Bioenvironmental Engineering Site Assessment I

Unit 16: Risk Communication

Unit Description: During this unit, you will be stationed at Pagliano AB in Pordenone, Italy. During your assignment, you'll be learning how to apply the principles of effective risk communication in reporting Health Risk Assessment information to the base community and to the Base Commander.

Table of Contents

Lesson 1: Risk Communication for Health Risk Assessments

Lesson Description

In this lesson, you will learn the fundamentals of risk communication for health risk assessments, including considerations and techniques to make your health risk communication more effective.

Lesson Overview (Page 1of 13)

You will often be called upon to communicate information about health risks to a variety of audiences. In this lesson, you will learn foundational skills necessary for preparing and conducting effective risk communication for health risk assessments (HRAs).

In order to prepare an oral or written HRA report, you need to be able to:

- Describe fundamentals of risk communication.
- Summarize the techniques and considerations for effective health risk assessment.

Audio Script

Narrator: During some minor renovation projects of an older school building on base, traces of asbestos were found in the mechanical rooms. The asbestos has since been removed and the building has been cleared by authorities; however, the base community is still concerned for their safety. Your expertise will be needed to provide information to the Commander about the health effects of the exposure so he can determine how to ease the community's concerns.

Alexandra AFB Scenario (Page 2 of 13)

Audio Script

BEE: Good morning, Sergeant. Something on your mind?

BE Tech: Yes, sir. My wife went to a PTA meeting at our son's school last night. She told me a lot of the parents were concerned about the asbestos that was discovered in the building. Even though they know it was only found in a storage closet and it's been cleaned up, they're worried about their kids' health.

Also, many of the teachers have worked in that building for years, so naturally they're concerned about long-term exposure effects. I'm not sure how much information they got when the problem was first discovered. I think it would be a good topic for the Commander to address with the base community and the public, before the situation escalates.

BEE: Good thinking. I'll talk to our leadership about seeing if the Base Commander would like to do that. I'll let you know what I find out.

BE Tech: Thank you, sir. I'll start reviewing the information from the HRA that was done at the school.

Alexandra AFB Scenario (Page 3 of 13)

As you review the information gathered during the HRA, you notice many technical terms may need to be simplified to effectively convey the appropriate messages to the base community. You begin listing the important topics and supporting documentation related to the asbestos risk.

In order to develop strategies for communicating that risk to parents and school faculty, you'll need to keep in mind some basic fundamentals of health risk communication.

Fundamentals of Health Risk Communication (Page 4 of 13)

You may wonder—am I responsible for communicating risk?

Yes, communicating risk is a daily occurrence for BE personnel. **Risk communication** is communicating with any stakeholder, internal or external, on any issue that could impact the mission.

Effective health risk communication is essential for relating information to individuals affected by a health risk and those who make decisions based on the findings of an HRA. Health risk communication is an integral part of Operational Risk Management (ORM).

It's important to understand the potential audience for health risk communication may be as small and informal as one person asking about the slightly discolored drinking water during a casual conversation at the commissary. It may also be as large and formal as a town meeting involving on-base and off-base communities.

Health risk communication is focused on two fundamental ideas:

- **Communicating the right information to the right people, at the right time.**
- **Providing practical and effective information and recommendations.**

Risk Communication

Risk communication is not public speaking or spinning and embellishing messages. It requires you to be open, honest, genuine and sincere about your message.

Communicating the Right Information to the Right People, at the Right Time

When communicating health risk information, make sure the appropriate message is made available to the right people at the right time. You can best convey information that is meaningful for your specific audience by developing key messages. While technical details may be important in certain situations, generally, your audience is mostly concerned with how the current risk affects them and what they need to do to protect themselves.

For example, if lead paint were found in base housing, you wouldn't initiate communication to the affected community by comparing lead paint to the health effects of mold. This could cause them to think of you as dishonest or untrustworthy because the message could be viewed as a way to justify the risk as irrelevant.

The right information has no benefit unless the appropriate people receive that information. If an order is given to discontinue use of a particular respirator to all shop workers on base, even though the only risk that exists is with workers in one

shop performing a certain type of work, this may cause widespread concern to individuals that are not affected by the risk.

Finally, the timeliness of communication is vital to ensuring the value it has for your audience. If your audience is not notified at the appropriate time, they may be delayed in taking actions to mitigate their exposure to the risk. For example, if a water main break occurs on base that only affects certain locations, you should notify the affected areas as soon as possible so they immediately begin using an alternate source of potable water.

Providing Practical and Effective Information and Recommendations

For health risk communication to be valuable, your audience must receive information in a practical and effective manner that enables decision making. If the communication delivered is too conceptual in nature, it may not contain specific information your audience needs. Messages that are too technical in nature may be misunderstood, decreasing the effectiveness of the message.

Remember these main points:

- Develop and limit key messages (usually 3 or less) so the important points don't get lost in extraneous details.
- Talk about what matters to your audience in language that makes sense to them.
- Be prepared to discuss the topic and show empathy and willingness to address audience concerns.
- Build trust and honesty by providing accurate information; addressing relevant issues, options, and recommendations; and abiding by promises.
- Be aware of communication that is based on risk perception, agendas, or emotions and address those issues honestly.
- The most effective risk communication involves two-way dialogue with your audience.

