internally. New York is going along the regulatory process slowly. No one enforces this in those states by pulling items from the shelves in any case.

It is simply evidence that metric is acceptable everywhere.

NIST has offered labeling and packaging workshops.

Only five states have adopted the unit pricing guide. NIST is writing a best practice guide. They hope it will facilitate adoption of metric unit pricing. Big retail chains sell products in multiple jurisdictions, so these five states have a wider effect. Much of this labeling is developed in house; there is little uniformity. Having best practices could be helpful in spreading adoption of a uniform system. They are getting advice from elsewhere, for example, the Australian who went around the world learning about how it is done and is sharing his results.

Gentry also discussed hydrogen filling stations. The bar is used elsewhere and will be allowed but not be encouraged.

(1) Report of the U.S. Metric Association report submitted by Lorelle Young, President (copy attached)

Young's report was shown. There was no discussion.

6. Other old business

No old business.

7. New business

Request for SI 10 to be made freely available by download in PDF format: Frysinger

Frysinger has pushed before, but this year has pushing it more strongly. He took it to Judy

Gorman on the Board of Governors in a letter, transmitted to David Ringle by email, that resulted in a chain of correspondence. IEEE and ASTM said no to the request to distribute SI 10 freely in PDF format because they make too much money from that and to meet our request would set a bad precedent!

A few standards are free. Some sponsor pays a fee to have it posted for free download in the IEEE Get program. Frysinger asked how much it would cost. Their estimate is that it would cost \$25k to \$50k per year for a typical standard.

Frysinger called Ana Sainvilus, who runs the Get program, to determine the specific price for sponsoring free release of SI 10 in PDF format but it turns out she is out of the office until 2 May.

Frysinger asked IEEE for sales figures. The answer: in 2010, IEEE sold two of 260.1, one of 270, one copy of 280, and three copies of SI-10.

Barrow says the sales figures show we are wasting our time in writing standards. He wants IEEE to go back to its former enthusiasm for this matter. Some 60 years ago, Barrow was in Europe and discovered ISO. There was a serious problem communicating these. When he returned, he told Chester Page, chair of SCC 14, that MKSA (along with similar metric systems) was being superseded by the development of the SI. The first, resulting IEEE version of SI-10 was published in Spectrum; there was great enthusiasm and support. Our audience should be every high school and university science instructor. The fact that the staff is so hung up on preventing this is strange. It's important that our work be widely distributed.

Frysinger said that after he checked the figures he would go back to Gorman.

Barrow said that if they came up with reasonable numbers, we could approach donors (including the IEEE foundation, for example). Ressel said that many companies are buying IEC things whenever they are published. Barrow doubts that that is true; IEEE is so broad.

Thompson checked and found that SI-10 freely available on IEEEExplore. It appears it's just institutions that have free access, which means that those institutions are paying licensing fees. Thompson suggested it should be available as part of the style guide. This is another possible way to go. All members present supported the quest to seek free release of the PDF of SI-10 to the public.

We want IEEE to recognize that this is a *pro bono* act, and they owe it to the community to make it available. We may need to form a strategy if stymied. Thompson wants as a fallback at least to make SI-10 available to all standards writers.

8. Date for 2012 meeting — April 19 in Gaithersburg? Tele/Web/Videoconference?

We propose meeting 13 or 15 March 2012. Frysinger will poll the members. The Chair opined that this meeting format seems to have worked well and likely will be used again.

The meeting adjourned at 13:10.

Changes made in IEEE/ASTM SI 10-2010

James R. Frysinger
Chair, IEEE-SCC14

Vice Chair, IEEE/ASTM Joint Committee for Maintaining SI 10

The following major changes were made when revising IEEE/ASTM SI 10-2002 to produce IEEE/ASTM SI 10-2010:

The title “American National Standard for Use of the International System of Units (SI): The Modern Metric System” was shortened to “American National Standard for Metric Practice”.

A note was added to Table 3 (“SI derived units with special names and symbols”), positing that if the set of SI units were to be considered a mathematical group, that set of base units should include the number 1. It notes that the CGPM has not yet taken this position. This note will be of more interest to theoretical metrologists and mathematicians than it would be to those who put the SI to practical use.

Table 5 (“Prefixes”) was rearranged, moving the multiplication factors from the first to the third columns.

Clause 2.2 (“Limited Character Sets”) was added. It addresses the problems arising in some situations with the SI symbols for the prefix micro and the unit ohm. Reference is made to IEEE Std 260.1 and the workarounds it suggests.

The wording of Clause 3.2.2 (“[Prefix] Selection”) was improved. Notably, the list of occasions when the centimeter might be the handiest unit to use was expanded.

Clause 3.2.5 (“Prefixes defined as powers of two”) was expanded to explicitly refer to the prefixes established by IEC to use for binary multiples. Earlier, it had said only not to use SI prefixes for that purpose.

