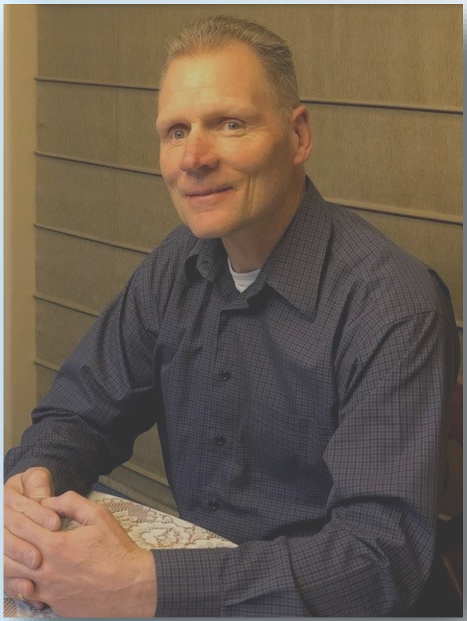
The NRRPT NEWS

OFFICIAL NEWSLETTER of the *National Registry of Radiation Protection Technologists*

March 2021 Incorporated April 12, 1976

Chairman's Message

Greetings fellow RRPTs!



As I write this, we are preparing to turn the clocks forward an hour and welcome spring. The Board of Director's and the Exam Panel have just completed holding their second virtual meeting. Although we could not meet in person that did not stop everyone from putting in the long hours and the huge amount of work to make sure that the Registry keeps moving right along. I would like to thank everyone involved for giving up more than two weekends worth of their time to make sure each task was completed and each detail addressed.

I would like to personally welcome the eleven new RRPTs that successfully passed the August 1, 2020 US exam and the four new RRPTs that successfully passed the December 7, 2020 Canadian exam. By the time that you are reading this we should have the results of the February 20, 2021 exam and will get to welcome more new RRPTs to the Registry!

Hopefully you will enjoy this issue of the newsletter put together by the Newsletter Committee and all the wonderful contributing authors who take the time to provide the content. There are great articles including long time RRPT Charlie Guinn receiving the prestigious Charles D. (Bama) McKnight Memorial Award to celebrate his many years of training Radiological Control Technicians and future RRPTs. Congratulations Charlie! You'll see the history of the exam development and how it is being modified to capture today's work environment. You will also notice some new things as well! There is a movie review that may entice you into scheduling some time to relax and watch the movie. Put on your thinking caps and challenge yourself with a crossword puzzle based on 10CFR835.

After more than a year of not being able to meet in person, the Board of Director's and the Panel of Examiner's are cautiously optimistic that we will get to meet in person during the Health Physics Society Annual Meeting being held

Inside This Issue

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in Phoenix, Arizona July 25 – July 29. The Board and Panel is scheduled to meet July 24 – July 27. I would really enjoy meeting and chatting with any of you that make the meeting if it's held! If you have any comments or questions, please send me an email at rickras@lanl.gov or give me a call at (505) 667-7440.

Respectfully,
Rick Rasmussen
NRRPT, Chairman of the Board

Welcome New NRRPT Members

Congratulations to the following individuals who successfully passed the **NRRPT** Examination on August 1, 2020:

Heather Baxter
David A. Cochran
Adam Engel
Curtis M. Ewen
James Harper
Gregory C. Jones
Rigel F. Lochner
Allan Monarres
Travis D. Murrell
Joshua Stong
Edward E. Walton

Congratulations to the following individuals who successfully passed the **NRRPT Canadian** Examination on December 7, 2020:

Adam Kinmond
Christina E. Sekeris
Stacy Shewen
Gavin Spiers

Charles D. (Bama) McKnight Memorial Award

By Kelli Gallion

Congratulations, Charlie Guinn!

Please join me in congratulating Charlie, he is the recipient of the prestigious NRRPT Charles D. (Bama) McKnight Memorial Award. This award is presented to persons who have given outstanding efforts in the radiation protection training field leading to increased knowledge and professionalism among Radiation Protection Technologists (RPTs). Read on to learn more about Charlie's journey and passion for training RPTs.

Charles (Charlie) Guinn, CHP, RRPT
Sandia National Laboratories

Charlie graduated from Midland Technical College in Columbia, SC in 1977 with an Associate Degree in Nuclear Engineering Technology. He began his career as a Health Physics Technician (HPT) at Oconee Nuclear Station in South Carolina. In 1981 he "hit the road" as a contract HPT, working various nuclear power stations in the southeast. In 1987, Charlie began his career as an Instructor at Palo Verde Nuclear Station in Arizona, providing steam generator mock-up training to craft personnel. During his time at Palo Verde, Charlie also taught General Employee Training, Radiological Worker Training, and Health Physics Technician training.

