NRRPT® NEWS

National Registry of Radiation Protection Technologists

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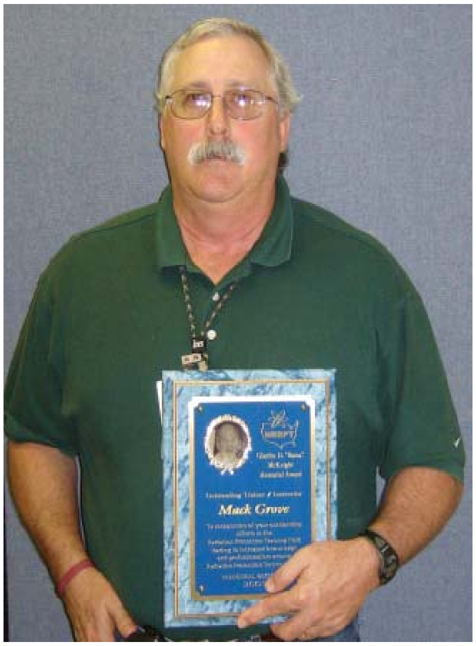
Chairman's Message

Kelli Gallion

On June 16, 2004, the Registry lost one of its "major building blocks" as Paul Harvey once described of the late great Charles D. "Bama" McKnight. In January 2005, The Charles D. (Bama) McKnight Memorial Award was established in honor of "Bama" because of his significant contributions to the **NRRPT**. "Bama" was one of the Registry's great Pioneers as well as an exceptional Instructor/Teacher, one that you never forgot. "Bama" had the gift of making the technically difficult understandable and enjoyable. It is for these reasons that The Charles D. (Bama) McKnight Memorial Award was created to honor individuals that have the ability and willingness to teach, coach and/or instruct. The inscription on the award plaque reads: **"In recognition of your outstanding efforts in the Radiation Protection Training field leading to increased knowledge and professionalism among Radiation Protection Technologists."**

The Inaugural recipient of The Charles D. (Bama) McKnight Memorial Award was awarded to **Mack Grove** on July 19,2006. Mack has been instructing, training, and mentoring in the nuclear industry for 30 years. His instruction began in the Navy as a Nuclear Prototype Staff instructor, and in 1983 he began working at the San Onofre Nuclear Generating Station. For the past 22 years, Mack has been instrumental in the instruction, training, and mentoring of hundreds of Health Physics Division personnel, including contract personnel. Mack not only possesses the excellent ability to train and instruct, he also has a personal passion for mentoring that doesn't go unnoticed. Mack's



Mack Grove

Andrew Martinez, Bob Corbett, Mack Grove & Scott Stinson
San Onfre Nuclear Generating Station

training and mentoring doesn't stop at the workplace, he also shares his passion and talent with the Southern California youth community through coaching Little League baseball and Pop Warner football.

Though we have lost one of our "building blocks" it is because of people like "Bama" and Mack that the Registry continues to grow and be strong!

On behalf of the Registry I would like to **Congratulate Mack** for supporting the primary objective of the **NRRPT** by "encouraging and promoting the education and training of Radiation Protection Technologists".

If you would like to nominate an individual like Mack that demonstrates outstanding efforts in the Radiation Protection Training field, please submit your nomination to: NRRPT@NRRPT.ORG.

Best wishes and thank you for your continued support!!

Kelli Gallion
NRRPT, Chairman of the Board

Welcome New Members

The following 2 individuals were omitted from the last newsletter. Congratulations for successfully passing the **NRRPT** August 13, 2005 examination:

Kipling M. Brumm
James W. Smith

New Members: If you do not have access to the private side of the web page please contact the Executive Secretary (nrrpt@nrrpt.org). She must have your email address on file in order for you to gain access.

Radiation Safety as an Integral Part of the Transportation Regulations

Dwaine Brown – Halliburton Energy Services, Inc.-Houston, TX
Steve Woods – Halliburton Energy Services, Inc. Duncan, OK

The International Atomic Energy Agency estimates that between 18 and 38 million packages containing radioactive materials are transported each year throughout the world. This material may be radioactive waste, medical isotopes, industrial radiography sources, well logging sources, research materials, and of course nuclear fuel cycle materials. These shipments are made by land transport, air, or by sea.

There are various agencies that regulate the commercial movement of radioactive materials and with minor variations primarily related to how a shipment is documented. The requirements are consistent for the control of exposure to radiation between the International Civil Aviation Organization (ICAO) as implemented through the International Air Transport Association (IATA) regulations, the International Maritime Organization (IMO) as implemented through the International Maritime Dangerous Goods (IMDG) Code, and specific country regulations that address the ground transportation of radioactive materials such as the United States Department of Transportation (USDOT).

