

# Progress On Revision of ISO-2889

Co-authors of the presentation.

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# History

- ▶ The original version of ISO 2889 was issued in 1975 and was a near copy of ANSI N13.1-1969 “*Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities.*”
  - Body mostly contained the guidance on sampling in the workplace.
  - Three Appendices specific to sampling from stacks and ducts.
- ▶ Revision started in 1998 and focuses on sampling from stacks and ducts.
- ▶ New title: “*Sampling Airborne Radioactive Materials from the Stacks and Ducts of Nuclear Facilities.*”

# History Cont.

- ▶ The work is performed for ISO Nuclear Technical Committee (TC85), Radiation Safety Subcommittee (SC2), Working Group 14 (WG14) Air Sampling.
- ▶ Convener is John Glissmeyer and John Rodgers is the co-convener.
- ▶ There are experts from the UK, Sweden, Poland, Germany, France, Canada, Argentina, Japan, USA, Switzerland, South Korea, and South Africa.
- ▶ Secretariat is AFNOR (French standards organization).

# History Cont.

## TC 85/SC 2 - Radiation protection

- Participating countries: 20
- Observing countries: 12

### Secretariat:

- [France \(AFNOR\)](#)

### Participating Countries

#### Participation by ISO members

- [Argentina \(IRAM\)](#)
- [Austria \(ON\)](#)
- [Belgium \(NBN\)](#)
- [Bulgaria \(BDS\)](#)
- [Canada \(SCC\)](#)
- [China \(SAC\)](#)
- [Finland \(SFS\)](#)
- [Germany \(DIN\)](#)
- [Italy \(UNI\)](#)
- [Japan \(JISC\)](#)
- [Kenya \(KEBS\)](#)
- [Korea, Republic of \(KATS\)](#)
- [Poland \(PKN\)](#)
- [Russian Federation \(GOST R\)](#)
- [Spain \(AENOR\)](#)
- [Sweden \(SIS\)](#)
- [Switzerland \(SNV\)](#)
- [USA \(ANSI\)](#)
- [United Kingdom \(BSI\)](#)

# History Cont.

## Observing Countries

- [Czech Republic \( CNI \)](#)
- [Hungary \( MSZT \)](#)
- [India \( BIS \)](#)
- [Ireland \( NSAI \)](#)
- [Mexico \( DGN \)](#)
- [Mongolia \( MASM \)](#)
- [Netherlands \( NEN \)](#)
- [Pakistan \( PSQCA \)](#)
- [Romania \( ASRO \)](#)
- [Slovakia \( SUTN \)](#)
- [South Africa \( SABS \)](#)
- [Ukraine \( DSSU \)](#)

# History Cont.

Subcommittees/Working Groups:	
Subcommittee/Working Group	Title
TC 85/SC 2/WG 2	Reference radiations fields <i>The convener can be reached through the <a href="#">secretariat</a></i>
TC 85/SC 2/WG 4	Apparatus for gamma radiography and irradiators <i>The convener can be reached through the <a href="#">secretariat</a></i>
TC 85/SC 2/WG 5	Materials and devices for protection against alpha, X, gamma, beta and neutron radiations, and equipment for remote manipulation of radioactive materials <i>The convener can be reached through the <a href="#">secretariat</a></i>
TC 85/SC 2/WG 11	Sealed sources <i>The convener can be reached through the <a href="#">secretariat</a></i>
TC 85/SC 2/WG 13	Monitoring and dosimetry for internal exposure <i>The convener can be reached through the <a href="#">secretariat</a></i>
TC 85/SC 2/WG 14	Air control and monitoring <i>The convener can be reached through the <a href="#">secretariat</a></i>
TC 85/SC 2/WG 17	Radioactivity measurements <i>The convener can be reached through the <a href="#">secretariat</a></i>
TC 85/SC 2/WG 18	Biological dosimetry <i>The convener can be reached through the <a href="#">secretariat</a></i>
TC 85/SC 2/WG 19	Individual monitoring of external radiation
TC 85/SC 2/WG 20	Illicit trafficking in radioactive material <i>The convener can be reached through the <a href="#">secretariat</a></i>
TC 85/SC 2/WG 21	Dosimetry for exposures to cosmic radiation in civilian aircraft <i>The convener can be reached through the <a href="#">secretariat</a></i>
TC 85/SC 2/WG 22	Dosimetry and related protocols in medical applications of ionizing radiation <i>The convener can be reached through the <a href="#">secretariat</a></i>

# History Cont.

- ▶ Revision of the standard was needed to
  - Implement technical advances
  - Clarify what should be requirements, recommendations, guidance or helpful information
  - Harmonize with the US and German standards.