In 1991, Charlie went to work at Savannah River National Laboratory (SRNL) conducting core Radiological Control Technician (RCT) training to newly hired RCTs. Charlie also taught Respiratory Protection to members of the workforce at SRNL. In 1994, Charlie relocated to Sandia National Laboratory, where he, along with other very talented instructors, developed the RCT training. Charlie eventually became the primary Radiological Control Technician instructor for SNL. While at SNL, Charlie has also provided Radiological Control Technician training to members of the Egyptian Atomic Energy Agency. He has also participated in Radiological Emergency Response training worldwide to individuals representing various member states of the International Atomic Energy Agency.

Charlie successfully passed the NRRPT exam in 1991 and in 1998, he became a Certified Health Physicist. He routinely proctors the NRRPT exams and CHP Part II exams in Albuquerque.

On behalf of the NRRPT Board and Panel of Examiners, THANK YOU CHARLIE for your years of passion, dedication, and mentorship to the past, present, and future Radiation Protection professionals.

Sincerely,
Kelli Gallion
RRPT, NRRPT Awards Committee Chairman

Changes to NRRPT® Examination Objectives
Effective June 1, 2020

Changes Effective June 1, 2020

The **NRRPT®** Board of Directors has approved changes to the learning objectives that will be evaluated by the **NRRPT®** Examination. These objectives will replace the existing **NRRPT®** role delineation rubric currently posted on the **NRRPT®** web site (NRRPT.org).

Background –

The original **NRRPT®** Board of Directors and Panel of Examiners assembled a list of tasks performed by Radiation Protection Technologists (RPTs) known as the **NRRPT®** "Content Specification." The list was as complete as it could be for the time; the Board and Panel determined what knowledge was necessary to perform the tasks. These knowledge factors were organized into major categories, which then became the Role Delineation and basis for testing a candidate's knowledge level.

The Role Delineation was reviewed by the Board and Panel from 1985 to 1987 and condensed from its five major categories to the current three categories. The numerous sub-categories were also condensed into the current 18 subcategories and grouped under the three major categories of "Applied Radiation Protection," "Detection and Measurements," and "Fundamentals." The end product was the **NRRPT®**'s Role Delineation.

In 1987 the Board and Panel members decided what percent of the examination should be devoted to each of the three major categories and their respective sub-categories. The percentages were then averaged for each of the major and sub-categories. The resultant averages determined the current exam blueprint. The categories were all assigned a numerical sequence known as a "Rubric" to individually identify it.

New Task Evaluation Process –

Starting in 2016, the **NRRPT®** commenced an updated task evaluation process with the goals of both updating RPT tasks and more clearly communicating to prospective registrants the depth and breadth of knowledge necessary for successfully passing the **NRRPT®** examination.

This process reviewed expected radiation protection knowledge objectives from INPO and DOE as well as representative information from the medical and military fields. These objectives were then combined into new common categories and a new exam blueprint was developed. After significant discussion and review by the **NRRPT®** Board of Directors and Panel of Examiners the new process was approved.

End Result –

The following list of Categories and respective Objectives are now being used for examination development starting with the August 2020 **NRRPT®** examination. As before, there will be a single passing point determined by the **NRRPT®** for each individual examination. Additionally, the process used to develop, grade and score the examination has not changed.

Listing of Knowledge Objectives – LINK

Exam Achievement Award

By Kelli Gallion-Sholler, Awards Committee Chairman

The **NRRPT** Exam Achievement Award is given to the individual with the highest score on each scheduled **NRRPT** examination for becoming a Registered Radiation Protection Technologist. In addition to a letter of recognition, the individual receives a complimentary "high scorer" membership plaque and is featured in an article in the **NRRPT** Newsletter. It is a great accomplishment to pass the exam and even a greater feat to achieve the highest score. Congratulations to our high scorers!

High Scorer—August 12, 2017 Examination

Aaron Karavias

I have a background in physics and education. At the time, I worked for a public shipyard, Norfolk Naval Shipyard. I now work for Dominion Energy at the Surry Power Station.

The studying I did for the NRRPT helped develop me as a professional and helped me progress in my career.

I did an extensive amount of studying.

Over the course of three years, I did the following:

- Took any training offered by work
- Created study aids for various topics. Often, I find teaching a topic is the best way to deepen your learning.
- Took two, once a week for 16 weeks, NRRPT specific courses taught by co-workers.
- Took two, one week long, NRRPT focused courses. They included many practice problems and several practice tests.
- One was taught by Dr. Thomas Johnson. He is an extremely valuable contact who takes pride in helping his students excel.