Impact of Health Risk Communication (Page 5 of 13)

When a health risk exists, it may seem like the best course of action is to keep the information quiet to avoid causing panic or other negative perceptions.

However, any time health issues affect a mission or population, clarifying the situation and communicating actual risk and appropriate responses to that risk are important.

Health risk communication can have a huge impact on the overall success or failure of a mission, depending on whether the risk is communicated **effectively** or **ineffectively**.

Effective Health Risk Communication

When risk is communicated effectively, decision-makers can determine the most appropriate course of action (COA) using information that is accurate, and then they can convey decisions in a way that is clear and concise to the appropriate person(s). Effective health risk communication ensures the public or other stakeholders are informed, valued, and reassured.

Ineffective Health Risk Communication

In the event that risk is communicated ineffectively, the consequences can be disastrous for all parties involved. Decision-makers are unable to react to dynamic circumstances appropriately because the information or recommendations presented were either not conveyed to the correct person(s) or were conveyed in a way that was unclear. Ineffective health risk communication to the public or affected populations can cause panic, distrust, continued anxiety, or inaction when action is necessary.

Example of Effective Health Risk Communication

In October, 1982, there were several deaths attributed to product tampering of Johnson & Johnson's Tylenol pain reliever. The capsules had been filled with cyanide and placed on store shelves. When incidents began occurring, Tylenol promptly notified the public, removed all of their products from store shelves, and began a constant communication campaign with the public about the situation where they accepted responsibility for the situation and apologized. Their communication campaign focused on public safety, well-being, and regaining the public's trust.

When the products were introduced back into the market, Johnson & Johnson added various tamper resistant features to their packaging and implemented sales and marketing techniques that included presentations to the medical community with the intent for the public to regain confidence in their brand. Because of Johnson & Johnson's effective communication with the public, they were able to maintain a positive relationship with stakeholders and restore confidence in their product.

Example of Ineffective Health Risk Communication

A partial meltdown of a reactor core at Three Mile Island on March 28, 1979, caused wide-spread public panic because the incident was not immediately communicated with the public. There was no risk of radiation exposure to the public, but because of the lack of effective, honest, and upfront communication, the community felt they were at risk and the company operating the facility lost all credibility with the public.

The lesson learned from this incident is that it is necessary to inform all appropriate parties who may be affected by a risk in an honest, open, and timely fashion. Additionally, when there is a potential or perceived risk inherent with an activity or facility, initial and ongoing effective communication helps people feel informed and secure.

Techniques for Effective Health Risk Communication (Page 6 of 13)

You are in a position to deal with potential health risks on a regular basis. Effective health risk communication efforts may require you to lead meetings with workers in a shop on base, go door-to-door to inform people of a situation, or hold a town hall meeting. You'll also be expected to use the fundamentals of health risk communication effectively when providing HRA / OEHSA information to co-workers, your team lead, or supervisors.

In order for health risk communication to be effective, you should:

- **Communicate clearly and honestly.**
- **Deal with uncertainty.**
- **Be cautious when using risk comparisons.**

Communicate Clearly and Honestly

While communicating to your audience, you should provide verbal and nonverbal messages that convey empathy, honesty, and commitment. Whenever possible, you should provide familiar examples and concrete information that can help place the risk in perspective.

You should always present information to the audience's level of understanding. If an audience perceives the information being presented as too difficult to understand or too technical in nature, they will often reject the communicator as being dishonest or untrustworthy. For example, using multiple acronyms or sampling data without well-defined explanations may lose your audience. As a result, they may refuse to acknowledge the information or become hostile. An audience may also become hostile if they feel they are being patronized. Knowing your audience is the key.

Deal with Uncertainty

When communicating health risks, the results may not be definitive. You should discuss sources of uncertainty, such as the methods for gathering, analyzing, and interpreting data as long as the message is still easy to understand and relevant to the audience. By following this process, you acknowledge that uncertainties are recognized, which can lead to an increase in trust.

When discussing uncertainty, you may need to subtly identify your expertise and knowledge of the subject. This becomes important when communicating with the community or discussing situations with shop personnel who may not be aware of your qualifications. If you have already built a relationship with a high level of trust with your audience, you may find discussing uncertainties somewhat easier.

Be Cautious When Using Risk Comparisons

It can be helpful to place risks in perspective by comparing an unfamiliar risk to a similar, more familiar, one. However, some types of comparisons are not appropriate. You should avoid comparing unrelated risks because they don't help people understand the risk they are currently encountering. You should also avoid comparing voluntary risks, such as smoking, to those that are not voluntary, such as drinking contaminated water. The confusion caused by these inappropriate risk comparisons can lead to distrust and fear.

For example, you should avoid comparing something familiar, like mold, to an unfamiliar chemical such as toluene. While both can irritate the upper respiratory system, toluene can cause severe internal physiological damage. Because the substances and effects are mostly unrelated, your audience may view you as untrustworthy and could then ignore your recommendations.

Refer to the table below for examples of appropriate risk comparisons.

Appraisal (Page 7 of 13)

Build a list of fundamental techniques related to effective health risk communication.