The month (symbol mo) and the year (symbol a) were added to Table 6 (“Units in use with SI”). No exact values were given for this. This reflects the need to use these periods of time in accounting and data collection, while retaining the flexibility needed by each user to define what is meant by those units in each instance. Likewise, the nautical mile (symbol nmi) and the knot (symbol kt) were added, with defined meanings for those two units.

Updated values from CODATA were inserted in Table 7 (“Units whose values are obtained experimentally”) for the electronvolt and the unified atomic mass unit.

In example stated in Clause 3.3.2.1 (“Time”) distinction is now made between the non-SI unit kilometer per hour (symbol km/h) and the SI unit meter per second (symbol m/s), since the hour is not an SI unit.

The wording in Clause 3.3.2.2 (“Plane angle”) and the previous restriction on the use of the minute and second of angle was removed.

The cubic hectometer (symbol hm³) was added to the list given in Clause 3.3.2.4 (“Volume”).

A short sentence was added to Clause 3.3.2.5 (“Mass”) to explicitly state that only the megagram

(symbol Mg) is SI, in contrast to the metric ton (or tonne).

In Clause 3.3.3.1 (“Pressure and Stress”) a sentence regarding the kilopascal (symbol kPa) was added and the sentence calling for the replacement of the millibar (symbol mbar) with the hectopascal (symbol hPa) was deleted.

Clause 3.4.5.2 (“Power”) was greatly expanded. This change supports the IEEE Power Engineering Society's needs to use the voltampere (symbol VA) for apparent power and the var (symbol var) for reactive power, with the watt being reserved for use to measure active power. Technically, those are synonyms for the watt. Power in phase is measured in watts, power in quadrature is measured in vars, and their vector combination is measured in voltamperes.

The header of Clause 3.4.8 was changed from “Quantities expressed as pure numbers” to “Dimensions of quantities”. A paragraph was added to describe what is meant by “dimension”.

Clause 3.5.1 (now “General rules for writing unit symbols”) and Clause 3.5.2 (“Rules for writing unit names”) were edited to a significant extent to provide improved clarity. Clause 3.5.1 was expanded to discuss factoring units out of algebraic sums.

In Clause 3.5.3.2 (“Unit symbols”) the sentence allowing a dot on the line to be used to indicate multiplication within compound symbols in the case of limited character sets was removed.

A new Clause 3.5.3.4 (“Attachments to unit symbols”) was added, explicitly stating that modifying unit symbols by use of attachments is incorrect. Examples are now provided to indicate correct practice. This used to be a matter discussed in Clause 3.5.5, which was then removed.

Clauses 3.5.4.1 (“Decimal marker”) and 3.5.4.2 (“Grouping digits”) were combined and subsequent clauses were accordingly renumbered. A sentence was added to state that the space separating 3-digit groups should be a non-breaking space.

Many changes were made to Table A.1. Most were editorial, but some units were added and some were removed. Space does not permit itemizing those changes here.

Annex B was edited to improve clarity and to better reflect the definitions used in modern metrology. Significantly, a new Clause B.7 was added to discuss “conversion” and “substitution”. SI 10 is promoting the use of these terms rather than the older terms “hard conversion” and “soft conversion”, since nobody can remember which is which and users dispute their meanings. By “conversion” is meant “mathematical conversion” with appropriate rounding. By “substitution” is meant “substituting newly calculated metric values”. Conversion requires only a calculator. Substitution requires re-engineering to choose a new rational size.

Clause C.6.2 (“Weight”) was reworded to improve clarity.

The Bibliography was updated. Significantly, the references to ISO 31 series and other standards has been replaced by references to ISO/IEC 80000 series standards.

The index was rebuilt. It now has a larger section indexing symbols. The page numbers are hyperlinked to their citations within the text for the convenience of those using electronic versions of SI 10-2010.

SCC14-INT Activity Report
Ambler Thompson

ISO TC 12 – No meeting since last SCC14 Meeting. ISO 31 replacement by ISO/IEC Series is complete. The Parts of the new 80000 standards will be revised to update references over the next several years. Work on the 80003 Series on physiological units is underway. Jim Frysinger was appointed Deputy Technical Advisor with access to the ANSI TC12 site, in order to post activity to the US Technical Advisory Group.

IEC TC 25 – Plenary meeting in Seattle, J. Frysinger attended with A. Thompson. TC 25 has the same activity on the 80000 and 80003 series as ISO TC 12.

Maintenance has begun on IEC 60027-1,2 and 3: Letter symbols to be used in electrical technology

Maintenance has begun on IEC 60375 Ed. 2.0: Conventions concerning electric and magnetic circuits

Maintenance has begun on IEC 60027-2 Ed. 3.0: Letter symbols to be used in electrical technology - Part 2: Telecommunications and electronics

Jim Frysinger was appointed Deputy Technical Advisor with access to the IEC TC 25 site, in order to post activity to the US Technical Advisory Group.