The other was taught by Tidewater.

Read and practiced some problems from several texts including:

Cember and Johnson	Knoll
Gollnick	Turner
	Bevelacqua

Answered weekly questions from a mailing list at work.

Lead a weekly study group at work.

Used practice software.

Practiced any free questions I could find online.

Some questions and answers I could find were out of date as regulations had changed. So it was very important to verify the answers to any regulatory question was still accurate.

My goal was to be able to answer practice problems in half the time allotted by the exam. Despite reaching this goal, I worked the exam for the entire time allowed.

Since the test covers such a large breadth of material, the most useful self study was working a few problems from each chapter (or resource). For instance, if a book had 10 chapters, I would work 3 randomly chosen problems from each chapter.

Afterwards, I would look at the problems I got wrong and try to identify which topic I was weakest on. I would then study that topic and repeat the process.

Working a broad selection of problems meant I would sometimes be working questions I hadn't studied at all. This was ok because it allowed me to document what I didn't know yet. I would write what I thought I knew (which was nothing sometimes) and move on.

For me, working straight through a chapter and working all the problems would have been harder and slower.

The most useful study aid was practice tests.

The most useful course was Thomas E. Johnson.

Weekly group study was helpful to keep me dedicated/motivated/accountable.

The exam was challenging. I know I missed additional questions from test fatigue. The full length practice tests helped with this.

I have found many helpful professionals just by reaching out (cold calling). If I was stuck on something, I'd email a few people, even if I'd never talked to them before. Of course, not everyone would respond or help, but I found many professionals (both inside and outside my company) who were happy to share what they knew.

High Scorer—February 24, 2018 Examination

Hereld Stuart

I have been working in radiation safety for the past 28 years at the GE-Hitachi Vallecitos Nuclear Center near Pleasanton, California. One of the requirements for attaining my BS degree in Radiation Protection and Health Physics from Thomas Edison State University was to be certified NRRPT. Due to time restraints, I could not afford to fail the NRRPT exam.

I reviewed Gollnick's text from cover to cover, and referred to those of Cember and Turner to go deeper into certain subjects. Since I commute four hours per day, I listened to Gollnick's audio CD's several times. Drs. Waite and Mayberry's Problem Solving guide was a great help as well. Another excellent resource is the set of online NRC Health Physics guides. I also spent much time studying applicable Nuclear Regulatory Commission (NRC) regulations. As a final insurance measure, I attended Nevada Technical Associates (NTA) NRRPT review course.

High Scorer—August 3, 2019 Examination

David Baker

I'm a Health Physicist currently working at Norfolk Naval Shipyard (NNSY). I graduated with my B.S. in Health Physics from Bloomsburg University. My current position is as an Instructor for the Radiological Controls Technician Qualification School (RCTQS).