Word Bank	**List**
Deal with uncertainty	_____
Emphasize your qualifications	_____
Do not address individual concerns	_____
Focus on technical facts	
Communicate honestly	
Use risk comparisons cautiously	

Considerations for Health Risk Communication (Page 8 of 13)

When you find yourself in a situation where verbal or written health risk communication is necessary, consider the following factors.

Tab: Preparation

When communicating information about health risks, you'll most likely be placed in a position to answer questions from the audience. You need to be well-prepared to both present information and answer questions. This is important for the audience to feel informed about the risk and is an opportunity to show you care about their situation.

You can prepare by anticipating questions and concerns the audience may have and by developing the most effective and meaningful responses. This preparation technique can also be used in written health risk communication by answering any anticipated questions within the document being prepared.

Tab: Professional Judgment

Your professional judgment is an important component of effective health risk communication. You should always base your communications on facts and professional judgments. Your professional judgment is critical when limited facts are available. Be sure to provide sources for facts and indicate when you've used professional judgment to draw a conclusion. Trust in the speaker is increased when the audience knows the source of the information.

Tab: Key Messages

A part of being an effective communicator is making sure your thoughts are organized into key messages. One key message for risk communication in the context of HRA / OEHSA is the health risk information that needs to be communicated to a specified audience. A second key message is related to recommendations for action or inaction based on that health risk information. These messages should be clear, concise, and to the point.

You should limit the number of key messages you are delivering at one time so your audience does not become overwhelmed. Whenever possible, no more than three messages should be communicated at one time. You should repeat messages as often as possible to ensure they are not misunderstood or misinterpreted.

Tab: Language and Presentation

The presentation and use of language is important when communicating health risk. Much of the information you are dealing with can be highly technical. Present technical information in a manner that is **understandable**, **clear**, and **concise.**

Understandable

Avoid messages that convey only technical facts and information. Decision-makers need to understand what the technical information means to the mission in terms that can be communicated to other non-BE personnel.

Community members need to understand what the information means for themselves or their families and what actions should be taken based on that knowledge.

Clear

Remember to define technical, medical, and scientific terms as well as acronyms when you must use them in your communications.

Concise

You can make highly technical information more concise through the use of visual aids and diagrams.

Tab: Overcoming Barriers

To be able to overcome barriers to effective health risk communication, you must first understand what you could be facing. Potential barriers when communicating health risk include:

- **Lack of public trust in government.**
- **Differences between military and civilian culture.**
- **Public discomfort with scientific information.**
- **Perception of reactive vs. proactive communication.**

Lack of Public Trust in Government

Public stakeholders may not trust government agencies, including the military. These perceptions can be traced back to Watergate and Vietnam, for instance, and continue to affect communication with various stakeholders. It is important to recognize that public trust is not transferable from one individual to another or from one program to another. Even though public opinion may be higher in a "pro-military" community, communicators must treat every message and meeting as an opportunity to build trust and credibility with their audience.

Strategies for overcoming a lack of public trust in government include:

- Communicating honestly, even when all the facts are not available.
- Using your professional judgment when appropriate.
- Being prepared to communicate with your audience and answer their questions and concerns.

Differences Between Military and Civilian Culture

When communicating risk to a civilian or mixed population, the difference between military and civilian culture can be a key factor. The military's command and control culture can be interpreted as not open to debate and, therefore, can cause an audience to view the military as uninterested in the well-being of external stakeholders.

Strategies for overcoming the perceptions caused by differences between military and civilian culture include:

- Tailoring the use of language and presentation to meet your audience's level of understanding and perspective on the situation.
- Addressing uncertainty about the risk while keeping your key messages clear and concise.
- Telling your stakeholders what information you do have as well as what you do not know.

Public Discomfort with Scientific Information

When communicating health risk, you may find that your audience experiences varying degrees of discomfort with scientific information. This is due to society's typically low tolerance for risk and the public's desire for certainty, even when some facts may not actually be available. This challenge is often intensified by the public's access to the internet which facilitates a perception that information should be accessible immediately.

Strategies for overcoming public discomfort with scientific information include:

- Providing open and honest communication that explains sources and reasons for any uncertainty.
- Providing your professional judgment when all of the facts are not known about a given risk.
- Ensuring your key messages are understandable, clear, and concise for the audience.

Perception of Reactive vs. Proactive Communication

A widely held perception of government is that it operates from a reactive rather than proactive perspective. This perception also holds true related to communicating health risks. This perception can be compounded because the military's organizational structure affects the flow of communication.

Strategies for overcoming perceptions of reactive vs. proactive communication include:

- Providing open and honest communication about what is known and unknown about a risk at the given time, as quickly as possible.
- Addressing the immediately affected stakeholders quickly and with information related to appropriate actions.
- Using understandable, clear, and concise language so that the audience can obtain a good perspective of the situation and what is being done to mitigate the risk.
- Being well-prepared to address an audience with the potential questions or concerns that may be presented.

Appraisal (Page 9 of 13)

Select whether each characteristic represents effective or ineffective health risk communication by marking the appropriate block in the table.

Characteristics	Effective	Ineffective
Communicate what is known and unknown.		
Focus on technical facts and information.		
Use visual aids and diagrams.		
Prepare answers for potential questions.		
Rely only on facts, not professional judgment.		