Each agency has adopted requirements for the control of package contents and external radiation levels based on the criteria presented in IAEA Safety Standards Series, Requirements, No. TS-R-1 (ST-1 Revised) and it is the basis of these Regulations that will be discussed in this document.

Prior to 1959 the United States Interstate Commerce Commission regulations served as the basis for the various national and international controls for the transport of radioactive materials. The rapid growth of the nuclear industry made the development of controls for the transport of all types and quantities of radioactive materials the highest priority of the IAEA shortly after its formation.

The general outline of these regulations was:

- Introduction
- Definitions
- General Provisions
- Activity Limits and Material Restrictions
- Requirements and Controls for Transport
- Requirements for Radioactive Material and for Packagings and Packages
- Test Procedures
- Approval and Administrative Requirements

USNRC Reporting Requirements for Domestic and International Shipments

Due to regulatory changes that have been implemented in the past two years based on criteria set forth by the International Atomic energy Agency and adopted by the G8 countries at the G8 Summit held in Sea Island, GA in 2004 significant changes have been implemented to address the security of radioactive materials in transit.

These changes directly affect the storage and use of radioactive materials that are in excess, either as single sources or cumulative quantities as well as the control and accountability of the same material when it is in transit.

While there is not a direct relationship between the quantities of concern and the prescribed values for varying levels of control for the shipment of radioactive materials, certain reporting requirements have been invoked for those shipments of radioactive materials in transit, especially those shipment in which the quantity of material exceeds the quantity of concern for specific isotopes.

Licensees that possess radioactive materials as single sources or aggregate quantities that are "Greater than the Quantity of Concern" are now required to establish and maintain specific additional security measures for storage facilities as well as during transport of these quantities. The Quantities of Concern are specific to each isotope as well as the form of the material.

The unity rule must be applied to mixed isotope shipments even if individual sources contained within the shipment may be less than the Quantity of Concern.

In addition to the increased storage and transport security controls, licensees have specific reporting and notification requirements to the USNRC and in some cases to each Agreement State through which a shipment of material will transit.

The A1 and A2 values discussed in this paper define the packaging and transport requirements for specific isotopes but do not have any bearing on the security, reporting and notification requirements for the transport of Quantities of Concern.

This paper will discuss the development and implementation of the Activity Limits commonly referred to as the A_1 and A_2 values for specific isotopes. Therefore, the first order of business will be to define the A_1 and A_2 values as well as a selected few additional terms prior to entering into a discussion as to how these values were derived.

A_1 – The maximum activity of special form material that is permitted in a type of package called a Type A package.

A_2 – The maximum activity of other than special form material that is permitted in a Type A package.

Special Form – Either an indispersible solid radioactive material or a sealed capsule containing radioactive material which has undergone very stringent testing to confirm that if the material was released in an accident the physical integrity of the special form capsule would make it unlikely that there would be any associated contamination hazard from the radioactive contents of the capsule. This allows larger quantities of special form material to be shipped in any Type A package.

Type A Package – Designed and tested to provide a safe and economical means of transporting Type A (A_1 or A_2) quantities of radioactive material. These packages must maintain their integrity under the kind of abuse or mishandling which may be encountered under normal conditions of transport. The testing of these packages simulates transportation related events which a package could be subjected to in handling or accident conditions.

The objective of the regulations is to provide assurance of the protection of individuals, property, and the environment from any harmful affects of radiation during the operations surrounding the transport of radioactive materials. Foremost in the provision of this assurance is the well-defined limits of quantities of material that may be contained and transported in specific package designs, specifically the A1 and A2 quantities of materials. The A_1 and A_2 quantities for each isotope define the amount of any material that may be transported in each type of container be it Excepted Packaging, Type A packaging, or Type B packaging. Stated in another way, the regulations as written provide guidance toward maintaining the exposure to individuals, property, and the environment **A**s **L**ow **A**s **R**easonably **A**chievable (**ALARA**).

There are basically 3 limits imposed relative to the activity of a package with radioactive contents.

- A_1 and A_2 in Bq (or multiples thereof).
- Activity concentration for exempt material in Bq/q.
- Activity limits for exempt consignments in Bq

For this presentation we will focus on the A_1 and A_2 value determination and save any discussion of exempt packages or consignment for a later date.

The values of A_1 and A_2 presented in the regulations evolved from what was known in the late 1970s as the Q-System. The Q-System was developed in support of the 1985 edition of the regulations to provide justification from a dosimetric standpoint for the A_1 and A_2 values and has been retained through the current regulations.