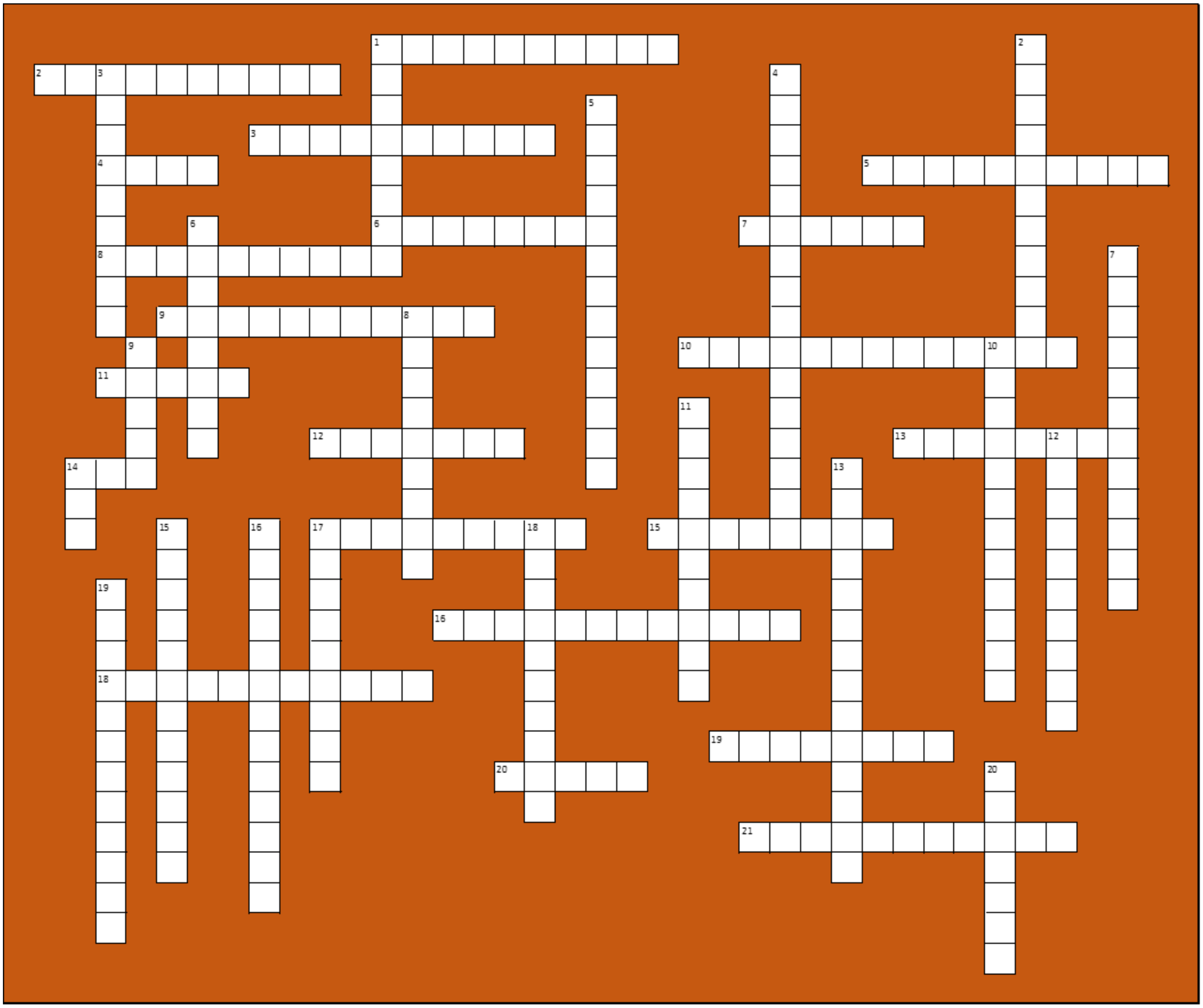
As far preparation goes, NNSY has been very supportive of NRRPT Qualifications. Starting in March each year currently qualified NRRPT members at NNSY have put together a 15 Week NRRPT Prep course. Those wanting to take the NRRPT exam, can attend a lecture each week. Each week covers a chapter in "Basic Radiation Protection Technology" - Gollnick. These lectures are taught by current NRRPT members from various roles at NNSY. In addition to this I used a NRRPT Practice Question Quiz Bank application and supported this with using references:

- Introduction to Health Physics - Cember
- Radiation Detection and Measurement - Knoll
- The long list of CFRs
- Internet resources.

The week prior to the exam, NNSY provided a 1 week crash course with the Contractor Tidewater Inc. in which we went through their provided training material and practice exams.

Crossword Puzzle

How Well Do You Know 10 CFR 835?



