NRRPT® NEWS

National Registry of Radiation Protection Technologists

Fall 2007 Edition

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INSIDE THIS ISSUE

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Chairman's Message

Kelli Gallion

It is with a heavy heart that I inform you that on August 18, 2007 we lost colleague and friend, Steve Carr of Frham Safety. Steve died of an apparent heart attack while out on a challenging bike ride. Steve was a strong supporter and provided significant contributions to the Registry.

Steve was very outgoing with a positive attitude, he loved life and he loved people. Steve was always the life of the party, with the "party" simply being "life". He truly enjoyed living and having fun.

Steve leaves behind his parents, wife, stepson, and daughter, all of whom he was extremely proud.

In Memory of Steve:
Trip McGarity: "Steve can never be replaced, and we will miss him dearly, but his positive, fun loving attitude will resonate through us always."

David Miller: "Steve was a strong supporter of the ISOE ALARA Symposium since its inception in 1997. His contributions to radiological safety are many and will be missed."

Bob Wills: "Steve was an outstanding supporter of nuclear power and the NRRPT (he had a heart of gold)."

I will forever remember Steve with his smile and his fun, kind-hearted, high-spirited personality. Steve has touched many lives and will be missed by his "Nuclear Family".

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Meeting Reminder: The next Board and Panel Mid-Year meeting will be held in conjunction with the ISOE North American ALARA Symposium/EPRI Radiation Protection Conference January 14-16, 2008 in Ft Lauderdale, Fl. For more information please visit our website at NRRPT@NRRPT.ORG. Remember, all members are invited to attend the NRRPT Board of Directors meeting held Saturday January 12th and Tuesday January 15th.

Congratulations to our newest members who successfully passed the exam on August 11th! See below for listing.

May all the blessings of life be yours in abundance. Hope you all had a wonderful Thanksgiving holiday!!

Thank you all for your continued support of the Registry.

Sincerely,
Kelli Gallion
NRRPT, Chairman of the Board

Welcome New Members

Congratulations to the following individuals who successfully passed the NRRPT August 11, 2007 examination:

Robert E. Bishop
Randy L. Blasa
Peter F. Blount
Diana A. Brock
Mark S. Chambers
Martin W. Connelly
Edward B. Erwin
Michael L. Gasink
John T. Giblin
Michael W. Griffith
Kenneth R. Harding
Lea M. Hendrickson
Heather A. Hubble
Jeffrey T. Jennelle
Christopher E. Kuches
Robert J. LaSalle
Sean C. McLane
Frank L. Moran
Darrel C. Pack
Larry E. Reeder
Christian J. Roberts
Anthony W. Ruckel
Brock A. Scott
Lance M. Scott
Randolph L. Smith
Paul A. Stokely
Richard E. Teague
Richard D. Van Hoorebeck
David A. Wanslee
Glen R. Watson
Alan J. Zelie

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.

Continuing Education Courses

(to be provided by the NRRPT)

At the 2008 North American ALARA Symposium/EPRI Radiation Protection Conference (January 14-16, 2008, Fort Lauderdale Marriott North), the NRRPT will provide three Continuing Education courses for your enrichment.

A Straight-Forward Approach to Radioactive Material Shipping

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 presentation.

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.

This session will address:

- Properly identify the material to be shipped
- Properly classify a package containing radioactive material
- Properly label and mark a radioactive materials package for shipment
- Properly prepare shipping documentation

Dwaine Brown, Lead Radiation Safety Officer for Halliburton Energy Services will present this session.

Laboratory Quality Requirements for NRC Licensees

This course will address the requirements of the NRC regarding waste characterization for final status survey support in license termination. The requirements of NRC Reg Guide 4.15 (Environmental Monitoring Programs), MARLAP (what it is) and will look into MARSSIM and how it effects survey requirements.

Robert Wills, Manager of Nuclear Industry Programs at General Engineering Laboratories will present this session.