Alexandra AFB Scenario (Page 10 of 13)

While reviewing the information gathered during the HRA conducted at the school, you find out asbestos was discovered only in one janitorial / maintenance closet.

Based on the air sampling data taken, it was determined the asbestos was a serpentine, chrysolite type commonly used for insulation applications. You also find that personnel who came in contact and inhaled the fibrous material were exposed to an 8-hour TWA of 0.165 fiber/cc of air, which is slightly above the permissible exposure limit (PEL), an 8-hour TWA 0.1 fiber/cc of air.

After the removal project, the closet was retested and no detectable levels of asbestos were found.

The HRA concluded that only the janitorial and maintenance personnel who routinely came in contact with the asbestos were at an increased risk of long-term health effects, normally not detectable for 15-20 years or more. These health effects include malignancy of the lining of the lung's passages, lining of the chest cavity, and lining of the abdomen.

Scenario Challenge Point (Page 11 of 13)

You've reviewed all of the data and information regarding the asbestos exposure and are ready to provide information for the Commander's community meeting presentation.

Which two of the following details should you provide to the Commander?

A I would recommend a long-term monitoring plan for high-risk individuals who have been exposed.

B I don't have all the long-term health effect information yet. I'll provide a document listing the effects of asbestos in a follow-up report.

C All people on base should be told they are at serious risk of the health effects of asbestos because we all could come into contact with the school.

D I have the OSHA and Air Force directives' recommendations regarding actions that should be taken by exposed individuals.

Which two of the following messages should be provided to the community by the Commander?

A Educational materials about the risks of asbestos exposure will be available to you at the end of this meeting.

B If you have any questions during the meeting, please hold them and contact my secretary in the morning.

C Many symptoms of asbestos-related disease do not occur for 15 to 20 years after exposure.

D There's really no cause for concern because the building has already been cleared by authorities and all threats were contained when the cleanup was performed.

Health Risk Communication Review (Page 11a of 13)

Fundamentals	Techniques	Considerations
Remember the fundamentals of health risk communication: • Communicate the right information to the right people, at the right time. • Provide practical and effective information and recommendations.	Remember the techniques for effective health risk communication: • Communicate clearly and honestly. • Deal with uncertainty. • Be cautious when using risk comparisons.	Remember the factors that influence the effectiveness of your health risk communication: • Preparation • Use of professional judgment, as appropriate. • Key messages. • Understandable, clear, and concise presentation.

Alexandra AFB Scenario (Page 12 of 13)

Audio Script

Base Commander: Good afternoon. I'm scheduled to speak to the community later. So, what are we dealing with here?

Medical Group Commander: The bottom line is that the school is safe. When the asbestos was there, it was limited to one supply closet. The janitors may have some long-term health effects because they were the ones exposed every day.

Base Commander: What type of health effects are we talking about for this situation?

Medical Group Commander: I think the BE team has put together a little presentation about that.

BEE: First, keep in mind the asbestos levels we're talking about. Prior to asbestos removal, air sampling indicated results slightly above acceptable standards in the supply closet. The follow-up sampling, after the removal project, showed no detectable levels of asbestos. But as we know, parents and faculty members are still concerned about health effects.

Their concern is understandable, of course, given the potential effects. Because asbestos is a fibrous material, it's often inhaled. A significant exposure would increase the risk of various types of lung cancers and diseases.

BE Tech: To address the issue with the community, I've gathered some educational materials about asbestos exposures. I also recommend sponsoring a stop smoking support group. This is important for anyone who may have been in contact with the material because smoking greatly increases the risk of getting lung cancer for individuals exposed to asbestos.

OSHA and Air Force directives require annual physical exams for potentially exposed individuals. They'll do pulmonary function tests to evaluate lung capacity, as well as chest X-rays.

Since most people don't show any signs or symptoms of an asbestos-related disease for 15 to 20 years after exposure, long-term monitoring and doctor notification is important in a situation like this, especially for high-risk employees like the janitorial and maintenance staff.

Base Commander: That's good information. I'll address the community and provide the educational materials you've gathered. I'll also make sure that Public Affairs and Legal approve the messages I'll be delivering.

I would like all of you to attend the community meeting to assist with questions that may come up. Thank you. You've done good work with this situation.

Lesson Summary

Effective health risk communication is vital to both key decision-makers and the community that may be impacted by a risk. Due to the complex situations you will encounter, it's important to be able to communicate health risks in a way that is understandable, clear, and concise.

You are responsible for communicating risk—it may not be as large an issue as asbestos exposure at a school, but the same basic health risk communication concepts apply to all situations. If you practice using effective health risk communication techniques while addressing minor health concerns, then you'll be ready to present risks for major health issues also.

Establishing your credibility while building strong relationships across your installation increases your ability to deal with health risk communication situations more effectively.

In this lesson you have:

- Described the fundamentals of risk communication.
- Summarized the techniques and considerations for effective health risk assessment communication.

Audio Script

Narrator: During a town hall meeting with the parents and school faculty, the Commander explained the situation in terms that were easy to understand and clear for the audience, while remaining sensitive to their situation and questions. Many of the individuals present were concerned about the safety of other buildings as well. Based on advice from Public Affairs and Legal, the Commander used this opportunity to discuss the risks associated with asbestos and what is being done to ensure that they are safe while in base facilities.