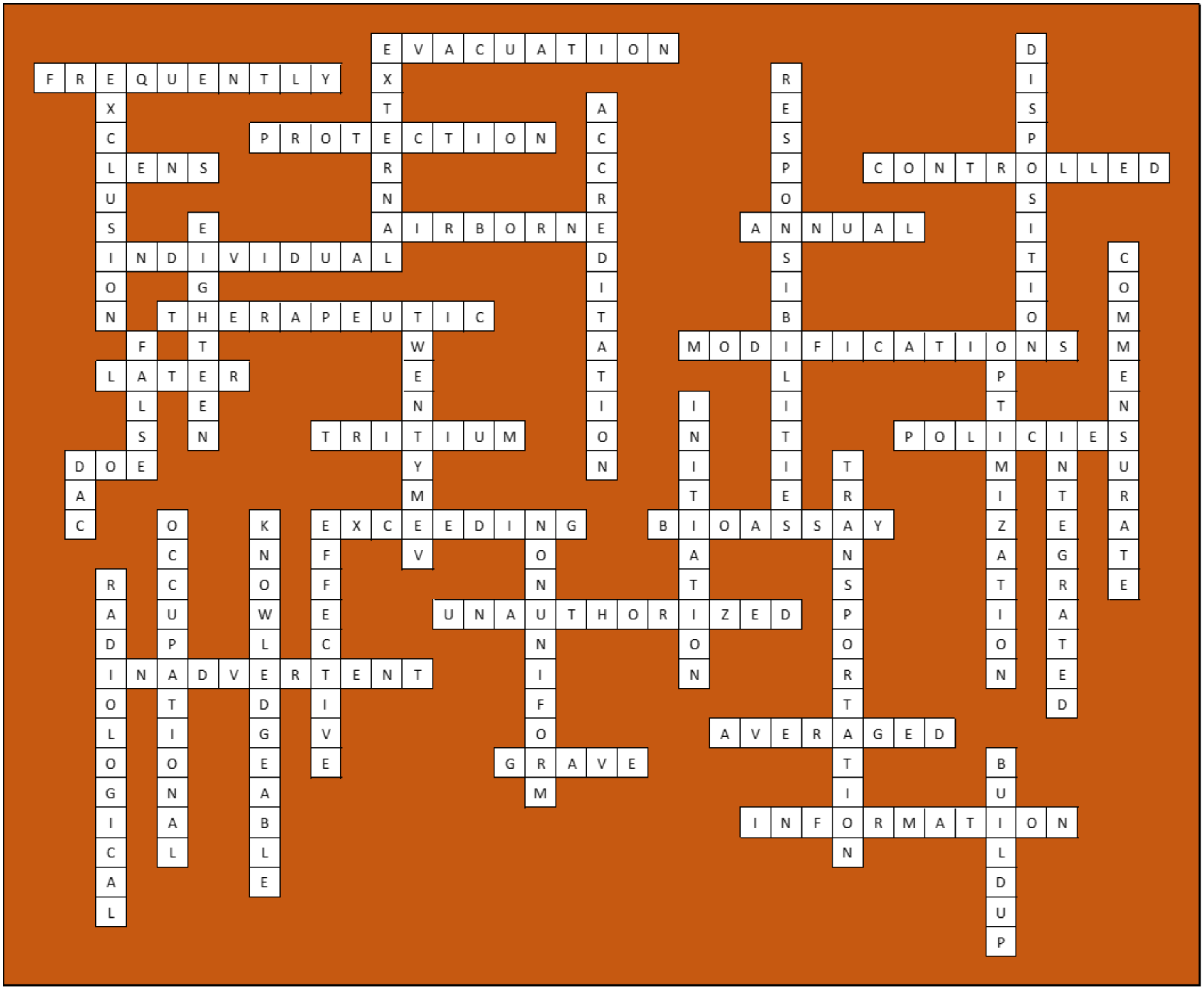
	Across
1	No control(s) shall be installed at any radiological area exit that would prevent rapid ________ of personnel under emergency conditions.
2	Internal audits of the RPP, shall be conducted no less ________ than every 36 months.
3	§835.101 states A DOE activity shall be conducted in compliance with a documented radiation ________ program (RPP) as approved by the DOE.
4	15 rems is the limit for an equivalent dose to the _____ of the eye.
5	Members of the public entering a ________ area likely to receive a dose in excess of 50 percent of the limit at §835.208 in a year from external sources shall be provided personnel dosimeters.
6	Real-time air monitoring shall be performed as necessary to detect and provide warning of _______ radioactivity concentrations that warrant immediate action to terminate inhalation of airborne radioactive material.
7	Each DOE or DOE-contractor-operated site or facility shall, on an _______ basis, provide a radiation dose report to each individual monitored during the year at that site or facility in accordance with §835.402.
8	________ means any human being
9	Doses from background, ________, and diagnostic medical radiation, and participation as a subject in medical research programs shall not be included in dose records.
10	The DOE may direct or make ______ to a RPP.
11	The monitoring required upon receipt of externally transported radioactive material shall be completed as soon as practicable following receipt of the package, but not ______ than 8 hours after the beginning of the working day following receipt of the package.
12	STC is an abbreviation for Special ________ compound.
13	Radiation safety training shall be provided to individuals when there is a significant change to radiation protection _______ and procedures that may affect the individual and at intervals not to exceed 24 months.
14	The rules in this part (§835) establish radiation protection standards, limits, and program requirements for protecting individuals from ionizing radiation resulting from the conduct of _____ activities.

	Down
1	The total effective dose during a year shall be determined by summing the effective dose from ________ exposures and the committed effective dose from intakes during the year.
2	Unless otherwise specified in this subpart (H), records shall be retained until final _________ is authorized by DOE.
3	Activities that are regulated through a license by the Nuclear Regulatory Commission or a State under an Agreement with the Nuclear Regulatory commission are an example of this 835.1 provision.
4	Radiation safety training shall include Individual ________ for implementing ALARA measures
5	External dose monitoring programs shall be accredited, or excepted from ________, in accordance with the DOE Laboratory Accreditation Program for Personnel Dosimetry.
6	A minor means an individual less than ________ years of age.
7	The degree of radiological area entry control shall be ________ with existing and potential radiological hazards within the area.
8	Neutrons greater than this energy have a Radiation Weighting Factor of 5.
9	True or false; planned special exposures are included when demonstrating compliance with occupational dose limits established for general employees.
10	During the design or modification of facilities, _________ methods shall be used to assure that occupational exposure is maintained ALARA in developing and justifying facility design and physical controls.
11	An update of the RPP shall be submitted to DOE prior to the _________ of a task not within the scope of the RPP.
12	In high and very high radiation areas each individual shall be monitored by a means capable of providing an immediate estimate of the individual's ________ equivalent dose to the whole body during the entry.
13	Upon receipt of radioactive material _________ packages, external surfaces of packages known to contain radioactive material shall be monitored if the package has been transported as low specific activity material on an exclusive use vehicle.