Continued on page 7

A General Review of X-Ray Equipment

By Augustinus Ong, Dartmouth College

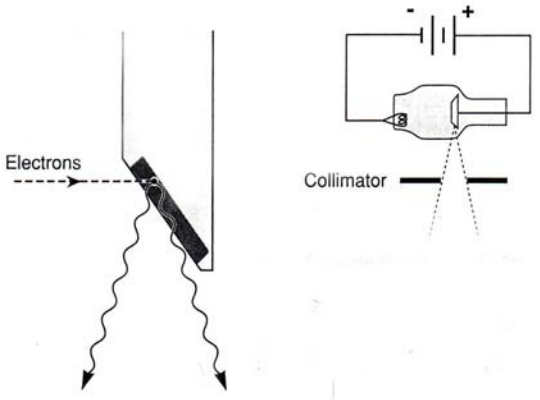
Let's reacquaint and remind ourselves how an x-ray system works. Most x-ray equipment have three principal sections: the operating control panel, the high-voltage generator, and the x-ray tube. The operating control panel consists of a power switch and controls for x-ray photon energy in kVp (kilovoltage peak) setting, tube current in mA (milliampere) unit, and exposure timer. The high-voltage generator provides electrical power to the x-ray tube. The energized x-ray tube is the source for the x-ray production. With a constant kVp and a mA current across the x-ray tube, this energy conversion occurs at the rate of

Power (Watts) = kVp X mA

For example, technical settings of 100 kVp and 50 mA will yield an energy conversion at rate of 5000 watts. But as we soon see, most of the kinetic energy of the electron beam is wasted in heating the anode.

Once a kVp setting is selected, a high electrical potential is set up across the cathode and the anode of the x-ray tube; for example, at 100 kVp setting on the control panel, there is a 100 kV across the x-ray tube. The cathode (negatively charged) consists of either a single or dual filaments (note that for the latter, only one filament can be active at a given exposure). The heated tungsten filament give rise to electrons that are boiled off from it via the thermionic process: Electrons are boiled off due to the high current flowing through the resistive filament. As the filament current increases (i.e., increasing the mA setting on the control panel), more electrons boil off proportionally. (It is important to distinguish between filament current and the mA current across the electrodes of the x-ray tube; they are entirely different current measurements.) The anode (positively charged) can either be a fixed or a rotating angle anode; typically the metal of choice for a general diagnostic x-ray unit is tungsten (high Z material, high heat conductivity, and high melting point).

"The following illustrations show a fixed-angle anode (left) and a rotating anode housed in its evacuated glass tube (right):



Because of the high electrical potential across the x-ray tube, those free electrons from the hot filament accelerate across the vacuum x-ray tube and then impact on the anode; in the process, some of the kinetic energies of those electrons are converted into x-ray beam energy and the rest are converted into heat.

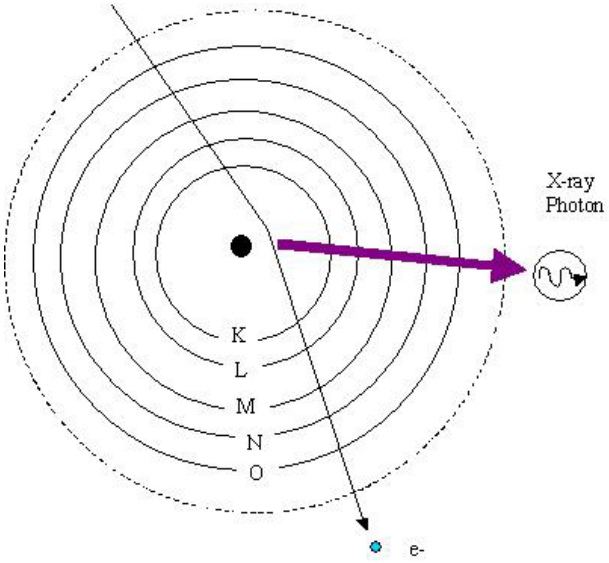
The efficiency of most modern x-ray equipment is approximately 1%, i.e., a full 99% of the kinetic energies of those electrons are converted into heat and only the residual 1% is converted into x-ray photons. The efficiency can be empirically approximated by

