

AIR FORCE SPECIALTY CODE 4B071 BIOENVIRONMENTAL ENGINEERING

Sampling Overview



QUALIFICATION TRAINING PACKAGE

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STS Line Item 4.5.1.5.1: Select Appropriate Occupational and Environmental Exposure Limit (OEEL) (TLV, MCL, SPEGL, MEG, STEL, CEILING, Excursion Limits, etc)

TRAINER GUIDANCE

Proficiency Code:	3c
PC Definition:	Can do all parts of the task. Needs only a spot check of completed work. Can identify why and when the task must be done and why each step is needed.
Prerequisites:	None
Training References:	NIOSH Pocket Guide
Additional Supporting References:	None
CDC Reference:	4B051
Training Support Material:	ACGIH TLV Booklet NIOSH Pocket Guide OSHA Preambles to the Final Rules: https://www.osha.gov/pls/oshaweb/owasrch.search_form?p_doc_type=PREAMBLES&p_toc_level=0 NIOSH Criteria Documents: http://www.cdc.gov/niosh/pubs/criteria_date_desc_nopubnumbers.html Documentation of the Threshold Limit Values for Chemical Substances, 7 th Edition: (available through ACGIH store or by contacting USAFSAM) http://www.acgih.org/store/ProductDetail.cfm?id=675
Specific Techniques:	Conduct hands-on training and evaluation of OEEL options to select most appropriate standard.
Criterion Objective:	Given a scenario and references, recommend an appropriate OEEL successfully completing all checklist items with NO trainer assistance.
Notes:	

TASK STEPS

1. Identify the possible OEEL options.¹
2. When OEEL options differ, identify the appropriate basis and/or criteria documents.²
3. Review criteria/basis documents.³
4. Compare basis/criteria results to each other.⁴
5. Select the most appropriate OEEL.⁵

LOCAL REQUIREMENTS:

NOTES:

1. OEEL options include, but are not limited to, the OSHA PEL, NIOSH REL, and ACGIH TLV. Most often when there are disputing values, it will occur between these three options.
2. Each of the three above organizations have specific methods for documenting the process used to determine their OEELs. The links for each of these are found in the training support materials.

NIOSH RELs are documented in *Criteria Documents* that are developed to provide the basis for comprehensive occupational safety and health standards. These documents generally contain a critical review of the scientific and technical information available on the prevalence of hazards, the existence of safety and health risks, and the adequacy of methods to identify and control hazards. Many chemicals are combined in individual documents under the chemical class. For instance, the criteria information for acetone, methyl ethyl ketone, cyclohexanone, and isophorone (among others) are found in the Ketone criteria document.

OSHA PELs may be documented in the preambles for the final rules. Very few preambles exist for most OSHA PELs. The majority of OSHA PELs are based on the values found in the 1968 ACGIH TLV booklet. Confirmation of this is frequently found in the NIOSH Criteria Document under the section *Basis for Previous Standards*.

ACGIH TLVs are documented in the Documentation of the Threshold Limit Values for Chemicals. This document is available for purchase from ACGIH through the provided website. TLVs are based on available information from industrial experience, from experimental human and animal studies, and when possible, from a combination of all three.

The following information is generally found in each of the various documentation formats (not all information types may be present for each chemical substance): 1) Animal studies which may include acute, subchronic, and chronic effects as well as effects on specific target organs or systems; 2) Human studies which may include case studies, experimental studies, epidemiological studies (e.g. cohort studies), as well as effects on specific target organs or systems.

3. There is a variety of information that should be considered when reviewing the criteria and/or basis documents. The first thing to consider is the date of implementation. Each OEEL has a date it was implemented. For NIOSH RELs, it is the date the criteria document was published. For many OSHA PELs it is the 1968 ACGIH TLV booklet value. To determine when an OSHA PEL value was originally established, a review of the *Historical TLVs* in the TLV basis document is necessary. It will identify the date when a given TLV was first implemented. Pay close attention to TLV dates as many chemicals have both a TWA and a STEL/Ceiling OEEL. A STEL may have been updated recently but the TLV may be decades old.

When reviewing the basis/criteria documents, start by reviewing what type of human studies were used. One type of human studies is case reports. These provide results of known exposures to the chemical and health results. These may be occupationally related or otherwise. Review these to determine their applicability to an occupational setting. Another type of human study is experimental studies. These involve intentional exposure to known doses under controlled circumstances. These generally are geared toward acute health effects but provide health effect date to specific, known concentrations. A third type of study is epidemiological studies. These usually involve correlating occupational exposures

to the chemical to health effects associated with the chemical. They often include the identification of exposure levels as found through air sampling.

In the absence of human information, animal studies would take the next level of precedence. Determine whether the animal studies were done on the chemical of concern or if they were done on other chemicals and extrapolations or analogies were drawn.

4. When comparing the basis/criteria of one organization's OEEL to another, start by identifying when the OEEL was determined. A more current OEEL generally has more recent studies associated with it. Next, identify the studies that were used in determining the OEELs. This can be done by using the footnotes listed in the documentation and then comparing them to the references. Start with human studies and, as necessary, continue to animal studies. Identify which studies were used in each OEEL. For OSHA PELs, this may not always be possible. For OSHA PELs based on the 1968 ACGIH TLV booklet, identify when the PEL value TLV was originally established by reviewing the Historical TLV or TLV chronology. Once the original date of the value is determined, identify those studies that were done before that date. This should provide a general idea of what information was available at the time the TLV/PEL was established. Once it has been identified which studies were used by multiple organizations, identify those studies that were only used by one organization. This will occur frequently when there is a significant difference in when different agencies established their OEELs. Review the dates of the studies to determine if they were completed during the interim between the OEEL establishment dates, and thus were not available to one organization, or if they were done beforehand and possibly not considered by the agency in the documentation review.