	Across
15	The estimation of internal dose shall be based on _______ data rather than air concentration values unless air concentration values are demonstrated to be as or more accurate.
16	A physical controls feature at an entrance or access point to a high radiation area can be continuous direct or electronic surveillance that is capable of preventing _______ entry.
17	An individual shall not receive a planned special exposure that would result in a dose _______ five times the numerical values of the dose limits established at §835.202(a) over the individual's lifetime
18	Appropriate controls shall be maintained and verified which prevent the _________ transfer of removable contamination to locations outside of radiological areas under normal operating conditions.
19	When an area of skin irradiated by a non-uniform dose is less than 10 cm2, the non-uniform equivalent dose shall be _______ over the 1 square cm of skin receiving the maximum dose.
20	The words "_______ Danger, Very High Radiation Area" shall be posted at each very high radiation area.
21	A radioactive material container label shall also provide sufficient _________ to permit individuals handling, using, or working in the vicinity of the items or containers to take precautions to avoid or control exposures.

	Down
14	The assumed working year breathing volume for an average worker when calculating a _____ is 2400 cubic meters.
15	The equivalent dose limit for the embryo/fetus from ________ exposure of a declared pregnant worker, is 0.5 rem (0.005 Sv).
16	Areas may be excepted from the posting requirements of §835.603 for periods of less than 8 continuous hours when placed under continuous observation and control of an individual ________ of, and empowered to implement, required access and exposure control measures.
17	Individuals who enter only controlled areas without entering radiological areas or radioactive material areas are not expected to receive a total _______ dose of more than 0.1 rem (0.001 sievert) in a year.
18	Part 835.205 covers the determination of compliance for _______ exposure of the skin.
19	§835.4, _______ units; states that the SI units, becquerel (Bq), gray (Gy), and sievert (Sv), may be provided parenthetically for reference with scientific standards.
20	The monitoring of individuals and areas shall be performed to detect the gradual _______ of radioactive materials.

Answer Key


EVACUATION
FREQUENTLY
PROTECTION
LENS
CONTROLLED
AIRBORNE
ANNUAL
INDIVIDUAL
THERAPEUTIC
MODIFICATIONS
LATER
TRITIUM
POLICIES
DOE
EXCEEDING
BIOASSAY
UNAUTHORIZED
INADVERTENT
AVERAGED
GRAVE
INFORMATION
EXTERNAL
DISPOSITION
RESPONSIBILITIES
ACCREDITATION
EXCLUSION
EIGHTEEN
COMMENSURATE
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OPTIMIZATION
INITIATION
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TRANSPORTATION
DAC
OCCUPATIONAL
KNOWLEDGEABLE
EFFECTIVE
NONUNIFORM
RADIOLOGICAL
BUILDUP

X rays at 125 Years: The Story of a Serendipitous Discovery Through Diligent Development