Efficiency = 10**(-6) X Z X kVp

where, Z is the atomic number of the target atoms and kVp is the voltage across the x-ray tube. For example, if Z = 74 (tungsten anode) and with a 90 kVp setting, the efficiency of an x-ray tube is only 0.7%. And of this 0.7%, only a fraction of it that emerges as a beam through the port window is useful for imaging purposes; the remaining x-ray photons are absorbed by the lead-lined tube housing.

X-ray photons are produced when high-speed electrons decelerate within the atoms of the anode. This x-ray radiation is called the bremsstrahlung radiation or "braking" radiation.

The following illustration shows an electron decelerating near the nucleus of an atom and giving rise to an x-ray photon as a result of that interaction:

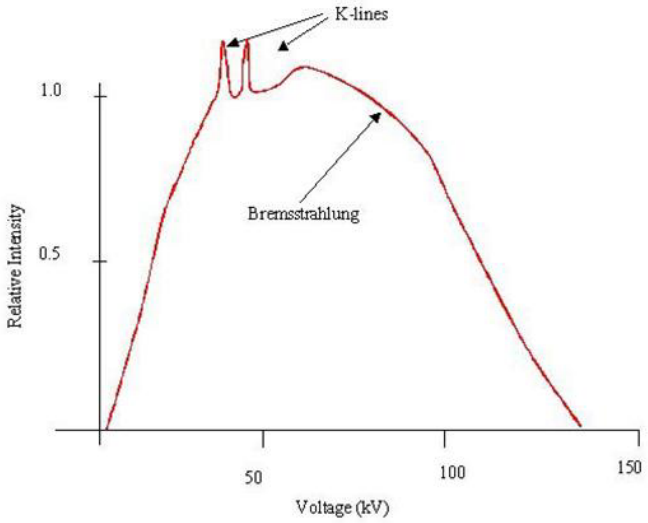


The energy of an x-ray photon is dependent on the severity of the electron deceleration. Therefore, the resultant x-ray photon energies can range from very low energies (minor deceleration) to the maximum energy (severe deceleration) as limited by the kVp setting. The balance of the initial kinetic energy remains with the decelerated electron. The energy equation for this interaction is

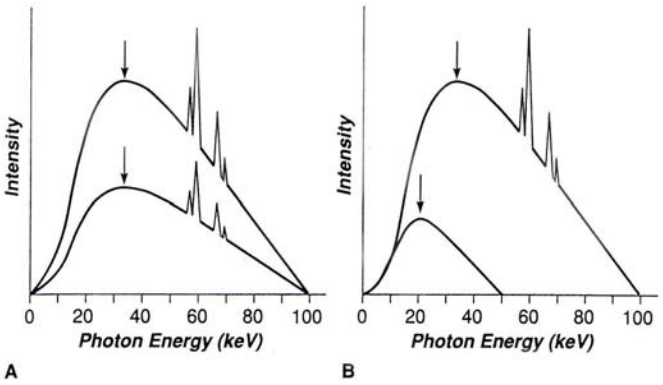
Electron kinetic energy (initial) = Electron kinetic energy (final) + x-ray photon energy

In addition to producing bremsstrahlung radiation, energetic electrons can also knock out inner orbital electrons to produce characteristic x-ray photon cascade of discrete energies.