The limits presented within the regulations to control and mitigate the release of radioactive material from transport packages are based upon the activity limits for Type A packages. These same limits are also used for specifying Type B and Type C package activity leakage limits LSA materials, and excepted package content limits.

Initially radionuclides were segregated into 7 groups for transport purposes with each group having a package content limit for special form radioactive material and for material in all other forms. In 1973 the regulations the group classification system evolved into the A_1/A_2 system where each nuclide had 2 Type A package content limits, A_1 and A_2.

The dosimetric basis of the A_1/A_2 system relied on a number of assumptions. A whole body dose limit of 3 REM (30 mSv) was assumed in deriving the A_1. In calculating the A_1 values the exposure was limited to 3 R (» 30 mGy) at a distance of 3 meters in a period of 3 hours, an intake of 10^{-6} X A_2 was assumed in the derivation of A_2 as the result of a median accident. This intake would result in one-half of the maximum permissible intake for a radiation worker. The median accident is defined as one which for a Type A package results in a complete loss of shielding and to a release of 10^{-3} of the package contents in such a manner that 10^{-3} of the released material was subsequently taken in by a bystander.

The Q-System developed for the 1985 regulations reassessed and modified for the 1996 regulations considers a broader range of specific exposure pathways than the earlier A_1/A_2 system. The Q-System continued to use the same assumptions as those used in the original Q-System, however in exposures related to the intake of radioactive material use was made of new data and concepts recommended by the ICRP particularly subjective assumptions were made regarding the extent of package damage and release of contents without reference to the median accident.

The Q –System considers a series of exposure routes for individuals in the vicinity of a Type A package involved in a severe transport accident. This led to five contents limit values:

- Q_A for external photon dose
- Q_B for external beta dose
- Q_C for inhalation dose
- Q_D for skin and ingestion dose due to contamination transfer
- Q_E for submersion dose

The A1 value for special form material was the lesser of the 2 values QA and QB, while the A2 value for non-special form radioactive material was the lesser of A1 and the remaining Q values.

The exposure pathways used in the determination of Q values are based on the following radiological criteria:

1. The effective or committed dose to an individual exposed near a transport package following and accident should not exceed a reference dose of 50 mSv.
2. The dose or committed dose equivalent received by individual organs, including the skin, of an individual involved in the accident should not exceed 0.5 Sv, or in the special case of the lens of the eye, 0.15 Sv.
3. An individual is unlikely to remain at 1 meter from the damaged package for more than 30 minutes.

The Q-System lies within the domain of exposures that are not expected to be delivered with any certainty but may result from either an accident at a source or from an event or sequence of events such as equipment failure and operating errors.

The earlier reference dose of 50 mSv used in the development of the A_1/A_2 values used in the 1985 regulations is no longer valid for these exposures however this value has been retained within the current Q-System with the consideration that historically actual accidents involving Type A packages have led to very low exposures. These exposures may be considered once in a lifetime exposures since most individuals will never be exposed. When considered with the previously cited dose limits the limiting dose rate from a damaged Type A package for whole body photon exposure is assumed to be 100 mSv/h at a distance of 1 meter.

Current Q value assumptions:

Q_A – External dose due to photons

Calculated using the complete X-Ray and gamma emission spectrum for each radionuclide from ICRP Publication 38

Q_B – External dose due to beta emitters

Calculated using the complete beta spectra for each radionuclide from ICRP Publication 38

Q_C – Internal dose via inhalation

The accident scenario used in this determination assumed a storeroom or cargo handling bay with a free air volume of 300 cubic meters with 4 room air changes per hour. With an adult breathing rate of 3.3×10^{-4} m^3/s this resulted in an uptake factor of approximately 10^{-3} for a 30 minute exposure period. Alternatively, another accident scenario may involve a transport vehicle with an interior free air volume of 50 m3 with 10 air changes per hour reveals an uptake factor of 2.4×10^{-3} which is of the same order of magnitude as the warehouse/cargo bay scenario.

For accidents occurring outdoors the dispersion parameters for a ground release with an exposure distance of 100 meters were used with resulting dilution factors of 7×10^{-4} to 1.7×10^{-2} s/m^3 resulting in uptake factors in the range of 2.3×10^{-7} to 5.6×10^{-6} for the previously cited adult breathing rate. Reduction of the exposure distance to 10 meters increases these uptake factors by approximately a value of 30 indicating that as the point of exposure approaches a few meters the uptake factors would approach the 10^{-4} to 10^{-3} range used in the Q-System.

Therefore, uptake factors in the range of 10^{-4} to 10^{-3} appeared to be reasonable for the determination of Type A package content limits.