***Wilhelm Conrad Röntgen, Discoverer of X Rays,* and**

William David Coolidge, Inventor of the Modern X-Ray Tube

By David J. Allard, CHP, RRPT, FHPS

Summary –

As with most major discoveries, there are incremental observations and often theoretical analyses that lead to a final momentous breakthrough. This was not the case with the discovery of X rays 125 years ago this year. In fact, a serendipitous discovery by Wilhelm Conrad Röntgen of immense consequence actually occurred during a repeat of another's experiment. On about November 8, 1895, Röntgen was examining the range of cathode rays (electrons) in air from a modified Crookes tube. He was applying very high voltage to a discharge tube that had a window to allow the cathode rays to exit into the surrounding air. Röntgen was using a paper screen coated with barium-platinum cyanide that would fluoresce when the rays interacted with the screen. Depending on their energy, the range of cathode rays in air will vary up to a few centimeters. To prevent interference from the low-level light from the tube, he covered it. As his research proceeded, he noticed the screen would glow up to 2 meters from the tube. As a brilliant experimental physicist, he fully evaluated his observation before announcing it. He named these invisible rays '*X rays'* as they were hitherto unknown, and published a paper in late December 1895 entitled "*A New Kind of Rays."* In this paper he presented the vast majority of the properties of X rays. These properties included: they radiated from a point on the tube's glass wall being struck by the cathode rays; their ability to penetrate paper, a 1,000 page book, glass, flesh, and various metals of differing thickness; their ability to penetrate matter was a function of the induction coil spark gap; the inability to refract in water, a prism, or mica; no marked reflection was found with any substance examined; and, the intensity of the X rays varied by the inverse square of distance. But as an avid photographer, Röntgen noted they darkened photographic plates as well. So during the course of his investigations he produced images of the barrel of a shotgun, other inanimate objects, and his wife's hand on photographic plates. It was this aspect of X rays that quickly led to their use in medicine, in particular, the imaging broken bones and finding foreign bodies (e.g., bullets). However, after his initial investigations, Röntgen did little more research with X rays. Röntgen was given many awards for his discovery, including the first Nobel Prize in Physics in 1901. However, the cold cathode tubes employed for medical imaging were very inefficient in X ray production, unstable, unable to penetrate thick body areas, and took a significant period of time to produce an image on a plate. Those limitations were overcome by William David Coolidge (1873-1975), who was a physicist, chemist, research scientist, and inventor of the modern X-ray tube. Besides Röntgen, with his 1895 discovery and subsequent studies of X-rays, perhaps no other individual contributed more to the advancement of X-ray technology than did Coolidge. The majority of this presentation will be about Coolidge's life and work as an industrial physicist.

William D. Coolidge was born in Hudson, MA and received his Bachelor of Science degree from MIT in 1896. That same year he went to Europe to study under renowned physicists of the time. Coolidge received his Ph.D. *summa cum laude* from the University of Leipzig in 1899 and soon after joined the staff of MIT. While studying at Leipzig, he met Roentgen. In 1905 he was asked to join the newly established General Electric Research Laboratory in Schenectady, NY. He promptly began fundamental work on the production of ductile tungsten filaments as a replacement for fragile carbon filaments used in incandescent light bulbs. This improved light bulb was brought to market by GE in 1911. It was the subsequent application of his tungsten work that led Coolidge to his studies in X ray production. Circa 1910, the state-of-the-art X-ray tube was a "gas tube" or "cold cathode" type tube. These crude X-ray tubes relied on residual gas molecules as a source of electrons for bombardment of low to medium atomic number metal targets. In 1912 Coolidge described the use of tungsten as an improved anode target material for X-ray production. Shortly after in 1913 he published a paper in Physical Review describing *"A Powerful Roentgen Ray Tube With a Pure Electron Discharge."* This tube used a tungsten filament as a thermionic source of electrons under high vacuum to bombard a tungsten anode target. Great improvements in X-ray tube stability, output and performance were obtained with the "hot cathode" or "Coolidge tube." With some variation in filament and target geometry, this (over) 100 year old invention is the same basic X-ray tube used today in medicine, research and industry. In 1932 Coolidge became Director of the GE Laboratory, then in 1940 Vice-President and Director of Research. Coolidge lived to be over 100 years old, he had 83 patents to his credit, numerous awards and honorary degrees, and in 1975 was elected to the National Inventor's Hall of Fame. At the time he was the only inventor to receive this honor during his lifetime. Dr. Coolidge was also the first recipient of the American Association of Physicists in Medicine's highest science award - named in his honor. From interview notes with Coolidge's son Lawrence in the mid-1990s, previous biographies, publications, books, GE literature, historic photographs, an 1874 stereo-view card with the 1-year old "Willie Coolidge," and other artifacts in the authors' collection, this presentation will review Dr. Coolidge's amazing life, work, accomplishments and awards. There will also be a brief review of the many current applications of X rays in medicine, research and industry.

David Allard
Email: allradcon@comcast.net
Hosted by the College of Physicians on November 11, 2020
YouTube link - https://www.youtube.com/watch?v=AYvGnRUHJq0&feature=youtu.be

NRRPT Blast from the Past!

Good evening Mr. and Ms. NRRPT, from border to border and coast to coast and all the ships at sea. Let's go back in time…

<u>The Date:</u> November 13, 1965

<u>The Event:</u> Uranium dioxide powder accumulation into a pump reservoir causing a criticality accident.

<u>The Place:</u> Elektrostal Fuel Fabrication Plant (also called Zatish'e until 1938) in the Soviet Union under jurisdiction of Moscow Oblast about 58 kilometers east of Moscow.

<u>The Cause:</u> Maintenance and lack of instrumentation.