Resources

- DoD Risk Communication Primer
- USACHPPM Technical Guide 248, Guide for Deployed Preventive Medicine Personnel on Health risk Management
- National Cancer Institute

Answer Key: Appraisals / Scenario Challenge Points

Lesson 1: Risk Communication for Health risk Assessments

Page 7 of 13

Build a list of fundamental techniques related to effective health risk communication.

Deal with uncertainty

Communicate honestly

Use risk comparisons cautiously

Rationale: Health risk communication is centered on the fundamentals of communicating the right information to the right people, at the right time, and providing practical and effective recommendations. Techniques for effective health risk communication are communicating clearly and honestly, dealing with uncertainty, and being cautious when using risk comparisons.

Page 9 of 13

Select whether each characteristic represents effective or ineffective health risk communication by marking the appropriate block in the table.

Characteristics	Effective	Ineffective
Communicate what is known and unknown.	X	
Focus on technical facts and information.		X
Use visual aids and diagrams.	X	
Prepare answers for potential questions.	X	
Rely only on facts, not professional judgment.		X

Rationale: When communicating health risk, you should convey what is known and unknown about the risk and make recommendations based on professional judgment in conjunction with available facts. Visual aids can help communicate technical information concisely, and anticipating questions and answers can help you prepare to communicate honestly with your audience.

Page 11 of 13

Which two of the following details should you provide to the Commander?

A **I would recommend a long-term monitoring plan for high-risk individuals who have been exposed.**

D **I have the OSHA and Air Force directives' recommendations regarding actions that should be taken by exposed individuals.**

Rationale: It's important to be well-prepared so you can present all the necessary information honestly and answer the questions and concerns your audience has about the risk.

Which two of the following messages should be provided to the community by the Commander?

A **Educational materials about the risks of asbestos exposure will be available to you at the end of this meeting.**

C **Many symptoms of asbestos-related disease do not occur for 15 to 20 years after exposure.**

Rationale: It's important to be well-prepared so you can present all the necessary information honestly and answer the questions and concerns your audience has about the risk.

Course Glossary

Acronyms

AAR
After Action Report

ACADA
Automatic Chemical Agent Detection Alarm

AFI
Air Force Instruction

AFMIC
Armed Forces Medical Intelligence Center

AFMS
Air Force Medical Service

AFMSA
Air Force Medical Support Agency

AFOSH
Air Force Occupational and Environmental Safety, Fire Prevention and Health

AFRRAD
Air Force Radiation and Radioactive Recycling and Disposal

ALARA
As Low As Reasonably Achievable

AMC
Aerospace Medicine Council

amu
Atomic Mass Unit

AO
Area of Operations

AOC
Area of Concern

AOR
Area of Responsibility

BE
Bioenvironmental Engineering Flight

CBRN
Chemical, Biological, Radiological, Nuclear

CE
Civil Engineering

COA
Course of Action

COC
Contaminant of Concern or Constituent of Concern

CONUS
Continental United States

CSM
Conceptual Site Model

CV
Coefficient of Variability

DIA
Defense Intelligence Agency

DF
Duty Factor

DOD
Department of Defense

DOE
Department of Energy

DOS
Department of State

DOT
Department of Transportation

D_{pel}
Estimated Hazard Distance

DRI
Direct Reading Instruments

EHF
Extremely High Frequency (Occurs between 30 and 300 GHz)

EMR
Electromagnetic Radiation

EPA
Environmental Protection Agency

EPD
Electronic Personal Dosimeters

FPWG
Force Protection Working Group

G_{abs}
Absolute Gain

HF
High Frequency (Occurs between 3 and 30 MHz)

HRA
Health Risk Assessment

HRE
Health Risk Estimate

HRM
Health Risk Management

IATA
International Air Transport Association

IPE
Individual Protection Equipment

LCL
Lower Confidence Limits

LET
Linear Energy Transfer

LF
Low Frequency (Occurs between 30 and 300 kHz)

MAJCOM
Major Command

MEDIC CD
Medical Environmental Disease Intelligence and Countermeasure CD

MIO
Medical Intelligence Officer

MF
Medium Frequency (Occurs between 300 and 3,000 kHz (3MHz))

MOPP
Mission Oriented Protection Posture

MPE
Maximum Permissible Exposure

MSP
Mission Support Plan

NFB
Near-Field Boundary

NGIC
National Ground Intelligence Center

NHZ
Nominal Hazard Zone

NIOSH
National Institute for Occupational Safety and Health

NOHD
Nominal Ocular Hazard Distance

NRC
Nuclear Regulatory Commission

OCONUS
Outside the Continental United States

OEH
Occupational and Environmental Health

OEHSA
Occupational and Environmental Health Site Assessment

OEL
Occupational Exposure Limits

OEL-C
Occupational Exposure Limits-Ceiling

OEL-STEL
Occupational Exposure Limits-Short Term Exposure Limit

OEL-TWA
Occupational Exposure Limits-Time Weighted Average

OH
Occupational Health

ORM
Operational Risk Management

OSHA
Occupational Safety and Health Administration

OSI
Office of Special Investigation

P_{avg}
Average Power

PEL
Permissible Exposure Limit

PH
Public Health

P_p
Peak Power

PPBS
Planning, Programming and Budgeting System

PPE
Personal Protective Equipment

PPM
Parts per million

PRF
Pulse Repetition Frequency

PW
Pulse Width

RFR
Radio Frequency Radiation

RSO
Radiation Safety Officer

S
Main-Beam Power Density

SAR
Specific Absorption Rate

S_{avg}
Power Density Average

SEG
Similar Exposure Group

SHF
Super High Frequency (Occurs between 3 and 30 GHz)