When available, review the exposure data from human studies. Identify any exposure levels with demonstrated health effects below any of the OEELs. For instance, the OSHA PEL for acetone is 1000 ppm and the ACGIH TLV-TWA is 500 ppm. A review of the ACGIH TLV basis document shows workers producing acetone exposed to levels of acetone at 700 ppm showed a variety of health effects. The study showed health effects at a known concentration that was below one of the OEELs, the OSHA PEL. This would suggest the OSHA PEL is not adequately protective against those health effects.

In situations where multiple OEELs were established in close proximity (1-2 years apart) and predominantly used the same studies (80-90%), identify how the OEEL was established. Was the OEEL established based on professional judgment? Was the OEEL established based on a mathematical comparison or conversion? Those with a more scientific method are generally "more appropriate".

This is a simplified hierarchy of precedence when reviewing basis/criteria documents: 1) OSHA, if most stringent, takes precedence over all others; 2) human studies "better than" animal studies; 3) more studies "better than" less studies; 4) more current "better than" older; 5) scientific/mathematical approach "better than" professional judgment.

5. Selection of the "most appropriate" OEEL should take into consideration all the different factors; what types of studies were available, the currency and relevancy of those studies, the number of studies utilized, etc. There is no one right method. The most appropriate value may not always be the most stringent OEEL. The most appropriate value will not always come from the same agency. While ACGIH often has the most current studies, there are cases where NIOSH or OSHA has more current information. A deferment to using the most stringent may result in the application of controls, and thus resources, not required for health protection and possibly creating additional worker hazards. A deferment to using the OSHA PEL may result in exposing workers without protection to exposure levels that may result in health effects. When uncertain, remember to contact the ESOH Service Center for assistance.

TRAINEE REVIEW QUESTIONS

STS Line Item 4.5.1.5.1: Select Appropriate Occupational and Environmental Exposure Limit (OEEL) (TLV, MCL, SPEGL, MEG, STEL, CEILING, Excursion Limits, etc)

1. What are the OEEL options for Acetone?

2. What are the most applicable basis and criteria documents for Acetone?

3. When reviewing the basis and criteria documents, what are the establishment dates for the different Acetone OEELs?

4. How many human studies were used for each of the OEELs for Acetone? Compare and contrast those used by different agencies.

5. Which OEEL would be most appropriate for Acetone? Why?

PERFORMANCE CHECKLIST

STS Line Item 4.5.1.5.1: Select Appropriate Occupational and Environmental Exposure Limit (OEEL) (TLV, MCL, SPEGL, MEG, STEL, CEILING, Excursion Limits, etc)

Proficiency Code:	3c
PC Definition:	Can do all parts of the task. Needs only a spot check of completed work. Can identify why and when the task must be done and why each step is needed

DID THE TRAINEE...		YES	NO
1. Identify the possible OEEL options?			
2. When OEEL options differ, identify the appropriate basis and/or criteria documents?			
3. Review criteria/basis documents?			
4. Compare basis/criteria results to each other?			
5. Select the most appropriate OEEL?			
Did the trainee successfully complete the task?			

TRAINEE NAME (PRINT)

TRAINER NAME (PRINT)

ANSWERS

1. What are the OEEL options for Acetone?

A:

NIOSH REL: 250 ppm

ACGIH TLV: 500 ppm

OSHA PEL: 1000 ppm

(Source: NIOSH Pocket Guide and ACGIH TLV Booklet)

2. What are the most applicable basis and criteria documents for Acetone?

A:

NIOSH REL: Criteria Document 78-173 *Ketones*

ACGIH TLV: Acetone Basis Document

OSHA PEL: NIOSH Criteria Document 78-173 *Ketones*

(Source: Note 2 of this QTP)

3. When reviewing the basis and criteria documents, what are the establishment dates for the different Acetone OEELs?

A: NIOSH REL established in 1978. ACGIH TLV established in 1997. OSHA PEL established based on 1968 ACGIH TLV booklet. TLV level first established in 1953.

(Source: NIOSH Criteria Document *Ketones 78-173* and ACGIH TLV Basis Document for *Acetone*.)

4. How many human studies were used for each of the OEELs for Acetone? Compare and contrast those used by different agencies.

A:

OSHA PEL: Up to 3 human studies (those dated prior to 1953 in NIOSH Criteria Document)

NIOSH REL: Approximately 7 human studies, all prior to 1973.

ACGIH TLV: Approximately 36 human studies, including 6 of the 7 used by NIOSH and 25 studies done after 1973.

(Source: NIOSH Criteria Document *Ketones 78-173* and ACGIH TLV Basis Document for *Acetone*.)

5. Which OEEL would be most appropriate for Acetone? Why?

A:

ACGIH TLV (500 ppm): It is based on the most human studies. It has the greatest currency. ACGIH TLV basis document shows health effects at levels below the OSHA PEL. ACGIH provides scientific rationale questioning results for health effect exposures below 500 ppm.

(Source: Notes 3, 4 and 5 of this QTP)