<u>The Setup:</u> The plant was using a uranium dioxide unloading machine as part of the systems used to convert UF6 to UO2 powder. To improve system efficiency, the equipment used a vacuum system with 2 in-line filters and a vacuum water pump.

<u>The Accident:</u> Not much to tell. The alarm sounded and staff evacuated. Multiple criticalities occurred (number unknown). Later investigations revealed that both filters had holes and some of the UO2 had built-up in the water reservoir of the pump. There was 157 kilograms of slurry removed after the accident. The uranium was enriched to 6.5% and weighed 51 kilograms.

<u>The Aftermath:</u> One of the criticalities had about 10^{15} fissions. One operator received 3.5 rad. The plant dismantled the uranium dioxide unloading machine.

Pete Darnell, RRPT, CHP, after-the-fact reporter

RAD MOVIE REVIEWS!

Imagine an alternate 1985, the world is unhinged. Nuclear war looms between America and Russia. But wait a minute! We have superheroes in tights to save the day. Thanks to the Watchmen - got to love their costumes in this flick.

Nevertheless, our superheroes are out of work because of the government's Keene Act. That is until the first death of the movie, The Comedian (Jeffrey Dean Morgan), an ex-hero commando falls out a window. Most of the Watchmen (formed from a group called the Minutemen – you have to be quick to follow along) don't have super powers. Unless, of course, you like tights and garters.

What does this have to do with a Rad Review? Two of the characters, Rorschach (Jackie Earle Haley) and Dr. Manhattan (Billy Crudup) DO HAVE SUPER POWERS! Rorschach can drive you nuts with his fancy mask and Dr. Manhattan is the reconstructed nightmare of a quantum mechanics experiment screw up, Dr. Manhattan is born after his "intrinsic field" is removed and he somehow rebuilds himself as a glowing blue meta -god. Think Mr. Spock without all the laughs.

Note the symbol for hydrogen on his forehead—great tattoo for a meta-god, huh?

Dr. M can do it all – no need to breathe air, can control radiation and manipulate time and space without breaking a sweat, and still get the girl in garters. He even populates Mars for a while in the movie. Just think what the world would become if this could happen to all rad techs!

Anyway, the movie is something to kill an evening after work. Special effects are good. If you can just overlook that this movie is a rehash of the graphic novel and it's very political; you'll get a kick out of Dr. Manhattan's mastery of radiation, that's for sure.

Peter Darnell, RRPT, CHP, amateur move critic

NRRPT Blast from the Past!

Good evening Mr. and Ms. NRRPT, from border to border and coast to coast and all the ships at sea. Let's go back in time…

The Date: August 14, 1961

The Event: Enriched uranium hexafluoride leak into an oil vessel causing a criticality accident.

The Place: Siberian Chemical Combine in the Soviet Union, originally known as Tomsk-7, now known as Severesk.

The Cause: Failure to follow process parameters, lack of sufficient cooling, temperature control devices inoperable, and a tank was bypassed.

The Setup: Seversk is an experimental facility that condensed and evaporated uranium hexafluoride. They purified uranium hexafluoride to an enrichment of 22.6%. The system being used consisted of a main cylinder cooled by liquid nitrogen (to condense gaseous UF6) and associated tanks. A tank and a pump with a cylindrical 60-liter oil vessel was part of the system.

The Accident: Some of the uranium hexafluoride leaked through the pump into the oil vessel. The uranium concentration rose to about 400 grams per liter. The yield was small – about 5×10^{15} fissions. Even so, the alarm system activated and the staff evacuated. But, they used portable gamma-dosimeters to check the area. They did not confirm a nuclear criticality accident. So, everyone thought it was a false alarm and the plant was restarted about 3 hours later. You guessed it, a 2nd criticality with about the same yield.

The Aftermath: The operator (who was a little shy of 2 feet from the pump) received 200 rad. Investigation revealed that higher temperature from lack of cooling and ejection of the oil reduced reactivity of the solution. Later calculations estimated the total fissions of 10^{16}. The facility was redesigned and rebuilt. Just in time for their next accident. Until the next article…

Pete Darnell, RRPT, CHP, after-the-fact reporter

If you'd like to join the Panel of Examiners please contact one of the following:

Exam Panel Chairman—Dave Wirkus—wirkdl63@gmail.com

Executive Secretary—DeeDee McNeill—nrrpt@nrrpt.org

Titanium Sponsor!

Thank You Envirachem!

Envirachem

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We provide a full complement of services but if you require a service not found on our site, or require additional information, please email us at sales@envirachem.com

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Detroit Edison operates the Fermi 2 Nuclear Power Plant located in Monroe, MI along the shores of Lake Erie. Fermi is a 1200 MW power plant supplying electricity to the metropolitan Detroit area.

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