When this range of uptake fractions is considered with the release fractions of 10^{-3} to 10^{-2} the overall intake factor for a Type A package becomes 10^{-6}, representing a combination of releases in the range of 10^{-3} to 10^{-2} of the package contents as a respirable aerosol combined with an uptake factor of 10^{-4} to 10^{-3} of the released material.

The calculation of Q_C was made using the most restrictive chemical form and dose coefficients and aerosol characterization used an aerosol median aerodynamic diameter (AMAD) of 1 micron.

Q_D – Skin contamination and ingestion doses

This value is determined by considering the beta dose to the skin of a person contaminated with non-special form radioactive material during handling of a damaged Type A package.

Calculated using the assumption that:

- 1% of the package contents are spread uniformly over an area of 1 square meter
- Handling of contaminated debris results in contamination of the hands to 10 % of the released quantity
- The affected individual was not wearing gloves but would be aware of the contamination potential and decontaminate the hands within a period of 5 hours.
- Beta spectra and discrete electron emissions from ICRP Publication 38 were used.

These same models were used in the determination of estimating the possible uptake of activity via the ingestion pathway.

It was assumed that an individual may ingest all of the contamination from 10 cm2 of skin over a 24 hour period and that the resultant intake is 10-6 Q_D compared with the earlier derivation of 10-6 Q_C. Due to the consideration that the dose per unit intake for inhalation is generally of the same or greater order as that of ingestion the inhalation pathway will generally be more limiting for internal contamination due to beta emitters.

Q_E – Submersion dose due to gaseous isotopes

The Q_E value for gaseous isotopes external to the body following their release in an accident is based on the following assumptions:

- 100 % release of the package contents into a storeroom or cargo handling bay with a free air volume of 300 cubic meters with 4 air changes per hour.
- Resulting airborne concentration of Q_E/300 m^{-3}
- Ventilation decay constant of 4 h^{-1} over a subsequent 30 minute exposure period resulting in a mean concentration of 1.44 X 10^{-3} X Q_E m^{-3}

Earlier issues of the regulations cited 4000 X DAC (Bq/m^3) as recommended by the ICRP for 40 hours per week and 50 weeks per year for occupational exposure in a 500 m^3 room, the use of the DAC was deemed to be inappropriate and the modified Q-System uses an effective dose for submersion in a semi-infinite cloud from USEPA Federal Guidance Report No 12.

The initial premise of the Q system utilized a maximum duration of transport of 50 days and thereby assumed that radioactive decay products with less than 10 day half-lives were in equilibrium with the longer lived parent. The Q values were then determined for the parent and progeny and the limiting value was used for the determination of the A_1 and A_2 values. For those isotopes whose progeny had a half life greater than 10 days or greater than the half life of the parent these were then considered as a mixture. This criterion has been retained in today's determinations of A_1 and A_2 values.

Alpha emitting radionuclides do not warrant the determination of Q_A or Q_B values due to their relatively weak gamma and beta emissions. The 1973 edition of the regulations assigned an arbitrary limit of 10^3 x A_2 for this material with no dosimetric justification. Based on the latest values from the ICRP for alpha emitters which resulted in a reduction of the Q_C values a tenfold increase in the arbitrary value was used in the modified Q system resulting in an additional Q value for alpha emitters QF which is 10^4 x Q_C. With the evaluation of internal dose due to ingested alpha emitters similar arguments to those of beta emitters apply regarding Q_D and the inhalation rather than the ingestion pathway is always more restrictive.

The 1973 A_1 and A_2 values were subject to an upper limit of 37 TBq (1000 Ci) to protect against the possible effects of bremsstrahlung radiation. This value was retained in the current regulations, recognizing that this was an arbitrary cut off point, at 40 TBq (1081 Ci). Bremsstrahlung evaluated in a manner consistent with the determination of Q_A and Q_B shows the aforementioned value to be reasonable. It does remain however that the explicit inclusion of bremsstrahlung within the Q system might limit A_1 and A_2 for some nuclides to about 541 Curies (20 TBq), a factor of 2 lower. The A_1 and A_2 values tabulated in the 1973 edition of the regulations have been retained within the current regulations.

Noble gases to which the QE value has been applied since they are not incorporated into the body and whose progeny are either a stable nuclide or another noble gas. The dosimetric routes other than submersion within a radioactive cloud and the related whole body exposure are realized when evaluating ^{222}Ra where the lung dose due to the inhalation of short-lived progeny. This exposure has received special consideration by the ICRP. The corresponding Q_C value in the original Q System was calculated to be 97 Curies (3.6 TBq) based on the 100 % release of radon as opposed to the 10^{-3} – 10^{-2} aerosol release incorporated into the QC model. This results in a reduction to a Q_C value in the range of 97.3 to 973 milliCuries (3.6 X 10^{-3} to 3.6 X 10^{-2} TBq). Evaluating ^{222}Ra as a noble gas resulted in a Q_E value of 114 milliCuries (4.2 X 10^{-3} TBq) which is near the low end of Q_C values. The value which is used for Type A packages.