Consultative Committee on Units (CCU) – The CCU met at the BIPM in September 2010. The CCU recommended to the CIPM a document outlining what the new SI definitions would look like once the experimental results are complete. A draft of the 2nd chapter was also prepared. Both documents can be found at this website http://www.bipm.org/en/si/new_si/ The CGPM will consider the recommendations in Draft Resolution A in October 2011.

NIST Physical Measurement Laboratory

The NIST Metric Program is currently within the Weights and Measures Division, Laws and Metric Group. The Physical Measurement Laboratory (PML) operational unit is currently undergoing reorganization. Although the reorganization is not yet final, no significant changes are anticipated for the Metric Program. More information regarding the current NIST organizational structure can be located:

- NIST Organizational Chart - <http://www.nist.gov/director/orgchart.cfm>
- PML Organization - <http://www.nist.gov/pml/organization.cfm>
- Weights and Measures Technical Resources - <http://www.nist.gov/pml/wmd/technicalresources.cfm>

Uniform Packaging and Labeling Regulation (UPLR)

NIST continues to encourage the two remaining States, Alabama and New York, to allow metric labeling on consumer packages. Currently 48 states permit the use of only metric units on packages, subject to their jurisdiction. The state of New York is engaged in the long regulatory process to seek adoption of the Uniform Packaging and Labeling Regulation (UPLR, NIST HB 130) metric labeling provisions. A proposal permit metric labeling has recently been introduced into the Alabama legislature.

Packaging and Labeling Training

WMD continues to offer specialized training on Packaging and Labeling, which is focused on the Uniform Packaging and Labeling Regulations (UPLR, NIST HB 130) for consumer and non-consumer packaging requirements, FDA and FTC requirements, and other various federal laws and regulations governing packaging and labeling as it pertains to the declaration of identify, responsibility, and quantity. Voluntary metric labeling, unit conversions, and units and symbol style for labeling applications is covered in the course, which is offered to U.S. regulatory officials and industry. Interested participants can register for this training through the NIST Management System Database (<https://tsapps.nist.gov/WMD/default.aspx>) or contact Lisa Warfield (lisa.warfield@nist.gov, 301-975-3308) or David Sefcik (david.sefcik@nist.gov, 301-975-4868). The next industry class is scheduled on August 2-4, 2011 (<http://www.nist.gov/pml/wmd/uplr-seminar.cfm>).

Unit Pricing Guide

A Unit Pricing Best Practice Guide is under development to facilitate consumer value comparisons, improve current unit pricing marketplace practices, and facilitate implementation of metric unit pricing. The publication will address processes that influence the flow of net quantity of contents data (e.g., from a manufacturer to a retailer). One of the project priorities is to identify, reduce and eliminate infrastructure barriers.

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Hydrogen Economy

Expanding use of the metric system is anticipated as new technologies enter the U.S. marketplace. For example, the U.S. approach to hydrogen fuel sale is now consistent with the global marketplace. In July 2010, the National Conference on Weights and Measures (NCWM) adopted a method of sale in NIST HB130 *Uniform Laws and Regulations in the areas of Legal Metrology and Engine Fuels* where all hydrogen fuel kept, offered, or exposed for sale and sold at retail shall be in terms of the kilogram (kg). U.S. consumers will now see hydrogen street pricing signage and advertisements in terms of the kilogram (e.g., \$3.49 per kg) and service pressures in megapascals (e.g., MPa).



U.S. METRIC ASSOCIATION, INC.

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USMA Report to the IEEE-SCC14 Meeting

USMA was very saddened to learn of Ted Wildi's death. Many of us knew him and of his many meritorious achievements. Jim Frysinger wrote the outstanding chronicle of his life which we proudly included in the Jan-Feb 2011 issue of *Metric Today*.

Forty-eight of the 50 states have adopted the Uniform Packaging and Labeling Regulation (UPLR) as found in NIST HB 130. This regulation permits the states to label products under their jurisdiction with metric units only. There is reason to believe that Alabama may consider adoption of this regulation in the near future. Should this occur, New York remains the lone state not having adopted it.

On 11 November 2010 the European Parliament "called on the European Commission to pursue, in light of the forthcoming meeting of the Transatlantic Economic Council (TEC) planned for 16-17 December 2010... the mutual recognition of legal units of measurement, in particular, acceptance of metric-only labeling of EU products in the U.S,"... among other things. I was unable to learn the outcome of the TEC meeting.

Elizabeth Gentry keeps USMA informed of metric news when she receives it. We are very thankful for the cooperation of the NIST Metric Program. Right now news for *Metric Today* is scarce but some of what there is is very important. We have kept our readership informed about the current effort to define all SI base units in terms of fundamental physical constants and about the meeting of the Royal Society in London this past January dealing with that. Jim Frysinger has provided a 3-part series of excellent articles entitled "*Development of Voluntary Consensus Standards in the U.S. Private Sector.*" One young engineering student wrote us to say thanks. He said he never did understand the process but after reading those articles he now feels informed.

Still no action on the education front from the present Administration to improve the metric education of U.S. students.

Lorelle Young, President