The following illustration consists of the bremsstrahlung spectrum superimposed by the characteristic x-rays (k-lines from the outer orbital electrons filling in the k shell vacancies):



If the target anode is made of tungsten, then the rightmost k characteristic x-ray line of the above plot will be at 69.5 kV (i.e., the binding energy for the k-shell electrons). Let's examine the next two figures below. If the kVp remains constant but the mA setting is now reduced by 50%, then the only major change in the above plot will be the reduction of the Intensity by 50% (Fig. A). If the mA setting remains constant but the kVp setting is now changed, then not only does the amplitude of the intensity change but so does the leading right tail of the curve as delimited by the set kVp (Fig. B). The differences in technical settings are illustrated below:



In conclusion, x-ray equipment are simply devices that convert energetic electron beams into a useful x-ray beams, but with the concomitant production of heat. It is the heat that eventually causes pitting and roughening of the anode surface, thus destroying the usefulness of the x-ray tube.

Problems:

(1) The penetrability of an x-ray beam through a mass is dependent on which of the following technical settings?

a. mA
b. exposure time
c. kVp
d. filament current

(2) The intensity of an x-ray beam through a mass is dependent on which of the following technical settings?

a. mA only
b. exposure time
c. kVp only
d. mA and kVp

(3) The high current through the filament causes

a. thermionic emission.
b. bremsstrahlung radiation at the filament.
c. characteristic x-ray emission at the filament.
d. electron beam production at the anode.

(4) The maximum x-ray photon energy is dictated by

a. mA
b. exposure time
c. kVp
d. filament current

(5) The efficiency of x-ray production is directly proportional to which of the following:

a. atomic mass of the anode material
b. filament current
c. atomic number of the anode material
d. x-ray tube current

Answers: (1) c; (2) d; (3) a; (4) c; (5) c

*** Attention CHPs ***

We would like to include your CHP designation in the 2008 NRRPT Handbook! Please let the Executive Secretary know you are a Certified Health Physicist. Next year there will be a box to mark on the annual sustaining form.

Email to: NRRPT@NRRPT.org

Continued from page 3

Basic Whole Body Counting and Internal Dosimetry for the HP Technician

This course will cover the basics of a whole body counter program and then will go into the basics of internal dosimetry. A Stand-up type whole body counter will be briefly described; the artifacts that are found in a typical whole body counter spectrum and errors associated with the spectra. Inputs into Internal dosimetry calculations will be outlined (no calculations will be performed) and the uses/misuses of the same. The use of Transuranics and Hard-to-Detect radionuclides will also be covered. Human relations as it applies to internal dose and body counting will also be discussed.

Tim Kirkham, Health Physicist and Program Manager for ENSR Corporation will present this session.

Each course costs $40.00 if advanced registration is received prior to January 4, 2008. After that time the cost will be $50.00. Questions about each course should be directed to:

Tim Kirkham
ENSR Corporation
317-735-3005

Send Registration to:

NRRPT
P.O. Box 6974
Kennewick, WA 99336
509-582-3500

Name:_____Company/Affiliation:_____

Street Address:_____

City:_____ State:_____ Zip:_____

Phone:_____

Session #1 _____ Session #2 _____ Session #3 _____

Total cost $_____ (to pay by credit card, please call the NRRPT office)

Nuclear Suppliers Association

A Worthy Organization!

Board Members and Executive Administrator (left to right):
Benji McWaters, *the late* Steve Carr, Rosann Travis, Jim Kost, DeeDee McNeill, Rich Palatine and Jimmy Orr

Last July, the Nuclear Suppliers Association (NSA) attended the NEI Health Physics Information Forum meeting in Bonita Springs, FL. Rosann Travis, NSA's Executive Administrator, coordinated the exhibit space, exhibitor registration, exhibit receptions and luncheons. The NSA also provided a highly anticipated golf outing to individuals attending the meeting. This is one of many conferences the NSA has successfully coordinated.

NSA is a non-profit organization that is governed by member-company representatives who are elected by ballots cast by all the voting members or their alternates. (Each member company designates its own voting member and an alternate.)