# Gross Comparison

## ISO-2889 2008

- ▶ Sampling Airborne Radioactive Materials from the Stacks and Ducts of Nuclear Facilities
- ▶ 28 Pages for core of standard
- ▶ 14 informative annexes, 69 pgs
- ▶ Duct and Stack Only
- ▶ 92 definitions
- ▶ Large Nomenclature
- ▶ Action levels in annex
- ▶ Performance based

## ANSI/HPS N13.1-1999

- ▶ Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities
- ▶ 57 Pages for core of standard
- ▶ 9 informative annexes taking 47 pages
- ▶ Duct and Stack Only
- ▶ 117 definitions
- ▶ Large Nomenclature
- ▶ Action Levels Required
- ▶ Performance based

# Philosophy

## ISO-2889 2009

### 7 requirements

- Sampling location provides the ability to extract a representative sample.
- Determine the properties of the sampling location through a series of tests.
- Determine penetration of contaminants through the system.
- Penetration 10- $\mu$ m AD particles  $\geq$  50%
- Determine penetration experimentally.
- Extract, deliver, and collect  $\geq$  50% of gases or vapors etc.
- Demonstrate performance of multi-nozzle probes the same as for single nozzle.

**157 recommendations so countries can write own derivative standards**



## ANSI N13.1-1999

### 169 requirements



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# Annexes

## ISO-2889 2008

- ▶ A – same but updated a little
- ▶ B – same but aspiration equation added and models updated and two other codes referenced
- ▶ C – same
- ▶ D – same and includes the informative material from the core and data on additional filter types

## ANSI N13.1-1999

- ▶ A -- Techniques for the measurement of flowrate through a stack or duct
- ▶ B -- Modeling of particle losses in transport systems
- ▶ C -- Special considerations for the extraction, transport, and sampling of radioiodine
- ▶ D -- Optimizing the selection of filters for sampling radioactive particles

# Annexes Cont'd

## ISO-2889 2008

- ▶ E – currently the same, but may be deleted
- ▶ F – Added the methods for demonstrating mixing that are in the core in the ANSI standard
- ▶ G – Same, but should add some material reflecting international experience

## ANSI N13.1-1999

- ▶ E -- Evaluation effluent sampling errors and uncertainty
- ▶ F -- Sampling system performance verification
- ▶ G -- Transuranic aerosol particulate characteristics: implications for extractive sampling in nuclear facility effluents

# Annexes Cont'd

## ISO-2889 2008

- ▶ H – same
- ▶ I -- Determining action levels material moved from core
- ▶ J -- Quality assurance, inspection (moved from the core)
- ▶ K – Carbon14 sampling

## ANSI N13.1-1999

- ▶ H -- Tritium sampling and detection

# Annexes Cont'd

## ISO-2889 2008

- ▶ L – Factors impacting system design, lifted from the core, including limited discussion of potential emissions
- ▶ M -- Sampling probes and nozzles with enhanced material on multi-nozzle probes
- ▶ N – Sampling and analysis for Ru-106
- ▶ Bibliography

## ANSI N13.1-1999

- ▶ I -- Bibliography

# Sampling Program

## ISO-2889 2008

- ▶ In Annex L

## ANSI N13.1-1999

- ▶ Required written technical basis addressing
  - Sampling objectives
  - Graded approach for meeting the objectives
  - Relevant facility conditions and airborne contaminants
  - Action levels signaling changing conditions of significance.

# Sampling Program Cont'd

## ISO-2889 2008

- ▶ Shortened in Annex L
- ▶ Removed Potential Impact Category (PIC) basis for requirements
- ▶ Performance recommendations based on PIC were defaulted to the most rigorous choice.

## ANSI N13.1-1999

- ▶ Graded approach used to focus resources on emission points with the greater potential to emit when control devices fail.
- ▶ Estimating potential emissions is required.

# Sampling Program Cont'd

## ISO-2889 2008

- ▶ All moved to informative Annex L

## ANSI N13.1-1999

- ▶ Elaborate discussion on planning for sampling normal and off-normal conditions.
- ▶ Recommendations for sampling difficult radioactive contaminants such as very large sized particles and reactive or condensing gases and vapors.
- ▶ Requirement for establishing defensible action levels and designing to verify that the action levels are measurable.

# Sampling Locations

## ISO-2889 2008

- ▶ Same, but suggestions given based on experience
  
- ▶ Same requirement

## ANSI N13.1-1999

- ▶ No specific distance relationships
  
- ▶ Sample where contaminants and velocity are uniform and well mixed
  - Four-part sequence of tests.
  - Performance criteria given.
  - Can test on models or similar stacks.

# Sampling Locations Cont.

## ISO-2889 2008

- ▶ Same requirement for single point sampling
- ▶ Field demonstration for multi-nozzle probes used where mixing not achieved

## ANSI N13.1-1999

- ▶ Single point sampling from location where contaminant distribution is shown to be uniform
- ▶ Same applies to multi-nozzle probes

# Sample Extraction

## ISO-2889 2008

- ▶ Same recommendation

## ANSI N13.1-1999

- ▶ Limits on the fraction of stack cross section that can be taken up with nozzles

# Sample Extraction Cont.

## ISO-2889 2008

- ▶ Same recommendations and some requirements for sample transmission.