Low specific activity (LSA) materials such as ^{238}U, ^{232}Th, ^{235}U, ^{nat}U, and ^{nat}Th fall into a category of radioactive material where the specific activities are so low that it is inconceivable that an intake presenting a significant radiological hazard could occur. The model assumed that it was unlikely that an individual would remain in a dusty atmosphere long enough to inhale more than 10 mg of material with a resulting mass intake of 10^{-6} A_2 which would not present a greater hazard than any quantity allowable for transport in a Type A Package.

This model lends itself to an LSA criterion of 10^{-4} $Q_C g^{-1}$ resulting in a Q value for these materials below this limit as unlimited. Compliance with this criterion presents an effective dose equivalent of less than 5000 milliREM (50 mSv). Additionally, the latest calculations using current dose coefficients by the ICRP show that unirradiated uranium enriched to less than 20% will also satisfy this criteria. Irradiated reprocessed uranium A_1 and A_2 values must be calculated using the mixtures equation considering the uranium radionuclides and fission products.

Another consideration of LSA material was the QD derivation for skin contamination and the model used was based on the assumption that 1 to 10 mg/cm2 of dirt present on the hands would be readily visible and removed promptly by wiping or washing without regard to the presence of radioactivity. Based on this assumption, the upper extreme of the range for a cut-off resulted in a LSA limit of $10^{-5} Q_D g^{-1}$, which retains the unlimited Q value for this value.

Key Points to Remember:

The lesser of the values for Q_A and Q_B determines the limiting A_1 value for special form material.

The least of the A_1 value and the remaining Q values determines the A_2 value for non-special form material.

The A_1 limit is defined by Q_A, the external dose due to photons.

The upper limit for alpha emitters where Q_F is substituted for Q_A determines the A_1 limit for alpha emitters.

Q_B, the external dose due to beta emitters, determines the A_1 limit for beta emitters

QC, the internal dose due to inhalation, defines the A2 limit.

The A_2 limit is defined by Q_D, the skin contamination and ingestion limit or Q_E, the submersion dose due to gaseous isotopes

Basically, if a radionuclide is in special form, larger quantities may be transported in a Type a package than the same radionuclide in non-special form there are however some cases where the A_1 and A_2 values are equal.

In all cases however, the Q System and the derived A_1 and A_2 values have been structured in such a manner that under most conditions incident to transportation the potential exposure to material handlers, the general public, and the environment is maintained ALARA when material is properly classified, packaged, marked and labeled prior to shipment as shown in the preceding discussion.

Even though a material shipment may be well under the A_1 or A_2 value for the specific isotope, shippers must closely monitor the quantity of material being shipped to ensure that the appropriate transportation security controls are in place and that the necessary notifications of shipment and receipt have been made.

What to Watch for in the Next Issue

Updates on the last **NRRPT** Board meeting in Providence, RI
Photos of the **NRRPT** 30th anniversary celebration
Arthur F. Humm, Jr. Award recipient
Mid-year meeting information
2007 sustaining information

Problem Solving in Preparation for the NRRPT® Exam

David Waite, Ph.D.
James Mayberry, Ph.D.

First Edition – June 2002

This book was donated to the **NRRPT** by David Waite and James Mayberry in June 2002. It is an excellent book that can be used as an examination preparation guide or reference guide for your office. To purchase this book, please complete the form location on page 23 and return to the Executive Secretary's office.

Poisson Distribution and Counting Statistics

By Augustinus Ong
Dartmouth College

The purpose of this paper is to reacquaint ourselves with and to show how to apply statistics from health physics' radio-analytical notes in order to calculate standard deviation and confidence interval in counting measurements.

Counting statistics simply mean the expected number of counts from a radioactive sample and that number can be described by a Poisson distribution. The standard deviation (s) for any counts (C) is the square root of C:

σ = sqrt C

EXAMPLE: What is the standard deviation of a sample that produced 1000 counts?

σ = sqrt C
= sqrt (1000) = 32 counts

EXAMPLE: What is the coefficient of variation (CV) of 1000 counts?

CV = (σ / C) x 100 = (31.6 / 1000) x 100 = 3.16%

EXAMPLE: What is the σ and CV for 100 counts?

σ = sqrt (100) = 10 counts

CV = [sqrt (100) / 100] x 100 = 10%

The above examples show that, as the number of counts increases from 100 to 1000, the standard deviation increases (from 10 to 32 counts), but the percent standard deviation (CV) decreases (from 10% to 3.16%). The conclusion is that there is less relative variability as the counts increase in counting measurements.