SLM
Sound Level Meter

S_{max}
Maximum Power Density

SPL
Sound Pressure Level

TLD
Thermoluminescent Dosimeters

TWG
Threat Working Group

UHF
Ultra High Frequency (Occurs between 300 and 3,000 MHz)

USACHPPM
United States Army Center for Health Promotion and Preventive Medicine

UTC
Unit Type Code

VA
Vulnerability Assessments

VHF
Very High Frequency (Occurs between 30 and 300 MHz)

VLF
Very Low Frequency (Occurs between 3 and 30 kHz)

Definitions

Absolute Gain (G_{abs})
The ratio of the power that would be required at the input of an ideal isotropic radiator to the power actually supplied to the given antenna, to produce the same radiant intensity in the far-field region.

Action Level
An airborne exposure level that dictates active air monitoring, medical monitoring, and employee training. The Action Level is one-half the Occupational Exposure Limit for time-weighted average (OEL-TWA) exposures, except where 29 CFR 1910 Subpart Z designates a different concentration or where the statistical variability of sample results indicates that a lower fraction of the OEL should be used as the Action Level.

Activity
The number of disintegrations or transformations of radioactive material per unit of time (usually expressed in seconds).

Antenna
The point on an RFR emitter where RFR energy radiates into free space.

Asbestos
A natural material that is made of tiny threads or fibers. The fibers can enter the lungs as a person breathes. Asbestos can cause many diseases, including cancer. Asbestos was used to insulate houses from heat and cold. It has also been used in car brakes and for other purposes. Some old houses still have asbestos in their walls or ceilings.

Asbestosis
A lung disease caused by breathing asbestos fibers over a period of time. The fibers eventually scar the lungs and make breathing difficult. Symptoms are similar to asthma.

Atomic Mass Unit (amu)
Approximately equal to the mass of a proton or a neutron and is used to describe the mass of an atom.

Becquerel (Bq)
The international standard for the unit of measurement for activity.

Breathing Zone
The location where exposure is measured in air sampling. The breathing zone is located forward of the shoulders within 9 inches of the nose and mouth. Breathing zone measurements are taken beneath a welder's helmet or face piece but outside of any respiratory protective devices.

Bremsstrahlung
An interaction that causes a form of x-ray production in which high-speed beta particles penetrate the electron cloud and interact with the nucleus.

Carcinogens
Hazardous materials that stimulate the formation of cancer.

Ceiling Limit (OEL-C)
The limit for an employee's exposure which shall not be exceeded during any part of the work day. If instantaneous monitoring is not feasible, the OEL-C will be evaluated during the worst-case 15-minute exposure period.

Chrysotile
The most common asbestos type. Chrysotile asbestos fibrils may appear crinkled, like permed or damaged hair, under plane-polarized light.

Coefficient of Variation (CV)
For an air sampling method, the CV is the standard deviation of the sampling and analytical error divided by the mean of the sample results. The CV is used to calculate the confidence limits for sampling. OSHA uses the term sampling and analytical error (SAE) to account for the total variation or error in the method.

Compton Scatter
A gamma/x-ray interaction which takes place between a photon and an outer electron where the photon has more energy than the electron can accept, so it imparts only a portion of its energy to the electron.

Conceptual Site Model (CSM)
Articulates the health threats and exposure pathways and begins when data or information is gathered during Predeployment and Baseline Activities.

Confidence Limits
The upper confidence limit (UCL) and lower confidence limit (LCL) are the boundaries for a single sample or a series of samples that have a specified probability (usually 95 percent) of including the true value of the level of exposure.

Controlled Environments
An area where personnel are aware of the potential for RFR exposures associated with their employment or duties.

Counts per minute (cpm)
The amount of radiation detected by an instrument each minute.

Diffuse Reflection
Situations where a laser beam is bounced off a dull or uneven surface that breaks the beam apart.

Disintegration per minute (dpm)
The number of atoms that decay or transform in a given amount of material per minute.

Disintegration per second (dps)
The number of atoms that decay or transform in a given amount of material per second.

Dose
The quantity of radiation absorbed.

Dose Rate
The quantity of radiation absorbed per unit of time.

Duty Factor (DF)
A unit-less number which only applies to pulsed wave systems that describes the ratio of time an RFR emitter is on to the total operating time.

Electromagnetic Radiation (EMR)
Waves of energy that can travel through space and matter.

Electromagnetic Spectrum
The entire frequency range of electromagnetic waves, or wave radiation.

Energy
The ability to do work.

Estimated Hazard Distance (D_{pel})
The distance from the antenna to the point where the power density equals the permissible exposure limit (PEL).