The NSA's founding purpose was to interface with electric utility groups in charge of their various nationally and regionally held conferences and to centralize and coordinate renting and distribution of vendor exhibit space. NSA expanded that role to include coordination of vendor-supported social events and to penetrate other market segments such as U.S. Department of Energy and decommissioning projects.

The NSA has long been an avid supporter of the NRRPT and NRRPT activities. Many of the membership within the NSA have donated equipment and material to training programs such as the Linn State Technical College Nuclear Technology program.

The current President and Vice President are Jimmy Orr and Paul Lovendale, respectively. Paul is a past Chairman of the NRRPT Board of Directors. The NRRPT's own DeeDee McNeill is on the NSA Board. The current slate of NSA officers and board members can be found on the website.

The NSA will be coordinating the upcoming meeting listed below. You must be an NSA member to exhibit at these well attended meetings.

1. NEI Health Physics Task Form Meeting at the Keystone Resort & Conference Center in Keystone, CO, August 18-20, 2008.

NSA meetings and membership information is available on their website at: www.nuclearsuppliers.org. Please support the Nuclear Suppliers Association by joining today!

Editor's Note:
As mentioned in the Chairperson's message, the NRRPT and NSA lost a friend, partner and supporter in August. Steve Carr, NSA Secretary, passed away on August 18, 2007. In 2005, Steve was presented the Arthur F. Humm Jr. award for his continued support of the NRRPT for over 10 years.

On a personal note, Steve was a great business partner and a great friend of mine. In business, he was always on the other end of the phone ready to design, build or supply whatever I might need at the time. As a friend, he would give the shirt off of his back if you needed it. I, for one, will miss him greatly as he has left a lasting impression on me and my family. He knew only one way to live, to the fullest extent possible and his positive attitude and demeanor was invigorating. When I think of Steve, I am reminded of this quote:

"I do not want to get to the end of my life and find that I just lived the length of it. I want to have lived the width of it as well."
-Diane Ackerman

If you wish to help Steve's family during this difficult time, Frham Safety Products, Inc. with the help of Wilson Bank and Trust has set up a memorial fund to benefit the family.

Your donations can be made in the following ways:

By Check Payable to - "Steve Carr Memorial Fund", in care of Wilson Bank & Trust, Attn: Gary Whitaker, P.O. Box 763, Lebanon, TN 37088 or mail to the NRRPT Office, P.O. Box 6974, Kennewick, WA 99336 (payable to Steve Carr Memorial Fund)

By Wire - Wilson Bank & Trust, 623 West Main Street, Lebanon, TN 37087, ABA# 064103529,
Credit Account - Steve Carr Memorial Fund, 623 West Main Street, Lebanon, TN 37087, Acct# 07270473, Contact: Gary Whitaker

You Are Cordially Invited!

NRRPT Board & Panel Meetings
January 12 - 15, 2008
Ft. Lauderdale, FL
North Marriott Hotel

** All NRRPT members are welcome and encouraged to attend **

2008 Sustaining Dues

The 2008 sustaining notice was mailed the end of September. If you haven't paid your 2008 annual dues, please submit to the Executive Secretary's office as soon as possible!

More Musings of an Old RPT

By Maynard Wright
mrw-ss@juno.com

What to do? What to do? What to do?

In an earlier issue of the Newsletter, I believe that the current Chairman, Kelli Gallion, suggested that RRPTs offer their expertise to the various agencies or groups who might need such expertise but might not know where or how to obtain it. Primarily, these agencies may be the local EMAs (Emergency Management Agencies), police, fire departments or transportation agencies.

Many of us that are retired from active RPT work, are still in good health, and lead an active lifestyle could well fill this role of providing aid and assistance to these agencies. I therefore strongly agree with the intent of the previously mentioned article and suggest that we, the active retirees, take the steps necessary to offer our services to those agencies that may need us.

In Georgia there are 169 counties, two nuclear power sites and four nuclear power reactors. There are also other nuclear facilities such as research reactors, radiopharmaceutical services and a nuclear submarine base. Of the 169 county EMAs only the eight or ten that are within the 10 mile EPZ (Emergency Planning Zone) of the nuclear power sites have any training at all about handling nuclear related accidents.