Another rule of thumb is the counting statistics can also be described by a Gaussian distribution with the stipulation that the number of counts must be greater than 30. In short, given any number of counts greater than 30, we can determine the standard deviation. We can easily find that 68% of repeated measurements will fall within C +/- sqrt C, that 95% of repeated measurements will fall with C +/- 2 x sqrt C, etc.

EXAMPLE: A radioactive sample has 100,000 counts. What is the 95% confidence interval?

95% confidence interval = C +/- 2 x sqrt σ = C +/- 2 x sqrt C

= 100,000 +/- 2 x sqrt (100,000)
= 100,000 +/- 632 counts

Therefore, at the 95% confidence interval the counts will be within 99,368 to 100,632 for repeated measurements. In other words, to have a 95% confidence interval +/- 2% of the true value, the measured counts needs to be at least 100,000.

The general equation for determining the number of counts needed to be sure that the true value is within some percentage (p) of the measured counts and where n = 1 for 68% confidence, n= 2 for 95% confidence, and n = 3 for 99% confidence:

C = [n / p] ** 2

EXAMPLE: What are measured counts needed in order to have a 95% confidence interval +/- 1%?

Let n = 2 and p = 0.01

Counts = [2 / 0.01] ** 2 = 40,000

or

Counts +/- 1% of the measured counts = 40,000 +/- 2 x sqrt (40,000) = 40,000 +/- 400

Another useful counting statistical equation dealing with count rate (R) in time (t):

R = C / T

Its standard deviation in the count rate is σ (r):

σ (r) = sqrt (C) / T
= sqrt [(C x T)] / T
= sqrt (R / T)

EXAMPLE: A radioactive sample gives 50,000 counts in 10 minutes. What are the count rate and standard deviation in the count rate? And what range of count rates would be predicted to fall within 68% of repeated measurements?

R = 50,000 counts / 10 minutes = 5,000 cpm

σ (r) = sqrt (50,000) / 10 = 22 cpm

or expressed as 5,000 +/- 22 cpm

At 68% confidence interval:

σ (r) = sqrt (R / T) = sqrt (5,000 / 10) = 22 cpm

So, the expected range of count rates for 68% of the time would be 5,000 +/- 22 cpm

As with all counting measurements, the background counts introduce a statistical uncertainty; therefore, the background counts (B) must be taken into account:

So, Net Count (N) = Gross Count (C) – Background Count (B)

And the standard deviation of the net counts is:

σ (n) = sqrt (C + B)

EXAMPLE: Gross sample counts = 2,000 and the background counts = 400 counts. What are the true net counts and the associated standard deviation?

N = C – B = 2,000 counts – 400 counts = 1,600 counts

σ (n) = sqrt (C + B) = sqrt (2,000 + 400) = 49 counts

or expressed as 1,600 +/- 49 counts.

** BIO ON OUR EXAM PANEL CHAIRMAN **
Karen Barcal, RRPT, CHP

Karen Barcal has 19 years experience in applied health physics, radiological protection, and decontamination and decommissioning in a variety of professional settings including nuclear power and DOE facilities. Her specialties include internal dosimetry, dose reconstruction, and technical support of radiation protection programs. Karen is a Health Physicist at MJW and is a technical contributor to consortium performing occupational dose reconstructions as part of the Energy Employees Occupational Illness Compensation Program Act.

In 1992, Karen Barcal became a Registered Radiation Protection Technologist and began serving on the **NRRPT** Panel of Examiners in 2001. Karen was elected as Exam Panel Chairman in 2005 and began serving her term on January 1, 2006. She currently holds a position on the **NRRPT** Board of Directors.

In 1998, Karen received her American Board of Health Physics certification. She is now pursuing her Ph.D. in Biomedical Engineering and Biotechnology and expects to complete her degree in 2008. She is on the Health Physics Society Ethics committee, and is a board member of the New England Chapter Health Physics Society (NECHPS).

Karen's pride and joy are her two dogs, Itsa (a german shepherd/husky mix) and Kavik (a malamute). She spends as much time as possible walking, playing and traveling with them.

Karen is also a bowler. And she doesn't just bowl for pleasure, she bowls competitively. With six perfect games (300), one 800 series, 2 state titles (in MI and MA) and the winner of <u>many</u> tournaments, she does not take this sport lightly! She proudly displays the rings, watches, pendants and bracelets that have come with her honor scores.