Excitation
Occurs when there is an addition of energy to an atomic system, changing the atom from a "ground" state to an excited state.

Exposure
Exposure occurs when an employee is subjected to a hazardous material through any of these routes: inhalation, ingestion, skin contact, or skin absorption. Airborne exposures are specified as the duration and concentration of hazardous materials measured in the breathing zone of an individual worker without regard for personal protective equipment used by the worker.

Exposure Assessment
An exposure assessment is a process of estimating or calculating potential exposure of a health threat for an individual or population at risk. The assessment includes professional judgment, calculations based on estimates or models, actual measurements, collection and analysis of samples, and statistical evaluation.

Exposure Pathway
Includes a threat and the opportunity for the population to come into contact with the threat.

f
Algebraic express that means, "a function of."

Fission
The splitting of the nucleus of an atom into nuclei of lighter atoms, accompanied by the release of energy.

Frequency
A value of how often a wavelength cycle occurs in a second.

Gain
The antenna's ability to concentrate its energy in a certain direction.

Hazardous materials
Materials that pose a hazard and require a Material Safety Data Sheet as defined in FED-STD 313, Federal Standard, Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Governmental Activities.

Health Risk
The health risk equals threat "combined with" vulnerability (health risk = (threat) + (vulnerability)). A health risk is an identified health threat and the vulnerability of the population at risk of coming into contact (i.e., completion of an exposure pathway) with the health threat.

Health Risk Assessment (HRA)
Health risk assessment is the process of identifying and analyzing or evaluating (exposure and toxicity assessments) OEH threats in populations or at locations over time (HRA = f [(health risk) "+" (HRE) "+" (COA)]). The HRA "product" is the validated health threat, qualified by the HRE, and the COA which includes overall mission impact, recommended control options, associated uncertainties, risk mitigation estimate(s), and a cost-benefit analysis if applicable.

Health Risk Communication
Health risk communication is the process of effectively communicating potential health effects, outcomes, and control measures to all stakeholders (i.e., commanders, supervisors, AF personnel, military, families, and the public). It provides detailed information about the HRA and should occur throughout the HRA process.

Health Risk Estimate (HRE)
Health Risk Estimate is the probability and severity of loss from exposure to the health threat. The HRE is a function of probability and severity when either or both increase the Health Risk Estimate increases. The HRE is also referred to as a health risk level.

Health Risk Management (HRM)
Health risk management is a decision-making process to evaluate and select COAs, minimize OEH risks, and maximize benefits for operations and missions. HRM is the health component of the ORM process and health risk management recommendations and decisions are integrated into the commander's ORM decision-making.

Health Threat
A health threat is a potential or actual condition that can cause short or long-term injury, illness, or death to personnel. A health threat can be occupational or environmental in origin; internal or external to the installation; or continuous, intermittent, or transient; and includes enemy capability and intent.

Ionization
Occurs when beta particles interact with nearby atoms causing an electron to be removed, creating an ion pair.

Ionizing Radiation
Radiation which has enough energy to change the atomic structure of matter.

Isotope
Elements with the same number of protons, but a different number of neutrons.

Kinetic Energy
Energy of motion.

Laser
Light amplification by stimulated emission of radiation.

Linear Energy Transfer (LET)
Energy lost by particles along the path through which they are traveling.

Mass
Description of how much matter there is present in an object.

Maximum Permissible Exposure (MPE)
The level of laser radiation to which a person may be exposed without hazardous effects or adverse biological changes in the eyes or skin.

Mesothelioma
Cancer that generally occurs in the chest, abdominal region, and areas surrounding the heart. It is typically associated with exposure to asbestos.

n
Algebraic express that means, "Number of samples."

Nominal Hazard Zone (NHZ)
The area within a laser workplace in which the exposure from direct beam, specular reflection, and diffuse reflection could exceed the Maximum Permissible Exposure (MPE).

Nominal Ocular Hazard Distance (NOHD)
The distance along the laser beam beyond which the exposure is not expected to exceed the appropriate Maximum Permissible Exposure (MPE).

Non-aqueous Phase Liquids (NAPLs)
Non-aqueous phase liquids are liquids that are sparingly soluble in water. Because they do not mix with water, they form a separate phase. For example, oil is an NAPL because it does not mix with water, and oil and water in a glass will separate into two separate phases. NAPLs can be lighter than water (LNAPL) or denser than water (DNAPL). Hydrocarbons, such as oil and gasoline, and chlorinated solvents, such as trichloroethylene, are examples of NAPLs.

Non-ionizing Radiation
Radiation which does not have enough energy to change the atomic structure of matter.

Nuclear Stability
Describes the certain combinations of neutrons and protons within a nucleus of an atom which are required for that atom to be considered stable.

Occupational and Environmental Health Site Assessment (OEHSA)
The key operational health tool for producing data or information used for health risk assessments (HRA) and to satisfy Occupational and Environmental Health (OEH) surveillance requirements.