With increased potential of proliferation of radioactive materials, the lack of knowledge of local EMAs is alarming to me. More nuclear medicines are being shipped back and forth, more solid waste shipments from nuclear plants and other facilities to waste disposal facilities are being made, there are more new fuel shipments to operating plants and, as I suggested last month, more nuclear power plants are likely to be started soon.

So what does it matter whether the EMAs have any nuclear training or not? It means that, if and when a nuclear related incident does occur, there will not be anyone available that knows anything about how to handle it for several hours or maybe even days. For example, I went to the local EMA director and explained who I was and what I could offer to him for services and/or training in handling such a radiological event. He told me that no one in his staff or the fire department or the police knew anything at all about radiation or what to do if anything does happen within the county. He is depending solely on the state level EMA and the Department of Natural Resources (DNR) for guidance and assistance if he ever needs it. He also took my name and contact information for use if he ever needs to get in touch with me. That was over two years ago now and I have not heard any more from him about it. I suspect that budget and time constraints and prioritizing of perceived needs are the main reasons for the apparent lack of concern. The main concerns seem to be storm preparations and the obvious events such as fire or traffic controls. That is well and good, but it still leaves the Emergency Management Agencies totally unprepared and completely uninformed about radiation accidents. So what to do, what to do, what to do is the question for us to consider.

As I suggested earlier, those of us that are retired, but still active, could do their community a valuable service by contacting the EMA directors in their communities and taking a few minutes to talk to them about emergency preparedness for radiation related accidents in their areas of responsibility. They may appreciate the offer of assistance or they may never mention it again after you leave, but you will have alerted them to the need and made yourself available if they ever do need the expertise that we can offer.

Southern California Edison

Bob Corbett, RPM
P.O. Box 128
San Clemente, CA 92672
(949) 368-9645
corbetrt@songs.sce.com

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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Detroit Edison Fermi 2

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frhamtn@frhamsafety.com

Incorporated in 1983, Frham Safety Products, Inc. continues its sole purpose of manufacturing and distributing products to the Nuclear Power Utilities, DOE, DOD, Naval facilities as well as several industrial accounts and related users of safety supplies and equipment.

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- LCCM offers products through a systematic approach of life cycle pricing to include disposal at the purchase point.
- MOST provides onsite product storage stocked systematically specified by the customer for easy access and stringent inventory control.
- CDP consists of proven disposables for every application which includes standard and custom specifications to meet your disposable needs.

Among these services and products, Frham also supplies chemical, biological and radiological equipment which will support applications for domestic, biological, nuclear, radiological or high explosive incident sites. This equipment is able to sample, detect and identify chemical warfare agents and radiological materials as well as provide safe-barrier, personal protection from chemical warfare, biological warfare, radiological and TIC/TIM environments.

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The Center for Continuing Professional Education at HSPH offers courses that enhance your knowledge of up-to-date news and other practical, problem-solving approaches relevant to the radiation protection industry. You are invited to attend the following 2007 programs:

In-Place Filter Testing Workshop 8/20 – 8/24

Occupational and Environmental Radiation Protection: Principles and Practices of Radiation Safety 4/23 - 4/26

Radiation Safety Officer Training for Laboratory Professionals 6/11 – 6/15

Radiological Emergency Planning: Terrorism, Security, and Communication 8/7 – 8/10

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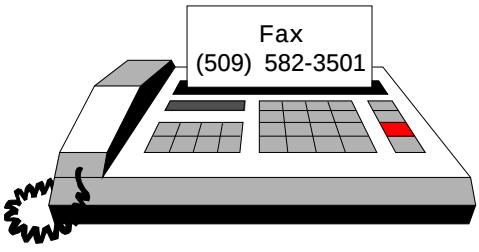

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