2005 Lion Award Nomination

Nomination: David Biela – Radiological Engineering Excellence

Nominee Names: David Biela

Award Category: Support Services/Administration

Nominee's Manager: Rich Hazard

Nominator Information: rich.hazard@wvnsco.com
Phone: (716) 942-4367
Fax: (716) 942-2097

Every employer strives to protect their workers. The measures needed to protect employees who work in radiologically contaminated areas are considerably more complicated than those required to protect employees from the industrial hazards that exist in most workplaces. For most workers, the hazards can be seen, heard or smelled – like working with heavy equipment or with chemicals. At the WVDP employees deal with the invisible dangers of working in radiologically contaminated areas that require thorough pre-work planning to ensure the radiological safety of workers.

Dave Biela is one of those employees project managers seek out because he is a proactive planner who keeps worker protection foremost in his mind. He has radiological engineering smarts and he knows how to apply his engineering knowledge in the field, and can often anticipate the needs of radiation protection and operations team members. Dave is hard-working and committed to doing the right thing at the right time, and he follows through on every challenge placed before him. In 2005, Dave demonstrated these winning characteristics in two specific fields: technical knowledge and people development / management.

First, technical know-how. Dave developed innovative ways to identify radiological conditions and requisite radiological work controls to ensure the safe, efficient execution of waste management operations at the West Valley Demonstration Project (WVDP). One of our major accomplishments in 2005 was the shipment of 335,000 cubic feet of low-level radioactive waste for offsite disposal. To accomplish this goal, workers were staged in nine different areas on site to process the waste before it was loaded for shipment.

One of the challenges of this project was that radiological controls – the controls identified before radiological work can begin – varied from one processing location to another, based on the determination of the project manager for that location. Workers provided feedback that, even though the radiological conditions at two different locations might be similar, the radiological controls might be different, based on the determinations made by the project manager. This isn't to say that any of the project managers provided controls that were less than protective, but the lack of consistency among the projects made the work planning for radiological controls challenging and inefficient.

To address this issue, Dave improved overall Project effectiveness by developing a chart of radiological conditions and the respective radiological controls that could be applied to each of the waste sorting facilities. This chart provided a standard from which work planners could match up the right radiological controls for the radiological environment of the work. This chart was also used to develop Radiation Work Permits, which establish the minimum radiological controls for the job, rather than relying on the judgement of each individual project manager. This chart has also been used as the technical basis for establishing radiological controls for work outside the nine waste processing areas.

Second, people development / management. As lead radiological engineer Dave was instrumental in leading the radiological engineers and radiological control supervisors. Dave conducted a daily meeting with engineers and supervisors, reviewing current and future work scope to ensure radiological controls were properly implemented. Under Dave's guidance the group did more than establish radiological controls; they focused on applying the appropriate level of control to ensure compliance with regulatory requirements while enabling the various projects to complete their work safely and on time. The radiological professional staff all benefit from Dave's proactive approach to applying radiological controls based on technical merit with less reliance on past practices and over-conservatism.

Dave's interest in developing people extends into his community as well. He is actively engaged in youth sports in his community as a baseball umpire and basketball referee in high school and community leagues.

In the larger nuclear community, Dave has been actively involved in the National Registry of Radiation Protection Technologists (**NRRPT**) for many years. He is currently the Vice President of the **NRRPT** and is the Testing Committee Chairman responsible for the semi-annual tests conducted nationwide for **NRRPT** applicants. Talking about Dave's dedication to this not-for-profit organization and the industry, **NRRPT** President Kelli Gallion said, "People like Dave keep the organization ticking." She also said that because he knows all the components of the organization, he was able to act on her behalf to chair the **NRRPT** 2005 mid-year meeting.

According to Ms. Gallion, Dave took ownership of the development of the **NRRPT** exam, which is based on Canadian nuclear regulations. He accomplished this by meeting with their Canadian counterparts to become knowledgeable on their regulations. This was no small feat as **NRRPT** has a large exam bank, consisting of enough questions for four exams (each exam contains 150 questions). Each of these questions had to be developed and reviewed, taking the Canadian regulations into consideration. The first exam based on Canadian regulations was finalized in August 2005 and will be administered on February 27, 2006, in Ontario, Canada. Thanks to the countless hours Dave dedicated to the project over two years the exam is now a reality.

Dave led the effort to broaden the membership to the international community by establishing a program that will enable Canadian radiological technicians to obtain **NRRPT** certification. This first-of-a-kind effort will enable the **NRRPT** to expand to other countries as well, encouraging and promoting the education and training of radiation protection technologists and, by so doing, promoting and advancing the science of health physics.

In addition to his role in the development of the Canadian exam, Dave also assumed responsibilities for compiling, distributing, grading and performing statistics for the U. S. exam (given twice a year), that were formerly handled by a testing center. These activities include developing and disseminating proctor instructions and other administrative actions related to the U. S. exam.