Occupational Exposure Limit (OEL)
The limit for the airborne concentrations of a specified substance for a specified time. Employees will not be exposed to concentrations greater than the OEL. The term OEL includes all OEL-TWAs, OEL-STELs, OEL-Cs, and acceptable ceiling concentrations, that apply to a specific substance. For each hazardous material, the OELs are the most stringent limits found in the latest edition of the TLV Booklet published annually by the American Conference of Government Industrial Hygienists, in 29 CFR 1910 Subpart Z, and in AFOSH Standards for specific substances. OELs apply to occupational exposures for each individual worker for a single 8-hour work shift except where 29 CFR 1910 Subpart Z allows 40-hour averages. Exposure during work shifts that exceed 8 hours must be adjusted before applying an OEL.

Operational Risk Management (ORM)
A systematic process of identifying hazards, assessing risk, analyzing risk control options and measures, making control decisions, implementing control decisions, accepting residual risks, and supervising/reviewing the activity for effectiveness.

Optical Cavity
The component that houses the laser.

Pair Production
Occurs when a photon disappears in the vicinity of a nucleus, and an electron and positron appear in its place.

Particulate Radiation
Fast-moving atomic or subatomic particles that may be charged positively or negatively or not at all.

Peak Power (P_p)
The maximum power density during the on time for a pulsed wave system.

Permissible Environment
Operational environment in which host country military and law enforcement agencies have control as well as the intent and capability to assist operations that a unit intends to conduct.

Permissible Exposure Limit (PEL)
The value to which an individual may be exposed without exhibiting damaging biological effects and is based on the emitter's frequency.

Photochemical Reaction
A chemical reaction which is induced by the absorption of energy in the form of visible, infrared, or ultraviolet radiation.

Photoelectric Effect
An "all or none" energy loss where gamma rays impart all of their energy into an electron.

Pleural Effusion:
When too much fluid collects between the lining of the lung and the lining of the inside wall of the chest.

Positron
Created when a proton changes into a neutron and a positron because there are too many protons in the n:p ratio.

Potential Energy
Energy of position.

Pulse Repetition Frequency (PRF)
The number of times the signal is on per unit of time.

Pulse Width (PW)
The length of time the signal is on for a pulsed wave system.

Quality Factor (Q)
A dimensionless quantity assigned to each type of radiation that allows doses to be normalized in relation to each other.

Radiation
Energy in the form of waves or moving subatomic particles emitted by an atom or other body as it changes from a higher energy state to a lower energy state.

Radiation Absorbed Dose (RAD)
The amount of radiation absorbed by the tissue.

Radioactive Decay
The spontaneous disintegration or transformation of an atom in an attempt by that atom to reach a stable state.

Radioactive Material (RAM)
Material which contains unstable (radioactive) atoms that give off radiation as they decay or transform.

Radioactivity
The spontaneous emission of matter or energy from the nucleus of an unstable atom.

Radioisotopes
Unstable isotopes that, in an attempt to become a stable atom, emit energy in the form of radiation.

Regulated Area
An area under the supervisor's control where entry and exit are restricted and controlled to prevent exposure to hazards. An area shall be established when a requirement in 29 CFR 1910 or 29 CFR 1926 exists, or when BE determines that employees entering the area might be exposed to a hazard unless access is controlled.

Short Term Exposure Limit (OEL- STEL)
A time-weighted exposure for a 15 minute (or shorter) period which shall not be exceeded during the work day. The definition of STEL is different in 29 CFR 1910.1000 (a) (5) (ii) and in the TLV Booklet. The definition must correspond to the reference being cited. As with other OELs, OEL-STELs are the most stringent limits found in the latest TLV Booklet, in 29 CFR 1910 Subpart Z, and in AFOSH Standards for specific substances.

Short-Term Public Emergency Exposure Guideline (SPEGL)
An acceptable peak concentration for unpredicted, single, short-term emergency exposures of the general public. These limits do not apply to occupational exposures.

Specific Absorption Rate (SAR)
An expression of how much RFR energy is imparted to each kilogram of biological body mass per second. SAR is expressed in units of watts per kilogram (W/kg).

Specular Reflection
Situations where a laser beam is reflected from shiny, mirror-like surfaces.

Spontaneous Fission
Spontaneous fission is a natural mode of decay in which nuclei disintegrate.

Stakeholders
Any individual who is affected by the content of the communication and/or will be making decisions based on the information provided.

Stratigraphy
The layering of rock or ice strata, from which information on succession, age relations, and origin can be deduced.

Threshold Limit Values—(TLVRs)
Exposure guidelines published annually by the American Conference of Governmental Industrial Hygienists (ACGIH) in Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. TLVRs are employed as OELs when they are more stringent than the OSHA PELs.

Time-Weighted Average (OEL-TWA)
Eight-hour average concentration for which the average is mathematically adjusted for the duration of exposure. The method for calculating OEL-TWAs is shown in 29 CFR 1910.1000 (d) and in the TLV Booklet.

Toxicology Assessment
Process of estimating the human toxicological impact of a specific material based on published and unpublished literature sources and taking into consideration: uptake, metabolism/biotransformation, transport and storage, and excretion including acute (short-term) and chronic (long-term) human health endpoints.

Transmission Line
Carries the RFR signal from the transmitter to the antenna.

Transmitter
The part of an RFR emitter that generates the RFR signal.

Uncontrolled Environments
An area where exposures may be incurred by people who have no knowledge or control of the hazard.

Wavelength
The distance from one peak of a wave to the next peak of a wave.