



Current Practices in Utilization of Units for Radiation Measurements by U.S. Federal and State Agencies

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ICRU and ICRP

- The International Commission on Radiation Units and Measurements (ICRU) adopted the unit gray (Gy) for absorbed dose and becquerel (Bq) for activity ~1975.
- The International Commission on Radiological Protection (ICRP) named the dose equivalent the sievert (Sv) in 1977.
- ICRP Publication 26 (1977) was published in SI-only units and retained the name sievert for the doubly weighted quantity, effective dose equivalent (ede).
- ICRP Publication 60 renamed ede as effective dose in 1990 (equivalent dose and effective dose both in Svs).



NCRP Report No. 82 (1985)



National Council on Radiation
Protection and Measurements

NCRP Report No. 82: SI Units in Radiation Protection and Measurements

From the Executive Summary: “The Council recommends the gradual adoption of SI units over a transition period beginning immediately and ending in about 5 years (December 1989).”



US EPA Regulations Use Traditional Units

- Drinking Water – 40 CFR Part 141 (1976)
- Uranium Fuel Cycle – 40 CFR 190 (1977)
- Uranium and thorium mill tailings – 40 CFR Part 192 (1983)
- National Emissions Standards for Hazardous Air Pollutants, Standards for Radionuclides – 40 CFR Part 61 (1983)
- Spent Fuel and High Level Waste – 40 CFR 191 (January 1994) Includes SI units in parenthesis.



Current EPA Federal Guidance Reports

| | FGR 11 | FGR 12 | FGR 13 |
|------------------|--|---------------|--------------------------|
| Subject | Internal dose conversion factors (DCFs) - Ingestion - Inhalation | External DCFs | Cancer Risk Coefficients |
| Dosimetry | ICRP 26/30 | ICRP 26/30 | ICRP 60+ |
| Units | SI | SI | SI |



Current Practice at US NRC*

- 10 CFR Part 20 lists traditional units first followed by SI units in parenthesis.
- Appendix values are in traditional units only.
- NRC's Metrication Policy provides for SI units listed first followed by traditional units in parenthesis.
 - Licensees required to use traditional units for records, but allowed to add SI units in parentheses
 - 10 CFR 20.2101(c) requires information recorded on shipping manifests to be in SI units or both SI and traditional units

* From presentation by Donald Cool at NRC Public Meeting - October 16, 2014



Current Practice at US DOL/OSHA

- Regulations at 29 CFR 1910.1096
- Standards are in traditional units only and are based on ICRP Publication 2 dosimetry (critical organ dose)
- Limit for workers expressed as 1.25 rem per calendar quarter



Current Practice at US DOT

From Dec. 2008 Radioactive Material Regulations Review (DOT Pipeline and Hazardous Materials Safety Administration)

“To ensure compatibility with international transportation standards, units of measure in the HMR **are expressed using International System of Units (SI) units**. U.S. standard or customary units, which appear in parentheses following the SI units, are for informational purposes only and are not intended to be the regulatory standard. Shipping papers and labels must use the International System of Units (SI) units, which may be followed by customary units in parentheses.”



Department of Health and Human Services

DHHS

- All peer-reviewed scientific publications are in SI.
- FDA Center for Devices and Radiological Health regulations are in SI.
- Agency for Toxic Substances and Disease Registry toxicological profiles usually give values in traditional and SI units.
- Centers for Disease Control and Prevention (CDC) uses SI preferentially, but their website gives definitions for both sets of units.



State Regulations

In keeping with US NRC regulations, many state regulations are written using traditional units, sometimes with SI units in parenthesis. (Disclaimer – A survey of all state regulations was not performed.)

The Conference of Radiation Control Program Directors (CRCPD) Policy and Procedures states: “Effective July 1, 1992, **all new Parts of the SSRCR [Suggested State Regulations for the Control of Radiation]** will list the **SI units first** followed by conventional units in parenthesis. As existing Parts are revised, such will be amended to reflect this policy. (Adopted January 26, 1992.)”



Observations on U.S. Use of Old Units

- Many federal and state regulations are written in traditional units; these rules typically remain in place for many years without updates.
- Recent efforts to update U.S. radiation protection regulations are moving slowly or stalled.
- Both traditional units and out-of-date systems of dosimetry are frequently codified in regulations, often forcing their continued use.
- Stakeholder opinions regarding moving to SI units have been mixed.



Encouraging Signs for Adopting SI Units

- Federal and state agency scientists are already using SI.
 - Peer reviewed journals and scientific conferences increasingly prohibit the use of traditional units in submitted papers and talks.
- The Fukushima nuclear power plant accident exposed federal and state emergency personnel to the pitfalls of operating in two systems of units.



Thank you for your attention!