Dave is one of the longest-tenured WVNSCO employees at the WVDP (24 years of service). He has held positions of progressively increasing responsibility beginning as a radiological technician, supervisor and engineer, and now as acting manager of the Radiation Protection Operations department. He uses these experiences to relate to all levels of employees – from technicians and operators to supervisors and managers. Because of his long-standing relationships with the entire work force Dave is able to bring a team together that can solve problems and provide the right solutions for safely completing work.

In his capacity as the acting Radiation Protection Operations Manager, Dave is currently mentoring two new radiological control supervisors. He is helping them in their new roles, providing them with guidance and direction as they learn to deal with the challenges of supervising technicians and controlling field activities, helping them with the transition from technician or individual contributor to supervisor.

Congratulations Dave Biela!
NRRPT, Vice-Chairman of the Board

Dade Moeller Technical Services *Press Release*

Media Contact
Arthur Desrosiers (508) 680-6544

For Immediate Release
July 24, 2006

Dade Moeller Technical Services Fills Key Safety Position for Nuclear Reactor Decommissioning Project

RICHLAND, Wash. – Radiation and environmental protection expert *Dade Moeller Technical Services* (DMTS) today announced that it will provide the Environment, Safety, Health & Quality Manager for the decommissioning of the University of Michigan Ford Nuclear Reactor Facility. Under subcontract to CH2M HILL Constructors, Dade Moeller Technical Services will provide the full-time onsite manager of worker safety and health protection programs during the active phase of this high-visibility project. As part of its services, DMTS will ensure compliance with all federal, state, local, and University of Michigan environmental and safety rules, regulations, and guidelines.

A single-source, full-service provider of occupational and environmental technical services, DMTS provides staff augmentation, field services, and program and project management to government agencies and their contractors, nuclear power generating companies, and other licensed users of radiological material.

DMTS is a subsidiary of Dade Moeller & Associates, an award-winning, employee-owned small business specializing in occupational and environmental protection.

Built in 1955, the University of Michigan's Ford Nuclear Reactor was a two-megawatt open-pool research reactor used by the University, the federal government, and private industry for research and educational purposes. The reactor is located at the University's North Campus in Ann Arbor, Mich.

# # #

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San Onofre Nuclear Generating Station is proud to have over 60 registered NRRPT members in our Health Physics, Training, Chemistry, Engineering, Operations, Oversight, and Maintenance organizations. We are especially proud that Kelli Gallion of our HP Planning group was a member of the Panel of Examiners, Board of Directors, and is currently the NRRPT Chairman.

San Onofre is a three unit site with two operating 1170 MWe Combustion Engineering reactors and one early Westinghouse unit in decommissioning. The station is located in Southern California on the Pacific Ocean and midway between San Diego and Los Angeles.

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Future NRRPT Exam Dates

February 10, 2007

Deadline for application: December 15, 2006

August 11, 2007

Deadline for application: June 15, 2007

Application Fee: $200

Retake Fee: $100
*Late Fee: $30

** Exam applications may be downloaded from our web page **

www.NRRPT.org

NRRPT 30th Anniversary Shirts Now Available!

The **NRRPT** 30th anniversary shirt is now available to purchase. The cost is $30 plus $7.50 for shipping. The shirts have the registry logo, "30th Anniversary", and "1976-2006" embroidered on the left chest side in black thread.

The shirts are made of 100% cotton herringbone, with 4-button clean finished placket and woodtone buttons, the 2-color tipped birdseye collar with half diamond on point, and 2-color tipped birdseye welt cuffs is very sharp looking, the shirts are single needle safety stitched on the shoulder seams and armholes, they have extended tail with side sents.

Sizes: XS-4XL Color: Khaki with black trim.

See page 23 for order form.

NRRPT Merchandise Order Form

Logo Apparel

Available Styles & Prices

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Blue Nylon/Fleece Jacket — $49
Khaki/Navy Hat — $15
Devon & Jones Golf (Dill or Stone)— $33
30th Anniversary (Khaki w/black trim)— $30
Jerzee Polo — $18
Denim Short Sleeve — $20
Khaki Nylon Vest — $40
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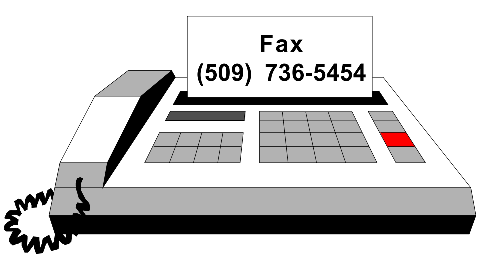

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