## ANSI N13.1-1999

- ▶ Performance criteria apply:
  - Sample aspiration
  - Transmission through all nozzle designs
  - Demonstrated compliance is required.
  - Isokinetic sampling is no longer a requirement, it alone is no longer a sufficient description of the nozzle performance.

# Sample Extraction Cont.

## ISO-2889 2008

- ▶ Moved to a new annex and multi-nozzle probes illustrated.
- ▶ Incorporated more flexible recommendations for existing facilities.

## ANSI N13.1-1999

- ▶ Two sample designs shown to illustrate nozzles that may meet criteria.
- ▶ Requirements for inspections of nozzles

# Sample Transmission

## ISO-2889 2008

- ▶ Same particle size requirement unless specific data is available.

## ANSI N13.1-1999

- ▶ Requires that the penetration of 10 micron AD particles (or larger) and gases and vapors from the free stream to the collector of detector be greater than, or equal to 50%.

# Sample Collection

## ISO-2889 2008

- ▶ General requirement in core.
- ▶ Most material in new annex.

## ANSI N13.1-1999

- ▶ Contaminant characterization requirements are addressed under the sampling program, sampling location, and quality assurance discussions.

# Sample Collection Cont.

## ISO-2889 2008

- ▶ Same recommendation
- ▶ Same recommendation
- ▶ Same recommendation
  - <0.1% bypass

## ANSI N13.1-1999

- ▶ 95% minimum collection efficiency for filters and a method for verification.
- ▶ Required to make the collection side of filters easily identifiable
- ▶ Filter holders should be checked to verify leak tightness. And they should be easy to use and be corrosion resistant.
  - A leak criterion is needed.

# Sample Collection Cont.

## ISO-2889 2008

- ▶ Same recommendations
- ▶ Same recommendations
- ▶ C-14 and Ru-106 guidance added

## ANSI N13.1-1999

- ▶ Recommendations are given for the use of solid adsorbents, liquid absorbers, condensation traps, and flow-through chambers.
- ▶ Specific guidance for radioiodine and tritium

# Flow Measurements

## ISO-2889 2008

- ▶ Same recommendation, but standard conditions are different to be consistent with ISO
- ▶ Same recommendation
- ▶ Same recommendation, but for effluent flow that can vary significantly, regardless of potential impact
- ▶ Flow in the duct or stack should be periodically measured or continuously monitored depending on variability.

## ANSI N13.1-1999

- ▶ Sample flow must be measured with calibrated instruments.
- ▶ Flow meters should be located downstream of the sample collectors.
- ▶ For the highest potential impact stacks, the sample flow is required to be controlled in proportion to the stack flow.
- ▶ Flow in the duct or stack must be measured or monitored in a manner depending on PIC.

# Flow Measurements Cont.

## ISO-2889 2008

- ▶ Recommendations are in informative Annex J.

## ANSI N13.1-1999

- ▶ Specific requirements are given for maintenance and calibration of sample and stack flow instrumentation by sensor type.

# Quality Assurance and Control

## ISO-2889 2008

- ▶ Quality assurance/control issues are very briefly addressed in the core of the standard.
- ▶ Quality assurance annex provides recommendations on
  - Documentation
  - Maintenance and inspection.

## ANSI N13.1-1999

- ▶ QA/QC clause addresses:
  - Quality assurance plan
  - Required documentation
  - Training
  - Maintenance and inspection
  - Calibration
  - Summary of performance criteria
  - 64 requirements (about 1/3 of all the requirements in the standard)
  - 23 recommendations.

# A little more history:-

- ▶ Before the last meeting two countries had voted against the standard, these being United Kingdom and Canada.
- ▶ The issues being.....
- ▶ There was an initial requirement that the sample transport lines be cleaned annually.
- ▶ Particulate be injected into the sample transport lines to confirm continuing efficiency.

# A little more history:-

The potential ongoing problems caused by these suggestions, on operating reprocessing plants were discussed at some length at the last meeting, with the requirements be revised.

# A little more history:-

- ▶ This is just one example of the potential for standards to inflict operational requirements on operators which may not be practical.
- ▶ Due to the good offices and diligence of our working committee representative these requirements were amended.



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## A little more history:-

For the future, we as operators and equipment suppliers should make the effort to be aware of what standards are in the process of being revised, re-written etc and take time to offer our national representatives any help and assistance to ensure the standard is robust from both a technical/safety and straightforward operational perspective.



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# Schedule

- ▶ Committee Draft July 31, 2006.
- ▶ Draft International Standard approved with comments January 2008.
- ▶ Final Draft International Standard completed in June 2008.
- ▶ It is being formatted and translated into French.
- ▶ Should be distributed for balloting about September 2008.
- ▶ Ballots due about February 2009.
- ▶ International Standard issued after editorial comments are resolved in 2009.